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Occupational Health & Safety Cost Analysis in Civil Construction Projects

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ABSTRACT

Introduction: Occupational Health and Safety (OHS) costs are crucial for implementing safety management systems in the construction sector, particularly in Indonesia. Previous studies emphasize the potential benefits of effective OHS cost planning in reducing workplace accidents and associated costs.

Objective: This study aims to analyze the allocation of OHS costs and its correlation with workplace accidents across various construction projects in Indonesia.

Method: A descriptive analysis approach was employed to examine OHS cost allocation and incident rates in ten construction projects conducted by a state-owned company across multiple regions in Indonesia.

Result: The study found significant variation in OHS cost allocation, ranging from 0.20% to 1.23% of project value across different projects. Larger projects tended to allocate a lower percentage of their budget to OHS compared to smaller ones.

Conclusion: Effective planning of OHS costs is essential not only in terms of percentage allocation but also considering project size, duration, workforce size, and technological aspects. The study underscores the importance of comprehensive cost-benefit analyses to further understand the impact of OHS provision on accident prevention in construction projects.

Keywords: Occupational Health and Safety (OHS); Construction Sector; Cost Allocation

INTRODUCTION

OHS costs are a crucial part of resource support for implementing an OHS management system based on ISO 45001:2018 and the Construction Safety Management System (CSMS) in Indonesia, specifically under the Ministry of Public Works and Housing Regulation No. 10 of 2021. Previous studies have shown that proper OHS cost planning positively impacts OHS implementation in companies and improves OHS performance, reducing workplace accidents and the additional costs they incur [1].

OHS cost planning is still considered an 'additional cost' whose benefits in creating a safe working environment are not yet fully recognized [2]. Many companies can calculate the financial losses caused by workplace accidents but have not yet figured out the OHS costs required to implement a sound OHS Management System [3]. Meanwhile, the number of workplace accidents in the construction sector in Indonesia has been increasing over time, with the leading causes of accidents from 2005-2015 being 1) electric shocks, 2) falling objects, and 3) falls from heights. The most significant losses due to workplace accidents are the additional costs incurred [4]. Previous research has indicated that workplace accidents are more prevalent in the construction sector compared to other industries, but the analysis of both indirect and direct costs is not well documented [5].

In civil construction projects, the higher the project value or cost, the higher the risk of fatal accidents. This is due to the increasing number of workers involved and the variety of tasks [6]. Therefore, OHS control must be based on the risks present on the field. However, construction work naturally varies from one project to another [7]. Furthermore, government regulations do not detail the accident risks that may arise from a construction contract [8].

Work risks and workplace accidents will influence OHS cost planning, especially as the number of workers increases. The OHS costs needed to carry out construction activities safely, based on the job risks, can reach 1.9% of the contract value or Rp 13,200 per person-hour or Rp 266,000 per square meter of project area. These figures can vary depending on the type of work, but there are generally fixed costs within the OHS budget common to nearly all projects, such as OHS training, consultation, and communication costs [9]. Thorough OHS cost planning is essential as it affects the implementation of the OHS Management System in the project. Additionally, in some construction contracts, OHS costs are not specifically mentioned, requiring contractors to allocate their OHS budget, which typically depends on the internal OHS culture of the contractor's company. This situation has significant potential for workplace accidents or occupational diseases during the construction project [2].

A study on the effectiveness of OHS cost plans on OHS performance in building construction projects in South Korea [8] showed that at 50% construction progress, workplace accidents were more frequent when the OHS budget was lower. The South Korean government has set the ideal percentage for OHS budget planning at 1.86% of the project contract value. However, for projects with a contract value exceeding 500 million won or Rp 5.8 billion, a higher OHS budget is required, with an average implementation rate of 2.98%. In Indonesia, the ideal OHS budget planning for implementing an OHS Management System ranges between 1.37% and 3.84% of the project contract value [11]. This OHS budget planning includes costs for OHS personnel, personal protective equipment, safety equipment, OHS activities, OHS reporting, OHS training, and OHS communication. However, these figures do not include costs related to safety devices or equipment directly associated with work methods, so the OHS budget may vary across construction projects depending on the work methods and technologies used [8, 11].

Good OHS cost planning will provide indirect measurable (tangible) benefits, such as reducing the costs of workplace accidents, both direct and indirect. It also offers other qualitative (intangible) benefits, such as reduced workforce fluctuations and improved job performance and quality [12].

METHOD

This research uses descriptive analysis to understand the allocation of OHS costs and the occurrence of workplace accidents in construction projects. The study is conducted on building construction projects of a state-owned construction company (PT XYZ). The project locations are spread across Sumatra, Java, Kalimantan, Sulawesi, Bali, West Nusa Tenggara, and East Nusa Tenggara. The inclusion criteria for this study are: construction projects owned by the Government or state-owned enterprises (funded by loans or non-loans), project progress between 35-100% from 2019 to 2023, single-year projects with a maximum duration of 12 months. The exclusion criteria for this study are: projects from oil & gas companies, projects with less than 35% progress, projects outside Indonesia, projects temporarily halted by the owner, and projects with a duration of more than 12 months.

The restriction on project duration to a maximum of 12 months is due to concerns about significant differences in OHS costs caused by longer project durations and larger workforce sizes. Based on these inclusion and exclusion criteria, the number of eligible samples is 10 projects, all of which are included in this study. Data management is performed using Microsoft Excel [13].

RESULTS

Overview of Research Analysis Unit

Based on the inclusion and exclusion criteria, a total sample of 10 projects was obtained, consisting of road & bridge construction, land preparation, high-rise buildings, and irrigation projects (Table 1). Half of the samples are road & bridge projects, while the least represented group is irrigation construction projects. These projects started in 2020, with the shortest project duration being 237 calendar days and the longest 760 calendar days (mean = 460; median = 420). The project contract values range from 88 billion Rupiah to 2.8 trillion Rupiah (mean = 796 billion Rupiah; median = 335 billion Rupiah), with most funding coming from the National Budget (APBN).

The projects are located in East Kalimantan, East Nusa Tenggara, East Java, Central Java, Banten, and South Sulawesi. Out of the 10 projects analyzed, 3 are privately owned, meaning the OHS cost components are not listed in the bill of quantities of the contract. For projects funded by the APBN (owned by government institutions), there is a specific OHS cost component in the bill of quantities. However, all projects have internally detailed OHS cost allocations for implementing the OHS Management System. The total OHS costs budgeted by these projects range from 0.20% to 1.23% of the contract value, or 300 million Rupiah to 7.3 billion Rupiah (mean = 2.9 billion Rupiah; median = 1.3 billion Rupiah).

From the analysis of these projects, it was found that as the contract value increases, the percentage of OHS costs decreases (Figure 1). The project with the largest contract value, Project 2 (2.8 trillion Rupiah), has the smallest OHS cost percentage (0.20% of the contract value). Conversely, Project 8, with the smallest contract value (88 billion Rupiah), has an OHS cost percentage twice that of Project 2. The project with the highest OHS cost percentage (1.23% of the contract value) is the only irrigation project, with a contract value of 105 billion Rupiah.

Table 1. Overview of Research Analysis Unit

NO	PROJECT	PROJECT LOCATION	TYPE OF CONSTRUCTION WORK	YEAR	PROJECT DURATION (days)	PROJECT CONTRACT VALUE	OHS COST	% OHS BUDGET	SOURCE OF PROJECT FUNDING
1	Project 1	East Nusa Tenggara	Road & Bridge	2023	420	Rp131.908.000.000	Rp1.121.736.036	0,85%	APBN
2	Project 2	East Kalimantan	Road & Bridge	2023	540	Rp2.850.597.497.000	Rp5.679.655.853	0,20%	APBN
3	Project 3	East Java	Road & Bridge	2022	547	Rp1.677.649.456.000	Rp7.387.713.090	0,44%	APBN
4	Project 4	Banten	Road & Bridge	2023	390	Rp995.594.831.501	Rp6.157.077.281	0,62%	APBN
5	Project 5	East Kalimantan	Road & Bridge	2023	390	Rp1.288.566.019.000	Rp3.497.045.288	0,27%	APBN
6	Project 6	Central Java	Land Preparation	2023	300	Rp514.303.569.690	Rp1.344.825.549	0,26%	APBN
7	Project 7	East Java	High Rise Building	2021	420	Rp156.000.000.000	Rp1.376.670.540	0,88%	Swasta
8	Project 8	East Kalimantan	Land Preparation	2020	237	Rp88.884.251.000	Rp375.425.102	0,42%	Swasta
9	Project 9	South Sulawesi	Irrigation	2021	600	Rp105.177.552.000	Rp1.298.717.051	1,23%	APBN
10	Project 10	East Kalimantan	High Rise Building	2021	760	Rp155.650.000.000	Rp811.920.226	0,52%	Swasta

