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Occupational Safety, Health and Environmental Risk Assessment of Reconstruction Projects Airport in Palu City

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Abstract
Airport construction projects in their implementation have risks related to Occupational Safety, Health and the Environment which have both positive and negative impacts. If risks related to Occupational Safety, Health and the Environment are not addressed and managed well, they will affect construction project targets in terms of cost, time, quality and occupational safety and health. The aim of this research is to identify, assess and handle risks in the airport reconstruction project in the city of Palu so that it will minimize the impact of time delays, cost overruns, non-compliance with specifications and occupational safety and health guidelines. The research method used consists of several stages, namely primary and secondary data collection. Primary data through direct site surveys, questionnaires and interviews with related parties. Data processing and data analysis using Descriptive Statistics, Risk Analysis using a risk assessment matrix. The research results obtained identification of risk risks in Airport Reconstruction Project activities including 6 activities with 36 potential safety, occupational health and environmental risks, the total frequency of risk levels based on the results of the risk assessment matrix analysis, namely 17 types of risk with a low risk level (47 %) and 19 types of risk with moderate risk level (53%). Risk control efforts are carried out based on a control hierarchy, namely engineering control, administrative control and personal perspective equipment (PPE).

Keywords: *risk, reconstruction, airport, Occupational Safety, Health and Environment*

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I. INTRODUCTION

The construction industry, especially airports, has an important role in the development process in every region, especially in the city of Palu. In the series of airport reconstruction activities, there is a process that manages project resources into an activity result in the form of an airport building. The processes that occur in this series of activities involve related parties, both directly and indirectly. Construction activities have greater risks than other business activities [1]. The risks related to Occupational Safety, Health and the Environment that may arise in airport reconstruction projects at this time are numerous and varied and will affect the targets or goals of construction projects, namely on cost, on time, on time, on quality and in accordance with Occupational Safety and Health guidelines. Occupational Safety, Health and Environment are efforts and ideas carried out in order to prevent, overcome and reduce the occurrence of accidents and their impacts through identification, analysis and control of hazards by implementing appropriate hazard control systems and implementing occupational safety and health legislation.

Types of work in airport reconstruction, especially runway work, include: preparatory work, excavation work with a depth of 0-3 meters, embankment work, geotextile/geogrid work, granulated pavement work (sub base course and base course), and asphalting work [2]. Runway reconstruction work raises several Occupational Safety, Health and Environment risks that can occur during work implementation, namely: for preparatory work including: damage to heavy equipment machines used in land clearing work and disturbances during work such as conditions that make it impossible to work and factors environment [3].

Excavation work with a depth of 0-3 meters includes: heavy equipment accidents, workers/vehicles falling into the excavation and landslides/collapse of side walls [4]. In landfill work, this includes: heavy equipment accidents, inhalation of dust and dust debris entering the eyes and being buried in the landfill material [5]. Geotextile/geogrid work includes: the risk that workers could be injured because of the material sewing tool, namely the sewing machine, and the reflection of sunlight poses a risk to workers' health [3]. In granular pavement work (Sub Base Course and Base Course) this includes: heavy equipment accidents, project traffic users scattering material that has not been leveled and inhalation of dust and dust debris entering their eyes [5]. Paving work includes: heavy equipment accidents, exposure to hot liquid asphalt and inhalation of asphalt vapor [6].

Occupational safety and health is a preventive effort whose main objective is to identify, replace, eliminate, assess and manage dangerous risk factors. Workplace inspections, surveys, and monitoring are methods for identifying hazards. The aim and objective of the Occupational safety and health control system is to create an occupational safety and health system in the workplace by involving integrated elements of management, labor, working conditions and environment in order to prevent and reduce work-related accidents and diseases as well as creating a safe, efficient, workplace. and productive [7].

Therefore, to minimize the occurrence of time delays, cost overruns, non-compliance with Occupational safety and health specifications and guidelines as well as the reconstruction project environment, it is necessary to identify, assess and handle risks related to Occupational Safety, Health and the Environment that may arise in airport reconstruction/construction projects as well as knowing the impact of Occupational Safety, Health and the Environment on the success of an airport reconstruction/construction project. It is hoped that the results of this research will become recommendations for related parties so that the targets and objectives of construction projects can be achieved and succeed according to plan.

