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Targeting Safety: Hazard Identification and Risk Assessment in the Work of Wood Carving in Tunjungsekar, Malang City, Using the HIRADC Method

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ABSTRACT

The furniture industry in Tunjungsekar Subdistrict has become one of the leading industrial centers in Malang City, successfully boosting the local economy by employing 90 percent of the workforce. However, this industry faces productivity challenges due to an ergonomically unfavorable work environment. Therefore, practical actions and in-depth analysis are needed to improve the work environment issues. This study aims to identify hazards and assess risks associated with the work of wood carving artisans in Tunjungsekar, Malang City, using the HIRADC (Hazard Identification, Risk Assessment, and Determining Control) method. Identification was carried out through direct observation and interviews with artisans, followed by analyzing hazards and risks at each stage of work using the HIRADC method with a 5 multiple 5 matrix. This research design uses a descriptive quantitative research design with a cross-sectional approach. The identification and analysis results showed 33 potential hazards that could lead to 59 risks across all work stages. These 59 risks were categorized into low, medium, and high based on the potential hazard level and the extent of exposure. Several control recommendations were proposed based on the risk assessment results, which can be implemented to reduce or eliminate the risks experienced by the wood carving artisans in Tunjungsekar, Malang City.

1. Introduction

The furniture industry in Tunjungsekar Subdistrict is one of the leading industrial centers in Malang City. In terms of numbers, this industry ranks second, following the soybean tempeh industry. Through effective institutional organization, the furniture industry in Tunjungsekar Subdistrict has successfully improved the local economy by employing 90% of the workforce However, this industry is currently facing issues related to fluctuations in worker productivity. Additionally, it has been found that there is a significant scarcity of raw materials in the Tunjungsekar furniture industry, leading to a decrease in output compared to input (Ashary et al., 2021). Productivity issues can be associated with decreased motivation, lack of training, unsupportive work climate, inadequate wages, unstable work ethic, and poor work management (Fitriyani et al., 2023). The work climate can encompass the ergonomics of

tools and workstations (Watiningsih, 2024). and the physical conditions of workstations, including lighting, air quality, temperature, and various workplace hazards (Rahmanto & Hamdy, 2022).

These problems require immediate action recommendations because such hazards not only decrease worker productivity but also pose other more dangerous impacts. These impacts include work accidents that ultimately affect the company's financials (Putra et al., 2024). This consequence is evidenced by data from the International Labour Organization (ILO), which estimates that around 380,000 workers die each year (13.7%). The prevalence of non-fatal accidents is much higher than that of fatal accidents, with 375 million non-fatal accidents occurring annually. The Social Security Administering Body (BPJS) for Employment in Indonesia reports 173.105 cases of work accidents. Despite the large number, work accident cases worldwide are still considered part of the iceberg phenomenon, where the number of unreported cases far exceeds the reported ones.

Therefore, effective actions are needed to address this issue through more comprehensive studies and reviews. No previous research has analyzed safety risks in the Tunjungsekar furniture industry in Malang City. This article aims to delve deeper into the potential hazards that may occur in the work of wood carving craftsmen in Malang City and to conduct a risk assessment of these hazards. Through in-depth analysis, this article is expected to provide a clear overview of appropriate control measures that can be implemented to reduce or eliminate the risks that may be faced by the craftsmen. Consequently, this article can indirectly contribute to the growth and development of the local wood carving industry by enhancing the welfare of wood carving craftsmen in Malang City.

2. Method

The method used in this article is a descriptive quantitative research method with a cross-sectional approach, consisting of descriptive observational techniques to identify hazards and risks at each stage of work among the wood carving craftsmen in Tunjungsekar which was carried out on April 27, 2024. The data for the identification process was obtained through direct observation of local craftsmen to monitor the production process, tools used, and safety practices implemented. Each existing process was subjected to hazard identification based on various hazard elements. This hazard element identification was conducted by examining the work area, the equipment or machinery used, the habits and actions of the operators, and the materials used . Additionally, the researchers conducted interviews with the craftsmen to gain deeper insights into the safety practices they have implemented.