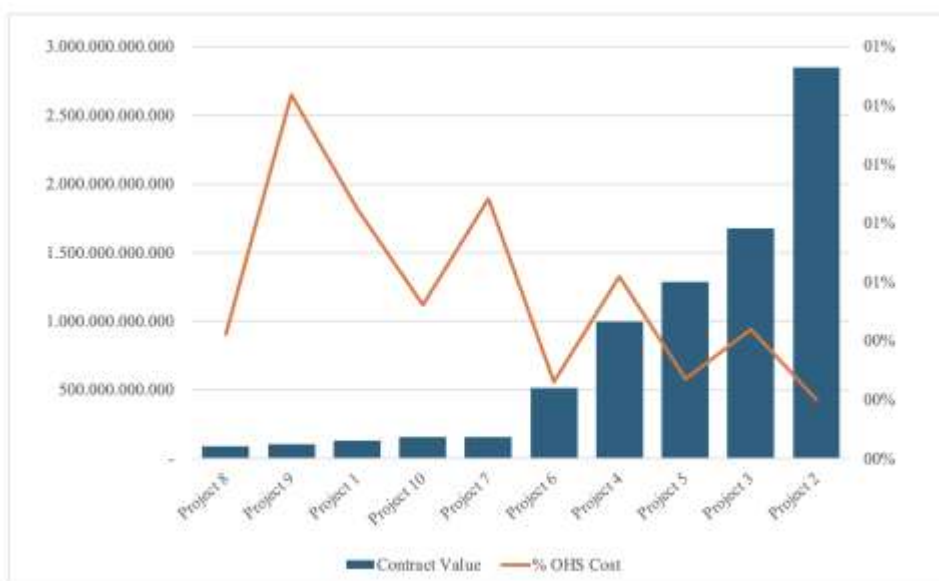


Figure 1. Overview of Total OHS Costs and Project Contract Value

Overview of OHS Cost Components

The OHS cost components for the 10 projects are detailed based on the Indonesian Ministry of Public Works and Housing Regulation No. 10 of 2021, which consists of 9 main components: Document Preparation, Socialization, Promotion and Training, Work Protective Equipment & Personal Protective Equipment, Insurance & Licensing, Personnel, Facilities, Infrastructure and Medical Equipment, Signage, Consultation with Experts, and Miscellaneous. The author added further details to some components, such as Personal Protective Equipment, Work Protective Equipment, Emergency Response, and Workplace Environment Management (Table 2), bringing the total number of cost components to 12 items. This was done to reflect the diverse nature of the projects and the varying OHS cost needs.

Table 2. List of OHS Cost Components

NO	COMPONENTS & SUB-COMPONENTS	NO	COMPONENTS & SUB-COMPONENTS
1	SMOHS Document Preparation	7	OHS Permits & Licenses
a	OHS Plan and Report Documents	a	Endorsement Permit of P2K3
b	OHS Work Procedures & Instructions	b	Quarterly Report of P2K3
2	OHS Socialization, Promotion, and Training	c	Equipment Inspection / SILO
a	Safety Induction	d	Operator License / SIO
b	Safety Briefing	e	Fuel Storage Tank Permit
c	Safety Talk	f	OHS Permit Other Equipment
d	OHS Training	8	Health Facilities
e	HIV/AIDS Socialization & Awareness	a	First Aid Equipment
f	Safety Reward	b	First Aid Room
g	OHS Campaign	c	Health Screening / Medical Check Up
3	Work Protective Equipment	d	Psychotropic and HIV Screening
a	Safety Net	e	Protection from pests and insects
b	Life Line	f	Infectious disease health protection
c	Safety Deck	g	Alcohol Tester
d	Restricted Area	h	Fatigue Test
e	Guard Railing	i	Ambulance
f	Others	j	Gymnastics Activities
4	Personal Protective Equipment	9	OHS Signs
a	Safety Helmet	a	OHS Signs
b	Safety Goggles	b	Safety Traffic Cone
c	Safety Gloves	c	Warning Lights Stick
d	Safety Shoes	d	Rotary Lamp
e	Safety Vest	e	OHS Banners
f	Wearpack	f	OHS Posters
g	Ear Plug / Ear Muff	g	OHS Information Board
h	Safety Mask	h	OHS Flag
i	Face Shield	i	Color Tagging for Inspection
j	Full Body Harness	10	Emergency Response
k	Fall Arrester	a	Light Fire Extinguishers
l	Buoy Vest	b	Evacuation Route Instructions
m	Welding Apron	c	Emergency Simulation
n	Welding Helmet	d	Emergency Siren
o	Welding Mask	e	Emergency Lights
p	Welding Gloves	f	Fire Blanket / Fire Proof
5	Insurance	g	Work Accident Reporting and Investigation
a	Employment Insurance	11	Work Environment Management
6	Salary of OHS Personel	a	Occupational Environment Air Quality Measurement
a	Safety Officer / Manager	b	Vibration Testing of the Working Environment
b	Safety Inspector / Admin	c	Hyginene Inspection Industry
c	Paramedic	d	Hygiene Industry test equipment
		12	Others
		a	Audit Internal
		b	Worker Identity Card

OHS Cost Allocation

Each project has varying allocations for OHS costs across different components. The average OHS cost allocation for each component ranges from 0.24% to 21.83% of the total OHS costs. Table 3 illustrates the OHS cost allocation for each component. Nearly half of the total OHS costs are spent on insurance & social security and OHS personnel salaries. The smallest allocation is for SMOHS Document Preparation (0.24%). Provision of Personal Protective Equipment and Work Protective Equipment accounts for 20% of the total OHS costs, with average allocations of 7.69% and 12.00%, respectively. Health Facilities at the project site are allocated an average of 17.82%. Other components such as Workplace Environment Management, Emergency Response, Signage, OHS Permits & Licensing, and OHS Socialization, Promotion, and Training Programs are allocated relatively small portions (below 6%) with a total allocation of 34.22% of the total OHS costs.

Each project has different allocations for each component. Project 2 has the largest OHS cost among all projects (Rp 5,679,655,853) and the smallest OHS cost percentage among all projects (0.20%). The largest cost component in Project 2 is Insurance & Licensing, amounting to 45.24% (Rp 2,569,655,853), which is also the highest percentage for this component among all projects. Another significant component is OHS Personnel Salaries at 10.73% (Rp 1,170,000,000, 21.83%). Conversely, Project 8 has the smallest OHS cost (Rp 375,425,102) but a larger OHS cost percentage ratio compared to Project 2 (0.42%). Project 8 does not allocate costs for SMOHS Document Preparation, Workplace Environment Management, and OHS Permits & Licensing. The largest component for Project 8 is OHS Personnel Salaries at Rp 118,500,000 (31.56%), followed by Health Facilities at Rp 58,450,000 (15.57%). Project 9 has the highest OHS cost percentage (relative to contract value) among all projects (1.23%), totaling Rp 1,298,717,051. The Insurance & Licensing component in Project 9 is the smallest among all projects (7.42%), amounting to Rp 96,304,551. The largest components allocated are OHS Personnel Salaries at 37.73% (Rp 490,000,000), Health Facilities at 22.92% (Rp 297,700,000), and Personal Protective Equipment at 17.57% (Rp 228,215,000).