II. RESEARCH METHODS

The data used consists of primary data and secondary data. Primary data was obtained through field observations, distribution of questionnaires, interviews and documentation, while secondary data was in the form of labor data from contractors, job safety analysis (JSA), Construction Safety Plan and monthly HSE reports. The questionnaire was distributed using purposive sampling, namely workers who knew and were involved in Occupational Safety, Health and the Environment in the Palu City Airport Reconstruction Project. The data instrument was tested using a validity test based on the value of r count (Corrected Item-Total Correlation) > r table of 0.361. Reliability testing shows that all variables in this study have a Cronbach Alpha coefficient (α) that is greater than 0.6, so it can be said that all questionnaire questions are consistent (reliable). Data analysis uses descriptive statistics and risk assessment using the Hazard Identification, Risk Assessment and Determining Control (HIRADC) approach method. The stages carried out in filling in the HIRADC table are Hazard Identification, Risk Assessment and Determining Control.

III. RESULT AND DISCUSSION

3.1 Respondent Characteristics

Based on Figure 1, it can be seen that 19 respondents from the contractor side dominate with a percentage of 63%, 6 respondents from the sub-contractor side with a percentage of 20% and 5 consultants with a percentage of 17%.

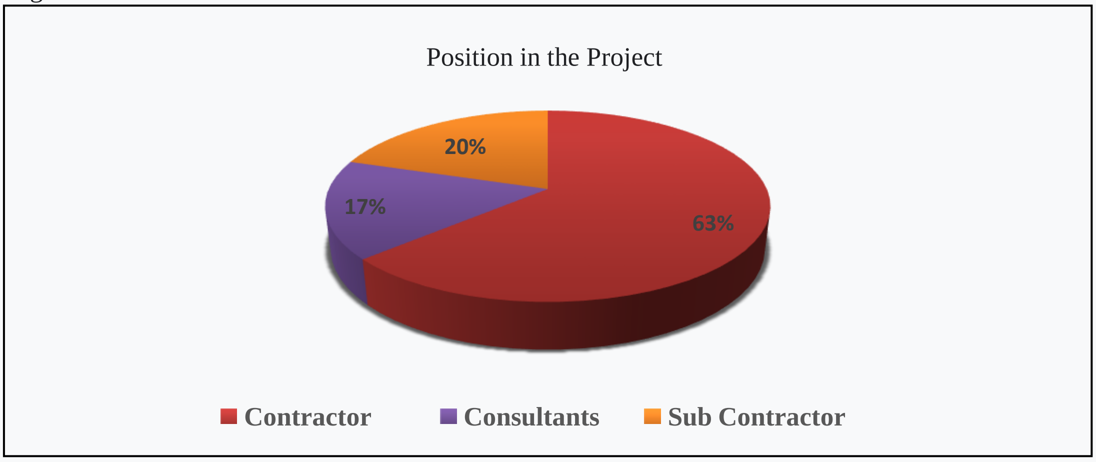

Figure 1. Distribution of Respondents Based on Position in the Project

Based on Figure 2, it can be seen that respondents with experience in the construction sector <5 years dominate with 17 respondents with a percentage of 57%, respondents with experience in the construction sector >10 years are 10 respondents with a percentage of 33%, and respondents with experience in the construction sector 6- 10 years as many as 3 respondents with a percentage of 10%.

