CIVED Journal of Civil Engineering and Vocational Education

EISSN: 2622-6774
Vol 12 No.1 March 2025
http://cived.ppj.unp.ac.id/index.php/CIVED

Risk Control of Work Accidents in the Overpass Steel Box Girder Erection Work Process with JSA and HIRADC Methods

Muhammad Yoris Saeful Siesmax[1*], Muhammad Oka Mahendra[2]
[1,2] Civil Engineering, Faculty of Engineering, Universitas Serang Raya, Indonesia
*Corresponding Author, e-mail: myoris2@gmail.com

Received 16th February 2025; Revision 17th February 2025; Accepted 5th March 2025

ABSTRACT

The construction of bridges, flyovers, overpasses, and other types of crossing structures is increasing along with the increasing volume of traffic. One important aspect of this development is the Girder Erection process, which is highly risky because heavy equipment and materials are in direct contact with workers. This study aims to analyze the risk of work at each stage of the construction of the Steel Box Girder Overpass Balaraja Barat B Tangerang City using the Job Safety Analysis (JSA) and Hazard Identification Risk Assessment and Determining Control (HIRADC) methods. This analysis covers each stage of work, starting from preparation, crawler crane setup, Steel Box Girder assembly, and Erection. The results showed 5 jobs with low-risk levels, 6 jobs with high-risk levels, and 7 jobs with very high-risk levels. In the research findings, the factor that causes the dominance of high and very high-risk levels is due to the impact of the risks that arise many of which have a very fatal impact so that they can cause large material losses and can cause casualties. Therefore, the determination of risk control is carried out to reduce the risk level to a lower level. After controlling, the risk level results are 11 jobs with low-risk levels, 6 jobs with moderate risk levels, and 1 job with high risk.

Keywords: *Risk Control; Job Safety Analysis (JSA); HIRADC; Erection Steel Box Girder*

DOI: https://doi.org/10.24036/cived.v12i1.724

INTRODUCTION

The Ministry of Manpower noted that by 2023 the number of work accidents in the construction industry sector will be the highest in all other industries in Indonesia [1]. And the ILO reports that more than 250 million workplace accidents and illnesses occur each year, and more than 160 million workers become ill and 1.2 million die from accidents and illnesses that occur in the workplace [2]. This shows the importance of more intensive and comprehensive efforts to improve work safety culture in the construction sector [3]. One of the determining factors in this regard is risk management. Identifying risks, analyzing risks, and controlling them are all parts of risk management in the construction industry [4].

The Occupational Safety and Health Management System (OSHMS), as described in Regulation No. 10 Year 2021 of the Minister of Public Works and Housing of the Republic of Indonesia on Guidelines for Construction Safety Management System (CSMS), is an integrated approach to discovering, preventing, and managing occupational safety and health risks in construction projects [5]. Construction workers and service providers must implement a Construction Safety Management System (CSMS) to reduce the risk of work accidents to ensure public safety, environmental safety, and labor safety [6]. The implementation of SMKK is expected to ensure the realization of a safe working environment and reduce the potential for construction accidents that can result in material and non-material losses (PERMEN PUPR RI NUMBER 10, 2021) [7].

In the case study discussed in this research, the problem discussed is the work of Erection Steel box Girder Overpss Balaraja Barat B Tangerang City. In this case Erection Steel box Girder Overpss as one of the work processes that is very important and has a high level of risk. Because heavy equipment and materials are in direct contact with workers and the surrounding environment, one of which this work process will be carried out on the toll road. Although there are several studies on the JSA method, there are still very few studies that discuss the application of the JSA and HIRADC methods together, especially in the process of erection of steel box girder overpass.

In the research conducted by W.Qin et al (2025), it still does not discuss specifically in the direction of risk control, in this study it is more related to the method of implementing the erection of steel box girder [8]. In the study conducted by L. Kopenhafer et al (2024), This qualitative study uses interviews and observations as well as cross-sectional studies and descriptive analysis [9]. Both use the JSA and HIRADC methods, but the case study studied is not Erection Steel box Girder.

