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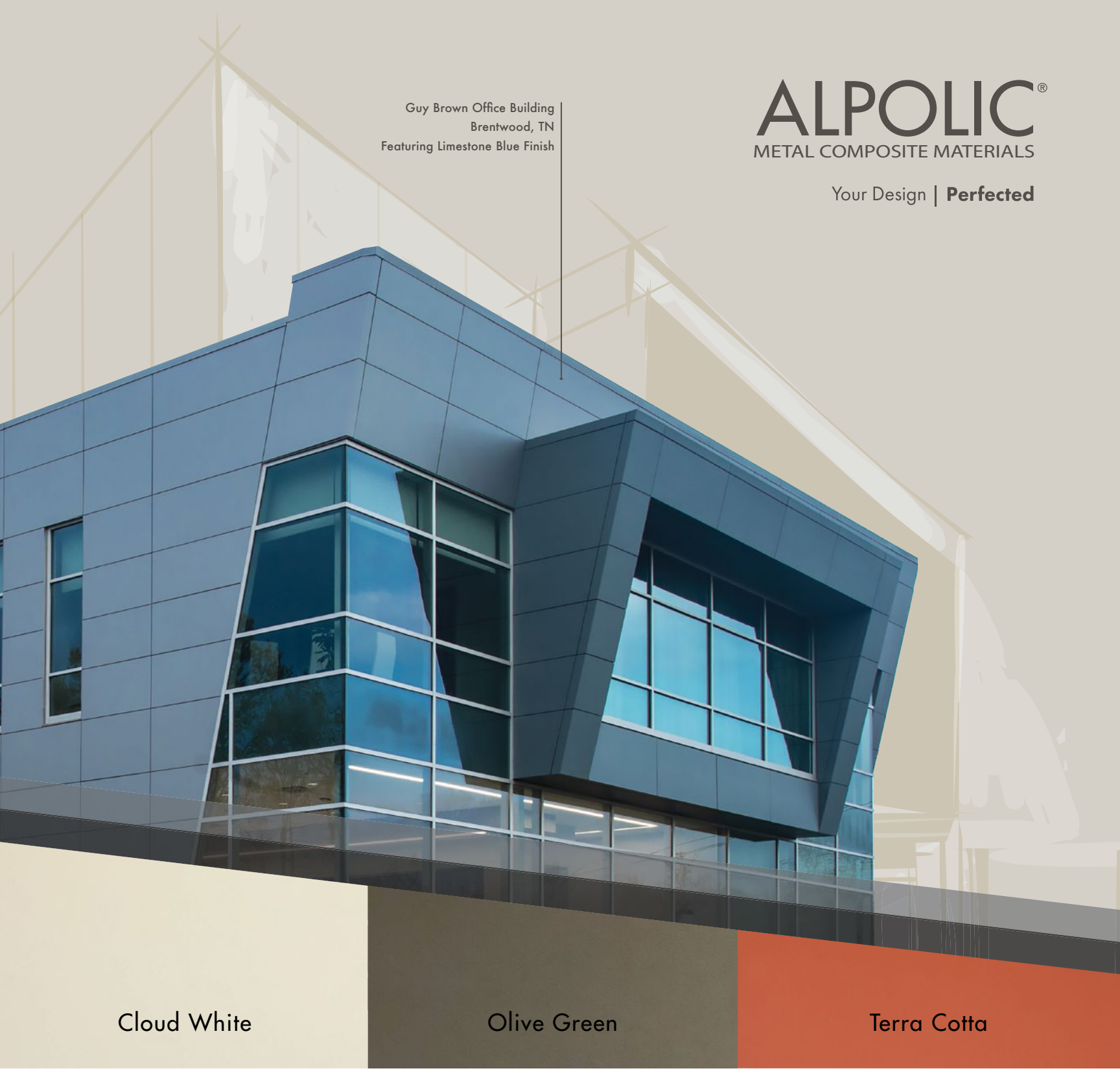

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Volume 109, number 5. May 2020.
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AIA 2020 HONORS

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ARCHITECT

Technology: Invasive Species as a Hot Commodity

TEXT BY TIMOTHY A. SCHULER

Cities from Los Angeles to Boston are mandating zero-carbon footprints for new public buildings. New York is even setting carbon limits on the private sector. Concurrently, designers and manufacturers alike are seeking alternative materials to create buildings and structures for which After Architecture founders Katie MacDonald, ASSOC. AIA, and Kyle Schumann have coined the term "ecology-positive."

The Knoxville, Tenn.–duo has set its sights on a byproduct of sustainable forestry and ecological restoration: invasive plants. In North America, efforts to remove or contain invasive plant species and rehabilitate native ecosystems are often ad hoc, relying on volunteer labor and limited funding. What constitutes an invasive species varies by region. In most cases, they comprise plants that are capable of creating imbalances in local food webs, crowding out indigenous species and reducing overall biodiversity. They also can exacerbate soil erosion, reduce groundwater recharge, and diminish habitat for local wildlife.

By developing architectural uses for nonnative species and timber thinnings—specimens that are strategically removed as part of forest management—MacDonald and Schumann believe the building industry can wean off carbon-intensive materials, such as concrete, steel, and aluminum, while creating mutually beneficial supply chains.

Learning about and working with invasive species may also help architects

Branching Inventory, by University of Tennessee students Tyler Sanford and Kevin Saslawsky

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> *To see more images of projects utilizing invasive tree and plant species, visit bit.ly/ARInvasive.*

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Technology: Invasive Species as a Hot Commodity

shed their tendency to rely on standardized commercial building products, MacDonald says. As design researcher and consultant Oliver J. Curtis writes in "Nominal Versus Actual: A History of the 2×4" (*Harvard Design Magazine*, No. 45), prior to industrialization in the United States, "trees were felled, skidded, sized, and made to order for carpenters. Sizing tolerances varied, thus leaving final measurements to site construction. Trees were grown and used locally."

The emergence of the railroad allowed for transcontinental shipping, driving the desire for smaller, lightweight, kiln-dried lumber, such as the common 2×4, to reduce shipping costs. In response to what Curtis describes as the building industry's "obsessive concern for material efficiency," he suggests that architects should "return to a species-based synthesis of growth, harvest, usage, and aesthetics."

After Architecture is pursuing such a synthesis, which it terms "bioagency," and which Schumann describes as "a collaboration between the designer and the embodied intelligence of the biological material." Bioagency moves beyond biomimicry, which tends to replicate natural forms and processes through mechanical or passive means. "Standardized materials have so much waste and energy embedded in their production," MacDonald says. "We're interested in the alignment of natural form that occurs in plant material and customized form for architectural applications, the idea that there might be a relationship between natural irregularity and a desired irregularity."

Last fall, MacDonald and Schumann led a University of Tennessee, Knoxville studio that explored the use of regional invasive species as building material. Working with experts to identify the most widespread and destructive nonnative species, their students developed fabrication techniques and structural systems that take advantage of the plants' behavioral, chemical, and aesthetic properties—or what Schumann refers to as their "embodied intelligence."

> "Standardized materials have so much waste and energy embedded in their production."
>
> —Katie MacDonald, ASSOC. AIA, co-founder, After Architecture

For their project Branching Inventory, UT students Tyler Sanford, ASSOC. AIA, and Kevin Saslawsky harvested and 3D-scanned the fallen branches of Bradford pear trees, a nonnative ornamental species whose weak forks make them prone to abruptly shedding their limbs. After organizing the branches by size and shape with custom computational tools, they developed a lattice-like architectural system. "Natural branch curvature is matched to the curves of the designed model," the students note in their project statement, "and thicker, stronger branches are located near the base of the assembly." Steel knife plates connect the small-diameter members of the 9-foot-tall, 25-foot-wide assembly, which the students erected on campus.

Rony Feghaly, Yegi Rahbari, and Courtney St. John augmented bamboo to create Reflex, a responsive sculpture installed along a busy walkway on the UT campus. First, they made kerf cuts into 7- to 12-foot-tall bamboo poles, rendering them flexible. Then, they anchored the poles into concrete footings, arranged them by height, and wired them together. When a sensor detects people moving nearby, a motor winds the wire, bending the poles in succession and creating an ephemeral arcade.

MacDonald and Schumann are planning to construct Homegrown, a 17-foot-tall, 13-foot-square pavilion constructed entirely using panels made of fibers from kudzu and bamboo plants. (The project is postponed due to the COVID-19 pandemic.) The panels take advantage of the natural mechanical performance and light weight of the plants' fibers. From the outside, the surfaces look flat, angular, and solid. From the inside, the panels' porosity is revealed along with their organic curves, molded with the help of a reusable pneumatic forming system.

Achieving Scale

Pavilions and small-scale installations cannot disrupt building supply chains alone, but they can have an outsize impact on public awareness. In Hawaii, for instance, invasive albizia trees are now sought after as a building material thanks to a recent demonstration project.

Albizia trees were introduced to the Hawaiian Islands in 1917 as a part of reforestation efforts. But the trees soon outcompeted slower-growing native trees and altered the forest's soil chemistry, further disadvantaging native species. Like Bradford pear trees, albizia are also prone to shedding branches without warning, leading many people to assume that the wood was weak and had little commercial value.

In 2016, Joey Valenti, then a doctoral student at the University of Hawaii at Mānoa School of Architecture, created the Albizia Project, a supply chain that seeks to reduce the island's housing costs and to fund future forest restoration. He designed and built Lika, a 400-square-foot, all-albizia affordable housing prototype. Completed on campus in 2018, the arched structure,

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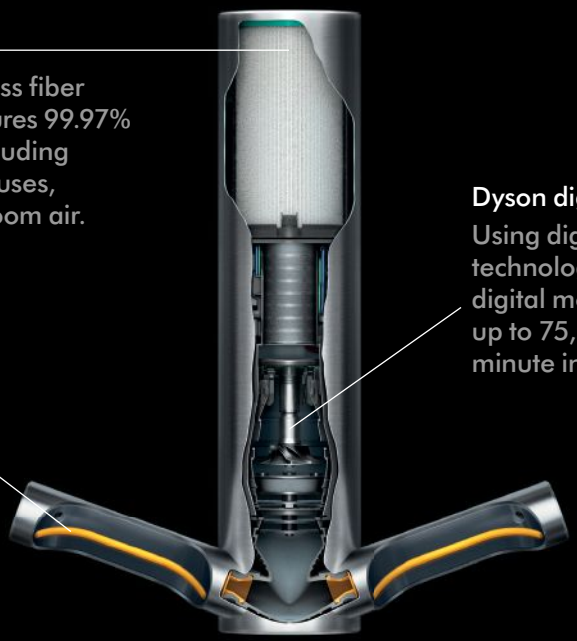

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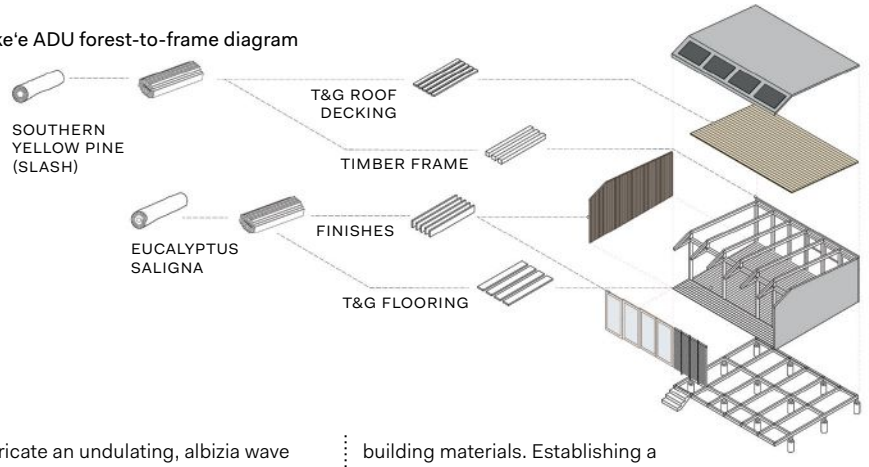
Technology: Invasive Species as a Hot Commodity

Kōkeʻe ADU forest-to-frame diagram



whose design was inspired by Polynesian dwellings, uses glue-laminated albizia members as structure.

