Research Paper

Implementation Of Occupational Safety And Health Management System In Small Qualification Contractors In DKI Jakarta

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ABSTRACT: *The Occupational Safety and Health Management System (SMK3) is an important system to be implemented in every company to ensure the safety and health of its workers. The implementation of SMK3 must be implemented in companies with the criteria of employing at least 100 workers or having a high level of potential danger (Government Regulation No. 50/2012). In this case, to find out how construction service companies implement SMK3, so as to provide an overview of the implementation of SMK3 in small qualification contractors in DKI Jakarta. So this research applies a quantitative method with a questionnaire that is processed by descriptive statistics and gets the percentage of SMK3 implementation, as well as a literature study method by conducting studies based on related sources, namely Government Regulation Number 50 of 2012, and related research and journal references. In SMK3 there are 5 categories of application as guidelines for companies that must be applied in implementing SMK3, namely the establishment of K3 policies, K3 planning, implementation of K3 plans, monitoring and evaluation of K3 performance, and review and improvement of SMK3 performance. Based on the measurement results of the SMK3 implementation assessment on small qualification contractors in DKI Jakarta, it shows an average of 74.71%, which means that some SMK3 policies have begun to be implemented in the company and have been running at the project level. Therefore, small qualification contractors in DKI Jakarta must work together to remind both workers and managers to be consistent in implementing SMK3 policies in their companies as a priority effort in personal protection in the work environment.*

KEYWORDS: *SMK3 Implementation, Contractor, Work Safety, Construction, Government Regulation No.50 of 2012.*

I.   INTRODUCTION

Construction is unique, dynamic, and time-constrained, making it one of the most hazardous industries (Mohammadi, Tavakolan, & Khosravi, 2018; Susilowati., Prawenti., & Puspitasari., 2022). A high level of risk can have an undesirable impact, therefore in every construction project, it is necessary to implement an occupational safety and health system (SMK3) to minimize environmental safety issues. However, work accidents in the Indonesian construction sector have increased. Based on the previous 5 years of data obtained from BPJS Ketenagakerjaan, the increase in the number of work accidents in Indonesia, especially construction services from 2020 to 2024, has increased from year to year. Where in 2020 there were 1773 cases of work accidents and in 2024 there were 4233 cases of work accidents.

The impact that will arise from accidents on construction projects not only affects project activities and progress, but also incurs cost losses. As for the case of construction failure of the collapse of the cendrawasih rukan, samarinda (June 2014), namely the three-story office house building (rukan) has a width of 25 m and a length of 100 m collapsed while still in the process of construction, causing 12 workers to die. work that left 12 workers dead (Susilo, 2017). That is an example that even small-scale construction work can have work accidents that kill workers.

Small qualification construction service companies are the dominating companies in the total number of Construction Services Business Entities (BUJK) registered throughout Indonesia, which is more than 80% of the total registered BUJK (Central Bureau of Statistics, 2020). The Occupational Safety and Health

Management System (SMK3) in Construction service companies is part of the company's overall management system in order to control risks associated with work activities in order to create a safe, efficient and productive workplace (PP No. 50 of 2012) (President of the Republic of Indonesia, 2012).

According to (Muzakky, 2019) based on pre-survey research, several respondents in small qualification construction companies said that the purpose of the company where they work is only to make a profit (*economic driver*) and does not focus on the SMK3 of the workers or the project. Therefore, in small qualification construction service companies there are still many who have not implemented SMK3.

Therefore, an evaluation of the SMK3 assessment system for small construction companies is needed. An assessment measurement format scale was formed to facilitate the implementation of SMK3 in small qualification construction referring to PP No. 50/2012 regulations. This research is focused on evaluating the level of SMK3 implementation in small qualification construction in DKI Jakarta based on PP No. 50 of 2012.

II. THEORETICAL STUDY

Occupational Safety and Health Management System (SMK3)

SMK3 is an important system to be implemented in every workplace to ensure the safety and health of workers. Based on the mandate of the legislation, SMK3 is regulated in Government Regulations (PP) listed in Law Number 13 of 2003 concerning Manpower Article 87 which states:

(1) Every company is required to implement an OHS management system that is integrated with the company's management system.

