International Journal of Engineering Applied Sciences and Technology, 2022
Vol. 7, Issue 5, ISSN No. 2455-2143, Pages 80-85
Published Online September 2022 in IJEAST (http://www.ijeast.com)

EVALUATION OF THE CONSTRUCTION SAFETY MANAGEMENT SYSTEM IMPLEMENTATION ON BRIDGE CONSTRUCTION PROJECTS (CASE STUDY: CONSTRUCTION OF THE NIBUNG BARU BRIDGE, BANGKA BELITUNG PROVINCE)

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Abstract— **Construction work is an infrastructure development sector that has high complexity. Along with the acceleration of infrastructure development in Indonesia, construction safety needs more attention and risk control. One of the risk control efforts in construction work is the implementation of the Construction Safety Management System (CSMS). This study aimed to determine the level of implementation of the Construction Safety Management System conducted by construction service providers on the Nibung Baru Bridge construction project in accordance with the Regulation of the Ministry of Public Works and Public Housing Number 10 of 2021 concerning Guidelines for Construction Safety Management Systems (Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia Nomor 10 Tahun 2021 tentang Pedoman Sistem Manajemen Keselamatan Konstruksi). This study used an audit method for the implementation of Construction Safety Management System with a checklist on 5 (five) Construction Safety Management System elements and sub-elements as well as interviews with the project K3 person in charge. The assessment and evaluation conducted by reviewing the implementation of each element of the Construction Safety Management System which was assessed from the Construction Safety Plan document of the service provider, the implementation of construction safety in the field, and the documents of the service provider related to the CSMS. Based on the results of the assessment, it is known that the implementation of the CSMS conducted by the service provider in the project was in the good category with a conformity score of 65%, but there are still some implementations of the sub-elements that are not in accordance with the applicable regulations.**

Keywords— **Construction Safety, Construction Safety Management System (CSMS), bridge construction.**

I. INTRODUCTION

A. Background

The availability of infrastructure is the foundation for Indonesia's development. Adequate infrastructure can facilitate community mobility, improve inter-regional connectivity, and encourage community economic growth. Therefore, the government continues to accelerate construction work for equitable infrastructure development throughout the country.

Construction work is one of the development sectors with high complexity, many things need to be considered so the construction work can run well and be completed according to the planned target. One of the things that are a concern in construction work is construction safety. Construction work includes various work items that have a risk of work accidents for both workers and the general public. Along with the acceleration of infrastructure development in Indonesia, it is necessary to pay more attention to construction safety so that construction works can run well and not cause losses.

Based on data from the International Labor Organization (ILO) in 2018, there are 2.78 million workers who die each year due to work accidents (13.7%) and work-related diseases (86.3%).

In addition, based on data from the Employment Social Security Administration (BPJS), the number of work accidents in Indonesia in 2021 will reach 234,270 cases. This number increased by 5.65% from 2020 which was 221,740 cases.

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Meanwhile, if we look at the five years since 2017, the number of work accident cases shows an increasing trend every year.

Therefore, it is necessary to control risk in the implementation of construction work. One of the efforts to control risk to create a safe work environment to support effective and efficient performance improvement is the implementation of the Construction Safety Management System (CSMS). The implementation of CSMS by the provisions can minimize the risk of moral and material losses for workers and the general public around them.

The application of CSMS needs to be carried out on all construction works, both work with simple technology and work with high technology. The Nibung Baru Bridge Construction Project in Bangka Regency is the longest bridge construction project in the Province of the Bangka Belitung Islands. The bridge construction project is classified as a construction work category that has a moderate level of the safety risk, so it is necessary to review and evaluate the application of CSMS in the implementation of its work. A properly implemented CSMS will create a safe and secure work environment.

B. Problem Formulation

Based on the description of the background above, the following problems can be formulated:

a. Is the application of CSMS on the Nibung Baru Bridge Construction Project accordance with the applicable regulations?
b. What are the follow-up actions for improvement in the effort to fulfill the implementation of CSMS conducted by construction service providers?

C. Research Objectives

The aims of this research are as follows:

a. Knowing the suitability of the application of CSMS on the Nibung Baru Bridge Construction Project
b. Knowing the follow-up improvements made by construction service providers to fulfill the implementation of CSMS on the Nibung Baru Bridge Construction Project.

