

THE ROLE OF THE USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE) IN MAINTAINING THE SAFETY OF TOLL ROAD PROJECT WORKERS

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Abstract

Keywords:
Personal Protective Equipment, Worker Safety, Toll Road Project, Compliance With The Use Of PPE.

This study aims to examine the role of the use of Personal Protective Equipment (PPE) in maintaining occupational safety on toll road projects through a Systematic Literature Review (SLR) approach to literature published between 2020 and 2025. Analysis was conducted on eight selected articles that were relevant and met the inclusion criteria. The results of the review indicate that the use of PPE is a central element in the implementation of effective Occupational Safety and Health (OHS) management in toll road construction projects. Compliance with the use of PPE has consistently been shown to significantly reduce the risk of work accidents. Factors that influence the effectiveness of PPE use include workers' understanding of OHS, the availability of adequate PPE facilities, management supervision, and the integration of a comprehensive OHS management system. This study concludes that efforts to improve education, supervision, and provision of appropriate PPE are essential to create an optimal occupational safety culture in the toll road project environment.

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INTRODUCTION

Toll road infrastructure development in Indonesia continues to increase in line with the government's efforts to facilitate the flow of transportation and support national economic growth. Toll road construction projects are one of the sectors that have a high level of risk of work accidents because they involve a variety of heavy physical activities, the use of heavy equipment, and a dynamic work environment full of potential hazards. In this context, the implementation of Occupational Safety and Health (OHS) is crucial to protect workers from the risk of injury, accidents, and occupational diseases.

One of the main aspects in the OHS system is the use of Personal Protective Equipment (PPE). PPE is equipment that must be used by workers in accordance with the potential hazards and risks in the workplace, with the main purpose of maintaining the safety of the workers themselves and those around them. The government has regulated the mandatory use of PPE through laws and regulations, and companies are required to provide PPE that meets the standards and ensure that workers wear it properly. Types of PPE commonly used in toll road projects include safety helmets, safety shoes, reflective vests, gloves, eye protection, and hearing protection.

However, even though regulations have been implemented and PPE facilities have been provided, it is still common to find workers who do not comply with the complete and correct use of PPE. Various reasons are cited, ranging from inconvenience, damaged or unavailable PPE, to a lack of understanding of the importance of PPE. Data from toll road construction projects show that there is still a significant percentage of workers who are sanctioned for not using PPE completely, although the trend of such violations tends to decrease along with increased supervision and sanctioning.

Factors that influence PPE use behavior include workers' knowledge and attitudes towards OHS, availability and appropriateness of PPE, training, and the reward and punishment system implemented by the Company. Research on various toll road projects in Indonesia shows a significant relationship between the level of knowledge and attitude of workers and compliance with the use of PPE. In addition, the implementation of routine safety patrols and consistent supervision has also proven effective in increasing workers' compliance with the use of PPE.

The successful implementation of OHS and the disciplined use of PPE not only has an impact on reducing the number of work accidents, but also increases productivity, worker morale, and the company's reputation in the eyes of the public and stakeholders. The case study on the Jagorawi Toll Road expansion project, for example, shows that management commitment, careful planning, and consistent OHS implementation can result in a construction project free of major incidents and set an example for other infrastructure projects in Indonesia.

Thus, an in-depth understanding of the factors that influence PPE use behavior as well as strategies to improve worker compliance is critical to creating an optimal work safety culture in toll road project environments. This research focuses on a systematic review of the literature related to PPE use in toll road projects, with the aim of providing a comprehensive overview of the challenges, determinants, and efforts to improve the effectiveness of PPE use to achieve overall OHS goals.

LITERATURE REVIEW

Occupational Safety and Health (OHS) is an important aspect in every industrial sector, especially in toll road construction projects which are known to have a high level of risk of work accidents. One of the main components in the implementation of OHS is the use of Personal Protective Equipment (PPE) which serves as the last control against potential hazards in the workplace. Personal Protective Equipment is a device used by workers to protect themselves from potential hazards and work accidents that may occur in the workplace. The use of PPE by workers while working is an effort to avoid exposure to hazards in the workplace. (Mustofa et al., 2019).

The use of PPE has been shown to significantly reduce the risk of work accidents. The study by Alamsyah (2021) shows that the use of PPE is an integral part of OHS risk management, especially in large projects such as the Cisumdawu Toll Road. This study emphasizes the importance of evaluation and supervision in ensuring compliance with PPE use. Various factors influence workers' behavior in using PPE, such as knowledge about OHS, comfort of tools, management supervision, and availability of PPE. Handari and Qolby (2021) revealed that workers who do not use PPE have a 3.5 times higher risk of having an accident. This was confirmed by Makupiola and Azis (2023), who found that understanding of OHS has a dominant influence on the application of work safety.

