



Study of COVID-19 Health Protocol Standards in Construction Industry of Indonesia

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Highlights:

- There are four main groups of elements for evaluating health protocol standard criteria, which can be divided into three levels each.
- The Ministry Regulation of PUPR No. 10 Year 2021 on Construction Safety Management System Guidelines did not accommodate emergency handling for natural disasters, including the global COVID-19 pandemic.
- There are no guidelines that cover an integrated health protocol standard and SOP for the construction industry for practical use during field work.
- The government regulation did not set a minimum health protocol standard that considered each market segmentation scale in the construction sector, thus there is a high potential of causing variety in implementation of the standard and financial expenditure gaps.
- The health protocol standards of two state-owned construction companies were shown to be satisfactory in accordance with international and national standards, but further study is needed on health protocol standard implementation, especially related to field work.

Abstract. Due to the decrease in GNI per capita, the Indonesian government has launched its national economic recovery program in response to the COVID-19 emergency crisis, known as the New Normal and ordered to partially resume on-hold infrastructure projects followed by the implementation of a new, integrated COVID-19 health protocol. This research presents a study of health protocol standard implementation in the construction industry with the aim of formulating recommendations for minimum criteria elements that can be used for construction services companies at all levels. The domain-taxonomy analysis approach was used as the research method: the ISO/PAS 45005:2020 and ILO standards were adapted to Ministerial Regulation of PUPR No. 10 Year 2020. A gap analysis was conducted with Singapore, Malaysia, and Australia. The analysis generated four segregated main groups of elements with level-2 sub criteria. The main groups of elements were: Planning, Prevention, Handling, and Control and Evaluation. These criteria were validated and implemented in a case study of state-owned construction enterprises, here called PT. X and PT. Y, with large, qualified

construction companies. From the implementation analysis it was found that PT. X and PT. Y had implemented the minimum criteria of the COVID-19 health protocol for construction workers very well.

Keywords: *construction health protocols; construction management; COVID-19; health and safety management; natural disaster mitigation.*

1 Introduction

Early 2020 in March, Indonesia was reported as one of 69 countries in the world that began to be infected by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), also known as COVID-19. COVID-19 is a respiratory disease caused by a coronavirus and is transmitted through physical touch [1] and possibly also through the air [2]. Based on data from the COVID-19 Response Acceleration Task Force of the Republic of Indonesia, the number of positive confirmed cases in Indonesia until October 5, 2020 was 303,498 people, with the Nr. of deaths, at 11,151 people, which means a case fatality rate of 3.7% [3].

Based on research conducted by the Chinese CDC, it is known that most COVID-19 cases occur in men at 51.4 %, at an age between 40 and 79 years [4]. In the construction sector, 98% of the total number of workers are men, and 47% of the total number of workers are in the 24-50 year age group, both working in the field and in the office, with 11.7% of them being experts [5]. The WHO categorizes construction sector jobs as jobs with a moderate risk of transmission [6]. According to Sparrow, *et al.* [7], the Indonesian government has been trying to overcome losses due to increased risk. The government currently seeks to initiate restriction regulations known as New Normal for high-priority sectors such as the construction sector, as a mitigation effort with a strategy of integrating new activity patterns in accordance with work-related health protocols. Most construction companies have incorporated aspects of COVID-19 guidelines into site health and safety policies with the majority regulating site access, handling of COVID-19 cases, induction, screening, and social distancing [8]

Following up on the New Normal regulations, the Ministry of Public Works and Public Housing (PUPR) of the Republic of Indonesia issued a directive through Instruction of the Minister of PUPR Nr. 02/IN/M/2020 concerning the Protocol to Prevent the Spread of Coronavirus Disease 2019 (COVID-19) in the Implementation of Construction Services, on March 27, 2020. The PUPR minister's instruction was based on an instruction of the President of the Republic of Indonesia, which was followed by the issuance of procedures for implementing the Circular Letter of the Minister of PUPR Nr. 18 of 2020 concerning the Implementation of New Normal Orders and Adaptations in the Implementation of Construction Services [9].

