

BUILDING DESIGN [®] + CONSTRUCTION

WHERE
TECHNOLOGY
AND INNOVATION
COLLIDE

JULY/AUGUST 2023

2023 GIANTS 400 REPORT

Ranking the Nation's Largest
Architecture, Engineering, and
Construction Firms

19



300 NORTH MICHIGAN AVENUE TOWER
CHICAGO, ILLINOIS

SGC HORIZON

Industrial Chic



Photo: atanblakely.com

Colorful metal panels mimic signature sculpture

Parc Haven features industrial-style PAC-CLAD Highline B2 metal cladding that references the adjoining train tracks. A punch of colorful Flush panel highlights nod to Symphony Park's Pipe Dream sculpture sited directly across the street.



View the case study and video



PAC-CLAD.COM | 800 PAC CLAD

FEATURES

2023 GIANTS 400 REPORT

Ranking the nation's largest AEC firms across multiple building sectors:

- 20 Architecture + AE Firms
- 28 Engineering + EA Firms
- 32 Contractors + CM/PM Firms
- 37 Retail Buildings
- 40 Office/Workplace
- 45 Hotels
- 48 Data Centers

DEPARTMENTS

6 EDITORIAL

Innovations from the 2023 Giants 400

8 NEWS+TRENDS

New surveys track how the construction industry is navigating market disruption; square foot construction costs for hospitality buildings

12 TRENDSETTING PROJECTS

Jacksonville Jaguars' "stadium of the future"; high-rise cancer center delivers new model for oncology care

54 PRODUCT INNOVATIONS

Vandal-resistant downlight; wood-frame window wall; cleanroom doors

58 GREAT SOLUTIONS

GC pilots wearables to reduce heat related injuries on jobsites



19



37



45



AIA CONTINUING EDUCATION

Fire safety considerations for cantilevered buildings

p.51



2014-2017, 2019-2020
JESSE H. NEAL
AWARDS
AWARD WINNER

ON THE COVER: The 47-story 300 North Michigan Avenue residential and micro-hotel tower anchors the corner of this prominent Chicago city block. The base of the building accommodates a large retail space within its refined and transparent façade. The team included: Magellan Development Group, Sterling Bay (developers), bKL Architecture (design architect), WSP (structural engineer), Hill Group (M/P/FP engineer), and Linn-Mathes (contractor).
PHOTO: KENDALL MCCAUGHERY, HALL+MERRICK+MCCAUGHERY PHOTOGRAPHERS



BUILDING DESIGN+CONSTRUCTION PRESENTS

Life of an Architect

a podcast by architects for architects

BD+C AND BOB BORSON, FAIA, have teamed up to bring you Life of an Architect, a twice-monthly podcast that delves into all things architecture and design.

CHECK OUT THE LATEST Life of an Architect episodes:

EPISODE 129

BUILT TO LAST

The Pantheon, 125 A.D. The Tower of Hercules, 117 A.D. Nanchan Temple, 782 A.D. The Hagia Sofia, 537 A.D. All of these structures were built centuries ago but still stand in use today. Do modern-era buildings get created in such a way that allows for them to last for this long? Of course not. But why is that? What can we do to improve the longevity of our buildings?

Editor's note: This podcast episode is accredited with AIA for 1.0 AIA/HSW learning units. To earn the free LU, listen to the episode and take the 10-question exam at BDCnetwork.com/BuiltToLast.

LISTEN TO ALL EPISODES AT:

BDCnetwork.com/lifeofanarchitect

COURTESY SKANSKA



Skanska's Portland, Ore., team brought drones to the Center for Deaf and Hard of Hearing Youth project so students could see how technology supports a project's overall design and execution.

5 WAYS STRONG COMMUNITY RELATIONS CAN LEAD TO SUCCESS IN K-12 SCHOOL CONSTRUCTION

When constructing a K-12 school, building positive relationships with the community—including students, parents, school staff, and residents—is critical to the success of the project. Skanska's Brian Urban and Mike Kingham outline five ways the firm puts the community first.

BDCnetwork.com/SkanskaBlog

WHEN OFFICE-TO-RESIDENTIAL CONVERSION WORKS

Perkins Eastman's residential practice leaders are helping developers decide which office buildings can be converted into apartments and condos. "It's not as simple as putting

units in a box," says Managing Principal Barbara Mullenex.

BDCnetwork.com/PerkinsBlog

DESIGNING HIGHER EDUCATION FACILITIES WITHOUT KNOWING THE END USERS

A team of architects with Page offers five important factors to consider when designing spaces for multiple—and potentially changing—stakeholders.

BDCnetwork.com/PageBlog

DESIGN CONSIDERATIONS FOR BEHAVIORAL HEALTH PATIENTS

The surrounding environment plays a huge role in the mental state of the occupants of a space, especially behavioral health patients whose perception of safety can be heightened.

BDCnetwork.com/DC-Blog

FOLLOW BD+C ON



CELEBRATING 20 YEARS OF MOVABLE GLASS WALLS





6 EMERGING TRENDS FROM THE 2023 GIANTS

This year, 550 of the nation's largest architecture, engineering, and construction firms participated in *BD+C's* 47th annual Giants 400 survey—a new record for this program. Starting on page 20, we highlight more than 240 innovations, technology advancements, and market-moves reported by the 2023 Giants firms—from launching startups to piloting AI and robotics to opening new offices. From this collection of innovations and firm news, six emerging trends stand out:

1. Firms leverage tech to measure how people experience spaces and places. Gresham Smith, for example, patented a smartphone app, called MPATH, which marries biometric data (comfort, stress, etc.) with geo-location data from wearable devices to quantify how people experience places and spaces.

2. The exoskeleton is finally here. Several contractors and engineering firms cited exoskeleton technology as a recent innovation. Burns & McDonnell is using exoskeletons on solar project sites. Balfour Beatty is pilot testing the Hilti EXO-01 passive assistance exoskeleton on a bridge replacement project in North Carolina. The project team is testing the device while removing concrete soffit formwork under the bridge. It allows workers to perform repetitive overhead work with high weight loads using the assistance of rubberized straps.

3. “Shark Tank” comes to AEC. Arup, IMEG, Integrated Project Services (IPS), and McCarthy Building Companies are among a growing number of firms to host formal in-house

innovation competitions. McCarthy's “Spark Tanks” have resulted in 1-2 business opportunities per month, including the establishment of two self-perform businesses generating more than \$2 million in revenue.

4. Building design as computer code. Engineering firm Teecom developed a new way to approach the design of buildings, called Buildings as Code. The concept involves writing the requirements for the systems and buildings the firm designs in a structured way, like a programming language. Why? Because it makes the design specifications formal, testable, and extensible. It also makes managing complexity much easier with version control and collaboration, says the firm.

5. Risk mitigation takes center stage. From Warfel Construction's Wet Work Program to Brasfield & Gorrie's adoption of Riskcast labor tracking software, firms are hyper-focused on leveraging advanced technology and processes to identify and mitigate sources of risk on projects. Warfel is planning for a 30% reduction in costs related to water systems damage just by taking actions like proper tagging/identification of the shut-off valves, posting shut-off valve location drawings throughout the work area, and use of flow monitors or water watch personnel.

6. ChatGPT is not a panacea—yet. Of the 300-plus firms to report their recent innovations, only one—just one!—mentioned ChatGPT, or any AI chatbot tool. And that firm, Sachse Construction, is using the tool for business tasks (writing, presentations, document creation, award submissions, etc.), not project-related work.

EDITORIAL STAFF

EDITORIAL DIRECTOR | David Barista
847.954.7929; dbarista@sgcmail.com

EXECUTIVE EDITOR | Robert Cassidy
847.391.1040; rcassidy@sgcmail.com

SENIOR EDITOR | John Caulfield
732.257.6319; jcaulfield@sgcmail.com

MANAGING EDITOR | Quinn Purcell
847.660.2743x126; qpurcell@sgcmail.com

CONTRIBUTING EDITORS | Peter Fabris, Novid Parsi, C.C. Sullivan

DESIGNER | Elena Soloc

EDITORIAL ADVISORS

DAVID P. CALLAN | PE, CEM, LEED AP, HBPD
Senior Vice President, McGuire Engineers

PATRICK E. DUKE | Senior Vice President
CBRE Healthcare

CAROLYN FERGUSON | FSMPS, CPSM
President, WinMore Marketing Advisors

JOSH FLOWERS | AIA, LEED AP
Legal Counsel, Gresham Smith

ARLEN SOLOCHEK | FAIA, Former Associate
Vice Chancellor, Maricopa County CCD

PHILIP TOBEY | FAIA, FACHA
Senior Vice President, SmithGroup

PETER WEINGARTEN | AIA, LEED AP
Director of the Architectural Practice, Gensler

BUSINESS STAFF

GROUP DIRECTOR – PRINCIPAL | Chris Perrino
847.391.1015, cperrino@sgcmail.com

VICE PRESIDENT – BUILDING GROUP | Tony Mancini
484.412.8686, tmancini@sgcmail.com

DIRECTORS – EVENTS

Judy Brociek
847.954.7943; jbrociek@sgcmail.com

Lisa Allen
847.954.7476; lallen@sgcmail.com

ASSISTANT DESIGN MANAGER | Dara Rubin
drubin@sgcmail.com

DATA & AUDIENCE DEVELOPMENT
bdc@omeda.com

For list rental information, contact **Claude Marada** at 402.836.6274; claude.marada@infogroup.com or **Bart Piccirillo** at 402.836.6283; bart.piccirillo@infogroup.com

CORPORATE

CHAIRMAN EMERITUS (1922-2003) | H.S. Gillette

CHAIRPERSON | K.A. Gillette

PRESIDENT AND CEO | E.S. Gillette

CHIEF OPERATING OFFICER | David Shreiner

SUBSCRIPTION INQUIRIES

Building Design+Construction
P.O. Box 300 | Lincolnshire, IL 60069-0300
BDC@omeda.com
Toll Free 877.501.7540 | Fax: 877.683.2064

For advertising contacts, see page 57.

THE BEAUTY'S IN THE DETAILS



When the iridescent, multi-toned effects of Fluropon® Effects Kameleon hit a certain light, the rich, pearlescent hues transform before your eyes. It's a spectacle that'll leave you with a different opinion each time. Our obsession with color is vast. It inspires us to push color beyond the expected and create something original. So our clients' visions shine for generations to come.

See where color can take you. Contact us at coil.sherwin.com.



SHERWIN-WILLIAMS.
Coil Coatings

TWO NEW SURVEYS TRACK HOW THE CONSTRUCTION INDUSTRY IS NAVIGATING MARKET DISRUPTION AND VOLATILITY

➔ **A recent survey of 514 project, site, and construction managers** in the U.S. and the U.K., conducted by OnePoll for XYZ Reality, found that 94% had project backlogs and 63% admitted to delivering projects off schedule either “somewhat” to “very frequently.”

“Poor project performance, low productivity, and costly major project failures—and high-profile industry bankruptcies—continue to dog the sector,” wrote KPMG International in its recently released 2023 Global Construction Survey, based on responses from 257 engineering and construction firms and project owners around the world (29% of which were based in North America).

Respondents to KPMG’s survey, while mostly “cautiously optimistic” about their industry’s future, still lamented that less than half of their projects are being completed on time. Both surveys cite similar reasons why

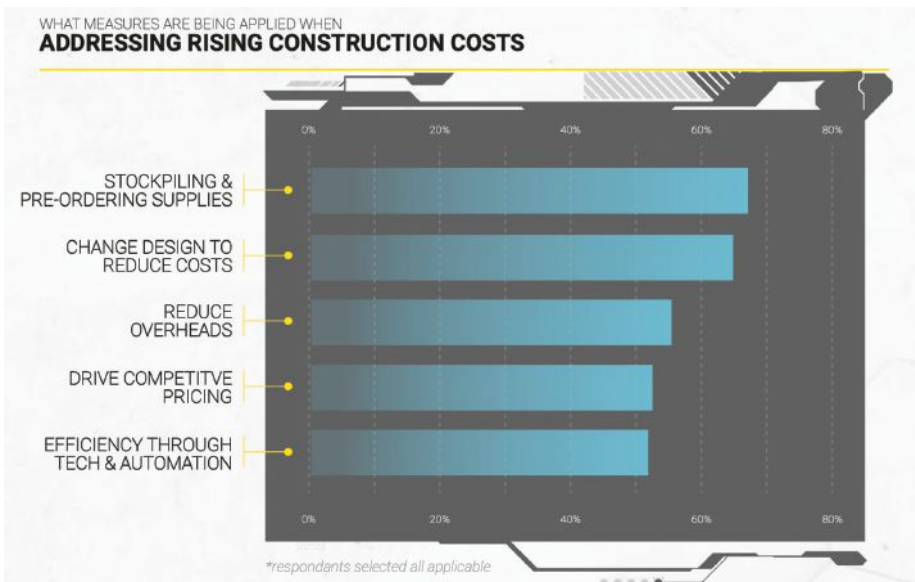
projects stall, starting with nagging supply-chain delays, labor shortages, and rising construction costs.

KPMG is also seeing a “dramatic shift” by contractors away from fixed-price and guaranteed maximum-price contractors for major projects. Colin Cagney, the firm’s Director of Infrastructure, Capital Projects, and Climate Advisory in the U.S., surmises that contractors are attempting to mitigate their primary responsibility for performance risk.

XYZ Reality’s survey notes, too, that construction firms struggle for a variety of reasons to meet their clients’ sustainability goals, and their projects get delayed as well by unexpected design changes, labor shortages, and poor jobsite communication.

The biggest priority for respondents to KPMG’s survey is improving estimating accuracy, transferring risk, and increasing innovation.

More at [BDCnetwork.com/disruption](https://www.bdcnetwork.com/disruption).



Both surveys find respondents taking measures to mitigate inflation and other market disruptions. Chart: XYZ Reality

10,105

The **total floor area** (in square feet) of a 3D-printed luxury horse barn in Wellington, Fla., making it the world’s largest 3D-printed building. The barn is 155 feet long, 83 feet wide, and 13 feet high.

Printed Farms used COBOD’s BOD2 construction 3D printer for the building, which was constructed to withstand extreme local weather conditions including hurricanes and tropical storms.

The versatility and benefits of 3D printing technology are also demonstrated through the structure’s 3D-printed walls that create a cavity and air gap, providing natural cooling to the building. The build process involved five moves of the printer with the two sides completed twice and the middle section executed once.

The average embodied carbon intensity (in kilograms per square foot) in core and shell industrial buildings in the U.S., according to analysis of 26 whole building life-cycle assessments by building consultancy Branch-Pattern. That means a 300,000-sf warehouse would emit 6,890 megatons of carbon over its lifespan, or the equivalent of the carbon emitted by 1,530 gas-powered cars driven for one year.

23.0

AEOS™
ASTM A913

**HIGH-STRENGTH
STRUCTURAL STEEL**



It's high strength, and it's

30% STRONGER

than the grade 50 steel.

Jeffrey Smilow, Nucor Mind of Steel
PE, F.ASCE
Executive Vice President, Managing
Director, Building Structures, WSP USA

**SHAPING FUTURE WORKSPACES
WITH HIGH-STRENGTH
STRUCTURAL STEEL**

Embodying a bold vision for the future of New York City, the skyscraper nicknamed The Spiral was built with Nucor's Aeos high-strength structural steel. That meant lighter columns per floor were needed to meet the strength requirements—and lighter columns equaled more usable space.

Discover how Aeos can elevate your project expectations and efficiency.
nucor.com/aeos-elevate

NUCOR®

HOSPITALITY BUILDINGS SQUARE FOOT CONSTRUCTION COSTS

By Gordian

First impressions form fast. In the hospitality industry, which includes restaurants, hotels, and entertainment facilities, an initial good impression is critical and hinges on clean, fully functioning facilities and a friendly, competent staff. Especially in a post-Covid society, providing clean and safe accommodations is paramount. Facilities managers and owners are now taking extra steps to ensure the highest cleanliness standards, including upgrading air filtration systems, installing no-touch technologies and contactless services, and reconfiguring spaces to promote social distancing. Additionally, automation is being implemented to combat labor shortages and improve overall efficiency.

Improvements to meet green building expectations, anticipate guests' needs with a more personalized experience, and ensure guests' safety are para-

CITY	HOTEL, 8-24 STORY	RESTAURANT	RESTAURANT (GREEN)	FAST FOOD RESTAURANT	MOVIE THEATER
NEW ORLEANS	\$217.89	\$238.14	\$291.25	\$251.92	\$189.96
MIAMI	\$220.69	\$241.20	\$295.12	\$257.03	\$191.42
PHOENIX	\$227.91	\$250.51	\$305.07	\$265.07	\$198.46
WASHINGTON, D.C.	\$246.63	\$268.16	\$325.45	\$284.01	\$211.49
SEATTLE	\$268.00	\$295.66	\$356.72	\$311.43	\$233.21
LAS VEGAS	\$266.81	\$299.07	\$361.88	\$317.05	\$235.67
BOSTON	\$287.44	\$318.44	\$384.41	\$335.59	\$253.43
LOS ANGELES	\$291.18	\$322.67	\$388.96	\$341.45	\$256.22
CHICAGO	\$294.87	\$332.87	\$400.50	\$349.15	\$264.10
NEW YORK	\$323.44	\$362.35	\$434.54	\$380.55	\$286.37

Please note: Square foot models are used for planning and budgeting and are not meant for detailed estimates.

mount. RSMeans Data from Gordian can help estimate these costs. With localized, square-foot costs for more than 100 building models including various hospitality industry facilities, RSMeans Data allows architects, engineers, and other preconstruction professionals to quickly and accurately create concep-

tual estimates for future builds. This table shows the most recent costs per square foot for 15-story hotels, restaurants, fast food restaurants, and movie theaters in select cities.

Visit rsmeans.com/bdandc for more information about RSMeans Data from Gordian.

RACIAL BIAS CONCERNS PROMPT LAWMAKERS TO ASK HUD TO BAN BIOMETRIC SURVEILLANCE, INCLUDING FACIAL RECOGNITION

➔ Two members of the U.S. House of Representatives have asked the Department of Housing and Urban Development to end the use of biometric technology, including facial recognition, for surveillance purposes in public housing.

Congresswomen Maxine Waters and Ayanna Pressley say that the technology could inaccurately identify residents of color leading to wrongful penalties. The effect could be to harass or punish residents for minor rule infractions, they asserted.

Multiple studies of facial recognition technology have pointed to divergent error rates across demographic groups, with women of color the least likely to be accurately identified. A 2018 Massachusetts Institute of

Technology study found that three commercially released facial analysis programs had a margin of error of between 20% and 34% when identifying dark skinned women, compared to 0.8% or lower for light-skinned men.

ELECTRIC VEHICLE CHARGERS ARE TOP PRIORITY FOR CORPORATE OFFICE RENTERS

➔ Businesses that rent office space view electric vehicle (EV) charging stations as a top priority. More than 40% of companies in the Americas and EMEA (Europe, the Middle East, and Africa) are looking to include EV charging stations in future leases, according to JLL's 2023 Responsible Real Estate study. The reason: Organizations need to fulfill their net zero carbon commitments or comply with increasingly stringent regulations, causing them to expand and reshuffle priorities.

These priorities, stemming from

organizational commitments to sustainability, impact how they engage with landlords. About 34% of business renters currently use some form of green-lease language in their contracts. Clauses around EVs, embodied carbon, electrification, and overall emissions showed the greatest increase in prioritization among corporate leaders.

This trend has momentum. The uptake of most green-lease targets is set to double as tenants sign their next lease, JLL says.

EXURBS AND EMERGING SUBURBS HAVING FASTEST POPULATION GROWTH

➔ Recently released county and metro-level population growth data by the U.S. Census Bureau shows that the fastest growing areas are found in exurbs and emerging suburbs.

Analysis of the data by Cushman & Wakefield shows population growth

in all areas since the 2020 census, with the exception of urban cores that have had declining numbers. In 2022, however, the rate of decline in urban counties slowed significantly, buoyed by the resumption of international migration following the Covid pandemic.

The Dallas-Fort Worth metroplex grew by roughly 170,000 residents, outpacing the metro area with the second largest population gains, Houston, by nearly 50,000 people. The New York metro region saw its population shrink by about 139,000. Since the 2020 Census, Austin, Texas, and Raleigh, N.C., rank as the two fastest growing metros on a percentage basis among major markets.

HUD OFFERS \$4.8 BILLION IN FUNDING FOR GREEN AND RESILIENT BUILDING RETROFIT PROJECTS

➔ The Department of Housing and Urban Development (HUD) recently released guidelines for its Green and

Resilient Retrofit Program (GRRP) that has \$4.8 billion for funding green projects.

Eligible properties could be awarded grants and below-market rate loans to upgrade projects for improved sustainability. HUD currently expects to provide about \$2 billion to 600 properties under GRRP's initial set of awards.

This program offers funding of up to \$40,000 per unit, or \$750,000 per property, to pay for improvements including electric HVAC heat pumps, Energy Star windows, fire resistant roofs, and clean energy generation systems.

OUTDATED FEDERAL RAINFALL ANALYSIS IMPACTING PROJECTS, FLOOD INSURANCE

➔ The way the federal government analyzes intense rain events isn't keeping up with the reality of climate change, and that has serious implications for infrastructure projects

and the availability of, and rising cost of, flood insurance.

Severe rainstorms, sometimes described as "atmospheric rivers" or "torrential thunderstorms," are making the concept of a "1-in-100-year flood event" obsolete, according to a report from First Street Foundation, an organization focused on weather risk research.

These events are occurring more frequently due to the impact of climate change, but federal rainfall analysis, managed by the National Oceanic and Atmospheric Administration, isn't keeping up with the new weather conditions, First Street says.

Half the people in the U.S. live in a county where a 1-in-100-year flood is at least twice as likely now as it had been in the past, coming once every 50 years instead of every 100 years. In some areas, a so-called "1-in-100-year" rainfall could now happen far more frequently—as often as every five to 10 years.

ZIPWALL®

DUST BARRIER SYSTEM

800-718-2255

Start every job with ZipWall®.

- Install in just a few minutes
- Up to 20' high
- No ladders, no damage

See how easy it is at zipwall.com.



NFL'S JACKSONVILLE JAGUARS RELEASE CONCEPTUAL DESIGNS FOR 'STADIUM OF THE FUTURE'



In June, the Jacksonville Jaguars

released the conceptual designs for the “Stadium of the Future,” a design project that began almost three years ago.

In July 2020, the Jaguars and the City of Jacksonville started working toward a long-term stadium solution with an engineering assessment of the current stadium, TIAA Bank Field. The assessment found the stadium’s challenges could be resolved by renovating the city-owned facility, rather than building a new venue.

