WORK SAFETY RISK MANAGEMENT TOWARDS ZERO ACCIDENT IN FASHARKAN SURABAYA

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ABSTRACT

Occupational health is an element of health related to the work environment and work, which can directly or indirectly affect work efficiency and productivity. Meanwhile, work safety is the main means to prevent work accidents that can cause harm in the form of injury or injury, disability or death, property loss, damage to equipment or machinery and environmental damage widely. In essence, Occupational Safety and Health (K3) is an effort to create protection and security from various risks of accidents and hazards, both physical, mental and emotional to workers, companies, communities and the environment. In addition, occupational safety and health is expected to create work comfort and high work safety as stated in PerKasal Number 26 of 2018 concerning Occupational Safety and Health in the Indonesian navy. This study aims to find out what types of accidents have a high risk in Fasharkan Surabaya, find out what impacts can be caused by high risk accidents and obtain steps that can be taken to reduce work accidents at Fasharkan Surabaya by using the Formal Safety Assessment (FSA) Method. There are four types of accidents that occur in Fasharkan Surabaya with the highest starting risk ranking, namely human accidents with work equipment, human accidents with property, human accidents with work systems and human accidents with the environment. The impact of the four accidents caused substantial material losses. To reduce the risk of the three types of accidents, the lowest Implied Cost of Averting a Risk (ICAR) measurement is carried out for each risk reduction option. The risk mitigation carried out is providing training for General K3 Experts, Electricity & Generators who have an ICAR of 92 million rupiahs, training of Fire K3 Officers who have an ICAR of 15.75 million rupiahs, Implementation of Work SOPs and Tightening of Supervision which has an ICAR of 12.5 million rupiah, and Procurement of Work Safety Equipment in the work area of workshops and ships as well as Personal Protective Equipment for each worker who has an ICAR of 53.5 million rupiah.

Keywords: Formal Safety Assessment (FSA), Risk Assessment, Work Accident.

1. INTRODUCTION.

The number of work accidents in Fasharkan Surabaya is very worrying. In the preliminary survey, in the last 10 years from 2010 to 2021, 20 incidents have been identified. This figure is still minimal when compared to actual events which are almost entirely not properly recorded through the workshop activity journal at Fasharkan Surabaya. Starting from scratching work accidents, falling materials, electrocuted, slipping, inhaling toxic gases, to the dangers of radiation of radioactive substances. So, based on these data, all are required to be more serious in implementing the OHS (Occupational Health and Safety) culture. Accidents not only cause death, material loss, and damage to the environment but also affect the productivity and welfare of the crew members of Fasharkan Surabaya. With a good K3 culture, the number of work accidents can be reduced, which in turn will increase work productivity. Work accidents also affect the human development index and the employment development index. (Menakertrans, Ida Fauziayah 2020).

Fasharkan Surabaya as one of The Work Unit in The Fifth Naval Main Base in particular and in the Navy in general which is loaded with high-risk construction work so there is a high potential for work accidents. Until now there is no SOP that specifically discusses Occupational Safety and Health as a derivative of Perkasal number 34 of 2020 concerning Guidelines for the Implementation of Occupational Health and Safety Management Systems (SMK3). Apart from the Jukker as an elaboration of the DSP, there are only ways to deal with fire hazards in the event of a fire disaster. The research that has been

carried out at Fasharkan Surabaya, especially regarding Risk Management, is to discuss global risks regarding the operations of Fasharkan Surabaya, both onshore and onboard operations. In this study, it will be discussed about risk management on work safety which is devoted to discussing the incidence of work accidents at Fasharkan Surabaya. What are the causes and how are risk mitigation efforts to overcome them. It is hoped that the final goal of this research is to be able to formulate a draft SOP regarding work safety standardization and minimize the occurrence of work accidents so that the goal of zero accident according to the Kasal Telegram Number 147/Basegram/0308 twu.0311.1538 can also be realized.