Meanwhile, the data processing for risk analysis in this article uses the HIRADC (Hazard Identification, Risk Assessment, and Determining Control) method with a 7x7 matrix by multiplying severity and probability/likelihood. Risk indicates the likelihood of an accident occurring during an operational cycle or a specific time period. Risk assessment is the process of evaluating the activities that have previously been identified for hazards. Risk assessment involves assigning a value to the severity of the impact (severity) and the frequency of occurrence of the potential hazard (likelihood). To ensure consistent and accurate values for all work processes, a definition of the established scale was created. The severity scale definition is based on physical and material severity, while the likelihood scale definition is based on how often the hazardous condition occurs and how frequently the hazardous activity is performed.

Risk = S (Severity) x L (Likelihood)

Description:

Risk is the potential risk that may occur.

S (Severity) is the level of severity of the risk of a hazard.

L (Likelihood) is the probability of the consequences caused by a hazard.

Table 1. Qualitative Measures of Probability

(AS/NZS 4360:2004)

Grade	Criteria	Description
A	Almost Certain	An event is almost guaranteed to occur under all conditions and during any activity undertaken.
B	Likely	An event is likely to occur under most conditions.
C	Moderate	An event may occur under certain specific condition.
D	Unlikely	An event may occur under specific conditions; however, the likelihood of occurrence is low.
E	Rare	An event may occur only under extraordinary or exceptional conditions, such as after several years.

Source: Primary Data, 2024

Table 2. Qualitative Measures of Severity

(AS/NZS 4360:2004)

Grade	Criteria	Description
1	Insignificant	No injury; negligible material loss.
2	Minor	Requires first aid treatment; minor material loss.
3	Moderate	Requires medical treatment; results in lost workdays or temporary loss of bodily function; moderate material loss.
4	Major	Causes permanent disability or total loss of bodily function; disrupts production processes; significant material loss.
5	Catastropic	Causes fatalities or death; results in severe material loss

Source: Primary Data, 2024

Table 3. Scale of Risk Assessment Results

(AS/NZS 4360/2004)

Likelihood	Severity				
	Insignificant	Minor	Moderate	Major	Catastropic
	1	2	3	4	5
Almost Certain	Low	Low	Medium	Medium	High
Likely	Low	Medium	Medium	High	High
Moderate	Low	Medium	Medium	High	Extreme
Unlikely	Medium	Medium	High	High	Extreme
Rare	Medium	High	High	Extreme	Extreme

Source: Primary Data, 2024

3. Result and Discussion

In accordance with Permenaker 5 Tahun 2018, the application of HIRADC analysis is a critical step in identifying, evaluating, and mitigating workplace risks to ensure compliance with occupational health and safety (OHS) standards. This regulation underscores the necessity of a systematic approach to hazard identification and risk assessment in order to implement effective control measures. The methodology employed aligns with the principles outlined in OSHA guidelines, which emphasize proactive risk management strategies to address physical, ergonomic, and electrical hazards. By integrating these regulatory frameworks, the analysis ensures that potential risks, such as sharp tools, electrical hazards, and ergonomic challenges, are effectively mitigated through hierarchical control measures, including engineering solutions, administrative actions, and the use of personal protective equipment (PPE).

Furthermore, the framework established by ISO 45001:2018 complements this approach by promoting the development of an occupational health and safety management system that prioritizes worker engagement and continuous improvement. This standard advocates for the regular review and evaluation of hazard controls to ensure their efficacy in minimizing workplace risks. Within the context of this analysis, control measures tailored for wood carving artisans are designed to comply with both legal and international standards while fostering a culture of safety and risk awareness. Preventative strategies such as worker training, ongoing monitoring, and ergonomic interventions play a vital role in sustaining a safe and healthy work environment. By adhering to these regulatory and international standards, the HIRADC process not only effectively reduces hazards but also supports the establishment of a long-term OHS management system.