Designed by HOK, the Stadium of the Future intends to meet the evolving needs of all stadium stakeholders—which include the Jaguars, the annual Florida-Georgia college football game, the TaxSlayer.com Gator Bowl, international sporting events, music festivals and tours, and the thousands of fans and guests who attend each event.

The design drew inspiration from Jacksonville’s landscapes—including

biking and walking trails, parklands, greenways, beaches, and marshes. Guests will enter through

a subtropical Floridian park that leads them to the main concourse.

Thirty feet above ground, the concourse will offer views of downtown Jacksonville and the St. Johns River. The 360-degree concourse, four times wider than before, will feature social bars and culinary options native to Jacksonville.

The flexible seating bowl will have a base capacity of 62,000 and will be able to hold up to 71,500 for a college football game and more for a concert. Lighting and digital technology will create distinctive experiences while keeping fans connected.

The design team has kept sustainability in mind. The mirrored, energy-efficient façade will reflect the area’s waterfront and vegetation. The open-air venue’s large shade canopy will

reduce heat retention by more than 70% and lower temperatures 10 to 15 degrees, while protecting guests from the weather. Raised at the northern and southern ends to improve airflow, the façade will enable passive cooling throughout the stadium.

The stadium design also addresses some fan requests—including a 185% increase in the main concourse surface area, a 260% increase in the upper concourse surface area, 360-degree connectivity in the upper concourse, 13 new elevators, 32 new escalators, and 220 new food and beverage points of sale.

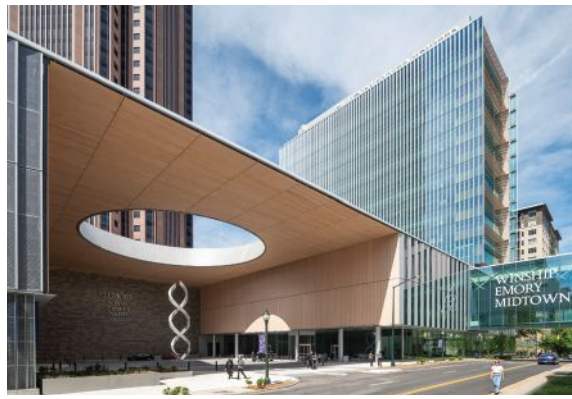
The team includes: HOK (design architect), AECOM Hunt and Barton Malow (preconstruction managers), and Impact Development Management (owners’ rep.).



HIGH-RISE CANCER CENTER DELIVERS NEW MODEL FOR ONCOLOGY CARE

In May, Atlanta's new Winship Cancer Institute at Emory Midtown welcomed its first patients. The 17-story, 450,000-sf facility adds inpatient, outpatient, and research facilities to Emory University Hospital Midtown and Winship Cancer Institute.

Designed by Skidmore, Owings & Merrill (SOM) and May Architecture, the facility includes comprehensive oncology facilities—including inpatient



beds, surgical capacity, infusion treatment, outpatient clinics, diagnostic imaging, linear accelerators, and areas for wellness, rehabilitation, and clinical research.

To design the facility, SOM and May Architecture used a highly collaborative process involving more than 160 stakeholders across Winship's leadership, patients, clinicians, volunteers, staff, and construction teams.

The building features two-story care communities, each focused on a specific type of cancer. Services typically distributed throughout a hospital are instead organized into one-stop destinations that combine exam, consultation, infusion, and supportive functions.

These care communities reduce or eliminate patients' waiting times. In addition, they bring fellow patients and families

together and allow specialists to visit both inpatients and outpatients without having to leave the two floors.

The care communities informed the exterior's two-story façade increments. The building's transparent storefront welcomes patients and visitors with a drop-off valet area that leads into the main lobby. Amenities throughout the building include a retail boutique, pharmacy, wellness center, cafe, and multipurpose spaces for future offerings of yoga, music therapy, education, and art therapy.

Thanks to an energy-efficient design, the Winship Cancer Institute will expend 40% less energy annually than the average Atlanta hospital. The building also features energy-efficient recovery mechanical equipment, with chilled beams.

N.J. DEVELOPMENT REPRESENTS STATE'S LARGEST-EVER INVESTMENT IN LIFE SCIENCES AND MEDICAL EDUCATION

In New Brunswick, N.J., a life sciences development that's now under way aims to bring together academics and researchers to work, learn, and experiment under one roof.

HELIX Health + Life Science Exchange is an innovation district under development on a four-acre downtown site. At \$731 million, HELIX, which will be built in three phases, represents New Jersey's largest-ever investment in life sciences and medical education.

SJP Properties, in collaboration with New Brunswick Development Corporation, recently unveiled plans for H-2—HELIX's second phase. A mixed-use, 600,000-sf building, H2 will include build-to-suit lab and office space that can serve a range of uses for large corporate life sciences and technology company tenants. HDR is the lead architect for H-2, and JLL is the building's leasing agent.

Next to Rutgers University and across from the city's train station, the 574,000-sf H-1, the development's first phase, will include the New Jersey Innovation HUB, the new home of Rutgers Robert Wood Johnson Medical School, and

a Rutgers translational research facility equipped with a variety of labs to advance the work of 80 research teams and help improve individual and public health. H-1's two-story ground floor will feature publicly accessible amenities and kiosks, such as a 10,000-sf market hall with food options and a 3,000-sf restaurant. H-1 is currently under construction.

H-3, the final phase of HELIX, is proposed as a 42-story mixed-use building with office space and 220 housing units.

HELIX tenants will have access to the New Brunswick train station. In line for a \$49 million renovation, the station will provide access to both NJ TRANSIT, operating nearly 100 train stops in the city each day, and Amtrak.



SJP PROPERTIES



SUTTON TOWER, AN 80-STORY MULTIFAMILY DEVELOPMENT, COMPLETES CONSTRUCTION IN MANHATTAN'S MIDTOWN EAST

In Manhattan's Midtown East, the construction of Sutton Tower, an 80-story residential building, has been completed. Located in the Sutton Place neighborhood, the tower offers 120 for-sale residences, with the first move-ins scheduled for this summer.

The project was designed by Thomas Juul-Hansen and developed by Gamma Real Estate and JVP Management. Lendlease, the general contractor, started construction in 2018.

Lendlease constructed the building on a 6,000-sf site within a dense neighborhood. The project team used a 10-foot cantilever over the adjacent buildings on each side, starting at the sixth floor. During construction, the team built out steel decking beneath the cantilevers to access their undersides.

The project team also had to carefully coordinate deliveries to minimize disruption to the neighbors



DAVID JOSHUA FORD, COURTESY LENDLEASE



on three sides. During construction, the building's ground-floor lobby functioned as a loading/unloading area for trucks. After the vertical construction was completed, the lobby interior was then finished.

Each of the 850-foot tower's luxury condominiums is located on a corner. The residences feature wide-plank solid oak floors; Italian-crafted kitchens with matte lacquer cabinetry, honed slabs of Statuarietto marble, and Sub-Zero and Wolf appliances; and primary bathrooms with marble slab accent walls. The building's limestone-clad façade leads to geometric detailing for the top mechanical floors.

Sutton Tower's amenities cover more than 22,000 sf and include a

double-height atrium, library, swimming pool, fitness center, spa suites, sports simulator room, screening room, private dining room, children's room with an interactive mural, and a 1,300-sf sculpture garden. Because of the building's smaller footprint, the amenities are spread across multiple floors.

GOETTSCH PARTNERS COMPLETES ITS LARGEST CHINA PROJECT TO DATE: A MIXED-USED, FIVE-TOWER COMPLEX



© CREAVAR

Chicago-based architecture firm Goettsch Partners recently announced the completion of its largest project in China to date: the China Resources Qianhai Center, a mixed-use complex in the Qianhai district of Shenzhen.

firm Benoy, which also designed the retail complex.

To prioritize the pedestrian experience, the project team combined the original eight-parcel site into two larger blocks, unifying the development and minimizing vehicular traffic within the site. The five towers are arranged around the site's perimeter to create an urban street wall while also opening the site's interior for pedestrians. Inside this "financial canyon," terraced levels reduce the scale of the urban streetscape and provide multiple options for social interaction. In addition, the pedestrian canyon's lush landscape supports Shenzhen's "sponge city" requirements to absorb rain and prevent flooding.

As one of the first developments within the recently created Qianhai district, the China Resources Qianhai Center supports a live-work environment to draw people to the neighborhood. The development also aims to project "a character of reserved elegance, quality, and permanence" to attract global finance companies, according to the firm. As an example, the windows can open and close within the shadows of the building's double-fin sunshades, reducing visual disruption and maintaining visual cohesion.

Developed by CR Land, the project includes five towers totaling almost 4.6 million sf.

The overall development, which totals more than 5.4 million sf, comprises three office towers, a hotel tower, an apartment tower, and a terraced retail complex. GP designed the towers and co-developed the master plan with UK-based design



Innovative Custom Solutions

For over 50 years, All Weather has provided exceptional custom aluminum window & door products to meet your commercial project needs. From multifamily housing to mixed-use development to education, All Weather is your commercial specialist.



ALL WEATHER
ARCHITECTURAL ALUMINUM

800.680.5800 | allweatheraa.com

PHOTO: DROR BALDINGER, FAFA



DAVID ADJAYE-DESIGNED MASS TIMBER STRUCTURE WILL BE A BUSINESS INCUBATOR FOR D.C.-AREA ENTREPRENEURS

Construction was recently completed on The Retail Village at Sycamore & Oak, a 22,000-sf building that will serve as a business incubator for entrepreneurs, including emerging black businesses, in Washington, D.C. The facility, designed by Sir David Adjaye, the architect of the National Museum of African American History and Culture, is expected to attract retail and food concepts that originated in the community.

The building, located in Congress Heights, which has a 38% poverty

level—more than double the district’s average rate—will provide a venue for job creation in the economically disadvantaged neighborhood. Michelin star chef and humanitarian Jose Andres will mentor Retail Village restaurant owners. The project was partly conceptualized and will be fully managed by members of the Congress Heights community.

The structure was constructed with Forest Stewardship Council (FSC)-certified, sustainably harvested mass timber. The entire structure, built

using screws instead of nails, can be taken apart and reused.

A plinth is used as a focal point for gathering and creates a viewing deck into the multiple programs held in the education centers, as well as for retail incubators, outdoor dining spaces, and a performance pavilion. The structure is open-air with a canopy that offers protection from the elements and cultivates a sense of intimacy or “community within community” when visitors gather underneath.

An environmental canopy collects rainwater and generates electricity from photovoltaic panels. An all-electric building, Sycamore & Oak will demonstrate the efficiency and effectiveness of solar energy, battery storage, heat pumps, and induction cooking. Some of the furniture used locally sourced wood from recovered street trees.

The project, which opened to the public on June 14, has already won an award from the D.C. Department of Energy and Environment for demonstrating equity and inclusion in sustainable construction.

NEW WING OF NATURAL HISTORY MUSEUM OF LOS ANGELES TO BE A DESTINATION AND PORTAL

NHM Commons, a new wing and community hub under construction at The Natural History Museums (NHM) of Los Angeles County, was designed to be both a destination and a portal into the building and to the surrounding grounds.

Major elements of the addition include sustainable gardens, a 400-seat multipurpose theater that will offer daytime and evening events, free admission to the Judith Perlstein Welcome Center, which will house Gnatale, the first real skeletal mount of a long-neck dinosaur on the West Coast, and Barbara Carrasco’s mural L.A. History: A Mexican Perspective.

The commons’ amenities include a cafe with indoor/outdoor seating, a retail space inside the airy Wallis Annenberg Lobby, and a spacious plaza intended as a communal gathering point for events and relaxation. The latter will also serve as the museum’s “front porch” to the neighboring Exposition Park.

The \$75 million NHM Commons expansion and renovation, designed by Frederick Fisher & Partners with landscape design by Studio-MLA, will create 75,000 sf of renovated space and new construction. The Native American Advisory Council, which represents native communities in Southern California, including Gabrieleno-Tongva, Tataviam, Chumash, and Ajach-



mem, contributed to programming and provided design input for the project. The council focused on ways to build a sense of welcome, acknowledgment, respect for native people who enter the space, and on opportunities to educate visitors that Los Angeles is on native land.

NHM Commons is part of a 10-year plan aimed at increasing access to research and collections that will provide more resources and amenities for neighboring communities and create integrated indoor-outdoor destinations at The Natural History Museums in Exposition Park and at La Brea Tar Pits in Hancock Park. The reimagining of La Brea Tar Pits—the only active urban paleontological site in the world—has begun with the early stages of master planning by the architectural team of Weiss/Manfredi.

WE'VE JOINED FORCES TO CREATE A NEW EVENT!



+



=



CONNECT WITH OVER 300 WOMEN FROM ACROSS THE INDUSTRY!

OCTOBER 25-27, 2023 - HILTON DOWNTOWN NASHVILLE

Further your professional and personal growth, take in different perspectives from leaders in home building and remodeling to development and architecture, as well as plenty of fun in the Music City – Nashville.

- Build your own experience
- Get the best of both worlds; residential & commercial - AEC
- Attend specified tracks
- Learn from women in every segment during group sessions



REGISTER TODAY!
WomensConstructionConference.com



PLATINUM PARTNERS



GOLD PARTNERS

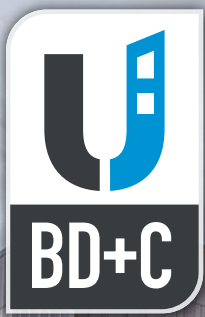


CORPORATE PARTNERS



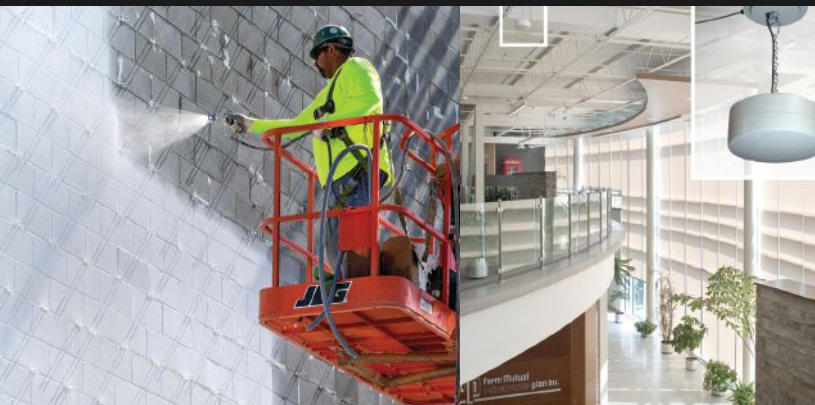
ASSOCIATION PARTNER





University
AEC CONTINUING EDUCATION

LOOKING FOR A WAY TO EARN AIA LEARNING UNITS?



- Online access to continuing education courses
- Courses provided to you free of charge
- Credits reported to AIA on your behalf
- Courses in many subject areas – learn about topics you care about
- Explore case studies, videos, and more from industry experts

SIGN UP FOR YOUR FREE ACCOUNT AND START TAKING COURSES TODAY!

BDCuniversity.com

BDCuniversity:
2017 + 2019 Award Winning Content



2023 Giants400

HOW WE GET THE DATA

Data for our Giants 400 charts is based on information supplied by the respective firms. Firms are asked to verify the accuracy of their data. The Construction section includes two types of statistics. The Contractors chart reflects revenues for general contracting, design-build, CM at risk, and IPD—projects where all revenues flow through the contractor. The CM Agent + PM chart lists firms that derive their revenues through fees. In the market-specific sections (Hotels, Retail, etc.) data labeled "Construction" includes all delivery methods.

Pictured: Nvidia's new 750,000-sf Voyager Building in Santa Clara, Calif.

PHOTO: JASON O'NEAR, COURTESY: TREC.COM

SPONSORED BY



INNOVATIONS AT 200 DESIGN FIRMS

BY ROBERT CASSIDY, EXECUTIVE EDITOR

//**3877** New office: New York City.

45 ARCHITECTURE Added six employees. New office: Nashville.

AE WORKS Launched Project + Planning Services and low-voltage services.

AE7 New offices: Cairo, Egypt; Riyadh, Saudi Arabia; Jacksonville, Fla.

AG ARCHITECTURE New

brand, logo, tagline: “Bright Vision, Bold Communities.”

AHL Created a Sustainability Action Plan for all projects >\$10 million.

ALVAREZ-DIAZ & VILLALÓN Implemented scaled compensation package, added cancer insurance. Aligned with UN Global Compact.

ANDERSON MIKOS

ARCHITECTS Using offsite-

constructed prefab modules on all projects.

AO Formed partnership with RY+A for government, healthcare, and critical facilities. New offices: Oakland, Orlando. New hospitality/casino studio head: Bob Dollar.

ARC/ARCHITECTURAL RESOURCES CAMBRIDGE Added 14 staff.

ARCADIS Acquired Cal-

lisonRTKL and IBI Group. Developing “SocialScout” tool to measure social value of the firm’s work.

ARCHITECTURE, INC. Alexandra Helisek named marketing director.

ARIA GROUP ARCHITECTS Chris Hamer named president.

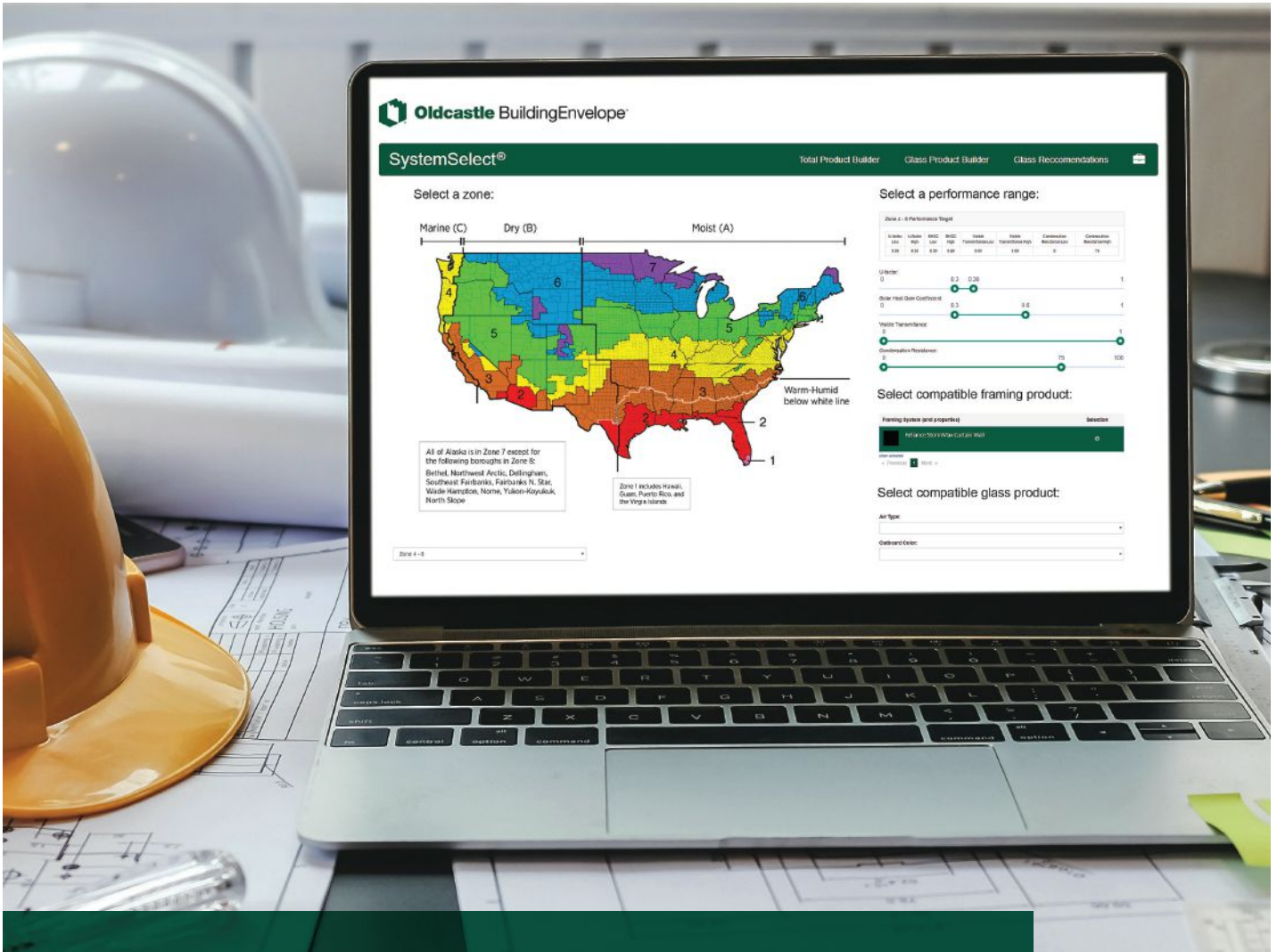
ASHLEY MCGRAW

ARCHITECTS Added 20 staff. Opened D.C. office.