Therefore, based on all the background above, it is necessary to take action in the form of controlling the risk level of work accidents, especially in this case in the process of Erection Steel box Girder work. Therefore, the Hazard Identification, Risk Assessment, Determining Control (HIRADC) and Job Safety Analysis (JSA) methods are used in this study. The purpose of this analysis is to identify all risks that may appear on the Erection Steel box Girder work, determine the level of danger, and provide recommendations for actions to control risks. It is hoped that this research can serve as a source of reference for future research and assist in controlling occupational risks in construction activities, especially in bridge construction in Indonesia.

METHOD

In this study, a qualitative approach was used. Qualitative research is a type of research that uses descriptive data from observable subjects and actors [10]. Primary and secondary data used in this study came from direct observation at the research site and interviews with experts in the field. Project data used as secondary data includes the work steps of the Steel box girder Erection process, job descriptions, equipment and heavy equipment used. Which is supported by data from literature studies in the form of collecting references, modules, guidelines, and regulations related to research. This research will use the Job Safety Analysis (JSA) method combined with the Hazard Identification Risk Assessment and Determining Control (HIRADC) method.

The research begins with determining the research topic and continues with the collection of related references and data needed at the research location. After the data is collected, it will be processed and analyzed using the JSA and HIRADC methods to identify risks, assess the level of occupational risk and control risks. Both methods will be combined to get detailed and clear analysis results. JSA is used to identify in detail all the risks that will arise in each job.

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 12 No.1 March 2025
http://cived.ppj.unp.ac.id/index.php/CIVED

RESULTS AND DISCUSSION

In the early stages of this analysis, the stages of work that will be identified will be included in the JSA and HIRADC forms. Namely the preparation stage includes work: Crawler Crane Inspection, Crawler Crane Operator Selection, Rigger Selection, Lifting Gear Selection & Inspection and Crane area Preparation. Furthermore, the Crawler Crane Setting Up stage includes work: Positioning of Main Body Crane, Positioning of Crawler Crane Track, Positioning of Main Boom, Installation of Pin Section, Installation of Crawler Crane Sling and Installation of Crawler Crane Counter Weight. The next stage is the Steel Box Girder Assembly stage which includes: Unloading Steel Box Girder, Setting SBG on Position and Welding Process. And then the main stage is the Erection stage, including work: Positioning Multiaxle and SBG in Erection position (Close Traffic), Girder Erection, Working on Toll and House Keeping.

1. Risk Identification

To identify jobs that are considered high risk in this study, there are a number of approaches that can be used, one of which is used in this study is a Job Safety Analysis (JSA). Job Safety Analysis is part of the OHS management commitment. With this method, after identifying jobs that are considered high-risk, those jobs will be identified as high-risk jobs [11].

Table 1. SA Method Risk Identification Form

No	Sequence of Work Steps	Hazard Identification			
		Workers	Equipment	Materials	Environment/Public Safety
Preparation Stage					
1.	Crawler Crane Inspection		There is no Crane SILO; Crane SILO is no longer valid; Crane condition is damaged or not suitable for use.		
2.	Crawler Crane Operator Selection	Operator does not have SIO; SIO owned is no longer valid; SIO Operator is not in accordance with the type classification of the crane used			
3.	Rigger Selection	Rigger does not have a License; License held is no longer valid			

EISSN: 2622-6774
Vol 12 No.1 March 2025
http://cived.ppj.unp.ac.id/index.php/CIVED

4.	Selection and Inspection of Lifting Gear		The condition of the Lifting Gear is damaged or not suitable for use used; Lifting Gear has no certificate and also information on WLL (Working Load Limit) / SWL (Safe Working Limit)		
5.	Crane area preparation				Ground conditions for the crane area are uneven; Landslide or unstable soil conditions; There are gas pipelines and cables; There are still other works that are still in the crane area.
Crawler Crane Setting Up Stage					
6.	Positioning the Main Body Crane		An error occurs when positioning so that the main body crane falls; Main body crane falls on surrounding facilities or people.		The ground collapses and is uneven; An error occurs when positioning so that the main body crane falls; Narrow area; Crowded area
7.	Positioning the Crawler Crane Track	Pinched, scratched	Track Falls; Track falls on surrounding facilities; Lifting Gear Failure		Narrow area; Crowded area of worker mobility
8.	Positioning the Main Boom		Boom fell; Error occurred when positioning the boom; Lifting gear failure		Boom fell on people or facilities; Narrow Area; Crowded Area
9.	Pin Section Installation	Fall from height; Slip; Pinch; Ergonomics			
10.	Crawler Crane Sling Installation	Falling; Pinching; Dislocation; Slipping; Falling on slings; Ergonomics			