The analysis results indicate the presence of several potential hazards, such as large and sharp tools, unsafe electrical currents, sharp wood splinters, and non-ergonomic worker positions. Each work stage has different potential hazards and risks. These hazards can lead to risks such as injuries, respiratory infections, and low back pain. Risk assessment was conducted by identifying the likelihood of hazard occurrence and the possible severity of its impact. The risk and occupational health and safety (OHS) impacts were assessed using the HIRADC method. The development of HIRADC in this analysis started from identifying potential hazards, assessing risks, controlling risks, and implementing control actions. The HIRADC assessment results for wood carving craftsmen can be seen in the following table

Table 4. Hazard Identification, Risk Assessment, dan Determining Control (HIRADC) for the Woodcraft Work Area in Tunjungsekar

Hazard Identification, Risk Assessment, dan Determining Control (HIRADC)									
No	Critical Task	Hazards	Risk Identified (Pure Risk)	Type of Risk			Risk Calculation		Risk Rank
				S	H	E	Cons	Freq	
1.	Preparing tools	Large, heavy tools	Crushing body parts	✓	✓		4	2	8
			Bone fracture		✓		4	2	8
		Piles of wood	Growing mold			✓	1	3	3
			Crushed by wood piles	✓	✓		4	2	8
			Bone fracture		✓		4	2	8
		Lack of air ventilation	Poor oxygen quality		✓	✓	2	1	2
			Shortness of breath		✓		2	4	8
		Cable near water dispenser	Electrical short circuit	✓		✓	4	2	8
			Fire	✓		✓	4	2	8
		Sharp tools	Puncture/cut	✓	✓		4	2	8
			Bone fracture		✓		2	3	6
		Lifting wood for production	Foot crushed by wood	✓	✓		4	2	8
			Scratches		✓		2	4	8
			Low back pain		✓		3	3	9
		Ladder not adjusted to workers' height	Bumping	✓	✓		2	4	8
			Falling	✓	✓		2	4	8
2.	Cutting wood	Sharp wood splinters	Hands punctured by wood splinters	✓	✓		1	3	3
		Non-ergonomic positions	Musculoskeletal problems		✓		2	3	6
		Use of electric machinery	Fingers cut	✓	✓		3	3	9
			Electric shock from the machine	✓	✓		5	2	10
			Fire	✓	✓	✓	5	1	5
		Loud machine noise	Work stress		✓		2	4	8
			Noise-induced hearing loss (NIHL)	✓	✓		2	4	8
3.	Wood carving	Non-ergonomic body positions	Back pain	✓	✓		2	4	8
			Neck pain	✓	✓		4	2	8
			Leg pain	✓	✓		2	3	6

		Sharp wood splinters	Injures the workers' body parts	✓	✓	4	5	20
		Repetitive movements	Musculoskeletal problems	✓	✓	4	5	20
		Use of sharp tools	Injures hands	✓	✓	4	5	20
		Workers' cigarette smoke	Respiratory tract infection	✓	✓	3	3	9
		Wood scroll tools (drilling)	Punctured	✓		2	3	6
		Flying wood dust	Eye irritation	✓	✓	3	3	9
			Respiratory tract infection	✓	✓	3	4	12
4.	Wood sanding	Scattered power cables	Tripping over the cables	✓		2	5	10
		Damp room	Dermatitis	✓	✓	3	5	15
		Peeling electric cables	Electric shock from the machine	✓	✓	4	4	16
		Work climate	Decreased concentration		✓	3	3	9
			Dehydration		✓	3	5	15
			Work stress		✓	3	5	15
		Scattered wood dust	Respiratory tract infection	✓	✓	3	3	9
			Eye irritation	✓		3	3	9
		Planer machine	Hand arm vibration syndrome (HAVS)		✓	3	3	9
			Noise-induced hearing loss (NIHL)		✓ ✓	3	3	9
5.	Finishing with paint/varnish	Spills of paint/varnish	Slipping due to stickiness and slipperiness	✓	✓	3	3	9
			Skin irritation	✓	✓	3	3	9
		Inhalable particulate matters	Lung disorders	✓	✓ ✓	2	3	6
			Coughing	✓		2	7	14
		Use of thinner liquid	Skin irritation	✓	✓	4	2	8
			Respiratory tract infection	✓	✓	2	4	8
		Non-ergonomic positions	Musculoskeletal problems		✓	2	4	8
6.	Returning tools to storage	Scattered equipment	Slipping	✓	✓	2	4	8
			Stumbling	✓	✓	2	4	8
			Falling due to loss of balance	✓	✓	2	4	8

