

Impacts of Pandemic-Induced Material Price Escalation on Construction Estimation and Bidding

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The COVID-19 pandemic introduced new severe supply chain bottlenecks in the construction industry. These bottlenecks reduced the availability of a wide variety of critical construction materials, which created a scarcity that has raised material prices at an unprecedented rate and extended lead times for some materials by months. This poses new challenges for contractors with pressure from owners to deliver ongoing contracts with fixed, pre-pandemic contract pricing and for estimators seeking to bid new projects with unforeseeable future material pricing. The objective of this research to focus on contractors operating within the state of California and their primary challenges in navigating a volatile materials market, and to discover trends and changes in preconstruction processes throughout the industry as this material price escalation event has transpired. Seven industry professionals from different contracting companies and manufacturers were interviewed for this case study from which a variety of challenges were identified and methods to reduce risk in preconstruction were explored, including expanded contingency, development of internal price forecasting systems, and increased focus on value engineering and alternative materials.

Key Words: Estimation, Bidding, Materials, Escalation, Pandemic

Introduction

Material Price Escalation in the Construction Industry

Contract prices for construction projects have risen dramatically during the COVID-19 pandemic. Costs of construction rise for a variety of reasons including labor shortage, market competition for Contractors and Subcontractors, and material pricing and availability (Morris). According to research conducted by Peter Morris and William F. Wilson of Davis Langdon, "...the sum of the input costs will provide a floor below which a bidder is normally unwilling to go, and so changes in input costs will influence bids to some degree" (Morris). Therefore, when material prices rise, the costs for construction rise, thus the price for construction contracts rise as well. When prices for construction contracts rise, owners must find ways to mitigate this cost. Morris' and Wilson's research states that the ways for owners to mitigate costs include putting projects on hold until contracts decrease in price,

redesigning the project to implement lower-cost construction materials and assemblies, and seeking additional funding, all of which are complex and time-consuming (Morris). Contractors must find better ways to predict impacts of rising input costs to avoid impending project delays. In doing so, each input cost must be addressed individually to create a plan for future escalation. This research is focused on one currently critical input cost: material price escalation caused, in part, by the ongoing COVID-19 pandemic. Contractors must find new ways to navigate the materials market to remain profitable in the modern industry. With proper methodology regarding the early-on approach to estimation and bidding that takes into consideration the market forces propelling a surge in material prices, contractors can find success with their bidding processes and reduce potential project delay.

Literature Review

It can be observed that the COVID-19 pandemic is directly linked to several causes of recent supply chain bottlenecks contributing to the rapid increase in material prices. In a recent study published by the Multidisciplinary Digital Publishing Institute (MDPI) that asked 34 contractors in the United States about the early impacts of the COVID-19 pandemic on their business that they have observed, some of the most frequent responses named material delays and shortages of material as the most challenging issues facing the industry (Alsharaf). Delays in material production, in turn, reduce overall supply of a given material (Alsharaf). According to this article, contractors linked reduced supply and higher material pricing to “the closure and reduction in the capacity of manufacturing and processing facilities that are upstream in the supply chain” (Alsharaf). Problems arising from reduced supply at the beginning of the pandemic have been amplified over the last few years to create larger problems for contractors.

Highly generalized research has been conducted in the past on the topic of material escalation construction contracts. Material escalation is not a new concept to construction; however, according to an article published by the Associated General Contractors of America notes that prices for various materials such as steel and lumber set unprecedented escalation records on a weekly basis in April of 2021 (Associated). Escalation for material in a construction contract has been predicted using indices such as the Construction Cost Index, Wholesale Price Index, Consumer Price Index, and Producer Price Index in the past, but these methods are no longer feasible given current market conditions (Shedabale). A rapid increase in input costs for a construction project with a fixed contract price is detrimental to a project’s success because contractors need to forego profit to complete such contracts (Associated). For example, Figure 1 shows the Associated General Contractors of America utilized data obtained from the Bureau of Labor Statistics to illustrate the loss of profitability that some nonresidential contractors may have faced between March 2020 and March 2021 (Associated).