Today, demand for albizia wood, once left to rot in the forest or along roadsides, has outstripped supply. "Whatever has reached the sawmills is gone," Valenti says. "It's used in projects."

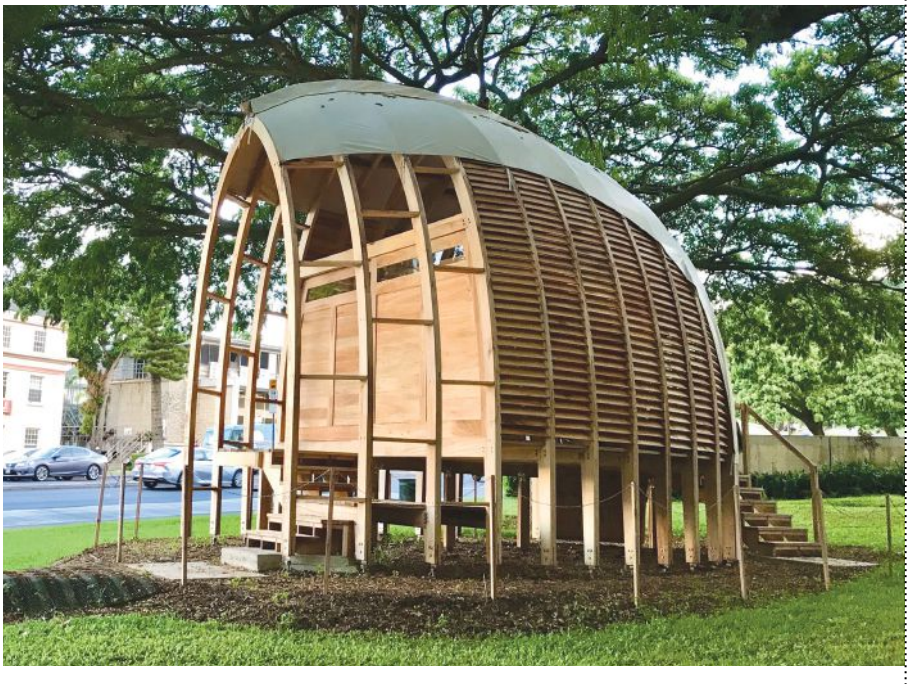
Valenti himself is also in demand, both as a designer and a fabricator. For the new headquarters of Hawaii's Elemental Excelerator business incubator, Valenti worked with Dean Sakamoto Architects to design and fabricate an undulating, albizia wave ceiling. More than 500 board feet of albizia was CNC-milled into a series of 11-foot-long fins, forming a rippling, woven pattern. For the local nonprofit Purple Maiʻa, Valenti is using albizia for interior screens and the frames of modern Shoji doors. Other designers in Hawaii have begun specifying albizia too. "This is just the beginning of an emerging market," Valenti says.

Still, albizia and other invasive tree species are far from displacing Douglas fir and Southern yellow pine as common building materials. Establishing a supply chain is a logistical, economical, and bureaucratic challenge, requiring the alignment of public agencies and industries such as forestry, shipping, and construction. Alongside his work on the Albizia Project, Valenti is coordinator of the Hawaii Wood Utilization Team, formed in 2018 after the state received a $250,000 Wood Innovations Grant from the U.S. Forest Service to further develop the market for local timber.

The team is planning to construct Kōkeʻe ADU, a 400-square-foot accessory dwelling unit built from nonnative trees—in this case, eucalyptus and loblolly pine planted for erosion control on Kauai in the 1960s and 1970s. The ADU is an experiment in what Valenti calls "forest-to-frame," or using invasive or unwanted woods for every part of a structural system. But without an existing logging industry on the island, necessary infrastructure is limited.

The Kōkeʻe Timber Management Area, located on the west side of Kauai, currently contains 1,760 acres—and 3.25 million net cubic feet—of nonnative eucalyptus and pine forest, enough to build 1,200 houses. Harvesting the trees is a priority for Hawaii's Department of Land and Natural Resources, which wants to encourage native species and reduce the risk of wildfire. But roads near Kōkeʻe are narrow and ill-suited to harvesting operations, and only a handful of companies on the island are capable of logging and milling the wood.

Furthermore, Hawaii has no one to



Lika, designed and built by Albizia Project founder Joseph Valenti

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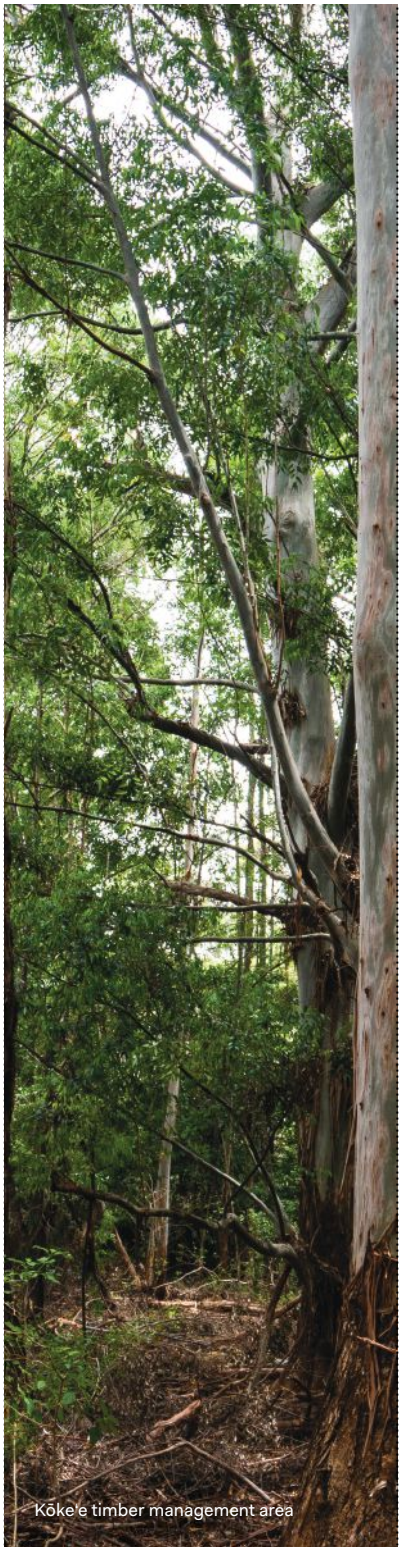
Technology: Invasive Species as a Hot Commodity

grade the lumber. Local building codes require that wood products be visually or mechanically graded to ensure quality; without a grade, lumber milled at Kōkeʻe wouldn't be permitted for building projects. (The ADU is considered a demonstration project.) Similar challenges exist for bringing albizia to market as a structural material.

These challenges are not insurmountable, says Amelia Baxter, CEO of WholeTrees in Madison, Wis. The company, which Baxter co-founded with Roald Gundersen, AIA, in 2007, provides unmilled timbers culled from managed forests for structural use. According to the company, whole timbers are 50% stronger than the largest wood member milled from the same tree—and they sequester twice as much carbon.

"Whole timbers are the original mass timber," Baxter says. Standard mass timber products such as CLT, she adds, typically require a "predictable, non-variable tree, meaning monocropped agriculture, so it still points to a paradigm of mining an agricultural resource."

The small- to medium-diameter trees that Whole Trees sources come from forest thinnings, which not only maximize the growth of the remaining trees, thus increasing profits for landowners, but also enhance biodiversity and wildlife habitat and may reduce the likelihood of wildfires. WholeTrees has coordinated with public agencies, like the Wisconsin Department of Natural Resources, but more often works with private forest owners.



Kōkeʻe timber management area

The company uses its 3D scanning technology to inventory trees slated for removal on project sites, choreographing their reuse with local sawmills, and maintains an online database of its inventory, as well as a CAD library full of beams, columns, trusses, assemblies, and connections in order to simplify the specification process.

The company also employs a Timber Products Inspection–certified grader, who visually inspects the wood in its manufacturing yards, where WholeTrees peels, sands, and finishes the wood with a nontoxic sealant. For timber fabricated out of state, the company contracts with a TPI grader near the project site. Baxter is working toward getting her products machine-stress-rated, which is how glulam and dimensional lumber is graded. She says mechanical rating is both more efficient and more accurate.

Because WholeTrees' timbers are minimally processed, their embodied energy is low and innate strength preserved. In a way, it's bioagency in action. Baxter expects the demand for whole timbers to grow with design tools such as the Embodied Carbon in Construction Calculator. "If architects have a database directing them to the cleanest, greenest materials," she says, "that's free advertisement for carbon-neutral or -negative materials like regional timber thinnings."

And yet the history of the 2×4—and of most building materials—is a reminder that market dominance results from myriad factors. A cost-competitive, reliable supply chain of building materials from invasive or unwanted woods will require the close coordination of product suppliers, forest owners, industry associations, regulatory agencies, contractors, and design professionals.

But it can happen. The principals of After Architecture point to mass timber as the result of exactly that level of coordination, especially in the Pacific Northwest, but also in states like Arkansas, where building codes have

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"It's exciting to see the alignment between government, industry, and design professions in promoting and developing a space in which mass timber construction is viable," MacDonald says. "That's a precedent for the type of work that we're doing."

The Invasive Supply Chain

Looking ahead, the best-case scenario for these symbiotic supply chains differs depending on the material. For business models that rely on byproducts of sustainable forest management, such as that of WholeTrees, developing a long-term supply chain makes sense because raw material will be available as long as economic and environmental incentives to manage forests through thinning exist.

Building a supply chain for an invasive species is more difficult: Some conservationists worry that creating a market for an invasive species might lead to its cultivation. One potential solution is to design temporality into the supply chain. In Hawaii, for instance, some forestry experts are working with product suppliers to develop a succession plan for transitioning to other unwanted tree species.

In any case, using invasive species in construction will require close coordination among agencies that oversee natural resources, utilize technology to monitor local ground conditions, and facilitate material selection. Most of all, it will take continued work and creative thinking. Buildings can be net-positive for planetary health and biodiversity, but only if the environmental footprint of architectural materials is part of the equation.

Top: WholeTrees supplied 13 tree columns to Blakeley Elementary, in Bainbridge Island, Wash., designed by Mithun.

Above: WholeTrees' 3D scanning facility

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Opinion: In Pursuit of an Architecture for Everyone

TEXT BY ANGELA BROOKS, FAIA

Today, our vulnerable populations are most at risk from the COVID-19 pandemic. Low-paid service workers and the homeless are often unable to maintain a healthy social distance from others, much less have the capacity to self-quarantine. They, like everyone else, need adequate housing to keep themselves and their greater communities safe.

Because housing is not seen as a basic right guaranteed by the U.S. government, affordable housing—defined as costing less than 30% of household income—comprises a complicated patchwork of programs that vary widely across states. Inefficiencies in funding mechanisms, building systems, infrastructure, and policy could be improved if a national housing act could be started from scratch.

In the Netherlands, the National Housing Act of 1902 was based on the premise that housing is a shared national responsibility: a right, and not a privilege. Similar legislation in this country could streamline our ability to provide housing for more people and address the inequities remaining from our history of redlining and from lack of social capital, a term coined about two decades ago to describe shared values and fairness of public programs for everyone—not just a few, and not just the wealthy.

Despite what NIMBYists may claim, housing affordability does not lessen the value of neighborhoods. Instead, it strengthens them, as studies by urban planners, social scientists, and nonprofit organizations such as Enterprise Community Partners and the Affordable Housing Design Leadership Institute have shown. Neighborhoods are more resilient when we invest in social capital. If everyone had access to safe and clean shelter, healthy food, local economic opportunities, and quality schools, infrastructure, and services—provisions that benefit everyone—neighborhoods would be more adept in overcoming health crises, natural disasters, and chronic challenges such as air pollution, because people at all income levels could live closer to their work and have better access to critical services, which would improve their health. A healthier and more proximate workforce can better strengthen local businesses and provide a reliable tax base that supports neighborhood schools.

Absent a national housing model, plenty can be done at the local level—though hurdles exist there as well. In Los Angeles, where homeless populations are surging, county and state funding is available to develop affordable housing. However, we cannot build quickly or cheaply enough due to impediments at the policy level. Dense housing is prohibited in the industrial zone of the downtown core and by the abysmally low allowable floor area ratios of every commercial boulevard, thanks to Proposition U, which passed in 1986 and halved the allowable FAR from 3:1 to 1.5:1. Zoning must be changed to incentivize—not prohibit—housing. Affordable housing must be allowed "by-right."

