

Analysis of Construction Safety during Covid-19 Pandemic

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Abstract—Covid-19 pandemic has a significant impact on the construction industry. Previous studies focus on addressing how this pandemic influence construction time and cost. However, the influence of the Covid-19 pandemic on construction safety has rarely been discussed. The objective of the research is to analyze the influence of the Covid-19 pandemic on construction worker safety. The Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA) data are analyzed. Research results show that the CDC and OSHA guidelines can improve workers' safety.

Keywords—Covid-19, construction safety, Centers for Disease Control and Prevention (CDC), Occupational Safety and Health Administration (OSHA)

I. Introduction

The construction industry faces various safety challenges. It has long been regarded as one of the most dangerous careers. During the Covid-19 outbreak, the United States' construction sector has roughly five times employees hospitalized due to Covid-19 infections than other industries [3].

According to the US Bureau of Labor Statistics (BLS) [1], in 2020, there were more than 4,000 fatal work injuries. This shows a 10.7% decrease from 2019. The number of construction worker deaths in 2020 was about 1000, which is a reduction of 5.3% fatality compared to 2019 [1]. These data show that the construction laborer deaths in the US have declined since the Covid-19 outbreak. Figure 1 presents pre-covid-19 construction laborer deaths in the United States. Safety incidents on many construction sites have dropped sharply due to Covid-19 restrictions [4]. Workers are aware of the situation and adhere to safety protocols stipulated by the various occupational safety teams. According to Figure 1, construction labor death increases from 2017 and reaches the highest in 2019. In 2020, the death decreases. Previous studies have investigated the impact of the Covid-19 pandemic on the construction industry. For example, [5] studies the impacts of covid-19 on the GCC construction industry.

Safety in the construction industry has been an issue. One reason is that workers do not have proper working gear and protection. Numerous studies have shown that construction injuries and accidents are higher than other occupations [7-9]. In that construction workers ranked fourth in the occupations with fatal work injury rates worldwide [1]. The construction industry has been hit hard since the Covid-19 began. Most of the workforce in the construction industry are unable to work due to restrictions and protocols set by different states in the struggle to combat the spreading of the virus [5-6]. According to Zack Phillips [10], positive Covid-19 test results in the construction industry is 10.1%, which is the second-highest profession. The first highest is correctional workers, with a 12%

infection rate. The construction workers accounted for 5.7% of the asymptomatic workers, and this was the highest rate among all listed professions with food service workers being the closest with 3.8%.

While most of the studies focus on the impacts of Covid-19 on construction project duration and cost, there are not enough investigations on the importance of workers' health and safety on the construction site. The objective of this research is to analyze the impact of Covid-19 on construction safety. Specifically, this research seeks to establish the impact of CDC and OSHA guidelines on construction workers' safety since Covid-19 has been declared in 2020. Data is obtained from CDC, OSHA, CPWER (The Center for Construction Research and Training), BLS publications and websites, journals, books, and conference proceedings.

II. Research Method

This research analyzes the events in order of the timeline which covers before and after Covid-19 outbreaks. This study focuses on investigating the current situation regarding the construction site and laborer safety. An inductive approach is taken with previous year's statistics on laborer deaths to reach a conclusion on the current state of safety in the construction industry. The review of construction safety before the Covid-19 is also an inductive approach enabling the research to analyze the guidelines before and during the pandemic. The action research method is used to gain information from various sources, which enables critical analysis of the measures set by OSHA and CDC. The collected data [12] ranges from 2016 to 2020. safety of construction labors makes up the longitudinal research basis used in the paper, with statistics being valued over a period of five years to ascertain the findings of this paper. The data used in this research is secondary data and is all majorly from websites, journals, and previous papers to help conclude whether the construction worker safety status has improved or deteriorated since the commencement of the Covid-19 pandemic.

This research involved a step-by-step procedure of analysis of the first phase of Covid-19 from March 2020 to December 2020 (as shown in Figure 1). First, this paper analyses the offset of Covid-19. Precautions taken by the US government are considered. In this step, emergency measures declared in the US are reviewed. The stay-at-home order is put in place in the US except for seven states. The second step is to study the measures for workers' health and safety during the Covid-19 pandemic. Two major bodies provide regulations and guidelines for the general public and workers, namely OSHA and CDC. The next step is to analyze the hierarchy of control through these precautions, from the most effective to the least effective. The fourth step is to analyze the positive and negative impacts of the guidelines announced by the CDC and OSHA. The data on

the number of accidents before the Covid-19 and after the offset of the pandemic has also been analyzed in this study to ascertain the impacts of the Covid-19 pandemic on worker health and safety in the construction industry. Finally, lessons learned from the pandemic on worker safety are concluded.