(2) Further provisions on the implementation of the OHS management system will be regulated in a Government Regulation.

Based on Government Regulation No. 50 of 2012, the occupational safety and health management system abbreviated as SMK3 in Chapter I article 1 is part of the company's overall management system in order to control risks related to work activities in order to create a safe, efficient and productive workplace.

Principles of implementing the Occupational Safety and Health Management System

The basic principle of the occupational safety and health management system is that every element of the workforce is entitled to protection of safety and security in carrying out work for welfare and increased national productivity.

According to Government Regulation number 50 of 2012 contained in appendix I concerning the application of SMK3 as a guideline for companies and companies are required to implement it, which consists of 5 principles of application, namely:

1) Establishment of K3 policy,
2) K3 planning,
3) Implementation of the K3 plan,
4) Monitoring and evaluation of OHS performance,
5) OHS review, and SMK3 performance improvement.

Legal Basis for Occupational Safety and Accident Management System

The implementation of a work safety and accident management system (SMK3) has a legal basis. Some of the laws that regulate it are as follows:

- Law of the Republic of Indonesia Number 1 of 1970 concerning Occupational Safety.
- Law of the Republic of Indonesia Number 13 of 2003 concerning Manpower.
- Government Regulation of the Republic of Indonesia Number 50 of 2012 concerning Occupational Safety and Health Management System (SMK3).
- Government Regulation of the Republic of Indonesia Number 14 of 2021 concerning Construction Services.
- Regulation of the Minister of Public Works Number: 02/PRT/M/2018 concerning Guidelines for Occupational Safety and Health Management Systems (SMK3) for Construction in the Field of Public Works.

Construction Services Work Accident Data

Based on data sourced from BPJS Employment (Ministry of Manpower of the Republic of Indonesia, 2025) the following is a summary of the number of work accident cases taken from the Work Accident Insurance (JKK) program for construction service workers:

Figure : Graph of the Number of Jakon Work Accident Cases in DKI Jakarta (Source: Employment Social Security Organizing Agency)

Number of Construction Service Companies

The number of active construction service business entities in 2025 in DKI Jakarta that have been registered as members of Gapensi (Indonesian National Construction Implementers Association) (Gapensi, 2025) is described as follows:
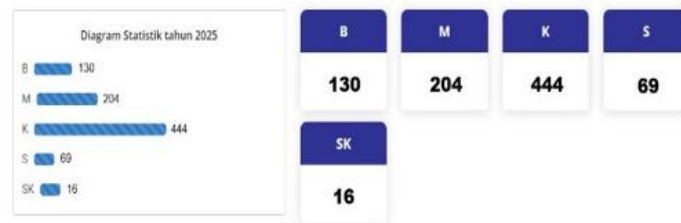
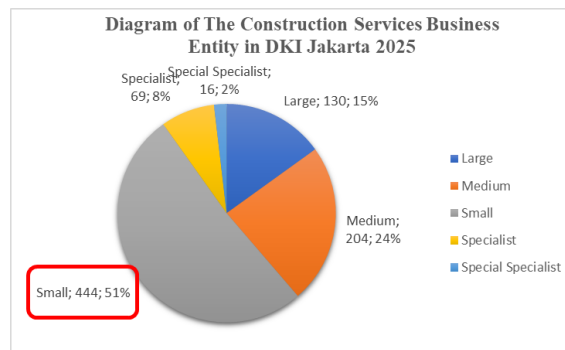(**Source:** Gapensi BPD DKI Jakarta (Gapensi, 2025), access 2025)

Figure : Diagram of DKI Jakarta Construction Services Business Entity 2025 (Source: Gapensi BPD DKI Jakarta, access 2025)

III.   RESEARCH METHODOLOGY

At the stage of analyzing, it is necessary to work in stages and arranged. Therefore, this writing system is carried out starting from collecting the necessary data to drawing conclusions from the processed analysis results.

Research Stages

1. **Data Collection**
    a. Secondary Method
        Relating to data processed from the results of recording based on written data of respondents' answers (open questions). There is also data obtained by direct interviews through questionnaires (closed questions).
    b. Literature Method
        Relating to collecting data on the theories used, through the internet, journals, books, visiting companies and various other data.

