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Analysis of SMK3 implementation in the SPKT building construction project of jembrana police resort

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abstract
The Occupational Safety and Health Management System (SMK3) is an essential aspect of construction projects for minimizing the risk of work accidents and creating a safe, healthy, and productive working environment. This study aims to analyze the implementation of SMK3, identify the factors influencing its implementation, and evaluate the efforts made to overcome obstacles in the implementation of SMK3 in the SPKT Building Construction Project of Jembrana Police Resort. This research employed a descriptive quantitative method, with data collected through questionnaires distributed to 30 respondents involved in the project. The collected data were analyzed using SPSS through descriptive statistical analysis based on mean values. The results showed that the implementation of SMK3 was categorized as very appropriate, with a mean value of 3.301. The factors influencing SMK3 implementation were categorized as influential, with a mean value of 3.0417. Occupational safety and health training was identified as the most dominant influencing factor, as it can improve workers' knowledge, skills, and awareness of workplace safety. The obstacles identified included a lack of occupational safety and health training, low awareness of the use of personal protective equipment (PPE), and inadequate safety planning. The efforts undertaken to overcome these obstacles included increasing K3 training, strengthening supervision, and improving safety facilities at the project site.
Keywords: *SMK3, occupational safety, construction project, work safety, K3 training*

INTRODUCTION

Construction projects are one of the sectors with a relatively high level of occupational safety and health risk because they involve complex activities, various types of equipment, construction materials, and constantly changing working conditions. Activities such as excavation, structural work, material handling, operation of heavy equipment, electrical installation, and work at heights can expose workers to various hazards. The dynamic nature of construction projects also makes safety management more challenging because the work environment and associated risks can change as the project progresses. Therefore, occupational safety and health must be integrated into construction project management from the planning stage through project completion. Occupational safety is not only intended to prevent accidents but also to ensure that construction activities can be carried out effectively, efficiently, and sustainably (Widiasanti & Lenggogeni, 2018; Lingard & Rowlinson, 2005).

The high-risk characteristics of construction work require systematic identification and control of potential hazards. Occupational accidents can result in injuries, fatalities, property damage, project delays, additional costs, and decreased productivity. Inadequate safety management may further increase workers' exposure to unsafe conditions and unsafe acts. Awwad et al. (2016) explain that construction projects in developing countries commonly face challenges related to safety practices, including inadequate safety awareness, insufficient resources, and weaknesses in safety management. Similarly, Zhou et al. (2015) emphasize that safety management in the construction industry involves multiple dimensions, including organizational management, worker behavior, safety practices, and environmental conditions. These conditions demonstrate the importance of implementing a comprehensive occupational safety and health management system in construction projects.

One of the important approaches to managing occupational safety and health in Indonesia is the Occupational Safety and Health Management System (SMK3). SMK3 provides a systematic framework for integrating occupational safety and health into an organization's management system. Government Regulation of the Republic of Indonesia Number 50 of 2012 concerning Occupational Safety and Health Management Systems establishes the implementation of SMK3 as an organized process involving policy development, planning, implementation, monitoring, evaluation, and continuous improvement. Through this system, occupational safety and health are expected to become an integral part of organizational activities rather than merely an administrative requirement (Government Regulation of the Republic of Indonesia Number 50 of 2012). The systematic implementation of SMK3 can therefore support organizations in identifying risks, determining preventive measures, monitoring safety performance, and improving safety conditions continuously.

The implementation of SMK3 is particularly important in construction projects because the work environment contains numerous potential hazards. Construction activities may involve work at heights, the use of temporary structures, heavy equipment operation, electrical work, material handling, and interaction between workers and machinery. Among these hazards, work involving cranes and other lifting equipment requires particular attention because improper operation, inadequate inspection, or poor coordination can lead to serious accidents. Neitzel et al. (2001) highlight the importance of crane safety in construction due to the potential consequences associated with equipment failure, improper operation, and unsafe working practices. Therefore, construction safety management must ensure that equipment is properly maintained,

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operators are competent, work areas are controlled, and workers understand the hazards associated with construction activities.

Another important aspect of SMK3 implementation is hazard identification and risk assessment. Before construction activities are performed, potential hazards should be identified and their associated risks assessed to determine appropriate control measures. Risk assessment allows project management to prioritize hazards based on their probability and potential consequences. Fung et al. (2010) emphasize the importance of risk assessment models in construction safety management as a means of systematically identifying and evaluating safety risks. Effective risk assessment can support decision-making and enable project managers to allocate safety resources to areas with higher levels of risk. Consequently, risk assessment should not be conducted only at the beginning of a project but should be reviewed periodically as work conditions and construction activities change.

In addition to risk assessment, the implementation of SMK3 depends heavily on worker behavior. Unsafe behavior can occur when workers ignore safety procedures, fail to use personal protective equipment (PPE), take shortcuts, or underestimate workplace hazards. Fang et al. (2016) explain that unsafe behavior among construction workers can be influenced by cognitive processes, perceptions, and individual responses to workplace conditions. Human error is also an important factor in occupational accidents. Reason (2000) explains that human error should be understood within the broader context of organizational and system-related factors rather than being attributed solely to individual workers. This perspective indicates that reducing unsafe behavior requires not only disciplinary measures but also improvements in training, supervision, work procedures, communication, and organizational safety systems.

