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Analysis of the Needs for the Development of a Work Environment-based Occupational Safety and Health Training Model in the Construction Industry

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Abstract

Occupational Health and Safety in the construction industry is not only a matter of meeting government regulations or international standards, but also an effort to reduce the number of frequent work accidents. this study aims to describe the analysis of the need for the implementation of health and safety in the construction industry to develop a work environment-based health and safety training model in the construction industry. This study uses a quantitative approach with a survey method to identify relevant health and safety training needs based on the conditions of the work environment at PT. XYZ. The design of this study is descriptive, aiming to clearly and objectively describe the needs of health and safety training based on the variables that exist in the work environment of PT. XYZ. This study uses a purposive sampling technique, selecting samples representing various divisions or different parts of the company, such as field workers, technicians, and supervisors totaling 32 people. The data collection time is adjusted to the company's operational schedule to minimize disruption to work activities. The results of this study will be used to develop a health and safety training model that is tailored to the needs identified in the research. The results of the research obtained needs analysis information including: (1) Analysis of the implementation of health and safety consisting of policies, namely Strengthening the supervision system for the implementation of health and safety, Conduct ongoing training with post-training evaluations to ensure employee understanding and compliance with health and safety, and Develop an incident reporting system that is easily accessible and protected from sanctions so that employees feel comfortable reporting any incidents; (2) There are several job

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risks that can be experienced by workers. The description is Excavation work is vulnerable to the risk of landslides or landslides, The work floor casting work involves the use of heavy equipment such as concrete mixers, transport trucks, and concrete vibrators. and Iron installation work is often carried out at construction sites with heights and (3) The results of the questionnaire related to the use of PPE for workers obtained information on workers using PPE by 28%; and workers do not use PPE by 72%. Thus, the tendency to use PPE for workers at PT. XYZ is in the category of not using.

Keywords: Needs Analysis, Occupational Safety & Health, Work Environment, and Construction Industry

INTRODUCTION

Occupational Safety and Health is a very important aspect in the construction industry, where the work carried out often involves a variety of physical, mechanical, chemical, and biological risks. In this context, the construction industry is known as a sector that has a high rate of work accidents compared to other sectors. Research shows that work accidents in the construction sector can be caused by a lack of knowledge and awareness of health and safety among workers, which has the potential to lead to serious injuries to death (Lidya et al., 2022; Wahyuni et al., 2018). In addition, the implementation of an effective health and safety program is expected to minimize the risk of accidents and occupational diseases, as well as increase work productivity (Nur, 2017; Semnasti, 2023).

Occupational Health and Safety in the construction industry is not only a matter of meeting government regulations or international standards, but also an effort to reduce the number of frequent work accidents. Data shows that work accidents in the construction sector tend to be higher compared to other industrial sectors. According to research, the construction sector accounts for more than 30% of all global work accidents, with the most common types of accidents including falling from heights, being hit by heavy objects, machinery accidents, and exposure to hazardous chemicals (Semnasti, 2023; Widiana, 2023). This shows that the construction sector has significant risks related to occupational safety, which requires serious attention from all parties involved.

The problem of work accidents in this sector is not only related to physical losses to workers, but also affects the efficiency and productivity of the construction project itself.

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Accidents can lead to project delays, additional costs for medical care and insurance claims, as well as negative reputational impacts for companies (Wacono et al., 2022). Research shows that the implementation of good health and safety not only reduces accidents, but also increases worker productivity and comfort (Darmawan, 2023; Widiana, 2023). Therefore, it is important for companies to implement an effective health and safety management system based on the working environment conditions in the construction industry, in order to prevent accidents and improve overall project performance (S. Sari et al., 2021; Suparno et al., 2020)

Work accidents that occur can not only cause financial losses, but also have a negative impact on the health and safety of workers. Research shows that the implementation of a good health and safety system can significantly reduce the number of work accidents (Bundiani, 2023; Semnasti, 2023). For example, in a study conducted on the PT. XYZ Building construction project, it was found that the health and safety program implemented consistently contributed to a decrease in work accidents (Semnasti, 2023). Therefore, it is important for construction companies to adopt a systematic approach in OSH management, including training and counseling to workers on the importance of safety in the workplace (Pradipto, 2023; Purnawinadi, 2019).