2. **Questionnaire Distribution Method**
   a. Respondent Profile
      Contains identity information from respondents, which consists of name, age, gender, education, work experience, and position.
   b. Questions on SMK3 Implementation Level
      In this section, respondents are given instructions for filling out the questionnaire by explaining the meaning of the assessment rating (score). And there are also questions with a type (closed questions) consisting of 20 questions related to the level of SMK3 implementation in the company where the respondent works.
   c. SMK3 Implementation Constraints Question
      Respondents are free to describe sentences in answering questionnaire questions based on what the respondent experiences while working related to obstacles that occur in the field.

3. **Interview Method**
   Interviews were conducted with experts or experts who have long worked in the construction world with a minimum of 10 years of service and a minimum of S1 education specifically in the field of Occupational Safety and Health Management Systems (SMK3). To answer research questions related to recommendations for improving the implementation of SMK3 in small qualification contractors in DKI Jakarta.

4. **Data Analysis Method**
   The method used to help analyze data is to use the help of the *Excel* program made by *Microsoft* as data processing. In the process of interviewing respondents to make it easier to arrange the format of questions measuring the level of implementation of SMK3 in the form of a questionnaire so that the discussion does not widen and the research data needed is in accordance with the methods used in the study. Measurement of the assessment of respondents' answers is given a score as follows :

Table : Respondent Answer Assessment

ASSESSMENT OF RESPONDENTS' ANSWERS	
SCORE	**EXPLANATION**
1	Never done
2	Rarely done
3	Sometimes done
4	Often done
5	Always done and documented

Then to determine the number of company samples that will be the respondents of the researcher, namely by using the Slovin formula. Slovin is a statistical method used to calculate sample size, also used to determine the size of a representative sample of a larger population.

$$\text{Rumus Slovin} \rightarrow n = \frac{N}{(1 + Ne^2)}$$

Description:
n   = Sample Size
N   = Population Size
e   = Desired error rate (in decimal form)

5. **Validity Test and Reliability Test**
   The validity test in this study will be carried out on each question (indicator) of the questionnaire by calculating the r_{count} on each question element with the total score obtained. Indicators are said to be valid if the correlation coefficient (*Pearson correlation*) is positive where $r_{hitung} > r_{tabel}$ (Apni & Puspasari, 2019). To test the significance of the Pearson correlation coefficient, the t-test is used.

$$\text{Rumus Korelasi Pearson} \rightarrow r = \sqrt{\frac{t^2}{(t^2+df)}} \quad \text{atau} \quad r = \frac{t}{\sqrt{(t^2+df)}}$$

Description:
r   = Pearson correlation coefficient
t   = The t table value in the t distribution table (where t corresponds to α and df)
df   = Degree of freedom

Finding the value of degrees of freedom by means of (df= N - 2), where :
N   = Number of samples
The t distribution table must first determine the value of (α), where :
α   = The level of significance to be determined

    Reliability test is if the questionnaire is said to be valid, then the reliability of the questionnaire is tested (Yan & Nuswantoro, 2024). If the Cronbach's Alpha value> 0.70 then the reliability is sufficient. The Cronbach's Alpha formula can be calculated by comparing the amount of shared variance (covariance) between items with the total variance of these items.

$$\text{Rumus Cronbach's Alpha} \rightarrow \alpha = \left(\frac{k}{(k-1)}\right) x \left(1 - \left(\frac{\sum Si^2}{\sum St^2}\right)\right)$$

Description:
α   = Cronbach's Alpha
k   = Number of items
Si^2 = Variance of item i
St^2 = Total variance

6.   Result Analysis Method

    In the analysis of the results, it is seen how far the suitability of SMK3 implementation in construction activities in the field with a measurement scale. This measurement scale is divided into 4 categories, namely the range of application levels of 0-25%, 26-50%, 51-75%, and 76-100%. Where in each of these ranges has an explanation, which is shown in the table as follows:

Table : Measurement Scale of SMK3 Implementation Level

| Measurement Scale	Implementation Level
0% - 25%	The company has not implemented SMK3 and does not understand the concept of SMK3.
26% - 50%	The company has not yet fully implemented SMK3 and is just beginning to understand the concept of SMK3.
51% - 75%	The company has begun to implement some SMK3 policies and is already running at the project level.
76% - 100%	The company partially implements SMK3 policies and the implementation of SMK3 in the company is high.