Architects can and should collaborate with planners, city officials, politicians, and policymakers to tailor zoning to new uses and new ways of living. Making connections between disparate elements to create a comprehensive whole is what we do. Design can promote social change.

We can use our talents to show developers and skeptics alike how higher density, reduced parking, and more open space can contribute to complete streets and livable cities. We can collaborate with city leaders on demonstration projects and research proposals to solve seemingly intractable problems. Throughout history, successful leaders have shared the common characteristics of empathy, a willingness to take risk, a collaborative spirit, and a respect for humanity.

Ultimately, humanity is our client. Our profession's success depends on our ability to lead on behalf of the greater good and to help those underserved by society. We are stronger—and more relevant—when we are connected to the lives of everyone and the space of the everyday.

Angela Brooks, FAIA, is the managing principal at Brooks + Scarpa Architects, based in Hawthorne, Calif.

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> *To read more opinion pieces by thought leaders in the design community, visit bit.ly/AROpinion.*

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CarbonPositive: Climate and the Coronavirus

TEXT BY EDWARD MAZRIA, FAIA

Where We Are Now

George Price, a physician at the turn of the last century, famously called the 1918–1919 influenza pandemic a "destroyer and teacher." So, what about the COVID-19 pandemic?

COVID-19 is teaching us that planning, preparation, and preventive action are crucial, and that complacency and indifference are dangerous and foolhardy. A delayed response to a pandemic in days and weeks, and to climate change in months and years, have amplifying feedbacks leading to impacts that can spiral out of control.

The U.S. intelligence community warned us in consecutive Worldwide Threat Assessments that such a pandemic was likely, that it was just a question of time before "massive rates of death and disability severely affect the world economy, strain international resources, and increase calls on the United States for support."

Risk Assessment

The February 2018 assessment advised that pathogens such as the MERS coronavirus have pandemic potential, and the World Bank estimated that a severe global pandemic could cost more than $3 trillion—and cause more than 100 million deaths worldwide. Yet, we did not prepare ourselves.

Likewise, the 2019 assessment addressed the threats of climate change in detail: "Climate hazards such as extreme weather, higher temperatures, droughts, floods, wildfires, storms, sea level rise, soil degradation, and acidifying oceans are intensifying, threatening infrastructure, health, and water and food security."

Climate change has been a visible concern of U.S. intelligence since at least 2008. Yet many politicians and special interests, seeking to avoid or minimize the systemic changes necessary to address this threat, have labeled climate science as "alarmist."

> "We've grown complacent about the future impacts of our current actions."

Today, we have unprecedented scientific knowledge to predict disasters as well as the technology and capacity to effectively address them, yet we've grown complacent about the future impacts of our current actions. We rush to prioritize and mobilize our resources once a crisis strikes, then scale back and return to complacency when it subsides, all at a terrible cost of human life and suffering, and economic and environmental well-being.

With the consequences of insufficient planning and inaction on the COVID-19 pandemic becoming evident, it is clear that we must immediately accelerate our efforts to tackle the serious challenge of climate change.

Make no mistake: The obligation to act, to successfully address climate change, falls squarely on us—the architecture, planning, and building community—as we are responsible for the majority of global CO_2 emissions. Countries will not act unless they see a credible way forward, and we provide that way.

How We Do It

To maintain a high probability of limiting warming to 1.5 C above preindustrial levels, humanity must limit its total emissions to a "carbon budget" of about 340 gigatons of CO_2 beginning this year. The numbers may be abstract, but the implications are firm:

We must reduce global CO_2 emissions 50% to 65% by 2030, and reach full decarbonization by 2040.

The road map and vision to systemically address climate change and meet the 1.5 C targets were the subject of CarbonPositive'20, a conference that Architecture 2030 organized with ARCHITECT in Los Angeles in early March, just before the terrible scope of the COVID-19 crisis became evident. The sessions will come online soon as free distance learning opportunities.

So, as we face these challenging times, let's remember to work together to create a bright future.

Edward Mazria, FAIA, is founder and CEO of Architecture 2030. This article is the first in a series he is writing for ARCHITECT on decarbonization.

> *Follow the series online at architectmagazine.com/carbon-positive.*

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The Rules: OSHA Regulations and COVID-19

TEXT BY TERRI PETERS

In the U.S., one in five workplace deaths occurs in the construction industry, with the so-called "fatal four"—falls, electrocution, being struck by an object, and being caught in or between objects—causing more than half of these fatalities, according to the U.S. Bureau of Labor Statistics.

The COVID-19 pandemic presents an additional risk for the building profession as many states and jurisdictions continue to deem construction an essential service. Health and safety are rightfully top of mind as people who must often work alongside each other also need to practice safe social distancing. National and state requirements for workplace safety and health regulations offer special protections for employees in health care and other service industries, but what protections exist for architects conducting fieldwork and visiting construction sites? And what about the workers executing their designs?

The Occupational Safety and Health Administration (OSHA) regulations were first created in 1971 to ensure that all employers who are liable for their employees, regardless of the work setting—such as an office, a construction site, or a factory—maintain a safe environment for those employees. (OSHA, the agency itself, is part of the U.S. Department of Labor and focuses on enforcement and regulations, which means its officers inspect work sites and can issue citations.) OSHA regulations specify standards for many workplace activities, including trenching and excavation, machine safeguarding, and material abatement. OSHA does not, however, specifically address work standards during a pandemic, such as that caused by the novel coronavirus.

"I've been getting calls from those in the building industry about OSHA and COVID-19," says Steven L. Nelson, an OSHA attorney based in the Milwaukee office of von Briesen & Roper, "but [OSHA] does not specify safety requirements on construction sites for contagious diseases like the common cold or flu, or even serious ones like COVID-19." However, he continues, OSHA does, on its website, advise employers to follow the Centers for Disease Control and Prevention guidelines and educate their employees about safe social distancing, frequent hand-washing, and self-policing of their own health.

Under OSHA, Nelson says, architects visiting jobsites are typically not responsible "for the welfare of construction workers or even themselves" when the general contractor or project owner—not the architect—is contractually in control of the means or methods of construction. That is, an OSHA inspector would not cite an architect for any breach of OSHA regulations; rather, the infraction would be handed to the contractor.

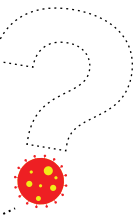
When working with design-build contracts, architects should be aware that if they are responsible for the means or methods, they would be cited under OSHA. "If the designer is also the builder," Nelson says, "they will be cited as the builder, and not as the design professional."

Regardless of the project delivery method, architects are responsible for following safety and health procedures and instructions on-site, including wearing personal protective equipment and understanding who is responsible for what areas in any workplace.

Though OSHA doesn't require it, AIA does recommend architecture firms formalize a safety plan that details employees' responsibilities and rights, as well as risks that they may encounter during site visits. A safety plan helps ensure that employees know to request and take heed of safety briefings and training on-site, and to be aware of and understand an owner's or contractor's safety plans. Architects should leave a construction site if they feel unsafe due to hazardous conditions.

Even when working remotely, architects should learn about risk and liability, including safe work environments, cybersecurity issues, and insurance considerations, including security and theft.

And, finally, pandemic or not, architects should speak up to whomever is in authority if they think people are at risk, not just because of OSHA, but out of general concern for the team.



> *To read more of The Rules, a monthly series covering important regulations in a clear manner, visit bit.ly/ARtheRules.*

ARCHITECT
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Next Progressives: SomePeople

EDITED BY KATHARINE KEANE

Location:
Brooklyn, N.Y.

Year founded:
2018

Firm leadership:
Kiki Goti

Education:
Diploma of Architecture, Aristotle University of Thessaloniki, in Greece; M.S., University of Stuttgart, Institute of Computation Design and Construction

Firm size:
Two

Origin of firm name:
As a reaction to the starchitects of the last decades, I definitely did not want to use my own name for the firm. The work of SomePeople does not have a signature style coming from a mastermind; rather, it is the outcome of the collaboration and synergy among several people who collectively brainstorm and speculate about the process of design and making.

Mission:
We are some curious, creative people who are passionate about architecture and design. We cannot stop wondering how technology changes the spaces we live in. We speculate about the future of design and construction by creating novel tectonic systems that are built by or with computers, machines, and robots. We are excited about exploring new ways of using these tools to enhance human experience, stimulate creativity, and democratize technology in design.

First commission:
Our first commission was Happy Stripe, a winning proposal for a public art competition for downtown Frederick, Md. The challenge for this project was to design a structure that activates the site—an abandoned alley—into a dynamic place of movement. We proposed a linear, playful, steel-framed structure with nylon ropes that is enhanced through augmented reality and acts as a virtual guide for visitors.

Favorite project:
Sky Gazing Tower is a public installation designed for the 2019 Los Angeles Design Festival that addresses the challenges of contemporary global lifestyles, such as social anxiety and agoraphobia, by providing personal space for the public to decompress. The design of this structure derives from 1960s proxemics diagrams that delineate the boundaries of intimate, personal, and social space as offsetting circles around the human body.

With this project, we tried to challenge the universal approach of personal space by creating a virtual reality environment that gives the visitors of the festival the opportunity to virtually modify the structure and define their personal space according to their needs and preferences.

Second favorite project:
Common Matter, our timber structure proposal that emerges from an in situ human-robot collaboration for the 2019 Tallinn Architecture Biennale pavilion in Estonia. Our material system questions the basic typologies of wood construction—surface versus frame tectonics—by creating a skin that acts as façade and structure.

Essential evening routine:
Creating a to-do list for the next day—I can sleep much better afterward.

Skills to master:
Organizing a desktop efficiently

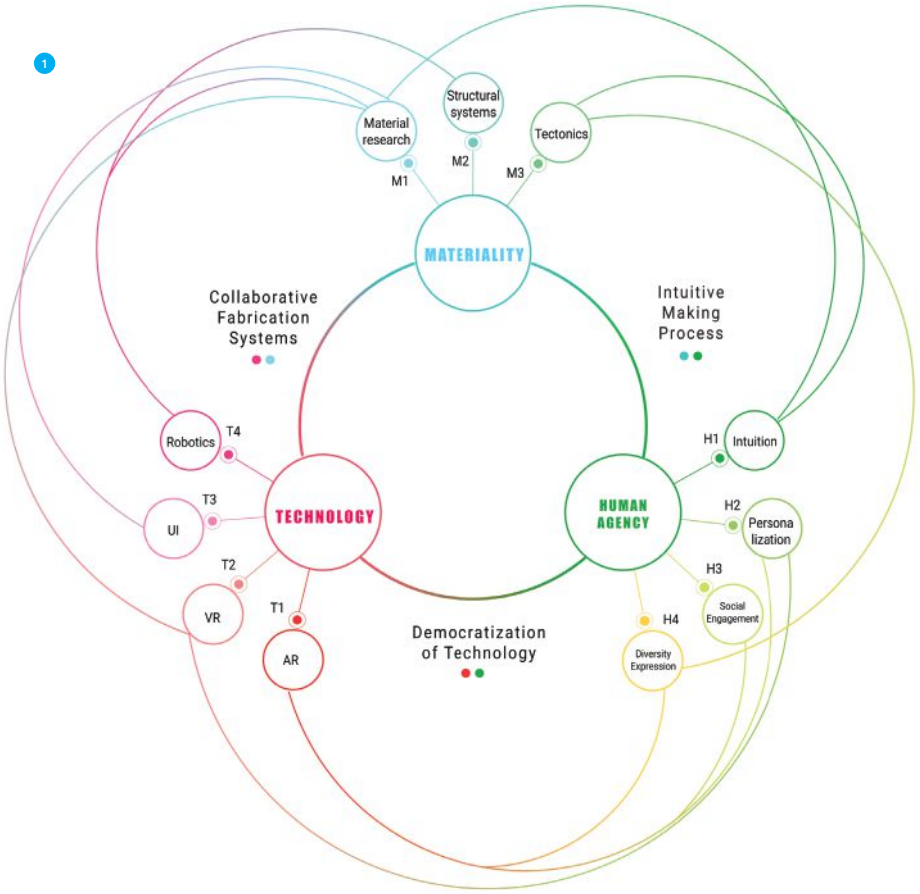
Recent inspiration:
Inflatables in fashion—specifically the balloon dresses by Fredrik Tjærandsen, the inflatable latex trousers by Harikrishnan, and the inflatable puffers by Craig Green for Moncler

