



Analysis of the Occupational Health and Safety (K3) System in Reducing the Number of Work Accidents in the Bahyangkari Building Construction Project of the Lamongan Police

Akmal Fibriansyah ¹, Agus Setiawan ², Ibnu Toto husodo ³, Ahmad Baharudin Amirullah ⁴

^{1,2} Prodi Teknik Sipil Universitas Islam Darul `ulum Lamongan, Jl. Airlangga No. 03, Sukodadi, Kabupaten Lamongan, Jawa Timur Indonesia, ³ Program Studi Teknik Sipil, Fakultas Teknik dan Informatika, Universitas PGRI Semarang Jl. Sidodadi Timur No. 24, Karangtempel, Semarang Timur District, Semarang City, Central Java 50232, ⁴ Department of Civil Engineering, Faculty of Science and Technology, University Islamic of Nahdlatul Ulama, No. 09 Taman Siswa Street, Pekeng, Tahunan, Jepara, 59427, Indonesia

Corresponding author: akmalfibriansyah@gmail.com

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Abstract

This study aims to analyze the implementation of Occupational Safety and Health (K3) in an effort to reduce the number of work accidents in the construction project of the Bahyangkari Building of the Lamongan Police Department. K3 is a system that aims to create a safe and healthy work environment, as well as minimize the potential for accidents in the field. This study uses a quantitative method with a survey approach by distributing questionnaires to 84 respondents consisting of workers, foremen, and project supervisors. The data obtained were analyzed using SPSS software version 27 through validity and reliability tests, multiple linear regression, t-tests, and F-tests. The results of the study indicate that the implementation of K3 has generally been running well. Of the three main variables studied, namely K3 policy, work environment conditions, and worker safety, only environmental conditions were proven to have a partial significant effect on the number of work accidents. However, simultaneously, all three variables had a significant effect on reducing the number of work accidents in the project. These findings confirm that a well-organized work environment and consistent implementation of K3 are very important in creating a safe construction project.

Keywords: K3, work accidents, construction projects, work environment conditions, work safety

1. Introduction

Occupational safety and health (OHS) is a crucial aspect of any construction project, particularly in building construction, which involves high-risk physical activity. The construction services sector plays a vital role in supporting national economic growth, but also carries a high potential for workplace accidents, ranging from minor injuries to fatalities [1]. These accidents often occur due to worker negligence, violations of safety procedures, and unsafe working conditions [2]

One of the dominant causes is workers' lack of understanding of the importance of using personal protective equipment (PPE), as well as a work culture that tends to ignore safety procedur [3]. The implementation of Occupational Safety and Health (OHS) is a strategic step to minimize the risk of workplace accidents. OHS aims to create a safe, comfortable, and orderly work environment through compliance with safety standards. In practice, the implementation of OHS in the Bahyangkari Building Construction Project of the Lamongan Police Department faces various challenges, one of which is the inconsistent use of PPE among workers [2].

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Three large quantitative studies in the Indonesian construction sector (Hartono et al., Tangerang; OHS \approx 68% \rightarrow "good" category), Faizah et al., Surakarta; OHS \approx 71.49% with an accident rate of only 0.8% and a very strong correlation), and Eufrosina et al., Denpasar; OHS explains 87.5% of the variation in workplace accidents, with workers/management as the dominant risk reducer). All show that OHS implementation at a "good" level (60–85%) consistently reduces the risk of workplace accidents, although its effectiveness can be eroded by low worker awareness and limited PPE budgets (as seen in a qualitative study in Lamongan). These findings encourage recommendations for further research to combine quantitative and qualitative methods, expand the scope of dominant variables (management, workers, PPE, materials), and design interventions to increase worker awareness and more efficiently utilize budgets.

Therefore, this study was conducted to evaluate the extent to which OHS was implemented in the project and to assess its impact on reducing workplace accidents. Through a quantitative approach, this study is expected to provide an objective overview of the effectiveness of the implementation of the occupational safety system in the field [4]. The results are expected to contribute to efforts to improve occupational safety standards in the construction sector.

1.1. Structure

National construction projects include the construction of roads, bridges, buildings, factories, and other public infrastructure that are carried out in a planned and physical manner; project types consist of building construction (carried out in limited areas for residential/shops) and civil (for public utilities in large areas) [5]; this project is characterized by high-risk multistage activities influenced by weather, design, implementation methods, new technology, high levels of labor rotation, and coordination of many parties [6]; therefore the potential for work accidents—including injuries, occupational diseases, or incidents during travel—generally stems from unsafe working conditions, the use of incorrect tools or materials, and human error [7]; optimal prevention is achieved through routine risk assessments, training based on worker experience, close supervision during the project, provision and arrangement of PPE, and comprehensive work location planning; The implementation of the Occupational Health and Safety (K3) System based on Ministerial Decree No. 463/MEN/1993 is crucial for creating a healthy, safe, efficient, and productive work environment—especially when supported by facilities such as helmets, safety shoes, gloves, body harnesses, warning signs, safety fences, and the availability of on-site first aid services[2].

