## ABSTRACT

### Hazard Identification and Risk Management in the Manufacturing Workshop UPTD BLK Garut

Murdiyono

murdio23@gmail.com

Dinas Tenaga Kerja dan Transmigrasi Kabupaten Garut

**Abstract:** This research aims to: (1) know the hazards of what can happen in the manufacturing workshop UPTD BLK Garut; (2) know about the risk assessment in the manufacturing workshop UPTD BLK Garut; and (3) determine the effort to control the risks that must be done by management in the manufacturing workshop UPTD BLK Garut. This research is descriptive with a survey method. Data was collected through observation, interviews, and documentation. The object of this research is the condition of the manufacturing workshop UPTD BLK Garut. Validity of data obtained by observing, interviewing, and photographing manufacturing workshop conditions. Data analysis using descriptive statistical analysis techniques to calculate the percentage of each indicator feasibility workshop, later identified hazards that occur, along with the percentage of the level of risk/hazards and the percentage of risk control/hazards. The results showed that: (1) the hazards identified from 9 indicators are the handling and storage of materials with 10 hazards; using hand tools with 7 hazards; machine guarding 4 hazards; designing the workplace/ workshop 8 hazards; lighting 5 hazards; weather work 6 hazards; and a facility worker/student 5 hazards; (2) assessment of risk/hazards in the manufacturing workshop UPTD BLK Garut, namely risk/hazards with a medium level of risk of a number of 6 (13.3%); (3) control of the risks/hazards that exist in the workshop includes control of the planned number of 26 actions (58%); and control of risks/hazards with an unplanned number of 19 actions (42%)..

*Keywords: identification of hazards, risk management, BLK, workshop*

# INTRODUCTION

A Job Training Center (BLK) is a place where the job training process is held for trainees so that they are able to master a certain type and level of work competence to equip themselves to enter the job market and/or independent business as well as a place for training to increase their work productivity so as to improve their welfare [1]. One of the functions of the BLK is to carry out training and skills testing and to maintain the implementation of training and report generation [2].

Based on data from the Ministry of Manpower, the total number of Vocational Training Centers is around 3388, which includes 272 government institutions, 1493 private institutions, 1602 community BLK and 21 Pre-Employment Card Partners [3]. This number can certainly increase in line with the focus of the President of the Republic of Indonesia in the second period to increase human resources in Indonesia.

Job training in BLK is held on a competency basis, so that the program must be prepared based on the SKKNI, SKK, and/or SKI. Job training must be competency-based [1]. Each vocational school has competency units that must be mastered by training participants.

Good infrastructure is needed to support the achievement of each unit of job training competency. One of them is a workshop as a place for job training that must meet eligibility standards so that the implementation of the training runs well. The implementation of training in the workshop must also meet the aspects of Occupational Safety and Health (OSH). Workshops that do not meet the OSH aspects can pose a potential hazard. Potential hazards that are not analyzed and controlled can result in work accidents.

Most of the BLK throughout Indonesia have not implemented the OSH aspects properly. especially for BLK-BLK in the regions. One of them is in the manufacturing workshop of UPTD BLK Garut. The large cost factor and poor management are factors that hinder the fulfillment of these OSH aspects. The findings in the manufacturing workshop of UPTD BLK Garut are poor air circulation, noise disturbance from the use of practical equipment, potential fire hazard originating from the operation of tools and machines, untidy arrangement of tools and machines, poor lighting, and personal protective equipment. This is not appropriate because there is no risk analysis in the workshop and there are still workshop users who do not care about OSH.

If this is left alone, it can pose a potential hazard. The threatening risks include exposure to radiation, chemical, biological, infection, allergies, electricity, and physical such as sprains, slips, falls, scratches, punctures, and bumps, depending on the type of practice activity being held. In addition, various situations and conditions that can cause errors or omissions during work are also threatening risks [4].