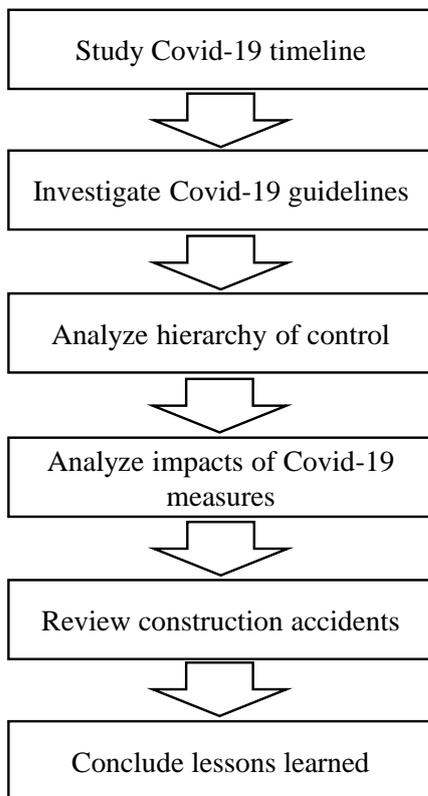


Figure 1. Research flow

III. Reasons for Construction Labor Absence

Construction is a labor-intensive industry. This study investigates the impact of the Covid-19 pandemic by analyzing the labor absence. As shown in Figure 4, from March to June 2020, most of the construction workers are absent from work due to personal days off or going on vacations. About 109.9K workers ask for leaves to take a break or on vacation. During the same span of March to June, 40.8K workers were absent from jobs due to family or personal obligations they needed to take care of during workdays. From March to June 2020, about 90.6K construction workers are absent from work due to personal medical reasons. Those are primarily Covid-19 concerns or contracted with Covid-19. Construction workers are absent due to OSHA and CDC regulations, which are announced in March 2020. In this period, some workers and employers still could not meet OSHA and CDC guidelines. In the month of April, around 152.9K construction workers are absent from work due to personal medical reasons, whereas 34.1K of construction workers are due to a personal day or a vacation and 26.7K are due to personal or family obligations.

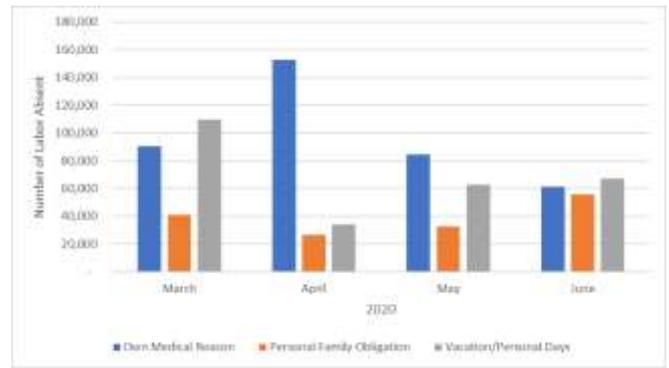


Figure 2. Reasons for Construction Labor Absence [2].

IV. OSHA Inspection and Citation

This research investigates the safety condition on construction sites using OSHA inspection and citation numbers. A citation is what is issued when an OSHA compliance officer finds a breach of an OSHA standard or a safety hazard in a construction site during an inspection [13]. An inspection and citation might be issued due to the lack of safety clothing among workers or any other violation of documented rules and regulations. The citations present the owner of the construction site with a list of the rules/rule violated and also gives information of the penalty proposed.

This study reviews OSHA inspections and citations in construction sites in the past decade to understand that a drop in both is due to Covid-19 pandemic. In Figure 3, the number of OSHA citations has reduced from the year 2011. In 2011, 75.9K citations are issued. The number of citations steady decreases from 2011 to 2019. As shown in the figure, the number of citations has dramatically dropped to 46.4K in the year 2020. The number of OSHA inspections in 2011 remains at 47.0K in 2011. During an OSHA inspection, health and safety compliance officials from OSHA visits the place of business during an inspection. The number of inspections reduced in 2019 to 37.5k inspections in eight years. In the year 2020, the OSHA construction site inspection remains at 23.2k, which is a significant reduction in the number of inspections in the sites.

