

Breaking Ground

THE MAGAZINE OF THE MASTER BUILDERS' ASSOCIATION OF WESTERN PENNSYLVANIA

MARCH/APRIL 2018

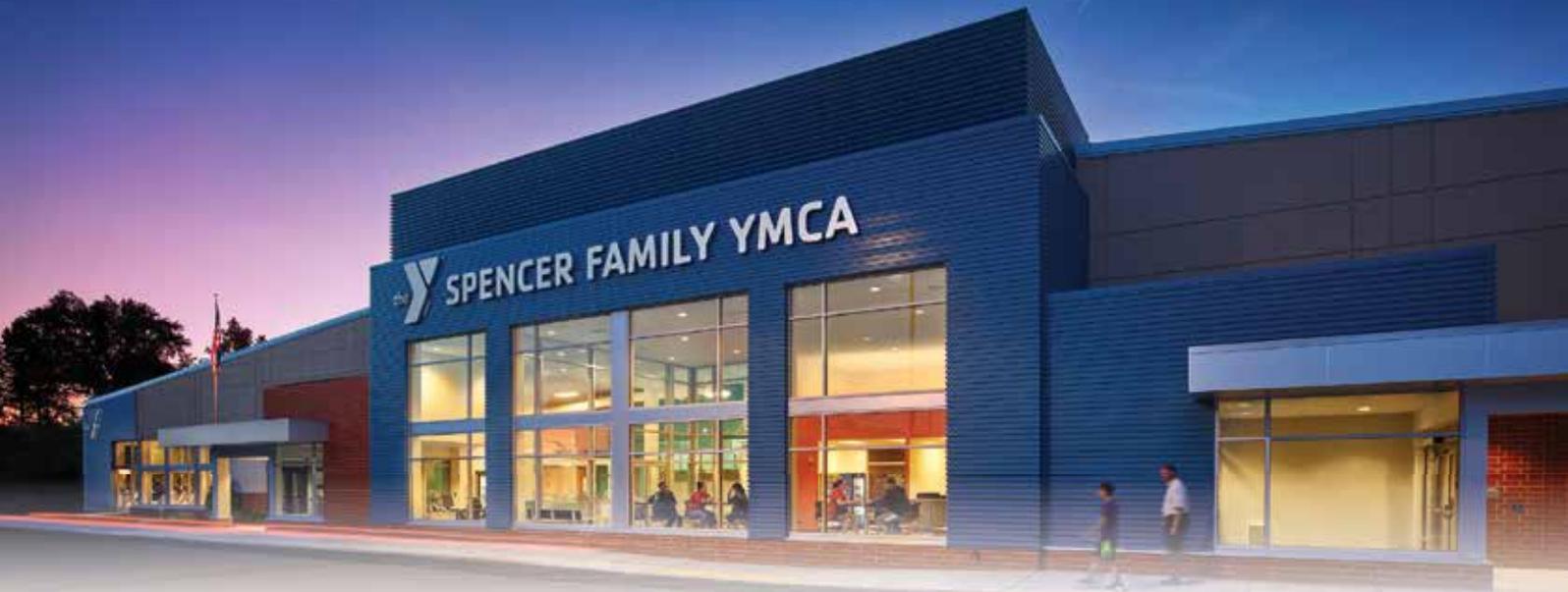
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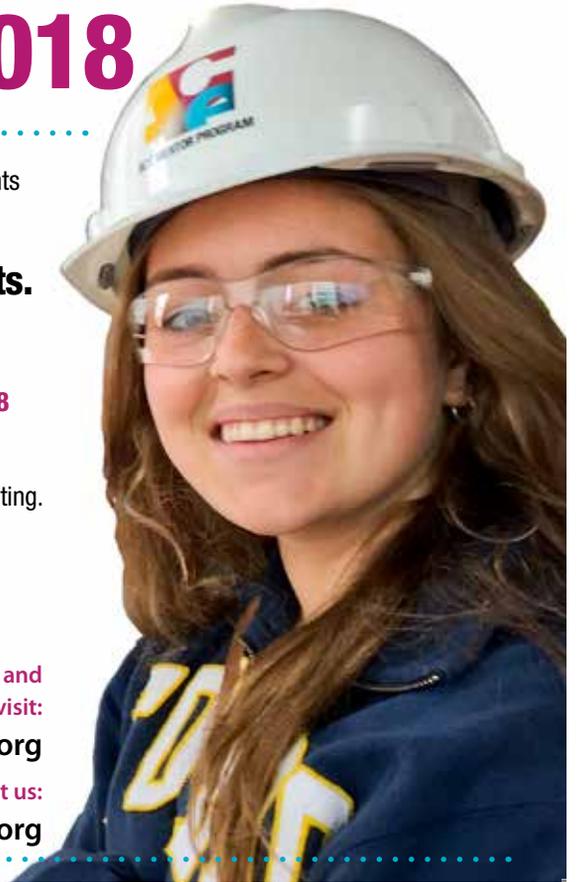
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5 PUBLISHER'S NOTE

7 REGIONAL MARKET UPDATE

23 NATIONAL MARKET UPDATE

29 WHAT'S IT COST?

31 FEATURE
Buildings of the Future:
A New Look at ROI

43 PROJECT PROFILE
Spencer Family YMCA

51 FIRM PROFILE
Wyatt Inc.

55 LEGAL PERSPECTIVE
Legal Year in Review

58 FINANCIAL PERSPECTIVE
New Law Offers Help for the
Flagging Pennsylvania SREC
Market

61 MANAGEMENT PERSPECTIVE
GBCI Develops Arc to
Manage Many Green Building
Certifications

64 BEST PRACTICE
What Is Design-Assist?

**68 INDUSTRY
& COMMUNITY NEWS**

75 AWARDS & CONTRACTS

80 FACES & PLACES

84 CLOSING OUT
Dr. Aurora Sharrard
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**Building Excellence
Awards on Page 13**

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PUBLISHER'S NOTE

I'm at a loss for words. For my family and friends, these are words that they have longed to hear, and never expected to read. (And, of course, in the following paragraphs you'll come to wonder if I understand what the phrase "loss for words" means.)

We're taking our biennial look at green building in the March/April edition of BreakingGround. I've always been proud of the fact that the first edition of the magazine that we produced completely on our own, back in November 2006, was focused on green building. We have been ahead of the advancement of green building since then but it feels like we've lost that edge in recent years. The advocacy for green building has expanded and exploded in so many ways that it's tough for one little regional magazine to keep up with the leading edge.

For that reason, the feature article has been authored by an outside expert. Peter Greaves is an Australian architect who has written extensively about pushing the envelope on design and performance expectations for buildings and construction. I hope you'll enjoy the insights Peter offers (and some of the Aussie colloquialisms).

But the feature article of this magazine isn't what I refer to when I claim to be at a loss for words.

An interesting development has occurred over the past nine months or so in my speaking engagement requests. One of the really enjoyable things I get to do as a result of this gig is to speak to the many regional associations that serve the construction and real estate markets. As would be expected, the requests for me to speak have heretofore been about the industry, usually about the construction economy. On some occasions, a group will ask for a presentation on the general economy but with an eye towards the impact on construction or development. This has begun to change, however.

On March 13, I spoke to the Mon Valley Regional Chamber of Commerce on the topic of what opportunities Amazon HQ2 can bring to the Mon Valley. Jeff Kotula, the president of the Washington County Chamber of Commerce, asked me to speak, apparently because no one else was willing to tackle the topic and he figured I'd come up with something. (He was correct.) That speech was the fourth in a year that was on a topic that was hardly in my sweet spot of expertise. I have a theory for why that is happening.

What isn't happening is that I've become a dynamic speaker. I am grounded enough to realize that these have most likely been invitations made in desperation; however, I think it's the topic that reveals a change in attitude.

The first of these out-of-character requests came from the National Association of Women in Construction last spring. I was asked to talk about the opportunities for Millennial women in the construction industry by Victoria Kurzyn from

Case Sabatini. Victoria is the kind of person who likes to shake things up so I chalked the unusual request up to that. As I thought about the topic, it wasn't very difficult to see how young women could take advantage of the demographic and cultural shifts that are occurring to carve out a place in the industry. The talk went well. It was a lot of fun and it was a pleasant surprise to speak to an audience that was at least half young woman, including a few from field positions.

Since that evening, I've had three other invitations to talk about more global issues than what sector of the construction market was booming or the like. None of the requests came from people who attended the NAWIC event. Maybe there was something going on here.

Four speeches do not make a trend, but I was willing to look for one anyway. What I believe may have happened while we weren't paying attention was that Western Pennsylvanians may have become optimistic. I'm as surprised as you are.

There has been an embarrassing amount of positive press about Pittsburgh for a number of years but this Amazon HQ2 search has thrown gasoline on that fire. As I write this, rumors are quietly swirling that Amazon is about to short-list to five cities. Should Pittsburgh stay on the list of contenders, the attention will ratchet up that much more. I'm still unsure about whether landing this economic opportunity will be a good or bad thing in the long run, but I do believe that the way the search has unfolded for Pittsburgh has been another tipping point in the transformation of the region. Bear in mind that the Amazon opportunity comes on the heels of news about the Shell cracker, Uber, Argo AI, the Advanced Robotics for Manufacturing Institute, and on and on. Even Pittsburghers could be forgiven if they have stopped looking for the other shoe to drop.

It's one thing for our civic leaders to talk about a bright future. That's their job. But when a group of ironworkers want to hear about how all this development is going to affect their kids' futures or an old white guy is asked to talk about the future for young women in the construction industry, that's a different level of optimism. And when business people in the Mon Valley want to know how Amazon might impact their communities, it means that we may have moved on from the idea that Pittsburgh's future will look like its past.

If you're thinking about asking me to speak to your group about something other than construction, I don't recommend it. That's a recipe for disappointment for both of us. But if you're thinking that your group would like to hear about how the future will look, I like your thinking.



Jeff Burd

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REGIONAL MARKET UPDATE



Dual announcements by Allegheny Health Network (AHN) and UPMC in October/November 2017 heightened anticipation about the construction market for 2018. As the first quarter winds down, the potential for a wave of construction is becoming reality.

Excitement about development in Western PA had been driven by a strong commercial real estate market, which was responding to rapid growth in emerging technology companies, and the midstream/downstream buildout of the Marcellus and Utica Shale plays. The potential of the latter is centered on the Shell polyethylene facility in Monaca. The major capital programs of Pittsburgh’s two large healthcare systems went well beyond icing on the cake. Allegheny Health Network plans to invest more than \$1 billion over the next five years, while UPMC expects to spend twice that. Thus far, both systems have moved faster and more decisively than expected.

As of mid-March, AHN had contracted with Massaro Corporation to manage its \$110 million St. Vincent Hospital expansion in Erie, PA, and the Massaro/Gilbane team was tabbed to build the \$220 million new Wexford hospital in Pine Township. AHN also broke ground on its \$80 million Cancer Institute at Allegheny General, which Massaro will also build. In outlying areas, Mascaro and Stantec were chosen to design/build cancer centers in Butler and Beaver; and Rycon Construction was selected to build a \$20 million cancer center at Forbes Regional Hospital in Monroeville and the first of AHN’s neighborhood hospitals, a \$32 million facility in Hempfield Township to be developed with its partner Amerus.

Although none of the major hospital projects proposed by UPMC is expected to get under construction until late in 2018 or in 2019, several of the hospitals have moved quickly into the market.

Turner Construction has taken bids on early packages and major trades for the \$111 million UPMC Hamot expansion in Erie. Mascaro/Barton Malow have been budgeting the UPMC Vision and Rehabilitation Hospital at Mercy, a project that has grown to two towers and \$350 million. The most exciting development has been the selection of architect/engineer teams and request for construction management proposals for the \$700 million UPMC Heart and Transplant Hospital at Presbyterian and the \$400 million Hillman Cancer Hospital at Shadyside.

Amid this healthcare boom, the region’s other economic sectors continue to show strength.

Commercial real estate saw a slower year in 2017 but activity for transactions and development has jumped since the start of the year. Several large projects have moved ahead that are banking on the continued growth of the technology transfer from Pitt and Carnegie Mellon. Walnut Capital brought forward plans for a nine-story, 320,000 square foot office – dubbed Bakery 3.0 – that will start work by the fourth quarter of 2018. The project will be built by PJ Dick. Walnut Capital has started construction

| BENCHMARK | 2016 | 2017 |
|----------------------------|-----------------|-----------------|
| Total SFD/SFA units | 2,927 | 3,006 |
| Total Multi-unit | 2,134 | 2,368 |
| Total residential \$\$ | \$1.07 billion | 1.18 billion |
| Total non-residential \$\$ | \$4.17 billion | \$4.54 billion |
| K-12 Additions/renovations | \$294.7 million | \$147.8 million |
| Healthcare construction | \$195.4 million | \$224.7 million |
| Hotel construction | \$142.5 million | \$92.4 million |
| Industrial construction | \$1.85 billion | \$1.94 billion |
| Office construction | \$351.3 million | \$503.5 million |
| Higher education | \$272.6 million | \$218.5 million |

on the \$7 million Craft Place office in Oakland and has proposed an 11-story office building on McKee Place. Along with the proposed repurposing of the Pittsburgh Athletic Association's building on Fifth Avenue, these projects represent Walnut Capital's shift in focus to office development in Oakland. The user groups for all of the projects are expected to be university or university-related tenants.

Burns & Scalo Real Estate took bids on its 150,000 square foot Riviera office building at the Pittsburgh Technology Center on Second Avenue. The building's proximity to Oakland, Downtown and Hazelwood Green has made it attractive to technology companies or companies serving emerging technologies. Likewise, Oxford Development's second phase of 3 Crossings is being designed. The \$300 million

mixed-use development will include multi-family but is being anchored by office buildings that should attract the kinds of tech tenants – which included Apple, Argo AI and Petuum – that are advancing in the robotics, autonomous vehicle and artificial intelligence fields.

Industrial construction continues to be driven by logistics and the natural gas industry build-out. There were rumors that the region's biggest logistics project, a one-million square foot fulfillment center for Amazon at Chapman Westport, was about to start construction for a December opening; but neither Amazon or its developer, Hillwood Properties would comment on whether a decision to proceed was imminent. Also in the speculative category is the report of a manufacturer looking for a site to build a 500,000 square foot facility.

Natural gas midstream development is definitely not in the speculative category. Last year saw a half-dozen new midstream projects get underway, along with expansion of several major processing and fractionation facilities. The projects started in 2017 in the seven-county metropolitan area topped \$1.6 billion. New construction of these facilities is expected to be lighter in 2018 while this additional capacity is completed.

HIGH-TECH SOFTWARE/SERVICES JOB GROWTH

| Rank | Market | Current Period 2015-2016 | Previous Period 2013-2014 | New Jobs 2016 | 2015- As % New Office Jobs 2015-2016 |
|------|---------------|-----------------------------|------------------------------|------------------|--|
| 1 | San Francisco | 39.4% | 42.7% | 22,367 | 63.2% |
| 2 | Charlotte | 31.6% | 18.6% | 4,630 | 25.1% |
| 3 | Pittsburgh | 31.4% | 14.1% | 4,400 | 95.1% |
| 4 | Indianapolis | 27.6% | 25.7% | 6,182 | 49.0% |
| 5 | Phoenix | 25.4% | 42.7% | 10,731 | 26.0% |

Source: 2017 Tech-30, CBRE Research, 2017

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As has been the case for the past few years, public construction spending remains well under the long-term trend. State fiscal problems are plaguing the higher education market, although a handful of major projects will advance in 2018. PlanCon remains un-reformed and stuck in a moratorium. Among the few major projects that will bid this year are the \$75 million Altoona High School (out to bid now), the \$85 million Peters High School and the \$50 million Franklin Regional Elementary Schools.

Infrastructure work remains competitive. Although Act 89 of 2013 provided a source of significantly higher funds for highway construction, the syphoning off of hundreds of millions of dollars to pay state police expenses and the rising costs of construction have left highway construction in a holding pattern. At the Constructors Association of Western PA's 2018 Construction Market Symposium on March 5, representatives from PennDOT and the Turnpike Commission laid out the plans for lettings in the coming year. Among the major projects coming are:

- Resurfacing and bridge rehabilitation, milepost (MP) 29-36; \$10-\$20 million
- Southern Beltway Section 55A-2; \$30-\$40 million
- Southern Beltway Section 55C2-2; \$30-\$40 million

- Roadway and bridge reconstruction, MP 102-109; over \$50 million
- Southern Beltway Section 55C2-1; over \$50 million
- Bituminous overlay and slope repair, MP 85-99; \$30-\$40 million
- Southern Beltway Section 55M maintenance facility; \$20-\$30 million

PennDOT's District 11, which includes Allegheny and Beaver Counties, announced planned lettings totaling \$378 million in 2018. Among the largest projects scheduled for letting in 2018 are:

- West End Bypass reconstruction; \$15-\$20 million
- I-579 Cap Project (over the Crosstown Expressway); \$26.4 million
- Parkway East, Ft. Pitt Bridge to Edgewood/Swissvale; \$19 million
- 9th Street Bridge: \$25-\$30 million
- Jerome Street Bridge, McKeesport; \$13 million
- Dooker's Hollow Bridge, North Braddock; \$10-\$20 million



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Final data compiled by the Pittsburgh Homebuilding Report for 2017 revealed a continuation of most of the prevailing trends in the Pittsburgh housing market. One of those trends, the heightened level of multi-family construction, continued in spite of the prevailing wisdom that the Pittsburgh market had become overbuilt.

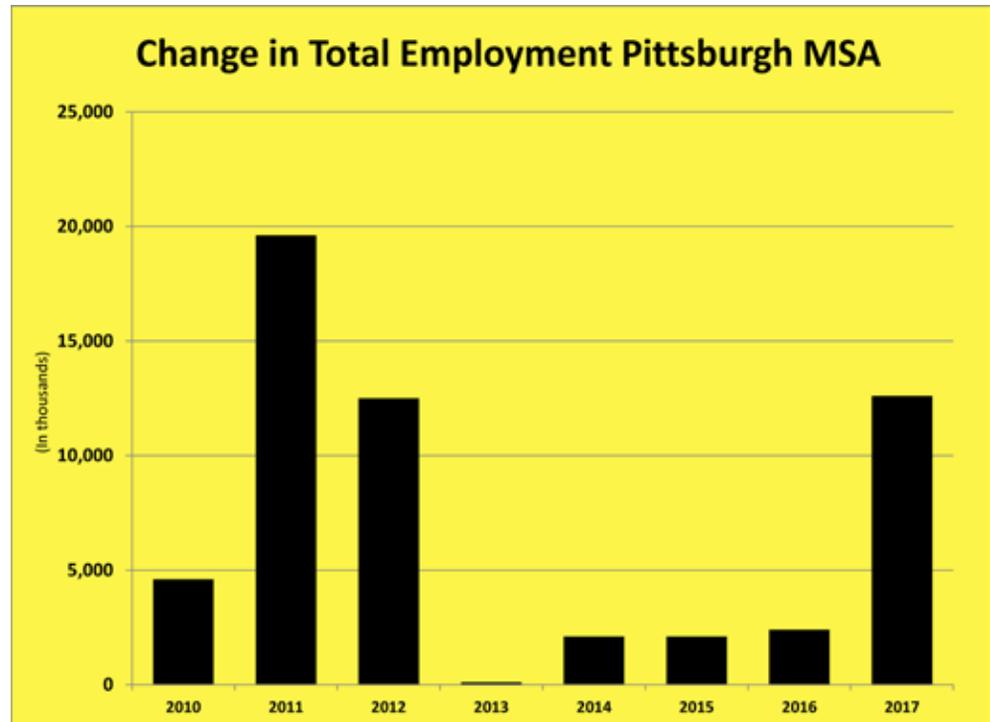
Construction of new apartments and condos peaked in 2013, when 3,227 units were started; however, construction of new multi-family units has remained above 2,100

units in each year since then. Activity in 2017 was expected to decline to around 1,800 units following the construction of 2,134 units in 2016. Lenders were almost unanimous in their growing wariness of the product. Vacancy rates started to climb in early 2017 and rents began to soften by five percent or more. By the spring leasing season, these dynamics reversed and rental rates grew by more than four percent in 2017. Rather than declining, apartment construction increased by 11.0 percent in 2017.

A combination of favorable demographics, stronger job growth – especially in sectors that attract younger workers – and heightened interest from investors drove momentum in new development. The pipeline of proposed new apartments has certainly slowed since 2015, but it seems like a reasonable expectation that the driving factors remain supportive of development and construction of 1,800 new units again in 2018.

The prevailing trends also drove activity in single-family construction in 2017. New construction fell slightly for single-family detached homes but rose by a greater number in single-family attached housing. There were permits for 1,971 new single-family detached homes in 2017, a 6.3 percent decline, and 1,035 single-family attached units, an increase of 25.6 percent.

