IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 23, Issue 10, Ver. 3 (October. 2018) 01-11
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Assessment Analysis of Ergonomics Work Posture on Wheel Installation With Ovako Work Posture Analysis System (OWAS) Method AND Rapid Entire Body Assesment (REBA) Method Preventing Musculoskeleal Disorders AT Perum PPD Jakarta

Muhammad Ramadhani[1)], Rukman[2)], Darul Prayogo[3)], Diajeng Ayu D. P[4)]
Corresponding Author: Darul Prayogo

Abstract: This ergonomi working posture research was done to reduce Muskuloskeletal Disorders in working activity at put the wheel in to the position in Perum Pengangkutan Penumpang Djakarta (PPD) by three workers. Workers are working in bending and crouching in long periods of time so that it can cause Muskuloskeletal Disorders. The workers are generally paying less attention to body posture at work. The Rapid Entire Body Assesment (REBA) method and Ovako Work Posture Analysis System (OWAS) method is used to analyze body posture. The research was conducted by interviewing the parties concerned at the activity put the wheel in to the position for designing the working tools required.

Keywords: Optimization, Ergonomic, Ovako Work Posture Analysis System (OWAS), Rapid Entire Body Assesment (REBA).

Date of Submission: 24-09-2018 Date of acceptance: 13-10-2018

I. INTRODUCTION

Musculoskeletal disorders are one indication of health problems caused by work activities, such as injury to muscles, nerves, tendons, bones, joints of bones, and cartilage. One of the main causes of musculoskeletal disorders (MSDs) is work posture that is not good / not ergonomic while doing workplace activities (Tarwaka et al., 2004). Based on research and complaints about musculoskeletal disorders, scientists and researchers in various countries have developed various methods of working posture assessment based on each body movement in investigating musculoskeletal disorders to create a safe, comfortable and healthy work system during work. The assessment tools include Ovako Work Posture Analysis System (OWAS), and Rapid entire body assessment (REBA).

Ovako Work Posture Analysis System (OWAS) is a work attitude analysis method that defines the movement of the body parts of the back, arms, legs, and heavy loads that are lifted. Each member of the body is classified into a work attitude (Rapid entire body assessment (REBA) is a method developed by Sue Hignett and Lynn McAtamney that is effectively used to assess worker posture, energy used, type of movement of workers (Mc Atemney , 2000).

Passenger Transportation Company General Djakarta (PPD) is a company engaged in transportation as a provider of public transport services. Based on observations of professional work practice activities (PKP) in Perum PPD, there is no attention to attitudes and work posture, one of which is the activity of installing a wheel that can cause musculoskeletal disorders. This can be seen from the absence of regulations and operational procedures standards (SOP) that regulate the attitude of work, instructions and posters that can provide an explanation of good work attitude in the workshop area. If this is not followed up properly, it will be able to trigger health problems for workers in the future.

II. LITERATURE REVIEW

The term Ergonomics comes from Latin, namely Ergon (work) and Nomos (natural law) and can be defined as the study of human aspects in the work environment which are reviewed in anatomy, physiology, psychology, engineering, management and design / design. Ergonomics also deals with the optimization, efficiency, health, safety and comfort of humans at work, at home, and in recreation. (Suma'mur 2009).

Musculoskeletal Disorders (MSDs) Musculoskeletal complaints are complaints in parts of the skeletal muscles that are felt by someone starting from very mild complaints to very painful. If the muscle receives a static load repeatedly and for a long time, it can cause complaints in the form of damage to the joints, ligaments,

and tendons. Complaints to damage are usually termed musculoskeletal disorders (MSDs) or musculoskeletal injuries. (Tarwaka et al, 2004).

Ovako Working Posture Analysis System (OWAS) is a method to identify unsafe work postures that cause musculoskeletal injuries, especially low back pain, and is developed to analyze and evaluate work postures used during work. The OWAS method was made by a man named O. Karhu from Finland in 1981 and has been used for approximately 22 years to analyze postural stress in various fields of manual work. This method was built as a tool to identify which body postures might be responsible for muscle problems. Its purpose is to improve the condition of workers in work, so that work performance can increase. The OWAS method is the best method to improve bad posture by correcting the back position of workers. This method consists of two parts, the first part is an observation technique to assess the work posture used in the daily work routine, the second part of this method is to create criteria for redesigning work postures and knowing reliable results after the basic OWAS training. arranged with a four-digit code which sequentially describes back, arm, leg and weight weights when carrying out material handling activities manually.