ARCHITECTURE FIRMS | TOP 90

Rank	Company	2022 Architecture Revenue	Rank	Company	2022 Architecture Revenue	Rank	Company	2022 Architecture Revenue
1.	Gensler	\$1,784,977,100	31.	Payette	\$66,904,234	61.	Macgregor Associates Architects	\$34,809,265
2.	HKS	\$500,000,000	32.	Niles Bolton Associates	\$63,894,000	62.	CSO	\$34,566,033
3.	Perkins&Will	\$453,457,445	33.	Ayers Saint Gross	\$63,010,000	63.	Ted Moudis Associates	\$34,000,000
4.	Corgan	\$331,183,667	34.	HNTB	\$61,659,414	64.	Goettsch Partners	\$33,440,000
5.	Perkins Eastman	\$265,140,000	35.	RATIO Design	\$60,295,854	65.	WDG	\$33,244,000
6.	ZGF	\$240,042,593	36.	Kirksey Architecture	\$60,210,146	66.	Grimm + Parker Architects	\$32,565,384
7.	NBBJ	\$238,000,000	37.	BWBR	\$56,659,621	67.	Stengel Hill Architecture	\$32,163,947
8.	Populous	\$223,779,983	38.	SGA	\$55,103,312	68.	Taylor Design	\$31,287,000
9.	Kohn Pedersen Fox	\$185,960,400	39.	Quinn Evans	\$54,586,192	69.	FCArchitects	\$30,204,972
10.	Interior Architects	\$161,861,718	40.	JCJ Architecture	\$54,578,479	70.	Smallwood	\$30,134,376
11.	HMC Architects	\$124,859,994	41.	TPG Architecture	\$54,289,000	71.	LRK	\$30,056,000
12.	KTGY	\$123,537,542	42.	LMN Architects	\$54,046,000	72.	TVS	\$29,694,349
13.	LS3P Associates	\$121,227,472	43.	Shepley Bulfinch	\$51,360,733	73.	Dattner Architects	\$28,968,596
14.	AO	\$115,080,000	44.	Handel Architects	\$51,347,395	74.	HuntonBrady Architects	\$28,437,129
15.	Nelson Worldwide	\$112,930,000	45.	Beck Architecture	\$51,139,300	75.	HBG Design	\$27,639,000
16.	Elkus Manfredi Architects	\$108,707,369	46.	Diamond Schmitt Architects	\$49,761,812	76.	FXCollaborative	\$26,049,234
17.	Solomon Cordwell Buenz (SCB)	\$108,705,253	47.	NAC Architecture	\$48,846,604	77.	ARC / Architectural Resources Cambridge	\$25,874,358
18.	DGA	\$92,762,899	48.	Dwell Design Studio	\$47,283,473	78.	JHP Architecture / Urban Design	\$25,804,913
19.	Hord Coplan Macht	\$92,029,263	49.	BHDP Architecture	\$46,395,583	79.	Chipman Design Architecture	\$25,800,000
20.	Cooper Carry	\$91,313,111	50.	Vocon	\$46,381,700	80.	Urbahn Architects	\$25,611,400
21.	MG2	\$88,066,286	51.	Sasaki	\$46,158,168	81.	Quattrocchi Kwok Architects	\$25,595,000
22.	WATG	\$87,077,234	52.	RRMM Architects	\$46,050,760	82.	Grace Hebert Curtis Architects	\$25,513,146
23.	Moody Nolan	\$84,736,577	53.	FGM Architects	\$46,037,551	83.	Champlin Architecture	\$24,454,848
24.	Humphreys and Partners Architects	\$83,250,443	54.	Orcutt Winslow	\$45,653,291	84.	Carrier Johnson + Culture	\$24,121,475
25.	Moseley Architects	\$81,035,661	55.	MBH Architects	\$44,639,000	85.	Massa Multimedia Architecture	\$23,771,614
26.	McMillan Pazdan Smith	\$78,523,709	56.	Mithun	\$42,548,537	86.	AHL	\$23,534,705
27.	CO Architects	\$76,975,418	57.	Dahlin Architecture Planning Interiors	\$40,800,000	87.	Legat Architects	\$23,513,000
28.	Cunningham	\$73,539,163	58.	GFF	\$38,514,745	88.	Bergmeyer	\$22,352,820
29.	EUA	\$70,273,000	59.	GBBN	\$37,000,000	89.	GGLO	\$22,186,077
30.	VLK Architects	\$70,268,800	60.	Hanbury	\$35,429,667	90.	Fogarty Finger	\$21,400,000

SOURCE: BD+C 2023 GIANTS 400 REPORT



SystemSelect[™]

System thermal performance,
instantly.

Compare thermal and visual performance details for entire architectural glass and metal systems quickly with our free online tool. Now enhanced to support LEED v4.1 Green Building Designs. No downloading, training or onboarding necessary. In minutes, you can literally save hours.

systemselect.obe.com

AYERS SAINT GROSS

Switched to Affinity and Rhino for workflows interoperability.

BAILEY EDWARD DESIGN

30th year in business.

BAR ARCHITECTS & INTERIORS

Hired Ryan Doone as the firm's first Director of Design.

BARGE DESIGN SOLUTIONS

Master planning City Walk BHAM for downtown Birmingham, Ala.

BASE4 Using Design PLUS tool for hospitality and multi-family clients.

BECKER MORGAN GROUP

New office: Charlotte, N.C. 30% annual revenue growth. 40th anniversary.

BERGMEYER New president: Rachel Zsembery.

New Director of Corporate Social Responsibility: Mike Davis. Designing first Passive House project.

BKL ARCHITECTURE Expanding presence in D.C. market.

BKV GROUP New office: Ho Chi Minh City, Vietnam.

BRAY ARCHITECTS Full brand refresh, new website. Expanding Davenport, Iowa, office.

BSB DESIGN Implementing four-day work week; mandatory education day one Friday/month. Expanding markets: industrial, affordable multi-family, commercial interiors.

BWBR Starting 101st year in business. Up 35% in annual revenue. Designed (with BCRA) new behavioral health facility for civilly committed persons in Washington state.

CARRIER JOHNSON + CULTURE

New hires: Craig Anderchack, Director of Interior Architecture; Ben Gist, Seattle office leader.

CB DESIGN GROUP 10%

increase in staff, 2022-23.

CESO INC. Reposition business model into eight market sectors.

CETRARUDDY ARCHITECTURE

Designed 25 Water Street, NYC, largest commercial-to-residential conversion in U.S. (1,300 units).

CLARK & ENERSEN Added 24 employees, 2022-23. New office: Lawrence, Kan.

CO ARCHITECTS Created month-long design curriculum for 4-6 high school students in the Los Angeles area.

COOPER CARRY Expanding into the Carolinas, Colorado, and Tennessee.

COOPER ROBERTSON New Directors: Elizabeth Stoel, Architecture; Brad Barnett, Urban Design.

CORDOGAN CLARK & ASSOCIATES Added 45 staff. New work in Arizona, Ohio.

CORGAN Office expansions: Atlanta, Austin, Chicago, Dallas, Houston, and LA (for healthcare).

COSCIAMOOS ARCHITECTURE Created a dedicated Existing Conditions & Site Assessment team. Using Matterport Pro 2 space capture camera to create digital twins.

CRAWFORD ARCHITECTS

Launched an ESOP

CRB GROUP New hires: Mike Dieterich, Senior Director of Sustainability; Ryan Thompson, CRB Industry 4.0 Initiative Director. New office: Jacksonville, Fla.

CREATIVE DESIGN SOLUTIONS

Promoted a fourth partner.

CROMWELL ARCHITECTS ENGINEERS

New EVPs: Rob Seay, Todd Kuhn. New office: Springdale, Ark.

CSARCH Using drones for

aerial traffic studies. On design team for 500,000-sf microchip factory in Malta, N.Y.

CURTIS & GINSBERG ARCHITECTS

Residential rehab projects: 12 Passive House, 13 all-electric, 31 Enterprise Green Communities. Mark Ginsberg named to NYC Landmarks Preservation Commission.

CUSHING TERRELL Completed four microgrids in remote areas of California with PG&E and Potelco. New offices: Minneapolis, Seattle.

DAG ARCHITECTS Added 15 architects in the last year.

DAHLIN ARCHITECTURE | PLANNING | INTERIORS Acquired Design Line Interiors.

DATTNER ARCHITECTS New Director of Sustainability: Shefali Sanghvi.

DESIGN COLLABORATIVE

New Directors: Chris Stine (architecture); Kelsey Rowe (engineering); Lauren Elliott (interior design); Ryan Birkey (innovation and technology).

DESIGNGROUP New Principal/Regional Practice Leader: Alan Schlossberg.

DGA Formed strategic partnership with Hennick & Company. DGA's new "perpetual partnership model" will allow future generations to become equity partners.

DIAMOND SCHMITT Delivered Canada's first dynamic BIPV panel project: Red River College and Polytechnic, Winnipeg.

DIEKEMA HAMANN ARCHITECTURE

Moved to four-day, 36-hour schedule.

DLA+ ARCHITECTURE & INTERIOR DESIGN Awarded \$1.2 billion baseball stadium, Incheon, South Korea.

DLR GROUP Mass timber

prototype initiative with U.S. Forest Service and U. of Minnesota; two million sf of mass timber designed. New leaders: Steven McKay, CEO; Peter Rutti, Chief Design Officer; Premnath Sundharam, Chief Climate Officer.

DWELL DESIGN GROUP First Director of Senior Housing: Sarah Gregory. New offices: Richmond, Va., and Charlotte, N.C.

DYER BROWN & ASSOCIATES

New sector: behavioral health environments. New Director of Workplace: Ashley L. Dunn.

E4H Joined MOREgroup (with Huckabee, TSK, and IEG).

FANNING HOWEY New office: Ferndale, Mich.

FCA Signed AIA 2030 Commitment. Hired Robert Fleming as Sustainability Consultant.

FENNICK MCCREDIE ARCHITECTURE

Signed onto the AIA 2030 Commitment.

FGM ARCHITECTS New office: Fort Worth, Texas.

FITZGERALD Hired Charlie Saville as Director of Sustainability. Firm was named Fitwel Champion. New office: Denver.

FK ARCHITECTURE 60th anniversary. Eight new hires in the last 12 months.

FLAD ARCHITECTS New offices: Boston, San Diego.

FOGARTY FINGER Expanding multifamily and commercial practice into Atlanta, Miami.

FRENCH & PARELLO ASSOCIATES

New office: Hackettstown, N.J.

FSB ARCHITECTS + ENGINEERS

New offices: Los Angeles, Denver, Tulsa, Houston, Mobile, Ala. New sectors: multifamily, mixed-use.



At 280,000 sm, Haikou International Duty-Free City on the west coast of Haikou City, China, is the world's largest single duty-free store. CRTKL was responsible for the commercial interior design, which features the AURA Sky Secret Forest themed atrium with its terracing balconies and large abstract trees.

FXCOLLABORATIVE

ARCHITECTS New Director of Interior Architecture: Florenca Kratsman.

GARMANN MILLER Added 10 FTEs this year; 36% annual revenue growth. Two new school district clients in Indiana.

GBBN Partnered with Danis Construction on onsite pre-fabrication for new Mercy Health hospital in Mason, Ohio. New Director of Research: Shan Jiang.

GENSLER Hired Bob Weis (formerly with Disney Imagineering) as Global Immersive Experience Design Leader.

GFF Celebrating its 40th anniversary.

GGLO In 2022, 100% of full projects were energy modeled; 68% were modeled for embodied carbon.

GMB ARCHITECTURE + ENGINEERING Implemented self-reported, fully transparent skills assessment tool. Launched a virtual Learning Hub for clients.

GOODWYN MILLS CAWOOD

Acquired Commercial Site Solutions. New office: Charleston, S.C.

GRACE HEBERT CURTIS ARCHITECTS Moved to Centerline program management software

GRESHAM SMITH Patented MPATH, which couples biometric data (comfort and stress) with location. New offices: Denver, Detroit. New expertise: design of battery plants. MPATH, a revolutionary, patented approach that quantifies the human experience within the built environment, providing invaluable insights to planners and stakeholders. MPATH effectively measures the levels of comfort and stress experienced by users by coupling community-shared biometric data from modern wearables with location.

GRIMM+PARKER Using Imetco wood-grained metal panels and Intus cast polymer windows to meet D.C. Green Codes for multifamily building envelope.

GWWO Opened first satellite office: West Hartford, Conn.

H2M ARCHITECTS + ENGINEERS New offices: Windsor, Conn., Pembroke Pines, Fla., and Pittsburgh.

HAGER Acquired hmb Architects.

HANBURY Became 100% employee owned (ESOP).

HANDEL ARCHITECTS Developed a database (with the Durst Organization) to track the environmental impact of all materials going into buildings it designs.

HDR Used machine learning for high-tech, low-cost approach to vernacular construction for a health hub in India. New offices: Kansas City, Mo.; Raleigh, N.C.

HED Issued firm's ESG Action Plan. President Michael Cooper named an ACEC Fellow. Sustainable Design Leader Dennis Jaconetti named to AIA COTE Leadership Group.

HENDY New co-CEOs: Susan Dwyer, Carolina Weidler. Completed ESOP. Added a Healthcare Studio.

HFG ARCHITECTURE Expanding into new healthcare markets.

HGA New office: San Diego. Terri Howard named Director of Equity; Deepa Balgi, S+T Practice Group Leader.

HILL WEST New Director of Design: Jason Ivaliotis. Julio P. Magarino named to Executive Team.

HKS Designed Cosm immersive experience venue: LED dome in LA. Named Meena Krenek Global Practice Director, Venues Interiors; Sara Dickinson, Director of Commercial Interiors. Launched mission-critical studio, headed by William Ringer.

HMC ARCHITECTS New employee wellness program.

HMFH ARCHITECTS Developing healthy materials standard for Massachusetts School Building Authority.

HOLLIS + MILLER ARCHITECTS Hired 18 new FTEs.

HORD COPLAN MACHT Acquired FWA Group.

HPE DCTS Relaunched con-

sulting practices in Indonesia, Thailand, and the U.S.

HUCKABEE New office: Los Angeles.

HUMPHREYS AND PARTNERS ARCHITECTS

Designed high-density micro-rentals (106 units/acre) in Nashville.

HUNTONBRADY

ARCHITECTS Developing prefab structural/architectural system (with Metro-mont). New markets: nursing schools, behavioral health. 75th anniversary.

HUNTSMAN ARCHITECTURAL GROUP Delivered LEED Platinum project.

IKM ARCHITECTURE Expanded into Columbus, Ohio, and Tampa, Fla.

INTERIOR ARCHITECTS IAXR retail concepts featured on the *Today Show*. White paper on unisex restrooms.

INVISION ARCHITECTURE Hired 14 FTEs. Implementing VantagePoint CRM.

JCJ ARCHITECTURE Office expansions: Las Vegas, NYC, Tulsa, Okla.

KAHLER SLATER Launched an academic graduate studio, staffed by Kahler Slater, with UW-Milwaukee and U. of Illinois. New EVPs: Tracie Parent, Trina Sandschafer.

KG+D ARCHITECTS Named AIANYS Firm of the Year.

KGD ARCHITECTURE Designed first 100% affordable housing in Tysons for Fairfax County, Va.

KIRKSEY ARCHITECTURE New office: Dallas. Completed mass timber residence wing at Rice University.

KOHN PEDERSEN FOX Created KBP Analysis Compute, KPfep (lifecycle carbon analysis) tools. New office:

Shenzhen, China.

KTGY Created 12-story repeatable modular prototype, The Essential, to house LA homeless.

LABELLA ASSOCIATES

Invested in new Learning Management System.

LANTZ-BOGGIO ARCHITECTS

Added five new partners.

LEGAT ARCHITECTS Named EP Friendly Firm by AIA Illinois.

LEO A DALY Edward Benes named President/Deputy CEO, LEO A DALY CO.

LMN ARCHITECTS Launched "Path to Zero Carbon" research.

LORD AECK SARGENT New offices: D.C., Detroit. Staff now 58% female.

LRK Moved Celebration, Fla., office to WELL-certified office in Orlando.

LS3P ASSOCIATES Partnering with Greystar on modular affordable housing.

LUMINAUT 40% increase in tech staff.

MACKAY MITCHELL

ARCHITECTS Adopted Miro for virtual meetings. Top hiring goal: young professionals.

MANNING, APC New expertise: program management First client: New Orleans public schools.

MARGULIES PERRUZZI Developed new workplace programming tool.

MARMON MOK Using mass timber and prefab components. New office: Austin, Texas.

MAY ARCHITECTURE Used Integrated Facility Design (with SOM and 200 stakeholders) for \$450 million oncology center at Emory U. New markets: Alabama, Florida, Oklahoma.



PHOTO: DAVE BURK, COURTESY SOM

SOM helped Wellesley College achieve the most ambitious building project in its modern history: transforming an outdated science center into an inviting, integrated, sustainable, and flexible village for teaching and learning. A central spine, the Chao Foundation Innovation Hub, connects the mix of old and new buildings and makes them intuitive to navigate. Built out of mass timber, this multistory cascade of spaces offers double- and triple-height interiors with views out to the landscape.

MBH ARCHITECTS Jason Dries-Daffner named COO.

MCFARLANE Added 45% capacity to HQ office.

MCKINLEY ARCHITECTURE AND ENGINEERING New office: Martinsburg, W. Va.

MCMILLAN PAZDAN SMITH Acquired Virgo Gambill Architects. New office: Augusta, Ga. Drafted five-year strategic plan.

METHOD ARCHITECTURE Acquired GSC Architects. Exploring AI tools.

MG2 Designed a rooftop sports complex atop a Costco warehouse in Mexico.

MILLER DUNWIDDIE 10% staff growth YOY.

MOODY NOLAN Moving into S+T work (Morgan State University); 117 new FTEs.

MOSELEY ARCHITECTS Charleston office moved to Charleston Technology Center.

NADEL ARCHITECTURE + PLANNING Formed collaboration with Portuguese

multifamily designer Saraiva e Associados.

NBBJ Launched Uplift health/sustainability podcast. Planted 25,000 trees in Florida toward goal of one million by 2030. Named Robert Mankin Managing Partner.

NILES BOLTON ASSOCIATES

New management: Jeff Smith, President; Cannon Reynolds, Managing Principal; Ray Kimsey, Senior Consultant; Niles Bolton, Board Chair.

NMDA New partner: Christina Straughan.

NORR Implementing XR simulation in health sciences work. New Sustainability Director: Blake Jackson.

NSPJ ARCHITECTS

Added VR technology. New VP: Todd Hicks.

See the full **GIANTS 400** rankings and bonus categories at: BDCnetwork.com/Giants2023

OCULUS Set up JVs for women-owned and service-disabled veteran-owned small businesses. Conducted stack effect survey for GSA courthouse, St. Louis.

ORCUTT | WINSLOW Acquired TEG Architects and HHCP

PAGE Using AI on 36-story office tower. New offices: Charleston, Richmond, Tampa.

PAPPAGEORGE HAYMES New office: Austin, Texas.

PARAMETRIX INC. Using digital twins, GIS web maps, AR/VR, 3D modeling, and project hubs. Acquired the Good Company and Parisi Transportation Consulting.

PARKHILL New SVP of Community Development and Growth: Drew Hardin.

PAYETTE Developed web-based embodied carbon tool, Kaleidoscope.

PBK ARCHITECTS Imple-

menting outdoor learning in school projects. Acquisitions: Manley Spangler Smith Architects, Harvard Jolly Architects.

PERKINS EASTMAN New hire: Drew Roskos, Chicago Senior Living studio.

PERKINS&WILL Released beta version of tallyCAT plugin (with Building Transparency and C Change Labs), which measures embodied carbon impacts of building materials in real time. New hires: Jason F. McLennan, CSO; Leigh Stringer, Global Advisory Services Director; AIA President 2023 Emily Grandstaff-Rice. (Note: All three are *BD+C* "40 Under 40" honorees.) Tim Wolfe named firmwide Interior Design Director.

PRDG Celebrating 10th anniversary.

PULSE DESIGN GROUP Rolled out 10-year strategic plan. Added Senior Director

of QA/QC, Mark Kohles.

QUATTROCCHI KWOK ARCHITECTS Appointments: Aaron Jobson, President/CEO; Jim Theiss, COO; Eddie Van Slambrouck, Director of Design.

QUINN EVANS Working with NIBS to develop protocols for documenting existing and historic buildings in BIM.

RANDALL-PAULSON ARCHITECTS New office: Nashua, N.H.

RATCLIFF ARCHITECTURE Adopted hybrid work model (minimum two days in office).

RBB ARCHITECTS Using lean design for healthcare projects.

RDG PLANNING & DESIGN Acquired Interact Business Group (police training facility planner). Using Power BI data visualization tool. New office: Iowa City, Iowa.

R.E. WARNER & ASSOCIATES Added >60

FTEs YOY.

REZTARK DESIGN STUDIO Hired 17 FTEs. New office: Cleveland.

RKTB ARCHITECTS Using cantilevered system to build apartment building over occupied structure in Brooklyn.

ROBERT SIEGEL ARCHITECTS Using Lumion for renderings and animations.

ROSSETTI Applying modular design to a multi-use soccer stadium.

ROTH SHEPPARD ARCHITECTS Used EOS software to clarify business operations.

RULE JOY TRAMMELL + RUBIO Under construction: \$230 million Shepherd Center Rehabilitation Hospital, Atlanta. Growing the firm's hotel portfolio.

S3 DESIGN New office: Orlando, Fla.

SAS ARCHITECTS & PLANNERS Using VR graphic

ARCHITECTURE/ENGINEERING FIRMS TOP 66

Rank	Company	2022 Arch/Eng Revenue	Rank	Company	2022 Arch/Eng Revenue	Rank	Company	2022 Arch/Eng Revenue
1.	Stantec	\$737,681,276	23.	GPD Group	\$92,615,400	45.	BKV Group	\$42,000,000
2.	HDR	\$640,790,000	24.	Ballingr	\$92,253,434	46.	Hoefler Welker	\$40,700,000
3.	Page Southerland Page	\$516,360,000	25.	Cushing Terrell	\$91,726,196	47.	CPL Architecture, Engineering, Planning	\$40,354,823
4.	HOK	\$487,756,000	26.	Goodwyn Mills Cawood	\$91,079,679	48.	TreanorHL	\$39,590,057
5.	Arcadis North America	\$364,159,462	27.	Core States Group	\$84,705,465	49.	Lord Aeck Sargent Planning & Design	\$38,407,351
6.	SmithGroup	\$354,084,386	28.	Michael Baker Intl	\$84,277,127	50.	Rule Joy Trammell Rubio	\$38,380,000
7.	DLR Group	\$344,400,000	29.	S/L/A/M Collaborative, The	\$81,283,558	51.	FSB Architects + Engineers	\$38,342,548
8.	Skidmore, Owings & Merrill	\$338,000,000	30.	Little Diversified Architectural Consulting	\$71,983,100	52.	TowerPinkster	\$37,192,420
9.	Gresham Smith	\$289,660,000	31.	Wold Architects and Engineers	\$71,415,000	53.	Kahler Slater	\$37,000,000
10.	CannonDesign	\$245,000,000	32.	E4H Environments for Health Architecture	\$70,161,345	54.	G70	\$34,010,910
11.	Ware Malcomb	\$224,161,074	33.	RS&H	\$69,700,000	55.	Barge Design Solutions	\$33,811,978
12.	PBK Architects	\$211,327,554	34.	LaBella Associates	\$68,618,875	56.	Baskerville	\$33,624,077
13.	HGA	\$209,523,283	35.	Greenberg Farrow	\$61,939,600	57.	AE7	\$31,837,525
14.	NORR	\$181,452,980	36.	SMMA	\$57,333,155	58.	BSB Design	\$31,188,533
15.	Flad Architects	\$149,500,000	37.	WD Partners	\$56,330,000	59.	GMB Architecture + Engineering	\$30,758,150
16.	Huckabee	\$133,961,519	38.	CESO	\$53,681,000	60.	Alliance	\$30,407,886
17.	PGAL	\$129,570,000	39.	RSP Architects	\$51,867,000	61.	Clark & Enersen	\$28,619,824
18.	EwingCole	\$122,807,560	40.	DES Architects + Engineers	\$50,000,000	62.	SGA Design Group	\$28,250,000
19.	HED	\$113,000,000	41.	BSA LifeStructures	\$47,259,279	63.	Onyx Creative	\$28,000,000
20.	LPA	\$109,780,585	42.	H2M Architects + Engineers	\$46,003,074	64.	Becker Morgan Group	\$28,000,000
21.	LEO A DALY	\$105,976,994	43.	RDG Planning & Design	\$45,830,732	65.	Schmidt Associates	\$27,925,000
22.	Parkhill	\$97,232,279	44.	Ryan Companies US	\$44,141,000	66.	Larson Design Group	\$27,055,031

SOURCE: BD+C 2023 GIANTS 400 REPORT

software, Revit, and drone imagery for client presentations.