Table 3. OHS Cost Allocation on Each Component

NO	PROJECT	OHS COST	COMPONENT 1	COMPONENT 2	COMPONENT 3	COMPONENT 4	COMPONENT 5	COMPONENT 6	COMPONENT 7	COMPONENT 8	COMPONENT 9	COMPONENT 10	COMPONENT 11	COMPONENT 12
1	Project 1	Rp1.121.736.036	Rp2.000.000	Rp77.000.000	Rp113.400.000	Rp119.700.000	Rp120.386.036	Rp246.400.000	Rp56.000.000	Rp154.150.000	Rp49.450.000	Rp24.500.000	Rp35.000.000	Rp143.750.000
			0,18%	6,86%	10,11%	10,67%	10,73%	21,97%	3,21%	13,74%	4,41%	2,18%	3,12%	12,81%
2	Project 2	Rp5.679.655.853	Rp30.000.000	Rp112.000.000	Rp355.000.000	Rp265.000.000	Rp2.569.655.853	Rp1.170.000.000	Rp75.000.000	Rp620.000.000	Rp253.000.000	Rp80.000.000	Rp150.000.000	Rp0
			0,53%	1,97%	6,25%	4,67%	45,24%	20,60%	1,32%	10,92%	4,45%	1,41%	2,64%	0,00%
3	Project 3	Rp7.387.713.090	Rp25.000.000	Rp533.814.000	Rp1.955.830.183	Rp399.475.000	Rp1.512.945.907	Rp1.035.000.000	Rp207.000.000	Rp782.850.000	Rp719.073.000	Rp146.000.000	Rp39.200.000	Rp31.525.000
			0,34%	7,23%	26,47%	5,41%	20,48%	14,01%	2,80%	10,60%	9,73%	1,98%	0,53%	0,43%
4	Project 4	Rp6.157.077.281	Rp20.000.000	Rp295.000.000	Rp1.330.200.000	Rp1.407.195.000	Rp898.482.281	Rp442.000.000	Rp116.000.000	Rp808.150.000	Rp569.050.000	Rp161.000.000	Rp45.000.000	Rp65.000.000
			0,32%	4,79%	21,60%	22,85%	14,59%	7,18%	1,88%	13,13%	9,24%	2,61%	0,73%	1,06%
5	Project 5	Rp3.497.045.288	Rp6.000.000	Rp310.500.000	Rp143.000.000	Rp601.625.000	Rp1.162.420.288	Rp273.000.000	Rp6.000.000	Rp633.000.000	Rp256.300.000	Rp22.200.000	Rp61.500.000	Rp21.500.000
			0,17%	8,88%	4,09%	17,20%	33,24%	7,81%	0,17%	18,10%	7,33%	0,63%	1,76%	0,61%
6	Project 6	Rp1.344.825.549	Rp9.168.000	Rp45.600.000	Rp29.500.000	Rp118.000.000	Rp464.886.549	Rp215.000.000	Rp0	Rp196.800.000	Rp94.083.000	Rp142.538.000	Rp26.500.000	Rp750.000
			0,68%	3,39%	2,19%	8,77%	34,57%	15,99%	0,00%	14,78%	7,00%	10,60%	1,97%	0,06%
7	Project 7	Rp1.376.670.540	Rp375.000	Rp68.200.000	Rp32.000.000	Rp103.875.000	Rp142.090.540	Rp202.000.000	Rp3.000.000	Rp733.530.000	Rp64.100.000	Rp18.500.000	Rp7.500.000	Rp1.500.000
			0,03%	4,95%	2,32%	7,55%	10,32%	14,67%	0,22%	53,28%	4,66%	1,34%	0,54%	0,11%
8	Project 8	Rp375.425.102	Rp0	Rp25.500.000	Rp12.180.000	Rp55.510.000	Rp81.625.902	Rp118.500.000	Rp0	Rp58.450.000	Rp18.259.200	Rp5.400.000	Rp0	Rp0
			0,00%	6,79%	3,24%	14,79%	21,74%	31,56%	0,00%	15,57%	4,86%	1,44%	0,00%	0,00%
9	Project 9	Rp1.294.717.051	Rp2.000.000	Rp71.962.500	Rp5.285.000	Rp228.215.000	Rp96.304.551	Rp490.000.000	Rp9.500.000	Rp297.700.000	Rp59.950.000	Rp19.800.000	Rp14.000.000	Rp4.000.000
			0,15%	5,54%	0,41%	17,57%	7,42%	37,73%	0,73%	22,92%	4,62%	1,52%	1,08%	0,31%
10	Project 10	Rp811.920.226	Rp0	Rp51.200.000	Rp2.000.000	Rp85.295.000	Rp141.775.226	Rp380.000.000	Rp0	Rp42.300.000	Rp14.400.000	Rp14.000.000	Rp7.750.000	Rp73.200.000
			0,00%	6,31%	0,25%	10,51%	17,66%	46,80%	0,00%	5,21%	1,77%	1,72%	0,95%	9,02%
AVERAGE			Rp9.454.300	Rp159.877.650	Rp397.839.518	Rp338.389.000	Rp719.057.313	Rp457.190.000	Rp45.250.000	Rp432.893.000	Rp209.766.520	Rp63.393.800	Rp38.645.000	Rp34.122.500
			0,24%	5,67%	7,69%	12,00%	21,58%	21,83%	1,03%	17,82%	5,81%	2,54%	1,33%	2,44%

Component 1: Preparation of SMOHS Documents

This component includes costs for OHS Plan and Report Documents, as well as the creation of OHS Procedure & Work Instruction Documents. Across all projects, budgets for this component vary from 0.07% to 0.61% of the total OHS costs. On average, the budget allocation for component 1-a is 0.15% of the total OHS costs, while for component 1-b it is 0.08%. The average budget allocated is Rp 5,425,000 (component 1-a) and Rp 4,029,300 (component 1-b).

Two projects did not allocate any budget to this component: Project 8 (Land Preparation) and Project 10 (High-rise Building), both funded privately. Project 6 (Land Preparation Project) allocated the highest budget for component 1-a, amounting to Rp 8,250,000 (0.61%), while Project 2 (Road & Bridge Project) allocated the highest budget for component 1-b, totaling Rp 15,000,000.

Table 4. OHS Cost Allocation in Component 1

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 1-a	COMPONENT 1-b
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp1.000.000 0,09%	Rp1.000.000 0,09%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp15.000.000 0,26%	Rp15.000.000 0,26%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp10.000.000 0,14%	Rp15.000.000 0,20%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp15.000.000 0,24%	Rp5.000.000 0,08%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp4.000.000 0,11%	Rp2.000.000 0,06%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp8.250.000 0,61%	Rp918.000 0,07%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp0 0,00%	Rp375.000 0,03%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp0 0,00%	Rp0 0,00%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp1.000.000 0,08%	Rp1.000.000 0,08%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp0 0,00%	Rp0 0,00%
AVERAGE					Rp5.425.000 0,154%	Rp4.029.300 0,087%

Component 2: OHS Socialization, Promotion, and Training

This component consists of 7 sub-components, with an average OHS cost allocation of 5.67% of the total OHS costs. The sub-components of OHS Briefings, OHS Meetings, and OHS Training hold the largest percentage value (4.39% of the total OHS costs). No project allocated any budget for the OHS Campaign sub-component (0.0%). The budget allocation for Component 2 is uneven, as only the OHS Meeting sub-component (Safety Talk/Toolbox Meeting) was budgeted by all projects, with a percentage range from 0.24% to 6.41%, provided by Project 4 (Rp 15,000,000) and Project 5 (Rp 224,250,000), respectively.

The OHS Training sub-component is one of the items not budgeted by all projects, with only a few projects allocating funds for this program. Project 3 and Project 4 allocated the highest costs for the OHS Training sub-component, with Rp 435,990,000 (5.90%) and Rp 186,000,000 (3.02%), respectively.

Table 5. OHS Cost Allocation in Component 2

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 2-a	COMPONENT 2-b	COMPONENT 2-c	COMPONENT 2-d	COMPONENT 2-e	COMPONENT 2-f	COMPONENT 2-g
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp7.500.000	Rp6.750.000	Rp6.750.000	Rp26.000.000	Rp30.000.000	Rp0	Rp0
					0,67%	0,60%	0,60%	2,32%	2,67%	0,00%	0,00%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp28.000.000	Rp28.000.000	Rp28.000.000	Rp0	Rp28.000.000	Rp0	Rp0
					0,49%	0,49%	0,49%	0,00%	0,49%	0,00%	0,00%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp25.224.000	Rp5.400.000	Rp40.500.000	Rp435.990.000	Rp1.500.000	Rp25.200.000	Rp0
					0,34%	0,07%	0,55%	5,90%	0,02%	0,34%	0,00%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp15.000.000	Rp15.000.000	Rp15.000.000	Rp186.000.000	Rp40.000.000	Rp24.000.000	Rp0
					0,24%	0,24%	0,24%	3,02%	0,65%	0,39%	0,00%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp28.750.000	Rp28.750.000	Rp24.250.000	Rp0	Rp28.750.000	Rp0	Rp0
					0,82%	0,82%	6,41%	0,00%	0,82%	0,00%	0,00%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp4.500.000	Rp4.500.000	Rp16.600.000	Rp10.000.000	Rp10.000.000	Rp0	Rp0
					0,33%	0,33%	1,23%	0,74%	0,74%	0,00%	0,00%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp1.500.000	Rp0	Rp42.000.000	Rp13.500.000	Rp0	Rp11.200.000	Rp0
					0,11%	0,00%	3,05%	0,98%	0,00%	0,81%	0,00%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp0	Rp0	Rp18.000.000	Rp3.000.000	Rp0	Rp4.500.000	Rp0
					0,00%	0,00%	4,79%	0,80%	0,00%	1,20%	0,00%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp1.562.500	Rp0	Rp34.000.000	Rp16.000.000	Rp0	Rp20.400.000	Rp0
					0,12%	0,00%	2,62%	1,23%	0,00%	1,57%	0,00%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp0	Rp19.200.000	Rp32.000.000	Rp0	Rp0	Rp0	Rp0
					0,00%	2,36%	3,94%	0,00%	0,00%	0,00%	0,00%
AVERAGE					Rp11.293.650	Rp10.760.000	Rp45.710.000	Rp69.049.000	Rp13.825.000	Rp8.530.000	Rp0
					0,313%	0,493%	2,394%	1,500%	0,540%	0,431%	0,000%

Component 3: Work Safety Equipment

Based on regulations, the detailed costs for Component 3 consist of safety nets, life lines, safety decks, restricted areas, guard railings, and other equipment tailored to the job risks. Given the variety of project types, not all projects use the same work safety equipment. For instance, the Guard Railing sub-component is not provided in road and bridge projects (Projects 1, 2, 3, 4, and 5) and land preparation projects (Projects 6 and 8). Interestingly, road and bridge projects do provide safety deck equipment, with costs ranging from Rp 7,000,000 to Rp 926,200,000. The life line sub-component is almost universally provided by all projects (except Project 3), with costs ranging from Rp 300,000 to Rp 100,000,000. However, Project 3 allocates the largest budget for the miscellaneous sub-component, amounting to Rp 788,885,000 (10.68% of the total OHS costs). The miscellaneous sub-component is provided by each project according to job risks and specific safety equipment needs (Table 6).

Component 4: Personal Protective Equipment (PPE)

This component has the largest number of sub-components, with 16 items. Similar to work safety equipment, not all projects allocate their budgets equally across each sub-component of PPE (Table 7). There are three sub-components provided by all projects: safety helmets, safety gloves, safety shoes, and safety vests. These items represent the largest allocation in Component 4, with an average total budget of up to 9.53% of the total OHS costs. Other items such as face shields, full-body harnesses, fall arresters, life jackets, and welding protective equipment are provided by only a few projects, with relatively small values (an average of Rp 928,201 for each item).

