

## CSC.06

# Measuring and Managing Cost Escalation

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**E**scalation in the construction market in recent years has been extremely volatile, and this trend is expected to continue in the near future due to competition for resources and skilled workers, as well as continued strong growth and excess work available. This situation has created a great deal of uncertainty and nervousness among project owners who have received bids that are significantly higher than budgets which were set prior to the recent market escalation. Project owners are faced with a limited number of choices, none of which are usually very palatable: putting their projects on hold in the hopes that the prices will eventually settle back down to pre-2004 levels; going through a redesign process to bring the project back under previously established budgets; or somehow finding additional funding to cover the missing funds.

Finding methods to both quantify and manage cost escalation on an individual project is therefore critical for owners and contractors in order to ensure that there are sufficient funds to deliver the final program in budget and on schedule. This paper details methods by which participants in construction projects can both track the extent of escalation and work together to minimize the impact of cost escalation on the success of a project.

## UNDERSTANDING ESCALATION

In order to measure or manage escalation on construction projects, it is first important to understand the driving forces behind it. This is especially critical in the current situation, where price fluctuations have been so volatile that it has been difficult to predict or estimate what bid prices might actually be.

The most important factor is that construction must be viewed as a commodity in itself, not a collection of commodities. The selling price of a project is not the result of the sum of its inputs plus a profit, except in the very rare cases where all work, including sub-contracts, is procured through a cost-plus contract. In all other cases, the selling price of a contract is determined by the bidders based on their opinion of the competition. At a very basic level, it simply needs to be \$1 less than the next bidder. 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. The ceiling is, however, set by the bidder's opinion of the competition: the key here being the word

"opinion". The bidder must not only estimate their own costs, but must also estimate what the other players will do.

One further consideration is that of risk. Strictly speaking, this belongs on the input side of the equation, since it relates to how input costs might vary: Will materials be available at the estimated price? Will labor productivity match the estimate? Can I find sufficient labor? As risk increases so too does the floor below which bidders are unwilling to go. Risk is very difficult to estimate, and few bidders do it systematically. Risk assessments are usually heavily influenced by short term perceptions based on the latest news, and as a result are often very inaccurate.

Escalation, therefore, comes from the interplay of changes, real or anticipated, in input costs, perceptions of risk, and perceptions of the competition. In some cases it comes from real information, such as actual changes in the cost of critical materials like steel or copper. More often than not, however, it comes from the formation of market opinions, which may or may not have a basis in fact. Ultimately, the ability for contractors to raise prices depends entirely on the market conditions, and the expectation that all bidders are increasing their prices. Increased input pricing and increased risk can influence that expectation, but cannot on their own increase prices. There is no such thing as a "pass through."

## ESCALATION FACTORS

A number of factors are responsible for the recent increases in the cost of construction. The most immediate issues are currently: the recent major natural disasters, increases in material cost, bid market disruptions, the high volume of construction work, and the regulatory climate. Upcoming issues which will increase the pressure on cost even further include coherence in the global economy, an ever growing demand for construction work, and a shortage of labor as more and more skilled workers retire without new workers to replace them.

## Input Cost Factors

**Hurricane Katrina and Other Major Disasters**—The hurricanes of 2005 damaged or destroyed roughly three times as much property as in a typical year, creating a very high demand for construction materials and labor. The total cost of reconstruction is in the range of 10 to 15 percent of the annual construction market in the United States. Recognizing, however, that reconstruction will take several years, the anticipated annual impact on construction activity due to reconstruction work is likely to be in the range of two to three percent per year. Given that much of this work may not show up as an increase in construction volume, but as a displacement of other planned work, the overall impact of the hurricanes on construction costs is expected to be relatively small.

This effect is likely to vary by region within the country. In the gulf region, there is a very high demand for construction services, leading to marked increases in the cost of labor and materials, and in competition for contractors. The effect has been much less in many other parts of the country. In areas where wages are typically higher than those in the Gulf region, there has not been much pressure on construction labor availability. Most regions in the country can expect to see disruptions in supplies for key construction materials as reconstruction begins to ramp up. While we expect that such disruptions are likely to be transient, the uncertainty over price and availability as well as the actual delays or difficulty in obtaining necessary materials can have a marked effect on schedule and productivity for projects, and thus lead to increases in overall project cost.

