

# Common Issues of Compliance with Personal Protective Equipment for Construction Workers

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Personal Protective Equipment (PPE) is an essential component to the safety of workers on construction jobsites. Construction is ranked one of the most dangerous industries to work in, with the highest reports of fatal work injuries. For this reason, it is required that construction employees wear PPE to keep them safe during work. Despite this requirement, many workers neglect to wear PPE, exposing themselves to high risk of injury and death. A survey was conducted on thirty-three (33) construction workers in California to gain a better understanding of issues with PPE and reasons for non-compliance. The survey found that only 64% of construction workers always wear their PPE. Analysis of this survey provided the highest ranked reasons for non-compliance from a worker's perspective including it causes stress in hot, sunny, confined, or poorly ventilated areas, it is not necessary at all times, and it is uncomfortable. Other reasons such as anxiety and fit of PPE were also brought to light. This paper will review the dangers of working in the construction industry, provide insight from a worker's perspective on reasons for non-compliance with PPE, and pose solutions for this ongoing problem.

**Key Words:** Personal Protective Equipment (PPE), Safety, Injury, Construction, Worker's Perspective

## Introduction

Construction is one of the most dangerous industries to work in. According to the Bureau of Labor Statistics, in 2019 the construction industry accounted for the highest number of fatal work injuries across all industry sectors. On average, the Occupational Safety and Health Administration (OSHA) states there are 15 deaths per day in the construction industry. Most of these work related fatalities and injuries can be attributed to ten of the most-frequently cited safety violations on construction jobsites: inadequate fall protection, inadequate hazard communication standards, unsafe scaffolding, failure to control hazardous energy (lockout/tagout violations), inadequate respiratory protection, unsafe ladders, powered industrial truck safety violations, inadequate fall protection training, unsafe machinery and inadequate machine guarding, and inadequate eye and face protection (OSHA, 2020). Four out of the ten most frequently cited safety violations pertain to inadequate use of PPE.

Personal protective equipment by definition "is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses" (OSHA, 2020). It is important to have a thorough understanding of the different types of PPE and their functions. Table 1 below lists common PPE worn by construction workers in order to protect them from jobsite hazards.

Table 1. A list of the PPE commonly used in the construction industry and their functions.

<b>PPE</b>	<b>Function</b>
Safety Helmet	Avoidance of head injury
Eye Protectors	Eye protection from dust, particles, flying chips, smoke and chemical splattering
Ear Protectors	Ear protection from high levels of noise.
Mask and respirator	Protection from inadequate oxygen supply, presence of toxic gases, harmful particles and virus in the air.
Protective gloves	Avoidance of hand injury.
Safety belts	Fall protection for working at heights
Safety footwear	Avoidance of foot injury and slipping on wet floors
Protective Clothing	Physical protection and increase of comfort levels

Source – Wong et al., 2020

While construction is a dangerous industry to work in, PPE helps to protect industry workers. As seen in Table 1, there is an extensive list of protective equipment to help keep workers safe. OSHA requires PPE to be worn while performing tasks that expose employees to danger but allows employers to determine when PPE is required to be worn to protect their workers. Unfortunately, many workers neglect to wear their PPE when required, resulting in workplace injuries and deaths. This paper will investigate the necessity of wearing PPE, common issues with PPE in the construction industry, and reasons for noncompliance with PPE from a worker’s perspective.

### **General Background/Literature Review**

Construction jobsites are filled with many people, hazardous chemicals, heavy machinery, various tools and equipment, and materials in all different shapes, sizes, and weights. When dealing with these different components, there are plenty of opportunities for errors and accidents to occur. In a paper identifying root causes of construction accidents, Tariq Sami Abdelhamid and John G. Everett (2000) reached the conclusion that accidents occur for three reasons: “(1) failing to identify an unsafe condition that existed before an activity was started or that developed after an activity was started; (2) deciding to proceed with a work activity after the worker identifies an existing unsafe condition; and (3) deciding to act unsafe regardless of initial conditions of the work environment”. The first reason can be attributed to unsafe conditions, while the latter two are a result of human error. An unsafe condition is a condition that is in violation of contemporary safety standards. Human error is “any one set of human actions that exceed some limit of acceptability” (Abdelhamid & Everett, 2000). The majority of accidents that occur on construction jobsites are a result of human error. As stated earlier, OSHA released a list stating the ten most-frequently cited safety violations, all of which can be attributed to human error.