Component 5: Insurance & Social Security

In contrast to personal protective equipment, Component 5 has the fewest sub-components, consisting of only one item: construction service insurance covering death and work accident guarantees. This insurance is provided by the Social Security Administering Body (BPJS) through one of its products for construction activities, BPJS Jakon. This item is a mandatory requirement for all contractors entering into contracts with the owner to carry out construction work, with the insurance amount calculated based on the project's contract value, at 0.09% of the project's contract value (Table 8). The larger the project contract value, the higher the BPJS Jakon insurance cost. Project 2 has the largest Component 5 budget (Rp 2,569,655,853), representing 45.24% of the total OHS costs; while the smallest total cost for Component 5 is Project 8, at Rp 81,625,902 (21.74%).

Table 6. OHS Cost Allocation in Component 3

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 3-a	COMPONENT 3-b	COMPONENT 3-c	COMPONENT 3-d	COMPONENT 3-e	COMPONENT 3-f
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp67.200.000 5,99%	Rp53.600.000 3,00%	Rp7.000.000 0,62%	Rp5.600.000 0,50%	Rp0 0,00%	Rp0 0,00%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp60.000.000 1,06%	Rp55.000.000 0,97%	Rp180.000.000 3,17%	Rp60.000.000 1,06%	Rp0 0,00%	Rp0 0,00%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp141.745.183 1,92%	Rp0 0,00%	Rp926.200.000 12,54%	Rp99.000.000 1,34%	Rp0 0,00%	Rp788.885.000 10,68%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp120.000.000 1,95%	Rp100.000.000 1,62%	Rp0 0,00%	Rp732.200.000 11,89%	Rp0 0,00%	Rp378.000.000 6,14%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp65.000.000 1,86%	Rp50.000.000 1,43%	Rp18.000.000 0,51%	Rp10.000.000 0,29%	Rp0 0,00%	Rp0 0,00%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp0 0,00%	Rp19.750.000 1,47%	Rp0 0,00%	Rp9.750.000 0,73%	Rp0 0,00%	Rp0 0,00%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp25.000.000 1,82%	Rp4.000.000 0,29%	Rp0 0,00%	Rp0 0,00%	Rp3.000.000 0,22%	Rp0 0,00%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp0 0,00%	Rp11.520.000 3,07%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp660.000 0,18%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp0 0,00%	Rp300.000 0,02%	Rp0 0,00%	Rp3.500.000 0,27%	Rp1.485.000 0,11%	Rp0 0,00%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp0 0,00%	Rp2.000.000 0,25%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%
AVERAGE					Rp47.894.518 1,459%	Rp27.617.000 1,211%	Rp113.120.000 1,684%	Rp92.005.000 1,607%	Rp448.500 0,033%	Rp116.754.500 1,699%

Table 7. OHS Cost Allocation in Component 4

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 4-a	COMPONENT 4-b	COMPONENT 4-c	COMPONENT 4-d	COMPONENT 4-e	COMPONENT 4-f	COMPONENT 4-g	COMPONENT 4-h	COMPONENT 4-i	COMPONENT 4-j	COMPONENT 4-k	COMPONENT 4-l	COMPONENT 4-m	COMPONENT 4-n	COMPONENT 4-o	COMPONENT 4-p	
1	Projek 1	0,85%	Rp131.988.888.888	Rp1.121.738.034	Rp22.509.000	Rp7.509.000	Rp2.250.000	Rp37.500.000	Rp15.000.000	Rp0	Rp0	Rp0	Rp0	Rp459.000	Rp59.009.000	Rp4.500.000	Rp0	Rp0	Rp0	Rp0	
					2,81%	0,67%	0,28%	3,34%	1,34%	0,00%	0,00%	0,00%	0,00%	0,04%	2,67%	0,40%	0,00%	0,00%	0,00%	0,00%	
2	Projek 2	0,20%	Rp2.830.397.497.800	Rp5.679.655.831	Rp59.009.000	Rp55.000.000	Rp25.000.000	Rp75.000.000	Rp50.000.000	Rp0	Rp0	Rp39.000.000	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	
					0,88%	0,82%	0,44%	1,22%	0,88%	0,00%	0,00%	0,53%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	
3	Projek 3	0,48%	Rp1.677.849.456.800	Rp7.567.713.099	Rp97.458.000	Rp0	Rp18.750.000	Rp18.300.000	Rp81.825.000	Rp0	Rp0	Rp0	Rp0	Rp43.098.000	Rp0	Rp0	Rp3.750.000	Rp4.280.000	Rp0	Rp0	
					1,32%	0,00%	0,23%	2,01%	1,11%	0,00%	0,00%	0,00%	0,00%	0,61%	0,00%	0,00%	0,05%	0,06%	0,00%	0,00%	
4	Projek 4	0,62%	Rp995.884.831.581	Rp5.157.077.281	Rp308.000.000	Rp509.000	Rp1.545.000	Rp805.000.000	Rp237.500.000	Rp0	Rp0	Rp2.500.000	Rp0	Rp68.000.000	Rp0	Rp0	Rp0	Rp150.000	Rp0	Rp0	
					4,81%	0,01%	0,03%	13,07%	3,86%	0,00%	0,00%	0,04%	0,00%	0,91%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	
5	Projek 5	0,27%	Rp1.288.366.819.800	Rp3.497.048.281	Rp74.758.000	Rp28.750.000	Rp135.200.000	Rp287.500.000	Rp41.325.000	Rp0	Rp0	Rp28.750.000	Rp0	Rp0	Rp0	Rp0	Rp1.250.000	Rp880.000	Rp1.500.000	Rp0	
					2,34%	0,82%	3,87%	8,22%	1,22%	0,00%	0,00%	0,82%	0,00%	0,00%	0,00%	0,00%	0,04%	0,02%	0,04%	0,00%	
6	Projek 6	0,26%	Rp514.383.588.888	Rp1.344.829.548	Rp14.000.000	Rp26.500.000	Rp1.400.000	Rp45.000.000	Rp22.500.000	Rp0	Rp0	Rp0	Rp0.000.000	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	
					1,89%	1,97%	0,18%	3,35%	1,07%	0,00%	0,00%	0,00%	0,58%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	
7	Projek 7	0,88%	Rp156.088.088.088	Rp1.378.678.548	Rp3.758.000	Rp2.750.000	Rp250.000	Rp38.675.000	Rp7.100.000	Rp43.980.000	Rp590.000	Rp0	Rp250.000	Rp0	Rp4.100.000	Rp0	Rp500.000	Rp0	Rp375.000	Rp225.000	
					0,27%	0,28%	0,02%	2,81%	0,54%	3,12%	0,04%	0,00%	0,02%	0,00%	0,44%	0,00%	0,44%	0,00%	0,03%	0,02%	
8	Projek 8	0,42%	Rp88.884.281.800	Rp375.425.102	Rp6.738.000	Rp1.450.000	Rp925.000	Rp17.500.000	Rp1.050.000	Rp26.888.888	Rp725.000	Rp6.400.000	Rp300.000	Rp0	Rp0	Rp0	Rp0	Rp380.000	Rp0	Rp110.000	
					1,79%	0,39%	0,23%	4,69%	0,28%	5,33%	0,19%	1,70%	0,08%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	
9	Projek 9	1,23%	Rp101.177.552.088	Rp1.298.717.051	Rp25.509.000	Rp6.000.000	Rp24.000.000	Rp124.500.000	Rp19.800.000	Rp0	Rp458.000	Rp65.000	Rp1.000.000	Rp2.500.000	Rp0	Rp3.000.000	Rp0	Rp0	Rp0	Rp0	
					1,86%	0,44%	1,85%	8,59%	2,00%	0,00%	0,07%	0,04%	0,08%	0,19%	0,00%	0,23%	0,00%	0,00%	0,00%	0,00%	
10	Projek 10	0,52%	Rp155.658.888.888	Rp811.820.226	Rp14.379.000	Rp0	Rp4.300.000	Rp45.400.000	Rp14.400.000	Rp0	Rp0	Rp0	Rp0	Rp4.125.000	Rp0	Rp1.300.000	Rp0	Rp0	Rp880.000	Rp400.000	
					1,77%	0,00%	0,55%	3,59%	1,77%	0,00%	0,00%	0,00%	0,00%	0,11%	0,00%	0,18%	0,00%	0,00%	0,10%	0,05%	
					Rp69.945.888	Rp18.848.888	Rp11.382.888	Rp163.487.888	Rp51.390.888	Rp6.386.888	Rp287.588	Rp4.811.588	Rp955.888	Rp17.287.588	Rp3.618.888	Rp888.888	Rp558.888	Rp545.888	Rp527.588	Rp155.588	
					1,810%	0,513%	0,756%	5,296%	1,589%	0,845%	0,819%	0,213%	0,877%	0,232%	0,312%	0,879%	0,812%	0,816%	0,821%	0,818%	

Table 8. OHS Cost Allocation in Component 5

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 5-a
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp120.386.036 0,09%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp2.569.655.853 45,24%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp1.512.945.907 20,48%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp898.482.281 14,59%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp1.162.420.288 33,24%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp464.886.549 34,57%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp142.090.540 10,32%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp81.625.902 21,74%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp96.304.551 7,42%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp141.775.226 17,46%
AVERAGE					Rp719.057.313 20,516%

Component 6: OHS Personnel Salaries

Component 6 consists of three sub-components: Safety Officer Salary, Safety Inspector Salary, and Paramedic. Overall, Component 6 accounts for the largest percentage of OHS costs (Average 21.83%). All projects have allocated personnel for safety officers, safety inspectors, and paramedics. However, the distinguishing factor lies in the unit salary costs for each sub-component, influenced by working hours and the personnel's grade or level. Several projects allocate over 1 billion Indonesian Rupiah for this component, such as Project 2, which allocates the highest budget for OHS Personnel Salaries among all projects, amounting to Rp 1,170,000,000 (20.60% of total OHS costs), and Project 3, which allocates Rp 1,035,000,000 (14.01% of total OHS costs).

