
CONSTRUCTION ESTIMATING CHALLENGES AFTER COVID 19 - THE EFFECT OF PRICE ESCALATION AND MATERIAL SHORTAGES ON CONSTRUCTION COST AND CONTRACT MANAGEMENT

Bashar Haddad

Western Kentucky University

bashar.haddad@wku.edu

Abstract: The cost of building materials is imperative for determining the profitability and success of construction projects. This paper focuses on the effect of the COVID 19 pandemic on material prices and the availability of material. The input cost of materials and services utilized in construction rose by 27.4% from April 2020 to August 2021. Typically, the material and equipment costs could reach up to 50-60 percent of the construction project cost. Therefore, the increase in material prices and the availability of material pose a significant risk to contractors' ability to bid and execute projects. Prudent contractors must develop a plan to manage and mitigate the risk of material price escalation at the bidding phase, during contract negotiation, and during the built phase of the project. The researcher provides contractors with risk mitigation strategies at each phase of the project to manage and control price volatility.

Key Words: *Risk management, material prices, risk mitigation, project cost, price escalation, construction management, material availability.*

1. INTRODUCTION

The construction industry considers a project to be successful if it finishes on time, within budget, and with satisfactory quality. To stay within budget, contractors ought to manage and control material costs. The cost of building materials is imperative for determining the profitability and success of construction projects.

The construction industry institute (CII) argues that material costs can reach more than fifty percent of the value of the project (Meng et al., 2018). Therefore, the effective management of material costs could determine whether the project will be completed within budget (Polat and Arditi, 2005; Georgy and Basily, 2008). This paper focuses on the effect of the COVID 19 pandemic on material prices and the availability of material. The paper also proposes an alternative approach to mitigate the effect of material shortages and price escalations on the project.

Inherently, the research produced in this area focused on managing material procurements during the construction phase. Scholars presented various material purchase management models to help contractors manage and control the material procurement process during construction. An example of these models is the economic order quantity (EOC), which defines the ideal material quantities to reduce the company inventory costs (Son et al. 2021). Another model is construction logistics planning (CLP). CLP provides contractors with the procedure to optimize material cost and inventory constraints (Hsu et al., 2018). Also, the dynamic programming model (DPM) is presented to balance material price with levels of demand for contractors to make optimal purchase decisions (Kang et al., 2016).

However, current construction industry market conditions, due to COVID 19, dictate that contractors must start managing the material procurement process from the project's bidding phase. Traditionally,

procurement management entails assuring material quantities availability, acquiring quotes, and delivery times from suppliers. Conversely, currently, the process should include incorporating clauses in the contract between the owner and the contractor to protect the contractor from price increases. At the same time, the clauses must protect the owner from unnecessary additional costs due to change orders and potential litigations.

The effect of the COVID 19 pandemic on the supply chain is substantial. The pandemic is causing a supply chain bottleneck that is causing an increase in material prices and issues with the availability of material. Manufacturers and suppliers are not able to meet the higher demand for the material. Even if they do, they are faced with a record shipping backlog and a shortage of truck drivers. The pandemic caused some factories to operate on part capacity due to issues with raw material availability, factory laborers not showing up to work, and cargo ships waiting extended time at sea before being able to dock at ports to unload. Also, Ships are not being allowed in certain ports due to COVID 19 restrictions and cargo handling has slowed as COVID 19 has depleted dockworker ranks.

Consequently, material prices have risen significantly. According to the Associated General Contractors of America (AGC) construction inflation report (2021), the input cost of materials and services utilized in construction rose by 27.4% from April 2020 to August 2021. Conversely, bid prices only rose by 5.2% in the same period (Figure 1). Prices are expected to continue to increase. According to the AGC Data Digest (2021) stated that for October 2021, the year over year rate for steel increased by 134%, aluminum mill shapes increased by 35%, plastic construction products increased by 30%, gypsum board increased by 23%, and insulation material the rates increased by 19%.

Figure 2 shows the producer price index (PPI) for bid prices for non-residential buildings construction and selected inputs. As shown in the figures above, there is a difference between bid price increases and material costs increases for the stated period. Furthermore, it is typical for the cost squeeze on contractors to last two years or more. Figure 3 shows the difference between a year-over-year change in material costs versus the bid process between January 2006 and August 2021. The change went up to above 18% for the first time between 2020 and 2021.

