

Original Article

**Evaluation of the Implementation of the Mining Safety Management System (SMKP) and Safety Culture in the Maintenance Department of PT Bumi Suksesindo**

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**ABSTRACT**

Occupational accidents in Indonesia's Mineral and Coal (Minerba) mining sector are still quite high. In 2022, there were 11 of 93 cases of fatality accidents. Organizational factors that often become the basic cause of accidents are the non-optimal implementation of the work safety management system and the low level of Safety Culture. The mining safety management system (SMKP) has been implemented at PT Bumi Suksesindo, but the number of accidents was still high, namely 16 accidents in the Maintenance department in 2022. This study aims to evaluate the implementation of SMKP and the maturity level of OSH culture (safety culture) in the Maintenance department. This was an evaluation study with a descriptive approach. Data were collected using a questionnaire and document review. The number of samples was 140 of 214 population of field workers. A 5-point Likert scale was applied to analyze workers' perceptions of the implementation of SMKP. The causal factors were analyzed using Incident Cause Analysis Methodology (ICAM), while the evaluation of the Safety Culture level was performed through a frequency distribution based on the 5 levels of OSH culture in accordance with UK CoalJourney, namely Basic, Reactive, Planned, Proactive, Resilient. The implementation rate of the Mining Safety Management System (SMKP) in the Maintenance department of PT Bumi Suksesindo was 67%, which was included in the Good category. However, there were 16 occupational accident cases, and the organizational factor was the most common cause (45 findings). Furthermore, the OSH culture maturity level was 60.5%, included in the Resilient level. It can be concluded that the implementation of SMKP in the Maintenance department was still sub-optimal, and the OSH culture maturity level had not yet covered 100% of workers. Such a finding implies a high number of occupational accidents. It is necessary to supervise the implementation of the SMKP and plan an OSH culture improvement program by involving all workers to achieve the SMKP goal of preventing occupational accidents.

**Keywords:** SMKP, Minerba, OSH culture, Safety Culture

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**INTRODUCTION**

Global data released by the International Labor Organization (ILO) revealed that there were 270 million (62.8%) cases of Occupational Accidents and 160 million (37.2%) cases of Occupational Diseases in the world per year, which caused 2.78 million deaths of workers every year <sup>1</sup>. Based on National Social Security Agency for Employment (BPJSTK) data, the number of occupational accidents in Indonesia continues to increase. In 2021, 234,370 occupational

accident cases were recorded, with 6,552 worker deaths, an increase of 5.6% compared to 2020<sup>1</sup>. Furthermore, based on the Ministry of Energy and Mineral Resources performance report, there were 93 accidents involving 36 minor injuries, 57 serious injuries, and 11 accidents with fatalities in the Mineral and Coal mining sector (Minerba) in 2022<sup>2</sup>.

One of the efforts to prevent accidents is implementing the Occupational Safety and Health Management System (SMK3). The government issued guidelines for implementing OSH through Regulation of the Minister of

Manpower and Transmigration Number 5 of 1996 concerning SMK3 and Government Regulation Number 50 of 2012 concerning SMK3<sup>3</sup>. In addition, the Ministry of Energy and Mineral Resources issued Decree of the Director General of Mineral and Coal No. 185k/30/DJB/2019 concerning technical instructions for implementing the Mining Safety Management System (SMKP) in the context of controlling mining safety risks including Mining OSH and Mining Operational Safety<sup>4,5</sup>.

PT Bumi Suksesindo, a gold mineral mining company in Indonesia, has implemented SMKP and conducts annual internal audits. The internal audit in 2021 achieved conformity of 68% accompanied by a record of 88 occupational accidents. The highest number of accidents occurred in the Maintenance Department by 12 cases, with 4 cases in the injury category for workers. In addition, there were 16 occupational accidents in 2022. According to James Reason in the Reason model on systems safety, accidents are not always caused by individual errors (active errors) but are also found in systemic and broader organizational factors (latent conditions), namely factors within the organization such as the implementation of a management system and the level of maturity of the OSH culture within an organization<sup>6,7</sup>.