COURTESY SOMEPEOPLE

> *For more of SomePeople's work and inspiration, visit bit.ly/ARSomePeople.*

Next Progressives:
SomePeople

1



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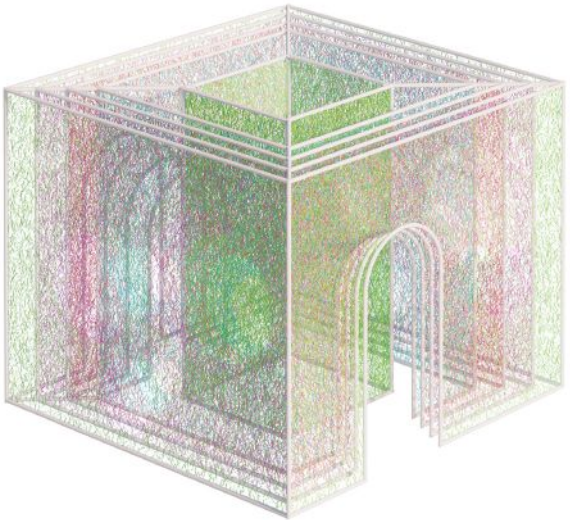
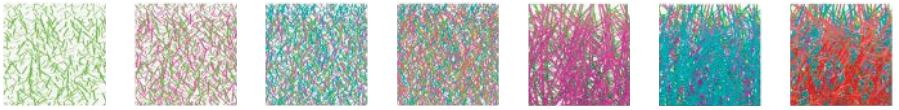
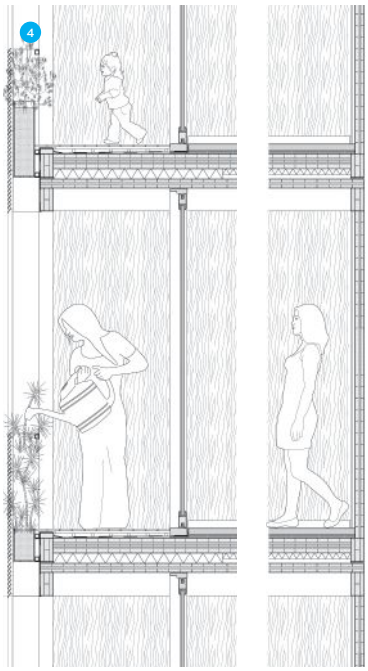




1, 3–6: COURTESY SOMEPEOPLE; 2: PAUL VU



1. SomePeople's work is driven by its "Techno-Pop Architecture: Systems of Technological Inclusion" research, which the firm notes, "explores the potential of using cutting-edge technological tools to achieve a human-centered, socioeconomically sustainable architecture." The practice's resulting projects are thus related to materiality, human agency, and technology. 2. ●●T2,3 ●●●H2–4 Visitors to the Sky Gazing Tower at the 2019 LA Design Festival were able to alter the installation's size, color, and materiality through a VR interface. 3. ●T1 ●M1 ●●H1,3 This pavilion proposal for the Winter Stations competition comprises four steel-framed cubes, each with a fabric overlay of varying colors. Visitors are encouraged to use an AR app when engaging with the space to "watch the texture grow and change colors." 4. ●T2 ●M3 ●●H2,4 SomePeople proposed installing prefabricated cross-laminated timber modules as affordable housing units for the Big Ideas for Small Lots NYC design competition. 5. The firm proposed hosting a live demo for components of the Common Matter pavilion at the Tallinn Architecture Biennale to demystify light construction technologies. 6. ●T1 ●M3 ●●●H2–4 Designed for the 2018 Dezeen x MINI Living Future Urban Home competition, the Personalized Creative Capsules of interconnected modules can track an inhabitant's movement, propose expansion based on their needs, and fabricate new spaces on site.

Residential: Butaro Oncology Support Centre, by MASS Design Group

TEXT BY KATIE GERFEN

A 2017 report from Partners in Health (PIH), the organization behind the Butaro Cancer Center of Excellence (BCCE) in Butaro, Rwanda, says that the outpatient facility has treated an average of 1,700 patients per year since it opened in 2012. For most of these patients, an appointment at the BCCE is not a day trip: They travel from all over the region for treatment, including from surrounding countries such as the Democratic Republic of Congo, South Sudan, and Burundi. A chemotherapy treatment might mean arriving on day one, having a multi-hour infusion on day two, and leaving on day three. A biopsy could add another day, surgery even more; some need to be close by for weeks. "While [the BCCE] was meant to be an outpatient clinic, there were a lot of travel costs that patients were incurring," says Sarah Mohland, a principal at Boston- and Kigali, Rwanda–based MASS Design Group. "The most extreme was lodging near Butaro—there aren't a lot of options." The problem became: Where could PIH house patients?

The solution manifested as the new Butaro Oncology Support Centre, which was designed by MASS and opened last year. MASS, which designed the BCCE, has been collaborating with PIH and the Rwandan Ministry of Health on the Butaro medical complex since the design of the main hospital—which opened in 2011. Given that history, the team knew the support center did not want to be another medical facility: Instead of open wards with lines of

The arches of the Butaro Oncology Support Centre's colonnades lit up at night

COURTESY MASS DESIGN GROUP

Project Credits
Project: Butaro Oncology Support Centre, Butaro, Rwanda
Client: Rwanda Ministry of Health; Partners In Health
Architect/Interior Designer/Landscape Architect/Lighting Designer: MASS Design Group, Kigali, Rwanda, and Boston · Alberto Cumerlato, Kelly Doran, Aziz Farid Shyaka, Sarah Mohland, Christelle Muhimpundu, Brad Pickard, Alan Ricks, AIA, Amani Rwibasira, Jean Paul Sebuyahi, Megan Suau, Theophile Uwayezu, Jean Paul Uzabakiriho (architecture project team); Sierra Bainbridge, Greg Dalke, Jessi Flynn (landscape project team)
Structural/Civil Engineer: MASS Design Group · Louise Foulkes, Zani Gichuki, Rosie Goldrick, Jenny Kay, Harriet Kirk, Shakira Nyiratuza, Obed Sekamana (project team)
MEP Engineer: Elie Carter Ndayizeye
Geotechnical Engineer: Alain Bayavuge
Construction Manager: MASS Design Group
General Contractor: HICE Consult
Size: 750 square meters (8,073 square feet)
Cost: $500,000 (construction); $102,000 (contingency)

> *To see more images of the project, visit bit.ly/ButaroOncologySupportCentre.*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Residential:
MASS Design Group

Public spaces such as a kitchen where patient caretakers can prepare food are concentrated at the east end.

beds, the center is more residential in feel, providing a relaxing environment where patients can live while receiving treatment. Often, patients do not travel alone, but with families or caregivers, all of whom also need housing. Facilities were also needed where patients or caregivers could prepare food.

Practically, the support center needed to be adjacent to the BCCE and accessible, and there the logistical challenges began: The BCCE is on a hill, and the only site that fit the bill for the support center is further down the steep slope. Excavating a series of terraces allowed for a two-story structure to house patients, but leaves the main entrance on the second floor, connected to the BCCE via a bridge.

The structure is built primarily from concrete masonry units on a concrete foundation. On the north façade, which faces a valley, are stacked colonnades with arches formed from locally fired brick. Surfaces are coated in white plaster, making the building stand out in the lush landscape.

The colonnades "create living rooms where patients can convalesce together, looking at the amazing landscape," says MASS founding principal and chief design officer Alan Ricks, AIA. They are articulated to follow the topography of the site, meaning that there are nooks and crannies with wooden chairs and benches that serve as public social areas. But "the way it works in plan, it also really provides a sense of privacy," says design intern Amani Rwibasira,

Section A–A₁

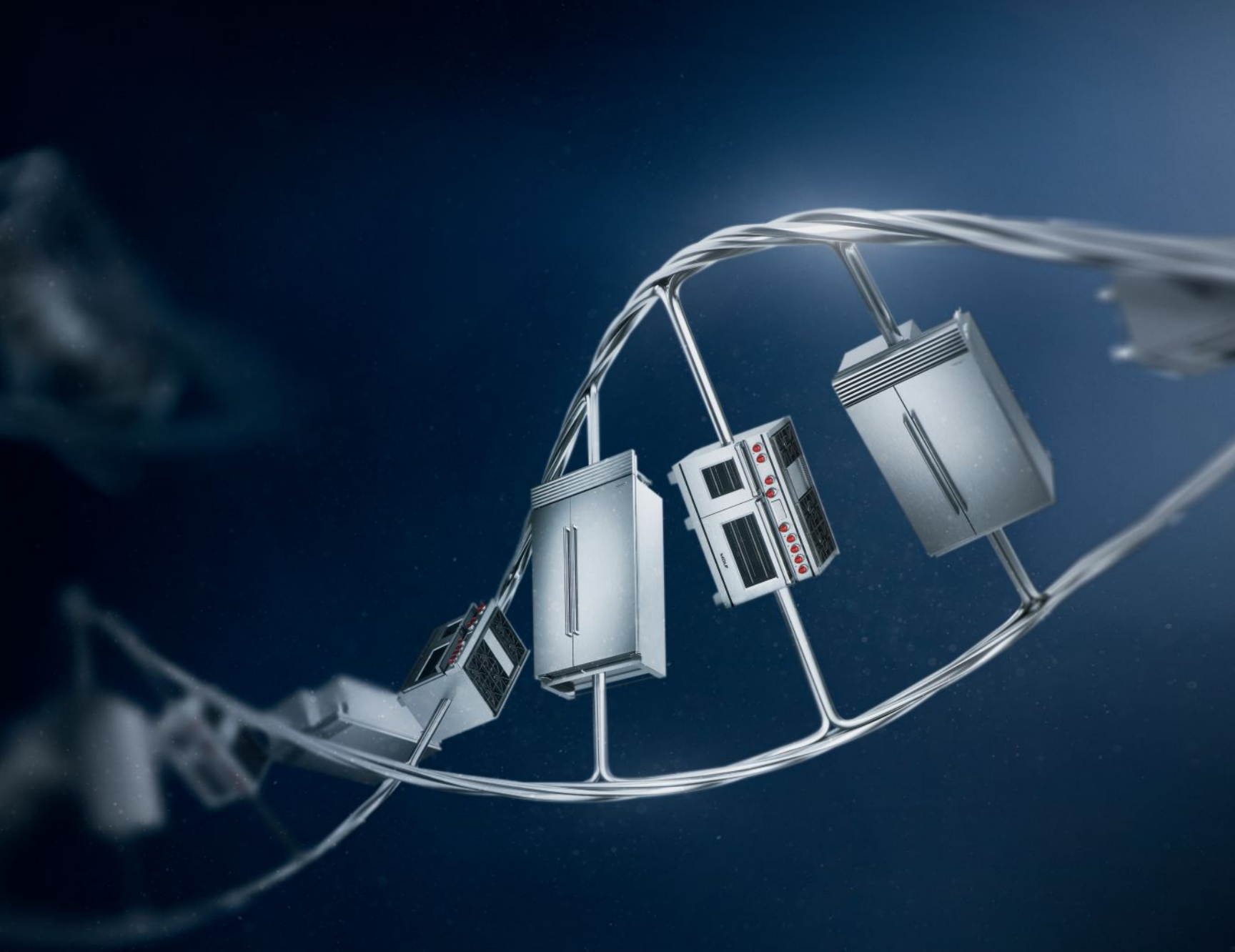
Second-Floor Plan

First-Floor Plan

1. Cooking Area
2. Kitchen
3. Cafeteria
4. Dormitory room
5. Single room
6. Double-occupancy room
7. Bathroom
8. Entry
9. Meeting room
10. Counseling room

