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## GIANTS 400 REPORT

AI, Data Tools, and More Innovations  
From AEC Giant Firms

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SkyVue Apartments, Pittsburgh, PA    Installing Contr.: Wyatt Inc.    Architect: Niles Bolton    GC: Massaro Corp.  
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## Flush + 7/8" Corrugated

Metal Wall Systems

Bone White, Stone White,  
Matte Black, Charcoal



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32



36

## FEATURES

### GIANTS 400 REPORT

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

- 20 Architecture
- 24 Engineering
- 28 Construction
- 32 University
- 36 Data Centers
- 40 Hotels
- 44 Science + Technology
- 48 Retail

## DEPARTMENTS

- 9 EDITORIAL
- 10 NEWS+TRENDS  
Maryland school system uses P3s to speed construction
- 14 TRENDSETTING PROJECTS  
SOM's plan for the 2026 Olympic Village
- 54 PRODUCT INNOVATIONS  
Viracon Plus Smart Glass
- 58 GREAT SOLUTIONS  
MojoDome: A new solution for managing office distractions



40



48

### AIA CONTINUING EDUCATION

Façade design for cost, performance, and delivery

p.52



More at: [BDCnetwork.com/Giants2021](https://BDCnetwork.com/Giants2021).



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**ON THE COVER:** A glulam structure and wood deck create a dramatic central corridor at the The Continuum, a technical education facility in Lake City, S.C., that provides high school, college, and continuing education students with workforce-focused courses, including HVAC and welding. The project is a collaboration of the Darla Moore Foundation, Florence-Darlington Technical College, and Francis Marion University. The building team includes McMillan Pazdan Smith Architecture, Britt, Peters & Associates (SE), RMF Engineering (MEP), and Thompson Turner Construction. PHOTO: KRIS DECKER, FIREWATER PHOTOGRAPHY, COURTESY MCMILLAN PAZDAN SMITH

### IMPROVING OPERATING ROOM ACOUSTICS

Lately, there's been a lot of "noise" about noise in hospitals, with studies showing that noise levels in a hospital OR can reach up to 120 decibels—the equivalent of a siren or a loud rock concert. This stems from both equipment-related and staff-related noise that reverberates in the OR due to hard, impervious surfaces used for infection prevention that reflect sound. In this blog post, Gresham Smith's Margaret Sutton, AIA, and Lesa Lorusso, PhD, discuss ways to improve ORs.

[BDCnetwork.com/blog/improving-or-acoustics](http://BDCnetwork.com/blog/improving-or-acoustics)

### HOW SMART CITIES CAN BECOME RESILIENT TO EXTREME HEAT

Extreme heat is the leading cause of climate change related death in the U.S. It is more deadly than hurricanes, tornadoes, and

flooding. As the planet warms, it is becoming more necessary to cool buildings and people. Stantec's Nels Nelson writes how the firm is using three smart city tools to help decision-makers create measurable public improvements to keep people cool.

[BDCnetwork.com/Stantec-Smart-Cities](http://BDCnetwork.com/Stantec-Smart-Cities)



COURTESY STANTEC

Pictured: Nicollet Commons Park, Burnsville, Minn.

### GIANTS 400 BONUS RANKINGS

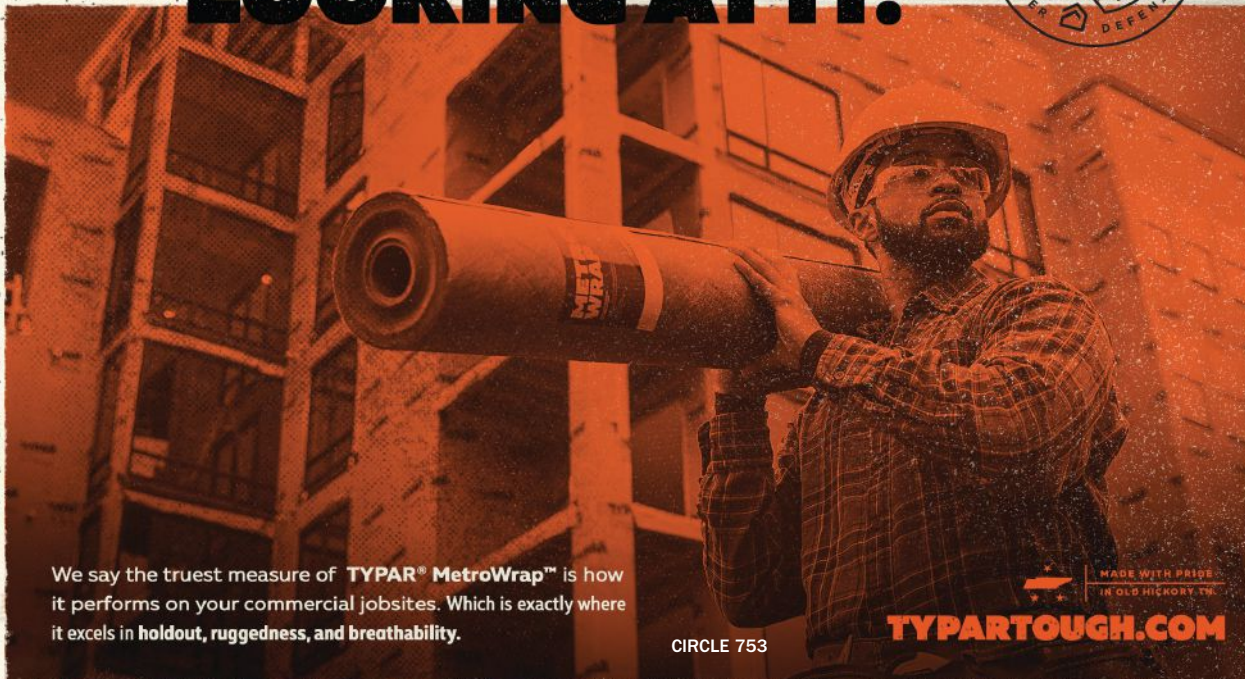
Extended coverage of BD+C's 2021 Giants 400 survey results will be released throughout August and September. The complete Giants report includes more than 100 sector rankings.

[BDCnetwork.com/Giants2021](http://BDCnetwork.com/Giants2021)

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# TECHNOLOGY TRENDS FROM THE GIANTS 400 FIRMS

**A** record number of architecture, engineering, and construction firms—500 in all—participated in *BD+C*'s 45th annual Giants 400 rankings (see page 18 for the start of our report). This collection of companies employs more than 727,500 AEC industry professionals worldwide and represents anywhere from 30 to 60 percent of all construction spending in any given U.S. building sector each year.

These AEC Giants also set the tone when it comes to vetting, adopting, and scaling emerging tools, technologies, and practices. They have deeper pockets to be able to invest in innovation initiatives. And they have more to gain from incremental improvements that stem from such initiatives, especially those that can be scaled across the organization and its projects.

Starting on page 20, *BD+C* editors compiled more than 200 noteworthy innovations, programs, and happenings reported by the 2021 Giants 400 firms. Here are several tech-related trends to note:

- **COVID-19 presents obstacles—and lasting opportunities.** Dozens of firms reported developing inventive tools and methods for helping their building owner clients safely reopen their facilities and jobsites during the pandemic. In some instances, these stopgap measures blossomed into business opportunities or novel tech tools for the AEC firms. Case in point: Arup leveraged its existing Mass-Motion software to create the Arup Space Explorer, an office layout planner that models people's movements in buildings, and calculates the risks, to help clients safely return to the workplace.
- **Firms are getting into the real estate asset management business.**

A growing number of firms are creating tools and launching services to assist their owner/developer clients with resource allocation, asset management, budgeting, and strategic planning. The players include Burns & McDonnell, with its AssetLens asset investment planning software; CBRE's Capital Planner tool for strategic planning; and Kimley-Horn's KHAMS Asset Management Services.

**From hardhats to drones to crane hooks to robot dogs, AEC teams are slapping cameras and sensors on anything and everything on the jobsite in an effort to get an accurate, real-time representation of the construction activity.**

- **Reality capture gets smarter—and easier.** From hardhats to drones to crane hooks to robot dogs, AEC teams are slapping cameras and sensors on anything and everything on the jobsite in an effort to get an accurate, real-time representation of the construction activity. AEC firms are looking to simplify and, where possible, automate the documentation side of reality capture. On the backend, they are creating or adopting increasingly sophisticated tools that allow their teams to leverage photos, video, scans, and related project data in new, inventive ways. More tech innovations from the AEC Giants starting on pages 20, 24, and 28.

# MARYLAND SCHOOL SYSTEM LAUNCHES P3 TO SPEED K-12 SCHOOL DEVELOPMENT



Prince George's County Public Schools is part of a public-private partnership that was formed to meet the needs of the school system's growing student population. Rendering courtesy Stantec

➔ **Prince George's County Public Schools** is the second-largest school system in Maryland. It is also the second-oldest, with more than half of its 208 schools over 50 years old.

Like many school systems around the nation, Prince George's faces rising enrollment with aging buildings and not enough seats. To address these shortfalls, the county has initiated an alternative construction financing program with some of the industry's leading AEC firms, whose goal is to accelerate the time it takes to plan, finance, and build schools, and to reduce the cost of construction and maintenance.

This consortium, known as Prince George's County Education & Community Partners, this week broke ground on six K-8 and middle schools whose completion is scheduled for the summer of 2023. The properties will be turned over to the consortium on July 1

to begin construction through a public-private partnership delivery approach. The consortium comprises Fengate Asset Management, an alternative investment manager focused on infrastructure, private equity, and real estate strategies; Gilbane Development Company (a financing member), Gilbane Building Company (the lead design-builder), Stantec (designer and AOR), and Honeywell (lead services provider).

Arel Architects, a certified county-based small business and minority business enterprise, is part of the design team and has a mentor protégé relationship with Stantec. Warren Builds Construction and Corenic Construction Group (also certified small and minority businesses) are on the construction team and have mentor protégé relationships with Gilbane. Three|E Consulting Group serves as the economic inclusion and compliance team.

The consortium is guaran-

teeing procurement of at least 30% of total eligible costs of the program to minority-owned businesses, community-based small businesses, and the creation of county-based jobs.

In Maryland, it typically takes seven years to plan and build a school. The consortium's members believe the county's alternative financing approach can cut that time in half, and save an aggregate of \$174 million in deferred maintenance and construction costs for all six new schools, compared to a traditional construction procurement model.

The six schools under construction create 3,000 jobs and will result in upgraded facilities for more than 8,000 students and their families.

Prince George's County claims to be the first public school system in the U.S. to leverage a full-scope alternative financing model to design, build, finance, and maintain a multi-school K-12 construction program.

The estimated reduction in power required to cool data centers

70%

built by Bechtel and Nautilus Data Technologies as part of their new partnership. The construction giant and data center provider are teaming to build high-performance, sustainable data center facilities. Their projects will utilize closed-loop water cooling systems that use naturally cold water from rivers, lakes, or bays, and returns all water to its source after use.

According to the firms, the design approach will provide a "dramatic improvement over the massive amounts of water—typically drinking water—consumed by the evaporative cooling systems currently used by data centers." Environmental improvements include the elimination of refrigerants, chemicals, wastewater, noise, and harm to fish and wildlife.

9%

The share of companies surveyed by CBRE that plan to significantly shrink their office portfolios. That figure is a sharp drop from last year's 39%. The survey found that 85% of the 185 companies polled expect employees to spend at least half of their time in an office. A majority of large companies plan modest office-space reductions.



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## CREATING A CLEAN, SAFE HOME AWAY FROM HOME: HOTEL CONSTRUCTION COSTS

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When it comes to the hospitality industry, consumer satisfaction is the highest concern. Clean and safe accommodations have always been paramount to hoteliers, but in our post-COVID-19 society this typically mundane selling point is now a high priority for travelers. Hotel facilities looking to improve their guests' experiences and meet more stringent standards for cleanliness may consider upgrades and modifications to HVAC systems, the installation of no-touch technologies, reconfiguring space to allow for social distancing, and the installation of anti-bacterial surfaces.

RSMeans data from Gordian can help estimate these costs. With localized, square-foot costs on over 100 building models, including hotels, RSMeans

CITY	Q3 2021	Q4 2021	Q1 2022	Q2 2022
LONG BEACH, CALIF.	\$226.64	\$227.38	\$233.48	\$233.98
PORTLAND, ORE.	\$221.98	\$224.47	\$230.46	\$231.44
GREEN BAY, WIS.	\$211.54	\$213.01	\$219.56	\$219.53
AUGUSTA, MAINE	\$204.59	\$205.99	\$212.66	\$214.20
ROCK SPRINGS, WYO.	\$193.14	\$195.34	\$200.77	\$201.07
PROVO, UTAH	\$192.85	\$195.11	\$200.90	\$201.10
PRESCOTT, ARIZ.	\$191.29	\$193.31	\$198.88	\$199.13
CHARLESTON, S.C.	\$187.19	\$188.70	\$193.88	\$193.83
MIAMI	\$184.94	\$186.97	\$191.97	\$192.12
GALVESTON, TEXAS	\$183.76	\$185.59	\$190.93	\$191.32

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

data allows architects, engineers, and other preconstruction professionals to quickly and accurately create conceptual estimates for future builds. This table shows the most recent costs per

square foot for 15-story hotels in select cities.

Visit [rsmeans.com/bdandc](https://rsmeans.com/bdandc) for more information about RSMeans data from Gordian.



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CIRCLE 757

## CONVERSION OF LARGE OFFICE BUILDINGS TO RESIDENTIAL WILL REQUIRE REVAMPED REGULATIONS

➔ **Transforming older commercial buildings** for residential use can be a fairly straightforward endeavor. Office buildings built after 1960, however, present more challenges. If a trend to convert these spaces to condos and apartments gathers steam, a rethinking of regulations will be required, said John Cetra, Co-founder at New York-based architecture firm CetraRuddy, in a *GlobeSt* report. Developers and architects will have to be particularly creative in redesigning larger buildings

for residential use.

Because the plates are much deeper in large post-1960s office buildings, there are long spaces where an apartment would be 50 feet in depth from the window. So, the distance between the windows and walls might have to be changed to make up for the ventilation that would have come through a window.

HVAC zoning would likely have to be readjusted, particularly in a post-COVID-19 world, with more concern over maintaining healthy indoor air quality. Interior spaces would have to be re-zoned to maintain a higher level of fresh air.

The large floor layouts mean that small studio apartments would have to be

very narrow and deep. This will reduce the potential for daylighting.

## FLORIDA CONDO COLLAPSE SPURS INCREASED SCRUTINY ON INSPECTIONS, REGULATIONS

➔ **The collapse of a condominium tower in Surfside, Fla.**, has spurred regulators and insurers to more carefully scrutinize the condition of other high-rise residential dwellings.

Miami-Dade County has increased oversight of buildings undergoing the mandatory 40-year recertification process. Residents of a residential tower in North Miami Beach were ordered to evacuate the structure after a review of a recent engineering report

warned of safety concerns.

In San Francisco, media reports raised renewed concerns over the safety of the 58-story Millennium Tower, which has tilted and sunk 18-inches since its opening in 2009. The engineer for that structure says, however, that it was built to a more stringent standard and that comparisons with the Surfside tower are unfounded.

Insurers have demanded that several condo associations show proof of current inspections, according to the *Miami Herald*. The *New York Times* reported that Miami-Dade County officials were investigating 24 multi-story buildings that failed 40-year inspections or hadn't submitted required documentation.

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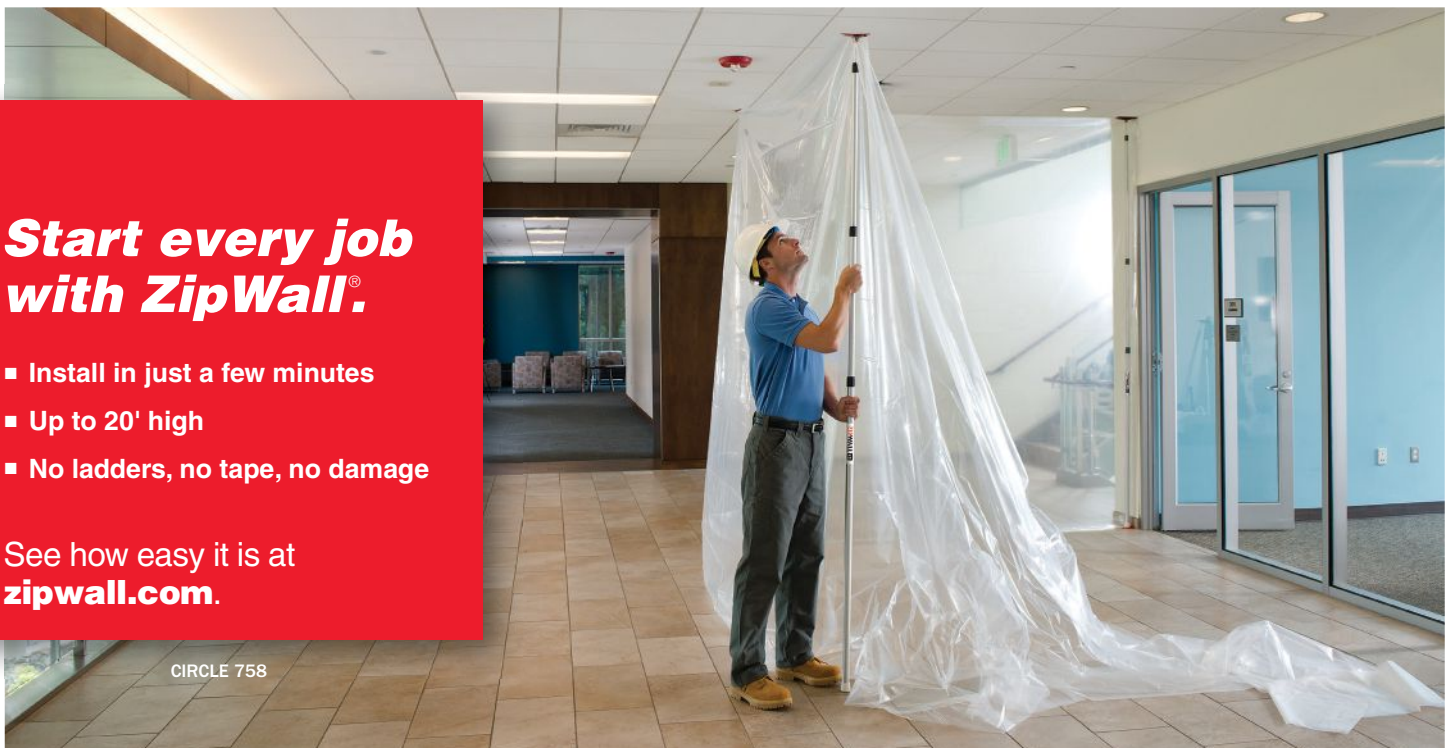
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# SOM TO LEAD DESIGN OF THE 2026 MILAN-CORTINA OLYMPIC VILLAGE



**Following an international competition** that featured 27 groups comprised of 71 studios from nine different countries, SOM has been selected to design the Olympic Village for the 2026 Milan-Cortina Olympics.