D. Research Limits

Due to time constraints and to achieve the objectives, this research was conducted with the following research limitations:

a. The research was conducted on the Nibung Baru Bridge Construction Project in implementing the Construction Safety Management System (CSMS) which was conducted by construction service providers during construction work;
b. The data collected by conducting an audit system on the implementation of the CSMS by the Regulation of the Ministry of Public Works and Public Housing Number 10 of 2021 concerning Guidelines for the Construction Safety Management System (CSMS).

II. BASIC THEORY

A. Construction Safety Management System (CSMS)

The latest regulation related to the implementation of CSMS is contained in the Ministry of Public Works and Public Housing Regulation Number 10 of 2021 concerning Guidelines for Construction Safety Management Systems, which explains that the Construction Safety Management System (CSMS) is part of the construction work implementation management system to ensure the realization construction safety.

The provisions regarding to the implementation of CSMS are contained in the Ministry of Public Works and Public Housing Number 10 of 2021 Article 2 which states that every service user and service provider in the implementation of construction services must implement CSMS. The service providers who must implement the CSMS are service providers that provide the following services:

a. Construction management consultancy;
b. Supervision construction consulting;
c. Construction work;
d. Integrated construction work.

The implementation of CSMS must meet security, safety, health, and sustainability standards by ensuring:

a. Construction engineering safety;
b. Occupational Health and Safety;
c. Public safety;
d. Environmental safety.

The implementation of the CSMS is contained in the CSMS document which consists of:

a. CSMS Conceptual Design;
b. Construction Safety Plan;
c. Construction Work Quality Plan;
d. Quality Program;
e. Environmental Management and Monitoring Work Plan;
f. Job Traffic Management Plan.

B. Elements of Construction Safety Management System

In implementing CSMS in the implementation of construction work, service providers prepare a Construction Safety Plan which contains 5 (five) CSMS elements consisting:

a. Labor leadership and participation in Construction Safety
b. Construction Safety Planning
c. Construction Safety Support
d. Construction Safety Operation
e. Evaluation of the implementation of CSMS performance.

C. Legal Basis of Construction Safety Management System in Indonesia

The implementation of CSMS refers to the applicable rules and regulations, including:

a. Law No. 1 of 1970 concerning Occupational Safety
b. Law Number 2 of 2017 concerning Construction Services
c. Government Regulation Number 50 of 2012 concerning Occupational Health and Safety Management System
d. Presidential Regulation Number 12 of 2021 concerning Amendments to Presidential Regulation Number 16 of 2018 concerning Procurement of Government Goods/Services

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e. Regulation of the Ministry of Public Works and Public Housing Number 10 of 2021 concerning Guidelines for Construction Safety Management Systems
f. ISO 45001:2018

III. RESEARCH METHODS

A. Place and Time of Research

The research was conducted on one project, namely the Nibung Baru Bridge construction project located in Bangka Regency, Bangka Belitung Islands Province, Indonesia. The research was conducted in November 2021, when the implementation of the bridge construction work was underway.

B. Data Type

a. Primary data: data obtained from direct observations at the job site
b. Secondary data: data obtained from construction service providers, in the form of organizational structure and implementation Construction Safety Plan documents

C. Research Procedure

This study used a qualitative descriptive method, which provided an overview and assessment of a situation that occurs and the results of the assessment are used to develop improvements to the situation. Data collection in this study was in the form of audits or observations on the implementation of CSMS based on the Ministry of Public Works and Public Housing Regulation Number 10 of 2021. The stages and procedures of this research were carried out as follows:

1. Preparation stage

In the preparation stage, a preliminary survey conducted on the location of the work project and data collection of data sources related to CSMS owned by service providers.

2. Data collection stage

At this stage, data was collected from direct visits to the job site and interviews with the person in charge of the OHS project.

3. Analysis stage

At this analysis or assessment stage, an assessment is carried out based on the conditions of the application of the CSMS in the field and an assessment of the RKK document for the construction service provider.