SASAKI ASSOCIATES Acquired DLANDstudio. Moved HQ to Boston's Chinatown.

SCB Expanding its presence in Boston S+T sector.

SCHRADERGROUP Expanding public safety work into Utah and Kansas.

SCIENTIA ARCHITECTS Renovated a retail mall into a 100,000-sf biotech lab.

SGA Used its SGA Dashboard to complete New England Patriots' office building in six months.

SGA DESIGN GROUP SGA Technology Labs developed software to test retail sales floor fixture capacities by department.

SHEPLEY BULFINCH Hired new Principal, Trent Williams, to lead Houston healthcare and higher ed ops, with Principal Natalie Thurman.

SHIVE-HATTERY Acquired St. Louis-based KdG Architects.

SOM Became a net-zero business in 2022. Issued a Climate Action Report on its climate initiatives. Partnered with Prometheus Materials on an algae-based bio-concrete that absorbs carbon.

SMITHGROUP New offices: Atlanta, Cleveland, Houston, Sacramento, and Portland, Ore.

SMMA Granted scholarships to four graduates of high schools the firm designed. Recipients will pursue AEC degrees. Teaching after-school programs for ACE Mentor students.

STANTEC Acquired Philadelphia design firm L2P.

STR PARTNERS Completed design and construction on \$47 million high school projects.

STUDIO+ Switched to Autodesk Construction Cloud and Egnyte for project management. Acquired TDM Architects (Los Angeles) and Assemble Design (Traverse City, Mich.).

STV Advising clients how to package contracts to increase opportunities for HUBs (historically underutilized businesses).

SWBR Hired 11 new FTEs. Submitted for JUST label.

TETER Adopted VantagePoint software to streamline marketing efforts. Changed ownership to ESOP.

S/L/A/M COLLABORATIVE New management: Greg Coles, President; Terri Finucane, Board Chair. Employed a first-of-its-kind modular clean-cube unit that can produce an optical surgical environment in hours, not weeks; and a process that produces hydrogen peroxide in gaseous state to decontaminate the air in ambulatory orthopedic surgicenter.

THENDESIGN ARCHITECTURE Designed elementary school with environmental dashboard, EV ports, PVs as learning tools. Selected by state to update Ohio Schools Design Manual.

THINK ARCHITECTURE Incorporating more co-working spaces in multifamily projects.

THRIVEN DESIGN New brand (formerly Kitchen and Associates), coinciding with 50th anniversary.

TOWER PINKSTER Adopted VantagePoint and CRM software. 70th anniversary.

TREANORHL Promotions to Principal: Scott Dangel (PK-12) and Nick McCormick (Advanced Industries).



PHOTO: ROBERT BENSON, COURTESY PERKINS EASTMAN

▲ The Boston Arts Academy, adjacent to historic Fenway Park, is the city's only public school dedicated to the visual and performing arts. After spending the first two decades of its existence sharing a repurposed warehouse with another high school, the school finally has a proper home: a 153,000-sf facility designed by Perkins Eastman, with Wilson Butler Architects as associate architect.

TRICARICO ARCHITECTURE AND DESIGN Hired Katelyn N. Jones, Business Development Manager.

TSK ARCHITECTS Joined MOREgroup. New office: Plano, Texas.

TVS Using AI-enabled tools to cut CD phase ~60%.

URBAHN ARCHITECTS Added 30 FTEs; revenue up ~50% YOY. Doing gut renovations of two hospitals in NYC corrections system.

V SQUARED WORKSHOP New sector: life sciences/lab design.

VESSEL ARCHITECTURE & DESIGN Adopted Enscape VR plug-in for Revit and Microsoft Power BI for data mining.

VLK ARCHITECTS New HQ in Fort Worth, Texas. Migrated to cloud-based server system

and project information management software. Hired Daniel Pitcock as Chief Experience Officer (K-12).

WARE MALCOMB Joined NOMA. New offices: Columbus, Ohio; Nashville; Monterrey, N.L., Mexico; Ottawa, Ont.; São Paulo, Brazil. Added 82 FTEs. 50th anniversary.

WATG Named Alejandra de Cordoba Estepa Managing Director for Europe, Middle East + Africa.

WDG Director of Interior Design: Courtney L. Murphy.

WEBER THOMPSON Designed 185,000-sf mass timber office-lab-warehouse, under construction, Lake Union, Wash.

ZGF ARCHITECTS New office: Denver.+

PRO+CONNECT EVENTS

BUILDING DESIGN
+ CONSTRUCTION

MULTIFAMILYPRO+

PROBUILDER
PROFESSIONAL BUILDER

“ProConnect Events are the best events in the industry, bar none.”

-18 TIME SPONSOR

ProConnect Events are the established leader in facilitating win-win partnerships between buyers and vendors in the construction market. Our format provides focused 1-on-1 meetings and fun networking with high-level decision makers. We focus on two different segments within the construction market:

Single Family and Multifamily

- 100% sales focused
- ProConnect qualifies and hosts each attending firm
- Each 1-on-1 meeting is pre-scheduled
- Unmatched ROI

SINGLE FAMILY

September 18-20

Sawgrass Marriott
Ponte Vedra Beach, FL

MULTIFAMILY

October 22-24

Westin Stonebriar
Dallas, TX

SUSTAINABILITY

December 11-12

Sawgrass Marriott
Ponte Vedra Beach, FL



For more information contact: **Dan Gardner / M: 989.860.7930 / dgardner@sgcmail.com**

INNOVATIONS AND TECH ADVANCEMENTS FROM THE NATION'S TOP ENGINEERING FIRMS

COMPILED BY DAVID BARISTA, EDITORIAL DIRECTOR

Of the 114 engineering and engineering/architecture (EA) firms that participated in *BD+C*'s 2023 Giants 400 survey, 44 firms provided details on their top innovations and technology enhancements from the past 12 months. Here's a roundup of the most compelling innovations and tech

advancements from the 2023 Engineering Giants (in alpha order):

AECOM expanded its career progression framework, called Career Path, with four career paths: Business Area Leadership, Growth and Client Management, Project and Program Management, and Technical Excellence. The firm also launched five new Global Business Line Technical Academies.

Joining the existing Water Academy are the Buildings + Places Academy, Environment Academy, Program Management Academy, Sustainable Legacies Academy, and Transportation Academy.

To meet growing demand for decarbonization services among its clients and the greater AEC market, **Affiliated Engineers Inc. (AEI)** has implemented several initiatives in recent months, including the development of template toolkits through Excel and PowerBI for training and streamlining project execution; providing mentorship for geothermal projects; and encouraging cross-market team collaboration for its energy and utilities and building performance practice groups.

Arora Engineers launched its Enterprise Solutions Group to assist its clients in leveraging data created during design and construction for more efficient operations and maintenance, and with implementing modern automation technologies such as virtual reality and digital twin. The firm works with each client to define standards and processes related to data collection, assimilation, and organization

ENGINEERING FIRMS TOP 56					
Rank	Company	2022 Engineering Revenue	Rank	Company	2022 Engineering Revenue
1.	Kimley-Horn.....	\$1,047,823,000	29.	Magnusson Klemencic Associates.....	\$61,702,159
2.	WSP	\$838,007,376	30.	AKF.....	\$61,142,672
3.	Tetra Tech High Performance Buildings Group...\$488,243,637		31.	Interface Engineering	\$59,108,929
4.	Langan.....	\$393,500,000	32.	HPE Sustainable Data Center Modernization ...	\$57,109,000
5.	IMEG.....	\$373,020,000	33.	P2S.....	\$55,980,158
6.	Fluor	\$294,951,301	34.	Jordan & Skala Engineers.....	\$53,999,459
7.	NV5 Global.....	\$264,707,370	35.	ThermalTech Engineering.....	\$51,171,000
8.	Arup.....	\$235,827,936	36.	Arora Engineers	\$49,004,158
9.	Jensen Hughes	\$226,574,651	37.	RTM Engineering Consultants.....	\$48,219,000
10.	KPF Consulting Engineers	\$203,733,218	38.	McKinstry	\$47,000,000
11.	Affiliated Engineers.....	\$181,344,000	39.	Bala Consulting Engineers.....	\$46,000,000
12.	Henderson Engineers	\$152,571,882	40.	Wallace Design Collective.....	\$42,800,000
13.	CMTA.....	\$146,823,899	41.	Martin/Martin.....	\$41,896,505
14.	Olsson.....	\$136,592,778	42.	Newcomb & Boyd	\$40,211,538
15.	Walter P Moore.....	\$132,775,174	43.	Heapy	\$40,174,754
16.	Syska Hennessy Group.....	\$127,724,516	44.	Osborn Engineering.....	\$39,300,000
17.	BR+A	\$126,500,000	45.	Mazzetti.....	\$37,200,000
18.	M.C. Dean	\$122,356,723	46.	Dunham Associates	\$36,140,000
19.	Vanderweil Engineers	\$104,440,100	47.	Teecom.....	\$35,937,725
20.	BKF Engineers	\$102,387,164	48.	H.F. Lenz.....	\$32,229,434
21.	TLC Engineering Solutions	\$94,079,662	49.	KCI Technologies.....	\$31,789,527
22.	Jaros, Baum & Bolles.....	\$90,250,500	50.	M/E Engineering.....	\$30,500,000
23.	ESD	\$86,492,583	51.	Henderson Building Solutions.....	\$28,599,818
24.	I.C. Thomasson Associates.....	\$75,774,000	52.	Specialized Engineering Solutions.....	\$24,500,750
25.	DeSimone Consulting Engineering	\$73,711,329	53.	CJL Engineering	\$24,212,501
26.	Smith Seckman Reid (SSR).....	\$69,725,955	54.	Parametrix.....	\$23,586,860
27.	RMF Engineering.....	\$63,000,000	55.	Swanson Rink.....	\$23,484,551
28.	ME Engineers.....	\$62,000,000	56.	TW Constructors.....	\$22,740,000

SOURCE: *BD+C* 2023 GIANTS 400 REPORT



to ensure that data generated throughout the design and construction process is in the correct format. According to the firm, “the result is an owner’s dream: a complete, accurate, and structured set of location and asset data, plugged into real-time conditions and performance monitoring representing the facility, supported with a navigable 3D model, to be used for managing the operation and maintenance of the facility.”

Since launching in 2020, **Arup’s** “Changing the Game” R&D investment fund has backed some 70 in-house innovation projects with more than \$1 million in total funding. One initiative borne from the program is a focus on experience design in smart buildings, including the fusion of digital technology and architectural design. These concepts are most clearly demonstrated with the 11-story 17xM building in Washington, D.C., developed by Skanska and designed by KPF. The SmartScore- and WiredScore-certified building features an integrated network for smart building controls through a single hub controlling the building’s all-electric systems, including HVAC, lighting, fire alarms, security, and safety.

Burns & McDonnell reported two innovations: the use of exoskeletons on solar project sites, which has reduced incidents of strain in the field; and increased use of modularization when constructing battery storage projects in the field to speed the construction process.

CDM Smith launched Trinnex, a wholly-owned

subsidiary that develops digital technology and tools for utilities and both public and private infrastructure owners—for needs ranging from asset performance and capital planning to digital twin design.

CMTA is leveraging its expertise and experience with geothermal, solar, and energy reduction measures to help its clients take advantage of new direct federal payments and tax credits stemming from the Inflation Reduction Act of 2022.

Dewberry is utilizing artificial intelligence (AI) tools to accelerate and expand related-topic research, space programming, and the alignment of goals to needs on projects. Using AI, the firm can rapidly generate numerous graphic and image options that meet programmatic requirements. For example, the technology was used to explore a variety of massing possibilities and site constraints on a current high school building project, as well as options to strategically display the school’s mascot.

Each year, **IPS–Integrated Project Services** hosts an internal innovation awards competition to explore creative solutions for the buildings market. One of its recent winners is Benchmark BI, a building analysis research platform that extracts valuable building layout

▲ For the 11-story 17xM building in Washington, D.C., Arup designed an integrated network for smart building controls through a single hub that controls the building’s all-electric systems, including HVAC, lighting, fire alarms, security, and safety.

and equipment configuration data from project BIM models. As the building database grows, data visualization studies are summarized in aggregate and presented via an interactive, comparative analysis dashboard. The ultimate goal of this effort is to guide future space planning solutions, promote cost-certainty, and instill confidence in decision-making for the firm's clients.

DLZ Corp. is finding success in public sector work through the build-operate-transfer (BOT) delivery method, a contract model for government agencies to finance large infrastructure projects. Two recent projects include \$60 million worth of BOT projects in Morgan County, Ind., to remake the county's justice buildings, including the sheriff's office, jail, courthouse, and training and fleet maintenance facility; and \$20.3 million in BOT projects in Greensburg, Ind., for the development of 10 acres for the city's new North Broadway Municipal Complex, which included a new 20,000-sf fire station and provisions for a new streets and sanitation facility.

IMEG launched its IDEA (Innovators in Design and Engineering Application) program, which promotes technology advancements internally related to building performance and project approach and delivery. Topics include battery energy storage, commissioning, decarbonization, digital twin, microgrids, and security design. Also, the company acquired 12 firms during the past 12 months, including the Columbus, Ohio-based engineering division of Veregy, and Washington, D.C.-area-based Christopher Consultants. IMEG now has 80 offices and 2,300 team members nationwide.

Jensen Hughes has worked to make lithium-ion battery storage safe through propriety testing of fire suppression, as well as performance-based design alternatives. The firm uses computational fluid dynamics, a fire dynamic simulator, and other computer-based programs to model the movement of smoke, gases, and flame spread to understand where to include gas detection and ventilation, predict occupant evacuation time for extended travel distance code variance, determine sprinkler activation time versus fire growth, right-size the fire safety system for each unique challenge, and support informed decision making for emergency response planning.

JQ implemented a firmwide recognition platform, called Work Tango, that allows staff to recognize their colleagues performing exceptional work, exhibiting firm cultural tenets, and exceeding agreed goals, using a company funded monetary based point system. The firm provides additional points to all staff based on corporate position each quarter.

KCI opened the doors to its National Training Center in Largo, Md., and graduated the inaugural class of its new Field Technician Training Program. This program offers non-degreed candidates an opportunity to build a career in the AEC industry and serves as a major component of KCI's talent development strategy by training and onboarding our future workforce. Throughout the 100-hour program, class participants learn about KCI while gaining the technical and work skills needed to be successful in field technician positions throughout the firm. Following the completion of the four-week program, all eight trainees graduated and were offered full-time positions at KCI.

Also, KCI partnered with ActivePure to bring to market a new air purifying technology for use in hospitals, homes, doctor's offices, professional sports facilities, and other commercial and residential buildings. The system uses advanced photocatalytic oxidation to mitigate the effects of common airborne pathogens, viruses (including Covid 19), bacteria, mold, fungi, and other respiratory irritants. As air passes through the ducts, key oxidizers are introduced to neutralize contaminants and provide cleaner air results than a traditional filtration system. The technology has been cleared by the FDA and is currently undergoing numerous case studies, including a three-year-long study in the Cleveland Clinic's operating rooms.

ENGINEERING/ARCHITECTURE FIRMS TOP 39					
Rank	Company	2022 Eng/Arch Revenue	Rank	Company	2022 Eng/Arch Revenue
1.	Jacobs	\$3,758,130,000	21.	CDM Smith	\$63,590,300
2.	AECOM.....	\$1,188,400,000	22.	Shive-Hattery.....	\$63,357,375
3.	Alfa Tech Consulting Engineers	\$668,916,000	23.	Burns Engineering.....	\$51,895,952
4.	Burns & McDonnell.....	\$607,991,307	24.	ISG	\$49,479,097
5.	Ramboll	\$446,000,000	25.	Woolpert.....	\$49,000,000
6.	EXP	\$413,632,000	26.	Highland Associates.....	\$43,200,000
7.	Thornton Tomasetti.....	\$340,000,000	27.	Halff.....	\$36,935,000
8.	Salas O'Brien.....	\$278,829,405	28.	Whitman, Requardt & Associates.....	\$31,072,708
9.	CRB Group	\$251,848,609	29.	GRAEF.....	\$29,934,795
10.	IPS-Integrated Project Services.....	\$251,455,461	30.	DLZ Corporation.....	\$29,822,055
11.	SSOE	\$201,089,634	31.	Stanley Consultants.....	\$29,618,067
12.	Dewberry.....	\$169,533,654	32.	EAPC Architects Engineers.....	\$25,531,159
13.	Ghafari Associates.....	\$140,137,000	33.	Hixson Architecture, Engineering, Interiors	\$24,000,000
14.	Wiss, Janney, Elstner Associates	\$136,852,000	34.	CBRE Group.....	\$22,545,319
15.	STV	\$124,529,283	35.	PS&S	\$19,353,840
16.	Morrison Hershfield.....	\$98,392,864	36.	EVstudio.....	\$14,550,000
17.	Farnsworth Group.....	\$84,516,271	37.	Davis, Bowen & Friedel.....	\$12,858,294
18.	PRIME AE Group	\$80,452,911	38.	Primera Engineers.....	\$6,745,780
19.	Walker Consultants	\$72,483,000	39.	R.E. Warner & Associates.....	\$6,436,780
20.	BRPH Companies.....	\$71,180,000			

SOURCE: BD+C 2023 GIANTS 400 REPORT

Magnusson Klemencic Associates developed building planning guides to help inform its clients on the newest building code, which includes for the first time design requirements for tsunamis. The guides aid decision making on building configuration, location, and hardening “so that our next generation of coastal projects are better able to resist loads from tsunami waves,” says the firm.

P2S launched its MEPTFP Image Database, a cloud-based digital asset management platform that houses more than 4,000 images of mechanical, electrical, plumbing, telecom, and fire protection installations. The platform’s search engine allows users to search for any keyword saved in the image’s metadata to identify specific installation methods and results. The database has streamlined access to information for engineering production staff and improved tracking of project content for the marketing team and the qualifications pursuit process.

Paradigm Structural Engineers has assisted a growing number of pharmaceutical manufacturing and data center clients in incorporating passive energy dissipation measures, such as base isolation and fluid viscous dampers, to mitigate business interruptions. The firm’s designs aim to not only protect the building structure, but also all of the elements and content within to allow for continuous operation.

PCS created a new position, Director of Innovation, which heads a team that enhances the firm’s advancement in the field of structural engineering. The Innovation Team recently solicited ideas from across the entire company and selected two submissions for further study in the next six-month period. The two concepts, which involve specific research in the areas of embodied carbon reduction and software implementation to increase material efficiencies, will be researched and tested for firm-wide use, with opportunities for substantial benefits to owners and clients.

PRIME AE Group developed a Project Manager Manual that provides best practices and protocols for managing projects from opportunity identification through project closeout. The manual establishes a standardized baseline for project execution to ensure that anyone can pick up a project due to unforeseen circumstances.

Schaefer’s five-year strategic plan has four core pillars: people, smart structures, smart business practices, and client experience and finances. The firm launched several employee-related initiatives, including extended paid parental leave (up to 12 weeks, with increased 100%-pay periods) and an employee resources group for women, which saw near-100% participation in the initial events.

SSOE is exploring the use of architectural sche-

matic analysis applications and stable diffusion during the early design phases on projects. The firm is investigating potential use cases for these new, rapid optioneering, AI-infused technologies. Also, utilizing its cloud-based BIM collaboration platform and common data environment, the firm has been able to automate the creation of more than 3,000 design project spaces in just two years.

As signatories of the MEP 2040 Challenge, **Syska Hennessy Group** is hyper-focused on the climate, decarbonization, and electrification. For instance, the firm continues to advance its energy and simulation modeling services, which enable Syska to develop carbon-neutral, net-zero buildings for clients, and to better predict project lifecycles. Also, the firm’s Syska Innovations subsidiary invests in seed-stage companies, pilots their software and products, and promotes ideation and technology development within Syska.

Teecom’s R&D team has developed a new way to approach the design of buildings, called Buildings as Code. The concept involves writing the requirements for the systems and buildings the firm designs in a structured way, like a programming language. According to the firm, Buildings as Code uses a domain-specific language within a well-developed programming ecosystem, which makes the design specifications formal, testable, and extensible. It also makes managing complexity much easier with version control and collaboration. Early pilot testing with several key clients has “yielded fantastic results,” says the firm.

TLC expanded its internal SharePoint system, My TLC, to include PowerBi reports that convey important data to firm directors for staffing and forecasting purposes. Its IT department implemented cyber security measures that reduce the risk of external threats.

Woolpert launched the Woolpert Vault to capture and share internal knowledge in a standard repository. Built on Microsoft’s Viva Topics technology, the system features an AI-based approach to content discovery, bringing knowledge directly to end users as they work across the Microsoft platform.

WSP is focusing its innovation efforts on two key areas: virtual reality and artificial intelligence. The firm’s acquisition of Odeh Engineers in late 2022 has been a catalyst for innovation with VR tools. Odeh’s team leverages a 10-projector immersive BIM room in its Providence, R.I., office to help clients and project team members visualize real-time changes and interactive data, and to aid in key design decisions. Based on Odeh’s success with VR, WSP is planning similar BIM VR rooms in other offices, including in Southern California and other locations on the East Coast.+

See the full
GIANTS 400
rankings and
bonus categories at:
[BDCnetwork.com/
Giants2023](https://BDCnetwork.com/Giants2023)

31 INNOVATIONS FROM THE 2023 CONTRACTOR GIANTS

COMPILED BY DAVID BARISTA, EDITORIAL DIRECTOR

Of the 188 contractors and construction managers that participated in *BD+C's* 2023 Giants 400 survey, 97 provided details on their top innovations and technology enhancements from the past 12 months. Here's a roundup of the 31 most compelling innovations and tech advancements from the 2023 Contractor Giants (in alpha order):

Andres Construction Services implemented Genda across several jobsites to accurately track labor, using beacons and checkpoints.

Arc Building Partners is partnering with cmBuilder.io to provide 4D logistics simulations on two mixed-use developments. Using the platform, Arc's teams have created a functional "digital twin" of the projects that have "significantly enhanced project planning workflows and helped us secure critical buy-in for on-site logistics," says the firm.

Austin Industries launched two preconstruction tools: TRUE Design and TRUE View. TRUE Design is a group of activities that facilitate

collaboration with design partners during the three main phases of the design process: a constructability review during the schematic design phase; a completeness review during design development; and a coordination review during construction documents. TRUE View offers a comprehensive look at construction market data that provides customers with insights on the cost trajectory in various markets and scopes of work.