Although the Instruction has been issued, there were no standard criteria for procedures for the implementation of COVID-19 handling protocols in the field of construction with value indicators for control until the moment this study was carried out [10]. Standard criteria are necessary to be implemented and aligned to the Occupational Health and Safety Management System in the construction sector [11], which is believed to possibly have an effect on the performance of many multi-year projects [12]. During the COVID-19 pandemic, the implementation of Construction Occupational Health and Safety (OHS) in Indonesia refers to PUPR Ministerial Regulation Nr. 10 of 2021, which contains documents to maintain quality of health, but does not include an approach to implementing health protocols for COVID-19 in the construction sector [11]. Maintaining the quality of health of workers is one of main aspects to manage the potential quality cost of project budget plans [13].

Considering the high spike in COVID-19 cases in Indonesia, the low level of discipline in carrying out health protocols in the work environment [14], and the high risk of transmission in the construction sector, it is necessary to have comprehensive standards and criteria to control the surge of COVID-19 cases, as well as a track record of research on human resource management mitigation mechanisms against pandemic disasters, to improve the construction sector's services and raise the sector's competitiveness [15]. This study identified and examined the health protocols used for the construction sector in Indonesia and compared them to similar international standards, as well as providing recommendations for elements of the minimum criteria for construction worker's health protocols at the company and project levels. This study also carried out an implementation analysis of minimum criteria for construction worker health protocols for state-owned contractors in the Indonesian construction sector.

2 Methodology

This research was carried out using a comparative qualitative research method with primary data collection derived from document studies. Documents are sources of data used to complete research in the form of written sources, films, photos, and monumental works, which provide information for the research process [16]. The secondary data collection used interviews as direct communication between researchers and respondents [17], using semi structured questions, aimed at identifying problems regarding the difficulties of implementing health protocols in Indonesia more openly. Existing data were analyzed for comparative identification, which was componential based on the highest classification level according to the Construction Safety Management System Guidelines (SMKK) from PUPR Ministerial Regulation Nr. 10 of 2021^{after} that, a gap analysis was carried out with other countries that have

implemented similar health protocols. The conceptual framework of this research is displayed in Figure 1.

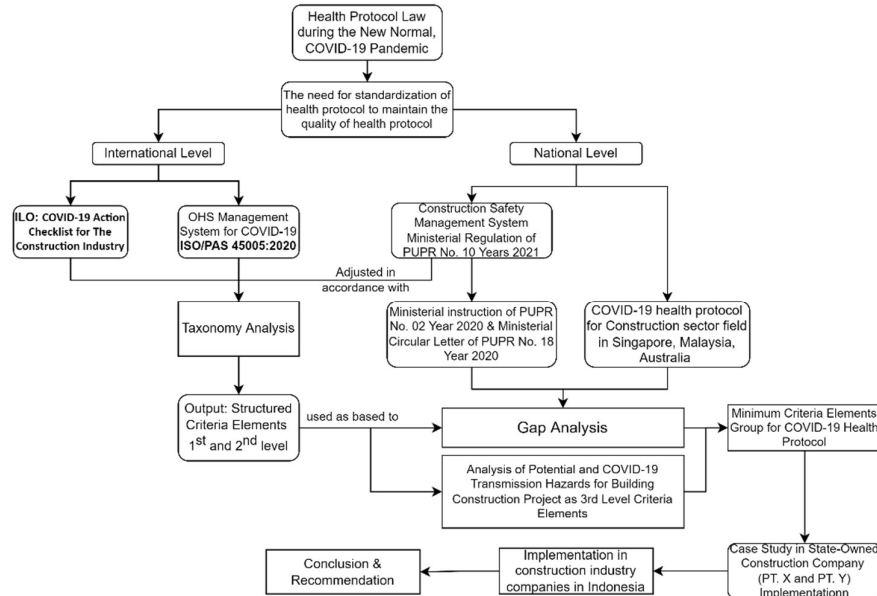


Figure 1 Conceptual framework of the research.

The regulations that were used as data for the study of documents in this research are described in Table 1.

Table 1 Health protocol regulations.

