

COVID-19 Impact on Construction Companies and Responses to the Pandemic

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The end of 2019 and throughout 2020 brought along the COVID-19 pandemic which majorly impacted the construction industry. For construction work to continue through the pandemic, adjustments to procedures and protocols were made that satisfied city and state requirements to reduce the virus spread. Since the virus is deemed highly contagious it is much easier to contract than a common flu, making containment for any potential spread a high priority. Understanding different companies' responses to the pandemic at the construction jobsite level provides opportunities to implement procedures to stop the spread of the virus. Using in-depth interviews, this paper examines early procedures and processes utilized by construction companies. Following each of the interviews, means and methods implemented by each company were analyzed to understand what responses were perceived as successful, and which were considered ineffective. Some effective processes included use of virtual meetings and creating safe environments by sending those around infected individuals' home. As the virus is still ongoing, it was also important to understand what individuals have learned so far throughout this pandemic, and how business may change going forward. Understanding some lessons learned from this process may allow better preparations for any potential future crisis.

Key Words: Construction Management, COVID-19, Field Operations, Preparation, Emergency Response

Introduction

The COVID-19 virus first hit Wuhan China in December of 2019. A few months later the virus evolved into a global pandemic that impacted nearly everyone worldwide. The novel coronavirus (COVID-19) is a disease that can cause respiratory illnesses which can lead to death in some individuals. The fear of this virus comes from its ease of transmission. The World Health Organization (WHO) classified the primary transmission of the disease as, "from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing, or breathe heavily" (World Health Organization, 2020). These transmission modes occur when people are in close contact with each other which led to the implementation of social distancing. Social distancing is the act of remaining 6 feet away from individuals who are not living in your same household. Since the virus is contracted through airborne droplets, keeping space between oneself and other individuals helps to prevent passage of the disease. (Center for Disease Control and Prevention, 2020a). Paired with the social distancing, the use of face masks reduced spread.

Face masks covered one's nose and mouth to prevent the spread of the airborne virus. Due to its prevention of passing the disease, masks were required in all public and work locations.

As mentioned prior, the major impact that the virus has is its ease of transmission. In the United States, one of the initial reactions to the virus became limiting people from public encounters. For example, California enacted stay-at-home orders that directed individuals to stay within their current residence unless they were completing operations that were critical for progression of the country deemed "essential". Stay-at-home orders initially forced a lot of businesses, including some in construction, to shut down temporarily. These shutdowns largely impacted people's lives. Immediately with the effect of the virus, people's way of life has been altered by forcing them to stay in their homes (Exec. Order No. N-33-20).

Following these stay-at-home orders, there were new policies enacted to continue operations. Businesses could open if they followed new protocols that were compliant with the current state of the world. For example, restaurant employees were required to wear masks and increase their rates of cleaning and disinfecting of publicly used areas. They also increased the amount of outdoor seating and altered establishment layouts in order to create greater social distancing between patrons (Centers for Disease Control and Prevention, 2020c). All types of schools, including K-12 as well as the college level, implemented different approaches. Some schools have opened with policies regarding masks and proper cleaning and sanitization, while others remain closed requiring students to attend via online schooling (Centers for Disease Control and Prevention, 2020b). Likewise, the construction industry implemented rules and regulations to continue their projects.

Across the country, states created different rules and regulations following the announcement of the pandemic for the construction industry. In most states, the construction industry was deemed essential as most of the states allowed at least some kind of construction to continue through the uncertain pandemic. As of April 2020, only the state of Pennsylvania stated that no construction projects could be completed or worked on. States like Washington, Missouri, New York, and Massachusetts were allowed to continue construction projects that were deemed essential by the state including healthcare and emergency projects as well as some transportation work. States such as California, Colorado, Texas, Florida, and Connecticut were allowed to work on all construction projects as long as proper procedures were met. (Construction Dive, 2020). Figure 1 displays what each state allowed, updated April 2020. In addition to state mandated guidelines, individual cities required additional regulations to protect their citizens. The City of San Francisco for instance has permitted construction under specific guidelines such as required COVID-19 supervisors as well as thoroughly implemented COVID-19 specific safety plans (SF.GOV, 2020).