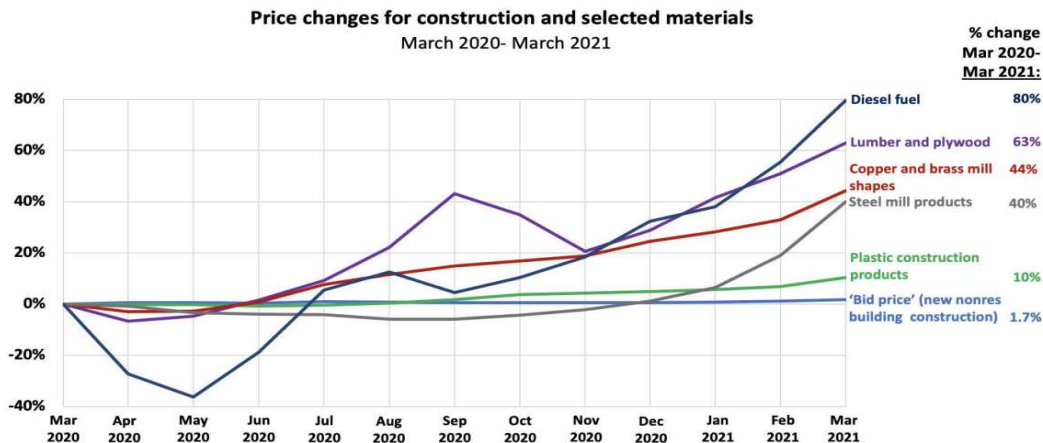


Figure 1: Associated General Contractors of America, producer price indexes for new nonresidential building construction, diesel fuel, wood, metal products, and plastic products, not seasonally adjusted.

The article goes on to state that "...many producers are drastically shortening the duration for which they will guarantee prices. This is problematic for contractors, who must typically guarantee a price to an owner long before placing a firm order for materials," which further complicates this issue for preconstruction professionals (Associated). It is made clear by observation of this data that many contractors need to have made significant changes to their preconstruction processes to avoid severe project cost overruns, which is a primary concern for the industry according to an article in the Mediterranean Journal of Social Sciences that found nearly 84% of responding contractors were "very impacted" or "extremely impacted" by cost overruns during the pandemic (Alhagar).

Research Objectives

Rapid rise in cost for construction poses great concern for the construction industry. With contract prices rising, owners may choose to put projects on hold until high material pricing subsides or additional funding may be secured, which can significantly delay a project and impact its success (Morris). Additionally, price instability creates massive hurdles during the preconstruction phase, with estimators battling to secure accurate pricing to prevent significant losses that may occur during the project without proper preparation and planning. Past research on this subject has either been generalized for basic escalation that can be expected from regular inflation or narrowed down to highly-complex, niche observations in specific industries with proposed solutions to those observations. With an unprecedented escalation event facing the industry and a lack of published research documenting it, this research's main objective is to analyze the trends in preconstruction processes, document the main challenges that a variety of contractors and manufacturers have faced, and to propose any successful change to preconstruction processes that have been implemented throughout the course of the COVID-19 pandemic. With a current, general, regional approach to this issue, this case-study research may provide a framework or a set of options for contractors to consider for the current escalation event or escalation events in the future.

Methodology

This research began with a literature review of past material price escalation events and development of thirteen questions to ask a variety of industry professionals. Semi-structured interviews were conducted with seven industry professionals operating in the state of California including project engineers, a project manager and estimator, a contracting company executive, and a manufacturer's representative from diverse general contracting companies, subcontracting companies, and manufacturers. This research method yielded qualitative, exploratory data. Topics of this interview included size of firm, trade, past experience in escalation events, changes taken in recent events and in the past to protect from severe losses, issues regarding implementation of changes, probability of such changes prevailing in an ordinary materials market, and more. All professionals were notified that answers to any questions were optional and that they may choose for their interview to remain anonymous. This anonymity serves to protect any sensitive information or company processes that may be shared during the interview. These questions established a case-study framework with information for contracting companies to consider in future escalation events.

