SCHOOL CONSTRUCTION

A LOCAL SNAPSHOT

GREATER HOUSTON BULLETIN SUMMER 2022

A publication of AGC Houston and the A4LE Gulf Coast Chapter

AGC HOUSTON CHAPTER
THE CONSTRUCTION ASSOCIATION

ASSOCIATION FOR LEARNING ENVIRONMENTS
Enhancing the Educational Experience
Gulf Coast Chapter

About the Report

This school construction cost report is the result of a collaboration between members of the Associated General Contractors of America, Houston Chapter (AGC) and members of the Association for Learning Environments, Gulf Coast Chapter (A4LE).

The goal of this report is to provide information to assist local school districts in planning for their construction projects.

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2022-2023
Cost Trends Survey

BY BOB RICHARDSON, DUROTECH, INC.

As part of the AGC/A4LE Joint Committee, Durotech, Inc. conducts an annual survey of over 3,000 subcontractors and major design firms in the K-12 construction market within the Houston region. Respondents are asked to provide cost projections from their point of view based on how costs affect their specific trades. They are grouped into three categories: Labor Intensive (shell, concrete, masonry, earthwork, underground, etc.), Finish/Specialty (non-MEP interiors), and MEP (mechanical, electrical, plumbing, and data).

Widespread media coverage has illuminated many causes of 2020-21 construction cost increases. Many of the 2020-21 impacts on price remain in place to effect costs in 2022 and beyond. New factors in Eastern Europe and a new covid strain have potential to impact costs for several years. These conditions are unprecedented. This report will attempt to isolate some of the factors currently visible and some lurking beneath the surface which could appear abruptly.

2020-2021 Cost Influences

A quick review of the 2021 construction cost impacts is important to see what factors appear to be carrying forward into the immediate future.

All entities in the built environment – owners, design teams, contractors – have experienced significant cost impact in recent years. For example, IDC Research in August 2021 reported 75% of developer owned projects under construction in the US were out of budget and also averaged 70 days behind project schedule. The Associated General Contractors at year end 2021 projected non-residential 2021 construction costs had risen by 24% (Table 1). These are results of covid related disruptions to links in the materials in the supply chain and to the construction labor force.

2021 Costs
IDC Research in August 2021:
• 75% of developer projects nationally are out of budget and are 70 days late
AGC 2021 cost results: 2021 Non-residential costs increased for the year by 24%

TABLE 1

Table 2 and Table 3 provide an at-a-glance snapshot of the covid impact on non-residential construction. Table 2 shows the change over 6 years in input costs (the cost of labor, materials, overhead and profit) which are the components of construction prices. In some economic conditions, suppliers, subcontractors, and general contractors reduce their profit and absorb price increases in order to secure work. The annual increase in these input costs was relatively modest until the covid generated impacts beginning in 2020. Table 3 clearly demonstrates the sudden impact on a month-by-month basis beginning in July 2020 through August 2021.

TABLE 2

American commercial building construction is loosely framed around a Lean, just-in-time delivery process. Materials arrive when or just before they are needed to be put in place. Manufacturers' supply chains are similarly structured to keep the manufacturing process flowing at a steady rate and hold inventory costs to a minimum. Integral to this network are low-cost multimodal logistics and distribution (sea/land/warehousing).

This entire process is a mappable web, linking the most efficient cost providers from raw materials to the end user. Inventories, production levels, and the transport system are based on connections with entities preceding and following in the chain. If part of the chain becomes dysfunctional it disrupts the entire chain. This is what happened with covid. When the chain began to be restored, it created a bottleneck in the transport portion of the chain. This was complicated by a covid induced change in consumer buying from retailers to receipt of direct shipment. Both manufacturing and distribution costs and delivery lead times rose.

The Federal Reserve Bank of New York's Global Supply Chain Pressure Index (Table 4), which is composed of 27 variables inputting to the supply chain, readily illustrates this affect. The preceding 14 years were relatively cost stable until covid. The Index of Global Freight Costs (Table 5) demonstrates the cost impact on transit in 2021 in costs for TEU's (container cargo pricing by container).

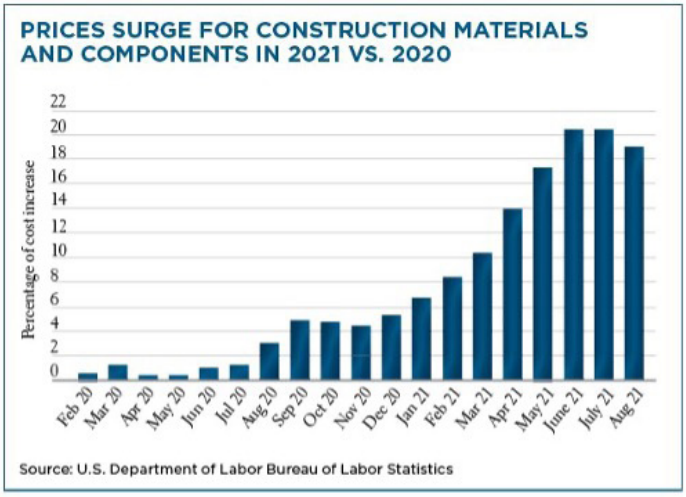

TABLE 3

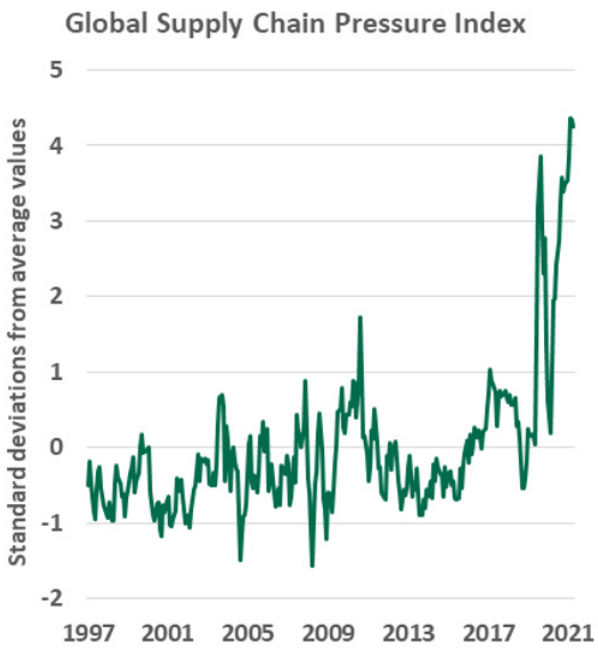

Table 4: Sources: Shanghai Shipping Exchange, Goldman Sachs, Federal Reserve Bank of New York

