

## Study of Literature on Risk Management for Employee Health and Safety in Construction Projects

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### ABSTRACT

*Assessing possible risks in construction projects helps predict risks and plan risk management strategies. In construction projects, many factors can affect project completion, including the risk of work accidents. This research aims to look for Occupational Health and Safety risk factors for COVID-19 in construction projects by conducting a literature study on several previous studies. The research methodology is a literature search using the Publish or Perish application. Relevant literature is then used as a source of research. Based on the results of a literature study, twenty-eight risk factors are considered to have the potential to occur in construction projects consisting of eighteen OHS risk factors and ten COVID-19 risk factors. The five most common risk factors for OHS in previous studies were: falling from a height, being hit by material, being electrocuted, being scratched by workers, being punctured by material, and being hit by heavy equipment.*

**Keywords:** COVID-19; Occupational Health and Safety (OHS); Risk Management; Construction Projects

### Introduction

The construction industry is diverse and comprises various types of employment and distinct industrial sectors [1]. A construction project is an activity related to building structures that must be completed within the specified time frame to achieve the specified goal. However, every construction project carries a risk [2]. Many factors affect the design and construction of a project, but the one that stands out the most is work accidents [3]. Work accident occurs due to a lack of attention to the health and safety of employees [4].

Occupational Health and Safety (OHS) is a crucial factor that must be considered in the construction industry. If OHS is approved, the risk of workplace work accidents will increase, eventually harming employee quality and jeopardizing all of the project's activities [5]. The government instructed the contractor to place OHS on the roof. However, although the government has begun implementing System Construction Safety Management, implementation of OHS in Indonesia still needs to be widespread. Fatal workplace accidents continue to occur and may cause complications during the launch of construction projects [6].

Social Security Administration Agency, in Indonesia, there were approximately 123.041 cases of work accidents in 2017, whereas there were 173.105 cases in 2018 [6]. According to the International Labor Organization (ILO), there are over 6.000 cases of work accidents that result from victims every day throughout the world. There are 20 fatal workplace accidents out of every 1000 in Indonesia due to worker negligence in construction [7]. Therefore, a risk management and control system for OHS is essential to implement during construction project implementation because it is part of project planning and control.

The risk of spreading the COVID-19 virus is currently affecting work activities on construction projects. The World Health Organization declared COVID-19 a global pandemic and a humanitarian disaster on 11 March 2020 [8]. COVID-19 has weakened various sectors, including the construction sector in Indonesia. Construction work involves a lot of human resources, and interactions between workers are difficult to avoid, so they are very vulnerable to the spread of diseases such as COVID-19 to workers [9]. The first case of COVID-19 in Indonesia was confirmed on 2 March 2020, and on 16 August 2022, the number of positive cases of COVID-19 in Indonesia reached 6,286,362 with 157,252 deaths [8].

A few studies focus on COVID-19 risk in construction projects, but none jointly analyze OHS and COVID-19 risk factors. Due to this, the purpose of the current study will be to identify risk factors that could negatively affect the execution of a design project, the methodology used, and the study's findings. A literature review is conducted to provide transparent information about potential risks that could arise during project construction and to serve as a guide for identifying risk factors in construction projects [10], [11]. Study

literature is valuable for developing academic ideas and solidifying an understanding of the current subject [12] identifying critical knowledge gaps, and researching contributions for a deeper understanding [13].

## Research Methods

The current project begins by looking for literature using the free app Publish or Perish, followed by selecting literature based on the keywords "manajemen risiko "keselamatan dan kesehatan kerja," " identifikasi risiko" and "COVID-19." the Risks that will be taken care of OHS and COVID-19 during the execution of the construction project. The literature review for this paper was based on the following research protocol [14], [15]:

1. Research using Google Scholar and the Crosreff database.
2. The key phrase that is used for writing is "manajemen risiko\* AND (pada proyek konstruksi OR keselamatan dan kesehatan kerja OR pada masa pandemi COVID-19) AND identifikasi risiko\* AND (pada proyek kontruksi OR keselamatan dan kesehatan kerja OR pada masa pandemi COVID-19)".
3. The literature references from the current year of 2018 until the year 2022.
4. Review literature based on title and compliance with the purpose of the study.
5. Identifying and minimizing risk factor.