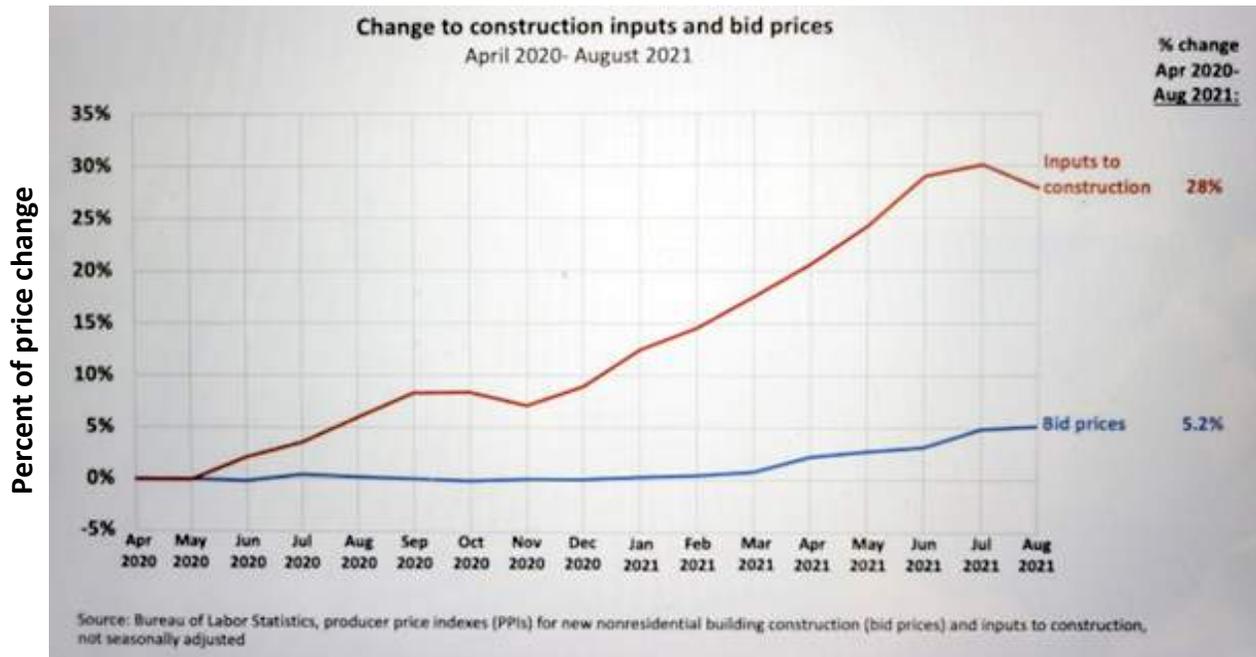


Figure 1 Change to construction inputs and bid prices from April 2020 to August 2021

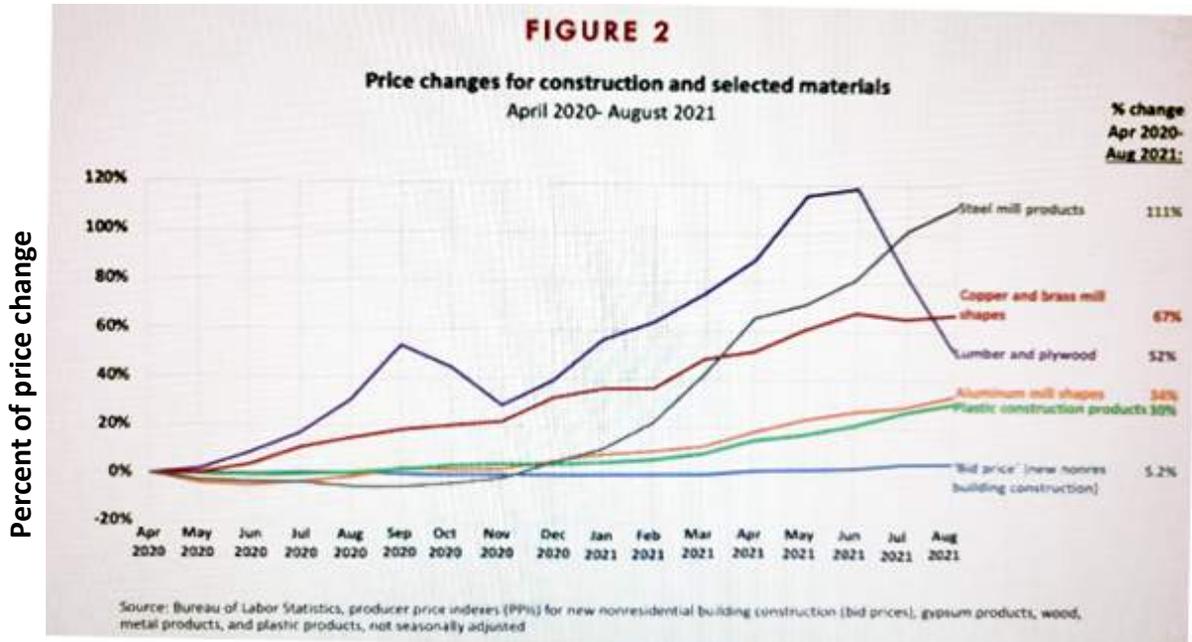


Figure 2 Change in the price for construction materials from April 2020 to August 2021