The Olympic Village will transform the Porta Romana district, creating a sustainable urban community and offer a new model for Olympic facilities to serve post-competition social goals. The village encompasses a set of

public green spaces, the transformation of two historic structures, and six new mass timber residential buildings that will serve Olympic athletes in the short term.

After the Olympics, the homes will be reused for student housing; the park and railway side buildings near the Olympic Square will be used for affordable housing; and the Olympic Village Plaza will become a neighborhood square with shops, bars, restaurants, and cafés planned

at street level, along with outdoor space for farmers' markets and other community events.

The new buildings take architectural inspiration from the historic buildings of Milan, featuring contemporary materials and communal terraces. Shaded by vertical plantings, these terraces serve as bridges between the buildings, becoming signature gathering spaces and outdoor study rooms for students.

The integration of greenery within the outdoor

areas of the village will contribute to the neighborhood's climate resilience and also create space for urban farms that enable on-site food production.

The village's mechanical systems will tie into the precinct's loops, with passive cooling strategies, solar panels, and rooftop gardens ensuring more than 30% of the energy used will be produced on site. Construction of the Olympic Village is slated to be completed by July 2025.



## HERZOG & DE MEURON UNVEILS DESIGN FOR SEATTLE MIXED-USE DEVELOPMENT

Sometime in mid to late 2022, construction is scheduled to start on Archetype, an 11-story mixed-use development in Seattle's Belltown, the city's most densely populated neighborhood. Belltown has transformed from what was once a low-rent warehouse district to a walkable community with galleries, restaurants, shops, residential towers and lofts, schools, and colleges that include the Art Institute of Seattle.

Seattle-based Hewitt is the executive architect on the Archetype project for developer Burrard Properties, which also brought on Herzog & de Meuron as design consultant. This is Herzog & De Meuron's first project in Seattle.

The building, on a 13,230-sf square lot, is located at a pivotal juncture where the northern entrance to the new Seattle waterfront intersects with Belltown.

Two curved showcases, or vitrines, will provide a continuous active street front and mark the entry point of a semi-private laneway heading to the building's rear alley. (Alleys have cultural and historic significance in Seattle, and this project presents an opportunity to connect the alley with 1st Avenue.) This is where Archetype opens toward Elliott Bay via its crescent shape that creates a courtyard surrounded by residential units with views of the bay and beyond.

Fostering a relationship with the street and neighborhood was an important project priority for the design team. Street-level retail, food, and beverage outlets are fronted by a low barrier, high transparency façade that alludes to classical architectural forms and maximizes natural light and air through an expansive window system. Metal and mineral cladding are meant to recall Belltown's warehouse and semi-industrial roots, but with a modern twist.

## CHILDREN'S WORLD OF THE JEWISH MUSEUM BERLIN OPENS

**ANOHA** — The Children's World of the Jewish Museum Berlin has opened in Berlin, Germany. ANOHA's goal is to give the museum's youngest guests a sense of hope and possibility through a world of imagination and play. The museum uses historic flood narratives as an allegory for engaging with important contemporary issues like climate change and resource conservation.

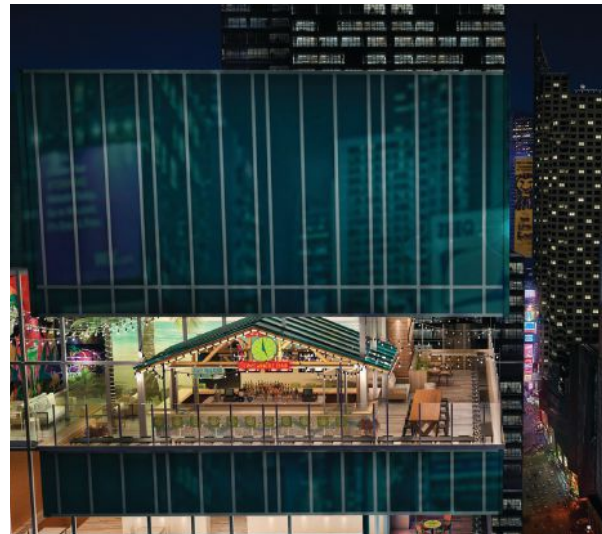
The project was built as a modern structure within a historic one. It is located within an existing former flower



market hall directly opposite the existing Jewish Museum Berlin. At the heart of ANOHA is a circular wooden ark that stands almost 23 feet tall with a 92-foot base diameter. The ark is populated by more than 150 sculptural animals made from found and recycled objects by a team of 18 German artists. The building incorporates passive daylighting, ventilation, and conditioning strategies.

The project was inspired by Noah's Ark at Skirball Cultural Center in Los Angeles.

MARGARITAVILLE HOSPITALITY GROUP



## TIMES SQUARE HOTEL POSITIONED AS OASIS IN THE CITY

Surrounded by buildings, asphalt, concrete, and enough exterior lighting to throw off anyone's circadian rhythm, Times Square is rarely mistaken as a place to go for relaxation. But a team of developers led by Margaritaville Hospitality Group and Soho Properties is marketing the newly opened Margaritaville Resort Times Square, located at 7th Avenue and 40th Street, as a vertical version

of a vacation getaway.

This is the first of 22 Margaritaville lodging venues that isn't horizontal. The \$370 million, 32-story hotel, rising 375 feet above street level, offers 234 rooms and five restaurants. To give the hotel its resort feel, the developers brought in The McBride Company as its interior designer. McBride has done the interiors for numerous other Margaritaville venues.

Outside one of the hotel's restaurants, the Landshark Bar & Grill, is Times Square's

only heated year-round outdoor pool. And the building's architectural design, by the firm Stonehill Taylor, maximizes guests' and visitors' views of the city.

To call attention to the hotel, the team incorporated a 32-foot-tall replica of the Statue of Liberty (hoisting a margarita glass, of course) into the building's design. A five-story stairwell (an improvisation to offset some setback and street wall requirements) allows pedestrians to see up to the

pool and deck on the fourth floor. The hotel's rooftop, and several of its rooms, give guests and visitors a perfect view of the New Year's Eve ball dropping.

Other building team members on this hotel project included WSP (SE and MEP), Frank Seta & Associates (façade consultant), Jenkins & Huntington (vertical transportation), URS (civil/geotech), and Longman Linsey (acoustics).

The project's construction cost was \$98 million.

## THE WORLD'S LARGEST ASTRONOMY MUSEUM OPENS IN SHANGHAI

The 420,000-sf Shanghai Astronomy Museum opened on July 18. The new astronomical branch of the Shanghai Science and Technology Museum is the largest museum in the world solely dedicated to astronomy.

The building does not include any straight lines or right angles as a nod to the geometry of the universe. The building's envelope traces a series of arcing paths that are influenced by gravitational pull: the heart of the central atrium, the forward momentum at the entry, and the planet-like



ARCHEXISTS

sphere that envelops the planetarium theater. Additionally, the museum's three principal architectural components, the Oculus, the Inverted Dome, and the Sphere, act as functioning astronomical instruments that track the sun, moon, and stars.

The Oculus is suspended over the museum's main entry and demonstrates the passage

of time by tracking a circle of sunlight on the ground across the entry plaza and reflecting pool. The Sphere houses the planetarium theater. The Inverted Dome is a large, inverted glass tension structure that sits on top of the central atrium at the roof line.

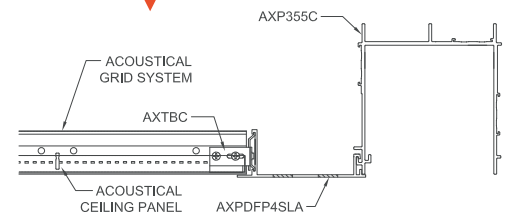




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# 2021 Giants 400

**Pictured:** The lobby at the Medical University of South Carolina Shawn Jenkins Children's Hospital and the Pearl Tourville Women's Pavilion, Charleston, S.C. **On the project team:** Perkins and Will (architect); Walter P Moore (SE, EOR for superstructure), ADC Engineering (SE, EOR for foundations); Robins & Morton (GC), Brownstone (contractor). **PHOTOGRAPHER:** HALKIN MASON PHOTOGRAPHY; PHOTO COURTESY WALTER P MOORE

## 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.

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# WHAT'S NEW AT 152 DESIGN FIRMS

BY ROBERT CASSIDY, EXECUTIVE EDITOR

- **//3877** Earned B Corp certification for verified social and environmental performance.
- **AE7** designed Astrobotic's mission control center for landers headed to the moon.
- **AE WORKS** hired Mark Logston, Chief Development Officer; Sara Lappano, VP of Operations.
- **AG ARCHITECTURE** New Director of Business Development: Katie Miller.
- **ÁLVAREZ-DÍAZ & VILLALÓN** celebrating 20th anniversary.
- **AO** created an S+T studio.
- **ARRAY ARCHITECTS** designed a 250-bed COVID-19 medical field hospital at the Baltimore Convention Center.
- **AYERS SAINT GROSS** 2020 AIA COTE Top Ten Award
- Winner (Hayden Library, ASU).
- **BARGE DESIGN SOLUTIONS** acquired Gould Turner Group.
- **BASE4** extended its hospital-ity modular expertise to multifamily and senior living.
- **BBS** Partner Kevin J. Walsh earned the ALEP credential.
- **BSB DESIGN** created a PM tool to make staff allocation more effective and efficient.
- **BERGMANN** New Advanced Design Technology Group.
- **BERMELLO AJAMIL** Director hires: Luis Sousa, RA, Healthcare; Rodolfo Hernandez, Interior Design.
- **BLAIR+MUI DOWD ARCHITECTS** Expanded into higher education work (CUNY).
- **BSA LIFESTRUCTURES** Using Lean Six Sigma principles

ARCHITECTURE FIRMS   TOP 90								
Rank	Company	2020 Architecture Revenue	Rank	Company	2020 Architecture Revenue	Rank	Company	2020 Architecture Revenue
1.	Gensler	\$1,322,095,908	31.	Payette	\$58,948,584	61.	Alliance	\$30,260,000
2.	Perkins and Will	\$595,684,000	32.	Quinn Evans	\$55,351,585	62.	HuntonBrady Architects	\$29,694,474
3.	HKS	\$430,053,922	33.	Diamond Schmitt Architects	\$53,274,622	63.	Vocon	\$29,530,000
4.	Perkins Eastman	\$264,000,000	34.	Eppstein Uhen Architects	\$52,320,000	64.	Sasaki	\$29,481,860
5.	ZGF Architects	\$245,543,609	35.	Ayers Saint Gross	\$50,738,079	65.	FGM Architects	\$29,184,874
6.	NBBJ	\$226,600,000	36.	Hart Howerton	\$49,904,136	66.	GGLO	\$28,727,000
7.	Kohn Pedersen Fox	\$219,700,000	37.	Mithun	\$48,614,595	67.	Dattner Architects	\$28,693,744
8.	Corgan	\$200,830,474	38.	Moody Nolan	\$48,453,116	68.	AHL	\$28,652,054
9.	Populous	\$187,812,114	39.	Shepley Bulfinch	\$46,953,719	69.	MBH Architects	\$28,362,000
10.	Nelson Worldwide	\$164,575,615	40.	Beck Architecture	\$46,917,959	70.	Grimm + Parker Architects	\$27,110,421
11.	Interior Architects	\$148,993,506	41.	Ratio Design	\$46,880,134	71.	Rule Joy Trammell + Rubio	\$26,282,410
12.	HMC Architects	\$100,265,657	42.	CBT	\$45,920,252	72.	Goettsch Partners	\$26,280,000
13.	HNTB	\$92,797,749	43.	Handel Architects	\$45,758,217	73.	WDG Architecture	\$25,500,000
14.	Cunningham	\$92,184,730	44.	Kirksey Architecture	\$45,509,095	74.	Smallwood	\$25,352,777
15.	AO	\$85,500,000	45.	TPG Architecture	\$42,491,000	75.	Quattrocchi Kwok Architects	\$25,326,715
16.	Hord Coplan Macht	\$83,038,518	46.	LMN Architects	\$41,389,289	76.	Array Architects	\$24,406,334
17.	Elkus Manfredi Architects	\$81,300,000	47.	BHDP Architecture	\$40,554,857	77.	Carrier Johnson + Culture	\$24,347,709
18.	LS3P Associates	\$80,901,413	48.	Steinberg Hart	\$40,054,866	78.	FCA	\$23,358,718
19.	KTGY	\$76,572,229	49.	Fentress Architects	\$39,000,000	79.	Marmon Mok Architecture	\$22,828,456
20.	Solomon Cordwell Buenz	\$76,022,735	50.	BWBR	\$36,385,982	80.	Spiezle Architectural Group	\$22,200,000
21.	RSP Architects	\$75,829,000	51.	Zyscovich	\$36,203,569	81.	Taylor Design	\$22,140,000
22.	WATG	\$72,245,000	52.	GFF	\$35,887,334	82.	RDC-S111	\$22,072,220
23.	Cooper Carry	\$71,729,164	53.	Macgregor Associates Architects	\$35,345,461	83.	Dahlin Group Architecture Planning	\$22,000,000
24.	Ennead Architects	\$70,037,008	54.	Niles Bolton Associates	\$34,485,177	84.	HMFH Architects	\$21,302,904
25.	CO Architects	\$65,690,978	55.	TreanorHL	\$32,955,197	85.	GWWO Architects	\$21,190,829
26.	DGA Planning   Architecture   Interiors	\$64,944,373	56.	GBBN	\$32,500,000	86.	KCCT	\$20,721,487
27.	NAC Architecture	\$62,020,112	-	Ted Moudis Associates	\$32,500,000	87.	SchenkelShultz Architecture	\$20,166,980
28.	Moseley Architects	\$61,665,157	58.	RRMM Architects	\$31,980,000	88.	Davis Brody Bond	\$19,525,875
29.	VLK Architects	\$61,000,000	59.	JCJ Architecture	\$31,683,016	89.	Massa Multimedia Architecture	\$18,853,278
30.	McMillan Pazdan Smith	\$60,059,565	60.	FXCollaborative	\$30,355,499	90.	SLCE Architects	\$18,464,500

SOURCE: BD+C 2021 GIANTS 400 REPORT

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to create Life Labs (high-performing research facilities).

- **BWBR** Appointed its first Sustainability Manager: Sara Curlee, AIA, LEED AP BD+C.
- **CALLISONRTKL** Kim Heartwell named President/CEO. Earned ILFI Just label. Launched ClimateScout, an app for selecting climate-responsive building strategies.
- **CLARK & ENERSEN** hired Byron McFee, PE, CxA, to lead new commissioning service. Celebrating 75th anniversary.
- **CLARK NEXSEN** acquired Ken Ross Architects. Pledged to uphold the SE 2050 Commitment (carbon-neutral structures by 2050).
- **COOPER ROBERTSON** New Senior Associates: Nathalie Guedes and Alfia White.
- **CORE STATES GROUP** formed Core States Energy to provide energy and sustainability services.
- **CPL** Introduced design-build into all practice areas.
- **CRAWFORD ARCHITECTS** provided P3 advisory services for UC Merced, UC Santa Cruz, and Aloha Stadium entertainment district.
- **CB DESIGN GROUP** New offices: Dallas, Arizona, Connecticut, Minnesota.
- **CBRE** launched Capital Planner, which helps clients develop strategic plans, and Office Ready, a quick design-through-delivery solution for small to mid-size offices.
- **CBT** promoted Joanna Morlot to Associate Principal.
- **CETRARUDDY ARCHITECTURE** designed its first Passive House project.
- **COOPER CARRY** Kyle Reis, AIA, named President/CEO.
- **CORGAN** rolled out Unscripted,

a tool to evaluate existing environments.

- **CROMWELL ARCHITECTS ENGINEERS** Greg Cockmon named CEO; Dan Fowler, President. New unit for energy/facility, roofing, and advanced technology services.
- **CSARCH** Using UAVs to map campuses, inspect buildings, capture existing conditions.
- **CTA ARCHITECTS** helped create a nondestructive façade-testing technique for NYC Buildings Department.
- **CUNINGHAM** elevated Meg Parsons, FAIA, to Board Chair.
- **DAHLIN GROUP ARCHITECTURE PLANNING** completed a Concept Home to overcome lasting COVID-19 impacts.
- **DESIGN COLLABORATIVE** developed its proprietary Fingerprint Process for design.
- **DIAMOND SCHMITT ARCHITECTS** won a P3 contract for a \$300 million hospital.
- **DLR GROUP** Its new InDePro digital platform guides teams through the integrated design process. Also new: its Sonrai IAQ analytics platform.
- **DLZ Corporation** New engineering offices: Logan, Ohio, and Merrillville, Ind.
- **DYER BROWN & ASSOCIATES** earned ILFI Just label.
- **EDI INTERNATIONAL** Michael Keller named Studio Leader for the new Austin office.
- **ELKUS MANFREDI ARCHITECTS** established an Inclusion, Diversity, Equity, and Awareness Committee.
- **EMERSION DESIGN** Delivered the first Midwest WELL Platinum project. Chad Edwards named President/CEO.
- **EUA** Chris Johns named Industrial Market Leader.
- **EYP** developed a business

development training program for younger staff.