After determining the risk based on the risk categories of OHS and COVID-19, risk management literature for the construction project is started. There are research checklists in Figure 1.

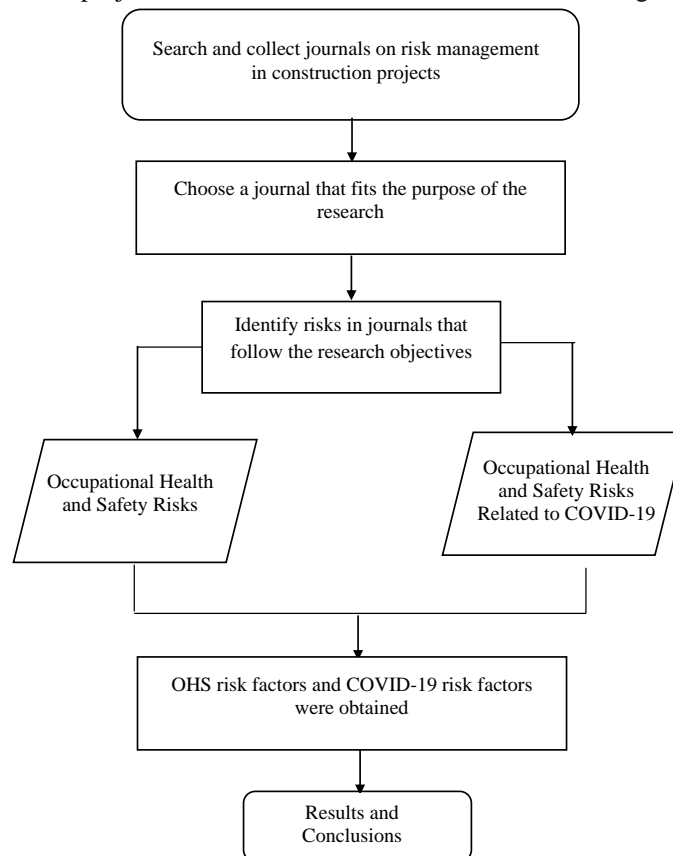


Figure 1 Research Framework

## Results and Discussion

About 60 works of literature are appropriate for the literature review based on title among the 100 revealed using the Publish or Perish app. Following a more thorough investigation using literature that is in line with the study's objectives, the table below lists 12 works of literature that are pertinent and exciting.

