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Evaluasi Implementasi Sistem Manajemen Keselamatan Konstruksi (SMKK) Berdasarkan Permen PUPR No.10 Tahun 2021 pada Proyek Infrastruktur Permukiman Kota Lama Kesawan Medan

Evaluation of the Implementation of the Construction Safety Management System (SMKK) Based on Regulation of the Minister of Public Works and Housing No. 10 of 2021 in the Kesawan Old Town Residential Infrastructure Project, Medan

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Abstrak

Sektor konstruksi merupakan salah satu sektor industri dengan tingkat risiko kecelakaan kerja yang tinggi karena karakteristik pekerjaan yang kompleks, lingkungan kerja yang dinamis, serta keterlibatan berbagai pihak dalam pelaksanaan proyek. Data Kementerian Ketenagakerjaan menunjukkan bahwa jumlah kecelakaan kerja di Indonesia terus mengalami peningkatan dalam beberapa tahun terakhir, yaitu sebanyak 298.137 kasus pada tahun 2022, meningkat menjadi 370.747 kasus pada tahun 2023, dan mencapai 462.241 kasus pada tahun 2024. Dari jumlah tersebut, sektor konstruksi menyumbang sekitar 0,8% kasus pada tahun 2023 dan sekitar 0,92% pada tahun 2024 atau sekitar 4.233 kasus kecelakaan kerja di sektor jasa konstruksi. Kondisi ini menunjukkan bahwa penerapan Sistem Manajemen Keselamatan Konstruksi (SMKK) menjadi aspek penting dalam upaya pencegahan kecelakaan kerja. Penelitian ini bertujuan untuk mengevaluasi implementasi SMKK pada proyek pembangunan infrastruktur permukiman Kota Lama Kesawan di Kota Medan berdasarkan ketentuan Peraturan Menteri PUPR Nomor 10 Tahun 2021. Penelitian menggunakan metode deskriptif dengan pendekatan campuran (mixed method) melalui observasi lapangan, telaah dokumen, dan wawancara dengan pihak terkait. Instrumen penelitian menggunakan daftar simak pemantauan dan evaluasi SMKK dengan metode penilaian Scoreing biner. Hasil penelitian menunjukkan bahwa tingkat kelengkapan dokumen SMKK mencapai 97,8% dengan kategori sangat memuaskan, sedangkan implementasi SMKK di lapangan mencapai 100%. Temuan ini menunjukkan adanya konsistensi antara perencanaan keselamatan konstruksi dan pelaksanaan di lapangan. Namun demikian, beberapa aspek masih perlu ditingkatkan, khususnya terkait sosialisasi kesehatan pekerja dan kelengkapan administrasi inspeksi material berbahaya.

Kata kunci: Keselamatan Konstruksi; SMKK; Manajemen Risiko; Kecelakaan Kerja; Proyek Konstruksi.

Abstract

The construction sector is recognized as one of the industries with a high risk of occupational accidents due to the complexity of work activities, dynamic working environments, and the involvement of multiple stakeholders in project implementation. Data from the Ministry of Manpower of Indonesia show that occupational accident cases have increased in recent years, reaching 298,137 cases in 2022, 370,747 cases in 2023, and 462,241 cases in 2024. The construction sector contributed approximately 0.8% of cases in 2023 and 0.92% in 2024, equivalent to about 4,233 occupational accidents in construction services. This condition highlights the importance of implementing an effective construction safety management system to reduce workplace accidents. This study aims to evaluate the implementation of the Construction Safety Management System (SMKK) in the Kesawan Old Town residential infrastructure development project in Medan City based on the Regulation of the Minister of Public Works and Housing

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No. 10 of 2021. The study employed descriptive design with a mixed-method approach through field observations, document reviews, and interviews with relevant stakeholders. The research instrument used a monitoring and evaluation checklist with a binary scoring method. The results indicate that the completeness of SMKK documentation reached 97.8%, categorized as highly satisfactory, while field implementation achieved 100%. These findings demonstrate strong consistency between safety planning and its implementation in the project. However, improvements are still needed in worker health awareness programs and hazardous material inspection documentation.

Keywords**:** *Construction Safety; Construction Safety Management System; Risk Management; Occupational Accident; Construction Project.*

1. INTRODUCTION

Construction work encompasses various activities related to the construction, maintenance, repair, demolition, and reconstruction of buildings or infrastructure. The construction sector plays an important role in supporting infrastructure development and national economic growth. However, this sector is also recognized as one of the industries with a high risk of occupational accidents due to the complexity of tasks, dynamic working environments, and the involvement of multiple stakeholders with diverse competencies.