To prevent accidents at work in the workshop, it is necessary to identify hazards, analyze risks, and control them. The stages in hazard/risk control are in accordance with the OSH Module in the Workplace published by the ILO, including: identification of several controls (risk reduction, risk transfer, risk avoided, risk acceptance); evaluation of control options based on costs, resources (internal) owned and external factors such as political, economic, and social considerations; determining the choice of control options to be used; preparation and planning of control options; implementation of control; evaluation of risk level after control; if the remaining risk is still high, control measures are carried out at the same stage (retain) [5]. According to OHSAS 18001:2007, in carrying out risk control, there are five hierarchies, namely: elimination (removing hazardous materials or processes), substitution (replacing hazardous materials or processes), engineering engineering, administrative control, and Personal Protective Equipment (PPE) [6].

Observing these problems, it is very important to identify hazards and implement risk management measures in the manufacturing workshop of UPTD BLK Garut. This is done in order to obtain accurate information about the potential hazards in the workshop as well as the level of risk. In addition, information can be obtained regarding hazard control measures to eliminate or reduce existing hazards.

The information is useful for continuous improvement by both the local government and the Ministry of Manpower.

The objectives to be achieved from this research are to (1) find out what hazards can occur in the workshop; (2) learn about risk assessment in the workshop; and (3) know the hazard/risk control efforts that must be carried out by UPTD BLK Garut.

# LITERATUR REVIEW

## 1. Occupational Safety and Health (OSH)

Occupational Health and Safety (K3) is generally defined as the science of anticipating and recognizing hazards, evaluating and controlling hazards that arise in the workplace that can interfere with the safety and health of workers by considering the impact on the environment in general. [7]. Occupational health is the application of health science or medical science in the field of manpower which aims to prevent occupational diseases and to maintain and improve the health of workers or laborers to improve their performance. While work safety is a condition where workers are safe, they do not experience accidents in carrying out their duties and work [8]. OSH, also known as Occupational Health, has the aim of obtaining the best possible health status for workers, including physical, mental, and social health against disease or health problems through preventive and curative efforts in the workplace [9].

## 2. Work Accident

The main definition that describes the combined form of an accident according to OHSAS 18001:2007 and BS 8800:2400 is an event that results in injury, illness or death, and the incident is not desired by all parties. As a result, an accident is unlikely to occur because it could disrupt a planned activity or process.Accidents can also cause harm to humans, the environment, and property. [10]. According to the Minister of Manpower Regulation Number 5 of 2021, work accidents are those that occur in an employment relationship, including accidents that occur on the way from home to work or vice versa, and diseases caused by the work environment [11].

The direct causes of an accident are unsafe acts and unsafe conditions. What is meant by "unsafe action" is an action that violates the rules or procedures for occupational safety and health that allow accidents to occur. Meanwhile, an unsafe condition is a physical condition or condition of the environment, as well as tools and machines that have the potential to cause direct danger and can allow accidents to occur.

Unsafe condition :

- Nearly 20% of all injuries at work are caused by unsafe workplace conditions
- Unsafe conditions related to physical and mechanical conditions that are not good or damaged. Can be repaired at a relatively low cost
- Unsafe conditions are the first area to be corrected when there is a program to reduce the number of work accidents

Unsafe Actions:

- Nearly 80% of work injuries or accidents are the result of unsafe worker actions
- Unsafe acts are more difficult to correct because workers will always move from one area to another following the flow of activities
- It can never be completely resolved through training, warning or motivation. [12].

## 3. Risk Assesment

Risk assessment can be defined as a series of processes for assessing and evaluating any risks that arise in the workplace against aspects of occupational safety and health [13]. What is meant by risk assessment is the process of determining the priority scale of hazard control based on the level of risk of accidents or occupational diseases that occur in the workplace [14]. According to the Occupational Safety and Health Administration, controlling hazards at their source is the best way to protect employees [15]. Depending on the hazard or workplace conditions, OSHAS recommends the use of engineering or work administration to control, manage, or eliminate hazards as much as possible[16].

Risk assessment methods include determining the possibility of an accident, determining the consequences of an accident, and determining the level of each risk [14]. In risk control, it is necessary to establish a risk control strategy to reduce the risk level to as low as reasonably practicable. With the stages of elimination (removal), substitution (replacement), technical control, administrative control, and the use of personal protective equipment (PPE) [6].