Table 9. OHS Cost Allocation in Component 6

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 6-a	COMPONENT 6-b	COMPONENT 6-c
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp104.000.000 9,27%	Rp65.000.000 5,79%	Rp77.400.000 6,90%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp540.000.000 9,51%	Rp270.000.000 4,75%	Rp160.000.000 6,34%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp225.000.000 3,05%	Rp225.000.000 3,05%	Rp585.000.000 7,92%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp234.000.000 3,80%	Rp65.000.000 1,06%	Rp143.000.000 2,32%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp97.500.000 2,79%	Rp117.000.000 3,35%	Rp58.500.000 1,67%
6	Project 6	0,26%	Rp514.103.569.690	Rp1.144.825.549	Rp85.000.000 6,32%	Rp80.000.000 5,95%	Rp50.000.000 3,72%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp91.000.000 6,61%	Rp55.000.000 4,00%	Rp56.000.000 4,07%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp55.300.000 14,73%	Rp39.500.000 10,52%	Rp23.700.000 6,31%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp180.000.000 13,86%	Rp160.000.000 12,32%	Rp150.000.000 11,55%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp177.333.333 21,84%	Rp126.666.667 15,60%	Rp76.000.000 9,36%
AVERAGE					Rp178.913.333 9,177%	Rp120.316.667 6,638%	Rp157.960.000 6,016%

Component 7: OHS Documents & Permits

Component 7 consists of 6 sub-components covering costs for administrative documents and permits such as P2K3 (Occupational Health and Safety Committee), operator licenses, and operational licenses for heavy equipment or lifting tools (Table 10). Additionally, budgets are allocated for permits related to fuel tank storage and OHS permits for various production equipment. Based on the available data, not all projects allocate funds for each sub-component. The most commonly allocated item is the P2K3 Approval Letter (only 4 projects did not allocate funds for this). Meanwhile, operator licenses, fuel tank storage permits, and other equipment OHS permits are allocated by only one project each, totaling Rp 65,000,000.

Component 8: Health Facilities

Health facilities include various sub-components such as first aid facilities, medical facilities, health checks, and health programs (Table 11). The most commonly prepared item across projects is the first aid kit (P3K), with budgets ranging from Rp 650,000 to Rp 90,000,000. However, several items are only prepared by one project each, including psychotropic and HIV checks (Rp 100,000,000 by Project 4), alcohol testers (Rp 7,500,000 by Project 3), and fatigue tests (Rp 7,500,000 by Project 3). Overall, Project 4 allocates the highest budget for Component 8, amounting to Rp 808,150,000 (13.13% of total OHS costs), while Project 10 allocates the smallest budget of Rp 42,300,000 (5.21% of total OHS costs).

Table 10. OHS Cost Allocation in Component 7

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 7-a	COMPONENT 7-b	COMPONENT 7-c	COMPONENT 7-d	COMPONENT 7-e	COMPONENT 7-f
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp1.000.000	Rp0	Rp0	Rp0	Rp10.000.000	Rp25.000.000
					0,09%	0,00%	0,00%	0,00%	0,89%	2,23%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp0	Rp0	Rp75.000.000	Rp0	Rp0	Rp0
					0,00%	0,00%	1,32%	0,00%	0,00%	0,00%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp2.000.000	Rp0	Rp180.000.000	Rp25.000.000	Rp0	Rp0
					0,03%	0,00%	2,44%	0,34%	0,00%	0,00%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp2.000.000	Rp10.000.000	Rp104.000.000	Rp0	Rp0	Rp0
					0,03%	0,16%	1,69%	0,00%	0,00%	0,00%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp1.500.000	Rp4.500.000	Rp0	Rp0	Rp0	Rp0
					0,04%	0,13%	0,00%	0,00%	0,00%	0,00%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0
					0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp3.000.000	Rp0	Rp0	Rp0	Rp0	Rp0
					0,22%	0,00%	0,00%	0,00%	0,00%	0,00%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0
					0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp1.500.000	Rp8.000.000	Rp0	Rp0	Rp0	Rp0
					0,12%	0,62%	0,00%	0,00%	0,00%	0,00%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0
					0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
					Rp1.100.000	Rp2.250.000	Rp35.900.000	Rp2.500.000	Rp1.000.000	Rp2.500.000
			AVERAGE		0,053%	0,091%	0,545%	0,034%	0,089%	0,223%

Table 11. OHS Cost Allocation in Component 8

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 8-a	COMPONENT 8-b	COMPONENT 8-c	COMPONENT 8-d	COMPONENT 8-e	COMPONENT 8-f	COMPONENT 8-g	COMPONENT 8-h	COMPONENT 8-i	COMPONENT 8-j
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp90.000.000	Rp8.150.000	Rp50.000.000	Rp0	Rp6.000.000	Rp0	Rp0	Rp0	Rp0	Rp0
					8,02%	0,73%	4,46%	0,00%	0,53%	0,00%	0,00%	0,00%	0,00%	0,00%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp50.000.000	Rp500.000.000	Rp0	Rp0	Rp20.000.000	Rp50.000.000	Rp0	Rp0	Rp0	Rp0
					0,88%	8,80%	0,00%	0,00%	0,35%	0,88%	0,00%	0,00%	0,00%	0,00%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp11.750.000	Rp40.000.000	Rp142.500.000	Rp0	Rp13.000.000	Rp128.600.000	Rp7.500.000	Rp7.500.000	Rp405.000.000	Rp27.000.000
					0,16%	0,54%	1,93%	0,00%	0,18%	1,74%	0,10%	0,10%	5,48%	0,37%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp30.000.000	Rp32.000.000	Rp300.000.000	Rp100.000.000	Rp12.500.000	Rp184.150.000	Rp0	Rp0	Rp65.000.000	Rp84.500.000
					0,49%	0,52%	4,87%	1,62%	0,20%	2,99%	0,00%	0,00%	1,06%	1,37%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp5.000.000	Rp0	Rp575.000.000	Rp0	Rp3.000.000	Rp50.000.000	Rp0	Rp0	Rp0	Rp0
					0,14%	0,00%	16,44%	0,00%	0,09%	1,43%	0,00%	0,00%	0,00%	0,00%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp24.000.000	Rp0	Rp0	Rp0	Rp5.000.000	Rp169.800.000	Rp0	Rp0	Rp0	Rp0
					1,78%	0,00%	0,00%	0,00%	0,37%	12,63%	0,00%	0,00%	0,00%	0,00%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp10.000.000	Rp7.500.000	Rp0	Rp0	Rp0	Rp716.030.000	Rp0	Rp0	Rp0	Rp0
					0,73%	0,54%	0,00%	0,00%	0,00%	52,01%	0,00%	0,00%	0,00%	0,00%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp650.000	Rp9.800.000	Rp43.200.000	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp4.800.000
					0,17%	2,61%	11,51%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	1,28%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp26.500.000	Rp26.050.000	Rp0	Rp0	Rp40.000.000	Rp77.150.000	Rp0	Rp0	Rp0	Rp128.000.000
					2,04%	2,01%	0,00%	0,00%	3,08%	5,94%	0,00%	0,00%	0,00%	9,86%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp0	Rp10.000.000	Rp16.500.000	Rp0	Rp0	Rp4.600.000	Rp0	Rp0	Rp0	Rp11.200.000
					0,00%	1,23%	2,03%	0,00%	0,00%	0,57%	0,00%	0,00%	0,00%	1,38%
	AVERAGE				Rp24.790.000	Rp63.350.000	Rp112.720.000	Rp10.000.000	Rp9.950.000	Rp138.033.000	Rp750.000	Rp750.000	Rp47.000.000	Rp25.550.000
					1,442%	1,698%	4,124%	0,162%	0,480%	7,819%	0,010%	0,010%	0,654%	1,425%

Component 9: OHS Signs

This component consists of 9 items, including signs, banners, posters, and other visual media to indicate hazards and warnings in work areas (Table 12). Overall, Project 3 allocated the largest amount, Rp 719,073,000 (9.73% of total OHS costs), followed by Project 4 (Rp 569,050,000 or 9.24% of total OHS costs). Among all items, only color tagging for inspections has the smallest budget allocation, covered by only two projects (Project 4 and Project 9). For other items, almost all projects have allocated funds.

