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# Welder Work Position Planning with the REBA Method (Rapid Entire Body Assessment)

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## Abstract

Welding is a job with a high risk of danger for the welder, such as a hot working environment, dehydration, eye complaints, and uncomfortable working positions. One of the conditions that often occur in welding workers when carrying out work is the position of the welder's body when carrying out welding, which is required to stand. This condition will cause complaints that the welder feels because carrying out the welding process takes a long time. This causes the welder to experience pain in the legs and back and, if done continuously, will trigger long-term illness. The method used in this research is method Rapid Entire Body Assessment (REBA). From the results of manually calculating the REBA method, a score of 2 is obtained, which can be interpreted according to the REBA Classification and Risk Level as low risk. Based on the results of work posture testing on the welding section, the workload of the workers has been reduced from 5 to 2. Therefore, the best position is welding while standing with the body upright; this will help the welder work without injury and has been tested using the REBA method.

**Keywords:** Welding; Risk; Rapid Entire Body Assessment (REBA).

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## 1. Introduction

Science and technology continue to develop from time to time. Developed countries have shown how science and technology play an important role in building their countries into competitive and recognized nations. Industrial developments have an impact and rapid change in the economy, from an agrarian economy to an industrial economy that uses machines to process raw materials into finished products. The manufacturing industry, in particular, made a major contribution to Indonesia's economic growth of 7.07% in the second quarter of 2021, with a growth of 6.91% despite the pressure from the COVID-19 pandemic. In the third quarter of 2021, the manufacturing industry grew by 3.68% and contributed 0.75% to Indonesia's economic growth. This is all inseparable from the role of human resources.

Human Resources (HR) is very important for economic growth and development. Advances in science in the current technological era will only be meaningful with the support of HR readiness in terms of science and mentality. To improve Indonesia's economic development, it needs to increase human resources. With quality human resources, it will have a positive impact and bring better economic growth to Indonesia.

However, many industries or companies still need to pay attention to their workers' conditions regarding safety and health. A comfortable, safe, healthy work environment will help workers increase productivity. However, if the work environment is unsafe and many harmful factors, it will negatively impact workers. Every company must anticipate major risks such as disease by providing safety and health protection for their workers. However, many companies ignore it because of the

high cost.

One of the conditions that often occur in welders is their body position when welding, which must be standing. This condition will cause complaints to the welding workers because the welding process takes a long time. This can cause pain in the feet and back of the welder and, if done continuously, can trigger long-term illness. Therefore, this study aims to re-plan the working mechanism with a focus on the working mechanism of the welder.

Welding is a process of joining two metal materials through a bonding metallurgical process carried out in a liquid state or can be referred to as a process of joining several metals using heat energy. Welding is a job with a high risk of danger to the welder, such as a hot working environment, dehydration, eye complaints, and uncomfortable working positions.

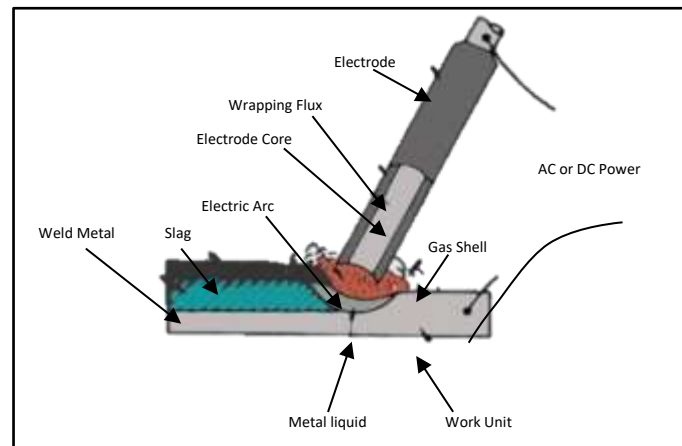


Figure 1. Welding [1]

This research uses the method Rapid Entire Body Assessment (REBA) optimized in the field of ergonomics to quickly measure the working position or posture of a welder's neck, back, arms, wrists and legs. Therefore, this method is used to reduce complaints of swelling or injury and analyze the impact on a welder during the welding process. The REBA method was designed to be easy to implement, requiring only a few good skills or expensive equipment. Before the REBA analysis, the first thing is to know the position of the welder's body when working using steps based on the Nordic *Body Map* (NBM). NBM is a way to assess complaints of pain experienced by welders when carrying out the welding process.



Figure 2. The position of the welder during the welding process

Figure 2 shows the position of the welder during the welding process. If this position continues to be carried out, it will result in several complaints or injuries to the welder and will cause inappropriate performance during the welding process. Therefore, this research was made to plan the mechanism of action of welding parts using the REBA method (Rapid Entire Body Assessment).

## 2. Materials and Methods

This research was conducted in a CV welding workshop engaged in fence repair. This research focuses on the position of the welder's body during the welding process.

Data collection methods used in this study include observation and literature study.

### 1. Observation

In observation, the first step is to identify the problems that occur in welding work and then analyze and find solutions to these problems. Observations were made to observe and analyze the welders directly during the welding process, focusing on the welder's body posture using Nordic Body Map (NBM). This method uses tables to analyze and find out the muscles that experience pain or discomfort in welding workers. Afterwards, proceed with the analysis using Rapid Entire Body Assessment (REBA).

### 2. Study Literature

For literature studies, this research uses reference sources from books, journals, and previous research as a reference in conducting research. After the data is obtained, it is continued with data processing. Data processing carried out in this study includes NBM and REBA. Data processing is done by measuring the welder's body posture before and after using NBM and REBA. This will compare the muscles that experience pain or discomfort in welding workers before and after using the body position recommended by REBA.