- **FANNING HOWEY** Promoted five employees to Owner.
- **FCA** FMA award for design of the EisnerAmper HQ.
- **FITZGERALD COO** Kathy Graham named Partner.
- **FINEGOLD ALEXANDER ARCHITECTS** Green Specification benchmark prioritizes products with EPDs, HPDs.
- **FLAD ARCHITECTS** signed on to the SE 2050 Commitment. Developed a POE process for completed projects.
- **FOGARTY FINGER** New offices in Atlanta and Boston.
- **FXCOLLABORATIVE** Partner Angie Lee elevated to FIIDA.
- **GARMANN MILLER & ASSOCIATES** Using Gigabit Passive Optical Network.
- **GBBN** hired Charlotte Horseman as Director of Research.
- **GENSLER** Established the Center for Research on Equity and the Built Environment. New Sector: Health.
- **GGLO** New Principals: Meaghan McDonald, CIDQ; Carissa Franks, AIA.
- **GOODWYN MILLS CAWOOD** Launched Disaster Recovery as a standalone department.
- **GREENBERGFARROW** Rebranding itself as GF.
- **GRIMM + PARKER** New Owners: Sue Hains, Zak Schooley, Paul Klee, David Whale, Antonio Rebelo, Mel Thompson, Steve Mundt.
- **GUIDE ARCHITECTURE** opened an office in Houston.
- **GWVO ARCHITECTS** created the Daily Dose podcast on tech topics for its staff.
- **H2M ARCHITECTS + ENGINEERS** Implementing design standards and procedures for QA/QC, scheduling, BIM/

Revit, and sustainability.

- **HAFER** Using Enscape plugin to view projects on the fly.
- **HANBURY** brought in George Kemper, AIA, as Laboratory Planning Director.
- **HANDEL ARCHITECTS** Three Passive House projects under construction; completed its first senior living project.
- **HART HOWERTON** won two NAHB National Community of the Year Awards.
- **HBG DESIGN** Designed the first Caption by Hyatt hotel in the U.S. (in Memphis).
- **HDR** New design tool analyzes wellness metrics in 3D.
- **HED** merged with Pacific Cornerstone Architects. Brought in Todd Drouillard, AIA, to lead its new S+T Studio.
- **HGA** AIA 2021 COTE Award for MIT.nano. New Sustainability Director: Ariane Laxo. New Sector Leaders: Leila Kamal, Higher Education; Rebecca Celis, Arts and Community; Chris Martin, S+T.
- **H. HENDY ASSOCIATES** used its New Generation Space system to design JLL's Irvine, Calif., office.
- **HILL WEST ARCHITECTS** helped craft NYC's new Zoning for Coastal Flood Resiliency ordinance.
- **HKS** used its design/delivery process for progressive envelope systems on SoFi Stadium, Inglewood, Calif.
- **HMC ARCHITECTS** named

Lance Hosey, FAIA, LEED Fellow, Chief Impact Officer.

- **HMFH ARCHITECTS** designed a positive-net-energy public school.
- **HOEFER WELKER** added MEP engineering services.
- **HOK** New Global Directors: Leslie Ashor, S+T; Kristine Bishop, Justice; Paul Auguste and Matt Needham, Aviation+Transportation. HOK Tapestry collaboration portal in use by >200 businesses.
- **HOLLIS + MILLER ARCHITECTS** became the official architect of the Rocky Mountain Athletic Conference.
- **HORD COPLAN MACHT** hired Tim Barnhill as COO.
- **HUCKABEE** New President: Josh Brown, AIA. Kerri Ranney, VP Educational Practice, reappointed to the Texas School Safety Center Board.
- **HUITT-ZOLLARS JV** partner on the \$850 million Bureau of Engaging currency facility.

- **HUMPHREYS & PARTNERS ARCHITECTS** released 8 new multifamily prototypes.
- **IA** launched Digital Studio, Ecos Studio, and IAXR, its extended reality practice.
- **JACKSON|MAIN ARCHITECTURE** designed the first LEED-certified self-storage facility in Washington State.
- **JLG ARCHITECTS** partnered with Sefaira on ways to improve energy modeling.
- **JLL** launched Sustainable Operations to help clients develop/manage portfolio-wide sustainability programs.
- **JRS ARCHITECT** Celebrating its 35th anniversary.
- **KAHLER SLATER** promoted EVPs Al Krueger and Glenn Roby to CEO. Used LOD 400 Structural Modeling to deliver a \$93 million project on time.
- **KIRKSEY ARCHITECTURE** Celebrating 50 years in business. Designed the nation's largest mass timber

- academic building.
- **KITCHEN & ASSOCIATES** Integrating renderings/animations in its BIM platform.
- **KPF** joined the RIBA 2030 Challenge (net zero carbon for buildings by 2030).
- **KTGY ARCHITECTURE + PLANNING** acquired Simeone Deary Design Group.
- **LABELLA ASSOCIATES** added 200 staff in Alabama, New York, and Tennessee.
- **LARSON DESIGN GROUP** New offices in Phoenix and Orlando.
- **LEGAT ARCHITECTS** New studio: Iowa City, Iowa.
- **LEO A DALY** Partnered with Turner Construction on WorkWell, a prefab building system aimed at controlling the spread of COVID-19.
- **LITTLE** designed Patio365, a module that helps protect restaurant patrons from COVID-19 and flu.
- **M+A ARCHITECTS** created

- a tech podcast, M+Ake It Innovative.
- **MBH ARCHITECTS** required “unconscious bias training” of all staff.
- **MCFARLANE ARCHITECTS** experienced 60% YOY growth in its research laboratories practice.
- **MCMILLAN PAZDAN SMITH** designed the first industrial project in South Carolina to use CarbonCure (captures carbon in concrete).
- **METHOD ARCHITECTURE** New office: San Antonio.
- **MKM ARCHITECTURE + DESIGN** launched a Fellowship Program in healthcare design.
- **MOODY NOLAN** received the 2021 AIA National Architecture Firm Award.
- **MOSELEY ARCHITECTS** merged with Cummings & McCrady.
- **NAC ARCHITECTURE** merged with Trinity: Planning,

ARCHITECTURE/ENGINEERING FIRMS TOP 66								
Rank	Company	2020 Arch/Eng Revenue	Rank	Company	2020 Arch/Eng Revenue	Rank	Company	2020 Arch/Eng Revenue
1.	Stantec	\$688,974,028	23.	HED	\$90,910,000	45.	Kahler Slater	\$30,770,000
2.	HDR	\$585,400,000	24.	Huckabee	\$88,467,417	46.	Hoefler Welker	\$29,403,000
3.	HOK	\$447,000,000	25.	RS&H	\$85,100,000	47.	Ryan Companies US / Ryan A+E	\$29,011,000
4.	Skidmore, Owings & Merrill	\$340,869,307	26.	Clark Nexsen	\$72,240,000	48.	AE7	\$28,666,471
5.	DLR Group	\$279,565,000	27.	SLAM	\$68,399,211	49.	BSB Design	\$28,271,751
6.	CallisonRTKL	\$273,026,107	28.	Wold Architects and Engineers	\$66,050,000	50.	KZF Design	\$28,224,951
7.	Smithgroup	\$267,168,526	29.	Little Diversified Architectural Consulting	\$63,369,659	51.	BKV Group	\$26,925,531
8.	IBI Group*	\$252,322,000	30.	Goodwyn Mills Cawood	\$54,356,191	52.	Sheehan Nagle Hartray Architects	\$26,184,756
9.	Page	\$206,243,000	31.	Core States Group	\$48,423,057	53.	Woolpert	\$26,126,359
10.	CannonDesign	\$190,000,000	32.	E4H Environments for Health Architecture	\$47,000,000	54.	Hollis + Miller Architects	\$25,711,480
11.	PGAL	\$179,200,000	33.	Progressive AE	\$45,155,862	55.	Huitt-Zollars	\$23,640,045
12.	PBK	\$174,800,000	34.	BSA LifeStructures	\$43,144,365	56.	Clark & Enersen	\$22,976,324
13.	Ware Malcomb	\$160,272,290	35.	RDG Planning & Design	\$41,023,198	57.	DLZ Corp.	\$22,908,867
14.	HGA	\$150,376,927	36.	H2M Architects + Engineers	\$39,479,220	58.	Barge Design Solutions	\$22,268,972
15.	NORR	\$128,839,831	37.	CESO	\$39,365,886	59.	Lawrence Group	\$22,139,868
16.	Gresham Smith	\$128,160,701	38.	Bergmann	\$39,180,000	60.	Fanning Howey Associates	\$22,124,899
17.	EYP	\$124,775,275	39.	LaBella Associates	\$38,428,000	61.	Wendel	\$21,615,494
18.	EwingCole	\$108,500,000	40.	CPL	\$35,548,808	62.	Becker Morgan Group	\$20,842,926
19.	Flad Architects	\$107,700,000	41.	Bermello Ajamil & Partners	\$35,002,668	63.	Baskerville	\$19,861,254
20.	LPA	\$103,230,795	42.	G70	\$34,662,496	64.	Cromwell Architects Engineers	\$19,608,013
21.	Humphreys and Partners	\$101,000,000	43.	GreenbergFarrow	\$33,715,000	65.	Larson Design Group	\$19,155,356
22.	Leo A Daly	\$93,870,859	44.	WD Partners	\$32,400,000	66.	TETER	\$18,588,242

SOURCE: BD+C 2021 GIANTS 400 REPORT \*EDITORS' ESTIMATE

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Design, Architecture.

- **NBBJ** acquired ESI Design. Sponsoring U of Washington research consortium to reduce noise perception in offices by 60%. New office: Washington, D.C.
- **NELSON WORLDWIDE** partnered with Swivel, a 3D technology for prospective clients to visualize design of future office spaces.
- **NILES BOLTON ASSOCIATES** designed Flamingo Crossings Village, a 10-phase, \$615 million residential community for Disney College interns.
- **NORR** Designing two space hub launch sites in Scotland.
- **ORCUTT | WINSLOW** Designed small-house concept homes for the VA in 6 states.
- **PAYETTE** Developed Kaleidoscope, an embodied carbon design tool. Won its 5th AIA COTE Award, 4 National AIA Honors.
- **PBK** Acquired WLC Architects. Promoted Melissa Turnbaugh, National Education & Innovation Leader, to Partner.
- **PERFORMA** Oshkosh Corp. HQ project achieved a perfect 3-star Fitwel certification. 25th anniversary.
- **PERKINS EASTMAN** Mergers with VIA Architecture, MEIS, and Pfeiffer Partners.
- **PERKINS AND WILL** New update of its SPEED energy, daylight, and solar analysis software.
- **PLUNKETT RAYSICH ARCHITECTS** expanded into Iowa, Mississippi, North Carolina, South Dakota.
- **PRELLWITZ CHILINSKI ARCHITECTS** New Director of Marketing & Communications: Deana Martin.
- **QUINN EVANS** Principal/Director of Equity+Diversity Saundra Little elevated to Fellow of the AIA.
- **RANDALL-PAULSON ARCHITECTS** implemented Unanet accounting/project management software.
- **RATIO DESIGN** Formed a partnership with Hennick & Company. JV'd with CSO and BSA LifeStructures on a \$1.6 billion hospital.
- **RDC** New office: San Diego, led by Principal Sean Slater.
- **RDG PLANNING & DESIGN** hired Will Downing as Healthcare Sector Lead. Partnered with AIA Nebraska and Pascale Sablan, AIA, NOMA, to highlight women and BIPOC persons in the design industry.
- **RKTB ARCHITECTS** used a new cantilevered structural system to build over occupied properties at One Sullivan Place, NYC.
- **RQAW** tripled its MEP department, expanded its multifamily studio, created a science laboratory studio.
- **SASAKI** opened an office in Denver.
- **SCB** New office: Boston, led by Clare Wineberg, AIA.
- **SEBREE ARCHITECTS** added an interior design service.
- **SHEPLEY BULFINCH** won a 2020 AIA COTE Top Ten Award. CEO Carole Wedge, FAIA, received the AIA's 2020 Edward C. Kemper Award.
- **SHP** Now shipping its patented FRAMEFROG electrified door hardware.
- **SKIDMORE, OWINGS & MERRILL** Issued a 34-point Equity, Diversity and Inclusion plan.
- **SMITHGROUP** Created DISTO, which collects data

that can be applied to design strategies. New Studio Leads: Lana Zoet, Higher Education; Ivo Rozendaal, Workplace; Brian Rener, Mission Critical.

- **SPIEZLE ARCHITECTURAL GROUP** relocated its Florida office to Maitland.
  - **STEINBERG HART** designed three of Los Angeles's first micro-housing communities.
  - **STANTEC** Named 5th most sustainable company in the world by Corporate Knights. New SVPs: Arliss Szysky, Business Ops Leader; Joshua Gould, Growth Leader.
  - **STUDIO+** co-developed a macro-enabled worksheet for forecasting project revenue and expenses.
  - **TAYLOR DESIGN** New hires: Michael Levendusky, AIA, Design Director; Enrique Cenicerros, AIA, S+T Studio Director.
  - **TETER** Doubled its community college footprint.
  - **THENDESIGN ARCHITECTURE** turned a historic Willoughby, Ohio, school building into its new office.
  - **THINK ARCHITECTURE** Incorporating co-working spaces and WFH amenities into its apartment designs.
  - **TPG ARCHITECTURE** 2020 Interior Design Best of Year Award for Corporate Interiors to Mavis Wiggins, IIDA.
  - **TREANORHL** Acquired the Stinnett Group; doubled the size of its Health Studio.
  - **URBAHN ARCHITECTS** Completed a post-COVID school reopening report for the NYC School Construction Authority. Celebrating its 75th anniversary.
    - **WALBRIDGE** appointed John Rakolta III to President.
- Continued its proprietary Material Lead Time/Pricing Feedback Survey.
- **WARE MALCOMB** Created Cold Ready, a speculative cold building design prototype.
  - **WATG** New President/CEO: David D. Moore, AIA. Invented Glam Pod mini-structures for "glamping" in ultra-remote locations.
  - **WDG ARCHITECTURE** hired Megan Kindle as Director of Business Development.
  - **WEBER THOMPSON** moved into a Salmon Safe-certified building in Seattle.
  - **WENDEL** developed Immersion, a new way to kick off projects in pre-design, and MasterBuilder, an alternative to design-bid-build delivery. Hired Amber Holycross, AIA, as VP of Architecture.
  - **WOOLPERT** Using wearable SLAM-based laser scanning gear (NavVis VLX) for fast data collection of large structures. Acquired Jviation, Data Cloud Solutions, and CivilTech Engineering.
  - **ZGF** Its Upstream calculator measures the embodied carbon impact of materials.
  - **ZYSCOVICH** New offices: Tampa and Jacksonville, Fla.

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# AI, 'DATA AS A DISCIPLINE' LEAD ENGINEERING FIRM INNOVATIONS

**H**ere's a recap of the top innovations from the 2021 Engineering and Engineering/Architecture Giants: **AECOM** launched *Mobilitics for Pandemic Response*, an updated version of its transportation scenario planning tool. This latest iteration helps transit agencies, departments of transportation, and other clients across the U.S. assess how pandemic infection rates, stay-at-home orders, availability and deployment of vaccines, economic recovery and reopening, and other factors are expected to impact transportation patterns.

In May 2020, **AlfaTech's** Innovation Team developed a handbook, "Engineering Strategies for Airborne Diseases" ([atce.com/news](http://atce.com/news)), that provides step-by-step advice for preventing the spread of the coronavirus through mechanical and electrical systems. The firm made the handbook freely available to clients, architects, landlords, even other engineering firms.

Similarly, **Bala Consulting Engineers** published multiple white papers that discuss COVID-19's impacts to facilities and outline

strategies to help reduce the potential of virus transmission in offices, long-term care facilities, and schools.

**Apogee Consulting Group** is focused on improving its corporate quality management program (QMP) approach for in-house services, which includes cost estimating and commissioning. The goal: to deliver the highest-quality services in a timely, cost-effective manner for all clients. The QMP ensures that managers at all levels have the tools available to identify and mitigate management issues. They include a program management plan, a quality management plan, corporate quality assurance/quality control, task order specific quality procedures, and standard operating procedures.

As its clients scrambled to safely reopen their facilities during the pandemic, **Arora Engineers'** Special Systems group saw a huge uptick in demand for touchless biometric technologies, including temperature-sensing cameras and video analytics, as well as biometric registration and credential validation. In cases where biometric credential validation technologies were implemented, Arora pushed

for a multipurpose approach that would allow the owner to leverage the system to achieve multiple objectives and for well beyond the COVID-19 pandemic. For example, at an airport project in the Northeast, Arora's engineers implemented a camera system that applied advanced analytics for temperature-sensing terminal biometric data collection to simplify passenger processing, as well as detect open parking spaces in the airport's smart parking system. This approach reduced costs by using a single video management system. It also streamlined data collection.

**Arup** developed several tools and innovations to help overcome obstacles presented by the pandemic:

- Arup Space Explorer is an office layout planner that models people's movements in buildings, and calculates the risks, to help clients safely return to the workplace. It combines Arup's MassMotion software with digital representations of workplaces to provide accurate models.

- Arup's CareBox is a series of design guidelines for scalable, modular, and rapid solutions to solve the problem of limited hospital capacity. It can be quickly transported,

deployed, and implemented to provide additional capacity in a range of settings, from existing healthcare campuses to conversion of existing facilities.

- Arup Virtual Engage allows public consultations and virtual exhibitions to be carried out using online platforms, bringing more of the public onboard, improving decision making. Audiences can access information, view maps and drawings, watch scheme fly-throughs, navigate 3D models, and share feedback from any location at any time.

**Black & Veatch** developed a comprehensive Site Due Diligence service in response to its data center clients' needs to assess potential new data center sites for critical infrastructure and environmental issues. Its scope of due diligence services spans power, water, and telecom infrastructure and environmental services. The firm also launched a new service, called Experts on Demand, for clients who need quick access to qualified professionals who can help them gain data center facility and facility infrastructure expertise without the hurdle of a long-term contract or consulting engagement. "We think this type



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of micro-consulting is ideal for the fast-paced data center industry,” said Drew Thompson, Associate Vice President for BV Data Centers.

**Burns & McDonnell** has seen “explosive growth” in the development of technology services, such as cloud computing. “Our data center architecture, engineering, and construction teams in San Francisco, Dallas/Fort Worth, Columbus, Chicago, Kansas City, and London have grown significantly to meet these needs,” said the firm. The data center boom is also benefiting Burns & McDonnell’s businesses that provide power,

water, environmental, and fiber optics design and construction services.

The firm reports several recent tech innovations, including:

- AssetLens asset investment planning software was developed by Burns & McDonnell’s business and technology consulting arm, 1898 & Co. It collects and cleanses data about the condition of a company’s critical infrastructure assets, applies proprietary algorithms, and automates an investment plan of capital projects with business justification.
- Aircraft Characteristics App, also from 1898 & Co., provides easy-to-access statis-

tics and specifications for aircraft of numerous makes and models. Data for commercial, military, and general aviation aircraft is sorted by manufacturer and labeled with group number for quick identification.