Component 10: Emergency Response

Component 10 consists of seven items, including emergency equipment such as fire extinguishers, evacuation route signs, emergency simulations, emergency sirens, emergency lights, fire blankets, and accident reporting & investigation (Table 13). The total expenditure for emergency response equipment is 2.54% of the total OHS costs, with each sub-component ranging from 0.017% to 0.836% of total OHS costs. Project 6 allocated the highest percentage of costs for Component 10 among other projects (Rp 142,538,000; 10.60% of total OHS costs). The highest budget was allocated for evacuation route signs and emergency simulations. Meanwhile, in nominal terms, Project 4 had the largest emergency response budget (Rp 161,000,000), although it accounted for less than 3% of total OHS costs.

Component 11: Workplace Environment Management

Items under workplace environment management include air quality measurement, vibration assessment, industrial hygiene inspection, and hygiene equipment measurement (Table 14). The average budget allocation prepared is 1.33%. Almost all projects have allocated funds for each related sub-component of workplace environment management. However, one project did not allocate funds for implementing OHS programs and accident prevention, namely Project 8. Interestingly, for industrial hygiene inspection, only 2 projects allocated funds (Project 3, Rp 39,200,000 and Project 4, Rp 10,000,000).

Component 12: Others

This component consists of two items: internal audit programs and procurement of worker identity cards. The internal audit program refers to audits related to the OHS Management System conducted internally by the company (Table 14). Funding for these programs covers transportation and accommodation costs for auditors during the audit process. Among all projects, only 4 allocated funds for internal audits, with the largest allocation being Project 1 (Rp 140,000,000). Meanwhile, for the procurement of worker identity cards, only three projects did not allocate funds. The budgets vary, ranging from Rp 750,000 to the largest amount of Rp 73,200,000.

Table 12. OHS Cost Allocation in Component 9

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 9-a	COMPONENT 9-b	COMPONENT 9-c	COMPONENT 9-d	COMPONENT 9-e	COMPONENT 9-f	COMPONENT 9-g	COMPONENT 9-h	COMPONENT 9-i
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp22.000.000	Rp5.000.000	Rp1.200.000	Rp600.000	Rp10.000.000	Rp5.000.000	Rp7.500.000	Rp150.000	Rp0
					1,96%	0,27%	0,11%	0,05%	0,89%	0,45%	0,67%	0,01%	0,00%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp120.000.000	Rp50.000.000	Rp0	Rp10.000.000	Rp10.000.000	Rp10.000.000	Rp30.000.000	Rp3.000.000	Rp0
					2,11%	0,88%	0,00%	0,53%	0,18%	0,18%	0,53%	0,05%	0,00%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp372.123.000	Rp175.000.000	Rp12.150.000	Rp9.000.000	Rp75.600.000	Rp43.200.000	Rp14.000.000	Rp18.000.000	Rp0
					5,04%	2,37%	0,16%	0,12%	1,02%	0,58%	0,19%	0,24%	0,00%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp420.000.000	Rp60.000.000	Rp32.500.000	Rp12.000.000	Rp5.000.000	Rp10.000.000	Rp20.000.000	Rp8.800.000	Rp750.000
					6,82%	0,97%	0,53%	0,19%	0,08%	0,16%	0,32%	0,14%	0,01%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp180.000.000	Rp30.000.000	Rp4.500.000	Rp9.000.000	Rp7.000.000	Rp4.000.000	Rp20.000.000	Rp1.800.000	Rp0
					5,15%	0,86%	0,13%	0,26%	0,20%	0,11%	0,57%	0,05%	0,00%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp56.175.000	Rp5.500.000	Rp870.000	Rp288.000	Rp5.000.000	Rp4.750.000	Rp39.000.000	Rp2.500.000	Rp0
					2,69%	0,41%	0,06%	0,02%	0,37%	0,35%	2,90%	0,19%	0,00%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp15.000.000	Rp1.500.000	Rp300.000	Rp500.000	Rp10.000.000	Rp30.000.000	Rp6.000.000	Rp800.000	Rp0
					1,09%	0,11%	0,02%	0,04%	0,73%	2,18%	0,44%	0,06%	0,00%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp13.059.200	Rp3.600.000	Rp0	Rp1.600.000	Rp0	Rp0	Rp0	Rp0	Rp0
					3,48%	0,96%	0,00%	0,43%	0,00%	0,00%	0,00%	0,00%	0,00%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp26.000.000	Rp6.000.000	Rp4.000.000	Rp5.000.000	Rp8.000.000	Rp1.200.000	Rp7.500.000	Rp1.650.000	Rp600.000
					2,00%	0,46%	0,31%	0,38%	0,62%	0,09%	0,58%	0,13%	0,05%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp10.000.000	Rp2.000.000	Rp0	Rp0	Rp0	Rp0	Rp2.000.000	Rp400.000	Rp0
					1,23%	0,25%	0,00%	0,00%	0,00%	0,00%	0,25%	0,05%	0,00%
	AVERAGE				Rp121.435.720	Rp33.660.000	Rp5.552.000	Rp6.798.000	Rp13.060.000	Rp10.815.000	Rp14.600.000	Rp3.710.000	Rp135.000
					3,157%	0,753%	0,132%	0,202%	0,409%	0,411%	0,644%	0,092%	0,006%

Table 13. OHS Cost Allocation on Component 10

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 10-a	COMPONENT 10-b	COMPONENT 10-c	COMPONENT 10-d	COMPONENT 10-e	COMPONENT 10-f	COMPONENT 10-g
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp7.500.000	Rp1.000.000	Rp15.000.000	Rp0	Rp1.000.000	Rp0	Rp0
					0,67%	0,09%	1,34%	0,00%	0,09%	0,00%	0,00%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp60.000.000	Rp0	Rp20.000.000	Rp0	Rp0	Rp0	Rp0
					1,06%	0,00%	0,35%	0,00%	0,00%	0,00%	0,00%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp81.000.000	Rp0	Rp42.000.000	Rp3.000.000	Rp0	Rp0	Rp20.000.000
					1,10%	0,00%	0,57%	0,04%	0,00%	0,00%	0,27%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp20.000.000	Rp0	Rp40.000.000	Rp0	Rp1.000.000	Rp0	Rp100.000.000
					0,32%	0,00%	0,65%	0,00%	0,02%	0,00%	1,62%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp7.200.000	Rp0	Rp5.000.000	Rp0	Rp0	Rp0	Rp10.000.000
					0,21%	0,00%	0,14%	0,00%	0,00%	0,00%	0,29%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp2.750.000	Rp72.500.000	Rp67.000.000	Rp0	Rp288.000	Rp0	Rp0
					0,20%	5,39%	4,98%	0,00%	0,02%	0,00%	0,00%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp12.000.000	Rp0	Rp2.500.000	Rp0	Rp0	Rp4.000.000	Rp0
					0,87%	0,00%	0,18%	0,00%	0,00%	0,29%	0,00%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp5.400.000	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0
					1,44%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp10.000.000	Rp1.200.000	Rp4.000.000	Rp4.000.000	Rp600.000	Rp0	Rp0
					0,77%	0,09%	0,31%	0,31%	0,05%	0,00%	0,00%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp14.000.000	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0
					1,72%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
					Rp21.985.000	Rp7.470.000	Rp19.550.000	Rp700.000	Rp288.800	Rp400.000	Rp13.000.000
					0,836%	0,557%	0,852%	0,035%	0,017%	0,029%	0,218%

Table 14. OHS Cost Allocation in Components 11-12

NO	PROJECT	% OHS COST	JUMLAH NILAI PROYEK	PROJECT CONTRACT VALUE	COMPONENT 11-a	COMPONENT 11-b	COMPONENT 11-c	COMPONENT 11-d	COMPONENT 12-a	COMPONENT 12-b
1	Project 1	0,85%	Rp131.908.000.000	Rp1.121.736.036	Rp8.000.000 0,71%	Rp27.000.000 2,41%	Rp0 0,00%	Rp0 0,00%	Rp140.000.000 12,48%	Rp3.750.000 0,33%
2	Project 2	0,20%	Rp2.850.597.497.000	Rp5.679.655.853	Rp60.000.000 1,06%	Rp90.000.000 1,58%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%
3	Project 3	0,44%	Rp1.677.649.456.000	Rp7.387.713.090	Rp0 0,00%	Rp0 0,00%	Rp39.200.000 0,53%	Rp0 0,00%	Rp0 0,00%	Rp31.525.000 0,43%
4	Project 4	0,62%	Rp995.594.831.501	Rp6.157.077.281	Rp15.000.000 0,24%	Rp15.000.000 0,24%	Rp10.000.000 0,16%	Rp5.000.000 0,08%	Rp50.000.000 0,81%	Rp15.000.000 0,24%
5	Project 5	0,27%	Rp1.288.566.019.000	Rp3.497.045.288	Rp50.000.000 1,43%	Rp9.000.000 0,26%	Rp0 0,00%	Rp2.500.000 0,07%	Rp10.000.000 0,29%	Rp11.500.000 0,33%
6	Project 6	0,26%	Rp514.303.569.690	Rp1.344.825.549	Rp13.500.000 1,00%	Rp13.000.000 0,97%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp750.000 0,06%
7	Project 7	0,88%	Rp156.000.000.000	Rp1.376.670.540	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp7.500.000 0,54%	Rp0 0,00%	Rp1.500.000 0,11%
8	Project 8	0,42%	Rp88.884.251.000	Rp375.425.102	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%	Rp0 0,00%
9	Project 9	1,23%	Rp105.177.552.000	Rp1.298.717.051	Rp0 0,00%	Rp7.000.000 0,54%	Rp0 0,00%	Rp7.000.000 0,54%	Rp4.000.000 0,31%	Rp0 0,00%
10	Project 10	0,52%	Rp155.650.000.000	Rp811.920.226	Rp0 0,00%	Rp5.600.000 0,69%	Rp0 0,00%	Rp2.150.000 0,26%	Rp0 0,00%	Rp73.200.000 9,02%
AVERAGE					Rp14.650.000	Rp16.660.000	Rp4.920.000	Rp2.415.000	Rp20.400.000	Rp13.722.500
					0,445%	0,669%	0,069%	0,150%	1,389%	1,051%