Data from the Ministry of Manpower indicate that the number of occupational accidents in Indonesia has continued to increase in recent years. In 2023, a total of 370,747 occupational accident cases were recorded, which increased to 462,241 cases in 2024. Of these incidents, the construction sector contributed approximately 0.8% of cases in 2023 and increased to about 0.92% in 2024. Although the percentage is relatively small compared to other sectors, the high-risk nature of construction work requires special attention in preventing occupational accidents.

To improve safety performance in the construction sector, the Indonesian government has established policies for the implementation of the Construction Safety Management System (SMKK) through the Regulation of the Minister of Public Works and Housing No. 10 of 2021. This regulation serves as a guideline for planning, implementing, controlling, and evaluating construction safety to protect workers, the surrounding community, and the environment.

In addition to technical and administrative aspects, behavioural factors play a crucial role in construction safety performance. Previous studies indicate that unsafe behaviour contributes significantly to occupational accidents, accounting for approximately 85% of accident causes. Furthermore, research by Ginting et al. (2021) demonstrated that occupational safety and health (K3) promotion has a significant effect on improving the use of personal protective equipment (PPE) and reducing unsafe behaviour among workers. This finding highlights that safety awareness and compliance are strongly influenced by continuous safety communication and promotion programs, which are essential components in developing a sustainable safety culture[1].

Several previous studies have examined the implementation of safety management systems in construction projects. Yuliana et al. (2025) reported that the level of construction safety implementation in a building project in Bali reached 88.37%, categorized as satisfactory. Meanwhile, Pasaribu and Susilawati (2024) found that the implementation of safety management systems in road construction projects showed a compliance rate of approximately 80%. However, most of these studies focus on construction projects with medium to high risk levels, such as high-rise building projects or transportation infrastructure projects.

Studies on SMKK implementation in low-risk construction projects remain limited, particularly in projects located in areas with high environmental and social complexity such as historic urban areas or heritage zones. In addition, research using official evaluation instruments based on Ministerial Regulation No. 10 of 2021 to assess the conformity between safety planning documents and field implementation is still relatively scarce. This study contributes to the scientific literature by evaluating the implementation of the Construction Safety Management System using monitoring and evaluation instruments directly referring to the provisions of Ministerial Regulation No. 10 of 2021, thereby providing a more structured and regulation-based assessment.

Unlike most previous studies focusing on medium- to high-risk construction projects, this research examines the implementation of SMKK in a low-risk construction project with complex environmental, traffic, and social conditions, namely residential infrastructure development in a historic urban area. Furthermore, this study not only assesses the administrative completeness of construction safety documents but also compares them directly with field implementation through observation and verification of safety indicators. This approach provides a more comprehensive overview of the consistency between construction safety planning and its practical implementation.

Based on these considerations, this study aims to evaluate the implementation of the Construction Safety Management System (SMKK) in the Kesawan Old Town residential infrastructure development project in Medan City based on the provisions of the Regulation of the Minister of Public Works and Housing No. 10 of 2021 by assessing the conformity between safety documentation completeness and the implementation of construction safety practices in the field.

2. METHODS

This study employed a descriptive research design using a mixed-method approach combining quantitative and qualitative analysis. The quantitative approach was used to assess the level of compliance with SMKK implementation indicators based on a scoring system, while the qualitative approach was used to describe the conditions of construction safety implementation through field observations and interviews with relevant stakeholders. The research was conducted in the Kesawan Old Town residential infrastructure development project located in Medan City, North Sumatra.

Data was collected through three main techniques, namely field observation, project document review, and interviews with parties involved in project implementation. The research instrument utilized the Monitoring and Evaluation Checklist for Construction Safety Management System implementation referring to the provisions of Ministerial Regulation No. 10 of 2021.

The instrument consists of several indicators covering aspects such as technical document readiness, compliance with construction safety requirements, workforce competency, equipment feasibility, material quality, traffic management planning, and environmental management planning. The assessment used a binary scoring method in which a score of 1 was given if the indicator was available and complied with the requirements, while a score of 0 was given if the indicator was unavailable or did not comply. The percentage of compliance was calculated using the following formula:

$$\textbf{Compliance Percentage} = \frac{\textit{Number of fulfilled indicators}}{\textit{Total number of indicators}} \times 100\%$$

85–100% = Satisfactory

60–84% = Good

0–59% = Poor

To enhance data validity, this study applied source triangulation by comparing field observations, project documents, and interview results with contractors, supervising consultants, and the Commitment-Making Official (PPK).