2. LITERATURE REVIEW

Risk management in this paper is using the FSA (Formal Safety Assessment) method. The steps carried out in implementing risk management are to identify the risks that may be experienced by the work unit, in this case Fasharkan Surabaya, after identifying them, an evaluation is carried out on each -each risk is reviewed from the risk value (severity) and frequency (IMO, 2002). The last stage is risk control. In the risk control stage, it is divided into 2, namely physical control (risk is eliminated, risk is minimized) and financial control (risk is retained, risk is transferred). Risk management consists of three components, namely:

a. Risk Identification & Analysis
b. Risk evaluation
c. Risk reduction & risk control (Risk Treatment)

2.1. Step 1 Hazard Identification:

Problem Definition. The purpose of the problem definition is to describe the problem correctly based on the analysis related to the regulation being reviewed or being developed. Problem definition must be in accordance with operational experience and applicable requirements by considering all relevant aspects.

Risk distinguishing proof, within the shape of a list of all important mishap scenarios with potential causes and results, as a reply to the address of what blunders might happen (IMO, 2002). The point is to distinguish a risk list and a set of scenarios whose need is decided by the level of hazard of the issue beneath the talk. This objective can be accomplished by utilizing standard strategies to distinguish dangers that contribute to mishaps, by screening these risks through a combination of existing information and conclusions, and by checking on the common show that was created amid the issue definition. The approach utilized for danger-distinguishing proof, for the most part, a combination of inventive and explanatory strategies, points to determining all significant risks. A harsh examination of the causes and impacts of each mischance category utilizing specific procedures, such as blame tree investigation, occasion tree examination, disappointment mode and impact investigation (FMEA), risk and operability thinks about (HAZOP), what on the off chance that investigation strategy, and chance commitment tree (RCT), which was chosen concurring to the issue being talked about.

2.2. Step 2 Risk Assessment:

This objective can be accomplished by utilizing methods that are fitting to the hazard show made and consideration is centred on the dangers that are surveyed as tall. The esteem in address is the level of hazard, which can be isolated into:

a. Risks that cannot be justified or accepted, except in exceptional circumstances (intolerable).
b. The dangers that have been made are so little that there's no requirement for advanced (insignificant) safeguards.
c. A hazard whose level is between an unfortunate and an irrelevant level (as low as reasonably practicable = ALARP).

2.3. Step 3 Selection of Risk Controls:

The point of step 3 is to propose successful and down-to-earth RCOs, by taking after four rule steps:

a. Centering on the dangers that require control, to channel the yield of the 2nd step, so that the centre is as it were on the zones that most require change control.

b. Distinguish activities to control potential dangers (risk control measures = RCMs).

c. Assess the adequacy of RCMs in decreasing chance by re-evaluating step 2.

d. Grouping RCMs into basic options.

2.4. Step 4 (Cost and Benefit Assessment):

The objective of step 4 is to recognize and compare the benefits and costs of actualizing each of the RCOs recognized in step 3. Costs must be expressed in life cycle costs, which incorporate a beginning, working, preparing, assessment, certification, decommissioning, etc. In the meantime, benefits may include diminishments in terms of passings (fatalities), injuries/losses (wounds), mischances (casualties), natural harm and cleaning (natural harm & clean-up), and reimbursements by third parties who are mindful. The yield of step 4 comprises of:

a. Costs and benefits for each RCO recognized in step 3.

b. The costs and benefits for the RCO of concern (which are most influenced by the issue).

c. Financial utility communicated within the suitable file.

d. The equation used to solve this problem is the Cost of Averting a Risk Index (ICAR) as given in Equation 2.1 below:

$$\text{ICAR} = \frac{(\Delta C - \Delta B)}{\text{Risk Reduction}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

ICAR = *Implied cost of averting a risk* (Risk reduction cost index)

ΔC = Risk control costs

ΔB = economic benefits of implementing risk control

Risk Reduction = Reducing risk after controlling

2.4. Step 5 (Recommendations for Decision Making):

The purpose of step 5 is to define the recommendations that should be provided to the decision-maker, in an auditable and traceable manner. Recommendations are based on:

a. Comparison and ranking of all hazards and their causes.

b. Comparison and ranking of risk control options as a function of combined costs and benefits.

c. Identification of risk control options that keep risk as low as possible so that it makes sense to implement.