Thus, the implementation of better health and safety based on the conditions of the working environment in the construction industry is very important to prevent such accidents. This includes training and socialization regarding health and safety to workers, the use of personal protective equipment, and strict supervision of work practices in the field (Purnawinadi, 2019; Situngkir et al., 2021). Awareness of the importance of health and safety must be instilled at all levels of the organization to ensure that every worker understands their responsibility in maintaining the safety of themselves and colleagues (Ramdani, 2023). With these measures, it is hoped that the number of work accidents in the construction sector can be minimized, thereby creating a safer and more productive work environment for all workers.

One way to ensure that workers can work in safe and healthy conditions is to provide health and safety training based on the work environment. This training is important because it focuses on creating and managing a work environment that can reduce the risk of accidents, illnesses, and injuries. cite the paragraph. Occupational Health and Safety training based on the work environment is an important step in creating safe and healthy working conditions. This training focuses on managing the work environment that can reduce the risk of accidents, illnesses, and injuries in the workplace. Research shows that an effective health and safety program can minimize the occurrence of occupational accidents and occupational diseases, as

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expressed by Pratama et al. who emphasized the importance of the health and safety program in the company to reduce potential hazards (Wahyuningsih et al., 2021). In addition, research by Zulfa et al. also shows that good health and safety training can increase workers' awareness and compliance with safety regulations, which in turn reduces the risk of accidents and illnesses (Semnasti, 2023)

This research is important because the implementation of an effective health and safety system is needed to create a safe and healthy work environment for workers. This includes the introduction of personal protective equipment, training on safety procedures, and strict supervision of work practices (E. S. Sari et al., 2022). Awareness of the importance of health and safety must be instilled at all levels of the organization to ensure that every worker understands their responsibility in maintaining the safety of themselves and colleagues (Anggraini, 2023; Jayaputra & Sriathi, 2020)). Occupational Safety and Health is not only the responsibility of the government, but also the shared responsibility of all parties involved in the construction industry (Anggraini, 2023; Ivana et al., 2014).

Based on this background, this study aims to describe the analysis of the need for the implementation of health and safety in the construction industry to develop a work environment-based health and safety training model in the construction industry. Health and safety training based on the work environment in the construction industry is expected to have a positive impact in creating a safe and healthy work environment for workers.

METHOD

This study uses a quantitative approach with a survey method to identify relevant health and safety training needs based on the conditions of the work environment at PT. XYZ. This approach allows for systematic data collection to analyze workers' perceptions, knowledge, and needs for OSH training programs. The design of this study is descriptive, aiming to clearly and objectively describe the needs of health and safety training based on the variables that exist in the work environment of PT. XYZ. This study uses a purposive sampling technique, selecting samples representing various divisions or different parts of the company, such as field workers, technicians, and supervisors totaling 32 people. The research instruments used were observation instruments and perception questionnaires. Data will be collected by distributing questionnaires to selected samples. This process can be done in person or through an online platform, depending on the accessibility of the respondent. The data collection time is adjusted to the company's

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operational schedule to minimize disruption to work activities. The results of this study will be used to develop a health and safety training model that is tailored to the needs identified in the research. The model will include training materials, delivery methods, and training schedules that are relevant to the conditions and risks that exist at PT. XYZ.

RESULT AND DISCUSSION

The stages of needs analysis carried out include, among others: (a) Analysis of the Implementation of health and safety; (b) Analysis of the Implementation of Construction Work; and (c) Analysis of the Use of PPE for Workers. The description of the results of the needs analysis is explained as follows.