When taking a closer look at OSHA’s ten most frequently cited safety violations, four out of the ten are linked to lack of PPE. The safety violations include inadequate fall protection, inadequate respiratory protection, inadequate fall protection training, and inadequate eye and face protection. Despite the requirement to wear PPE, many workers choose not to wear it constantly or do not receive proper training on the use of PPE. In an annual training program presented by the Environmental Health and Safety department of New York University (NYU), troubling statistics were presented on the relationship between PPE and worker’s injuries. The report stated that “hard hats were worn by only 16% of those workers who sustained head injuries; only 1% of approximately 770 workers suffering face injuries were

wearing face protection; only 23% of the workers with foot injuries wore safety shoes or boots; about 40% of the workers with eye injuries wore eye protective equipment” (NYU, 2005). This statement supports the evidence that construction workplace injuries are a result of workers not wearing their PPE. Choosing not to wear PPE is a human error that contributes to the high number of accidents, injuries, and fatalities on construction jobsites. While PPE can’t offer complete protection from accidents, it does provide an increased level of safety and protection.

Workplace injuries can be detrimental not only to the affected individual, but also to their families and loved ones. In a study done on 60 construction workers in Hong Kong, only about 3% reported wearing their PPE for family responsibilities (Wong et al., 2020). This small percentage represents the lack of awareness a serious injury would have on the individual’s family and loved ones. In addition to the effect of injuries and death to people, workplace injuries can also be expensive. In the US, about 1,000 workplace eye injuries occur every day. The cost of these eye injuries is about \$300 million per year, resulting from medical expenses, workers’ compensation, and lost job productivity (NYU, 2005). This study also found that 40% of injured workers were not wearing the appropriate eye protection and three out of every five workers were not wearing eye protection at all (NYU, 2005).

If PPE can offer protection from injury and death, why do some employees choose not to wear it? In the qualitative study mentioned above, sixty construction workers in Hong Kong were analyzed on workers attitude towards using PPE and reasons for using and not using PPE (Wong et al., 2020). The study found that 73% of workers had a positive attitude about the use of PPE, while about 24% felt neutral and 3% felt negatively about it. The highest ranked reason for using PPE was in response to a safety management system that gives citations or offense points for safety violations, provides safety supervision and training, and provides safety incentives. The highest ranked reason for not wearing PPE was for utilitarian outcomes, or in other words convenience, physical comfort, time saving, and effort saving. Lastly, when workers were given the option to vote between if internal factors, such as accident experience or habituation, or external factors, such as time pressure and accident information were the greater cause for wearing PPE, the majority voted internal factors. A survey of twelve worksites in South Florida reported similar findings (Faroqui et al. 2009).

As the construction industry continues to be a dangerous field to work in, many workers are still getting injured and killed. A large contributing factor to this problem is the lack or non-use of PPE while on the jobsite. For this reason, there needs to be a better understanding of why construction workers do not wear their PPE. Once this issue is addressed and tackled across jobsites around the world, solutions can start to be integrated in order to save lives and significantly reduce the number of injuries. The first step to conquering this issue is to gain a better understanding from a worker’s perspective on the reasonings for non-use of PPE.

## **Methodology**

The methodology for this project was conducted through a survey created on Microsoft Forms. The main purpose of this survey is to gain a better understanding as to why construction workers choose to not wear PPE. When more data is collected on this subject, knowledge will increase, and more attention will be brought to this issue. The survey collected quantitative and qualitative data on compliance issues with PPE.

### *Survey*

Thirty-three responses were anonymously collected by construction workers and tradespeople. The survey consisted of ten questions, nine of which were multiple choice and one free response. The average time to complete the survey was a little over three minutes. The questions were kept simple and straightforward, in order for it to be completed in a timely manner and to not take up a significant amount of work time. The survey was kept anonymous in order to try to get answers that were as honest as possible. When addressing the issue of compliance with PPE, workers may feel obligated to say they follow regulations to avoid penalties. If the survey was distributed in an anonymous fashion, workers are more inclined to answer honestly. Honest answers help provide a better understanding as to why workers choose not to wear PPE, and thus provide a step in the right direction to finding solutions. The questions cover topics of compliance with PPE, reasons for noncompliance, training on use of PPE, responsibility, injuries, and demographics.