Health Protocol	Regulation References
ILO	1) ILO standards and COVID-19 (Coronavirus) 2) Safe Return to work Guide for Employers on COVID-19 Prevention 3) COVID-19 Action Checklist for the Construction Industry
ISO	ISO/PAS 45001:2018; ISO/PAS 45005:2020
Singapore	Building and Construction Authority: COVID-Safe Restart Criteria
Malaysia	CIDB Malaysia, SOP Construction Sector
Australia	Coronavirus (COVID-19) Guidelines For The Building and Construction Industry Victoria
Indonesia	1) Instructions of the Minister of PUPR Nr. 02/IN/M/2020 concerning Protocols for Preventing the Spread of COVID-19 in the Implementation of Construction Services 2) Circular Letter of the Minister of PUPR Nr. 18/SE/M/2020 concerning the Implementation of the New Normal Order and Adaptation in the Implementation of Construction Services

The taxonomic structure and grouping structure of the international health protocols belonging to ISO/PAS and ILO were analyzed to then serve as a basic reference in determining the minimum grouping criteria. Taxonomic techniques are usually used to identify differences and make a classification based on knowledge to construct class models [18]. To identify and build the base knowledge, it is necessary to conduct a comparative analysis between current existing classes [19]. Therefore, to adjust commitments and consider aspects that cannot be reached by ISO/PAS and ILO, a comparative analysis of the implementation of health protocols in Australia, Singapore and Malaysia was conducted. The expected result of this analysis was a description or map of the relationships, linkages, and potential hazards of each activity. The results of the identification were classified based on which mitigations are recommended that can be used as standard parameters or indicators for the government to measure the implementation of the COVID-19 prevention health protocol system.

As validation, we also collected data in the form of case studies from the state-owned enterprises (BUMN) PT. X and PT. Y, with the level of the taxonomy being developed only up to two levels. The PT. X and PT. Y state-owned enterprises were large, qualified construction companies that succeeded in incorporating a health protocol in their Construction Safety Plan (Rencana Keselamatan Konstruksi – RKK) for the first time, and were able to continue various megastructure projects in Indonesia. This taxonomy represents health protocol indicators at the company level and at the project level or for work in the field, where data were obtained based on observations of activities as part of building project work. Then a risk analysis was carried out on the potential for transmission that may occur during field work (grouped by type of field work). The case studies were also analyzed for the implementation level of the two state-owned enterprises to formulate the minimum criteria recommendations. The implementation level by the companies was calculated by the average method through a binary scale, based on (value 1) has or not yet has (value 0) criteria.

3 Structured Analysis of the International Guidelines of COVID-19 Health Protocol with the Approach of Indonesian Construction Safety Management System Law

Referring to the standardization theory of Verman [20], standardization authority levels are distinguished at the company, national, regional and international levels, and comprise a range of assessments and classifications. At the international level, the integration of a COVID-19 prevention health protocol in the scope of work can refer to the general guidelines ISO/PAS 45005:2020, which is a derivation from ISO 45001:2018, while the direction of applying disciplined

knowledge to construction workers in general refers to ILO's *COVID-19 Action Checklist for The Construction Industry*. Both were formulated based on general directions from the WHO. In Indonesia, Occupational Health and Safety standards for construction work are generally regulated by PUPR Ministerial Regulation Nr. 10 of 2021 concerning Construction Safety Management System Guidelines, where the preparation is in line with international norms, ISO 45001:2018 and ILO guideline OHSAS 2001 [21].

3.1 Taxonomic Analysis and Complete Structure of the COVID-19 Health Protocol

First, the taxonomic analysis mechanism used ISO/PAS 45005:2020 and the ILO COVID-19 checklist for the construction industry, which was then adjusted to the element content rules in PUPR Ministerial Regulation Nr. 10 of 2021. Based on the ISO/PAS 45001:2018 element approach, the best occupational health and safety (OHS) management system effort is based on four elements, namely: plan (orange), do/implementation (blue), check/inspection (purple), and action/improvement (yellow). These four elements are illustrated in the diagram in Figure 2.

