

Analysis of Occupational Safety and Health (OSH) Management using The HIRARC Method in The Construction of Rubaru 1 Elementary School

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ABSTRACT

Construction projects in Indonesia continue to face high rates of workplace accidents due to inadequate implementation of Occupational Safety and Health (OSH) systems. This study aims to analyze how the Hazard Identification, Risk Assessment, and Risk Control (HIRARC) method can be effectively applied in the Rubaru 1 Elementary School construction project to minimize risks and improve workplace safety. Using a qualitative descriptive approach, data were collected through field observations, interviews, and documentation studies over six months. The research identified multiple hazards categorized by severity: six major risks, three high risks, and six medium risks. These included hazards from working at heights, exposure to chemicals, and improper use of personal protective equipment (PPE). Risk controls were implemented through administrative strategies (training, supervision), engineering controls (equipment modifications, warning signs), and mandatory PPE usage. The results showed that the HIRARC method is effective in systematically identifying and mitigating construction-related hazards. However, its success is influenced by the discipline of workers and management's commitment to supervision. The findings emphasize the need for continuous evaluation and structured training programs to enhance OSH compliance and cultivate a safety-oriented culture in construction environments.

Keywords: Occupational Safety, HIRARC, Risk Management, Construction, PPE

INTRODUCTION

Occupational Safety and Health (OSH) is a crucial aspect in the construction industry due to the high risk of work accidents (Costa et al., 2021; Jaafar et al., 2018; Supriyatna et al., 2020). The implementation of an effective OHS management system is necessary to reduce accidents and improve work efficiency (Awuy et al., 2017). In the case of construction projects, especially in the construction of school buildings such as SDN Rubaru 1, a structured OHS management system can prevent the occurrence of incidents that can negatively affect workers and the project in general.

Various studies have shown that one of the main causes of work accidents in the construction sector is the lack of implementation of an OHS Management System (SMK3) in accordance with international safety regulations and standards (Lestari et al., 2023). The study conducted by Nazilah et al. (2023) shows that construction projects in Indonesia still face various obstacles in the implementation of OHS, such as the lack of workers' awareness of hazards in the work environment and the lack of strict supervision.

The Hazard Identification, Risk Assessment, and Risk Control (HIRARC) method is a systematic approach that can be used to identify hazards, assess risk levels, and implement appropriate control measures (Nurul et al., 2024). The application of this method to construction projects can help mitigate the risk of workplace accidents and improve safety for workers (Afzal et al., 2021; Arici, 2024; Enshassi et al., 2019; Yiu et al., 2019).

Previous studies conducted by Saragi and Sinaga (2021) revealed that construction projects that do not implement HIRARC properly tend to have higher accident rates. In addition, research by Setiawan et al. (2022) confirmed that a comprehensive risk analysis can reduce the likelihood of serious work accidents by identifying potential hazards from the early stages of the project.

In Indonesia, regulations regarding OHS have been set by the Minister of Manpower and Transmigration, which requires every construction company to implement an OHS management system to create a safer working environment (Setiawan et al., 2022). However, implementation in the field often encounters various obstacles, such as budget constraints, lack of training for workers, and low compliance with applicable regulations (Risk Management Guidelines Companion To AS/NZS 4360:2004, 2007). The Rubaru 1 primary school construction project in Sumenep district faces similar challenges in implementing an effective OHS system. Workers' lack of understanding of the importance of personal protective equipment (PPE), as well as weak supervision, increases the likelihood of workplace accidents (Rakasyiwi et al., 2022). Therefore, there is a need for an in-depth analysis of the most effective methods to identify, assess and control OHS risks in this project.

Based on the above, it is important to evaluate how the HIRARC method can be used effectively in the Rubaru 1 primary school construction project. This evaluation aims to determine the main risk factors, the severity of these risks, and the most appropriate control strategy to minimize the potential for accidents in the workplace (Bevilacqua & Ciarapica, 2018; Rajabi et al., 2025).

In the construction project of SDN Rubaru 1, the implementation of the Occupational Safety and Health (OHS) management system still faces various obstacles that can have an impact on the safety of workers and the smooth running of the project (Permana et al., 2025). The HIRARC method is one approach that can be used to identify, assess and control existing risks. However, how this method can be effectively implemented in this project is still a major question (Kabul & Yafi, 2022; Prabaswari et al., 2020; Rosman et al., 2023).