REBA or Rapid Entire Body Assessment was developed by Dr. Seu Hignett and Dr. Lynn Mc Attamney, an ergonomist from the university at Nottingham (University of Nottingham's Institute of Occupational Ergonomics).

Rapid Entire Body Assessment is a method developed in the field of ergonomics that can be used quickly to assess the work position or posture of the neck, back, arms, wrists and legs of an operator. In addition this method is also influenced by factor coupling, external loads supported by the body and worker activity. Assessment using REBA does not take long to complete and do general scoring on the list of activities that indicate the need for risk reduction caused by the operator's work posture.

III. METHODOLOGY

This research was conducted at Djakarta Passenger Transportation Company (PPD) Public Company. The following is a research flow chart shown in Figure 1 below.

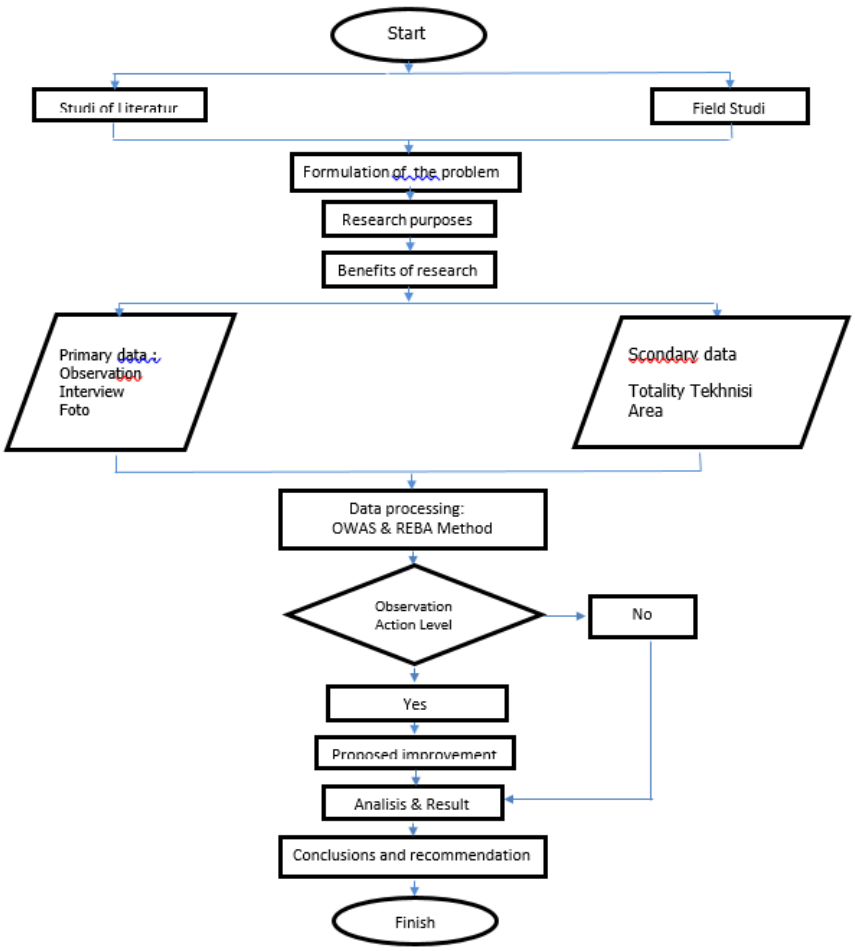

Figure 1. Research Flow Chart

Data Collection Technique

Primary Data Collection

Data collection through primary data collection in the form of field observations, closed interviews, documentation, literature studies and questionnaires on three workers. Secondary Data Collection Secondary data collection is in the form of data on the total number of techniques in the General Transportation of Djakarta Passengers (PPD) in the Ciputat area.

Data Analysis Technique

Data Processing Analysis with OWAS Method

Analysis with the OWAS method is carried out in three stages, namely the stage of work posture recording, the determination of the weight of the load and the coding of the posture. The process of coding posture with the OWAS method can be seen in the picture below.