IV. RESULTS AND DISCUSSION

A. General Project Description

The Nibung Baru Bridge construction project is located in Central Bangka Regency which connects Nibung Village and Simpang Perlang Village (Coordinates: -02^{O} 30' 46,61478" South Latitude, 106^{O} 23' 40,19982" East Longitude). The construction project for the Nibung Baru Bridge was conducted by the construction service provider PT. AVG. The 300 m long bridge was built because the Nibung Bridge was damaged by the annual flood disaster in Central Bangka Regency, besides that the construction of new bridges on the side of the existing bridge aimed to reduce the traffic load from the existing bridges which are each functioned. The image of the location of the Nibung Baru Bridge construction project can be seen in Figure 1 below.

Fig. 1. Location of the Nibung Baru Bridge Construction Project

Based on the Ministry of Public Works and Public Housing Regulation Number 10 of 2021 article 34, construction safety risks which are components of CSMS implementation activities consist of small, medium, and large construction safety risks. Medium construction safety risks must meet the following criteria:

a. Construction work with a self-estimated price value above Rp. 10,000,000.00 (one billion rupiah) up to Rp. 100,000,000.00 (one hundred billion rupiahs),
b. Employ construction workers totaling 25 (twenty-five) people up to 100 (one hundred) people.

The Nibung Baru Bridge construction project is a work project with a moderate construction safety risk because the contract value was Rp. 26,350,200,000.00 and employs a construction workforce of 59 (fifty-nine) people.

B. Vocational CSMS

The Construction Safety Management System (CSMS) on the Nibung Baru Bridge construction project is compiled into a single unit by standards and guidelines in the form of a Construction Safety Plan document. The Construction Safety Plan document was prepared by construction service providers and consulting service providers. The Construction Safety Plan document compiled by the construction service provider is in the form of a bid Construction Safety Plan document and an implementation Construction Safety Plan document.

The evaluation of the implementation of the Construction Safety Management System (CSMS) was carried out on the construction project of the Nibung Baru Bridge to determine the level of implementation of the CSMS by construction service providers on the project. The evaluation process is carried out with an audit system for evaluating the application of CSMS which refers to the Ministry of Public Works and Public Housing Regulation Number 10 of 2021 concerning Guidelines for Construction Safety Management Systems with a checklist method for 5 (five) elements along with the CSMS sub-elements. The results of the assessment of the

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implementation of the CSMS in each element of the CSMS are explained as follows

C. Labor Leadership and Participation in Construction Safety

Elements of leadership and workforce participation in construction safety are assessed based on the completeness of the documents in the Construction Safety Plan document. This element consists of 2 (two) sub-elements, namely:

1. The leadership's concern for internal and external issues

Based on the results of the assessment, it is known that the service provider has not implemented the leadership's concern for internal and external issues properly. This is evidenced by the absence of a determination of internal and external issues that affect the implementation of CSMS, but service providers already have an organizational structure for managing CSMS with competent personnel in their fields as well as the composition of duties, authorities, and responsibilities of the CSMS management organization which are determined in writing by the provider management. service.

2. Construction safety commitment

Based on the results of the assessment, service providers have not fully implemented construction safety commitments by regulations. The service provider already has a construction safety policy signed by the highest leadership, but the construction safety policy is not up to standard and there is no evidence of implementation of policy communication to all internal and external stakeholders. In addition, the provider has conducted a safety meeting as evidenced by photo documentation but has not been equipped with a monthly report on the implementation of the CSMS and proof of the attendance list of workers in the communication on the implementation of the CSMS.

D. Construction Safety Planning

Construction safety planning elements consist of 3 (three) sub-elements, namely:

1. Hazard Identification Risk, Control, and Opportunity Assessment

The service provider has determined Hazard Identification, Risk Assessment, Control and Opportunity (IBPRP) contained in the RKK, but has not been equipped with data related to accidents, has not reviewed the IBPRP in the event of an accident and does not have a Job Safety Analysis).

2. Action Plan (Goals and Programs)

The service provider has set the construction safety targets as stated in the Construction Safety Plan document, but there is no evidence of the implementation of communication of construction safety targets to all employees and workers and there is no monthly evaluation report on the targets.

3. Standards and Regulations

The service provider has identified construction safety regulations and standards but has not yet fully implemented the implementation of construction safety in the field in accordance with these standards and regulations

E. Construction Safety Support

The construction safety support element consists of 5 (five) sub-elements, which are as follows:

1. Resources

Based on a review of the Construction Safety Plan document, service providers have appropriately prepared the resources and infrastructure needed to implement the CSMS and allocate the CSMS costs for each construction activity.

