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Development Standard Operational Procedure of Safety Architecture Work in University of Indonesia Project Based on Work Breakdown Structure to Reduce Work Accidents

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ABSTRACT

The construction industry is one of the most dangerous industries in the world, due to its very high accident and death rate. As a high-risk construction industry, in addition to cost, time and quality, work safety will have a major impact on the success of a project. With the procedure safety properly, it is expected that work accidents will be reduced due to integrated work breakdown structure. The method used in this study is qualitative method, with research strategy in the form of archival analysis, case study, and expert validation. Data collection was conducted by interview method with questionnaires with professional experts who have long worked in the field of Safety, which then resulted in the conclusion that Standard Operational Procedures on Architectural work can reduce work accident.

Keywords: Construction Safety, SOP, WBS, Work Accident

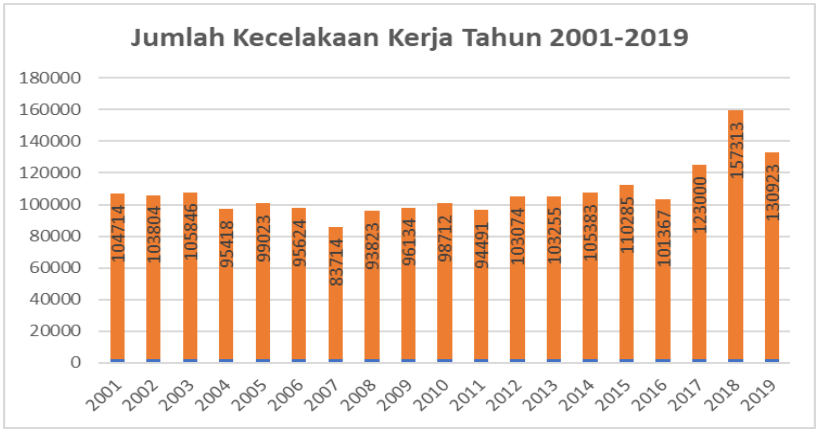
JEL Classification Codes: L70, L74, Y90

INTRODUCTION

According to (Elsye, Latief, & Sagita, 2017), the construction industry is a very unique industry and more dangerous compared to other industries. Construction projects involve a lot of sub-contractor work so they are interrelated with each other. workplace safety is the most important component of efficiency and productivity. Construction workers, both staff and field workers are well protected and productive assets until the completion of the construction project without any accidents (zero accidents). Workers must be protected from the threat of accidents at work; therefore, workers must follow work safety rules. According to (Febyana Pangkey, Malingkas, O, &Walangitan, 2012), construction projects have distinctive properties, including workplaces in open spaces that are affected by weather, limited work periods, using untrained workers, using work equipment that endangers occupational safety and health and work that is much labor-intensive. Based on these unique properties, the construction services sector has a risk of fatal accident costs.

Many factors cause work accidents on construction projects, one of which is poor job safety management. Employees are the core of Management, Employee Work Discipline further we all know that the components in an organization one of which includes the human element so that employee discipline is needed, with disciplined employees who have been entrenched can increase work motivation in an organization that allows birth (Uloli et al., 2019) This is because the delivery of information about the dangers of work accidents to workers is less than optimal, coupled with complex buildings, short work time and minimal allocation of costs for occupational safety and health. According to BPJS, the number of cases of work accidents in Indonesia every year is still quite high at approximately one hundred thousand cases for every year from 2001 to 2019.

Figure 1. Work Accident in Indonesia (2001-2019)



Source: BPJS Ketenagakerjaan

The International Labor Organization (ILO) more than 250 million occupational accidents and more than 160 million diseases are caused in the workplace. The high number is because the construction industry has different characteristics from other industries.

Architectural work that is often called finishing work is a non-structural work, but in its implementation can take a considerable amount of time and a large cost weight, especially for commercial building functions that highlight the comfort and luxury of its interior (Siahaan, 2015). Architectural jobs also have a risk of work accidents.

Activities in college have the potential to pose potential hazards and risks that impact aspects of occupational safety and health (Herzanita, 2020). The university must ensure