11.	Installation of Counter Weight Crawler Crane				Ground collapse Counter weight falls on people or nearby facilities; Lifting Gear Failure
Steel Box Girder Assembly Stage					
12.	Unloading SBG	Lifting failure; Reach distance is too far; Worker's hand is pinched	Crane experienced lifting failure		
13.	Setting SBG on Position	Worker's hand is pinched; Material lifting failure; Worker's foot is pinched and crushed by material.			
14.	Welding Process	Fire; Explosion; Worker's eye was hit by welding spatter; Worker inhaled welding fumes.			Welding fumes inhalation; welding sparks
Girder Erection Stage					
15.	Positioning Multiaxle and SBG in erection position (Close Traffic)	Altitude Hazard; Physical Hazard			
16.	Erection Girder	Height hazard; Worker fall; Physical hazard; Lifting hazard; Noise hazard			Existing facilities/buildings collapsed; Area around noise
17.	Working on the highway	Falling materials from above; workers falling from height			
18.	House Keeping	Scratches; ergonomics			

2. Risk Assessment

After identifying the potential hazards associated with the data, the risks must be analyzed to determine whether they are major, moderate, minor, or negligible. To perform the assessment, categories of risk likelihood and impact are identified. Then, the results of these categories go into the Risk Matrix table, which results in a risk rating/level [12].

Risk assessment is carried out by determining the level of likelihood and consequence using a risk analysis matrix. Secondary data determines data processing and analysis techniques, observations, and interviews. The risk level is obtained from the risk analysis table based on the Risk Matrix in Table 2.

Table 2. Possible categories

Level	Description	Detail
1	Very Rare	May occur in certain situations
2	Occasionally	Possible, but unlikely
3	May Occur	Occurs, but not always
4	Happens often	Occurs repeatedly over a period of time
5	Almost Always Occurs	May occur at any time under normal circumstances

Table 3. Type of Risk Impact

Level	Description	Detail
1	Not Significant	Circumstances do not cause harm or injury to people
2	Minor	Incurs minor losses and non-serious injuries
3	Moderate	Severe injuries that are hospitalized do not cause permanent disability or significant financial loss.
4	Severe	Resulting in severe injury, permanent disability, and significant financial loss, as well as significant consequences
5	Catastrophic	Resulting in death and significant losses, and may even permanently halt operations.

Table 4. Risk Matrix

Possibilities		Consequencesi				
		No Significant	Small	Medium	Severe	Disaster
		1	2	3	4	5
Almost Certain to Happen	5	T	T	ST	ST	ST
Happens Often	4	S	T	T	ST	ST
May Occur	3	R	S	T	ST	ST
Occasionally	2	R	R	S	T	ST
Very Rarely	1	R	R	S	T	T

*Description:
R = Low Level
S = Medium Level
T = High Level
ST = Very high Level

After identifying the risks in table 1 and determining the parameters are clear. Then the next step is to determine the risk level. By adjusting the risks that arise after being identified in each job according to the risk identification table (Table 1) and then adjusted to the possibility category (Table 2) and the risk impact category (Table 3). With these two categories, the risk level will be obtained using the Risk Matix table (Table 4). And the results will be obtained as presented in Table 6.

3. Determination of Risk Control

In determining controls, the hierarchy of controls must be considered, which includes elimination, substitution, technical, administrative, and PPE measures tailored to project

CIVED Journal of Civil Engineering and Vocational Education

EISSN: 2622-6774
Vol 12 No.1 March 2025
http://cived.ppj.unp.ac.id/index.php/CIVED

circumstances, costs, human factors, and the environment [13].

Tabel 4. Hierarchy of Controls

Hirarki Pengendalian ANSI ZIO		
Elimination	Elimination of risk sources	Safe workplace/job reduces hazards
Substitution	Substitution of tools/machines/materials	
Engineering	Modification or design of tools/ machine/ safer workplace	
Administrative	Methods, regulations, instructions, working time, danger signs, signs, posters, labels	Safe workforce reduces exposure
APD (PPE)	Workers' personal protective equipment	

The Hierarchy of Controls is a series of actions taken to reduce and manage risks that may arise, which includes a variety of different levels [14]. These include elimination, substitution, engineering, administration, and the use of PPE. The controls implemented cover three aspects of the control hierarchy, namely engineering, administration, and the use of PPE [15]. The measures applied are based on discussion and verification with relevant experts. After the control is completed, the risk level shows a decrease, which is presented in Table 6.