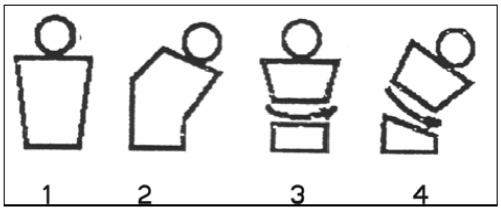

Figure 2. Back Posture
Source : Seminar Nasional Teknik Industri [SNTI], 2017

a). Back posture
1). Straight
2). Bent
3). Rotate or tilt sideways
4). Bend and twist.

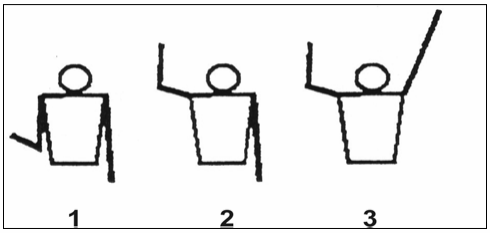

Figure 3. Hand Posture
Source: Seminar Nasional Teknik Industri [SNTI] , 2017

b). Arm posture
1). Both arms are below the shoulders
2). One arm is on or above the shoulder
3). both arms on or above the shoulder

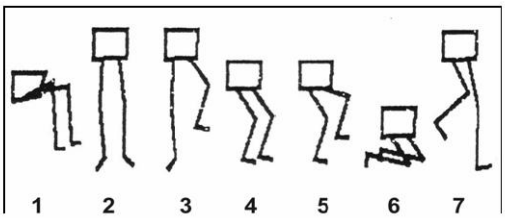

Figure 4. Foot Posture
Source: Seminar Nasional Teknik Industri [SNTI] , 2017

c). Foot posture
1). Sit
2). Stand leaning on both legs straight
3). Stand resting on one straight leg

4). Stand resting on both feet with knees bent
5). Stand resting on one leg with your knees bent
6). Kneel on one or both knees
7). Walk

d). Load weight
1). Load weight is W = 10 kg
2). Load weight is 10 kg <W = 20 kg
3). Load weight is> 20 kg

Data Processing Analysis with *REBA Method*

Analysis with REBA method can be done by using *REBA WORKSHEET*. The analysis with *REBA WORKSHEET* can be seen in this figure below :