**Buro Happold’s** Buildings and Habitats object Model (BHoM) Life Cycle Assessment Toolkit was awarded a 2020 AIA Innovation Award. The open-source LCA tool acts as an accessible, data-driven framework that allows design professionals to measure the embodied carbon of building designs. Also, the firm co-developed (with architecture

studio Generate) Tallhouse, an online catalog of timber-based building systems to help make mass timber construction more easily adoptable by investors and designers.

**DeSimone Consulting Engineers** implemented an integrated modeling approach to develop its BIM models. By creating its models as relational databases, the firm can more effectively benchmark design performance against past projects.

In the wake of COVID-19, **Dewberry** is seeing demand for specialized decontamination areas in police and fire stations. Fire stations now often employ a progressive system of spaces that moves personnel from zones of higher contamination to zones of low to no contamination. This approach, which can be instructive to the design of police stations, consists of red zones (the first areas firefighters enter), yellow zones that serve as transition areas or buffers, and finally green or no-contamination zones. Like firefighters, law enforcement officers routinely place themselves at risk in day-to-day operations, ranging from exposure to hazardous chemicals, narcotics, and members of the public who may pose a disease risk, including COVID-19.

## ENGINEERING FIRMS | TOP 56

Rank	Company	2020 Engineering Revenue	Rank	Company	2020 Engineering Revenue
1.	Kimley-Horn.....	\$568,704,813	29.	P2S .....	\$44,272,937
2.	Terracon Consultants*.....	\$333,200,000	30.	Martin/Martin Consulting Engineers.....	\$40,285,857
3.	Tetra Tech High Performance Buildings Group .....	\$275,271,866	31.	HEAPY .....	\$38,881,623
4.	Langan .....	\$265,000,000	32.	Mazzetti.....	\$38,158,927
5.	IMEG Corp.....	\$224,013,000	33.	Bala Consulting Engineers.....	\$36,900,000
6.	Arup .....	\$201,742,315	34.	Newcomb & Boyd .....	\$36,121,754
7.	KPFF Consulting Engineers .....	\$196,364,000	35.	HPE Data Center Technologies Services.....	\$33,700,000
8.	Jensen Hughes .....	\$168,616,860	36.	Osborn Engineering.....	\$32,744,000
9.	Affiliated Engineers Inc.....	\$158,545,000	37.	raSmith.....	\$30,600,000
10.	Henderson Engineers .....	\$127,760,939	38.	M/E Engineering.....	\$28,465,000
11.	Walter P Moore .....	\$123,338,091	39.	ThermalTech Engineering .....	\$25,477,000
12.	Syska Hennessy Group.....	\$119,163,759	40.	Dunham Associates .....	\$24,670,000
13.	Fluor Corp.....	\$99,440,000	41.	H.F. Lenz.....	\$24,111,000
14.	Vanderweil Engineers .....	\$96,610,100	42.	TEECOM .....	\$23,196,162
15.	Pennoni*.....	\$94,656,000	43.	LBYD .....	\$22,396,139
16.	M.C. Dean .....	\$77,787,370	44.	French & Parrello Associates .....	\$22,196,623
17.	ESD .....	\$71,584,764	45.	KCI Technologies.....	\$20,063,200
18.	TLC Engineering Solutions .....	\$69,643,721	46.	Spectrum Engineers.....	\$19,627,296
19.	CMTA .....	\$67,150,322	47.	Bridgers & Paxton Consulting Engineers .....	\$19,148,968
20.	Jaros, Baum & Bolles.....	\$64,580,081	48.	Specialized Engineering Solutions.....	\$17,257,550
21.	AKF Group.....	\$63,400,000	49.	Swanson Rink.....	\$17,165,115
22.	RMF Engineering.....	\$60,000,000	50.	EYP Mission Critical Facilities .....	\$16,700,000
23.	ME Engineers.....	\$57,550,000	51.	Peter Basso Associates .....	\$14,900,000
24.	DeSimone Consulting Engineers .....	\$54,127,073	52.	Schaefer.....	\$13,941,058
25.	Magnusson Klemencic Associates.....	\$53,738,949	53.	Karpinski Engineering.....	\$13,200,500
26.	Arora Engineers .....	\$47,395,349	54.	Kohrs Lonnemann Heil Engineers.....	\$12,915,464
27.	I.C. Thomasson Associates.....	\$45,814,885	55.	PBS Engineers .....	\$12,203,000
28.	Smith Seckman Reid.....	\$45,007,506	56.	McKinstry .....	\$12,000,000

SOURCE: BDC 2021 GIANTS 400 REPORT \* EDITORS' ESTIMATE

On data center projects, **EYP Mission Critical Facilities** now uses computational fluid dynamics (CFD) analysis for both interior and exterior equipment layout planning. “Air flow patterns outside of the building are difficult to predict because of the different variables which design engineers and architects are not able to control,” according to the firm. Variables include wind speed, air temperature and humidity, and wind direction, all of which impact performance of the outdoor data center equipment.

**French & Parrello Associates** expanded its service lines with geographic information systems (GIS) and unmanned aerial systems (UAS) services with the goal of providing added value to existing clients and attracting new prospects and clients. “Since introducing our GIS services, we’ve acquired clients for whom we maintain GIS asset inventories that allow for real-time situational awareness and collaboration

between our clients’ staff and emergency response contractors,” said the firm.

**Half Associates** is developing machine learning and deep learning technology. Machine learning is being used to develop predictive models for public infrastructure risk exposure based on historical condition assessments, and future conditions flood impacts based on development patterns and site selection of parks from demographic trends. Deep learning is being implemented to increase the efficiency of object recognition to support pipe defect identification, asset inventories from mobile scanning, and construction inspection.

**KCL Engineering** has started to implement low temperature variable-air-volume (VAV) systems on its K-12 school projects. The system offers improved energy performance over traditional approaches, and allows the engineering team to reduce duct sizes by at least 25 percent.

**Kimley-Horn’s New Ventures** initiative launched two tools:

- **KHAMS Asset Management Services**, which allows owners to assess their physical assets, prioritize improvement needs, and develop budgets, as well as track ADA compliance and monitor the impacts of nearby construction on their sites.

- **PublicCoordinate**, an interactive public engagement tool that eases the process of getting public input on projects in the design phase for new or redevelopment work.

**KLH Engineers** launched **Levcon Analytics**, a “data as a discipline” practice and software platform focused on identifying, leveraging, and auditing data to drive planning, design, construction, and operations. The practice provides project teams with a Revit add-in and web application to create and leverage a single source of truth (SSOT). Users can insert pertinent project data with a single click, assign responsibilities, manage and edit information in a bulk

manner from one location, review data in real time, and perform auditing measures to confirm compliance.

**Magnusson Klemencic Associates (MKA)** developed a front-end structural analysis model engine to allow the firm to more quickly build models, study permutations, and extract results. The tool provides robust feedback on different lateral system options, while greatly reducing data entry tasks required to build models. MKA also created a building planning guide in response to new code-based design requirements for tsunamis. The guide helps the firm’s clients make informed decisions related to building configuration, location, and hardening.

**Marque Engineering** empowers its young engineers working toward professional engineering licensure by giving them the opportunity to contribute to teams and on projects immediately—versus having to “wait their turn” and serve as support for senior professionals. Expanded responsibilities include project communication and collaboration (with staff and clients), setting project priorities, time management, and quality control. This strategy has benefited the firm in multiple ways: a growing number of interns have become certified Engineers in Training (EIT), the firm has seen an increase in home-grown jobs, and overall revenue has increased.

**McKinstry** launched **Dawson Ventures**, a corporate venture studio to fund and nurture business and technology initiatives that address inefficiency and waste in the built environment. The firm plans to fully build out the DV team by 2025.

**Morrison Hershfield** partnered

**ENGINEERING/ARCHITECTURE FIRMS | TOP 40**

Rank	Company	2020 Engineering/Architecture Revenue	Rank	Company	2020 Engineering/Architecture Revenue
1.	Jacobs .....	\$3,319,210,000	21.	Morrison Hershfield.....	\$86,091,321
2.	AECOM.....	\$1,303,400,000	22.	Ghafari Associates .....	\$81,300,000
3.	Burns & McDonnell.....	\$551,599,410	23.	Olsson .....	\$75,834,729
4.	Alfa Tech Consulting Engineers .....	\$500,000,000	24.	Farnsworth Group.....	\$68,112,548
5.	WSP USA.....	\$427,524,789	25.	Ross & Baruzzini.....	\$61,900,000
6.	EXP .....	\$350,011,905	26.	Cushing Terrell .....	\$57,783,842
7.	Buro Happold .....	\$331,749,000	27.	CDM Smith.....	\$52,425,406
8.	Thornton Tomasetti.....	\$256,518,041	28.	Stanley Consultants.....	\$44,111,652
9.	NV5 Global.....	\$217,072,000	29.	Shive-Hattery.....	\$44,110,573
10.	Salas O'Brien.....	\$157,962,569	30.	Black & Veatch Corp.....	\$38,190,000
11.	IPS-Integrated Project Services.....	\$156,528,984	31.	Highland Associates.....	\$29,200,000
12.	CRB .....	\$146,810,000	32.	GRAEF .....	\$28,192,627
13.	SSOE Group .....	\$142,413,414	33.	Galloway & Company .....	\$27,683,047
14.	CHA Consulting.....	\$139,900,000	34.	GMB Architecture + Engineering.....	\$26,011,414
15.	Wiss, Janney, Elstner Associates .....	\$124,850,000	35.	Half Associates .....	\$25,335,000
16.	Dewberry.....	\$118,199,945	36.	Hixson Architecture, Engineering, Interiors .....	\$20,000,000
17.	STV .....	\$114,382,473	37.	Apogee Consulting Group .....	\$18,833,367
18.	Merrick and Company* .....	\$110,175,000	38.	PS&S .....	\$17,515,318
19.	Haskell.....	\$104,801,302	39.	Epstein.....	\$14,375,000
20.	BRPH .....	\$86,183,604	40.	SchraderGroup .....	\$11,435,754

SOURCE: BD+C 2021 GIANTS 400 REPORT \* EDITORS' ESTIMATE

with BC Housing and industry sponsors to expand the “Building Envelope Thermal Bridging Guide” to include details applicable to all Canadian climates and energy codes. The project included development of a web-based database (ThermalEnvelope.ca) that lets users easily search for over 500 building envelope details, compare approaches to mitigate thermal bridges, and calculate the overall thermal transmittance of opaque wall assemblies.

To meet growing demand from its clients, **P2S** launched two new services in 2020: geographic information system (GIS) support and microgrid analysis and design. “We expect these new offerings to be considerable drivers of new revenue from existing clients while also being important in attracting new clients,” said the firm.

**Ross & Baruzzini** developed a medical equipment planning system, called Planview, which allows its engineers to create customized reports for key stakeholders on projects: architects for space planning, engineers for MEP requirements, contractors for installation requirements, and owners for budgeting, procuring, and deployment activities. The proprietary tool integrates the firm’s medical equipment plan data with Revit models to more effectively coordinate the equipment requirements—which change over the life of a project—with the overall project design.

**Shive-Hattery** last year launched its Design Technology and Innovation group (DaTI). The group works in collaboration with the firm’s IT and Project Delivery groups to research, test, implement, and train staff in new technology.

Early results include increased speed to market for new tech-based initiatives and tools; increased awareness firmwide of research projects and the status of research, testing, and training; and more efficient connections between front-line staff and corporate leaders focused on implementing innovations firmwide. “The best ideas come from our ‘boots on the ground,’” said the firm.

**SSOE’s** in-house development team has automated its BIM 360 project creation process, expediting a just-in-time project environment. Since January 1, 2021, “more than 450 projects have been created in minutes,” according to the firm. In addition, SSOE is using Cintoo Cloud, a 3D mesh technology that enhances the value of laser scanning data in BIM. It allows the firm’s engineers to quickly load large data sets to tablets and laptops for collaboration with clients and in the field.

**Syska Hennessy Group**, in April 2020, launched Syska Innovations to support the firm’s innovation initiatives, pilot software and products, and invest in seed-stage companies that serve the AEC community. Syska Innovations is active with several AEC investment groups, including AEC Angels, Building Ventures, and Shadow Ventures. One of its first pilot projects is OpenSpace, AI-driven 360-degree photo documentation software for construction sites. “With this tool, people can walk through a space with a 3D camera on their heads and the camera will snap pictures and video and convert it into a 3D representation,” said Syska’s Robert Ioanna, PE, LEED AP, Senior Principal, Board Member, and

New York office site leader (and *BD+C* 40 Under 40 honoree, Class of 2016). “Once we have the representation, we can compare it side by side on screen with our Revit models. It’s a cool solution that holds a lot of promise.”

**TEECOM’s** in-house R&D team, TEECOMlabs, developed PSA Builder, a tool that extends the capabilities of the firm’s CRM to automatically generate consistent professional services agreements. The tool enables staff to complete the task 15 times faster than previously.

**Thornton Tomasetti** launched T2D2, a software as a service (SaaS) platform that uses artificial intelligence—specifically computer vision powered by deep learning—to identify and assess damage and deterioration to building envelopes and structures through images. Developed within Thornton Tomasetti’s CORE studio incubator and commercialized through the firm’s TTWiiN accelerator, T2D2 applies data from the firm’s more than 50 years of building inspection and forensic investigation work. It is available for use by property and portfolio owners and managers, as well as municipalities, to identify deterioration early and throughout the life of an asset.

To support its growing durability assessment services business for reinforced concrete structures, **Wiss, Janney, Elstner Associates** developed WJE CASLE, service life modeling software to predict the development of corrosion-related damage in concrete structures. The software tool helps WJE engineers evaluate the remaining service life—and guide repair decisions—of existing

structures, and select appropriate corrosion protection strategies for new concrete structures. The custom-designed software tool evaluates a host of circumstances and exposure conditions on projects, including construction geometry, materials behavior, sealers, coatings, corrosion-resistant reinforcing, the presence and installation of overlays, pre-existing chloride profiles, concrete cracking, and two-sided exposure conditions.

In 2020, **WSP** formed its Innovation Advisory group to help, among other things, its design teams, clients, and building end users connect the physical and digital aspects of the built environment. The group sees itself as a digital consultant during the project design process, using data flows, systems integration, analytics, user interfaces, and user journey mapping to more effectively engage with clients, collaborate within the design team, and produce high-impact, high-value designs. “These digital technologies have positively impacted WSP’s ability to exceed stakeholder expectations, while simultaneously turning project data into knowledge,” said the firm.+

—Compiled by David Barista, Editorial Director

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# GCs FOCUS ON VIRTUAL JOBSITES, DATA TOOLS

**H**ere's a recap of the top innovations from the 2021 Contractor and Construction Management Giants:

To stay consistent across its growing portfolio of construction projects for Amazon, **Alston Construction** assembled a dedicated team—the Amazon business unit—to propose, estimate, and build projects for the e-commerce giant.

#### Andersen Construction

developed a proprietary target value design (TVD) tool that allows its teams and clients to utilize historical cost information from past similar projects. It normalizes the cost for

inflation and year over year and geographic/regional cost variations.

**Balfour Beatty** partnered with Beck Technology to test and refine Beck's Destini Estimator software for its preconstruction operations. Destini Estimator features the ability to integrate 2D and 3D quantity takeoffs directly into the estimate from BIM files. 2D quantity takeoffs

can be performed in a matter of hours, versus days using traditional methods.

**BC Contracting** built custom subcontractor insurance tracking software that provides analytics to manage risk and automatically review Certificates of Insurance.

**CBRE** launched two tech tools last year:

- **Capital Planner** allows CBRE clients to run scenarios and score and prioritize projects to help develop strategic plans and ensure clients are allocating and managing capital effectively.

- **Office Ready** is a quick design-through-delivery solution for small to mid-size office space. It lets users plan, design, and preview a 3D model of their space in minutes by leveraging pre-designed templates that meet health, safety, and wellness requirements. Office Ready projects are typically delivered 20% faster and are, on average, 20-30% more affordable than a traditional built-out, according to the firm.

**DPR Construction** developed a mobile app and online portal, called prescreen. virtualbuild.com, that presents a COVID-19 prescreening questionnaire and documentation of screening results. The app greatly improved tracking of people visiting DPR's offices, jobsites, and events.

The firm released the app to the market for anyone to use.

DPR also piloted an IoT-enabled tool and equipment tracking system that allows its project teams to maintain accurate asset inventory, track equipment utilization, and reliably plan for equipment/tool costs on projects.

**Gilbane** partnered with startup Versatile to pilot CraneView 4.0, a multi-sensor device mounted under a crane's hook that captures and measures thousands of data points—load, weight, motion, rigging, unrigging, material, location, tasks, idle times—in real time. The firm is testing the device at its GSA General Assembly Building project in Richmond, Va., which entails erecting some 370 tons of structural steel and more than 1,200 precast panels. Early results include improved coordination of real-time deliveries and better management of crane picks. To date, the project team has seen up to 90% utilization rate on steel erection and 98% on the precast façade.

**Haskell** led the NEXT Coalition, an industry-wide effort to source and vet technologies to assist in keeping teams and businesses operational during the height of the COVID-19 pandemic. Members of the coalition shared all findings, analysis, and detail with the

industry. The core business has adopted several innovations identified through the NEXT Coalition to help streamline design reviews, quality inspections, and commissioning.

#### Manhattan Construction

**Group** adopted a host of tech tools to help increase efficiencies and collaboration: StructionSite (project tracking), Fuzor (4D modeling), Tempus (resource planning), PowerBI (project reporting and project risk assessment/management), and the Enterprise Fleet Management system (tracking company trucks for safe driving).

**McCarthy** partnered with Join.build, a design-phase collaboration tool that helps improve collaboration when aligning design options and alternatives with the anticipated construction costs, and how that relates to the client's budget.

**PCL** merged its Job Site Insights platform with Latium Technologies, an IoT solutions provider, in an effort to expand the IoT platform to adjacent industries like oil and gas, mining, and the renewable energy sector. Job Site Insights collects and analyzes data from any connected sensor and asset on a jobsite, providing real-time monitoring, threshold alerting, and insights.