7. Flow Chart of Research Stages
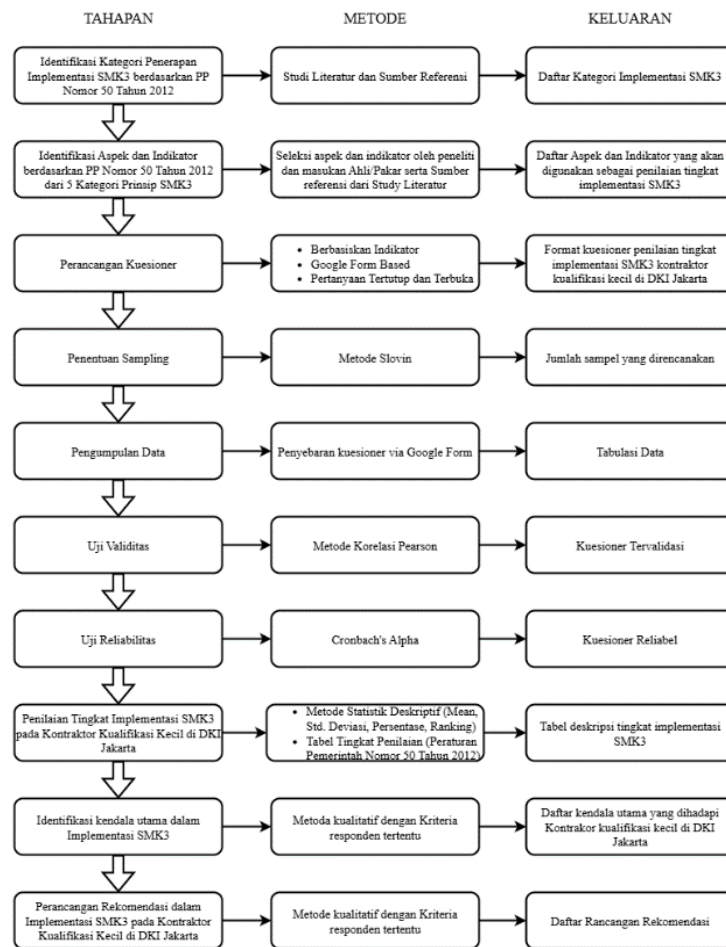
Figure : Research *Flow Chart*

IV. ANALYSIS AND DISCUSSION

The research results are divided into 4 discussions, namely demographic information, the level of SMK3 implementation, identification of constraints faced by small qualification contractors, and efforts to improve SMK3 implementation for small qualification contractors.

Demographic Information

The table below shows the profile of respondents and small qualification contractor companies based on the questionnaire (closed questions)

Table : Demographic Information of Small Qualification Contractor Respondents

Demographic Information of Respondents and Company	Total	%
Age of Respondents		
20-29	29	41%
30-39	36	52%
40-50	5	7%
Respondent Position		
Director	2	3%
HSE Manager	3	4%
HSE Expert	23	33%
Safety Officer	11	16%
HSE Staff / K3 Staff	12	17%
Supervisor	19	27%
Respondents' Last Education		
SMK/SMA	13	19%
D3	3	4%
S1	48	69%
S2	5	7%
S3	1	1%
Respondents' Work Experience		
<6 Years	38	54%
7-9 Years	18	26%
>10 Years	14	20%
Work that is often done		
Building	49	70%
Road & Bridge Construction	18	26%
Reservoir	2	3%
Irrigation Channel	1	1%
MEP Installation	0	0%

SMK3 Implementation Level Measurement Form

The following is a table for measuring the level of implementation of SMK3 in small qualification construction service companies, based on 5 categories, 10 aspects, and 20 indicators used as guidelines based on the reference sources that have been obtained. Can be seen in the table below:

Table : Questionnaire Question Form (Closed)