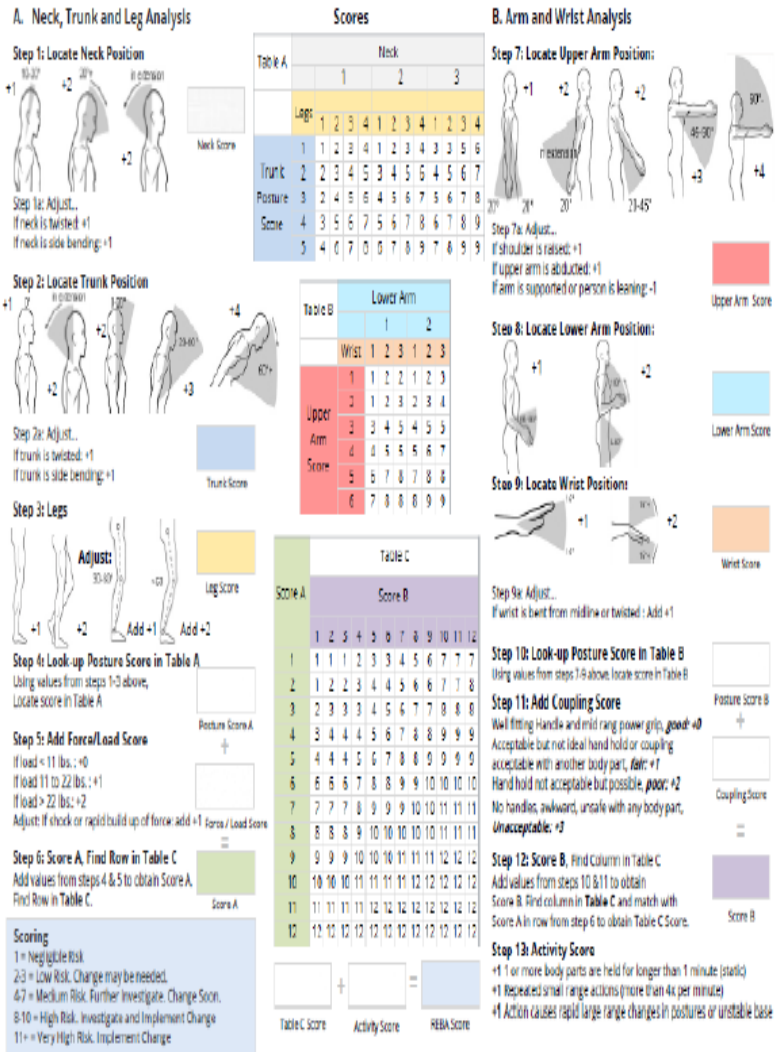

Figure 5. Reba Worksheet

Source : McAtamney dan Hignett, 2000

IV. Analysis And Discussion

On wheel installation activity, usually it has 3 main activities such as wheel installation, wheel nut installation, and locking the wheel nut. From these three activites,it will be assessed by using OWAS and REBA method

Rating Result with OWAS method. Rating result with OWAS method can be seen in this table below.

Table 1. Assessment of wheel installation activities with OWAS method

Picture	Posture	Code	Explanation
	Trunk	2	Bend over
	Arm	2	One arm above the shoulder
	Legs	6	Kneel on one or both legs
	Load force	3	Weight = >20 kg

Source : Analysis Result, 2018

The rating result with OWAS method has a "2263" score. Based by OWAS category, "2263" score got 4th category which means this posture is dangerous and causing a risk that needs immidiate improvement.

Table 2. Assesment of the activity of installing wheel nut with OWAS method

Picture	Posture	Code	Explanation
	Trunk	2	Bend over
	Arm	1	Two arms under the shoulder
	Legs	1	Sit
	Load force	1	Weight = 10kg

Source : Analysis result, 2018

Rating result with OWAS method got "2111" score. Based from OWAS category, "2111" score got 2nd category which mean this posture is dangerous and needs improvement in the future.

Table 3. Locking wheel nut activity assessment with OWAS method

Picture	Posture	Code	Explanation
	Trunk	2	Bend over
	Arm	1	Two arms under the shoulder
	Legs	4	Stand resting on both feet with knees bent
	Load force	1	Weight = 10 kg

Source : Analysis Result, 2018

The rating resul with OWAS method got "2141" score. Based from OWAS category, "2141" score got 3rd category which means this posture is dangerous and need an improvement immidiately.

Rating result with REBA method

REBA calculation :

1. Group A + load = Score A
2. Group B + handle = Score B
3. Score A + Score B = Score C
4. Score C + Activity Score = REBA score

To ge a corner on work posture, needs a help from Autocad software as a reference, so the size of the corner are precise and accurate.

Figure 5. Wheel Installation

Source : Documentation result, 2018

Score A

a) *Trunk*

From the figure above, can be known that trunk's movement is included on bending position, with ammount of the trunk's movement is 49^0, so got a +3 score

b) *Neck*

From the figure above, can be known, neck's movement is 50^0, so the score is +2

c) *Legs*

From the figure above, can be known the legs movement, 29^0 bended, so the score is +1 on legs movement and +2 on score change. So, 1+2=3 on REBA'S legs score result.
d) The next step is put all of each Score A on the table and can be known the group A's information result is 6

Score B
a) *Upper Arm*
From the figure above, can be known that the upper arm's movement is included in one arm above the shoulder's position, with the ammount of movement is 175^0, so the score is +4 and the shoulder raised away from the body's score change got +1 score, so 4+1 = 5
b) *Lower Arm*
From the figure above, can be known the lower arm's movement is 165^0, so the score is +2
c) *Wrist*
On wrist, can be known that wrist movement is included in rotating and bending position with the ammount is 116^0, so the score is +2 on the wrist movement and +1 on the score change. So 2+1 = 3 on REBA's result score for wrist movement.
d) The next step is put all of each Score B into the table and can be know the group B's information result is 8.
Put the result from Score A and Score B into table c then add load score for score A is 2 with value (6+2). And coupling score for Score B is 1 with value (8+1). Can be specified the value of score C is 10, +1 for activity score (10+1 = 11) so the risk level is very high. Needs an improvement at that time as soon as possible.

Every work posture activity will get a value of risk level according to calculation result on REBA method. Risk level on work posture will determine the action that should be done to reduce the risk of *Musculoskeletal Disorders* impact. The higher the risk value from work posture, the worse *the Musculoskeletal Disorders* impact, And because of that, there is a new work posture design recommendation, as a way to reduce the work posture risk level.