Table 6. HIRADC Method Risk Level Assessment and Control Form

No.	**Sequence of Work Steps**	**likelihood (F)**	**Impact (A)**	**Risk Level (F x A)**	**Control**	**After Control**
Preparation Stage						
1.	Crawler Crane Inspection	2	1	R	- Certification by the local labor office - Conduct periodic inspections and routine maintenance - Making ITP Schedule - Implementation of Pre Trip Daily Inspection Check (Form from Hki)	R
2.	Crawler Crane Operator Selection	2	1	R	- Operators and riggers must have an active, verified and experienced SIO and in accordance with their classification. - Operators must be in good physical and mental health	R
3.	Rigger Selection	2	1	R	- Rigger must have an active, verified and experienced License - Rigger must be in good physical and mental health	R
4.	Lifting Gear Selection and Inspection	2	1	R	- All certificate documentation must be available in accordance with the lifting gear to be used. - Inspection is carried out by PJK3 to determine the condition of the lifting gear whether it is suitable for use	R
5.	Crane area preparation	3	4	ST	- Positioning the crane on hard and level ground - Compaction of the soil using vibro or other means is required.	S

CIVED Journal of Civil Engineering and Vocational Education

EISSN: 2622-6774
Vol 12 No.1 March 2025
http://cived.ppj.unp.ac.id/index.php/CIVED

					- Use of landing plate for crane mobilization area - Coordinate with related parties to find out whether the area is safe from gas pipelines and power lines. - Coordinate and provide signs so that the crane area is sterile from other work. - Ensure the data from the Land pavement is correct (DCP/Sandcone data)	
Set nmting Up Crawler Crane Stage						
6.	Memposisi kan *Main Body Crane*	3	4	ST	• - Issuing work permit from Maincon - Compaction of Crawler Crane access path - Structuring the Crawler Crane access path - Installation of grounding plate for Crawler Crane - Set up area must be spacious and out of reach - The existence of competent and certified operators and riggers - crowd - Barricade the area and provide safety signs in the crane set up area - Make sure workers use PPE (Helmets, safety vests, safety shoes, gloves).	R
7.	Memposisi kan *Track Crawler Crane*	3	4	ST	- Set up the crane with safe working procedures - The presence of competent and certified Operators and Riggers - Lifting Gear used must be certified and in accordance with the capacity used - Keep a safe distance from pinch point hazards - Barricade the area and install safety signs in the setting up area - Make sure workers use PPE (Helmet, safety vest, safety shoes, gloves)	S
8.	Memposisi kan *Main Boom*	2	4	ST	• Set up with safe work procedures - The existence of competent and certified Operators and Riggers - Lifting Gear used must be certified and in accordance with the capacity used - Keep a safe distance from pinch point hazards - Use tag line during lifting - Barricade the area under the assembly radius and install safety	S

					signs - Make sure workers use PPE (Helmet, safety vest, safety shoes, gloves),	
9.	Pemasangan *Pin Section*	2	4	T	• Unauthorized persons are prohibited in the setting up area. - Body position when installing pins must be safe - Keep a safe distance from pinch point hazards - Barricade the area under the assembly radius and install safety signs - Make sure workers use PPE (Helmet, safety vest, safety shoes, gloves, and Full Body Harness)	R
10.	Pemasangan *Sling Crawler Crane*	2	4	T	- Perform installation safely and securely - Keep a safe distance from pinch point hazards - Barricade the area under the assembly radius and install safety signs - Body position when installing pins must be safe - Make sure workers use PPE (Helmet, safety vest, safety shoes, gloves, and Full Body Harness)	R
11.	Pemasangan *Counter Weight Crawler Crane*	2	5	ST	- Compaction of access path for setting up cranes - Structuring the access path for the setting up crane - Perform installation safely and securely - The presence of competent and certified Operators and Riggers - Lifting Gear used must be certified and in accordance with the capacity used - Keep a safe distance from pinch point hazards - Using tag line during lifting - Barricade the area and install a safetysign in the setting up area - Make sure workers use PPE (Helmet, safety vest, safety shoes, gloves, and Full Body Harness)	S
Steel Box Girder Assembly Stage						
12.	*Unloading* SBG	2	5	ST	• Ensure lifting equipment is up to standard and in decent condition -Ensure the distance for lifting is in accordance with the specified load and distance -Ensure that the distance and position of workers are appropriate and in a	S