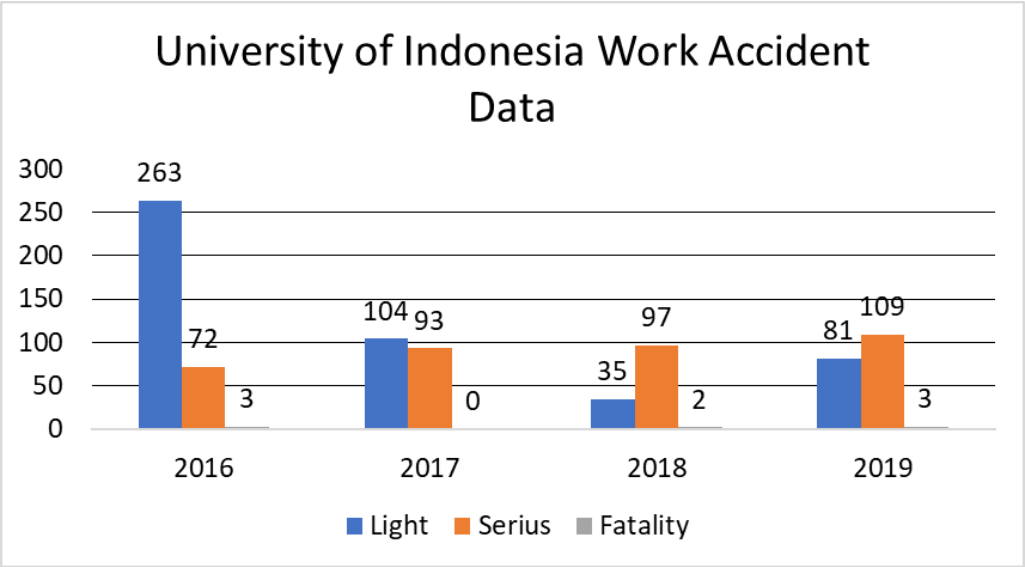
the safety and security of all parties in the university area to prevent accidents. In general, accidents occur due to unsafe conditions and unsafe actions. Unsafe act is defined as any human action that can allow accidents in themselves and others, while unsafe conditions (unsafe condition) is defined as one of the working environment conditions that can allow accidents (Nugroho, 2020).

The case of work accidents on the Campus of the University of Indonesia is still relatively high University of Indonesia (UI) has implemented OHSL (Environmental Occupational Safety Health Management System) since 2016 with the holding of Rector Regulation No.1 of 2016 on the implementation of OHSL and the creation of upt (technical implementation unit) safety UI. According to Lestari (2020), ui implementation has not been classified as maximal, there are only 4 out of 17 faculties that already have formal faculty safety units, while others only have officers and employees of safety faculty, 2 of the 14 faculties that have OHSL standard certification. In addition, the fulfillment of safety goals and objectives in 2019 only reached an average of 45%. The goals and objectives of OHSL in 2019 are as follows:

1. The fulfillment of OHSL in the Faculty reaches 40%.
2. Fulfillment of Emergency Response Management in the Faculty reaches 45%
3. Fulfillment of safety Aspects in the building and safety Contractor guidelines at the faculty reached 50%

Here is the case of the work accident chart on the UI campus from 2016-2019.

Figure 2. University of Indonesia Work Accident Data



Source: UPT K3L UI

The phenomenon of work accidents has an impact on many things, namely project success, people, costs, time and law (Han et al., 2014; Chantawit et al., 2004; Hinze et al., 1998; Yi & Langford, 2006). In addition to the impact on the project itself, work accidents also have an impact on institutions. Some of them are financial losses, material damage, environmental damage to image degradation (Lestari et al., 2019). Meanwhile in China, the increasing number of accidents in the university area has caused public concern (Gong, 2019).

According by Karim and Hariyono (2018) the application of safety is more often used in companies engaged in industries that have high risk. while the educational environment

is often considered a safe place for academic activities, so there is no need for safety implementation at the institution. safety culture plays an important role in minimizing deaths and injuries (Hasan and Younos, 2020). special supervision is required during the implementation of development in the university area which has a high risk for people who are active in the vicinity. (Tymvios & Gambase, 2016; Yanar et al., 2019).

One of the causes of high work accidents that occur due to work activities that are not supervised in accordance with procedures. In a construction project WBS (Lim, 2019) *(Work Breakdown Structure)* is a tool that is mandatory to perform an activity. Standard Operating Procedure. Standard operating procedures are instructions, steps, guidelines that must be carried out in certain work processes to maintain performance so that they can be completed effectively and efficiently. SOPs are established by companies with several purposes, including preventing the workers from the possibilities of occupational accidents (Rahmawati, 2018).

LITERATURE REVIEW

1. WBS

WBS forms the basis for planning, estimating, scheduling, monitoring, management, and control of all project activities. The proposed methods for developing a deliverable are well defined and comprehensive, and the importance of increasing the probability of project success by ensuring that the best resources applied to the project. A standardized WBS for the project is used to facilitate the preparation of project financing and a standardized WBS is also used to define project (Elyse et al., 2017)

2. SOP

Standard Operational Procedure is a set of written instructions that document the routine or repetitive activities adopted by the organization. The development and use of SOPs is an integral part of good quality because SOPs can provide information for each individual to do the job properly and correctly. (EPA, 2007). SOP is a guideline for carrying out work tasks in accordance with the functions and work assessment tools based on various administrative, procedural, and technical indicators in accordance with the work system in the unit concerned (Anggraini, 2018).