2. Competence

The service provider guarantees that each worker works by their respective competencies and job descriptions, this is evidenced by proof of work competency certificates for construction safety personnel (construction safety officers / Construction OHS Experts) and workers by their field of work. However, there is no evidence of participation in the morning training of emergency response officers and first aid workers.

3. Concern

Service providers ensure that workers know the construction safety policy as evidenced by documents, photo documentation, socialization schedules, and analysis of training plans as needed.

4. Communication

Service providers already have a construction safety communication schedule but are not yet equipped with procedures.

F. Construction Safety Operation

The construction safety operation element consists of 2 (two) sub-elements, namely:

1. Construction Safety Planning

The service provider already has a person in charge for each stage of construction described in the Construction Safety Plan document but has not been equipped with work procedures and instructions related to construction safety operations and there is no evidence of implementation of construction safety risk control.

2. Operation Control

In this sub-element there are still several criteria that are not by the provisions, among others, there is no report on the implementation of the Construction Safety Plan document, job safety analysis (JSA) documents, SOPs/work instructions for tool operation, SOPs/work instructions for receiving materials, and photographs. documentation of the implementation of operational control in the field.

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G. Evaluation of the performance of the implementation of CSMS

The performance evaluation element of the implementation of CSMS consists of 3 (three) sub-elements, as follows:

1. Monitoring, measurement, and evaluation

The service provider has carried out monitoring, measurement, and evaluation activities as evidenced by photos of documentation as well as inspection and audit implementation schedules, but there is no report on the implementation of each activity.

2. Internal Audit

There is no report on the implementation of the internal audit of the implementation of construction safety carried out by the service provider.

3. Management Review

The service provider has not carried out a construction safety management review for continuous improvement.

H. Recapitulation of CSMS Assessment Results

Analysis by conducting an audit based on an assessment list in the form of a checklist that refers to the Ministry of Public Works and Public Housing Regulation Number 10 of 2021 assessed each element of the CSMS. Then the value of each element is multiplied by the weight of each assessment.

The total value of the number of scores multiplied by the weight of the assessment of each element is categorized into 3 (three) ratings, namely satisfactory, good, and less with the categories as shown in Table 1 below.

Table 1 CSMS Assessment Category

Category	Value Range
Satisfactory	80 ≤ Total Value ≤ 100
Good	60 ≤ Total Value < 80
Less	Total Value < 60

The results of the analysis and assessment of each element of the CSMS in the Nibung Baru Bridge construction project can be summarized as can be seen in Table 2 below.

Table 2 Recapitulation of the Suitability of the Application of Each Element of CSMS

No	Element	Rating Weight (%)	Value (%)
1	Labor leadership and participation in construction safety	25	19
2	Construction safety planning	20	12
3	Construction safety support	15	10
4	Construction safety operation	30	19
5	Performance evaluation of the implementation of CSMS	10	5
Total Value			**65**

Based on the results of the assessment of the implementation of the CSMS on the construction project of the Nibung Baru Bridge above, this project has a score of 65% so it is classified in the good category.

I. Repair Solution

The implementation of the CSMS on the Nibung Baru Bridge construction project has been implemented by construction service providers with a good category. As for the results of the review and assessment with the CSMS audit checklist, several criteria are not by applicable regulations. Therefore, solutions for improving the implementation of CSMS that need to be done include:

1. Service providers need to improve the Construction Safety Plan document by referring to the Ministry of Public Work and Public Housing Regulation Number 10 of 2021 concerning Construction Safety Management System Guidelines;
2. Service providers need to improve the implementation of construction safety in the work site field;
3. Service providers need to schedule and conducted a training, and simulations, and improve workforce competencies related to the implementation of CSMS in the work environment;
4. Service providers need to carry out OHS inspections and audits and carry out regular and scheduled evaluations;
5. Service providers need to complete reports on the implementation of CSMS implementation activities in the form of monthly routine reports and final activity reports.