### 4. Hazard Identification

Hazard identification is identifying a condition, object, environment that has the potential to cause a hazard which is part of the hazard/risk evaluation process. The term often used to describe the entire process is risk assessment. Risk assessment consists of several processes namely, identification of hazards; risk analysis, and risk evaluation; risk control or determine appropriate controls for hazards that arise [17]. Hazard identification means identifying undesirable conditions or events that lead to the materialization of hazards and establishing a mechanism for how these undesirable events can occur [18].

The purpose of hazard identification is to find and record potential hazards that may exist or arise in the workplace. This can help the process of activities in the workshop which includes workers who usually work and or visitors to the workshop. With the identification of hazards, valid information will be obtained making it easier to carry out inspections [17].

## METHODS, DATA AND ANALYSIS

This type of research is descriptive qualitative research with a case study method. This study attempts to describe the possible hazards and risks that may occur in the manufacturing workshop of UPTD BLK Garut. Then, assess the risk and formulate hazard control so that the risk of work accidents can be minimized.

This research was conducted at the Garut UPTD BLK Manufacturing Workshop located on Jalan Samarang KM. 4 Cintarakyat, Samarang, Garut 44161 from 10 May to 15 June 2022.

The subjects of this research are: 1) Manufacturing Workshop Coordinator, 2) Manufacturing Workshop Instructor/User, and 3) Head of UPTD BLK Garut. Research subjects act as informants to provide information through interview methods regarding risk assessment and control in manufacturing workshops. While the object of research is the manufacturing workshop of UPTD BLK Garut.

### 1. Methods

The research procedure is carried out based on the Hazard Identification and Risk Assessment (HIRA) steps including: 1) hazard/risk identification, 2) risk assessment, and 3) hazard/risk control. Hazard/risk identification is carried out by identifying hazards based on observations in the workshop using a check list sheet. Risk assessment is carried out after the hazard/risk is identified. Risk assessment data were obtained from interviews with research subjects.

The first step before determining the priority of hazard control is to measure the level of risk. The level of risk is based on the severity and level of frequency of the risk occurring. Table 1 shows the severity of a risk, along with an explanation of each score. The lowest level is level 1, which means that the risk is not significant, does not cause losses but causes relatively small financial losses. The highest level is level 5 or catastrophic, which means the risk of causing a very severe impact and can cause death and large financial losses.

**Table 1.** Qualitative measures of severity

| Level | Descriptor | Detail |
|---|---|---|
| 1 | Insignificant | No injuries, low financial loss |
| 2 | Minor | First aid treatment, medium financial loss |
| 3 | Moderate | Medical treatment required, high financial loss |
| 4 | Major | Medical treatment required, high financial loss |
| 5 | Catastrophic | Death, huge financial loss |

Source: AS/NZS 4360-2004

After an assessment based on severity, the second step is to conduct an assessment based on the frequency with which the risk occurs. In Table 2, there are indicators that explain the level of risk. Level A is the highest level, where a risk is considered almost certain to occur. While level E is the lowest level, which means risk may occur but only under certain conditions that are very rare.

**Table 2.** Qualitative measures of likelihood

| Level | Descriptor | Detail |
|---|---|---|
| A | Almost Certain | Is expected to occur in most circumstances |
| B | Likely | Will probably occur in most circumstances |
| C | Possible | Might occur at some time |
| D | Unlikely | Could occur at some time |
| E | Rare | May occur only in exceptional circumstances |

Source: AS/NZS 4360-2004

After the first and second steps are completed, followed by the third step, which is to combine the severity with the frequency of a risk, using the reference in Table 3, From this combination, a more detailed risk classification will be obtained from low risk to extreme risk. This risk classification is used in developing a hazard control plan. The highest level is E, or extreme risk, which means that a risk requires immediate treatment so as not to cause severe side effects. While the lowest level is L, or low risk, where this risk means that the handling is carried out only through routine procedures [19].