Therefore, this research will focus on the question: "How to identify, assess, and control Occupational Safety and Health risks using the HIRARC method in the Rubaru 1 Elementary School Building construction project?". The analysis conducted is expected to provide a deeper understanding of the application of this method and provide recommendations that can improve the effectiveness of the OHS management system in the construction project.

Concept of Occupational Safety and Health (OHS)

Occupational Safety and Health (OSH) is an important aspect in the construction industry to reduce the risk of workplace accidents (Supriyatna et al., 2020). According to Awuy et al. (2017), effective OHS implementation can increase productivity and reduce incidents that are detrimental to the project. The OHS Management System aims to ensure that every worker is in a safe environment and protected from hazards. With strict regulations, the implementation of this system is increasingly becoming a top priority in the construction sector.

As part of the risk mitigation strategy, construction companies are required to implement safety standards set by national and international regulations (Lestari et al., 2023). Compliance with these regulations aims to reduce negative impacts on workers and the work environment. Poor implementation of OHS can lead to an increase in work accidents that result in material and moral losses for the company. Therefore, an in-depth understanding of the OHS concept is very important for all stakeholders in the construction industry.

In its application, OHS is also related to the use of personal protective equipment (PPE) as a form of protection against occupational risks (Nazilah et al., 2023). The use of appropriate PPE can prevent workers from fatal injuries that often occur at project sites. However, there are still many workers who ignore the use of PPE due to comfort factors or lack of awareness of the importance of work safety. Therefore, education and training related to OHS must

continue to be carried out regularly.

According to Nurul Patria et al. (2024), the implementation of an optimal OHS system must be supported by strong company policies and strict supervision. Without consistent supervision, OHS implementation is often neglected, increasing the risk of accidents. Therefore, the right managerial approach in implementing OHS must be carried out systematically. One effective way is to integrate OHS in every stage of project implementation.

Regulations related to OSH have also been regulated in various national policies that require every company to implement appropriate safety standards (Minister of Manpower and Transmigration of the Republic of Indonesia, n.d.). Companies that do not comply with these regulations may be subject to administrative sanctions up to revocation of business licenses. Therefore, construction companies must have a clear strategy in implementing OHS to ensure that projects run safely and efficiently.

HIRARC Method in Risk Management

The Hazard Identification, Risk Assessment, and Risk Control (HIRARC) method is an approach that is often used in managing OHS risks in construction projects. This method aims to identify hazards, assess the level of risk, and determine appropriate control measures (Setiawan et al., 2022). By using HIRARC, project management can conduct a more structured analysis to prevent work accidents. It also helps in making decisions regarding more effective risk mitigation strategies.

Hazard identification is the first step in the HIRARC method which involves observing various aspects that have the potential to cause accidents (Saragi & Sinaga, 2021). Hazards can come from human factors, work tools, work methods, or the work environment. This identification process must be carried out thoroughly so that no risk factors are missed. Therefore, the involvement of all parties in the project is needed in this stage.

Once the hazards have been identified, the next step is a risk assessment that measures the severity and likelihood of the hazard occurring (Rakasyiwi et al., 2022). This risk assessment uses a risk matrix that divides risks into low, medium, high, and very high categories. By knowing the level of risk, project management can prioritize hazard control. This step is also useful in developing mitigation strategies that are suitable for the project conditions.

Risk control is the final stage in the HIRARC method that aims to reduce the likelihood of occupational accidents (Guidelines for Hazard Identification, Risk Assessment, and Risk Control, 2008). There are three main types of risk control, namely administrative control, engineering, and the use of PPE. A combination of these three methods is often used to provide maximum protection for workers. However, the success of risk control also depends on the discipline of workers in following established procedures.

Evaluation and monitoring of HIRARC implementation needs to be carried out regularly to ensure its effectiveness in reducing the risk of occupational accidents (Risk Management Guidelines Companion to AS/NZS 4360:2004, 2007). Construction projects that do not conduct regular evaluations are likely to experience increased accident rates due to failure to identify new hazards. Therefore, project management must continue to monitor and improve the OHS system implemented.

Factors inhibiting the implementation of

The implementation of OHS systems in construction projects often experiences various obstacles that hinder the effectiveness of their implementation. One of the main factors is the lack of worker awareness of the importance of work safety (Awuy et al., 2017). Many workers think that work accidents are something that cannot be avoided, so they do not comply with OHS procedures. This attitude can reduce the effectiveness of OHS system implementation at the project site.