Previous study conducted by Gito Sumarno, et al regarding analysis on the implementation of SMKP at the Plant Support Equipment Department of PT Pama Persada in 2018, it was revealed that the implementation of SMKP reached 88.9%, but the level of OSH culture maturity was only 45% in the low category. Such two achievement values seemed contradictory and indicated that the implementation of SMKP was only of a formal administrative nature. A low level of OSH culture maturity leads to the potential of an increase in the frequency of occupational accidents<sup>8</sup>.

Since the beginning of the implementation of the SMKP at PT Bumi Suksesindo in 2016, there has never been an initial review of the level of OSH culture maturity as mandated in the SMKP planning elements. So, the established OSH program only referred to the analysis of the causes of accidents and general best practices carried out in mining companies in Indonesia.

This study aims to evaluate the

implementation of the mining safety management system (SMKP) and the level of safety culture maturity in the Maintenance department of PT Bumi Suksesindo. The evaluation results are intended to be used as a basis for more targeted OSH program planning to decrease the occupational accident rate.

## METHOD

This was an evaluation study with a quantitative descriptive approach. The study was conducted in March -April 2023 at the Maintenance Department of PT Bumi Suksesindo, Banyuwangi Regency, East Java. A sample size of 140 workers was selected using a purposive random sampling technique from a population of 214 field workers, by using the Slovin formula (margin error of 0.05). Primary data were obtained using a questionnaire instrument that had been tested for validity and reliability (0.94), and secondary data were obtained through document review. Univariate data analysis was performed using Microsoft Excel. Description and comparison with theories and or similar research findings were further applied for the results of data analysis.

This study applied a 5 point Likert scale to analyze workers' perception regarding the implementation of SMKP. The causal factors of accidents were analyzed using Incident Cause Analysis Methodology (ICAM), while the evaluation of OSH culture levels applied a frequency distribution based on 5 OSH culture levels according to UK Coal Journey: Basic, Reactive, Planned, Proactive, Resilient.

## RESULTS

Table 1 presents the characteristics of 140 respondents. 28.6% of respondents were aged 31-40 years, 77% had been working for 1-5 years, 80.7% had an education level of Senior High School, and 95% had a non-managerial position.

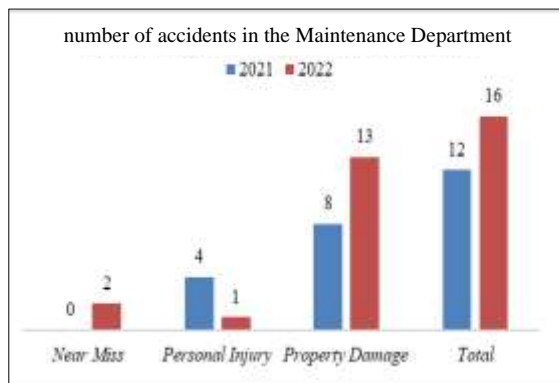
**Table 1. Characteristics of Respondents**

Characteristic	Number	%
<b>(n=140)</b>		
Age (years)		
<=20	0	0
21-30	40	28.6
31-40	54	38.6
41-50	35	25.0

>51	11	7.9
Education		
Elementary	0	0
JHS	4	2,9
SHS	113	80.7
Diploma/ Bachelor	23	16.4
Years of Service (years)		
<1	0	0
1-5	108	77.1
6-10	27	19,3
>10	5	3.6
Position		
Managerial	7	5
Non-Managerial	133	95

Figure 1 revealed 16 accident cases in the Maintenance Department in 2022, which consisted of 2 near misses, 1 injury, and 13 equipment damage. This figure showed an increase compared to 2021 by 12 accident cases.

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**Figure 1. Graph on Accident Cases in 2021 and 2022 in the Maintenance Department**  
*Causal Factors of Accidents*

Based on Table 2, analysis of the causal factors of accidents using the Incident Cause Analysis Method (ICAM) identified Absent or Failed Defense by 21 findings, Individual/Team Action by 22 findings, Task/Environmental Conditions by 21 findings, and Organizational Factor became the most common cause of accidents by 45 findings, with the most sub-factors of risk management by 8 findings.