V. CONCLUSIONS

A. Conclusion

Based on the results and discussion described above, the following conclusions can be obtained:

1. Application of CSMS on the Nibung Baru Bridge construction project implemented by PT. AVG has reached the good category with a percentage value of 65%;
2. The discrepancies found include, among others, that the Construction Safety Plan document format is not by regulations, the implementation of construction safety in the field is not appropriate, and training or competency improvement for workers related to the implementation of CSMS at work sites has not been carried out, inspections and internal audits have not been carried out to evaluate the implementation of the CSMS, and the report on the implementation of the CSMS is not yet complete;
3. Corrective actions that can be taken include improving the format of the Construction Safety Plan document, improving the implementation of construction safety in the field, conducting training related to the implementation of the CSMS for workers, carrying out inspections and internal audits of the implementation of

the CSMS, and completing reports on the implementation of the CSMS.

B. Suggestion

Based on the results and conclusions above, the suggestions that can be given to improve the implementation of CSMS are as follows:

1. Service providers or companies need to carry out internal audits and evaluations regularly to review the implementation of the CSMS is implemented and make continuous improvements;
2. Service providers or companies need to regularly review and follow the development of guidelines and regulations related to CSMS in an effort to fulfill the implementation of CSMS by applicable regulations;
3. This research was conducted to determine the level of implementation of CSMS carried out by construction service providers on bridge construction projects, it is recommended that further research review the level of worker productivity after the implementation of CSMS is carried out by applicable regulations

VI. REFERENCE

[1] Choudhry, Rafiq. M., Dongping Fang and Syed M Ahmed. (2008) Safety Management in Construction: Best Practice in Hong Kong. Journal of professional issues in engineering education and practice ASCE.

[2] Hartono, Widi, Purwandari, Yunita, and Sugirato. (2016). Analisis Sistem Manajemen dan Keselamatan Kerja (SMK3) terhadap Tingkat Kecelakaan Kerja pada Proyek Pembangunan Gedung di Tangerang dan Sekitarnya. E-Jurnal MATRIKS Teknik Sipil, (Pg. 208-215).

[3] Ibrahim. (2020). Analisis Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3) pada Proyek Konstruksi Gedung, Yogyakarta: Universitas Islam Indonesia.

[4] ILO. (2018). Meningkatkan Keselamatan Dan Kesehatan Pekerja Muda. https://www.ilo.org/

[5] Pangkey, Febyana. (2012). Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3) pada Proyek Konstruksi di Indonesia. Jurnal Ilmiah MEDIA ENGINEERING Vol. 2, No.2, Juli 2012 ISSN 2018-9334 (Pg. 100-113).

[6] Menteri Pekerjaan Umum dan Perumahan Rakyat. (2021). Peraturan Menteri Pekerjaan Umum dan Peurmahan Rakyat Nomor 10 Tahun 2021 tentang Pedoman Sistem Manajemen Keselamatan Konstruksi, Kementerian Pekerjaan Umum dan perumahan Rakyat.

[7] Menteri Tenaga Kerja dan Transmigrasi Republik Indonesia. (1980). Peraturan Menteri Tenaga Kerja dan Transmigrasi Nomor 1 Tahun 1980 tentang Keselamatan dan Kesehatan Kerja pada Konstruksi Bangunan, Kementerian Tenaga Kerja dan Transmigrasi Republik Indonesia.

[8] Pemerintah Indonesia. (2012). Peraturan Pemerintah Republik Indonesia Nomor 50 Tahun 2012 tentang Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja, Kementerian Sekretariat Negara RI.

[9] Steven dan Waty Mega. (2020). Analisis Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja pada Pembangunan Gedung dan Perumahan, Jurnal Mitra Teknik Sipil, Vol. 3, No. 3, Agustus 2020 (Pg. 547-554)

[10] Pemerintah Indonesia. (1970). Undang-Undang No. 1 Tahun 1970 tentang Keselamatan Kerja.

[11] Pemerintah Indonesia. (2017). Undang-Undang Nomor 2 Tahun 2017 tentang Jasa Konstruksi.

[12] Wahyuno, Danang Eko. (2021). Penerapan Sistem Manajemen Keselamatan Konstruksi pada Proyek Klasifikasi Kecil Paska Diterbitkannya Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 21/PRT/M/2019. Semarang: ISBN 978-602-361-385-4.