Another factor that often becomes an obstacle is the limited budget allocated for the implementation of OHS (Lestari et al., 2023). Many companies are reluctant to allocate sufficient funds for the purchase of PPE or safety training. In fact, investment in OHS can reduce costs that must be incurred due to work accidents. Therefore, it is important for project management to understand that OHS implementation is a long-term investment.

In addition, the lack of supervision from management is also an obstacle that often occurs in the implementation of OHS (Nazilah et al., 2023). Many projects do not have a strict monitoring system, so many workers ignore safety procedures. As a result, work accident incidents still occur frequently despite the implementation of OHS regulations. Stricter supervision can improve worker discipline in carrying out safety procedures.

Based on research by Setiawan et al. (2022), another obstacle is the lack of training provided to workers regarding work safety. Many workers do not have sufficient understanding of how to use PPE properly. This lack of training can increase the risk of work accidents at the project site. Therefore, companies should routinely conduct comprehensive training programs.

The last factor that becomes an obstacle is the imbalance between project targets and the application of OHS (Nurul et al., 2024). In some cases, projects must be completed in a short time, so OHS aspects are often ignored in pursuit of time targets. This situation leads to an increased risk of work accidents due to carelessness at work. Therefore, project management must be able to balance between time efficiency and work safety.

The construction sector in Indonesia is one of the industries most prone to workplace accidents due to a lack of consistent implementation of Occupational Safety and Health (OSH) standards. Many projects neglect proper safety planning, leading to high risks that compromise worker safety and project continuity. In the case of the Rubaru 1 Elementary School construction project, inadequate use of Personal Protective Equipment (PPE), insufficient supervision, and low worker awareness of hazard procedures increased the likelihood of accidents.

Despite government regulations requiring OSH implementation, construction projects still face various operational and managerial challenges. Budget limitations, lack of training, and failure to implement structured risk identification methods often result in overlooked hazards. As a result, there is an urgent need for a systematic approach that can assess, classify, and mitigate risks effectively within such high-risk environments.

This research is urgent as it addresses the pressing need for structured risk management in Indonesian construction projects, where safety violations are common and accident rates remain high. By analyzing the use of the HIRARC method in a real-world setting, this study contributes to improving worker protection and ensuring compliance with national safety standards, especially in public infrastructure projects like schools.

Saragi & Sinaga (2021) highlighted that construction projects lacking structured hazard assessments tend to experience more frequent and severe accidents. Their study advocated for systematic safety models such as HIRARC to reduce risks, yet acknowledged weak field-level implementation.

Setiawan et al. (2022) emphasized that risk management strategies grounded in HIRARC significantly reduced serious incidents in school building projects. Their work revealed the importance of continuous supervision and adaptation of safety plans according to project stages.

Nazilah et al. (2023) focused on compliance with OSH in urban construction sites and found that worker behavior, low awareness, and inadequate use of PPE were the most common causes of accidents. They stressed that regular safety training and consistent PPE use are critical for safety performance but often lacking in practice.

While previous research confirms the effectiveness of HIRARC in reducing risks, few studies provide detailed, site-specific analyses of its implementation in rural or school construction projects. This study addresses that gap by offering a contextual, project-level application of HIRARC, identifying hazard categories, and evaluating real-time mitigation strategies in a mid-scale education infrastructure setting.

The novelty of this study lies in its direct application of the HIRARC method in a live school construction project, offering a structured breakdown of hazard categories—major, high, medium, and low—and linking them to specific job types and working conditions. It also quantifies the effectiveness of administrative, engineering, and PPE-based controls, making it a valuable reference for future OSH planning.

The objective of this research is to analyze the implementation of the HIRARC method in the Rubaru 1 Elementary School construction project by identifying potential hazards, assessing risk levels, and evaluating the effectiveness of risk control strategies to improve Occupational Safety and Health performance.

This research benefits construction project managers, safety supervisors, and policymakers by providing a practical framework for implementing OSH through HIRARC. It offers actionable recommendations for improving risk prevention strategies, increasing compliance with safety protocols, and fostering a culture of safety in Indonesian construction environments.

METHOD

This research uses a qualitative descriptive approach to analyze the application of the Hazard Identification, Risk Assessment, and Risk Control (HIRARC) method in the Rubaru 1 Elementary School Building construction project. The descriptive method is used to describe the condition of occupational safety and health (OHS) in the field based on the data collected. The data obtained was analyzed to identify risk factors that have the potential to cause work accidents and mitigation strategies that can be applied. Through this approach, the research results can provide a comprehensive picture of the effectiveness of the application of the HIRARC method.