Balfour Beatty US is pilot testing the Hilti EXO-01 passive assistance exoskeleton, a device designed to reduce strain and effort inherent to overhead work, on the Harkers Island (N.C.) Bridge Replacement project. The project team is testing the device while removing concrete soffit formwork under the bridge. The EXO-01 reduces strain by applying passive assistance to the user's upper arms using rubberized straps.

Barton Malow is employing its LIFTbuild collaborative vertical manufacturing technology to build the 16-story Exchange residential tower in Detroit's Greektown neighborhood. A LIFTbuild

structure consists of concrete structural spines (core) and steel-framed plates for the roof and floors. All roof and floorplate assembly is done at ground level. Once the floor plates have been assembled, the exterior façade and selected building systems are installed above and below the floor plate. The entire floor plate is then lifted to its final position and locked into place.

To help alleviate mounting pressure stemming from supply shortages and material costs, **Bozzuto Construction** has worked to condensed the buyout phase on projects from 270 days to 60 days. The firm has also strategically employed warehousing for materials, "as suppliers have been unable to hold material pricing for the duration of a project."

After piloting Riskcast labor tracking software on multiple jobs, **Brasfield & Gorrie** scaled up implementation of the tool across multiple projects. The tool tracks (via mobile devices) both Brasfield & Gorrie employees and contract labor in the same system, which allows superintendents and project managers to understand the

true quantity and production rates, including overtime.

DPR Construction is investing in and incubating creative solutions for increasing efficiency and reducing risk through its venture capital arm, WND Ventures. For instance, robotic solutions are being scaled to help take workers away from hazards from things like silica dust and poor ergonomics while also making work in the field more productive. Currently, WND is investing in several companies, including Dusty Robotics, and helping to incubate nearly 20 startups.

Just four years into its Lean operations journey, **Findorff** now requires 100% of its projects implement the 5S Lean construction operations process.

Fortis Construction is leveraging prefabrication, modularization, and Design for Manufacturing and Assembly (DfMA) strategies to help overcome supply chain issues, labor shortages, and economic headwinds. For example, on a recent 493,000-sf, LEED Gold data center, the firm manufactured more than 600 modules, which removed 40,000 field labor hours and allowed for the

work to happen in a safer, controlled environment.

Gilbane established an emerging tech evaluation peer group comprised of leaders across the business focused on streamlining the existing technology stack and experimenting with new digital tools. The group is focused on solving pain points, simplifying processes, and driving efficient operations. Monthly pitch meetings are held where vendors from across the country can showcase their offerings. The team has met with more than 30 companies so far and has

moved forward with pilots with four vendors.

Haskell, through its innovation arm Dysruptek, has cultivated hundreds of ideas from its employees. Dysruptek received its first U.S. Patent in 2022 for RAPTOR (short for “Remotely Activated Pressure Testing, Observation & Recording”), a system to remotely pressure test pipe systems.

Hill International, in early 2023, launched its global Project Management Information Systems (PMIS) group. PMIS was founded to leverage Hill’s project controls

expertise and experience, which spans nearly 50 years and has helped to monitor and track some of the most complex projects ever built.

IMC Construction’s LEAD Program is a comprehensive two-year program designed for early-career employees. The program aims to enhance core technical, soft, and leadership skills while fostering relationships across all levels of the company.

Lease Crutcher Lewis has adopted the Progressive Design-Build delivery model in a big way. To date, the firm

has built more than \$350 million in Progressive Design-Build work across multiple projects, with another \$150 million on the books. In this structure, the design-builder holds the prime contract for a project and engages in a collaborative design and construction process with the owner and project team. Using this method, the firm delivers projects where the budget is fixed from day one, while the scope is variable. In collaboration with the architect, owner, and rest of the project team, the project is designed to a set of

CONTRACTORS | TOP 90

Rank	Company	2022 GC Revenue	Rank	Company	2022 GC Revenue	Rank	Company	2022 GC Revenue
1.	Turner Construction	\$16,099,926,887	31.	Alston Construction	\$2,144,760,000	61.	LeChase Construction Services	\$969,678,375
2.	STO Building Group	\$10,390,000,000	32.	Pepper Construction	\$1,915,567,453	62.	Beck Group, The	\$960,639,986
3.	DPR Construction	\$9,237,513,000	33.	Lendlease	\$1,895,082,980	63.	Findorff	\$960,498,925
4.	Whiting-Turner Contracting Company, The	\$8,437,277,918	34.	Fortis Construction	\$1,828,658,263	64.	James G. Davis Construction	\$928,710,165
5.	Clark Group	\$6,578,107,000	35.	Miron Construction	\$1,756,888,370	65.	IPS-Integrated Project Services	\$908,220,225
6.	Hensel Phelps	\$6,419,578,665	36.	Robins & Morton	\$1,681,353,092	66.	Clancy & Theys Construction	\$862,607,641
7.	Gilbane Building Company	\$6,139,700,000	37.	Choate Construction	\$1,643,291,137	67.	Rogers-O'Brien Construction	\$796,848,590
8.	JE Dunn Construction	\$5,759,521,811	38.	Clune Construction	\$1,584,240,805	68.	Nabholz	\$768,591,145
9.	AECOM	\$5,750,400,000	39.	Haskell	\$1,536,263,952	69.	VCC	\$750,000,000
10.	ARCO Construction	\$5,661,922,533	40.	CORE Construction Group	\$1,470,449,549	70.	McKinstry	\$740,000,000
11.	HITT Contracting	\$5,416,293,205	41.	Weitz Company & Affiliates, The	\$1,450,517,390	71.	Sundt Construction	\$734,763,296
12.	Clayco	\$5,216,000,000	42.	Burns & McDonnell	\$1,420,000,000	72.	Weis Builders	\$710,372,960
13.	Skanska USA	\$4,898,557,234	43.	Fluor	\$1,390,661,781	73.	Truebeck Construction	\$688,549,444
14.	Suffolk Construction	\$4,810,500,000	44.	Boldt Company, The	\$1,381,308,000	74.	Lease Crutcher Lewis	\$681,136,156
15.	Brasfield & Gorrie	\$4,807,955,148	45.	Power Construction	\$1,373,000,000	75.	McCownGordon Construction	\$672,775,500
16.	Holder Construction	\$4,568,000,000	46.	Messer Construction	\$1,370,231,477	76.	Bozzuto Construction	\$667,300,000
17.	Barton Malow	\$4,477,240,313	47.	McShane Companies, The	\$1,365,496,035	77.	Commercial Contracting Corporation	\$633,550,000
18.	PCL Construction Enterprises	\$4,144,178,747	48.	Manhattan Construction	\$1,325,987,503	78.	Kitchell	\$629,144,546
19.	Ryan Companies US	\$4,051,390,351	49.	Crossland Construction	\$1,319,739,797	79.	Saunders Construction	\$621,182,500
20.	McCarthy Holdings	\$3,981,151,211	50.	Adolfson & Peterson Construction	\$1,310,367,428	80.	Batson-Cook Construction	\$620,187,295
21.	Swinerton	\$3,926,938,474	51.	M.C. Dean	\$1,270,133,436	81.	Kraus-Anderson	\$594,369,295
22.	Walbridge	\$3,527,660,000	52.	Summit Contracting Group	\$1,258,897,836	82.	Graycor	\$567,614,656
23.	Balfour Beatty US	\$3,347,186,185	53.	Shawmut Design and Construction	\$1,216,748,606	83.	C.W. Driver Companies	\$565,863,738
24.	Mortenson	\$3,262,639,000	54.	W.E. O'Neil Construction	\$1,173,483,579	84.	Kaufman Lynn Construction	\$503,450,000
25.	Walsh Group, The	\$3,194,730,621	55.	BL Harbert Intl.	\$1,158,981,583	85.	Holt Construction	\$496,075,000
26.	Gray Construction	\$3,187,487,993	56.	Level 10 Construction	\$1,131,511,845	86.	W.M. Jordan Company	\$479,964,580
27.	Yates Companies, The	\$2,725,520,600	57.	Hoar Construction	\$1,063,032,000	87.	Andres Construction Services	\$473,580,417
28.	Alberici-Flintco	\$2,623,786,312	58.	Andersen Construction	\$1,028,910,000	88.	IMC Construction	\$461,700,000
29.	Big-D Construction	\$2,466,136,321	59.	Webcor	\$1,010,500,000	89.	CSI Construction	\$448,048,494
30.	Austin Industries	\$2,349,832,470	60.	JRM Construction Management	\$980,000,000	90.	Harkins Builders	\$448,000,000

SOURCE: BDC 2023 GIANTS 400 REPORT

budget targets using target value design, benchmarking, real-time estimating, and variable contingency management. These projects often include risk-reward agreements, where critical members of the project team are financially incentivized to meet overall project goals.

Level 10 Construction implemented Dusty Robotics for layout operations on a recent 188,000-sf, two-building project. The system comprises a robotic total station, Dusty (similar to a Roomba), and a tablet for the operator to communicate with the system. Through early collaboration with project trade partners and using Dusty Robotics hardware for joint layout operations, the team was able to reduce the

layout duration from 18 days per floor to eight days, resulting in a direct saving of six weeks in the project schedule, according to the firm.

McCarthy Holdings hosts “Spark Tanks” to encourage and support employee engagement and innovation. These events invite employees to propose ideas for business improvement, which in turn are evaluated by leaders across the organization. As a result, the firm as implemented an average of 1-2 business opportunities per month, including the establishment of two self-perform businesses generating more than \$2 million in revenue, five distinct employee benefits programs, and the creation of business intelligence dashboards.

For its data center work, **Mortenson** designs and manufactures factory precast duct banks (in lieu of cast-in-place on site) for the large runs of underground conduit that carry data cabling and low-voltage connections between data centers and to the grid. This approach improves quality control and leads to less defects, a better working environment for craft labor, lower risk of weather delays, and faster, simpler field installation that requires less labor on site.

PCL Construction Enterprises developed Job Site Insights (JSI), a tech platform that uses sensors to monitor jobsite conditions such as water intrusion, vibration, temperature, humidity, and structural strength to miti-

gate potential risks, improve quality, save time, and increase efficiencies. “The use of this real-time data paired with artificial intelligence has become more prevalent on our busy construction sites,” the firm added.

PMA Consultants developed Project Summit, a software tool that combines the full detail of a P6 schedule with an interactive, visual canvas, “making it the ideal planning and scheduling tool for owners and upper management looking to understand complex schedules,” says the firm. The tool features a patented algorithm for rolling-up dependencies as the schedule is summarized. Unlike Gantt chart software, this allows for progress updates and



COSME WATER TREATMENT PLANT
St. Petersburg, Florida

what-if analysis to be carried out at any level of detail and instantly reflected up or down while maintaining complete vertical integration. Project Summit leverages the Graphical Path Method (GPM) to harness real-time calculations while the mouse moves, as well as constraint-free activity start dates.

Poettker Construction launched Poettker Elevate, a cloud-based companywide learning management system comprised of on-demand electronic training, practical evaluations, and hybrid options. The program is designed to give employees a clear understanding of career trajectory, keep trainings condensed within the average adult attention span timeframe, and give

managers access to course feedback.

Robins & Morton has formed several R&D partnerships to beta test robotics, such as Honda's Autonomous Work Vehicle and HP's SitePrint layout robot. Also, the firm, through its Innovation Lab, developed several custom products to solve project challenges. They include: CordClip, a device to hold temporary cables into studs, walls, and Unistrut; a fire damper reset tool for fire damper testing; and PrismPoint, a custom anchor for robotic total station layout.

Ryan Companies' in-house computational design team has developed several custom tools to optimize existing processes. The Mass Yield

Study Tool (MYST) enables project teams to quickly iterate through design options for a proposed building site. It also integrates multiple data sources to incorporate sustainability evaluations and feedback from the firm's Post Occupancy Evaluation Tool (POET). Ryan is leveraging computer vision, Internet of Things (IoT), and AI technology to accelerate the reporting process and identify abnormalities within delivery methods. For instance, using IoT and AI monitoring, teams can detect events like sudden increases in water utilization and take the required preventive actions to minimize water usage on jobsites to meet sustainability goals.

Sachse Construction is

using ChatGPT for various writing tasks, including internal presentations, document creation, award submissions, and press releases. "By leveraging this technology, we can significantly reduce the time and effort required to create high-quality written content," says the firm.

Schimenti Construction developed an internal QA/QC process mapping tool, SchimentiQC, that is now implemented on all projects. The cloud-based process map guides project teams through every step of a project. "Since implementation, it has ensured all risks are highlighted and mitigated at an early stage and compliance consistency. The overall quality of a project outcome has increased by 12%," says the firm.



Building a better tomorrow

Experience the power of adaptability with PCL Construction - transforming complex infrastructure projects into impactful realities.



CONSTRUCTION

WATCH US BUILD AT [PCL.COM](https://www.pcl.com)

▶ TOGETHER WE BUILD SUCCESS

Shawmut Design and Construction launched its Diverse Partnerships Program to increase partnerships with diverse vendors, subcontractors, and suppliers. In the firm’s New England Region, the pilot program brought in seven companies in early 2023 to complete its Building Partners Series, a six-session, 12-course accelerator program built for Shawmut’s trade partners and subcontractors. The firm aims to establish long-lasting partnerships with these Underrepresented Business Enterprises (UBEs) that will lead to knowledge-sharing, innovation, and long-term success.

Skanska USA’s data solutions team launched a data literacy training series and knowledge sharing forums to provide employees with a better understanding of data tools and how they can be

integrated into their work. The firm is also focused on building dashboards and other data visualizations “to bring data to life and help us solve challenges quicker and earlier,” says Skanska. For example, the firm’s production tracking dashboard connects data from project BIM models and project management and scheduling tools. It allows teams to track and monitor trade partner workforce, schedule, and percent-complete data in real-time.

Sundt Construction launched a safety program, called “Stop the STCKY” (“STCKY” stands for “sh*t that can kill you”), that focuses on eight areas of high-risk work: built at heights, underground, moves, lifts, shocks, is hazardous, pinches or crushes, has stored energy. Data is collected during STCKY Walks

(high-energy control assessments) and analyzed to help the firm review, manage, and implement improvements, trainings, coaching, and best practices.

Truebeck Construction developed a custom Project Health Dashboard that enables the project team to visualize a project’s key performance indicators (KPIs) in one centralized location. By providing real-time updates on key project metrics such as budget, schedule, safety, and change management, the dashboard helps project teams quickly identify potential issues and take proactive steps to address them. Centralizing all this information in one place minimizes the time spent running reports and chasing down information to see if a project is on track, says the firm.

VCC Construction adopted predictive modeling

and algorithmic automation to evaluate and improve procurement lists for projects. This automation scans large volumes of data present in expediting lists for projects and can catch omissions or simple mistakes (e.g., miskey or “fat finger”) in the submission process, which “used to take painstaking effort to correct,” says the firm.

Warfel Construction developed project risk analysis software to better understand the potential risks associated with projects and project opportunities. Using a set of customizable questions and a proprietary weighted formula, the software generates a project-specific risk rating that can be used by teams to inform decision-making, proactively implement proper risk mitigation plans, and improve project outcomes.+

CM AGENT + PM FIRMS | TOP 66

Rank	Company	2022 CM+PM Revenue	Rank	Company	2022 CM+PM Revenue	Rank	Company	2022 CM+PM Revenue
1.	Alfa Tech Consulting Engineers	\$912,000,000	23.	HPM	\$42,952,000	45.	Balfour Beatty US	\$8,120,852
2.	CBRE Group	\$842,720,198	24.	Barge Design Solutions	\$33,811,978	46.	Executive Construction	\$8,000,000
3.	Skyline Construction	\$554,623,930	25.	Skanska USA	\$32,843,549	47.	Barton Malow	\$7,705,602
4.	Hill International	\$418,284,768	26.	AOA	\$31,460,171	48.	KCI Technologies	\$5,280,173
5.	AECOM	\$276,000,000	27.	RSP Architects	\$27,951,000	49.	Sundt Construction	\$5,050,359
6.	STV	\$169,100,782	28.	Bancroft Construction	\$25,536,519	50.	Wesbuilt Construction Managers	\$5,000,000
7.	CDM Smith	\$168,960,000	29.	Zelus	\$25,000,000	51.	KPFF Consulting Engineers	\$4,796,176
8.	Gilbane Building Company	\$160,300,000	30.	Whiting-Turner Contracting Company, The	\$24,449,536	52.	Progressive AE	\$4,503,498
9.	Turner Construction	\$156,338,393	31.	AFG Group	\$20,214,418	53.	Robins & Morton	\$4,447,675
10.	McKinstry	\$153,000,000	32.	CRB Group	\$17,142,441	54.	Adolfson & Peterson Construction	\$4,362,721
11.	Arcadis North America	\$119,144,525	33.	CORE Construction Group	\$17,114,961	55.	Pointcore Construction	\$4,259,989
12.	WSP	\$118,410,594	34.	Swinerton	\$17,000,000	56.	Cordogan Clark & Associates	\$3,935,000
13.	Michael Baker Intl	\$109,593,585	35.	Cotter Consulting	\$15,807,000	57.	Brownstone Construction Group	\$3,799,127
14.	SSOE	\$76,144,382	36.	Campus Construction Management Group	\$15,500,000	58.	Miron Construction	\$3,611,152
15.	Kitchell	\$73,985,367	37.	LeChase Construction Services	\$15,257,532	59.	WD Partners	\$3,570,000
16.	Walbridge	\$72,570,000	38.	ThermalTech Engineering	\$13,000,000	60.	Yates Companies, The	\$3,519,500
17.	JE Dunn Construction	\$68,237,002	39.	Suffolk Construction	\$12,200,000	61.	Arora Engineers	\$3,486,677
18.	LaBella Associates	\$65,404,130	40.	Premier	\$11,920,027	62.	Stanley Consultants	\$3,364,386
19.	PMA Consultants	\$61,880,008	41.	Lendlease	\$11,514,728	63.	Big-D Construction	\$3,327,818
20.	Messer Construction	\$56,411,773	42.	Salas O'Brien	\$10,245,624	64.	CMR Partners	\$2,931,300
21.	McDonough Bolyard Peck (MBP)	\$56,409,497	43.	Wiss, Janney, Elstner Associates	\$9,490,000	65.	Álvarez-Díaz & Villalón	\$2,900,000
22.	Kraus-Anderson	\$50,208,905	44.	Mortenson	\$8,200,000	66.	Burns & McDonnell	\$2,700,000

SOURCE: BD+C 2023 GIANTS 400 REPORT



RETAIL, PLUS

Retailer survival continues to hinge on blending online and in-person shopping, and mixing retail with other building types, like offices and residential.

Over the past year or so, California-based Architects Orange has enjoyed a bump in its retail assignments that, according to its Managing Partner Rob Budetti, can be attributed mostly to retail being integrated into larger mixed-use projects.

“The mixed-use trend is expanding to more non-traditional elements, incorporating industrial, retail, entertainment, residential into one cohesive development,” he explains. One such example in AO’s portfolio is Phase II of Mountain View Village in South Valley, Utah. AO designed the master plan for this 85-acre destination with more than one million sf of constructed space that includes 30 dining options, a 14-screen Cinemark Theater complex, 177,000 square feet of Class A offices, and shopping options for health and beauty, apparel, home furnishings, and electronics.

The landscaping of Mountain View Village, whose construction was completed in 2022, features thousands of plants and 1,700 new trees. “Our goal was to design and plan a retail concept that replicated a

downtown feel with a sense that the buildings were developed over time,” says Budetti.

Retail has also been one of Kimley-Horn’s fastest-growing practice sectors, increasing nearly 80% in 2022, according to Leslie Netzer, the firm’s Director of Retail. Mixed use drove that growth, as traditional shopping malls “are turning into communities offering a combination of apartments, gyms, grocery stores, theaters, retailers, offices, and restaurants.” One of Kimley-Horn’s recent projects, for which it provided civic engineering, due diligence, and permitting services, was The Yard at Fischers District in Indiana, a mixed-use development with multiple restaurants and retail within close proximity. To the east of Fischers District, which was completed last year, Kimley-Horn continues to work on a development called The Stations, which will include a retail pad, a hotel, an office building pad, and 37 townhouses.

▲ Architects Orange attributes recent design opportunities in the Retail sector to larger mixed-use projects like the 85-acre Mountain View Village in Utah, which includes offices, restaurants, a variety of retail stores, all combined to replicate the feel of a downtown.

ADJUSTING TO SEISMIC DISRUPTIONS

Retail was as hard hit by the coronavirus pandemic as any corner of the U.S. economy. Simultaneously, retailing was being rattled by the tectonic shift to where online shopping and ordering predominate. These factors alone have made the sector harder to read, even as most of the AEC Giants contacted for this article say their retail practices have been thriving lately.

“On the occupier side of retail, our work has slightly decreased. Our clients are being cautious due to the economy,” says Greg Lang, CBRE’s Senior Managing Director—Retail and Multi-Site sector. However, he adds, his firm has seen an uptick in demand among its investor clients for tenant coordination and real estate development services “for the first time in 2-3 years.”

(Investors and developers continue to send out mixed signals about their interest in retail properties. A few weeks after *BD+C* interviewed Lang, Pacific Retail Capital Partners acquired the 1.2 million-sf Bridgewater Commons shopping mall in New Jersey, with more than 150 retail tenants. The acquisition included an adjacent 94,000-sf open-air shopping district called The Village at Bridgewater Commons. On the other hand, David Simon, CEO of the mall giant Simon Property Group, told *WWD* last February that his company wasn’t planning on buying more retailers, at least in the near term.)

Jonathan Fiato, Shawmut Design and Construction’s Senior Director—New York Region, says his firm has also seen an increase in retail-related construction demand, especially among retailers and brands that are invest-

ing in their flagship locations. He cites BMW Mini’s Manhattan flagship as one prominent example, as well as Culture Kings’ U.S. flagship, a two-story, 25,000-sf store that opened last November in The Forum Shops at Caesars in Las Vegas. This is Culture Kings’ largest store to date, and features a 75-foot-tall hat wall, arcade machines for patrons, a basketball half court, and a slushy bar. The building team on this project included Henderson Engineers, bokor architecture + interiors, Bunnyfish Studio, and Lighting Design Alliance.

It goes without saying that survival now requires retailers to have a strong and palpable online presence, which includes their physical stores being able to accommodate BOPIS, which stands for “buy online pick up in store.” “Systems need to connect seamlessly to online ordering, inventory, etc., and be easily managed by instore associates,” asserts Michele Devereaux, CPSM, Marketing Strategist for the retail mixed-use practice of Callison RTKL, a division of Arcadis.