**Labor and Material Increases**—In the past few years a number of strategic materials, steel, wood, cement, copper, PVC pipe and oil, have seen significant increases in cost, sometimes more than doubling in less than a year's time. While much of the recent escalation in overall construction cost has been blamed on these material cost spikes, it is worth noting that even a dramatic price increase such as the steel price increase in early 2004 has a relatively small impact in aggregate.

For example, the world price for raw steel more than doubled in price in less than year in 2004, rising from around \$300/TN to around \$600/TN. Even with that doubling in price, however, the overall direct impact to total building construction cost was actually very small. Taking into account all the steel in a building - the structure, studs, doors and frames, ductwork, pipework, conduit, and so on - buildings usually only use about 20 to 30 pounds of steel per gross square foot (GSF). For an increase of \$300/TN, this translates into an increase of only about six dollars per square foot, or roughly two to four percent on a typical building. This is certainly not enough to account for the dramatic rise in construction project bids seen during this time.

Material cost increases have been the headline story in construction cost in recent years, with construction materials increasing in cost at a rate far in excess of core inflation. The Davis Langdon material cost index, which is based on producer price indexes for specific construction materials and weighted to reflect a typical building, has increased by 27 percent in the past three years, or roughly 8 percent per annum. Since materials represent around half the total construction cost of a project, this would translate into a four percent per annum contribution to overall

cost escalation. While this is significant, it does not account for all the increase seen in recent years.

In contrast to material costs, labor unit costs have been relatively steady, with generally moderate increases in the cost of wages and benefits. Most of the change in labor cost in construction has come from losses in productivity due to a constrained labor market, and changes in crew mixes, with less use of helpers or apprentices in many trades.

**Code & Practice Changes**—A frequently overlooked escalation factor is changes to code and practice in design and construction. This includes changes to building codes, changes in regulations controlling activities within buildings. An example would be the changing requirements for Bio-safety performance in research facilities, and changes in the way buildings are used. While these changes can both increase and decrease the cost of construction, our studies indicate that this change typically adds only about one percent per annum in the long run to the cost of construction.

In addition to changes in code or practice, changes in review or enforcement can have an impact on construction cost. When construction volumes are very high, reviews, permits, and inspections can be significantly delayed, especially in jurisdictions which have hiring freezes. In periods of high cost escalation, delays in a project increase the costs in two main ways. In the first instance, the delay increases the impact of escalation. The second impact is the pressure on the entire project team to accelerate the project, which can involve prebidding portions of the work, deferred approvals, or simply accelerating the construction schedule.

## Risk Factors

**Market Volatility**—While direct changes in the cost of material and labor have a relatively small impact on the cost of construction, the uncertainty over prices has created significant disruption in the bidding environment. Traditional bidding approaches place all risk of material and labor pricing at the subcontractor level, where there is very little room to accommodate price movements. Returning to the steel price increase as an example, while a \$300/TN increase created an increase of only two to four percent on the bottom line of the building, it was a 25 to 30 percent increase in cost to reinforcing steel contractors.

The following two graphs show how market volatility impacts each level of participant in a construction project. Assume that a particular material price doubles from \$300 to \$600. The first graph shows this cost increase as it is added to the total financial input from vendors, subcontractors, and the owner for a particular project.

It is not the actual cost of the increase that is the problem, however, as much as how it affects the party involved. The next graph shows the percentage impact this \$300 has on each party.

As can be clearly seen, the impact is much greater on the vendor than on the owner, who is much more able to absorb any increases in material cost. Typical bidding practices, however, push the risk down the contract chain to those who are least able to absorb any possible cost fluctuations, and as a consequence,