### *Geographic Location and Project Details*

The survey was distributed at two jobsites in Southern and Central California. The first jobsite was located in San Diego, California. The commercial project, Cubic Headquarters, consisted of two office buildings. Both buildings involved core and shell and tenant improvement construction. The project owner was Cubic; the general contractor was The Whiting-Turner Contracting Company. At peak busyness, the project had around 200 workers on site daily. The second jobsite was located in San Luis Obispo, California. This project, named Twin Creeks, was mixed use and multi-family (residential). Similar to the first, this project also consisted of core and shell and tenant improvement construction. The owner for the project was Joe Collins and the general contractor was Robbins | Reed. The project had about 60 workers on site daily. All survey questions were answered by employees of the subcontractors on site, ranging from foreman to laborers.

### **Results**

For this section of the paper, the questions from the survey will be reviewed and the answers will be analyzed. Honest answers from construction workers will help answer questions as to why PPE is not worn and open the discussion to probable solutions.

Questions 9 and 10 on the survey asked the workers their age and years of experience in the construction industry. It is important to analyze this information to gain an understanding of who responded to the survey.

*Question 9. How old are you?* Of the 33 workers, 3 workers were aged 18-24 years of age, 11 workers were aged 25-34 years old, 11 workers were aged 35-44 years old, 5 workers were aged 45-54 years old, and 3 workers were aged 55-64 years old. Roughly 43% of workers were considered younger adults, 48% were considered middle aged adults, and 9% were considered older adults.

*Question 10. How many years of construction related experience do you have?* The majority of responders answered 11+ years of experience in the construction industry. Of the 33 respondents, 27% answered 1-5 years, 9% answered 6-10 years, and 64% answered 11+ years. Most of the responders had above adequate experience in the construction industry and were not new to the idea and implementation of wearing PPE.

*Question 1. How often do you wear your PPE while completing your work?* The first question started off the survey to gauge how often construction workers wore their PPE. Only 64% of workers reported “always” wearing their PPE when completing their work. As PPE is a safety regulation enforced to keep

workers safe, it is concerning that less than three quarters of the surveyed workers reported always wearing their PPE while completing tasks. 27% of workers reported “usually” wearing their PPE while completing tasks. The last three options were “sometimes”, “rarely”, and “never”, and each category received 3% of responses. The responses are shown graphically below in Figure 1.

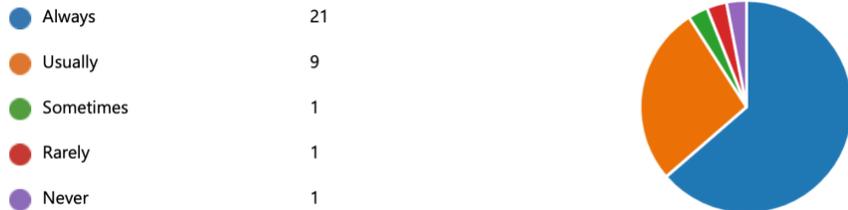


Figure 1 – “How often do you wear PPE while completing your work?” Response graph

*Question 2. What are some reasons for not wearing your PPE? (Select all that apply)*

This question provided a list of nine possible answers for workers to select from, and more than one answer could be selected. The most selected option was “other”, which has a follow up question in question three which will be discussed after this section. Out of the list provided, 12 workers reported not wearing PPE because it causes stress in hot, sunny, confined, or poorly ventilated areas, making it the most common reason for not wearing PPE. The next most common reason, receiving 11 votes, is that it is not necessary at certain times or at all. 9 workers reported it is uncomfortable, 6 workers reported it reduces their productivity, 3 workers reported it is not enforced, and 2 workers reported it is not available from their employer. The responses are shown graphically below in Figure 2.

