The influence of occupational safety and health program on the manpower performance of construction company in Banda Aceh city

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Abstract. The implementation of occupational safety and health program in Banda Aceh city is still not optimal, as indicated by a high rate of work accidents. The purpose of this research is to study the effect of the occupational safety and health program on the manpower performance of construction companies in Banda Aceh city. Three construction companies were studied and compared to each other. Data collection was carried out by observation, using questionnaires, and interviewing the respondents of the research, in this case, the foreman, chief workman, workman, and worker. Data processing is conducted by using descriptive statistical analysis, validity test, reliability test, and regression analysis. The results of the analysis show that the application of occupational safety and health program has a significant influence on manpower performance.

1. Introduction
Occupational safety and health (OSH) issues in Banda Aceh are still often overlooked; this is indicated by the incessant infrastructure development carried out by the government which is directly proportional to the risk of labor accidents. The Indonesian Ministry of Manpower said the highest number of work accidents occurred in the construction sector [1]. In order to reduce the number of occupational accidents, the Ministry of Labor will increase supervision and law enforcement in the field of K3 [2,3]. Labor is an important factor for company activities because the company cannot be separated from the name of the workforce. Based on data from the Social Security Administering Agency (BPJS), there were 80,392 cases of work accidents in 2017 [4]. One of the causes of these accidents is the lack of optimal supervision and implementation of OHS, as well as OHS behavior in the workplace. Therefore, the International Labor Organization (ILO) estimates that losses from accidents reach 2-4% of a country's gross national product. This loss that happened due to accidents and other events is a risk that must be faced by every organization or company. Human factors are the main cause of workplace accidents (85% of total workplace accidents cause, according to ILO), therefore, workplace accidents are mostly caused by human factors.

In a construction project, OSH is a very important thing, one of which is the physical and mental of the workforce. The health of workers who are less than optimal can affect the high absenteeism and poor performance of the workforce, as well as the safety of the workforce. By meeting safety standards in
work will make the workforce safer and achieve the success of a project. If the workplace does not meet safety standards and there are many hazards, it will cause an accident while working.

The implementation of the OSH program on construction projects is expected to achieve a better quality of the workforce. One of the factors that influence the performance of a workforce is OSH; therefore, it must be considered more. The existence of the OSH program applied to a construction project can improve the performance of a better workforce, guaranteed in terms of safety and health in working in a healthy environment so that the overall workforce can work more optimally and the complete the construction project on time.

Based on the above background, the problem in this study is whether there is an effect of the implementation of the OSH program on the workforce performance of construction companies in Banda Aceh city. Three construction companies were studied. The purpose of this study is to see the effect of the OSH program on the performance of the three construction companies in Banda Aceh city.

2. Methodology

The research objects are three construction companies located in Banda Aceh city, which are PT. Raya Cipta Mulia, PT. Tanjung Harapan, and PT. Mirtada. The research variables were occupational safety and health (OSH) (X variable) and the manpower performance (Y variable). The indicators for variable OSH were workplace environment, machinery and equipment, guaranteed safety, condition of sense organ, stamina, emotions, and health insurance program. The indicators for variable manpower performance were quantity, timeliness, effectiveness, independence, and work commitment.

The research was conducted by observing the foreman, chief workman, workman, and worker during the construction project work. For PT. Raya Cipta Mulia, the observation was performed during the construction of Project Revitalisasi RKB SMAN 1 (Block A) Banda Aceh. For PT. Tanjung Harapan, the observation was performed during the construction of Project Revitalisasi RKB SMAN 1 (Block C) Banda Aceh. While for PT. Mirtada Sejahtera, the observation was conducted during the construction of Project Konstruksi Fisik Work Shop (Laboratorium Mini plant Turunan CPO dan Laboratorium Bengkel – Mekatronika) Sekolah Menengah Teknologi Industri (SMTI) Banda Aceh. All the project was constructed in 2018. In addition, the interviews were also conducted with the foreman, chief workman, workman, and worker regarding research variables.