	Staircase without handrail	Getting pierced by metal bars underneath the stairs	✓	✓	4	2	8
	Scattered production waste	Stumbling	✓		2	3	6
		Environmental pollution		✓	3	3	9
	Uncovered and scattered chemicals	Chemical poisoning and contamination		✓	2	2	4
	Limited wood warehouse	Crushed by wood		✓	3	3	9
		Bone fracture		✓	3	2	6

Source: Primary Data, 2024

The results from the data analysis in Table 4 were then used to calculate the risk to obtain the risk rank. This number was obtained by multiplying the severity level and the frequency of occurrence for each identified risk. Risk assessment was conducted using a 7x7 matrix, with low, medium, and high-risk levels. The calculation revealed 33 potential hazards. Within these 33 potential hazards, 59 risks were identified in the wood carving craftsmen's work area. Table 4 shows the presence of low, medium, and high risks

3.1 Risk Hazard Identification

Based on the risk assessment results in Table 4, appropriate control recommendations are proposed to reduce or eliminate these hazards. Suggestions for control efforts include improving worker positioning and the use of personal protective equipment. The implementation of the recommended control measures is expected to enhance the safety and health of wood carving craftsmen in Malang City while reducing the risk of accidents and injuries. From the multitude of risks above, they can be categorized and selected for low, medium, and high-risk levels. Based on these categories, they can be outlined as follows:

3.1.1 Low Hazard Level

The wood carving craftsmen in Tunjungsekar, Malang City, operate a furniture industry that utilizes wood and various large and small equipment daily to support the productivity of their craft business. In the course of their work, they face hazards that pose various risks. When conducting an HIRADC analysis on wood carving craftsmen, several categories of risk levels are identified, one of which is the low-risk level. The risks associated with this low level are as follows:

a. Poor oxygen quality can occur due to inadequate air ventilation, leading to mold growth in wood piles. The risk arising from the presence of mold in the room threatens work health, including infections and allergies. Consistent with Dewi et al.'s research (2021), the quality of the oxygen we breathe is a crucial determinant of health. Diseases that may arise include infectious diseases like the flu, hypersensitivity (asthma, allergies), and toxicoses, which are toxins in the air in contaminated rooms that cause symptoms of SBS (sick building syndrome). The HIRADC table analysis results indicate a low risk level because it rarely occurs (Dewi et al., 2021).

b. Hands punctured by wood splinters are caused by sharp wood splinters and could possibly be due to the use of a wood scroll tool for drilling wood. In line with Ilmy et al.'s research (2020) this can happen due to inappropriate work methods in handling and using tools during work. Controlling actions to prevent potential hazards in this process can enhance work focus and the use of personal protective equipment (PPE), such as gloves and safety shoes, following the company's work instructions, and educating about occupational health and safety (OHS) and accident prevention. This falls under the low-risk level as it rarely occurs in workers (Ilmy, 2020)

3.1.2 Medium Hazard Level

a. In wood carving, there are hazards that fall into the medium risk category, with the most dominant being complaints of bone fractures, low back pain, musculoskeletal problems, back pain, neck pain, and leg pain. These risks appear in almost all stages of work. According to research by Rahmawati et al. (2022), these problems cause muscle tension, spinal ligament tension, abnormal pressure on tissues, and isometric contraction of back muscles, which can lead to herniated nucleus pulposus (HNP). These issues are caused by non-ergonomic worker positions maintained for long periods (Rahmawati et al., 2022)

b. Besides these hazards, there are other medium-risk hazards such as shortness of breath, scratches, punctures/cuts, NIHL (noise-induced hearing loss), eye irritation, respiratory tract infections, lung disorders, coughing, poisoning, and chemical contamination. This is due to the lack of PPE use. For example, one worker uses a mask that is no longer suitable for use, posing a risk of coughing due to dust and bacteria. According to research by Puspitasari (2016), the use of PPE is very important to reduce dust exposure in the lungs because these tools function as filters for respiratory air, thus preventing lung disorders (Puspitasari et al., 2016)