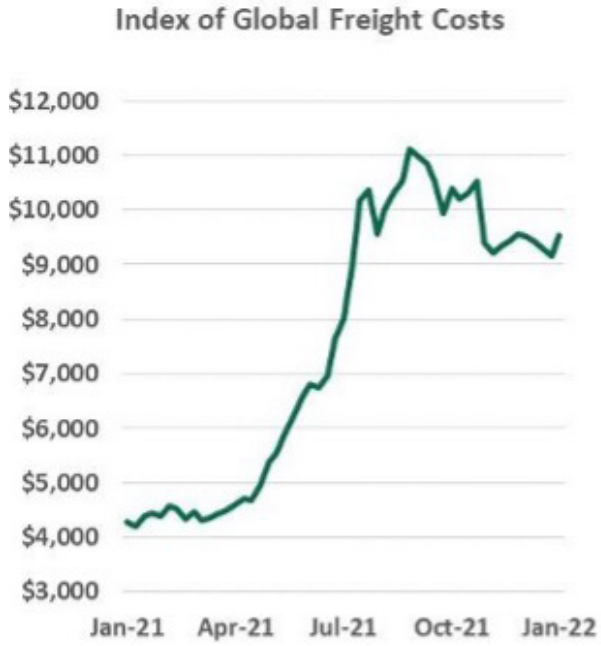

Table 5: Sources: Bloomberg, Freightos

Other Cost Influences

Construction costs begin with raw materials and their means of transit for processing (Table 6). Year over year in the raw materials spot market, copper is up by 15% at a 14-year high. Aluminum is up 66% and expected to rise higher as will be noted below. However, iron ore has begun to fall (down 15% year over year), indicating some possible relief in steel pricing; while the Baltic Dry rate, the daily freighter bare boat charter rate which moves these materials, is up 30% year over year and is down 33% from where it was in early October of 2021. This also indicates a possible forward mitigation in steel pricing and iron ore transport costs. July 2022 spot prices reflect speculator selling.

Materials Commodity Prices

Copper			Iron Ore			Aluminum			Baltic Dry Index ($135,000 in 2008)
14-Mar	$3.04 /lb	11-Jan	$180.00 /ton	11-Feb		$1.20 /lb	12-Jan		$1,783
15-Mar	$2.74 /lb						14-Jan		$2,337
16-Feb	$2.02 /lb	16-Feb	$45.58 /ton	16-Feb		$0.68 /lb	16-Feb		$2,417
17-Feb	$2.78 /lb	17-Feb	$86.60 /ton	17-Feb		$0.84 /lb	17-Feb		$7,402
18-Jun	$3.38 /lb	18-Jun	$66.00 /ton	18-Jun		$1.05 /lb	18-Jun		$1,340
19-Mar	$2.92 /lb	19-Mar	$85.79 /ton	19-Mar		$0.95 /lb	19-Mar		$600
20-Mar	$2.84 /lb	20-Mar	$83.76 /ton	20-Mar		$0.87 /lb	20-Mar		$582
21-Mar	$3.99 /lb	21-Mar	$163.68 /ton	21-Mar		$1.00 /lb	21-Mar		$2,072
22-Mar	$4.62 /lb	22-Mar	$150.11 /ton	22-Mar		$1.66 /lb	22-Mar		$2,684
	15% Increase		9% Decrease			66% Increase			30% Increase
22-Jul	$3.31 /lb	22-Jul	$106.69 /ton	22-Jul		$1.10 /lb	22-Jul		$2,145

Source: Composite of Spot Market sources

Table 6

Houston subcontractors 2022 materials cost projections show a significant overall increase (Table 8). This is less than the actual 2021 increase (Table 7). 2022 anticipates a lesser rate of increase. The anticipated 2022 increase will still push costs upward.

Past actual costs affect current and future pricing from subcontractors. 2021 subcontractor actual costs varied significantly from subcontractor projections (Table 7). Actual costs are shown as solid lines. 2022 projections are shown as dotted lines in Table 8.

Subcontractors hit with such severe 2021 cost increases will likely be careful with bid inputs in 2022-24 to avoid a repeat experience. This historical experience will be a consideration in materials supplier and subcontractor pricing over the next several years.

Nationally a well-publicized inflationary period caused by covid costs, stimulus payments, and low interest rates is underway. Significant increases in monetary supply carry forward in inflationary impact (Table 9). That impact will continue through 2023.

Increase in Material Cost

		Estimated	Actual	
Houston Subcontractors	2020	7.3%	7.6%	
Houston Subcontractors	2021	13.6%	29%	
Houston Subcontractors	2022	18.3%		= 1.5% per month
	2020 - 2021	20.9%	35.6%	

Table 7

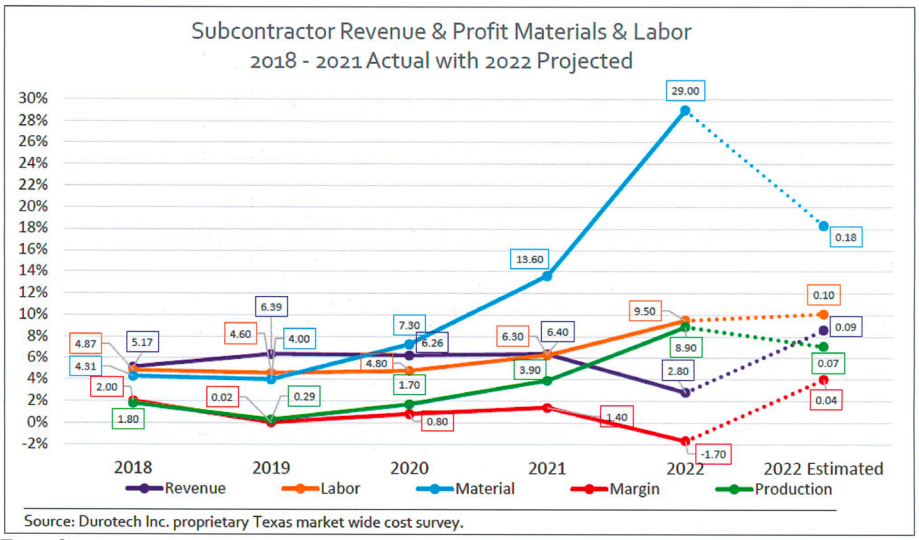

TABLE 8

Money Supply Inflation		
Year	**Increase in Money Supply**	**Inflation Impact Felt In:**
2008 - 2009	8%	2010
1/2020 - 6/2020	20%	2021 - 2022
2021	20% +	2022 - 2023