**Table 3.** Risk priority matrix

| Likelihood | Severity | | | | |
|---|---|---|---|---|---|
| | Insignificant 1 | Minor 2 | Moderate 3 | Major 4 | Catastrophic 5 |
| A (Almost Certain) | H | H | E | E | E |
| B (Likely) | M | H | H | E | E |
| C (Moderate) | L | M | H | E | E |
| D (Unlikley) | L | L | M | H | E |
| E (Rare) | L | L | M | H | H |

Source: AS/NZS 4360-2004 [20]

Legend
E : extreme risk; immediate action required
H : high risk; senior management attention needed
M : moderate risk; management responsibility must be specified
L : low risk; manage by routine procedures

Hazard/risk control is carried out after the level of hazard/risk is known. Determination of control based on the level of hazard/risk that has been identified through interviews.

## 2. Data

Data were collected in the manufacturing workshop of UPTD BLK Garut through observation using an ILO checklist [21] and interviews with research subjects to obtain information on risk assessment and hazard/risk control measures. The data obtained was tested for the validity of the data and found to be credible and trustworthy. Testing the validity of the data using the Credibility Test (Member Check Technique), Dependability Test, and Confirmability Test.

## 3. Analysis

The data analysis technique is data analysis using the Miles and Huberman model, which consists of three steps, namely data reduction, data presentation, and drawing conclusions or verification. Data reduction consists of an analysis of the condition of the workshop, risk assessment, and hazard control in the manufacturing workshop [22]. The data presentation uses HIRA (Hazard Identification and Risk Assessment) tables and graphs. Then the data that has been presented with the HIRA table and graphs is drawn for conclusions or verification.

# RESULT AND DISCUSSION

## 1. Result

After making observations using a check list and direct observations in the manufacturing workshop of UPTD BLK Garut, a description of the condition of the workshop can be obtained consisting of 9 indicators with 101 statement items. The results of the check list can be seen in Table 4.

**Table 4**. Result of the Observation Check List

| Indicator | Total of list | Answer | |
|---|---|---|---|
| | | Yes | No |
| 1. Material handling and storage | 12 | 5 | 7 |
| 2. Use of hand tools | 11 | 8 | 3 |
| 3. Machine safety | 17 | 12 | 5 |
| 4. Workshop design | 26 | 19 | 7 |
| 5. Lighting | 6 | 2 | 4 |
| 6. Working weather | 7 | 2 | 5 |
| 7. Noise and vibration | 3 | 3 | - |
| 8. Worker facilities | 11 | 7 | 4 |
| 9. Workshop Organization | 8 | 6 | 2 |
| **Total** | **101** | **64** | **37** |

From the results of the observation check list, it can be seen that the number of cases regarding workshop conditions that have the potential to cause hazard and those that do not pose a hazard from each indicator can be seen in Figure 1.

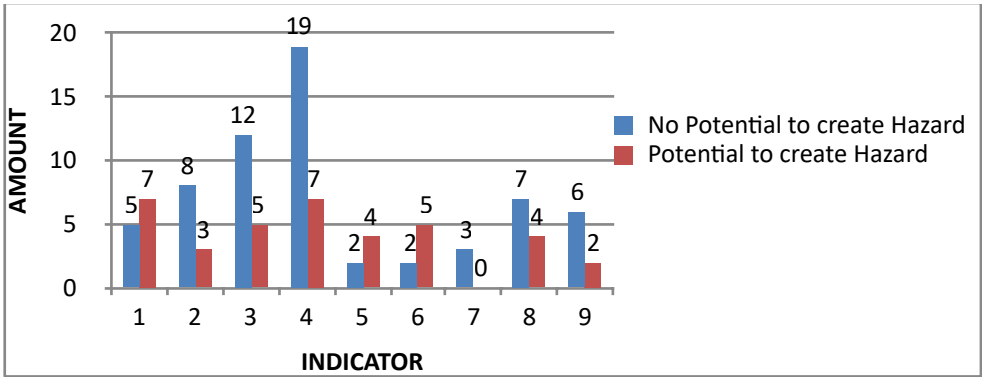


**Figure 1**. Number of Cases Regarding Workshop Conditions

The identified hazards are 45 hazards that have different levels of risk. The level of risk that occurs consists of 6 (six) levels as shown in Table 5 and the Level of Risk Tolerance in Figure 2.