**Table 1** Previous Research about Risk Identification

No.	Literature/References	Research Result
1	S. P. Nugroho, R. Pratiwi, and Syahrudin (2018)	Ten jobs were obtained with the highest risk of causing work accidents with the highest value, namely the risk of falling from a height [16]
2	W. Hartono, S. Sugiyarto, and P. Siwi R (2019)	Slab formwork, column installation, and column reinforcement fabrication provide the most significant risks. Risks associated with the two previous jobs include material loss and job loss due to overuse or underuse of the material [17]
3	F. Tamim and A. Ismail (2020)	It is known that six risks are classified as high, namely electric shock, sparks, and fire, worker falls with a rating of 16, workers falling from a height, workers injured while working, and fire due to a leaky tube with a rating of 12 [18]
4	A. Firdaus, H. Hazairin, and G. P. Partadisastra (2021)	Ninety-two risk variables were found, consisting of two high risk, forty-one low risk, and forty-nine medium risk. The risk that most affects work activities on the project is the spread of COVID-19, with a risk index value of 16.45 [19]
5	N. K. S. E. Yuni, I Nyoman Suardika, and I Wayan Sudiasa (2021)	OHS risk in constructing a geological building was identified in the structural and architectural risk chapter. The risk category that has been identified is below-average risk and above-average risk moving forward [20]
6	I. A. Alfarezi, J. W. Soetjpto, and S. Arifin (2021)	Risky workplace scenarios include the possibility of material spillage due to a malfunctioning sling crane, tower crane collapse, and job-related injuries [21]
7	H. M. Sari (2021)	Deployment COVID-19 and reactivated/positive COVID-19 are the highest risk levels [22]
8	N. M. Jaya, G. A. P. C. Dharmayanti, and D. A. R. Ulupie Mesi (2021)	Risk dominance ranges from two to three times as much for the high risk category [6]
9	W. Boy, R. Tuhjiah M, and R. A. Fitrah (2022)	It should be noted that according to AS/NZS 4360, there are two risks of categorized low and eight risks of category moderate [23]
10	T. A. N. Cahyo and A. Sutarto (2022)	There are no variables that fall under the high category. However, two dozen variables fall into the medium, and thirty-three variables fall into the low categories [3]
11	S. Fauziyah, R. Susanti, and L. Lukman (2022)	The specific risk associated with the COVID-19 pandemic from the perspective of the contractor, which includes human factor risk, material risk, method risk, and environmental risk assessment, is the primary risk factor of COVID-19 [24]
12	S. M. K. G. Camacho and O. V. M. J. Antonio (2022)	Everything here is a guide for identifying risk management strategies that apply to businesses and institutions. The impact that has been identified can be used as a backup plan in case a new case of health occurs in the future. It can also guide how the construction industry can grow and prosper [25]

Results of the literary analysis based on the above literature are shown in Table 2 below.

**Table 2** Literature Identification of Risk

No.	Risk Identification	Number of Literature according to Table 1												Amount	
		1	2	3	4	5	6	7	8	9	10	11	12		
1	Workers scratched and punctured material		✓		✓		✓	✓							4
2	Crushed material	✓	✓	✓	✓		✓	✓	✓		✓				8
3	Head bump		✓												1
4	Skin irritation		✓	✓	✓										3
5	Worker trips over material		✓												1
6	There is a spark and it starts a fire				✓										1
7	Workers get injured while working	✓		✓											2
8	Respiratory disorders due to sand/cement dust	✓		✓											2
9	Get hit by a work tool				✓		✓								2
10	Lumbar muscle injury				✓										1
11	Fall into a dug hole			✓	✓	✓									3
12	Hidden due to embankment					✓									1
13	Hit by heavy equipment			✓	✓	✓			✓						4

No.	Risk Identification	Number of Literature according to Table 1												Amount	
		1	2	3	4	5	6	7	8	9	10	11	12		
14	Exposure to chemicals					✓									1
15	Fall from a height	✓	✓	✓	✓	✓	✓	✓	✓		✓				9
16	Grind cut					✓									1
17	Cut bar bender/ bar cutter			✓		✓									2
18	Got electric shock	✓	✓	✓		✓			✓		✓				6
19	Spread of COVID-19				✓			✓							2
20	Reactive/positive for COVID-19				✓			✓							2
21	Workers are exposed to COVID-19 due to crowds							✓							1
22	Workers catch the COVID-19 virus as a result of not wearing masks							✓							1
23	Workers contracted COVID-19 due to additional workers from outside the project							✓							1
24	Workers are exposed to COVID-19 due to direct contact							✓							1
25	Lack of epidemic prevention materials such as disinfectants, hand sanitizers, masks											✓			1
26	Lack of firm attitude in implementing health protocols												✓		1
27	Work standards that do not prioritize health protocols												✓		1
28	Lack of knowledge of workers about the consequences of not complying with health protocols												✓		1

The journal used in this study was published in domestic and foreign countries for five years, from 2018 to 2022. The grouping of journals based on the year of publication can be seen in Figure 2 below.