Worker competence and occupational safety training are therefore essential elements in SMK3 implementation. Training provides workers with knowledge and skills concerning workplace hazards, safe work procedures, emergency response, and the correct use of PPE. Workers who have adequate safety knowledge are more likely to recognize hazards and take appropriate preventive actions. Fatimah et al. (2025) found that training and supervision are important elements supporting the implementation of an integrated SMK3 system in construction projects. Similarly, Vinodkumar and Bhasi (2010) demonstrated that safety management practices can influence safety behavior, indicating that organizational efforts to provide safety training, communication, and management support can contribute to improved worker safety behavior. Thus, occupational safety training should be conducted regularly and adjusted to the characteristics of the work being performed.

The use of personal protective equipment is another essential component of occupational safety in construction. PPE can provide protection when hazards cannot be completely eliminated through engineering or administrative controls. Depending on the nature of the work, construction workers may require safety helmets, safety shoes, gloves, protective glasses, reflective vests, hearing protection, or fall protection equipment. However, the availability of PPE does not automatically guarantee worker safety. Workers must understand the purpose of PPE and consistently use the appropriate equipment. Low awareness or poor compliance with PPE requirements can increase the risk of injury. This issue is closely related to safety behavior because workers' perceptions and attitudes toward safety influence their willingness to comply with established safety procedures (Vinodkumar & Bhasi, 2010; Fang et al., 2016).

Supervision is also an important factor in ensuring that safety procedures are consistently implemented in the field. Construction workers may understand safety requirements but still engage in unsafe practices because of work pressure, established habits, lack of awareness, or inadequate monitoring. Effective supervision enables project personnel to identify unsafe acts and unsafe conditions and take corrective action before accidents occur. Hinze et al. (2013) explain that leading indicators can be used to evaluate construction safety performance before accidents occur, highlighting the importance of proactive safety activities such as inspections, training, and safety observations. Li et al. (2015) similarly emphasize proactive behavior-based safety management as an approach to improving construction safety. Therefore, safety supervision should focus not only on responding to accidents but also on identifying and correcting unsafe conditions before they result in incidents.

Safety management also requires strong commitment from project management. Project managers and contractors have an important role in establishing safety policies, providing adequate resources, ensuring worker competence, and monitoring safety performance. Teo et al. (2005) emphasize the role of project managers in managing construction safety through systematic planning, coordination, communication, and control. Management commitment can influence how workers perceive the importance of occupational safety within the organization. When management consistently demonstrates that safety is a priority, workers are more likely to comply with safety requirements. Conversely, weak management commitment may result in safety procedures being treated as secondary to productivity and project completion targets (Mohammadi et al., 2018).

Safety culture and safety climate are closely related to management commitment and worker behavior. A strong safety culture encourages workers and management to communicate openly about hazards, report unsafe conditions, participate in safety programs, and take collective responsibility for accident prevention. Zohar (1980) introduced the concept of safety climate to describe employees' perceptions of the importance of safety within an organization. In construction, a positive safety climate can encourage workers to prioritize safe work practices even under challenging project conditions. Goh et al. (2018) further indicate that safety performance in construction is dynamic and can be affected by changes in organizational and operational conditions. Therefore, developing a positive safety culture requires continuous communication, supervision, evaluation, and commitment from all project stakeholders.

The relationship between safety and productivity should also be considered in construction project management. Occupational safety should not be viewed as an obstacle to project productivity or as an additional burden that increases project costs. On the contrary, effective safety management can prevent accidents, reduce work interruptions, minimize damage to equipment and materials, and improve worker performance. Aziz and Hafez (2013) explain that improvements in construction performance can be achieved through systematic approaches that reduce waste and improve work processes. From a safety perspective, reducing unsafe activities and improving work organization can contribute to both safety and operational efficiency. Therefore, the implementation of SMK3 can support not only worker protection but also the achievement of project objectives in terms of time, cost, quality, and productivity.

Previous studies in Indonesia have also demonstrated the importance of SMK3 implementation in construction projects. Risnaldi et al. (2023) examined the implementation of SMK3 in building construction projects and highlighted the importance of applying safety management practices to protect workers and control construction risks. Anggana et al. (2025) evaluated SMK3 implementation in a high-rise building construction project and showed the importance of assessing the extent to which safety management requirements are implemented in actual project activities. These findings indicate that the effectiveness of SMK3 should be evaluated based on field conditions rather than solely on the existence of written safety policies. Evaluation can identify gaps between planned safety measures and their actual implementation.

Recent research also emphasizes the importance of integrated strategies in implementing SMK3. Fatimah et al. (2025) analyzed strategies for implementing an integrated SMK3 system in construction projects in Banda Aceh and identified training and supervision as important supporting factors. Juliar et al. (2025) also examined the implementation and control of SMK3 in relation to occupational safety and health performance on construction projects. These studies demonstrate that effective safety management requires the integration of planning, implementation, monitoring, and control. Therefore, the evaluation of SMK3 implementation should examine not only individual safety practices but also the relationships between management commitment, worker competence, supervision, safety facilities, and safety behavior.

The importance of continuous safety evaluation is further supported by research on construction safety performance. Wardhani et al. (2025), in their study of SMK3 implementation in road construction projects, demonstrate that the application of safety management principles is necessary to control risks arising from construction activities. Mohammadi et al. (2018) also identify several organizational and project-related factors that influence safety performance. These findings suggest that safety performance is influenced by multiple interconnected factors rather than a single variable. Consequently, construction project management needs to identify the dominant factors affecting safety implementation so that improvement strategies can be developed according to the actual needs and conditions of each project.

