Construction Outlook 2021

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Initial Construction Outlook 2021, 2-5-21, based on data from:

Actual Jobs data includes BLS Jobs to Jan 16th, issued 2-5-21
Forecast includes US Census Dec 2020 year-to-date spending as of 2-1-21
Forecast includes Dodge Outlook 2021 and Dec construction starts 1-19-21

Purpose and Method of Analysis

This report presents the results of analysis using currently available actual and predicted national construction data to determine the impact of recent construction market activity and cost inflation and to forecast future construction activity, jobs and inflation.

The analysis utilizes a unique model to factor construction starts and cash flow data to predict construction market activity. Forecast market activity is viewed in relation to jobs growth and availability to predict market inflationary response.

T**his analysis is national level data.**

All Adjusted Starts, Backlog, Cash Flow and Spending reported in the tables in this report is directly forecast from the construction starts data provided by Dodge Data & Analytics. The input data is new and forecast construction starts. Survey market share factors and cash flow curves applied are developed by Construction Analytics from historical actual starts and spending data. Actual Spending data is reported by U.S. Census. All jobs data is from U.S. Census Bureau of Labor Statistics. Inflation indices are developed by Construction Analytics and inputs are from various named sources.

Residential inflation indices are primarily single-family homes but would also be relevant for low-rise two to three story building types. Hi-rise residential work is more closely related to nonresidential building cost indices.

A nonresidential buildings index would be representative of commercial construction or hi-rise residential construction, since hi-rise residential is quite similar too commercial construction and in fact large portions of the building are constructed by firms classified as commercial constructors.

Summary of Analysis – Conclusions

Construction Spending drives the headlines. Construction Volume drives jobs demand. Volume is spending minus inflation. Current outlook shows the most recent peak volume was 2017-2018. Total Volume is forecast to decline every year out to 2023, but Residential is rising, Nonresidential is falling.

When spending increases less than the rate of inflation, the real work volume is declining. Nonresidential buildings spending for 2020 is down -2%, but with 3% to 5% inflation, volume is down 5% to 7%. The extent of volume declines would impact the jobs situation.

STARTS – BACKLOG - SPENDING

By far the greatest impact of the pandemic on construction is the massive reduction in new nonresidential construction starts in 2020 that will reduce spending and jobs in that sector for at least the next two years. Residential continues to increase.

- 2020 new starts declined -8%. Res +7%, Nonres Bldgs -24%, Nonbuilding -14%.
- New starts for residential reached an all-time high in 2020. Expect up +5% in 2021.

Nonresidential construction starts in backlog at the beginning of the year provide for 75% to 80% of all spending in 2021. New starts in 2020 were down 24% for buildings and 14% for non-buildings, so backlog is down. It would be difficult to show any scenario that has these sectors up in 2021.

- Starting Backlog for 2021 is forecast down -10%. Backlog for 2022 is forecast down -5%.
- 2021 Starting Backlog for nonresidential buildings is down 18%. Residential is up 12%.

Construction has yet to experience the greatest downward pressure from the pandemic. After hitting a post-pandemic spending high in December, spending and jobs losses won't hit bottom until 2022. Nonresidential declines outweigh Residential gains.

- Spending forecast for 2021 is up +1.4%, but nonresidential buildings is down -11%.
- Almost all gains in spending are due to large 12%/yr gain in residential.

The largest declines in 2021 spending are Lodging -37%, Amusement/Recreation -26%, Manufacturing -19% and Power -15%.

PROJECT COST ESCALATION – INFLATION

- Inflation for nonresidential buildings near 4% the next few years. Residential 5% to 6%.

VOLUME - JOBS

Construction Jobs annual average for 2020 is down 220,000 jobs. The current spending forecast is indicating that December 2020 was the highpoint for jobs. Residential jobs will be up in 2021, but Nonresidential Buildings jobs are down steep. Net jobs will be down 15 of next 18 months. Forecast 2021 net annual average jobs losses of -200,000. Nonresidential Buildings 2021 jobs losses will outweigh residential gains.

Terms - Construction Starts > Cashflow > Backlog > Spending > Volume

New Construction Starts (construction starts referred to in this report is Dodge Data Starts) is excellent data for forecasting. The process to produce the market activity information needed is outlined here.

The starts data is a survey. As in any survey, **STARTS data captures only a share of the total market or a portion of all construction spending, on average about 60% of all construction.** The easiest way to understand this is to compare total annual construction starts to total annual spending. National starts in recent years about $800 billion/year, while spending in this period ranges from $1,200 billion/year to $1,300 billion/year. From this simple comparison we can see starts captures a share of about 60% of the total market. The actual share for each market varies from as low as 35% to as high as 70%.

In this analysis every market is adjusted by its own individual market share factor. The factors have been shown to produce a reliable prediction of total future market activity. See plot next page.

Construction starts data is needed to predict spending or the level of market activity. This provides insight into market costs and inflation. **To predict spending activity from new construction starts, the starts data must be spread over time using appropriate CASH FLOW curves.** On average about 20% of new nonresidential building construction starts get spent within the year started, 50% is spent the next year and 30% is spent in years three and four. The cash flow curves used in this model are market specific and can vary from the average. Applying a predicted duration for all starts depending on market type to produce a cash flow from starts data, the forecast pattern of spending is developed.

BACKLOG at the beginning of the year is how much remains to be completed for all the work in contract. Backlog or new starts within the year does not give an indication of spending within the year or next year. New starts within any given year could contribute spending spread out over several years. Total cash flow in the year, or spending, could include cash flow from projects that started or entered backlog years ago.