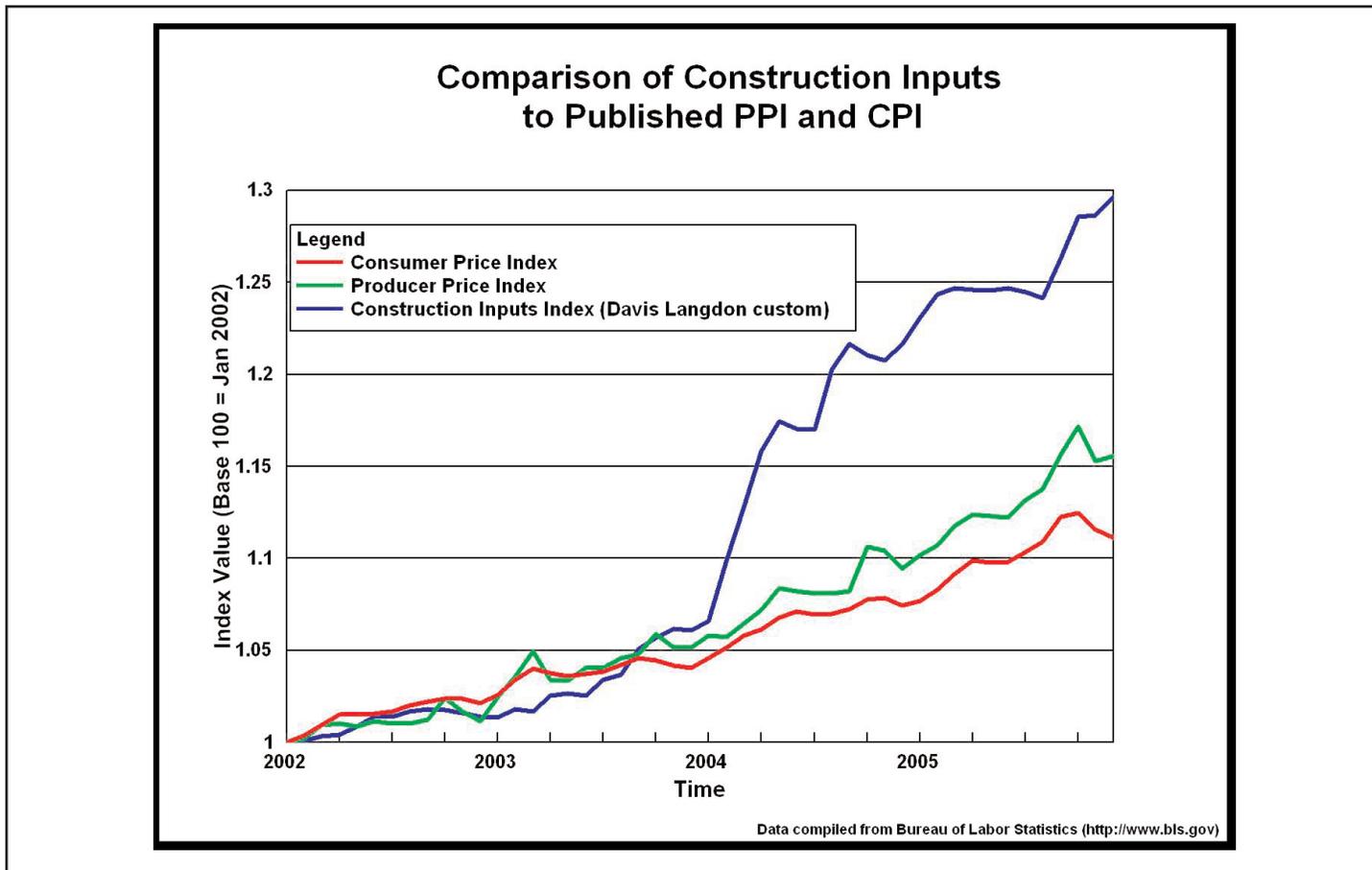


Figure 1

each successive level is more and more likely to include a premium in their bid in order to cover their risk. Clearly such an increase is enough to wipe out all profit, and destroy the contractor. Each subcontractor must therefore insure as best they can against fluctuation in their own key materials, and this insurance takes the form of increased bid pricing. Even though it is unlikely that all materials will increase sharply, current contracting methodology effectively forces excess insurance of the risk, by transferring the risk to the areas where it can be least managed.