Interview Questions

Interview for Contractors

- Please feel free to introduce yourself and explain your company, career experience, qualifications, and industry specialization.
- In what sectors does your company specialize?
- What are your company's top markets?
- Does your company self-perform work? If so, what work do you perform, and how often do you do so?
- Did the frequency at which your company self-performs work change during the course of the ongoing pandemic? Why do you believe so?
- Has the current material price escalation event impacted your company's ability to accurately estimate job costs? To what degree has this impacted your company's job-to-job success?
- Has your company made systemic changes to their estimation/bidding processes to mitigate potential loss due to a highly volatile materials market? If so, and if you are comfortable sharing, what systemic changes have you made, both successful and unsuccessful?
- Have you observed that material price volatility fosters a more or less competitive bid environment? Why is this so?
- Have you observed that a volatile materials market favors a particular project delivery method, such as Design-Bid-Build or CM at Risk? Why is this so?

- How have owners, agencies, and trade partners you currently work with responded to rapidly rising construction costs? Have you been able to reach agreements such as expanded contingency budgets or escalation allowances?
- Has the current material price escalation event changed which trade partners your company was accustomed to working with prior to the pandemic?
- Have the manufacturers that produce and supply your company's material for self-perform work been willing to reach short-term agreements regarding material pricing?
- How and when do you expect the materials market to stabilize? Will this escalation event become a long-term issue for the construction industry?

Interview for Manufacturers

- Please feel free to introduce yourself and explain your company, career experience, qualifications, and industry specialization.
- In what sectors does your company specialize?
- In what trades are your materials used on a construction site?
- Have you observed any variation in the number of jobs for which you supply material during the course of the ongoing pandemic? Why do you believe so?
- Has the current material price escalation event impacted your company's ability to accurately determine material costs before fulfilling purchase orders? To what degree has this impacted your company's job-to-job success?
- Has your company made systemic changes to their pricing and sales processes to mitigate potential loss due to a highly volatile materials market? If so, and if you are comfortable sharing, what systemic changes have you made, both successful and unsuccessful?
- Have you observed that material price volatility fosters a more or less competitive procurement environment? Why is this so?
- Have you observed that a volatile materials market encourages your company's customers and clients to favor a particular product or system you supply, inquire for new value engineering options, or ask for new substitutions to satisfy warranty requirements?
- How have contractors you currently work with responded to rapidly rising construction costs? Have you been able to reach agreements such as extended price agreements or discounted accessory materials?
- Has the current material price escalation event changed which contractors your company was accustomed to working with prior to the pandemic?
- How have fluctuating lead times impacted your purchase order fulfillment?

- How have fluctuating material prices impacted your purchase order fulfillment?
- How and when do you expect the materials market to stabilize? Will this escalation event become a long-term issue for the construction industry?

Analysis

Contractors

Shell Roofing Solutions- Rudy Gutierrez, President and CEO of Shell Roofing Solutions in Southern California, was interviewed for this study. Shell Roofing Solutions specializes in re-roofing and repeat business, so his company's approach to challenges arising from the COVID-19 pandemic and the following material price escalation event was to meet with frequent clients and service contract partners to re-strategize for the future (Gutierrez). As a result, Mr. Gutierrez was able to expand his business during the pandemic and the current material price escalation event (Gutierrez). During the beginning of the current material price escalation event, ongoing projects were the largest challenge for Shell Roofing Solutions because many ongoing contracts did not include escalation clauses, causing the company to forego some profitability (Gutierrez). To mitigate loss, projects were managed more closely, and value engineering increased in importance to meet owner/General Contractor expectations (Gutierrez). One important method that Shell Roofing Solutions used to mitigate loss due to a volatile materials market was to offer quarterly pricing in their proposals – one contract price for a start date in Q1, another for a start date in Q2, and more if necessary, using a unique price forecasting method they developed with the aid of their suppliers and distributors (Gutierrez). Mr. Gutierrez stated that the material escalation event has not changed the clients his company is accustomed to working with, since repeat business is Shell Roofing Solutions' specialty (Gutierrez). From Mr. Gutierrez's perspective, material prices will likely take years to stabilize in the roofing trade, so this event will be a problem for contractors to overcome for a long time (Gutierrez).