No.	Question	1 Never done	2 Rarely done	3 Sometimes-sometimes done	4 Often done	5 Always done and documented
Establishment of OHS Policy						
X1	The availability of a document containing the company's objectives in implementing OHS. K3					
X2	There is a written order (SOP) and socialization to all workers regarding the implementation of OHS					
X3	Have an OSH officer who is K3 certified					
OHS planning						
X4	Create a procedure document procedure document for handling hazard risks related to OHS					
X5	Provide PPE according to the number workers and always in use					
X6	OHS signs are installed in strategic locations					
X7	Have a jobdesk document for each worker and his/her competence					

X8	Available order form for goods and services services along with specifications				
Implementation of OHS Plan					
X9	Job requirements are recorded to serve as guidelines for the placement of workers				
X10	Have SOPs in the implementation of special tasks that must appoint workers with certificates of competence in accordance with the special work				
X11	Training is organized for managers and supervisors related to managerial matters.				
X12	All workers, including new workers, are given training in accordance with				
X13	Have strict supervisors in implementing the SOP that has been available				
X14	There is a permit form for carrying out hazardous work				
X15	Has a specialized emergency management officer who is certified				
X16	Provides equipment along with emergency hazard signaling system and maintenance form.				
OHS Performance Monitoring and Evaluation					
X17	Procedures are in place for inspection and assessment of work accidents				
Review and Improvement of SMK3 Performance					
X18	There is meeting documentation for improvement of OHS in the company with OHS experts				
X19	Has a document containing documentation of all activities activities in detail				
X20	Have a regular meeting schedule to discuss the effectiveness of SMK3 implementation				

Table : Questionnaire Question Form (Open)

Give answers according to your opinion or experience while working or what happened in the field.
Note: Answers are described in a sentence and may be more than one sentence.

No.	Open Question
C. Questions on constraints in SMK3 Implementation	
1	In your experience, what might be the main obstacles in implementing SMK3 in your company?

Selected Sampling

To determine the number of samples from the large population of small qualification contractors in DKI Jakarta, the Slovin formula is used. Based on data on the population of small qualification construction services in DKI Jakarta from Gapensi BPD DKI Jakarta in 2025, which is 444 companies.

Then the calculation is described as follows:
N= 444 (Gapensi data on active small qualification contractors 2025)
e= 11% (0.11) error correlation limit (*Error Tolerance*) used
Generated,

$$n = \frac{444}{(1+(444 \times 0.11^2)} = \frac{444}{6.3724} = 69.68 \sim \text{rounded } 70$$

Based on the calculation of the Slovin formula, the number of respondents is 70 respondent.

Validity and Reliability Test of SMK3 Implementation Assessment Measurement

The validity test on the measurement indicator of the SMK3 implementation level is using 70 respondents.

Then the degree of freedom value is obtained, namely df = N - 2 = 70 - 2 = 68. The *Significance level* determined by the author is 0.05 or 5%, obtained in the Pearson correlation t Distribution Table is 1.668. Then calculated using the Pearson correlation formula.

Based on the results of calculations using the Pearson correlation formula, the results of the indicators in each category are valid where the average r $_{count}$ is 0.872> r $_{table}$ 0.198 can mean a strong correlation value.

The reliability test used with the reference value or threshold of Cornbach's Alpha is worth 0.70. Where the Cornbach's Alpha value in each category exceeds the threshold, namely with an average of 0.983> 0.70, the category can be said to be reliable.

Table : Reliability Test with *Cornbach's Alpha*

No.	Category	Number Variance	Total Variance	Reference Value Threshold	Cronbach Alpha	Conclusion
PK1	Establishment of OHS Policy	4,268		0,70	1,487	Reliable
PK2	OHS Planning	8,088		0,70	1,230	Reliable
PR1	Implementation of OHS Plan	13,716	495,490	0,70	1,111	Reliable
PE1	OHS Performance Monitoring and Evaluation	1,569		0,70	0,997	Reliable
PP1	Review and Improvement of SMK3 Performance	4,984		0,70	1,485	Reliable
	Total Average	32,625		0,70	0,983	**Reliable**

Results of Implementation of Occupational Safety and Health Management System (SMK3)