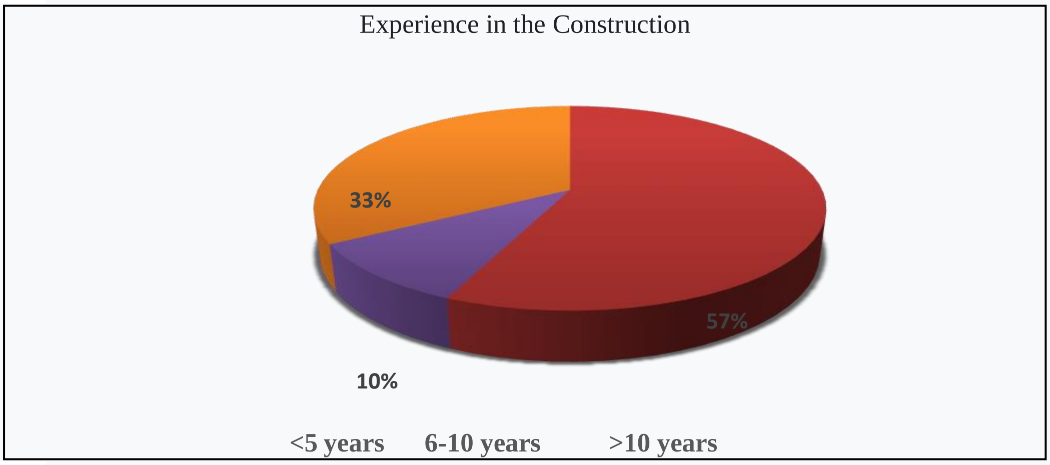

Figure 2. Distribution of Respondents Based on Experience in the Construction

In this research, respondents who had received Occupational safety and health training were grouped into 2 parts, namely Yes and No. Based on Figure 4.6, it can be seen that respondents who have received Occupational safety and health training dominate 24 respondents with a percentage of 80% and respondents who have never received Occupational safety and health training are 6 respondents with a percentage of 20%.

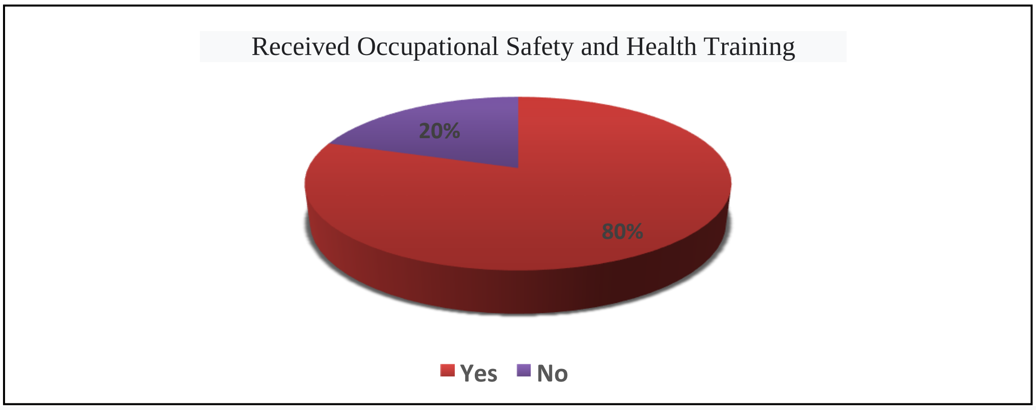

Figure 3. Distribution of Respondents Based on Ever Received Occupational safety and health training

In this research, last education is grouped into 4 sections, namely SMA/SMK, D3, D-4/S-1 and S-2/S-3. Based on Figure 4, it can be seen that respondents with a final education of D4/S1 dominate as many as 18 people with a percentage of 60%, respondents with a final education of D3 are 6 respondents with a percentage of 20%, respondents with a final education of SMA/SMK are 5 respondents with a percentage of 17% and There were 1 respondents with a master's/doctoral degree with a percentage of 3%.