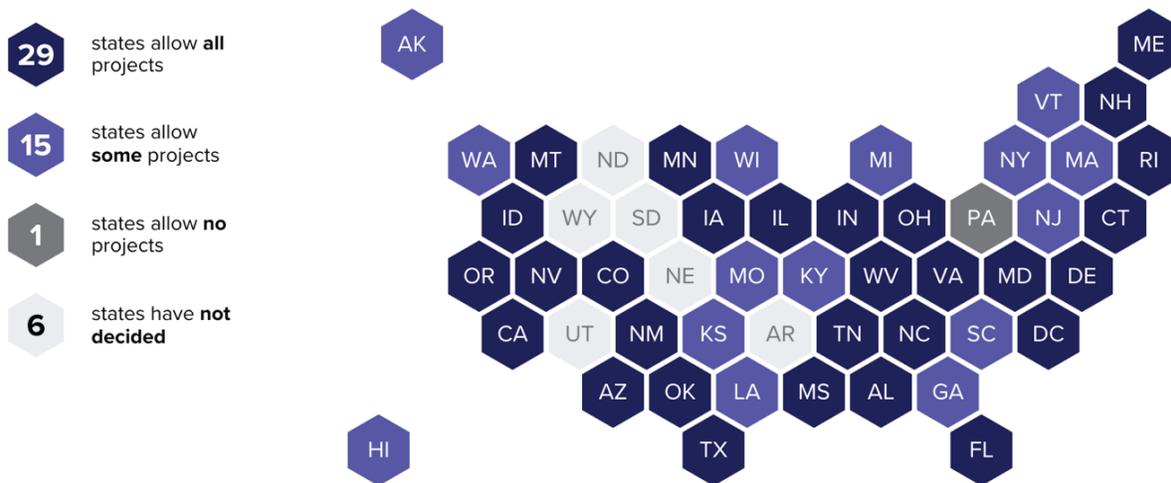


Figure 1: Construction Dive. (2020, April 20). *Mapping the coronavirus impact on US construction.*

Throughout this battle with COVID-19 it is important to note that there has been no clear solution for the protection of citizens. As scientists and experts are still discovering new information about the virus, its spread and its effect on individuals, new methods continue to be considered to determine the best ways to combat and control the spread of the virus. This has created an environment of uncertainty about best practices in the construction arena. When the pandemic first hit the United States in February, many construction companies immediately started developing new processes and approaches to stay compliant with rapidly changing state and city ordinances. As the pandemic is still in effect it is worthwhile to analyze approaches that construction companies have taken in response to the virus. It gives an opportunity to learn good and bad responses in order to continue construction projects given the current state of the world.

The objectives of this action research project are as follows:

- Identify and document various construction company solutions to proceed with work during the COVID-19 pandemic
- Identify and document similarities and differences between construction company practices implemented
- Identify and document what construction companies learned from these adjusted pandemic practices and how they may impact the future of their organizations

Methodology

To analyze some of the decisions made allowing construction projects to continue during the pandemic, four in-depth semi-structured interviews were conducted with different construction companies. The chosen number of interviews was four to gather enough information to complete a preliminary analysis for comparing and contrasting responses between the various companies. Each interviewee was working in the field operations for a construction company within the United States. Field operations are projects where the interviewees are specifically on a working jobsite. Each interview included the same list of baseline questions with added follow up questions to continue to gather information. The interviews were split into three different sections regarding COVID-19 and construction. The first portion includes initial reactions and impact of the virus. The middle section included questions regarding current implemented practices and their effectiveness. Finally, the interview concluded with discussions on the potential futures of each company in regard to lessons learned throughout the pandemic. All of the interviews were conducted through recorded Zoom calls and lasted between 20 and 35 minutes. The typical questions that were asked in each interview are listed below:

- Introduction – Initial reactions to COVID-19
 1. Work location? (office/jobsite/both)
 2. What were your initial reactions to the COVID-19 pandemic and its potential effects on the construction industry?
 3. How long were you working from home or away from your typical working location?
 4. What were some initial differences you noticed in the way your work was completed during quarantine?
- Middle section - Examining company's response to COVID-19
 1. What were some changes implemented in order to return to work?
 2. What changes should have been made that weren't?
 3. Have OSHA standards and compliance been more of an issue now than it has been previously?
- Final section - What we see in the future
 1. What changes if any do you think will be implemented into future project for your company? Such as things that will occur even without COVID-19 or will things return to their original method of function?
 2. What was the biggest takeaway so far through this pandemic that will help make better company decisions in the future?
 3. If you could return to February 2020 (when the pandemic first started) are there things you would've implemented right away to prevent declining workplace productivity?
 4. Do you think that your company is now better off prepared for a future pandemic after this or do you think there are more things that need to implement into a plan?

Following each interview, the audio files were transcribed to allow information to be dissected. The details from the interview transcriptions were then sorted and compiled into different sections of information.

Results and Discussion

When categorizing the interviews, eight different themes emerged. The interviews and information gathered were meant for analysis of field operations only since each interviewee took part in the on-site operations for their project. Each theme analyzed different approaches in companies for similarities and differences. Each of the interviewees worked for a commercial general contracting company. In order to keep anonymity between companies for this analysis the interviews and interviewee names are identified as follows:

<u>Interview Number</u>	<u>Company Number</u>	<u>Interviewee Identifier</u>	<u>Project Locations</u>	<u>Type of Construction</u>	<u>Interviewee Work Location</u>
1	Company 1	Person A	Sacramento CA	Commercial Construction	Jobsite Operations
2	Company 2	Person B	San Francisco CA	Commercial Construction	Jobsite Operations
3	Company 3	Person C	Seattle WA	Commercial Construction	Jobsite Operations
4	Company 4	Person D	Colorado Springs CO	Commercial Construction	Jobsite Operations

Table 1: Interviewee Information

Initial Impact of COVID-19 to General Contractors

This theme displayed the initial reaction from each company to the COVID-19 pandemic. The largest change that was seen from all companies was the introduction of wearing face masks on the jobsite. As mentioned previously, mask implementation is one of the first steps to stopping the COVID-19 spread. Each construction company interviewed required all of their employees along with all individuals on their jobsite to wear proper face coverings to comply with newly implemented regulations.

Each of the interviewees were participating on projects deemed essential and allowed to continue working without a stoppage for COVID-19. For Company 1 the project was deemed essential because it was a government project, so the state of California allowed them to continue. Company 2 was working a mixed-use office and residential building and was allowed to continue work due to the impact of increased living in the San Francisco area. Company 3 was allowed to continue because it was a transportation project and deemed essential by local government. Company 4 was allowed to continue as Colorado deemed construction essential and the project was for a major insurance company.

Although there were no required shutdowns for these projects, new policies needed to be implemented to reduce the spread of the virus. Two of the companies implemented early systems that limited employee days on the jobsite per week to lower the potential risk of COVID-19 exposure. Select employees would work at the jobsite Monday/Wednesday/Friday, while the other half of the employees would be present Tuesday/Thursday. One company decided to send employees home who didn't need to be on the jobsite daily, such as project engineers or project managers, whilst leaving the superintendents and key field personnel to run the physical jobsite. In the beginning of the pandemic with so much uncertainty these seemed like the proper approaches to limiting potential exposure. A couple of months into the pandemic, the companies that implemented temporary work from home procedures altered their protocols to allow those temporarily working from home to return to the jobsite.