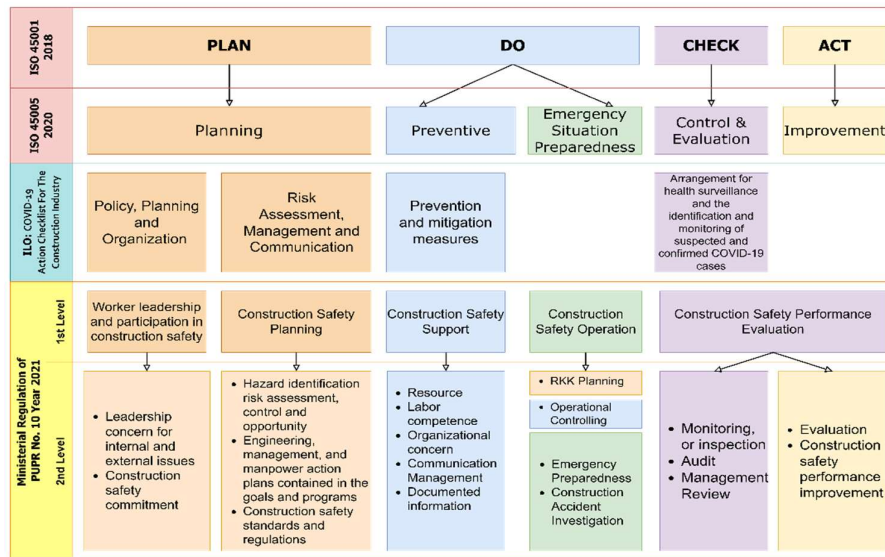


Figure 2 The taxonomy classification group and complete structure adjustments.

The structure of ISO 45005:2020, between Planning and Implementation, is mediated by handling emergency situations, so it is divided into two situational efforts, namely prevention (blue) and handling (green). Thus, there are five main

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basic elements that can be used as basic references, which will be the major components on level 1 to facilitate the process of analyzing taxonomic groupings on levels 2 and 3. Based on ISO 45005:2020 and synthesis results of ILO standards and PUPR Ministerial Regulation Nr. 10 of 2021, the level-2 taxonomy is described Table 2.

Table 2 Synthesis result of Covid-19 health protocol taxonomy.

Level 1	Level 2	Availability Checklist		
		ISO OHS Management System for COVID-19	ILO for COVID-19	SMKK PUPR Ministerial Regulation Nr. 10 for 2021
Planning	1. Risk Management, Identification and Assessment	✓	✓	✓
	2. Organization	✓	✓	✓
	3. Leadership and Participation	✓	-	✓
	4. General Planning	✓	✓	✓
	5. Workplace Planning	✓	✓	✓
	6. Roles and Activities	✓	✓	✓
	7. Commitment and Communication	✓	✓	✓
	8. Change Policy and Workload Limitation	✓	✓	✓
Prevention	1. Mental and Physical Health	✓	✓	✓
	2. Hygiene and Sanitation	✓	✓	✓
	3. Communication	✓	✓	✓
	4. Resource	✓	✓	✓
	5. Personal Protective Equipment (PPE)	✓	✓	✓
	6. Operation	✓	✓	✓
Handling (Workers Exposed to COVID-19 Cases)	1. Identification of Workers Exposed to COVID-19	✓		
	2. Management of Exposed Cases in Workplace	✓	(No, because it is left to the protocol of medical personnel)	(None, but included in emergency response readiness)
	3. Contact Testing and Tracking	✓		
	4. Quarantine	✓		
Control and Evaluation	1. Management Review	✓	-	✓
	2. Monitoring/Inspection	✓	✓	✓
	3. Audit	-	-	✓
Improvement	1. Monitoring and Evaluation	✓	✓	✓
	2. Improvement	✓	-	✓

3.2 Basic Taxonomy Classes for COVID-19 Health Protocol

Our comparison of ISO/PAS 45005:2020, ILO: COVID-19 Checklist for Construction Industry, and PUPR Ministerial Regulation Nr. 10 of 2021 concerning Construction Safety Management Systems, showed the following differences.

3.2.1 Planning

In the ILO standards, planning begins with planning policies, organizations, risk assessments, management, and communication, while PUPR Ministerial Regulation Nr. 10 of 2021 begins with leadership and participation, as well as construction safety planning. This is in accordance with the substance content contained in ISO/PAS 45005:2020 on level 2, namely leadership and communication.

The ILO standards do not include things like leadership, but the participation of all parties involved; however, not as a criterion for the elements of communication. Meanwhile, Workplace Planning in ISO 45005:2020 is regulated in the Construction Safety Plan (RKK) document, which is grouped under Construction Safety Operations.