1. Health and Safety Health and Safety Implementation Analysis

Observation results related to the implementation of health and safety at PT. XYZ which consists of policy aspects, training & education, and health and safety inspection & audit procedures, it is known that there are several obstacles obtained, namely in the context of the health and safety policy that has been well prepared, it still raises several root problems that are often ignored due to lack of compliance in the field. Some workers neglect the use of personal protective equipment (PPE) because they feel uncomfortable or used to working without PPE. Additionally, employees sometimes lack understanding of the importance of safety procedures, especially if there is no strict supervision.

In the aspect of training and education, there are several things that are still a problem, namely that training is not carried out massively or comprehensively. In addition, field employees do not always get updates regarding the latest procedures. Furthermore, the health and safety team and workers still depend on one-way training which is carried out without periodic evaluation. There are several aspects of the inspection and audit procedures for health and safety that are also still an obstacle, namely workers are reluctant to report incidents for fear of getting sanctions or being viewed negatively. Furthermore, there is no easy-to-use and transparent reporting system. As well as a thorough investigation of the incident that occurred.

Based on the results of the observations that have been made, PT. XYZ currently requires: (1) Strengthening the supervision system for the implementation of health and safety, both through technology and routine inspections by the health and safety team; (2) Conduct ongoing training with post-training evaluations to ensure employee understanding and compliance with

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health and safety; and (3) Develop an incident reporting system that is easily accessible and protected from sanctions so that employees feel comfortable reporting any incidents.

These findings are in line with research conducted by (Sudarni et al., 2023) which explained that strict supervision of health and safety has an important role in minimizing the potential for accidents that can result in injury or even death of workers. Work accidents not only endanger the safety of individuals, but they can also lead to lost work time, high medical costs, and significant compensation for companies. The results of the study show that the implementation of an effective health and safety program can significantly reduce the rate of occupational accidents, especially in the construction sector, where the risk of accidents is higher.

The other findings are in line with the results of research conducted by (Virandika & Assidiq, 2022) which explains that with adequate training and strict supervision, workers can better understand the dangers that exist and the actions that need to be taken in risky situations. Other research shows that increasing worker knowledge and awareness about health and safety is directly related to the reduction of work accidents (Ridwan et al., 2021).

2. Analysis of Construction Work Implementation

As a result of the observations and documentation that have been carried out, there are several construction works carried out in the field of smelter projects, namely: (1) Soil Excavation Work; soil excavation work carried out using excavators then surveyors make measurements to obtain the appropriate soil depth and elevation in the design drawings; (2) Work Floor Work; After excavating the soil with a flat ground, then the casting of the working floor (lean concrete) is continued which functions so that the excavation of the ground does not become muddy when it rains and makes it easier for workers when assembling iron; (3) Iron installation; It is a strong reinforced concrete slab and its installation is directly concentrated by concrete columns; and (4) Casting; namely the process of melting materials or materials using a mixer, then poured into a hollow mold according to the desired pattern or shape, the mold will be filled by the material used.

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Figure 1. Location of PT XY Smelter Project

Based on the results of the observation of the implementation of construction work above, it is known that there are several job risks that can be experienced by workers. The description is: (1) Excavation work is vulnerable to the risk of landslides or landslides, especially if excavation is carried out in areas with poor soil stability or steepness; (2) The work floor casting work involves the use of heavy equipment such as concrete mixers, transport trucks, and concrete vibrators. In addition, workers also have to handle heavy materials such as cement, sand, gravel, and water. Plus the workers involved in the casting often interact directly with the chemicals used in the concrete mixture, such as cement and other addictive materials. Direct exposure to cement can cause skin irritation or respiratory distress if the dust is inhaled; and (3) Iron installation work is often carried out at construction sites with heights, such as on steel frames for high-rise buildings or bridges. Workers who do not use adequate safety precautions risk falling from a height, which could lead to severe injury or death.

The findings are in line with research conducted by (Sundara et al., 2023) which stated that unstable excavation conditions can also worsen the situation, where unexpected soil movements can cause the collapse of excavation walls, thereby increasing the risk of workers being hit by materials. In addition, Budiarti et al., (2019) asserted that the health risks associated with casting work do not only come from chemicals, but also from the weight of the material that must be lifted and moved by workers. Handling of heavy materials without adequate protection can cause physical injury, including back and joint injuries.