Figure 6. Wheel nut installation *Source : Documentation result, 2018*

Score A
a) *Trunk*
From the figure above can be known that the trunk's movement is included in bending position, with the ammount of the trunk's movement is 31^0, so the score is +3.
b) *Neck*
From the figure above can be known that the neck's movement is 35^0, so the score is +2.
c) *Legs*
From the figure above can be known that the leg's movement 29^0bend, so the score is +1 and +1 on the score change. So 1+1 = 2 for REBA'S score result in leg's movement.
d) The next step is put all of each score A into the table and can be known the group A's information result is 5.
Score B
a) *Upper Arm*
From the figure above, can be known that the upper arm movement is included in both arm under the shoulder position, with the ammount of upper arm movement is 79^0, so the score is +3.
b) *Lower Arm*
From the figure above, can be known that the lower arm's movement is 77^0, so the score is +1.

c) *Wrist*
From the figure above, can be known that on wrist there is no corner, or the wrist movement is 0^0, so the score is +1 for wrist movement on REBA's score result.

d) The next step is put all of each score B into the table and can be known that the group B's information score is 3.
Put the result from score A and score B into table C and then add load score for score A is 0 with the value (5+0). And coupling score for score B is 0 with the value (3+0). Can be specified that score C is 4, +1 for activity score (4+1 = 5) so the risk level is medium and needs an improvement in the future.

Figure 7. Locking the wheel nut

Source : Documentation result, 2018

Score A

Trunk

From the figure above, can be known that the trunk's movement is included in bending position, with the ammount of trunk's movement is 34^0, so the score is +3 and the score change is 0. So 3+0 = 3.

1. *Neck*

From the figure above, can be known that the neck's movement is 46^0, so the score is +2. And the score change os 0. So (2+0 = 2).

2. *Legs*

From the figure above, can be known that the leg's movement is 141^0, so the score is +2 and for the score change is +1. So 2+1 = 3 for REBA's score result on leg's movement.

The next step is put all of each score A into the table and can be known the group A information result is 6.

Score B

3. Upper Arm

From the figure above, can be known that the upper arm movement is included in both arms under the shoulder position, with the ammount of movement is 27^0, so the score is +2.

4. *Lower Arm*

From the figure above, can be known that the lower arm movement is 133^0, so the score is +2

5. *Wrist*

From the figure above, can be known that the wrist movement is 140^0, so the score is +2 and also got +1 because the wrist is rotating in score change. So 2+1 = 3 on REBA's wrist movement result score.

6. The next step is put all of each score B into the table and can be known the group B's information result is 4.

Put the result of score A and score B into table C then add load score for score A is 0 with the value (6+0). And coupling score for score b is 0 with the value (4+1). Then, can be specified that score C is 8, +1 for activity score (4+1 =9) so the risk level is high and needs an improvement as soon as possible.

Work Posture Recommendation

1. *Work posture recommendation on wheel installation.*

Figure 8. Wheel installation with Handtruck
Source: Documentation result, 2018

2. *Work posture recommendation on wheel nut installation*

Figure 9. Wheel nut installation by using chair.
Source: Documentation result, 2018

3. *Work posture recommendation on locking the wheel nut.*

Figure 10. Locking the wheel nut by using chair.
Source: Documentation result 2018

Analyzing the level of risk on the suggested work posture is equal to the calculation on previous work posture which is by using OWAS and REBA method. After finishing the calculation on work posture with OWAS and REBA method, there are changes in the risk level score on work posture , for the result can be seen by this explanation below.

1. From the results of the evaluation of OWAS and REBA on the recommendation of working postures to install wheels using Hand Truck, the results of category 1 on the OWAS method means that there is no problem in this posture and level 2 action on the REBA method which means the risk of low muculoskeletal.
2. From the results of the evaluation of OWAS and REBA on the recommendation of work posture to put wheel nuts with the help of chairs, the results of category 1 on the OWAS method which means that there is no problem in this posture and level 3 action on the REBA method which means moderate risk.
3. From the results of the evaluation of OWAS and REBA on the recommendation of working posture locking the wheel nut with impact air wrench, the results of category 1 on the OWAS method which means that there is no problem in this posture and level 3 action on the REBA method which means moderate risk.