Therefore, we concluded that all classifications carried out by ISO 45005:2020 are in accordance with the Construction Safety Management System Guidelines in PUPR Ministerial Regulation Nr. 10 of 2021, and the terminology of the grouping could be used.

3.2.2 Preventive Act

The Mental and Physical Health category in the Construction Safety Management System Guidelines contained in PUPR Ministerial Regulation Nr. 10 of 2021 is not a concern for level-1 Prevention but is a concern for RKK in the preparation of project planning in Indonesia. The Hygiene and Sanitation, and Communication category in the Construction Safety Management System Guidelines contained in PUPR Ministerial Regulation Nr. 10 of 2021 was discussed but not on aspects and angles of preventing the transmission of COVID-19.

There are arrangements for prevention efforts related to light/heavy equipment, materials, and entry fees for resource element groups. Personal protective equipment (PPE) is provided for in terms of technology, equipment, materials, and costs. ISO refers to operations that are carried out for general work environments and offices, while the ILO standards do not discuss any specifics of the project's location and focuses on the room.

3.2.3 Emergency Preparedness

Handling in Emergency Situation Handling in ISO and ILO refers to handling the situation of workers exposed to COVID-19 at construction sites. Handling in the Construction Safety Management System Guidelines contained in PUPR Ministerial Regulation Nr. 10 of 2021 is equivalent to the Emergency Response Preparedness Clause.

3.2.4 Control and Evaluation

Control and Evaluation at ISO is defined as a group of criteria to control and minimize the possibility of COVID-19 by means of data collection and reporting discipline [22-23]. The Construction Safety Management System Guidelines contained in PUPR Ministerial Regulation Nr. 10 of 2021 can be categorized as a management review and evaluation of construction safety performance because it is an effort to collect data regarding reviews of the implementation of the COVID-19 Health Protocol Management.

When compared, the content and rules on control and evaluation contained in ISO 45005:2020 can use the Construction Safety Management System Guidelines imposed by PUPR Ministerial Regulation Nr. 10 of 2021 to adjust procedures that are appropriate and suitable to be implemented in Indonesia.

3.2.5 Improvement

Contains protocols or guidelines need to be carried out to improve the quality of the implementation of health protocols against COVID-19. At this stage, it is hoped that there will be activities to innovate and improve the health protocol planning system.

4 Gap Analysis of Indonesian COVID-19 Health Protocol for the Construction Industry with Other Countries

After analyzing the standard guidelines at the international level, the results of the synthesis were obtained for the groups of element on level 1 and level 2. The two levels were re-matched for their substance content with the COVID-19 Health Protocol Standards implemented in the construction sector at the national level. At the national level, the organizers of the standards are the government, agencies under the government, or representatives appointed by the government who issue official standards.

Based on the results of the analysis of the differences in the regulations of the Health Protocol of the Ministry of PUPR and the Health Protocol of the State Construction Sector, it was found that the Health Protocol for the Construction

Sector of the Ministry of PUPR still has many gaps. For levels 1 and 2, almost all have been accommodated. However, when compared to the implementation in Singapore and Australia, Indonesia does not have criteria for the assessment range that can accommodate the control of the implementation of health protocols. Compared to other countries, the health protocol from the Ministry of PUPR needs intensive and dynamic renewal and improvement, as well as following the development of new information related to COVID-19.

In addition, it is necessary to have specifications on construction work in the field [24] because so far, the instructions of the Minister of PUPR and the circulars of the Minister of PUPR have only discussed bureaucratic and administrative procedures, but there is no qualification system or market segmentation for companies in the implementation of health protocols in the two regulations. In the Construction Safety Management System Guidelines from PUPR there is a qualification system, while BCA Singapore has accommodated different elements of health protocols.

The Construction Safety Management System Guidelines from PUPR need to be implemented based on the qualifications of the project size. Implementation of the health protocol has a large procurement variant, so there needs to be a health protocol that has been adjusted to the qualifications, so that no company or small project implements a health protocol that exceeds its budget.

In the study that has been carried out, it was also found that the substance of the meaning of communication commitment is emphasized in other standards in each group of elements for various levels of workers (both task forces and other workers). While the importance of communication commitment in the regulation of the Circular Letter of the Minister of PUPR is not emphasized and submitted to each company's efforts, so it is not standardized.