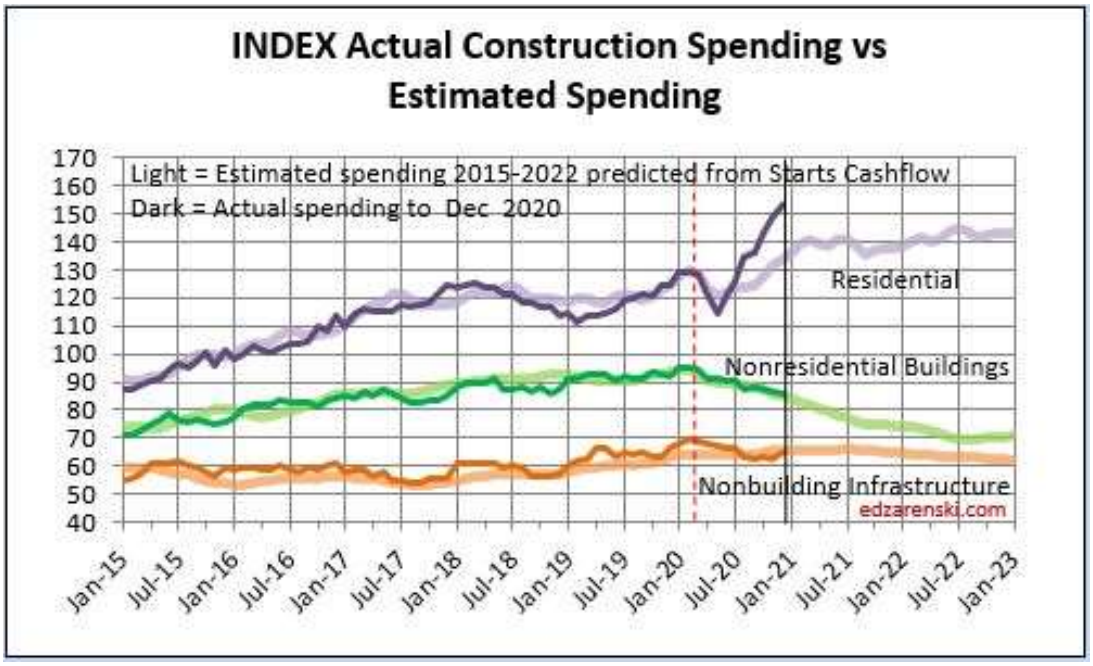
Backlog increases if new starts during the year is greater than spending during the year. However, an increase in backlog does not necessarily indicate there will be an increase in market activity. An increase in backlog could represent a level rate of market activity, but for a longer duration.

Cash flow provides the best indicator of how much and when SPENDING will occur. Cash flow from all previous starts gives a prediction of how spending will change monthly from all projects in backlog. Cash flow totals of all jobs can vary considerably from month to month, are not only driven by new jobs starting but also old jobs ending, and are heavily dependent on the type, size and duration of jobs.

One of the best predictors of construction inflation is the level of activity in an area. When the activity level is low, contractors are all competing for a smaller amount of work and therefore they may reduce bids. When activity is high, there is a greater opportunity to bid on more work and bids can be higher. The level of activity has a direct impact on inflation. **Inflation helps differentiate between spending, or revenue, and volume of work. VOLUME is spending minus inflation.**

Measuring Methodology

The following plot is a check on this analytical modeling method. It shows a comparison of the cash flows predicted from all construction starts vs actual spending. The nonresidential buildings plots (and the residential plot prior to 2020) are remarkably close, providing an indication the method of analysis employed, cash flow of all construction starts to get spending forecast, is reasonably accurate.



Note the divergence of residential in Jul-Dec 2020. Actual residential spending finished much higher than predicted. Even the cash flow from an all-time high in new residential starts does not predict spending to increase so rapidly. In 3 months, the actual spending pushed 15% higher than starts predicted. A part of the spending is the resumption of delayed projects, but another big part was renovations, which surged, and reno is 40% of all residential spending. Renovations has since subsided and single family is now responsible for most all residential growth.

First, projects delayed were predicted to take six to eight months to come fully back up to production. But residential project spending was fully back to prior levels by August, within 3 months from the May bottom. About 60% of the return to prior spending was supported by growth in residential renovations.

Second, a small portion of jobs delayed were predicted to be canceled permanently. Based on the rapidly increasing spending data since May, this likely had very little impact.

Finally, prior to November, Dodge was forecasting that residential new starts in 2020 would finish the year down slightly. With December starts data now in, residential starts for 2020 finished up 4%. In fact, over the final 5 months of 2020, new residential construction starts posted 4 of the 5 highest monthly totals since 2004-2006. Residential new starts finished 2020 at a 15-year high, with almost 50% of new activity for the year posting in the final 5 months, which contributed to the rapid increase in spending at the end of 2020, but also, will put a lot of that spending into 2021.

New Construction Starts

By far the greatest impact of the pandemic on construction is the massive reduction in new nonresidential construction starts in 2020 that will reduce construction spending and jobs for at least the next two years.

Total construction starts for 2020 ended down -8%, but Nonresidential Buildings starts finished down -24% and Non-building Infrastructure starts are down -14%.

Residential starts finished the year up +7% from 2019.

Most nonresidential buildings markets and residential new starts are forecast to increase 5% in 2021. Nonbuilding starts will increase 10% in 2021.

In the Great Recession, beginning in Q4 2008, nonresidential buildings new construction starts fell 5%, then fell 31% in 2009 and 4% in 2010. Spending began to drop by Dec 2008, then dropped steadily for the next 24 months. Spending dropped 40% over that next two years. During that period, residential starts and spending fell 70%.

In 2020, nonresidential buildings starts fell 24%, but the six months from Apr-Sep, starts fell 33%. Starts are forecast to fall 4% in 2021. Nonres Bldgs spending began to decline in Aug, is now down 10% from Feb high and is forecast to drop steadily the next 20 months, for a total decline of 25%. This time around residential starts and spending are increasing.

Over the final 5 months of 2020, new **Residential** construction starts posted 4 of the 5 highest monthly totals since 2004-2006. Residential new starts finished 2020 at a 15-year high, with almost 50% of new activity for the year posting in the final 5 months, which will put a lot of that spending into 2021. Total 2020 residential starts are up 7%, but the average for the last 5 months is up 10% from the same period 2019. There is a large portion of 2021 spending from that last 5 months of starts, that will be up 10%.

Nonresidential Buildings new construction starts in 2020 averaged down 24%: Manufacturing -57%, Lodging -46%, Amusement/Recreation -45%, Education -12%, Healthcare -7%. Most of the spending from those lost starts would have taken place in 2021, now showing up as a major decline in spending and work volume.

Manufacturing starts in 2020 fell 57%. Manufacturing projects can have a moderately long average duration, because some projects are 4-5 years. So, projects that fell out of the business plan starting gate in 2020 caused a drop in starting backlog of -32% for 2021 and -33% for 2022. It should not be hard to see how that leads to a huge decline in construction spending the next two years. The same thing happened with Amusement/Recreation and Lodging, although lodging tends to have shorter duration, so affects mostly 2021.

Commercial/Retail starts in 2020 dropped 16%. But this group includes warehouses which finished the year up +1% and warehouses is 60% of the total market. All other Commercial/Retail ended 2020 down 35%.

Non-building Infrastructure new construction starts in 2020 averaged down -13%. Power -37%, Transportation -22%. Highway (along with residential) was the only market to gain new starts in 2020, +8%.

Power new starts fell 37% in 2020, but Power backlog has not increased since 2018. Even though Power new starts in 2021 are forecast to increase 13%, that's not enough to push spending to positive.