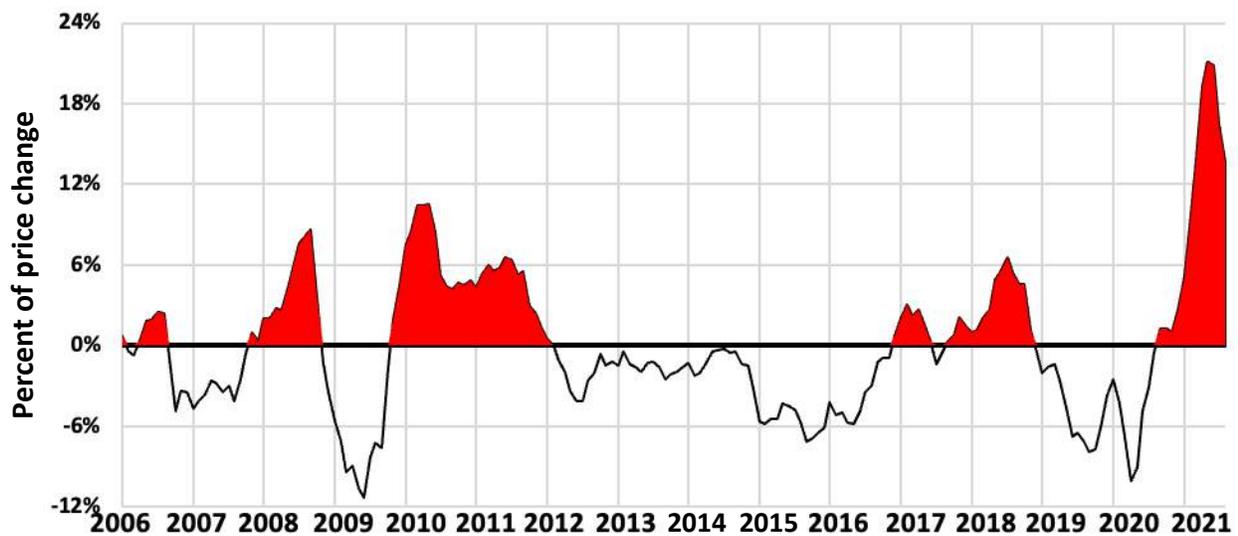


Figure 3 Producer price indexes for goods inputs to nonresidential construction (material costs) and new warehouse construction (bid prices). Source: Bureau of Labor Statistics

The aforesaid entails a burden on contractors to mitigate the effect of the material price increases on the project. According to the Federal Reserve open market committee report (2021), this situation could last for one year or more. The report also states the inflation rates are expected to keep rising for the next two years. Therefore, the contractor should develop an alternative approach to address price volatility to stay in the industry and avoid future conflicts with the owner.

This situation poses a significant risk to contractors' ability to bid and execute projects. However, the issue of material price fluctuation is not new to the construction industry. The inadequacy and inconsistency of the methods used in bidding projects and contract agreements constitute a major challenge to contractors (Golikova et al., 2019). Haddad (2007) posits that a risk-sharing approach

between the owner and the contractor could save a substantial amount on project price and reduce potential conflicts. Therefore, prudent contractors must develop alternative strategies to manage and mitigate the risk of material price escalation at the bidding phase, during contract negotiation, and during the built phase of the project

Therefore, this paper provides alternative approach strategies that can be implemented during the project's bidding phase, during contract negotiation, and for existing contracts.

2. BIDDING PHASE STRATEGY

At the bidding phase of the project, the contractor must talk to owners about alternative materials to be used in the project. The proposed material should be available, have more price consistency, and have better delivery time. Currently, it is very challenging to find an adequate alternative material with the aforesaid characteristics. However, the contractor should spare no effort to find and present to the owner with alternative materials.

The Contractor should also utilize cost indices to account for price escalations. Cost indices such as Turner Cost Index (TCI), Building Cost Index (BCI), and Construction Cost Index (CCI) can be used as a basis to calculate cost escalation when the material is needed for the project. In addition, the contractor must start negotiating material prices with suppliers and manufacturers at an early stage of the bidding phase to lock in prices and mitigate the risk of any price increase. Given the current supply chain issues, suppliers and manufacturers may be hesitant to lock in prices early in the project.