2. Method

This study employed a quantitative approach based on a cross-sectional survey using a Likert-scale questionnaire and brief interviews to collect primary data from survey respondents and integrate secondary project data. This was followed by construct validity and internal reliability (Cronbach's α) testing to ensure the instrument's validity. SPSS software was then used for inferential statistical analysis, such as regression or correlation, to test the hypothesis regarding the relationship between K3 implementation and the workplace accident rate. The procedure included problem identification, variable and hypothesis formulation, sample selection, instrument testing, data collection, and statistical analysis, followed by objective, numerical evidence-based conclusions.

3. Results and Discussion

3.1 Respondent Characteristics

Before conducting data analysis, it is necessary to understand the background of the respondents, as they are the primary source of information for this study. Respondents in this study consisted of workers, foremen, craftsmen, and OHS supervisors directly involved in high-risk activities on the Bahyangkari Building construction project at the Lamongan Police Department. Selection was conducted using a purposive sampling technique, based on their direct involvement in fieldwork that carries high OHS risks, such as working at heights or structural work. The distribution of respondents' positions is as follows:

- a. OHS Supervisor: 16.7%
- b. Laborer: 40.5%
- c. Foreman: 7.1%
- d. Craftsman: 35.7%

Therefore, the majority of respondents are operational workers, so their opinions reflect the actual conditions of OHS implementation in the field.

3.2 Validity Test of the Research Instrument

Validity aims to measure the extent to which the measuring instrument (questionnaire) is able to measure what it is intended to measure. In this study, validity was tested using Pearson correlation, with a minimum threshold of $r = 0.2146$ (for $N = 84$, $\alpha = 0.05$). Results: All questionnaire items for variables X1 (OHS policy), X2 (environmental conditions), X3 (occupational safety), and Y (workplace accidents) had calculated r values $>$ table r , thus all items were declared valid. Significance: Each question in the questionnaire reliably measures the concept under study.

3.3 Instrument Reliability Test

Reliability is a measure of the consistency of an instrument when used repeatedly. The Cronbach's Alpha method was used, where a value ≥ 0.60 indicates reliability, and ≥ 0.80 is considered highly reliable. The results are as follows:

- OHS Policy (X1): 0.891
- Environmental Conditions (X2): 0.866
- Occupational Safety (X3): 0.851
- Occupational Accidents (Y): 0.895

This means that all instruments are highly reliable; meaning the data collected is consistent and trustworthy.

3.4 Multiple Linear Regression Test

Multiple linear regression is used to test the joint and individual effects of independent variables on the dependent variable. In this context: Dependent variable (Y): occupational accidents; and Independent variables (X1, X2, X3): OHS policy, environmental conditions, and occupational safety. The results are as follows:

- Only X2 (environmental conditions) has a partial significant effect ($p = 0.032 < 0.05$).
- X1 (OHS policy) and X3 (occupational safety) are not partially significant.

This means that the factor that most contributes to the reduction in occupational accidents is the quality of the work environment.

3.5 T-Test (Partial Effect)

The t-test was conducted to determine the effect of each independent variable separately on occupational accidents. The results are as follows:

Table 1. T test results

Model	Unstandardized Coefficients B	Standardized Coefficients Std. Error	Number of Workers Beta	t	Sig.
Constanta	2,136	,490		4,360	,000
K3 policy (x1.1)	,163	,145	,183	1,120	,266
environmental conditions (x2.1)	,254	,116	,279	2,185	,032
work safety (x3.1)	,147	,142	,149	1,032	,305

Source : Researcher Processing (2025)

- Occupational Health and Safety Policy (X1): not significant ($p = 0.266$)
- Environmental conditions (X2): significant ($p = 0.032$)
- Occupational safety (X3): not significant ($p = 0.305$)

This means that only X2 is statistically proven to have an impact on reducing workplace accidents.

3.6 F Test (Simultaneous Effect)

The F test is used to determine whether all independent variables (X1, X2, X3) simultaneously influence the dependent variable (Y). The results are as follows:

Table 2. F test results

Model	Sun of Squares	Df	Mean Square	F	Sig.
Regression	4,528	3	1,509	10,840	,000 ^b
Residu	11,139	80	,139		
Total	15,667	83			

Source : Researcher Processing (2025)

- F count = 10.840
- Significance = 0.000 (<0.05)

Meaning: All three variables simultaneously have a significant impact on the workplace accident rate. This means that comprehensive implementation of OHS remains important even though only X2 is partially dominant.

3.7 Coefficient of Determination (R²)

R² explains how much of the change in workplace accidents can be explained by the regression model (X1, X2, X3). The result is R² = 0.799. This means that 79.9% of the variation in workplace accidents can be explained by these three variables. The remaining 20.1% likely comes from other factors, such as work fatigue, project pressure, or psychological factors.