Effective surveillance systems, such as safety patrols, also play an important role in improving compliance. Sartika et al. (2022) stated that the successful implementation of OHS is strongly influenced by supervision and the availability of adequate PPE facilities. The use of PPE cannot be separated from the implementation of a comprehensive OHS management system. Sumedhi et al. (2020) showed that proper construction methods can increase the success of OHS implementation, including the use of PPE. However, Srisantyorini and Safitriana (2020) emphasized that OHS implementation must be more than a formality; it requires the establishment of a strong safety culture so that the use of PPE is truly carried out as a necessity, not just an obligation. Research by Permatasari et al. (2024) used a Systematic Literature Review approach and found a positive correlation between compliance with the use of PPE and low rates of work accidents in the mining sector, which is relevant to the conditions of the construction sector.

RESEARCH METHODS

This research uses the *Systematic Literature Review (SLR)* method to examine the role of the use of Personal Protective Equipment (PPE) in maintaining work safety on toll road projects. This approach was chosen to summarize and analyze empirical findings from various relevant studies, in order to obtain a deep and comprehensive understanding of the topic under study. This research design is descriptive qualitative based on a systematic review of the literature, which aims to identify, evaluate and synthesize the results of previous research.

The literature analyzed were national and international journals published between 2020 and 2025, in both Bahasa Indonesia and English, with a focus on PPE use and work safety in construction projects, particularly toll road projects. Articles that did not

have full-text access, were not relevant to the topic, or did not contain empirical data were excluded from the review. A literature search was conducted through Google Scholar using the keywords: *"The Role of Personal Protective Equipment in Toll Road Project Worker"*

RESULTS AND DISCUSSION

Based on the search results in Google Scholar using the keywords "The Role of Personal Protective Equipment in Toll Road Project Workers" obtained as many as 2,010 Google Scholar articles (n= 2,010) that are right with these keywords. Research method. Cross-sectional, literature review, quantitative descriptive, and case control were the research methods used. These books and journals were published from 2020 to 2025 and written in Indonesian and English. The results of the literature search in accordance with these keywords resulted in 416 articles (n = 416). Afterward, the articles were screened based on the abstract and resulted in 115 articles (n=115). In addition, some journals were evaluated for full text eligibility based on inclusion and exclusion criteria, and 8 articles were obtained (n=8). After that, the collected articles were re-selected and described and analyzed in depth.



No.	Journal Author (Year)	Research Title	Type of Research	Research Results
1.	Cepi Wendik i Alamsyah (2021)	OHS Risk Management Analysis of Cisumdawu Toll Road Phase III Work	Quantitative descriptive	This study concludes that the use of PPE is an integral part of the success of OHS risk management in the Cisumdawu Toll Road project. The success of risk identification, prevention, evaluation, and control is highly dependent on the consistency and awareness of PPE use in the field. Therefore, to achieve an optimal level of work safety, it is necessary to improve the evaluation and supervision system for the use of PPE, both in terms of the quality of the equipment and the use of PPE. labor compliance
2.	Siti Riptifah Tri Handari, Meidisty Samrotul Qolby (2021)	Factors of Occupational Accidents in High Altitude Workers at PT. X in 2019	quantitative analytic with cross-sectional design	This study found that two main factors have a significant relationship with the incidence of work accidents, namely the use of personal protective equipment (PPE) and the level of knowledge of workers regarding occupational safety and health (K3). As many as 70.9 percent of respondents did not use PPE properly. complete when working at

				heights. This is an important finding because workers who do not use PPE have a 3.5 times higher risk of occupational accidents compared to those who use PPE.
3.	Muhammad Sumedhi, Yunan Hanun, Manlian Ronald A.Simanjuntak (2020)	Analysis of the Effect of Construction Methods on the Successful Implementation of Occupational Health and Safety in Elevated Toll Projects	Quantitative and Qualitative	In this study, it can be concluded that proper and planned construction methods not only play a role in the technical and management aspects of the project, but also greatly influence the successful implementation of OHS. The use of PPE in a disciplined and standardized manner is one of the main keys in creating a safe working environment and reducing the number of work accidents on construction projects, especially toll road projects. elevated.
4.	Ribly Ukhra Assidiqi (2022)	Application of OHS (Occupational Safety and Health) Using the CSA (Construction Safety Analysis) Method on Pile Cap Work (Case study: Solo-Yogyakarta Toll Road Construction Project)	Qualitative	This research suggests that the implementation of CSA is effective in identifying and controlling potential hazards. The use of PPE, although as the last control, remains key in reducing the number of work accidents. Discipline, education, and supervision of the use of PPE should be a concern. major in any construction project.

