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Assessing Construction Safety Management System in a High-Risk Hospital Construction Project

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Abstract
This research evaluated the implementation of the Construction Safety Management System (CSMS) in a high-risk hospital construction project undertaken by PT. Harafiel Tri Jaya. Despite the widespread adoption of CSMS, there remains a significant gap in specific, in-depth studies evaluating its on-site application and identifying nuanced non-compliance issues, particularly in high-risk projects. This study addresses this gap by aiming to assess the level of compliance with the Indonesian Minister of Public Works and Public Housing/ PUPR Regulation No. 10 of 2021 and identify areas for improvement. A qualitative case study approach was employed. The project was selected as the research sample because it is categorized as high-risk, with a contract value exceeding IDR 50 billion and a duration of over one year. The research tools comprised a structured observation checklist, semi-structured interview guidelines, and content analysis of project documents. The findings revealed a satisfactory level of CSMS compliance (89%), but also highlighted several areas needing improvement, such as risk assessment integration, safety program enforcement, worker competency, risk control, 5R program implementation, hazardous material handling, emergency response plans, and internal audits. The study underscores the necessity for continuous improvement in CSMS implementation, even in projects demonstrating high compliance. Recommendations include prioritizing proactive safety measures, investing in worker training, and establishing robust emergency response protocols to enhance overall construction safety and project success.

Keywords: *construction safety management system; high risk; hospital construction; occupational safety and health*

Abstrak
Penelitian ini mengevaluasi penerapan Sistem Manajemen Keselamatan Konstruksi (SMKK) dalam proyek konstruksi rumah sakit berisiko tinggi yang dikerjakan oleh PT. Harafiel Tri Jaya. Meskipun SMKK telah diadopsi secara luas, masih terdapat kesenjangan yang signifikan dalam studi spesifik dan mendalam yang mengevaluasi penerapannya di lapangan dan mengidentifikasi masalah ketidakpatuhan yang bernuansa, terutama dalam proyek-proyek berisiko tinggi. Tujuan penelitian ini adalah untuk menilai tingkat kepatuhan terhadap Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat/PUPR No. 10 Tahun 2021 dan mengidentifikasi area yang perlu ditingkatkan. Pendekatan studi kasus kualitatif digunakan. Proyek ini dipilih sebagai sampel penelitian karena dikategorikan berisiko tinggi, dengan nilai kontrak melebihi Rp50 miliar dan durasi lebih dari satu tahun. Temuan penelitian menunjukkan tingkat kepatuhan SMKK yang memuaskan (89%), tetapi juga menyoroti beberapa area yang perlu ditingkatkan, seperti integrasi penilaian risiko, penegakan program keselamatan, kompetensi pekerja, pengendalian risiko, penerapan program 5R, penanganan bahan berbahaya, rencana tanggap darurat, dan audit internal. Penelitian ini menggarisbawahi perlunya peningkatan berkelanjutan dalam penerapan SMKK, bahkan dalam proyek yang menunjukkan kepatuhan tinggi. Rekomendasi yang diberikan antara lain memprioritaskan langkah-langkah keselamatan proaktif, berinvestasi dalam pelatihan pekerja, dan menetapkan protokol tanggap darurat yang kuat untuk meningkatkan keselamatan konstruksi secara keseluruhan dan keberhasilan proyek.

Kata Kunci: *sistem manajemen keselamatan konstruksi; risiko tinggi; konstruksi rumah sakit; keselamatan dan kesehatan kerja*

1. Introduction

The construction sector in Indonesia is experiencing rapid growth, but it is accompanied by a high rate of work accidents[1]–[4]. Data from *BPJS Ketenagakerjaan* (Indonesian Workers Social Security Agency) shows an average of 360,635 work accident cases occur annually [5], indicating the need for

serious attention to occupational safety and health (OSH) in this industry. The implementation of an Occupational Safety and Health Management System (OSHMS) is crucial to control the risk of work accidents and create a safe and productive work environment [6]–[8].

The unique characteristics of construction projects, such as open work locations, the use of heavy equipment, and the involvement of many workers with diverse backgrounds, demand the implementation of a specific and comprehensive OSHMS [9], [10]. Regulation of the Indonesian Minister of Public Works and Public Housing (PUPR Regulation) No. 10 of 2021 concerning Guidelines for Construction Safety Management System (CSMS) serves as a reference in effectively managing construction activities, ensuring construction safety, and protecting workers, the community, and the surrounding environment [11].