Proposals ought to be given in an organization that can be caught on by all parties, not withstanding involvement. Accommodation of suggestions as a result of an FSA handle must be given instantly and get to pertinent supporting archives by a component that incorporates comments. The yield of step 5 comprises:

a. An objective comparison of alternative options, based on potential risk reduction and cost-effectiveness, according to legislation or regulations that are being reviewed or developed.

b. Feedback information to review the results given in the previous steps.

Table 1. Severity Index

Skala	Human	Property	Environment	Stakeholder
C0	Not significant (very small chance of injury) (0-1 million)	Not significant (0 - 10 million)	Insignificant (meaningless damage) (0 - 10 million)	Not significant (0 - 10 million)
C1	Minor (One minor injury) (1 million – 5 million)	Small (10 - 100 million)	Minor (Controlled short term damage) (10 – 50 million)	Small (Temporary project stop or work restrictions) (10 – 100 million)
C2	Medium (a lot minor injuries or one serious injury) (5 Million-10 million)	Currently / Middle (100 - 200 million)	Moderate (Major Damage) (50 - 100 million)	Medium (National scope, the project is temporarily closed for a few days. There are no KRI maintenance and repair activities) (100 - 200 million)
C3	Severe (Many serious injuries or one death) (10 million – 25 million)	Big (200 - 500 million)	Major (widespread damage with potential environmental damage) (100 - 200 million)	Large (National scope, Fasharkan temporarily closed from maintenance and repair projects for a few days) (200 - 500 million)
C4	Catastrophic / major disaster (Many cause death (25 Million and more)	Big disaster (500million+)	Disaster (Damage is extensive to neighboring countries) (200million+)	Disaster (international scope, Fasharkan closed, work was interrupted and maintenance and repair activities did not occur for a long period of time) (500million+)

(Table's Legend : *Port & Harbour Risk Assessment & Safety Management System*)

Table 2. Risk Possibility Assessment

Scale	**Concecuency**	**Definition**
F1	*Almost Certain*	Can happen any time Happens almost every day
F2	*Likely*	Happens once a week
F3	*Possible*	Can happen every now and then Happens 1 time in 1 month
F4	*Unlikely*	Can happen 1 time in 1 year
F5	*Rare*	Almost never, very rarely Happened once in more than 1 year

(Table's Legend: Australian Standard / New Zealand Standard 4360, 2004)

Table 3. Risk Matrix

Consequence	C4	5	6	7	8	10
	C3	4	5	6	7	9
	C2	3	3	4	6	8
	C1	1	2	2	3	6
	C0	0	0	0	0	0
Frequency		F5	F4	F3	F2	F1

Information:

0 & 1 = Negligible risk

2 & 3 = Low risk

4 & 5 = Area of As low as Reasonably Practicable Area (ALARP)

6 = The risk is getting higher

7 & 8 = Significant risk

9 & 10 = Risiko tinggi

2.5. Formal Safety Assessment

Formal Safety Assessment (FSA) could be a judicious, organized, and orderly technique or process for evaluating dangers related to exercises within the oceanic division (shipping) and assessing the costs and benefits of a few hazard control alternatives, utilizing chance investigation and cost-benefit appraisal (International Maritime Organization, 2002). FSA points to diminishing existing dangers, as well as moving forward with shipping security (marine security), which incorporates assurance of life, well-being, marine environment, and property rights.