When material prices are fluctuating wildly, as has been the case over the past few years, bidders cannot lock in prices at bid time. Suppliers are unwilling, or unable, to provide any price assurance for anything other than short term orders. Delivery schedules are often extended because material demand is so high, as a result of high construction volume as well as panic-induced stockpiling of materials, which can impact project schedules. Contractors often have to pay premiums to expedite supplies, but to counteract the possibility of shortages or delays, some bidders double or triple-book orders, which only compounds the materials shortages. Contractors are, understandably, nervous, since typical bidding processes ask them to submit fixed prices for work that often may not even start for up to a year or more after the bidding period. And suppliers are even more nervous, since they are asked to adhere to prices for materials which may cost them more to obtain once construction actually starts.

Volatility therefore makes contractors more likely to build risk premiums into their bids to cover potential increases in material

prices, and suppliers more likely to wrap material quotes with an additional premium, to ensure that they will still be able to make a profit in case of spikes in material cost. These premiums are usually much higher than the expected increase in overall material cost, making volatility a far greater cost inflator.

**Labor/Skill Shortages**—The current high volume of construction is creating a high demand for skilled construction workers. In some regions of the country demand has outstripped supply, leading to reduced availability of workers, and in many cases, reduced skill levels. Even where demand is not so high, worker availability is affected by the drawing of workers in to the high demand areas.

The shortages of skilled labor increase the contractor's risk, by increasing the likelihood of delay, and increasing the likelihood of more punch list and remedial work.

Market Factors

**Construction Congestion**—Construction activity in most regions of the country has been strong for many years. This is resulting in a very high demand for construction services. In addition, where markets in neighboring regions are also very active, it makes it very difficult to draw contractors into the region from other areas. And as the economy continues to strengthen, it is expected that this strong growth trend will only increase.