This research focuses on evaluating the implementation of CSMS in the Padang Eye Center Special Eye Hospital Development Project. This project is categorized as high-risk due to its significant potential hazards to safety and the environment. By conducting a comprehensive evaluation of the CSMS implementation, this research aims to identify the level of compliance of CSMS implementation with PUPR Regulation No. 10 of 2021, as well as analyze problems and provide recommendations for improvement.

2. Materials and Methods

This research adopts a qualitative approach with a case study design to evaluate the implementation of the Construction Safety Management System (CSMS) in the Padang Eye Center Special Eye Hospital Development Project, carried out by PT. Harafiel Tri Jaya. The case study was chosen because it allows for an in-depth understanding of a specific phenomenon, namely the implementation of CSMS, within the real context of a high-risk construction project.

The research was conducted chronologically through several stages. The initial stage involved a literature review to gather information from various sources, including regulations, CSMS standards, and relevant scientific literature, to build a strong theoretical framework. Subsequently, field observations were conducted at the project site to directly observe the implementation of CSMS using an observation checklist developed based on PUPR Regulation No. 10 of 2021. In-depth interviews were also conducted with various stakeholders, such as project management, OSH supervisors, and field workers, to gather information regarding their understanding, perceptions, and experiences related to CSMS implementation. This study conducted interviews with 10 key informants, including the project manager, HSE coordinator, and several field workers from different divisions to ensure a comprehensive perspective. Additionally, project documents were analyzed using content analysis techniques to obtain secondary data on CSMS implementation.

The data obtained from observations, interviews, and document studies were then analyzed qualitatively using coding and categorization techniques. This analysis aimed to identify the level of compliance of CSMS implementation with PUPR Regulation No. 10 of 2021, as well as reveal the problems and challenges in its implementation. Based on the results of the data analysis, specific and implementable recommendations for improvement were formulated to enhance OSH performance and construction safety in the project.

The research sample is the Padang Eye Center Special Eye Hospital Development Project carried out by PT Harafiel Tri Jaya (HTJ), which was chosen because it falls into the category of high-risk construction projects. The research tools used include an observation checklist, interview guidelines, and qualitative data analysis software. Testing was conducted through field observations and interviews to assess the compliance of CSMS implementation with established standards, while data acquisition was carried out through recording observation results, transcribing interviews, and collecting project documents related to OSH.

3. Results and Discussion

Evaluation of General Requirements Compliance

Every service user and service provider in the provision of construction services must implement CSMS. This is stated in Article 2 paragraph (1) of the PUPR Regulation No. 10 of 2021 concerning Guidelines for Construction Safety Management System. HTJ's Padang Eye Center Special Eye Hospital Development Project falls under high-risk work, where its implementation can endanger public safety and the environment. Therefore, HTJ has implemented CSMS in the work environment in accordance with the PUPR Regulation No. 10 of 2021.

Compliance of HTJ's CSMS with the PUPR Regulation No. 10 of 2021

In general, HTJ in the Padang Eye Center Special Eye Hospital Development Project has implemented CSMS based on the Construction Safety Management System Guidelines. The assessment of CSMS implementation refers to the PUPR Regulation No. 10 of 2021 with several elements in accordance with Article 6 paragraph (2) including: a. Leadership and worker participation in Construction Safety; b. Construction Safety Planning; c. Construction Safety Support; d. Construction Safety Operations; e. Construction Safety Performance Evaluation.

The criteria for the implementation of the Construction Safety Management System by HTJ in the Padang Eye Center Special Eye Hospital Development Project based on the Minister of Public Works and Public Housing Regulation No. 10 of 2021 can be seen in **Table 1** below.