TABLE 9

K-12 Results and 2022 Design Survey

Middle school costs remained within annualized cost projections due to most of those projects coming out early in the year. A high spread in elementary pricing, reflects a changing product type, and a narrowing range in middle schools, perhaps signals the cusp of a product type change (Table 11).

2021 Houston Market Wide Results	
Q1/2021	230.97 / sf
Q2/2021	293.78 / sf = +27%

Source: Durotech Inc. proprietary Texas market wide cost survey.

TABLE 10

2016-2021 Square Foot Data Average Ranges Greenfield						
Elementary School Cost Data						
	2016	2017	2018	2019	2020	2021
Spread	$169-220	$153-200	$172-233	$151-253	$180-275	$208-337
Low/High	$51	$47	$61	$102	$95	$98
Middle/Jr. High School Cost Data						
	2016	2017	2018	2019	2020	2021
Spread	$171-245	$178-254	$182-256	$168-248	$209-266	$208-253
Low/High	$74	$76	$74	$81	$57	$45
High School Cost Data						
	2016	2017	2018	2019	2020	2021
Spread	$210-253	$218-263	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Low/High	$43	$45				
HISD not included in this survey.						
Note: The above SF cost are for new schools and do not include any addition, renovation or replacement schools.						

TABLE 11

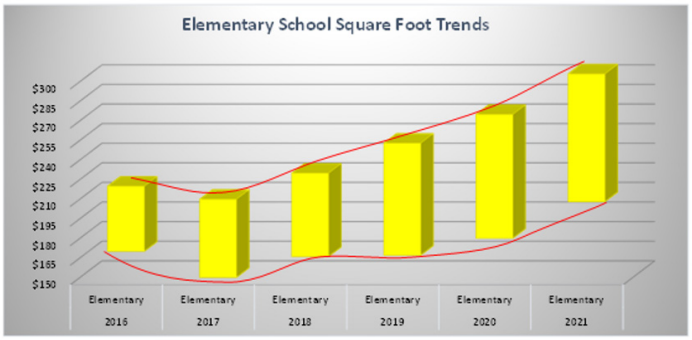

TABLE 12

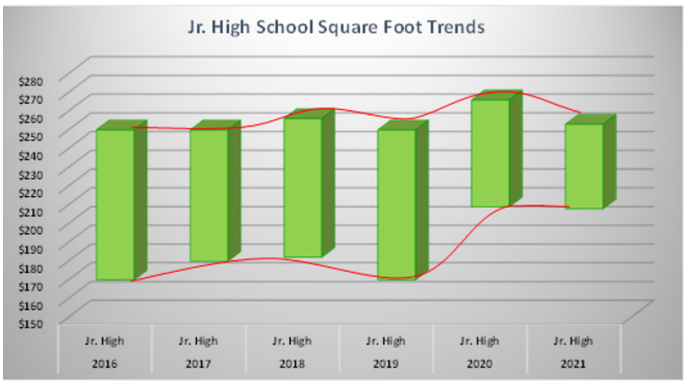

TABLE 13

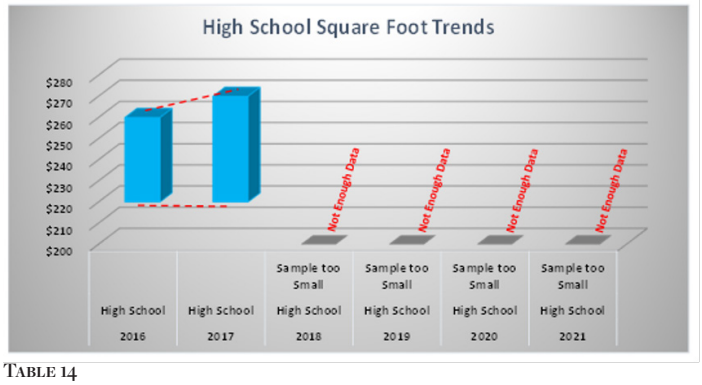

TABLE 14

These ranges are visually expressed in Tables 12-14 where the tightening of the middle school pricing is most apparent. The key for elementary and middle school future costs is the continued rise in the bottom number of their cost range since 2019, showing change is in progress or about to happen.

The actual year over year cost increase for 2021 market wide K-12 cost projections were not as dramatic as were many individual project pricing outcomes (Table 15). This is because of the timing when the dramatic cost shift manifested, as will be shown later.

2021 materials cost and delivery issues can be clearly identified as accelerating K-12 costs beginning in May 2021 (**Table 10**). In the period January through April, Elementary and Middle School costs were tracking well under budget projections with some pressure on projections for elementary schools. In May 2021 this changed and continued through December 2021. Both elementaries and middle schools would have been further over budget projections if more projects had been let to bid. **Internal Durotech projections during Q3/4 2021 indicated that if 6 more elementary schools had been bid in the second half 2021 at prevailing levels, the market average elementary cost could have broken $300 per sq.ft.**

More middle schools' bids would have likely shown a breakout from that projected budget range. **Year-end market wide, elementaries were $17.31/sf over projections while middle schools squeaked within their projections.**

Design professionals forward projections for 2022, 2023, and 2024 have shifted to reflect the market changes and average +/- $50 sq.ft. increases over their 2021 projections.