CSI Construction- Nathan Horst, a Project Engineer from CSI Construction, a large commercial General Contractor from Northern California was interviewed for this study. Mr. Horst stated that his office does not generally self-perform any work, but they sometimes choose to buy material for some jobs and subcontract out labor to install material (Horst). He noted that material pricing can change drastically from the time that a proposal is finalized to when a work begins on a project, which has been a challenge for CSI Construction since the beginning of the pandemic (Horst). Mr. Horst said that the most successful change his company made to their preconstruction process was emphasizing the early subcontractor sign-on and shifting of responsibility for escalation cost to their subcontractors (Horst). This allows trade partners to make their own decisions regarding forecasting of material pricing in their trade, which is more precise than generalization of escalation as a large contingency item in a General Contractor bid package (Horst). He explained that the project he is primarily responsible for in San Luis Obispo is the first project his company has worked on in the area, so trade partnerships are completely new, therefore have not changed throughout the course of the material price escalation event (Horst). In Mr. Horst's perspective, this escalation event will certainly be a long-term issue for the construction industry because many trades are still experiencing rapid escalation years into the pandemic (Horst).

California Central Coast Custom Homes Builder- A Preconstruction Project Engineer from a small residential home builder on the California Central Coast was interviewed for this study. He

noted that his company expanded their market share during the course of the pandemic, but reduced crew size in recent months (Project Engineer 1). Lumber is a critical material for most residential construction, but the interviewee explained that he has been unable to receive guaranteed accurate material pricing for lumber further than two to three days before delivery, which is a problem for his company during estimation and bidding because he has no other choice but to predict pricing himself (Project Engineer 1). The interviewee explained that his company has not found a successful method to mitigate the potential risk that arises from material price prediction, but they are continually looking for alternatives and methods (Project Engineer 1). Various subcontractors that work with this interviewee's company have raised their contract prices by approximately 20% from pre-pandemic levels, but trade partnerships have been maintained (Project Engineer 1). From this interviewee's perspective, this escalation event will become a long-term issue for the construction industry because it is unlikely for prices to ever reduce to pre-pandemic levels (Project Engineer 1).

Northern California Commercial Contractor- A Project Engineer from a large Commercial General Contractor in the San Francisco Bay Area was interviewed for this study. He explained that several projects went on hold at the start of the pandemic, and only recently have projects started to see a full bounce-back to pre-pandemic levels, with future activity forecasted to exceed pre-pandemic levels in the coming months (Project Engineer 2). The interviewee stated that material price escalation has become an issue for his company due to their high frequency of self-perform work and inconsistent, shorter-term price-holding by his company's suppliers (Project Engineer 2). Addressing these challenges has been paramount to the job-to-job success of this company (Project Engineer 2). One method for mitigating loss due to unforeseen material escalation noted in the interview is a large contingency budget for each project; however, owners have been reluctant to adopt this solution (Project Engineer 2). The interviewee admitted that because of this, his company will likely need to forego some profit on their current jobs to finish them on time if they run out of allocated contingency (Project Engineer 2). Despite challenges in preconstruction, the trade partnerships for this company have not changed throughout the duration of the pandemic and material price escalation event (Project Engineer 2). From this interviewee's perspective, this escalation event will be an issue that will take years to solve, but the industry will eventually return to a relative normal (Project Engineer 2).