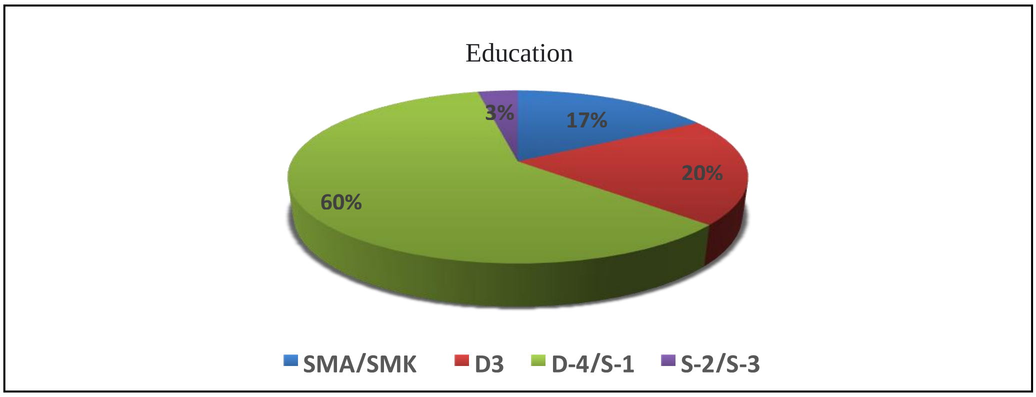

Figure 4. Distribution of Respondents Based on Education

3.2 Risk Identification of Occupational Safety, Health and the Environment

To determine the magnitude of the likelihood and impact (consequences) a questionnaire was distributed to workers involved and understanding of Occupational Safety, Health and the Environment in the Reconstruction of Runway. There were 30 total respondents consisting of 19 respondents from the contractor, 6 respondents from the sub-contractor and 5 respondents from the consultant.

Based on the results of the likelihood value of 36 risk identifications of Occupational Safety, Health and the Environment, there are 16 risks in the likely risk category which are classified as rare, 16 risks are in the possible risk category which is classified as unlikely to occur and 4 risks are in the likely risk category. classified as possible. Based on the impact value (consequences) of 36 risk identifications, there is 1, risk in the insignificant category, 34 risks in the medium category, and 1 risk in the high category.

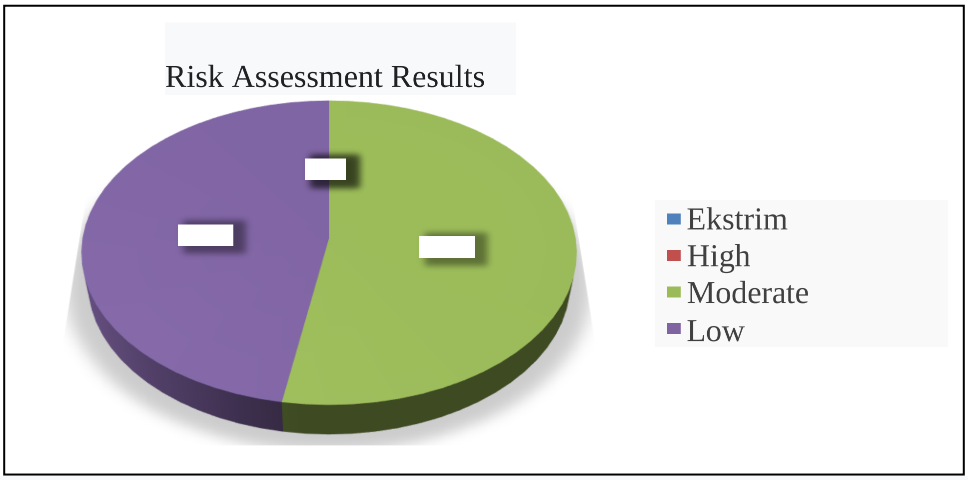

Figure 5. Occupational Safety, Health and the Environment of Risk Assessment Results

3.3 Occupational Safety, Health and the Environment of Risk Assessment and Control

Based on the results of the Occupational Safety, Health and the Environment of risk assessment, it can be determined that:

1. Variables in the L-Low (Low Risk) category are 17 variables with a percentage of 47%.
2. Variables in the M-Moderate (Medium Risk) category are 19 variables with a percentage of 53%.

In the preparatory work for the 2 stages of work, 6 hazard risks were identified, including 3 risks with a percentage of 50% moderate risk and 3 risks with a percentage of 50% low risk. In this work, the level of moderate risk in preparatory work, namely neglecting the use of PPE, has a risk level value of 5.6. This is followed by a risk level value of 5.2 at the land clearing stage, namely damage to the heavy equipment used in land clearing work, then followed by a risk level value of 5.1 at the equipment mobilization and demobilization stage, namely workers being hit/run over by heavy equipment. Furthermore, there are 3 hazards identified as having a low risk during preparatory work, namely the occurrence of disturbances during work such as conditions that make it impossible to work and environmental factors at the land clearing stage have a risk level value of 4.3. This was followed by a risk level value of 3.5 at the equipment mobilization and demobilization stage, namely the excavator overturned, then followed by a risk level value of 3.2 at the land clearing stage, namely workers were injured while operating bulldozer and motor grader heavy equipment.

