

# ANALYSIS OF THE IMPLEMENTATION OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM ON WORKERS PRODUCTIVITY ON STRUCTURAL FINISHING WORKS OF REINFORCED CONCRETE COLUMNS

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**Abstract.** The implementation of the project from year to year is significantly improved on implementation aspects of cost, quality, and time, in order to manage the use of human resources to be realistic. Occupational health and safety in a company is often ignored especially for companies which are doing project developments. This also affects the occupational safety of the workers and occupational illness arisen after the projects have been implemented. So in running safe business, occupational health and safety management System should be implemented consistently. The research was conducted in the project of Dialog Villa Petitenget, Cendrawasihstreet, Denpasar, with 15 workers as sample. The implementation of occupational health and safety management system can ease the workload of the workers of the structural finishing works of reinforced concrete columns. This is proved by analysis on the treatment group ( $p\text{-value} < 0.05$ ). This shows that the workloads felt by group P2 (group which implement occupational health and safety management System are lighter than the ones felt by group P1 (group which do not implement the system). The decrease in workload felt by group P2 is 4.2%. The implementation of occupational health and safety management system can increase work productivity on the construction project of reinforced concrete structure columns. This is proven by the productivity analysis result which shows that the productivity increase experienced by group P2 is 25% with significance level ( $p\text{-value} < 0.05$ ). Thus, the implementation of occupational health and safety management system on the structural finishing works of reinforced concrete columns is proven to be able to improve work productivity

*Keywords : Occupational health and safety management, column finishing, productivity*

## 1. INTRODUCTION

The project implementation from year to year is significantly improved on the implementation aspects of cost, quality, and competition time which is more intense in construction field. Resources which have effects on the project are man, materials, machine, money, and method. Resources are factors that define the success of a construction project. Even a very little project, if it is not supported by human resources that are good in quality and production, will not give maximum and satisfying result.

In order to manage the use of human resources to be realistic, contractors have to know the level of workers' productivity. It is much needed to monitor and map about what will happen in a project because of the use and utilization of labor. For this reason, it is necessary to know the factors that influence worker productivity [1].

The implementation of a health and safety management system (SMK3) needs to be a standard procedure inherent in the company [2]. the application of this SMK3 needs to be studied properly the impact of its profits on workers and companies.

Based on the discription above, it is considered that research on the effects of the implementation of occupational health and safety management system in work productivity is needed to conduct. The results are expected to be able to improve work results and quality that leads to the increase of profits for both workers and the companies.

The objectives of this research are: (a) to know the reduction of workloads in the structural finishing works of reinforced concrete columns after the implementation of occupational health and safety management system, (b) to know and measure the increase of labors productivity in the structural finishing works of reinforced concrete columns after the implementation of occupational health and safety management system.

This research is limited in reviewing the benefits of the implementation of occupational health and safety management system in increasing the performance or work productivity especially in the implementation of structural finishing works of reinforced concrete columns. The item examined is the structural finishing works of reinforced concrete columns.

## 2. METHODS

This research was conducted experimentally using treatment by subject on a villa construction project. Reseach location is at Cendrawasih street, Petitenget, Kuta, Badung, Bali. The time for conducting this research is two weeks from 15 May 2017 until 27 May 2017. This research is conducted for 8 working hours (8 a.m. – 5 p.m.). The sampling applies probability sampling method with nonrandom sampling technique, that is by using saturated sampling where the whole population is chosen as sample, so the samples obtained are 15 persons.

Hypothesis of this reseach: (a) the effects of the implementation of occupational health and safety management system can reduce the workloads of the workers of the structural finishing works of reinforced concrete columns. (b) the effects of the implementation of occupational health and safety management system can increase the work productivity of the structural finishing works of reinforced concrete columns.

To support the collection process, the data is collected by implementing survey method. The research instruments are stationary and pulse. The processing data technique applied in this research is comparative descriptive with the steps as follows: editing, tabulating the data, and analyzing the data. The data is processed through some analysis: descriptive analysis, normality analysis, homogeneity analysis, and comparative analysis or difference test.

## 3. RESULTS AND DISCUSSION

### SMK3 Implementation system

Occupational health and safety are the most important factors in the achievement of the project targets and objectives. The moral disadvantages are, for example, many workers experience permanent disability and the worst impact is death. The implementation of occupational health and safety management system is regulated in the government regulations number 50 in year 2012. Objectives of the implementation of occupational health and safety management system are:

1. To increase the protection effectiveness of occupational health and safety by applying planned, measured, structured, and integrated ways.
2. To avoid work accident and reduce occupational diseases, by involving: management, labors/ workers, and labor union.

### Characteristics of the Subject

The characteristics of the workers to be in the subjects in this research are as follows:

Table 1. Reseach Subject Characteristics

No	Variables	Average	SD	Range
1	Age (year)	29.15	3.07	2 - 10
2	Body Weight (kg)	64.21	4.17	58 - 76
3	Body Height (cm)	168.43	3.46	165.5 - 173.5
4	Year of Experience (year)	5.50	2.06	2 - 10

Table 1 shown the age range of workers is between 20 and 40 years. This age is still in the productive age with weight in the range of 60-78 kg and work experience plowing fields using hand factors between 2 and 10 years. This shows that the physical condition of the subject is in productive conditions with sufficient work experience. Work experience is one of the factors that influence the level of worker's skills, complaints that occur in the workload and work productivity [2].

**Working Environment Condition**

The results of the measurement of the working condition at the rice field workplaces conducted from morning to evening (08.00 am to 04:00 pm). This environmental condition data was tested for normality by using Shapiro-Wilk test and obtained normal working environment data results ( $p > 0,05$ ) both in group P1 (before improvement) and P2 (after repair). The result of different test of working environment condition is presented in Table 2 below.

