

Evaluation of the Use of Personal Protective Equipment in the Welding Process at the Arjasa District Welding Workshop

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Abstract

Personal Protective Equipment (PPE) is a safety tool workers use to protect themselves from potential hazards or work accidents in the workplace environment. Based on the Regulation of the Minister of Manpower and Transmigration No. 8 of 2010, employers or administrators are required to provide PPE by Indonesian National Standards or applicable standards. This research was conducted in a welding workshop in Arjasa Subdistrict using a survey method. The results showed that the availability of PPE was 76%, welding helmets were 68%, welding goggles were 73%, welding masks were 68%, gloves were 78%, safety shoes were 73%, welding clothes were 65%, and the conditions of the welding workshop were the appropriate standard of 74%. From these results, the use of PPE in the Arjasa District welding workshop is quite good.

Keywords: Personal protective equipment; SNI; Welding; Arjasa District

1. Introduction

In various workplaces, there are many sources of danger lurking for workers. Therefore, sources of danger must be minimized or controlled to prevent potential work accidents. Handling in the workplace is carried out according to the handling hierarchy, including efforts for elimination, substitution, engineering, technology, administration or the use of Personal Protective Equipment (PPE) [1].

PPE is used to protect workers from potential hazards that occur when working in the workplace. The use of PPE is very important to protect part or all of the worker's body from potential hazards in the workplace. PPE is used to reduce the risk of exposure to hazards. Using PPE may not eliminate the hazard, but the risk of work accidents can be minimized.

Employers or administrators must provide PPE for all workplace workers and comply with Indonesian National Standards or applicable standards [2]. PPE is the most important component in implementing Occupational Safety and Health (K3) in the workplace.

Implementation according to K3 regulations is very important and necessary in all aspects of work in the work environment to avoid potential accidents or disasters. Applying K3 in the educational environment also needs to be considered to get qualified and superior workforce candidates.

The main objective of implementing OSH is to protect and guarantee the safety of every worker and other people in the workplace, ensure that every source of production can be used safely and efficiently, and improve national welfare and productivity [3][4].

Occupational Health Safety is an activity carried out to guarantee and protect the safety and health of workers through efforts to prevent work accidents and work-related diseases [5].

Personal Protective Equipment (PPE) is used to protect the security and safety of workers. Falling off heavy objects, being injured by production machines, or being exposed to chemicals are some potential hazards in the work area that can be prevented using personal protective equipment. Therefore, the use of personal protective equipment needs to be adjusted to the potential hazards that exist in the workplace. Several types of personal protective equipment include gloves, goggles, protective clothing, helmets, safety shoes, and masks.

Table 1. Personal Protective Equipment in Welding

Type of work	Personal Protective Equipment	A Body That Needs to be Protected	Types of Hazards
Welding	APRON or welding work clothes, welding gloves, helmet or welding mask, welding shoes, and welding masks	All parts of the body: head, eyes, nose, fingers, feet, breathing apparatus.	Exposure to smoke and gas, physical hazards, electric shock, fire and explosion

Welders must know the dangers that can occur in the welding process. Every job has its risks, and being a welder means having to deal with many risks of accidents.

Several types of hazards that often occur in the welding process include:

1. Danger from ultraviolet and infrared rays
2. Electric shock hazard
3. Gas and dust hazard
4. Welding spatter hazard
5. Explosion hazard
6. Fire hazard
7. Danger of falling

The use of Personal Protective Equipment (PPE) in welding must be by applicable standards to protect welding workers in the workplace. The selection of PPE is the most important component in minimizing work accidents. For example, the selection of protective eyewear must be considered in order to provide maximum protection.

Table 2. Welding Glass Selection Parameters

Operations	Protective Shade
Shield Metal Arch Welding (SMAW)	7-11
Gas Welding	4-6
Gas Metal Arch Welding (GMAW)	7-10
Gas Tungsten Arch Welding (GTAW)	8-10
Oxygen Cutting	3-5
Flux Cored Arch Welding (FCAW)	7-10

Head protection is the most important component that every worker must use. This tool protects the head from the impact of objects that are dropped or thrown. Head protection must be impact-resistant, chemical resistant and non-flammable. The head protection equipment used must comply with recognized safety standards.