In earth excavation work at a depth of 0-3 meters from 2 stages of work, 10 hazard risks were identified, including 7 risks with a percentage of 70% moderate risk and 3 risks with a percentage of 30% low risk. In this work, the risk level is moderate risk in earth excavation work at a depth of 0-3 meters, namely dust inhalation and dust debris entering the eyes, which has a risk level value of 7.2. This is followed by a risk level value of 5.4 at the excavation stage with a depth of 0-3 meters, namely workers/vehicles falling into the excavation. This is also followed by a risk level value of 5.3 at the excavation stage with a depth of 0-3 meters, namely being hit by a swinging excavator and neglecting the use of PPE. Then, at the soil excavation stage with a depth of 0-3 meters, where the excavator hits surrounding facilities, it has a risk level of 5.2. And at the earth excavation stage with a depth of 0-3 meters, namely landslides/side wall collapses and dump trucks falling, they have the same risk level value, namely 5.1. Furthermore, there are 3 hazards identified as having a low risk in earth excavation work at a depth of 0-3 meters, namely heavy equipment collisions and excavator overturning at the work site preparation stage, which have the same risk level value, namely 4.0. This is followed by a risk level value of 3.7 at the excavation stage with a depth of 0-3 meters, namely workers being hit by excavators.

In the earth filling work from 2 stages of work, 6 hazard risks were identified, including 2 risks with a percentage of 33% moderate risk and 4 risks with a percentage of 67% low risk. In this work, the risk level is moderate risk in earth embankment work, namely neglecting the use of PPE, which has a risk level value of 6.3. This is followed by a risk level value of 6.2 in the stages of spreading and compacting embankment material, namely inhalation of dust and dust debris entering into the eyes. Furthermore, there are 4 identified hazards that have a low risk in earth embankment work, namely the dump truck getting stuck at the stage of spreading and compacting the embankment material has a risk level value of 4.7. This is followed by a risk level value of 4.3 at the stage of spreading and compacting embankment material, namely being exposed to heavy equipment swing maneuvers, then followed by a risk level value of 4.0 at the stage of spreading and compacting embankment material, namely being buried by material. Then at the workplace preparation stage, heavy equipment collisions have a risk level value of 3.5.

In Geotextile/Geogrid work from 1 stage of work, 4 hazard risks were identified, including 2 risks with a percentage of 50% moderate risk and 2 risks with a percentage of 50% low risk. In this work, the level of moderate risk in geotextile/geogrid work, namely dust inhalation and dust debris entering the eyes, has a risk level value of 6.2. This is followed by a risk level value of 5.6 at the stage of deploying and connecting geotextiles/geogrids, namely neglecting the use of Personal Protective Equipment. Furthermore, there are 2 identified hazards that have a low risk in geotextile/geogrid work, namely the risk that workers could be injured because of the material sewing tool, namely the sewing machine, at the stage of deploying and joining the geotextile/geogrid, which has a risk level value of 4.1. This is followed by a risk level value of 3.4 at the stage of deploying and connecting geotextiles/geogrids, namely the reflection of sunlight poses a risk to workers' health.

In granular pavement work (sub base course and base course) from 2 stages of work, 5 hazard risks were identified, including 2 risks with a percentage of 40% moderate risk and 3 risks with a percentage of 60% low risk. In this work, the risk level is moderate risk in granular pavement work (sub base course and base course), namely dust inhalation and dust debris entering the eyes, has a risk level value of 6.1. This is followed by a risk level value of 5.6 at the stage of spreading and compacting the sub base course and base course, namely neglecting the use of Personal Protective Equipment. Furthermore, there are 3 identified hazards that have a low risk in granular pavement work (sub base course and base course), namely being exposed to heavy equipment swing maneuvers at the spreading and compacting stages of the sub base course and the base course has a risk level value of 4.3 . This is followed by a risk level value of 4.0 at the spreading and compacting stages of the sub base course and base course, namely project traffic users hitting material that has not been leveled. This is then followed by the workplace preparation stage, namely heavy equipment collisions have a risk level value of 3.9.