0 10 20

COURTESY MASS DESIGN GROUP



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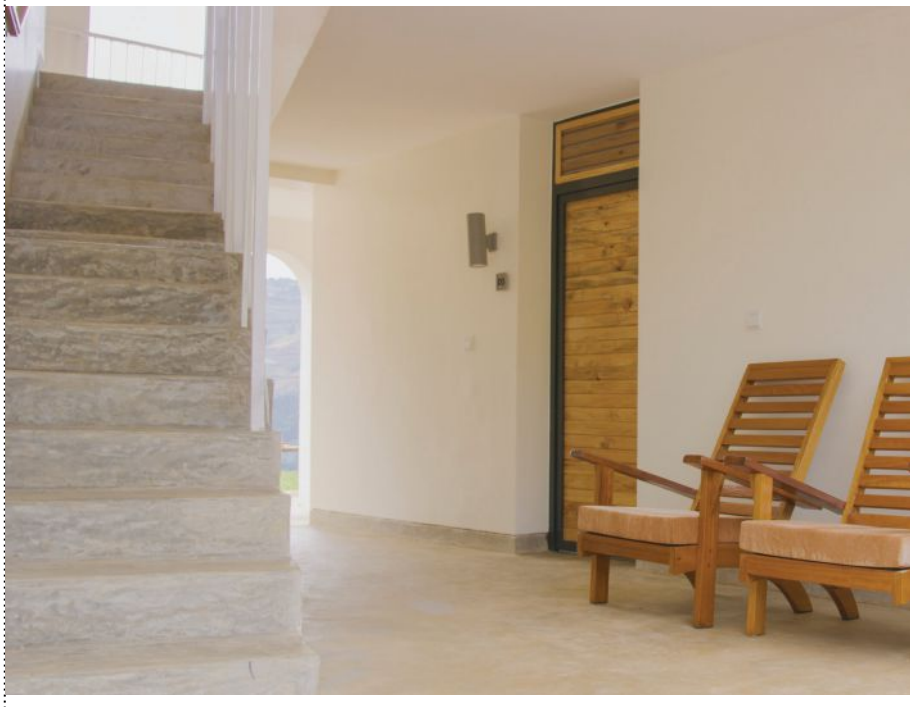
Residential:
MASS Design Group

who traveled each week from Kigali to oversee construction. "There are corners that you can go in and not see people."

The colonnades serve as single-loaded corridors for a row of bedrooms in varying sizes on each floor. "We were trying to maximize the number of patients we could accommodate, but also think about how there could be different family structures or patient needs," Mohland says. Some rooms have a single bunk bed, while others have two or four; there are 72 beds in all.

A thin line of windows runs from floor to ceiling in each room, allowing in light and, more importantly, air, which is exhausted out through louvers over each door. Ventilation is an important part of a strategy to minimize the risk of infection, as many patients are immunocompromised as a result of their treatments. The team looked at the distance between each bed to minimize the chance of particulate transmission and designed low-slope ladders to make it easier for patients, who may have reduced strength, to access the bunks.

Above the first-floor kitchen at the east end of the building is a meeting space and counseling center where patients can receive support about treatments—a social service that didn't have a dedicated venue before. Having returned to see the center in use, Rwibasira reports that the colonnades are full of people relaxing, free from the burden of having to find housing. "I think this project is really going to help patients in their recovery," he says.



Top: The arches were built out of locally fired brick supported on piers of concrete masonry units. The surfaces are covered in white plaster to create an even surface and bounce light into the building.

Above: Louvers in the transom over each bedroom door keep the air moving, which can limit the spread of infection to immunocompromised patients, even without mechanical systems.

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Residential:
MASS Design Group

Right: Dormitory rooms have four locally made bunk beds apiece; double mattresses on the lower bunks allow them to serve as couches during the day.

Below: Seating areas in the colonnade along the west façade feature locally made furniture and are spaced such that family groups can have privacy, or socialize together.

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Typology: FDNY Rescue Company 2, by Studio Gang

TEXT BY CLAY RISEN

Early in the process of designing a new home for Brooklyn's Rescue Company 2, one of the New York City Fire Department (FDNY)'s six elite emergency response teams, Jeanne Gang, FAIA, and her office came to a surprising realization: The urban rescue workers they were dealing with knew almost as much about architecture as they did. "They have to go into all sorts of buildings, often without light," says Gang, whose Chicago-based firm won a competition to design the facility in 2015. "They have this mental picture of all these different styles in their head." That intimate relationship between client and design informed almost every aspect of the building, which was commissioned as part of New York's Project Excellence program and opened in 2019.

The architects asked themselves: How do you build a better firehouse? Gang and her team had done extensive research into, and designed, civic buildings, but they had never designed a firehouse before. They began the design process with lengthy interviews with the firefighters themselves—the architects even went out on an emergency call. "They were so anxious to let us know what they do," Gang says.

The firefighters' top priority for a new facility was that it allow them to conduct training. The city's rescue companies respond to a wide range of emergencies, from burning buildings to overturned boats, and each crewmember has to master a range of skills, from scuba diving to climbing down the side of

TOM HARRIS

The main truck bays take up the bulk of the first floor.

Project Credits
Project: FDNY Rescue Company 2, Brooklyn, N.Y.
Client: FDNY; New York City Department of Design and Construction
Architect: Studio Gang, Chicago and New York · Jeanne Gang, FAIA (founding principal, partner); Weston Walker, AIA (design principal, partner); William Emmick, AIA (principal of design management)
Structural Engineer: Thornton Tomasetti
MEP/FP Engineer and Façade Consultant: ADS Engineers
Civil Engineer: Langan
Construction Manager: The LiRo Group
General Contractor: ZHL Group
Landscape Architect: SCAPE
Lighting Designer: Domingo Gonzalez Associates
Wayfinding: Once-Future Office
Geothermal Consultant: P.W. Grosser Consulting
Cost Estimator: Toscano Clements Taylor
Expeditor: KM Associates of New York
Size: 20,000 square feet
Cost: $32 million

> *For materials and sources information, visit bit.ly/RescueCompany2.*

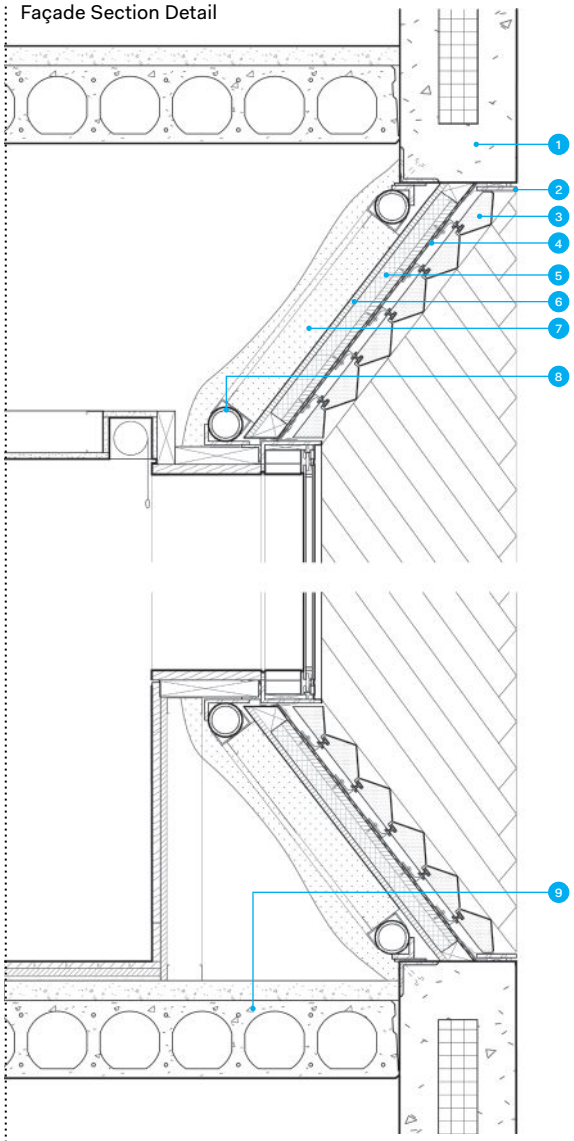
Typology:
Studio Gang

a building. The company's previous firehouse was cramped, antiquated, and the firefighters had to practice where they could—either traveling to northern Manhattan to the city's main training site, or improvising closer to home with empty shipping containers.

Because the new building's usable floor area was limited to just over 20,000 square feet, barely enough space for the crew and its equipment, Studio Gang had to get creative to integrate training facilities as well. And so the firm designed two firehouses in one. The two-story structure does all the work of a standard firehouse. It can hold up to four apparatuses (or, to lay folk, trucks) and house five firefighters and an officer—there's a kitchen and even a pair of classic brass fire poles. But the building is also a Swiss Army knife of training tools. Practically every corner plays double duty. A two-story central atrium brings fresh air and natural light into the truck bay, but its walls are fitted with various window shapes so firefighters can practice rappelling. A trench in the floor opens to simulate a construction-site collapse. Doors at both front and back make it easy to clear out the garage for training drills.

Even the exterior walls, made from precast concrete panels, have tie-offs along their parapets to give the 32-member crew opportunities to develop rope skills. "This little toolbox is about taking an ordinary building and creating opportunities with it," Gang says.

Façade Section Detail



1. Insulated precast panel
2. Steel plate frame
3. Terra cotta baguette
4. Air and moisture barrier
5. Insulation and sheathing panel
6. Fiberglass-mat gypsum wallboard
7. Spray cellulose insulation
8. Steel tube frame
9. 8" hollow-core precast plank

0 6 12"

TOM HARRIS

Red "baguettes" from Boston Valley Terra Cotta frame the windows, doors, and voids of Rescue Company 2.

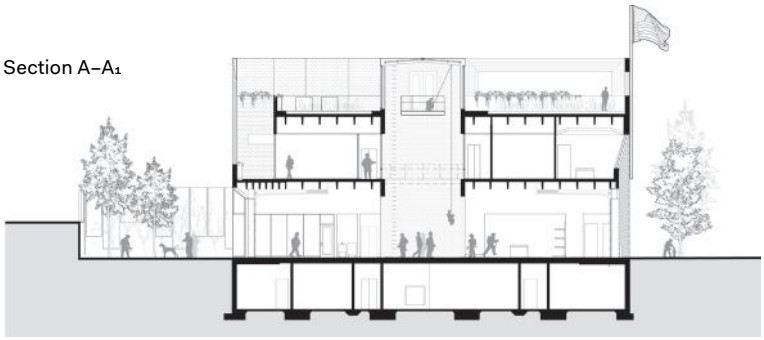
Typology:
Studio Gang

In addition to making the facility doubly useful, Studio Gang made it sustainable—a key mandate of the city's design excellence program. The firehouse sports a green roof, a solar hot-water system, and a geothermal HVAC system. Rainwater is collected in reservoirs for later use; what isn't collected flows into the ground through permeable concrete surrounding the structure.

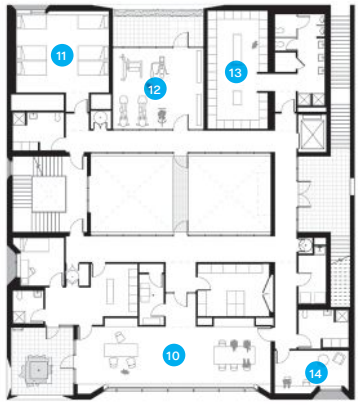
Gang may describe the building as a tool, but she also wanted to make sure it was a home. The kitchen and an attached lounge provide communal recreation space, but they are located next to the garage in case the firefighters get a call during a meal. Company and FDNY memorabilia adorns the walls, and just inside the front door is a memorial that recognizes the many fellow Brooklyn firefighters who died responding to the Sept. 11 attacks.

She also wanted to make sure that it was a part of its community. Firehouses are typically a neighborhood anchor, and Rescue 2 is no different: Located in Brownsville, a lower-income area in central Brooklyn, it sits on a former brownfield site, next to a massive new affordable housing complex. The concrete exterior is punctuated by bright-red terra cotta "baguettes," which surround and accent windows. There's even a street-level bench built into the wall, inviting passersby to engage with the building. "It was important to keep it functional, but to give it a civic presence at the same time," Gang says.