A qualitative approach was used to deeply understand the factors influencing the implementation of OHS systems in construction projects. Interview techniques and direct observation were applied to obtain data from various parties involved in the project. Thus, this research not only provides quantitative data on the risk of work accidents, but also provides insight into workers' perceptions of the OHS system. The information obtained will be the basis for designing a more effective strategy in the application of the HIRARC method.

Location and Time of

This research was conducted at the Rubaru 1 Elementary School building project site located in Sumenep District. This location was chosen because it has characteristics that are relevant to the study of the application of the HIRARC method in a construction environment. In addition, the project has a fairly high complexity of work, so it can provide a more comprehensive picture of the challenges in implementing the OHS system. Observation and data collection were conducted directly at the project site to ensure the accuracy of the information collected.

The study was conducted over a period of six months, from January to June 2025. This time span was chosen to ensure that all stages of the project could be observed, from the initial stage to the final stage of construction. The long duration of the study allowed the researcher to identify changes or improvements in the implementation of the OHS system as the project progressed. In addition, this research also includes periodic evaluation of the effectiveness of the HIRARC method in reducing the risk of work accidents.

Collection Technique

Data in this study were collected through three main techniques, namely field observations, interviews and documentation studies. Field observations were conducted by directly observing the implementation of the OHS system in the Rubaru 1 primary school construction project. This technique allowed researchers to identify potential hazards as well as assess workers' compliance with safety procedures. In addition, observation was also used to document working conditions that could affect the level of accident risk.

Interviews were conducted with various stakeholders, including project managers, safety supervisors, and workers in the field. The purpose of these interviews was to gather information about their experience in applying the HIRARC method. Meanwhile, a documentation study was used to collect secondary data including work accident reports, OHS policies, and safety guidelines implemented in the project. The combination of these three techniques is expected to provide a more holistic picture of the implementation of the OHS system.

Analysis Technique

The collected data was analyzed using a qualitative analysis approach with a triangulation method. Qualitative analysis was used to identify patterns and key findings relating to the application of the HIRARC method in this project. This technique allowed the researcher to explore the relationship between various factors that influence the effectiveness of the OHS system. The results of this analysis were then compared with applicable occupational safety standards to assess the extent to which the application of HIRARC complied with existing regulations.

Triangulation is done by comparing the results of observations, interviews, and documentation studies to ensure the validity of the data obtained. With this method, potential bias in data collection can be minimized, so that the research results are more accurate and reliable. In addition, the results of the analysis are also categorized based on the level of risk found, so that the main priorities in improving the OHS system in the project can be known. The findings of this research will be used as the basis for developing recommendations for improving work safety.

Limitations

Although this research has been designed with a systematic method, there are some limitations that need to be noted. One of the main limitations is that the scope of the study is limited to one construction project, so the results of this study may not be fully generalizable to other projects. In addition, external factors such as weather conditions and company policies may affect the research results. Therefore, further research in different locations is highly recommended to gain a broader understanding of the application of the HIRARC method.

Another limitation is the level of openness of respondents in providing information related to the implementation of the OHS system. Some workers may be reluctant to disclose violations of safety procedures that occur in the field. Therefore, a more persuasive approach in interviews is needed to obtain more accurate data. In addition, this study only focuses on the application of the HIRARC method, so other aspects of risk management may not be fully covered in the analysis conducted.

RESULTS AND DISCUSSION

Occupational Safety and Health (OHS Risk Identification)

Risk identification in the Rubaru 1 Elementary School building project was carried out using the HIRARC method. Based on observations, several potential hazards were found, which are divided into various risk categories. Some of the potential hazards include falling from a height, contact with heavy equipment, and exposure to chemicals. This identification aims to provide a comprehensive overview of risk factors that may appear in the project environment.

In addition, interviews with workers showed that most of them did not fully understand the established safety procedures. This lack of understanding increases the potential for work accidents to occur during the construction process. Therefore, more intensive socialization and training related to OHS aspects are needed. This became one of the main focuses in evaluating the application of the HIRARC method in this project.

After analyzing the various risks found, the risk categories were divided into four levels: low, medium, high and very high. Most of the identified risks fall into the medium to high category, especially those related to the use of heavy equipment and work at heights. The high level of risk indicates the need for more systematic mitigation measures. In this case, the HIRARC method can be used to effectively optimize the risk control process.