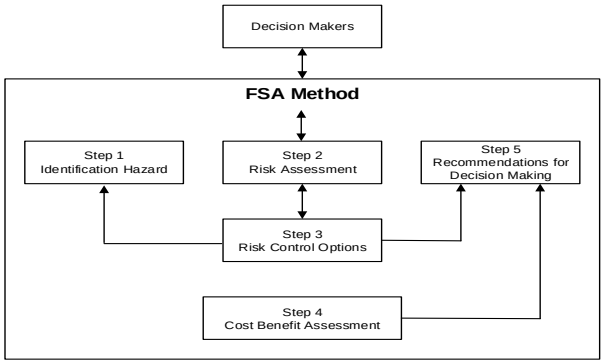

Figure 1. *Framework Formal Safety Assessment* (FSA)

2.6. Zero Accident

The Indonesian navy has a zero accident program as outlined in the Kasal Telegram Number 147/Basegram/0308 twu.0311.1538 which states that zero accidents means that there are no more accidents at work sites that can cause temporary or permanent injury, even fatal or death, as well as material loss. . Creating a zero accident work environment is not easy. This requires a long process even years and requires a continuous process. The zero accident campaign is one method to reduce the potential for work accidents caused by human error. The zero accident campaign is a campaign that supports the trinity of principles, methods and practices. If one of them is removed, the zero-accident campaign will not be achieved. The zero accident campaign consists of 3 (three) main principles, namely zero, anticipation and participation. These three are called 3 (three) basic image principles, namely:

a. Zero principle

It is a principle to eliminate all accidents to zero, including occupational accidents, occupational diseases and traffic accidents, by finding, understanding and solving hazards or problems that are hidden in everyone's daily life or hidden in the workplace and work.

b. Anticipation principle

Preventing the emergence of accidents before activities, by discovering, understanding and solving the hidden dangers and problems in their daily lives and of course the hidden dangers in the workplace and work, and to create a happier workplace, zero accidents and illnesses.

c. Prinsip partisipasi

Practicing problem solving activities in the spirit of self-initiative in their respective positions and workplaces with the integration and cooperation of leaders, managers, staff, and employees, to find, understand and solve hidden hazards or problems in the workplace and work.

3. RESULT AND DISCUSSION.

At the beginning of data collection, one thing that is needed is how many work orders there are in Fasharkan Surabaya in the period 2010 to 2021 including Hardepo and Harmen / Hardar. The Fasharkan Surabaya 2010-2021 Job Data Table provides an overview of this.

Table 4. Fasharkan Surabaya Job Data (SPK unit)

No.	Year	Type of work	
		Hardepo	Harmen / Hardar
1	2010	156 SPK	157 SPK
2	2011	179 SPK	217 SPK
3	2012	102 SPK	127 SPK
4	2013	141 SPK	165 SPK
5	2014	139 SPK	203 SPK
6	2015	113 SPK	177 SPK
7	2016	99 SPK	182 SPK
8	2017	77 SPK	166 SPK
9	2018	121 SPK	154 SPK
10	2019	135 SPK	133 SPK
11	2020	165 SPK	199 SPK
12	2021	125 SPK	145 SPK

After knowing the common depiction of the conditions at Fasharkan Surabaya, the other most vital thing is to display information on mishaps that have happened. The Work Mishap Information table underneath appears mishap information that happened at Fasharkan Surabaya which appears the number of episodes recorded from 2010 to 2021.

Table. 5 Work Accident Frequency at Fasharkan Surabaya
Year 2010 – 2021

No	Type of Accident	Number of Frequency												Jumlah
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
1	Human with Work System												1	1
2	Human with Environment		1		1		1							3
3	Human with Property			1					1	1	1	2		6
4	Humans with Work Tools	1				2	2	1		1	3			10
	Summary	1	1	1	1	2	3	1	1	2	4	2	1	20

(Table's Legend : Production Dept. of Fasharkan Surabaya and Author's processed results)

3.1. Determining Consequence Criteria Value

In determining a consequence criterion, an interview with an expert on work accidents that occurred at Fasharkan Surabaya was carried out, which later on the results of the interview will be assessed based on existing criteria standards, such as AS/NZS Standard 4360:2004, IMO, and others.

a. Humans: incidents on work safety that are the recipient of the direct impact of workplace accidents. The risks accepted by humans from mild to death.

b. Property: any work accident can cause property loss. For example, a fire in a workshop or other facility that causes damage to the asset.

c. Environment: work accidents can cause environmental damage, for example fires in the work area due to plate welding and others. The environmental damage includes those that have an impact on plants around the work area.