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 12 No.1 March 2025
http://cived.ppj.unp.ac.id/index.php/CIVED

					safe position	
13.	Setting SBG on Position	2	4	T	• Ensure lifting equipment is up to standard and in decent condition -Ensure the distance for lifting is in accordance with the specified load and distance -Ensure the distance and position of workers are appropriate and in a safe position.	R
14.	*Welding Process*	3	3	T	• Ensure the welding location is away from flammable materials -Ensure that pressurized tubes have flashback arrestors installed. -Workers are equipped with PPE in accordance with the risk of work	S
Girder Erection Stage						
15.	Memposisikan *Multiaxle* dan SBG di posisi *erection* (*Close Traffic*)	2	4	T	• Ensure that the area used for crane and multiaxle support is solid. - Ensure the crane area is well-grounded - Ensure there are no people in the swing crane area - Ensure signage and rubber cones are in place during closure - Make sure the rubber cone installation is equipped with a stick lamp and hose light. - Traffic closures are assisted by the police	R
16.	*Erection Girder*	2	5	ST	• Lift point at the top of the flage so that the SBG is more stable - using 4 slings to lift - to stabilize the SBG will be done swing alternately between cranes - on the landing plate after being loaded by the body crane and counter weight crane. - Make sure Crane & Multiaxle are in good condition - Make sure operators and workers are in good health - Make sure no one is in the falling radius of the material when lifting. - Make sure the position of workers during joint bolting work is in a safe position. - Required to use PPE (Safety Shoes, Helmet, Safety Gloves, Glasses, Ear Plug, Full Body) - Ensure the radius of reach of the crane is in accordance with the calculation	T

Journal of Civil Engineering and Vocational Education

EISSN: 2622-6774
Vol 12 No.1 March 2025
http://cived.ppj.unp.ac.id/index.php/CIVED

17.	Bekerja di atas Tol	2	4	T	• Provide protection in the form of a safety net to prevent material from falling down. -Workers who work at heights are equipped with FBH and lifeline	R
18.	House Keeping	1	2	R	- Provide a place for leftover materials - Ensure and check the work area before leaving the work area to ensure no tools are left behind or scattered. - Cleaning the work area - Do the 5Rs (Ringkas, Rapi, Resik, Rawat, Rajin)	R

Based on the discussion presented above, it is evident that the implementation of risk controls has contributed to significantly reduce the level of risk in each stage of the work process. To provide a clearer visual representation of the changes in risk levels, the following graph presents a comparison of risk levels before and after the implementation of control measures.