The results of the data recapitulation of the implementation of the Occupational Safety and Health Management System (SMK3) from all variable categories on small qualification contractors in DKI Jakarta can be seen in the following table description:

Table : Results of Recapitulation of Achievement Level of SMK3 Implementation of Small Qualification Contractors in DKI Jakarta

No.	Category	Score	% Implementation
PK1	Establishment of OHS Policy	278	79,33%
PK2	OHS Planning	264	75,31%
PR1	Implementation of OHS Plan	259	74,07%
PE1	OHS Performance Monitoring and Evaluation	260	74,29%
PP1	Review and Improvement of SMK3 Performance	264	75,52%
	Average	**265**	**74,71%**
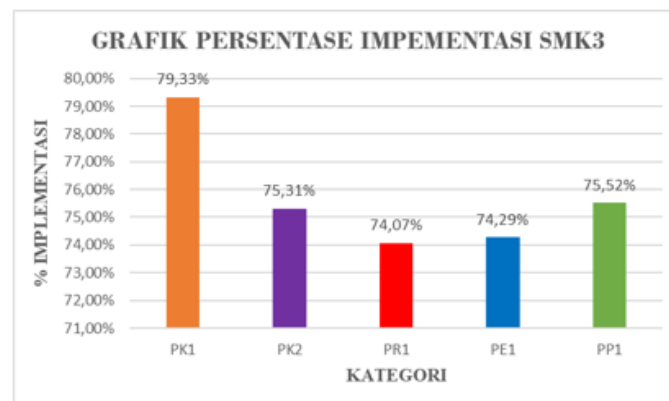
Analysis of Constraints of Small Qualification Contractors in Implementing SMK3

In contractors with small qualifications, there are still many who have not been able to fully implement SMK3 as a whole. As in Bandar Lampung City (Zhafira, Elian. et al, 2023), and also in Kebumen Regency (Kusumaningrum, A. Nindhita. et al, 2020). Therefore, it is necessary to analyze the main obstacles faced by small qualification contractors in DKI Jakarta in implementing SMK3. The criteria for respondents who are measured are able to provide the right answers because the respondents are directly involved in the project, for this reason the criteria for selecting respondents are divided into the table description below:
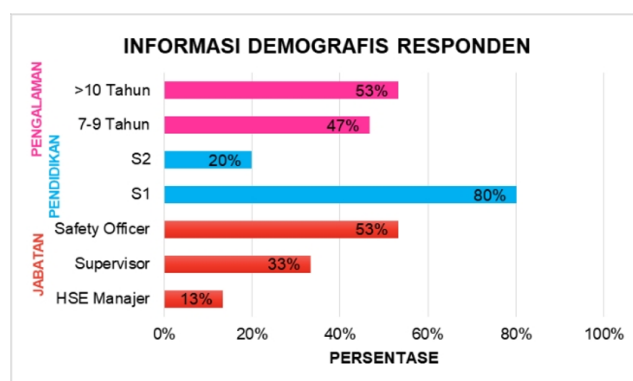
Figure : Percentage of Demographic Information of Questionnaire Respondents (Open)

Based on the selected respondent criteria, the respondents' responses regarding these obstacles have been summarized in the following description:

No	Constraints of Small Qualification Contractors in DKI Jakarta
1	Discipline, care, awareness, commitment, and support are still low
2	Limited budget and competent resources in the field
3	Limited standard safety equipment
4	Too many requirements in meeting the criteria for SMK3 implementation
5	Arrangements from management that are less controlled and documented
6	Minimal coordination between divisions
7	The additional costs incurred by small contractor scale companies are quite large to implement OHS.