Transportation starts declined -22% in 2020. But Transportation backlog increased 70% over the last three years. There is a large volume of Transportation projects currently in backlog, and although backlog does drop slightly for 2021, spending is supported by the large volume of starting backlog and a forecast for increased new starts in 2021.

The following NEW STARTS table shows, for each market, the current forecast for new construction starts. With exception of residential, spending in all other markets, due to longer schedules, is most affected by a decline in new starts, not in the year of the start, but in years following. As we begin 2021, some effects of reduced starts have not even begun to show up in the data. A 24% decline in new nonresidential starts in 2020 results in a huge decline in spending and jobs in 2021-2022.

Almost every nonresidential construction market has a weaker spending outlook in 2021 than in 2020, because approximately 50% of spending in 2021 is generated from 2020 starts, and 2020 nonresidential starts are down 24%, with several markets down 40%. Starts lead to spending, but that spending is spread out over time. An average spending curve for nonresidential buildings is 20:50:30 over three years. Only about 20% of new starts gets spent in the year they started. 50% gets spent in the next year. The effect of new starts does not show up immediately. If new nonresidential buildings starts in 2020 are down 24%, the affect that has in 2020 is to reduce spending by -24% x 20% = - 4.8%. The affect it has in 2021 is -24% x 50% = -12%. In 2022-2023 the affect is -24% x 30% = -7.2%.

FORECAST NEW STARTS - ADJUSTED												
-Delays -Cancels -Starts		Change		Change		Change		Change		Change		Change
adjusted for SHARE		Yr/Yr		Yr/Yr		Yr/Yr		Yr/Yr		Yr/Yr		Yr/Yr
$ in millions 000,000s	2017		2018		2019		2020		2021		2022	
TOTAL ALL MARKETS	**1,334,314**	**5.9%**	**1,357,444**	**1.7%**	**1,338,966**	**-1.4%**	**1,228,260**	**-8.3%**	**1,299,905**	**5.8%**	**1,351,056**	**3.9%**
RESIDENTIAL BLDGS	**551,385**	**9.1%**	**560,282**	**1.6%**	**570,694**	**1.9%**	**608,779**	**6.7%**	**638,765**	**4.9%**	**664,572**	**4.0%**
MANUFACTURING BLDGS	73,826	0.0%	72,775	-1.4%	65,806	-9.6%	28,376	-56.9%	28,989	2.2%	30,456	5.1%
OFFICE BLDGS	77,653	8.2%	81,610	5.1%	79,586	-2.5%	63,140	-20.7%	67,818	7.4%	69,866	3.0%
COMMERCIAL BLDGS	85,580	0.1%	82,452	-3.7%	69,005	-16.3%	58,039	-15.9%	61,848	6.6%	63,715	3.0%
EDUCATIONAL BLDGS	101,745	4.6%	104,364	2.6%	103,527	-0.8%	92,344	-10.8%	91,323	-1.1%	95,012	4.0%
LODGING BLDGS	30,887	8.4%	31,790	2.9%	27,537	-13.4%	15,204	-44.8%	14,508	-4.6%	15,094	4.0%
HEALTHCARE BLDGS	44,051	3.0%	45,671	3.7%	46,562	2.0%	43,248	-7.1%	47,406	9.6%	49,805	5.1%
AMUSEMNT RECREATN BLDG	27,432	3.4%	27,769	1.2%	24,833	-10.6%	13,728	-44.7%	12,792	-6.8%	12,984	1.5%
TOTAL NONRES BLDGS	**453,732**	**3.5%**	**458,368**	**1.0%**	**426,780**	**-6.9%**	**324,268**	**-24.0%**	**336,081**	**3.6%**	**348,615**	**3.7%**
POWER INFRA	107,967	3.6%	109,477	1.4%	104,173	-4.8%	65,656	-37.0%	74,653	13.7%	76,907	3.0%
HIWAY / ST / BRDG INFRA	95,368	2.5%	98,127	2.9%	100,838	2.8%	109,774	8.9%	112,163	2.2%	116,683	4.0%
TRANSPORTATION INFRA	53,833	8.9%	57,229	6.3%	60,326	5.4%	46,962	-22.2%	64,428	37.2%	67,031	4.0%
ENVIRON PUB WORKS INFRA	48,264	5.1%	51,029	5.7%	53,712	5.3%	52,201	-2.8%	52,948	1.4%	56,173	6.1%
COMMUNICATION INFRA	23,765	1.2%	22,931	-3.5%	22,442	-2.1%	20,621	-8.1%	20,868	1.2%	21,076	1.0%
TOTAL NONBLDG INFRA	**329,197**	**4.2%**	**338,794**	**2.9%**	**341,491**	**0.8%**	**295,213**	**-13.6%**	**325,059**	**10.1%**	**337,870**	**3.9%**
Reference Source: Dodge Data & Analytics Starts thru Dec 2020 + 2021 Outlook											edzarenski.com	