**Measuring Cost Escalation**

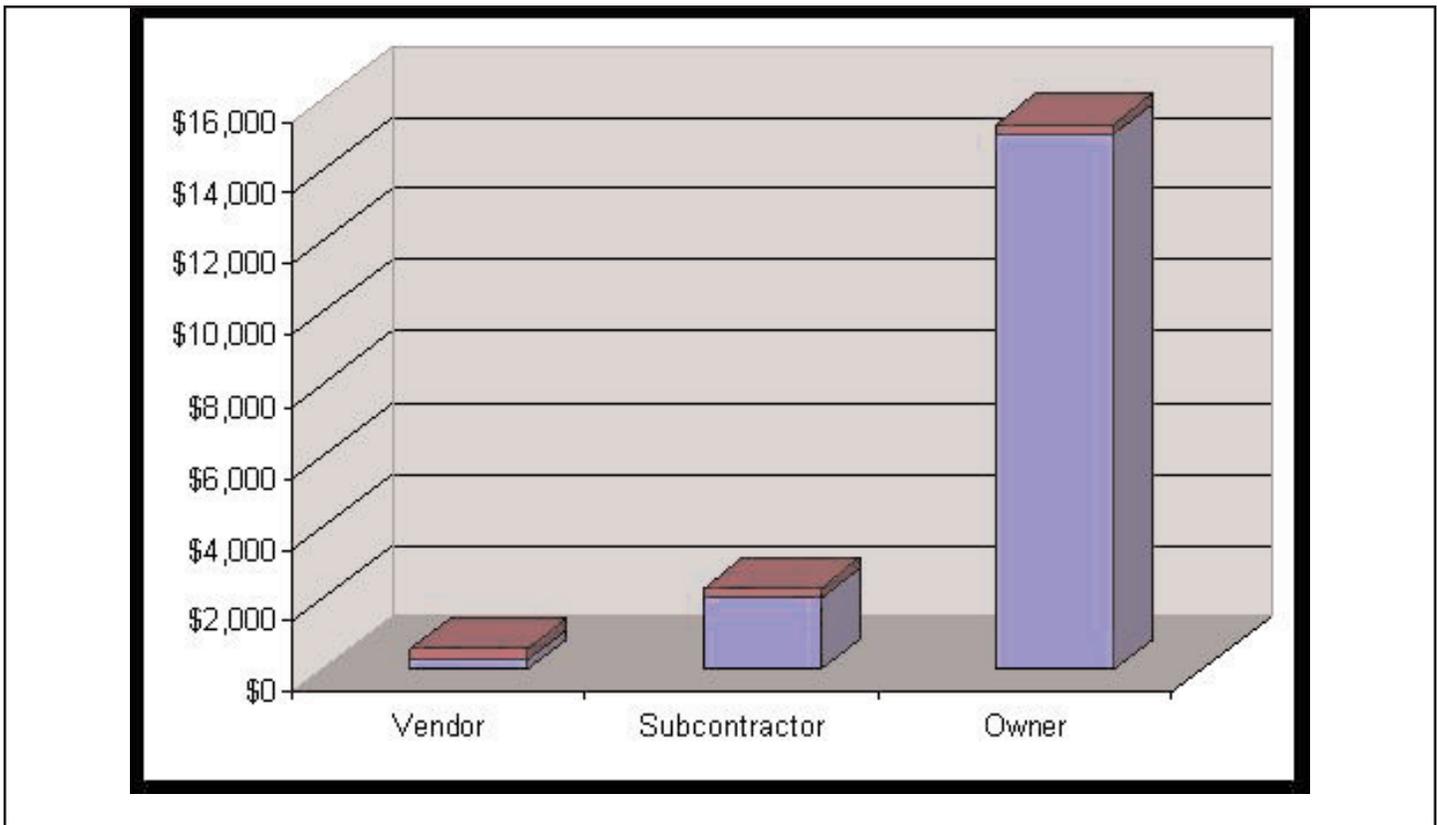


Figure 2

Measuring and tracking cost escalation requires a reasonably accurate index based on information that is reliable and captures a wide enough spectrum of data that all aspects of escalation are covered. There are a number of cost indexes currently available, based on the following methods of data collection and analysis.

**Basket of Goods (small)**—These indexes rely on surveying suppliers of a small range of strategic materials and labor (up to 10 items). They are very simple and cheap to administer, and rely on the presumption that overall market costs will correlate with costs of the small number of items included in the basket. These indexes also rely on supplier interviews for the data, which may not always be the most reliable source of information. The main weakness of these indexes is that they typically only track labor and material, and disregard the more volatile areas of profit and risk assessment.

**Basket of Goods (large)**—These indexes are slightly more expensive and complex to administer, since they are based on surveying suppliers of a larger range of strategic materials and labor, up to 40 items. The larger the number of items tracked, however, the greater the chance of inconsistency between data collection periods. As with their more limited counterparts, these indexes also rely on data provided by the suppliers, as well as on the presumption that market costs overall will correlate with the costs of those items included in the basket. These also usually do not address the profit and risk premiums in bids.

**Project Specific Basket of Goods**—A variant of the large basket of goods, this index is useful for tracking escalation on an indi-

vidual project. The index is built from the project estimate, with escalation factors being applied to the primary trades. This allows the project team to evaluate local pressures on materials, labor or contractors. While it adds subjectivity in the analysis, it provides for a very high degree of transparency to team members.

**"Feels Like" Surveys**—These indexes are based on surveys of 15 to 20 contractors and subcontractors for their opinions on cost trends. These are obviously very subjective, as they are based on opinions of individuals instead of measured data, although centering on a sample of 15 to 20 does help minimize the effect of subjectivity by any one individual surveyed. The great advantage of these is that they reflect the total costs in a market.

**Tender Price**—These indexes are a statistical analysis of bid projects by type. They rely on consistent data collection, and are moderately expensive to administer, as they require 10 to 15 projects per type. The established criteria measured can be objective, but the indexes are centered to eliminate any differences between projects. These indexes are generally good at showing broad trends and will, to some degree, pick up changes in codes and practice.