Recommendations to Improve the Implementation of SMK3 in Small Qualification Contractors

Based on the description of the results of responses from respondents using questionnaires (open questions) related to the main obstacles in the implementation of SMK3 in contractors with small qualifications, then interviews with experts or experts related to what recommendations are needed by small qualification contractors to improve the achievement of SMK3 implementation levels. As for the criteria chosen as experts or experts in answering this research question, the respondent criteria are outlined in the table below:

Table : Demographic Information of Interview Respondents

Demographic Information Respondents	Number
Respondent Position	
HSE Manager	2
HSE Officer	1
Respondent's Work Experience	
>10 Years	3

The following responses from experts or experts have been described as recommendations for small qualification contractors facing efforts to improve the achievement of SMK3 implementation, namely:

No	Draft Recommendation
1	Small qualification contractors are encouraged to participate in socialization and training activities for managers and workers so that they can improve their skills, insights, competencies, and can prioritize safety. work.
2	Conducting association movements in the workers' environment to remind each other in personal protection efforts in the work environment.
3	Implement the management system in stages starting from the use of personal protective equipment, administrative fulfillment, prioritizing high hazard and high risk areas. personal protection equipment, administrative compliance, prioritizing high hazard and high risk area environments.
4	Holding daily meetings as a form of good communication efforts towards hazardous and high-risk activities. activities that have high hazards and risks.
5	The management began to strive for awareness of the importance of hazards and risks in the work environment by implementing some of the criteria for implementing SMK3 so that it becomes a habit in the company.

V. CONCLUSION

Based on the findings, the implementation level of the Occupational Safety and Health Management System (SMK3) in small qualification contractors in DKI Jakarta, as mandated by Government Regulation No. 50 of 2012, achieved an average score of **74.71%**. This result indicates that several SMK3 elements have been adopted and are being applied at the project level, although not yet comprehensively or systematically across all companies. The partial implementation reflects an encouraging initial effort but also highlights the need for more consistent and institutionalized safety practices in small construction firms.

Research Implication: this study contributes both practically and academically. From a practical perspective, the findings emphasize the urgent need for targeted interventions from government regulators, professional associations, and clients to enhance SMK3 adoption among small contractors. This could be achieved through simplified regulatory procedures, continuous technical assistance, accessible training programs, and the introduction of performance-based incentives. From an academic standpoint, the study provides a foundation for future research to explore the impact of SMK3 implementation on project outcomes such as cost efficiency, productivity, and worker well-being in small-scale construction environments. It also opens opportunities to develop adaptive SMK3 models tailored to the resource limitations and operational characteristics of small qualification contractors.

REFERENCES

[1].   Central Bureau of Statistics. (2024, April 13). Number of Construction Service Company. Retrieved from Central Bureau of Statistics: https://www.bps.go.id/id/statistics-table/2/MjE2IzI=/banyaknya- perusahaan- construction.html
[2].   Central Bureau of Statistics. (2020). Central Bureau of Statistics. Retrieved from Central Bureau of Statistics: https://www.bps.go.id/id
[3].   Gapensi. (2025, April 13). Gapensi Member Statistics 2025. Retrieved from Gapensi Member: https://gapensi.or.id/statsanggota
[4].   International Labor Organization (ILO). (2020). Geneva: ILO. Safety and Health in Construction: An ILO Perspective.
[5].   Ministry of Manpower of the Republic of Indonesia. (2025, April 13). One Data Ministry of Manpower. Retrieved from Case Accidents Work: https://satudata.kemnaker.go.id/data/kumpulan-data/1872
[6].   Manu P., Mahamadu A., P. V., & et al. (2018). Safety Science. Health and Safety Management Practices of Contractors in South East Asia: A Multi Country Study of Cambodia, Vietnam, and Malaysia, Vol. 107, No. 188-201.
[7].   Mohammadi, A., Tavakolan, & Khosravi, Y. (2018). Factors Influencing Safety Performance on Construction Projects. Safety Science.
[8].   Muzakky, I. (2019). Study on the Development of a Measurement Model for the Level of Implementation of the Occupational Safety and Health Management System in Small Qualification Construction Service Companies. Digital Library of ITB, 44-45.
[9].   Government of Indonesia. (1970). Law of the Republic of Indonesia Number 01 of 1970 concerning Occupational Safety. State Gazette of the Republic of Indonesia Year 1970, No. 1. Jakarta: State Secretariat.
[10].   Government of Indonesia. (2003). Law of the Republic of Indonesia Number 13 of 2003 concerning Labor. State Gazette of the Republic of Indonesia Year 2003, No. 39. Jakarta: State Secretariat.
[11].   President of the Republic of Indonesia. (2012). Government Regulation No. 50 of 2012 on the Implementation of Occupational Safety and Health Management System (SMK3). Jakarta: State Gazette of the Republic of Indonesia Number 5309.
[12].   Scribd. (2025, May 22). Table T for Alpha 5% and R. Retrieved from https://www.scribd.com/document/362110780/tabel-t-dan-r
[13].   Suma'mur. (1989). Occupational Safety and Accident Prevention. Haji Masagung.
[14].   Sudjatmiko, & Jayady, Arman. (2023). Implementation Method of Steel Box Girder Erection in the KM 5+ 145 Bekasi Antelope Bridge Relocation Project - West Java. IKRA-ITH Technology Journal of Science and Technology, Vol. 2, No. 1-12.
[15].   Amrina, E., & Suryani, F. (2019). Evaluation of Sustainable Campus Implementation with UI GreenMetric at Andalas University. Impact: Journal of Environmental Engineering, University of Andalas, Vol. 16 No. 2.
[16].   Susanto, D., & et al. (2021). Mathematics Book for Grade 11 SMA / SMK Independent Curriculum. South Jakarta: Center for Bookkeeping of the Education Standards, Curriculum, and Assessment Agency of the Ministry of Education, Culture, Research, and Technology.
[17].   Susilo, L. J. (2017). Governance, Risk Management, and Compliance. DKI Jakarta: Grasindo.
[18].   Aurora, S. K., Suryani, F., & et al. (2022). Implementation of OHS Management System in the Mth 27 Office Project Suites Cawang Project. IKRA-ITH Technology.
[19].   Hauzan R, Farhan, Jayady, Arman, et al. (2025). Application of HIRADC in MRT Construction Risk Reduction: Learning from