The SPKT Building Construction Project of Jembrana Police Resort is one construction project that requires serious attention to occupational safety and health. The project involves construction activities that may expose workers to various occupational hazards. As with other building construction projects, activities such as material handling, structural work, installation, work at heights, and the use of construction equipment require appropriate safety procedures. The implementation of SMK3 is therefore necessary to ensure that workers are adequately protected and that project activities can be performed safely and efficiently. The application of appropriate safety management is also important to prevent accidents that could disrupt the progress and performance of the project (Risnaldi et al., 2023; Wardhani et al., 2025).

Based on conditions observed in the project, several issues related to SMK3 implementation require further attention. These include low worker awareness regarding the use of PPE, inadequate occupational safety training, and insufficient safety supervision. Such conditions may increase workers' exposure to occupational hazards and create a gap between established safety requirements and actual practices in the field. Fang et al. (2016) indicate that unsafe behavior is influenced by workers' perceptions and cognitive processes, while Hinze et al. (2013) emphasize the importance of proactive safety indicators in preventing accidents. Therefore, addressing these issues requires a combination of worker education, effective supervision, safety communication, and continuous evaluation.

The lack of adequate safety planning may also become an obstacle to effective SMK3 implementation. Safety planning should be integrated with construction planning so that hazards can be anticipated before work begins. It should include hazard identification, risk assessment, control measures, allocation of safety responsibilities, emergency procedures, and provision of safety facilities. Fung et al. (2010) emphasize the importance of systematic risk assessment, while Teo et al. (2005) highlight the role of project managers in planning and controlling construction safety. Therefore, improving safety planning can provide a stronger foundation for preventing accidents and ensuring that safety requirements are incorporated into daily project activities.

In addition to improving planning, efforts to strengthen worker training and supervision are essential for overcoming the obstacles identified in the project. Training should be provided according to the risks associated with specific construction activities, while supervision should be conducted consistently to ensure that workers apply the knowledge obtained during training. Fatimah et al. (2025) emphasize the role of training and supervision in supporting integrated SMK3 implementation. Li et al. (2015) further indicate that proactive behavior-based safety management can contribute to construction safety improvement. These approaches suggest that safety improvement should focus on prevention and behavioral change rather than relying solely on corrective action after accidents occur.

The evaluation of SMK3 implementation is therefore necessary to determine whether occupational safety and health practices in the SPKT Building Construction Project of Jembrana Police Resort have been implemented appropriately. The evaluation can provide an overview of the existing level of implementation and identify aspects that require improvement. In quantitative research, descriptive analysis can be used to describe respondents' assessments of safety

implementation and the factors influencing it. Sugiyono (2019) explains that quantitative research provides a systematic approach to collecting and analyzing numerical data to describe phenomena and examine relationships among variables. Accordingly, the use of questionnaires and descriptive statistical analysis can provide measurable information regarding the implementation of SMK3 in the project.

Based on the background described above, this study was conducted to determine the level of Occupational Safety and Health Management System (SMK3) implementation in the SPKT Building Construction Project of Jembrana Police Resort, identify the factors influencing its implementation, and evaluate the efforts undertaken to overcome the obstacles encountered during project implementation. The study is expected to provide practical information for project management, contractors, safety officers, and workers regarding aspects of SMK3 that require improvement. The results may also contribute to the development of more effective safety strategies through increased training, strengthened supervision, improved PPE compliance, better safety planning, and enhancement of safety facilities. Ultimately, effective SMK3 implementation is expected to minimize occupational accidents and diseases, strengthen the safety culture, improve worker performance, and support the successful completion of construction projects (Anggana et al., 2025; Juliar et al., 2025).

LITERATURE REVIEW

Occupational Safety and Health Management System (SMK3)

SMK3 is a part of the overall management system used to control occupational safety and health risks in the workplace. According to Government Regulation of the Republic of Indonesia Number 50 of 2012, SMK3 aims to create a safe, efficient, and productive work environment.

Occupational Safety in Construction Projects

Construction projects have a high level of occupational risk due to the complexity of work activities. Tarwaka (2017) explained that occupational safety implementation in construction projects can reduce work accidents and improve worker productivity.

Factors Affecting SMK3 Implementation

Several factors influence the implementation of SMK3, including occupational safety training, supervision, planning, worker awareness, and availability of safety facilities. Wardhani et al. (2025) stated that K3 training and supervision significantly influence workers' compliance in implementing occupational safety procedures.

Conceptual Framework

The conceptual framework of this study explains the relationship between factors influencing SMK3 implementation and the level of SMK3 implementation in construction projects.

Factors Influencing SMK3:

- K3 Training
- Safety Supervision
- Safety Planning
- PPE Awareness
- Safety Facilities

METHODOLOGY

Research Design

This study employed a descriptive quantitative research method to analyze the implementation of the Occupational Safety and Health Management System (SMK3) in the SPKT Building Construction Project of Jembrana Police Resort. A quantitative approach was selected because the research required measurable data obtained from respondents and analyzed statistically to describe the actual condition of SMK3 implementation. According to Sugiyono (2019), quantitative research emphasizes the collection of numerical data and its analysis using statistical procedures to describe phenomena systematically. In the context of construction safety, quantitative assessment can provide measurable information regarding the extent to which safety management practices are implemented in a project. This approach is also consistent with previous construction safety studies that assess safety management practices, safety performance, and SMK3 implementation using structured indicators and respondent assessments (Anggana et al., 2025; Risnaldi et al., 2023).