**Robins & Morton** is using

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photorealistic virtual mockups to replace physical mockups. At the Carilion Roanoke (Va.) Memorial Hospital project, the contractor produced detailed virtual mockups of patient rooms and operating rooms, including equipment modeled

from manufacturer cut sheets and realistic finishes. With the ability to experience a 360-degree interactive view of each space, the client and design team were able to provide feedback on multiple iterations prior to beginning

construction. The project team at CRMH saved approximately \$500,000 by using virtual mockups.

**Rogers-O'Brien Construction** implemented employee recognition software, Motivosity, which allows coworkers to send

“RO Bucks” to one another for demonstrating RO’s core values throughout their work day.

**Ryan Companies** added a computational design practice that provides scripting and algorithms to evaluate design scenarios for traditional elements, as well as attributes including revenue generation, use-resiliency, and constructability. The practice has increased Ryan’s efficiency in generating site reviews and phasing options, and effectiveness in pursuits and analyses.

**S.M. Wilson** developed Skilled, a construction career education program that provides hands-on opportunities for individuals from all experience levels, from pre-K students to workforce professionals.

**Saunders Construction** was part of a consortium that, last August, completed North America’s largest sewer heat recovery system installation. The renewable energy project for the National Western Center, in Denver, uses Enwave’s Sewer Heat Recovery system, which heats and cools buildings with recycled thermal energy from nearby pipelines.

**Shawmut Design and Construction** created the Shawmut Vitals platform to allow employees and subcontractors to self-certify daily health screenings accessed through a job-specific QR code. The tool checks for COVID-19 symptoms and manages contact tracing using real-time data tracking. The construction giant is piloting eight new software and hardware solutions aimed at enhancing communication, collaboration, and engagement in safety. These include software that streamlines the subcontractor qualification and selection process,

CONTRACTORS   TOP 90					
Rank	Company	2020 GC Revenue	Rank	Company	2020 GC Revenue
1.	Turner Construction	\$14,409,934,501	46.	Pepper Construction	\$1,253,690,000
2.	Whiting-Turner Contracting Co., The	\$8,712,361,000	47.	Manhattan Construction Group	\$1,252,562,060
3.	STO Building Group	\$8,080,000,000	48.	Shawmut Design and Construction	\$1,234,687,944
4.	DPR Construction	\$6,457,971,000	49.	Adolfson & Peterson Construction	\$1,212,035,456
5.	Gilbane Building Company	\$6,418,123,000	50.	BL Harbert International	\$1,196,264,492
6.	AECOM	\$6,245,000,000	51.	Fortis Construction	\$1,188,466,989
7.	Hensel Phelps	\$5,882,391,660	52.	Robins & Morton	\$1,158,630,971
8.	Clark Group	\$5,139,065,061	53.	Haskell	\$1,075,357,462
9.	Swinerton	\$5,046,878,208	54.	Choate Construction	\$1,074,069,050
10.	PCL Construction	\$4,489,769,376	55.	Coastal Construction Group*	\$1,043,800,000
11.	Skanska USA	\$4,150,245,838	56.	Beck Group, The	\$1,003,815,477
12.	Holder Construction	\$4,023,000,000	57.	James G. Davis Construction	\$992,040,363
13.	McCarthy Holdings	\$4,019,571,814	58.	M.C. Dean	\$990,212,630
14.	JE Dunn	\$3,966,291,629	59.	Power Construction	\$975,000,000
15.	Suffolk Construction	\$3,891,225,726	60.	Christman Company, The*	\$968,874,000
16.	Brasfield & Gorrie	\$3,875,195,130	61.	Sundt Construction	\$950,009,191
17.	Balfour Beatty US	\$3,865,614,631	62.	Hoar Construction	\$932,433,000
18.	Clayco	\$3,811,000,000	63.	Hunter Roberts Construction	\$903,978,000
19.	Walsh Group, The	\$3,385,727,177	64.	LeChase Construction Services	\$820,755,501
20.	Tutor Perini Corp.*	\$3,307,350,000	65.	Nabholz	\$820,576,563
21.	Ryan Companies US / Ryan A+E	\$3,046,650,321	66.	Level 10	\$808,615,543
22.	Mortenson	\$2,784,156,000	67.	Boldt Company, The	\$803,804,000
23.	Hoffman Construction	\$2,602,572,473	68.	W.E. O'Neil Construction	\$763,445,230
24.	HITT Contracting	\$2,515,373,899	69.	Burns & McDonnell	\$738,554,159
25.	Fluor Corp.	\$2,465,190,000	70.	CRB	\$722,330,000
26.	Lendlease	\$2,464,701,633	71.	Rodgers Builders	\$710,101,000
27.	ARCO Construction	\$2,447,431,635	72.	Rogers-O'Brien Construction	\$707,436,232
28.	BartonMalow	\$2,132,484,620	73.	Joeris General Contractors	\$664,820,946
29.	Devcon Construction*	\$2,000,000,000	74.	JRM Construction Management	\$660,000,000
30.	Yates Companies, The	\$1,880,887,000	75.	Batson-Cook	\$657,858,391
31.	Walbridge	\$1,843,041,624	76.	Graycor Construction	\$644,520,787
32.	Consigli Construction*	\$1,742,000,000	77.	Summit Contracting Group	\$642,333,049
33.	Gray Construction	\$1,614,267,752	78.	Andersen Construction	\$640,000,000
34.	Alston Construction	\$1,558,940,000	79.	W. M. Jordan Company	\$639,067,204
35.	Webcor	\$1,487,171,000	80.	Clancy & Theys Construction	\$634,432,217
36.	Messer Construction	\$1,480,546,865	81.	Lease Crutcher Lewis	\$630,000,000
37.	Alberici-Flintco*	\$1,468,600,000	82.	McCownGordon Construction	\$622,897,543
38.	J.T. Magen	\$1,391,121,981	83.	C.W. Driver Companies	\$614,886,823
39.	Miron Construction	\$1,381,337,065	84.	Weis Builders	\$528,272,717
40.	Weitz Company, The	\$1,356,059,600	85.	Kraus-Anderson Construction	\$458,000,000
41.	CORE Construction Group	\$1,343,036,818	86.	Millie and Severson General Contractors	\$454,239,528
42.	Clune Construction	\$1,336,332,647	87.	Bozzuto Construction	\$438,790,295
43.	Austin Industries	\$1,330,629,178	88.	Paric Holdings	\$434,894,893
44.	Crossland Construction	\$1,274,900,468	89.	Kaufman Lynn Construction	\$426,495,059
45.	McShane Companies, The	\$1,259,912,935	90.	New South Construction	\$405,227,000

SOURCE: BD+C 2021 GIANTS 400 REPORT \*EDITORS' ESTIMATE

and the use of wearables to control access zones, critical work barriers, and proximity to work devices, as well as monitor for soft tissue injuries.

**Skanska** launched its internal Data Steering Committee and Data Working Group to develop, define, oversee, manage, and analyze data collection and processes. Its data innovations include:

- A dynamic scheduling dashboard that allows users to view, aggregate, and analyze project schedules across the organization.
- Custom APIs that manage social distancing data and conduct accurate contact tracing from IoT wearables.
- A Procore project dashboard that illustrates comprehensive data around project RFIs, submittals, observations, punch lists, daily logs, and inspections.

**STO Building Group** implemented several new virtual construction tools, including

Texturra for pre-qualifying subcontractors; Rhumbix for time and material tracking; Skill Signal and SmartTagit for safety; increased use of virtual walkthrough tools like Matterport, OpenSpace, and Reconstruct; CMiC mobile for project management; and embedded concrete sensors.

**Sundt Construction** launched its Infrastructure Development group. Its first major project is an investment in the Port of San Antonio's innovation center, which aims to showcase new technologies developed in San Antonio. Also, Sundt is seeking tech tools to help streamline its vertical construction projects. One such promising innovation is a "slab former" technology to help create ready-made edge forms for concrete slabs.

**Swinerton** developed a portable mass timber fastening machine to reduce the labor and time required to fasten

mass timber decks on the jobsite. The machine moves craft workers into a standing position to install the tens of thousands of fasteners required for a typical project. Multiple screws are installed at once, so a single operator can drive screws 50-75 percent faster with a push of a button.

To speed interior wall layoffs, Swinerton partnered with startup Dusty Robotics to pilot its autonomous robot, which prints lines and characters on the floor using the CAD layout drawings.

**VJS Construction Services** implemented its Nothing Hits the Ground Policy to minimize damage to and loss of materials and equipment. The firm also implemented centralized tool charging stations to better control inventory and ensure crews have the correct tools for the project.

**Walbridge's** Material Lead Time and Pricing Feedback Survey allows the construction

giant to better understand material availability, lead times, and current trends related to pricing. The short survey is sent monthly to all vendors and subcontractors.

**Webcor** launched its SAFE app, which enables the firm to share safety-related information across the company and collect safety data uniformly across all projects. The app's latest feature is the ability for teams to record daily and weekly safety walks.

On a recent data center campus project in Des Moines, Iowa, **The Weitz Company** piloted Makusafe wearable devices to help identify risks—such as sound dosage, push and pull motions, and worker density—in real time. The wearables send alerts and collect data that allows safety and operations personnel to take proactive steps to improve worker safety.+

—Compiled by David Barista, Editorial Director

**CM AGENT + PM FIRMS | TOP 66**

Rank	Company	2020 CM+PM Revenue	Rank	Company	2020 CM+PM Revenue	Rank	Company	2020 CM+PM Revenue
1.	CBRE	\$1,663,441,063	23.	Robins & Morton	\$34,451,552	45.	H2M Architects + Engineers	\$5,890,000
2.	Jacobs	\$828,999,000	24.	Clune Construction	\$32,275,391	46.	Weitz Company, The	\$5,711,300
3.	Alfa Tech Consulting Engineers	\$700,000,000	25.	Hunter Roberts Construction	\$26,195,000	47.	WD Partners	\$5,100,000
4.	VCC	\$650,000,000	26.	Swinerton	\$23,314,000	48.	Executive Construction	\$5,000,000
5.	Hill International	\$368,524,194	27.	Burns & McDonnell	\$22,889,431	49.	KCI Technologies	\$4,942,400
6.	JLL	\$326,085,068	28.	Russell Construction	\$21,100,000	50.	Salas O'Brien	\$4,922,289
7.	AECOM	\$299,700,000	29.	LeChase Construction Services	\$16,875,963	51.	BartonMalow	\$4,906,451
8.	STV	\$132,797,386	30.	CHA Consulting	\$15,600,000	52.	Rodgers Builders	\$4,378,000
9.	Turner Construction	\$130,234,924	31.	Granger Construction	\$14,912,311	53.	Hagerman Group, The	\$4,000,000
10.	CDM Smith	\$125,289,799	32.	Campus Construction Management Group	\$14,800,000	54.	Adolfson & Peterson Construction	\$3,685,789
11.	JE Dunn	\$96,010,370	33.	Cotter Consulting	\$14,250,996	55.	Ryan Companies US / Ryan A+E	\$3,483,579
12.	Gilbane Building Company	\$81,877,000	34.	Batson-Cook	\$12,674,884	56.	Whiting-Turner Contracting Co., The	\$3,244,349
13.	CRB	\$81,610,000	35.	International Alliance Group	\$12,657,260	57.	BL Harbert International	\$3,202,061
14.	Skanska USA	\$72,456,059	36.	WSP USA	\$12,183,318	58.	Progressive AE	\$3,162,849
15.	Walbridge	\$66,818,376	37.	Yates Companies, The	\$10,676,000	59.	Nehmer	\$3,100,000
16.	Kraus-Anderson Construction	\$60,000,000	38.	Mortenson	\$10,403,000	60.	CannonDesign	\$2,500,000
17.	LaBella Associates	\$51,100,000	39.	Epstein	\$9,100,000	-	Blach Construction	\$2,500,000
18.	Henderson Engineers	\$49,794,052	40.	Balfour Beatty US	\$8,426,003	62.	Wohlsen Construction Company	\$2,406,000
19.	McDonough Bolyard Peck	\$49,659,325	41.	Wiss, Janney, Elstner Associates	\$7,960,000	63.	Brownstone	\$2,368,400
20.	IPS-Integrated Project Services	\$42,467,226	42.	CORE Construction Group	\$7,801,434	64.	Brasfield & Gorrie	\$2,282,178
21.	HPM	\$41,362,000	43.	BKV Group	\$7,249,917	65.	Pepper Construction	\$2,133,000
22.	SSOE Group	\$37,706,910	44.	Suffolk Construction	\$6,993,314	66.	McCarthy Holdings	\$1,823,568

SOURCE: BD+C 2021 GIANTS 400 REPORT

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# IS AIR QUALITY THE NEXT HOT CAMPUS AMENITY?

The university sector continues to see growth in demand for community college buildings and technical college facilities. A recent notable project is The Continuum, a technical education facility in Lake City, S.C., that provides high school, college, and continuing education students with workforce-focused courses, including HVAC and welding. The project is a collaboration of the Darla Moore Foundation, Florence-Darlington Technical College, and Francis Marion University. The building team includes McMillan Pazdan Smith Architecture, Britt, Peters & Associates (SE), RMF Engineering (MEP), and Thompson Turner Construction.

**New research shows that students want to be back on campus, but they—and their parents—are asking more of higher ed institutions.**

**W**hile the debate persists among office workers and employers on when and how “return to work” will occur as the COVID-19 pandemic wanes, there is little doubt about what the nation’s 19.7 million college and university students are planning to do this fall.

They want out of mom and dad’s house. They want to be back on campus. And, it’s not up for debate, according to a survey of more than 1,500 college students by student housing developer and manager Core Spaces. The study, conducted among residents of Core Spaces properties across 14 states, showed that an overwhelming majority—92 percent—





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said they wanted to come back to campus when classes began for the spring 2021 semester, up from 89 percent in the fall 2020 semester. Moreover, nearly 88 percent said that they planned to go back to campus even if online/distance learning protocols were still in place. (Core Spaces has not released data for the fall 2021 semester, but we surmise that this sentiment will hold true.)

The rush back to campus places the pressure squarely on higher education institutions to maintain health and safety protocols campus-wide to help prevent the spread of the coronavirus. In fact, public health and safety just might be the new in-demand amenity at U.S. universities and colleges, according to a newly released research study on college/university selection factors by JLL's Higher Education team.

The JLL survey asked 500 parents of

high school-aged children who are currently evaluating higher education institutions to rank their top selection factors for choosing a school. Not surprisingly, "quality of academics" and "affordability of college or university" were cited most often by parents. The eye-opener was number three on parents' wishlist—"campus cleanliness and indoor air quality"—which was cited as an "important" or "somewhat important" factor in the selection process by 84 percent of respondents. IAQ/cleanliness outranked more traditional selection factors like location, campus housing options, financial strength of the school, diversity of the student body, and commitment to sustainability.

Admittedly, most parents—59 percent—said that they did not consider campus air quality a factor prior to the COVID-19 pandemic. Ron Gregory, JLL Higher Education's Executive Vice President North America,

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**Pictured: Engineering lab space at Purdue University’s newly renovated and expanded Agricultural and Biological Engineering Building. The project, which includes 125,000 sf of new construction and 37,000 sf of renovated space, serves as the new home for Purdue’s College of Agricultural and Biological Engineering. The project team included Flad Architects, MSKTD and Associates, and Pepper Construction.**

believes that prospective students and their parents will demand “the highest standards around cleanliness and air quality” from their school of choice.

JLL says cleanliness extends to the overall look and feel of the campus and the physical condition of the buildings. Nearly nine in 10 respondents—88 percent—said the physical condition of buildings was important; 86 percent for campus condition.

“While transparency around campus cleanliness and air quality remains top of mind, the way prospec-

tive students and their families perceive the health and safety of the campus based upon appearance could also play a pivotal role in the decision process,” the study’s authors wrote.

The survey also sheds light on the growing importance of sustainability on college campuses. More than a fifth of parents—21 percent—indicated that the pandemic raised their awareness of a school’s overall commitment to sustainability.+

—David Barista, Editorial Director

**UNIVERSITY SECTOR ARCHITECTURE + AE FIRMS | TOP 10**

Rank	Company	2020 University Revenue
1.	Gensler .....	\$73,908,414
2.	CannonDesign .....	\$63,000,000
3.	Smithgroup .....	\$54,253,141
4.	Kohn Pedersen Fox .....	\$34,348,492
5.	Perkins and Will .....	\$33,000,000
6.	HMC Architects .....	\$27,957,447
7.	Mithun .....	\$25,543,367
8.	DLR Group .....	\$25,250,000
9.	Stantec .....	\$24,977,507
10.	Ayers Saint Gross .....	\$24,469,216

SOURCE: BD+C 2021 GIANTS 400 REPORT

**UNIVERSITY SECTOR ENGINEERING + EA FIRMS | TOP 10**

Rank	Company	2020 University Revenue
1.	AECOM .....	\$95,600,000
2.	Jacobs .....	\$42,350,000
3.	Arup .....	\$27,129,939
4.	RMF Engineering .....	\$25,000,000
5.	IMEG Corp. ....	\$21,774,063
6.	NV5 Global .....	\$20,633,000
7.	Affiliated Engineers Inc. ....	\$19,810,565
8.	Salas O'Brien .....	\$17,299,900
9.	Buro Happold .....	\$17,190,000
10.	WSP USA .....	\$15,981,956

SOURCE: BD+C 2021 GIANTS 400 REPORT

**UNIVERSITY SECTOR CONSTRUCTION + CM FIRMS | TOP 10**

Rank	Company	2020 University Revenue
1.	Turner Construction .....	\$1,477,400,323
2.	DPR Construction .....	\$673,283,000
3.	Whiting-Turner Contracting Co., The .....	\$402,828,659
4.	Gilbane Building Company .....	\$387,191,000
5.	McCarthy Holdings .....	\$354,591,316
6.	PCL Construction .....	\$333,048,992
7.	STO Building Group .....	\$332,250,000
8.	Shawmut Design and Construction .....	\$270,027,183
9.	Messer Construction .....	\$261,265,924
10.	AECOM .....	\$246,200,000

SOURCE: BD+C 2021 GIANTS 400 REPORT

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# DATA CENTER DEMAND SHOULD REMAIN STRONG

Cloud and edge computing are driving forces, as facilities get built bigger and sustainable, with more amenities.

**S**everal commercial building sectors went into hibernation during the coronavirus pandemic. The data center sector wasn't one of them, according to AEC firms and facility providers.

"Our business changed little, and continued its growth curve," says Neil Sheehan, AIA, RIBA, Principal with Sheehan Nagle Hartray Architects (SNHA). Demand for hyperscale centers—those massive facilities usually associated with data-spewing goliaths like Amazon, Google, and Facebook—has been particularly strong, he adds.