**Table 2. Causal Factors of Accidents**

Causal Factor	Total
<b>Absent or Failed Defence</b>	21
Detection system/ procedure	1
Protection system/ procedure	5
Guards or barriers	2
Recovery system/ procedure	1
Hazard identification	10
Safe work procedure	2
<b>Individual / Team Action</b>	22
Supervision	2
Operating speed	1
Equipment use	2
Work procedure	4
Safety compliance	1
Training for task	2
Change Management	2
Hazard recognition and perception	7
Work method	1
<b>Task/ Environmental Condition</b>	21
Weather	2
Surface gradient/ conditions	3
Workspace access	1
Housekeeping	1
Tools/ equipment condition/ availability	4
Task planning/ preparation	1
Routine/ nonroutine	1
Abnormal operational	1
Work procedures - availability and suitability	1
Time pressure	1
Peer pressure	1
Confidence level	2
Personality	1
Distraction/ pre-occupation	1
<b>Organizational Factor</b>	45
Training	5
Communication	1
Procedures	7
Maintenance Management	6
Design	5
Risk management	8
Management of change	2
Contractor management	1
Organizational learning	7
Vehicle management	3

**Table 3. Perceived Implementation Elements of SMKP**

<b>Implementation Sub-Element</b>	<b>Score (n=140)</b>	<b>%</b>
1. Implementation of Operational Management	357	68
2. Implementation of Work Environment Management	370	66
3. Implementation of Occupational Health Management	369	66
4. Implementation of Mining Operational Safety Management	383	70
5. Determination of Design and Engineering Systems	386	69
6. Determination of Purchasing System	369	66
7. Monitoring and Management of Mining Services Companies	383	68
8. Emergency Management	405	64
9. Provision and Preparation of First Aid	369	66
10. Implementation of off-the-job safety	383	68
<b>Mean</b>		<b>67</b>

**Information:**

0-24.99%: Very Poor  
25-49.99%: Poor  
50-74.99%: Good  
75-100%: Very Good

Table 3 revealed that the highest score of perceived SMKP implementation (70%) was for the sub-element of mining operational safety management, and the lowest score (64%)

was for the sub-element of emergency management. The mean score of workers' perceptions regarding the implementation of SMKP was 67%, categorized as Good.

**Table 4. The Level of OSH Culture Maturity in the Maintenance Department**

<b>Elements</b>	<b>Basic</b>	<b>Reactive</b>	<b>Planned</b>	<b>Proactive</b>	<b>Resilient</b>
1. Leadership & Accountability	0%	3%	14%	23%	60%
2. Policy and Commitment	0%	2,1%	10%	29%	59%
3. Risk and Change Management	0%	1%	6%	28%	65%
4. Legal Requirements	0%	1%	8%	23%	68%
5. Objectives & Performance Measurement	0%	4%	8%	22%	67%
6. Training, Competence & Awareness	0%	3%	10%	24%	64%
7. Communication & Consultation	0%	1%	7%	32%	60%
8. Control of Documents	0%	2%	4%	38%	56%
9. Operational Control	0%	1%	9%	27%	63%
10. Emergency Procedures	1%	1%	16%	41%	40%
11. Incident Investigation	0%	3%	7%	32%	58%
12. Monitoring, Auditing & Reviews	0%	2%	7%	25%	66%
<b>Average</b>	<b>0%</b>	<b>2%</b>	<b>9,3%</b>	<b>28,2%</b>	<b>60,2%</b>

Table 4 presents the distribution of the level of OSH culture maturity based on the UK Coal Journey model. It was shown that the mean level of OSH culture maturity was 60.2%,

including the Resilient level. The emergency procedures element showed the lowest response score at the Resilient level (40%) and a response at the Basic level (1%).