Table 1. Problems in the Implementation of CSMS

No.	Criteria No.	Criteria	Evidence of Findings
1	B.1.1	The Service Provider establishes Hazard Identification, Risk Assessment, Control, and Opportunities.	The company has established Hazard Identification, Control, and Opportunities as stated in the JSA form, but risk assessment is not included in the JSA.
2	B.2.7	The service provider ensures that the construction safety program is implemented.	The company has ensured that the program is implemented, but the implementation is not strict. There are still findings of workers who do not use standard PPE that has been provided and there are still tools that are not placed in their proper places and there are also workers who smoke while working.
3	C.2.5	The Service Provider employs workers who have competency certificates according to their field.	There are still some workers employed by the company from various educational backgrounds.
4	D.1.4	The Service Provider carries out construction safety risk control by eliminating hazards; replacing processes, operations, materials, or equipment with those that are not dangerous; conducting technical engineering, carrying out administrative controls and using adequate personal protective equipment.	The company has carried out construction safety risk control but it is not yet optimal. This is because in the aspect of eliminating hazards there are still potential hazards caused by worker negligence such as scattered building debris and the use of PPE which is sometimes still neglected by workers.
5	D.2.13	The Service Provider implements the 5R (*Ringkas, Rapi, Resik, Rawat dan Rajin*/ Concise, Neat, Clean, Careful, Diligent) program	The company does not carry out these 5R activities optimally
6	D.2.16	The Service Provider makes procedures for receiving, storing, using and disposing of toxic and hazardous materials with socialization in accordance with the Material Safety Data Sheet (MSDS)	The company carries out independent disposal of toxic and hazardous waste and reuses paint cans
7	D.2.33	The Service Provider makes a plan and implements Emergency Response (floods, earthquakes and other natural disasters)	The company already has a plan and implements a Fire Emergency Response program, but does not yet have an earthquake and tsunami emergency response plan
8	E.2.1	The service provider conducts an internal audit regarding the implementation of construction safety	The company has just implemented monitoring in the form of daily inspections and safety patrols in its implementation
9	E.2.2	Internal audit results are documented	The company does not carry out internal audits

Assessment of the Level of CSMS Implementation at HTJ

The assessment of the level of CSMS implementation can be carried out based on the Indonesian Minister of Manpower Regulation No. 26 of 2014 [12] concerning the Assessment of the Implementation

of the OSHMS. Article 30, it is explained that the level of achievement for companies that have conducted an assessment of the implementation of OSHMS includes:

a. The level of achievement of implementation 0 - 59% including the level of assessment of implementation, is less.
b. The level of achievement of implementation 60 - 84% including the level of assessment of implementation, which is good.
c. The level of achievement of implementation 85 - 100% including the level of assessment of implementation, is satisfactory.

Table 1 shows the results of the implementation of HTJ's CSMS in the Padang Eye Center Special Eye Hospital Development Project based on the PUPR Regulation No. 10 of 2021 concerning Guidelines for Construction Safety Management System. It can be concluded that HTJ has implemented 5 CSMS elements. In the assessment that was carried out based on 86 criteria, HTJ in this project met 77 criteria out of 86 criteria (89%) with a satisfactory level of implementation achievement.

Problems and Solutions in the Implementation of HTJ's CSMS

Although in general the implementation of CSMS at HTJ is good, there are still several problems that need attention.

- Lack of risk assessment. Although the company has established Hazard Identification, Control, and Opportunities as stated in the JSA form, risk assessment has not been included. This can hinder the effectiveness of risk control because there is no quantification of the level of risk from each identified hazard.
- Lack of strictness in implementing the construction safety program. The company has ensured that the construction safety program is implemented, but its implementation is not strict. There are still workers who do not use standard PPE, tools that are not placed in their proper places, and workers who smoke while working. This indicates that there is still a gap between policy and implementation in the field, which can increase the risk of accidents.
- Suboptimal worker competence. There are still some workers employed by the company from various educational backgrounds, who may not yet have the competence according to their field. This can affect the quality of work and increase the risk of accidents due to human error.
- Construction safety risk control is not yet maximized. Although the company has carried out construction safety risk control, there are still potential hazards caused by worker negligence, such as scattered building debris and the use of PPE which is sometimes still neglected.
- Not implementing 5R activities. The company has not implemented 5R activities (Sort, Set in Order, Shine, Standardize, and Sustain) optimally. This can cause the work environment to become disorganized and increase the risk of accidents due to tripping, slipping, or being hit by objects.
- B3 material handling procedures are not yet appropriate. The company carries out independent B3 waste disposal and reuses paint cans, which is not in accordance with the procedures for receiving, storing, using, and disposing of B3 materials in accordance with the Material Safety Data Sheet (MSDS). This can pose a risk of environmental pollution and health problems for workers.
- Does not yet have an earthquake and tsunami emergency response plan. Although the company has a plan and implements a fire emergency response program, it does not yet have an earthquake and tsunami emergency response plan. Considering that the project location is in a disaster-prone area, this can increase the risk of loss of life and property if a disaster occurs.
- Has not carried out an internal audit. The company has only implemented monitoring in the form of daily inspections and safety patrols, but has not yet carried out an internal audit regarding the implementation of construction safety. Internal audits are important to evaluate the effectiveness of CSMS implementation comprehensively and independently.