Development of single-family homes remains severely depressed since the 2007-2008 housing crisis. Financing conditions for residential development continue to elevate the risk for single-family projects beyond what Pittsburgh's conservative developers deem reasonable. Rising land costs and topography



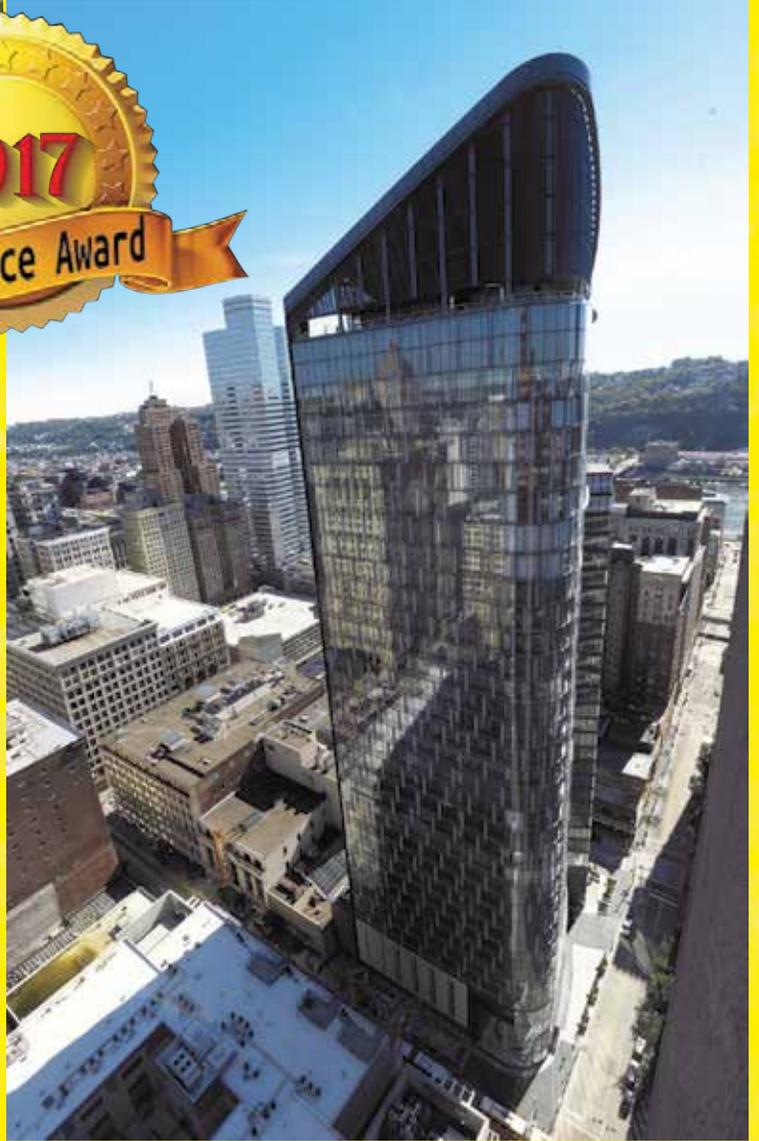
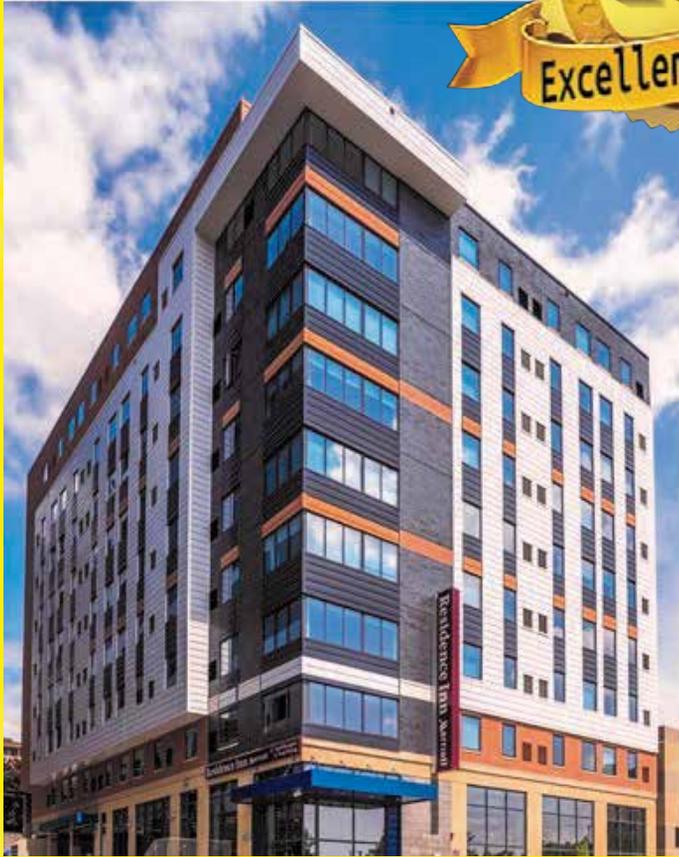
are also making the development of townhomes and attached homes more attractive. An increasing number of “right-sizing” Baby Boomers are driving demand for this product as well. The demand for property within the city’s popular neighborhoods is also creating a bigger market for higher-density products.

Growth in the City of Pittsburgh proper was the other prevailing trend that was manifest in 2017’s data. Permits for new construction – exclusive of adaptive re-use and renovation – topped 1,700 units in Pittsburgh last year. While the construction of 1,465 multi-family units drove this number, it’s worth noting that the 249 single-family units started was 61.6 percent higher than those permitted in Cranberry Township, which had the second-most starts.

Pittsburgh’s economy still lags the rest of the U.S. in unemployment rate, 4.9 percent versus 4.1 percent, but the latest report on average weekly wages showed that Pittsburgh workers earned almost \$80/week more than the average U.S. worker. Average weekly wages fell from January-to-January in most U.S. cities, including Pittsburgh. Workers saw 1.4 percent lower weekly wages in Pittsburgh this year compared to last. Median income in Pittsburgh continued its upward trend in 2017, however. And, employment gains in Pittsburgh in 2017 broke the trend of no growth, with 12,600 jobs added. Job growth in 2017 was 1.4 percent. That rate still lags the benchmark city rate of 1.7 percent but represents an increase in employment that should create demand for new residential and office space. **BG**

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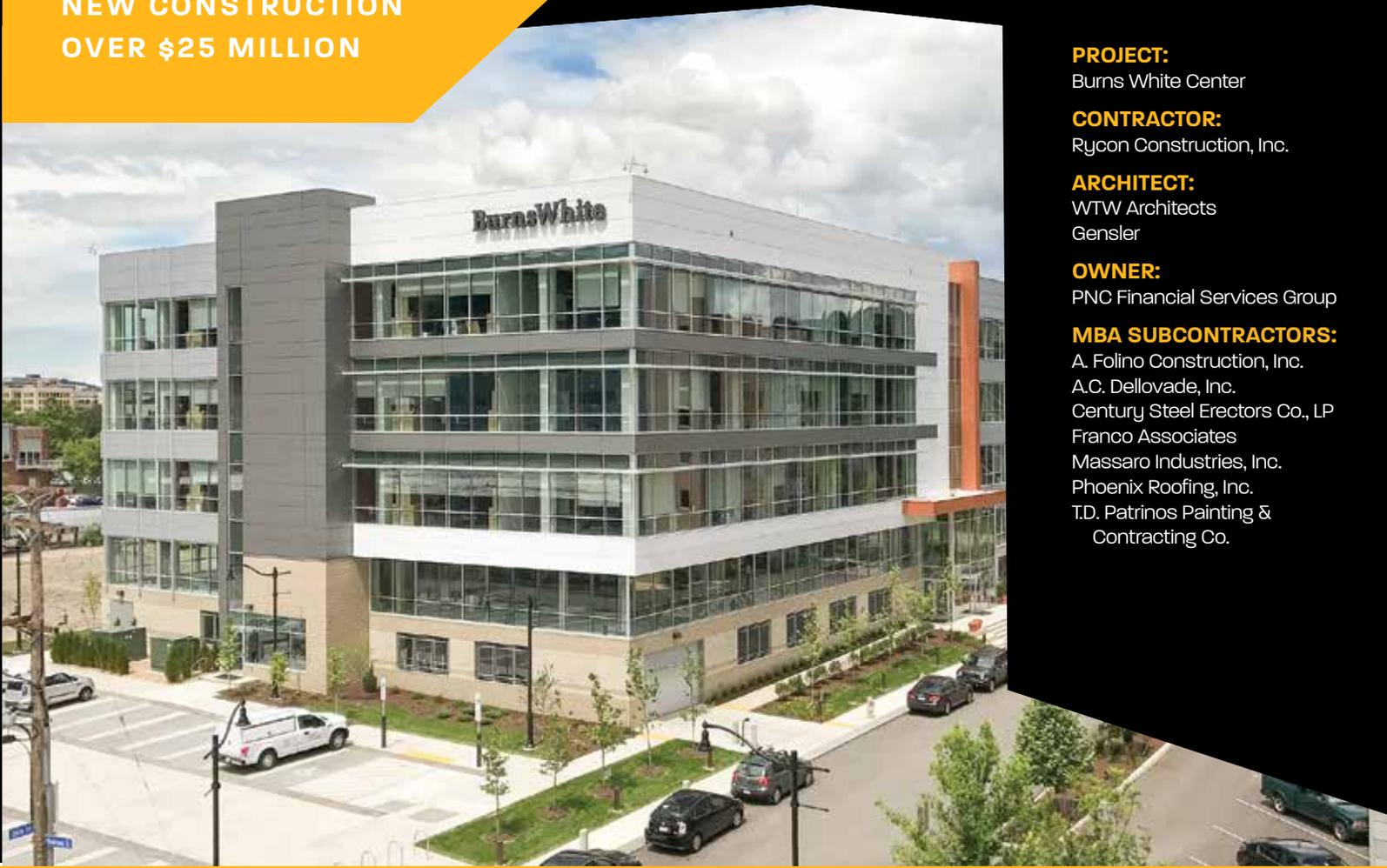


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ARCHITECT:
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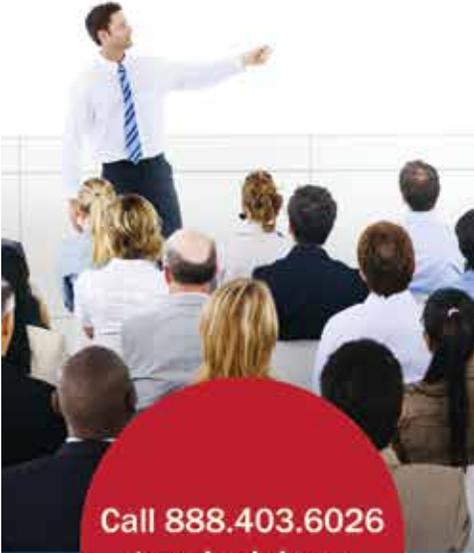
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NATIONAL MARKET UPDATE

A year into the Trump Administration, an economic policy built on growth is beginning to come into focus. Having accomplished two major goals in driving growth – cutting corporate taxes and reducing regulations – the administration is hoping to score additional policy changes that will be supply-side stimuli for increased productivity and business investment.

There are some inherent economic risks associated with supply-side stimulus at this point in the business cycle. Some economists argue that with unemployment at 4.1 percent, there is insufficient slack in the labor force to fuel higher growth, even if investment occurs, without overheating the economy. The pace of wage and commodity price growth has quickened, adding incentive for the Federal Reserve's Open Markets Committee (FOMC) to raise rates each quarter. Less likely – but a greater risk to construction – is the prospect that bond buyers could react to the loose fiscal policy of the U.S. by demanding higher rates, thus pushing borrowing costs up precipitously. This last happened in the late 1990s.

Creating higher growth has clearly outweighed concerns about these potential risks to the economy

thus far in the Trump Administration. Policy changes are new at this point and it will take the balance of 2018 to judge if the measures taken to boost growth have worked or not. For the nation's employers and job-seekers, the current state of the economy is upbeat.

The March 9 report on February job creation far exceeded the consensus of forecasts for the month. According to the Bureau of Labor Statistics, employers added 313,000 jobs to the economy in February, with 287,000 of those added in the private sector. The report also revised upward the growth in January (239,000) and December 2017 (175,000). The diffusion index of 258 industries showed that 68.6 of the industries added jobs. All industry sectors gained jobs in February, with the exception of information services, which was down 12,000 jobs due to declines in telecommunications and motion picture production.

Unemployment remained at 4.1 percent, an indicator that the strong job market is bringing more chronically unemployed persons back into the workforce. That trend is borne out by an increase in workforce participation, in spite of the demographic trends dogging the labor supply.

One underperforming metric in February was the increase in hourly wages, which rose only 2.6 percent over February 2017 (although weekly wages rose 2.9 percent). February's wage growth outstripped the pace of inflation, which is one of the reasons wages haven't been pushed higher by the tight job market. History shows that wages tend to follow inflation, rather than leading inflation higher. Absent a higher overall inflation rate, employers will find it more difficult to pass on wage hikes to customers and will instead see profits erode. Even without higher inflation pressures, the expectation is that hourly wages will continue to grow at a pace closer to three percent throughout 2018.

Two days earlier, the ADP/Moody's Analytics report on private payrolls



American Institute of Architects' monthly billing survey bears out the increased business confidence over the past six months.



The gap between private and public construction spending has narrowed as government investment in structures has increased during the past six months. Source: U.S. Census Bureau

showed the private sector humming along at a high level. Private employers added 235,000 jobs in February, according to the report, which also included an upward revision of the January job creation number to 244,000. As in January, the strong hiring in February reflected the economic optimism of small-

and medium-size businesses about the pro-business Trump Administration. The prospect of lower taxes, fewer regulations and higher growth have businesses beefing up staffing to meet higher demand.

As a result of the strong labor market, markets are now betting that the FOMC will increase the Fed funds rate by 25 basis points four times in 2018, beginning with the March meeting.

The strength of the employment situation is helping to keep consumer spending at elevated levels (although spending growth has slowed somewhat). Job gains help drive demand for office space. Healthy consumer balance sheets and incomes are supporting retail spending, which is driving the demand for warehousing and fulfillment centers, even as retailers struggle to sort out their bricks

and mortar portfolios. Conditions are supportive for a robust construction economy and the results thus far bear out that trend.

Construction spending totaled \$1.263 trillion at a seasonally adjusted annual rate in January, another



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record level before adjusting for inflation, the Census Bureau reported on March 1. Construction spending was essentially flat from December, although there was notable activity in several sectors. Private residential construction dipped as builders struggled to find lots and workers, although single-family spending rose 0.6 percent in January from December. State and federal government spending rose 1.8 percent, led by a 14.9 percent surge in federal spending. Offsetting the public spending was a 2.7 percent decline in commercial real estate construction. The commercial spending decline was not unexpected, as a result of the Tax Cuts and Jobs Bill of 2017.

In its haste to pass the tax cuts at the end of 2017, Congress crafted legislation that left much more work on the details and rules for the IRS to sort out than usual. With regard to several rules important to commercial real estate – including the carried interest deduction – there are potential revisions or clarifications that will need to be made by the IRS to remove uncertainty about commercial real estate tax liability under the new law. Developers looking to accelerate projects under the new tax environment are waiting to see the clarifications to avoid making a hasty decision that could have negative consequences. The Tax Cuts and Jobs Act of 2017 is decidedly positive overall for

commercial real estate ownership and development, so observers expect it to boost new construction once the technical uncertainty is removed.

Residential construction volume remains below the long-term trend for household formations but continues to rise steadily; and tax reform is having a noticeable – although not dramatic – impact on residential demand.

The Census Bureau reported on February 16 that “privately-owned housing starts in January were at a seasonally adjusted annual rate of 1,326,000. This is 9.7 percent above the revised December estimate of 1,209,000 and is 7.3 percent above the January 2017 rate of 1,236,000. Single-family housing starts in January were at a rate of 877,000; this is 3.7 percent above the revised December figure of 846,000. The January rate for units in multi-family buildings with five units or more was 431,000.”

Total housing starts for 2017 showed continued slow recovery and unexpected strength in multi-family construction. There were 852,800 single-family detached and attached homes started in 2017 (817,000 detached units) and 411,000 starts of five units or more, which is the Census Bureau’s definition of multi-family. That’s 6.2 percent lower than the 2016 multi-family



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 - * Dave Rainsford—Associated Steam
Basics of Steam—Steam Distribution,
Steam Traps, Steam System Efficiency

** Each PDH Session is 90 minutes. Choose one of the three.*
 - 10:30 a.m. — 12:00 p.m.
 - * Gary Stauffer—SPX
Variable Flow Over Multiple Cooling Towers
for Energy Savings
 - * Jim Nolan—Bell & Gossett
Modern Pump Selection for System Efficiency
 - * Adam Meddaugh—Daikin Applied
The Future of HVAC Refrigerants

** Each PDH Session is 90 minutes. Choose one of the three.*
 - 12:00 noon — 12:30 p.m. Lunch Break - (Hot Lunch Provided)
 - 12:30 p.m. — 2:00 p.m.
 - * Madhav Kashinath—Daikin North America
Optimizing VRF Performance with
Refrigerant Temperature Control
 - * Steve Hoffman—Honeywell
HVAC Control Fundamentals

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- When:** Friday, April 13, 2018
9 am.—2 p.m.
- Where:** Steamfitters Technology Center
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 Nick Kappas: njk@ua449.com
 Brad Tisdale: bct@ua449.com

total but higher than any other year since 1990.

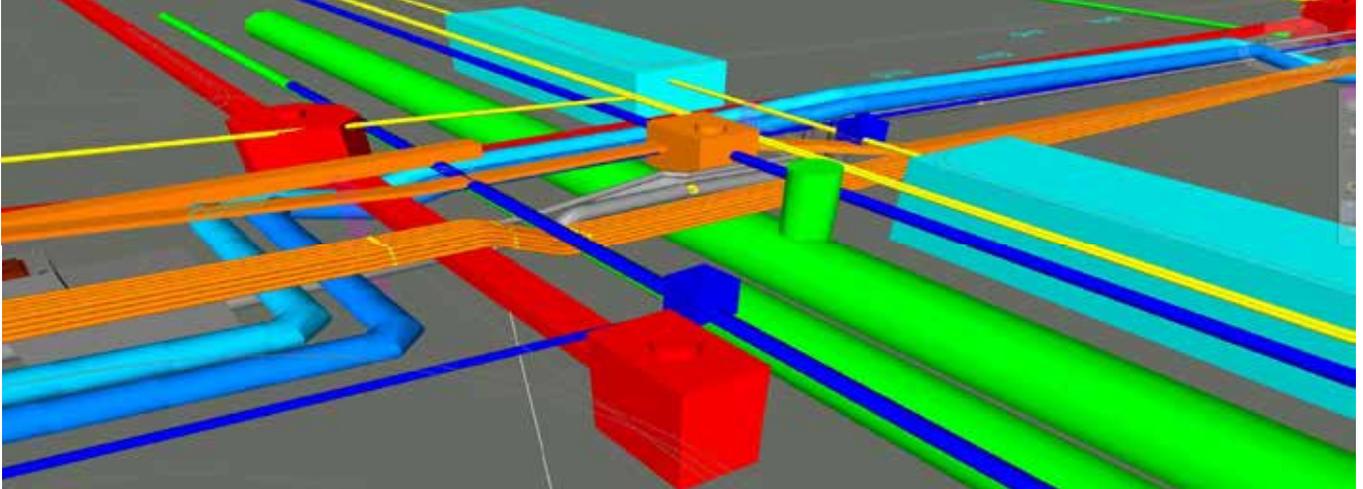
Multi-family construction appears to be gaining momentum again in 2018. During the second and third quarters of 2017, the number of multi-family starts declined 4.7 percent, owing in part to better economic conditions and rents that had risen above the level of home ownership affordability in many markets. There were signs that the Millennial generation was beginning to move into home ownership in larger numbers. By the final quarter of 2017, however, construction rebounded. The National Association of Home Builders (NAHB) reported recently that its Multi-family Production Index (MPI) gained seven points to 53 in the fourth quarter of 2017. In addition to the jump in multi-family starts in January, the Census Bureau reported that completions of apartments fell to 305,000, a gap of 126,000 units compared to starts. And the provisions of the Tax Cuts and Jobs Bill of 2017 that cap state and local tax deductions and mortgage interest deductions have been blamed for a slowdown in home shopping traffic and slightly higher demand for renting.

When the American Institute of Architects released its

monthly Architectural Billings Index (ABI) on February 21, the data showed increased activity in January, marking 11 of the past 12 months of higher billings. Moreover, an examination of the past three years reveals that the trend of higher billings is sharply up from the low of that period, which occurred in September 2016.

The ABI survey, which asks member firms if billings are up or down for that month, also appears to reflect the heightened business optimism that resulted from the lowering of the corporate tax rates. Responses about higher or lower numbers of inquiries for architectural services have remained somewhat flat – albeit at a high level – during the same period of time, suggesting that project owners have not increased the number of projects being proposed but have been more decisive in releasing projects on the boards for design completion. As an indication of how the economy is impacting construction, the latter trend reflects the confidence of owners to invest for future growth. That should drive construction higher for the seventh consecutive year in 2018. **BG**





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WHAT'S IT COST?

Virtually all cost data and influences are pointing to significantly higher prices for the materials and products that are used in construction. The February 15 report on consumer and producer prices by the Bureau of Labor Statistics (BLS) showed that producer price index (PPI) for final demand rose 0.6 percent from December to January and 2.7 percent year-over-year. The PPI for final demand construction experienced the largest year-over-year increase since March 2014, increasing 0.8 percent for the month and 3.4 percent compared to January 2017.

Within the BLS were several ominous trends for construction costs; moreover, events beyond the supply and demand dynamics of the business cycle are pushing prices higher for construction than for general producer or consumer inflation.

Among the biggest jumps in year-over-year pricing were increases for diesel fuel (up 3.2 percent in January and 43 percent year-over-year); copper and brass mill shapes (5.4 percent and 18 percent); lumber and plywood (0.8 percent and 12 percent); aluminum mill shapes, (-1.4 percent and 11 percent); gypsum products, (2.3 percent and 7.0 percent); steel mill products, (0.1 percent and 5.3 percent); and transportation (1.4 percent and 5.2 percent).

Hikes in freight charges are being driven by several factors, none of which appears to be abating. The higher price of diesel is being passed on to customers as expected, but a shortage of available trucks and drivers has also become severe. A new federal regulation requiring truckers to electronically track their hours behind the wheel has lengthened delivery times for long hauls and kept drivers off the road. A Wall Street Journal report on February 7 noted that freight customers with last-minute shipments had paid premiums of as much as 30 percent.

The February BLS report showed that PPIs for inputs to seven types of new nonresidential structures had increases ranging from 3.8 percent for industrial buildings to 5.6 percent for power and communications structures. PPIs for inputs to new residential structures rose 4.3 percent for single-family housing and 3.9 percent for multifamily.