The descriptive approach was used because this study focused on describing the existing condition of SMK3 implementation without manipulating the variables under investigation. The research assessed how occupational safety and health management practices were implemented, the factors influencing their implementation, and the obstacles encountered during project activities. Descriptive analysis is appropriate for providing an overview of respondents' perceptions regarding safety practices and management conditions in construction projects. Mohammadi et al. (2018) explain that construction safety performance is influenced by various project, organizational, and management factors, making systematic assessment necessary to understand the existing safety condition. Therefore, the descriptive quantitative design in this study was intended to provide an objective overview of SMK3 implementation based on measurable responses from project personnel.

Research Object and Location

The object of this study was the implementation of the Occupational Safety and Health Management System (SMK3) in the SPKT Building Construction Project of Jembrana Police Resort. The research was conducted at the project location in Jembrana Regency, Bali, Indonesia. The project was selected because construction activities involve various

potential occupational hazards that require proper safety management, including material handling, construction equipment operation, work at heights, and other activities associated with building construction. Construction projects have dynamic working environments in which risks can change according to the progress and type of work being conducted (Widiasanti & Lenggogeni, 2018). Therefore, evaluating SMK3 implementation at the project location is important for determining whether safety management practices are adequately applied to control potential hazards.

The selection of the project as the research object was also based on the need to examine the practical implementation of safety management rather than focusing solely on written policies or regulatory requirements. The implementation of SMK3 requires systematic planning, implementation, monitoring, evaluation, and continuous improvement, as stipulated in Government Regulation of the Republic of Indonesia Number 50 of 2012. Previous research has demonstrated that the implementation of safety management systems in construction projects may be affected by worker awareness, management commitment, supervision, training, and safety facilities (Fatimah et al., 2025; Juliar et al., 2025). Therefore, the selected project provides an appropriate context for examining the implementation of SMK3 and identifying factors that influence its effectiveness.

Population and Respondents

The respondents in this study consisted of workers, supervisors, and project stakeholders who were directly involved in the SPKT Building Construction Project of Jembrana Police Resort. A total of 30 respondents participated in the study. The respondents were selected because they had direct experience with construction activities and were considered capable of providing information regarding occupational safety and health practices at the project site. In construction safety research, involving personnel who are directly exposed to project activities is important because their perceptions and experiences can provide valuable information concerning actual safety practices. Fang et al. (2016) emphasize that construction workers' perceptions and cognitive responses can influence unsafe behavior, while Vinodkumar and Bhasi (2010) demonstrate the relationship between safety management practices and worker safety behavior.

The involvement of workers and supervisory personnel also allows the study to obtain information from different levels of project activities. Workers can provide information regarding the practical application of safety procedures, PPE use, training, and workplace conditions, while supervisors and project personnel can provide information concerning safety planning, monitoring, and management practices. This approach is consistent with the principle that construction safety is a shared responsibility involving workers, supervisors, contractors, and project managers (Teo et al., 2005; Lingard & Rowlinson, 2005). Therefore, the respondents were expected to provide a comprehensive assessment of SMK3 implementation in the project.

Types and Sources of Data

This study used both primary and secondary data. Primary data were obtained directly from respondents through questionnaires and from observations conducted at the project location. The questionnaire was designed to obtain respondents' assessments of SMK3 implementation and factors influencing occupational safety and health practices. Direct observation was used to complement questionnaire data by examining actual conditions at the construction site, particularly regarding PPE use, safety facilities, work practices, and safety supervision. The combination of respondent assessments and field observations is useful because safety performance may be influenced by the difference between formal safety requirements and actual practices in the field (Tam et al., 2004; Awwad et al., 2016).

Secondary data were obtained from scientific journals, books, government regulations, and other relevant literature related to occupational safety and health management and construction safety. The literature was used to establish the theoretical foundation of the study, develop research indicators, and support interpretation of the findings. Government Regulation of the Republic of Indonesia Number 50 of 2012 was used as an important regulatory reference concerning SMK3 implementation in Indonesia. In addition, previous studies concerning construction safety management, safety behavior, risk assessment, and safety performance were reviewed to identify relevant factors and indicators (Zhou et al., 2015; Fung et al., 2010). Literature review also helped ensure that the questionnaire indicators were relevant to the objectives of the research.

Data Collection Methods

Data collection in this study consisted of questionnaire distribution, direct observation, and literature study. First, questionnaires were distributed directly to 30 respondents involved in the project. The questionnaire contained statements related to the implementation of SMK3 and factors influencing safety management. Respondents were asked to provide assessments based on their experience and observations during project implementation. Questionnaires are appropriate for quantitative research because they allow perceptions and assessments from multiple respondents to be converted into numerical data that can subsequently be analyzed statistically (Sugiyono, 2019). The questionnaire indicators were developed based on occupational safety management principles, including training, supervision, PPE use, safety planning, safety facilities, and worker awareness.

Second, direct observation was conducted at the construction project location. Observation was intended to identify actual safety conditions and practices, including the use of PPE, implementation of safety procedures, availability of safety facilities, workplace conditions, and supervisory activities. Observation is important because construction safety performance can be dynamic and may change according to project activities and working conditions (Goh et al., 2018). Furthermore, proactive safety management requires continuous identification of unsafe conditions and behaviors before they

result in accidents (Hinze et al., 2013; Li et al., 2015). Therefore, field observation was used as supporting information for the questionnaire results.