FORECAST STARTING BACKLOG												
-Delays -Cancels -Starts		Change		Change		Change		Change		Change		Change
adjusted for SHARE		Yr/Yr		Yr/Yr		Yr/Yr		Yr/Yr		Yr/Yr		Yr/Yr
$ in millions 000,000s	2017		2018		2019		2020		2021		2022	
TOTAL ALL MARKETS	1,097,367	10.6%	**1,187,026**	**8.2%**	**1,247,607**	**5.1%**	**1,270,527**	**1.8%**	**1,148,333**	**-9.6%**	**1,086,151**	**-5.4%**
RESIDENTIAL BLDGS	172,434	11.5%	**180,346**	**4.6%**	**180,801**	**0.3%**	**194,878**	**7.8%**	**218,605**	**12.2%**	**217,174**	**-0.7%**
MANUFACTURING BLDGS	109,031	9.6%	113,710	4.3%	114,803	1.0%	110,717	-3.6%	74,499	-32.7%	49,616	-33.4%
OFFICE BLDGS	79,202	22.4%	96,181	21.4%	112,995	17.5%	119,187	5.5%	98,864	-17.1%	88,687	-10.3%
COMMERCIAL BLDGS	84,869	11.3%	83,141	-2.0%	77,127	-7.2%	64,859	-15.9%	54,989	-15.2%	59,622	8.4%
EDUCATIONAL BLDGS	103,716	10.0%	110,881	6.9%	114,278	3.1%	117,642	2.9%	108,332	-7.9%	104,151	-3.9%
LODGING BLDGS	21,979	100.4%	26,495	20.5%	26,803	1.2%	24,485	-8.6%	13,930	-43.1%	11,771	-15.5%
HEALTHCARE BLDGS	43,126	3.4%	45,592	5.7%	49,422	8.4%	54,064	9.4%	50,839	-6.0%	53,475	5.2%
AMUSEMNT RECREATN BLDGS	27,346	8.0%	31,774	16.2%	34,810	9.6%	30,978	-11.0%	17,743	-42.7%	13,306	-25.0%
TOTAL NONRES BLDGS	480,839	16.5%	**519,777**	**8.1%**	**541,443**	**4.2%**	**528,671**	**-2.4%**	**429,205**	**-18.8%**	**391,723**	**-8.7%**
POWER INFRA	188,147	7.8%	206,205	9.6%	213,781	3.7%	206,831	-3.3%	162,154	-21.6%	141,255	-12.9%
HIWAY / ST / BRDG INFRA	136,350	6.2%	141,736	4.0%	150,100	5.9%	159,159	6.0%	167,520	5.3%	167,078	-0.3%
TRANSPORTATION INFRA	52,178	2.9%	65,120	24.8%	81,586	25.3%	97,373	19.3%	91,450	-6.1%	92,672	1.3%
ENVIRON PUB WORKS INFRA	45,887	-6.3%	51,321	11.8%	57,789	12.6%	61,969	7.2%	58,908	-4.9%	56,148	-4.7%
COMMUNICATION INFRA	21,533	-4.0%	22,521	4.6%	22,106	-1.8%	21,647	-2.1%	20,492	-5.3%	20,102	-1.9%
TOTAL NONBLDG INFRA	444,094	4.5%	**486,903**	**9.6%**	**525,362**	**7.9%**	**546,979**	**4.1%**	**500,524**	**-8.5%**	**477,254**	**-4.6%**
Reference Source: Dodge Data & Analytics Starts thru Dec 2020 + 2021 Outlook											edzarenski.com	

Starting Backlog

Starting backlog is the estimate to complete (in this analysis taken at Jan 1) for all projects currently under contract. The last time starting backlog decreased was 2011.

Backlog leading into 2020 was at all-time high, up 30% in the last 4 years. Prior to the pandemic, 2020 starting backlog was forecast UP +5.5%. Due to delays and cancelations, that has been reduced to +1.8%, still an all-time high. Starting Backlog, from 2011-2019, increased at an avg. rate of 7%/year.

If new construction starts are greater than construction spending in the year, then for the following year starting backlog increases. It's when new starts don't replenish the amount of spending in the year that backlog declines. And that is the case this year.

Total starting backlog is down -10% for 2021 and -5% for 2022. 2021 Starting Backlog is back to the level in 2018. In 2022, backlog drops to the level of 2017.

Nonresidential Buildings new starts declined by -24% in 2020 resulting in starting backlog drops -19% for 2021 and drops -9% for 2022.

For Non-building Infrastructure, a drop of -14% in 2020 starts results in a drop of 9% in 2021 starting backlog and -5% for 2022.

Residential starting backlog for 2021 is up +12%. New starts are up 6%.

2021 backlog declines in every nonresidential market, except Highway.

80% of all nonresidential spending in any given year is from backlog and could be supported by projects that started last year or 3 to 4 years ago. Residential spending is far more dependent on new starts than backlog. **Only about 30% of residential spending comes from backlog and 70% from new starts.**

Projects in starting backlog could have started last month or last year or several years ago. Many projects in backlog extend out several years in the schedule to support future spending. Current backlog could still contribute some spending for the next 6 years until all the projects in backlog are completed.

Reductions in starts and starting backlog lead to lower spending. Residential construction is going counter to the trend and will post positive results for new starts, backlog and spending for the next two years. Nonresidential buildings will experience the greatest reductions in new starts, backlog and spending through 2022.

Spending Forecast 2021

2021 Residential spending will climb about 13%, up $80 billion to $695 billion. Nonresidential Buildings spending is forecast to drop -11% to $410 billion, a decline of $50 billion. Non-building spending drops -2% to $343 billion, a decline of only $8 billion.

Most all the change in this forecast from previous is an increase to residential spending. Both recent starts and spending increased substantially since previous forecasts. When looking at Total Construction Spending for 2021, residential growth obscures the huge declines in nonresidential.

The monthly rate of spending for residential increased 33% in the 7 months from May to December. The last time we had growth like that was 1983. The last time we had rapid growth in residential work, 2013-2014 and 2004-2005, it took 2 years to increase 33%. Residential spending in Dec 2020 is 23% higher than Dec 2019.

Nonresidential Buildings spending drops -2% to -3% each quarter in 2021. Nonresidential Buildings spending as of Dec. 2020 is down 10% From Feb. 2020 and 8% from Q4 2019. By 3rd quarter 2021, nonresidential buildings spending is forecast down another 12% lower than Dec. 2020, or 20% below the Feb. 2020 peak. This tracks closely with the 24% decline in new construction starts in 2020.

U.S. Total Construction Spending Summary

totals in billions current U.S. dollars

$ in billions % growth vs prior yr	2015	2016	2017	2018	2019	2020	Forecast 2021	Forecast 2022
Nonresidential Bldgs	385.8	421.1	434.2	452.5	472.3	462.4	410.6	384.2
	15.3%	9.2%	3.1%	4.2%	4.4%	-2.1%	-11.2%	-6.4%
Nonbuilding Hvy Engr	315.7	316.6	299.9	316.7	342.2	351.0	342.6	329.2
	5.9%	0.3%	-5.3%	5.6%	8.1%	2.6%	-2.4%	-3.9%
Residential	438.7	486.0	545.8	563.9	550.9	616.2	695.7	709.9
	14.7%	10.8%	12.3%	3.3%	-2.3%	11.8%	12.9%	2.0%
Total	1140.2	1223.7	1279.8	1333.1	1365.4	1429.6	1448.9	1423.2
% growth vs prior yr	12.3%	7.3%	4.6%	4.2%	2.4%	4.7%	1.4%	-1.8%
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Private	846.4	926.7	983.3	1023.0	1030.7	1075.8	1065.0	1053.5
	14.5%	9.5%	6.1%	4.0%	0.8%	4.4%	-1.0%	-1.1%
Private Residential	431.8	479.4	539.0	557.6	544.5	604.3	682.3	696.2
Private Nonresidential	414.6	447.3	444.3	465.5	486.3	471.5	382.7	357.3
Public	293.8	297.0	296.5	310.1	334.7	353.8	384.0	369.7
	6.4%	1.1%	-0.1%	4.6%	8.0%	5.7%	8.5%	-3.7%
Total	1140.2	1223.7	1279.8	1333.1	1365.4	1429.6	1448.9	1423.2
% growth vs prior yr	12.3%	7.3%	4.6%	4.2%	2.4%	4.7%	1.4%	-1.8%
Share Private % of Total	*74.2%*	*75.7%*	*76.8%*	*76.7%*	*75.5%*	*75.3%*	*73.5%*	*74.0%*
Share Public % of Total	*25.8%*	*24.3%*	*23.2%*	*23.3%*	*24.5%*	*24.7%*	*26.5%*	*26.0%*