IHS Markit and the Procurement Executives Group (PEG) reported that their research on February's costs showed marked increases too. The headline HIS-PEG index registered 58.9, up 2.6 points compared to

January. The index surveys procurement executives and ratings over 50 indicate rising price pressures. The materials/equipment price index posted a 57.4 figure in February, falling from the stronger January figure of 58.9, indicating prices rising at a slightly slower pace in February. The reading on subcontractor prices was up sharply in February, jumping to 62.2 from 50.3 the previous month.

The National Highway Construction Cost Index increased 4.2 percent from March to June 2017 and 3.4 percent from June to September, according to the Federal Highway Administration's report in late January. These were the highest quarterly increases since September 2014.

In the midst of this tightening supply environment, construction demand is expected to again increase in 2018. Those conditions make the Trump Administration's proposed tariffs on steel and aluminum – and threats of other goods – an even bigger concern for the construction industry than similar measures that might have occurred in 2017. **BC**

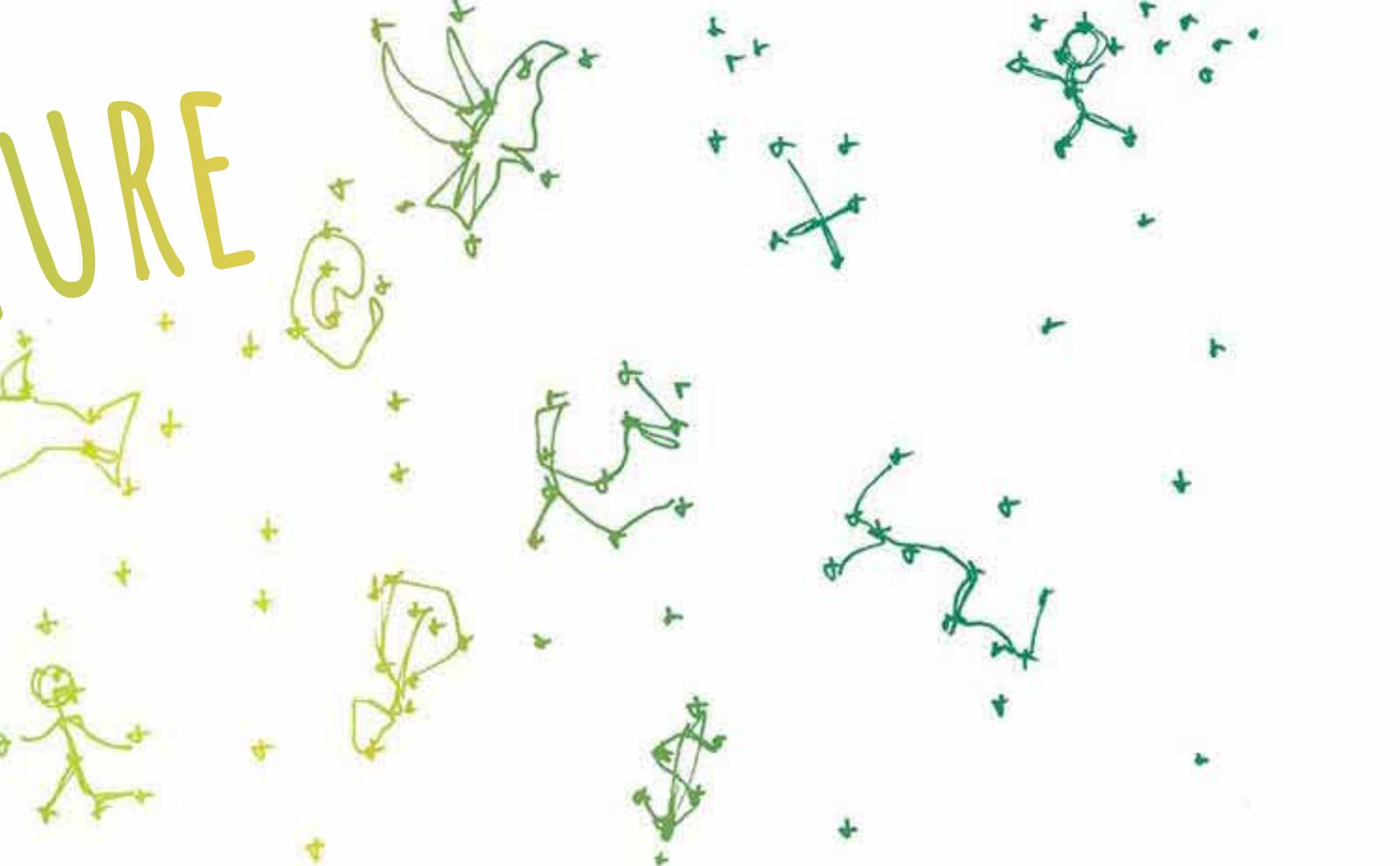
| PERCENTAGE CHANGES IN COSTS | Jan 2018 compared to | | |
|--|----------------------|-------|-------|
| | 1 mo. | 3 mo. | 1 yr. |
| Consumer, Producer & Construction Prices | | | |
| Consumer price index (CPI-U) | 0.5 | 0.5 | 2.1 |
| Producer price index (PPI) for final demand | 0.6 | 0.4 | 2.7 |
| PPI for final demand construction | 0.8 | 0.5 | 3.4 |
| Costs by Construction Types/Subcontractors | | | |
| New warehouse construction | 0.3 | 0.5 | 3.5 |
| New school construction | 1.4 | 1.0 | 4.2 |
| New office construction | 0.5 | 0.3 | 2.5 |
| New industrial building construction | 1.0 | 0.6 | 4.6 |
| New health care building construction | 0.4 | 0.1 | 3.4 |
| Concrete contractors, nonresidential | 0.4 | 0.2 | 3.4 |
| Roofing contractors, nonresidential | (0.1) | 0.2 | 1.1 |
| Electrical contractors, nonresidential | 0.8 | 1.0 | 4.3 |
| Plumbing contractors, nonresidential | 0.9 | 0.8 | 4.3 |
| Construction wages and benefits | N/A | 0.4 | 2.4 |
| Architectural services | 0.0 | 0.0 | 2.2 |
| Costs for Specific Construction Inputs | | | |
| #2 diesel fuel | 3.2 | 5.7 | 43.4 |
| Asphalt paving mixtures and blocks | 6.2 | 5.7 | (0.4) |
| Cement | 1.1 | 0.8 | 3.1 |
| Concrete products | 0.4 | 0.8 | 2.7 |
| Brick and structural clay tile | 0.3 | 0.6 | 2.6 |
| Plastic construction products | (0.3) | 0.0 | 4.1 |
| Flat glass | 0.7 | 1.3 | 1.8 |
| Gypsum products | 2.3 | 2.2 | 7.0 |
| Lumber and plywood | 0.8 | 1.7 | 11.8 |
| Architectural coatings | 0.8 | 1.0 | 2.9 |
| Steel mill products | 2.8 | 1.4 | 10.1 |
| Copper and brass mill shapes | 5.4 | 5.4 | 18.0 |
| Aluminum mill shapes | 1.4 | 0.3 | 10.9 |
| Fabricated structural metal | 1.2 | 0.8 | 3.1 |
| Iron and steel scrap | 12.9 | 17.8 | 14.7 |
| Source: Bureau of Labor Statistics, Updated February 15, 2017 Compiled by Ken Simonson, AGC Chief Economist | | | |

BUILDINGS OF THE FUTURE

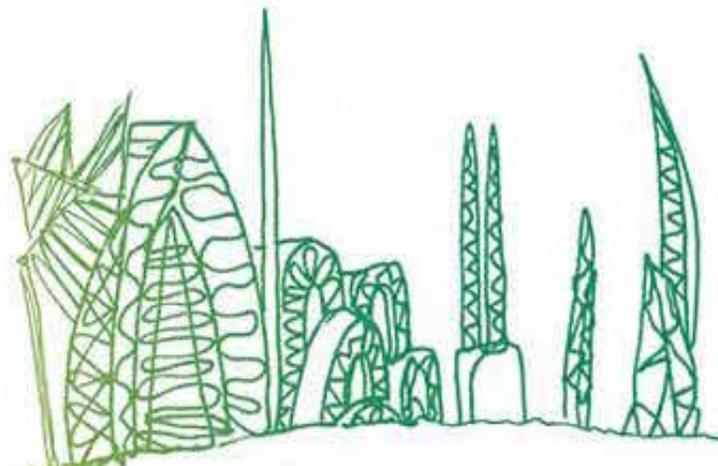
BOTTOM LINE BENEFITS -
IS "PROVE IT" THE ENEMY OF INNOVATION?



URE



THE MAJORITY HAS ALMOST ALWAYS HAD A THING FOR PLAYING IT SAFE. NO ONE WANTS TO BE WRONG. SO, WE SHOULDN'T BE SURPRISED WHEN THE CASE FOR A NEW INNOVATION NARRATIVE MEETS WITH OUR BEST DEFENSE OF 'BUSINESS AS USUAL'. BUT WHEN FAMOUS ARCHITECT NORMAN FOSTER ADMITS TO GETTING IT WRONG ON APPLE'S RECENTLY CONSTRUCTED HEADQUARTERS, THERE'S DEFINITELY CAUSE FOR CONCERN. FOSTER'S PRACTICE SPENT THE PAST EIGHT YEARS DESIGNING APPLE'S CAMPUS 2 — BUT, LOOKING BACK, REGRETS THAT THE HEADQUARTERS FEATURE A MASSIVE UNDERGROUND GARAGE FOR 11,000 VEHICLES. THE COST OF DIGGING A DEEP, DARK UNDERGROUND CAVERN IS HUGE. TODAY, THIS IS AN AMENITY BUT, IN FUTURE, AS TRANSPORTATION PATTERNS EVOLVE, PARKING GARAGES MAY VERY WELL BECOME OBSOLETE. FOSTER CAUTIONS OTHERS THAT "BY RETHINKING THE SPACES DURING THE DESIGN STAGE, BUILDING OWNERS CAN ENSURE THAT GARAGES CAN BE RETROFITTED INTO HABITABLE SPACE WHEN GARAGES BECOME LESS IMPORTANT...A LONG-TERM VIEW OF A BUILDING IS MUCH MORE THAN DESIGNING 'OPEN PLAN' OFFICE SPACES..."



LIFE-CYCLE COST OF A BUILDING

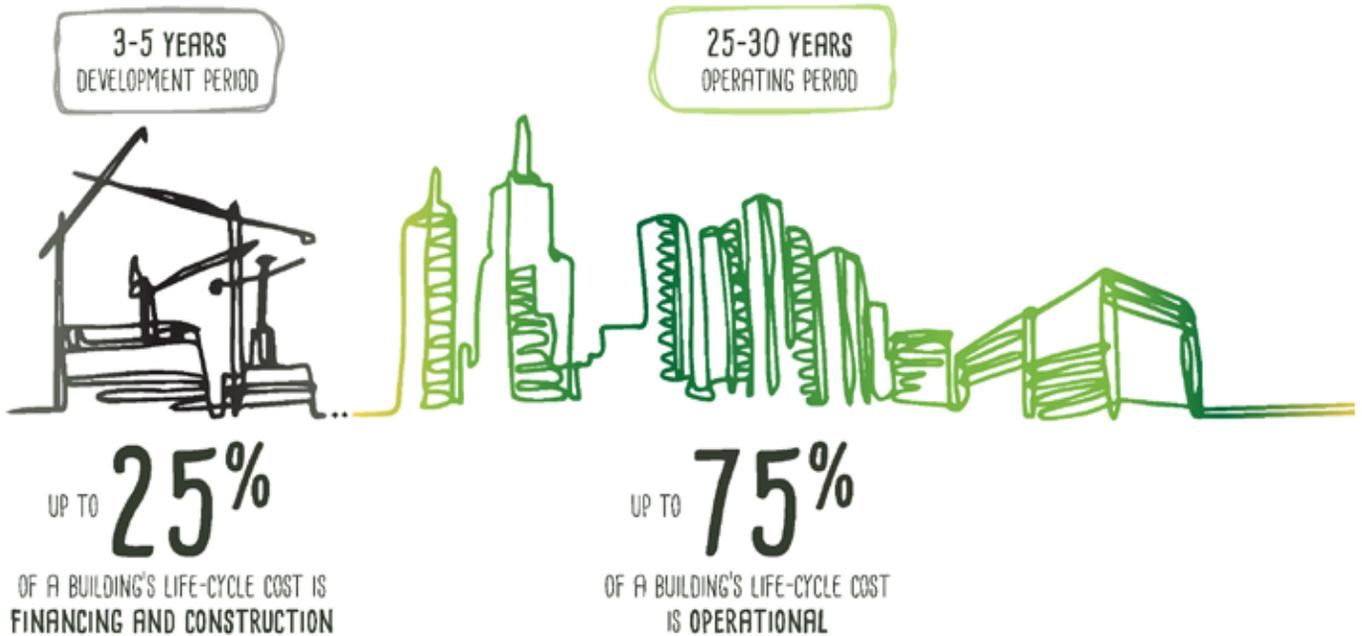


Fig. 2

Source: <https://www.schneider-electric.com.au/documents/buildings/BuildingsOverview.pdf>



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Foster's practice spent the past eight years designing Apple's Campus 2 — but, looking back, regrets that the headquarters feature a massive underground garage for 11,000 vehicles. The cost of digging a deep, dark underground cavern is huge. Today, this is an amenity but, in future, as transportation patterns evolve, parking garages may very well become obsolete. Foster cautions others that "By rethinking the spaces during the design stage, building owners can ensure that garages can be retrofitted into habitable space when garages become less important...A long-term view of a building is much more than designing 'open plan' office spaces..."

Of course, everyone wants Buildings of the Future to pay off in our back pockets, but cost-value equations that champion future buildings' return on investment simply don't exist yet. And all our traditional design methods and delivery models tend to block innovation before it is able to take a step out of the door. In the constant effort to 'prove it', we are forced back into short-term thinking, and we spend our time delivering interim solutions rather than exploring the long-term possibilities of intelligent future design.

The truth is, we don't have the tools or language to make the guarantees that they will pay off. Intelligent building design is carving out fresh tracks as we go, and there's little by way of historical precedence to provide the landmarks for the journey.

Dividing net profits by total assets is no longer an acceptable way to determine the 'profit' of the building. The equation is far more complex than this, and includes a building's ability to provide a healthy working environment — and thereby reduce absenteeism; its ability to attract top talent; to create the perception of value to influence rental returns; and successfully support corporate strategy elements such as environmental responsibility and collaboration.

This paper explores why and how our thinking around return on investment (ROI) needs to evolve. It will explore a new narrative around the ROI of intelligent buildings and is a call for a new ROI model that reflects the importance of designing buildings for the long term and looks at both the financial and non-financial benefits of intelligent buildings.

The ROI analysis of the future is far more three dimensional in its approach — presenting the elements of design as interconnected pieces of a living and dynamic puzzle. The drivers of a building's ROI have also shifted to include aspects that everyone from building owners to occupants can intuit and harness its compound value. The 'estimated' (or 'perceived') and 'actual' costs of constructing a sustainable building can be very different.

Proving value starts at the design phase

Solving the investment conundrum is a key hurdle for Buildings of the Future. Often, initiatives get culled during the schematic design and design development stages because we don't yet have the necessary financial models to convey the message.

Efficiencies in operations, building practices and response to climate change are at the heart of innovation in the building of the future.

To solve the investment conundrum, we will need to focus on improving the tools we use to calculate the cost-value equation. We'll need to develop better metrics to support the business case for Buildings of the Future, and take advantage of government incentives to foster innovation in this field.

The first step in proving the value of an innovation should start at the design stage. This involves working hand in hand with

a client to identify which innovations will provide real value and instill a shared understanding of the vision. For example, space optimization doesn't only involve asking "how small can we make the space?" Rather, it involves understanding a client's future space requirements and the need for flexible design, which will minimize long-term operational costs.

Returns on investment aren't always financial

Traditionally, when calculating the cost of a building, two factors were taken into consideration: the start-up cost and the cost of construction. Buildings of the Future demand a more robust and full-bodied evaluation of their ROI.

A holistic approach is needed because everything from operating and maintenance costs, employee comfort and productivity, as well as the building's ability to attract prospective tenants needs to be considered.

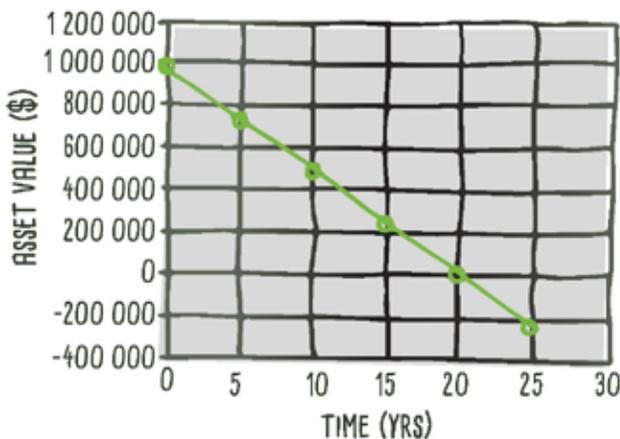
A holistic ROI package will account for energy savings on operational efficiencies, for example, as well as tax incentives from the resulting utility savings. Employee satisfaction and increased productivity also lead the pay back picture to become much more complex than kilowatt savings alone.

Energy savings have typically been the main financial driver for sustainable buildings (which makes sense, since building automation and integrated control systems can save 10-40 percent on electricity bills alone). In fact, buildings achieving Green Star certification in Australia have been shown to

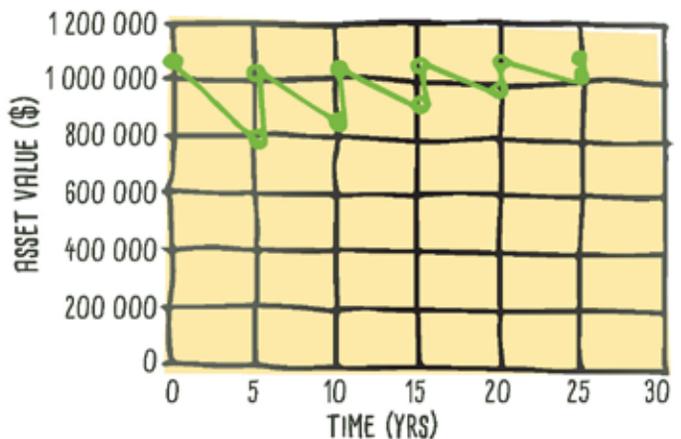
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consume considerably less energy and therefore produce 62 percent fewer greenhouse gas emissions than average Australian buildings. But simply focusing on the hard numbers won't embrace the full ROI for intelligent design. There's more to the story than energy savings alone.

Today's war on talent requires a physical environment that can match its people's creative and innovative spirit. That's where the benefits of sensor technologies play out, offering invaluable insight into the way in which people interact with their built environments. Analytics track the effect of air quality, acoustics and natural lighting on employee well-being and productivity. A healthier work environment

For most businesses, that 10 percent boost is enough to completely change the game.

And the good news is these options apply to existing buildings as much as intelligent ones. The Internet of Things is helping to bring old buildings into the future.

Taking a long-term view of investment is key.

Taking a short-term view could lead you to end up with wasted space, inefficient designs and inflexible stories within your building.

Looking at what is needed today and in the short-term can

Driving smart investment

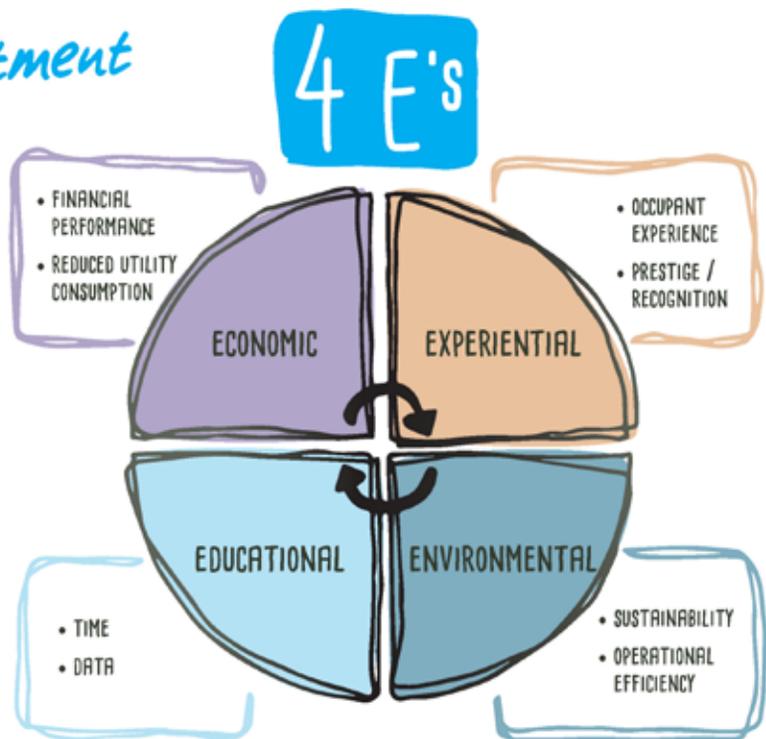
There are four key areas, that drive smart investment into Buildings of the Future. We like to call them the 4 E's.

Educational – How can we turn a building into a living, breathing example of good design?

Economic – How can we increase a building's ROI?

Experiential – How can we increase productivity in a building?

Environmental – How can a building benefit the community and environment?



means less days at home in bed and more time to innovate with engaged colleagues. And the more these interdependencies are understood, the more changes can be made to the overall design of the building which, in turn, boosts staff engagement, customer service, 'rentability', while reducing building maintenance.

While these aspects may seem like 'soft' benefits because they aren't always easy to quantify, they carry a very real return on investment.