c. Another medium hazard risk includes being struck by large equipment, feet being crushed by wood piles, collisions, falls, fingers being cut, electric shocks from machinery, fires, slipping due to sticky and slippery surfaces, tripping, falling due to loss of balance, and being pierced by metal. These risks can occur because wood and machinery, whether large or small, are not neatly arranged, hence limiting workers' movement, and the lack of adherence to SOPs in using equipment. Additionally, these risks can arise from the lack of handrails on stairs and the limited space in the woodworking area relative to the amount of equipment and materials present. Agustina et al. (2017) state that knowledge about hazards is crucial to implementing occupational safety and health to prevent workplace accidents and occupational diseases (PAK) (Agustina et al., 2016)

d. The woodworking area has many dangling and poorly arranged cables, which can lead to various issues, including fires caused by cables being chewed by rats and resulting in electrical short circuits. This risk assessment scores as medium due to the significant threat to the safety and health of workers. Electrical cables covered with wood dust can cause short circuits or tripping, leading to worker injuries and interruptions in their usual activities (Berutu & Bora, 2024)

e. Work stress and decreased concentration experienced by workers can be caused by the lack of work shifts and rest periods. This situation can arise due to job demands to meet order targets, forcing workers to work overtime. Excessive working hours can increase fatigue and work stress. This is consistent with the study by Husnatun Laili (2024), which revealed a relationship between work shifts, fatigue, and work stress (Laili & Susilawati, 2024).

f. Production waste scattered around can cause environmental pollution. Research by Prasetyo and Yuliawati (2023) also notes that scattered wood waste and the lack of blowers or dust extractors disrupt operational environments. Therefore, this risk assessment scores as medium because it can negatively affect air quality (Yuliawati & Prasetyo, 2023).

g. According to interviews with the workers, they frequently experience various problems, including low back pain, coughing, injuries from cutting tools, and being struck by objects.

h. Although the risks are mostly of medium level, if control measures are not implemented, these problems can lead to various long-term impacts, including:

    1. Musculoskeletal disorders resulting from prolonged work positions without intervention (Pradana & Muslimah, 2019)

    2. Loss of bodily functions, such as bone fractures, hearing loss, and amputated fingers (Pradana & Muslimah, 2019)

    3. Respiratory diseases, such as asthma and chronic obstructive pulmonary disease (COPD) (Pradana & Muslimah, 2019)

    4. Woodcraft workers also have a 90% high risk of acute respiratory infections due to frequently inhaling fine wood dust and particles over long periods (Sitohang et al., 2021).

3.1.3 High Hazard Level

a. Additionally, there are high-risk hazards in the Tunjungsekar wood carving industry. For instance, during wood carving activities, workers often encounter sharp wood splinters that might injure their bodies. This is categorized as a high hazard level due to the high frequency of incidents. The primary causes are the absence of standard operating procedures (SOP) for using protective footwear, gloves, and long-sleeved clothing.

b. Musculoskeletal problems among workers due to repetitive movements while carving wood are also frequent. These issues arise from prolonged periods of carving. This can be prevented by implementing an SOP for stretching exercises every few hours and providing adjustable chairs with cushions or back support. Regular evaluations of the established SOPs are crucial to ensure they are continually updated to match the working environment conditions, hence preventing workplace accidents. This is supported by research from Mahbubi (2023), which advocates for SOP evaluations accompanied by the establishment of

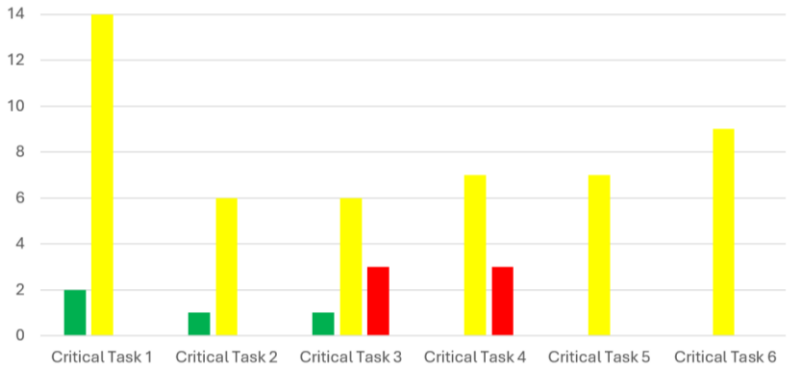
strict rules or sanctions for workers who do not comply with the regulations (Mahbubi, 2023)

