



IMPROVING OCCUPATIONAL SAFETY IN BUILDING MATERIAL RETAIL THROUGH HIRA AND JSA

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ABSTRACT

Construction and material shops involve various high-risk activities, making Occupational Safety and Health (OSH) practices essential. This study aims to build a clear picture of existing safety practices and key risks in building material retail requiring attention through structured safety initiatives. Based on the findings, this study provides recommendations to improve OSH practices for workers in these environments. HIRA (Hazard Identification and Risk Assessment) and JSA (Job Safety Analysis) methods were employed to identify potential occupational hazards by defining the characteristics of possible hazards and evaluating associated risks. The findings reveal several unsafe acts and conditions from various working process and activity leading to potential hazards. A total of eight potential hazards were identified with HIRA uncovering one extreme risk, three very high risks, three high risks, and one medium risk. Among these potential hazards, manual handling posing the highest risk, followed by ergonomic issues, dust exposure, and contact with sharp objects where all classified as very high risks. To mitigate these risks, by using JSA, a combination of engineering controls, administrative measures, and PPE use was recommended in order to improve material handling, workstation conditions, and safety equipment usage. These recommendations serve as the foundation for implementing a proper OSH management system.

Keywords: Hazard identification, construction, building material retail, HIRA, JSA.

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1. INTRODUCTION

The general industrial construction plays a crucial role in infrastructural development (Wati et al., 2021). Following this fact, the competition in the construction business such as general contracting service and building material store has also becoming more intense. However, despite the competition, the awareness of safety among many business owners and workers in construction-related industries such as building material stores, remains low (Irawan et al., 2015; Palengka and Liperda, 2022; Anggrayni and Beatrix, 2024).

Construction and material shops typically host a multitude of activities, ranging from handling heavy materials to operating machinery, which can lead to various occupational hazards. Research indicates that 32% of work accidents in Indonesia occurred in the building construction sector (Kementerian, 2018; Kadir et al., 2022). Construction site accidents have been widely studied, but little attention has been given to accidents in building material stores. Despite handling heavy materials, there is a lack of statistical data on workplace accidents in these stores. However, several studies have reported a high prevalence of lower back pain among construction warehouse and material store workers in few countries, such as Indonesia, Malaysia, and Turkey (Yilmaz, 2014; Zhao et al., 2022; Winata et al., 2023; Salsabila et al., 2024). This condition is often linked to poor ergonomics and unsafe work practices, which may result from a lack of worker awareness, contributing not only to musculoskeletal disorders but also to workplace accidents and injuries (He et al., 2022; Rafindadi et al., 2022).

The effort to prevent work-related accident has become a challenge in Indonesia (Palengka and Liperda, 2022). Safety measures are often overlooked, putting workers at risk of accidents and long-term health issues. This highlights the urgent need for a structured approach to workplace safety, which is where Occupational Safety and Health (OSH) plays an important role. OSH is an approach that plays crucial role to ensure both physical and mental well-being in the workplace by considering the potential consequences for surrounding communities and the general environment (Alli, 2008;

Thirunavukkarasu et al., 2021; Kavouras et al., 2022). The primary goal of OSH is to create a safe and comfortable work environment for all parties involved. A job is considered safe when potential risks associated with workers' tasks can be effectively mitigated (Wati et al., 2021). Consequently, occupational safety measures must be implemented across all job types to prevent work-related accidents (Dyreborg et al., 2022).

TB XYZ is one of many retail shops in Yogyakarta specializing in construction supplies, including building, civil, and interior construction materials, as well as furniture and light steel products. Located in a rapidly developing area known for its high demand for student boarding houses, the shop has experienced significant business growth as the need for these products continues to rise. Despite the growth in the construction market, the company has yet to implement proper safety and health management system. Preliminary observations indicate potential work-related accidents such as manual loading, falling materials, slips and trips, contacts with sharp tools, etc. To address this issue, implementing an OSH management system and measuring its effectiveness is crucial (Aichouni et al., 2023; Duryan et al., 2020).