Changes to Work

With new protocols and COVID-19 prevention procedures in place there were changes to the daily work on jobsites. Three of the companies enlisted an additional temporary employee hired to keep the jobsite clean. This individual would walk around cleaning commonly used surfaces and touch points to prevent contraction of disease from doorknobs, handrails, etc. All four of the companies noticed an immediate issue with the 6 feet social distancing guidelines while working. To allow work withing 6 feet against Center for Disease Control (CDC) guidelines, there were certain prerequisites to complete. Company 1 encountered this issue while completing their concrete pours. Since those involved with the pour were within 6 feet for more than 10 minutes of work, they were required to complete paperwork prior stating their reasoning for breaking the 6-foot distancing. They were also required to wear full face shields as well as special eyewear called “spoggles” which were secured around the individuals’ eyes to prevent contraction in close quarters. The other three companies had similar procedures with necessary paperwork required prior to the beginning of close quarters work acknowledging the risk of COVID-19. Unlike Company 1, they didn’t require the extra “spoggles” and face shield equipment. The inclusion of close quarters paperwork is important as it allows a form of close contact tracking for working individuals. If one of the employees that has filled in the close contact paperwork contracts the virus, other individuals involved in the close quarters work may be at risk as well. This helps to identify potential cases before they turn into outbreaks. Looking at the different approaches, Company 1 may not have required the extra equipment to protect employees. Even with “spoggles” and face shields there is a potential to contract the virus. The other companies all saw the extra equipment as unnecessary only requiring the filing of paperwork before close contact work.

Virtual Meetings

With some companies requiring individuals to work from home, it became necessary to adapt to virtual meetings instead of the typical in-person ones. Each of the 4 companies interviewed included at least some variation of virtual meetings for their jobsite through programs such as Microsoft Teams, Zoom, and Go-to meetings. Three of the companies agreed that the virtual meetings weren’t as productive as regular in-person meetings. Person A stated that with virtual meetings you miss a lot of the personal interactions that you get with people. They stated that the construction industry is, “60 percent relationship building and 40 percent putting stuff in place”. They mentioned that without in-person meetings one starts to lose that relationship building. Person D stated that virtual meetings prevent one from sitting down with a tradesperson or architect to quickly answer questions regarding plan documents. Asking specific questions in-person while directly looking at plans is a much more effective method than requiring attempted coordination over virtual meetings. One of the interviewees stated that they felt no loss in communication or coordination through the virtual meetings. They stated that although it is a change of pace from typical in-person meetings, the role and purpose of the meeting is still accomplished. They admitted that sometimes the pacing of virtual meetings allows one to miss the opportunity to state their opinion with the conversation already steamrolling to the next topic. Another interviewee mentioned that virtual meetings became their only interaction with the owner’s representative for the duration of the project for the pandemic. Due to certain restrictions regarding necessary quarantine after flying and before entering the jobsite, the owner’s representative would need to fly to the site location, quarantine for two weeks, then finally enter the site. Through the use of virtual meetings, the owner’s representative was able to coordinate and properly accomplish tasks that needed to be done from a remote location thus eliminating the need for quarantine. Person C also mentioned a very helpful tactic to make virtual meetings effective. They stated that it is imperative that all individuals attending the meeting leave their camera on. When the camera is off there is a high potential for loss of focus in the meeting which then allows for loss of information requiring backtracking to keep everybody on the same page. Committing to being engaged in the conversation by turning the camera on provides direct focus and leads to a more productive interaction.

New Requirements for Subcontractors

With the impact of the virus, there were many new requirements for subcontractors in order to execute their work. Each of the companies implemented a requirement for COVID-19 safety plans. These safety plans acknowledged the current COVID-19 pandemic and specific course of actions if a case were to occur on the jobsite. Two of the companies also implemented required temperature scanners prior to subcontractors being allowed to enter the site. With fever being a primary symptom to carrying the COVID-19 virus, requiring temperature scans before entering

the site can be the first step to a site outbreak. In order to make the temperature scanning a requirement, both companies created a single-entry point to their site, making it impossible for anyone to enter the site without being scanned. One of the companies that implemented this noticed difficulty with a bottleneck being created by people in the morning due to the size of the project. The other two companies didn't require a temperature scan to enter the site but implemented systems for subcontractors to record their own temperatures. Subcontractors would need to have all of their own employees take their own temperature and not enter the site if they are running a fever. Another system implemented by two of the companies was an end of day cleaning period. This period forced those working on-site to take 15-30 minutes each day to clean their tools and area of work. Each of these companies felt that instructing the subcontractors to clean their own areas following their work was better than hiring an outside source to complete a site cleaning.