**Bid Reprice**—This entails taking two or more similar projects from different bid dates with known bids and detailed pre-bid estimates. The later project is re-priced using unit pricing from the earlier detailed estimates, which have been reconciled with their bids. This generates an estimate that gives an indication of what the later project would have cost at the date of the earlier project, and that can now be compared to the bid price of the later

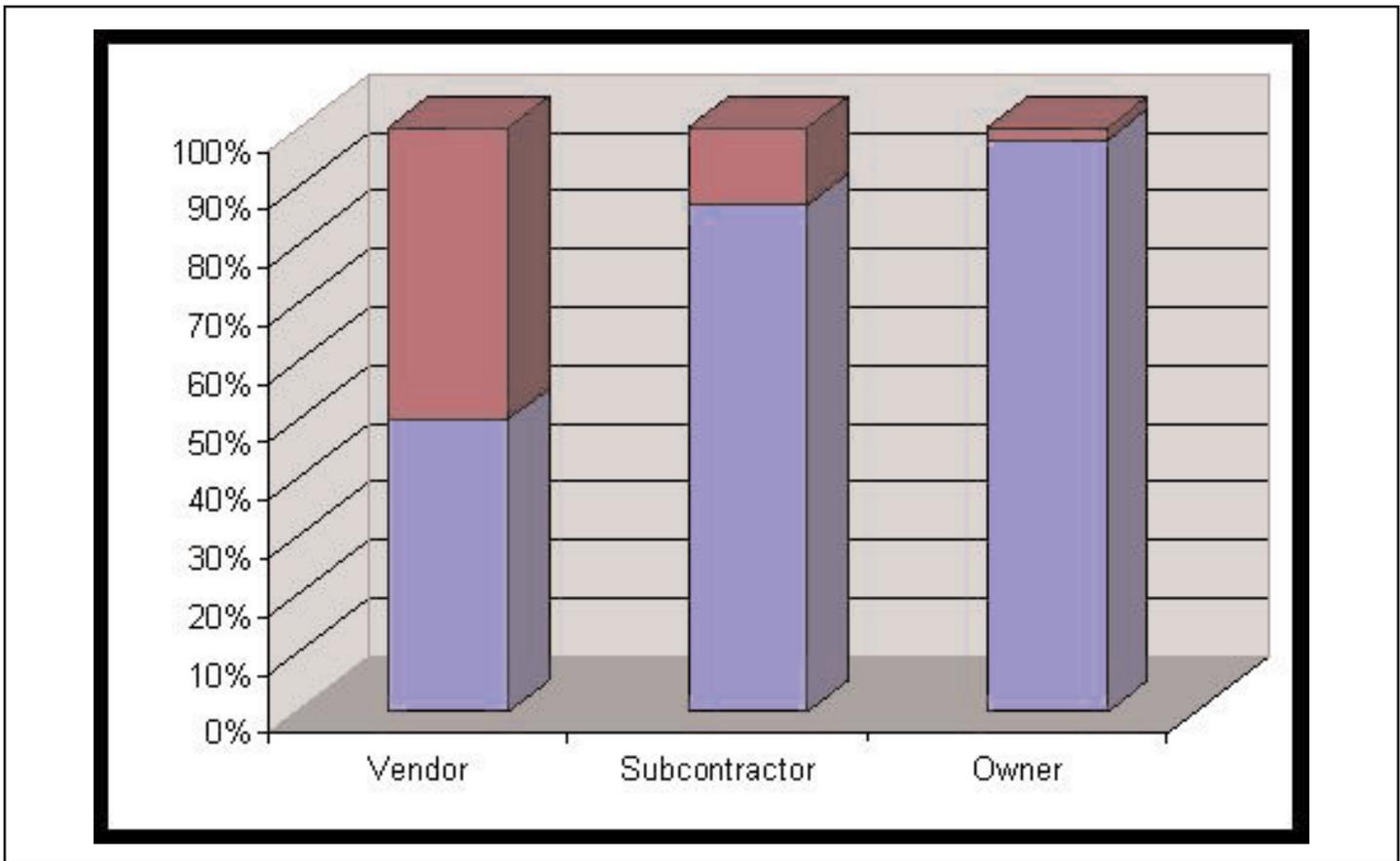


Figure 3

project. Since both data points reflect actual market bids for a single project, the difference represents the market change over time. These indexes are the most complex and difficult to manage, but provide the most detailed and realistic assessment of cost change over time.