According to the Green Building Council of Australia, when Indoor Environmental Quality (IEQ) elements are given good attention, productivity increases by up to 10 percent.

lead you to miss the disruptors on the horizon (much like Apple's parking garage). When you consider 75 percent of a building's life-cycle cost is operational compared to 25 percent in the development period, the investment focus should be in the operational phase.

Today, legislation can also present significant disruption for those who don't invest in the right tools and methodologies from the outset. The building sector is still lagging behind the implications of buildings becoming micro-energy hubs. The European Commission is currently proposing a voluntary scheme for rating the 'smart readiness' of buildings. The scheme, which is expected to be adopted by the end of 2019, will include the development of a Smart Readiness

Indicator (SRI) and a methodology to calculate this. The SRI will measure a building's capacity to use Information Communication Technology (ICT) and electronic systems to optimize operation and interact with the grid.

While it's true that in the short-term, Buildings of the Future have marginally higher start-up costs (2-6 percent more expensive than that of traditional buildings), many buildings can boast that ROI is achieved within six months to two years.

With focus given to heating, ventilation and air conditioning (HVAC), lighting, and some types of electrical loads, operating costs can be reduced anywhere between 10-50 percent. Maintenance costs are between 8-12 percent lower; employee productivity increases by ten percent; and landlords can charge five percent more for premium property rentals. All of these statistics offer significant savings down the line and it's also important to remember, as the cost of new technologies continues to become more affordable, even the initial cost of a Building of the Future will decrease in time.

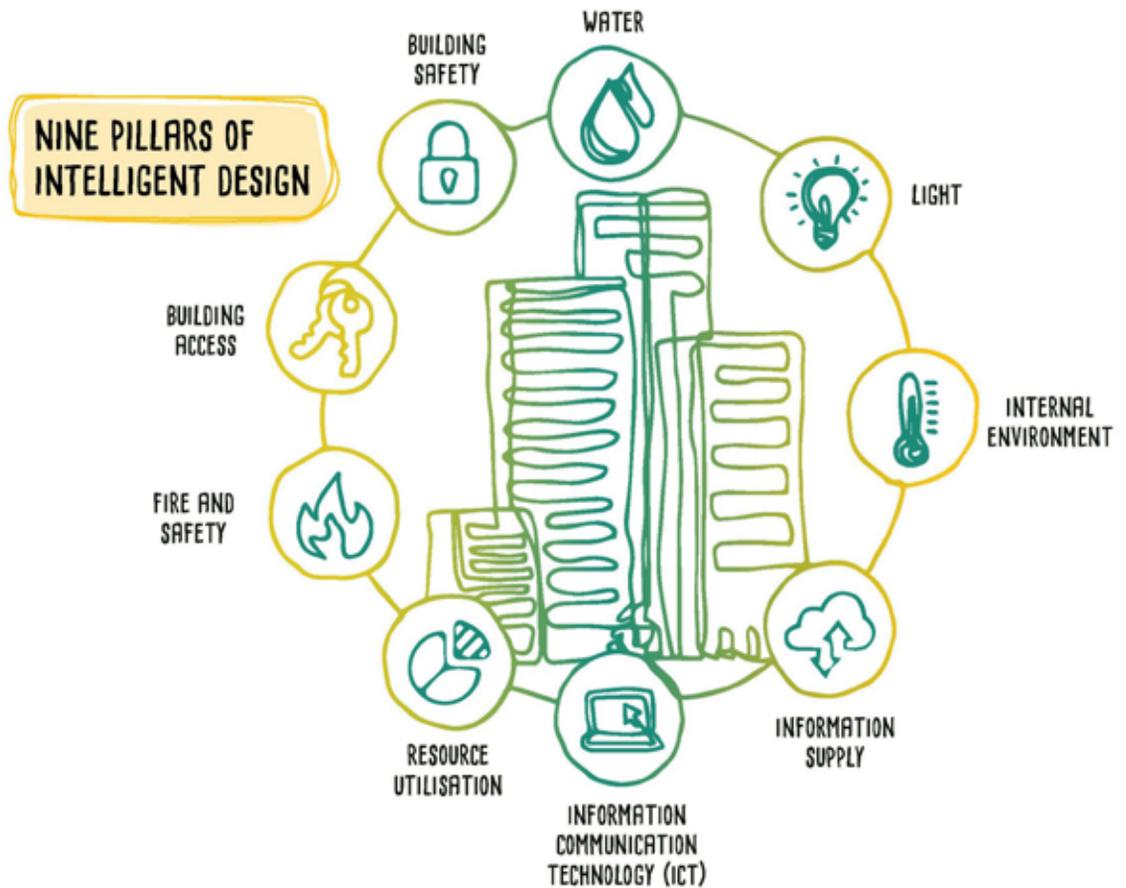
Thinking of designing a building? Forget what you know!

Once we've included long-term thinking and non-financial returns in the ROI equation, we also need to consider the changing nature of construction design and materials.

Prefabricated construction, automated technology such as robotics to install these prefabricated construction materials, and additive printing are all construction technologies that can be implemented to make not only construction but also building maintenance easier — driving down short- and long-term costs.

These buildings will be highly accurate, with small tolerances. They will achieve a high quality finish throughout any story level and will be fully planned and documented very quickly. Because they will be manufactured, not built, there will be reduced weather delays and waste, and carbon

generation and site time will be reduced. This safer way to build will require only low or semi-skilled labor for fast onsite assembly/installation.



In the future, the ROI on a 3D printed building assembled in 'next to no time' could be almost immediate, with its parts integrated into a digital model of the building that makes maintenance a cinch.

Staying one step ahead

Beyond construction and maintenance, the way we maintain our buildings is also set to undergo a significant evolution, enabled by the advent and progression of digital technology. Like anything that is smart or intelligent, Buildings of the Future have a nervous system. These embedded digital 'organs' capture and monitor consumption and usage in

order to optimize building performance over the long haul. It's a far more fascinating venture that demands an equal amount of learning and unlearning from stakeholders.

"Thanks to the Internet of Things (IoT) and blockchain, Buildings of the Future are becoming living canvases that, through ongoing and real-time feedback, keep speaking to us about how we can do design better, smarter, safer."

Predicting versus reacting

"If it ain't broke, don't fix it." How often have we heard that before? But the problem with a traditional 'wait until it breaks' approach to building is that: one, things always break; and two, it's always more expensive than you planned. According to the International Facility Management Association, maintenance typically accounts for 35 percent of a facility's operational cost.

Within the new building model, this reactive approach to fixing the problem is moving to a more proactive posture of anticipating the problem before it arrives. While a preventative maintenance approach relies on performing regular, prescheduled maintenance checks and repairs, a better way to go about it is by using a predictive maintenance approach based on the actual condition of the equipment. In this way, repairs and maintenance are prioritized according to what the building owner and operator deem important.

The ROI success story speaks for itself, with 70-75 percent fewer breakdowns, 35-45 percent reduction in downtime, 20-25 percent increase in production and a ten percent ROI. When supported by analytics, an optimized system can reduce a building's maintenance and energy costs by up to 20 percent.

When analytics and predictive maintenance are coupled, building owners and operators have real-time information that allows them to make decisions quicker and easier. System faults and physical malfunctions are fast detected and dealt with accurately, which sets a positive ripple effect into motion. Operational costs are reduced, as the overall process becomes more efficient. Instead of playing guessing games, with breakdowns only a matter of time, designers and patrons of future buildings can keep their finger on the pulse of their

assets and even see them improve over time.

With this new approach, the asset performance over a life cycle could change from a linear reduction to a saw tooth drop and rise, maintaining a higher valued asset.

A new kind of learning

The analytics around these maintenance systems are robust. Stakeholders will look at everything from maintenance logs to inspection reports, repair invoices to warranty claims, and operator profiles to test results, when building resilient systems.

Analytics will even go a step further and analyze patterns of



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Pittsburgh Ballet Theatre

The Byham Center for Dance



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Congratulations to Pittsburgh Ballet Theatre on their new Byham Center for Dance. A 14,000-square-foot annex that is connected to the PBT's current building. This new center houses two dance studios, expanded facilities for Pilates and fitness classes, and a more spacious environment for students.

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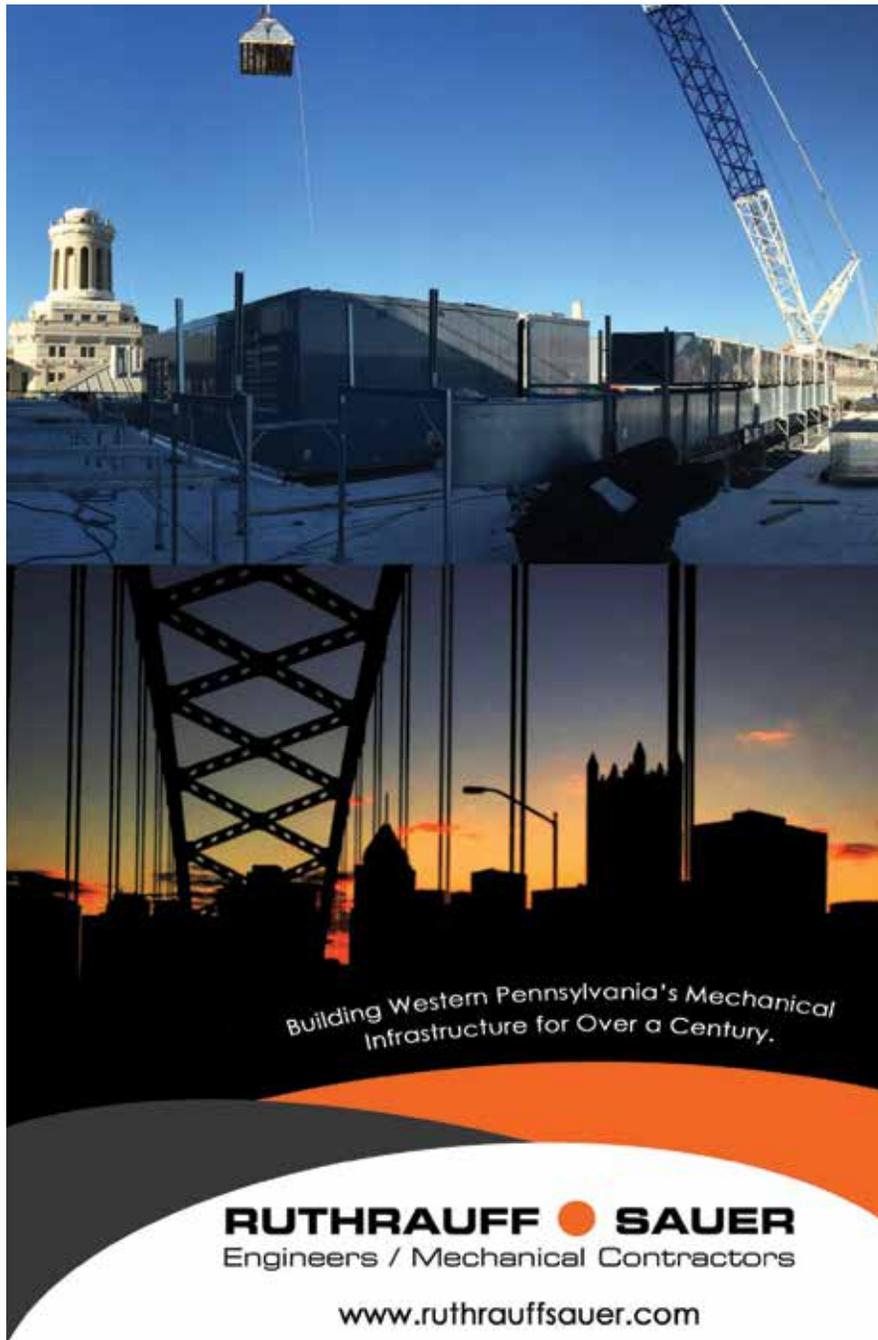


frequent failures; identify ineffective repair methods; match the best usage of lights and energy to environmental controls that react to weather patterns and occupancy.

These algorithms and 'machine learning' will be able to make the 'smartest' maintenance choices almost instantly and precise calls will be made around predictive failure almost immediately, which will allow businesses to focus on the more important matter of serving clients and delivering to shareholders.

Leaping forward

Leapfrog technologies such as blockchain and cryptocurrencies will also have a large impact on facilities



management that investors should consider. Facilities will be run smarter and also be able to run themselves due to self-executing contracts that can preschedule, monitor and automate processes that needed manual interventions in the past.

Cryptocurrency can be used to short-circuit the need for time-consuming administration logs of maintenance contracts and tasks.

There will be greater transparency in the supply chain records of intelligent buildings thanks to public ledgers that connect the physical to the digital world by housing a digital version of assets, maintenance and costs. Manual, routine tasks such as rubbish collection will become 'on demand' tasks to sensors that can report when the bins are full and need to be collected and emptied; robots may be used to welcome staff, and the entire building will become a living organism that knows occupants' meeting schedules, the way they use the building and how to optimize the spaces for them.

Driving smart investment

There are four key areas that drive smart investment into Buildings of the Future. We like to call them the 4 E's.

Educational — How can we turn a building into a living, breathing example of good design?

Economic — How can we increase a building's ROI?

Experiential — How can we increase productivity in a building?

Environmental — How can a building benefit the community and environment?

Here's how these key factors have played out in two of Aurecon's recent projects, to build a considerable case for the smart design of Buildings of the Future:

Educational

When we first pitched the vision of today's Aurecon Centre, home base for 700 Melbourne staff, the goal was pretty straightforward. We wanted to be an example of what a smart, green, connected and innovative building should look like. The task of getting there, however, was rather more oblique.

With market-leading standards for air quality, energy efficiency and sustainability

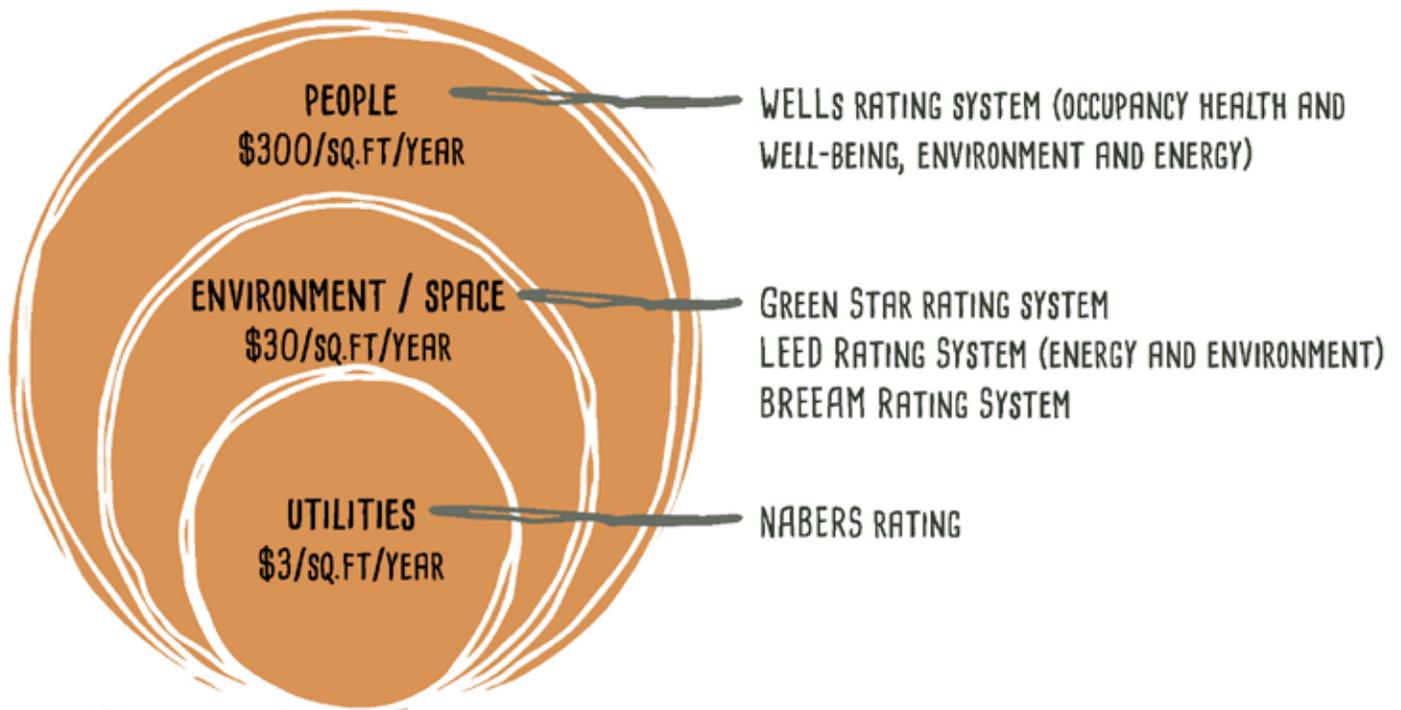


Fig. 5 *The rating systems that apply to the 3/30/300 model.*

- ✓ **PEOPLE SHOULD BE CENTRAL TO THE DESIGN IMPERATIVE**
- ✓ **FAILING TO INCORPORATE HUMAN-CENTRED DESIGN LEADS TO WASTED ECONOMIC OPPORTUNITIES**

driving design, key data that was needed to build our innovative portfolio was either inconsistent, or it simply wasn't around yet. Integration systems were inadequate and failed to paint a picture of the kind of value we could derive from our proposed model of integrated sustainable design. We knew full well that technology for the sake of technology didn't make a building intelligent, especially if those systems didn't continue to optimize the building's performance and the people's well-being. But we didn't know exactly how to integrate those innovative elements into a cohesive whole that would achieve this intelligent picture.

The learning experience has helped us mitigate risks to reduce initial building costs and use these systems to maximize operational efficiency and predictive maintenance.

Since then, we are far more equipped to understand the interdependent nature of each design element as it relates to the integrated whole.

Thanks to the opportunity to experiment, fail and refine as we go, the Aurecon Centre project gave us ample legroom to run with new ideas and see them come to life. We gathered up expertise in the area of green building — knowledge that we have been able to share since then within the engineering industry.

Our holistic approach to designing Buildings of the Future now includes a triple bottom line, where the economic, social and environmental benefits of design are built into the big picture on strategic sustainability.

Economic

On average, a Building of the Future only requires 2-6 percent more upfront capital. If done well, the full payback to this investment could be as soon as six months. Intelligent buildings can offer tremendous economic incentives, and the new Corporate Headquarters for client Transport Accident Commission (TAC) in the city of Geelong in Victoria, Australia, which Aurecon designed, is no exception.

Over the past four years, we have been able to reduce the TAC's energy consumption by 40 percent.

This is due to a series of rigorous energy saving initiatives, which include fully-automated energy efficient lighting; smart, customized air controls; and a rather funky building façade that reduces energy consumption. Grey, double glazed low-e glass

eliminates glare and traps heat on the surface, creating a natural heating system for the building. Altogether, from 2014-2015, the Centre saved approximately \$109,472 in energy consumption and, in 2015-2016, gas consumption was optimized by an average of 23 percent.

Experiential

The rapidly accepted 3/30/300 model says that for every \$3 per square foot that organizations spend on energy, they spend \$30 on rent and \$300 on their employees' salaries and benefits. People are always central to the design imperative. So, addressing their needs should be the highest priority when developing intelligent building technologies.

Aurecon saw productivity levels increase by 8 percent when designing the Aurecon Centre. Due to the fact that the building was situated close to traffic and transportation systems, we implemented noise reduction initiatives and better spatial design to overcome these factors. Temperature controls and systems to regulate air quality were part of the overall intelligent design. According to a sick building syndrome study of the facility, staff health improved by 11 percent. Not only was the occupational experience vastly improved, but so was the reputation of Buildings of the Future to draw and retain talent with better working conditions in place.

Environmental

Given the ubiquity of climate change and the pressure of urbanization on our already-overpopulated city spaces, future-proofing our buildings just makes sense.

"The less negative impact a design can have on the environment, the greater benefit it may prove to have in the long run."

But going green is not just a once-off investment. A sustainable building is not deemed sustainable, because you plug green elements into the initial design alone. Rather, what makes a building green is the degree to which smart, connected systems interweave and continue to optimize operational efficiency over time.

Operational efficiency has been enhanced at TAC Headquarters. The TAC is now a green building, having achieved an initial 4.5 Green Star rating from the Green Buildings Council of Australia (GBCA), which was later optimized to a 5 Green

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Star rating. We were able to reduce the carbon footprint by 50 percent and increase the solar energy generation on the premises by 7.9 percent per year. Additionally, the greenhouse gas emissions that were generated from running the building have decreased by an average of seven percent per year. So, evident were our achievements that the initial 4.5 NABERS (National Australian Built Environment Rating System) rating was optimized to a 5.5 NABERS rating within one year.

Building the synergy to build the future

As is the case in every industry, silos remain the great enemy to innovation.

If smart buildings are going to meet their full potential, everything from water saving and heat generation to optimizing the internal environment and ICT has to be linked, tracked, analyzed and measured. The nine pillars of intelligent design (water, light, internal environment, information supply, ICT, resource utilization, fire and safety, building access and building safety) require ongoing and interconnected analysis, in order to keep talking as one integrated digital organism.

Too often, we fail to achieve the intended outputs because we don't have a sense of long-term buy-in from the relevant stakeholders.

Engineering consultants go off the job after construction is completed, and the original design or intention is lost or muddled over time. Either constraining budgets are to blame, or incorrect installation, or faulty configuration of the systems during construction and post-completion. Whatever may be the case, the overall design loses value because of this inability to tie all elements through the entire life cycle of the building. Smart buildings stand to benefit greatly from innovations like new materials, robotics and blockchain. But the ROI will only be realised if the impacts of innovation are considered in light of how each of those nine elements will benefit and draw on these resources.

The key in all this: building synergy to build our future. Not only do smart systems and technologies demand tight collaboration; so too do the people who design, fund and use them. Buildings of the Future can offer a model of future-ready architecture, but they are only as good as the sum of all its parts working together as a functioning ecosystem.