One of the trickiest requirements for subcontractors came when discussing Company 1's issue with their personnel hoist. Company 1's project was a large high rise building that utilized four personnel hoists in order to transport subcontractors to their proper floors. With COVID-19 and city regulations, the maximum number of individuals per hoist was reduced from 20 down to 5 riders. This made for large changes in how each subcontractor got to their proper floor for work. Pre-COVID-19 the process of transporting individuals to the proper floors of the building took 20 minutes. After the new regulations this process timeline increased to 1-2 hours. In an attempt to expedite the process, a schedule was created which required subcontractors to have staggered start times, preventing an overabundance of people trying to use the hoists at once. This process became frustrating to some subcontractors as they now had to adjust their start times or face serious delays from hoists. Companies 2 and 3 were also utilizing personnel hoists as well but hadn't run into similar problems due to the smaller size of their project.

Issues with Compliance

This theme addresses some of the issues that the companies ran into with on-site individuals not complying with their COVID-19 policies. Across the board the biggest issue was people not wearing their masks. Person A mentioned that many of the subcontractors on-site found it difficult to keep their masks on while working. Person A mentioned how on numerous occasions they would walk around a corner wearing their General Contractor's vest and witness all the subcontractors rush to apply their masks. A solution to this issue was to remind all people on site that wearing the mask is about protecting everybody and not just the individual self. Two of the companies both stated that they reminded individuals that the end goal is safety. Nobody wants to bring the COVID-19 virus to their own home and infect their families and as a general contractor it is important to remind everyone to think about other people's health and not just their own. Person C stated that setting the example for compliance starts with the General Contractor. If the General Contractor refuses to wear their mask properly then subcontractors will follow suit. It needed to be a constant reminder that nobody is exempt from the rules. Each interviewee agreed that a typically successful tactic is the constant reminder of health and safety for everybody. Reminding those that refuse to wear their masks that they are not only potentially harming themselves, but also running the risk of bringing the virus to family members and roommates can help to snap their attention to following procedure. This helps to keep everyone on the same wavelength of protecting all parties involved with the project.

What Happens with a Positive Case

In order to understand more on the company procedures during the COVID-19 pandemic, it is important to learn what happens following a positive or possible positive case. At the time of the interview Person D held the only jobsite of the four that hadn't encountered a possible or confirmed COVID-19 case. Company 1 had a case involving a subcontracted employee who was at work the day before they found out a positive COVID-19 test result. As soon as Company 1 heard of this they shut down the site sending everybody home in a matter of two hours. After everyone was sent home for the day, a third-party cleaning service was hired costing the company upwards of \$20,000 to effectively clean the site, office spaces, and common touch surface. The company then completed close contact reports to discover employees that were in close contact with the positive individual. Those in close contact were quarantined for 10 days unless they provided a negative COVID-19 test. After the deep clean of the building the site was able to open the next day and work was continued. Luckily this positive case only shut down the site for one day.

Company 2 had two different positive COVID-19 cases with a slightly different approach. Instead of shutting down the entire job, any individual that tested positive was required to self-isolate for two weeks. With the removal of individuals who have tested positive, the area which they work goes through a deep thorough clean. This process limits any major stoppage to work while keeping employees safe. Following a similar pattern, Company 2 completed close contact reports to discover other potentially infected individuals.

Company 3 also had a positive on-site and followed close procedures to Company 2. There was no entire site shut down, but the individual was required to complete a two-week quarantine period. The area where the positive individual worked went through a deep clean and Company 3 also insisted that their employees receive COVID-19 tests as a precaution. Both Companies 2 and 3 were happy with their response to the positive case. They took a proactive response by expressing care with a positive case whilst also continuing work.