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The observations that have been made are also in line with other studies that show that fall accidents are one of the leading causes of fatal injuries in the construction industry, with many cases that can be prevented through the proper use of personal protective equipment (PPE) and adequate safety training (Delhi et al., 2020; Rodrigues et al., 2022). In addition, research on the safety climate in the construction industry shows that the interaction between supervisors and workers, as well as support from colleagues, is critical in shaping worker safety behavior (Arcury et al., 2012; Vitharana et al., 2015). Thus, increased training and awareness of the importance of using PPE can contribute significantly to reducing the risk of falls and improving safety on construction sites (Chen et al., 2021).

3. Analysis of Personal Protective Equipment (PPE) Usage for Workers

PPE has a crucial role in maintaining the safety and health of construction workers, who are often exposed to various physical, chemical, and mechanical risks in the workplace. Based on the results of the observations that have been made, several information descriptions were obtained that included the use of PPE for farmers. The analysis of the use of PPE for workers was conducted using the questionnaire method to obtain an overview of the use of PPE for workers. The results of the questionnaire related to the use of PPE for workers obtained information on workers using PPE by 28%; and workers do not use PPE by 72%. Thus, the tendency to use PPE for workers at PT. XYZ is in the category of not using. The graph of PPE use for workers is illustrated in Figure 2.

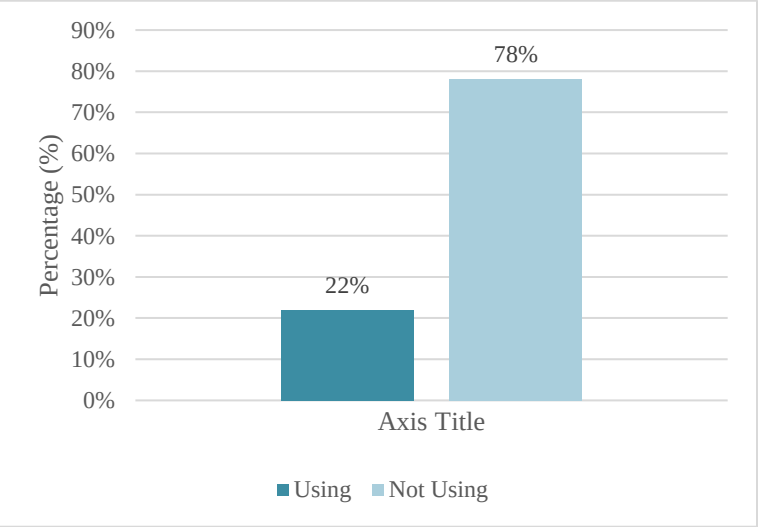


Figure 2. The use of PPE for workers at PT. XYZ

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One of the main reasons workers do not use PPE is a lack of understanding of the importance of the tool in protecting their safety. Companies need to provide regular education and training to workers about the risks that exist in the workplace and how PPE can prevent serious injury or even save lives. On the other hand, workers do not use PPE because they feel that the tool is uncomfortable or hinders their activities. Therefore, PT. XYZ needs to ensure that the PPE provided is comfortable, according to the size of the worker, and does not interfere with work.

These findings are in line with research conducted by (Laily et al., 2022) which explains that there are comfort factors that affect the use of PPE. Many workers do not use PPE because they feel that the tool is uncomfortable or hinders their activities. This shows that the design and ergonomics of PPE need to be considered so that it can be used more comfortably by workers. Other research also shows that workers' attitudes towards the use of PPE are greatly influenced by their perception of the benefits and ease of use of the tool (Dahyar, 2018).

Other research has also shown that although workers are aware that PPE can prevent work-related injuries, many of them do not use it due to the discomfort felt while using the tool (Kambris et al., 2019). A study by Simanjuntak et al. also highlighted that only one in nine workers wore gloves, indicating the need for counseling to increase awareness and behavior of PPE use among workers (Simanjuntak et al., 2016). This misunderstanding often leads to unsafe behavior, where workers do not use PPE even though they know the importance of the tool (Noviarmi, 2023).