c. Hand injuries caused by sharp tools. Wood carving activities require specialized tools with sharp edges, making workers, especially their hands, vulnerable to injuries. A preliminary study conducted by Saputra and Ramberson (2023) found that workplace accidents, such as cuts on fingers/hands, result in uneven wood surfaces and injuries from falling sharp objects like hammers and wood. Most respondents did not wear a complete set of PPE. Using UVEX gloves and long-sleeved clothing can reduce the risk of cuts (Saputra et al., 2023)

d. The area for smoothing wood has high humidity, causing dermatitis in workers. This condition makes workers uncomfortable. Additionally, the working climate or weather tends to be hot, causing the hypothalamus to stimulate sweating as the body's response to the surrounding environment. Sweating leads to fluid loss in the body, resulting in thirst and dehydration (Rachim, 2023). Providing adequate drinking water and fair shift work distribution will significantly help reduce this risk.

3.2 Hazard Identification and Risk Assessment with HIRADC

Based on the analysis results using HIRADC, a risk assessment can be conducted for the hazards in the work area of wood carvers. This risk assessment can serve as a reference for determining the risk level by calculating the combined Consequence (severity level) and Frequency (likelihood of occurrence). The risk assessment can be carried out using a risk matrix to rank the risks. The results of all calculations yield the risk assessment as shown in Figure 1.



Source: Primary Data, 2024

Figure 1. Summary of Risk Rank Results from the HIRADC

Based on Figure 1, the most prevalent risks fall under the medium level (tolerable risk), distributed across every work process of wood carvers, particularly in stage 1, which involves preparing tools, and stage 6, which involves returning tools to storage. There are 49 medium-level risks, 6 high-level risks, and 4 low-level risks. The majority of high-level risks, totaling 9, occur in stage 6, which is the tool storage stage.

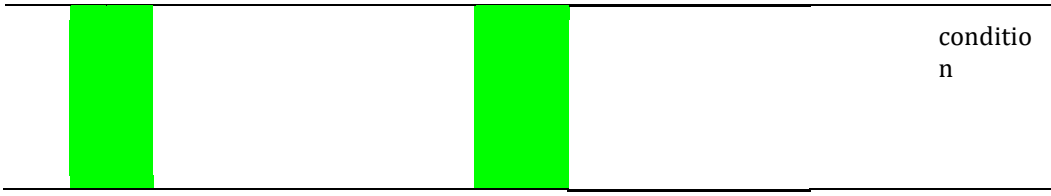
Each work stage in the informal wood furniture industry has potential hazards that can lead to work-related accidents or occupational diseases (Ramadhania et al., 2022). The sanding and painting processes can produce dust or wood particles, and inhaling vapors of organic solvents and hazardous chemicals often leads to occupational health and safety issues, especially respiratory system disorders. Other risks include musculoskeletal disorders resulting from heavy manual handling tasks, such as moving furniture from the work area to the storage location, and safety hazards like being struck by heavy objects, punctured by nails, or hammered (Fitriyani et al., 2023).

3.3 Risk Control with HIRADC

Based on Hazard Identification and Risk Assessment, it is necessary to implement risk control measures for wood carvers in Tunjungsekar. This stage aims to propose actions for preventing and controlling the previously identified risks. Risk control is conducted using the hierarchy of control guidelines, which include elimination, substitution, engineering controls, administrative controls, and PPE. The risk control process is implemented as outlined in Table 5.