Fasharkan Surabaya stakeholders will also accept the risks caused by work accidents. For example, if there is a work accident at Fasharkan Surabaya, it will automatically concentrate on completing the work on time according to the schedule and production targets will be late and also production costs will swell due to the completion of the accident. The following table shows the initial risk level for this type of accident.

Table. 7 Hazard List with Frequency Scores and Consequences and Score Scores for Each Event

Danger Number	Hazard Type	Workshop Type	Danger Details	Possible Cause	The Most Likely Consequences						Worst Possible Consequence					
					Hazard Type	Hazard Impact Assessment				Frequency	Hazard Type	Hazard Impact Assessment				Frequency
						Human	Property	Environment	Stakeholer			Human	Property	Environment	Stakeholer	
1	(A) Human Accident with Work System	All Workshop	Accidents that occur when there is missed communication between 1 work team and another work team, including not complying with Standard Operating Procedures	- Communication tools that don't work normally - Errors in reading & understanding the SOP of a job - There is no backup communication (messenger) who is in charge of conveying messages when the communication tool is constrained	- Electrocution weak current - Bruises on the body - Irritation to the skin - Shock & fall - Sprained / slipped / bruised ankle	C1 2	C0 0	C0 0	C1 2	F3	- Electrocuted strong current - Severe bruises and even broken bones - Severe irritation to the skin - Shocked & Fallen even died	C2 6	C1 3	C1 3	C2 6	F2
2	(B) Human Accident with Property	All Workshop	Accidents that occur between humans and property that cause damage to property and humans	- The physical condition of the property / infrastructure is fragile due to the age factor - Lots of electric current leakage in buildings / ships - Lots of oil spills on the ship/workshop - Limited working space conditions	- Electrocution weak current - Bruises on the body - Shock & fall - Sprained / slipped / bruised ankle - Minor damage to buildings	C2 4	C1 2	C0 0	C1 2	F3	- Electrocuted strong current - Severe bruises and even broken bones - Shocked & Fallen even died - Severe damage to buildings	C3 7	C2 6	C1 3	C2 6	F2
3	(C) Human Accident with Environment	All Workshop	Accidents that occur between humans and the environment that cause damage to the environment and humans	- Unhealthy / stuffy work environment - Insufficient/excessive lighting in the workspace - The condition of a messy workspace with used materials & equipment that are not used / haven't been cleaned up	- Minor visual disturbances - Mild respiratory distress - Mild irritation to the body - Light pollution to the environment	C0 0	C0 0	C0 0	C0 0	F5	- Severe visual impairment - Severe respiratory distress - Severe irritation to the body - Severe pollution to the environment	C1 2	C1 2	C1 2	C1 2	F4
4	(D) Human Accident with Work Equipment	All Workshop	Accidents that occur between humans and work equipment that cause damage to work equipment and humans	- Only 50% ready-to-use work equipment - Lack of operator knowledge about work equipment - Operators do not understand the SOP for the use of work tools used - Unstable electrical voltage & imperfect lubrication on work tools	- Minor injuries to the body - Electrocution weak current - Shocked & fell - Minor damage to work tools	C2 6	C1 3	C0 0	C1 3	F2	- Severe injuries to the body - Electrocuted by a strong current - Shocked & fell - Severe damage to work tools	C3 9	C2 8	C1 6	C2 8	F1

(Source: Result of interview with expert and crew of Fasharkan)

Table 9. Results Obtained After Giving Weight

Incident	Most Likely Consequences				Worst Possible Consequence				**Summary**	**Order**
	Human	Property	Environment	Stakeholder	Human	Property	Environment	Stakeholder		
Human Accident with Work System	0,8	0	0	0,6	2,4	0,6	0,3	1,8	6,5	**3**
Human Accident with Property	1,6	0,4	0	0,6	2,8	1,2	0,3	1,8	8,7	**2**
Human Accident with Environment	0	0	0	0	0,8	0,4	0,2	0,6	2	**4**
Human Accident with Work Equipment	2,4	0,6	0	0,9	2,7	1,6	0,6	2,4	11,2	**1**

From the calculation the table above shows that human accidents with work equipment are the events that have the highest risk then the second is human accidents with property, the third is human accidents with the environment and the last is human accidents with work systems.