Tabel 2. Working Environment Condition

Variable	P1 Group		P2 Group		t	p
	mean	SD	mean	SD		
Tempe-rature (°c)	27.2	2.5	27.7	2.4	4.071	0.305
Relative Humidity (%)	74.6	3.4	75.0	2.9	3.184	0.185
Light Intensity (lux)	407.6	32.5	416.8	29.3	8.329	0.061
Sound Intensity (dBA)	71.8	3.4	71.3	3.1	1.813	0.216

SD = Standard Deviation

From the results of microclimate condition analysis, it showed that the working environment microclimatic conditions of the craftsmen of the gems both in group P1 and group P2 were still within comfortable working condition for the workers. Temperature variables, relative humidity, light intensity, and noise (sound intensity) did not have a significant difference between the groups P1 and P2 ( $p > 0.05$ ). This means that the working environment between P1 and P2 can be considered the same and consistent.

Table 2 showed that the working environment microclimatic conditions of the craftsmen of the gems both in group P1 and group P2 were still within normal condition and comfortable for the workers. The threshold value of air temperatures for workers is 33°C and the relative humidity for Indonesian workers is between 70% - 80% [3]. If works outdoors in sun exposure, it is suggested as well that headgear is worn by the workers to prevent excess heat to the face and head [4], and other body armor so that workers can work comfortably. The highest sound intensity threshold that is tolerable by human being for working time of not more than 8 hours a day is 85 dBA [5].

**Workloads**

Workload is measured by the pulse of the workers both at rest (resting pulse) and at work (working pulse). This workload data is tested in normality by using Shapiro-Wilk test. From the test it is found that the resting pulse and the work pulse in both groups (P1 and P2) are normally distributed ( $P > 0.05$ ).

Prior to analysis of the effect of treatment, first comparability of resting pulse. This is done to see the initial conditions of the worker whether the difference is significant or not. It is necessary to see if the workload change is purely due to the effects of research intervention or any external factors contributing to the change in the workload. The comparability of the resting pulse on this worker is done by using t-pair test. The result of the analysis shows that there is no difference between P1 and P2 in the resting pulse ( $p > 0,05$ ) as shown in Table 3. It means that the initial condition of worker workload can be considered the same. Treatment effects were also analyzed using a t-pair test with the results shown in Table 3.

Table 3. Workloads Analysis on Workers

Variable	Group P1		Group P2		t	p
	Mean	SD	Mean	SD		
Resting Pulse (beats/ minute)	70.3	1.9	71.1	1.4	0.219	0.113
Working Pulse (beats/ minute)	120.4	3.3	115.3	3.7	-1.014	0.000

SD = Standard Deviation

Table 4 shows that the before activity workload condition between the two groups was not significantly different or could be considered the same ( $p > 0.05$ ). While conditions after work there are significant differences between P1 and P2. Judging from the average of workload there was a significant decrease between group P1 and

group P2 by 4.2%. Table 4 also shows that the workload for the fieldworkers using hand tractor is classified as a moderate workload. A mean work rate of 120.4 and 115.3 beats/minute is between 100-125 beats/minutes is moderate workload [6]. There needs to be an improvement in the work station to provide solutions to the problems of the workers so that they can reduce the workload [7,8]. The decrease in workload is due to SMK3 intervention. SMK3 is part of ergonomics. Ergonomic interventions with changes in work systems will lead to decreased workload [9,10,11].

### Work Productivity Analysis

Productivity is a comparison between output and input. Productivity is affected by some factors namely management and individual factors. In this research, the work productivity of group P1 is 0.1000440; meanwhile the productivity of group P2 is 0.1251000. The result of statistic analysis shows that the work productivity of group P2 is greater than the control group P1 ( $p < 0,05$ ). In order to know the effect of treatment, the mean difference test between each group (group P1 and P2) is tested using pair t-test. The analysis results are shown in Table 4 below.

Table 4. Production and Work Productivity Comparison Analysis

	Mean	N	Std. Deviation	Std. Error Mean	p
Productivity P1	0.1000440	15	0.00700348	0.00180829	0.000
productivity P2	0.1251000	15	0.00881299	0.00227550	

From the above analysis result, it can be concluded that productivity of the treatment group is greater than the control group ( $p < 0,05$ ). This proves that the implementation of occupational health and safety on the column reinforcement is very effective in the increase of work productivity.

Meanwhile, from the examination result, the increase of work productivity in group P1 is caused by the reduction of workloads and level of muscle complaints, so the workers in group P1 can work optimally. The increase of productivity also affects the acceleration of the project time which later will lead to savings in production cost. In Tawaka's research [12], it is also concluded the same thing; with the implementation of occupational health and safety management system can increase the work productivity of workers in female laundry. Performing SMK3 and ergonomic interventions in the industrial world will increase the production and productivity of workers [13,14,15]. Increased productivity can be done by designing new work systems [16, 17,18].

## 4. CONCLUSION

From the result of the analysis and discussion above, it can be concluded that:

- The implementation of occupational health and safety management system can reduce the workloads of the workers of structural finishing works of reinforced concrete columns. This is proven by the analysis on the treatment group ( $p\text{-value} < 0,05$ ). This shows that the workloads felt by group P2 (the group which implement the system) are lighter than group P1 (the group which do not implement the system). Reduction of the workloads experienced is 4.2%.
- The implementation of occupational health and safety management system can increase the productivity in the structural finishing works of reinforced concrete columns. This is proven by the result of the productivity analysis which shows that the increase of productivity experienced by group P1 is 25% with the level of significance ( $p\text{-value} < 0,05$ ). Thus, the implementation of occupational health and safety management system on the structural finishing works of reinforced concrete columns can increase the work productivity

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