From engineers to designers, city planners to politicians, it will take all hands on deck to turn a truly transformative design into society's new normal.

But, with automated construction; energy sources and the analysis of data for enhanced efficiencies changing so rapidly — can we afford not to make it our new normal? **EG**

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The exterior of the former ice rink was redone, with a new façade and windows added throughout. Photo by Halkin Mason Photography.

SPENCER FAMILY YMCA

In April 2017, the Spencer Family YMCA opened its doors on Church Road in Bethel Park. The new 74,000 square foot YMCA, named for benefactor and YMCA trustee Larry Spencer, was the result of a complicated renovation of the former Bladerunners. The Spencer Family YMCA is the largest facility in the footprint of the YMCA of Greater Pittsburgh, and it is one of the few YMCAs in the U.S. with an ice rink. It's probably the only one that formerly had two rinks.

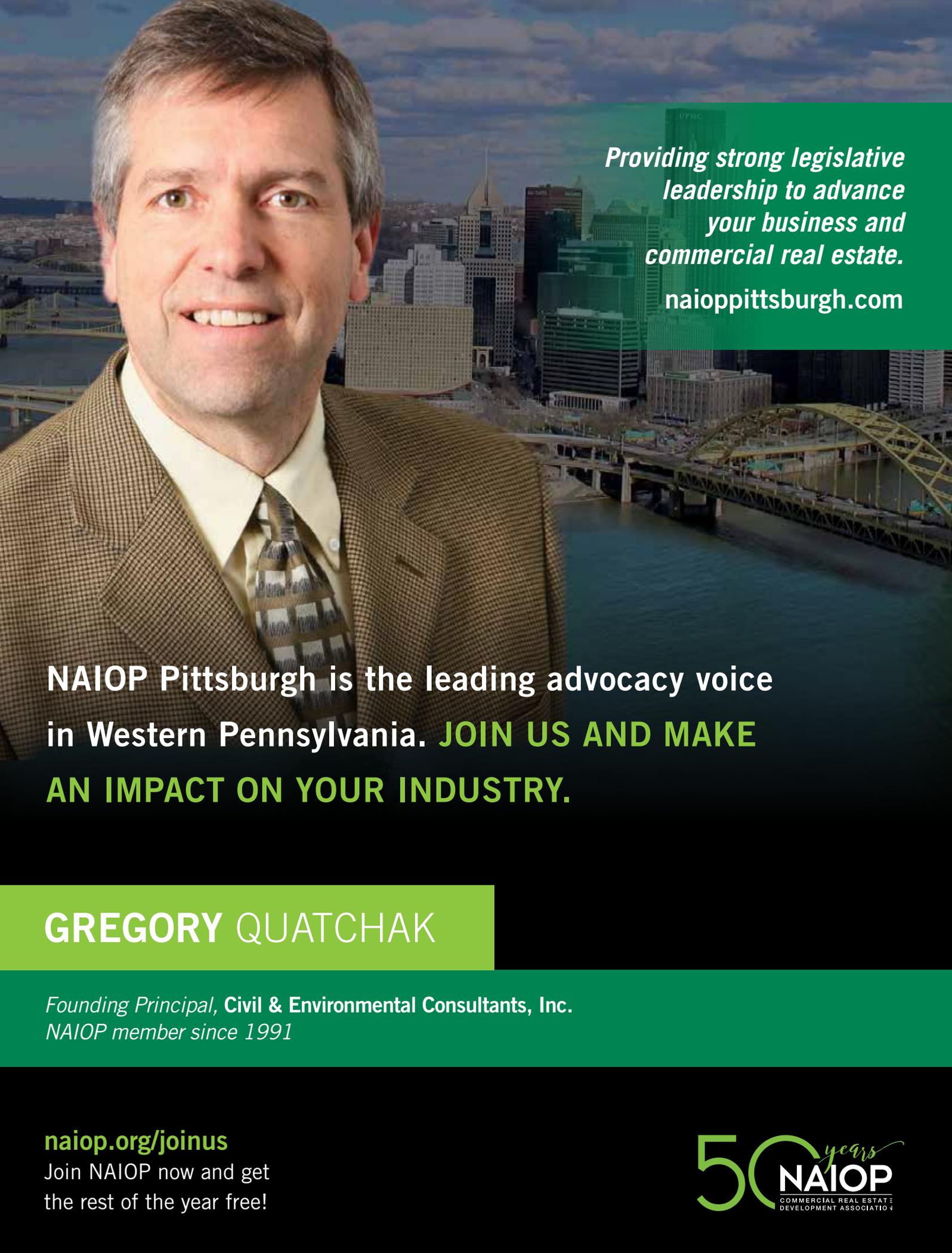
Development of the Spencer Family YMCA was a lengthy project that had a short construction duration (more about that below). The new facility is the first permanent, consolidated YMCA facility in the South Hills, a surprise given the size and population density of that part of Western PA.

"The Y itself has been in the community for several generations," says Ken Soliday, regional executive director for the Spencer Family YMCA. But what the YMCA had been is less traditional than what you would expect. It has been

community-based programming that utilized other people's facilities. We have used gyms and swimming pools that had office space that we could use for family programming."

"The need to get a full-service branch in that area was because the facilities we were using couldn't provide that. There was a little bit of camping and programming and pools that were seasonal outdoor programs," notes Rich Perallo, vice president of facilities and construction for the YMCA of Greater Pittsburgh.

Perallo explains that the YMCA owned 10.5 acres of property in the Bethel Park area since the early 2000s that was to be developed into a full-service membership YMCA. The Great Recession was a cold splash of water for the project, which required fundraising in addition to Larry Spencer's gift. The cost to develop became more expensive than expected and the project was tabled for a few years. The Bladerunners ice rink became available when Kratsa Properties decided to exit the ice rink business.



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"We had a board member who had a contact with the Kratsa's and that conversation started happening," recalls Perallo. "The price was right and there was no need for road or traffic improvements or site construction. We saved several million dollars compared to sticking with that land and developing a new building."

The YMCA purchased the Bladerunners building, which had two ice rinks and contracts for ice time with a number of schools and the South Hills Amateur Hockey Association (SHAHA). For the next three years, local hockey players continued to use the rink, which provided a revenue stream for the YMCA but created a programming challenge for the board. The most expeditious way to develop the project would have been to close the facility so that it could be completely gutted and reconstructed. Eliminating the ice rink would allow the YMCA to use that 22,000 square feet for program space, instead of shoe-horning a 12,000 square foot second floor where none existed, as Ken Soliday notes. The scope of work was extensive. The smart choice would have been to save time and money by removing any impediments to the construction.

"We couldn't do that because we made commitments to the communities and to SHAHA. We couldn't just say 'too bad' to those groups," says Perallo. "We knew that brought extra cost to the project. We knew that extended the opening as well. If we turned over an empty building like that we probably could have saved three months on the schedule."

WTW Architects had been retained to help the YMCA with the evaluation of the Bladerunners. Warren Bulseco, principal in charge of the project for WTW, saw the value in the property, with its proximity to Bethel Park High School and its size. He also saw the challenge that came with renovating a pre-engineered steel building into a full-service YMCA, all while operating full-time.

"One of the design and construction challenges was that the project had to be done in multiple phases. Because of the scheduling of the ice rink programs, the rink had to be in operation and could only be closed a few months out of the year," says Bulseco. "We designed with the idea that the building had to be phased. That was incorporated into our documents, with the caveat that the contractor could evaluate the phasing schedule and provide input. We wanted to collaborate with the contractor to understand the phasing and maybe come up with better ideas."

There was an element of risk to this approach because the YMCA settled on a design-bid-build delivery method, meaning the successful contractor would be bidding to plans and specs that were complete, even with this open-ended question of phasing and approach. The YMCA put the project out to public bid in November 2015 and then interviewed a short list of three contractors. In January 2016, DiMarco Construction was awarded the contract for the project.

Phil DiMarco, owner of DiMarco Construction, was willing to take on the challenge of evaluating the phasing plan. With his project manager, Scott Wardle, DiMarco saw some significant issues presented by the six-phase plan that WTW had proposed in the documents. For example, the locker rooms were slated as a later phase but couldn't be taken out of commission if the rink was going to be used continuously. The tight schedule – the rink had to be back in operation in less than four months from the April 2016 start of work – meant that scope scheduled for later phases had to be compressed into phase one.

"We took on more than you would have thought in the first phase just to facilitate the schedule. We put phases one through four in the first phase," says Wardle.



Photo by Halkin Mason Photography.

“Scott and I sat down and came up with the scheme where it became just two phases. It was a pretty challenging job from a phasing standpoint because we were trying to keep an ice skating operation going while we were doing a significant amount of construction,” explains DiMarco. “We had to change the structural steel design in order to do that, come up with some temporary systems, and move the building systems.”

Separating the activities while operating one ice rink was a daunting enough challenge but the bigger problem with the phasing was the structure of the mezzanine. The structural engineers naturally designed the steel as a continuous 80-foot span, but the phasing plan meant that only half of the structure could be erected at a time. To get around this problem, DiMarco had its steel fabrication subcontractor, Multi Metals, devise a splicing detail so that half of the

Even with the additional time used for structural design and the front-loading of some scope planned for later phases, construction on the first phase was completed on time.

“Rich Perallo from the Y told me after the fact that he didn’t think we would actually get it done by August. He didn’t tell us that at the time, of course,” jokes DiMarco. “We took the schedule seriously. That’s what we get paid to do.”

There was a sense that, after the brutal first phase, there was some breathing room when phase two commenced, but Phil DiMarco says there wasn’t any relief in the second phase either. During phase two, the team experienced more of the limitations that come when working in an existing building, especially one that is pre-engineered.

“We were repurposing a pre-engineered building that has very low tolerance for change. The design and the program



One of the more challenging aspects of the scope was the construction of a two-story structure within the building to add program space and a point of entry and access. Photo by Halkin Mason Photography.

mezzanine could be erected in each of the two phases without losing the structural integrity of the second floor.

Phase one had an additional complication in that a temporary shoring and façade barrier had to be erected to allow the structural work – new foundations, masonry and steel erection – to be completed during a six-week period in the midst of the phase without affecting the integrity of the existing structure. This created a wind tunnel effect that made the building more susceptible to uplifts when the wind picked up.

“That was a serious issue,” says DiMarco. “We brought our structural people in and they said not only did we have to worry about supporting the live load, but we had to worry about uplift. We used these gigantic concrete blocks with braided cable to tie down the structure.”

all had to work within the confines of the existing structure and building envelope,” explains Bulseco. “How you do that is obviously a major design challenge. When these pre-engineered buildings are built by a developer sometimes the driver is cost-effectiveness as opposed to the design.”

Bulseco is diplomatically saying that it was clear that the original plans and specs were not always followed to the T. DiMarco said they discovered conduit embedded in concrete, plumbing vents that went nowhere, and a few corners cut. There were also conditions that were unforeseen, like an underground stream bisecting the building that was discovered during DiMarco’s excavation of the floor. Bulseco gives DiMarco Construction credit for how it handled the variances.

“DiMarco would note that the contractor didn’t build things the way they were drawn, and we’d have to go back into the field and look at it,” he recalls. “I thought DiMarco did a wonderful job of suggesting what we could do with the different conditions we encountered. We would go back and forth and work together.”

“Anytime you are into an existing building, you run into all kinds of problems,” says DiMarco. “There were utilities that nobody expected. They had water issues in the back that had to be addressed. The storm system was antiquated when we dug into it. But that’s the typical thing that’s not unusual when you renovate a building.”

What was unusual was the conditions that were faced with the demolition of the second ice rink to prepare for the construction of the two swimming pools. The soils directly

an ice rink either, but the project team did its homework.

“We shared with DiMarco lessons learned from other people that do this,” says Bulseco. “If you expose the soil and let it thaw first, then you may reduce the amount of soil you have to remove. That kind of working together creates the best results.”

Their luck didn’t always hold.

After we got through the permafrost we discovered rock and that all had to be hoe-rammed to remove all the rock. We started to wonder what else would go wrong,” laughs DiMarco.

Other challenges remained. The swimming pools were concrete shell pools, which are built with shotcrete applied directly to the soil. The top edge of the pool are formed and



Two swimming pools were excavated and constructed within the former ice rink space. Photo by Halkin Mason Photography.

underneath the ice surfaces freeze solid, becoming like permafrost in the Arctic. Over time – and Bladerunners operated for nearly 20 years – the permafrost spreads deeper and expands beyond the footprint of the building. DiMarco Construction didn’t know the extent of the freezing prior to demolition.

“We didn’t have the ability to do any core samples because we had to keep the rink in place. We didn’t know what we had until we were already engaged and working on the project,” Perallo notes. “That was a big concern. We have had good coverage in our contract, with unit costs and an allowance to remove that material. We were lucky in that it was nowhere near as bad as it could have been.”

The frozen soil conditions created another opportunity for collaboration. WTW Architects had no experience removing

poured concrete. Rebar and wire mesh is embedded in the soil. Shotcrete is sprayed on the walls and floor and troweled to the finish surface. Because of this method of construction, the excavation for the pool had to be done precisely. That was made more complicated by being inside the existing building.

Another aspect of the project made more complicated by the program was the building’s HVAC system, which had to condition the ice rink and the swimming pool.

“There are actually three major environments. There is the refrigeration zone of the ice rink. Then you have the humidity zone of the aquatic center, and then you have everything else,” explains Bulseco. “We had to separate the three and, as best possible, create envelopes within the interior. The challenge there was to make sure everything was buttoned-

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up. The devil is in the details. We're still looking at it. We are still under the one-year warranty to see how the building's operating. You have to let the building fully operate to see how things are working and no doubt there will be some things we have to go back and adjust."

What Bulseco and the rest of the team see when they revisit the building is a facility that has been transformed. To the community resident, the building's façade is completely different. Bladerunners was clad in metal panels but the new Spencer Family YMCA is washed in light from banks of windows that were added. The front elevation has been replaced with a colorful geometric entrance that makes the building appear to be new construction. Upon entering the lobby, you see common areas and a second floor that didn't exist in the building's previous iteration.

In recounting the experience of working on the project, all the participants spoke of the unusual challenges in this \$7.5 million renovation, but each is proud of the result, and the process of building the Spencer Family YMCA.

"This is just personal, but I really enjoyed working with DiMarco Construction. They kept to the vision that the YMCA had for the project and helped the YMCA realize that. I thought they were a very positive active partner in the process," says Bulseco. "There are contractors

who want to build and then you have contractors that just want to manage and do paperwork. I would say DiMarco falls in the category of the contractors that want to build projects."

"With the exception of the basic structure and foundations, we essentially gutted the whole thing. To pull all that off within a year was in my mind the single biggest accomplishment," notes DiMarco. "How many recreational buildings can you say have a pool and an ice skating rink? When you look at what we started out with and what we ended up with we're pretty proud of it. It's always nice to be associated with a building that's good for the community too."

The community has responded to the new facility in a big way. Rich Perallo, a native South Hills resident, enjoys the building so much that he uses it as his office most of the time. Ken Soliday says that having a home base has made a difference that is palpable.

"The finished product is beautiful. It's given us a chance to reinvent what the YMCA is to this community," Soliday says. "It has been a non-facility programmatic presence, and this gives us a home base. We're proud to say we're creeping up on serving 2,000 new households in the South Hills area and we continue to grow each month. We are extremely happy with the finished product." **BG**

PROJECT TEAM

DiMarco Construction Company
General Contractor

YMCA of Greater Pittsburgh
Owner

WTW Architects
Architect

Loftus Engineers
Mechanical/Electrical Engineer

Barber & Hoffman
Structural Engineer

A. J. Demor & Sons
HVAC

DePasquali Plumbing Inc.
Plumbing

Verns Electric
Electrical

Multi Metals Inc.
Steel Fabrication

Century Steel Inc.
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Wyatt Inc. celebrated 60 years in business in 2017. One of the region's largest specialty contractors, Wyatt has been involved with the interiors, fireproofing or millwork for most of the buildings built during Renaissance II and III that dot the Pittsburgh skyline, and has been part of the team for all of the new sports venues built for Pittsburgh's major league teams. Like most long-lasting businesses, Wyatt's success has come from a combination of vision, perseverance and some beneficial unintended consequences, which include the company's founding.

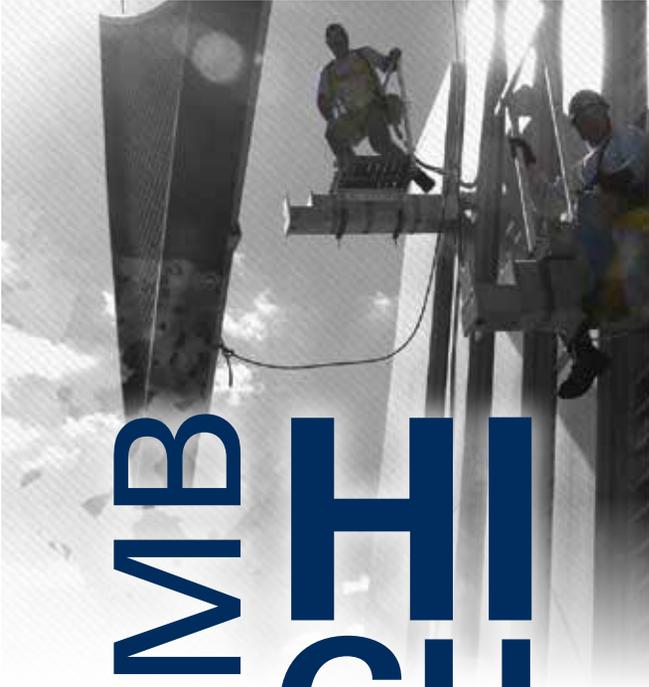
What became Wyatt Inc. in 1967 is the legacy of a company called Randy Industrial Products. Dick and Wes Wyatt's father owned the company, which primarily installed and relocated demountable metal walls and computer access floors for the steel business. J&L Steel was one of his biggest customers. Mr. Wyatt became ill and passed away while Dick was in college and Wes was operating tractor trailers for heavy steel haulers. The two men were forced to make a decision when their mother called them with an order from J&L Steel. They decided to continue. Doing work for J&L and the business grew from there.

A few years later another bit of good fortune set the course of the business for the next four decades. Wes Wyatt was anxious to grow the business and, in 1972, Wyatt Inc. decided to expand into the drywall business. At an equipment auction, Wes met Fred Episcopo and ended up hiring him.

"I was working for an uncle of mine and his partner who were plastering contractors. They never got along well and decided to part ways and dissolve the company," Episcopo recalls. "We were having an auction for the equipment that the company had and Wes Wyatt came to the auction because he was getting into the drywall business. He started talking to my uncle's partner asking if he knew anybody that was interested in being an estimator for Wyatt and that's how I got to know them."

Over the course of the next decade, Wyatt Inc. gained market share performing all phases of interior construction, including drywall, ceilings, fireproofing, plastering, millwork, casework and prefabricated items.

A few years after Episcopo started with Wyatt, there was an opportunity to fabricate the exterior wall panels at the 400



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Hightower project in Robinson Township. They rented a former steel building in Carnegie to do that fabrication. In 1981, Wyatt jumped on another opportunity when the Johnstown-based millwork contractor for PPG Place couldn't keep up with the demand or quality requirements. Wyatt was brought in to supplement the supplier and ultimately did all of the millwork for PPG's executive offices. The result of the project prompted Wyatt to invest in milling equipment and expand their Carnegie facilities. Within a few years, demand prompted a move to a larger shop in West Mifflin. When that property was sold to make way for a Target store, Wyatt moved again to its current location in Monessen, where the company operates a 140,000 square foot plant.



Wyatt was the specialty contractor responsible for the millwork and interiors on the Benter Foundation's offices at the Benedum Trees Building. Photo by Massery Photography.

In 1981, Wyatt parlayed its fabrication and drywall capabilities into what Episcopo says was one of its big breaks, the 56-story Dravo Building (now known as One BNYMellon Center).

“Turner Construction from Boston took quite a chance with us because they gave us \$7 million-dollar job in 1981 when we were probably doing \$15 million a year total,” he says. “What made it a great job was that we were probably one third of the way up the building when Dravo backed out and Mellon said they would take it. Mellon changed everything about the building and we did just about everything we could in that building. We insulated the back side of the exterior plate wall and did everything from that exterior wall right through all the interiors.”

“In 1984 we were still involved with Mellon Bank in Pittsburgh. They alerted us that they were buying Girard Bank in Philadelphia and encouraged us to establish an office in Philadelphia to be a part of the transition,” Episcopo recalls. “So we did. We started with a job for Turner, a project called Pier 3 at the Old Navy Yard. Then the things started to come out for Mellon with Gilbane as their construction manager. We did a lot of projects for them, from New Jersey down to Delaware. That helped get our Philadelphia office going.”

Episcopo estimates that the work Wyatt does is split about 60/40 between Pittsburgh and Philadelphia, with the larger share in Pittsburgh most years. He notes that many years one large project tends to tip the scales. That was the case in 2017, when Wyatt’s work on the \$1.2 billion Comcast Innovation Center in Philadelphia was at its peak. Roughly 60 percent of Wyatt’s volume is drywall/interiors subcontracting. Fireproofing makes up another ten percent and the remainder comes from its millwork/casework and wall panel fabrication. Wyatt installs 100 percent of what it fabricates.

Wyatt is a fixture in Engineering News Record’s Top 600 Specialty Contractors, finishing at 375 in 2017. The company has worked on a number of iconic Pittsburgh and Philadelphia buildings, including PNC Park, Heinz Field, PPG Paints Arena, the UPMC Lemieux Sports Center, One Fifth Avenue Place, 3 PNC and the Tower at PNC Place. In addition to the two Comcast skyscrapers, Wyatt also worked on the Philadelphia Convention Center, where it has a maintenance contract today staffed with carpenters who helped build the building in 1992.