5.	Christy Makupiola, Agata Rizky Aprianti Azis (2023)	Analysis of the Influence of Personality on the Implementation of Occupational Safety and Health in Construction Workers (Case Study of the Pinrang - Rappang Road Rehab Supervision Project)	Quantitative	The results showed that of the four main variables analyzed, workers' understanding of OSH (X3) had the greatest influence on the application of OSH, which was 60.9%. This means that the higher the workers' understanding of the importance of OHS including the function and how to use PPE, the better the implementation of OHS. their behavior in implementing work safety.
6	Opa Sartika, Teuku Farizal, Aulia Rahman (2022)	Implementation of OHS System on Nasruhe - Lewak - Sibigo Road Improvement Construction Project	Descriptive qualitative	This study explains that the application of PPE in the construction sector has not run optimally. Factors such as worker understanding, availability of PPE, and supervision from leaders greatly influence the level of compliance with PPE use. This study emphasizes the importance of a holistic approach to OHS management, focusing on education, supervision, and the provision of appropriate PPE facilities.



7.	Triana Srisantyorini, Rika Safitriana (2020)	Implementation of Occupational Safety and Health Management System in the Construction of Jakarta-Cikampek 2 Elevated Toll Road	Quantitative qualitative	This research explains that although the implementation of SMK3 has touched almost all aspects, work accidents still occur, including incidents with injuries and even fatalities. This shows that the implementation of the OHS system, including the use of PPE, must be more than a formality. The use of PPE must really be made a habit and a priority. workers' needs, not just obligations.
8.	Intan Permata Sari, Yuanita Windusari, Novrikasari, Elvi Sunarsih, Nur Alam Fajar (2024)	Causative factor Incident Accident Work At Mining Company Workers In Indonesia	Systematic Literature Review	In the research This found existence correlation between compliance Use of PPE (Personal Protective Equipment) with Incident Rate accident on the spot Work.



The review shows that the use of PPE is a central element in the implementation of effective OHS management in toll road construction projects. For example, Alamsyah (2021) emphasized that the success of risk management relies heavily on awareness and consistency in the use of PPE. Research by Handari & Qolbi (2021) also corroborates that not using PPE completely increases the risk of work accidents by up to 3.5 times.

Furthermore, a holistic approach to PPE implementation was found in a study by Sartika et al. (2022), which showed that compliance with PPE is influenced by workers' understanding, management supervision, and the availability of adequate PPE facilities. This is in line with a study by Makupiola & Azis (2023), which found that understanding of OHS has a dominant contribution to the implementation of work safety.

On the other hand, several studies have also examined the relationship between OHS management systems and the role of PPE in the context of the construction methods used. Sumedhi et al. (2020) emphasized that well-planned construction methods influence the successful implementation of PPE. Similarly, a study by Assidiqi (2022) highlighted the effectiveness of the CSA method in identifying hazards and reinforced the importance of disciplined PPE use.

Criticism of the implementation of the OHS system was also expressed by Srisantyorini & Safitriana (2020), who noted that although the system has been implemented, accidents still occur because the use of PPE is only considered a formality. This shows the importance of establishing a strong safety culture in the field.

Finally, the article by Permatasari et al. (2024) directly used the Systematic Literature Review approach and confirmed the correlation between compliance with the use of PPE and low rates of work accidents.

Overall, this SLR shows that the use of PPE has a significant impact on reducing the risk of occupational accidents. However, its effectiveness is largely determined by the integration of worker education, availability of appropriate equipment, consistent supervision, and a comprehensive OHS management system.

CONCLUSIONS

Based on the results of a systematic review of eight relevant articles, it can be concluded that the use of Personal Protective Equipment (PPE) plays a crucial role in efforts to reduce the number of work accidents in toll road construction projects. Consistent use of PPE is proven to reduce the risk of accidents, especially when supported by good worker understanding, effective supervision, and the availability of adequate tools.

The implementation of an integrated OHS management system with an educative approach and field supervision is the key to creating a sustainable work safety culture. The findings show that the use of PPE is not only mandatory, but must be cultivated as a basic necessity in construction work.

The practical implications of these findings are the need to strengthen regular OHS training and socialization, increase supervision of compliance with PPE use, and continuous evaluation of the quality and availability of PPE in the field. Future research is recommended to examine the effectiveness of management interventions in improving workers' compliance with the use of PPE in various types of construction

projects.

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