Based on the taxonomic analysis, the minimum criteria that have been determined previously require additional level-2 sub criteria in the prevention category. Based on best practices from all national-level health protocols, it is necessary to add recommendations for the sub criteria for the Implementation group of Construction Work, Division of Work Zones and Physical Distancing, and Travel/Mobilization, which are in accordance with the substance contained in ISO 45005:2020.

5 Analysis of Potential COVID-19 Transmission Hazards in Construction Activities

This analysis was used to develop and consider level-3 analysis processes in the level-1 and level-2 analysis processes that have been carried out previously.

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Based on the results of the analysis of the potential dangers of COVID-19 transmission in construction activities, it can be concluded that dangerous things that need to be watched out for in order to be taken into consideration when making level-3 analysis processes are as follows:

1. Activities in public spaces: There needs to be a grouping at level 3 where public space activities, for example in toilets, places of worship, places to eat/canteen, barracks, and so on, are considered to be handled separately.
2. Contact when touching objects that are shared: There needs to be a grouping at level 3 where the activity of using shared tools is a consideration, because in Indonesia PPE in the form of gloves is still rarely used, especially for medium- to low-level projects.
3. Grouping of health protocol procedures based on project location: It is necessary to consider grouping implementation procedures based on the type of project, especially wet and dry projects, because water can be a dangerous transmission medium. As a matter of fact, drainage and septage management also need to maintain waste that has the highest transmission risk [25].

For the majority of construction activities carried out in open space it is necessary to pay attention to the standard operating procedures (SOP) of work and health protocols, especially related to physical distancing. Physical contact between workers due to the process of transferring materials and construction equipment is one of the main potential routes for the spread of Covid-19.

All construction work ranging from preparation work, lower structure work, upper structure work to architectural work has different transmission risks, especially work in closed rooms such as basements, which has the highest risk. Almost 68% of COVID-19 cases in the construction industry were transmitted in office rooms and basement construction[26]. Therefore, managing the work zones when fabrication and mobilization of materials or hand tools carried out by humans can lower the risk of virus transmission.

In the operation and implementation of construction services, prevention protocols must be applied at level 2 starting from: 'Meeting and Work Visits', 'Procurement Protocol', 'Contract Preparation Procedure', 'Construction Work Procedure'. The Level 3 Prevention Protocol at this stage will refer to the Instruction of the Minister of PUPR No. 2 of 2020 concerning Prevention of the Spread of Covid-19 and Circular of the Minister of PUPR Nr. 18 of 2020 concerning the Implementation of New Normal Habits in Implementation of Construction Services, while it has not been regulated in ISO and ILO. In addition, for 'Procurement and Contract Preparation', sub criteria are more bureaucratic with dynamic regulations, so the procedure itself needs to be adjusted over time and should not be based on rigid standard criteria.

6 COVID-19 Standard Guidelines Used for State-owned Construction Companies in Indonesia

The Ministry of State-owned Enterprises (BUMN) controls the implementation of health protocols at the company level using the COSMIC application, which is integrated with the cloud drive database system, making it easier for the BUMN ministry's audit team to monitor. Therefore, state-owned companies already have an assessment standard for the implementation of the Health Protocol in Indonesia.

Based on the taxonomy model, it was found that state-owned companies have a more complete set of health protocol elements due to the complexity of the reference base, not only from the Ministry of PUPR, but also from an international scale as well as other ministries such as the Ministry of Health and the Ministry of BUMN. For the company level and the project level, construction companies can use the Health Protocol of a state-owned enterprise in the construction service sector as a reference to more specific implementation, especially at the project and the planning levels. Meanwhile, the division of organizations such as the task force is not yet clear in the regulations, so that the management of the task force for each company is very varied and irregular.

Based on research studies, not all state-owned enterprises make efforts to 'improve' the health protocols implemented, such as Company X (PT. X). Meanwhile, Company Y (PT. Y) made improvements by holding a competition for the application of innovations in the COVID-19 health protocol management system. However, there are advantages, one of which is vendor job protection protocols and arrangements for accommodations. These two elements are not found in other elements of the health protocol but are included in the direction of the Circular Letter of the Minister of PUPR Nr. 18 of 2020 and can be considered for inclusion in the minimum protocol element.