In the construction sector, safety shoes are mandatory to reduce the risk of fatal accidents such as falling sharp or heavy objects. Safety standards that each safety shoe product must meet include EN ISO 20345:2011, SNI 0111:2009, and SNI 7079:2009. The national standard requires safety shoes to be equipped with steel front hardeners to protect the toes from blows, impacts, and other hazards related to the work area.

Table 3. Shoes Selection Recommendations Safety in accordance with the Potential Hazard

Potential hazard	Recommendation Safety shoes
Falling heavy objects	Have steel or composite gaiters
Falling sharp objects	Steel or composite midsole

Potential hazard	Recommendation Safety shoes
Injury to the sole	Has metatarsal shields that cover the soles of the feet
Risk of clipped toes	Special safety shoes for work using machines
Smooth surface	It has an anti-slip sole
Contact with chemicals	Features soles with chemical resistance
Ankle injury	Features ankle protection
Work with extreme temperatures	Soles that have heat and cold resistance
Biohazard	Shoes that are easy to clean with a machine
Jobs that have to work standing for a long time	It has a comfortable and equipped damper on the heel

Burns, abrasions, and cut fingers are some types of accidents that often occur in the work environment. Therefore, workers must always use safety gloves to protect their hands and fingers from potential hazards that can result in injury [6].

Protective equipment, especially safety gloves, can prevent 70.9% of accidents or hand injuries [6]. There are several standards for the use of safety gloves, such as ANSI/ISEA 105-2016 and EN388, which can be used to select safety gloves according to potential hazards.

Table 4. Guidelines for Selection of Hand Protectors according to ANSI/ISEA 105-2016

Level	Cut Resistance (Gram)
ASTM ANSI CUT LEVEL A1	200-499 Gram
ASTM ANSI CUT LEVEL A2	500-999 Gram
ASTM ANSI CUT LEVEL A3	1000-1499 Gram
ASTM ANSI CUT LEVEL A4	1500-2199 Gram
ASTM ANSI CUT LEVEL A5	2200-2999 Gram
ASTM ANSI CUT LEVEL A6	3000-3999 Gram
ASTM ANSI CUT LEVEL A7	4000-4999 Gram
ASTM ANSI CUT LEVEL A8	5000-5999 Gram
ASTM ANSI CUT LEVEL A9	6000 + Gram

Table 5. Guide to Selection of Hand Protectors according to EN388 Standards

Level	Cut Resistance (Gram)
A EN388	2 newtons (203 gram)
B EN388	5 newtons (509 gram)
C EN388	10 newtons (1019 gram)
EN388	15 newtons (1529 gram)
E EN388	22 newtons (2243 gram)
F EN388	30 newtons (3059 gram)

2. Materials and Methods

This survey research aims to find out the facilities for Personal Protective Equipment (PPE) available in welding workshops and how much PPE is used by workers while carrying out welding work.

Data was collected by asking written questions answered in writing by the respondents. Alternative answers accompany the question, and the respondent only needs to provide the available answers. Documentation is carried out to determine the amount of PPE in the welding workshop, and then the percentage of PPE used during the welding process is calculated.

Questions regarding the use of PPE by workers during the welding process are made according to the overall situation that has been developed. Before being used, the questions were tested on similar subjects to determine whether the instrument was appropriate.

The results of this study are expected to provide an overview of the condition of the facilities and the use of PPE in the welding workshop. Thus, steps can be taken to improve the quality of facilities and the use of PPE to provide maximum protection for workers while doing welding work. This research can also be a reference for other welding workshops in improving the quality of

facilities and the use of PPE.

3. Results

Based on the test results in this study, the data is shown in the table below.