3.2. Weighting Sensitivity

On this occasion it will be shown how the sensitivity of this weighting value if it is varied to values that are considered realistic. In this study, the weighting values for humans varied,
namely 0.3, 0.4, 0.5, 0.6, 0.7 with the weighting values for Meteri given in the table below:

Table 10. Weight Variation

No	Human	Property	Environment	Stakeholders
1	0,7	0,1	0,1	0,1
2	0,6	0,1	0,1	0,2
3	0,5	0,15	0,05	0,3
4	0,4	0,2	0,1	0,3
5	0,3	0,2	0,2	0,3

Table 11. Variations in Weighting of Human Victims

Type of Accident	Risk Rating Per Weighted				
	0,7	0,6	0,5	0,4	0,3
Human Accident with Work Equipment	1	1	1	1	1
Human Accident with Property	2	2	2	2	2
Human Accident with Work System	3	3	3	3	3
Human Accident with Environment	4	4	4	4	4

The table above shows that by giving weighting variations, it does not provide a significant risk rating change from the types of accidents that exist. What is more important in risk mitigation here is how we reduce the high risk value that occurs to an acceptable risk value

Table 12. Risk Reduction

Incident	Initial Risk				General, Electrical & GenSet OHS Expert Training				Fire K3 Officer Training				Enforcement of Standard Operational Work Procedures & Tighter Supervision				Procurement of Personal Protective Equipment (PPE) in accordance with The List of Personnel Composition (DSP)			
	Human	Property	Environment	Stakeholder	Human	Property	Environment	Stakeholder	Human	Property	Environment	Stakeholder	Human	Property	Environment	Stakeholder	Human	Property	Environment	Stakeholder
Human Accident with Work Equipment	9	8	6	8	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Human Accident with Property	7	6	3	6	6	4	2	4	6	4	2	4	5	3	2	3	6	4	2	4
Human Accident with Work System	6	3	3	6	4	2	2	4	-	-	-	-	3	2	2	3	-	-	-	-
Human Accident with Environment	2	2	2	2	1	1	1	1	-	-	-	-	0	0	0	0	-	-	-	-

Table 13. Risk Reduction Cost (in Rupiah)

Countermeasures	Countermeasures Cost (ΔC)	Benefit (ΔB)			
		Human Accident with Work Equipment	Human Accident with Property	Human Accident with Work System	Human Accident with Environment
General, Electrical & GenSet OHS Expert Training	242 million	150 million	100 million	50 million	10 million
Fire K3 Officer Training	81,5 million	50 million	25 million	-	-
Enforcement of Standard Operational Work Procedures & Tighter Supervision	105 million	80 million	50 million	25 million	10 million
Procurement of Personal Protective Equipment (PPE) in accordance with The List of Personnel Composition (DSP) (238)	607 million	500 million	350 million	-	-

Table 14. ICAR Calculation (in Rupiah)

Countermeasures	Risk Reduction				ICAR			
	A	B	C	D	A	B	C	D
General, Electrical & GenSet OHS Expert Training	2	2	2	1	92 million	142 million	192 million	232 million
Fire K3 Officer Training	2	1			15,75 million	56,5 million		
Enforcement of Standard Operational Work Procedures & Tighter Supervision	2	2	2	2	12,5 million	27,5 million	40 million	47,5 million
Procurement of Personal Protective Equipment (PPE) in accordance with The List of Personnel Composition (DSP) (238)	2	1			53,5 million	257 million		

Information: A = Human Accident with Work Equipment
B = Human Accident with Property
C = Human Accident with Work System
D = Human Accident with Environment