A lessening curriculum impact is shown on facility costs, but high owner design expectation is still present (Tables 18 and 19) in design professionals view of programming cost drivers. Some design professional 2022 market concerns score lower than in the past and are replaced in magnitude by materials cost and delivery concerns, a need for longer design and construction schedules, and an unmitigated concern for permit and utility lead times impacting cost and schedules (Table 20). Owners should develop a permit and utility strategy with their architects and contractors before these project stress points translate into increased project costs.

Actual Annual Increase Over Prior Year									
	2014	2015	2016	2017	2018	2019	2020	2021	Average
Elementary School	11%	12%	2%	-7%	11%	-0.5%	1.02%	8.7%	4.77%
Middle School	11%	30%	0%	-2%	4.5%	5%	-5%	9%	7.75%
High School	8%	15%	5%	-1%	N/A	N/A	N/A	N/A	6.75%
Source: Durotech Inc. proprietary Texas market wide cost survey.									

TABLE 15

Design Professional Average Future Cost Projections						
	2019	2020	2021	2022	2023	2024
Elementary School	$200-258/sf (Avg. $229/sf)	$195-255/sf (Avg. $222/sf)	$180-270/sf (Avg. $225/sf)	$195-375/sf (Avg. $285/sf)	$260-350/sf (Avg. $283/sf)	$275-365/sf (Avg. $320/sf)
Middle / JH School	$210-280/sf (Avg. $250/sf)	$225-245/sf (Avg. $231/sf)	$200-290/sf (Avg. $245/sf)	$240-340/sf (Avg. $290/sf)	$275-350/sf (Avg. $312/sf)	$300-341/sf (Avg. $321/sf)
High School	$245-305/sf (Avg. $280/sf)	$245-290/sf (Avg. $267/sf)	$190-270/sf (Avg. $230/sf)	$275-305/sf (Avg. $290/sf)	$310-365/sf (Avg. $333/sf)	$332-373/sf (Avg. $354/sf)
Source: Annual Design Professional Survey by Durotech Inc.						

TABLE 17

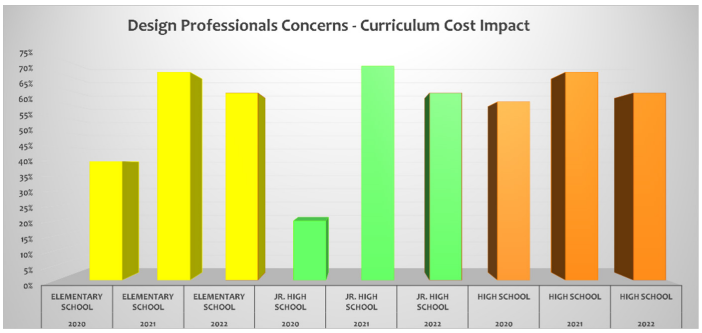

TABLE 18

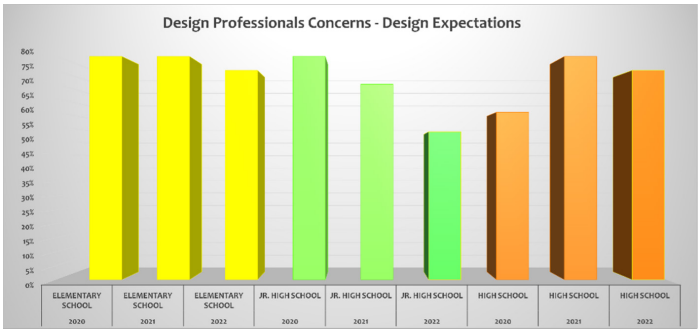

TABLE 19

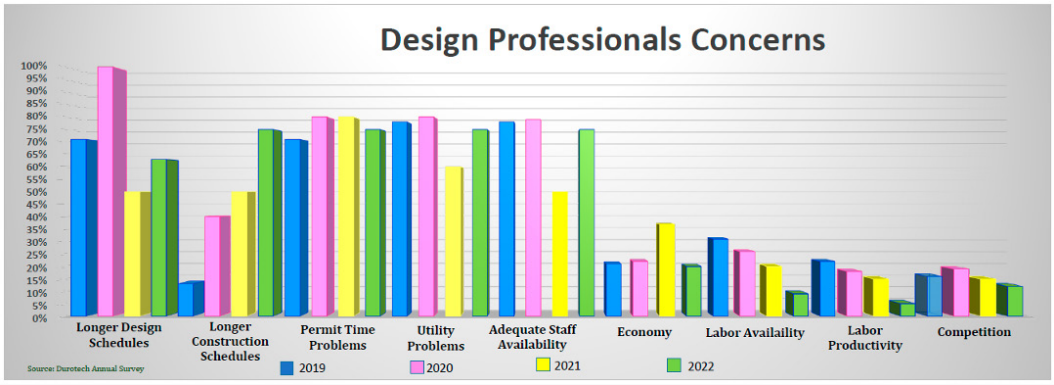

TABLE 20

2022 Subcontractor Survey Results

2022 Subcontractor survey results (Table 21A) anticipate rising revenue and margins. These increases, if they occur, will be driven by increased costs. The tightening labor market, which has been a subcontractor concern for several years, appears to be manifesting as a Houston cost issue starting in 2022-23, as data below will confirm.

Detailed survey results (Table 21B) show a trend starting in 2020 and continuing in 2021 of unrelenting pressure on materials and labor costs, while driving down revenues and margins.

It is important to notice the actual 2021 labor cost increase across all trades was 9.5%. (Table 21B) This was almost 50% over their projected 6.3% increase. Labor costs are projected to increase as an average of all local trades in 2022 by 10.1%. This is not covid driven. **The return-to-work rate nationally in the construction trades is 99% of pre-covid levels and is the highest in any industry group.** The projected trade wage increase appears to flag that the long-predicted construction trade workforce shortage has arrived in Houston.

Major subcontractor concerns have not altered radically from prior years (Table 22). Like design professionals, their attention is now riveted on materials cost and deliveries.