## **DISCUSSION**

### **Implementation of SMKP in the Maintenance Department**

Based on the characteristics of respondents, the majority (77%) of respondents had been working for 1-5 years. Years of service provide experience to a person and proficiency in completing work faster and more precisely. Based on data derived from the Bureau of Labor Statistics (BLS), most work accidents are experienced by new workers due to lack of experience, not being properly trained or not understanding the applicable OSH policies. BLS data states that almost a third of the total non-fatal work-related injuries or illnesses are experienced by workers with less than one year experience<sup>9</sup>. Workers with long years of service also have the risk of accidents when they are too confident and underestimate existing risks so as to ignore hazard controls. Table shows that the confidence level factor became a causal factor for accidents by 2 times. It is indicated that experienced workers with a high level of confidence tended to ignore the hazard identification process because they thought that they were used to it and assumed they would definitely not make mistakes. Such a finding is in accordance with a study conducted by Sah, (2019) which concluded that one of the basic causes of accidents in industry was workers who took shortcuts, they were too confident and neglected the OSH aspects<sup>10</sup>.

Optimal control of hazard factors is very important to prevent the risk of becoming an actual accident. There were 16 accident cases in the Maintenance Department in 2022 which consisted of 2 near misses, 1 injury and 13 equipment damage. Analysis of the causal factors of accidents using the Incident Cause Analysis Method (ICAM) identified Organizational Factor as the most common cause of accidents by 45 findings (Table 2). Three organizational sub-factors that often caused accidents were failure of risk management (8 findings), organizational learning (7 findings), and procedures (7 findings).

Risk management sub-factor is an effort to identify, assess, control, and mitigate hazards. A failure in risk management means placing workers or organizations at higher and unanticipated risk, leading to an accident. Based on the results of the investigation regarding accidents that occurred in the maintenance department, inadequate risk management

factors involved the goals, objectives, scope, and boundaries of risk management activities that were not clearly defined, the level of risk analysis that was not in accordance with actual conditions in the field, and the hazard identification process that did not cover all operations and equipment, inappropriate selection or implementation of risk control measures, and inadequate monitoring of the effectiveness of implemented risk controls. According to Gerry Gibb in the ICAM guidebook (2016), inadequate risk management can lead to risk level of above tolerance limit, inappropriate risk levels and allocation of risk control resources, and incomplete risk lists, that may lead to uncontrolled dangers and consequences which can further increase the incidence of accidents. Findings regarding the organization learning sub-factor in the investigation towards accidents that occurred in the Maintenance department involved failure in implementing and monitoring recommendations from previous similar accident investigation and failure to convey learning points to workers, so that similar accidents might re-occur. This is in accordance with Drupsteen's statement in 2018, that the high number of accidents was due to the failure of organizations to learn from past accidents.

The next sub-factor finding was related to procedures. Identified procedural failures included procedures that were not updated and reviewed after modifications or changes in the field, to create irrelevant work procedures.

Such irrelevant procedures led to certain assumptions among workers that gave rise to a lack of control over hazards, which in the end could become accidents. Periodic evaluation of procedures and monitoring their implementation is very important to perfect things considered vulnerable or can trigger work accidents<sup>11</sup>. This is in accordance with James Reason's theory in *Managing The Risks Of Organizational Accidents* that latent conditions such as lack of supervision, maintenance failure, and inadequate procedures will defeat accident prevention defenses<sup>12</sup>. A study conducted by Nur Azizah (2017) concluded that there was a relationship between work procedures and work accidents. Procedures that were inadequate and not adhered to by workers had the possibility of an increase in the accident rate<sup>13</sup>.

Based on Table 3, the achievement of SMKP implementation in the Maintenance

department was 67% or in the Good category. Such a good category contrasted the 16 accident cases during 2022. Good implementation of SMK3 should be in accordance with its objectives of reducing the number of occupational accidents and diseases<sup>4</sup>.