Table 5. Risk Control with HIRADC

Ref No	Risk Rank			Existing Control	Effectiveness of Controls (%)			Residual Risk Rank	Additional Controls Recommended				
	S	H	E		S	H	E		Elimination	Substitution	Engineering	Admin	PPE
				Effectiveness Of Controls									
3.3.1	2	20	0	Using chairs and tables		40 %		12		Chairs with cushioning and back support		SOP for stretching every few hours	
1.5.2		12		Transporting tools according to the SOP		65 %		4			Using trolleys for transporting items	Warning sign	PPE (safety helmet, safety wearpack)
2.1.1	4	4		Wearing fabric gloves as PPE	25 %	25 %		3				Conducting inspections to ensure PPE is in good	Kevlar gloves



Source: Primary Data, 2024

Based on the risk assessment conducted in the Tunjungsekar furniture industry, the existing control measures were evaluated through in-depth interviews with workers. Existing controls include the use of chairs and tables in the production process, the presence of SOPs, the use of fabric gloves, and so on. However, these control measures are not yet maximized to sufficiently reduce the risks arising from the work processes. As shown in Table 5, there are still risks with a medium hazard level. Therefore, improvements are needed to lower the risk level to a low level.

Table 6. Recommendations and Action Plan

Recommendations and Action Plan								
Ref No	Risk Rank			Action Plan (Additional Control)	Resources Allocated	Responsible Person	Starting Date	Due Date	Progress Status (%)
	S	H	E						
1		4		Monitoring workers' posture and providing adequate rest breaks for workers, as well as providing PPE, such as lifting hand gloves	The OSH Department and funding the procurement of lifting hand gloves	Nadia	8 May 2024	1 July 2024	0%

Source: Primary Data, 2024

Based on the risk assessment analysis with HIRADC, there is a need for deeper risk control efforts. Recommendations and an action plan are highly necessary to mitigate the existing hazards. Therefore, risk control efforts are carried out with recommendations based on the hierarchy of controls. In the elimination stage, efforts are needed to remove spills of paint/varnish, eliminate water gallons, and dispose of unused wood. In the substitution stage, improvements should be made to ladders adjusted to the qualifications of workers, procurement of chairs that can be adjusted and have cushions and back support. In the engineering stage, efforts should be made to use trolleys, forklifts, have fire extinguishers, use cable clamps, have dust suction machines, and machines for processing waste. Next, in the administrative stage, training should be conducted, SOPs developed, warning signs installed, safety induction held, health screening conducted, shift work scheduled, and equipment and PPE completeness checked. In the final stage, PPE should be worn, including safety helmets, safety wearpacks, safety shoes, safety kevlar gloves, lifting hand gloves, cut & puncture resistant gloves, earmuffs, and ear plugs. These recommendations may not eliminate 100% of

the hazards in the furniture industry, but they can be efforts to mitigate and minimize hazards resulting from the work processes.

This study has several limitations that should be noted. The research was conducted at a carved wooden furniture workshop in Tunjungsekar, Malang City. It focuses primarily on hazard identification and risk assessment using the HIRADC (Hazard Identification, Risk Assessment, and Determining Control) method. External factors, such as government policies or market conditions that could influence occupational safety, are not included in this analysis. Consequently, the findings of this study are limited to the internal conditions at the research site, without consideration of these external influences.

This study provides a robust foundation for formulating government policies aimed at improving occupational health and safety for employees in the carved wooden furniture sector in Tunjungsekar, Malang City. Grounded in factual and empirical data, the research evaluates the residual risk rank of existing safety controls. Moreover, the study offers a comprehensive recommended action plan, serving as a strategic guideline for both companies and policymakers. These recommendations are intended to support evidence-based decision-making in the field of occupational health and safety

4. Conclusion

The risk analysis conducted in the wood carving work area in Tunjungsekar, Malang City, reveals that medium-level risks are the most prevalent. These risks include bone fractures, musculoskeletal disorders, low back pain, neck pain, foot pain, shortness of breath, cuts, punctures, noise-induced hearing loss, eye irritation, respiratory infections, poisoning, chemical contamination, being struck by heavy tools, bumps, falls, slips, electric shocks, fires, and scattered production waste. To mitigate or eliminate these risks, recommended controls include improving worker positions, mandating the use of PPE, enforcing stricter SOPs, and enhancing worker awareness of workplace safety. Implementing these measures is expected to reduce potential workplace accidents and negative health impacts on workers. However, this study is limited to hazard identification at each stage of the Tunjungsekar furniture industry's work processes, and the findings may not be generalizable to all furniture industries. Furthermore, the research was conducted over a single day of observations and interviews, which limited the communication and implementation of the identified hazards and recommended solutions. These limitations should guide future researchers in conducting more extensive and comprehensive studies.

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