Specialty Contractor Surveys & Trends

	Labor Intensive Trades					Finish/Specialty Trades					MEP Trades					Average All Trades					
	2019 Actual	2020 Est.	2020 Actual	2021 Actual	2022 Est.	2019 Actual	2020 Est.	2020 Actual	2021 Actual	2022 Est.	2019 Actual	2020 Est.	2020 Actual	2021 Actual	2022 Est.	2019 Actual	2020 Est.	2020 Actual	2021 Est.	2021 Actual	2022 Est.
Materials Cost Increases	3.50	3.90	5.40	38.10	15.90	2.98	5.36	8.40	15.60	15.50	6.17	5.72	11.20	28.83	24.90	4.00	4.80	7.60	13.60	29.00	18.30
Labor Cost Increase	4.10	3.80	4.90	9.70	15.90	3.50	4.40	6.10	6.80	6.60	4.56	6.56	4.75	11.83	10.46	4.60	4.60	5.00	6.30	9.50	10.10
Labor Production	0.29	0.79	0.18	4.40	0.79	-1.80	7.70	3.81	-1.80	7.70	0.44	1.56	2.08	0.44	1.56	0.29	3.60	1.80	3.90	8.90	7.10
Revenue Increase	7.50	6.90	-2.12	6.41	12.88	-2.20	1.90	11.80	-2.60	6.50	14.89	2.83	14.00	4.17	6.17	6.31	12.60	6.50	6.40	2.80	8.60
Margin Increases	-1.20	0.20	2.00	0.90	3.60	0.60	1.55	0.20	4.90	2.50	27.22	1.72	0.04	5.00	6.25	0.02	0.02	0.08	1.40	-1.70	4.00

* Percentage indicated are an average of all respondents in each category and overall.

Source: Annual Subcontractor Survey by Durotech, Inc.

TABLE 21A

Specialty Contractor Surveys & Trends

	Labor Intensive Trades					Finish/Specialty Trades					MEP Trades					Average All Trades					
	2019 Actual	2020 Est.	2020 Actual	2021 Actual	2022 Est.	2019 Actual	2020 Est.	2020 Actual	2021 Actual	2022 Est.	2019 Actual	2020 Est.	2020 Actual	2021 Actual	2022 Est.	2019 Actual	2020 Est.	2020 Actual	2021 Est.	2021 Actual	2022 Est.
Materials Cost Increases	3.50	3.90	5.40	38.10	15.90	2.98	5.36	8.40	15.60	15.50	6.17	5.72	11.20	28.83	24.90	4.00	4.80	7.60	13.60	29.00	18.30
Labor Cost Increase	4.10	3.80	4.90	9.70	15.90	3.50	4.40	6.10	6.80	6.60	4.56	6.56	4.75	11.83	10.46	4.60	4.60	5.00	6.30	9.50	10.10
Labor Production	0.29	0.79	0.18	4.40	0.79	-1.80	7.70	3.81	-1.80	7.70	0.44	1.56	2.08	0.44	1.56	0.29	3.60	1.80	3.90	8.90	7.10
Revenue Increase	7.50	6.90	-2.12	6.41	12.88	-2.20	1.90	11.80	-2.60	6.50	14.89	2.83	14.00	4.17	6.17	6.31	12.60	6.50	6.40	2.80	8.60
Margin Increases	-1.20	0.20	2.00	0.90	3.60	0.60	1.55	0.20	4.90	2.50	27.22	1.72	0.04	5.00	6.25	0.02	0.02	0.08	1.40	-1.70	4.00

* Percentage indicated are an average of all respondents in each category and overall.

Source: Annual Subcontractor Survey by Durotech, Inc.

TABLE 21B

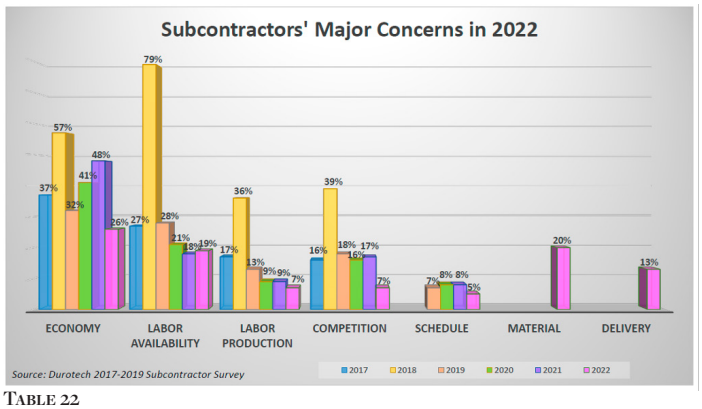

TABLE 22

Market Condition Implications for Subcontractors

Subcontractor survey responses indicate a wide range of opinions on the current market and economy. The market wide composite results, as indicated above in the text, show the subcontracting community may have higher profit margin vulnerability and risk than the 2021 survey results indicted (i.e., a 2.74% differential on projections in 2022 vs. a .93% differential in 2021 projections).

Across the board, the survey points toward the growing shortage in skilled labor and an impending rise in wages. A battle for labor forces appears to be at hand. Subcontractors would be prudent to examine their bids for wage and materials cost flexibility over the life of each project. In addition, it would be prudent to examine internal cost structures, overall overhead ratios, and overhead relative to each project. Similarly, interest rates structures will change (see Table 23 for forecasts). While these rates remain low, any use of financial leverage should be reviewed for the impact of upcoming rate increases. The overall construction market will be volatile and unpredictable, and it is prudent to stay prepared for unexpected developments.

Global and Local Factors Influencing 2022 Market Projections

2022 has an unprecedented set of economic influences. A valuable forward perspective is to look at current projections from a conservative forecasting source such as Northern Trust (Table 23).

Interestingly, from February 2022 and March 2022 Northern Trust has raised its 2022 GDP projections by 10% to a 2022 growth projection of 3.7%. While lower than their record breaking 2021 pre-Omnicom virus GDP projection, this forecast is well above the actual annual GDP for the last decade. A 3.7% GDP growth will maintain cost pressures into 2023. Their 4.7% CPI price projection validates a continuing inflationary presence. The July revisions are lower, but still positive.

The non-profit New York Conference Board projects inflation continues well into 2023. Always insightful Morgan Stanley Chairman Jamie Dimon sees significant consumer spending driving economic growth for a decade, supplemented by a decade long baby boom tied to millennial demographics.

Pre-Ukraine, the Chairman of international engineering and design firm AECOM forecast a "global infrastructure renaissance" of new projects as a result of supply chain issues and global growth. AECOM is receiving the contractual backlog to support that assertion. The Chairman of his competitor Jacobs also sees "multi-year growth" led by US infrastructure and logistics/supply chain spending and cyber software.