3. Safety

Occupational safety and health (OSH) is a cross-disciplinary area and it is concerned with guarding the safety, health and welfare of people who are engaged in work or employment. Health is related to physical condition, state of mind, and condition of body. Everyone involved in the construction area should be provided with protection from any harm in the form of injury or illness. Safety in the workplace must be maximized by reducing or eliminating the risk of harm. (Towlson, 2003).

RESEARCH METHOD

There are several strategies used in this study that are described as follows:

1. Literature Studies
   According to Nugroho (2020), literature studies are a method by collecting secondary data in the form of relevant previous research and can answer research problems. Data obtained from literature studies is included in secondary data.
2. Safety UI Document Collection (Archive Analysis)
   Documents are all objects in the form of goods, images, or writings as evidence and can provide important and legitimate information (Pebrianti, 2016). This document consists of guidance in implementing OHS in the UI area that is adapted to standard operating procedures (SOPs) as well as forms related to the management of safety UI. This data is primary data.

3. Expert Validation
   Expert Validation is the activity of collecting data or information from experts in their field to determine valid or invalid to the research developed.

RESULTS

This data collection is about the existing SOP (Standar Operational Procedure) related to the implementation of safety on architectural work for the FTUI S Building project. This existing SOP (Standard Operational Procedure) is an archive belonging to the Technical Implementation Unit Safety University of Indonesia. This SOP Standard Operational Procedure will later become a guide in a website-based information system to carry out various architectural work activities. In this questionnaire using the Guttman scale by answering "Yes / No." The number of experts at this stage is 3 people.

Table 1. Expert's Profile

No	Experts	Title	Experience
1	Expert 1	Contractor Safety University of Indonesia	5 Years
2	Expert 2	Contractor Safety University of Indonesia	5 Years
3	Expert 3	Management Coordinator Safety University of Indonesia	7 Years

Table 2. Standard Operational Procedures Existing

No	Procedures	Experts			Conclusion
		1	2	3	
1	Work Instruction First Aid	Yes	Yes	Yes	Yes
2	Personal Protective Equipment	Yes	Yes	Yes	Yes
3	Internal Audit	No	No	No	No
4	HIRADC	Yes	Yes	Yes	Yes
5	Identification of Laws and Regulations and Other And Evaluation of Fulfillment	No	No	No	No
6	Work Permit	Yes	Yes	Yes	Yes
7	Safety Induction	Yes	Yes	Yes	Yes
8	Inspection	Yes	Yes	Yes	Yes
9	Competence, Training, and Awareness	Yes	Yes	Yes	Yes
10	Communication, Participation and Consultation	Yes	Yes	Yes	Yes
11	Logistics	Yes	Yes	Yes	Yes
12	Reporting and Investigation of Incidents	Yes	No	No	No
13	Work Environment Monitoring	No	No	No	No
14	Setting Goals and Objectives	No	No	No	No
15	Laboratory Waste Management	No	No	No	No
16	Quality Document Control	No	No	No	No
17	Quality Record Control	No	No	No	No
18	Corrective and Preventive Measures	Yes	Yes	Yes	Yes
19	Management Review	No	No	No	No

From the results of the questionnaire in the table above, it can be concluded that there are 11 SOPs used to support the implementation of safety in architectural work. After obtaining the results of the SOP that will be used for the implementation of architectural work, the development of the SOP (Standard Operational Procedure) is carried out by adding new procedures related to architectural work that has a high risk. This SOP was obtained from various literature studies.

Table 3. New SOP

No	New SOP	Do you agree with the creation of a new SOP?			Conclusion
		1	2	3	
1	Working at high	Yes	Yes	Yes	Agree
2	Working use tower crane	No	Yes	No	Disagree
3	Working on scaffolding	Yes	Yes	Yes	Agree

From the response in the table above can be concluded to add two new SOPs related to the implementation of safety in architectural work, namely SOP (Standard Operational Procedure) working at altitude and working using scaffolding. After the related SOP (Standard Operational Procedure) works at height and works using scaffolding has been validated, then Work Instruction validation uses the guttman scale to determine each stage of work from each work package based on WBS architectural work.

