Tibuana
Journal of applied Industrial Engineering-University of PGRI Adi Buana

p-ISSN 2622-2027
e-ISSN 2622-2035

Risk Assessment on Install and Dismantle Scaffolding Using Task Risk Assessment Method

Talitha Cornelia Azura[1], Moch. Luqman Ashari[2], Rina Sandora[3]
[1,2,3] Shipbuilding Institute of Polytechnic Surabaya, Surabaya 60111, Indonesia.
talithazura@gmail.com, ashari.luqman@ppns.ac.id, rinasandora@gmail.com

Abstract

Accidents can occur anytime and anywhere such as accidents that occur at work at height. This study aims to identify and analyze potential hazards in the install and dismantle scaffolding work using TRA (Task Risk Assessment) method. The results of the risk assessment using TRA on this work obtained four job description with 2 jobs at low risk, namely initial risk of 4 and after controlling for residual risk of 2. For install and dismantle scaffolding show that medium risk was obtained with an initial risk of 12 and after controlling, the residual risk becomes 9.

***Keywords*; Install and Dismantle Scaffolding; Initial Risk; Residual Risk.**

I. INTRODUCTION

Accidents can occur anytime and anywhere, such as accidents that occur at work at high altitudes, for example, falling from the top of the scaffolding. Installation of scaffolding that does not meet the standards can result in accidents such as falling, pinching, and even death. This work includes non-routine work because this company never had install and dismantle scaffolding before, so it is for the first time and it does not have a risk assessment related to the process. The risk assessment process is carried out using the Task Risk Assessment (TRA) method. TRA is used to identify and analyze potential hazards in the install and dismantle scaffolding work, so it can help workers easy to understand the dangers of their work. In addition, it is also to avoid accidents because of the potential danger because in the TRA implementation process there are control measures to prevent the occurrence of these hazards and there are also safe working methods in accordance with the work steps outlined in TRA, there is also an initial risk process before carrying out a job and residual risk to decrease the previous risk using the assumption that pre-determined control measures are effective. While the benefits of this research are the results TRA preparation is expected to become materialevaluation of the importance of identifying hazards that might occur for preventionwork accident [3].

II. RESEARCH METHODOLOGY

TRA is a basic method to reduce the likelihood of accidents in the workplace and has been identified as a way to improve occupational health and safety in an activity that will be carried out while working [1]. Risk assessment process in TRA are as follows [4]:

1. Define the Task to be assessed

The risk assessment title description detail must provide information on Who, Why, How and When the task will be performed.

2. Identify the Hazard

A visit to the work site is mandatory in order to assess the layout of the area, site conditions and adjacent plant and activities. The team must be familiar with the scope of the task to be carried out and should list all the significant hazards in TRA worksheet. A group brainstorm, with the team leader making sure that each member is given adequate opportunity to express their views.

3. Identify the Severity

Severity are the most credible outcome of the hazard. The team should be as explicit as possible in the Severity details. It is important to consider property damage and environmental impact and not just personal injury. The table below is used as guidance to determine the Severity level (1-5).

p-ISSN 2622-2027
e-ISSN 2622-2035

Table 1. Severity Criteria

	Decision Issue			
	People	**Asset/Prod**	**Environment**	**Reputation**
5 Catastropic	Potential fatalities or permanent disabling injury or illness	Extensive damage; long term impact on production; long term loss in revenue	Massive effect; enviromental impact could last for decades; long term contamination requiring remediation	Impact would receive national and global attention
4 Major	Severe injury or illness / Hospitalisation / Disability	Major damage; Major damage to equipment; Delay in operations; short-term loss in revenue	Major effect; Environmental Impact could last for years; area becomes restricted for a limited period of time	Impact would receive regional and industry coverage; potential chronic health impact to community
3 Severe	Severe injury or illness / Lost Time	Local Damage; severe damage to equipment impact on part of operations; partial loss of revenue	Severe impact; environmental impact could last for months; reportable quantity spill or release; spill or release requires clean-up	Considerable impact to local community; potential acute health impacts to community; community response plan activated
2 Minor	Minor injury or illness / OSHA recordable / Doctor visit	Minor Damage; damage to equipment; minor impact on operations; no loss in revenue	Minor impact; environmental impact could last for weeks; spill or release external to facility; no clean-up required	Minor impact; immediate area to facility may be alerted; odour noise complaints
1 Slight	Slight injury or illness / First Aid Case	Slight damage; no significant impact on operations; no loss in revenue	Slight effect; environmental impact could last for days; no long-term consequences; spill or release internal to facility	Slight impact; no impact to local community, little notice by the community

4. Identify the Likelihood

Likelihood is the likelihood of the hazard being realized. The team shall ask themselves "how likely is the hazard controls are in place".Historical evidence, individual experience or personal perception of the hazard shall be considered. The following table shall be used to determine the hazard Likelihood.