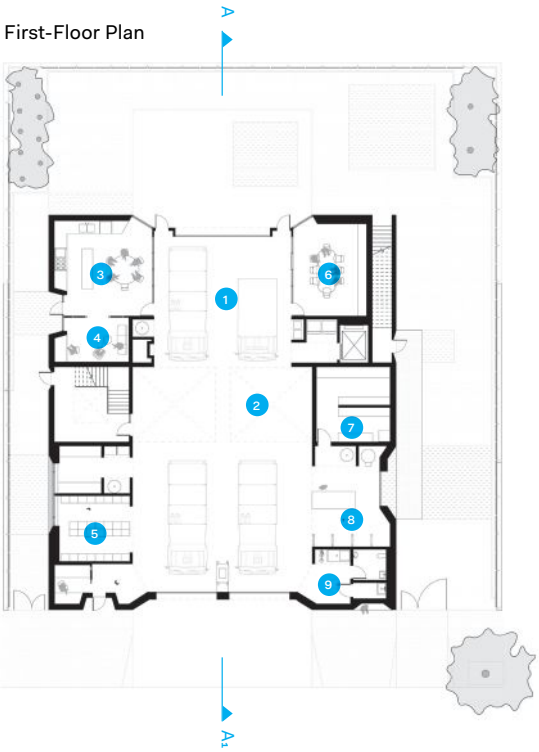
Section A–A₁



Second-Floor Plan



First-Floor Plan



COURTESY STUDIO GANG

1. Truck bay
2. Training tower
3. Kitchen
4. Lounge
5. Bunker gear
6. Conference
7. Tool storage
8. Lumber storage
9. Decontamination area
10. Office
11. Dormitory
12. Gym
13. Locker room
14. Study room

0 10 20

The east façade, seen here from the adjacent neighborhood basketball court, is primarily composed of insulated precast panels from the High Concrete Group.

TOM HARRIS

Typology:
Studio Gang

TOM HARRIS

The voids incorporated into the top of the structure frame an exterior staircase and terraces, and serve as a functional metaphor: They offer spaces for training, while also referencing the fact that firefighters often cut openings into burning buildings so they can rescue occupants and allow smoke to vent.

Typology:
Studio Gang

Right: The east wall in the training tower has integrated tie-offs to allow the firefighters to practice climbing and rappelling. Scuff Master paint ensures durability and TGP fire-rated glazing admits daylight.

Opposite: The truck bay shows off the cast-in-place structure, with concrete from Long Island Concrete.

TOM HARRIS


FIRE DEPARTMENT
CITY OF NEW YORK
RESCUE
FDNY
RESCUE
BROOKLYN

Spring 2020 Product Call Highlights

Selected from 172 submissions to ARCHITECT's second annual Spring Product Call, these 20 products showcase material innovations, timeless forms, and sleek design.

TEXT BY LINDSEY M. ROBERTS

No2 Recycle, Fritz Hansen

Japanese studio Nendo designed this stackable chair—made of upcycled household plastic waste—with a back that mimics the form of a folded piece of paper. Available in seven color options, No2 can be specified with four powder-coated or chrome steel legs, a sledge chromed steel base, or polished aluminum swivel base, and with or without arms. Optional seat cushions come in black, dark gray, and light gray. *fritzhansen.com*

> *For the complete roundup of products, visit bit.ly/ARSpringPC2020.*

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Products:
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Soundscape, Shaw Contract

Carpet isn't the only sound-absorbing option in flooring. This luxury vinyl tile can also soften footfalls with its acoustical backing layer. Finished with a scratch- and abrasion-resistant coating and a clear, anti-aging layer, these planks look like wood, but have an Impact Insulation Class rating of 59—only two points fewer than carpet tile. Available in 6"-by-48" tiles and in 10 colorways, Soundscape can be installed in herringbone, brick, ashlar, stagger, offset, and monolithic configurations. *shawcontract.com*

Celliant, Designtex

Imagine sitting on a chair that increased circulation, improved cellular oxygenation, and helped regulate body temperature—all processes that promote energy, endurance, and comfort. Designtex, in collaboration with Huntington Beach, Calif.–based Hologenix, has made Celliant, an upholstery with fiber technology that incorporates 13 naturally occurring thermoreactive materials. Offered in three fiber options—100% silicone, 100% polyester, and a cotton-polyester mix—Celliant is available in many solid colorways. A fourth, acrylic-polyester mix option, Pennant, is available in a geometric print with six colorways. Celliant comes in standard 52"-wide units and has been approved as a medical device by the FDA. *designtex.com*

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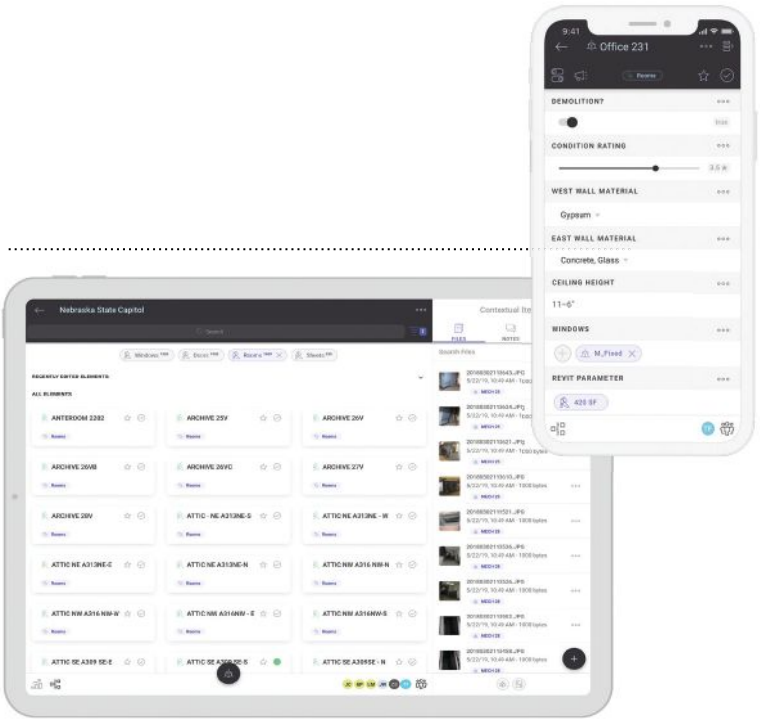

Layer App and Revit Add-In, Layer
Available as an add-in for Autodesk's Revit or as a stand-alone app, this project management platform brings together spreadsheets, folders, emails, and more for building teams to communicate as one. A red-line image markup tool lets AEC professionals edit BIM software models, tracking who made which edits and when. Users can even edit an Autodesk Revit element's parameter and push changes to the model. Meeting notes, photographs, and to-do lists can also be saved. *layer.team*

Seven, Franz Viegener
This faucet runs water through thin, flat-machined bar stock brass for a slim, modern profile softened by the curved edges of the handle and spout. Measuring 7⅛" tall with a 5⅜" spout, Seven can be specified in various polished or matte finishes. *franzviegener.com*

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Infinity I-Series, Fortress Building Products

This composite decking material is 40% lighter than conventional options, resists moisture, and is scratch-resistant. The material also boasts improved heat dissipation and slip- and splinter-resistance. The bamboo pattern is dual-embossed, ensuring that no two boards have the same grain pattern, and comes in four stains. Available in 12'-, 16'-, and 20'-long boards. *fortressbp.com*

Coil Collection, LightArt

In an attempt to address the industrywide question of what manufacturers can do with pre-consumer waste, LightArt and parent company 3form joined forces to design this line of seven pottery-like lighting pendants, produced by 3D printing a resin made of 65% upcycled waste from the company's manufacturing process. Available in heights ranging from 9" to 12", with depths of 8" to 12", the fixtures are available in powder-coated finishes of matte black or white and can be fitted with a dimmable 9W LED. *lightart.com*

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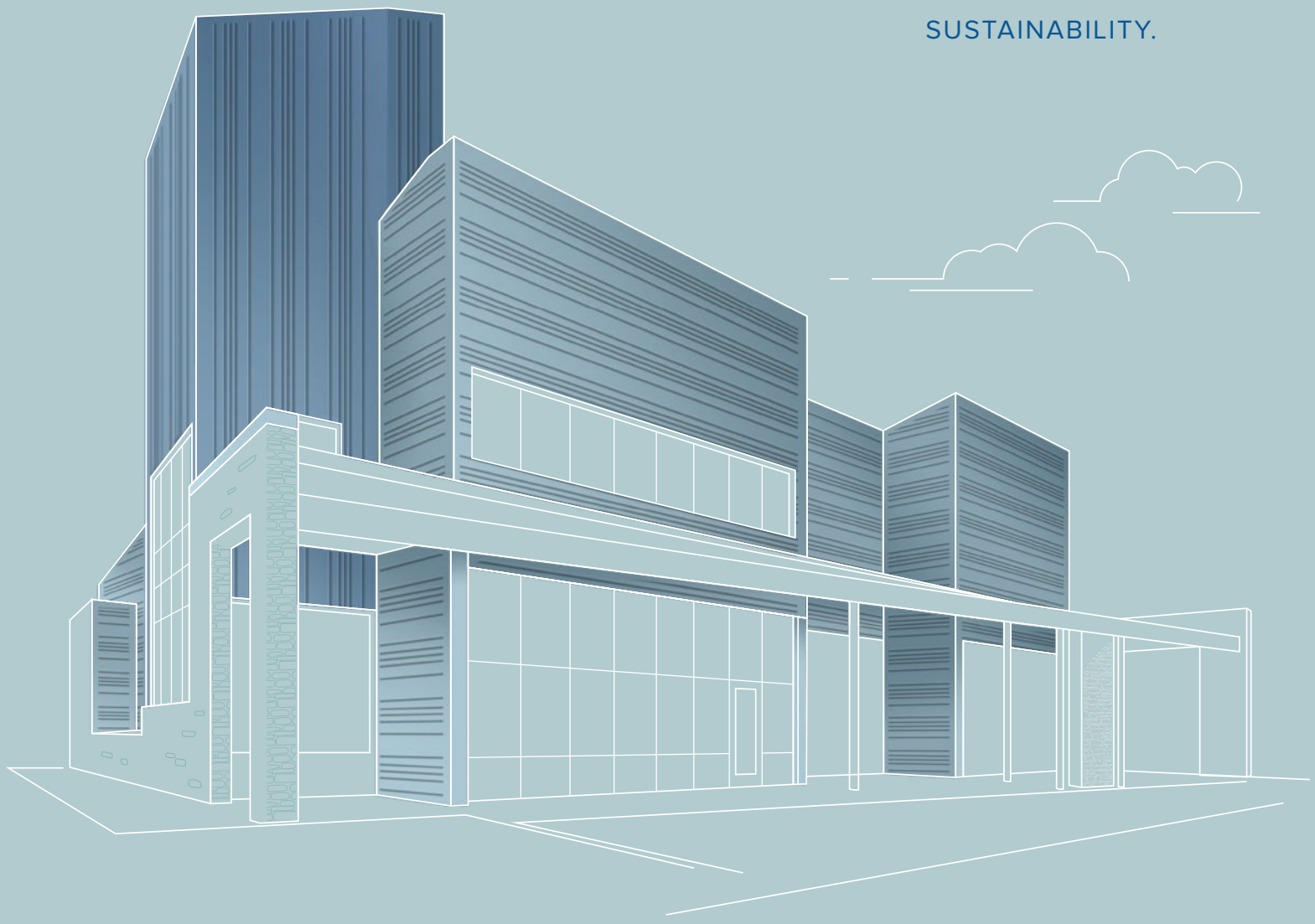

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NY+LON Streets, Interface
Inspired by the streets of London and New York, this line of carpet tile gives new meaning to “street style” with six gritty, geometric patterns named after specific roads. The collection uses 72% post-consumer nylon and is solution-dyed for durability. Available in 19⅞"-square tiles, NY+LON is carbon neutral and recyclable. *interface.com*

HxDR, Hexagon Geosystems
Using data from a library of point clouds and laser and drone scans, this cloud-based platform allows designers to create accurate 3D real-world visualizations of proposed buildings, cities, and landscapes. HxDR features a 3D city catalog and “fly-through” touring capabilities, and it allows users to place CAD or object models in context. In addition to new or infill construction, the subscription-based platform can show 3D renderings of what's left when existing structures are torn down. Optimized for Google Chrome. *hxdr.com*