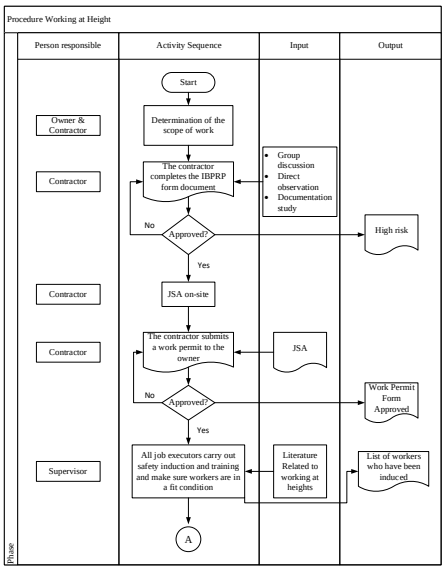
Table 4. Results of Work Instruction Questionnaire

No	Job Package	Stages	Implementation Methods	Experts		
				1	2	3
1	Railing Iron	Preparation	Personal protective equipment is used in accordance with safety procedures that have been made.	v	v	v
			Make sure the procedure works at altitude and/or work using scaffolding goes well.	v	v	v
			Make sure the JSA and Work Permit are approved.	v	v	v
			Keep the ceiling arrangement in a place that has been approved by the owner.	v	v	v
			Prepare all the equipment and materials to be used.	v	v	v

DISCUSSION

SOP (Standard Operating Procedure) that has been validated; the SOP (Standard Operational Procedure) is directly incorporated into the information system which will be a guide in carrying out architectural work.

Figure 3. Standard Operational Procedure



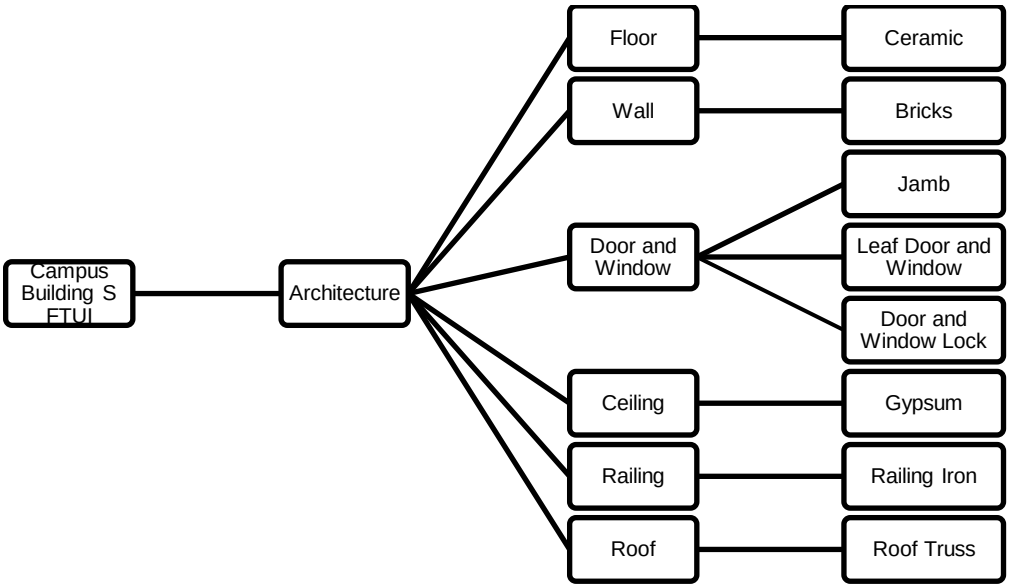
In this study only focused on architectural work that has a high risk that can cause death. The components of architectural work are classified using WBS to define the levels in each work activity in more detail, so that the control method to prevent work accidents is more precise. Based on the data collection and analysis carried out at the planning stage, the results of the WBS level in general are as follows:

1. Level 1 is the name of the project, namely the college building with S FTUI
2. Level 2 is a Construction Primary Element, namely architecture
3. Level 3 is the type of work, namely walls, ceilings, railings, and so on.
4. Level 4 is a work package for each type of work.

Based on the four levels of the WBS, the implementation method for each work package is obtained. Here is a WBS architectural work.

Figure 4. Work Breakdown Structure

Level 1	Level 2	Level 3	Level 4



After that is done the description of the working methods of each work package based on previously validated data.

Table 5. Work Instruction

Railing		
Code	**Description**	
WBS Level 2	Construction Primary Element,	Architecture
WBS Level 3	Type of Work	Railing
WBS Level 4	Work Package	Iron
	Implementation Methods	Preparation Stage: 1. Personal protective equipment is used in accordance with safety procedures that have been made. 2. Make sure the procedure works at altitude and/or work using scaffolding goes well.

CONCLUSION

The scope of work on the architectural work of building S FTUI can be grouped into 5 wbs levels:

- WBS Level 1 is the name of the project.
- WBS Level 2 is a construction primary element.
- WBS Level 3 is a type of work.
- WBS Level 4 is a work package.

There are 11 of the 19 existing SOPs and the addition of 2 of the 3 new SOPs used to do the architectural work of building S FTUI. There are 6 types of work, 8 work packages and 8 working methods in architectural work groups that have a high level of risk based on WBS that have been validated at the planning stage.

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DECLARATION OF CONFLICTING INTERESTS

The present study which is reported in this article is not being published in other publisher and is free from the interests of any party.

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