7 Minimum Criteria Element Group COVID-19 Health Protocol Recommendation

From the results of research based on document studies, recommendations as elements that need to be present in the implementation of health protocols in the scope of construction work in Indonesia are listed in Table 3 below. The level-2 implementation criteria, measured by has (value 1) or not yet has value 0, the minimum criteria have been implemented in both Indonesian state-owned contracting enterprises. Based on the results of case studies, it was found that the implementation level of minimum criteria for the Covid-19 Health Protocol for both companies was equal to 0.96 from 1.00 for all criteria. This illustrates that

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both companies have implemented the minimum criteria for the Covid-19 protocol for construction workers very well. PT. X and PT. Y already have a commitment to implement the COVID-19 health protocol both in the project and the office environment. Of all the criteria, only the criteria for the stop mechanism for construction work have not been applied in both companies, because the mechanism is dynamic and always follows applicable government regulations.

Table 3 Implementation level based on minimum criteria of COVID-19 health protocol for state- owned contracting companies.

Elements of Health Protocols as Minimum Criteria	Element Origin	Implementation Level	
		PT X	PT Y
I PLANNING		1.00	1.00
Risk Management, Identification and Assessment		1	1
Organization		1	1
Leadership and Participation		1	1
Workplace Planning	ISO/PAS	1	1
Roles and Activities		1	1
Commitment and Communication		1	1
Change Policy and Workload Limitation		1	1
II. PREVENTION		1.00	1.00
Mental and Physical Health		1	1
Hygiene and Sanitation		1	1
Communication	ISO/PAS	1	1
Resource		1	1
Personal Protective Equipment (PPE)		1	1
Operation and Operation of Construction Services	PUPR and BCA	1	1
Work Zone Division and Physical Distancing	BCA and VBA	1	1
Travel and Mobilization	BCA	1	1
Accommodation and Places to Stay	BUMN	1	1
III. HANDLING		0.83	0.83
Identification of Workers Exposed to COVID-19		1	1
Management of Exposed Cases in the Workplace	ISO/PAS	1	1
Contact Testing and Tracking		1	1
Quarantine		1	1
Cooperation with Medical Workers	PUPR	1	1
Construction Work Stop Mechanism	PUPR	0	0
IV. CONTROL AND EVALUATION		1.00	1.00
Management Review	PUPR	1	1
Monitoring/Inspection	PUPR	1	1
Data Collection	CIDB	1	1
Audit	PUPR	1	1
V. IMPROVEMENT	ISO/PAS	1.00	1.00

For the planning aspect, the planning protocol for prevention owned by SOEs is in the form of a separate protocol package from all health protocol units and is used for project management levels. For the prevention aspect, the classification of health conditions of the two companies follows the instructions from the Ministry of Health, while the status and work activities follow the ISO/PAS standards 45005:2018. PT. X and PT.Y have different groupings for the four elements, cleanliness and sanitation, communication, resources, and PPE. Both companies also focus on the distribution of zones, mobilization, and the process of maintaining the quality of accommodation and places of stay. For the handling aspect, starting from the identification of workers exposed to COVID-19, case management, quarantining to cooperation with medical personnel, the two companies refer to the provisions of ISO, the Ministry of Health, and the Ministry of Public Works and Housing. In the control and evaluation aspect, the two enterprises manage COVID-19 cases through the Cosmic application accommodated by the Ministry of BUMN. Both companies have tried to evaluate and improve the application of protocols on an ongoing basis.

8 Conclusion

Construction activities require protocol procedures at the project level that are comprehensive and safe for workers, therefore adjustments to existing health protocol standards need to be made. Health protocols are dynamic because they follow changes in government mandates, so improvements and adjustments must be made. The five groups of elements recommended for a Health Protocol for Construction Workers in this study were: Planning, Prevention, Handling, Control and Evaluation, and Improvement. In the case study based on two construction state-owned companies, it was found that PT. X and PT. Y had implemented the minimum criteria of COVID-19 health protocol for construction workers very well. The elements of the health protocol can be used for further research on other infectious diseases or natural disasters and can maintain a multidisciplinary work environment to protect workers.

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