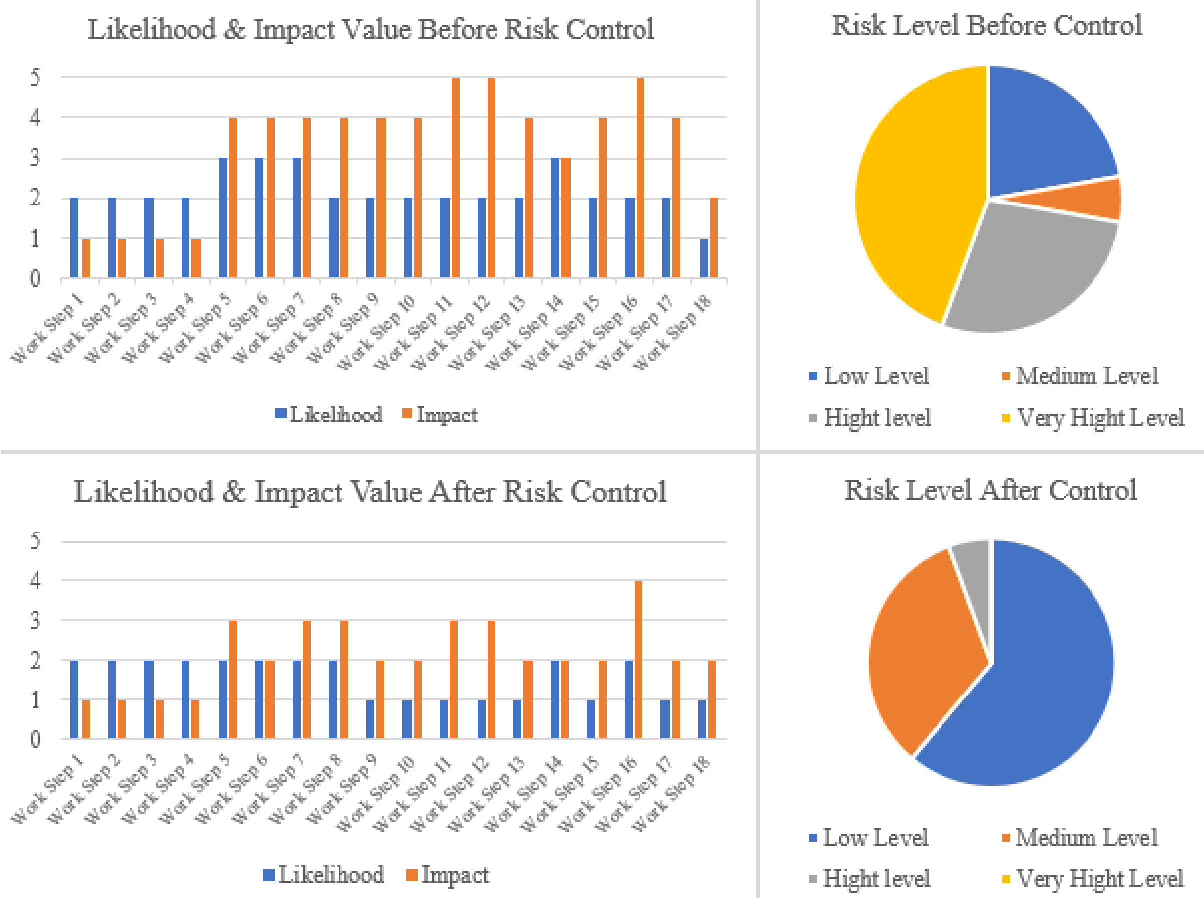

Figure 1. Value Risk Control

The control measures include engineering, administration, and the use of personal protective equipment (PPE), which were implemented through discussion and verification with relevant experts in the field at the time of the research. The effectiveness of these measures can be clearly seen in the decrease in Likelihood and Impact Value which results in a decrease in risk level in the risk level assessment before and after the implementation of controls, as shown in Table 6 and the comparison graph above.

CONCLUSION

Based on the results of the analysis of work risk control in the Balaraja Barat B Overpass Steel Box Girder Erection project in Tangerang City using the JSA and HIRADC methods, it was found that initially there were 8 types of work with very high risk, 6 jobs with high risk, 0 jobs with medium risk, and 5 jobs with low risk. The main factors that led to the dominance of high and very high risks were fatal impacts such as serious injury, permanent disability, and death, as well as the potential for environmental pollution due to gas pipeline leakage. After the implementation of risk control, there was a significant decrease, with 11 jobs at low risk level, 6 jobs at medium risk level, 2 jobs with high risk, and no more jobs with very high risk. This shows that the implementation of appropriate risk control can effectively reduce the level of work risk on the project.

REFERENCE

[1] R. A. Machfudiyanto, S. Kim, Yusuf Latief, S. Nurul, and Naufal Budi Laksono, "Analysis of design-for-safety implementation factors in the Indonesian construction industry: A two-staged SEM-artificial neural network approach," *Heliyon*, vol. 9, no. 11, pp. e21273–e21273, Nov. 2023, doi: https://doi.org/10.1016/j.heliyon.2023.e21273.

[2] M. A. Khorasane, M. Alimohammadlou, K. Klockner, M. Kamalinia, and M. Jahangiri, "Identifying the influential contributing factors to micro-enterprises' workplace accidents using a hybrid D-DEMATEL-IFISM method," *Expert Systems with Applications*, vol. 200, p. 117059, Aug. 2022, doi: https://doi.org/10.1016/j.eswa.2022.117059 .