**Table 5**. The Level of Risk

| Lkelihood | Saverity | | | | |
|---|---|---|---|---|---|
| | 1 Insignificant | 2 Minor | 3 Moderate | 4 Major | 5 Catastrophic |
| A (Almost Certain) | 0 | 0 | 0 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| B (Likely) | 0 | 0 | 0 | 0 | 0 |
| C (Moderate) | 1 | 6 | 0 | 0 | 0 |
| D (Unlikely) | 15 | 3 | 0 | 0 | 0 |
| E (Rare) | 20 | 0 | 0 | 0 | 0 |

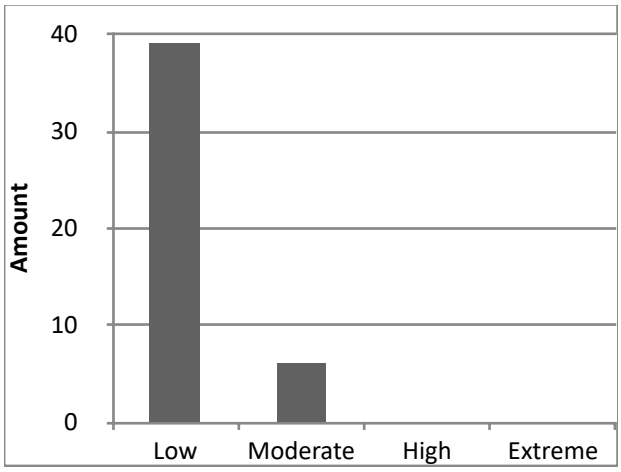


**Figure 2**. Number of Hazards Based on Risk Level

The hazard control action plan that has been identified in the manufacturing workshop of UPTD BLK Garut can be seen in Figure 3.

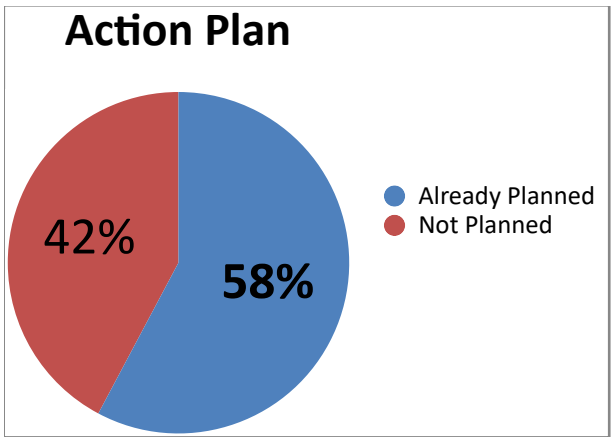


**Figure 3**. Action Plan

In order to obtain a coherent study, the discussion starts from the condition of the workshop, hazard identification, risk assessment and hazard control measures.

## 2. Discussion

### Material Handling and Storage

Good material handling and storage conditions will increase the effectiveness and efficiency of work in the workshop. Material handling and storage conditions in the workshop that can cause danger are mixed material storage, not optimal storage racks, a lot of material is scattered, the use of moving equipment is not maximized, and the form of material use does not exist. The risk level that occurs at the low risk level Hazard control that can be done is to make multilevel storage racks that are tailored to the type and size of the material; store the material according to the type and size; use hand pallets to move heavy materials; and create material use forms so that incoming and outgoing materials can be controlled. Material storage and cutting shelves are focused on one area so that it will be more effective and efficient.

### Use of Hand Tools

Hand tools that are durable and not easily damaged need regular maintenance. Conditions in the workshop that can cause danger are precision measuring tools piled up or scattered, the use of hand tools that are not in accordance with standard operating procedures, equipment maintenance has not been carried out routinely, and the use of hand power tools on transportation routes. The risk level that occurs at the low risk level Although the risk is still at a low risk level, hazard control must still be carried out. Hazard control that can be done is making a schedule for maintaining hand tools, making measuring tools, making SOPs for each hand tool, and applying OSH during practice. All parties can be involved to reduce the potential hazards that exist in the workshop.

**Machine safety**

The general condition of machine safety in the manufacturing workshop of UPTD BLK Garut that can cause danger is that some machines have not been properly covered, the cable connections are not neat and there is no tube safety. The risk level that occurs at the low risk level The control that can be done is to improve the connection of cables, make gas cylinders safer and make engine covers/ protectors. Repair of cable connections is a priority in the near future.