The questionnaire was conducted by distributing a set of questionnaires that contained questions that were arranged according to the research variables to the workforce. The method used was a closed questionnaire. Questionnaire instruments were validated and reliability was measured so that the research produces valid and reliable data. The validation of the instrument was done by factor analysis, where each value in each question is correlated with the total value of all questions for one variable using the Pearson correlation formula t-test and as follows [5-7]:

\[
r_{cal} = \frac{n\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{(n\Sigma X^2 - (\Sigma X)^2)(n\Sigma Y^2 - (\Sigma Y)^2))}}
\]

(1)

\[
t_{cal} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}
\]

(2)

where \( r_{cal} \) = correlation coefficient, \( t_{cal} \) = the calculation t, \( n \) = the number of respondents \( \Sigma X \) = total score of question items, and \( \Sigma Y \) = the total score for a variable. The decision is made by comparing the of \( t_{cal} \) with \( t_{table} \); if \( t_{cal} > t_{table} \) means the instruments are valid and if \( t_{cal} < t_{table} \) means the instruments are invalid. The reliability of the instruments was measured by the Cronbach Alpha method with a measuring scale from 0 to 1. The instruments are reliable if the Cronbach Alpha is greater or equal to 0.6 [8].

In the questionnaire, the research instruments for each indicator stated above are as follows:

a. For an indicator of workplace environment:
   - The company provides training and education for every workforce to maintain a safe and clean environment (X1)
   - Circulation, temperature, lighting in the workplace meet the standard operating procedures (X2)
b. For an indicator of machinery and equipment:
   • The company always provide protective work such as helmets, boots, gloves, masks (personal protective equipment, PPE) (X3)
   • All work equipment is in good condition and is suitable for use, and dangerous equipment is given a sign (X4)
   • Safeguarding work equipment is in accordance with the standard operating procedure of safety (X5)
   • Technology and how to use the machines are in accordance with the standard operating procedure and project requirements (X6)

c. For an indicator of guaranteed safety:
   • The company provides the instructions on the importance of using PPE when working and the instructions regarding the appropriate stages in completing work (X7)
   • The company provides a place to store the goods to maintain the quality of the goods (X8)

d. For an indicator of the condition of sense organ:
   • The influence of work, in the long run, has an impact on the deterioration of sense organ and lung function (X9)

e. For an indicator of stamina:
   • The company always guarantees the maintenance and improvement of the health and nutrition of the workforce (X10)

f. For an indicator of emotions:
   • Emotions are unstable due to the pressure of work that must be completed on time (X11)

g. For indicator health insurance program:
   • The company provides health insurance to every workforce (X12)

h. For an indicator of quantity:
   • The level of achievement of the work volume produced has been in accordance with company expectations (Y1)
   • Often completing work outside of working hours to achieve the targets charged by the company (Y2)

i. For an indicator of timelines:
   • Looking for other ways for the work to be completed on time when there is a deadlock in the process of completing work (Y3)
   • Doing a job deftly and not procrastinate (Y4)
   • Trying to prioritize work rather than personal interests (Y5)

j. For an indicator of effectiveness:
   • Can complete the work carefully as expected (Y6)
   • Do work accurately and rarely make mistakes (Y7)

k. For an indicator of independence:
   • Have initiatives that are useful to help resolve better jobs (Y8)
   • Able to provide creative ideas for the progress of the company (Y9)

l. For an indicator of work commitment:
   • Has responsibility for the work charged (Y10)
   • Responsible for the results of work achieved (Y11)