A previous study conducted by Andy Lay Wirawan and Mega Wati in 2020 concerning the Analysis of the Relationship between SMK3 and the Accident Rate concluded that the implementation of SMK3 positively correlated with the accident rate. Such findings indicated that implementing SMK3, both administratively and in the field, might reduce the number of accidents<sup>14</sup>. The current study finding indicated that the implementation of K3 in the Maintenance department was still administrative to meet statutory regulations and had not yet become a value and culture for all elements of management and workers to be practiced in daily work activities. The OSH philosophy states that Safety is a culture, not a program. Therefore, the implementation of OSH should not be just a program run by the company to meet laws or obligations and to obtain awards and certificates, despite becoming a reflection of the culture within the organization<sup>11</sup>.

### **The Level of OSH Culture Maturity**

The level of OSH culture maturity (safety culture) in the Maintenance department still showed that workers' perception was at the 2 lowest levels, namely Basic and Reactive. The emergency procedure element obtained the lowest level, wherein 1% of workers had the Basic level.

Emergency procedures emphasize detailed plans for managing mining areas' hazards, risks, and accidents. Based on the result of field observations, it was found that the access of several Light Fire Fighting Equipment (APAR) was blocked by materials, resulting in potential delays in response if a fire occurred in the workplace. The Maintenance department appointed 11 worker representatives to become volunteer members of the Voluntary Emergency Response Team. Still, there should be an improvement in the consistency of the appointed workers by participating in the emergency response training program.

Operational activities and the work environment that often change also challenge emergency response. In addition, plans that were too complicated and untested could be

ineffective, thus endangering workers and potentially leading to an emergency situation<sup>15</sup>. Leadership support is certainly needed to improve this consistency by allocating special time for training within so many work operational activities.

Emergency management was also the sub-element in implementing SMK3 in the Maintenance department with the lowest score. Such finding confirms a previous study conducted by Dharmayanti and Pramana, (2018), which revealed that the lack of OSH culture and discipline was one of the obstacles to implementing OSH<sup>16</sup>.

The Leadership and Accountability elements need more concern because there were still 3% at the Reactive level. Safety leadership and responsibility have a role in achieving the goal of building a safety culture and successful OSH performance<sup>17</sup>. A leader's success will depend on his understanding of organizational culture. Leaders are considered successful when their solutions are realized and become values expressed as shared assumptions within the organization. Such assumptions become the organization's identity and character and the culture being hold<sup>18</sup>.

Furthermore, the Policy and Commitment element also still obtained a response at the Reactive level (2.2%). This element is closely related to the Leadership and Accountability element because a good and responsible leader will formulate and establish a strict OSH policy. A strict OSH policy must be accompanied by a strong commitment initiated by the leader. The OSH program should ideally start from the top level of the organization (top management) through the formulation of a policy that shows commitment to OSH which is applied in OSH programs that involve all elements of the organization<sup>11</sup>. A study conducted by Putri and Assidiq, (2022) concluded that one of the factors that inhibited the implementation of OSH system and culture was weak commitment to OSH policy<sup>19</sup>.

The Objectives and Performance Assessment element obtained a response of 4% at the Reactive level. Such element is related to planning and setting goals for the implementation of OSH as well as monitoring and assessing OSH performance. Failure in planning and setting goals and inappropriate monitoring can fail to achieve good OSH performance. Benjamin Franklin says, "If you fail to plan, you plan to fail." OSH planning

failure will impact subsequent safety system elements. OSH objectives and performance can be assessed using a combination of lag (output) and lead (input) indicators. Assessment of OSH performance can improve an organization's ability to reduce the risk of accidents. OSH performance information reflects the effectiveness of OSH program implementation. The development of OSH culture is an important element to ensure good OSH performance<sup>20</sup>.

The Reactive level was further identified for the elements of Training, Competence, and Awareness (3%). In the assessment of SMKPS implementation, discrepancies were also found regarding worker competence. Some workers had not obtained appropriate training and certification, for example, welders in the Maintenance department. A person is considered competent if they are adequately qualified, properly trained, and has sufficient experience to perform the assigned tasks correctly and safely<sup>21,22</sup>. A study conducted by Putri (2022) concluded that there was an effect of training (30.6%) and competence (78%) on worker performance (productivity, reduced levels of errors and accidents)<sup>23</sup>.