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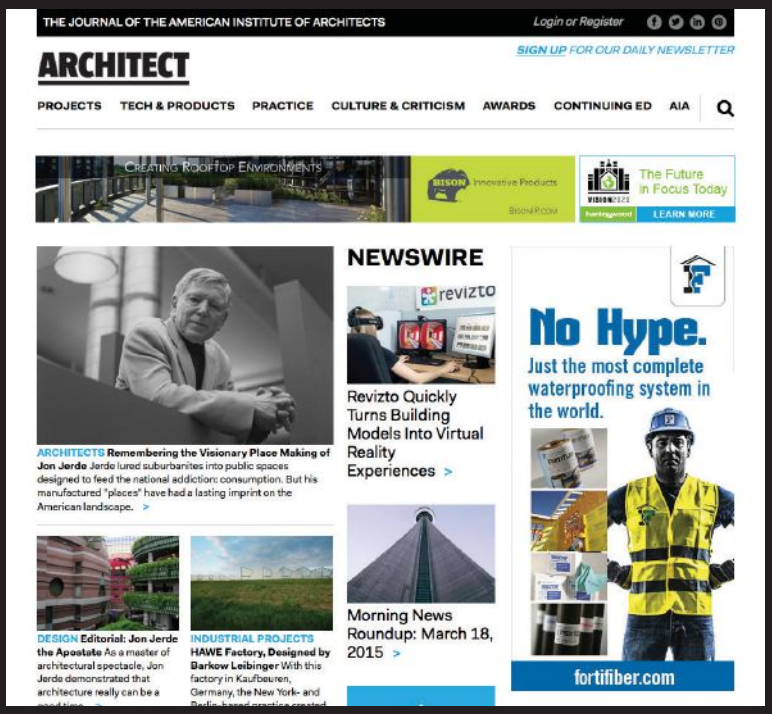

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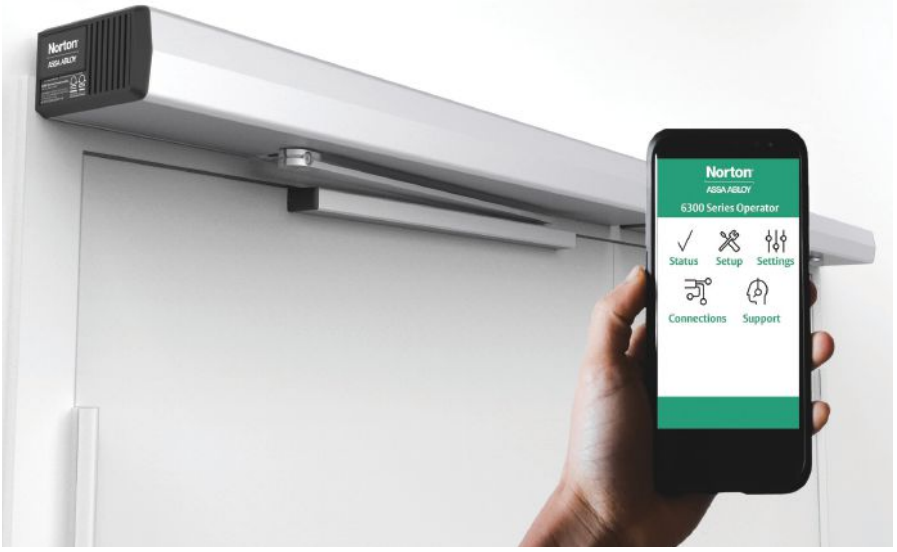
Patina Inline, Cembrit

The Patina Inline is a façade panel with personality. Available in a fiber-cement option with a linear design and contemporary light gray, dark gray, and light tan colors. (A custom square or triangular pattern is also available.) The milled grooves cast shadows over the board that change as the sun moves. The 48"-by-96" and 48"-by-120" panels are maintenance-free and fade over time to acquire a weathered, aged look. *cembrit.com*



Norton 6300 Series Low Energy Operator, Assa Abloy

The capabilities of this door control system includes power close, latch assist, and obstruction detection in moderate- to high-traffic environments. Designed to fit interior or exterior doors from 36" to 48" wide, the Norton 6300 can be programmed with a Wi-Fi-enabled device to activate automatically with a slight push or pull, or to be activated by a switch. Available in aluminum, bronze, black powder-coat, and white powder-coat finish options. *nortondoorcontrols.com*

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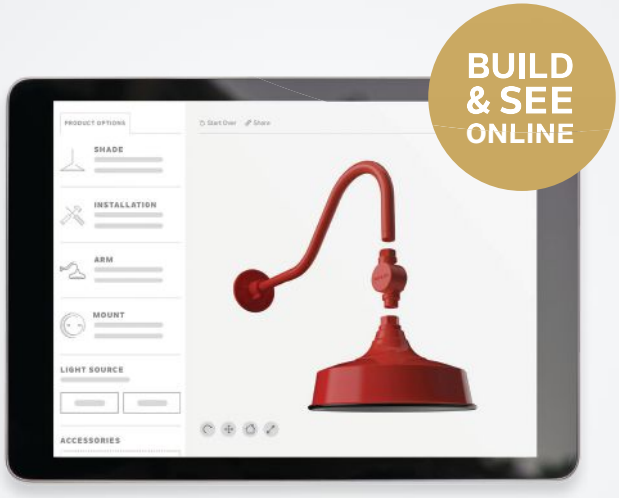

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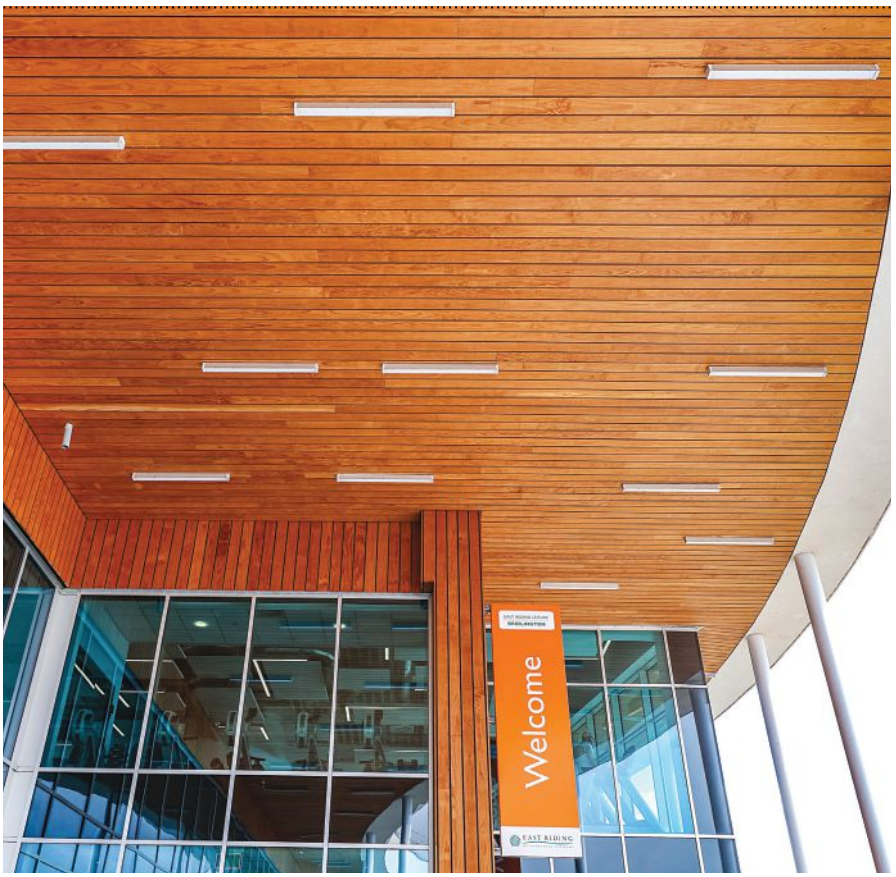

Lignia Fire, Lignia
No aftermarket surface coating or fire-retardants needed here. This modified timber is enhanced at a molecular level to achieve a Class A flame spread rating. Featuring a consistent golden-brown hue, Lignia Fire has greater stability, density, hardness, and mold resistance than conventional wood. Available in planks 7' to 20' long and ⅞" to 3" thick. Applications include outdoor cabinets, decking, siding, windows, and doors. *lignia.com*

Vetrite, Pulp Studio
Gardena, Calif.–based Pulp Studio partnered with Italian mosaic manufacturer Sicis to design a large-format decorative glass collection. For use on walls, floors, countertops, furniture, and other applications, the scratch-proof glass fused with metal polymers is its own mosaic of color and texture. The glass does not require waterproofing and can be specified with straight or beveled edging. Available in 23 colorways, Vetrite can be specified in panels up to 47¼" by 110". *pulpstudio.com*

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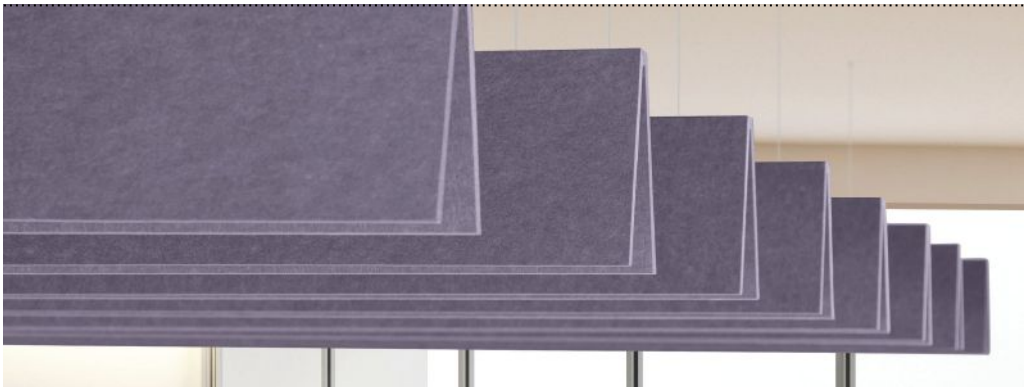
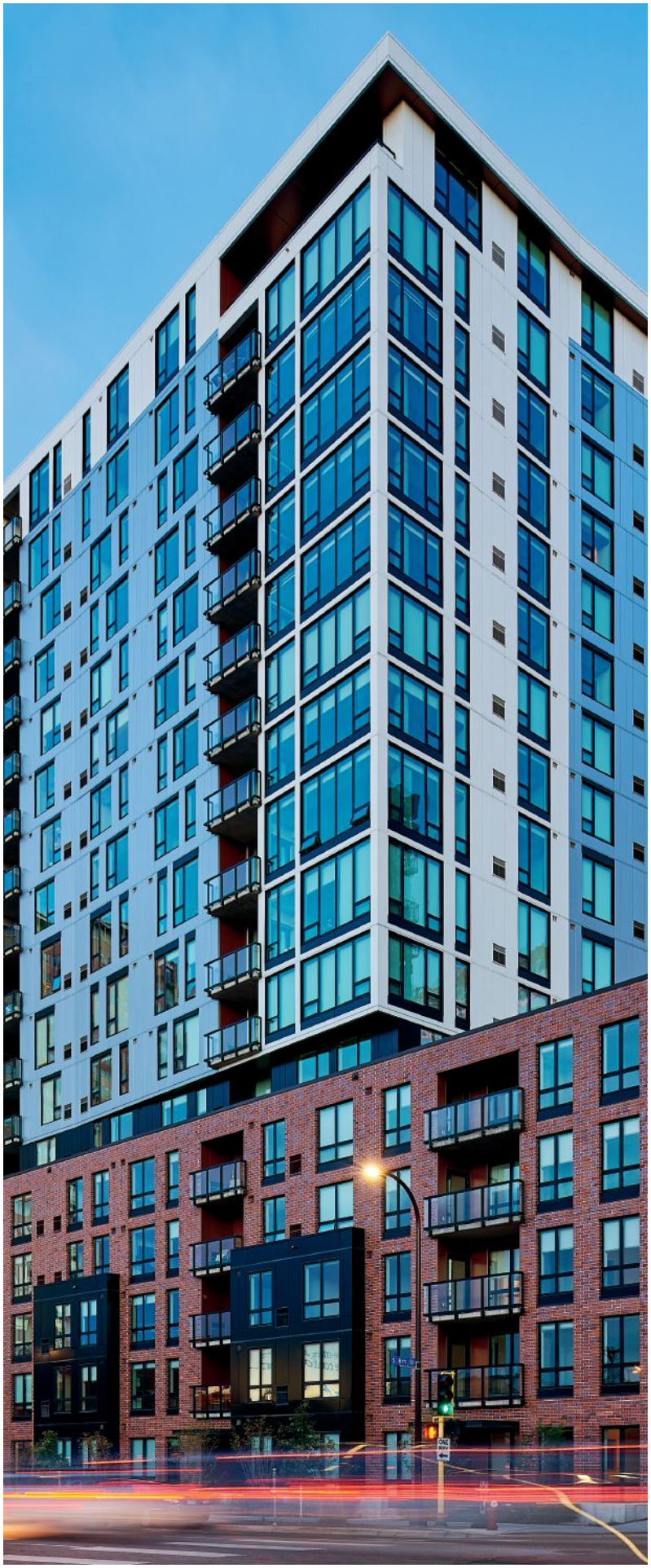