While AEC firms report less downsizing of bricks and mortar stores than might be expected, they have been seeing more retailers reducing their in-store inventories in favor of spacious showroom presentations. Retailers “are trending toward right sizing that enhances the omnichannel retail experience,” says Shawn Bland, Core States Group’s Director of Retail. This trend, he adds, has been a boon for his firm’s in-house architectural, engineering, and program management services to help retail clients devise branded, unique brick-and-mortar environments. (Bland points specifically to his firm’s recent work for Primark in Sunrise, Fla., Just Salad in Miami, and the Lidl grocery in Exton, Pa.)

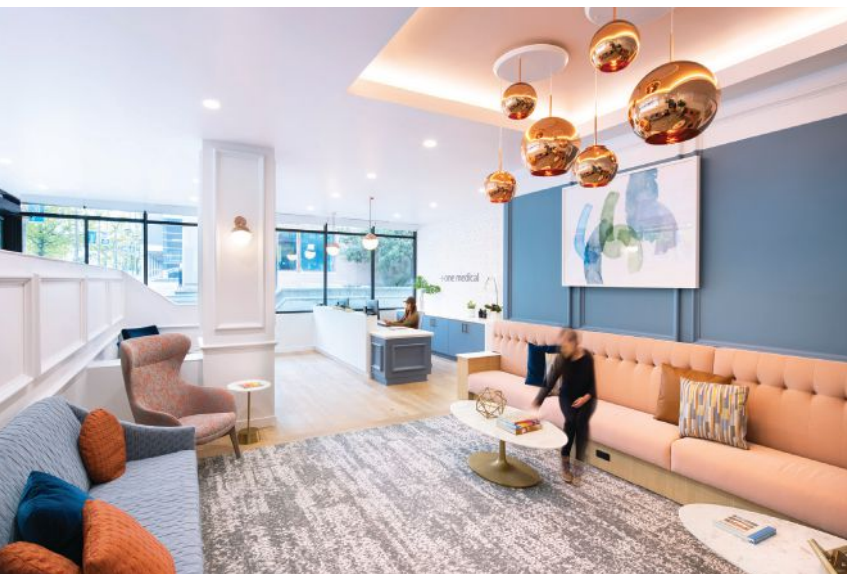
OPPORTUNITIES FOR REINVENTION

Jason Zoeller, Retail Sector Executive for Henderson Engineers, says that retail clients should always be thinking ahead about how their spaces might need to evolve in the future. He says he’s already seeing a shift toward flexibility about store locations at a time when there’s broad availability of retail space that’s cost effective and offers greater return on investment.

This flexibility is creating opportunities for renovation and adaptive reuse. “We continue to push innovation and develop creative design solutions for clients seeking flexible spaces which can contract and expand based on tenant needs,” says AO’s Budetti.

Lounges in banks and car dealerships are signs of this trend. Other examples find Kimley-Horn helping a nationwide general merchandise retailer upgrade its MEP systems and secure permitting to move refrigeration to the front of its stores. Netzer adds that shopping center developers are collaborating with AEC firms to design interior spaces that appeal to

See the full
GIANTS 400
rankings and
bonus categories at:
[BDCnetwork.com/
Giants2023](http://BDCnetwork.com/Giants2023)



CALLISONRTKL

CallisonRTKL has been helping the concierge medical practice One Medical reimagine the client experience with calmer environments. Since 2017, the design firm has delivered more than a dozen medical care offices, ranging from 3,000 sf to 6,000 sf, many of them in retail settings.

multiple generations, and are ordering landscape architecture for exterior spaces of national restaurants.

To accommodate customers who prefer to order online from their smartphones or cars, quick-service restaurants are building more drive-thrus or mobile-only smaller buildings. (Netzer notes, parenthetically, that these retailers still have the same land needs because the pickup spaces must be larger.)

Retailers are turning to AEC firms when they need to reposition their image with consumers. For example, CallisonRTKL recently helped Petco transform its brand from a big-box pet products store to a health-and-wellness service for pets and their owners. The redesign entailed wider aisles and streamlined wayfinding to make the store easier to navigate. The service design focuses on quality and convenience, and supports every in-store interaction.

NON-RETAIL TENANTS WELCOMED

AEC firms say that retail developers and property owner/managers have become more receptive to leasing space to non-retail tenants in shopping plazas and strip malls.

“What’s changed,” explains AO’s Budetti, “is the integration of expanded asset types like multifamily, medical, hospitality, coworking, fulfillment, and larger entertainment venues.” As part of the so-called “Medtail” trend, CallisonRTKL has been assisting One Medical Group, a concierge medical practice, to reposition its spaces as calming, comfortable environments. Since 2017, the firm has provided architectural design and construction administration services for more than a dozen of One Medical Group’s locations that range from 3,000 to 6,000 sf, many of them within retail centers, says Devereaux.

Non-retail tenants sometimes have design and engineering requirements that are different from basic clothing or jewelry stores. “Ventilation, finish treatments, wall assemblies, and lighting are all considerations,” says Devereaux.



↑ Last January, the Just Salad chain opened a 2,114-sf location in Miami—its 11th in South Florida and 15th overall—whose design merges with eco-conscious dining. According to the What Now Miami website, the restaurant includes climate-responsible products developed using practices that protect the planet, chairs made from 75% waste polypropylene and 15% reclaimed wood, eco-friendly real moss accents, receptacles made using recycled steel drums, and a library wall with used books sourced from Books by the Foot.

AO, says Budetti, has found that upgrades to existing structures are often required to handle larger live loads. Making changes might also mean that zoning needs to be renegotiated. Lang of CBRE says that plumbing is “a major challenge” when converting retail space for non-retail use, especially in older enclosed malls whose infrastructure “never contemplated fitness, education, or medical/dental tenants.” Lang adds that electrical systems in open-air centers typically need upgrades and more capacity. Bland of Core States Group notes as well that accommodating non-retail tenants usually means an increased need for low-voltage design services for technology such as frictionless checkout, POS ordering, and lighting and security controls.

Zoeller of Henderson Engineers suggests that having the right design and construction partners to evaluate a space before leasing is crucial, and often helps when negotiating better leasing terms depending on the upgrades needed.+

—John Caulfield, Senior Editor

RETAIL SECTOR ARCHITECTURE + AE FIRMS TOP 10		
Rank	Company	2022 Retail Revenue
1.	Gensler	\$183,337,590
2.	Arcadis North America.....	\$83,785,485
3.	Core States Group	\$60,382,501
4.	WD Partners	\$54,940,000
5.	NORR	\$43,068,568
6.	MBH Architects	\$40,004,000
7.	Nelson Worldwide	\$39,830,000
8.	MG2.....	\$38,313,224
9.	Greenberg Farrow.....	\$37,688,000
10.	AO	\$35,332,000

RETAIL SECTOR ENGINEERING + EA FIRMS TOP 10		
Rank	Company	2022 Retail Revenue
1.	Kimley-Horn.....	\$288,467,000
2.	Henderson Engineers	\$83,333,038
3.	Jacobs	\$40,100,000
4.	EXP	\$21,573,000
5.	WSP	\$17,677,542
6.	Alfa Tech Consulting Engineers	\$17,040,000
7.	Wallace Design Collective.....	\$15,700,000
8.	Langan	\$14,000,000
9.	Wiss, Janney, Elstner Associates	\$13,853,000
10.	Dewberry.....	\$13,537,372

RETAIL SECTOR CONSTRUCTION + CM FIRMS TOP 10		
Rank	Company	2022 Retail Revenue
1.	Whiting-Turner Contracting Company, The.....	\$584,033,447
2.	ARCO Construction	\$340,554,913
3.	Swinerton	\$335,223,652
4.	PCL Construction Enterprises.....	\$334,573,354
5.	Turner Construction	\$297,524,932
6.	Schimenti Construction	\$286,812,490
7.	VCC.....	\$234,446,984
8.	Balfour Beatty US	\$203,054,435
9.	Shawmut Design and Construction	\$181,195,950
10.	Ryan Companies US.....	\$179,151,227



AN UNCERTAIN FUTURE FOR OFFICE SPACE

Hybrid work seems here to stay, but developers still think they can lure employees back into offices with robust amenities and an emphasis on collaboration and culture.

Over the past several years, Structure Tone's workplace practice in New York City has been occupied with the buildout of the \$25 billion Hudson Yards project, much of which consists of office space. As that mega project on 28 acres wound down to completion earlier this year, Structure Tone's office-related work "headed back to normal," says Dennis Murray, the firm's Senior Vice President of Estimating.

"Normal," though, in the topsy-turvy office sector, can mean different things to different AEC firms. Architectural design firms like HOK, Stantec, and SGA report steady demand for their services on corporate office projects, and that work is mostly divided evenly among new construction, renovation,

and adaptive reuse. "The most sustainable thing we can do to start a project is to keep the existing building," says HOK's co-CEO Eli Holsington.

Engineering and construction firms, on the other hand, like Arup, BCCI Construction, Gilbane Building Company, and Jaros, Baum & Bolles (JB&B), report slowdowns in their office-sector business, especially on the new-build side. The construction firm Hensel Phelps has temporarily stopped looking at interior fitouts in the private market, to capitalize instead on opportunities in the Washington, D.C., market for office construction projects in the federal sector. (The research firm CoStar recently estimated that the office vacancy rate in the nation's capital in the first quarter of 2023 was 19.2%.)

On May 15, three professors from the business

← **HOK designed Boston Consulting Group's Canadian headquarters in Toronto that reinforces its client's hybrid work approach. Taking up three floors and 100,000 sf, the office design prioritizes health and wellbeing. Employees can move between open offices, case team rooms, convertible private offices, soundproof phone booths, a quiet library, a café, and individual spaces.**

schools of New York University and Columbia University published a working paper that stated the pandemic-induced switch to remote work had created an “apocalypse” in office real estate in the U.S., which they estimate underwent a “value destruction” of \$506.3 billion from March 2020 to March 2023, with lower-quality office space “at risk of becoming a stranded asset.”

AEC firms' perspective of market conditions, while hardly rose-colored, isn't quite as dire. Rather, “clients are reallocating similar amounts of space to new priorities, such as cultural activation, hospitality-inspired vignettes, and supporting hybrid work models,” observes Gable Clarke, LEED AP, NCIDQ, a Partner and President of Interior Design at SGA.

That trend, though, hasn't exactly clarified which direction the market is headed. “We're still not entirely sure what this ‘office of the future’ looks like,” say JB&B's Walter Mehl, PE LEED AP, Managing Director, and Michelle DeCarlo, PE, LEED AP BD+C, its Associate Partner. “Whatever it is, it'll be interesting.”

MEETING REMOTE WORK HALFWAY

Demand in the office sector has many drivers. Certain large job centers, like New York and San Francisco (the latter of whose 30% office vacancy rate is the country's highest), have seen their populations decrease in recent years. In its West Coast markets, San Francisco-based BCCI Construction has tracked “a flight to quality, but also a flight to safety,” says the firm's President and COO Dominic Sarica. Arup has seen more clients conduct portfolio assessments for strategic assignments to decarbonize their corporate real estate assets, says David Farnsworth, Arup's Principal and Americas Property Business Leader.

→ **NBBJ provided master planning and interior design at LinkedIn's global headquarters in Sunnyvale, Calif., a “nexus” office that draws people from other places on campus and from their homes. The “living room” space serves as a social anchor, and team hubs offer areas for group discussions. The first floor features coworking space, a market-style cafeteria, coffee shop, and community events space.**

Client priorities are pretty much the same across the country, say AEC firms: getting workers back into offices, by emphasizing wellness, business culture, and flexibility that accommodates hybrid working preferences.

“With hybrid work the new norm, spaces and programs that facilitate connectivity—both in-person and virtual—are highly desirable,” explains Clarke. In May, SGA completed a new 22,000-sf hybrid workspace for Cambridge Consultants on the 12th floor of the 2 Drydock building in Boston's Seaport district. The design accentuates the company's competence, experience, work style, brand, and culture to workers and visitors alike.

HOK designed Boston Consulting Group's new Canadian headquarters, which spans three floors of the 49-story 81 Bay Street office tower in Toronto. BCG's hybrid work approach allows staff to work in the office, on-site with clients, or from home. Within this new 100,000-sf office space, employees can move between open offices, soundproof phone booths, a quiet library, a large café, and individual spaces. The building team worked with the developer Hines to re-engineer the floor plate to make way for an 80-foot-long, 20-foot-wide central atrium on the first two floors. Suites with glass partitions allow daylight to reach the offices. The suites feature several layouts



that let users choose furniture configurations that meet their work needs.

Daylight, fresh air, and biophilia are essential components in what the architectural design firm NBBJ refers to as a “restorative workplace.” The firm points specifically to LinkedIn’s global headquarters, for which NBBJ provided the master planning and interior design services. The design creates a “nexus office” that draws people to it from other places on campus and from their homes via diverse workspaces, unique amenities, and experiences that can only be found at the office. The first floor features coworking spaces, a market-style cafeteria, coffee shop, and community events area. This project has fewer workstations than normal, replacing them with sofas, tall standing tables, and corner nooks with bookshelves.

In response to questions from *BD+C*, NBBJ says it’s been collaborating with Harvard Business School professor Raj Choudhary, an expert on the future of the office, on a concept called the 40 Percent Office. The concept is grounded in research that suggests 40% is the ideal amount of time office workers spend together. Given that less than half of office space in the U.S. is occupied at any given time, the concept rethinks how space is leased, shared, and used. This new model has far fewer desks, and explores remote sites as settings for culture-building activities. Choudhary’s research also suggests that companies should be more purposeful about how, where, when, and why workers convene.

THE NEW MANTRA: FEWER DESKS!

SGA also has re-evaluated its design approach to identify how office spaces can support hybrid work by creating environments that balance personal, team, spatial, and technological needs. These environments, says Clarke, integrate flexible, scalable, hospitality influenced features with open layouts.

The firm recently employed this strategy within a speculative office suite in Boston, whose layout breaks into “Meet, Ideate, Connect, and Retreat” areas that incorporate lounge zones for in-person



▲ Led by BCCI Construction, renovations to the 444 Castro Street building in San Francisco (pictured) included modifying the existing main building lobby, courtyards, common areas, and three two-story plaza buildings. Amenities include the build-out of a new fitness center, locker room facility, lobby board room, and associated MEP infrastructure improvements. At 221 Main Street, BCCI upgraded roof deck amenities to create a yoga area, multiple levels of seating, new stainless steel radius planters, a bar, trellis with 80-inch outdoor TV, and a new glass guardrail along the perimeter.

collaboration and all-hands meetings, traditional conference rooms, meet and focus spaces, and quiet commons for private work.

More of Gilbane’s clients now place emphasis on enhanced amenities such as fully appointed fitness centers, cafes, and green rooftops, says Mike O’Brien, the firm’s Senior Vice President. Clients, he adds, are also allocating more dollars to furniture, fixtures, and equipment.

“Clients have come to terms with the unknowingness of how the workplace of today and tomorrow and beyond will evolve,” says Colleen Arria, a Principal with Stantec’s Boston office. Consequently, clients are focusing their spending on spaces that build community, reinforce brand, and “recharge” their employees. Luxury amenities such as plunge pools, mediation rooms, and rock-climbing walls are no longer one-offs in office settings, she says.

NBBJ notes, too, that some clients have sought partnerships that help them create new programming opportunities in the office, like self-improvement classes conducted in the building’s lobby, rotating artists’ programs, and community gardens or farmer’s markets that breathe new life into the office and, at the same time, support local businesses.



OFFICE CONVERSIONS EASIER SAID THAN DONE

Much has been written about developers converting vacant office spaces into something else that's more leasable, and how such conversions might help alleviate America's chronic housing shortage.

SGA, says Clarke, is currently working on a "hospitality build to suit" that breaks up a large-scale office building into high-end condos and a luxury hotel with a rooftop pool and other amenities spaces. SGA has also taken a deeper dive into this strategy to work out the challenges associated with office-to-residential conversions, such as the potential need for zoning relief, vertical transportation, parking, and site circulation.

"Full-scale conversions usually require major infrastructure changes, which can be extremely costly," assert Mehl and DeCarlo of JB&B. They also point out that other building sectors are facing instability that makes conversions riskier; for example, residential seems to be moving away from luxury and toward mixed affordability.

The life sciences sector has been an increasingly popular target of office conversions for developers. "It's achievable if designers and building owners bring a detailed understanding of the technical and spatial considerations that life sciences requires," says NBBJ.

The problem is that building owners "are struggling to understand the new value of their properties in the post-Covid world, which makes it hard to justify the new investment cost of a conversion," says Brooks McDaniel, Senior Vice President of Building Repositioning for STO Building Group, which includes Structure Tone and BCCI Construction. McDaniel notes that the depth of office floorplates sometimes makes conversion to residential untenable from a leasing standpoint. Offices usually don't have operable windows, which are typically required for residential units.

Office buildings have more elevators than residential buildings need, and bathroom and mechanical spaces that a conversion to residential would make unnecessary.

Arup, says Farnsworth, has looked at quite a few feasibility studies for conversions of office buildings. He states emphatically that conversions to affordable housing are all but out of the question without incentives or tax abatements. The office building stock eligible for complete conversion to residential is also limited by current zoning rules. "Shifting the age for buildings would open up quite a bit more office space to full conversion," says Farnsworth.

On the plus side, cities like San Francisco with surfeits of leasable office space available are unveiling plans that widen the latitude for a building's activities and use for conversions. Gilbane's O'Brien has seen an influx of conversions in Washington, D.C., Chicago, Detroit, Milwaukee, and New York. In the Boston area, Gilbane recently completed the reconstruction of 225,000 sf of former retail space within an active shopping mall into lab/office space.

In early June, Amazon revealed its intention to tear down nine office buildings on three sites in Virginia to make way for four data centers. Hensel Phelps is currently converting one client's office space into a data center, a project that started before the pandemic and prior to the decline of the office market. Hensel Phelps has also been hearing more about office-to-residential conversions. "Most of the time, the biggest challenge associated with a switch like that will be re-permitting," says the team that responded to BD+C's questions: Director of Operations Matt McCaulley, Operations Managers Drew George and Alex Paschalides, and General Superintendent Brian Fish.+

—John Caulfield, Senior Editor

OFFICE SECTOR ARCHITECTURE + AE FIRMS TOP 10		
Rank	Company	2022 Office Revenue
1.	Gensler	\$844,324,156
2.	Stantec	\$162,348,416
3.	HOK	\$159,864,539
4.	Interior Architects.....	\$139,060,869
5.	Perkins&Will	\$124,884,730
6.	Page Southerland Page.....	\$123,151,860
7.	Skidmore, Owings & Merrill	\$105,771,000
8.	NBBJ.....	\$73,000,000
9.	HKS	\$64,000,000
10.	SmithGroup	\$55,162,040

OFFICE SECTOR ENGINEERING + EA FIRMS TOP 10		
Rank	Company	2022 Office Revenue
1.	Jacobs	\$501,900,000
2.	WSP	\$229,374,531
3.	Alfa Tech Consulting Engineers	\$189,600,000
4.	AECOM.....	\$143,500,000
5.	Thornton Tomasetti	\$108,370,385
6.	Tetra Tech High Performance Buildings Group	\$99,232,278
7.	Burns & McDonnell.....	\$89,406,860
8.	Langan.....	\$56,000,000
9.	NV5 Global.....	\$55,437,190
10.	Dewberry.....	\$43,161,478

OFFICE SECTOR CONSTRUCTION + CM FIRMS TOP 10		
Rank	Company	2022 Office Revenue
1.	Turner Construction	\$4,028,275,639
2.	STO Building Group.....	\$3,594,000,000
3.	AECOM.....	\$1,680,500,000
4.	DPR Construction.....	\$1,556,828,000
5.	HITT Contracting.....	\$1,353,173,382
6.	Clark Group.....	\$1,143,000,000
7.	Gilbane Building Company	\$1,088,256,000
8.	Balfour Beatty US	\$1,020,869,795
9.	PCL Construction Enterprises.....	\$1,019,215,504
10.	Clayco.....	\$976,000,000

THE STANDARD IN SOUND REDUCING DRYWALL

When sound control is important in your design, accept nothing less than QuietRock, the original sound reducing drywall with more than 20 years of proven reliability. QuietRock is an easy and cost-efficient way to build high STC performing wall partitions to reduce the sound transmission between spaces. Installed in commercial and residential projects throughout North America, QuietRock provides high sound attenuation and fire resistance in one panel saving time, labor and material costs compared to other acoustical treatments.

QuietRock[®]
by  PABCO Gypsum



Scan code or visit:
pabco gypsum.com/quietrock



WELCOME BACK

Guests are returning to hotels again, and new construction and renovations rebound.

The hospitality sector continues to recover from pandemic shock that grounded business and leisure travel. *Lodging Econometrics* estimates that 596 hotels with 71,117 rooms will open in the U.S. in 2023, representing year-over-year growth of 25.7% and 26.6%, respectively, with New York and Dallas leading the charge.

AEC Hospitality Giants tell the same tale about their hospitality practices, with all but one of the eight firms contacted for this article reporting gains over the previous 12 months.

The engineering firm Walter P Moore has seen a “marked increase” in hotel work, says Tim Santi, CE, PE, Senior Principal—Structures. HKS has enjoyed a “surge” that’s global and ranges from boutique hotels and destination resorts to casinos and entertainment venues, says Sergio Saenz, Partner and Global Practice Leader. “Hospitality, like multifamily, is one of the brighter spots,” says Michael Liu, AIA, NCARB, Partner and Design Principal with The Architectural Team (TAT). “Given the right location and the right sector, hotel projects can be an attractive development opportunity.”

Gensler is looking to capitalize on the trend of leisure travel to resort destinations, says Tom Ito, the

architecture firm’s Principal and Hospitality Leader. The overseas hotel market has been “exploding” for Perkins Eastman, while domestically the firm is seeing more demand in the Carolinas, California, Florida, and Texas.

Aside from its new construction work, Perkins Eastman is like other AEC firms that have seen an uptick in requests for renovations and adaptive reuse. One such recent project for Shawmut Design and Construction was the renovation of the lobby within the Four Seasons Hotel Boston, which included the addition of a new bar and restaurant called Coterie. The lobby now consists of multiple, smaller lounge spaces. Shawmut was also the GC on the \$200 million conversion of the former Federal Reserve Bank of Boston to The Langham, a 312-key hotel with a ballroom that can accommodate 225 guests. Dyer Brown & Associates was the architect on this project, which was completed last year.