The analysis results regarding the level of OSH culture maturity in the Maintenance department generally appeared to be almost comparable to the achievement level of SMKPS implementation (64% compared to 60.2%). Therefore, improving the OSH culture among workers will certainly positively impact the successful implementation of the OSH management system. The implementation of the OSH management system reflects the OSH culture (safety culture) within the organization, which must become the values adopted and the basis for organizational development<sup>24</sup>.

OSH culture is not something that can be bought. An organization or company will find it difficult to build an OSH culture without high commitment and priority from the leaders or top management. Commitment and integrity to safety start from management, but management alone cannot drive the entire OSH culture without the commitment of all organizational components. Generally, a strong safety culture is more effective in preventing occupational accidents and injuries<sup>24</sup>. The importance of OSH culture becomes a concern of the Regulation of the Minister of Manpower number 135 of 2022 concerning National OSH

Month 2023. It set the main theme of "Making Decent Work with an OSH Culture to Support Business Sustainability in Every Workplace"<sup>25</sup>.

## CONCLUSIONS

The implementation rate of the Mining Safety Management System (SMKPS) in the Maintenance department of PT Bumi Suksesindo was 67%, which was included in the Good category. Furthermore, the level of OSH culture maturity was 60.2%, which was included in the Resilient level. These two achievements contradicted the still high number of occupational accidents in the Maintenance department. This indicated that the implementation of SMKPS was still administrative to meet regulations. In addition, the implementation of OHS programs was still a formality and had not been on target, nor had it become a culture of all workers.

Based on the results of the study and conclusions, recommendations can be delivered to the Maintenance department of PT Bumi Suksesindo to form an internal departmental supervision team for the implementation of SMKPS, perform periodic reviews of risk management, especially at extreme and high risks and monitor the effectiveness and suitability in the workplace. Furthermore, PT Bumi Suksesindo needs to carry out an initial study in the form of an assessment of the OSH culture maturity level and KP performance so that the results can be used to plan OHS programs that are more targeted toward the main goal of the prevention of occupational accidents.

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## REFERENCE

1. Kemenaker. Profil Keselamatan dan Kesehatan Kerja Nasional Indonesia Tahun 2022. Jakarta: Kemenaker RI; 2022.
2. ESDM. Tingkat Kecepatan dan Keparahannya Kecelakaan Tambang 2022 [Internet]. 2023 [cited 2023 Apr 20]. Available from: <https://modi.esdm.go.id/kecelakaantam>