All the above directly indicate continued vigorous demand for the capital goods consumed in construction domestically and globally. Systemic labor and materials supply demands will likely continue. A recession could mitigate some of these influences.

Missing in these forecasts is the cost/availability impact of the situation in Eastern Europe and current sanctions against Russia. A market shortfall absent Russian petroleum production will influence costs. Petroleum is a component of most construction materials and costs. But Russia is also a major exporter of aluminum and copper ore. Both are significant inputs to construction materials and costs. The major upcoming expenditure not yet mentioned in any economic assessments is a potential huge increase in global defense spending resulting from the Ukraine situation and the effect of that expenditure on metals and electronic component pricing.

Northern Trust Projections 7/22						
		GDP	CPI	Unemployment	Treasury Bill Rate 2-year	10-year
2022	2/22	3.4%	227.50			
	3/22	3.7%	-13.13	3.6%	1.91	2.34
	7/22	2.0%	8.0	3.7	2.72	3.82
2023	3/22	2.4%	212.65	3.4%	2.47	2.75
	7/22	1.5%	3.7	3.8	2.91	3.81

- Conference Board (NYC non-profit research) 1/22 - Inflation into 2023
- Jamie Dimon, Chairman Morgan Stanley:
  10-year boom in consumer spending
  10-year baby boom
- Chairman, AECOM: "Global Infrastructure Renaissance"
- Chairman, Jacobs: "Multi-year Growth"

Russia: Energy Impact
Major Aluminum and Copper Producer
Expect big future defense expenditure in US and Europe

TABLE 23

Several sources predict a 2023 recession, most forecasters are cautious.

Focusing on domestic and local specifics, AGC national economist Ken Simonson sees growth in several sectors in 2022 but suggests high bid input prices (labor, materials, overhead and profit) will continue while the supply chain still works out its issues. His case seems validated by the Dodge Momentum Index of new projects (Table 24) which has shown monthly increases in planned activity in 2021 and ended the year approaching the 2008 level. Construction Pro's early 2022 index of non-residential construction starts confirmed this pattern as it increased 32%. At the end of February 2022, the US Bureau of Economic Analysis confirmed this by reporting Q4 2021 GDP had grown an accelerated 7%.

DODGE MOMENTUM INDEX
(2000=100, Seasonally Adjusted)

	Feb-22	Jan-22	% Change
Dodge Momentum Index	158.2	151.9	4.2%
Commercial Building	177.0	174.8	1.3%
Institutional Building	135.0	123.6	9.2%

Source: Dodge Construction Network

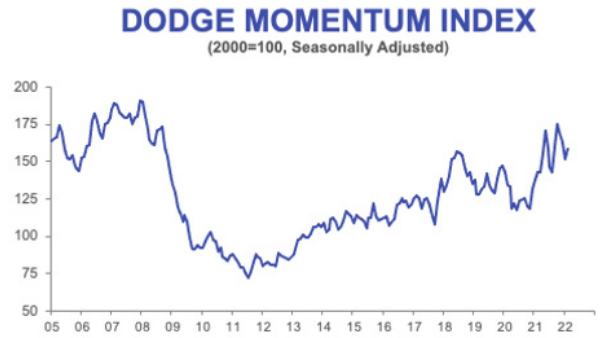

TABLE 24

In Houston, the current most cost impactful construction sub-market is warehouse/distribution center space. It will not drive-up costs as much as the 2013-15 office building boom, but it can impact local costs for site, underground, concrete, and steel. (Table 26). In June of 2021 CBRE forecast the US would need 330 million new feet of warehouse/distribution space by 2025. This figure may be low and 1 billion new square feet is more likely. Currently 541.6 million sf of warehouse/distribution space is underway nationwide.

Year to Date Construction Starts

	June 2022
Nonresidential Building	13%
Residential Building	3%
Nonbuilding Construction	-2%

Source: Dodge Construction Network

TABLE 25

Warehouse/Distribution Center Construction	
6/21	**CBRE:** US needs 330 million new SF by 2025
2/22	**NAIOP Forecast:** 2022 - 401 million SF net absorption 2023 - 334 million SF net absorption
2/22	**CBRE Houston:** 2021 - 22 million SF net industrial absorption 2022 - #1 in US in big box new construction over 200,000 SF **Clear Height:** Now: 37 feet clear Prior/; 33 feet clear Earlier 22 feet clear
This means more steel, more concrete.	

TABLE 26

As of February 2022, the NAIOP forecast 400 million square feet of net absorption (new lease -vacancies=net absorption) and an additional 334 million square feet of net absorption in 2023. In Houston, CBRE has tallied 22 million square feet of net absorption in 2021 (=12% of the entire local market) and in 2022 shows that Houston is #1 in the US in starts of big box distribution centers (a big box DC is over 200,000 sq.ft.). With the Port expansion and current distribution center demand, developers are confident they can raise rents to cover the 57% increase they have seen in dark shell warehouse construction costs.

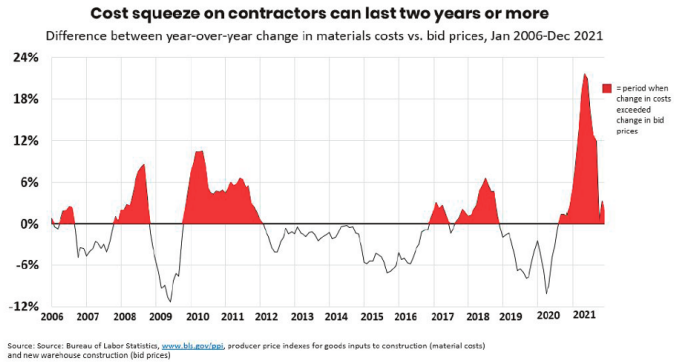

TABLE 27

Currently the most desired distribution/warehouse facility has 37 feet clear space from the slab to the bottom of the joists for high stacking. In the recent past, that figure was 33 feet and before that it was 22 feet. What the 37-foot clearance height means is new facilities require 10% more steel, 10% more wall concrete, and the larger site big boxes need require more concrete aprons and site work. The entire Houston warehouse/distribution market now only has a 6.6 vacancy rate, including existing facilities which are now clearance height dysfunctional. Market demand and the ability to raise rental rates signals a cost impact for several years on the concrete, steel, and site costs of non-warehouse projects.