3. Result

The evaluation results of the SMKK implementation documents indicate that the project demonstrated a very good level of administrative readiness with a compliance percentage of 97.8%. Most evaluation components such as technical documentation readiness, traffic management plans, and environmental management plans fulfilled all required indicators. However, several indicators were not fully satisfied. One of the deficiencies identified was the absence of health awareness socialization related to HIV/AIDS prevention among project workers, which resulted in a slightly lower score in the compliance component of construction safety requirements at 97.4%. In addition, the absence of a specific inspection form for hazardous materials or chemicals resulted in the material usage component achieving a score of 87.5%.

Explanation results are made clear and concise without providing interpretation and extrapolation of the results being reported. Researchers don't need to provide explanations on the methods at the beginning of the results. The entire results of the analysis and experiments were reported in the manuscript including the results of the analysis of Sensitivities and secondary analysis. Reported results are not limited to significant statistic-only results or results selected to support research hypotheses. It is worth mentioning the number of observations in each analysis, as well as information on missing data, how to handle and analysis.

Table 1. Results of the SMKK Document Evaluation

No	Criteria	Score	Observation Result
1	An internal audit related to Construction Safety has been conducted.	1	The internal audit was conducted on August 16, 2023, with an internal auditor achievement score of 84.09%, categorized as **"GOOD"** in the implementation assessment.
	Technical Document Readiness	1	
A.1	**Planning**		
2	SMKK conceptual design	1	There is an SMKK Conceptual Design as stated in the RKK document No: BAP/KSWN-MDN/RKK/2022
3	Detailed Engineering Design (DED) drawings prepared by the Design Consultant	1	The DED drawings included in the project documentation are available in both softcopy and hardcopy formats.
4	Budget for the implementation of the Contractor's SMKK	1	The budget allocation for the implementation of the Contractor's SMKK is included in the Bill of Quantities (BOQ).
5	Technical Specifications	1	The technical specifications are available in both softcopy and hardcopy formats.
A.2	**Implementation**		
6	Project location map and description	1	The project location map is available in the RKPPL and RMLLP documents in both softcopy and hardcopy formats.
7	Implementation schedule / S-curve	1	Available in both softcopy and hardcopy formats.
8	Minutes of PCM / Pre-Construction Meeting	1	Available in both softcopy and hardcopy formats.
9	Work drawings	1	Available in both softcopy and hardcopy formats.
10	Supervision Work Plan	1	Available in the program documents prepared by the consultant.
11	Work Permit (Permit to Work / Request of Work)	1	Included in the RKK document in the form of work submission for each location and each work activity, as well as work reporting documentation.
12	Work supervision implementation method	1	Available in the work permit submission documents.
13	Implementation of supervision activities	1	Documented in weekly reports and work progress reports.
14	Inspection report	1	Available in the monthly HSE report.
	Technical Document Readiness	**13 100%**	
15	SMKK Documents		
a.	Construction Safety Plan (RKK) prepared by the Contractor	1	Available in document No.Doc: BAP/KSWN-MDN/RKK/2022
b.	Construction Safety Implementation Plan (RMPK) by the Contractor	1	Available in document No.Doc: BAP/KSWN-MDN/T-RMPK/2022
c.	Quality Program prepared by the Supervising Consultant	1	Available in document No.Doc: 001/PROG-MUTU/CD/KL-EP/VII/2022
d.	Construction Safety Plan (RKK) for Supervision prepared by the Supervising Consultant	1	Available in document No.Doc: 001/RKK/CD/KL-EP/VII/2022
e.	Environmental Management Plan (RKPPL) prepared by the Contractor	1	Available in document No.Doc: BAP/KSWN-MDN/HSE-RKPPL/2022
f.	Environmental Monitoring Plan (RMLLP) prepared by the Contractor	1	Available in document No.Doc: BAP/KSWN-MDN/HSE-RMLLP/2022
16	Contractor Organizational Structure, including the entire UKK organization	1	Included in the RKK and reports; the UKK structure is presented in the HSE section, consisting of 1 Senior Construction Safety Expert as the head of the UKK, 2 Intermediate Construction Safety Experts, and 1 Junior Construction Safety Expert holding certification from BNSP.
17	Supervising Consultant Organizational Structure	1	Included in the RKK document. The commitment of each contractor entity is signed by the leadership and