To determine the number of samples, the Slovin’s formula is used as follows:

\[ n = \frac{1}{1 + Ne^2} \]

where \( n \) = the number of samples, \( N \) = the number of populations, and \( e \) = error. In this research, the value of \( e = 0.1 \) which means that the level of confidence of 90% was used. According to the above formula, the minimum number of samples obtained is 46. The correction of the number of samples was done by adding several subjects so that the samples are fulfilled. A correction was done using the large drop-out correction formula as follows
\[ n = n / (1 - f) = 46 / (1 - 0.1) = 51 \]  

where \( f \) = estimated proportion of drop out = 0.1

To see the correspondence characteristics and perception of the implementation of the OSH program, the descriptive analysis, which uses frequency analysis and the obtained average values, was used. To see the relationship between variable OHS and variable manpower performance, the correlation analysis, and regression analysis were used. In order to see the difference and similarity between the three companies studied in this research, a Duncan test was used.

3. Results and discussion

The characteristics of the respondents based on gender, level of education, length of work experience, and position of work are shown in Table 1-4.

| Table 1. Characteristics of the respondents based on gender. |
|-----------------|-----------------|----------------|-----------------|
| Gender          | Company name    |                |                |
|                 | PT. Raya Cipta Mulia | PT. Mirtada Sejahtera | PT Tanjung Harapan | Total |
|                 | N %             | n %             | n %             | n %             |
| Man             | 18 100          | 17 100          | 16 100          | 51 100          |
| Woman           | 0 0             | 0 0             | 0 0             | 0 0             |
| Total           | 18 100          | 17 100          | 16 100          | 51 100          |

| Table 2. Characteristics of the respondents based on the level of education. |
|-----------------|-----------------|-----------------|
| Pendidikan      | Frequency       | Percentage (%)  |
| SD              | 8               | 15.7            |
| SMP             | 21              | 41.2            |
| SMA             | 19              | 37.3            |
| Diploma         | 3               | 5.9             |
| Total           | 51              | 100             |

| Table 3. Characteristics of the respondents based on the length of work experience. |
|-----------------|-----------------|----------------|
| Length of work experience | Company name    |                |
|                  | PT. Raya Cipta Mulia | PT. Mirtada Sejahtera | PT Tanjung Harapan | Total |
|                  | N %             | n %             | n %             | n %             |
| 0-3 years        | 0 0             | 5 29.4          | 5 31.3          | 10 19.6          |
| >3-5 years       | 4 22.2          | 3 17.6          | 4 25.0          | 11 21.6          |
| >5-7 years       | 8 44.4          | 3 17.6          | 3 18.8          | 14 27.5          |
| >7 years         | 6 33.3          | 6 35.3          | 4 25            | 16 31.4          |
| Total            | 18 100          | 17 100          | 16 100          | 51 100          |

| Table 4. Characteristics of the respondents based on the position of work. |
|-----------------|-----------------|----------------|
| Work Position   | Company name    |                |
|                 | PT. Raya Cipta Mulia | PT. Mirtada Sejahtera | PT Tanjung Harapan | Total |
|                 | n %             | N %             | n %             | n %             |
| Foreman         | 1 5.6           | 1 5.9           | 1 6.3           | 3 5.9           |
| Chief workman   | 2 11.1          | 2 11.8          | 2 12.5          | 6 11.8          |
| Workman         | 7 38.9          | 6 35.3          | 7 43.8          | 20 39.2         |
| Worker          | 8 44.4          | 8 47.1          | 6 37.5          | 22 43.1         |
| Total           | 18 100          | 17 100          | 16 100          | 51 100          |
The results of the validity test for the X variable and Y variable are shown in Tables 5 and 6. From the test results, it is obtained that $r_{cal} > r_{table}$ which means that the instruments used in this study are valid.