Third, a literature study was conducted by reviewing books, scientific journals, regulations, and previous research related to SMK3 and construction safety management. The literature review included studies concerning safety management systems, worker safety behavior, safety climate, risk assessment, safety performance, and construction project management. Previous studies by Anggana et al. (2025), Fatimah et al. (2025), Risnaldi et al. (2023), and Wardhani et al. (2025) were used as references for understanding the implementation of SMK3 in construction projects. International literature was also used to strengthen the theoretical basis, particularly studies on safety behavior, safety climate, safety management practices, and risk control (Zohar, 1980; Reason, 2000; Mohammadi et al., 2018).

Research Instrument

The main research instrument used in this study was a structured questionnaire. The questionnaire was developed based on indicators relevant to SMK3 implementation and factors influencing construction safety. The indicators included occupational safety training, safety supervision, PPE use, safety planning, safety facilities, worker awareness, and other relevant safety management practices. The selection of these indicators was based on the understanding that construction safety performance is influenced by multiple organizational and individual factors. Mohammadi et al. (2018) identify several factors influencing safety performance in construction projects, while Vinodkumar and Bhasi (2010) demonstrate that safety management practices are associated with safety behavior. Therefore, the questionnaire was designed to capture respondents' perceptions of these aspects.

The questionnaire used a four-point assessment scale to avoid a neutral response and encourage respondents to provide a clear assessment of the conditions observed in the project. The assessment results were converted into numerical scores and analyzed using descriptive statistics. The use of structured numerical responses enables researchers to calculate mean values and compare the implementation level among different indicators. According to Sugiyono (2019), quantitative instruments should be designed systematically so that the resulting data can be analyzed objectively. The questionnaire was therefore tested for validity and reliability before being used as the basis for interpreting the research findings.

Data Analysis

The questionnaire data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistical analysis was applied to determine the general condition of SMK3 implementation and the influence level of each factor. The main statistical measures used in this study were the mean and standard deviation. The mean value was used to determine the average response of respondents for each indicator, while the standard deviation was used to describe the variation or distribution of respondents' answers. Descriptive statistical analysis is suitable for summarizing quantitative data and presenting the overall characteristics of respondents' assessments (Sugiyono, 2019).

The mean value was calculated using the following formula:

$$\bar{X} = \sum XN \quad \text{..... (1)}$$

Where:

- $\bar{X}$ = Mean value
- $\sum X$ = Total score of respondents' answers
- N = Number of respondents

The categorization of mean values provides a systematic basis for interpreting respondents' perceptions regarding SMK3 implementation. A higher mean indicates a stronger level of agreement or a more appropriate implementation of the assessed safety practice. This approach is useful for identifying dominant safety factors and determining areas requiring improvement. Previous research on construction safety has similarly emphasized the importance of measuring safety management practices and identifying factors associated with safety performance (Hinze et al., 2013; Goh et al., 2018; Wardhani et al., 2025).

Validity and Reliability Tests

Before the questionnaire data were analyzed, validity and reliability tests were conducted to determine whether the research instrument was appropriate for collecting data. The validity test was performed to determine whether each questionnaire item adequately measured the intended variable or indicator. The calculated correlation coefficient (r-count) for each item was compared with the r-table value at the predetermined significance level. An item was considered valid when the r-count was greater than the r-table value. Instrument validity is important because inaccurate measurement may affect the reliability of the research conclusions (Sugiyono, 2019).

The reliability test was conducted using Cronbach's Alpha. Reliability testing was intended to determine the internal consistency of the questionnaire items within each variable. An instrument was considered reliable when the Cronbach's Alpha value was greater than 0.60. A reliable instrument indicates that the items used to measure a particular construct have sufficient consistency. This testing procedure is important in quantitative research because the results of statistical analysis depend on the quality of the measurement instrument. In the context of construction safety research, reliable measurement is particularly important because safety management practices involve several interrelated dimensions, including management commitment, worker behavior, training, supervision, and safety procedures (Vinodkumar & Bhasi, 2010; Mohammadi et al., 2018).

Overall, the research method was designed to provide a systematic and measurable assessment of SMK3 implementation in the SPKT Building Construction Project of Jembrana Police Resort. The combination of questionnaires,

direct observation, and literature study enabled the research to obtain quantitative information while maintaining a connection with actual project conditions. The use of validity and reliability testing strengthened the quality of the questionnaire data, while descriptive statistical analysis provided a basis for determining the level of implementation and identifying dominant influencing factors. This methodological approach is consistent with the need for systematic evaluation of occupational safety management in construction projects, where effective safety performance depends on the interaction between organizational systems, management practices, worker behavior, supervision, and workplace conditions (Zhou et al., 2015; Juliar et al., 2025).

RESEARCH RESULT

Analysis of Factors Affecting SMK3 Implementation

Based on descriptive statistical analysis using SPSS, all variables were categorized as influential toward SMK3 implementation.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PERENCANAAN	30	2.00	3.4	2.70 0	.44178
PELAKSANAAN	30	2.00	4.0	3.19 3	.48844
PENGAWASAN	30	2.00	3.8	3.07 3	.48561
PELATIHAN K3	30	2.20	4.0	3.20 0	.39304
PENERAPAN SMK3	30	2.15	3.5	3.04 7	.36462
Valid N (listwise)	30				

Picture 1. Results of Descriptive Analysis of Factors Influencing SMK3
Source: Research Data (2026)

The results indicate that K3 training had the highest mean value of 3.2000, making it the most dominant factor affecting SMK3 implementation. Meanwhile, safety planning had the lowest mean value of 2.7000.