No	Criteria	Score	Observation Result
			approved by the PPK and PKP officials.
18	Commitment to the Construction Safety Action Plan by the Supervising Consultant	1	Available in the contractor's Construction Safety Plan document.
19	Results of Identification of External and Internal Project Issues	1	Available in the RKK document.
20	Support for Socialization and Training		
a.	First Aid Training (P3K)	1	Documented in reports of simulation activities and certified training programs.
b.	Construction Safety Training (Basic Safety)	1	Documented in reports and conducted through weekly safety induction activities.
c.	Socialization of Construction Safety Commitments and Policies	1	Documented in reports and conducted on a weekly basis.
d.	Records of all training attended by workers are available and archived for a specific period	1	Available in reports, activity documents, documentation records, and training certificates.
e.	Socialization on the handling of hazardous chemicals and utilities around the work area	1	MSDS socialization conducted in the warehouse with MSDS documentation displayed.A
f.	HIV/AIDS Socialization	0	Not implemented
g.	Emergency Response Simulation	1	Earthquake and fire emergency simulations have been conducted, and supporting documentation is available in the report.
21	Hazard Identification, Risk Assessment, and Risk Control (IBPRP/HIRAO) derived from the Work Breakdown Structure (WBS)	1	Available in the RKK document under the IBPRP section.
22	General Objectives and Program	1	Available in the RKK and monthly reports.
23	Specific Objectives and Programs	1	Available in the RKK and monthly reports
24	Construction Safety Analysis (AKK)/CSA for specific works derived from work methods	1	Available in the RKK document.
25	Standard Operating Procedures (SOP)		
a.	Work Permit SOP	1	Work permit submission forms and workflow are available in the RKK and in work implementation reports.
b.	SOP for Inspection and Test Plan (ITP)	1	Implementation forms for ITP are available in the RMPK document.
c.	SOP for Changes in Work Implementation	1	Work change forms are available in the management procedure documents for changes and document addendums.
d.	SOP for Testing and Commissioning / Function Feasibility Testing (Quality Inspection)	1	Inspection forms and test plans are available in the RMPK document.
e.	Policy on Working Hours Regulation	1	Included in the staff employment contract.
f.	SOP/IK and documentation of environmental measurement results at the workplace	1	Available in the environmental testing report conducted by the Medan Industrial Standardization and Service Center.
g.	SOP/Policy/Rules for Vehicle Safety	1	Available in the traffic safety management procedure document No.2-000-57-02/04.
26	Occupational Safety Communication		
a.	Safety Induction	1	Plans, reports, and documentation are available in the monthly K3 report.
b.	Safety Briefing	1	Plans, reports, and documentation are available in the monthly K3 report.
c.	Toolbox Meeting		Plans, reports, and documentation are available in the monthly K3 report.
d.	HSE Meeting		Plans, reports, and documentation are available in the monthly K3 report.
27	Implementation of MCU, fit-to-work assessment, and periodic health examination of workers	1	Meeting minutes, inspection documents, and supporting documentation are available.
28	Regulations related to worker accommodation (mess) and its inspection	1	In accordance with the Circular Letter of the Minister of Public Works and Housing No.10/SE/M/2022; the

No	Criteria	Score	Observation Result
			Audit SOP and internal management review documents are available.
29	Audit Guidelines and Program	1	Available in the Audit Standard Operating Procedure (SOP) document and the internal management review documentation
30	Monthly Construction Safety Report	1	Monthly reports are available in accordance with the Regulation of the Minister of Public Works and Housing No.10 of 2021, Attachment on Implementation Reports.
	Compliance with Construction Safety Requirements	**37 97,4%**	
31	Proof of competency certification for expert and skilled personnel of the executing contractor	1	Available in the contract document attachments: Construction Safety Expert, Cultural Heritage Expert, Building Expert, Construction Management Expert, Quality Management System Expert, MEP Expert, and Geotechnical Expert.
32	Proof of competency certification for supervising consultant experts	1	Available in the contract attachments: Construction Management Expert, Architecture Expert, Building Expert, MEP Expert, Construction Safety Expert, Landscape Expert, and Road Expert.
33	Heavy equipment operators possess Operator License (SIO)	1	SIO certificates for lifting and excavation equipment operators (Excavator) are available.
34	Proof of participation in BPJS Employment (social security)	1	Available in the form of BPJS Employment membership certificates No. B/082022
35	Periodic training for workers	1	Training activities such as APAR (fire extinguisher training), First Aid (P3K), and Working at Height are conducted, supported by documentation and records.
	Utilization of Competent Workforce	**5 100%**	
36	Heavy equipment possesses Operation Feasibility License (SILO)	1	SILO certificate for Excavator equipment is available.
37	Equipment feasibility inspection (pre-use inspection)	1	Checklist documents are available in the monthly HSE report
38	Equipment operation manual available in Indonesian	1	Equipment operation manual is available in the warehouse.
39	Equipment calibration	1	Calibration certificates for equipment are available.
40	Lifting capacity calculation (lifting plan)	1	Calculation results for lifting equipment capacity (20-ton crane) are available from the material vendor.
41	Use of subcontractors and equipment vendors	1	Equipment support is provided by the material vendor.
	Use of Equipment that Meets Feasibility Standards	**6 100%**	
42	Material test report	1	Concrete test results and steel tensile test results from POLMED laboratory are available.
43	Inspection and Test Plan (ITP)	1	Material inspection documents, acceptance criteria, and hold point procedures are available in the RMPK document.
44	SOP for Materials		
a.	SOP for Material Ordering and Receiving	1	Procurement procedures for goods and services are available.
b.	SOP for Material Storage		Procurement procedures for goods and services are available.
c.	SOP for Material Use	1	Procurement procedures for goods and services are available.
45	Inspection forms for hazardous materials used, handled, or stored in the workplace	0	Inspection forms are not available.