While there are many established cost indexes available, it is important to evaluate each one to determine which provides the clearest and most consistent method of tracking what is happening to costs in the real world. Evaluation criteria to consider include:

- Correspondence with true inflation—does it accurately reflect changes in building cost?
- Cost to administer—what does the index cost to maintain?
- Objectivity—are the data free from subjective interpretation?
- Self-correcting—will the index correct for deviations from year to year?
- Contribution of the following costs to the total calculated index, including whether they are even included in the index at all:
  - Materials
  - Labor
  - General conditions
  - Market conditions
  - Codes and practices

Each index should be evaluated not only on these criteria, but on how it is intended to be used for a particular project or process calculation. Those which include input not just from materials and labor prices, but also from general and market conditions, and code and practice impacts, can be reasonably expected to be more reliable.

Indexes which are based on statistical information are more likely to be objective than those based on opinions or views of individuals. And indexes which track larger numbers of items or projects can be expected to achieve a greater accuracy and level of reliability, since it is more likely that they will take into account a wider range of the variables that impact cost escalation in the current world market. However, these types of indexes are often more complicated and costly to administer.

#### Managing Escalation

As can be seen, cost escalation in the construction market is a cumulative effect of a number of different factors. While each of them may contribute only a small amount to the overall cost of a project, when combined they are a significant driving force behind the rising costs of building a new building. Because there are so many factors contributing to escalation, managing escalation requires a variety of strategies. Many of the strategies will demand new ways of approaching construction design and procurement, and a redistribution of the risk allocation in projects. For many owners, particularly those in the public sector, some of these strategies will simply not be permissible under current pro-

curement rules. The alternative, however, is to do nothing, and simply pay a lot more, or get a lot less building.

**Recognition**—The first step is to recognize that escalation is a real threat to construction programs and projects, and to acknowledge its existence. There is still a high degree of wishful thinking in project budgeting, hoping that escalation is not going to remain high. Project owners must first:

- Recognize the reality of hard price increases—Materials are not going to go back to the levels of 2003, before the recent cost volatility; in fact, costs are expected to rise, and long term cost increases are predicted to continue in the range of eight to 12 percent per annum. It is worth noting that, when looked at over a ten year period, construction material escalation is broadly in line with the broader measures of escalation: that is to say, prices have been abnormally flat for about eight years, now they are catching up.
- Recognize the reality of the bid market—As long as construction volume remains high and the pool of skilled workers does not grow to accommodate the demand, bidders will always have plenty of options. Projects which are perceived as difficult, whether for the complexity of the design, the level of regulatory requirements, the location of the project, or even the reputation of the project owner, are less likely to attract bidders, and those who are willing to bid on these projects are more likely to increase their bids to cover their risks. This means that prices will rise even if material and labor prices do not. Input indexes no longer reflect the reality in construction markets.
- Recognize the reality of the bid volatility—Material prices will continue to fluctuate, although perhaps not to the extent seen in recent years. Bidders' interest will continue to fluctuate, based on the amount and type of work available at any given time. And more importantly, even as in times of less volatility, some contractors and sub-contractors are going to fail. All of this means that bidding is going to be volatile for some years to come. The biggest change in the construction environment has been the unprecedented change in the risk landscape of the past two years. Bidders can no longer continue business as usual and expect to remain in business.

**Cost Risk Allocation**—The dominant escalator in the current market is poor risk allocation. Traditional bidding methods place a bulk of the risk on those who are least able to absorb any fluctuations in cost. To manage cost escalation and minimize the impact of future cost increases or other factors which will surely arise to put additional pressure on the market, project owners need to change how they think about, and handle projects. Everyone who is required to 'buy' the risk involved in a project will charge a premium. By passing the risk to the contractor, contractors will include premiums in their bids and by requiring contractors to submit hard money bids for long term contracts, the risk is passed to vendors, who will also build a premium into their bids. Perhaps the most important thing project owners can do to minimize the impact of the volatile construction market is to become partners in the risk. This takes the burden of handling market

volatility off the back of the contractors and vendors and in turn reduces the pressure for bidders to charge premiums.