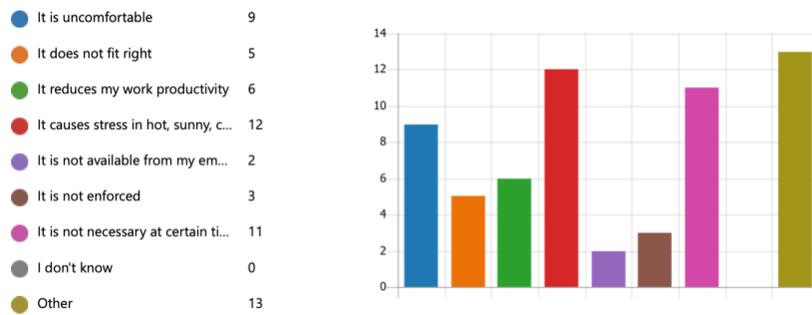


Figure 2 – “What are some reasons for not wearing your PPE? (Select all that apply)” Response graph

*Question 3. If you selected Other please provide a reason.* The best way to show the free response answers is to refer to Table 2 below. The answers are honest and genuine and cover topics such as anxiety, enforcement, fogging eye ware and more. While some answers state PPE is worn at all times, other answers provide reasoning for cases in which it is not worn.

Table 2. “If you selected Other please provide a reason:” Response Chart		
ID	Name	Response
1	Anonymous	I work out of the office

2	Anonymous	Certain fine work tasks are hindered by the use of gloves.
3	Anonymous	The only reason I would not wear my PPE is if its a private or residential job where it is not required. Even then I would typically wear it to set a good example for coworkers.
4	Anonymous	PPE is worn per Contract requirements The only time PPE would not be worn is when we are advised that it is no longer necessary
5	Anonymous	I have anxiety and often bring my glasses down and take hard hat off to relax
6	Anonymous	PPE is not with me and it's only going to take a second. What's PPE? My trade is exempt from tie off. Not my company's policy to tie off in lift.
7	Anonymous	no reason
8	Anonymous	THE ONLY THING NOT WORN 100% OF THE TIME IS EYE PROTECTION. I OFTEN HAVE ISSUES WITH FOGGING/ NOT BEING ABLE TO SEE
9	Anonymous	the only reason it would be acceptable to remove PPE, such as a vest, would be if it would create more of a hazard to keep it on.
10	Anonymous	Welding with the safety vest me catch on fire
11	Anonymous	there is not a reason I would not wear PPE
12	Anonymous	No good reason. Every issue above has a solution that allows a person to wear their PPE 100% of the time.
13	Anonymous	It not being enforced is the biggest reason with workers not wearing PPE.
14	Anonymous	Sometimes it hard to get in places or if you are wearing a mask and protective glasses it can get foggy and it hard to work and breath.

*Question 4. Does your company provide training on the use of PPE?* Majority of workers responded affirmative to this question, with a 91% response of “yes”. The remaining 9% responded “no” to this question. Employers are required by OSHA to provide PPE and training to all employees. It appears that most employers have met this requirement. If a worker did not receive training, it is possible they missed the main training session, and thus employers need to be held accountable to ensure all workers receive training. The responses are shown graphically below in Figure 3.

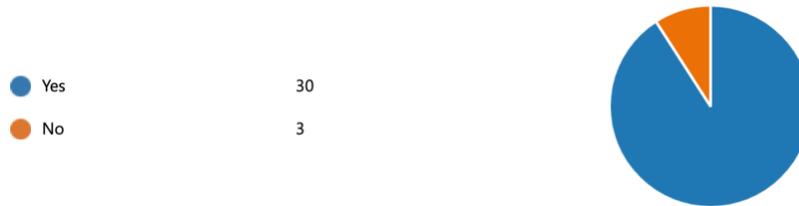


Figure 3 – “Does your company provide training on the use of PPE?” Response graph

Question 5. If you were responsible for purchasing, selecting, or influencing the purchase or selection of PPE, would you be more inclined to wear it? This question has responses that were somewhat more evenly distributed. 52% of workers responded affirmative to the question, while 30% responded negatively, and 18% responded they were unsure about the matter. If PPE was designed to be more compatible to workers preferences, they may be more inclined to wear it. In addition, if workers are able to select their own PPE, they can make sure it fits comfortably and properly and this can rule out the option of not wearing it due to fit or comfort. The responses are shown graphically below in Figure 4.