Source $ Data: U.S. Census Bureau, Department of Commerce.
Actual Spending data includes revisions 2018-2019 issued 7-1-20
Forecast includes U.S.Census Dec 2020 year-to-date spending issued 2-1-21
Forecast includes Dodge Construction Outlook and Starts data through Dec

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Nonresidential Buildings construction will take several years to return to pre-pandemic levels. Although nonresidential buildings spending is forecast down only -2% for 2020, the 15%-25% drop in 2020 construction starts will mostly be noticed in 2021 spending. Project starts that were canceled, dropping out of new backlog between April and September 2020, would have had midpoints, or peak spending, April to September 2021. Nonbuilding project midpoints could be even later. The impact of reduced new starts in 2020 is reduced spending and jobs in 2021 and 2022.

Almost every market has a weaker spending outlook in 2021 than in 2020, because of lower starts in 2020. Starts lead to spending, but on a curve. A good average for nonresidential buildings is 20:50:30 over three years. 20% of the total of all starts in 2020 gets spent in 2020 (yr1) and that represents also about 20% of all spending. 50% of the total value of 2020 starts gets spent in the following year, 2021. So, 50% of spending in 2021 is generated from 2020 starts. If starts are down 20% and 50% of spending comes from those starts, spending will be down 20% x 50% of the work.

For 2020, the biggest declines are Lodging (-14%), Manufacturing (-10%) and Amuse/Recreation (-7%). Commercial/Retail finishes up +4.2%, but this is entirely due to Warehouse, 60% of the total

Commercial/Retail market. Office and Educational are down -4% and -1%. Nonresidential buildings takes the brunt of declines in both 2020 and 2021.

In 2021, every nonresidential building market is down from 2020, some markets down -10% to -20%. Educational, Healthcare and Office are all down -3% to -6%. Non-building infrastructure Power market is down -15%, but Transportation spending is up +10% due to strength in backlog from several multi-billion$ starts over the past few years.

Manufacturing projects have a moderately long duration. So, projects that fell out of the business plan caused a drop in starting backlog of -32% for 2021 and -33% for 2021. It should not be hard to see how that leads to a huge decline in construction spending the next two years. The same thing happened with Amusement/Recreation and Lodging, although lodging tends to have shorter duration, so affects mostly 2021.

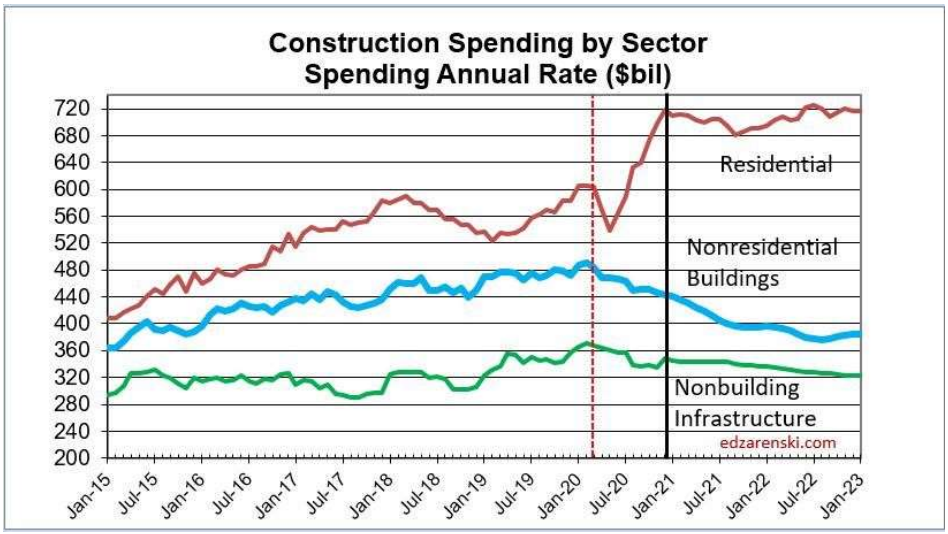
U.S. Total Construction Spending Summary

$ in billions % growth vs prior yr	Actual 2020		Forecast 2021		Forecast 2022	
Total Construction	**1430**	**4.7%**	**1449**	**1.4%**	**1423**	**-1.8%**
Residential	**616**	**11.8%**	**696**	**12.9%**	**710**	**2.0%**
Nonresidential Buildings	**462**	**-2.1%**	**411**	**-11.2%**	**384**	**-6.4%**
Nonbuilding Infrastructure	**351**	**2.6%**	**343**	**-2.4%**	**329**	**-3.9%**
Educational	104.5	-1%	100.5	-4%	97.1	-3%
Healthcare	47.5	4%	45.3	-5%	46.7	3%
Amusement / Recreation	26.9	-7%	20.0	-26%	14.1	-29%
Commercial / Retail	83.8	4%	75.4	-10%	80.1	6%
Lodging	28.5	-14%	17.8	-37%	15.4	-14%
Office	81.1	-4%	75.9	-7%	68.0	-10%
Manufacturing	71.9	-10%	57.9	-19%	45.7	-21%
Other Nonres Bldgs	18.2	29%	17.8	-2%	17.2	-3%
Power	119.1	5%	101.4	-15%	87.0	-14%
Highway / Bridge / Street	99.2	2%	100.7	2%	100.5	0%
Transportation / Air / Rail	56.7	-1%	62.5	10%	64.0	2%
Sewer / Water / Conservation	53.4	4%	55.7	4%	55.9	0%
Communication	22.7	2%	22.3	-2%	21.7	-3%

Forecast includes U.S.Census Dec 2020 year-to-date spending issued 2-1-21

Forecast includes Dodge Construction Outlook and Starts data through Dec edzarenski.com

A recent AGC survey of construction firms asked, how long do you think it will be before you recover back to pre-COVID-19 (levels of work)? The survey offered "longer than 6 months" as an answer choice. Less than 6 months was the right answer for residential, but my current forecast for full recovery of nonresidential buildings work is longer than 6 years.