In the asphalting work from 2 stages of work, 5 hazard risks were identified, including 3 risks with a percentage of 60% moderate risk and 2 risks with a percentage of 40% low risk. In this work, the moderate risk level for asphalting work, namely inhalation of asphalt vapor, has a risk level value of 5.9. This is followed by a risk level value of 5.8 at the stage of spreading and compacting hot mix asphalt, namely being exposed to hot asphalt, then followed by a level value of 5.2 at the stage of spreading and compacting hot mix asphalt, namely neglecting the use of PPE. Furthermore, there are 2 identified hazards that have a low risk in asphalting work, namely an accident between heavy equipment that is operating and project traffic users at the spreading and compacting stage of hot mix asphalt, which has a risk level of 4.5. This is followed by a risk level value of 3.9 at the workplace preparation stage, namely heavy equipment collisions.

Risk control is an effort to minimize and prevent occupational safety, health and environmental risks. Based on the results of interviews with sources who said that the case study implementation in the field already had control treatment by occupational safety, health and environmental officers so that the risk level value was classified as medium risk. The controls that must be carried out at the medium risk level in the Reconstruction of Runway in Airport, are by using hierarchical control stages, which are used in this research are engineering control, administrative control. and personal perspective equipment (PPE), which includes:

1. Inhalation of dust and dust fragments entering the eyes.

The risks that can occur from this potential danger are that workers can experience health problems during the breathing process and cause workers to experience eye irritation. The technical implementation to minimize and prevent the occurrence of these potential dangers is:

a. Create appropriate and correct work procedures, according to the work being carried out.

b. All workers are required to wear personal protective equipment according to standards, such as masks and glasses.

c. In order to minimize the presence of dust, occupational safety, health and environmental project parties are encouraged to carry out regular watering using water tanks in the area around the work.

Provide training to workers regarding safe work methods, existing hazards and project regulations.

2. Negligent use of Personal Protective Equipment

The risk that can occur from this potential danger is that workers can experience interference or be injured while doing work. The technical implementation to minimize and prevent the occurrence of these potential dangers is:

a. All workers are required to wear personal protective equipment in accordance with standards and the risk of danger arising from carrying out the work.

b. Routinely conduct safety mornings and toolbox meetings before work begins.

c. Supervise workers in the work area.

3. Inhalation of asphalt vapor

The risk that can occur from these potential dangers is that workers can experience health problems. The technical implementation to minimize and prevent the occurrence of these potential dangers is:

a. All workers are required to wear personal protective equipment according to standards, such as wearing masks during the asphalting process.

b. Provide training to workers regarding safe work methods, existing hazards and project regulations.

c. Supervise workers in the work area.

IV. CONCLUSION

Based on the research results, it can be concluded: 1) The results of the identification of occupational safety, health and environmental risks carried out on the Reconstruction of Runway in Airport, resulted in 36 hazards identified originating from the work environment, worker attitudes, and work tools/machines. 2) Occupational safety, health and environmental risk assessment carried out on the Reconstruction of Runway in Airport, there are 2 types of risk levels from the 36 identified hazards, starting from what dominates, namely the moderate risk with 19 potential danger findings with a percentage of 53% and 17 potential danger findings with a low risk with a percentage of 47%. 3) Of the 36 potential hazards in the Reconstruction Of Runway in Airport. Risk control that must be carried out to prevent and minimize the occurrence of potential dangers in these risks is by: a) Creating appropriate and correct work procedures, in accordance with the work being carried out. b) Providing training to workers regarding safe work methods, existing hazards and regulations on the project. c) All workers are required to wear personal protective equipment in accordance with standards, and the risk of danger arising from carrying out the work. d) Supervise workers in the work area.

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