▲ **The Le Vaux rooftop garden at Hotel Barrière Fouquet’s New York continues the property’s Art Deco aesthetic with an unmistakably French palette of lavender-green hues and furnishings, while at the same time placing the setting firmly in Manhattan’s Tribeca neighborhood. This eight-story hotel also features a 158-seat restaurant, 130-seat bar, and screening room.**

WORK AND LEISURE TRAVEL BLUR

Last November, EY-Parthenon released the results of a survey of 20 hospitality CFOs about the state of their market. They acknowledged a “boom” in leisure travel, but the respondents also expressed concern about labor shortages, and the slower recovery in business travel that was likely to hold back growth in revenue per available room (RevPAR) through 2024. “The industry will need even more creativity to continue its recovery,” EY-Parthenon summarized.

To that end, HKS, says Saenz, has made “significant investments” in research to figure out how the effects of hotel design can foster social connection and a sense of community. Dyer Brown is aiming its hotel designs more directly at health and wellness, sustainability, and diversity, equity, and inclusion, “at a time when decision makers in hospitality are doing the same,” says the firm’s President, Brent Ziegler, AIA, IIDA. Ziegler adds that Dyer Brown is also keeping an eye on the rise in work-related travel, “especially the blurring of the line between work and leisure travel.” (Perkins Eastman uses the term “bleisure,” whose amenities are tailored to “an increasingly normal” mobile/remote lifestyle. “The hotel has become the social landing point for businesses,” says the firm.)

Earlier this year, the design firm Webber + Studio identified 10 hotel design trends for 2023 and beyond. Among these were catering to guests who are seeking spaces that offer a work-life balance, and hotels that blend work and vacation. Other AEC firms and their hotel clients are already emphasizing some combination of live-work-play-recreate in their designs.

“This approach of establishing multifunctional districts that cater to work, living, and recreation has proven to be highly effective in numerous locations around the country,” observes Santi of Walter P Moore.

Travelers, says Perkins Eastman, are also willing to pay premiums for bespoke experiences that improve their wellbeing. This “global wellness tourism” is the fastest-growing sector of the travel industry, and Perkins Eastman is currently engaged in several destination eco-resort projects in the U.S., the Middle East, Africa, and China.

HOTELS ARE PRESENTING UNIQUE EXPERIENCES

A lot of these hotel trends seem to be rooted in efforts by AEC firms and their clients to create authentic experiences for guests. “Thematic elements from the neighborhood are often woven throughout the interior design of our hotels,” says Eric Reid, PE, Executive Vice President and Co-Lead for AECOM Tishman’s New York region. This design “allows the community to have



COURTESY DYER BROWN

Dyer Brown was the architect and provided exterior improvement services for the \$200 million adaptive reuse of the former Federal Reserve Bank of Boston into the 312-key hotel called The Langham. The façade honors the historical significance of the building and its Beaux-Arts style. The eco-resin backlit ceiling in the hotel’s Grana restaurant emulates the original skylight for the banking hall, and the bank’s original seal is preserved in the restaurant’s terrazzo floor. The project’s building team included Shawmut Design + Construction (GC), Thornton Tomasetti (SE), Richmond International (interior design), Peak Project Management (project management), Reveal Design Group (lighting), AKF (MEP/FP/IT), and NV5 (pool/spa/fitness, stormwater retention).

a sense of familiarity with the space,” Reid states.

Gensler’s Ito calls authenticity “a design driver. Guests desire enriched experiences that are connected to local people, culture, and history.” For HKS, authenticity is a “non-negotiable value,” says Saenz, and “a pillar of our design ethos.” One example is the outdoor lodging brand Auto Camp’s newest location adjacent to Zion National Park in Utah, for which HKS was the design architect. The 16-acre property, which opened in May, is located between the Virgin River and the desert. The focal point of Auto Camp is its signature Clubhouse, which according to HKS is designed to reflect the desert landscape with mid-century modern architecture. “Our design intent was to provide a rare, luxurious, contemporary take on the glamping experience,” says Michael Strohmmer, Partner and Regional Practice Director of Hospitality.

AEC Hospital Giants are also creating hotel spaces that give guests greater control over their environments, and the ability curate their stay to their personal interests. “The rapid growth of Internet of Things in the hospitality industry makes this possible,” explains Christine Chatfield, PE, Market Leader for Hospitality and Education at engineering firm Jensen Hughes. “We help to make sure these spaces are safe and secure.”

At the service of this trend, the hospitality sector has been shifting from mass marketing to “experience marketing,” says Perkins Eastman, which pointed specifically to the collaboration between the



leisure travel company Black Tomato and EON Productions to curate a journey into the world of James Bond, 007, which can include a high-octane pursuit down the river Thames in London or a high-stakes night at the Casino de Monte-Carlo in Monaco, both settings in Bond novels and movies.

Personalized guest experiences are available at wellness resorts whose pre-arrival process begins by mailing a guest a wearable biometric tracker to gather real-time fitness, sleep, and recovery data prior to the hotel stay. The hotel uses this data to structure a program suited to the guest's desired outcome.

PART OF A MIXED-USE COMBINATION

As is the case for many typologies, hotels are being sought after as elements of larger mixed-use projects. "More corporate headquarters plans are incorporating hotels and hybrid workforce housing, including flexible meeting and event space," observes Erik Gardner, Shawmut Design and Construction's Director of Business Development.

The TAT-designed, \$400 million Raffles Boston Back Bay hotel, which is scheduled to open in September, will offer 147 guestrooms designed by Stonehill Taylor and 146 condos designed by Rockwell Group. This is Raffles' first mixed-use property in the U.S. "The mixed-use hospitality-residential condominium approach is an attractive development model for an upscale demographic, which we believe is here to stay," says TAT's Liu.

Liu cautions, however, that there are design implications to mixed use that revolve around the appropriate mixing or segregating of populations and their circulation routes, as well as making support and servicing functions as efficient as possible. Other design considerations for mixed-use projects, says Gensler's Ito, are guest views, solar orientation, shared outdoor spaces, guest arrivals, and parking requirements.

Despite these caveats, Perkins Eastman sees a lot of benefits in mixed use, including lower development

costs, especially in markets with prohibitive construction price tags. "Mixed use development is often the only way a project can pencil out."

MORE FIRMS EXPLORE MODULAR OPTIONS

Perkins Eastman has a partnership with Nexii, a green construction and technology company, that recently completed the exterior building envelope of a nine-story Courtyard Marriott in Nanaimo, British Columbia. Nexii produced the 750 envelope panels for this project at its production facility in Squamish, B.C.

More than any single hotel brand, Marriott has championed prefabrication and modularization for construction as speed-to-market and cost-reduction solutions.

But if the AEC firms interviewed are any indication, modular and prefab are still more admired as concepts than for practical application in the field. "We've explored modular design and construction for hotel projects. It works and can save on both costs and time," concedes Chatfield of Jensen Hughes. "However, modular units are constructed off-site and often in a different state. This can be problematic as code compliance varies from state to state."

TAT's Liu sees "exciting possibilities" in modular design and construction, and "would be interested" in exploring these practices in hotel development in the future.

Saenz of HKS says that the importance of approaching design solutions from the perspective of how to lower a project's impact on the environment, while controlling the design and potential experience of the guest, led his firm to explore prefabrication, flat packing, and on-site assembly, especially for remote locations. HKS has implemented modular design "on many projects," says Saenz, and is currently working to develop a portable guest room space that can be experienced and transported nearly anywhere in the world.+

—John Caulfield, Senior Editor

HOTEL SECTOR ARCHITECTURE + AE FIRMS TOP 10		
Rank	Company	2022 Hotel Revenue
1.	Gensler	\$84,147,384
2.	WATG	\$79,381,738
3.	HKS	\$72,000,000
4.	JCJ Architecture	\$43,259,252
5.	HBG Design	\$26,458,000
6.	DLR Group	\$24,440,000
7.	Cooper Carry	\$19,400,953
8.	Perkins Eastman	\$17,596,156
9.	Baskervill	\$14,381,252
10.	Arcadis North America	\$14,193,249

HOTEL SECTOR ENGINEERING + EA FIRMS TOP 10		
Rank	Company	2022 Hotel Revenue
1.	Jacobs	\$52,300,000
2.	IMEG	\$30,832,200
3.	EXP	\$25,791,000
4.	Tetra Tech High Performance Buildings Group	\$19,126,184
5.	Jensen Hughes	\$18,095,203
6.	Langan	\$17,000,000
7.	Kimley-Horn	\$16,411,000
8.	NV5 Global	\$15,061,366
9.	Arup	\$14,774,300
10.	DeSimone Consulting Engineering	\$14,158,030

HOTEL SECTOR CONSTRUCTION + CM FIRMS TOP 10		
Rank	Company	2022 Hotel Revenue
1.	Suffolk Construction	\$708,900,000
2.	Yates Companies, The	\$562,087,000
3.	STO Building Group	\$545,000,000
4.	PCL Construction Enterprises	\$424,452,178
5.	AECOM	\$373,440,000
6.	Swinerton	\$373,279,550
7.	Brasfield & Gorrie	\$296,445,281
8.	Balfour Beatty US	\$258,140,870
9.	W.E. O'Neil Construction	\$256,269,448
10.	Turner Construction	\$253,736,545



ELECTRIFYING GROWTH

Demand for more data centers is soaring, but delivery can be stymied by supply delays, manpower shortages, and NIMBYism.

Developers and owners can't build data centers fast enough. Forecasts about demand globally and in North America range from steady to exuberant. And AEC firms in this sector continue to reap the benefits of this growth.

HDR, for one, experienced a 200% increase in data center-related projects over the past year, according to Bob Haley, the firm's Mission Critical Facilities Director in Omaha, Neb., which provides building engineering services. He adds that one data center client has adopted a particularly aggressive artificial intelligence strategy (more on that later). Robert Thorogood, HDR's Client Development Director in London, who oversees the firm's work in Europe, the Middle East, and Asia, says that both hyperscale and colocation data center clients are expecting IT power capacity to increase by 50% or more over the next year.

But there's one hitch: developers and owners can't build data centers as fast as they'd like. Supply chain and manpower snags and shortages are impinging on construction, to the point where some AEC firms say demand has tempered, leading them to wonder if these problems might have longer-term consequences.

It's little wonder, then, that "speed to market" is the main priority and concern among AEC firms' cli-

ents, sprinkled with lowest first cost, access to available power, and sustainability. "Schedule has been a key driver," says John Arcello, an Advanced Technology Core Market Leader for DPR Construction. He's also seen a shift to more economical cost-per-megawatt metrics for key design decisions.

On top of trying to complete their projects faster, data center developers and owners are under pressure to reduce the facilities' water consumption, at a time when the industry has been trending discernibly toward liquid cooling in support of higher-density racks for apps, AI, and machine learning functions.

"The largest trend looming in the industry is densification utilizing various liquid cooling technologies," says Gabe Clark, Corgan's Principal and Data Center Sector Leader. He observes that, until recently, the adoption of these technologies at scale had been limited. But constrained sites, localized power availability, and other factors "may push the industry to a more holistic adoption in the near future."

Tom Widawsky, HDR's Associate Technical Sector Principal in Princeton, N.J., says that with AI and ML ascending, "we are seeing more emphasis on direct cooling at the chip being employed and planned for." While hyperscale sites are still air-cooled, primarily, "planning for industrial water at the rack is being developed for those needs."

Widawsky adds, parenthetically, that Design for

◀ Corgan provided master planning services for Vantage's AZ1 campus in Mesa, Ariz. Pictured is AZ11, a two-story 144,046-sf data center with four data modules, supporting infrastructure, and offices. The building has its own substation, and its landscaping retains stormwater. AZ11 is the first 16-megawatt phase of a 64-MW building scheduled to open next year, with AZ12 and AZ13 being constructed to the north and west. Corgan is working with McCarthy Building Companies in a design-build capacity on future phases of this campus.

Manufactured Assemblies (DfMA) is driving integration of prefabricated portions of data centers to be coordinated with site-adapt construction needs. "This is blurring the separation between design intent, means, and methods," he asserts.

DATA CENTERS ARE GETTING BIGGER

As IT infrastructure demand expands, so have the sizes of data centers. "They continue to become larger and more specialized, and as a result versatility of data centers is important," says Robert Bonar, Vice President with the engineering firm Burns & McDonnell. Bonar adds that, at the same time, a greater variety of data center is being built to service specific needs such as hybrid cloud and AI.

Burns & McDonnell and DPR are on the building team, with the design architect Sheehan Nagle Hartray Architects, for the Meta Mesa Data Center in Arizona, a greenfield development of a five-building campus encompassing over 2.5 million sf of data center and administrative space. This site—Meta's 18th data center globally and 14th in the U.S.—will be supported by 100% renewable energy and is slated for LEED Gold certification.

HDR has designed two NEXT DC colocation data centers that are scheduled to house Australia's largest and most comprehensive cloud ecosystems, says Sam Feigen, the firm's Project Leader and Director down under. The data centers—the one-million-sf M3 Melbourne in West Footscary, and the 172,000-sf M2 Melbourne in Tullamarine—will collectively deliver 210 MW of critical IT infrastructure to enterprise and government "in a climate of unprecedented digital innovation," says Feigen.

Corgan provided master

planning services on the Vantage AZ11 data center in Goodyear, Ariz., which is scheduled for completion in Spring 2024. This 114,046-sf, two-story building encompasses four data modules, infrastructure, and office space. AZ11 is the first 16-MW critical load phase of a 64-MW building, with AZ12 being constructed to the north and AZ13 to the west (Corgan and McCarthy Building Companies are working in a design-build capacity on future phases). Corgan worked with the city of Goodyear, Ariz., to expedite the review process and to provide landscape enhancements along with pedestrian walkways. With a substation built on the southeast corner of the lot, additional power is provided by Arizona Public Service.

On the coast of Portugal, Jacobs provided planning and due diligence and is designing the first phase of Sines 4.0, a nine-building, 495-MW complex for Start Campus. It is one of Europe's largest data center projects, and will provide leasable space to multiple regional hyperscale providers, says Alexis Stobbe, Jacobs' Vice President and Global Data Center Market Leader. "Most of our colocation clients are looking to meet the demand of hyperscales to lease rather than build more campuses."

Stobbe says this project's first phase develops nine hectares (22.2 acres) for the construction of the NEST (New and Emerging Sustainable Technologies) data center, a 15-MW, single-story building that will

See the full
GIANTS 400
rankings and
bonus categories at:
[BDCnetwork.com/
Giants2023](https://BDCnetwork.com/Giants2023)

▶ **First announced in August 2021, the Meta Mesa Data Center in Arizona is a five-building campus with over 2.5 million sf of data center and admin space. The complex, which is being built by DPR Construction, is scheduled for completion in 2026. It claims to be among the most advanced and energy- and water-efficient data centers in the world.**



be a model for new and prospective tenants to test and transition into spaces within one of the future data center buildings on this campus. This project, says Stobbe, is intended to be a “sustainable global technology powerhouse in a legacy industrial zone,” using 100% renewable energy for backup power. Sines 4.0 aims for its operations to be carbon neutral up to 2027, and carbon-free energy afterward.



^ The 645,834-sf, 80-MW NEXDC Merlot 3 data center, located in the suburb of Melbourne, Australia, designed by HDR, operates as a colocation facility for retail, enterprise, and hyperscale customers. To respect its neighbors, the building is set back 20 meters, and that zone features a community café along a tree-lined perimeter that transitions the site from residential to industrial.

AI’S RISE REQUIRES RACKS WITH HIGHER LOAD CAPACITIES

The global data center market, which was valued at \$200 billion in 2021, is expected to zoom to \$450 billion by 2027, with more than 25 million sf added during that period, according to Ken Research’s latest estimates. In the U.S. alone, the data center market is projected to expand from \$20.21 billion in 2022 to \$28.56 billion in 2028 (a compound annual growth rate of 6%), when it will have 25.95 million sf of leasable space and 3,404 MW of power capacity, according to Arizton estimates.

JLL, in its Global Data Center Outlook for 2023, notes that the fastest-growing segments of data center space continue to be hyperscalers and edge data centers that allow for diversification and improved latency. “The rise of artificial intelligence will both bolster demand, with increased data usage, and improve computing efficiency,” states the report.

Bonar of Burns & McDonnell says that AI is driving infrastructure development due to its need for computational power. “It seems that this may change the industry significantly over the next five to 10 years,”

he predicts. DPR’s Arcello adds that this demand is coming from two groups: giants like Meta, Google, and Amazon; and “pure AI companies” looking for larger power availability from one place.

HDR’s Thorogood says that some hyperscale clients are already modifying facilities under construction to accommodate higher rack load requirements.

However, some market watchers are also sensing some headwinds ahead. Jacob’s Stobbe points out that the global supply chain continues to be an issue. “Equipment lead times are still well beyond the market’s comfort zone for operators.” She also sees a “significant talent gap” that data center growth has created.

And while everyone wants their electronic devices and computers that depend on data centers to function glitch-free, not everyone is as eager to have a data center in their backyard. Inevitably, in some markets, public resistance “is slowing development timelines,” says John Major, AIA, Mission Critical Market Sector Leader for Page.+

—John Caulfield, Senior Editor

DATA CENTER SECTOR ARCHITECTURE + AE FIRMS TOP 10		
Rank	Company	2022 Data Center Revenue
1.	Corgan	\$122,647,818
2.	HDR	\$100,780,000
3.	Gensler	\$41,014,418
4.	Page Southerland Page	\$27,108,900
5.	HED	\$20,200,000
6.	HKS	\$17,000,000
7.	Stantec	\$14,891,794
8.	DGA	\$3,566,199
9.	Cushing Terrell	\$2,705,244
10.	AO	\$1,944,000

DATA CENTER SECTOR ENGINEERING + EA FIRMS TOP 10		
Rank	Company	2022 Data Center Revenue
1.	Jacobs	\$225,700,000
2.	Burns & McDonnell	\$133,160,332
3.	WSP	\$102,916,409
4.	EXP	\$96,714,000
5.	Alfa Tech Consulting Engineers	\$90,000,000
6.	Fluor	\$75,884,501
7.	ESD	\$67,766,209
8.	HPE Sustainable Data Center Modernization	\$57,109,000
9.	M.C. Dean	\$42,183,579
10.	Olsson	\$38,141,592

DATA CENTER SECTOR CONSTRUCTION + CM FIRMS TOP 10		
Rank	Company	2022 Data Center Revenue
1.	Turner Construction	\$3,641,495,139
2.	Holder Construction	\$3,464,000,000
3.	HITT Contracting	\$3,286,093,601
4.	DPR Construction	\$2,727,588,000
5.	Fortis Construction	\$1,542,865,291
6.	Mortenson	\$1,233,816,000
7.	JE Dunn Construction	\$843,253,961
8.	Whiting-Turner Contracting Company, The	\$804,905,329
9.	Clayco	\$759,000,000
10.	Clune Construction	\$704,022,175



FIRE SAFETY CONSIDERATIONS FOR CANTILEVERED BUILDINGS

Jose Rivera, PE, FPE, LEED AP, is an Associate Principal and Director of Plumbing and Fire Protection with Lilker, an IMEG company. He brings more than 20 years of experience in the design of plumbing and fire protection systems for commercial, institutional, residential, and transportation facilities. Rivera is well versed in the evaluation of projects for constructability and cost—from design through construction management—including documents and contractor proposal review, site visits, and detailed cost estimating. He is a licensed professional engineer in the state of New York, and is a member of the American Society of Plumbing Engineers and National Fire Protection Association.

Cantilevered buildings seem to be everywhere in New York City these days, as developers and architects strive to maximize space, views, and natural light in residential developments. With a seemingly insatiable demand for housing stock in a city that has limited availability and height restrictions in many areas, cantilevers have become a go-to solution and a design element in their own right. Central Park Tower, New York City's tallest residential building and home to Nordstrom's flagship Manhattan department store, famously incorporated the concept on the 13th floor to enhance views of the park.

Bold cantilevered designs are not without challenges though. In addition to basic structural challenges, fire protection and life safety considerations need to be addressed from the perspective of the cantilevered building, as well as from the adjacent building. Both properties are at risk from a fire initiated in either building, which can spread via conduction in solid materials, convection through circulating fluids such as air, or thermal radiation. To maximize life safety and fire protection, New York City mandates stringent standards when considering a cantilevered construction option.

The 2014 New York City Building Code Section BC 705.12 requires a formal, peer-reviewed fire engineering analysis acceptable to the Commissioner of Buildings, where a portion of a new building is cantilevered over an adjacent building or a tax lot by a horizontal distance greater than one foot. A separate approval from the fire



COURTESY LILKER

Central Park Tower, New York City's tallest residential building and home to Nordstrom's flagship Manhattan department store, famously incorporated the cantilever concept on the 13th floor to enhance views of the park.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- + **UNDERSTAND** the fire/life safety risks of cantilevered buildings and the ways in which fire may be spread to adjacent buildings.
- + **RECOGNIZE** the distinction between passive and active fire protection systems and list examples of each.
- + **DESCRIBE** the components of a fire engineering analysis.
- + **UNDERSTAND** the parameters, variables, and safety factor standards in a design fire simulation.



department is also required regarding access to the buildings and roofs in accordance with the New York City Fire Code. The New York City Department of Buildings (DOB) filing procedure was thoroughly clarified in the technical document, “Buildings Bulletin 2017-014,” dated October 25, 2017.

FIRE ENGINEERING ANALYSIS FOR CANTILEVERED BUILDINGS

Detailed plans indicating where the cantilevered portions begin in relation to neighboring properties—as well as fire separation distance—need to be submitted to the DOB. The fire separation distance will be measured perpendicularly from the face of the exterior wall to any neighboring building or tax lot line, whichever is closer. The fire separation distance will be measured individually from all exterior walls cantilevered over a tax lot line. Building code requirements for exterior openings (i.e., windows and doors) and opening protections near lot lines must also be addressed.

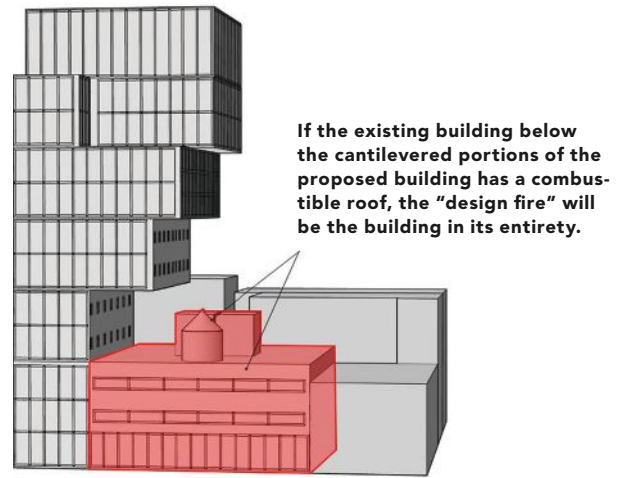
Written descriptions of the existing buildings below the cantilevered portion, as well as the proposed cantilever building (including detailed information regarding passive and active fire protection systems), are also required. Passive fire protection systems do not require any external power but rely instead on specific construction features and the use of materials, products, and building elements that meet well-defined fire performance requirements, such as fireproofing around structural steel.