In any company, OSH aspects significantly impact performance and productivity levels (Assey, 2019; Bathan and Joy, 2023; Shabani et al., 2023). Two approaches that can be employed to identify hazards are HIRA (Hazard Identification and Risk Assessment) and JSA (Job Safety Analysis). HIRA is a technique used to identify potential occupational hazards by defining the characteristics of possible hazards and evaluating associated risks through a risk assessment matrix (Herlina et al., 2022). JSA, on the other hand, is utilized to determine potential hazards in each activity and identify appropriate control measures (Sugarindra et al., 2017; Herlina et al., 2022). By combining these approaches, this study aims to build a clear picture of existing safety practices and key risks in TB XYZ that required attention through structured safety initiatives. This approach also helped uncover both systemic issues and individual behaviors that could have put workers at risk in building material shops especially in Indonesia (Eyiah et al., 2019). Based on the findings, this study

provides recommendations to improve occupational safety and health (OSH) practices for workers in these environments.

2. METHODS

This study used a qualitative approach focusing on descriptive analytical methods to gather data effectively. By engaging in interviews and direct observations, insights were collected from workers involved in manual tasks such as lifting and moving heavy goods, monitoring building materials, and delivering materials to customers. Previous studies have shown that qualitative research is especially useful in uncovering hidden risks and safety behaviors in construction-related work (Lestari et al., 2020; Priyanka and Basaria, 2023).

The proposed study will utilize both Hazard Identification and Risk Assessment (HIRA) and Job Safety Analysis (JSA) methods to conduct a comprehensive analysis of hazards in TB XYZ material shops. HIRA is a method used to quantify the risk in the workplace/activity by evaluating hazard based on the likelihood and severity (Arumugaprabu et al., 2022), and JSA is a hazard analysis technique to identify hazards and develop key measures to reduce the risks (Magda et al., 2023). In this study, HIRA will be implemented as the systematic examination of operations and potential risk exposures, considering the specific contextual factors associated with Indonesian workplaces. Potential hazard was identified according to the ISO 45001:2018 standards. Meanwhile, JSA will facilitate step-by-step evaluations for common tasks, identifying risks associated with job functions and establishing control measures.

Alongside the interviews, observations were conducted to assess workers in real time as they carried out their daily tasks. This provided valuable insights into how they handled loads, used equipment, and followed safety protocols. Observations help to reveal gaps between what workers reported and what actually happened on-site, helping to identify areas where additional training or process improvements were needed to strengthen adherence to JSA and HIRA frameworks (Esmail and Sakwari, 2021). Using both interviews and observations together ensured a well-rounded understanding of

workplace safety in construction and material retail settings.

3. FINDINGS AND DISCUSSION

3.1. Findings

Workers in TB XYZ face various hazards across different job processes. Store preparation involves risks from sharp tools, leading to potential cuts or impacts, as well as exposure to chemicals that may cause respiratory issues or skin irritation. Inventory management poses dangers such as falling objects, slips and trips, dust exposure, and injuries from handling sharp materials like zinc sheets. Workers performing sales transactions and customer assistance often experience ergonomic strain due to repetitive movements, improper working techniques, and potential injuries from falling building materials. In shipments and handling deliveries, employees are exposed to harmful substances, heavy lifting risks, unloading hazards, and potential vehicle crashes, which can result in serious injuries or even fatalities. The identified risk factors found not only dangerous equipment and machinery, but also the ergonomic issues such as manual handling, improper techniques, exertive excessive strength, etc (Cheraghi et al., 2019; Chiboyiwa et al., 2020).



Figure 1. Unsafe acts and unsafe conditions in TB XYZ

Risk Assessment with HIRA and JSA

A risk assessment tool using a risk matrix effectively evaluates potential risks by combining

the likelihood and severity of hazards (Maharani, 2020; Palengka and Liperda, 2022; Dewantari et al., 2023; Herlina et al., 2022). The matrix classifies risks into four categories: E for extreme risk, T for high risk, S for moderate risk, and R for low risk. The risk level is determined by multiplying the likelihood or probability (P) of an event occurring with the severity (S) of its impacts. The risk classification matrix can be seen on Table 1. Each classification indicates the urgency of required actions; for example, E (extreme risk) demands immediate countermeasures and management involvement, while H (high risk) requires prompt corrective actions and management training. M (moderate risk) should be managed by supervisory personnel, and L (low risk) can be controlled through existing procedures (Smarandana et al., 2021; Dewantari et al., 2023). This structured matrix not only simplifies the risk evaluation process but also helps prioritize responses, improving workplace safety.