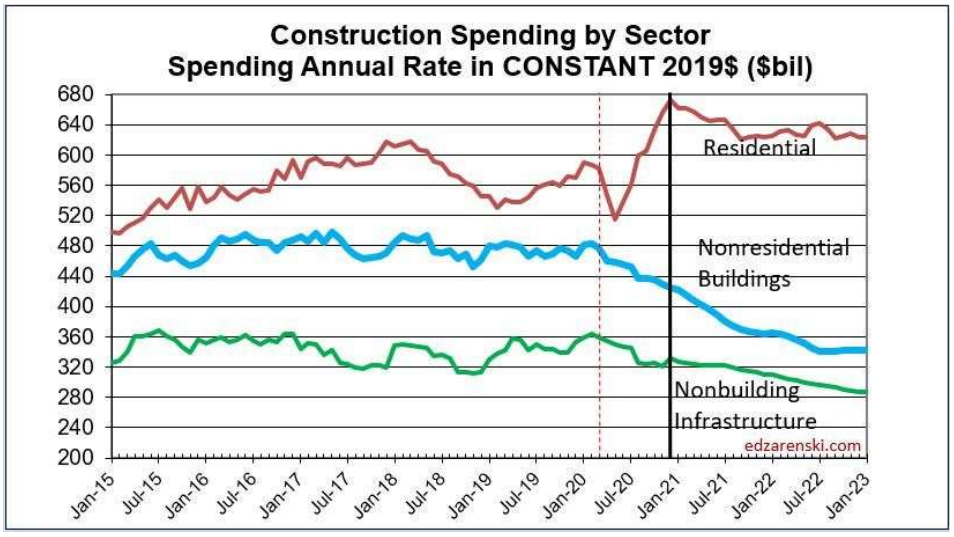


Before we can look at the effect on jobs, we need to adjust spending for inflation. The plot above "Spending by Sector" is current dollars. Here that plot is adjusted for inflation and is presented in constant $. Constant $ show volume. Notice future residential remains in a narrow range after adjusting for inflation. No sector shows improvement in volume through Jan. 2023.

While 2021 Residential spending will climb about 13%, Nonresidential building spending is forecast to drop -11% and Non-building spending drops -2%. But with 3% to 4% inflation, after inflation Residential Volume is up only 9%, Nonresidential Building is down 14% and Non-building is down 6%.

By far the greatest decline in volume is in the nonresidential buildings sector. The greatest losses in 2020 are Lodging, Manufacturing, Amusement/Recreation and Commercial/Retail (without warehouse). In 2021, every major nonresidential building market declines, with 30% declines in Lodging and Amusement/Recreation. Commercial/Retail and Manufacturing will drop -10% to -15%.

Here's the same graphic as above, but in Constant $, so it is inflation adjusted. That provides the change in volume of work.



Inflation

In April 2020, and again in June 2020, I recommended adding a minimum 1% to normal long-term construction inflation (nonres longterm inflation = 3.75%), to use 4% to 5% for 2020 nonresidential buildings construction inflation. Some analysts were suggesting we would experience deflation. Deflation is not likely. Only twice in 50 years have we experienced construction cost deflation, 2009 and 2010. That was at a time when business volume was down 33% and jobs were down 30%. In 2020, volume dropped 8% from Feb to May and we've gained half that back by Dec. Jobs dropped 14%, 1,000,000+ jobs, in two months! Now volume is still down 4% and jobs are down 2% from Feb peak. We've gained back 850,000 jobs. But also, we've gained back more jobs than volume. That's inflation.

Volume drops another 5% in 2021, all nonresidential, and then another 3% in 2022. Jobs could drop overall 8% to 10% for all of 2021-2022, 500,000 to 700,000 jobs.

Even though material input costs are up for 2020, nonresidential inflation in 2020 remained low, probably influenced by a reduction in margins due to the decline in new construction starts (-24%), which is a decline in new work to bid on.

Nonresidential inflation for 2020 dropped to 2.5%, the first time in 7 years below 4%. It's expected to increase in 2021.

Residential inflation averaged 5.1% for 2020. However, a decline in volume midyear 2021 could temper 2021 inflation.

Volume = spending minus inflation.

For the year 2020, Residential Building Materials Inputs are up 6.2%. See PPI charts. Sharply higher lumber prices have added more than $17,000 to the price of an average new single-family home since mid-April. The U.S. Census Single-Family house Construction Index is up 6% from Nov 2019 to Nov 2020. The index increased 4% in the last 5 months. https://www.census.gov/construction/nrs/pdf/price_uc.pdf

The most recent Producer Price Index tables published by AGC for year-end 2020 https://www.agc.org/sites/default/files/PPI%20Tables%20202012.pdf shows input costs to nonresidential buildings up about 3.5% to 4.5% for 2020, but final costs of contractors and buildings up only 1% to 2%. This could be an indication that, although input costs are up, final costs are depressed due to lower margins, a result of fewer projects to bid on creating a tighter new work available environment which generally leads to a more competitive bidding environment. This could reverse in 2021 as the volume of work to bid on in most markets begins to increase.

The Turner Construction Cost Index (nonresidential buildings) for Q1-Q2-Q3 is +1%, -1%, -0.5%, effectively reporting the index down -0.5% year-to-date. But the Turner index year-to-date average (avg Q1+Q2+Q3=1179) is still 2.6% higher than the average of Q1+Q2+Q3 2019 and 2% higher than the avg for all of 2019 (1156). So, while the index appears to show no gains in 2020, through the first nine

months of 2020 it is up 2.6% above the average of the same months in the 2019 index. http://turnerconstruction.com/cost-index

The Rider Levitt Bucknall nonresidential buildings index average index for 2020 (through October 1, 2020), although up less than 1% in the last 6 months, is up 3.5% from the average 2019 index. https://s28259.pcdn.co/wp-content/uploads/2020/07/Q2-2020-QCR.pdf

R.S.Means quarterly cost index of some materials for the 4th quarter 2020 compared to Q1: Ready-Mix Concrete -1.8%, Brick +10%, Steel Items -1% to -5%, Framing Lumber +32%, Plywood +8%, Roof Membrane +5%, Insulating Glass +12%, Drywall +3%, Metal Studs +23%, Plumbing Pipe and Fixtures +1%, Sheet Metal +20%. https://www.rsmeans.com/landing-pages/2020-rsmeans-cost-index