Analysis of SMK3 Implementation Actions

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PERENCANAAN	30	2.2	4.	3.18	.4577
PELAKSANAAN	30	2.0	4.	3.40	.4202
PENGAWASAN	30	1.8	4.	3.32	.4283
PELATIHAN K3	30	2.0	3.	3.29	.3886
PENERAPAN SMK3	30	2.3	3.	3.30	.3335
Valid N (listwise)	30				

Picture 2. Results of Descriptive Analysis of SMK3 Implementation Actions
Source: Research Data (2026)

The results show that SMK3 implementation in the SPKT Building Construction Project of Jembrana Police Resort was categorized as very appropriate with an overall mean value of 3.301. The implementation variable obtained the highest mean value of 3.400, indicating that occupational safety practices on site had been implemented properly.

DISCUSSION

The findings of this study indicate that the implementation of the Occupational Safety and Health Management System (SMK3) in the SPKT Building Construction Project of Jembrana Police Resort was categorized as very appropriate, with a mean value of 3.301. This result indicates that, in general, occupational safety and health management practices have been implemented properly throughout the project. The high implementation score suggests that the project has paid considerable attention to safety procedures, worker protection, supervision, and the provision of safety facilities. This finding is consistent with the principle of SMK3 established in Government Regulation of the Republic of Indonesia Number 50 of 2012, which emphasizes that occupational safety and health management should be implemented systematically through planning, implementation, monitoring, evaluation, and continuous improvement. Similar findings were also reported by Anggana et al. (2025), who found that proper implementation of SMK3 is important for improving safety management performance in building construction projects.

The relatively high level of SMK3 implementation can be understood from the characteristics of construction safety management, which requires the integration of various safety-related activities into project operations. Construction projects involve changing work environments, different types of construction activities, and interactions between workers,

equipment, materials, and temporary structures. Therefore, safety management cannot depend on a single safety measure but must involve several interconnected components. Zhou et al. (2015) explain that construction safety management consists of various dimensions, including organizational management, safety practices, worker behavior, and environmental conditions. In the SPKT Building Construction Project, the overall mean of 3.301 suggests that these aspects have generally been managed appropriately, although specific areas still require improvement.

The results also indicate that occupational safety and health training is one of the most influential factors in SMK3 implementation, with the overall influencing factors categorized as influential with a mean value of 3.0417. Training is important because construction workers need adequate knowledge and skills to recognize hazards and perform their tasks safely. Workers who understand occupational risks are more likely to comply with safety procedures and use PPE correctly. Fatimah et al. (2025) emphasize that occupational safety training is an important component of an integrated SMK3 strategy in construction projects. Similarly, Vinodkumar and Bhasi (2010) found that safety management practices, including training and communication, can influence workers' safety behavior. These findings support the result of this study, which identifies K3 training as a dominant factor influencing SMK3 implementation.

The importance of training is particularly relevant in construction because workers are exposed to different hazards depending on their tasks. A worker performing work at heights faces different risks from a worker operating heavy equipment or handling construction materials. Therefore, general safety training should be complemented by task-specific training. Training should explain the hazards associated with particular activities, appropriate control measures, correct PPE use, emergency procedures, and safe work methods. Fang et al. (2016) explain that unsafe behavior among construction workers is related to cognitive processes and individual perceptions of risk. Providing appropriate training can improve workers' understanding of hazards and reduce the likelihood that they will underestimate or ignore safety risks.

The findings further demonstrate that safety supervision plays a significant role in supporting SMK3 implementation. Supervision ensures that safety policies and procedures established by project management are actually implemented in the field. Even when workers have received adequate training, unsafe behavior may still occur because of work pressure, habits, fatigue, or perceptions that safety procedures are inconvenient. Effective supervision can identify unsafe acts and unsafe conditions before they result in accidents. Hinze et al. (2013) emphasize the importance of leading indicators in construction safety performance, including safety inspections, training, and other proactive safety activities. Therefore, consistent safety supervision can function as a preventive mechanism rather than merely responding to accidents after they occur.

The role of supervision is also closely connected to worker compliance with PPE requirements. PPE is an important component of construction safety because it provides protection against residual risks that cannot be completely eliminated through engineering or administrative controls. However, the effectiveness of PPE depends on workers' willingness and ability to use it correctly. Low awareness regarding PPE usage was identified as one of the obstacles in the SPKT Building Construction Project. Vinodkumar and Bhasi (2010) explain that safety management practices can influence safety behavior, including workers' compliance with safety procedures. Therefore, supervision is necessary to ensure that workers consistently use PPE according to the hazards associated with their activities.

The problem of low PPE awareness should not be interpreted solely as an individual worker's failure. Worker behavior is influenced by organizational and situational factors. Reason (2000) explains that human error should be understood within the broader context of organizational systems and working conditions. If PPE is uncomfortable, unavailable, unsuitable for the task, or workers are not adequately informed about its importance, non-compliance may occur. Similarly, if supervisors do not consistently enforce PPE requirements, workers may perceive safety rules as optional. Therefore, improving PPE compliance requires a combination of adequate PPE provision, worker education, supervision, and consistent enforcement of safety policies.