Table 1. Risk Classification Matrix

	Insignificant	Minor	Significant	Major	Severe
Almost Certain	Moderate (5)	High (10)	Very high (15)	Extreme (20)	Extreme (25)

	Insignificant	Minor	Significant	Major	Severe
Likely	Moderate (4)	Moderate (8)	High (12)	Very high (16)	Extreme (20)
Moderate	Low (3)	Moderate (6)	Moderate (9)	High (12)	Very high (15)
Unlikely	Very Low (2)	Low (4)	Moderate (6)	Moderate (8)	High (10)
Rare	Very Low (1)	Very Low (2)	Low (3)	Moderate (4)	Moderate (5)

Based on the likelihood and severity of the risk for each potential hazard, risk score is calculated to define the risk category. Table 2 presented the risk assessment by using HIRA method. In the Job Safety Analysis (JSA) method, it is essential to classify and identify hazards associated with each work activity performed by the workers. This systematic approach allows for a detailed analysis of the risks inherent in each specific task which is important to identify potential hazards and necessary safety measures. Table 3 presents the classifications utilized within the JSA method, highlighting the relationship between specific tasks and their corresponding safety concerns.

Table 2. Hazard Identification and Risk Assessment

Risk Code	Possible Hazards	Impact	P	S	Risk Score	Risk Category
R1	Contact with sharp materials	Hand or body injuries from cuts or impacts	4	4	16	Very High
R2	Chemical exposure	Respiratory issues or skin irritation	4	3	12	High
R3	Falling objects due to improper stacking or handling	Head injuries and broken limbs	3	4	12	High
R4	Slips and trips due to uneven or slippery floors	Knee injuries and broken limbs	3	4	12	High
R5	Dust exposure to nose and eyes	Respiratory issues, eye irritation	5	3	15	Very High
R6	Manual handling of heavy materials	Musculoskeletal injuries	5	5	25	Extreme
R7	Ergonomic issues and repetitive improper working techniques	Fatigue and back pain, musculoskeletal injuries	4	4	16	Very High
R8	Vehicle crashes	Bone fractures, serious injuries, or death	1	5	5	Medium

P : Probability; S : Severity

Table 3. Job Safety Analysis Necessary Precautions

Risk Code	Possible Hazards	Control Category	Necessary Precautions
R1	Contact with sharp materials	PPE	Wear proper PPE such as gloves and shoes
R2	Chemical exposure	PPE	Wear proper PPE such as mask
R3	Falling objects due to improper stacking or handling	Engineering; PPE	• Proper stacking procedures • Use of storage racks • Wear proper PPE such as helmet and safety shoes
R4	Slips and trips due to uneven or slippery floors	Engineering; Administrative	• Repair uneven surface • Maintain clean and dry workstation
R5	Dust exposure to nose and eyes	PPE	Wear proper PPE such as face covering mask
R6	Manual handling of heavy materials	Engineering; Administrative	• Provide helping tools • Provide training on proper technique • Implement job rotation to reduce strain
R7	Ergonomic issues and repetitive improper working techniques		
R8	Vehicle crashes	Engineering	• Mark dangerous zone • Provide traffic safety mirror

3.2. Discussion

According to the Australian / New Zealand Risk Management Standard 4360:2004, the potential hazard that has the score between 10 to 25 is categorized as high to extremely risky. Based on the findings as seen on Table 1, manual handling of heavy materials has the biggest score of risk, indicating that this hazard is highly likely to occur and poses a severe threat to worker safety. This finding is in accordance with previous studies by van der Molen et al. (2009), Salsabila et al. (2024) and Ukotbutr et al. (2025) about the high numbers of workers experiencing musculoskeletal disorder due to manual handling in construction industry. Other hazards such as ergonomic issues, dust exposure, and contact with sharp materials also needs proper attention as it holds very high risk with a total of 16 risk score and requires prompt corrective actions and management training.