Workplace Accident Data

Workplace accident data across all projects are presented in Table 16, indicating that Project 10 experienced one fatality incident. The project recorded a total of 6,000 days lost due to workplace accidents, following the regulations of the Ministry of Manpower regarding the conversion of lost workdays due to accidents such as permanent disability and death (Decree of the Director General of Industrial Relations Development & Labor Inspection, Ministry of Manpower No. KEP. 84/BW/1998). In addition to the fatality case, Project 10 also reported 1 first aid case and 1 medical treatment case. The frequency rate recorded is 2.22, and the severity rate is 4432.46. Furthermore, Project 5 also has a significant number of workplace accidents, with 3 first aid cases and 1 medical treatment case reported. The recorded frequency rate for this project is 2.31, with a severity rate of 0.00. Apart from these two projects, the other projects have no recorded history of workplace accidents in any category.

Table 15. Work Accident Data and Statistics

NO	PROJECT	% OHS COST	MANPOWERS	MANHOURS	NEAR MISS	FIRST AID CASE	MEDICAL TREATMENT CASE	FATALITY	LOST WORKDAYS	FREQUENCY RATE	SEVERITY RATE	FIRST AID RATE	MEDICAL TREATMENT RATE	FATALITY RATE
1	Project 1	0,85%	293	1.608.442	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
2	Project 2	0,28%	1.339	8.879.370	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
3	Project 3	0,44%	690	3.096.738	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
4	Project 4	0,62%	1.333	3.689.452	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
5	Project 5	0,27%	841	1.731.131	0	3	1	0	0	2,31	0,00	1,73	0,58	0,00
6	Project 6	0,26%	969	2.385.135	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
7	Project 7	0,88%	246	734.812	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
8	Project 8	0,42%	168	326.838	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
9	Project 9	1,23%	191	940.270	0	0	0	0	0	0,00	0,00	0,00	0,00	0,00
10	Project 10	0,52%	295	1.355.650	0	1	1	1	6000	2,22	4432,46	0,74	0,74	0,74

After determining the number of workplace accident cases, the accident occurrence rates were calculated for first aid cases (FACR), medical treatment cases (MTCR), and fatalities (FATR). The highest FACR rate is observed in Project 5, while the highest MTCR and FATR rates are recorded in Project 10. Using these rates, trends and linear relationships between the amount of OHS costs and workplace accidents can be identified.

Figure 2. OHS Cost Trends and First Aid Case Rate (FACR)

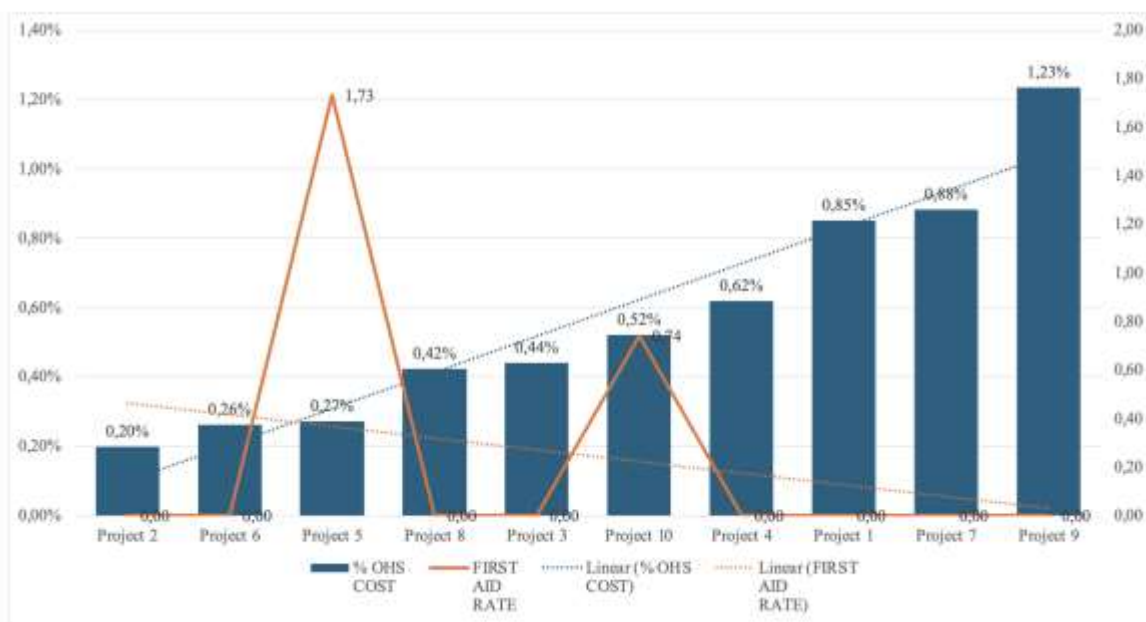


Figure 3. OHS Cost Trends and Medical Treatment Case Rate (MTCR)

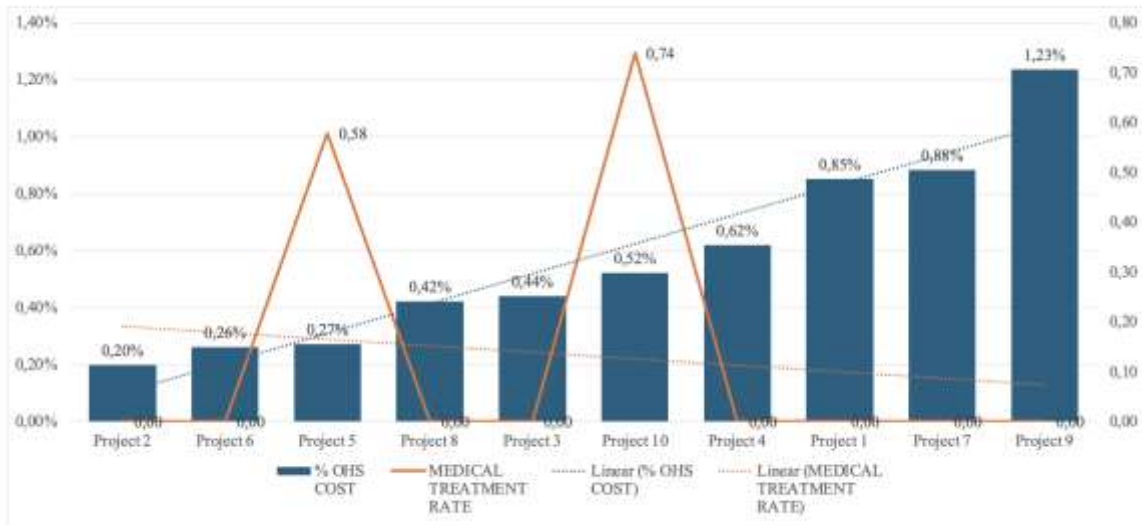


Figure 4. OHS Cost Trends and Fatality Rate (FATR)