4. CONCLUSION.

From the results of the analysis carried out, the following conclusions are obtained:

a. The number of work mischances in Fasharkan Surabaya is very stressful. This may be seen from the overall rate of work mischances for 11 a long time (2010 to 2021) as numerous as 20 cases that can be recorded, not counting work mischances that are not well recorded within the everyday movement diary and work unit minutes. After the calculations are carried out, they can be positioned consecutively beginning from the most noteworthy hazard esteem, specifically:

1) Human Accident with Work Equipment, with risk value 9

2) Human Accident with Property, with risk value 7

3) Human Accident with Work System, with risk value 6

4) Human Accident with Environment, with risk value 2

For these four types of accidents, risk reduction measures are carried out by knowing in

advance the main causes of the four types of accidents.

b. The main cause of the four types of work accidents with high risk is due to a very minimal understanding of K3 (Occupational Health and Safety) by Fasharkan Surabaya crew members. The most likely damage is injuries to the workers' bodies, damage to property buildings (infrastructure) and environmental pollution around the Fasharkan Surabaya workshop. Human Accidents with Work Equipment, Property, Work Systems, and Environment, are often motivated by work equipment that is not ready to use or only 50% of its technical condition and also the work space and work atmosphere that is not conducive so that there is a chance for work accidents to occur in humans and also result in accidents. damage to the physical building (infrastructure) of Fasharkan Surabaya.

c. The actions to reduce the risk of the four types of work accidents at Fasharkan Surabaya are as follows:

1) Human Accidents with Work Equipment, namely by holding training for General K3 Experts, Electricians & Generators who have an ICAR of 92 million rupiah so that workers understand K3 culture and avoid the risk of work accidents, as well as training for Fire K3 Officers who have an ICAR of 15.75 million rupiah so that workers are ready and alert within the occasion of a fire in the workshop or ship work area. Next is the implementation of work SOPs and tightening supervision which has an ICAR of 12.5 million rupiah so that workers understand and comply with all good and safe work procedures. Then the last one is the Procurement of Work Safety Equipment in the work area of workshops and ships as well as Personal Protective Equipment for each worker who has an ICAR of 53.5 million rupiah so that workers feel safe while working..

2) Human Work Accidents with Property, namely by holding training for General K3 Experts, Electricians & Generators who have an ICAR of 142 million rupiah so that workers understand K3 culture and avoid the risk of work accidents, as well as training for Fire K3 Officers who have an ICAR of 56.5 million rupiah so that workers are ready and alert within the occasion of a fire in the workshop or ship work area. Next is the implementation of work SOPs and tightening supervision which has an ICAR of 27.5 million rupiah so that workers understand and comply with all good and safe work procedures. Then the last one is the Procurement of Work Safety Equipment in the work area of workshops and ships as well as Personal Protective Equipment for each worker who has an ICAR of 257 million rupiah so that workers feel safe while working.

3) Human Accidents with Work Systems, namely by holding training for General K3 Experts, Electricians & Generators who have an ICAR of 192 million rupiah so that workers understand K3 culture and avoid the risk of work accidents and the application of work SOPs and tighten supervision which has an ICAR of 40 million rupiah so that workers understand and comply with all good and safe work procedures.

4) Human Accidents with the Environment, namely by holding training for General K3, Electricity & Genzet Experts who have an ICAR of 232 million rupiah so that workers understand K3 culture and avoid the risk of work accidents and the application of work SOPs and tighten supervision which has an ICAR of 47.5 million rupiah so that workers understand and comply with all good and safe work procedures.

From the results of this final project, we suggest reducing the occurrence of work accidents that can have a major impact on both human and material casualties, namely risk mitigation to reduce the occurrence of work accidents between humans and work equipment, property, work systems and the environment in Fasharkan Surabaya is to provide an understanding maximum about Occupational Safety and Health (K3) through training of General K3,

Electricity and Genzet Experts as well as fire prevention training. Then enforce professional and safe work SOPs and tighten supervision in the field. The next step is to equip work safety equipment both in the Fasharkan workshop and on the ship and equip workers with personal protective equipment that is comfortable to wear while working and provides security for the wearer.

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