No	Criteria	Score	Observation Result
46	Quantity/volume measurement documents prepared by the supervisor	1	Mutual Check 0 (MC0) documents and joint field inspections are available.
47	Control of subcontractors and material vendors	1	Available in the material vendor contract documentation.
	Use of Materials that Meet Quality Standards	**7 87,5%**	
48	Coordination with relevant units including the owner and local authorities	1	Available in the monthly RMLLP document, invitation letters, and meeting documentation.
49	Inventory of road types and traffic needs	1	Available in the monthly RMLLP document.
50	Plan or report for maintenance of traffic equipment	1	Available in the monthly RMLLP document.
51	Traffic lane closure plan (work layout)	1	Available in the monthly RMLLP document.
52	Work schedule for traffic lane closure	1	Available in the monthly RMLLP document.
	Traffic Management Plan Documents	**5 100%**	
53	Utility documents located around the project area	1	Available in the monthly RKPPL document.
54	Environmental management work plan sheet	1	Environmental impact management activities are available, including environmental management and monitoring plans documented in the monthly RKPPL
55	Air emission and air pressure testing and monitoring	1	Environmental testing reports conducted by the Medan Industrial Standardization and Service Center are available.
56	SOP for Chemical Handling	1	Available in the management procedures and documentation for hazardous and toxic waste (B3) according to Ministerial Regulation No. B3/01.
57	SOP for Water Utilization	1	Available in the water management procedures during temporary construction activities (document No. 2-0002-000-57-23).
58	SOP for Construction Waste Management (solid, liquid, and air)	1	Available in waste management procedures according to B3 and non-B3 waste regulations.
59	Available in waste management procedures according to B3 and non-B3 waste regulations.	1	Available in waste management procedures according to B3 and non-B3 waste regulations.
60	Flora management program including protection of vegetation and invasive plant control	1	Available in the Bill of Quantity (RAB), addendum, and contract documents.
61	Environmental management report	1	Environmental monitoring results, management outcomes, and conclusions are documented in the monthly RKPPL report.
	Environmental Management Plan	**9 100%**	
	Completeness of SMKK Implementation Documents	**82 97,8%**	

Meanwhile, the results of field observations on the implementation of SMKK showed a very high level of compliance with a score of 100%. All evaluated indicators, including the installation of safety signs, regulation of project entry and exit access, use of personal protective equipment, and provision of occupational health facilities, were implemented in accordance with applicable regulations.

Table 2. Completeness of SMKK Implementation Documents

No	Criteria	Score	Observation Result
A.	**Safety Sign**		
1	Project information board containing at least: service provider name, project address, contact	1	Information boards are installed at two locations: one in front of the Cong Api building and another in front