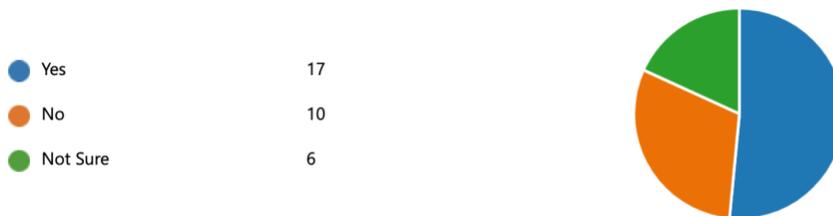


Figure 4 – “If you were responsible for purchasing, selecting, or influencing the purchase or selection of PPE, would you be more inclined to wear it?” Response graph

Question 6. Do you feel you have a responsibility for other peoples' compliance with PPE? This question was answered with over a majority affirming it. 88% of workers reported they do feel a responsibility for other peoples' compliance with PPE, while 9% disagree, and 1% was not sure on the matter. Safety is everyone's responsibility on a jobsite, so it is important to analyze how workers view each other's compliance with PPE regulations. If workers can hold each other more accountable for safety, injuries and death rates could decrease on construction jobsites. The responses are shown graphically below in Figure 5.



Figure 5 – “Do you feel you have a responsibility for other peoples' compliance with PPE?” Response graph

*Question 7. Do you feel you have a responsibility for wearing PPE at all times?* It is comforting that almost the entire group responded affirmative to this question. 94% of workers felt a responsibility to wear PPE at all times, 3% was unsure on the matter, and only 3% responded negatively about the matter. This response helps illuminate the idea that despite not wearing PPE on occasion, workers feel responsible and know it should be worn at all times for their safety. The responses are shown graphically below in Figure 6.



Figure 6 – “Do you feel you have a responsibility for wearing PPE at all times?” Response Graph

*Question 8. Do you personally believe that wearing PPE can help protect you from work related injuries?* Again, it is comforting that almost the entire group responded affirmative to this question. 97% of workers believe that wearing PPE can protect them from work related injuries, while only 3% of respondents disagreed. This response provides probable reasoning that workers choose to not wear PPE for reasons like comfort instead of a lack of safety knowledge. The responses are shown graphically below in Figure 7.

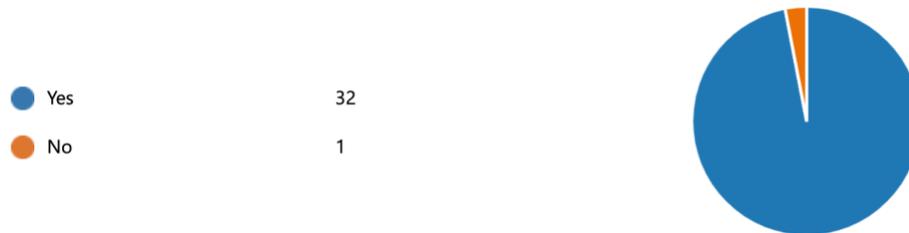


Figure 7 - “Do you personally believe that wearing PPE can help protect you from work related injuries?” Response Graph

### Analysis

The data shows that only 64% of workers always wear their PPE while completing work. This response is troubling given that 36% of workers are willingly exposing themselves to potential danger, injuries, and death. While not wearing safety glasses for a quick task may seem reasonable in the moment, it just takes one unlucky accident to risk permanent damage to one’s eyes for the rest of their life. With responses directly from construction workers themselves, insight is provided on the reasons for noncompliance. Analyzing these responses will hopefully lead the way for solutions to the issue of noncompliance with PPE.

It would be most beneficial to analyze the free response questions. Removing eye protection due to fogging glasses was mentioned twice. Impairing one's vision can be dangerous when working with various tools and equipment on a construction site. Visibility is a key sense that must be kept intact when completing tasks around the jobsite in order to be aware of surroundings. If workers remove their glasses due to lack of visibility, it opens them up to the risk of eye injuries. A possible solution to this issue would be to redesign safety glasses to reduce fogging occurrences. Another free response answer explained removing PPE due to anxiety while on the jobsite. The mental health of construction workers is a topic that is rarely discussed. More attention needs to be brought to this issue. Questionnaires to assess the mental health of construction workers could be beneficial to gain a better understanding of their needs and what could improve their mental health on the jobsite. Other options like daily check-ins before work starts could also be beneficial to their overall well-being. Removing of safety vest was also mentioned twice. From the responses, it appears to sometimes be more of a hazard on than off. If the safety vest is bulky or loose, it can impair or get in the way of tasks. One worker provided insight that it might catch on fire while welding. A possible solution to this issue is to provide bright and luminous clothing that is tight and well fitted to replace safety vests. On the topic of well-fitting clothing, another response said gloves hinder the ability of a worker to complete certain fine tasks. Another possible solution would be to provide tight and form fitting gloves, specific to each worker in different trades. Since there is so much variance between tasks in different trades, the gloves they receive should be altered to their specific trade.