4. Analysis of the Needed Health and Safety Training Model

The construction industry is one of the sectors that has a high risk of work accidents. In this dynamic and often dangerous environment, the implementation of Occupational Safety and Health (OHS) procedures is crucial. Based on the results of the observations that have been made, a health and safety training model that integrates the work environment is needed. The work environment health and safety training model focus on training that is tailored to the specific conditions of the construction site, ensuring that workers not only understand the theory of health and safety but can also apply it directly in field conditions.

The work environment-based health and safety training model adopts a contextual approach, which is different from conventional health and safety training which tends to be general and theoretical. In this model, the training materials are tailored to the specific environment of a particular construction project site, making them more relevant and applicable

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directly to the workers. Environment-based training allows workers to learn from real-life situations on a construction site, not just from theories or simulations that may not correspond to the conditions they face on a daily basis.

The construction industry encompasses many different types of projects with varying risks, such as high-altitude projects, underground projects, or projects in environments with extreme conditions. This model provides novelty through its flexibility to be tailored to the specific risks of each project site. Thus, training can be focused on hazard mitigation that is most relevant to the situation at hand.

After analyzing various training models and analyzing syntax, relevant syntax was selected in accordance with the development of the training model in this study. The description of syntax and theoretical support in the preparation of the syntax of the health and safety training model based on the work environment can be seen in Table 1.

Tabel 1. Conceptual Syntax of health and safety Training Model based on Work Environment

Syntax	Theoretical Support
Internalization	Occupational safety and health culture is a priority that must be prioritized over a rule or regulation. A health and safety culture must be had, not only expectations from the outside that are driven by institutional regulations. health and safety culture is a commitment that must be carried out not only by individual workers but also leaders through their policies (Maghfirah & Susilawati, 2023).
Health and Safety Training	One of the programs that can be organized by companies is training to improve workers' understanding of the world of OSH. This training can be carried out by the company's own health and safety experts or in collaboration with external parties. This training can also be used by companies to remind their workers of the importance of OSH principles always applied in the scope of their work (Damayanti, 2022).
Assesment	Risk assessment is an attempt to calculate the magnitude of a risk and determine whether the risk is acceptable or not. Risk assessment is used to determine the level of risk reviewed from the likelihood of

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	occurrence (*likelihood*) and the severity that can be caused (*severity*) (Urrohmah & Riandadari, 2019).
Actualization	health and safety is a form of realizing comfortable and safe working conditions so that maximum productivity is achieved (Andika et al., 2022).

Based on the results of the syntax analysis of the results of the elaboration of various training models relevant to this study, from these results, the work environment-based health and safety training model consists of 4 (four) stages, namely: (a) Internalization; (b) health and safety Training; (c) Assessment; and (d) Actualization. The syntax of the training model is designed in a continuous manner that is interrelated between the first stage and the next stage so as to provide direct experience for workers in the training process.

Training conducted in a real-world environment helps workers become more skilled and confident in using equipment and technology, as well as better prepared to deal with dangerous situations. With a focus on specific work environment-based training, workers in the construction industry become more aware of the hazards around them and know how to avoid them, which in turn lowers the risk of work accidents.

CONCLUSION

Based on the results of the needs analysis which includes analysis of the implementation of occupational safety and health, analysis of construction projects, and analysis of the use of PPE for workers, it is known that the training programs needed need to be oriented to the work environment. Training conducted in a real-world environment helps workers become more skilled and confident in using equipment and technology, as well as better prepared to deal with dangerous situations. With a focus on specific work environment-based training, workers in the construction industry become more aware of the hazards around them and know how to avoid them, which in turn lowers the risk of work accidents. The work environment-based occupational safety and health training model is expected to be able to facilitate cooperative training so that there is interaction between participants and participants, between participants and instructors, and between participants and training materials.

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