Fred Episcopo became president of Wyatt Inc. in 2003. When asked about his management style and Wyatt’s philosophy, Episcopo turns to a couple of factors that he thinks help Wyatt stand apart.

“First we invest in our people. That means doing whatever we can to help them to achieve and excel, whether that’s education, time off, you name it. We are very cognizant that young families have different needs than us old guys,” he laughs. “They will work 24 hours a day, but it just may not be in front of you. We



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“The company has worked on a number of iconic Pittsburgh and Philadelphia buildings, including PNC Park, Heinz Field, PPG Paints Arena, the UPMC Lemieux Sports Center, One Fifth Avenue Place, 3 PNC and the Tower at PNC Place. In addition to the two Comcast skyscrapers, Wyatt also worked on the Philadelphia Convention Center, where it has a maintenance contract today staffed with carpenters who helped build the building in 1992.”

also find young people love continuing education.”

“Our estimators are also the project managers,” he continues. “They are the salespeople. Let’s face it, they are the ones out there meeting and greeting the customers. They are not just estimators tucked in a back room somewhere. We tend to start them as draftspersons and bring them into estimating. That’s a natural transition and the same is true from estimating to project management.”

Wyatt employs a field staff of around 320 between the two offices, with 21 people in the office. Dick and Wes Wyatt are semi-retired, leaving the day-to-day operations to Episcopo. Episcopo has no plans for retirement yet, but transition is a relevant topic.

“I get the question about who is going to carry the business on. Everybody looks at me and asks how long I’m going to work,” Episcopo acknowledges. “There are plans in place and I think they will work out well. We have a very young controller and he has been instrumental in carrying us through good times and tough times. We have some young talent.”

“We are putting a lot of our efforts into the infrastructure for prefabrication. There is more investment and more space needed for prefabrication,” he says. “I do believe our continued support of prefabrication is going to take us into the future. I think that’s where the money and talent are going to be needed.” **BG**



Wes Wyatt



Dick Wyatt



Fred Episcopo

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LEGAL PERSPECTIVE

Construction Law 2017 – The Year in Review

BY D. MATTHEW JAMESON III, ESQ.

On Thursday, March 22, 2017, the Construction Services group of the law firm of Babst Calland Clements & Zomnir, P.C. held its annual Year in Review Seminar. Attended by over one-hundred construction professionals, Babst Calland's Year in Review Seminar summarized and addressed the implications of the following noteworthy construction-related legal developments of 2017.

Revisions to AIA Documents

On April 27, 2017 the American Institute of Architects ("AIA") issued its most recent revisions to a variety of construction contract documents, including the AIA A201 general conditions, one of the most common construction contract documents utilized in the industry. As with most of their contract documents, the AIA revises the A201 every ten years, and the 2017 revisions include significant changes to the following topics:

- Section 2.2 – contractors have a greater ability to require that the owner provide evidence of sufficient financial arrangements to pay for the work. These are welcomed revisions to many contractors considering the proliferation of special purpose development entities.
- Section 3.3.1 – if the contractor is going to decline to proceed with specified work based on safety concerns, the contractor is now required to propose safer alternative methods and must proceed with those means and methods unless the architect determines that the contractor's proposal does not conform to the design intent.
- Section 14.4 – absent the negotiation of a separate "termination fee," the contractor is no longer entitled to recover "reasonable overhead and profit on the work not executed" under a termination for convenience.
- Insurance – many of the insurance provisions that were previously part of Article 11 of the A201 are now located in a nearly six-page exhibit to the AIA A101, A102, and A103, which sets forth more extensive insurance provisions, including builder's risk property insurance, liability limits for a variety of contractor-required coverages, causes of loss sub-limits, property insurance sub-limits and various optional coverages.
- Mechanic's Lien Law:

The Pennsylvania's Mechanics' Lien Law underwent significant changes beginning January 1, 2017. Among those changes was the introduction of an online Construction Notices Directory which owners, contractors, and subcontractors can use to file certain notices in order to maintain their mechanics' lien rights on certain "searchable projects" consisting of the construction, alternation or repair of an improvement costing at least \$1.5 million. The Directory is maintained and managed by the Pennsylvania Department of General Services ("DGS"), and includes records of every project filed with the Directory since the amendments became effective at the beginning of 2017. Surprisingly, there are only slightly over 200 projects (state-wide) listed in the Directory. This strongly suggests that the Directory is being under-utilized. By requiring that first- and second-tier subcontractors that want to preserve their mechanics' lien rights file a Notice of Furnishing, the filing of a Notice of Commencement by an owner on a construction project serves to benefit owners, general contractors, and construction lenders, so it is certainly surprising that more projects are not listed in the Directory. We certainly expect the Directory to become used more frequently as the industry learns of its benefits.

On March 30, 2017, the Third Circuit Court of Appeals issued an interesting opinion in *Linear Electric Company, Inc. v. Cooper Electric Supply Co.*, discussing key differences between NJ and PA mechanics' lien law. In this case, an electrical subcontractor in NJ filed for bankruptcy, and a week thereafter, two of its material suppliers filed liens against projects for which they supplied materials to the electrical subcontractor. The electrical subcontractor moved to dismiss the liens based upon an argument that those liens really attached to its accounts receivable, which is property protected by the automatic bankruptcy stay. The bankruptcy court agreed with the electrical contractor and dismissed the liens as violating the automatic stay, the district court affirmed, and the Third Circuit also affirmed. In its affirmance, the Third Circuit expressly stated that the outcome would be different, and the automatic stay would not bar the liens, under Pennsylvania law. The Third Circuit explained that because under Pennsylvania law a lien relates back to the commencement of construction, any bankruptcy filed after construction commences will not bar a subsequent lien filing because that filing will be deemed "pre-petition."

“This case reinforces the point that a contractor should not assume that it cannot file a lien against a property owner when performing work for a tenant. The viability of such a lien claim will be determined on a case-by-case basis depending largely on the terms of the lease.”

On November 17, 2017, in *Lobar Associates, Inc. v. Edward J. O’Neill*, the Pennsylvania Superior Court affirmed the trial court’s order granting summary judgment on a mechanics’ lien claim in favor of a contractor who renovated property for the owner’s tenant. The Court held that the provisions of the lease satisfied the “immediate use and benefit standard” of the statute because those provisions made clear the purpose of the lease was to improve the property for mutual benefit, and (a) called for collaboration of landlord and tenant in the renovation project of the Property, (b) required landlord’s prior written approval for changes, alterations and additions to the Property which would negatively impact the value of the Property, and (c) declared all improvements would be property of landlord expiration of the lease term or earlier termination. This case reinforces the point that a contractor should not assume that it cannot file a lien against a property owner when performing work for a tenant. The viability of such a lien claim will be determined on a case-by-case basis depending largely on the terms of the lease.

Bid Protests

On July 10, 2017, the Commonwealth Court on Pennsylvania issued its opinion in *Clearwater Construction, Inc. v. Northampton County General Purpose Authority*, where it decided that a party that bids on a municipal project governed by the P3 Act but is not ultimately chosen for the project does not have standing to challenge the priority of the selection process. The Court noted that absent a statutory provision to the contrary, generally disappointed bidders lack standing to challenge the award of a government contract. Section 9109(n) of the P3 Act does not provide that statutory basis as its application is limited to a “development entity,” which by statutory definition is a party to the contract. Therefore, if a disgruntled bidder to a public contract (including a P3 contract) wants to file a bid protest, it must do so through an interested taxpayer who pays taxes to the public owner.

Negligent Misrepresentation

On September 27, 2017, the Pennsylvania Superior Court expanded the reach of possible liability or negligent misrepresentation claims beyond architects and design professionals in *Fulton Bank, N.A. v. Sandquist*. The court examined the *Bilt-Rite* ruling (holding that architects could be liable to contractors on a theory of negligent misrepresentation) and expanded it to include potential liability for accountants and their firms under a theory of

negligent misrepresentation for providing professional information that is designed to be relied upon by a third party. “We find the court applied a too narrow reading to *Bilt-Rite* in determining that the case only concerns disputes involving an architect/contractor scenario. Rather, we conclude *Bilt-Rite* can be applied to other factual scenarios where a party is providing professional information that is designed to be relied upon by a third party.” In the construction context, this case raises the question of whether negligent misrepresentation claims could exist for (1) a surety against an accountant regarding financial statements that a surety relied upon in determining bonding capacity, (2) an owner against an architect’s sub-consultant for alleged errors in their work.

Contractor and Subcontractor Payment Act (“CASPA”)

On June 20, 2017, the Pennsylvania House of Representatives passed House Bill (“HB”) 566, which proposes amendments to CASPA, by a 168 to 26 vote. The is similar to HB 1387 but is now farther along in the legislative process because it has passed the House and is now with the Senate Labor and Industry Committee for consideration. The proposed legislation provides that a contractor or subcontractor may suspend performance if payment is not received in accordance with the terms of their construction contract. Specifically, if the contractor/subcontractor is not paid in accordance with the contract terms, the contractor/subcontractor must provide two separate 30 day notices before it can suspend work. Specifically, the contractor/subcontractor must take the following steps before suspending:

- Once 30 calendar days have passed since the end of the billing period, the contractor/subcontractor must provide written notice to the owner/contractor stating payment has not been made.
- When an additional 30 days have passed since that notice, the contractor/subcontractor must provide written notice stating that the contractor/subcontractor intends to suspend work in 10 calendar days.

Thus, suspension of work under the proposed legislation would require two notices and waiting at least 70 days. The proposed legislation also establishes that the provisions of CASPA cannot be waived in a contract and requires a written explanation of the good faith reason for withholding payment (including retainage payment) for a deficiency item. Failure to provide

such notice would constitute a waiver of the basis to withhold payment and require payment to the contractor or subcontractor in full. In addition, the proposed bill requires an invoice recipient (owner or general contractor) who believes the received invoice is overstated still must pay the amount of the invoice it believes is correct when that amount would otherwise be due. This revision appears to be aimed at preventing a dispute over one component of an invoice from being used to delay payment of amounts not otherwise in dispute. It would also permit a contractor or subcontractor to facilitate the release of retainage on its contract before final completion of the project by posting a maintenance bond with approved surety for 120% of the amount of the retainage. Finally, HB 566 provides that if the withholding of retainage is longer than 30 days after the final acceptance of the work, a written explanation must be provided for the withholding, and failure to provide such an explanation constitutes a waiver of the basis to withhold payment and requires payment in full.

HB 566 has generated some controversy within the industry as an argument can be made that a subcontractor's ability to stop work for lack of payment should be addressed on a contractual case-by-case basis, and not via a statutory amendment. A tricky issue could arise where the general contractor withholds payment from a subcontractor because the general contractor believes that the subcontractor's work is defective or behind schedule and the subcontractor then relies on CASPA to argue that it is entitled to stop work for lack of payment.

For ongoing updates to this and all other issues impacting construction law in Pennsylvania, you are welcome to subscribe to the Babst Calland Construction Law Blog at <http://www.babstcalland.com/construction-law-blog/>. 

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FINANCIAL PERSPECTIVE

New Law Offers Help for the Flagging Pennsylvania SREC Market

When the solar and alternative electricity generation technologies began to emerge as possible sustainable successors to fossil fuels, governments recognized that incentives would help increase demand for alternative energy while the market was created. Among the incentives were solar renewable energy credits (SREC). Equivalent to the generation of one megawatt of electricity, a solar credit could be traded in the same way that tax credits are. Unlike tax credits, which are bought to offset profits, SRECs were purchased by the utilities as offsets for falling short of the standards for renewable generation that had been imposed upon them.

Pennsylvania, like most states, adopted standards for the portion of the energy used that was from renewable sources, like wind and solar. These Alternative Energy Portfolio Standards (AEPS) were set in PA in 2004, establishing the share of a producer's total energy portfolio that had to be from renewable sources. In PA, the standard was set at 0.5 percent of the total. For generators that couldn't (or wouldn't) invest to add renewable generating capacity, the solution was to buy SRECs to offset the difference between their renewable portfolio and the AEPS.

SRECs were intended to be a transitional measure, used by utilities while they built renewable capacity. Instead, SRECs became a way for utilities and other energy companies – often foreign companies – to meet the standards without the risk of overinvesting or investing in the wrong technology. Using SRECs also became an excellent way for well-meaning property owners to justify construction of solar photovoltaic (PV) arrays, since the payback for the PV installation was longer than was generally acceptable by investors and developers. In the mid-2000s, SREC prices soared. Within a decade, however, solar projects boomed around the world and, as the renewable share of AEPS grew, a glut of SRECs developed. Prices tumbled.

Once the primary driver of development for solar generation, SREC prices fell precipitously in the early part of this decade. The decline in SREC value, which fell over 98 percent in Pennsylvania, was a wet blanket on the major financial incentive that drove solar development. The Commonwealth has taken steps to try to stabilize the SREC market, although the implementation process at the Pennsylvania Utility Commission (PUC) has delayed the effect of the measures.

Last October 31, the PA legislature addressed what the industry perceived as an inequity in the market in Act 40 of 2017. Since the adoption of the Alternative Energy Portfolio Standards, Pennsylvania has been an open market for anyone selling SRECs. The same has not been true for our neighboring states. While solar generators from around the globe were not permitted to sell credits in New Jersey or New York, for example, they could do so in Pennsylvania. The result was a glut of credits that drove prices to the floor. Act 40 of 2017 closed the borders to generators located outside PA. The exact language of the bill's restriction is:

“Section 2804. Alternative Energy Portfolio Standards. The following shall apply:

(1) Notwithstanding section 4 of the act of November 30, 2004 (P.L.1672, No.213), known as the “Alternative Energy Portfolio Standards Act,” in order to qualify as an alternative energy source eligible to meet the photovoltaic share of this Commonwealth’s compliance requirements under the “Alternative Energy Portfolio Standards Act” and to qualify for solar renewable alternative energy portfolio credits, each solar photovoltaic system must do one of the following:

(i) Directly deliver the electricity it generates to a retail customer of an electric distribution company or to the distribution system operated by an electric distribution company operating within this Commonwealth and currently obligated to meet the compliance requirements contained under the “Alternative Energy Portfolio Standards Act.”

(ii) Be directly connected to the electric system of an electric cooperative or municipal electric system operating within this Commonwealth.

(iii) Connect directly to the electric transmission system at a location that is within the service territory of an electric distribution company operating within this Commonwealth.”

In addition to these requirements, Act 40 took the extra step of specifying that the standards applied to credits that were certified prior to the act's passage. That meant credits certified prior to Act 40 of 2017, which were generated in PA, still qualified. Most observers within the industry interpreted that to mean that credits from out-of-state generators were not “grandfathered” under

“We’ve already passed the law. We got it through the legislation like it was supposed to happen and now it’s being interpreted in a completely opposite direction. Even closing the borders would help because if we don’t do that then the market stays flooded.”

Act 40. The legislature signaled that was the intention of the act. The PUC, which executes the act, is less clear on that point.

On December 21, the PUC issued temporary guidelines for implementation of Act 40. At that time, however, the PUC commissioners accepted a narrow interpretation of the Act, allowing generators with credits certified prior to October 31, 2017 to continue to qualify, regardless of where the solar generation occurred. In an unusual turn of events, Chairman Gladys Brown and Vice-Chairman Andrew Place were in opposition to the full panel’s interpretation of Act 40, opting to follow the legislature’s intent of closing the borders. Interested parties had until February 5, 2018 to comment on the PUC’s decision. Since those comments were received, the PUC has made no final determination on that critical piece of the new law.

Nils Hagen-Frederiksen, press secretary for the PUC, cautions against drawing any conclusions about final implementation until a final implementation order is issued.

“Anytime the PUC implements legislation the commission issues a tentative implementation order. Then they open a period for comment, digest the input and take final action,” Hagen-Frederiksen explains. “In the case of Act 40, the commission was clear in its tentative order that different interpretations were possible. That was why the commission reached out for comment to various stakeholders that could be impacted by the differing scenarios.”

There is no time table for the PUC to issue its final implementation order, although Hagen-Frederiksen acknowledges the commission’s wish is to act as quickly as possible. Until it does, however, it’s not possible to judge the impact of closing PA’s borders to SRECs from generation outside the state.

Mike Carnahan, general manager for Scalo Solar Solutions, points out that Pennsylvania’s low solar carve out and open borders are holding the state’s solar industry back. He believes that closing the borders is an important step in setting a bottom to the market and supporting solar jobs.

“There are federal tax credits and depreciation benefits that come from the federal level but there has to be

some sort of state-level benefit. If you look at state rankings based on criteria ranging from net metering laws to renewable portfolio standards, the best isn’t California or Florida where there’s lots of sun,” Carnahan says. “Do you know what the number one state for solar is? It’s Massachusetts. New Jersey is number two. They don’t have more sun than we do but they have more incentives. And they are producing more solar and they are putting people to work.”

Pennsylvania’s poor incentive environment and lukewarm policies were the reasons the Commonwealth ranked 22nd in the 2017 United States Solar Power Rankings. The need for incentives was highlighted by the weak investment conditions for solar in PA. A 5-kW solar installation requires 12 years to pay back the investment and has an internal rate of return (IRR) of 8.7 percent. By comparison, Massachusetts projects have a five-year payback and a 28.5 percent IRR.

For investors, Pennsylvania’s IRR and payback stack up poorly against the full spectrum of opportunities. As a risk-adjusted investment, other commercial real properties and bonds simply look more appealing. A more favorable tax credit environment would tilt the scales in the direction of more solar projects. Well-meaning users continue to push renewable energy sources forward and the additional financial incentive couldn’t hurt the justification of that choice.

“There would not be a huge demand from raising the AEPS standards but there could be more demand from other standards within the state. For example, municipalities or universities can commit to getting higher portions of their generation from sustainable standards, like Pittsburgh’s commitment to getting to 100 percent renewable,” says Kristen Osterwood, technical and policy director for the Green Building Alliance. “The March 8th [Finding Pennsylvania’s Solar Future] meeting looked at how to get to ten percent generation in Pennsylvania from five percent. It’s not always about the AEPS. What other ways do you encourage through leading by example from the state or communities?”

Carnahan also looks at adoption by a greater number of property owners as the best scenario for growth of solar generation. He points out that, unlike other renewable sources, solar isn’t seeing significant technology changes and Carnahan doesn’t expect that to change.



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"Ninety-five percent of the commercial market is the crystalline and multi-crystalline technologies. There has been very little improvement in technology," Carnahan notes. "It's still just a rock under glass. That's our technology. Silicon is a rock. We put it under glass, excite the electrons and we take the energy. The technology isn't changing. The incentives are changing. The motivations are changing. Attitudes are changing. We are seeing increases from corporations. Giant Eagle is our biggest customer. Huntington Bank did a massive installation out in Columbus. Corporations want to be sustainable."

The elevated level of interest from corporations, institutions and communities adds to the frustration that solar advocates feel about the less-than-friendly environment in Pennsylvania. Most would like to see the AEPS standard increased and/or the carve-out for solar enlarged. And, in the short term, solar players want to see Act 40 implemented in a way that tightens the bloated SREC market.

"The Renewable Portfolio Standard carve-out would obviously make a huge difference but that's the funny thing about the PUC issue [with Act 40]," says Carnahan. "We've already passed the law. We got it through the legislation like it was supposed to happen and now it's being interpreted in a completely opposite direction. Even closing the borders would help because if we don't do that then the market stays flooded."

SREC traders seem to agree with Carnahan. Credits traded in the \$40 to \$60 range as late as early 2015 before collapsing to \$4 last year. Prices rebounded to \$15 per credit in January 2018, after Act 40 passed, before tumbling back to the \$9 range during the post-comment period in February and March.

"It definitely makes sense to close the borders," agrees Osterwood. She sees Act 40 leveling the playing field for PA generators and preparing the SREC market for future progress in standards for solar energy.

"Sites built out of the state for generation are getting double credits. Sites in New York and New Jersey are getting credit for generating [in their states] and selling credits in Pennsylvania," she says. "Pennsylvania's standard may only be 0.5 percent now but, in the future, we might get a legislature that's more in line with the general population's goals and there would be a higher requirement. If we did that without closing the borders it would be a moot point." **BG**

MANAGEMENT PERSPECTIVE

GBCI Develops Arc to Manage Many Green Building Certifications

As building sustainable and healthy projects has become more mainstream, more options for certifying “greenness” and wellness have proliferated, even as Leadership in Energy and Environmental Design (LEED) has become eponymous. Alternatives to LEED—including certifications that predated it – and certifications that measure other sustainable values or qualities of buildings offer many choices to owners and developers of buildings.

At the 2017 Greenbuild conference, representatives from nearly all of the certifying organizations made presentations. Green building advocates cannot be unhappy about the growing variety of certifications, since it means that building performance is being measured across a broader spectrum of standards. Among those organizations that spoke at 2017 Greenbuild were:

International Living Future Institute

- The International Living Future Institute (ILFI) seeks to counter climate change by pushing for an urban environment free of fossil fuels.
- ILFI runs the Living Building Challenge, which is the world’s most rigorous green building standard
- In April 2017, the International Living Future Institute announced a new initiative in Pittsburgh, through financial support from the Commonwealth of Pennsylvania and in collaboration with Green Building Alliance, ILFI launched the Pittsburgh Living Product Hub to accelerate this transformation.
- The HUB will work with local manufacturers to lead the industry as models of ingredient transparency, material health and net-positive handprints.
- The HUB also partners with local universities, nonprofits and other institutions to conduct pioneering research and outreach efforts that advances our mission

Building Research Establishment Environmental Assessment Method (BREEAM)

- Developed in 1990, BREEAM is the world’s first and most widely used sustainability assessment method for buildings and is the grandfather of all green building rating systems in the world. BREEAM is a methodology backed by scientific research to rate existing buildings based on

performance benchmarks.