Subcontractors and General Contractors have absorbed much of the cost increases shown in Table 27. As of February 2021 they were underwater by 12.2 %. As the year progressed, they made up some of this deficit in higher pricing. By year end a deficit still existed with general and subcontractors still absorbing costs to get work. The yearend deficit in costs not passed on in bids was 7.1% (Table 28). Going forward, contractors may be more sensitive to this deficit and quicker to react than in 2020-21 to covering this deficit in their bids.

Inputs = Labor, Materials, Overhead and Profit.

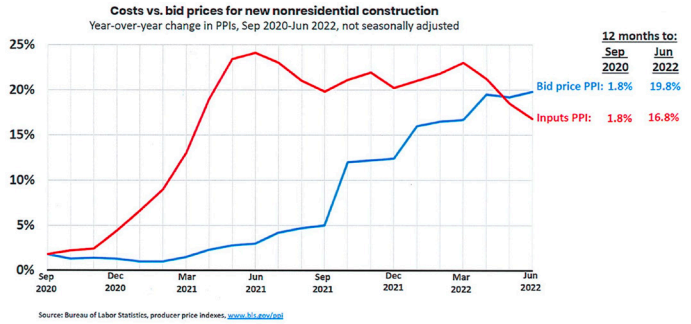

TABLE 28

Labor shortages and its cost consequences are beginning an impactful arrival in the Houston construction market. Houston subcontractors have seen labor costs exceeding their projections for most years from 2017 to 2022. In 2022, for the first time, the overall market labor cost increase projection is double digits (see Table 21B) This signals how critical the skilled labor shortage has become.

Labor shortages and labor cost increases have been forecast for some years. It has become more critical as more workers approach retirement age without replacements appearing. A survey by Worksite from mid 2020 through mid 2021 quantified the rising contractor concern about construction labor (Table 29).

Results of a 2022 AGC/FMI study (Table 30) for construction bonding companies showed the top contractor concerns for 2021 and 2002, exceeding supply chain and materials cost issues, is the shrinking skilled labor supply.

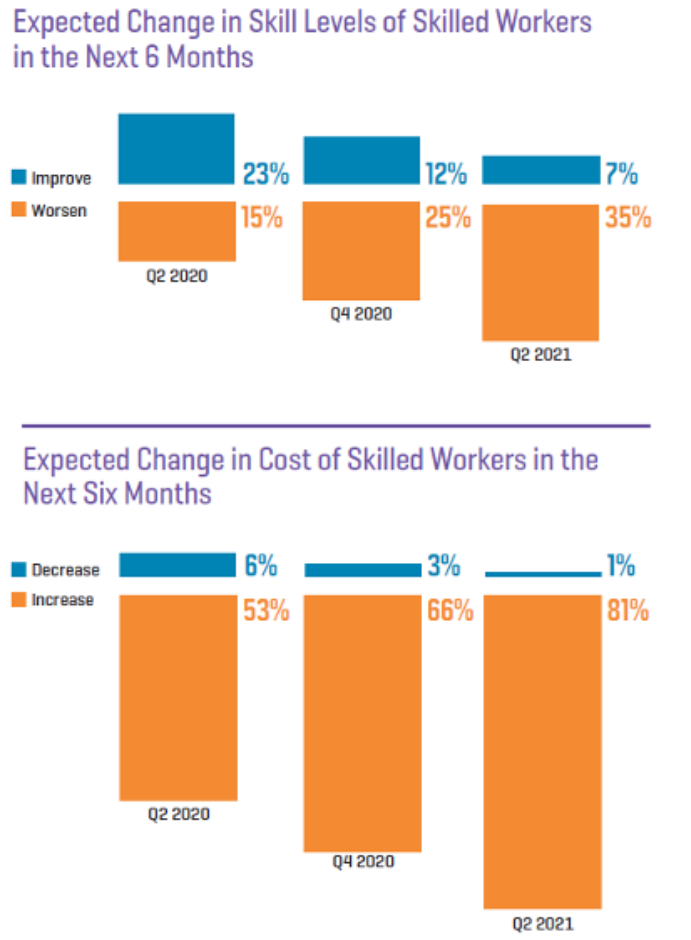

TABLE 29

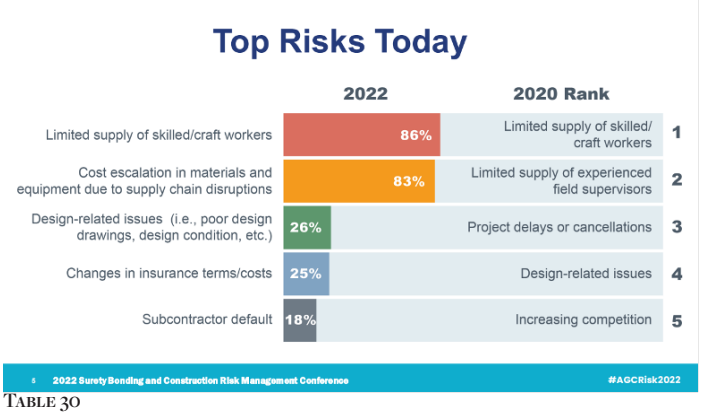

TABLE 30

Nationally recognized economist Larry Summers has advocated the current labor situation is worse than the government represents. The results of an AGC/ AutoDesk survey bear out his conclusions (Table 31). Despite 73% of respondents increasing wages, 89% of respondents are having a hard time finding skilled labor, and 86% have the same experience with salaried personnel. 74% need even more staff. In early 2022, the ABC forecast a shortage of 650,000 skilled construction workers. A similar situation exists in manufacturing.