Devices in active fire protection systems require manual, mechanical, or electrical power. For example, a sprinkler system requires sprinklers to open and a water supply at a sufficient flow rate and pressure after activation to be delivered through the system. A smoke control system relies on roof vents that open or a mechanical system to operate when a fire is detected. A detection and alarm system requires electric power to operate.

Fire engineering analysis must demonstrate that the cantilevered portions and surrounding building elements will withstand the anticipated effects of a “design fire.” A simulation or a model of the anticipated effects of the fire (convection, conduction, and radiation) utilizing generally accepted fire engineering principles needs to be included in the analysis.

DESIGN FIRE SIMULATION

Finite element modeling and computational fluid dynamics (CFD) computer models may be used to simulate the design fire. The design fire is programmed to occur on a 92 F summer day and last a minimum of 30 minutes. The scenario would



involve a total “burn-out” of the fuel source where all active fire suppression systems fail to operate in the existing building below the cantilever and the fire department does not respond. The model will assume optimal fire conditions in which the air is flowing freely through broken windows in the existing building facing or located directly below the cantilever.

The design fire analysis should include the quantity of combustible materials per unit floor area (fuel load density) and the rate in which the fire releases energy (heat release rate, HRR, per unit area) of the existing building. The fuel load density and heat release rate per unit area are based on guidance documents published from the Society of Fire Protection Engineers (SFPE), National Fire Protection Association (NFPA), or another internationally recognized fire protection engineering organization.

The model should account for the type of materials used for the façade of the cantilevered building and window assembly, such as type of glass, and the exterior wall coverings of the façade. The exterior walls, the glazing assemblies, structural elements, and horizontal assemblies will undergo intense failure analysis.

The severity of this design fire will vary whether or not the existing building below has a combustible or noncombustible roof. In the case of a combustible roof, the fuel source is the existing building in its entirety. In the case of a noncombustible roof, the fuel source would be limited to the combustible structures and equipment located on the roof (cooling towers, photovoltaic systems, etc.) or the contents of the floor level below the main roof, whichever is the greater hazard.

EDITOR'S NOTE

Additional reading is required for this course. To earn 1.0 AIA/HSW learning unit, read the full article carefully and take the exam posted at

[BDCnetwork.com/cantilever](https://www.bdcnetwork.com/cantilever)

BUILDING DESIGN + CONSTRUCTION

Name: _____

Company: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____

E-mail: _____

By providing your phone, fax, and/or email address, you are giving us permission to contact you concerning your subscription.

- YES! Please continue/start my FREE subscription of Building Design+Construction.**
- No, thanks.**

Signature _____

Title _____

Date _____

1. How would you like to receive your subscription?

- Print OR
 Digital (E-mail address required; please print clearly in space above.)

2. What is your company's role in the design and construction of commercial, industrial, institutional and multifamily building projects? (Check one box only.)

OWNING FIRM

- 10 Owner/Developer/Manager
 11 College/University
 12 Corporate Real Estate
 13 Government/Military/Utility
 14 Hospital/Healthcare System
 15 K-12 School System

BUILD FIRM

- 20 Construction Management Firm
 21 Design - Build Firm
 22 General Contractor
 23 Specialty Contractor

DESIGN FIRM

- 30 Architecture/Design Firm
 31 Engineering Firm
 32 Architecture/Engineering Firm
 33 Engineering/Architecture Firm

OTHERS ALLIED TO THE FIELD

- 90 Other (please specify) _____

3. Which category best describes your job title? (Check one box only.)

- 10 Architect/Designer/CAD-BIM Specialist
 20 Building Owner/Property Developer
 30 Construction Professional
 40 Engineer/Engineering Manager
 50 Facility, Building, Property or Asset Manager
 60 Specifications Writer
 70 Other Company or Firm Management
 90 Other (please specify): _____

to continue your free subscription!

Complete this entire form. Please sign, provide your title, date, and answer all questions below.

For Fastest Service, go online to:
www.BDCnetwork.com/subscribe

Complete all information on this form and email:
bdc@omeda.com

Or Mail to:
 Building Design+Construction
 P.O. Box 300 | Lincolnshire, IL 60069-0300

4. Which of the following building types does your firm own, manage, design or build? (Check ALL that apply.)

- A Airport/Transportation
 B College/University
 C Correctional Facilities/Courthouses
 D Cultural Facilities
 E Data Centers/Mission-critical
 F Government/Military
 G Hospitals/Healthcare
 H Hotels/Resorts/Casinos/Restaurants
 I Industrial/Warehouses
 J K-12 Schools
 K Multifamily Housing
 L Office Buildings
 M Religious/Places of Worship
 N Retail Shopping/Malls/Big Box
 O Senior Housing/Assisted Living
 P Sports/Recreation/Stadiums
 99 None of the above

5a. Do you buy, specify, approve or recommend the following building systems, products, services or equipment for your projects? Yes No

5b. Which building products, systems, services or equipment do you buy, specify, approve or recommend? (Check ALL that apply.)

- 01 Structural Systems - Concrete, Steel, Wood, Brick + Masonry
 02 Building Envelope Systems - Cladding, Glass, Insulation, Windows and Doors, Moisture Control, Architectural Metals
 03 Interior Systems - Ceilings, Flooring, Gypsum, Kitchen + Bath, Paints + Coatings, Hardware, Daylighting, Wall Coverings, Furniture, Furnishings, Shades
 04 Building Systems - Building Automation, Lighting, Electrical, HVAC, Plumbing, Security, Life Safety, Fire Protection, Sun Control, Elevators + Escalators, Solar + Wind
 05 Computer Systems - Laptops, Tablets, Software, BIM, CAD, Printers

6. Current Projects (Check ALL that apply.)

- A Is your firm directly involved in any phase of renovation or reconstruction projects? Yes No
 B Is your firm directly involved in green building or sustainability projects? Yes No
 C Is your firm using BIM (building information modeling) in projects? Yes No
 D Does your firm engage in projects under design-build delivery? Yes No



Designed with embedded threaded connectors, the FeltWorks Blades — VarAffix linear acoustical panels from **Armstrong World Industries** offer design and installation versatility, including cable-to-deck independent suspension and threaded rod. The rectangular blades come in 16 standard sizes and 12 standard neutral colors that can be mixed for dynamic visuals. Part of the company’s Sustain portfolio, as well as the CleanAssure family of disinfecting ceiling panels, these panels are made from 60% pre-consumer recycled PET fibers. They provide sound absorption of up to 0.85 NRC depending on blade depth and spacing.



Sierra Pacific Windows' TimberLite 2.0 Wall System offers the warmth of wood on the interior side of the frame, and heavy duty powder-coated aluminum on the exterior. Its GroundLine feature creates a true floor-to-ceiling aesthetic, as the glass dies into the floor with no bottom mullion. The wood interior components are made of a thick veneer (Douglas fir) over LVL beams, allowing for narrow sightlines. Concealed fasteners maintain a clean, slim wood-frame look.

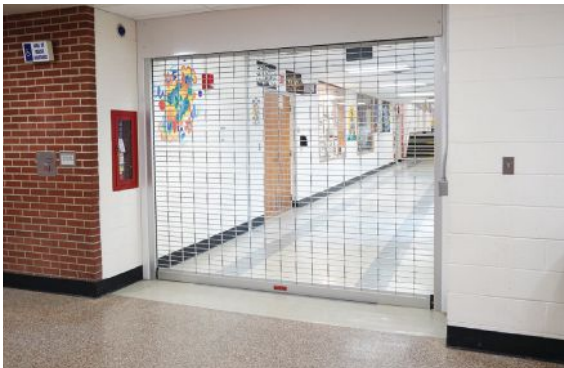
The **Legrand** Networked Level 2 Commercial Electric Vehical Charger is suitable for offices, parking garages, multi-unit dwellings, fleets, and other commercial applications. Preconfigured with software from EV charging provider AmpUp, building owners and facility managers can access advanced charging management software

right out of the box, including real-time monitoring, remote diagnostics, and customizable settings to meet the needs of different types of EVs. Access to the charger can be controlled—for example, making chargers available for tenants, customers, or employees—via its built-in RFID card reader or authorization through the AmpUp Driver app. The 48A charger achieves an average of 46 miles of range per hour of charging, depending on the vehicle.



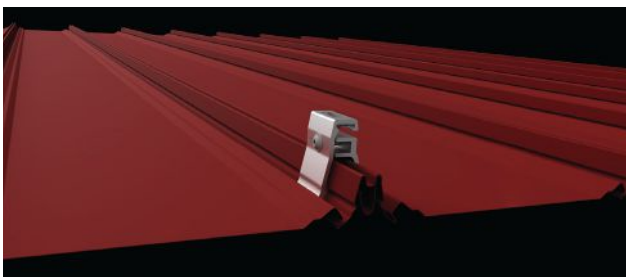
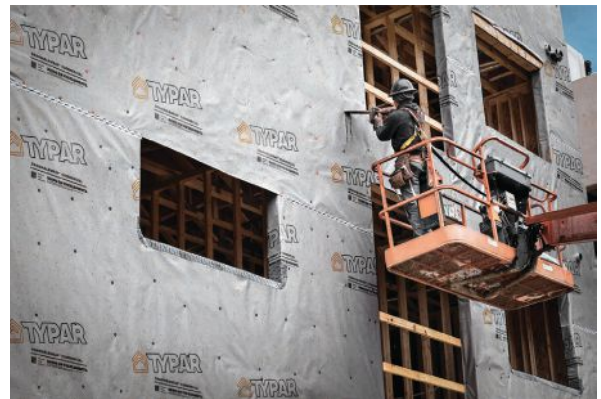
Years of working with customers to understand their needs for reliable pedestrian access solutions has resulted in the addition of 17 door products to **Horton's** collection of cleanroom ISO-rated products. Available in various configurations as well as manual or automatic sliding doors, these door options are ISO 14644-3 certified for Class 3 cleanroom applications, making them suitable for use in medical and non-medical applications.

An expansion of the company's seamless resinous flooring portfolio, SofTop Comfort flooring systems from **Sherwin-Williams High Performance Flooring** resist cracking, chipping, and impacts while also being tolerant of temperature extremes and waterproof. The range features two different systems intended for lighter and heavier foot traffic: SofTop SL consists of a flexible membrane with a polyurethane topping, while SofTop Comfort SL has a denser membrane for areas needing extra strength, sound dampening, and cushioning. Formulated with up to 25% natural, renewable plant oils and containing very low levels of VOCs, the flooring systems install easily over prepared concrete substrates. A high-traffic satin topcoat delivers a fine slip-resistant texture for added safety.



Available on grilles, doors, and insulated doors through **Clopay's** Cornell and Cookson brands, CrossingGard with ThreatProtect creates lockdown zones within a building when a hostile event alarm is triggered or opens in the event of a fire alarm. While it installs like a standard rolling door, the wiring within creates a direct line of communication from the premise's central command to the grille or door itself. A battery backup will allow the door or grille to operate and respond to alarm conditions during a power outage for up to 48 hours or 10 open/close cycles.

Joining Typar MetroWrap in the company's portfolio of building wraps designed specially for commercial structures, the Typar DrainableWrap Commercial from **Berry Global Group** is engineered to protect multi-story structures from the elements and manage excess moisture. The brand's meltshot technology adds an integrated layer of fibers to the building wrap, creating a drainage gap that channels wind-driven rain and bulk water away from the structure. Available in 5x150-foot rolls, the drainable building wrap can be paired with the brand's line of house wraps, tapes, and accessories.



Made of high-tensile structural aluminum, the S-5-RC clamp from **S-5!** can attach a wide range of rooftop accessories to the Riverclack metal roof profile, protecting the roof from corrosion and preserving its thermal cycling characteristics. Its two-piece design interfaces with the rib geometry and can be installed anywhere along the seam for placement flexibility. The clamp creates a mechanical interlock strong enough to mount most rooftop applications, such as with rails or with the S-5! PVKIT solar solution.



The Vandal Resistant Downlight (VRDL) series from **Luminaire LED** combines a sleek aesthetic with the capability to withstand heavy abuse and harsh environments. Designed to comply with behavioral health and correctional facilities environments, the luminaries are rated IK10 for impact resistance and rated IP66 for resistance against water and dust, making the downlights suitable for transit hubs and parking facilities. Compatible with both nLight Wired and Wireless lighting control platforms, the light series comes in four- and six-inch sizes with a range of 1800K through 6500K in various color temperatures.



To accomplish an artist's vision and ensure the longevity of a multi-piece sculpture on the side of a parking structure in a mixed-use neighborhood in Boise, Idaho, the design/build and engineering teams of Studio Capacitator turned to Alucobond Plus from **3A Composites** for its durability, attractiveness, and pliability. According to the artist's statement, the piece draws upon the metaphor of a universal watering hole, so Alucobond Plus Galaxy Blue was selected to replicate the waterhole while the color Ocean appears on the figures because of its color shifting elements depending on lighting and time of day. The 14 uniquely positioned, six-foot blue origami figures—created through photogrammetry, a process involving overlapping photos of an object and converting them into a 3-D model, after taking photos of a single model in a pose—came together using unique patterns from which the aluminum composite material components could be produced and then wrapped around an aluminum skeleton using small connector tabs to fasten.

SCHWEISS

DOORS

HYDRAULIC —OR— BIFOLD

ONE-PIECE DOORS STRAP LIFT DOORS

507-426-8273

SCHWEISSDOORS.COM



Part of residential development around a former railyard turned park in Las Vegas, the architects of a 290-unit apartment building took inspiration from surrounding activities to inspire the exterior's appearance. PAC-CLAD 24-gauge steel Highline B2 panels in musket gray from **Petersen** are utilized as wall cladding as a reference to the adjoining train tracks, while Flush Panels in multiple colors are placed in a seemingly random pattern around several exterior elevations as a nod to the park's signature sculpture located across the street. Additionally, the brand's 7.2 panels in .032-gauge aluminum screen the parking garage, and Snap-Clad standing-seam roof panels top pop-out elements designed to break up the linearity of the apartment building's long façade.

ADVERTISING SALES

GROUP DIRECTOR/PRINCIPAL | Chris Perrino
847.391.1015, cperrino@sgcmail.com

EXECUTIVE VICE PRESIDENT – BUILDING GROUP | Tony Mancini
484.412.8686, tmancini@sgcmail.com

DIRECTOR OF SALES | Sean Olin
984.389.8898, solin@sgcmail.com

DIRECTOR OF BUSINESS DEVELOPMENT/SALES MANAGER | Bill Black
267.483.8788, bblack@sgcmail.com

INTEGRATED MEDIA ADVISOR/PRINCIPAL | Jeff Elliott
616.795.6248, jelliott@sgcmail.com; AL, AR, DC, FL, GA, IL, IN, KS, KY, MI, MS, NC, OH, TN, VA, Eastern Canada

INTEGRATED MEDIA ADVISOR | Robert Reed
630.460.2585, rreed@sgcmail.com; States: AK, AZ, CA, CO, HI, IA, ID, KS, MO, MT, NE, ND, NM, NV, OK, OR, SD, TX, UT, WA, WI, WY, Western Canada

Integrated Media Advisor/Inside Sales | Andreja Williamson
630-721-0712, awilliamson@sgcmail.com;
States: CT, DC, DE, MA, MD, ME, MN, NH, NJ, NY, PA, RI, VT, WV

MEDIA COORDINATOR | Tina Kanter
847.391.1054, tkanter@sgcmail.com

DIRECTOR OF ADOPS & ANALYSIS | Ernisa Hodzic
847-954-7957, ehodzic@sgcmail.com

PRINT ADVERTISING MATERIALS | Karen Teeter
847.391.1005, kteeter@sgcmail.com

REPRINT SALES | Tina Kanter
847.391.1054, tkanter@sgcmail.com

SUBSCRIPTION INQUIRIES

Building Design+Construction
P.O. Box 300 | Lincolnshire, IL 60069-0300
BDC@omeda.com

Toll Free 877.501.7540 | Local 847.763.4933
Fax subscription changes to: 877.683.2064


ADVERTISER Index

	Page #
Advance Lifts	57
All Weather Architectural Aluminum*.....	15
Atlas Tube.....	Back Cover
Gyms For Dogs	57
Modernfold Inc.	5
Nucor Corporation	9
Oldcastle Building Envelope.....	21
Pabco Gypsum	44
PAC-CLAD Petersen	Inside Front Cover
PCL Construction Enterprises, Inc.	34-35
Schweiss Doors	56
Sherwin-Williams/Valspar	7
Zipwall.....	11

*Regional/Demographic ad. The advertiser index is published as an additional service. The publisher does not assume any liability for omissions or errors.

BUILDING DESIGN+CONSTRUCTION (ISSN 0007-3407) is published six times annually by SGC Horizon LLC, 220 N Smith Street, Suite 440, Palatine, IL 60067-2477. Periodical postage paid at Palatine, IL 60067-2477 and other mailing offices. Subscription Rates per year: USA \$146.00; Canada and Mexico \$190.00 (payable in USA funds); all other international \$280.00 (payable in USA funds). **Single copies:** USA \$15.00; all international (payable in USA funds) \$30.00. Reproduction of contents is strictly forbidden. ©Copyright 2023. **BUILDING DESIGN+CONSTRUCTION** accepts no responsibility or liability for the validity of information supplied by contributors, vendors, advertisers or advertising agencies. **POSTMASTER:** Send address changes to: **Building Design+Construction**, P.O. Box 300, Lincolnshire, IL 60069-0300; **To subscribe to Building Design+Construction, please go to:** www.BDCnetwork.com/subscribe.

DOG PARK PRODUCTS



DOG WASH TUBS



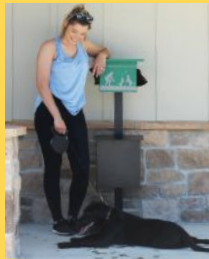
FUN PRODUCTS



NATURAL PLAY



WATER FOUNTAINS



PET STATIONS




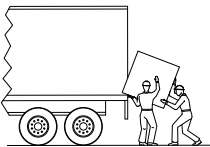
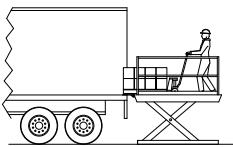
AGILITY ITEMS



GYMS FOR DOGS™
Natural Dog Park Products


GymsForDogs.com
sales@GymsForDogs.com
800-931-1562







**JUST (1) LOWER BACK INJURY
OR
(1) TORN ROTATOR CUFF
OR
(1) SMASHED METATARSAL
CAN COST MORE THAN (1) DOCK LIFT**


- **PROTECT WORKERS**
- **SAVE MONEY**
- **INCREASE EFFICIENCY**



INSTALL AN ADVANCE DOCK LIFT
MORE INFORMATION AT advancelifts.com



ISO 9001:2015
Certified



1-800-DOCK-LIFTS

ADVERTISEMENT
PRODUCT SPOTLIGHT

ROGERS-O'BRIEN CONSTRUCTION PILOTS WEARABLES TO REDUCE HEAT RELATED INJURIES ON JOBSITES

The Texas contractor is the first GC to pilot the SafeGuard platform for enhanced worker safety to reduce heat related injuries.

ROGERS-O'BRIEN CONSTRUCTION (RO) HAS LAUNCHED A PILOT PROGRAM utilizing SafeGuard, a safety-as-a-service platform for real-time health and safety risk assessment. Non-invasive wearables connected to SafeGuard continuously monitor personnel to prevent heat exhaustion on jobsites, reducing the risk of related injuries.

RO is the first GC to pilot this program, alongside organizations such as Boeing, the United States Air Force Research Laboratory, and the Department of Homeland Security.

SafeGuard combines wearable sensors with physiological and environmental monitoring, to predict and address potential safety issues before they pose a problem.

With personalized alerting and intuitive data visualizations, the patented intelligent guardian software provides comprehensive workforce protection. When compatible sensors such as a Polar armband, Garmin watch, or Apple watch detect signs of overheating or concerning heart rates among workers, both the individual and their safety manager receive an alert advising them to take a break and hydrate.

Recognizing that many laborers opt out of much-needed breaks, it becomes crucial to have safety managers step in when sensors pick up dangerous thresholds according to



Rogers-O'Brien's safety manager utilizes the Polar armband to monitor his biometrics while on the jobsite.

industry safety standards.

"We're pioneering a new era of worker safety," says Todd Wynne, Chief Innovation Officer at RO. "SafeGuard technology empowers us to prevent heat-related risks and protect our employees like never before. As the first general contractor to adopt this game-changing solution, we're setting a precedent for the industry and demonstrating our unwavering commitment to sending everyone home each day."

SafeGuard focuses on health and safety monitoring without evaluating work performance or tracking breaks. The platform ensures data privacy and advanced security measures while complying with HIPAA standards.

With this pilot program deployed across three major jobsites in Texas, RO aims to significantly reduce heat-related risks in the construction industry, where 20 lives are lost annually due to heat exhaustion.

PHOTOS COURTESY RO

PRO+CONNECT EVENTS

BUILDING DESIGN
+ CONSTRUCTION

MULTIFAMILYPRO+

PROBUILDER
PROFESSIONAL BUILDER

“ProConnect Events are the best events in the industry, bar none.”

-18 TIME SPONSOR

ProConnect Events are the established leader in facilitating win-win partnerships between buyers and vendors in the construction market. Our format provides focused 1-on-1 meetings and fun networking with high-level decision makers. We focus on two different segments within the construction market:

Single Family and Multifamily

- 100% sales focused
- ProConnect qualifies and hosts each attending firm
- Each 1-on-1 meeting is pre-scheduled
- Unmatched ROI

SINGLE FAMILY

September 18-20

Sawgrass Marriott
Ponte Vedra Beach, FL

MULTIFAMILY

October 22-24

Westin Stonebriar
Dallas, TX

SUSTAINABILITY

December 11-12

Sawgrass Marriott
Ponte Vedra Beach, FL



For more information contact: **Dan Gardner / M: 989.860.7930 / dgardner@sgcmail.com**

ATLAS TUBE
JUMBO HSS
MADE IN AMERICA

 **Atlas Tube**
A DIVISION OF ZEKELMAN INDUSTRIES



FOR YOUR LARGEST PROJECTS, CHOOSE JUMBO HSS.

When it comes to industrial projects like manufacturing facilities, using structural steel with wider spans and high axial load capacities is essential.

Enter Jumbo HSS from Atlas Tube. Our HSS have a high strength-to-weight ratio, which means you can use less steel and lower your embodied carbon. Our products are also the largest domestically made HSS and have frequent rollings, making it even easier to meet your projects' demands.

Go big with Jumbo HSS at atlastube.com/jumbo