Another response stated wearing PPE is not enforced. Better supervision and enforcement in the field must be implemented in order to uphold workers to the requirement of constantly wearing PPE. A similar response said if their PPE is not with them and the task will only take a second, they proceed with the task and without their PPE. If better supervision and enforcement was implemented, situations like this would not be allowed. Lastly, a response reported that PPE is sometimes not required by the employer on smaller residential jobs. It is at the employer's discretion to decide if PPE is required, but for the safety and well-being of construction workers, employers should enforce this regulation and employees should adhere to the requirement to set a good example for other workers.

## **Conclusion**

Responses provided in the survey start to build a better understanding of a worker's perspective toward PPE. With this information, improvements in the design and compatibility of PPE can be made to make PPE more comfortable and appealing to construction workers. In addition to the design of PPE, other factors like enforcement and well-being check-ins can be implemented to ensure that workers are wearing their PPE and feeling comfortable doing so. Gaining more data and research on this topic is just the beginning of making the construction industry a safer place to work in. Any one of these topics can be delved into at a deeper level. One option would be to further investigate the fit and design of PPE. Areas such as eye protection design, safety vest or safety clothing fit, and glove design can all be investigated in order to provide solution to the issue of fit and design. If PPE is designed better to fit the needs of construction workers, they may be more inclined to wear it. Another option for future research is to investigate the mental health of construction workers. As stated before, this topic is rarely brought up or discussed. As an extremely demanding occupation, construction workers face both physically and mentally straining demands on a daily basis. If that wasn't enough, some workers struggling with anxiety or other mental health issues may find the demands of daily tasks and compliance with PPE to be overwhelming. More research and attention need to be brought to this topic. With continued improvement and understanding of worker's opinions on PPE, drastic changes can be made and safety on construction jobsites will be higher. As more research is done, improvements can be made, and lives can be saved.

## References

- Abdelhamid, T. S., & Everett, J. G. (2000). Identifying root causes of construction accidents. *Journal of Construction Engineering and Management*, 126(1), 52-60. doi:10.1061/(asce)0733-9364(2000)126:1(52)
- Ahmed, S. M., Azhar, S., & Farooqui, R. U. (2007). Safety Management Practices in the Florida Construction Industry [Scholarly project]. In ASC Proceedings Archive. Retrieved March 15, 2021, from <http://ascpro0.ascweb.org/archives/cd/2007/paper/CPRT156002007.pdf>
- Charts related to the latest "census of fatal occupational injuries" news release | more chart packages. (n.d.). Retrieved February 21, 2021, from <https://www.bls.gov/charts/census-of-fatal-occupational-injuries/number-and-rate-of-fatal-work-injuries-by-industry.htm>
- Farooqui, R. U., Ahmed, S. M., Panthi, K., & Azhar, S. (2009). *Addressing the Issue of Compliance with Personal Protective Equipment on Construction Worksites: A Workers' Perspective* [Scholarly project]. In *Associated Schools of Construction*. Retrieved February 21, 2021, from <http://ascpro0.ascweb.org/archives/2009/CPRT176002009.pdf>
- NYU. (2005). OSHA Personal Protective Equipment Standard Annual Training [PDF]. New York City: Environmental Health & Safety New York University.
- OSHA. (n.d.). Commonly Used Statistics. Retrieved March 12, 2021, from <https://www.osha.gov/data/commonstats>
- OSHA. (n.d.). Personal Protective Equipment. Retrieved March 12, 2021, from <https://www.osha.gov/personal-protective-equipment>
- Rajendran, S., Plugge, W., & Bender, W. (2014). Construction Safety Laboratory [Scholarly project]. In ASC Proceedings Archive. Retrieved March 15, 2021, from <http://ascpro0.ascweb.org/archives/2014/CEUE142002014.pdf>
- Wong, T. K., Man, S. S., & Chan, A. H. (2020). Critical factors for the use or non-use of personal protective equipment amongst construction workers. *Safety Science*, 126, 104663. doi:10.1016/j.ssci.2020.104663