Jacobs' data center business has been racking up double-digit year-over-year growth for the past five years. Despite a brief pandemic "pause," the market "has steadily escalated," says Sunny Woodward, the firm's Sales Operations Manager—Data Center Market, especially for colocation centers that lease space and power to multiple customers.

The engineering firm Morrison Hershfield has also seen "a measurable uptick" in its data center business over the 12 months through late May, when *BD+C* spoke with the company. "Data centers have firmly staked out their position as a unique type of facility/industry application, and have created an opportunity for engineering firms to set up and grow business units focused almost exclusively on the design of data centers," says Shaunak Pandit, the firm's Vice President of Critical Facilities.

The runway for this sector looks clear and wide,

too. In its latest Global Outlook and Forecast, ResearchandMarkets.com projects that the U.S. data center market alone will reach \$104 billion by 2026, growing at a compound annual rate of more than 3%. Drivers include the rollout of 5G networks and robust expansion in AI-based infrastructure.

During the pandemic, Morrison Hershfield was selected as the engineer for Stack Infrastructure's first international expansion: TOR01, a 56MW data center campus on 19 acres in Toronto, with build-to-suit options, an available powered shell, and 8MW of commissioned critical capacity.

Aligned, a leading data center provider, last year completed facilities in Utah and Virginia, and, last spring, broke ground on an 18.5-acre hyperscale campus in Chicago that, when finished, will be 580,000 sf with more than 100MW of capacity.

"As an 'essential' business, our data center operations never slowed during the pandemic," says Andrew Schaap, Aligned's CEO. "Customers are looking for more incrementally scalable technology and infrastructure that allow them to expand on demand, wherever and whenever they require it."

## GOING TO THE EDGE

Sheehan of SNHA, whose data center business has been rising "exponentially," leavens his optimism by listing factors that still inhibit the realization of data center projects, starting with labor shortages in some markets. In denser areas, such as Ashburn, Va., and Santa Clara, Calif., it's getting harder to

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find land at reasonable prices. The time needed to secure power for these facilities is increasing. And power and environmental concerns are leading developers to consider projects that marry large-scale data centers to renewable power-producing sources.

Those caveats notwithstanding, however, the AEC executives contacted for this article all expect the data center sector to remain vibrant and fiercely competitive for at least the next two years.

That includes edge data centers, which deliver information closer to consumers, and are benefiting from the 5G rollout. Colocation edge solutions “are getting much bigger,” observes James Warren, PE, Principal with kW Mission Critical Engineering. Size is being driven by computing needs and economies of scale.

Conversely, Jeffrey Blank, HDR’s Senior Vice President, notes that there is a “plethora” of edge systems providers setting up edge ecosystems for smaller entities to provide lower latency for everything from Internet of Things devices to telemedicine support.

“The terminology of the edge is adapting,” says Kurt Wallner, PE, PMP, Project Executive with DPR Construction. “It is now taking on the definition of smaller data centers strategically placed throughout the metros and branching out to be closer to the consumers.” Pandit of Morrison Hershfield envisions a version of edge computing that’s modeled on data

centers collocated within or adjacent to other facilities, particularly in urban downtowns.

### THE CLOUD CHALLENGES AND REWARDS

Firms serving this sector must reckon every day with the dominance of the public cloud giants, such as Amazon Web Services, Microsoft Azure, and Google Cloud, that operate around 600 large data centers, more than half of the global total. Schaap noted that 70% of all hyperscale data centers are in facilities that are leased from their operators or owned by partners of hyperscale operators.

The expansion of the cloud giants, which Schaap predicts is likely to accelerate, presents “incredible opportunities of growth” for AEC firms, says Pandit.

The dominance of these cloud giants, though, is also exerting “significant cost pressures” on all parts of the data center supply chain, says John Arcello, DPR’s Advanced Technology Core Market Leader. To bring more certainty to their construction plans, owners are pre-negotiating terms with contractors and trade partners to meet their speed-to-market needs. “They are looking to deploy infrastructure in a repeatable and rapid manner,” says Barry Buck, DPR’s Advanced Technology Core Market Marketing Leader.

DPR believes that, for the time being at least, the retail/colo/wholesale model should predominate

**In May, ground broke in Orlando, Fla., for the \$35 million, 95,000-sf data center and corporate headquarters for HostDime, the global data center infrastructure provider. This seven-story building on five acres will serve as the only Tier IV public data center in Central Florida. Its 10,000-sf top floor will include a large conference room and training center with an indoor-outdoor floor plan.**

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for data centers, with “more mega builds,” says Wallner. But his firm also anticipates the eventual prevalence of data centers as a service (DCaaS), which is already “driving the industry into larger, regionalized facilities operating at higher densities,” says HDR’s Blank. With this trend, more importance is being placed on network connectivity, latency, and bandwidth.

DCaaS is also helping to shape the definition of data center types, “much like the class definitions of office space,” notes Warren.

To serve this trend, Jacobs has created Cloud Condos, a design concept that brings together the best of hyperscale and colocation design. Woodward characterizes Cloud Condos as a “fast-track solution” that offers “off the shelf Plan of Record” and incorporates the flexibility, scalability, and sustainability that providers want to expand while reducing their carbon footprint.

**AEC firms and providers agree that the demand for sustainable and green solutions for data centers’ construction and operations remains**

**palpable.** Chris Gorthy, DPR’s Project Executive, singles out Facebook’s commitment to be net zero CO<sub>2</sub> emissions by 2030 as a sign of where this sector has been heading. “Significant carbon and water usage reductions over design are becoming more of a focus,” says Jeremy Bray, DPR’s Northeast Data Center Preconstruction Lead. Buck adds that tenants are insisting on greater accountability by the data center industry.

This commitment to carbon neutrality “means a focus on carbon-neutral power, not just through offsets,” says Sheehan, “as well as increasing concern for carbon content and materials’ lifecycle for the products and systems we specify.”

To that end, Aligned has been pushing its patented Delta3 cooling system, which uses up to 80% less energy and 85% less water than traditional systems to improve power usage effectiveness. Delta3 allows customers to expand on demand, incrementally scaling in place up to 50 KW per rack without stranding capacity.

Jacobs, says Woodward, has been partnering with clients to benchmark their global sustainability initiatives. That includes working with an international colocation client to pilot a carbon-neutral facility that Woodward predicts (without elaboration) “will revolutionize how the industry approaches carbon goals.”



**Toronto-based WZMH Architects, working with Ryerson University, has devised a concept for providing supplemental energy to buildings that are linked to a microgrid that would draw that energy captured from the testing of nearby data center generators.**



**DATA CENTER SECTOR ARCHITECTURE + AE FIRMS | TOP 10**

Rank	Company	2020 Data Center Facility Revenue
1.	Corgan	\$66,713,848
2.	Gensler	\$28,769,904
3.	Sheehan Nagle Hartray Architects	\$24,843,756
4.	Page	\$19,752,373
5.	HED	\$10,100,000
6.	HKS	\$6,169,849
7.	Wendel	\$3,386,675
8.	DGA Planning   Architecture   Interiors	\$3,378,495
9.	Macgregor Associates Architects	\$2,534,893
10.	Stantec	\$2,509,019

SOURCE: BD+C 2021 GIANTS 400 REPORT

**DATA CENTER SECTOR ENGINEERING + EA FIRMS | TOP 10**

Rank	Company	2020 Data Center Facility Revenue
1.	Jacobs	\$211,400,000
2.	Burns & McDonnell	\$65,517,695
3.	ESD	\$57,091,521
4.	WSP USA	\$54,717,636
5.	Alfa Tech Consulting Engineers	\$50,000,000
6.	Black & Veatch Corp.	\$37,630,000
7.	HPE Data Center Technologies Services	\$33,700,000
8.	Vanderweil Engineers	\$32,952,900
9.	AECOM	\$28,300,000
10.	Syska Hennessy Group	\$26,652,448

SOURCE: BD+C 2021 GIANTS 400 REPORT

**DATA CENTER SECTOR CONSTRUCTION + CM FIRMS | TOP 10**

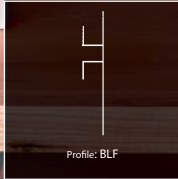
Rank	Company	2020 Data Center Facility Revenue
1.	Holder Construction	\$2,593,000,000
2.	Whiting-Turner Contracting Co., The	\$1,775,279,988
3.	DPR Construction	\$1,565,877,000
4.	Turner Construction	\$1,510,898,975
5.	HITT Contracting	\$1,053,798,171
6.	Fluor Corp.	\$909,670,000
7.	Fortis Construction	\$860,372,727
8.	Mortenson	\$558,592,000
9.	STO Building Group	\$529,000,000
10.	JE Dunn	\$528,970,119

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# HOTELS CAN BE MORE THAN PLACES TO SLEEP

Supporting remote work, connecting to outdoors, and relying on technology are how hotels are drawing guests back.

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**I**n 2020, the U.S. hotel industry surpassed one billion unsold room nights for the first time in history, according to the data provider STR. Revenue per room plummeted by nearly 48%, and occupancy rates sank to 44%. The American Hotel & Lodging Association was expecting more of the same through at least the first half of 2021. Business travel, which normally accounts for three-fifths to two-thirds of the industry's annual revenue, could still be off this year by 85% compared with two years ago, according to an association report, released last January, that assessed the state of the hotel sector.

Yet, there have been signs that hotels could begin their recovery phase sometime this year. The sector is expected to add 200,000 operations jobs in 2021, which will still leave it 478,245 workers short of pre-pandemic employment levels, but it's a start. The association foresees something resembling full employment again by 2023.

During the pandemic, hotel construction and renovation did proceed, albeit cautiously. Lodging Economics estimates that 1,311 projects with 179,304 rooms were under construction at the end of the first quarter of 2021. It forecast that 691 projects with 81,866 rooms would open by the end of this year, representing a 2% increase in supply.

In June, the Dutch developer citizenM opened its second West Coast hotel, the 11-story, 315-key citizenM Los Angeles Downtown (Mortenson Construction was the GC), along with two properties in Miami. The company has hotel projects in development in several other American cities, including Washington, D.C., San Francisco, and Chicago.

Also in the Windy City is the 115-key, 11-story Nobu

Hotel Chicago, that luxury hotelier's first property in the Midwest. Shawmut Design and Construction built this hotel. In Boston, Shawmut performed extensive renovations on The Langham, a 312-key hotel that opened in June.

## LINKING PHYSICAL SPACE WITH USER EXPERIENCE

The pandemic forced hotel owners and their AEC partners to rethink their properties' amenities, services, and spaces, and not just their cleaning protocols or deciding to remove buffets from dining areas.

Indeed, the engineering firm Jensen Hughes has been assisting its hotel clients in navigating building and fire codes that come with different user needs, says Christine Chatfield, the firm's Hospitality Market Leader.

"COVID-19 is the latest—and worst—outcome in a volatile cycle of crises that has had devastating effects on the hospitality industry," says Sergio Saenz, Principal and Director of Hospitality at HKS. "By understanding the conditions that have made this field particularly vulnerable, we can anticipate, and design for, the impact of future catastrophes or calamities. Reimagining a hotel as more than just a place to sleep—where it becomes an active part of the local culture and daily life—will make it as much of an attraction as the destination where it's located."

Physical space and user experience "are more connected than ever," adds Emily Marshall, IIDA NCIDQ, Principal and Interior Design Director for HBG Design. Her firm has been working with an international hotel brand on new prototypes for two limited-service flags that turn underutilized breakfast and food service space into areas for all-day use that can be adapted for different mixes of guests.





Randy Shelly, Executive Vice President of Hospitality for Shawmut Design and Construction, says his firm has seen a “major push” to continue outdoor dining that became essential during the health crisis. He points specifically to Los Angeles, where outdoor dining programs created in response to COVID-19 are progressing toward becoming permanent.

**CATERING TO THE ‘BLENDED TRAVELER’**

Shelly sees outdoor dining as part of a larger picture of hotels—whose revenues dwindled during the pandemic—striving to monetize every square foot of space at

a time when they are desperate to recoup their losses in revenue per room. These efforts include supporting their guests’ remote work, with some hotels leveraging their WiFi, parking, and dining to rent unoccupied rooms to businesses during working hours.

“Many of our hotel and resort clients have re-prioritized their offerings of an optimum alternative work environment for the ‘blended traveler’” who combines work and leisure, says HBG’s Marshall. Nathan Peak, LEED Green Associate, the firm’s Design Director, notes that within two completed projects in Memphis—Hyatt Centric Beale Street and Hilton Canopy Memphis—lobbies



**Shawmut Design and Construction completed the first Nobu hotel in the Midwest, the 115-room Nobu Hotel Chicago, which opened in July 2020. Located in the city’s West Loop, the 11-story hotel includes Rooftop at Nobu, a spa and indoor serenity pool, and flexible event space.**

HOTEL SECTOR ARCHITECTURE + AE FIRMS   TOP 10		
Rank	Company	2020 Hotel Facilities Revenue
1.	Gensler .....	\$59,670,857
2.	WATG .....	\$57,114,575
3.	HKS .....	\$55,388,244
4.	CallisonRTKL .....	\$29,553,707
5.	Hart Howerton .....	\$23,165,324
6.	Cooper Carry .....	\$20,907,748
7.	Perkins Eastman .....	\$17,596,156
8.	HBG Design .....	\$16,713,000
9.	Stantec .....	\$16,559,655
10.	DLR Group .....	\$16,400,000

SOURCE: BD+C 2021 GIANTS 400 REPORT

HOTEL SECTOR ENGINEERING + EA FIRMS   TOP 10		
Rank	Company	2020 Hotel Facilities Revenue
1.	Jacobs .....	\$29,900,000
2.	Jensen Hughes .....	\$24,434,254
3.	EXP .....	\$15,369,106
4.	NV5 Global .....	\$12,351,000
5.	Kimley-Horn .....	\$11,253,103
6.	WSP USA .....	\$8,967,923
7.	Buro Happold .....	\$6,641,000
8.	Walter P Moore .....	\$6,103,386
9.	Thornton Tomasetti .....	\$5,969,756
10.	IMEG Corp. ....	\$5,666,614

SOURCE: BD+C 2021 GIANTS 400 REPORT

HOTEL SECTOR CONSTRUCTION + CM FIRMS   TOP 10		
Rank	Company	2020 Hotel Facilities Revenue
1.	Suffolk Construction .....	\$752,316,154
2.	AECOM .....	\$672,720,000
3.	Yates Companies, The .....	\$516,316,000
4.	McCarthy Holdings .....	\$485,801,692
5.	Swinerton .....	\$471,580,664
6.	STO Building Group .....	\$423,000,000
7.	Gilbane Building Company .....	\$388,426,000
8.	DPR Construction .....	\$302,071,000
9.	Whiting-Turner Contracting Co., The .....	\$299,596,577
10.	Balfour Beatty US .....	\$297,157,670

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have zones that can shift from virtual quiet workspaces with auditory privacy to collaborative hubs. And at the HBG-designed Cache Creek Casino Resort in Brooks, Calif., near Sacramento, all guestrooms feature round desk-height tables that function seamlessly for remote working or in-room dining.

By offering temporary collaborative office environments when in-person meetings or social gatherings are desired, hotels can move away from their heavy reliance on out-of-town business meetings and conferences, says Saenz.

During the pandemic, hotels turned to technology to give guests greater control over their experiences and safety. Contactless check-in/-out, voice-activated concierge services, and personalized room temperature and lighting controls are among the tech-driven additions that the pandemic has made standard for a growing number of hotels.

Technology also gives hotels the leeway to inject more flexibility into their operations. Saenz says HKS has been exploring with some clients the intermixing of traditional guestrooms with furnished apartments on the same floor for short-term renters. Flexibility is

also now more evident in the design of hotel lobbies. “We have seen the lobby space completely revisualized and transformed back into a focal point,” says Jensen Hughes’ Chatfield, whose firm has been working to ensure guest safety in such upgrades.

The lobby in one of Leo A Daly’s projects, the 236-room Embassy Suites in San Rafael, Calif., creates “human scale” within a huge atrium. Mark Pratt, AIA, the firm’s Global Hospitality Leader, is also seeing a “big push to get back to nature” in lobbies where biophilic design “is very relevant.” The architecture and shaping of the lobby within the HBG-designed Hilton Canopy hotel in Memphis create framed views of the Mississippi River, says Peak.

Shawmut’s Shelly says that hotel lobbies are also integrating local community through their food and beverage services and outdoor dining options that invite the local neighborhood in.

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Lobbies can be a hotel’s entrée into its wellness programming that, according to Pratt, “provides the guest with mindfulness and elements of self-care, and leaves space for people to create their own experiences.”

Shelly says that what’s emerging are new hotels “grounded in wellness.” But he and other AEC sources also note that wellness means different things to different guests. HKS’s Saenz says that some resorts are “pushing the boundaries” by creating immersive medical and healing guest experiences. He’s also seeing a rise in hotels that are seeking wellness-centered certifications.

HBG’s Marshall says that hotels are more attentive to building and renovating with less-toxic materials. And Peak notes that connecting to the outdoors through biophilic has now become “routine” in his firm’s hotel designs. For example, the interior design of the Cache Creek Resort in California draws heavily from the region’s agrarian landscape, he says. The hotel’s guestrooms and suites also provide scenic views from every window.+

—John Caulfield, Senior Editor



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# PANDEMIC PUTS S+T FACILITIES AT CENTER STAGE

Expanding demand for labs and life science space is spurring new construction and improvements in existing buildings.

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**M**ost AEC executives would probably agree with Greg Peele, Skanska's Executive Vice President for operations in North Carolina and Virginia, who states that 2020 was a year "of remarkable growth and transformation" for the science and technology (S+T) sector.

The coronavirus pandemic triggered a private- and public-sector recommitment to bringing drug production back to the U.S. Firms like SmithGroup and Payette helped clients convert vacant or underutilized offices into life science spaces. The pandemic heightened the urgency for speed to market, especially among midstream pharma and personalized medicine/gene therapy focused clients, says Ed Cordes, Perkins and Will's Global S+T Practice Leader. Cordes also points to a "doubling down" on research labs in clinical facilities.