Table 2. Likelihood Rating

L1 (Rare)	**L2 (Unlikely)**	**L3 (Possible)**	**L4 (Probable)**	**L5 (Almost Certain)**
The event may only occur in exceptional circumtances	The event could occur at some time	The event may occur at some time	The event will probably occur in the most circumtances	The event is expected to occur in most circumtances
The team has never heard of such an event occurring in company or Industry generally	Only a few occurances are known of in the experience of the team	The team know of a few occurances but not in the last few years	It is a common occurance in industry bit not heard of company in last year	The team know of several events occurring in recent months

5. Evaluation of Risk

Risk is determined by assessing the effect once the hazard event as occurred against the Likelihood of it occuring. The level of this risk is determined by use of a rating chart which simply determines the necessary risk ratings from where it can be judged whether to be within acceptable limits. The risk created by each hazard on the list should be evaluated according to Severity and Likelihood. Risk (R) is derived from matrices showing Severity (S) and Likelihood (P). The initial assessment of risk is to be determined on the basis that no specific control measures exist. This is in order that the full risk potential may be recognized. The effectiveness of the assessment will depend entirely on the team's ability to identify and evaluate all significant hazards associated with the task. The team should also consider the possibility of the interaction of different hazards, including those related to location, critical activities and simultaneous activities. The following table provided guidance for level of risk identified:

p-ISSN 2622-2027
e-ISSN 2622-2035

Table 3. Risk Matrix (5x5)

	LIKELIHOOD					
5 Catastropic	5 Medium	10 Medium	15 High	20 High	25 High	SEVERITY
4 Major	4 Medium	8 Medium	12 Medium	18 High	20 High	
3 Severe	3 Low	6 Medium	9 Medium	12 Medium	15 High	
2 Minor	2 Low	4 Low	6 Medium	8 Medium	10 Medium	
1 Slight	1 Low	2 Low	3 Low	4 Medium	5 Medium	
	1 Rare	2 Unlikely	3 Possible	4 Probable	5 Almost Certain	

where:

- Low (Acceptable)

The acceptable risk criteria is describedas **LOW**, this is the region on the Risk Matrix shade in green. Any risk that lies below the lower boundary of the tolerable region is broadly acceptable. Note that if a risk is acceptable this does not necessarily preclude the initiation of improvements if they are economic, readily identified and practicable.

- Medium (Tolerable)

A risk defined as **MEDIUM** is considered tolerable, this region of the Risk Matrix is shaded yellow. Although these riks are in the tolerable range, effort should still be made to reduce them to levels that are As Low As Reasonably Practicable. This is the ALARP principle and it must be clearly demonstrated.

- High (Intolerable)

If the risk level is **HIGH**, it is considered to be unacceptable. High is illustrated on the Risk Matrix as the area shaded in red. If a high risk result remains, once all available controls have been identified, the task must not be undertaken. Further reviewconsultation, and risk assessment is required.

6. Risk Assessment

Risk is something that must be considered before making a decision [2]. Risk can be calculated using the following formula:

Risk = Likelihood x Severity(1)

where :
Likelihood = frequency of risk failure
Severity = the impact of an accident

7. Determine the Risk Control

Once the initial assessment of risk is complete, the team must work systematically through the list of hazards and specify all the additional control measures which are needed to mitigate eachassociated risk to reduce them to a point where they are considered ALARP (As Low As Reasonably Practicable).Controls, which prevent the hazard being realized, should be used in preference to controls that reduce the effect of a hazard. The hierarchy of controls is applied in the following order:

a. Elimination
b. Susbtitution
c. Engineering Controls
d. Adminitrative Controls
e. PPE (Personal Protective Equipment)

7. Re-evaluate the Risks for Acceptability

The team must re-evaluate the risk for all those hazard for which controls have been determined. Using the risk matrix the numeric value of the residual may be read off against the actions todetermine what actions should be undertaken to ensure a safe work environment. It must always bedetermined that the residual risk is ALARP if not further mitigations should be considered to ensurethis level is achieved. If the residual risk remains too high then the job cannot go ahead asplanned.