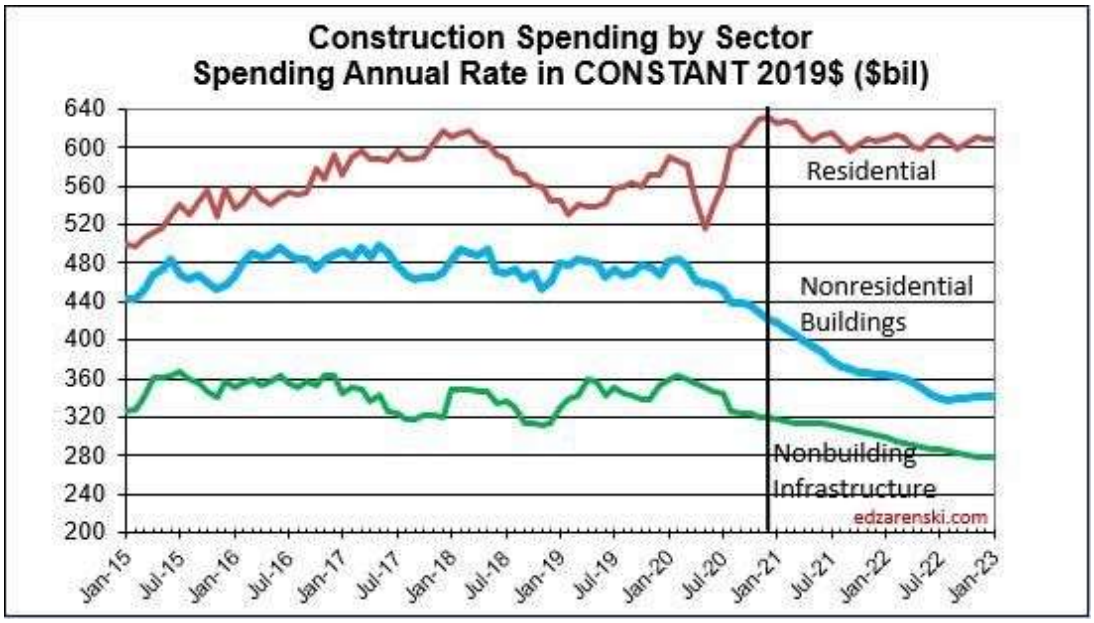
Steel Prices at mill in the U.S. are up 60% to 100% in the last 6 months. All prices are 50% to 75% higher than Feb 2020. http://steelbenchmarker.com/files/history.pdf . This is mill price of steel which is about 25% of the price of steel installed. What affect might a steel cost increase have on a building project? It will affect the cost of structural shapes, steel joists, reinforcing steel, metal deck, stairs and rails, metal panels, metal ceilings, wall studs, door frames, canopies, steel duct, steel pipe and conduit, pumps, cabinets and furniture, and I'm sure more. Assuming a typical structural steel building with some metal panel exterior, steel pan stairs, metal deck floors, steel doors and frames and steel studs in walls, then all steel material installed represents about 14% to 16% of total building cost. Structural Steel only, installed, is about 9% to 10% of total building cost, but applies to only 60% market share being steel buildings. The other 6% of total steel cost applies to all buildings. https://www.thefabricator.com/thefabricator/blog/metalsmaterials/steel-prices-reach-levels-not-seen-since-2008 At these prices, if fully passed down to the owner, this adds about 1.5%-2% to building cost inflation. **With demand in decline for nonresidential buildings, I would expect to see some or all these steel price increases recede.** Also, take note, none of this steel price movement appears captured in the PPI data or RSMeans data.

Post Great Recession, 2011-2020, average nonresidential buildings inflation is 3.7%. In 2020 it dropped to 2.5%, but for the six years 2014-2019 it averaged 4.4%. Residential cost inflation for 2020 reached 5.1%. It has averaged over 5% for the last 8 years. The 30-year average inflation rate for nonresidential buildings is 3.75% and for residential it's over 4%.

Almost every construction market has a weaker spending outlook in 2021 than in 2020, because approximately 50% of spending in 2021 is generated from 2020 starts, and 2020 nonresidential starts are down 10% to 25%, several markets down 40%. Nonbuilding starts are down 15%, but will increase 10% in 2021.

Typically, when work volume decreases, the bidding environment gets more competitive. We can always expect some margin decline when there are fewer nonresidential projects to bid on, which typically results in sharper pencils. However, if materials shortages develop or productivity declines, that could cause inflation to increase. We can also expect cost increases due to material prices, labor cost, lost productivity, project time extensions or potential overtime to meet a fixed end-date.

Constant $ = Spending minus inflation = Volume



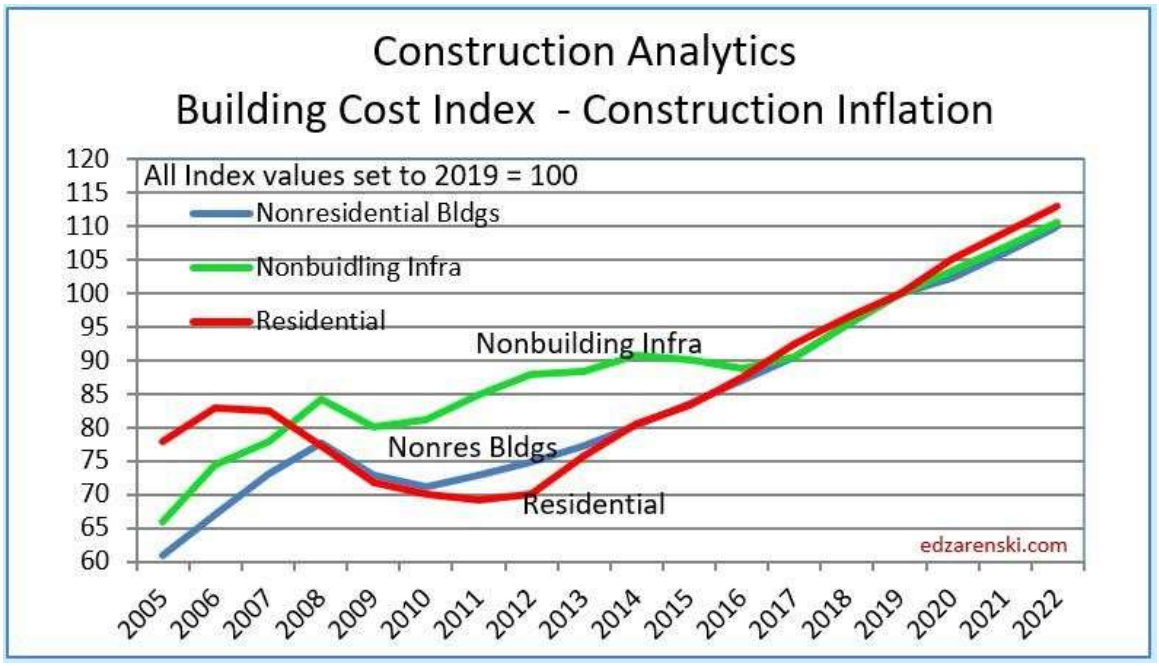
Many projects under construction had been halted for some period of time and many experienced at least short-term disruption. The delays may add either several weeks to perhaps a month or two to the overall schedule, in which case, not only does labor cost go up but also management cost goes up, or it could add overtime costs to meet a fixed end-date. Some of these project costs have yet to occur as most would be expected to add onto the end of the project.