The pandemic made virtual project design, coordination, and approvals more expedient and acceptable, say Vanderweil Engineers' Managing Principals John Saad, LEED AP, and Chad Wisler, PE, LEED AP BD+C. But the health emergency also created delays in the overseas shipments of equipment and materials that can still impact the commissioning and validation processes. "It's important to identify these critical items early in project procurement, evaluate alternative manufacturers where possible, and create flexibility with the schedule," warns Brian Garbecki, Vice President with Gilbane Building Company.

## RENOVATION, ADAPTIVE REUSE ASCENDING

New construction still accounts for the bulk of S+T projects for AEC firms like Vanderweil, McCownGordon Construction, Jacobs, SmithGroup, and Payette.

However, Ellen Sisle, AIA, LEED AP BD+C, Jacobs' Principal and Global Director of Science and Research, acknowledges that her firm's ratio of new builds to renovations or adaptive reuse projects varies by location, with adaptive reuse being more prevalent in urban areas with a concentration of biotech, like Cambridge, Mass.

Joe Grosshart, President of Good & Roberts, a design-build affiliate of C.W. Driver Companies, notes that in Southern California, one of the country's S+T hotbeds, 52% of life-science clients are choosing to repurpose existing buildings rather than build from the ground up. Good & Roberts recently completed a \$4 million renovation project in San Diego for the medical device supplier NuVasive that converted a three-story building into a showroom and surgery suite; and a \$2 million renovation of an existing 15,000-sf building for Cell Applications, which distributes cell cultures for medical research.

Developer and property manager The RMR Group redeveloped what had been the north campus of Scripps Research Institute for two decades into Muse, a 186,000-sf life sciences space whose three-building campus is owned by Diversified Healthcare Trust. The RMR Group manages this property and expected tenants to start occupying the building by mid-summer of this year.



JEFFREY TALKA © 2019



“Functionality is most in demand for life science buildings that need to serve both R&D and business purposes, so providing a mix of modern lab facilities and flexible office space is crucial,” says Chris Bilotto, RMR’s Senior Vice President. Other in-demand features include connection to the outdoors, and food amenities.

Skanska anticipates an uptick in adaptive reuse for S+T projects, too, but this will vary by region and mostly depend on the relative availability of land. When it comes to design changes, Skanska has seen the greatest shifts among its higher ed clients. It recently completed labs for North Carolina State University, Duke University, and a private

company in Durham, N.C. “Three different clients with three different designers, and in all three, we saw an increase in the size of the lab benches and the addition of cubicle dividers on the bench offices to support social distancing,” says Peele.

During renovations, it’s not uncommon for tenants’ employees to continue working in the building. AEC firms say they regularly confer with those workers about logistics. The firms also proactively seek occupant input about their projects’ parameters.

Communicating with people who will be using the building “is the heart and soul of our programming and planning,” says Jeffery Talka, AIA, LEED AP, Science + Technology Practice Leader for SLAM. He ex-

**Earlier this year, a building team that included the EA firm Jacobs completed the renovation of the historic four-story Bulletin Building within Philadelphia’s Schuylkill Yards with offices and labs for Spark Therapeutics, a developer of gene therapy treatments. The design brings natural light into the research space (each floor plate averages 50,000 sf) and creates transparency throughout.**

### SCIENCE AND TECHNOLOGY SECTOR ARCHITECTURE + AE FIRMS | TOP 10

Rank	Company	2020 S+T Facilities Revenue
1.	HDR .....	\$144,862,468
2.	Perkins and Will .....	\$73,807,000
3.	DGA Planning   Architecture   Interiors .....	\$53,931,599
4.	HOK .....	\$48,270,000
5.	Payette .....	\$46,554,425
6.	Flad Architects .....	\$37,760,000
7.	Smithgroup .....	\$37,268,154
8.	Gensler .....	\$35,938,984
9.	EwingCole .....	\$33,500,000
10.	ZGF Architects .....	\$30,313,020

SOURCE: BD+C 2021 GIANTS 400 REPORT

### SCIENCE AND TECHNOLOGY SECTOR ENGINEERING + EA FIRMS | TOP 10

Rank	Company	2020 S+T Facilities Revenue
1.	Jacobs .....	\$418,290,000
2.	CRB .....	\$132,170,000
3.	Affiliated Engineers Inc. ....	\$55,542,687
4.	Burns & McDonnell .....	\$43,779,473
5.	BRPH .....	\$38,063,890
6.	WSP USA .....	\$21,713,559
7.	Vanderweil Engineers .....	\$16,651,900
8.	Alfa Tech Consulting Engineers .....	\$15,000,000
9.	EXP .....	\$14,258,687
10.	RMF Engineering .....	\$14,000,000

SOURCE: BD+C 2021 GIANTS 400 REPORT

### SCIENCE AND TECHNOLOGY SECTOR CONSTRUCTION + CM FIRMS | TOP 10

Rank	Company	2020 S+T Facilities Revenue
1.	Skanska USA .....	\$971,988,650
2.	Whiting-Turner Contracting Co., The .....	\$695,084,089
3.	CRB .....	\$620,910,000
4.	DPR Construction .....	\$598,099,000
5.	Gilbane Building Company .....	\$333,290,000
6.	McCarthy Holdings .....	\$325,401,717
7.	Turner Construction .....	\$320,072,281
8.	Lendlease .....	\$314,392,573
9.	JE Dunn .....	\$280,940,564
10.	STO Building Group .....	\$202,000,000

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plains that end users establish area requirements, quality of space, engineering controls, equipment needs, cultural relationships, and safety measures.

“Good science is not just about coordinating utilities and meeting technical demands,” says P&W’s Cordes. “The right environments can attract and retain top talent, support collaboration and innovation, and help improve speed to market.”

The input from end users might be what’s spurred the interest among developers and AEC teams in computational fluid dynamics that optimizes a building’s airflow and personnel comfort. It also goes without saying the conversations with occupants have led to the emphasis on visibility for the interior design of S+T projects.

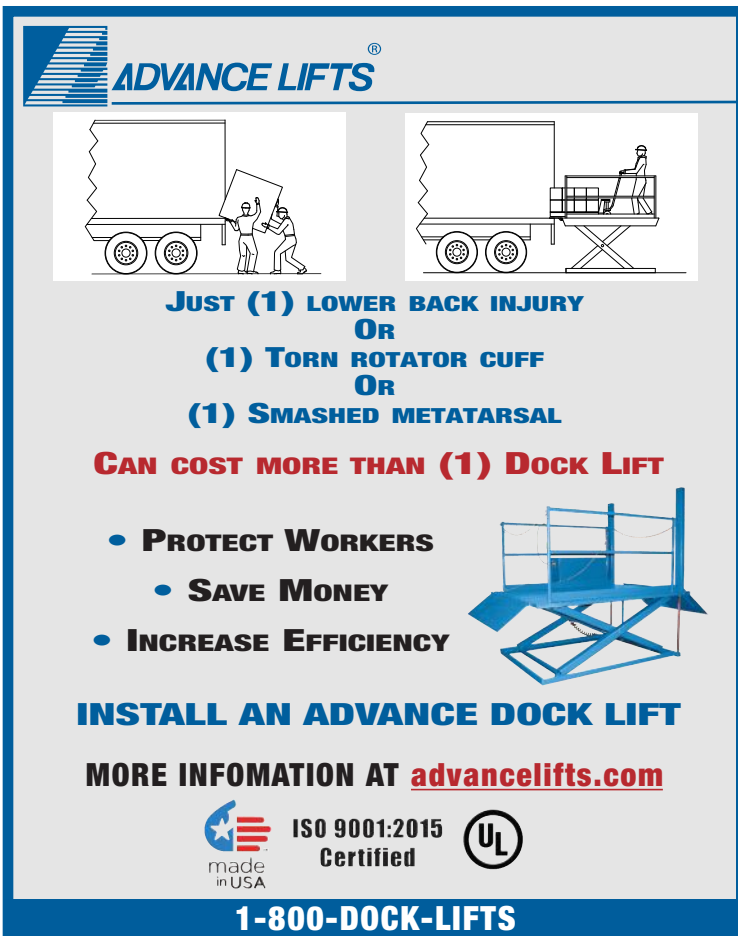
“Space is a social system,” says Tom Simister, AIA, LEED AP, Payette’s Director of Space Strategies. “The whole point of investing in a science or technology building is to bring people together with specific resources to solve problems. Visibility makes that interaction intuitive and effortless, and enables buildings to showcase innovation and inspire a new generation of scientists.”

Visibility has included minimizing storage above workbenches. Daniel Lacy, Vice President of McCownGordon’s Healthcare and S+T Business Unit, says visibility is also manifested in clients’ requests for “critical” natural light, and for providing the public with opportunities to view a facility’s inner workings. Vanderweil Engineers has been incorporating visual mechanical rooms and interactive control/sustainability data boards into its S+T projects.

Several sources contacted for this article have seen S+T owners move toward digital technologies like artificial intelligence (AI). Skanska’s Peele says AI is improving the operation of clinical trials and enabling remote participation. “Our pharmaceutical clients are also using AI to find sequences and patterns that took much longer to run before.”

P&W’s Cordes observes that as production related to cell and gene therapies becomes more modular and accelerated, AI and automated processes are prevalent. “Some clients have set goals of 100% automation by the end of 2025.”+

—John Caulfield, Senior Editor



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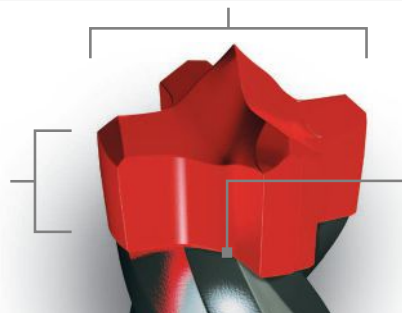
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# THE FATE OF RETAILING RESTS ON THE EASE OF SHOPPING

**Fulfillment, technology, and personalized services are the shovels with which survivors are digging out of their hole.**

**T**he economic impact of the coronavirus pandemic hit the retail industry as hard as it did any business sector. CoStar Group, the commercial real estate firm, estimates that a record 12,200 retail stores closed in the U.S. in 2020, littering the field with brand-name bankruptcies. About one-third of those closings was mall-based. And the carnage continued through the first quarter of 2021 when at least another 1,000 retail stores closed, according to a *Business Insider* analysis.

The COVID-19 outbreak wasn't the only disruption that brick-and-mortar retailers were confronting, either. Ecommerce increased by 44% and accounted for more than one-fifth (21.3%) of all retail dollar sales in 2020, according to *Digital Commerce 360*. Ecommerce is expected to grow by nearly 14% in 2021, according to a report by *eMarketer*.

Developers, seeing the writing on the wall, are trying to figure out what's next for their properties. For some, their inclinations are toward something other than retail. The *Los Angeles Business Journal* reported in June how local developers were transforming vacated mall stores into studios, offices, medical suites, community centers, schools, and multifamily buildings.

"The opportunities for adaptive reuse [of retail] are tremendous," confirms Helen Cho, Senior Associate and Consumer Insights and Brand Strategist for CallisonRTKL. "This is where we can expect to see a major burst of creativity and innovation that will set new standards for future developments."

Kimley Horn has "dozens" of active mall redevelopment projects in the works, and foresees this trend escalating. "Malls continue to be some of the most valuable and flexible real estate in our communities," says Lesley Netzer, the firm's National Retail Lead. Uses being added to malls include apartments, hotels, office, fitness, and restaurants.

Healthcare is also filling this real estate void. Jim Scarpone, a Director at Shawmut Design and Construction, says his firm has seen a proliferation of storefront medical. Some malls are evolving into "medtail" centers where health systems are bringing their services to satellite locations, says Jason Wollum, Henderson Engineers' Principal and Retail Practice Director. And there's the "doc in a box" concept, where all medical disciplines are under one big-box roof, separated into office suites and connected by a central core with other wellness options, says Bob Hopfenberg, PCL Construction's Vice President—National Business Development.

## **STORES LEAN TOWARD DISTRIBUTION OR EXPERIENCE**

Despite all this adaptive reuse, retail stores aren't going away. But COVID-19 and ecommerce have altered the game permanently, forcing changes onto physical stores' presentations, operations, and purpose.

There are now two types of retailers, says Netzer of Kimley Horn: those whose products can be put in cardboard boxes, and those whose products can't. The former, she says, "better be thinking about fulfillment times, leveraging your stores, and logistics overall." The

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DROR BALDINGER PAIVA, COURTESY CALLISONRTKL



CallisonRTKL created a new customer experience for Buff City Soap’s two Dallas stores, whose prototype design divides the stores into two spaces: an experiential retail zone and a self-guided shopping zone, each providing the customers with different ways to interact with and personalize the product. (For example, when soap is being made, the Fresh Soap glass bubbles light up.)

latter must focus on improving the in-store experience.

Wollum predicts that Henderson Engineers’ retail work will increasingly involve designing micro-distribution sites within retail stores to support in-store and curbside pickup, and home delivery. CallisonRTKL’s Cho points specifically to the fashion designer Virgil Abloh’s Off-White flagship store in Miami, which was designed as “a modern fulfillment center” and multipurpose event space.

“How can we help our clients develop a blank canvas that allows for such transitions while still maintaining the brand’s core characteristics? That will be a key question in this world of hyperflexible formats,” says Cho.

**Specialty retailers have been hardest hit during the**

**pandemic and ecommerce waves.** Shawmut’s Scarpone says that specialists that have the capital are making “calculated decisions” on where and how to invest in bricks and mortar sites.

Yet, Cho contends that, post-COVID, specialty retail could emerge as “more relevant” to consumers in search of variety. And among the trends that CallisonRTKL is seeing are specialty retailers clustered within a “village” format, a la Anya Hindmarch’s The Village in London and Chip and Joanna Gaines’ Magnolia Market at the Silos, in Waco, Texas.

A variation of this trend can also be found at The Vineyards at Porter Ranch, one of Kimley Horn’s recent

RETAIL SECTOR ARCHITECTURE + AE FIRMS   TOP 10		
Rank	Company	2020 Retail Revenue
1.	Gensler	\$143,432,226
2.	CallisonRTKL	\$125,440,715
3.	Nelson Worldwide	\$54,076,579
4.	Core States Group	\$47,672,612
5.	Stantec	\$37,177,681
6.	NORR	\$34,588,845
7.	WD Partners	\$32,100,000
8.	RSP Architects	\$27,456,000
9.	GreenbergFarrow	\$26,927,000
10.	Progressive AE	\$25,369,325

SOURCE: BD+C 2021 GIANTS 400 REPORT

RETAIL SECTOR ENGINEERING + EA FIRMS   TOP 10		
Rank	Company	2020 Retail Revenue
1.	Kimley-Horn	\$144,747,530
2.	Henderson Engineers	\$59,696,763
3.	EXP	\$40,199,767
4.	Jacobs	\$23,500,000
5.	BRPH	\$16,638,853
6.	CHA Consulting	\$14,800,000
7.	Galloway & Company	\$14,007,565
8.	Wiss, Janney, Elstner Associates	\$13,300,000
9.	Cushing Terrell	\$13,184,488
10.	Dewberry	\$12,349,955

SOURCE: BD+C 2021 GIANTS 400 REPORT

RETAIL SECTOR CONSTRUCTION + CM FIRMS   TOP 10		
Rank	Company	2020 Retail Revenue
1.	Whiting-Turner Contracting Co., The	\$686,918,399
2.	PCL Construction	\$535,124,806
3.	AECOM	\$460,500,000
4.	VCC	\$354,965,850
5.	Shawmut Design and Construction	\$298,634,920
6.	STO Building Group	\$209,000,000
7.	Schimentl Construction	\$201,000,000
8.	CBRE	\$163,980,921
9.	Crossland Construction	\$147,775,514
10.	W.E. O’Neil Construction	\$128,948,718

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civil engineering projects in Northridge, Calif., a pedestrian friendly mixed-use development with 26 acres of retail, 13 acres of apartments, and 10 acres of medical office buildings. This sustainable development has a range of features and construction methods to ensure a lower ecological footprint, says Netzer.

Whatever retail turns into, it's going to be tech-driven. "A customer thinks digital first now," says Lee Peterson, WD Partners' Executive Vice President—Thought Leadership and Marketing. "When designing physical retail, the idea of easy pickup, delivery, storage space, a 'flat' storefront, digital pricing showroaming, and flexibility has to be built into everything from the get-go. To us, there is no one thing in terms of technology affecting shopping; it's all things.

"Twenty-first Century retail is going to look and act a lot different than 20th Century retail," warns Peterson. "And if it doesn't, you won't be looking at it much longer."

Briana Griffin, a Designer with CallisonRTKL, sees retailers experimenting more with ways to reach their customers on digital platforms. What they are trying to overcome is the fragmentation of different digital communities and how online spaces "can vary dramatically"

in how they process information. "Technology blurs the edges of demographics," observes Griffin.

Even before the pandemic, retailers were building customer loyalty through an "omnichannel" approach that linked their stores, websites, social media, and marketing. Technology, says Henderson Engineers' Wol-lum, also provides the data that can provide retailers with valuable insights into how to enhance their in-store and online experiences.

Technology can also provide the means for retailers to step up their games, aesthetically. Recently, Shawmut partnered with the clothing retailer Primark for its first store in Illinois, on Chicago's State Street. The building team installed more than 1,900 lights, including 520 sf of LED panels in a new canopy and vestibule "to bring the façade to life," says Scarpone.

Even as it focuses on touchless solutions, PCL Construction, says Hopfenberg, expects technology's greatest impact on retail to come from augmented and virtual reality, along with automated bar code shopping that tracks that product once it's placed into a customer's basket.+

—John Caulfield, Senior Editor

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# FAÇADE DESIGN FOR COST, PERFORMANCE, AND DELIVERY

## LEARNING OBJECTIVES

After reading this article, you should be able to:

- + **DISCUSS** best practices for communicating and delivering façade designs to clients and partners
- + **SUMMARIZE** the different types of building skins and how they relate to costs
- + **UNDERSTAND** the difference between design-build and design-assist delivery
- + **LIST** the performance and analysis measures required for façades

*David Frey, AIA, LEED BD+C, DBIA, NCARB, is the Technical Principal in HOK's West Coast practice and a member of the firm's Technical Board and Exterior Wall Knowledge group. He is an expert in the design of high-performance building façades and innovative delivery methods. Frey has designed complex skins for buildings around the world.*

**T**he façade is one of the most important factors in shaping the overall aesthetics and performance of a building. At the same time, architects are under pressure to design building envelopes as quickly and inexpensively as possible. This is particularly true within the design-build delivery format. But it also applies to the traditional design-bid-build process, where innovative façade concepts can easily fall victim to value engineering.