Table 6. Test Results

No	Indication	Percentage %	Category
1	Availability of personal protective equipment	76%	Good
2	Classification helmet	68%	Enough
3	Welding goggles	73%	Good
4	Welding mask	68%	Enough
5	Safety gloves	78%	Good
6	Safety shoes	73%	Good
7	Welding clothes	65%	Enough
8	Equipment according to standards	74%	Good
9	Workshop conditions welding standard	74%	Good
10	Standard personal protective equipment	74%	Good

Data presentation is made in tabular form to facilitate observation and evaluation. From the table, the availability of Personal Protective Equipment (PPE) is 76%, indicating that the workshop's PPE is in a good category. The welding helmet shows 68%, which shows that the welding helmet in the workshop is sufficient. The welding goggles show a value of 73%, which is good and shows that the welding goggles are always used in the welding process. The welding mask shows a value of 68%, which means it is sufficient. Gloves show a value of 78%, which indicates a good category. Safety shoes show a value of 73%, which indicates a good category. Welding clothing shows a percentage value of 65%, which indicates the sufficient category. Equipment according to standards, welding workshop conditions according to standards, and PPE according to standards show a value of 74%, which means it is in a good category.

From the description above, the availability of PPE, equipment that complies with standards, workshop conditions, and PPE that meets standards in welding workshops shows a good percentage value. This shows that the welding workshop is highly committed to workers in implementing Occupational Safety and Health (K3). All PPE, such as welding helmets, goggles, masks, protective clothing, gloves and safety shoes, are important components that must be used in workshop activities to avoid accidents, foot injuries, electric shock, falling sharp objects, etc. As stated in Article 1 Point 1 of the Minister of Manpower and Transmigration Regulation No. 8 of 2010, PPE is a tool used to protect someone by protecting part or all of the body to avoid hazards in the workplace.

The results of this study can provide an overview of the condition of the facilities and the use of PPE in welding workshops and provide recommendations for improving the quality of facilities and the use of PPE to provide maximum protection for workers while carrying out welding work. This research can also be a reference for other welding workshops in improving the quality of facilities and the use of PPE.

4. Discussion

Based on the research results described above, the availability and use of Personal Protective Equipment (PPE) in welding workshops is quite good. However, there are still some aspects that need to be improved. Welding helmets show a value of 68%, which shows that the welding helmets in the workshop are in the sufficient category. This shows that there are still workers who still need to start using welding helmets when carrying out welding work. The welding mask shows a value of 68%, which means it is sufficient. This shows that some still need to start using welding masks when carrying out welding work.

It is important for welding workshops to continuously improve the quality of facilities and the use of PPE in order to provide maximum protection for workers while carrying out welding work. This can be done by providing PPE that meets recognized safety standards. PPE must be impact-

resistant, chemical resistant, and non-flammable. In addition, welding workshops must also provide training and education to workers regarding the importance of using PPE. Workers must know the types of hazards that can occur in the welding process and how PPE can protect them from these hazards.

In addition, the welding workshop must also enforce the rules for using PPE in the workplace. Workers must use PPE by applicable standards when carrying out welding work. If workers do not comply with these rules, the welding workshop must provide appropriate sanctions so that workers are more disciplined in using PPE.

This research can also be a reference for other welding workshops in improving the quality of facilities and the use of PPE. Thus, a safe and healthy work environment can be created for workers in the welding workshop. Good Occupational Safety and Health (K3) implementation will reduce the risk of work accidents and increase worker productivity.

5. Conclusions

Based on the research results presented above, the use of Personal Protective Equipment (PPE) by welders, including welding helmets, welding goggles, welding masks, welding gowns, welding gloves, and safety shoes, shows different percentage values. However, the availability and use of Personal Protective Equipment (PPE) in the welding workshop is quite good. However, some aspects still need to be improved, such as the use of welding helmets and welding masks. Welding helmets and masks have a value of 68%, which means they are in the sufficient category. The other aspects are in a good category.

It is important for welding workshops to continuously improve the quality of facilities and the use of PPE in order to provide maximum protection for workers while carrying out welding work. This can be done by providing PPE that meets recognized safety standards, training and educating workers about the importance of using PPE, and enforcing the rules for using PPE in the workplace.

This research can also be a reference for other welding workshops in improving the quality of facilities and the use of PPE. Thus, a safe and healthy work environment can be created for workers in the welding workshop

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