**Workshop design**

Good workshop design can reduce the number of potential hazards. A good workshop design does not necessarily have to have a large area but must meet the ergonomics and PPE aspects. Conditions in the manufacturing workshop of UPTD BLK Garut that can pose a hazard include: gas cylinders close to sparks, incomplete PPE equipment, the number of machines not meeting standards, no vacuum cleaner, unclear evacuation routes and machines not properly separated. The level of risk that occurs at the level of moderate risk and low risk Hazard control measures that can be carried out are: moving gas cylinders away from sparks, fulfilling the number of machines, completing PPE equipment, and doing insulation between welding work and machining work.

**Lighting**

The lighting in the workshop still optimizes natural light from sunlight. The condition of the window glass is not clean and the dark walls of the workshop will reduce the intensity of the lighting. Natural light has not been able to illuminate the work area evenly. This can lead to hazards such as machine operating errors, impaired concentration, and eye fatigue. The risk level that occurs at the low risk level Control of these hazards can be done by cleaning the glass, changing the color of the walls to light colors, and providing additional lighting in certain areas.

**Working Weather**

Good working weather will make the trainees feel comfortable working in the workshop. However, if conditions such as poor ventilation, dust or iron filings are still spreading throughout the room, and piled up garbage can pose risks and hazards such as lack of concentration at work, respiratory problems, and eye irritation. This hazard has a risk level of moderate risk and low risk. Hazard control can be carried out by improving air ventilation, providing a cover on the machine, maintaining the cleanliness of the workshop and working according to Standard Operating Procedures.

**Noise and Vibration**

Apart from the weather, the workshop is also familiar with noise and vibration. Noise and vibration are still in normal conditions. The factor of care and maintenance of the machine is the key to reducing noise and vibration. In addition, it is possible to isolate noisy machines and use earplugs for trainees.

**Worker Facilities**

Conditions such as inadequate Personal Protective Equipment (PPE), PPE care is not optimal, health service facilities do not yet exist, and signs for rooms with PPE are not clear, which can cause hazards such as exposure to welding rays, contamination with dust and smoke, theft, accidents, or occupational diseases. The levels of risk that occur are moderate risk and low risk. This can be overcome by completing PPE facilities, good locker facilities, and the provision of health facilities and first aid kits. All stakeholders must be able to participate in realizing good and correct work facilities.

**Work organization**

The work organization at UPTD BLK Garut only involves managers, instructors, and technicians, while the training participants do not play a major role. However, training participants should be involved to ensure effective and efficient workshop management. The problem is that there is no involvement of all parties in conducting a workshop ergonomics risk assessment and occupational safety and health management system. The simplest thing that can be seen is the absence of a picket

officer to be responsible for the cleanliness of the workshop. All stakeholders involved should be sure that the occupational safety and health management system is running well.

## CONCLUSION

Based on the results of research that has been carried out at the Garut UPTD BLK Manufacturing Workshop, the percentage of workshop conditions that have the potential to cause danger is 36.7%. This means that the overall manufacturing workshop of UPTD BLK Garut is in safe condition. The risk assessment that has been analyzed from the research results shows a low risk level of 86.7% and a moderate risk level of 13.7%. So there is no high and extreme risk assessment. Hazard control that needs to be implemented is based on the level of risk. From the moderate risk level first, then to the low risk level. As much as 58% of hazard control has been planned and 42% has not been planned. The implementation of the planned hazard control awaits the budget from the local government and the central government.

The benefits of the results of this study are as an evaluation material for future improvements, a guide to risk analysis in the manufacturing workshop of UPTD BLK Garut, and as a study in making policies related to the progress of BLK-BLK in the region.

## IMPLICATION/LIMITATION AND SUGGESTIONS

Of course, this research has some shortcomings and mistakes. Research instruments that are adopted from the ILO and modified according to the type of workshop will certainly reduce the validity of the instrument. The use of workshops for training that is only 2 to 3 times a year or even none at all will reduce the validity of the results of the risk level. The research, which lasted only for approximately 1 month, could not dig up detailed data, so there was some data from the workshop that did not appear in this study..

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