III. RESULTS AND DISCUSSIONS

The step description of this work is tools and equipment preparation, install scaffolding, dismantle scaffolding, housekeeping and demobilization all tools and equipment. The following table is show the result of risk assessment.

p-ISSN 2622-2027
e-ISSN 2622-2035

Table 4. Task Risk Assessment Worksheet

1	2	3	4	5			6	7		
No.	Step Description	Hazard Description	Hazard Effect	Initial Risk			Control Measures Required	Residual Risk		
				S	L	R		S	L	R
1.	Tools and equipment preparation	- Slip and trip - Incorrect position of work - Pinch point	- Minor personal injury	2	2	4*	- All workers had a HSE Induction - Ensure the work area is free from all hazard before the job start - Proper manual handling practice - Proper PPE mandatory is required (safety shoes, safety helmet, gloves, safety goggles)	2	1	2
2.	Install scaffolding	- Slip and trip - Incorrect position of work - Pinch point - Falling from a height - Falling object - Scaffolding collapse	- Severe personal injury - Equipment damage	3	4	12	- Give safety briefing and training to all workers - Make a step description for install scaffolding - Install safety signs and barricades in the work area as a sign that there are people who work at height - Replacing damaged equipment with others - Proper manual handling practice - All equipment is secured using a rope so that it does not fall - Proper PPE mandatory is required (safety shoes, safety helmet, gloves, safety goggles)	3	3	9
3.	Dismantle scaffolding	- Slip and trip - Incorrect position of work - Pinch point - Falling from a height - Falling object - Scaffolding collapse	- Severe personal injury - Equipment damage	3	4	12	- Give safety briefing and training to all workers - Make a step description for dismantle scaffolding - Install safety signs and barricades in the work area as a sign that there are people who work at height - Proper manual handling practice - All equipment is secured using a rope so that it does not fall - Proper PPE mandatory is required (safety shoes, safety helmet, gloves, safety goggles)	3	3	9
4.	Housekeeping and demobilization all tools and equipment	- Slip and trip - Incorrect position of work - Pinch point	- Minor personal injury	2	2	4*	- Proper manual handling practice - Proper PPE mandatory is required (safety shoes, safety helmet, gloves, safety goggles)	2	1	2

From the result of hazard identification and risk assessment of install and dismantle scaffodling using TRA above, it is known that in the step description number 1 and 4 show the severity value is 2because it makes minor personal injury and the likelihood value is 2 because the event could occur at some time, so the initial risk value is 4 (low). After the control measures are taken, the likelihood value decrease to 1 because the team has never heard of such an event occuring in this company or industry generally and then the residual risk value becomes 2 (low). For the step description number 2 and 3 show the severity value is 3 because it makes severe personal injury and some equipments damage and the likelihood value is 4 because the event will probably occur in the most circumtances, so the initial risk value is 12 (medium). After the control measures are taken, the likelihood value decrease to 3because it is a common occurance in industry bit not heard of this company in last year and then the

p-ISSN2622-2027
e-ISSN2622-2035

residual risk value becomes 9 (medium).

Recommendations are given based on the hazard control hierarchy including elimination, substitution, engineeringcontrol,administrative control, and PPE, so the recommendation that can be given are all workers had a HSE Induction, ensure the work area is free from all hazard before the job start, give safety briefing and training to all workers, make a step description for install scaffolding, install safety signs and barricades in the work area as a sign that there are people who work at height, replacing damaged equipment with others, proper manual handling practice, all equipment is secured using a rope so that it does not fall, proper PPE mandatory is required (safety shoes, safety helmet, gloves, safety goggles).

IV. CONCLUSIONS

Based on the overall result of TRA method, it is known that the highest risk of install and dismantle scaffolding is medium level with the initial risk value of 12 and then after the control measures are taken the residual risk value become 9. Then, priority recommendations are given based on the analysis in task with the highest risk value, as follows:

a. Give safety briefing and training to all workers
b. Make a step description for install and dismantle scaffolding
c. Install safety signs and barricades in the work area as a sign that there are people who work at height
d. Replacing damaged equipment with others
e. Proper manual handling practice
f. All equipment is secured using a rope so that it does not fall
g. Proper PPE mandatory is required (safety shoes, safety helmet, gloves, safety goggles)

REFERENCES

[1] Alvani, I. N. “Penilaian Risiko dan Perencanaan Kegiatan Perawatan Ketel Uap Menggunakan Metode RCM II dan Identifikasi Bahaya Menggunakan TRA di PT.X”, Surabaya, (2016).
[2] Department of Occupational Safety and Health Ministry of Human Resources, “Guidelines of Hazard Identification, Risk Assesment and Risk Control”, Malaysia, (2008).
[3] Febrianto, D., Muliatna, I. M., “Study Identifikasi Bahaya dan Penilaian Resiko dengan menggunakan Metode TRA (Task Risk Assessment) di Unit Workshop Perawatan Mesin 1 sebagai Upaya Pencegahan Kecelakaan Kerja di PT. PJB UBJ O&M Tanjung Awar-Awar”.
[4] “Operating Risk Assessment”, unpublished.