**Table 5. Result of validity test for X variable.**

| Variables | $r_{cal}$ | $r_{table}$ | Remarks |
|-----------|-----------|-------------|---------|
| X1        | 0.729     | 0.444       | Valid   |
| X2        | 0.627     | 0.444       | Valid   |
| X3        | 0.620     | 0.444       | Valid   |
| X4        | 0.634     | 0.444       | Valid   |
| X5        | 0.610     | 0.444       | Valid   |
| X6        | 0.599     | 0.444       | Valid   |
| X7        | 0.613     | 0.444       | Valid   |
| X8        | 0.638     | 0.444       | Valid   |
| X9        | 0.603     | 0.444       | Valid   |
| X10       | 0.606     | 0.444       | Valid   |
| X11       | 0.628     | 0.444       | Valid   |
| X12       | 0.601     | 0.444       | Valid   |

**Table 6. Result of validity test for Y variable.**

| Variables | $r_{cal}$ | $r_{table}$ | Remarks |
|-----------|-----------|-------------|---------|
| Y1        | 0.550     | 0.444       | Valid   |
| Y2        | 0.703     | 0.444       | Valid   |
| Y3        | 0.610     | 0.444       | Valid   |
| Y4        | 0.584     | 0.444       | Valid   |
| Y5        | 0.568     | 0.444       | Valid   |
| Y6        | 0.637     | 0.444       | Valid   |
| Y7        | 0.736     | 0.444       | Valid   |
| Y8        | 0.573     | 0.444       | Valid   |
| Y9        | 0.794     | 0.444       | Valid   |
| Y10       | 0.631     | 0.444       | Valid   |
| Y11       | 0.584     | 0.444       | Valid   |

The results of the reliability test for the instruments used in this research are shown in Table 7. The $C_{alpha}$ obtained from the analysis is greater than 0.6. This means that the instruments used in this research are reliable.

**Table 7. The result of the reliability test.**

| Variable               | n  | $C_{alpha}$ | Remarks |
|------------------------|----|-------------|---------|
| OSH Program            | 12 | 0.852       | Reliable|
| Performance of manpower| 11 | 0.853       | Reliable|
The relationship between the application of the OSH program and the performance of manpower is shown in Figure 1. The correlation test result on the influence of the application OSH program on the performance of manpower is shown in Table 8. From Table 8, it is known that the coefficient of the relationship between the application OSH program and the performance of the workforce is 0.541 which is positive relationships. From the significance test using the t-test, it is obtained that tcal is 4.503 which is greater than t table (at the level of 5%) which is 2.010. This means that the relationship between the two variables is significant. The regression model for the relationship between two variables is proposed as follows:

\[ Y = 1.864 + 0.545X \]

\[(4)\]

**Figure 1.** Relationship between the application of the OSH program and the performance of manpower.

**Table 8.** Result of correlation test on the influence of OSH program application on the performance of manpower.

| The relation between OSH program application and manpower performance | Regression | R  | R²  | tcal | ttable |
|-------------------------------------------------|------------|----|-----|------|--------|
| Constant                                       | 1.864      | 0.121 | 0.541 | 4.503 | 2.010  |
| Coefficient                                    | 0.545      | 0.121 | 0.541 | 4.503 | 2.010  |

Based on the hypothesis, the application of the OSH program has a significant influence on the workforce performance of the three companies. This is evidenced from a significant level of 0.000 smaller than a = 0.05. This means that there is an influence of the application of the OSH program on the workforce performance of the three companies.
4. Conclusions
Based on this research, the following conclusions can be drawn:
1. The results of the validity test show that all elements of the statement for data on the application of the OSH program and the performance of the workforce at the three companies having a value of $r_{cal}$ greater than the value of $r_{table}$; this means that all instruments are valid.
2. The reliability test results show that all elements of the statement for each data of each variable are reliable based on the value of Cronbach's Alpha that is greater than 0.60.
3. The results of the hypothesis test are known that the application of the OSH program has a significant influence on the performance of the workforce of all three construction companies. This is evidenced from a significant level of 0.000 smaller than $a = 0.05$.
4. The simple linear regression has the result: $Y = 1.864 + 0.545X$ ($Y = $performance of manpower, $X = $OSH program). This shows that there is a linear relationship between the implementation of the OSH program on the performance of the manpower of all three companies.

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