V. CONCLUSIONS AND SUGGESTIONS

A. Conclusion

1. From the results of visual observations of the initial mechanical work posture when installing the wheel, it can be concluded that the mechanic has not been able to carry out the work safely and comfortably. This is seen from the mechanical work posture and the tools used.
2. From the results of visual observations of the initial mechanical work posture when installing wheel nuts, it can be concluded that there is still a potential for work accidents. This is seen from the use of personal protective equipment (PPE) such as safety shoes that are not used while working. And the mechanical work posture is done sitting without using a chair.
3. From the results of visual observations of the initial mechanical work posture when locking the wheel nut, it can be concluded that the mechanic cannot carry out the work safely and comfortably. This is seen from the mechanical working posture that is less safe.
4. From the results of the assessment using the OWAS method on the activity of installing a wheel on its position, the results obtained are in category 4. Where this work posture is harmful to Musculoskeletal resulting in a clear risk, it is necessary to improve work posture right now.
5. From the results of the assessment using the OWAS method on the activity of installing wheel nuts, the results obtained are in category 2. Where this work posture is harmful to Musculoskeletal, repairs are needed in the future.
6. From the results of the assessment using the OWAS method on the activity of locking the wheel nut, the results obtained are in category 3. Where this work posture is harmful to Musculoskeletal, immediate repair is needed.
7. From the results of the evaluation using the REBA method on the activity of installing the wheel on its position, the results obtained are at the action level 5, the risk of musculoskeletal is very high, it needs improvement now (very high risk, implement change).
8. From the results of the assessment using the REBA method on the activity of installing wheel nuts, the results are obtained at the action level 3, moderate risk, need for future improvements (Medium risk, further investigation, change soon)
9. From the results of the assessment using the REBA method on the activity of locking the nut, the results were obtained.

B. Suggestions

1. Provide *Hand truck tool*
2. Use chair on wheel instalation activity
3. Provide *Impact Air Wrench tool.*
4. Provide new *Wearpack*.
5. Provide special airline at the garage.
6. Make *Checklist Form*
7. Make Safety Poster
8. Sosializing Health safety environment program
9. Build a Polyclinic
10. Make a safety team
11. Make standard operational procedure about work posture
12. Using REBA method as a reference for counting mechanics work posture.

BIBLIOGRAPHY

[1] Alfara, Ifen, Irwan Iftadi, & Rumahniah Dwi Astuti. (2017). *Performa*. *Analisis Postur Kerja Operator Perakitan Di Yessy Shoes Untuk Mengidentifikasi Resiko Gangguan Muskuloskeletal Akibat Kerja*. 16 (1). 9-14.

[2] Bintang, Alfin Nur & Shanty Kusuma Dewi. (2017). *Jurnal Teknik Industri***.** *Analisa Postur Kerja Menggunakan Metode OWAS dan RULA*. 18 (1). 43-54.

[3] Hignett, Sue & Lynn McAtemney. (2000). *Technical Note. Rapid Entire Body Assessment (REBA)*. 201 - 205.

[4] Karlsson, Dan , B. Stenlund & L. Lindbeck. (2002). *ERGONOMICS. Significance Of House Painters' Work Techniques On Shoulder Muscle Strain During Overhead Work*. 455 - 468.

[5] Mulyati, Dewi, Vera Viena, Irhamni, & Baharuddinsyah. (2017). *Analisis Postur Kerja Manual Material Handling Dengan Metode Ovako Working Analisis System (OWAS) Pada Home Industri Mawar*. *Makalah*. Dalam : Seminar Nasional Teknik Industri (SNTI 2017), 13-14 Agustus 2017.

[6] Sulaiman, Fahmi & Yossi Purnama Sari. (2016). *Jurnal Teknovasi. Analisis Postur Kerja Pekerja Proses Pengesahan Batu Akik Dengan Menggunakan Metode REBA.* 3 (1). 16 – 25.

[7] Wahyudi, M.Arip, Wike A.P Dania & Rizky L.R Silalahi. (2015). *The 2014 International Conference on Agro-industry (ICoA): Competitive and sustainable Agro-industry for Human Welfare*. *Work Posture Analysis Of Manual Material Handling Using OWAS Method*. 195 – 199.

Darul Prayogo'' Assessment Analysis of Ergonomics Work Posture on Wheel Installation With Ovako Work Posture Analysis System (OWAS) Method AND Rapid Entire Body Assesment (REBA) Method Preventing Musculoskeleal Disorders AT Perum PPD Jakarta" IOSR Journal Of Humanities And Social Science (IOSR-JHSS). vol. 23 no. 10, 2018, pp. 01-11