Things the Company Did Right

This segment allowed interviewees to gauge how well their company responded to the COVID-19 pandemic. Each interviewee stated that their company reacted in a way that fit with the pandemic. Given the circumstances it seems that the initial reactions weren't detrimental to the project and allowed for the continuation of work for direct employees and subcontractors. One company took the pandemic and some of their jobs being temporarily shut down as an opportunity to send younger employees to different locations. They stated that an employee on another jobsite was offered to work on a job in Florida after their current project was temporarily shut down giving the employee an opportunity to live somewhere different and have new experiences that otherwise may not have happened. Another interviewee mentioned that their company is constantly trying to improve new safety measures as they come up with ideas and concepts. The newest addition to their jobsite was the implementation of an airflow generator within their personnel hoists to circulate air and prevent people from sharing oxygen and potentially spreading disease. This is a direct correlation to the care that the company gives its employees and the attention to limiting potential exposure. Person C mentioned that their company took the pandemic to acknowledge the resiliency of their organization. They were able to turn the negative of the pandemic into a learning lesson for a positive way to react and to stick through the difficult times. Another interviewee mentioned that the company did right in their initial reaction to the pandemic. The company could have taken an aggressive approach shutting everything down as soon as the word pandemic appeared but took the time to analyze the situation to come up with a productive solution. All in all, it seems that each of the interviewees was very happy with the handling by their company. None of the individuals had complaints mainly due to the fact that their companies were all working with limited information where no one had the perfect answer to the current situation.

Next Steps

This final theme is examining some of the future impacts following the pandemic. All respondents came to the conclusion that their companies weren't prepared for this pandemic. Although their companies were able to react accordingly, planning ahead may have limited some of the confusion. Hence came the need to develop an emergency response plan. Person A stated that due to the pandemic, alongside other major events throughout 2020, their company intends to create action plans given certain situations. These "Emergency Action Plans" are meant to be generic plans that offer guidance through uncertainty. If there were to be another crisis event, employees have the ability to refer to a pre-engineered plan to allow them to work through the situation. Person D looked more at the potential of another pandemic. They stated that although the next virus won't be COVID-19, it may become a commonality to create a "Sickness Prevention Plan" that incorporates prevention of potential future diseases. This then helps to identify some procedures prior to a pandemic so that employees are aware of certain abilities to prevent the spread of disease. Nobody knows what the next big impact will be but preparing and having a plan of action leaves less room for negative results and higher probability of success.

All four of the companies declared that following the pandemic, COVID-19 procedures shall be removed. Without the need to prevent against spreading disease, social distancing and mask requirements will no longer be necessary. Since it has become a burden on general contractors to be the enforcers of these new policies, the interviewees predict they will be swiftly removed. Since these COVID prevention procedures have been a pain for general contractors to control, once the necessity is gone there will be no need to keep the procedures in place. One

company stated that virtual meetings will become less common and work will likely proceed as normal following the end of the pandemic.

Conclusion

According to all four of the interviews, there were a lot of good tactics taken by each company. For companies to continue their course of work, it seems that all interviewees took similar approaches. The implementation of required masks, developing specific COVID-19 prevention plans, and engaging in temperature checks are a few examples of these changes. Each of the companies included some of their own specific responses to the COVID-19 pandemic. One of the key differences was seen when analyzing the immediate responses to COVID-19 outbreaks on a jobsite. Company 1 took an approach of immediate action shutting down the entire jobsite in order to clean every surface and space whereas Companies 2 and 3 decided that caution was required but an entire shutdown wasn't necessary. They instead took the approach to remove individuals who may have contracted the disease from their positive case and then proceed to clean areas where they may have worked. This approach was seen to be less hurtful to the overall progression of the job whilst accomplishing the goal of creating a clean and safe environment. Finally, there are some things learned from the pandemic. The biggest takeaway here was looking into preparation. Although there were many uncertainties regarding the COVID-19 pandemic, it seemed that many companies didn't have any prepared plan to prevent spread of disease. In the future, there may be an increased implementation of health and safety plans that will incorporate an umbrella coverage for sickness prevention. Since the future is unknown, the plans implemented may not directly correlate to the given situation but will have some generic approach to disease spread prevention.

There were limitations to this study. A further in-depth approach to this would be to compare and contrast strategies of more than four companies in the construction field. For more details regarding new policies and analysis of a wider range of construction industry practices, more interviews would need to be conducted. As the purpose of this analysis was to gather general information regarding some practices, the in-depth interviews conducted were sufficient. The interviews were also gathered across multiple locations. Since some of the companies were in different states there is the possibility that many of their differences are based solely on demographic location. Again, stating that the report is meant for general analysis the information gathered allows preliminary discussions of information. In the future it may be beneficial to analyze not only the jobsite perspective of impact but also the general office to get a complete umbrella analysis of the impact of COVID-19.

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