3.8 Mean Analysis (Respondent Average)

This analysis provides an overview of respondents' perceptions of each indicator used in the study. The results are:

Table 4.8 Results of Mean Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Occupational accidents (y.2)	84	3	5	4,70	,555
OHS policy (x1.3)	84	3	5	4,74	,518
Occupational accidents (y.4)	84	3	5	4,74	,518
OHS policy (x1.1)	84	3	5	4,75	,488
OHS policy (x1.5)	84	3	5	4,75	,488
Occupational safety (x3.2)	84	3	5	4,79	,493
Occupational safety (x3.1)	84	3	5	4,79	,441
OHS policy (x1.4)	84	3	5	4,80	,510
Environmental conditions (x2.4)	84	3	5	4,80	,460
Occupational safety (x3.4)	84	3	5	4,80	,485
Occupational safety (x3.4)	84	3	5	4,81	,478
Environmental conditions (x2.2)	84	4	5	4,81	,395
Occupational accidents (y.3)	84	3	5	4,81	,478
Occupational safety (x3.3)	84	3	5	4,82	,415
Environmental conditions (x2.5)	84	3	5	4,82	,470
Occupational accidents (y.1)	84	3	5	4,83	,434
OHS policy (x1.2)	84	3	5	4,85	,396

	N	Minimum	Maximum	Mean	Std. Deviation
Occupational safety (x3.5)	84	3	5	4,85	,425
Environmental conditions (x2.3)	84	4	5	4,87	,339
Occupational accidents (y.5)	84	4	5	4,88	,326
Valid N (listwise)	84				

Source : Researcher Processing (2025)

- All indicators have a mean value > 4.70 , indicating that respondents view the implementation of OHS positively.
- The highest indicator: occupational accidents (Y5) = 4.88
- Low standard deviation \rightarrow respondents' perceptions are quite consistent

This means that respondents believe that the project has generally implemented OHS well, although improvements are needed in policy implementation and the use of PPE.

3.9 Implementation

Based on the results of questionnaires and field observations, the implementation of the Occupational Health and Safety Management System (SMK3) in this project can be considered fairly good, although there are still shortcomings in certain aspects. From the planning perspective, hazard identification has been carried out before the work begins, accompanied by routine briefings (toolbox meetings). A concrete example can be seen in the upper floor concreting work, where the foreman consistently emphasizes the importance of ensuring that scaffolding is safe before use.

The inspection and evaluation aspects are conducted through weekly inspections by supervisors. Violations, such as workers removing helmets or gloves, are immediately addressed. Even minor incidents, such as nearly slipping in wet areas, are used as evaluation material to improve work pathways.

The implementation of occupational safety practices is also quite evident. Most workers use personal protective equipment (helmets, safety shoes, and vests), high-risk areas are marked with warning signs, and specialized tasks such as welding are equipped with additional protective gear.

However, occupational safety policies and objectives are not yet fully understood by the workers. They are only aware of general rules without understanding the long-term goals, so this aspect has not had a significant impact on reducing workplace accidents.

Overall, the implementation of SMK3 is already good, particularly in planning, execution, supervision, and evaluation. Nevertheless, the dissemination of policies needs to be improved so that workers not only comply formally but also understand the benefits of their implementation.

3.10 Impact

Regression analysis shows that the implementation of the Occupational Health and Safety Management System (SMK3) simultaneously has a significant effect on workplace accidents (F-test = $0.000 < 0.05$). Partially, planning, implementation, as well as inspection and evaluation have a significant effect, while policy and objectives do not. This condition is consistent with field realities, where written regulations are not always effective because some workers still violate them, such as removing safety shoes during hot conditions.

On the other hand, thorough planning—such as checking material pathways before concreting—can reduce the risk of falling or being struck by objects. The use of personal protective equipment (PPE) protects workers from minor incidents, while routine inspection and evaluation become the most dominant factors as they help prevent more serious accidents.

The coefficient of determination (Adjusted R^2) of 0.830 indicates that 83% of workplace accidents are influenced by the implementation of SMK3, while the remaining 17% is affected by external factors such as weather, worker experience, and technical project conditions.

4. Conclusions

Based on the analysis and discussion, it can be concluded that the implementation of the Occupational Safety and Health (K3) System in the Bahyangkari Building construction project of the Lamongan Police Department is generally considered good. This is reflected in the average questionnaire score above 4.7 on a five-point scale, as well as the validity and reliability test results showing that all variables have a Cronbach's Alpha value above 0.85. The majority of respondents assessed that K3 policies, work environment conditions, and safety and health facilities have been implemented properly at the project site. In addition, the level of worker awareness regarding the use of personal protective equipment (PPE) and compliance with K3 procedures is also quite good. However, there are still certain areas that show inconsistencies in the implementation of K3, so there is a need for increased awareness and stricter supervision to ensure optimal K3 implementation across all parts of the project.

5. Declarations

5.1. Author Contributions

Conceptualization, A.F. and A.S.; methodology, I.T.H.; software, A.F.; validation, A.F., A.S., and A.B.A.; formal analysis, A.F.; investigation, I.T.H.; resources, I.T.H.; data curation, A.F.; writing—original draft preparation, A.S.; writing—review and editing, A.B.A.; visualization, A.B.A.; supervision, I.T.H.; project administration, I.T.H. All authors have read and agreed to the published version of the manuscript.

5.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.:

5.3. Funding

Funding information is not available:

5.4. Acknowledgements

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5.5. Conflicts of Interest

The authors declare no conflict of interest.:

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