In this case, the contractor should use its negotiation skills to reach a mutual ground that the suppliers can agree to. For example, the contractor can limit the supplier's right to increase prices to the contractor's right to increase prices to the owner. Conversely, the contractor can negotiate with the supplier to limit the increase in material prices to a fixed amount. Thus, controlling the amount of exposure to changes in price.

Laos, the alternative approach requires contractors to add bid contingency that accounts for potential price escalation to the bid price. Contractors should factor in winning the bid versus losing money on the job. Contractors should also reduce the validity time of the bid. The expiration date on the bid must be shortened due to price volatility, shortage of material, and delivery time challenges.

3. CONTRACT NEGOTIATION STRATEGY

Contract negotiation is a very critical step for the success of the project. The contractor must ensure that the owner and the designer are willing to cooperate to mitigate the risk of material availability, price, and delivery. During the contract negotiation, the contractor must discuss the following with the owner:

- The stage of design. Design must be complete to start with material purchases as early as possible
- The impact of any potential design changes on the project
- The effect of changes to material selection on the project

Furthermore, the contractor must start presenting alternative material that will aid the project to finish on time with a low risk of price volatility. The contractor is expected to discuss the project delivery method. The contractor should avoid lump-sum contracts as these typically assign the risk of material price escalation to the contractors. Hence, the contractors bear the risk of any financial impact arising from fluctuations in material prices. This author recommends the contractor include a material price escalation clause when signing any new project regardless of the delivery method of the project.

A Material Price Escalation Clause

The ConsensusDocs contract form provides a material price escalation amendment, the ConsensusDocs 200.1, which aims to protect owners and contractors against price volatility. The amendment should list the material that is expected to have price changes during the project execution phase. Also, it should include a baseline price for each material. For these materials, the amendment includes a clause to adjust the contract price in the event of a decrease in the baseline price. Hence, the owner has the right to decrease project costs accordingly. Conversely, in the event of an increase in the baseline price, the contracting parties need to agree on the percentages to be added to the contract price.

Furthermore, Haddad (2019) argues that identifying risks at an early stage of the project and establishing a control mechanism to alleviate their impact on completing the project will improve controlling project costs and reduce project uncertainties. The contractor needs to identify the price escalation risk to the owner and include a clause in the contract to mitigate its risk.

4. EXISTING CONTRACTS

For existing contracts that have no Material Price Escalation Clause, contractors may be able to find relief from material price escalation through existing contract provisions or equitable principles. For instance, contractors may use the following contract clauses to alleviate the effect of material price escalations:

- Contract documents allow for an equitable adjustment for additional costs or time needed resulting from any change in law, including increased taxes, enacted after the date of the Agreement
- Force Majeure
- Mutual Mistake
- Commercial Impracticability

However, the research in this field argues that this approach constitutes a challenge to the contractor to prepare and convince the owner of his claim.

5. AN ALTERNATIVE APPROACH

Based on the aforesaid, the researcher provides the following alternative approach for risk management of material price unpredictability in today's market after COVID 19.

The contracting parties must agree on the list of the risky material to be included in the contract. the contractor must provide a baseline price for these materials to be reviewed and approved by the owner. Then the contracting parties should agree on the following:

- Reward to the owner in case material prices drop. Typically, the owner is rewarded the full amount saved due to the decrease in the price.
- In case of the material price increases, the contract clause should state the amount or percentage the owner will accept. For instance, the clause can state that the contractor will assume up to five percent of the price increase. Further, any increase beyond the five percent is the owner's responsibility.

Alternatively, the owner may decide to assume this risk. Therefore, the owner provides all or part of the listed material to the project. The contracting parties should agree on the owner's allocation of risks. In such an event, the owner should base payments to the contractor on the actual costs incurred plus 10% for overhead and profit.

In all cases, the contractor must include a clause in the contract to exculpate itself from any project delays liability due to the said material's late delivery to the site. Finally, utilizing the alternative approach

to material risk management and applying proper procurement methods and strategies enhances the opportunity for the contractor to mitigate the risk of material price fluctuation.

6. RECOMMENDATIONS FOR FUTURE STUDIES

For future studies, the researcher recommends Studies that are aimed to determine owners' willingness to assume the costs of identified materials. The contracting parties must recognize the cost benefits associated with assuming risks. This provides them with the knowledge necessary to make an informed decision on what risks he/she should assume and what risks he/she should shift to the other party.

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