The findings regarding PPE awareness are also consistent with the concept of safety climate. Zohar (1980) introduced safety climate as employees' perceptions regarding the importance of safety within an organization. When workers perceive that management genuinely prioritizes safety, they are more likely to follow safety procedures and use PPE consistently. Conversely, if production targets are perceived as more important than safety, workers may prioritize speed and productivity over safe working practices. Therefore, improving PPE compliance should be accompanied by efforts to strengthen the project's overall safety climate. Management should demonstrate through actions, not only written policies, that safety is a fundamental project priority.

Safety planning was another important issue identified in this study. Although the overall implementation of SMK3 was categorized as very appropriate, insufficient safety planning remains an obstacle that needs to be addressed. Safety planning is essential because construction risks should be anticipated before work begins. Effective safety planning involves hazard identification, risk assessment, selection of control measures, preparation of safe work procedures, emergency planning, and allocation of safety responsibilities. Fung et al. (2010) emphasize the importance of systematic risk assessment in construction safety management. Therefore, inadequate safety planning can reduce the effectiveness of other safety measures because workers may be exposed to hazards that have not been properly anticipated or controlled.

The importance of safety planning becomes even greater because construction risks change throughout the project. A construction site is not a static environment; work areas, equipment, materials, access routes, and worker activities change as construction progresses. Goh et al. (2018) explain that construction safety performance is dynamic and can change according to project conditions. Consequently, safety plans should not be treated as static documents prepared only at the beginning of a project. They should be reviewed and updated according to changes in construction activities. Regular safety

meetings, inspections, and risk assessments can help ensure that safety planning remains relevant to current project conditions.

Risk assessment is an important component of safety planning because it allows project personnel to prioritize hazards according to their probability and potential consequences. Without adequate risk assessment, safety resources may not be directed toward the most critical hazards. Fung et al. (2010) demonstrate the importance of developing risk assessment approaches to support construction safety decision-making. In the context of the SPKT Building Construction Project, safety planning should therefore be connected directly to daily construction activities. Before a high-risk activity begins, workers and supervisors should identify potential hazards, determine appropriate controls, and communicate these controls to everyone involved.

The relationship between safety training, supervision, and safety planning demonstrates that SMK3 implementation should be understood as an integrated system. Training alone cannot guarantee safety if workers are not supervised. Similarly, supervision cannot be effective if workers have not received adequate training or if safety procedures are unclear. Safety planning provides the foundation, training develops worker competence, and supervision ensures that safety requirements are implemented consistently. Government Regulation of the Republic of Indonesia Number 50 of 2012 supports this integrated approach by requiring occupational safety and health management to be implemented through systematic stages. Juliar et al. (2025) similarly emphasize the importance of implementation and control of SMK3 in influencing occupational safety and health performance in construction projects.

The finding that K3 training is the most dominant factor is important because worker competence is directly related to the ability to recognize and respond to occupational hazards. Training can improve workers' knowledge of safe work procedures and help them understand the consequences of unsafe behavior. However, training should be continuous rather than conducted only once. Construction projects involve workers with different levels of experience, and project activities change over time. New hazards may emerge as construction progresses. Fatimah et al. (2025) emphasize the importance of training as part of an integrated SMK3 strategy, while Li et al. (2015) highlight the importance of proactive behavior-based safety management. These findings support the need for routine training, toolbox meetings, safety briefings, and task-specific safety instructions.

The effectiveness of safety training also depends on the methods used to deliver it. Training should be understandable, practical, and relevant to workers' daily activities. Excessively theoretical training may be less effective if workers cannot relate the information to actual workplace hazards. Practical demonstrations of PPE use, emergency procedures, equipment operation, and safe work methods can improve workers' understanding. Fang et al. (2016) indicate that workers' cognitive processes and perceptions influence unsafe behavior. Therefore, training should focus not only on transferring information but also on developing workers' ability to recognize hazards and make safe decisions in real work situations.

The findings also support the importance of continuous safety supervision. Supervision should be conducted systematically rather than only when violations occur. Supervisors should regularly inspect work areas, observe worker behavior, verify PPE compliance, evaluate safety conditions, and provide immediate feedback. Hinze et al. (2013) emphasize the value of leading indicators as proactive measures of construction safety performance. Similarly, Li et al. (2015) demonstrate that proactive behavior-based safety management can support safety improvement. These findings indicate that the project should emphasize preventive supervision, where potential problems are identified and corrected before an accident occurs.

Safety supervision should also encourage communication between workers and supervisors. Workers are often the first individuals to observe unsafe conditions because they are directly involved in construction activities. If workers are encouraged to report hazards without fear of blame or punishment, management can obtain valuable information about potential risks. Teo et al. (2005) highlight the role of project managers in coordinating and managing construction safety. Effective communication between workers, supervisors, safety officers, and project managers can therefore strengthen the safety management system. A collaborative approach can also improve workers' sense of responsibility toward safety.

The findings of this study are consistent with Wardhani et al. (2025), who reported the importance of K3 training and supervision in supporting workers' compliance with occupational safety procedures in construction projects. This similarity indicates that training and supervision are not only important in one particular project but represent broader components of effective construction safety management. The findings also support Anggana et al. (2025), who emphasized the importance of evaluating SMK3 implementation in construction projects to determine whether safety management practices have been properly applied. Thus, the high SMK3 implementation score obtained in this study should be maintained through continuous improvement rather than considered as an indication that no further safety improvements are required.