- Since being launched in 1990, globally there are more than 558,256 BREEAM-certified developments, and more than 2,260,000 buildings registered for assessment.
- There are nine environmental categories of BREEAM: Management, Health and Well-Being, Energy, Transport, Water, Materials, Waste, Land Use, and Ecology and Pollution.
- BREEAM USA is open to all existing commercial buildings – any size, any age and any performance level. Any existing commercial building can start an assessment by simply registering with BREEAM USA online and completing a BREEAM USA In-Use assessment.

Global Reporting Initiative (GRI)

- GRI helps businesses and governments worldwide understand and communicate their impact on critical sustainability issues such as climate change, human rights, governance and social well-being. This enables real action to create social, environmental and economic benefits for everyone
- GRI is an independent international organization that has pioneered sustainability reporting since 1997.
- GRI also works to support the widespread use and implementation of these standards by advising companies as well as policy makers.

International WELL Building Institute (IWBI)

- Started in October 2014, after six years of research and development, the WELL Building Standard is the premier standard for buildings, interior spaces and communities seeking to implement, validate and measure features that support and advance human health and wellness.
- WELL was developed by integrating scientific and medical research and literature on environmental health, behavioral factors, health outcomes and demographic risk factors that affect health with leading practices in building design and management. WELL also references existing standards and best practice guidelines set by governmental and professional organizations.
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reduced absenteeism and employee turnover.**

Fitwell

- The Fitwel certification measures building properties affecting the health and fitness of the occupants in both the private and public sectors. The Center for Active Design (CfAD) is the licensed operator of Fitwel. The Centers for Disease Control and Prevention provide Fitwel’s research and evaluation and the General Services Administration provides leadership by using Fitwel to certify buildings in all 11 regions of its portfolio.
- Fitwell uses evidence-based strategies and a simple method for measuring and tracking progress towards certification. Fitwell promotes the philosophy that a healthier built environment should be accessible for all occupants by attracting “champions” that will support Fitwell’s mission and certify their developments.
- Owners desiring to certify their projects first register the project through Fitwel’s online portal. A numerical score is given immediately upon completion of the Fitwell Scorecard so that a benchmark can be established against which the project may be measured. Certification documents are completed online for Fitwel review. The resulting certification is a Fitwell star rating.

Absent a single organization for measuring and certifying all buildings and construction projects, there is the potential for confusion about what certification is best for the project. Moreover, the most widely-used certifications focused first on construction projects and expanded more recently into measurement of existing building performance. The certification of existing building stock is a key to spreading the benefits of wellness, sustainability and resiliency to the entire built environment. That, ultimately, will be the key to reducing the environmental impact of buildings.

LEED’s certifying agency, Green Business Certification Inc. (GBCI), has developed Arc, a new digital platform for owners and professionals to measure the sustainability of their projects, regardless of the certification being used (or not used). GBCI aims to have all buildings in the Arc platform, which is designed to measure the outcomes of the sustainability measures taken. To that end, GBCI has

secured commitments from Tishman Speyer, Vornado, Boston Properties, Kilroy, BNYMellon, and others to add all their properties to the Arc platform.

Arc uses data to help measure and improve sustainability performance across the built environment. Arc generates a performance score that allows projects to track and benchmark progress and allows owners to update that performance score as improvements are made to the building. Arc intends to drive continuous and incremental improvement. Every building receives a performance score, regardless of how far along the project or property is on the sustainability continuum. As the building is improved, its performance score will increase, allowing property owners to benchmark their portfolios against similar properties. A developer or property owner using Arc can get a comparable performance score, whether the project was ever certified and regardless of which certification system was employed.

In the same manner, GBCI hopes to use Arc to allow benchmarking for building performance between communities and cities. Gautami Palanki, director of the U.S. Green Building Council (GBCI’s parent organization) answered questions about Arc for BreakingGround.

How/when does one interface with Arc?

Building owners and managers can engage with Arc at any time. Right now, more than 2,600 buildings representing nearly one billion square feet of space globally are using the platform to benchmark, measure and improve sustainability performance. Arc works for any building, a group of buildings, such as a neighborhood or large development, or an entire portfolio. The platform promotes transparency. It is designed to help you collect, manage and benchmark your building data so you can see where you’re starting from, set goals and make decisions that allow you to incrementally improve performance. It offers clarity and insight for stakeholders and turns your building data into actionable information. It also has the ability to look beyond individual buildings and evaluate performance at the city and community level. Currently, cities like Washington, D.C., Phoenix, Ariz., Chicago, Ill., Denver, Color. and more are tracking city-wide data.

For building owners and managers interested in LEED, there are several ways to engage with Arc. If your project

is already LEED certified, you can use Arc to track whether your building is performing as intended and recertify to LEED. You can also use Arc to achieve a building's first LEED certification. For owners and managers, not yet ready to pursue LEED, Arc helps you understand your current performance and steps you can take to improve it and work toward certification.

What metrics of building performance does Arc track/measure?

Arc generates a global performance score using data the building team submits across five categories – Energy, Water, Waste, Transportation and Human Experience. Arc then sums these scores to create a total performance score of between 0 and 100. Higher scores indicate better performance. Buildings using Arc can also compare performance to global and regional averages.

Arc has an industry standard API that it uses to connect to other systems managing data, to streamline the process for you.

How does Arc work on new construction vs. existing?

Arc is available to any operational building, a city or a community. Buildings don't always perform as intended. This "performance gap" describes the difference between designed and actual building performance. As the development trend is toward low and zero-energy buildings equipped with new and complex technologies, there is a danger that the performance gap will become even greater. Through Arc, we are able to help improve the quality and performance of your building through continuous performance monitoring. This means reducing energy use and improving indoor environmental quality by continuously tracking and analyzing issues. Arc is the first of its kind to do this using a global performance score.

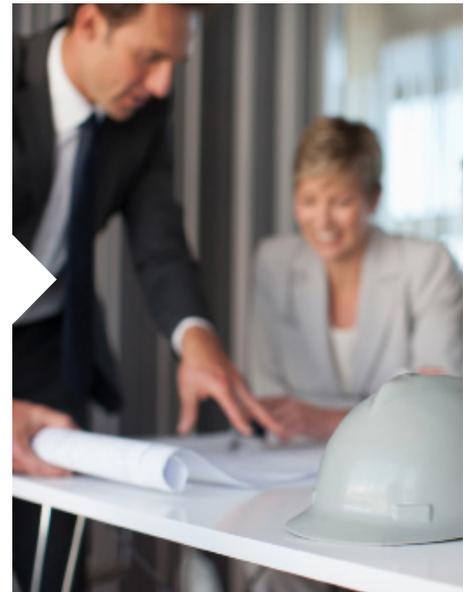
We often hear the term "you can't manage what you don't measure." Measuring building performance is the number one way to reduce operating costs, save

energy, water and other resources, as well as improve indoor environmental quality and human health, resulting in reduced absenteeism and employee turnover. Arc's ability to measure and manage performance combined with LEED's recognition and verification delivers a better bottom line and a sustainable building.

Is Arc a first step in transition away from LEED or other point-based, design systems of measurement?

Definitely not! Arc can be used for both LEED and non-LEED buildings. The easiest way to explain Arc is that it's a technology platform that collects your data, reports out on the sustainability performance and allows you to take actions for improvement. This is the core of LEED and green building and what we strive to do – improve our new and existing buildings through data, green building strategies and action. **EG**

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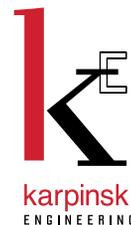
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BEST PRACTICE

What Is Design-Assist? With a structured approach to collaboration, project teams can reduce risk and add value.

BY ROCCO GALLO, PRINCIPAL

Think of a construction project that's gone absolutely wrong.

Let's say an owner undertakes a substantial renovation of their existing facility. The design team performs their fieldwork and completes the design. Then, during construction, the contractors keep discovering all the sins of the past, hidden behind walls and above ceilings. The costs grow, and the schedule keeps getting pushed back. The project has change order after change order. The occupants are continually disrupted. The final E&O is astronomical.

On another project, a facility addition, the design team gets to work with the owner's scope requirements. They create plans that match the owner's vision...but after bidding, everyone learns that the project is 25 percent over budget. The owner isn't going to be able to get more funding, so the team goes through extensive value engineering exercises. The owner builds the project, but they're disappointed in the process and the results.

I've worked on projects that have gone like this, and heard about many more. You probably have, too.

These kinds of scenarios are an owner's nightmare...yet to some extent, they're expected and accepted on projects. At the same time, issues like these can cause endless hassle, disrupt the schedule, and be a major source of stress.

In both these examples, let's assume the teams did the best they could. They just couldn't make the project any better given the tools they had in front of them. For me, that's possibly the worst part: knowing that a project could have been better if we'd had a different set of tools.

I'm going to suggest that we – the project team of owners, designers, and contractors – don't have to accept this way of working through projects. There are other ways, and there are better sets of tools.

One of them is design-assist. I've had the opportunity to work on projects using design-assist, and I can tell you, it makes a tremendous difference for the whole team.

- Design-assist is a way to reduce risk and provide better project outcomes for everyone on the team
- It lets teams take the value they provide to the next level so that ultimately, the owner gets more value (something we'll talk about more in future posts)
- It helps us escape the cycle of conflict and finger-pointing that too often occurs on projects

Here, I'm going to outline an introductory definition of design-assist.

What is design-assist?

Design-assist is a progressive, collaborative delivery model to provide better project outcomes.

When a project uses design-assist, the design and construction teams work on the design together. Members of the construction team (typically a qualified trades contractor, estimating support, and management support) come on board during design, rather than after bidding (as with traditional delivery methods). They provide their knowledge and expertise while design is underway.

To see how design-assist is structured, it helps to compare it with the traditional design-bid-build process.

With design-bid-build, the architect and engineers complete the design on their own. At bidding, the contractors see the drawings for the first time and provide pricing. The winning team then proceeds with construction.

With design-assist, the contractors join the project around the same time as the engineering team.

The design team does the work they have always done: Field surveys, design concepts, calculations, system selections, building design

The construction team contributes their expertise to the design process. They provide input on site conditions, constructability, means and methods of installation, and cost.

By bringing the contractors on board early, the project team can draw on each team member's knowledge at the right time to improve the overall quality of the project.

Depending on how you incorporate your design-assist partner, they would either stay on as your construction partner, or you would send the job out for competitive bidding (the latter option, only if bid expectations are not met).

When your design-assist partner is also your construction partner, you have a team already primed for construction. They understand the design intent, they've accounted for potential issues, and they've thought through constructability.

Also, it's important to know: You can incorporate design-assist partners into different contract types. (How to do so is its own subject.)

Here's one way we've worked with design-assist partners:

On infrastructure renovations, we've conducted field surveys alongside the construction team. Our design-assist partner can open up walls, ceilings, and equipment

to determine existing conditions (something we as designers are not typically qualified to do). They can identify phasing requirements, preferred method of installation, or temporary equipment that will be needed during construction.

This helps everyone: We are able to incorporate that information into our designs. The owner can budget and schedule appropriately (especially if we discovered something unexpected). The construction team can account for real site conditions in advance.

What if we'd used design-assist?

Let's go back to the examples we started with. What could the projects have been like if they'd incorporated design-assist?

The existing conditions monster of a renovation. We've already talked about the difference that a design-assist partner can make on a renovation project: With their hands-on experience, they're going to spot things that the design team, who's hired for a different skill set, wouldn't. With their help, the design team could have factored more existing conditions into the drawings, and the owner could have made decisions proactively rather than reactively.

The over-budget addition. Designers aren't the experts in estimating. We can provide general estimates, but we don't have detailed knowledge of installation costs, current market conditions, or other factors that impact pricing. Our construction counterparts do. If they had joined the project as a design-assist partner, they would have provided estimates throughout the design process, and even before design began. Their input would have helped the owner make budget and scope decisions as design progressed, rather than after bidding. Their knowledge could have saved the owner time and disappointment.

These are the very basics of design-assist. Next up, we'll look at 4 key components that make design-assist work.

1. The project team identifies the complete scope of work.

The complete scope of work includes both what is being built and how it's being built. Working together, the design and construction teams run through the major items that will go into the project: equipment, labor, phasing, temporary conditions, and so forth. Their goal is to nail down as many factors as possible to assist with proper budgeting and scheduling.

Design documents wouldn't include all of this information (nor are they expected to). Yet the answers can greatly impact price and schedule.

Too often, the design team begins with an assumed scope of work. Let's say we start planning the renovation of 20,000 square feet of office space. Only when I see the existing building drawings do I know what the impact will be on the

floor below. That area isn't part of the 20,000 square foot renovation, but it may be affected. By the time I have enough information on the drawings for an estimate, it may already be too late and too expensive. We'll come back to this point at #3, construction estimates.

If we're thinking in terms of the traditional SD – DD – CD phases, the design-assist partner would come on board around the end of the SD phase. Depending on the type of project, it could be even sooner. As one of my colleagues, an executive for an electrical contracting company, likes to say: The right time to identify the complete scope is as soon as you want the real price.

2. The design and construction teams perform field investigations together.

As the design and construction teams do fieldwork, they are looking for complementary sets of information: The design team is looking for the information they need to properly design the systems. The construction team (that is, the design-assist partner) is looking for the information they need to properly build the systems.

Their investigations feed off one another. They discuss and coordinate design. They talk about installation and constructability. They walk through phasing and disruption of services.

The construction team can also give the design team a look behind walls, above ceilings, or inside equipment – tasks the design team isn't typically qualified to do. Together, they might uncover existing conditions that impact the scope of work (for example, disused equipment left inside the walls, undocumented systems behind walls and above ceilings, areas that are difficult to access due to occupants, or inoperable valves and tie-in locations).

As a result, the whole team gains a more accurate picture of how the project is going to come together. This activity is especially relevant for renovation projects.

3. The design-assist partner provides construction estimates throughout design.

Regular estimates help the project team stay on track and in budget.

Conceptual Estimating

Once the team has identified the full scope of work (see #1), the design-assist partner may be asked to provide a "conceptual estimate." The goal of a conceptual estimate is to get an actual price range for the complete scope, early in the project.

With a conceptual estimate, the design-assist partner provides an estimate with a blank drawing. This doesn't mean estimating without any information. Rather, it means estimating without being able to count and price every individual item. (This approach is a change in culture for many contractors, because they are accustomed to receiving the design team's drawings in order to provide an estimate.)



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The design-assist partner uses the complete scope of work identified by the project team as the basis for their estimate. The owner and project team can then evaluate the budget and scope of work in light of the estimated construction cost.

Pre-Construction Estimating

The design-assist partner continues to provide pre-construction estimating throughout design. These estimates help the project team in a few different ways:

Getting an early-as-possible accurate estimate helps the owner secure appropriate funding.

The project team can make adjustments during design, avoiding value engineering sessions later.

The design-assist partner can provide input on the cost impact of different design options, helping the owner to get the best bang for their buck.

Here's an example of where the third item comes into play. Let's say you're constructing a new three-story building, and the architect is working through options for floor plans. In one option, the electrical and mechanical rooms are in different locations on each floor. In another option, the rooms are vertically stacked. The design-assist partner can price the two options so the owner and architect can see the cost of each design option and select the one that provides them greater value.

Final Cost Validation

The design team submits completed drawings and specifications to the design-assist partner for a final cost validation. There should be no surprises at this point, because the design and construction teams have been working together throughout to keep the project in scope.

After the final cost validation, the owner gives approval to proceed into construction. Permit documents may be submitted at this time as well.

4. The design-assist partner prepares for construction.

As design progresses, the design-assist partner continues to support the project design and looks ahead to construction.

The design-assist partner feeds information to the design team to influence design efficiency. For example, I might show the installation of pipes and conduits in a certain location. A design-assist partner would verify my design and let me know if I should run them in a different direction. The design-assist partner might also identify opportunities for pre-fabrication.

The design-assist partner identifies long lead-time equipment for early purchase, which can reduce construction duration.

The design-assist partner gains a more in-depth understanding of design intent, project phasing, and sequence of installation. When construction begins, there's no learning curve. They're already primed and ready to go.

The project team can better prepare for temporary conditions and systems. They can plan and estimate equipment rentals and temporary services.

Conclusion

Too often, project teams make important discoveries late in the project, and everyone is left scrambling. With these four design-assist activities, the project team gains meaningful information at the right time to make a positive impact on the project. **EG**

Rocco Gallo, Principal LEEP AP is vice president and director of production for Karpinski Engineering, a mechanical, electrical, and civil engineering consultant.



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INDUSTRY & COMMUNITY NEWS

The Master Builders' Association of Western Pennsylvania, Inc. (MBA) and the Construction Advancement Program (CAP) awarded three scholarships this year at the MBA's Annual Membership Reception. The scholarship awardees were Alexander Citerone, Nicole Bell, and Kate Lundy. Collectively, the University of Pittsburgh School of Engineering's Construction Management/Civil Engineering Program students received \$15,000. Nearly \$180,000 in scholarships have been provided to students since the MBA & CAP teamed to provide annual scholarships in 1998.

The Master Interior Contractors Association (MICA) honored three construction apprentices with the "MICA Thomas L. Milletary Education Award." The three awardees were Justin Schneider, a carpenter apprentice, Mike Hegland, a taper apprentice, and Andrew Rivett, a plasterer apprentice. Schneider is a member of the Keystone + Mountain + Lakes Regional Council of Carpenters. Hegland is a member of Drywall Finishers District Council 57 Local 2006. Rivett is a member of Plasterers Local 31.



MICA Thomas L. Milletary Education Award winner Justin Schneider (left) and Mike Heglund (right) flank Wyatt's Fred Episcopo.



MBA Board President Steve Massaro (left) with CAP scholarship winners Alex Citerone and Kate Lundy, and TEDCO's Jim Frantz.



Councilman Corey O'Connor and Nello's Gene Boyer (right).

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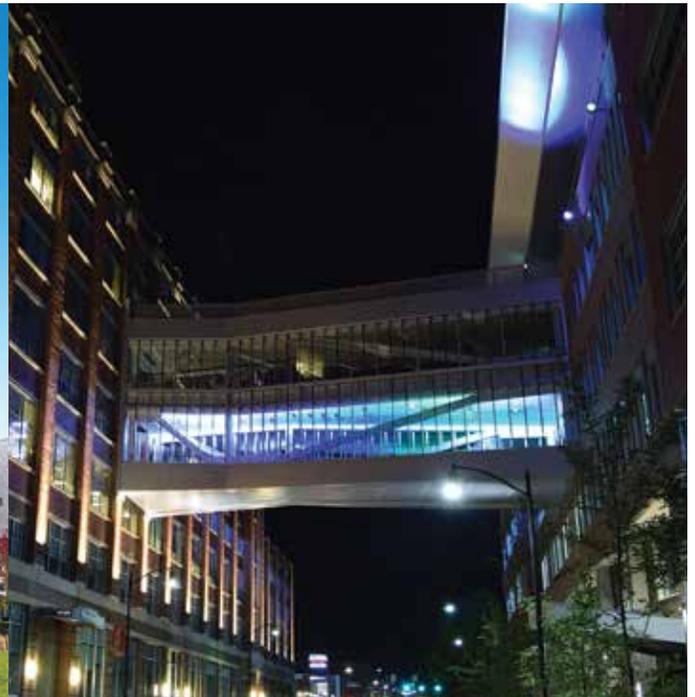
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Mascaro Construction hosted the annual Gentlemen's Night Out at the Aviary on February 9 at Heinz Field's PNC Champions Club. The event raised over \$180,000 in support of the National Aviary.



Cheryl Tracy, executive director of National Aviary and Michael Mascaro, National Aviary's Board of Trustees President.



John Mascaro, Jr. and Allegheny County Executive Rich Fitzgerald.



(From left) SSM's Tom Szymczak, John Jordan from McKamish, Jay Davis from SSM Industries, and McKamish's Dave Lyons.



Uhl Construction's Mona Hengelsberg (left) and Margie Bailon at the Ironworkers Employers Association's annual safety awards banquet.



(From left) Mike Macurak from D-M Products (left) with Turner's Tara Connor and Dick Macurak.



AE7's Howard Fugitt, Yasa Petrunak, D.J. Bryant, Marley Oswald, and Teresa Bucco.



Bohlin Cywinski Jackson's Jennica Deely (left) and Patricia Culley flank Noah Shaltes from PJ Dick.

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Molly Martini and Anthony Martini of A. Martini & Company.



MBA President Steve Massaro (left) with Carpenters Executive Secretary Bill Waterkotte and Brooke Waterkotte from Easley & Rivers.



MBA Executive Director Jack Ramage (left) with Mike Halpin from Cuddy Roofing.



(Left) Brian Hawk from Brayman Foundations, Lisa Wampler from Cohen Seglias and Lighthouse's Todd Mikec.



Jacquelyn Tully (left) and Sharon Grachen from Burchick Construction.



(From left) Mascaro's Kristina Falvo, Mary Ann Berg and Nadine Lee.



(From left) Jendoco's Pierre Brun, John Schneider from Gateway Engineers and Volpatt's John Zang at the 25th NAIOP Pittsburgh Awards Banquet.



Landau Building Company's Sharon and Jeffrey Landau, with Robin Zoufalik from Pieper O'Brien Herr at NAIOP Pittsburgh's awards banquet.

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(From left) Rycon's Danielle McCullough, David Heaton and Ben Kelley from Oxford Development and Rycon's Jason Sigal.



(From left) Kate Schuster of V.O. George, Dave Hengelsberg from Uhl Construction and Lauren Pataky from Manning Mills at the MBA Young Constructors' kickoff.



(From left) Massaro Corp.'s Emily Eichner, Module's Ankur Dobriyal and Shivam Mathur, and Massaro's Lindsay Wirtz.



Schneider Downs' Brittany Becker, Joe Bruce and Michael Lockerman.

AWARDS & CONTRACTS

Landau Building Company is the construction manager for Phases B and C of the Radiology Master Plan at WVU Medicine J.W. Ruby Memorial Hospital located in Morgantown, WV. These phases of the project will transform over 16,000 square feet on level 3 of the hospital into a new radiology center. Construction began on January 15, 2018 and is anticipated to be complete in December of this year. The designers are Harley Ellis Devereaux Architects.