The first step is for project owners to take more responsibility for the risk associated with material price fluctuations. Because the owner is much more diversified, they are better able to handle the risk. This can be done in a number of ways at each level of the design and build process. To help absorb the risk for the contractors, project owners can:

- Use fluctuation clauses, which allow for shifts in material costs; in other words, the owner agrees to cover the cost of materials and does not require the contractor to submit a fixed price for something they may not be able to purchase for quite some time.
- Pre-purchase materials, to limit the impact of future price fluctuations.
- Provide dedicated float for schedule slippage by understanding that, due to the current market and transient material shortages, some scheduling delays may be inevitable.
- Reduce the bid award period to accommodate shorter price locks.
- Delay the bidding of non-essential packages, so that when those items are bid, prices can be closer to actual costs at the time they are needed.
- Negotiate subcontracts along with the contractors.
- Use Cost-Plus contracts.

To help absorb the risk for the architects and engineers, project owners can:

- Limit the redesign clause. This has some far reaching consequences, in that owners must be willing to take more responsibility for the final design and not count on redesign to catch changes in scope.
- Recognize inflation during the design process and modify the design appropriately, where it may be needed.

At the program level, project owners can:

- Develop program-wide contingencies and risk management protocols. This requires first recognizing the types of risk that exist and then ensuring that all members of the project team understand and are trained on how to deal with them.
- Redefine success. The success of a project is often measured only in whether or not the building is actually built, and not in how well it meets program needs. Within a given building program, it may be appropriate to deliver fewer high quality buildings, rather than a larger number of inadequate buildings.
- Be willing to fail (occasionally). This means being willing to stretch the boundaries of what is considered usual practice. Typically each project must carry its own risk, rather than pooling risk throughout a program. When this is done, projects will usually carry a larger risk contingency, and so design to a lower budget. Fear of failure therefore leads to lower performance in the long run. If individual projects can fail within a successful program, overall performance can be improved.

At all levels of the project, the key thing for the project owner to do is to actively manage design and cost, by ensuring that all participants in the design process are fully aware of budgetary constraints as well as the impact of any changes or delays on overall project cost. This will likely require a departure from the usual method of designing and building projects and takes committed leadership, freedom of action at the project level, and most importantly, more work and commitment from all members of the project team to meet higher performance expectations. This also is likely to require some flexibility in budget and contingency as well.

**Cost Control**—A fundamental tool in managing escalation is high quality cost management. This involves development of a realistic cost model with appropriate recognition of risk, regular cost monitoring throughout the project, and a commitment to address issues as they arise. The keys to successful cost planning & management are high quality information and good communication.

To effectively minimize the cost risk of a project the project owner, as well as the entire project team, must assess the potential cost risks in a project to identify all risk factors and profiles, calculate the range of outcomes for each of these factors, identify the level of potential loss for each outcome, and determine the level of control over each factor and outcome that the project team can reasonably be expected to have.

Cost models can be developed from the program and statement of condition by establishing key parametric quantities for the estimate. These are then reviewed with the design and owner teams to ensure complete understanding of the available funds, and the anticipated scope and quality. The budgets include recognition of the risks inherent in the budgeting process through the application of appropriate design and bidding contingencies. The project should not move ahead without complete buy-in from all interested parties, nor should it proceed without solutions or strategies for addressing the cost risks.

Following establishment of a budget and cost plan, the approach is to provide both periodic cost checks at design milestones, and ongoing cost validation and reporting to identify any significant changes. As with the cost plan, the efficient flow of information and the active development of solutions are key to the success of the process.

**P**erhaps the most important lesson to learn from this discussion of how to manage cost escalation is that ignoring it will not make it go away. In fact, even though the current market volatility is expected to eventually settle, prices will remain at higher levels, and are expected to continue to grow at robust rates per annum for the foreseeable future. The effect of limited supplies and higher demand, not just in the U.S. but around the world, means that market volatility can be expected to continue in the long term as well. While some project owners may choose to try to wait it out, it is not likely that construction prices will drop to pre-2004 levels. Additionally, due to the number of factors at play, inflation will rise and be less predictable, which means that virtually no currently published index provides a reliable method of tracking or predicting future trends.

In order to minimize the risks associated with this market volatility, project owners must move away from the traditional way of thinking about projects. Quick and innovative responses are needed if the quality of construction is to be maintained. Project owners need to become more flexible and more willing to work with contractors to absorb some of the risk of the rapidly fluctuating construction materials markets, and project teams must become more collaborative and more able to deal with risk and changes quickly and effectively.



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