[3] J. S. Peatie, Hasan Haroglu, and T. Umar, "Barriers to achieving satisfactory dropped objects safety performance in the UK construction sector.," *Heliyon*, vol. 10, no. 17, pp. e37413–e37413, Sep. 2024, doi: https://doi.org/10.1016/j.heliyon.2024.e37413.

[4] J. Park, S. Seong, S. Park, M. Kim, and H. Y. Kim, "Multi-label material and human risk factors recognition model for construction site safety management," *Journal of Safety Research*, vol. 91, pp. 354–365, Oct. 2024, doi: https://doi.org/10.1016/j.jsr.2024.10.002.

[5] M. Yang, Y. Wang, R. Hammer, and P. Maresova, "Occupational health and safety management system and stock price crash risk," *International Review of Financial Analysis*, vol. 93, p. 103141, May 2024, doi: https://doi.org/10.1016/j.irfa.2024.103141.

[6] J. Xiao, W. Zhang, and R. Y. Zhong, "Blockchain-enabled cyber-physical system for construction site management: A pilot implementation," vol. 57, pp. 102102–102102, Aug. 2023, doi: https://doi.org/10.1016/j.aei.2023.102102.

[7] Novelin Tumatar and Bangun Marpaung, "Analysis of the Implementation of SMKK (Construction Safety Management System) Based on the Regulation of the Minister of PUPR No.10/2021 on the Construction Project of Coastal Safety Development," pp. 437–444, Jan. 2023, doi: https://doi.org/10.5220/0012584400003821.

[8] W. Qin, H. Li, W. Li, C. Han, X. Ji, and J. Gu, "A proactive driving risk assessment on mountainous two-lane roads considering opposite-direction vehicle interactions from video-based trajectories," *Computers & Industrial Engineering*, pp. 110848–110848, Jan. 2025, doi: https://doi.org/10.1016/j.cie.2024.110848.

[9] L. Kopenhafer *et al.*, "Patient experience and unmet needs in high-risk nonmuscle-

invasive bladder cancer: Insights from qualitative interviews and a cross-sectional survey," *Urologic Oncology Seminars and Original Investigations*, vol. 42, no. 3, pp. 70.e1–70.e10, Jan. 2024, doi: https://doi.org/10.1016/j.urolonc.2024.01.013.

[10] M. Valasik, "Gang injunction, What's your function? Investigating the relationship between civil gang injunctions and gang associates' patterns of association," *Journal of Criminal Justice*, vol. 96, p. 102339, Jan. 2025, doi: https://doi.org/10.1016/j.jcrimjus.2024.102339.

[11] Y. Xin, Y. Xin, X. Huang, and L. Xu, "Coping strategy of independent directors for job-fulfillment risk under different ownership types and enforced legal environments," *China Journal of Accounting Research*, vol. 17, no. 4, pp. 100392–100392, Oct. 2024, doi: https://doi.org/10.1016/j.cjar.2024.100392.

[12] Y. Guo, Y. Sun, Q. Si, X. Guo, and N. Chen, "Probabilistic Risk Assessment of Civil Aircraft Associated Failures under Condition-based Maintenance," *Reliability Engineering & System Safety*, pp. 110550–110550, Oct. 2024, doi: https://doi.org/10.1016/j.ress.2024.110550.

[13] B. Arnaud *et al.*, "Status Of Infection Prevention And Control In Cameroon Healthcare Facilities: Lessons Learned From The Who Covid-19 Scorecard Tool Under The Hierarchy Of Control Model," *Infection Prevention in Practice*, vol. 6, no. 4, pp. 100407–100407, Oct. 2024, doi: https://doi.org/10.1016/j.infpip.2024.100407.

[14] Vahid Hajipour, D. D. Caprio, F. J. Santos-Arteaga, Amirali Amirsahami, and S. V. Noshafagh, "A two-stage stochastic programming model for comprehensive risk response action selection: A case study in Industry 4.0," *Expert Systems with Applications*, pp. 125565–125565, Oct. 2024, doi: https://doi.org/10.1016/j.eswa.2024.125565.

[15] J. Zhu, M. Saberian, J. Li, L. Wang, and T. Maqsood, "Turning crisis into opportunity: A comprehensive review on the application of personal protective equipment (PPE) waste in asphalt pavement construction for sustainable development," *Resources, Conservation and Recycling*, vol. 211, p. 107857, Dec. 2024, doi: https://doi.org/10.1016/j.resconrec.2024.107857.