Some projects that were put on hold (nonresidential buildings starts in 2020 dropped 24%) just prior to bidding in 2020 may now re-enter the bidding environment. The rate at which these projects come back on-line could impact the bidding environment. If several months-worth of projects that delayed bidding last year all come onto the market at once, or at least all in a more compressed time span than they would have, the market could be flooded with work and bidding contractors now have more choice, can bid more projects than normal and could potentially raise margins in some bids. This would have an inflationary effect. Also, there can be difficulty in starting many projects at the same time, rather than more staggered starts. It burdens subcontractors and suppliers with too much of the same type of work all going on at the same time. This could exacerbate labor issues and could lead to project time extensions.

The hidden inflationary costs of bidding environment, project time extensions, potential overtime and lost productivity haven't yet all appeared in the data. Some of these could still add to 2020 inflation. Also, the huge loss of new starts in 2020, which meant fewer projects to bid on in 2020, probably reduced margins in 2020. Nonresidential starts are projected to increase 4% in 2021, so that could lead to some recovery of margins, however, even with 4% growth in new starts, that comes after a 24% drop in 2020, so remains still 20% below 2019. Total volume of work is declining and new projects available out to bid is still depressed, so pressure on margins still exists.

I expect non-residential buildings inflation in 2021 to range between 3.5% to 3.75%, with potential to be held lower. Expect inflation of 3.75% to 4% for residential work with potential to push slightly higher.

Nonresidential inflation, after hitting 5% in both 2018 and 2019, and after holding above 4% for the six years 2014-2019, increased only 2.5% in 2020. Forecast is to 3.8% in 2021 and hold near that level the next few years. Forecast residential inflation for the next three years is level at 3.8%. It was only 3.6% for 2019 but averaged 5.5%/yr since 2013 and returned to 5.1% in 2020.



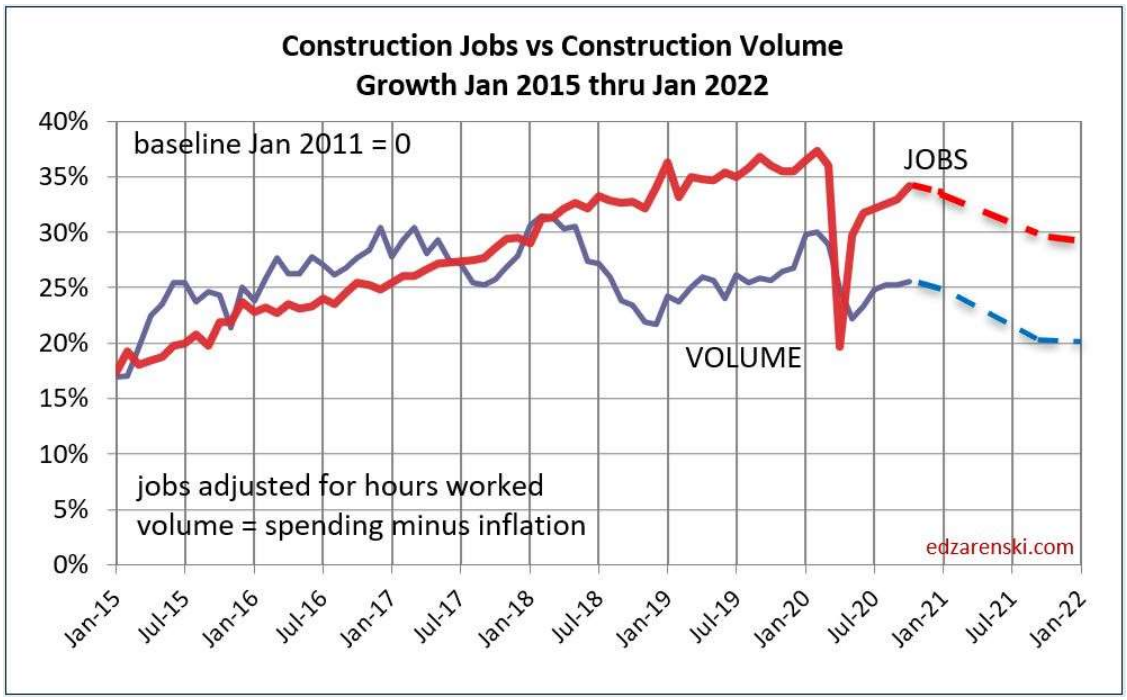
See **Construction Inflation Index Tables** for indices related to Nonbuilding Infrastructure work.

Volume of Work and Jobs

When we see spending increasing at less than the rate of inflation, the real work volume is declining. For example, with construction inflation at 3% annually, a nonresidential building spending decline of -2.1% in 2020 would reflect a work volume decline of 5.1%. The extent of volume declines would impact the jobs situation.

Residential construction volume dropped 12% from the January 2020 peak to the May bottom, but has since recovered 22% and now stands at a post Great Recession high, 10% above one year ago. Although residential spending remains near this high level for the next year, volume after inflation begins to drop by midyear.

Nonresidential volume has been slowly declining and is now down 10% from one year ago. By 3rd quarter 2021, nonresidential buildings volume is forecast down another 15% lower than December, or 25% below the Feb 2020 peak. This tracks right in line with the 24% decline in new construction starts in 2020. Most of the spending from those lost starts would have taken place in 2021, now showing up as a major decline in spending and work volume.



While construction spending in 2021 is forecast up 1.3%, after inflation construction volume is expected to decline 2.5%. Residential construction spending is forecast up 13%, volume up almost 9%, but 2021 nonresidential buildings spending is forecast down -11% leading to a decline in volume after inflation of -14%. Nonbuilding Infrastructure spending in 2021 declines -2.5%, volume drops -6%.

Nonresidential buildings volume declines of 14% project to a loss of over 400,000 jobs next year and non-building infrastructure is projected to drop 60,000 jobs, but Residential could experience growth next year of 250,000 jobs. That could net annual average jobs losses to -200,000. Job losses continue into 2022 with net volume declines of 4%.

Jobs are supported by growth in construction volume, spending minus inflation. This time next year, volume will be 5% lower than today, 10% below the Feb 2020 level. **We will not see construction volume return to Feb 2020 level at any time in the next three years.**

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