No	Criteria	Score	Observation Result
	number		of the project office.
2	Directional / information signs	1	Green-colored signs indicating locations are installed. Traffic signs are placed according to traffic management needs.
3	Prohibition signs	1	Red-colored signs are installed indicating activities that are prohibited in certain areas.
4	Warning signs	1	Located in the work area, yellow in color indicating slippery surfaces, landslide hazards, and excavation hazards.
5	Mandatory signs	1	Located in the work area and office area; blue-colored signs indicating mandatory use of helmets.
6	Temporary work signs	1	Installed in the work area; orange-colored signs indicating temporary work activities.
7	Assembly point signs	1	Located at the office area and Ahmad Yani Street.
8	Traffic warning stick (Warning Lights Stick)	1	Used for traffic regulation during night work.
9	Traffic cones	1	Used for diverting traffic flow.
10	Rotary lamp	1	Installed around the project area and used in locations where night work activities occur.
11	Traffic hose lamp	1	Installed at the PPDU as a boundary marker for work areas during nighttime activities.
12	Moveable Concrete Barrier (MCB) / Rubber	1	Used for diverting and closing traffic lanes.
	Safety Sign	**12** **100%**	
B.	**Project Entry and Exit Gates**		
1	Adequate project gate under normal and emergency conditions	1	Open area / district-scale project
2	Gate security personnel	1	Located in front of the office and conducting periodic patrols
	Project Entry and Exit Gates	**2** **100%**	
C.	**Socialization and Promotion**		
1	Safety Induction	1	Work location orientation is conducted weekly every Wednesday morning.
2	Completion of worker attendance list	1	Conducted daily before work activities begin.
3	Banner (Safety Banner)	1	Installed across all work areas
4	Poster	1	5R posters, project regulation information posters, and other informational posters are installed in all work areas.
5	Occupational Safety and Health (K3) information board containing accident data, number of workers, number of working days, and updates	1	Located in front of the site office and within the work area.
	Socialization and Promotion	**5** **100%**	
D.	**Use of Personal Protective Equipment (PPE)**		
1	Safety Helmet	1	In accordance with Indonesian National Standard (SNI), used during work activities.
2	Eye protection (Goggles / Spectacles)	1	Used during grinding activities.
3	Respiratory protection and mask	1	Used during work activities.
4	Safety Gloves	1	Used during work activities.
5	Safety Shoes	1	Used during work activities.
6	Rubber safety shoes and toe cap	1	Used during work activities.
7	Full body harness (whole body support)	1	Used during work at height (minimum height 1.8 m).
8	Safety Vest	1	Used during work activities.
	Personal Protective Equipment (PPE)	**8** **100%**	
E.	**Use of Work Protective Equipment**		

No	Criteria	Score	Observation Result
	(WPE/APK)		
1	Safety Net	1	Used for work at height, installed on scaffolding.
2	Life Line	1	Used for work at height and installed beneath the work area.
3	Restricted area barrier	1	Constructed using a triplek barrier with spacing not exceeding 25 mm between barriers and supports, capable of withstanding loads across the work area.
4	UV radiation protection equipment	1	Helmets equipped with neck protection are used when working under direct sunlight exposure.
	Work Protective Equipment (WPE/APK)	**4 100%**	
F.	**Scaffolding**		
1	Completeness of scaffolding installation	1	The main frame scaffolding is not corroded and stands upright. Each scaffold unit has been inspected, equipped with base plates (for scaffolding), access ladders, and/or portable ladders including their safety features (railings). The scaffolding is installed on a solid base. Safe access routes leading to the scaffolding are available, and access restrictions are applied to unauthorized personnel. Scaffolding is marked with inspection tagging.
	Scaffolding	**1 100%**	
G.	**Health Facilities and Infrastructure**		
1	First Aid equipment (P3K)	1	First aid boxes (at least two units per work location), stretchers, medicines, oxygen cylinders, stethoscopes, body weight scales, and tensimeters are available in the office.
2	First Aid Room	1	Available in the office.
3	Handwashing facility	1	Located in front of the office and inside the office area.
4	Hand Sanitizer	1	Available inside the office.
	Health Facilities and Infrastructure	**4 100%**	
H.	**Direksi Keet**		
1	Availability of chairs, tables, document cabinets, and tiled flooring	1	Available in the office.
2	Availability of project schedule information, safety drawing information, and attendance records	1	Installed on the wall of the safety office room.
3	Availability of safety policies	1	Installed on the wall of the safety office room.
4	Office toilet	1	Two toilets are available in the office in accordance with Ministerial Regulation No. 5 of 2018 concerning Occupational Safety and Health in the Work Environment.
5	Minimum office size of 6 × 10 meters	1	The safety office is in a two-story building rented at the project location.
6	Availability of storage racks for safety helmets and safety shoes	1	Located at the entrance of the office.
	Direksi Keet	**6 100%**	
I.	**Work Area**		
1	Work Environment Inspection:		
a.	Storage area for chemical materials	1	Two warehouses are available in Mabar and Aluminium areas, equipped with information on the