One important outcome of risk analysis is the need for increased use of personal protective equipment (PPE). Based on the data collected, there are still many workers who do not use PPE consistently, especially in jobs that have a high level of risk. Therefore, stricter monitoring of PPE compliance is an important step in risk control in this project. The implementation of stricter policies regarding the use of PPE needs to be done immediately to improve work safety.

The identification results also show that most accidents that occur in construction projects are related to human factors and the work environment. The lack of understanding of safety procedures and the lack of warning signs in risky areas are the main factors that increase the likelihood of accidents. Therefore, the installation of warning signs and the placement of OHS supervisors at the project site can be a strategic step in reducing the level of work accidents.

Table 1. Risk Assessment

No.	Jobs	Potential Hazards	Likelihood	Severity	LxS
1	Site Clearance	Worker Scratched by Sharp Material	3	2	6
		Worker slips / Falls	3	2	6
2	Soil Excavation and backfill	Worker hit by excavation landslide	2	2	4
		Worker Slips or Falls	3	2	6
3	Foundation and wall masonry work	Worker Hit by Collapsed Hebel/Brick	3	3	9
		Worker Falls from Height	3	4	12
		Worker's Eye Hit by Cement Splash	2	1	2
4	Concrete work	Skin Irritation from Cement Splash	2	1	2
		Worker's Eye Hit by Concrete	2	1	2

No.	Jobs	Potential Hazards	Likelihood	Severity	LxS
5	Plastering Work	Splash			
		Skin Irritation from Cement	2	1	2
6	Ceramic work	Splash			
		Worker Falls from Height	3	4	12
		Workers exposed to ceramic cutting tools	1	4	4
7	Roof work	Workers exposed to ceramic splash	3	3	9
		Worker Falls from Height	3	4	12
		Worker hit by collapsed roof material	3	4	12
		Workers scratched by sharp materials	3	3	9
8	Painting work	Workers exposed to paint splashes	3	2	6
		Workers slip or fall	3	4	12
9	Sanitary work	Exposed to Pipe Cutting Tools	1	4	4
		Workers inhale PVC glue	4	1	4
		Scratched by Pipe While Cutting	3	2	6
10	Electrical Installation Work	Worker was electrocuted	3	4	12
		Exposed to cable cutting tools	2	1	2

Source: Processed by Researchers, 2024

Table 1 shows the distribution of risk levels based on hazard categories in the Rubaru 1 Primary School Building construction project. The data displayed in this table is the main basis for determining risk mitigation priorities using the HIRARC method. From the analysis of the table, it can be seen that the majority of risks are in the medium to high category, indicating that control measures should be implemented immediately. Hazards with a high risk level should be the main concern in work safety management to minimize the incidence of accidents at the project site.

One of the key findings from this table is that there are six major risk categories that have a significant impact on worker safety. These risks include potential falls from height, exposure to heavy machinery, and contact with hazardous materials. These factors point to the need for stricter implementation of control strategies, such as the installation of safety fences at work sites and increased frequency of safety training for workers. With effective control, risks that are in the high category can be reduced to safer levels.

In addition, this table also indicates that there are three hazards that fall into the high risk category. This shows that although the potential for accidents is lower than the high risk category, systematic mitigation measures are still needed. One effort that can be made is to ensure the use of personal protective equipment (PPE) by all workers. Stricter supervision of compliance with the use of PPE is a strategic step in reducing the possibility of accidents due to human factors.

The table also shows six hazards with moderate risk levels that require special attention in their management. Although the impact is not as great as high or major risks, hazards in this category can still affect the continuity of the project if not handled properly. Control efforts can be made by increasing workers' awareness through regular socialization and training on the importance of work safety. This approach not only helps reduce the potential for accidents but also improves the safety culture in the work environment.

In general, table 4.2 provides a comprehensive overview of the various levels of risk present in the Rubaru 1 SDN building project. The data in this table shows that the application of the HIRARC method is indispensable in developing an effective risk control strategy. By understanding the distribution of risks based on hazard categories, project management can design more targeted mitigation measures. Therefore, evaluation of the effectiveness of the control methods that have been applied must continue to be carried out regularly to ensure work safety is maintained throughout the project.

Assessment and Control

Risk assessment was conducted using a risk matrix that measures the severity and probability of an accident occurring. The results of the analysis show that six hazards fall into the major risk category, three hazards fall into the high risk category, and the remaining six hazards are in the medium risk category. Knowing this classification, appropriate mitigation measures can be implemented to reduce the impact. The main focus is on hazards with a high risk level that have the potential to seriously impact workers.