Central Valley Public Works Contractor- A Project Engineer from a large Public Works General Contractor in the Central Valley was interviewed for this study. This interviewee explained that his company was required to reduce their crew sizes during the material price escalation event because the amount of public works jobs available decreased significantly (Project Engineer 3). The biggest challenge for his company has been price-holding; subcontractors have not been able to guarantee contract prices longer than a few weeks due to material price instability among several trades, which has caused his company to lose multiple bids in the last year (Project Engineer 3). This interviewee explained that expanded contingency budgets have been the key to his company's success in recent months, since complex risk allocation regarding pricing has become more important (Project Engineer 3). He stated that owners are not very receptive to expanded contingency, but they have been open to value engineering options and substitutions based on availability to move a project along (Project Engineer 3). Due to the nature of this company's specialization in public works projects, some trade partnerships have not prevailed because of the emphasis on low-bid contractor selection, meaning that this company cannot always work with the subcontractors that they prefer (Project Engineer 3). From this interviewee's perspective, this escalation event will take years to stabilize because the pandemic reduced the efficiency of the supply chain, which is a long-term challenge for the construction industry (Project Engineer 3).

Southern California Structural Steel Subcontractor- A Project Manager/Estimator from a structural steel subcontractor in Southern California was interviewed for this study. This interviewee stated that the quantity of jobs available in his trade has not changed, but he has seen an increased quantity of public infrastructure work out to bid and a reduced quantity of regular commercial work available (Project Manager). Material price volatility has directly affected this company's ability to accurately estimate job costs on current jobs but has not had as significant of an effect on preconstruction estimation and bidding because of their great supplier relations; suppliers are willing to hold their prices for longer periods of time than in other trades (Project Manager). Thus, preconstruction processes have remained unchanged since steel is almost always volatile, therefore it is captured on each proposal (Project Manager). This interviewee explained that a challenge to preconstruction in his trade that has arisen is material-dominant contracts – the material component of a contract is solely dependent on price, while the labor component can be engineered to be more competitive in a bid environment; when labor makes up a lesser percentage of a contract's cost, the bid environment becomes increasingly more competitive (Project Manager). The material price escalation event has not changed the trade partners this company is accustomed to working with (Project Manager). From this interviewee's perspective, pricing for steel will likely never return to pre-pandemic levels for two reasons: COVID-19 greatly reduced steel production and transportation worldwide, and demand for steel never ceased (Project Manager). Because steel production is extremely backlogged, demand for steel has not faltered, and steel remains volatile even in a normal market, manufacturers do not need to return to pre-pandemic pricing, making this escalation event a long-term issue for this industry (Project Manager).

Manufacturer

Southern California Materials Manufacturer- A regional Vice President from a large materials manufacturer in Southern California was interviewed for this study. This interviewee acknowledged that the number of orders he has received for material has significantly increased from pre-pandemic levels despite rapidly rising material costs (Regional). He noted that the most difficult problem to overcome regarding material pricing is the increased lead times in his trade that have resulted from the pandemic; due to extremely high demand, some materials cannot be fabricated for months due to backlog and input costs for materials requested on a purchase order will be entirely different when they are actually fabricated in the future (Regional). To combat this, the primary modifications made to this company's pricing and fulfillment processes has been price increases to orders shipping after certain dates to allow this company to remain profitable while managing rapidly increasing input costs and the use of a company schedule projection system to estimate exactly when materials will be shipped to a jobsite so materials can be priced accordingly (Regional). These changes, unfortunately, have not proven to be effective solutions, but he added that close communication with clients during this escalation event has been the most important aspect of his company's success (Regional). This interviewee stated that his company has upheld client relations throughout the course of the material escalation event because of their direct-shipping method of business and value through quality; each client is important, so trade partnerships have been prioritized and maintained (Regional). In this interviewee's perspective, this escalation event will take years to correct from a supply standpoint because it will take a very long time for production to meet current demand (Regional).

Conclusions and Future Research

Personal interviews with these seven industry professionals yielded valuable results for analysis. Firstly, five out of seven respondents noted that they had made significant changes to their estimation and bidding processes to remain profitable, yet competitive in an unprecedented, challenging bid environment. The changes discussed in the interviews include more stringent project management, an increased focus on value engineering, offering quarterly pricing in project proposals, development of internal price forecasting systems, increased contingency budgets, material substitutions, early subcontractor sign-on, shift of escalation responsibility to subcontractors, and development of internal schedule forecasting systems. Two contractors have not altered their preconstruction processes – one cited his trade as perpetually volatile, so his company was already prepared for an escalation event, and another stated that his company was open to alternatives but had not found anything effective.