No	Criteria	Score	Observation Result
			stored chemical materials (MSDS/LDKB).
b.	Temporary storage area for hazardous waste (B3)	1	Hazardous waste has not yet been generated; however, a temporary storage facility has been prepared before disposal to the final disposal site. The area is covered and equipped with B3 warning/information signage.
c.	Storage area for construction material residues	1	Materials are directly transported to the designated disposal site managed by the municipal government.
d.	Cleanliness of the implementation of the 5R program in the workplace and access roads	1	Equipment and materials in the field are well organized and stored according to their characteristics, grouped based on type and category. There are no puddles of liquid waste such as grease or oil.
e.	Safe distance maintained for each work activity	1	Heavy equipment work areas are clearly marked with safety boundaries by PPDU.
2	Drainage system	1	Covered drainage channels are available.
3	Domestic waste (non-construction waste)	1	Waste bins and waste segregation facilities are available in front of the office.
4	Proper placement of electrical equipment	1	Located in the office warehouse.
5	Prayer room / place of worship	1	Available in the office.
6	Worker rest area	1	Worker mess is available.
7	Drinking water source for workers	1	Available in the office.
8	Worker kitchen	1	Available in the worker mess.
9	Public toilet	1	Available in the office and worker mess. Clean, odorless, water supply available, equipped with drainage/septic tank system. One toilet is available for every 15 workers in accordance with Ministerial Regulation No. 5 of 2018 on Occupational Safety and Health in the Work Environment.
10	Evacuation area	1	Located opposite the office and on Ahmad Yani Street.
11	Smoking area	1	Located in front of the office.
	Work Area	**14** **100%**	
J.	**Construction Safety Personnel**		
1	Construction Safety Expert and/or Construction Safety Officer employed by the Contractor	1	Senior Construction Safety Expert
2	Construction Safety Expert employed by the Supervising Consultant	1	Intermediate Construction Safety Expert
3	Emergency response personnel and/or first aid personnel or medical/health personnel	1	Emergency Response Officer and Junior Construction Safety Expert
4	Traffic control personnel (Flagman)	1	Safetyman
5	Environmental cleanliness personnel	1	Cleaning staff
	Construction Safety Personnel	**5** **100%**	
K.	**Equipment Related to Construction Safety Risk Control**		
1	Fire extinguisher (APAR)	1	Fire extinguishers are available in the office in accordance with the Regulation of the Minister of Manpower and Transmigration No. PER.04/MEN/1980.
2	Occupational Safety and Health (K3) flag	1	Installed in the office area.
3	Identification cards:		
a.	Worker Identification Card (KIP)	1	Owned by all workers.
b.	Visitor Identification Card	1	Available at the security post.
4	Communication equipment (Handy Talky / HT)	1	Held by the coordination team.
5	Closed-circuit Television (CCTV)	1	Installed in the office area.

No	Criteria	Score	Observation Result
	Equipment for Construction Safety Risk Control	**6 100%**	
	Compliance with SMKK Implementation in the Field	**100%**	

The project is classified as a low-risk construction activity; therefore, the 17 items that constitute the requirements for medium- and high-risk construction projects were not assessed and were categorized as Not Applicable (N/A).

4. DISCUSSION

The findings of this study indicate that the implementation of the Construction Safety Management System (SMKK) in the Kesawan Old Town residential infrastructure project demonstrates a high level of compliance with national construction safety regulations. The strong alignment between safety documentation and field implementation reflects the effectiveness of structured safety management practices within the project environment. This finding supports the concept that the integration of safety planning, risk identification, and operational control plays a critical role in improving construction safety performance [2].

Previous studies in the construction sector emphasize that systematic safety management frameworks significantly contribute to reducing occupational accidents and improving safety performance in construction projects. For example, research conducted by Khosravi et al. found that projects implementing formal safety management systems demonstrated significantly better safety outcomes compared with projects that relied only on traditional supervision methods [3]. Similarly, Lingard and Rowlinson highlight that structured safety management programs, including hazard identification, training, and safety communication, are key components in establishing a sustainable construction safety culture [4]. The findings of the present study reinforce these arguments, as the high level of compliance observed in the project is associated with the presence of comprehensive safety documentation, regular safety communication activities, and certified safety personnel.

Compared with previous research conducted in Indonesia, the level of SMKK implementation identified in this study appears relatively higher. Yuliana et al. reported that the implementation level of construction safety management in building projects reached 88.37%, while Pasaribu and Susilawati identified a compliance rate of approximately 80% in road construction projects. The higher level of compliance observed in this study may be attributed to stronger managerial commitment, improved safety supervision, and structured documentation systems required under the SMKK framework. Organizational commitment is widely recognized as one of the key determinants influencing safety management effectiveness in construction projects [5].