The findings can also be compared with international research on construction safety. Awwad et al. (2016) identified various challenges in implementing construction safety practices in developing-country contexts, including organizational and behavioral issues. These challenges are relevant to the current study because low PPE awareness and inadequate training demonstrate that safety implementation depends on both organizational systems and individual behavior. Mohammadi et al. (2018) similarly found that construction safety performance is influenced by multiple factors. Therefore, improving SMK3 implementation requires a multidimensional approach that considers management, workers, supervision, training, planning, and workplace conditions simultaneously.

Another important implication of the findings is the need to develop a stronger safety culture within the project. Safety culture is not created only through regulations or written procedures but through repeated behaviors, management commitment, communication, and shared perceptions regarding the importance of safety. Zohar (1980) explains that employees' perceptions of organizational safety priorities can influence safety-related attitudes and behaviors. If workers observe that supervisors consistently enforce PPE use, management provides adequate training, and unsafe conditions are promptly corrected, they are more likely to develop positive safety attitudes. Therefore, strengthening safety culture should be considered a long-term objective of SMK3 implementation.

The relationship between safety and productivity should also be considered when evaluating the findings. Some construction personnel may perceive safety procedures as reducing work speed, especially when PPE requirements, inspections, or safety meetings require additional time. However, effective safety management can prevent accidents, work interruptions, equipment damage, and other losses that negatively affect project performance. Aziz and Hafez (2013) emphasize the importance of improving construction performance through systematic management approaches. From this perspective, safety training and supervision should not be viewed as obstacles to productivity but as investments that can contribute to more stable and efficient project implementation.

The overall result of 3.301, categorized as very appropriate, demonstrates that the SPKT Building Construction Project has established a relatively good foundation for SMK3 implementation. Nevertheless, the presence of obstacles indicates that a high overall score does not mean that every aspect of safety management is optimal. The difference between overall implementation and individual influencing factors highlights the need for detailed evaluation of specific safety indicators. Anggana et al. (2025) and Risnaldi et al. (2023) demonstrate the importance of evaluating individual components of SMK3 to identify aspects requiring improvement. Therefore, project management should continue monitoring safety performance even when the general implementation category is already high.

The mean value of 3.0417 for influencing factors, categorized as influential, further indicates that several factors have meaningful roles in determining the effectiveness of SMK3 implementation. The dominant role of K3 training suggests that improving worker competence should be prioritized. At the same time, the findings concerning supervision, PPE awareness, and safety planning indicate that these factors cannot be addressed independently. Mohammadi et al. (2018) emphasize that construction safety performance is influenced by a combination of factors, while Goh et al. (2018) demonstrate that safety performance changes dynamically according to project conditions. Therefore, improvement strategies should integrate training, supervision, safety planning, PPE compliance, and continuous monitoring.

Based on the findings, several practical efforts can be recommended for improving SMK3 implementation in the SPKT Building Construction Project. First, K3 training should be increased in frequency and adjusted to the specific hazards associated with construction activities. Second, safety supervision should be strengthened through routine inspections, behavioral observations, and immediate corrective actions. Third, worker awareness regarding PPE should be improved through safety briefings, demonstrations, reminders, and consistent enforcement. Fourth, safety planning should be reviewed periodically and integrated with changes in project activities. These measures are supported by previous research emphasizing training, supervision, proactive safety management, and risk assessment as important components of construction safety improvement (Fatimah et al., 2025; Hinze et al., 2013; Li et al., 2015; Fung et al., 2010).

Finally, the results of this study demonstrate that successful SMK3 implementation requires continuous commitment from all parties involved in the construction project. Workers, supervisors, safety officers, contractors, and project managers each have responsibilities in creating and maintaining a safe working environment. SMK3 should therefore be implemented as a continuous management process rather than as a one-time compliance activity. Continuous evaluation, training, supervision, risk assessment, and improvement are necessary to ensure that safety practices remain effective throughout the project. In accordance with Government Regulation of the Republic of Indonesia Number 50 of 2012 and supported by previous studies on construction safety management, maintaining a strong safety system can reduce occupational risks, improve safety behavior, support productivity, and strengthen the overall safety culture of the project (Juliar et al., 2025; Wardhani et al., 2025; Zhou et al., 2015).

CONCLUSIONS

Based on the research results, the implementation of the Occupational Safety and Health Management System (SMK3) in the SPKT Building Construction Project of Jembrana Police Resort was categorized as very appropriate, with a mean value of 3.301. This indicates that occupational safety and health practices were generally implemented properly throughout the construction project.

The factors influencing SMK3 implementation were categorized as influential, with a mean value of 3.0417. Among the identified factors, K3 training was the most dominant factor. This finding indicates that improving workers' knowledge, skills, and awareness through regular occupational safety and health training is essential for maintaining effective SMK3 implementation.

Several obstacles were identified, including inadequate K3 training, low awareness of personal protective equipment (PPE) use, and insufficient safety planning. These obstacles need to be addressed because they may increase the risk of occupational accidents and reduce the effectiveness of safety management at the project site.

The efforts undertaken to overcome these obstacles include increasing K3 training programs, strengthening PPE supervision, improving safety planning, and providing adequate occupational safety facilities. Contractors are therefore recommended to conduct regular training, strengthen supervision, improve workers' safety awareness, and continuously

evaluate SMK3 implementation. These efforts are expected to maintain a safe working environment, reduce the risk of occupational accidents, and improve the overall safety performance of future construction projects.

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