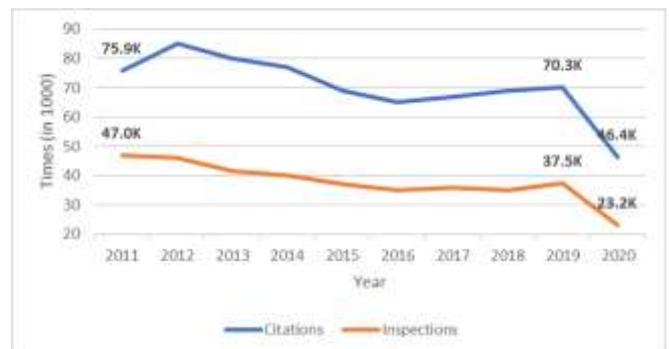


Figure 3. Number of OSHA inspections and citations [13]

V. Deficiency of Personal Protective Equipment (PPE)

This research attempts to understand if construction workers could acquire proper PPE to protect their health and safety at sites by analyzing the supply of PPE. Proper usage

of PPE could protect workers. Therefore, wearing correct PPE for work is a mandate on construction sites. As demonstrated in Figure 4, after the Covid-19 pandemic, the request for face PPE increases between March and April 2020. Ten kinds of face covers are displayed in the figure. Demands for face shield and safety goggles are below these masks. A surge needs for surgical masks can be found in the figure due to the need for respiratory treatment. The deficiency of PPE is a direct impact caused by the Covid-19 pandemic. It triggers a strain in the construction industry, increasing the risk of infection and harmful substances in the workplace, such as dust.

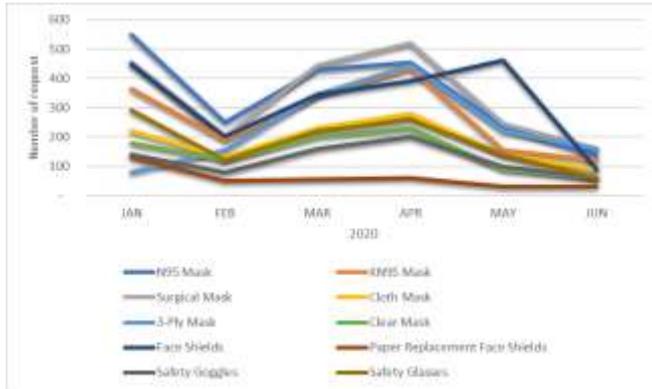


Figure 4. Number of OSHA inspections and citations [2]

VI. OSHA and CDC Guidelines on Construction

OSHA and CDC play a key role in the establishment of health and safety regulations [4]. Both OSHA and CDC set guidelines to aid combat the Covid-19 pandemic in its early phase. OSHA recommendations are made for workers and business owners, while CDC guidelines are applied to all people. OSHA emphasized low-risk as well as high-risk situations in their recommendations for the management and prevention of Covid-19 in construction.

OSHA establishes a number of guidelines to protect the construction workers against the spread of Covid-19 at work. For example, for spaces with no contact with members of the general public, at least six feet between each worker should be maintained in low-risk positions. The employees who must work within six feet of one another are considered to be at medium risk. According to OSHA, people suspected or known to have Covid-19 should not attend workplaces. OSHA advised that the number of people attending in-person meetings should be limited, and they should be kept as brief as possible (including toolbox lectures and safety briefings) [15].

OSHA also instructed that all employees should wear face coverings with at least two layers of finely woven breathable fabric unless their jobs require workers to wear a respirator. Face covers should be provided free of charge to all employees. Furthermore, PPE should be used as a standard control measure to protect workers. OSHA also instructs that employers should provide and ensure that employees have all the supplies they need to maintain high standards of hygiene at all times. If employees do not have immediate access to soap and water, hand sanitizers with at least 60% ethanol or 70% isopropanol could be used. Still,

construction workers should not share tools or equipment. After each use, the items should be cleaned and sanitized thoroughly. OSHA recommended that portable toilets and hand sanitizer dispensers should be cleaned and disinfected on a regular basis. Covid-19 rules and procedures should be explained to workers in a language they understand so that they can follow the rules. OSHA instructs that every worker's temperature must be measured upon arrival at the workplace. Proper ventilation is essential when working with a limited amount of floor space. OSHA also advises that adjusting the work schedules would help limit the number of employees on-site at any given time.

CDC's guidelines related to construction workers are briefed as follows [16]. Detailed CDC guidelines can be found on CDC's website at <https://www.cdc.gov/>.