Mangga Besar Station. Journal of IKRAITH-TECHNOLOGY, Vol. 9, No. 1.
[20]. Susilowati, F., Prawenti, H., & Puspitasari, E. (2022). Study of Occupational Safety and Health Management System in Road Construction Companies in Indonesia. Journal of Civil Engineering ITB, Vol. 29, No.2.
[21]. Tavakol, M., & Dennick, R. (2011). Making Sense of Cornbach's Alpha. International Journal of Medical Education, 2:53-55 Editorial.
[22]. Jayady, Arman, Moerdianto, Edwin. (2022). Risk Management of Time Control on the Construction of Saumlaki Port. Indonesian Journal of Multidisciplinary Science.
[23]. Jayady, Arman., Pribadi S, Krishna., Abduh, M., et al. (2017). Success Indicators of Knowledge Transfer for The Transferee on The Construction Joint Venture in Indonesia. Bandung Institute of Technology, Vol. 3, No. 479.
[24]. Terry, G. R. (1958). Principles of Management (Organizing), Actuating and Controlling.
[25]. Zalika Syahriani Mahyudin, Y. M. (2025). Analysis of OHS Implementation in the PT R Construction Project.
[26]. Journal of Environmental and Safety Engineering (JESE), Vol. IV, No. 1.
[27]. Herliandre, Agus, Suryani, Fitri. (2018). Application of Lean Construction in Building Construction in Bintaro. Journal of IKRA-ITH Technology, Vol. 2, No. 3.
[28]. Mulya, Oktafian, Jayady, Arman, et al. (2024). Efforts to Achieve Zero Accident in Lower Structure Construction with the HIRADC Method: Case Study of Mini Park TCD Project. Journal of IKRAITH-TECHNOLOGY, Vol. 8, No. 3.
[29]. Kubais, Ibnu., Suryani, Fitri., Jayady, Arman. (2024). Engineering Value in Projects Building Construction: Case Research Sofifi 3-Story ASN Official House - North Maluku Province. Asian Journal of Engineering, Social and Health, Vol. 3, No. 10.
[30]. Aninditya, Bayu., Suryani, Fitri., et al. (2023). Implementation of The Hazard Identification, Risk Assessment and Risk Control (HIRARC) Method on Erection Girder Work of South Japek II Toll Road Construction Project Package 3: Journal of Interdisciplinary Studies, Vol. 9, No. 824-835.