Current Construction Labor Situation	
AGC/Auto Desk Survey	73% have raised wages
	89% report difficulty hiring craft workers
	86% report difficulty finding salaried workers
	74% expect to hire more staff in 2022
ABC Economist Projections	Shortfall of 650,000 craft workers

TABLE 31

A new change by the Biden administration to the Davis Bacon Act could trigger an increase in hourly wages. Davis Bacon arose in 1930's because of the depression. Its current prevailing wage calculation has been in place since 1980. It is calculated based on the range of 51% or more of wages falling within a given area, or, failing a close range, the use of a weighted average of area wages (Table 32). It is now being changed to a 30% range. When the weighted average was used under the older calculation, it favored lower, open shop wages. A weighed average under the new rule could favor higher, union scale wages on all Davis Bacon projects. It is possible we will see an increase in local Davis Bacon scale and a resultant increase in project wages.

Davis Bacon Act Changes	
At Present:	Since 1980, 51% range of area wages becomes prevailing wage. If area wages do not fall in a range, then a weighted average is used. This formula favors lower area wages.
New Calculation:	30 % range of area wages becomes prevailing wage. If area wages do not fall in a range, then a weighted average is used. This formula favors higher wages.

TABLE 32

The probables nationally and locally affecting Houston construction costs are (Table 33).

The above represent significant construction cost input influencers. A recession (predicted by some) would mitigate some but not all of these inputs. It is possible, but not probable, that cost, and supply chain issues will settle sooner than projected. Cost levels will continue to be an issue for the near term.

Local Construction Cost Impactors	
Inflation	High probability it will continue through 2023
Materials	Cost and delays continue through Q3/2022 and are bumpy in 2023.
Infrastructure	Work, especially at Houston metro level, raises steel/concrete/underground/site costs.
Texas Medical Center 3	More construction begins, drawing down skilled labor supply.
Metro Area Residential Subdivisions	Increase and multi-family work pushes some costs.
K-12	$8 billion+ of Houston metro area K-12 2022 bonds on 2022 ballots
Labor	Costs appear likely rise for skilled labor. This can become a long-term impact.
Energy Cost	Appear likely to rise and filter into all product costs due to petroleum-based components.
Defense	Spending rises causing some metals and critical materials and electronic costs to increase.
Reshoring/Restructuring of Supply Chain	Increases manufacturing/distribution construction and costs

Source: Durotech Inc. proprietary Texas market wide cost survey.

TABLE 33

Based on the above, and keeping in mind there are so many wild cards in addition to existing circumstances that prediction is difficult, we project 2 scenarios (Table 34):

A. Quick supply chain restructure; quick settlement of Ukraine situation and sanction restrictions

B. Two-year Supply Chain restructure: Ukraine consequences impact before that war is resolved and the impact carries forward

A Perfect Storm

With seemingly overwhelming circumstances and events at present, it is difficult to see their flow and impact. It is possible to grasp some capital projects cost impacts and their duration from the above table. The following are documentable cost impact observations:

1. Inflation: Will likely continue to mid 2024 before being controlled. Costs may mitigate somewhat but are unlikely to return to pre-2022 levels.

2. Materials: settling down the supply chain into alternative sources and channels appears to extend through 2024. Cost will settle, but not at prior levels.

Items 1 and 2 are near-term, 2 to 5 year events.

3. Infrastructure: the national infrastructure program is long overdue. It will result in significant, much needed capital expenditures and will likely spur additional local infrastructure capital expenditures.

4. Texas Medical Center 3: major multi-billion dollar capital outlay stressing local skilled construction labor and materials capacity.

5. Metro Area Residential Subdivisions: many private sector capital project lenders were restrained about Houston starting in 2014-15. As a result, regardless of the increased housing demand of recent years, Houston is under supplied with lots and new homes relative to its historical market supply level. Lenders now are funding. The uptick in subdivision infrastructure work will raise prices for dirt, utility, and paving contractors and related materials.

6. $8 billion in 2022 area K-12 school bonds: $3.5+ billion passed in May, $4+ billion is slotted for November. This will keep labor and materials in demand. A potential $5 billion more in k-12 bonds may appear in 2024.

Items 3-6 are mid-term events lasting 7-10 years.

Due to the effects of international events, domestic corporate restructuring, and local market conditions, Houston is in a perfect storm of near term, mid-term, and longer term impacts on capital goods construction labor and materials. Dallas, and especially Austin/CenTex with new semi-conductor plants, will be impacted even more strongly and could create upward Houston wage pressure by the need for labor in those areas.

7. Labor: construction labor shortages will increase and become more problematic for costs and schedules. As a society, we have devalued trade work. When wages rise and society revalues trade work, more people will enter the market place as tradespersons. Until then, there will likely be continued labor shortages and increased wages.

8. Energy Costs: Deconstruction of the current energy supply chain will not occur anytime soon. Electric vehicles have not solved all their own issues. Readily available fueling stations are absent. The power grid and generation system are inadequate to support massive electric vehicle charging and the people and forces who support mass vehicle electrification simultaneously oppose expansion of electric generation and power grid systems. Washington's anti-energy industry posture discourages replenishing traditional energy supplies. As a result, we will not see energy price mitigation beyond a limited range.

9. Defense: Major worldwide defense system expenditures will be made in response to weapon system lessons in Ukraine. Electronics systems and specialized metals costs could increase. For over 30 years, Russian plans for Ukraine have been publicly available, but Americans and Europeans have been uninformed about them by their media. Those plans readily available to anyone who wants to find them.

10. Reshoring/restructuring of Supply Chain: A major event already in progress from the Covid caused collapse of the worldwide just in time supply system. Companies are restructuring supply lines increasing on hand inventories to survive. This is a major, capital intensive, long term realignment.

Items 7-10 are long term events. We are accustomed to distant events not really impacting us and to quick recovery from disruptions. That is not the case at this time. Items 3-6 are 15 years plus and will take a long time to work through.

Cost Projections

A. Quicker supply chain restructure, quicker Ukraine settlement, less Ukraine consequences		
2022	2023	2024
10-16% increase	8-12% increase	6-10% increase
B. Multi-year supply chain restructure, Ukraine Consequences longer, more severe; China COVID lockdown is extended		
2022	2023	2024
16-19% increase	12-16% increase	10-12% increase
C. Recession		
2022	2023	2024
10-14%	Unknown	Unknown

Note: You should not rely on Durotech's projections as a basis for any determination for your purposes. You should retain professional expertise and evaluate the individual circumstances of your factual scenario in determining any escalation for any building program under consideration.

TABLE 34

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