- Workers should put on a face mask before beginning their task to ensure they are protected from acquiring the virus from the air.
- Workers should avoid physical contact by maintaining a six-foot distance.
- Workers should avoid large crowds and gather.
- Workers should cover their mice and nose when coughing or sneezing. The surrounding area should be thoroughly cleaned and disinfected after someone coughs or sneezes.
- Workers should keep track of their overall health on a daily basis in order to ensure that they remain healthy throughout time.

VII. Health and Safety Control

One challenge in the construction industry during the outbreaks of the Covid-19 pandemic is the deficiency of PPE. For medical reasons, many of the workers are absent from the workplace. The number of construction site citations decreases, as shown in Figure 3. In addition, the number of construction worker deaths decreased in 2020 due to Covid-19 restrictions. The social distance requirements reduce the number of workers on-site. According to [17], construction workers' mental health, particularly foreign workers, should be considered.

Worker safety and hazard could be mitigated using a hierarchical system of controls, as shown in Figure 5 [10]. The most to the least effective methods have been analyzed. An investigation of CDC and OSHA guidelines may use to develop a strategy to improve workers' health and safety conditions during the Covid-19 pandemic. The most successful strategy is to eliminate the danger from the people, which is the ultimate way to deal with any hazardous situation. This strategy could not be achieved without daily monitoring of workers' health conditions. To remove the virus, cleaning and sanitizing contact points can also be done.

The application of engineering controls to isolate the hazards has been widely used to control the spread of Covid-19. This strategy includes putting up physical barriers, making sure there is appropriate ventilation and sprinkling in breaks throughout the day. An administrative control that can be used to restrict the spread of the virus is a proper shift work duty. Shortening meetings could be one administrative

control to protect workers' health and safety during the Covid-19 pandemic. The final option is the use of PPE, such as face masks and protective gloves.

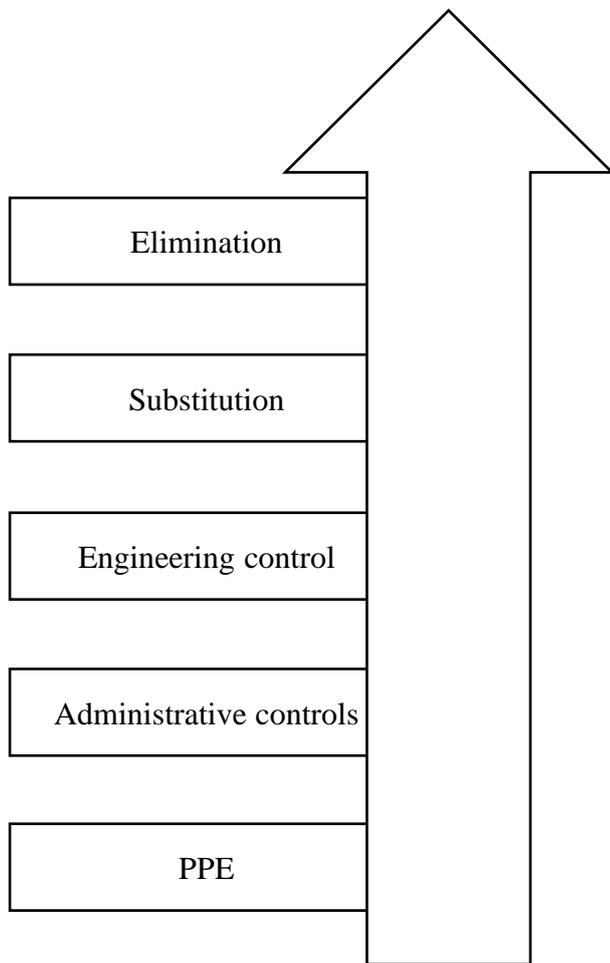


Figure 5. Hierarchy of controls [10]

VIII. Conclusions

Covid-19 pandemic cause a huge impact on construction projects. However, its impact on construction safety has rarely been discussed. This research analyzes the impacts of the Covid-19 pandemic on workers' health and safety conditions. This paper first analyzes the absence of construction workers during the Covid-19 outbreak in 2020. Then, OSHA inspection and citation are discussed, followed by the analysis of PPE shortage and a brief review of CDC and OSHA guidelines.

This research finds that physical barriers could serve as a reminder for construction workers to follow safety guidelines. Shortening the meetings may contribute to construction safety, as safety officers and construction managers have more time to monitor the job sites. Also, monitoring workers' healthy conditions on a daily basis is essential for safety because healthy individuals are less likely to get hurt at work. Furthermore, flexible work schedules relieve work stress and therefore increase workers' safety. In the future, questionnaires could be used to expand on the study goal from the worker's perspective.

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