CSMS Problem Solutions

To overcome these problems, HTJ can take several corrective actions, including:

- Adding risk assessments to JSA. The company needs to add risk assessments to each construction work activity, so that the determination of Hazard Identification, Risk Assessment, Control, and Opportunities can be made to minimize the chance of work accidents [13].
- Strengthening the implementation of the construction safety program. The company must strengthen the construction safety program that is implemented by always reminding them in every activity and reprimanding every violation committed by workers, and even giving sanctions

directly in the field. In addition, the company can also provide rewards for workers who consistently implement OSH [14], [15].

- Improving worker competence. HTJ needs to conduct training and certification for workers who do not yet have the competence in their field. The company can also collaborate with credible training or certification institutions to improve worker competence [16], [17].
- Increasing the effectiveness of risk control. HTJ needs to re-identify potential hazards in the workplace and implement more effective control measures. For example, they can replace damaged or unsafe equipment, improve workplace layout, and increase supervision of the use of hazardous materials [18].
- Implementing the 5R program. HTJ needs to create a more structured and measurable 5R program, and involve all workers in its implementation. For example, they can make a regular schedule for 5R activities, provide 5R training to workers, and conduct periodic audits to evaluate the implementation of the 5R program [19].
- Improving toxic and hazardous material handling procedures. HTJ needs to improve procedures for receiving, storing, using, and disposing of materials in accordance with the Material Safety Data Sheet (MSDS). The company also needs to provide training to workers on the safe handling of materials [18].
- Preparing an earthquake and tsunami emergency response plan. HTJ needs to prepare a comprehensive emergency response plan, including evacuation procedures, victim handling, and post-disaster recovery. The company also needs to conduct emergency response simulations periodically to ensure the readiness of all workers in dealing with disasters [20].
- Conducting internal audits regularly. HTJ needs to conduct internal audits regularly to evaluate the effectiveness of CSMS implementation. Internal audits can be carried out by the company's internal team or by independent external parties [21]. The results of internal audits must be documented and followed up with necessary corrective actions.

By implementing these corrective actions, it is hoped that the implementation of CSMS HTJ can be more optimal, so as to improve OSH performance, prevent work accidents, and create a safe and healthy work environment for all workers.

Study Limitations

This study has several limitations that should be considered. First, as a qualitative case study, the findings are specific to the Padang Eye Center Special Eye Hospital Development Project and may not be generalizable to all construction projects. Second, the data collection period was limited, which provides a snapshot of the project's safety performance but does not capture its full lifecycle. This short duration may not fully reflect long-term trends or the effectiveness of all implemented safety measures. Third, although interviews were conducted with key informants, the study relies on self-reported data which may be subject to social desirability bias. Future research could address these limitations by conducting longitudinal studies, expanding the sample to include multiple projects of varying scales and risks, and incorporating quantitative methods for a more comprehensive assessment.

4. Conclusion

The evaluation of CSMS implementation at the Padang Eye Center Special Eye Hospital Development Project revealed that PT Harafiel Tri Jaya has achieved a satisfactory level of compliance, meeting 89% of the assessed criteria. However, several areas require improvement, including risk assessment integration, enforcement of safety programs, worker competency enhancement, risk control optimization, 5R program implementation, proper handling of hazardous materials, development of comprehensive emergency response plans, and regular internal audits. Addressing these issues will contribute to a safer and healthier work environment, minimizing accidents, and promoting overall project success. The findings of this research emphasize the importance of continuous improvement in CSMS implementation, even in projects with high compliance levels. It is recommended that construction companies prioritize proactive safety measures, invest in worker training and development, and establish robust emergency response protocols to ensure the well-being of all stakeholders involved in construction projects.

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