## 3. Results

In this study, researchers observed workers during the welding process. Based on the background that has been explained, this research was carried out directly by observing the welding workers during the welding process. The purpose of this study is to reduce workload complaints felt by workers.

This research was conducted for joining ASTM A36 steel materials through welding. Welding is a skill that must be trained repeatedly and continuously. If someone can weld and stop for a long time, they will likely need to practice again to get good and desired weld results. Below is the welder's body position when welding, as seen in Figure 2.



Figure 3. Welding posture during the welding process after being identified

Figure 3. shows the position of the welder during the welding process. The researcher identified the workload experienced by the welder when carrying out the welding process on the neck, back and arms using the NBM questionnaire. Also, using the REBA method, researchers conducted tests using manual calculations where workers form working positions when carrying out the welding process.

Table 1. Score results Rapid Entire Body Assessment before planning

| No | Information | Score |
|----|-------------|-------|
| 1  | Neck        | 2     |
| 2  | Back        | 3     |
| 3  | Feet        | 1     |
| 4  | Upper arm   | 2     |
| 5  | Lower arm   | 1     |
| 6  | Wrist       | 2     |

The table above shows the scores Rapid Entire Body Assessment (REBA) on the welder when the welding process is carried out. Furthermore, data processing is carried out using the REBA method manually.

Figure 4. Calculation method Rapid Entire Body Assessment manually [2]

The image above shows the manual calculation method Rapid Entire Body Assessment (REBA) against the welder. The table below will show the results of the manual calculation of the REBA method.

Table 2. Classification and Risk Level Rapid Entire Body Assessment

| Action Level | Shoes REBA | Risk Levels    | Corrective action |
|--------------|------------|----------------|-------------------|
| 0            | 1          | Can Be Ignored | No need           |
| 1            | 2-3        | Low            | May Be Necessary  |
| 2            | 4-7        | Currently      | Need              |
| 3            | 8-10       | Height         | Urgently needed   |
| 4            | 11-15      | Very high      | Need Right Now    |

From the table, it can be seen that the REBA score on the welder when the welding process is carried out is 5, which according to the REBA Classification and Risk Level, indicates moderate risk. Based on the results of work posture testing on the welding section, the workload of the workers is quite heavy. Therefore, it is necessary to improve the position of the welder during the welding

process. If this position continues to be maintained, it will result in some complaints or injuries to the welder and lead to inappropriate performance during the welding process. So the researchers reduced the complaints of the welding workers by redesigning the work posture in the welding section.

In the next stage, the posture design for the welder is carried out.



Figure 5. The position of the welder after it is designed

Figure 5 shows the position of the welder after planning the posture during the welding process.

Table 3. Score results Rapid Entire Body Assessment after planning

| No | Information | Score |
|----|-------------|-------|
| 1  | Neck        | 2     |
| 2  | Back        | 1     |
| 3  | Feet        | 1     |
| 4  | Upper arm   | 2     |
| 5  | Lower arm   | 1     |
| 6  | Wrist       | 2     |

The table above shows the score of Rapid Entire Body Assessment on the welder during the welding process. After designing the body posture, then data processing is carried out using the method of rapid entire body assessment manually.

The image above shows the manual calculation method Rapid Entire Body Assessment (REBA) after designing the posture of the welder. Table 2 below shows the results of the manual calculation of the REBA method.

Table 2. Classification and Risk Level Rapid Entire Body Assessment

| Action Level | Shoes REBA | Risk Levels    | Corrective action |
|--------------|------------|----------------|-------------------|
| 0            | 1          | Can Be Ignored | No need           |
| 1            | 2-3        | Low            | May Be Necessary  |
| 2            | 4-7        | Currently      | Need              |
| 3            | 8-10       | Height         | Urgently needed   |
| 4            | 11-15      | Very high      | Need Right Now    |

Table 2 shows the REBA Risk Classification and Levels. From the results of manually calculating the REBA method, a score of 2 is obtained, which indicates low risk according to the REBA Classification and Risk Level. Based on the results of work posture testing on the welding section, it can be seen that the workload of the workers has been reduced from 5 to 2. Therefore, the best position for welding is to stand with an upright body position, which has been proven to help

welders work without injury and has been tested using the REBA method with a low-risk score of 2.

#### 4. Discussion

From the discussion above, it can be analyzed that this study aims to reduce workload complaints felt by welders by redesigning the working mechanism that focuses on the working mechanism of the welder. The method used in this research is Rapid Entire Body Assessment (REBA), an ergonomics-optimized way to quickly measure a welder's working position or posture of the neck, back, arms, wrists and legs.

From the results of observation and analysis using the REBA method, it was found that the position of the welder's body when carrying out the welding process, which is required to stand, causes complaints to the welding workers. This causes the welder to experience pain in the legs and back and, if done continuously, can trigger long-term illness. Therefore, this study redesigned the working mechanism with a focus on the working mechanism of the welder.

After redesigning the working mechanism, the result was that the REBA score on the welder during the welding process decreased from 5 to 2, which indicates a reduced risk from moderate to low. This shows that redesigning the working mechanism has reduced the workload complaints the welding workers felt.

Thus, redesigning the working mechanism using the REBA method can help reduce workload complaints felt by welders and increase their performance and productivity when carrying out the welding process.

#### 5. Conclusions

From the results of the description above, this study succeeded in redesigning the working mechanism of the welder using the method of Rapid Entire Body Assessment (REBA) to reduce workload complaints felt by welding workers. After redesigning the working mechanism, the REBA score of the welder during the welding process decreased from 5 to 2, indicating a reduced risk from moderate to low. This shows that redesigning the working mechanism has reduced workload complaints felt by welders and increased their performance and productivity during welding.

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