Classification of Journals Based on Year of Publication

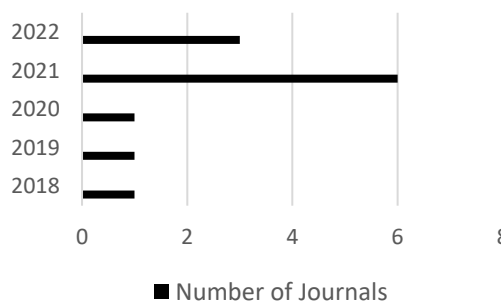


Figure 1 Journal submission guidelines based on the current year

In-depth research has been done by several scholars on the risk factor OHS, including S. P. Nugroho, R. Pratiwi, and Syahrudin (2018), who warn that the risk factor is too high if it represents a high during the existing process. W. Hartono, S. Sugiyarto, and P. Siwi R's paper from 2019 assert that the pekerjaan besting pellet and kolom have the greatest risk. Tamim & Ismail's research (2020) found six high risks, namely electric shock, sparks and fire, workers falling from heights, workers being injured while working, and fires due to leaking tubes. A. Firdaus, H. Hazairin, and G. P. Partadisastra's paper from 2021 assert that the risk of COVID-19 infection is the risk that has the most impact on project activities. Penelitian N. K. S. E. Yuni, I Nyoman Suardika, and I Wayan Sudiassa (2021) used to interview and surveillance to identify two dozen OHS risks and solicit responses regarding risk mitigation strategies, with eleven risks in the mild category and seventeen risks in the moderate category. I. A. Alvarez, J. W. Soetjipto, and S. Arifin's study from 2021 identified four significant risks associated with the risk of work accidents, each caused by a different causal factor. According

to H. M. Sari (2021), the most significant risk associated with this project is the spread of COVID-19. N. M. Jaya, G. A. P. C. Dharmayanti, and D. A. R. Ulupie Mesi (2021) used various techniques to identify risks, including brainstorming, questionnaire, and interview.

Several studies have already been conducted to identify and analyze the OHS risk in the construction project. There are differences in the locations located in various regions of Indonesia and beyond the country and some discussion of the COVID-19 factor. Researchers S. P. Nugroho, R. Pratiwi, and Syahrudin (2018) and W. Hartono, S. Sugiyarto, and P. Siwi R (2019) both use interview and questionnaire methods for risk identification as well as risk assessment instruments to analyze risks in formwork installation work. Research Tamim & Ismail (2020) used the risk assessment standard AS/NZS 4360:2004 tools to identify a significant risk to the project. In contrast, researchers A. Firdaus, H. Hazairin, G. P. Partadisastra, and I. A. Alfarezi (2021) and I. A. Alfarezi, J. W. Soetjipto, and S. Arifin (2021) used the Kuesioner Method and Bowtie Analysis to identify and analyze risks, including the COVID-19 pandemic risk. Numerous research findings indicate that the risk of altitude and exposed COVID-19 must be immediately addressed in the construction project. Research also reveals that systematic data collection and risk analysis using appropriate techniques can assist in reducing OHS risk in construction project designs.

## Conclusion

Based on literature studies conducted, the following conclusions may be drawn:

1. There are two multiples of the OHS risk factor, composed of the OHS risk factor and one risk factor related to the COVID-19 pandemic.
2. There are numerous factors, including: being harmed by height, having too much material, being listed, having erroneous work done, needing more material, and having too much specific equipment. The final risk factor that has been identified can be used to inform researchers about how to manage worker safety and health risks in construction projects by using the method and standard AS/NZS 4360:2004 and relative importance index (RII) risk assessment. In light of this, it may be recommended that the last phase of the study focus on managing risk at the OHS level by combining the COVID-19 risk factor with the risk assessment using RII and AS/NZS 4360:2004 standards.

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