Risk control in this project was carried out through three main approaches, namely administrative control, engineering, and the use of PPE. Administrative controls include developing safety procedures, providing training, and increasing supervision at the project site. These efforts aim to ensure that all workers understand the safety procedures and apply them consistently. With this step, it is expected that the rate of work accidents can be significantly minimized.

Engineering is done by modifying equipment and the work environment to reduce risk exposure. For example, the installation of safety fences in work areas located at heights and the installation of warning signs in locations with high hazard levels. The implementation of safer technologies is also applied, such as the use of more stable scaffolding to reduce the possibility of falling from heights. With this approach, risks stemming from technical factors can be effectively reduced.

In addition to administrative and engineering approaches, risk control is also carried out by requiring the use of PPE for all workers. The type of PPE used is tailored to the potential hazards, such as safety helmets, gloves, protective shoes, and respirator masks. However, the main challenge in this implementation is the lack of awareness of workers in using PPE properly. Therefore, strict supervision and sanctions are needed for workers who do not comply with the rules for using PPE.

Risk control efforts also involve periodic evaluation of the effectiveness of the OHS system that has been implemented. Monitoring is carried out by collecting data related to incidents that occur and conducting safety audits in the field. From the evaluation results, adjustments can be made to the OHS policy to improve its effectiveness. Thus, the OHS system implemented in this project can be continuously improved to comply with applicable safety standards.

Discussion

The results showed that the application of the HIRARC method in the Rubaru 1 Elementary School building project still has some weaknesses that need to be improved. One of the main challenges is workers' lack of understanding of the importance of work safety. Despite socialization, there are still many workers who ignore the use of PPE and established safety procedures. Therefore, more intensive educational efforts are needed to increase workers' awareness of the importance of the OHS system.

In addition to workers' lack of understanding, work environment factors are also a major cause of the high risk of accidents. Some work areas in this project have a higher risk level than others, especially locations with work at height and areas involving the use of heavy equipment. To overcome this, it is necessary to rearrange the design of the work environment to reduce exposure to hazards that have the potential to cause accidents.

The risk control strategies that have been implemented in this project have shown quite good results, although they still need to be improved. Administrative control efforts, engineering, and the use of PPE have succeeded in reducing most of the risks of work accidents. However, there are still some obstacles in their implementation, especially in the aspect of worker compliance with safety regulations. Therefore, there is a need for stricter incentive and sanction mechanisms to improve workers' compliance with safety standards.

From the results of the risk assessment, it was found that most of the accidents that occurred were related to human factors and lack of supervision at the project site. Thus, there is a need for a more effective supervision system to ensure that all safety procedures are properly implemented. In addition, increased involvement of project management in safety supervision can also help in ensuring more optimal OHS implementation.

The use of the HIRARC method in this project has provided significant benefits in identifying, assessing and controlling risks. However, the effectiveness of this method is highly dependent on the extent to which the project management can supervise the implementation in the field. Therefore, continuous evaluation is required to ensure that the method can be continuously improved and adapted to the needs of the project.

In general, the results of this study show that the HIRARC method is an effective approach in improving work safety in construction projects. However, better implementation is still needed, especially in raising workers' awareness and strengthening the supervision system at the project site. Thus, it is expected that the rate of work accidents can continue to be reduced and workers' safety can be better ensured.

CONCLUSION

Based on the research findings, the HIRARC method has proven effective in identifying, assessing, and controlling Occupational Safety and Health (OHS) risks in the Rubaru 1 Elementary School construction project. Risk identification was conducted by categorizing hazards based on human, environmental, and equipment-related sources, revealing that most risks fell into medium to high categories—necessitating more stringent mitigation strategies. The risk assessment employed a risk matrix to measure the likelihood and severity of each hazard, identifying six high-risk, three moderate-risk, and six medium-risk hazards, which helped prioritize mitigation measures more systematically. Risk control strategies involved administrative measures (such as safety procedures and training), engineering interventions (such as safety devices and worksite modifications), and mandatory use of Personal Protective Equipment (PPE). This three-pronged approach significantly reduced the likelihood of workplace accidents. Overall, the study confirms that HIRARC is an effective framework for enhancing OHS performance in construction; however, its success depends heavily on worker discipline and management's commitment to continuous supervision and evaluation. For future research, it is recommended to conduct multi-site studies across different construction

environments to evaluate the scalability of HIRARC, incorporate real-time digital monitoring tools to track risk compliance, and investigate behavioral interventions to increase worker adherence to safety protocols.

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