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3. PP RI. Nomor 55 Tahun 2012. Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja. Jakarta; 2012.
  4. ESDM. Kepdirjen ESDM No. 185.K/30/DJB/2019 Petunjuk Teknis Pelaksanaan Keselamatan Pertambangan dan Pelaksanaan Penilaian dan Pelaporan Sistem Manajemen Keselamatan Pertambangan MINERBA. Jakarta; 2019.
  5. ESDM. Keputusan Menteri Energi dan Sumber Daya Mineral Nomor 1827 Tahun 2018. Pedoman Pelaksanaan Kaidah Pertambangan yang Baik. Jakarta; 2018.
  6. Othman I, Majid R, Mohamad H, Shafiq N, Napih M. Variety of Accident Causes in Construction Industry. MATEC Web Conf. 2018;203:1–9.
  7. Tannya A, Pingkan, Mangare JB. Faktor-Faktor Penghambat Penerapan Sistem Manajemen K3. J Sipil Statik ISSN 2337-6732. 2017;5(4):187–95.
  8. Sumarno G, Winarso A, Fardhan M. Analisis Implementasi Sistem Manajemen Keselamatan Pertambangan Batubara di Plant Support Equipment Departement. Pros Nas Rekayasa Teknol Ind dan Inf XIII Tahun 2018. 2018;51–5.
  9. Safety Sign. Pekerja Baru Rentan Mengalami Kecelakaan Kerja. Safety Sign [Internet]. 2017. Available from: <https://safetysignindonesia.id/pekerja-baru-rentan-mengalami-kecelakaan-kerja-ini-yang-harus-dilakukan-perusahaan/>
  10. Sah DP. Occupational Accidents in Cement Industries of Nepal. J Adv Res Altern Energy, Environ Ecol. 2019;6(3&4):22–8.
  11. Hasibuan A, Purba B, Mahyuddin IM, Sianturi E, Armus R, Gusty Muhammad Chaerul S, et al. Teknik Keselamatan dan Kesehatan Kerja. Cetakan1, November 2020. 2020. 1–240.
  12. Reason J. Managing The Risk of Organizational Accident. New York: Taylor & Francis; 2016.
  13. Azizah N, Setiawan S, Silaban G. Hubungan Antara Pengawasan, Prosedur Kerja Dan Kondisi Fisik Dengan Terjadinya Kecelakaan Kerja Pada Perawat Di Ruang Rawat Inap Rumah Sakit Permata Bunda Medan Tahun 2017. JUMANTIK (Jurnal Ilm Penelit Kesehatan). 2019;4(1):125.
  14. Wirawan AL, Waty M. Kesehatan kerja terhadap tingkat kecelakaan pada proyek. JMITS J Mitra Tek Sipil [Internet]. 2020;3(4):1363–72. Available from: <https://journal.untar.ac.id/index.php/jm-ts/article/view/8365/6562>
  15. Arsyad M. Modul manajemen penanggulangan bencana pelatihan penanggulangan bencana banjir 2017. Pusat Pendidikan Dan Pelatihan Sumber Daya Air Dan Kontruksi. 2017. 77 p.
  16. Dharmayanti GAPC, Pramana GNPS. Kendala Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3) pada Kontraktor di Bali. J Tek Sipil. 2020;15(1):12–8.
  17. Sukwika T, Sutrisno G. Kepemimpinan Keselamatan, Komitmen Ahli K3, Akuntabilitas Terhadap Kepuasan Kerja dan Kinerja Keselamatan. J Ecodemica J Ekon Manaj dan Bisnis. 2021;5(2):164–74.
  18. OGP. Shaping safety culture through safety leadership. 2013;(452):32. Available from: [www.ogp.org.uk](http://www.ogp.org.uk)
  19. Putri K, Assidiq FM. Analisis Faktor Penghambat Penerapan Sistem Manajemen K3 Serta Langkah Menciptakan Safety Culture Terhadap PT. Gunanusa .... SENSISTEK Ris Sains dan Teknol ... [Internet]. 2022;(November):78–83. Available from: <https://journal.unhas.ac.id/index.php/SENSISTEK/article/view/19385%0Ahttps://journal.unhas.ac.id/index.php/SENSISTEK/article/view/19385/7824>
  20. Mohammed G, Naji A, Shahrul A, Isha N, Saleem MS, Ajmal M. The Importance of Safety Culture with Safety Performance Measures. Int J Public Heal Saf. 2023;7(December 2022):2020–2.
  21. Marhavilas PK, Pliaki F, Koulouriotis D. International Management System Standards Related to Occupational



- Safety and Health: An Updated Literature Survey. *Sustain.* 2022;14(20).
22. ISO. International Standard International Standard (ISO) 45001:2018. Switzerland; 2018.
23. Putri SAN, Hidayat W, Jumpakita Pinem R. Pengaruh Pelatihan dan Kompetensi terhadap Kinerja Karyawan Pabrik PT Indonesia Steel Tube Works Semarang. *J Ilmu Adm Bisnis.* 2022;11(3):483–91.
24. Dihartawan D. Budaya Keselamatan (Kajian Kepustakaan). *J Kedokt dan Kesehat.* 2018;14(1):98.
25. Kemenaker RI. Keputusan Menteri Ketenagakerjaan Republik Indonesia Nomor 135 Tahun 2022 [Internet]. Nomr 135 2022. Available from: <https://jdih.kemnaker.go.id/katalog-2261-Keputusan Menaker.html>