Another important finding is that despite pressure from owners and developers to meet strict contract pricing, five out of seven respondents have maintained trade partnerships despite not always receiving lowest-bid proposals. The most common reasoning respondents gave for this is that familiarity with certain trade partners fosters healthy communication, which is crucial during hard times. One responding contractor who has strayed from trade partnerships during the ongoing material price escalation event specializes in public works, a sector that almost always favors the lowest bid. The other contractor is operating in a new area for his company, so trade partnerships in the area were already new before the beginning of the pandemic and when material pricing became volatile.

Lastly, there is a consensus among respondents that the current material price instability will take years to subside, making it a long-term issue for the construction industry. Preconstruction experts as well as on-site management must be prepared to mitigate potential loss before submitting project bids and managing escalation throughout the project duration. It is generally accepted by respondents that material pricing will never return to pre-pandemic levels, so higher costs for construction are inevitable in the future.

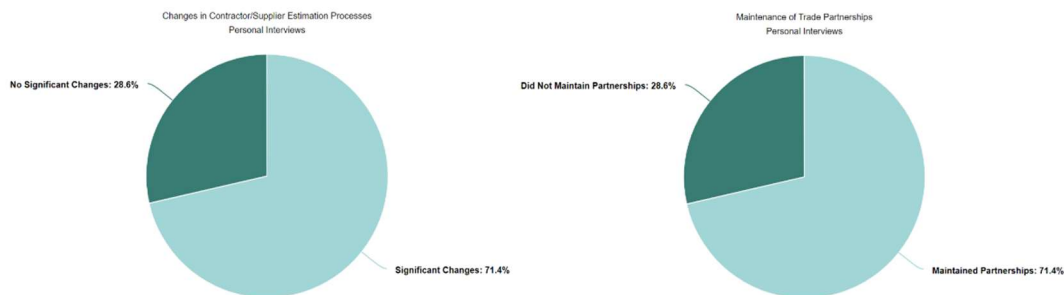


Figure 2: Personal interviews. Changes in contractor/supplier estimation processes (left) and maintenance of trade partnerships (right).

In future research, a larger sample of industry experts may be used to create a more accurate generalization of industry trends. Some interview questions asked in this study did not generate topically similar responses across all respondents, so a clearer objective for more specific research should be devised to narrow down analysis and conclusions in future research. Additionally, a manufacturer was included in this study to provide a more holistic overview of the topic, but

differences in responses generated by separate studies conducted with contractors and manufacturers/suppliers may yield significant results when compared.

References & Appendix

Alhagar, Abdulsalam and Gamil, Yaser. "The Impact of Pandemic Crisis on the Survival of Construction Industry: A Case of COVID-19." *Mediterranean Journal of Social Sciences*, vol. 11, no. 4, July 2020.

Alsharif, A.; Banerjee, S.; Uddin, SMJ.; Albert, A.; Jaselskis, E. Early Impacts of the COVID-19 Pandemic on the United States Construction Industry. *Int. J. Environ. Res. Public Health* 2021, 18, 1559. <https://doi.org/10.3390/ijerph18041559>

"Construction Inflation Alert." *Associated General Contractors of America*, May 2021.

Gutierrez, Rudy Interview. (2022, February 24). Personal.

Morris, P., & Willson, W. F. (2006). Measuring and managing cost escalation. *AACE International Transactions*, CS61-CS67.

Project Engineer 1 Interview. (2022, February 17). Personal.

Project Engineer 2 Interview. (2022, March 11). Personal.

Project Engineer 3 Interview. (2022, March 28). Personal.

Project Manager Interview. (2022, February 18). Personal.

Regional Vice President Interview. (2022, March 9). Personal.

Shedabale, Komal, et al. "Cost Escalation in Construction: An Alternative Approach." *The IUP Journal of Infrastructure*, vol. IX, no. 3, 2011.