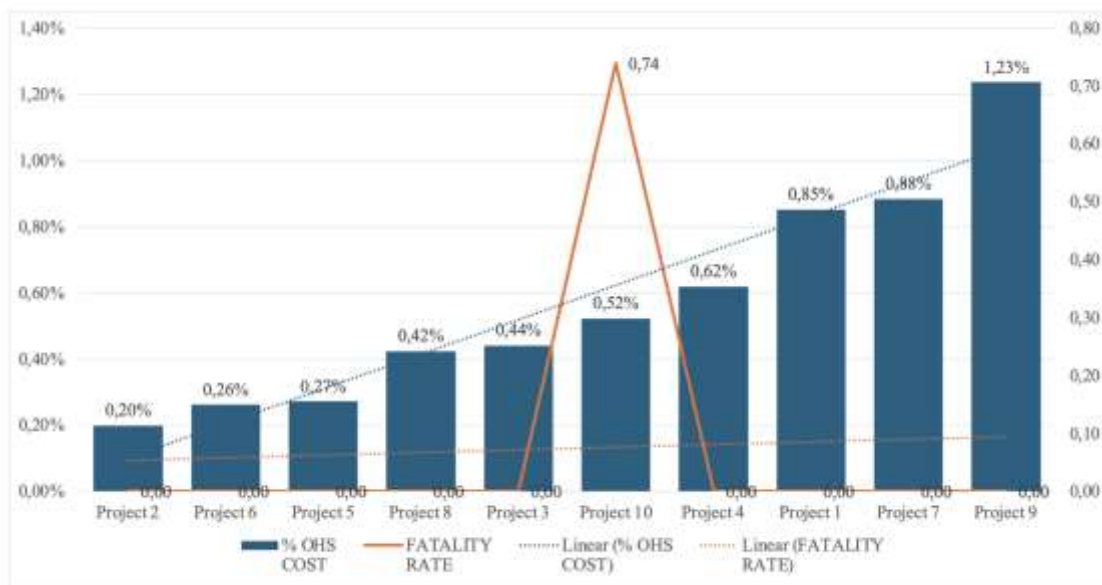
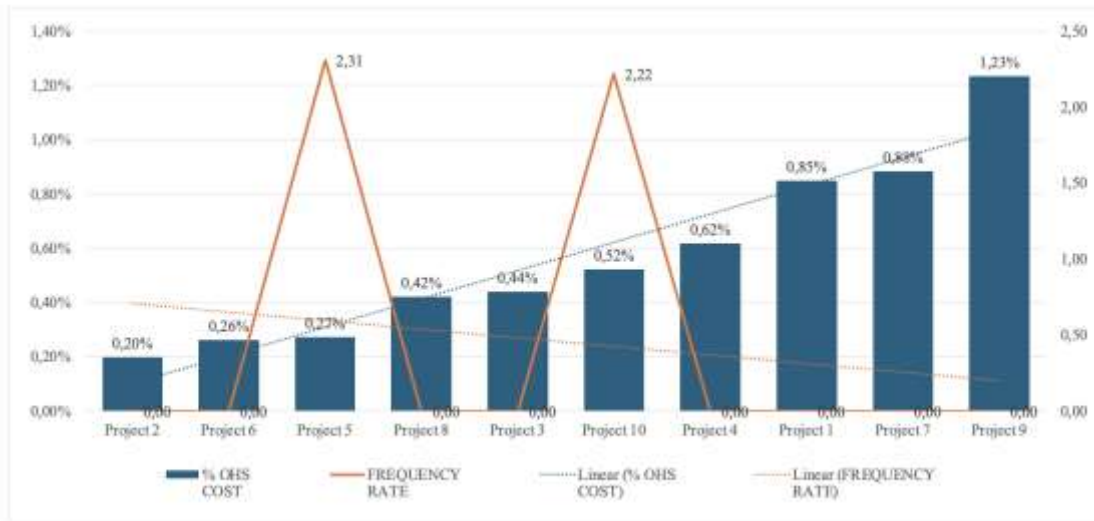


Figure 5. OHS Cost Trends and Frequency Rate (FR)



In Figure 2, it is evident that the linear relationship between OHS costs and the First Aid Case Rate (FACR) is inversely proportional. This indicates that as OHS costs increase, the potential for First Aid Case incidents decreases. However, this trend does not apply to Projects 5 and 10, as their FACR appears relatively high. Similarly, the trend in Medical Treatment Case Rate (MTCR) shown in Figure 3 also demonstrates an inverse relationship with OHS costs. This suggests that higher OHS costs correspond to lower rates of medical treatment cases. Like the First Aid Case scenario, Projects 5 and 10 exhibit higher MTCRs, deviating from the general trend. A slightly different pattern is observed in the Fatality Rate (FATR) trend, where the relationship does not hold for Project 10 alone, as it is the only project with a history of fatality incidents.

To summarize the overall accident data, an analysis of the trend between OHS costs and Frequency Rate (Figure 5) shows that increased OHS costs generally lead to lower frequency rates across projects. However, this trend does not apply to Projects 5 and 10, as both have experienced incidents of fatality, medical treatment cases, and first aid cases. These findings underscore the complex relationship between OHS investments and incident rates, highlighting the importance of tailored safety strategies for different project contexts, particularly in mitigating severe incidents such as fatalities.

DISCUSSION

Research Limitations

This study has several limitations. Firstly, the number of analytical units sampled does not fully represent the conditions of all construction projects. Additionally, the accident data obtained from the construction projects have not been comprehensively managed, particularly regarding high potential (HIPO) near-miss incidents. There is only one project each for the Irrigation and Land Preparation categories that meet the criteria for the analysis unit. Therefore, to draw general conclusions from this research, further studies are needed to conduct a more specific OHS cost analysis for each type of construction work.

OHS Cost

Ten sampled projects have allocated OHS costs in their project activities, adhering to the components outlined in the Regulation of the Minister of Public Works and Public Housing No. 10/2021. The allocation of OHS costs across all projects varies between 0.20% and 1.23%, significantly lower than the findings of Yang et al. [8] for general construction in South Korea, where OHS costs range from 1.97% to 3.09% of the contract value, and the study by Ketabi & Heravi [14], which found OHS costs between 1.62% and 3% of the contract value. Specifically, projects with contract values of Rp 0-500 billion have OHS cost percentages between 0.42% and 1.23%; projects with contract values of Rp 500 billion to Rp 1 trillion have OHS cost percentages between 0.26% and 0.62%; and projects with contract values above Rp 1 trillion have OHS cost percentages between 0.20% and 0.44%. Interestingly, the larger the project contract value, the smaller the percentage of OHS costs. This is consistent with Yang et al.'s [8] findings that in South Korea, the percentage of OHS costs for general construction projects decreases as the project contract value increases.

The OHS cost components in accordance with the Minister of Public Works and Public Housing Regulation No. 10/2021 include nine items: OHS Document Preparation, OHS Promotion & Training, Work and Personal Protective Equipment, Licensing, Insurance & Social Security, OHS Personnel Salaries, Health Facilities, Safety

Signs, and Others. The author has added several categories to provide a more detailed view of OHS cost allocation, namely OHS Licensing, Emergency Response, and Workplace Environment Management. Among all components, the largest allocations of OHS costs are for Insurance & Social Security and OHS Personnel Salaries, with averages of 21.58% and 21.83%, respectively. Insurance & Social Security includes BPJS Jasa Konstruksi, which increases with the project value. This aligns with Ahn et al.'s [15] findings that OHS personnel salaries constitute a significant portion of overall OHS costs. The smallest allocation component is OHS Document Preparation (average 0.24%), which includes the OHS implementation plan and report, as well as OHS procedures and work instructions. Ahn et al. [15] noted that the highest OHS implementation costs are for Safety Facilities or Work Protective Equipment, while Insurance & Social Security was not included as a cost component. According to Oswald et al. [16], insurance costs arise when workplace accidents occur, consistent with Gurcani et al.'s [9] finding that fatalities can lead to additional insurance costs. These include non-refundable insurance premiums in case of accidents and additional costs associated with claims and handling insurance [17]. This differs significantly from the BPJS Ketenagakerjaan Jasa Konstruksi system, which requires a one-time insurance payment for the entire construction project duration.

Four components significantly influence the increase or decrease in OHS cost percentages: Insurance & Social Security, OHS Personnel Salaries, Health Facilities, and OHS Safety Signs. Trends show that as the project contract value increases, the percentage of OHS Personnel Salaries decreases. However, this trend does not apply to Insurance & Social Security, which exhibits the opposite trend. The percentages for Health Facilities and OHS Safety Signs remain relatively consistent across different project contract values. Other components show similar trends for each project value and have small nominal figures, thus not significantly impacting the overall OHS cost allocation (average below 12%). However, Work Protective Equipment and Personal Protective Equipment components have the largest allocations, averaging 7.69% and 12%, respectively. Interestingly, these components show different trends: the percentage for Work Protective Equipment decreases as the project contract value decreases, while the percentage for Personal Protective Equipment increases as the project contract value decreases. Work Protective Equipment is related to the work area size, while Personal Protective Equipment is related to the number of workers involved and the project duration. The research data indicates that projects with the highest contract values and longest durations involve the largest number of workers, and vice versa. The nominal OHS cost per worker decreases as the number of workers and the project value increase.

Work Accident Incidents

According to Behm et al. [18], the quality of OHS implementation models indicates that OHS costs will increase over time. However, this increase will lead to a decrease in costs resulting from workplace accidents, eventually reaching a point where no accidents occur. Proper allocation of OHS costs will positively impact the implementation of the OHS Management System, thereby reducing workplace accidents and maintaining safety performance [19].

The research findings show that the trend of OHS cost allocation is inversely proportional to the number of workplace accident cases, including First Aid Cases, Medical Treatment Cases, and Fatalities. The impact of OHS cost allocation on workplace accidents can be represented by the costs incurred due to these accidents, such as direct costs and indirect costs. Therefore, a cost-benefit analysis method is highly recommended to understand the benefits and relationship between OHS cost allocation and workplace accidents in construction projects [20, 21].

CONCLUSION

The allocation of OHS costs in construction activities cannot be measured solely by percentage. Several factors must be considered, including the project contract value, the number of workers, the project duration, the project area, and the technology used in construction activities. As the contract value of a project increases, the percentage of OHS costs tends to decrease. Key components that significantly impact the allocation of OHS costs include Insurance & Social Security, OHS Personnel Salaries, Health Facilities, and OHS Signage. Conversely, the smallest component is OHS Document Preparation.

The trend in workplace accidents is inversely proportional to the increase in OHS cost allocation. However, a cost-benefit analysis is necessary to determine the benefits of allocating OHS costs in reducing workplace accidents.

SUGGESTION

To address the limitations of this study, it is necessary to conduct an in-depth analysis of the OHS Cost components for Work Safety Equipment, categorized by project type and specific area size. Additionally, further analysis of direct costs and indirect costs associated with workplace accidents is needed to understand the benefits of allocating OHS Costs. A larger sample size of projects will be required to make the research findings more representative of the construction activities in Indonesia.

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