How can architects ensure that a building envelope lives up to the aesthetic vision of the project while being cost-effective, high-performing, and quick to design, iterate, and install? Understanding the following concepts can go a long way toward reaching a solution that works for everyone:

- Active client and team communication
- Early façade analysis and modeling

- Choosing a delivery approach
- Selecting the best wall system
- Finding cost savings

### ACTIVE CLIENT AND TEAM COMMUNICATIONS

As clients and project teams meet during pre-design to discuss issues such as programming, sustainability, massing, and orientation, the building envelope isn't always a top priority. Yet just because the façade isn't a focus of these conversations doesn't mean designers should ignore the envelope during the early stages of design. Teams often face the difficult task of conceptualizing the façade simultaneously to concurrently with the development of programming, MEP, and structural system selections.

For this reason, it's important for teams to develop multiple façade design placeholders that can be conveyed to the client as early in the design process as possible. These concepts can then be refined and transformed as more information becomes available.

Clear and open communication during this critical period streamlines what otherwise can be an unwieldy and complex process. This communication should be internal among the team and external with the client and other partners.

Internally, a design team must be on the same page when it comes to the technical and aesthetic aspects of a project and be prepared to quickly vet how design iterations would impact the performance

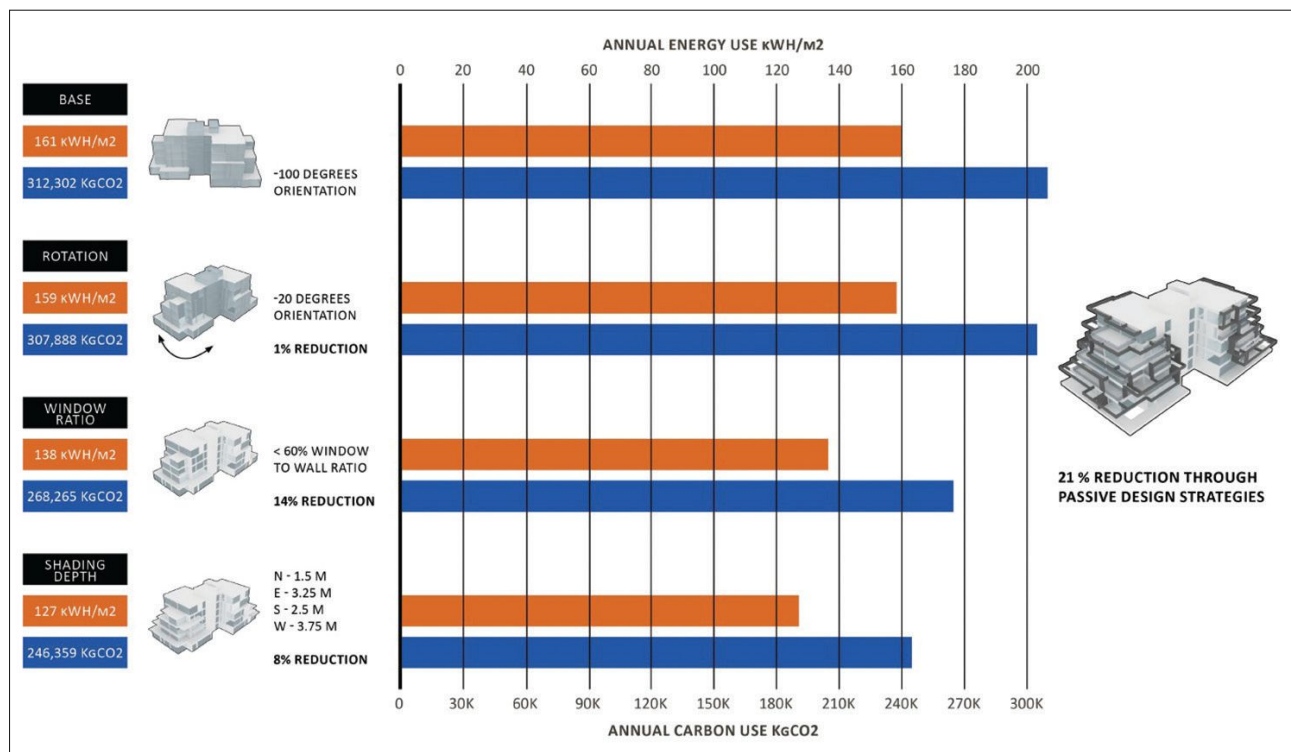
and budget of the building skin. Externally, teams need to be clear about costs and performance and, most importantly, understand how the façade—like the rest of the building—will reflect the client's mission and values. Questions to ask the client include:

- What are keywords that define your business or operation?
- Rank the following values in order of importance: aesthetics, energy performance, construction cost, maintenance and operations, and tenant demand/retention.
- What do you want people to feel and say upon seeing the building? What do you want people to feel and say when using the building?

Once the client's vision and goals are understood, the team can begin the process of developing the design and analyzing how it will affect building use and performance. Follow-up communications with the client will require meetings about the façade's impact on energy use, daylighting, comfort, glare, building size, and costs. While these discussions can lead to design modifications, early modeling and analysis can prevent teams from having to make drastic changes late in the design and documentation process.

**Editor's Note: Additional reading is required for this course. To earn 1.0 AIA CES HSW learning units, study the remainder of the article and take the exam at: [BDCnetwork.com/HOKfacades](http://BDCnetwork.com/HOKfacades).**

**Figure 1: Technical analysis can reveal energy and CO<sub>2</sub> savings based on a combination of building orientation, window-to-wall ratio, and the effective use of exterior fins. Image courtesy of HOK's Sean Quinn.**





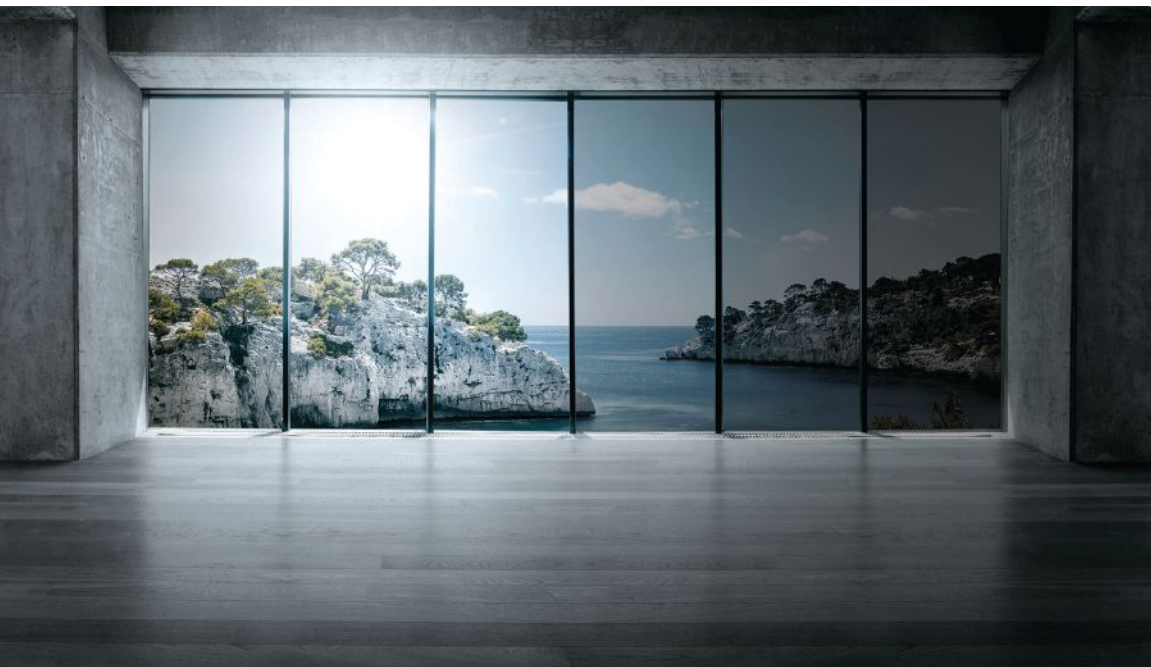
**Banker Wire** introduced Anodized Aluminum, a finish option for its DS-9 wire mesh pattern. The mesh features an opaque-style pattern produced with tooling that consistently crushes the wires before weaving. When the flattened ovals are brought together, they nest perfectly to form a solid sheet of woven wire mesh that can be used for all surfacing applications. Suitable for a variety of applications, including commercial environments, multifamily buildings, private residential projects, and hospitality spaces.

CIRCLE NO. 860



Mills Phenolic No-Site Partitions from **Bradley Corp.** eliminate unpleasant gaps between doors and pilasters for complete privacy. The integral No-Site design is now standard for all Phenolic models. A key feature of the partition system is a rabbeted edge on both the hinge and latch sides of the door. This grooved edge closes off sightlines and provides a flush finish for a European-inspired look. Greenguard Certified as a low-emitting material, phenolic stands up to high usage and wet and humid environments, and is resistant to water, oil, bacteria, and graffiti.

CIRCLE NO. 861



**Viracon** introduced Viracon Plus Smart Glass powered by Halio, self-tinting smart glass that incorporates Halio's electrochromic technology into Viracon's insulated glass units. The system employs proprietary, cloud-based controls combined with IoT sensors and a rooftop skycam to precisely adjust tint levels based on changing conditions. Viracon Plus Smart Glass is the first product to emerge from Viracon's Viracon Plus strategic partnership program, which was created to develop new architectural glass technologies and bring those technologies to market faster.

CIRCLE NO. 862



**Chemetal's** interior metal wall panels are now available in thicker metal options with its new Surface Mode collection. The company uses ALU metals—aluminums finished with an ambient industrial black—overlaid with CNC-carved designs to create distinctive wall panels in neutral shades of black. Surface Mode panels are .09-inch thick and do not require a wood panel backer like MDF, which can speed installation. The line includes 14 designs, all in 4x8-foot panels. CIRCLE NO. 863



**Birdair's** TensoSky ETFE Film is a durable, transparent, lightweight alternative to glass for traditional skylight applications, long-span structures, and building façades. The film has a density of just 1.012 oz. per cubic inch and a low coefficient of friction of its surface, which prevents dust and dirt from sticking to the surface. Highly transparent (90-95 percent), TensoSky does not discolor, degrade, or structurally weaken over time. It can be applied in a single-layered form and is reinforced with either wire cables, lightweight steel, or aluminum to maintain its shape and stability. CIRCLE NO. 864



**ASI | Architectural Systems** has unveiled Structura Ceiling Tiles, a collection of 12 decorative tiles available in a range of finishing options. The tiles are lightweight, thin, durable, and scratch-resistant, with a Tuffcoat finish. Available in dimensional, textured, and acoustical/perforated patterns in 2x2- and 2x4-foot sizes. The ceiling tiles can be easily cut to size with a razor knife, scissors, saw blades, or drilling tools for thermoplastics. CIRCLE NO. 865



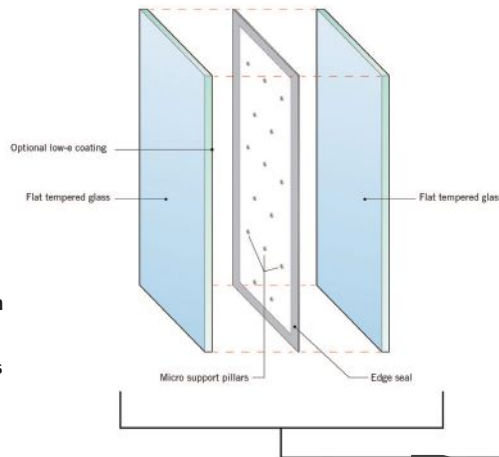
**E-Screen** from **ClarkDietrich** is a new polypropylene entangled mesh rain screen drainage mat designed for areas of the country that now require additional drainage due to excessive moisture. It complies with recent changes to the International Building Code relating to water resistive barriers and lathing and furring for stucco. It features a two-ply design that deflects mortar when used in stucco or stone veneer installations. Available in 6mm and 10mm sizes. CIRCLE NO. 866



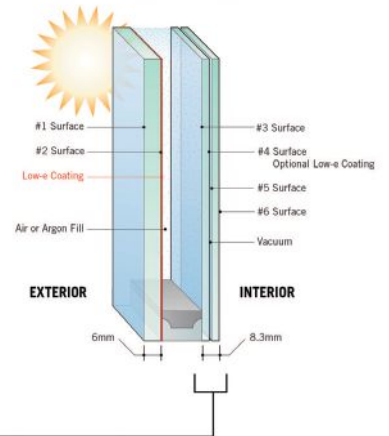
To meet growing demand for stylish glass writing boards, wall panels, and mobile panels, ACCO Brands launched **Arden Studio**, a design-focused manufacturer of custom glass systems for interior environments. The company offers infinite combinations of colors, sizes, and printing options with glass systems that are easy to clean and disinfect, movable, and customizable to fit any space. Its systems meet rigorous environmental standards, including UL Greenguard Gold certification. CIRCLE NO. 867

**Vitro Architectural Glass** has reached an agreement with LandGlass and VIG Technologies to sell their tempered vacuum insulating glass (VIG) products in North America. Available this fall, the new 8.3mm tempered VIG units consist of two fully tempered lites of glass separated by a non-lead metal seal and a vacuum space. The inclusion of fully tempered glass enables the LandVac VIG unit to be used globally across indoor and outdoor temperature extremes, which can cause failures in non-tempered VIG units. The VIG units deliver an R-value of 14, which is closer to the R-value of a traditional wall than glass. CIRCLE NO. 868

VIG Insulating Glass Unit



Hybrid VIG Insulating Glass Unit



**Georgia-Pacific's** new DensDefy Liquid Barrier is a fluid-applied air- and water-resistive barrier that produces a seamless,



durable membrane on exterior gypsum sheathing, wood sheathing, CMU, and concrete walls. The barrier can be paired with the company's DensElement Barrier System and ForceField Weather Barrier to provide a durable WRB-AB system across multiple substrates. The single-component, monolithic, elastomeric, STP-based barrier cures quickly, even in wet conditions, and is vapor permeable, meaning it allows damp surfaces to dry. CIRCLE NO. 869



The LRTH-DFX recessed architectural luminaire from **Viscor** features UVA technology to help disinfect occupied spaces such as office areas, retail stores, schools, hospitals, nursing homes, and fitness centers—without requiring occupants to leave spaces. CIRCLE NO. 870



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Fabcon USA*.....	51	773	Typar Housewrap.....	6	753
Freud Tool.....	47	761	Unilock Group of Companies.....	BC	767
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Gyms for Dogs.....	50	772	Viracon.....	33, 35	763, 764
IRE.....	43	770	Vitro Architectural Glass (Formerly PPG Glass).....	19	760
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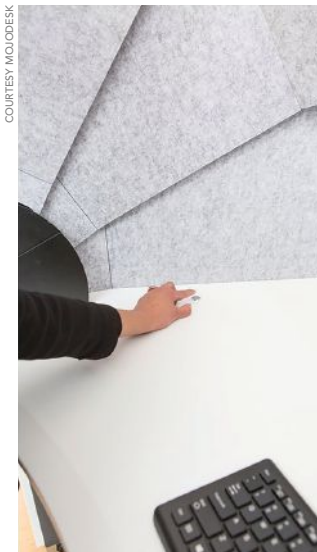
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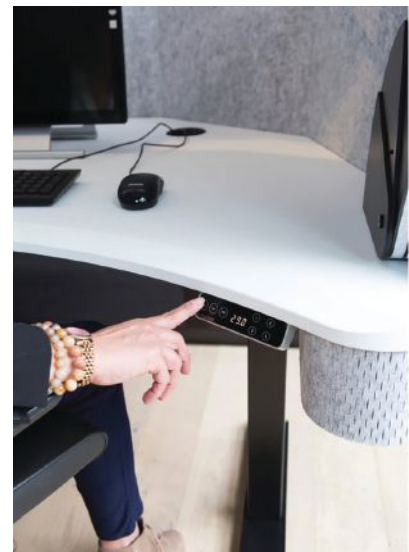
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# MOJODOME: A NEW SOLUTION FOR MANAGING OPEN OFFICE DISTRACTIONS

This adjustable desk allows for a private workspace while also maintaining a collaborative environment.



The desk features a privacy dome that can also be raised or lowered at the touch of a button. The dome can adjust from fully overhead, to partially raised, to a simple panel divider.



**MOJODOME, THE NEWEST OFFERING FROM MOJODESK,** is an adjustable privacy pod and standing desk bundle meant to help ease the return of employees to the open office.

With a footprint that is the same as a typical open office desk, the electric sit-to-stand MojoDome doesn't require extra space or buildouts to use. MojoDome can be used for both sitting

and standing and is raised or lowered via a button on the front of the desk. The commercial-grade frame accommodates a height range from 4'11" to 6'6".

The desk features a privacy dome that can also be raised or lowered at the touch of a button. The dome can adjust from fully overhead, to partially raised, to a simple panel divider. When fully raised, the dome offers

a spacious workspace that is lit from overhead with LED lighting. Lighting is turned on and off via a sensor. Touching and holding the sensor allows for the lighting to be dimmed to the user's preference.

When raised, the dome also absorbs sound from going out or coming in to create a more private environment for the single employee and the office at large. The curved acoustical panels eliminate echo for superior sound quality during phone calls and video conferences. In order to achieve this, the dome is made of 12mm, 100% polyester fiber. As each dome absorbs sound, the more Mojodomes an

office has, the quieter the environment will become. The domes also act as a sneeze guard and contribute to office social distancing efforts.

MojoDome is offered in 12 desktop finishes. Each desk is manufactured in MojoDesk's Denver factory with UL Greenguard certified 3D laminate to help contribute to a healthy work environment. A magnetic cable management system helps prevent trip hazards and provides a clean, minimalistic look. Optional upgrades include matching mobile storage cabinets, side tables, and electric solutions.

Pricing for MojoDome starts at \$2,999.

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(Check one box only.)

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- 40  Engineer/Engineering Manager
- 50  Facility, Building, Property or Asset Manager
- 60  Specifications Writer
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- Yes  No

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755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905	915	925	935
756	766	776	786	796	806	816	826	836	846	856	866	876	886	896	906	916	926	936
757	767	777	787	797	807	817	827	837	847	857	867	877	887	897	907	917	927	937
758	768	778	788	798	808	818	828	838	848	858	868	878	888	898	908	918	928	938
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