International safety standards such as OHSAS 18001, OSHA, and ISO 45001 emphasize the importance of keeping work environment safe by identifying potential hazards, assessing the risks, and taking the right steps to control them (Reese and Eidson, 2006; Aung, 2024; Damayanti and Alifin, 2024; Ndiwa et al., n.d.). However, the findings showed a gap especially in preventing hazards, improving ergonomic conditions, and providing proper training. To better protect workers and reduce the chance of injuries, it is

crucial for current safety practices to follow safety regulations.

The Job Safety Analysis (JSA) in Table 3 outlines key workplace hazards and necessary precautions to enhance worker safety. To reduce risks, redesigning worksites and choosing appropriate tools can prevent serious injuries (Nath et al., 2017), proper Personal Protective Equipment (PPE) also needs to be emphasized (Ammad et al., 2021; Lee et al., 2021; Martin et al., 2021), such as gloves and shoes for handling sharp materials and face masks to prevent dust or chemical exposure. Engineering and administrative controls play a crucial role in preventing accidents (Bai et al., 2022; Dyreborg et al., 2022), for example improving storage systems and enforcing PPE regulations help mitigate falling object hazards, while repairing uneven surfaces and maintaining clean work areas reduce slips and trips. For manual handling of heavy materials, providing lifting aids, proper training, and job rotation can help prevent musculoskeletal injuries. Vehicle-related risks, such as crashes, can be minimized by marking hazardous zones and installing traffic safety mirrors at key locations. The implementation of necessary precautions can create a safer environment and reduce the likelihood of work-related injuries (Dyreborg et al., 2022; Hadi et al., 2025).

The findings and proposed recommendations are not only applicable to building material retail

stores but can also be implemented in various other industries to enhance workplace safety. Many sectors, such as manufacturing, warehousing, logistics, and construction, face similar hazards, including manual handling injuries, slips and trips, falling objects, and vehicle-related risks (Al Shaaili et al., 2023; Yensan, 2023; Almaskati et al., 2024). Thus, adopting HIRA and JSA-based strategies across different sectors can create safer working environments and improve overall occupational health and safety standards. However, continuous monitoring is essential to assess their effectiveness and identify emerging risks. Regular worker training is also needed to reinforce safety practices, ensure proper use of PPE, and adapt to new hazards. As workplaces evolve, updating safety measures and conducting periodic risk assessments will help maintain long-term effectiveness and compliance with safety regulations. These efforts are not only vital for protecting workers but also for reducing the financial burden of workplace incidents.

Work-related incidents in construction lead to major financial losses (Yilmaz, 2014). Investing in OSH management leads to lower medical costs, compensation claims, and legal expenses. Fewer injuries mean less downtime and absenteeism, allowing for smoother operations and higher productivity (Heinrich, 1941; Heier et al., 2021; Siegel et al., 2021; Kavouras et al., 2022; Shabani et al., 2023). Improved worker safety also enhances morale and efficiency, reducing turnover and training costs. As a result, investing in better working conditions will lead to long-term savings by lowering occupational health and safety expenses while also decreasing the number of reported incidents (Pawłowska and Rzepecki, 2000; Targoutzidis, 2014; Rikhotso et al., 2022; Mustard and Yanar, 2023).

4.CONCLUSION AND SUGGESTION

This study provides a comprehensive assessment of workplace safety at TB XYZ by identifying key hazards and evaluating risks using the Hazard Identification and Risk Assessment (HIRA) framework. The findings reveal that manual handling poses the highest risk (extreme), followed by ergonomic issues and contact with sharp objects (very high risks). These results highlight the need for immediate action to

improve worker safety and reduce potential injuries. By combining Job Safety Analysis (JSA) and HIRA, this research provides a practical foundation for safety improvements, such as better manual handling training, ergonomic adjustments, and stricter PPE enforcement. These insights can help shape better safety policies, employee training programs, and workplace improvements, which help for a more structured Occupational Safety and Health management system.

Future efforts should focus on monitoring the effectiveness of the proposed safety measures. Workers should receive regular, comprehensive training on hazard recognition, proper use of PPE, and safe handling of materials. For the workstation maintenance, stricter storage and handling procedures should be put in place, ensuring proper work technique and management according to regulations.

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