Another important aspect highlighted in this study is the role of safety communication and training in strengthening workers' awareness of safety practices. Activities such as safety induction, toolbox meetings, and safety briefings were conducted regularly within the project. These practices are consistent with the proactive safety management approach proposed in modern safety management theory, which emphasizes prevention through communication, training, and worker participation rather than reactive responses to accidents [6]. Studies in construction safety management also show that continuous safety communication significantly improves workers' risk perception and compliance with safety procedures [7].

In addition to safety communication, supervision and individual worker characteristics also play a critical role in shaping safe behaviour. Ginting et al. (2020) reported that personal factors such as knowledge and the presence of effective work supervision are significantly associated with unsafe actions among workers. This indicates that even when safety systems and procedures are well established, inadequate supervision or low worker awareness may still lead to unsafe practices. In the context of this study, the high level of compliance observed may also be influenced by the presence of structured supervision and competent safety personnel within the project. The existence of certified safety experts and regular monitoring activities likely contributed to minimizing unsafe actions and ensuring adherence to safety procedures[2].

The findings of this study are consistent with previous research emphasizing the importance of safety promotion in shaping worker behaviour. Ginting et al. (2021) found that K3 promotion significantly improves the use of personal protective equipment and reduces unsafe behaviour among workers. This suggests that safety performance is not solely determined by the availability of safety systems and documentation but is also highly dependent on behavioural factors influenced by continuous education and communication. In the context of this study, the high level of compliance observed in PPE usage and safety practices may be associated with regular safety induction, toolbox

meetings, and safety briefings implemented in the project. These activities function similarly to K3 promotion programs, reinforcing safety awareness and encouraging safe behaviour among workers[1].

Despite the overall positive findings, several areas require improvement. The absence of health awareness programs related to HIV/AIDS and the lack of administrative inspection forms for hazardous materials indicate that certain aspects of occupational health management have not been fully integrated into the safety management system. According to international occupational safety standards, effective safety management systems should incorporate both occupational safety and occupational health components, including health promotion and exposure monitoring programs [8]. Therefore, strengthening occupational health management within the SMKK framework would further enhance the effectiveness of safety implementation.

The results of this study also demonstrate that the implementation of construction safety management systems is not only necessary for high-risk projects but also important for projects categorized as low risk. Even though the observed project falls under the low-risk category, the structured implementation of safety management practices contributed to maintaining safe working conditions and preventing potential hazards. This finding aligns with previous studies emphasizing that safety management systems should be applied consistently across all types of construction projects regardless of their risk classification [9].

However, this study has several limitations. First, the evaluation was conducted in a single construction project, which may limit the generalizability of the findings to other construction contexts. Second, the assessment focused primarily on compliance with safety documentation and observable safety practices, while behavioural aspects of safety culture among workers were not quantitatively measured. Future research is recommended to involve multiple projects and integrate quantitative safety performance indicators to provide a more comprehensive assessment of construction safety management implementation.

Overall, the findings of this study contribute to the growing body of literature on construction safety management by demonstrating that effective integration between safety planning, documentation, and field implementation plays an essential role in strengthening construction safety culture and improving compliance with national safety regulations.

5. CONCLUSION

The findings of this study indicate that the implementation of the Construction Safety Management System (SMKK) in the Kesawan Old Town residential infrastructure development project in Medan City has been carried out effectively and is largely in accordance with the provisions of the Regulation of the Minister of Public Works and Housing No. 10 of 2021. The high level of compliance between construction safety documentation and field implementation demonstrates that the project has successfully integrated safety management practices into both planning and operational activities. The completeness of SMKK documentation and the full implementation of safety measures in the field reflect a strong commitment from project stakeholders in maintaining construction safety standards and preventing workplace accidents.

The results also indicate that the application of structured safety management systems contributes to strengthening safety awareness, improving compliance with safety procedures, and supporting the development of a positive construction safety culture. Nevertheless, several aspects still require improvement, particularly in the implementation of worker health awareness programs and the completeness of administrative documentation related to hazardous material inspection. These findings suggest that construction safety management should not only focus on operational safety controls but also incorporate broader occupational health management aspects to ensure comprehensive protection for construction workers.

Based on these findings, it is recommended that project stakeholders strengthen occupational health promotion programs and improve documentation procedures related to hazardous materials management. In addition, regulatory authorities and construction organizations are encouraged to continuously enhance monitoring and evaluation mechanisms for SMKK implementation to ensure consistent compliance with safety regulations. Future research is also recommended to involve a broader range of construction projects and incorporate additional safety performance indicators to provide a more comprehensive understanding of the effectiveness of construction safety management systems in different project contexts.

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