Landau Building Company began work in November 2017 as the General Contractor for the 15,015 square foot first phase of WVU Medicine Cancer Center fit-out on the second and third floors of the Mary Babb Randolph Cancer Center located in Morgantown, WV. The architect is IKM, Incorporated.

Carnegie Mellon University selected **Landau Building Company** as construction manager for the renovations to Warner Hall. Perfido Weiskopf Wagstaff Goettel Architects is the architect.

Bobby Rahal Motors selected **Dick Building Company** to build its new Land Rover Jaguar dealership on Route 19 in North Strabane Township outside Washington, PA. The architect for the 42,000 square foot new facility is Dean Hess.

Dick Building Company was awarded the renovations for the expanded growing facilities for Robotany at the M. Berger Industrial Park on the South Side. Renaissance 3 Architects is the architect.

FMS Construction was the successful general contractor for the renovations to the Historical Society of Mt. Lebanon. The project involves renovations to 5,000 square feet. The architect is RSH Architects.

Volpatt Construction was awarded a contract for tenant improvements for WSP USA (formerly WSP Parsons Brinckerhoff) at 11 Stanwix Street. The architect for the 7,500 square foot fit-out is HOK.

Allegheny Health Network awarded two contracts to **Volpatt Construction**. Volpatt was the successful contractor for renovations at Forbes Regional Hospital. Zilka & Associates is the architect. Volpatt was also awarded the Suite 309 Mammography Dexa Unit at Jefferson Regional Medical Center. The Design Group is the architect.

Volpatt Construction was the successful contractor on the Mellon Institute Yttri Lab renovation for Carnegie Mellon University. IKM Inc. is the architect for the \$600,000 project.

Carnegie Mellon University awarded a \$2 million contract for Hamerschlag Hall Phase 2 window replacement to **Volpatt Construction**. The architect is Perfido Weiskopf Wagstaff Goettel Architects.

DiMarco Construction was awarded a \$2,413,000 contract for the general construction of the \$3.2 million Washington County Airport Public Safety and JPO Training Buildings. The project consists of the new construction of an 18,500 square foot public safety garage and an 8,500 square foot maintenance garage and JPO training facility. The architect is Ross Schonder Sterzinger Cupcheck PC Architects.

Ellwood City Forge selected **DiMarco Construction** as general contractor for its new 28,000 square foot office building in Ellwood City, PA. The architect is Franus Architectural Associates.

Independence Excavating was awarded the site work package for Allegheny Health Network's new Forbes Medical Clinic. The scope of work includes site demolition, earthwork, utility installation, footer excavation and backfill, and fine grading.

UPMC Hamot in Erie PA is building a new patient care tower and **Independence Excavating** was awarded the "make ready" utilities package. The scope involves the re-routing and upgrading of utilities to prepare for the new facility. Unique to the project is 30-foot-deep receiving shaft for a 200-foot jack and bore under an existing hospital facility.

TEDCO Construction is the contractor for the expansion of Amazon's offices at South Side Works. The architect for the 22,000 square foot tenant improvement is IA Architects.

UPMC Health Plan awarded **TEDCO Construction** the contract for its renovations to the sixth floor of the USS Tower at 600 Grant Street. The Design Alliance is the architect for the \$600,000 fit-out.

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TEDCO Construction was the successful contractor for the \$1 million renovations to UPMC Children's Hospital Adolescent Medicine at University Center in Oakland.

PJ Dick Inc. was selected as the construction manager at risk for Carnegie Mellon University's \$20 million GSIA/Posner Academic Backfill project. The 165,000 square foot renovation includes the full upgrade of the HVAC, lighting, fire protection and roofing systems, plus reconfigurations of the offices, student spaces and circulation areas to accommodate the new academic users. GBBN Architecture is the project's architect.

PJ Dick was selected to provide preconstruction services for Penn State University's Willard Renovation Project. Work includes renovation of 23,000 square feet of the existing Willard Building to house the new Bellisario School of Communication. The building will feature state-of-the-art multi-media studios including news, production and black box studios. In order to fit these new spaces into the building, a 60,000 square foot addition will be added to the structure. The existing building will also receive all new MEP systems and architectural upgrades.

PJ Dick, in partnership with Pike, was selected to provide general contractor services for the \$143 million Construction and Renovation of Canandaigua VA Medical Center in Canandaigua, NY.

PJ Dick was awarded the 2018 Construction Safety Excellence Award at the Association of General Contractors (AGC) of America conference in New Orleans, LA. Sponsored by Willis Towers Watson, this is a national awards competition that recognizes companies who have developed and implemented excellent safety and loss prevention programs. PJ Dick competed against 200 applicants in our building division 650,000-1,000,000 hours category.

Carnegie Mellon University selected **Jendoco Construction Corporation** as construction manager for the \$13 million buildout of 60,000 square feet for the Advanced Robotics for Manufacturing Institute in the Mill 19 Building under construction at Hazelwood Green. The architects for the project are MSR Design and Renaissance 3 Architects.

Massaro Corporation was the successful general contractor for the tenant buildout of 34,000 square feet for judicial offices in The Buncher Company's One Waterfront Place. The architect is TKA Architects.

Turner Construction was awarded a contract for the tenant improvements for Cozen O'Connor at One Oxford Centre. The \$1.6 million project, which was designed by DLA+ Architecture & Interior Design, involves the fit-out of 20,700 square feet on the 41st floor. The U.S. General Services Administration awarded **Mascaro Construction** a contract to be construction manager as constructor for the new \$137 million, 243,000 square foot Federal Courthouse in Harrisburg, PA. The architect is Ennead Architects.

Mascaro received an award notice for renovations at Two PNC Plaza for Phases 16 and 17. Renovations will begin in April and are expected to be completed by December 2018.

UPMC awarded a contract to **Mascaro** for renovations to its orthopedic center at UPMC St. Margaret Hospital

Mascaro received a design-build contract for a new 15,000 square-foot dispatch center and meeting room for the Operating Engineers.

Mascaro's Client Services is the general contractor for several projects at Allegheny General Hospital that include the central sterile washer replacement, OR scrub sink replacement, and the renovations required for a new gamma pod in the radiation/oncology department. Additionally, Mascaro is the



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construction manager for two projects at Allegheny General Hospital that includes renovations for the pharmacy and renovations to a linear accelerator vault in the radiation/oncology department.

Mascaro is expected to begin construction in March on the \$38 million Tippin Gymnasium Renovation / Expansion project at Clarion University. The project was designed by DLA+ Architecture & Interior Design.

Nello Construction was the low bidder on the additions and alterations to Hillview Elementary School in Grove City. The architect for the \$29 million project is Eckles Architecture.

CA Ventures selected **A. Martini & Company** as general contractor for its \$32 million, 172-unit McCandless Senior Living Facility at the McCandless Crossings development. The 175,000 square foot facility includes 80 units of independent living, 60 units of assisted living and 32 units of memory care. The Architectural Team is the architect.

YMCA of Pittsburgh selected **A. Martini & Company** as construction manager for the \$3.5 million renovation of the former YMCA Hill District building. The project's architect is RSH Architects.

North of Pittsburgh, **Rycon** is contractor for a five-phase interior cancer center renovation and addition of a linear accelerator vault is underway at UPMC Northwest Hospital. Work will wrap up late November 2018.

In Morgantown, renovations to the training facility at West Virginia University's Milan Puskar Stadium is underway by **Rycon**. The \$3.3 million project is set to finish July 2018.

Rycon was chosen by Argo AI as construction manager for their \$7.9 million tenant improvements at their future location within Riverfront West at 3 Crossings in the Strip District.

Rycon continues to be awarded renovation work at One PNC Plaza.



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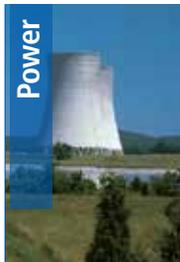
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Phases 5 & 6 began in February and are designed to achieve LEED Certification.

PREIT selected **Rycon** to demo a Macy's store in Moorestown, NJ. Redevelopments of the former 80,000 square foot space are underway. Create Architecture is the designer.

Rycon's Special Projects Group is the CM at-risk for \$1.3 million modifications of a cancer center pharmacy in Johnstown. Stantec is the architect.

In Sewickley, **Rycon's Special Projects Group** is responsible for completing \$2.3 million high-end renovations to a dermatology office. IKM is the architect.

Seritage Growth Properties chose **Rycon** to complete two six-month projects totaling over \$6.6 million for demolitions of existing Sears stores at Fair Oaks Mall in Fairfax, VA and Hunt Valley Mall in Cockeysville, MD.

At Andrews Air Force Base in Maryland, **Rycon's Special Projects Group** is constructing a Panda Express within a newly built food court. The two-month project is slated for completion mid-April 2018.

At the end of February, **Rycon** wrapped up office upgrades on floors 9, 10, and 11 at Three PNC Plaza for owner Reed Smith. Gensler was the architect.

At Tower Two-Sixty, the **Rycon Special Projects** team recently completed a large office fit-out for law firm McGuireWoods on the 17th and 18th floors. McGuireWoods selected Rycon again for their expansion on the 16th floor.

Construction is underway by **Rycon** on a new \$8.7 million Floor & Décor store in Miami, FL.

In April, **Rycon** will start improvements to a Ross Dress for Less in Miami, FL. The 27,000 square foot interior renovation will continue until July 2018.



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InvenTrust Properties awarded **Rycon** a construction management contract for a PetSmart build-out in Sarasota, FL. Designed by Richard L. Bowen & Associates, work is slated for completion mid-June 2018.

In Ohio, **Rycon** recently broke ground on a new \$2.5 million Chase Bank. Work on the 3,500 square foot building will continue for four and a half months.

Construction on a new Tire Kingdom in Palm Beach, FL is anticipated to begin in March by **Rycon**. TBC Corporation is the owner of the 6,700 square foot store.

Rycon is proud to be part of the award-winning 3 Crossings team. Congratulations to Oxford Development Company on the recognition by NAIOP Pittsburgh for Best Mixed-Use Development: 3 Crossings.

Nicholson Construction has teamed up with sister company and ground improvement specialist **Menard Group USA** on the \$38 million biodigester project at the City of Grand Rapids Water Resource Recovery Facility (WRFF). The biodigester, which converts food waste into energy, part of the city's efforts to rely 100 percent on renewable energy to power city buildings by 2025. Construction of the biodigester includes three, large-diameter tanks, a process facility, a gallery and various other support structures.

AIM Construction started construction on the UPMC Presbyterian University Hospital Heart Vascular Institute Phase 2. The \$30 million renovation to the clinical space will take two-and-a-half years. Bostwick Design Group is the architect.

Butler Health System awarded a \$1.7 million contract to **AIM Construction** for renovations to Butler Memorial Hospital's fifth floor. IKM Inc. is the architect.

Nello Construction was the successful general construction contractor on the \$29 million Hillview Elementary School renovation for Grove City Area School District. The architect is Eckles Group.

Landau Building Company announced the promotion of **Christopher Priest** from estimator to senior estimator. Chris began working for Landau as part of the University of Pittsburgh Cooperative Education Program as a project engineer. After graduating with a B.S. in Civil Engineering in 2009, he was hired full-time as an estimator.

Josh Pisarcik joined **Allegheny Construction Group** as director of project development.

John Guna joined the **Mascaro** team in January as chief financial officer. John will be filling the shoes of Charley Soklovy who will be retiring this spring.

Wes Klowkowski, a transplant from Chicago, became a member of the **Mascaro** team this past January. As project manager, Wes is overseeing several healthcare projects for Mascaro.

Shawn Smith joined **Mascaro's** team in January. Shawn has a 29 year background in building construction projects, with extensive experience in institutional projects.

Brian Miehl joined **Mascaro** in February as a project manager. John, a graduate of Point Park University, brings 19 years of construction experience to the Mascaro team.

Jessica Cisneros joined **Rycon's** Atlanta office as preconstruction coordinator. She brings over 10 years' experience to the company.

Rycon's Building Group added **Tim Kwan** as MEP Coordinator. Tim has a degree in Mechanical Engineering, a Professional Engineer certification, and over ten years' experience in sustainable MEP design and project management.

With 16 years' experience project manager **Robert McTeague** has been hired in **Rycon's Atlanta** office. He holds a degree from the University of South Florida.

Project engineer **Ciara Price** was hired in **Rycon's** Special Projects Group. She recently graduated from the University of Pittsburgh earning a degree in Civil Engineering.

Rycon added **Joel Schubert** as a project manager in the Building Group. He received bachelor degrees from the University of Pittsburgh and Saint Vincent College in Civil Engineering and Mathematics respectively. He has over 13 years' relevant experience.

NEW PLACES

Penn State alumnus **George Strasbaugh** joined **Rycon's Special Projects Group** as an assistant project manager. George was a commercial carpenter for eight years prior to jumping to the other side of the industry where he worked for six years in building material sales and management.

With six years' field experience, **Rycon** welcomes aboard **Brian Taylor** as a project engineer in the Special Projects Group.

Austin Zrenner joined **Rycon** Cleveland as a project manager. He holds a degree in Construction Management from The Ohio State University and has over nine years' experience in the construction industry, with the past four in health care construction.

Stephane Bourillot was recently named the new president of **Nicholson Construction Company**. Bourillot comes to Nicholson from its parent company Soletanche Bachy, where he held many leadership roles in a variety of international environments. Bourillot holds a master's degree in Civil Engineering from ESTP Paris and a PhD from CHEC Paris specializing in reinforced and pre-stressed concrete.

Landau Building Company is pleased to announce the promotion of **Jennifer Landau** from project manager to vice president. Jennifer started working at Landau Building Company in 1999 as an intern and was hired full time in 2001. She has a B.S. in Civil Engineering and a M.S. in Construction Management from the University of Pittsburgh. She is also a LEED Green Associate.

Landau Building Company is pleased to announce the promotion of **David Curry** from chief estimator to vice president of estimating. Dave began his career at Landau Building Company in 1994 when he graduated from the University of Pittsburgh with a B.S. in Civil Engineering and Environmental Engineering.

PJ Dick has hired **Joseph McCosby** as a project manager. Mr. McCosby studied Architectural Drafting and Design at Beattie Technical School and has 38 years of construction experience.

PJ Dick Industrial has hired **Brian Lomago** as a project manager. Mr. Lomago has an MA and BA from California University of Pennsylvania and has seven years of construction experience.

PJ Dick has hired **Sean Hreha** as a project manager. Mr. Hreha has a BS in Civil Engineering from the University of Pittsburgh and has 13 years of construction experience.

PJ Dick has hired **Drew Millier** as a Site Safety Manager. Mr. Millier has an MS in Environmental Health from the University of Saint Francis, a BS in Environmental Science from SUNY Empire State College, and an AS in Nuclear Energy Technology from SUNY Empire State College. He has 16 years of industrial and environmental health and safety experience.

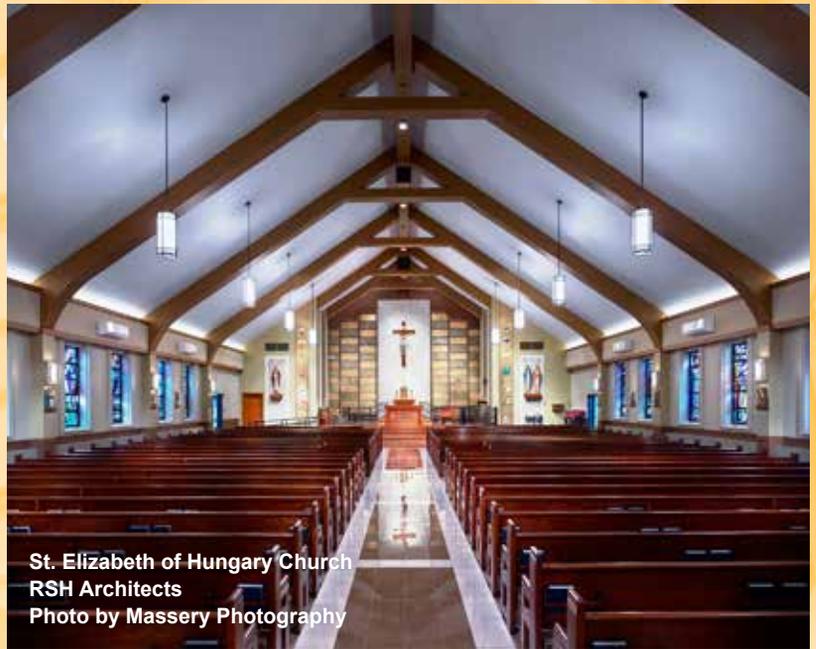
PJ Dick has hired **Ron Resch** as a project superintendent with more than 20 years of experience.

PJ Dick has hired **Alex Lincoln** as a project engineer.



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CLOSING OUT

BY DR. AURORA SHARRARD

It's 2018 and Green Building Alliance (GBA) is celebrating 25 years as an organization. That's 25 years that green building has been not just a topic of conversation, but rigorously implemented, evaluated, and showcased in our region – and we're not slowing down.

In a blink, GBA and green buildings have grown up in Western Pennsylvania – both literally and figuratively. There are now 364 LEED certified projects in Western Pennsylvania, totaling 37.5 million square feet. While there is an obvious cost for certification (nothing is free), anyone in the business knows you can design and construct a LEED building at cost parity, if not with cost savings through integrative design.

At GBA, we're asking every owner/developer and their project team to pursue a green building or community certification that makes sense for their project. Consider it. It may be past the realm of possibility on the project you're building right now, but if we're building 100-year assets for the region, it's certainly not past time for that building to start tracking its operational performance and chasing a certification to prove that it's doing well.

Despite a rapidly advancing market, we at GBA still get the question: "Does certification pay for itself?" Looking at just U.S. LEED certified buildings, Harvard University's 2017 HEALTHfx study showed that U.S. green buildings saved \$10.7 billion from 2000 – 2016 (\$6.7 billion in energy costs, plus an additional \$4 billion in health and climate benefits). If dollars aren't enough for you, in that same time period, U.S. green buildings also prevented 21,000 lost work days; 16,000 lost school days; and 172 to 405 premature deaths – and these are just the co-benefits Harvard quantified.

But green building no longer just means LEED – and our region is keeping up with the trends. Going back to 2010, Pittsburgh celebrates a number of net zero energy projects (buildings that create and use all their energy on-site). Given a push for local resiliency, the precipitous drop in solar prices, and a global imperative to do so, zero net energy buildings are a trend that's only expected to grow exponentially (especially given new data out of Rocky Mountain Institute proving that net zero leased office buildings have a 19 percent increase in profits (given a 10-year hold), despite seven percent higher upfront costs. GBA has embraced this reality head on, putting out a goal for all new construction to be net zero by 2030 – and for every existing building to be on the path to net zero by 2050 (mirroring the World Green Building Council's imperative).

Taking net zero one step further are Living Building projects (net zero energy, net zero water, red list free, and more); in the region, we have one Living Building out of only 15 in the world so far (Phipps Center for Sustainable Landscapes), with two in hot pursuit and a handful pursuing Petal certification – even at the Living Community scale. Our region's leadership on this front was validated in 2017 when the International Living Future Institute co-located with GBA to start the first Living Product Hub, which is bringing transparency into the building supply chain by working with local manufacturers to lead the industry as

models of ingredient transparency, material health, and net positive handprints.

And then there's Passive House. Don't let this misnomer fool you: Passive House is a performance standard and certainly not just for homes. Here in Western Pennsylvania, seven projects have certification so far, with the multifamily sector leading the charge. Pennsylvania is also showing the world that you can build Passive House here for 2.5 percent less than conventional construction; with an expected utility bill up to 50 percent less annually, the business case alone for Passive House is astounding.

Lest we forget the people who occupy all these places where we live, work, learn, and play, the WELL Building Standard's emphasis on human health and well-being is getting quite a bit of attention from owners and developers. Despite only one certified project so far in the region (out of only 82 internationally), commercial offices, universities, K-12 schools, and cultural and healthcare institutions are all exploring its applicability – at both the building and community scales.

Beyond certifications, GBA's Pittsburgh 2030 District is an internationally recognized, locally driven, and voluntary initiative that supports property owners to achieve 50 percent reductions in energy use, water consumption, and transportation emissions (below baselines) by the year 2030. Bridging four neighborhoods, the Pittsburgh 2030 District supports 493 committed buildings, leading all 18 international 2030 Districts with the most committed square feet (79.2 million). Through 2016, Property Partners collectively saved nearly \$57 million in energy and water costs – and we're expanding the opportunity across Western Pennsylvania.

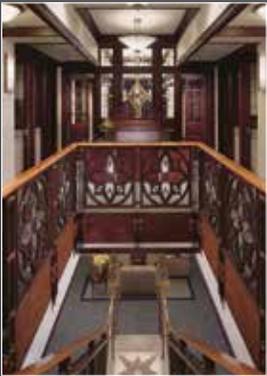
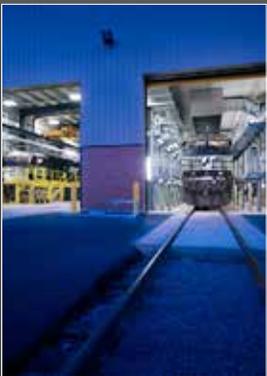
If you just skimmed this article and didn't recognize a word, it's time to reach back out to GBA. Every scale of the built environment can improve – and we work to make that happen every day.

The built environment is inherently resource-intensive, but our region has long shown that sustainability can positively impact people, our planet, places, and markets. We at GBA are committed to transforming the built environment within a generation, using proven solutions and innovative approaches to advance our vision of every building and community being sustainable. We can't do it without you.

Dr. Aurora Sharrard is the Executive Director of Green Building Alliance (GBA). Founded in 1993, GBA is an independent 501(c)3 nonprofit organization — and one of the oldest regional green building organizations in the United States. GBA.org



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