AVIO Collection, Kirei

Made from Kirei's proprietary EchoPanel material, which uses 60% post-consumer plastic, these acoustic ceiling baffles are available in four geometric shapes—A (shown), V, I, and O—and are designed to be installed singly or in groups. The collection is available in 27 colors, ranging from vivid lime green to muted gray, and in four standard sizes ranging from 40" by 7" to 96" by 7". *kireiusa.com*

Two-Thirds, Allsteel

Conceived by Ada, Mich.–based designer Joey Ruiter, the poufs, benches, and tables that comprise this collection are easy to reconfigure thanks to their lightweight construction—from 8 lbs to 28 lbs each—and dynamic forms. Available in Block, Pebble, and Round shapes, the pieces each measure between 15⅝" and 18⅝" tall and have no predetermined front, back, or side, making it possible to combine or separate them as necessary. Two-Thirds comes in a variety of solid and two-tone colors; fabrics with customization available. *allsteeloffice.com*



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The KA Block includes the new Kraus-Anderson Construction headquarters, HQ Apartments, Finnegan's microbrewery and the Elliot Park Hotel.

pella.com/urbanarchitecture

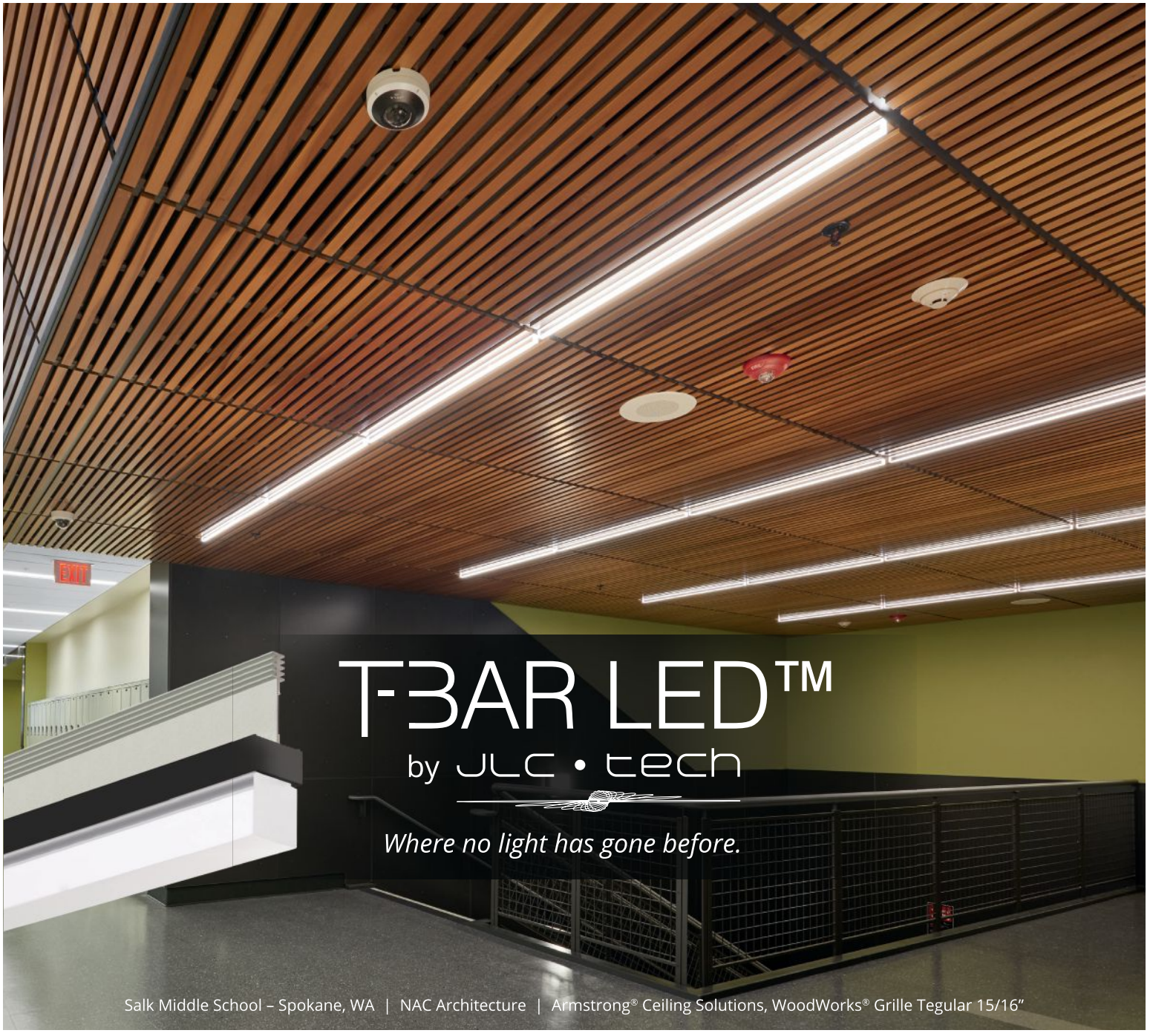
Products:
Spring 2020 Product Call Highlights

Slot Linear Drain, Infinity Drain

This drain's slim ⅜" gap nearly disappears into a shower, allowing a bathroom floor to flow almost uninterrupted wall to wall, even with large format tile. Available with an accessible clean-out tray, the Slot Linear Drain can be specified in satin stainless steel, polished stainless steel, oil-rubbed bronze, satin bronze, and matte black. The drain comes in six lengths, from 24" to 60". Suitable for indoor or outdoor installation. *infinitydrain.com*

SL84, NanaWall Systems

This aluminum-framed bi-fold door system features a slim 3⅞" junction and is thermally efficient, with a U-factor of 0.30 and solar heat gain coefficient of 0.18. The floor-supported panels, standing up to 11½' tall, can be configured for in- or out-swing, and can accommodate open-corner designs. Choose a fourfold or sixfold panel set, and either powder-coated or anodized finishes. *nanawall.com*



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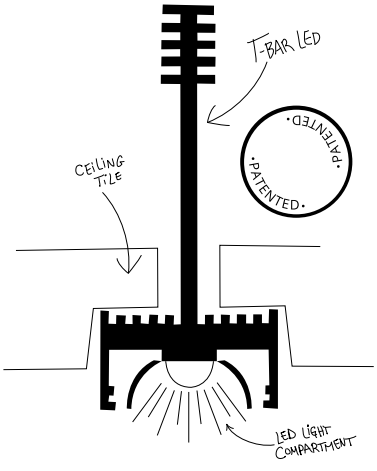

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Products:
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Captain Flint Outdoor Floor Lamp, Flos
London-based industrial designer Michael Anastassiades has redesigned his classic 2015 floor lamp, Captain Flint, for exterior applications. Now waterproof, the 60½"-tall fixture features a stone base—in black lava stone, gray lava (shown), and occhio di pernice lava, or travertine—paired with a conical diffuser in black, brushed brass, stainless steel, or deep brown, respectively. Available in 2700K, 3000K, and 4000K color temperatures. *usa.flos.com*

Flight Bench, Forms+Surfaces
Designed in collaboration with Houston-based OJB Landscape Architecture, this minimalist bench is suitable for outdoor and indoor settings. Made of a corrosion-resistant powder-coated aluminum frame that can be painted in one of 16 matte colors or three glossy colors, the bench can be specified with a Cumaru hardwood or high-performance concrete seat. Available in 6' or 8' lengths at a standard height of 18" and width of 17⅝". *forms-surfaces.com*

The Blake, MTI Baths
A collaboration with New York architecture firm Studio DB, this 66"-by-32"-by-22½" tub is made of the manufacturer's proprietary, nonporous, and mold- and mildew-resistant SculptureStone material, which consists of 75% organic components. Originally designed for a Brooklyn condo project, the Blake can hold up to 120 gallons of water. Offered as a soaker (weighing 360 lbs) or air bath (weighing 375 lbs), the Blake comes in a standard white matte finish, with optional color and gloss upgrades. *mtibaths.com*

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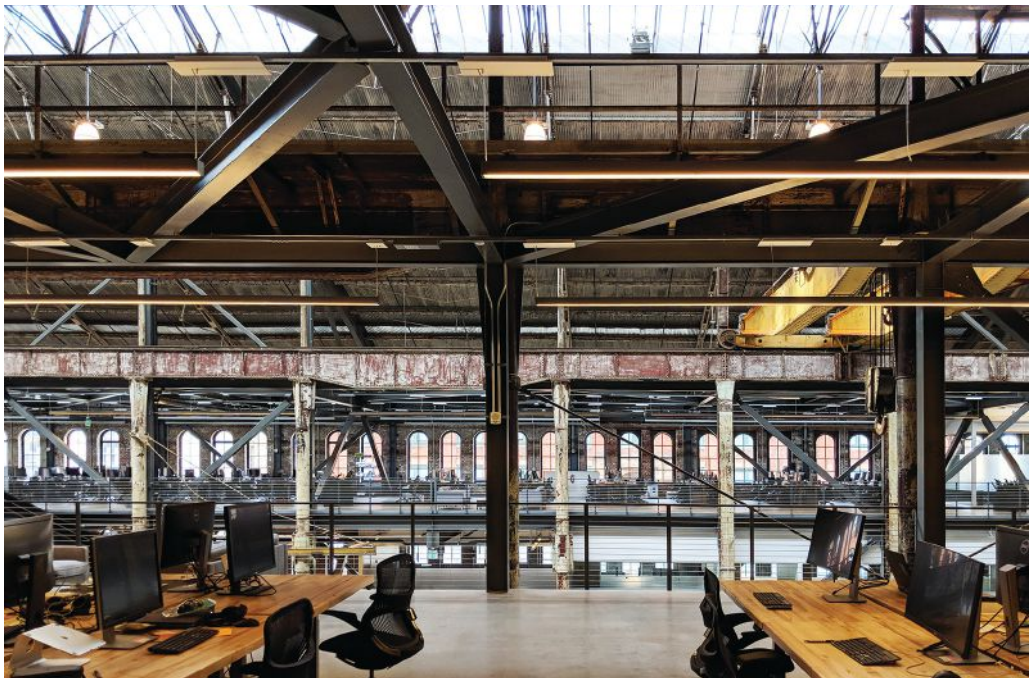

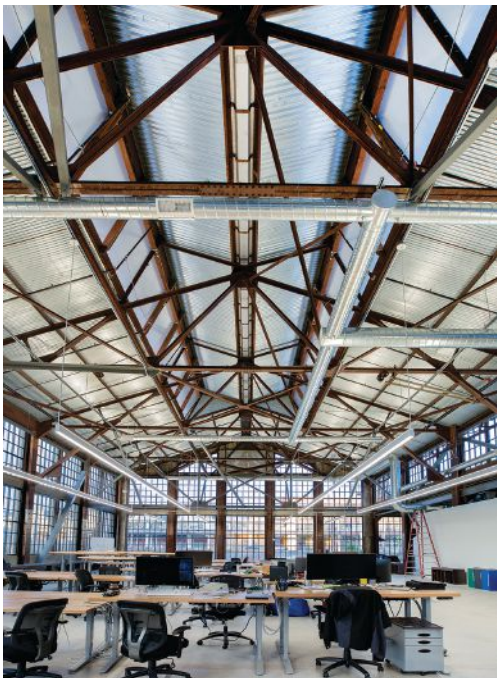

Structural steel is a durable, noncombustible, fire-resistant material. In addition, building codes allow the use of bare steel for buildings of a certain height, areas, and occupancy (pictured UBER Advanced Technologies Group R&D Center). Photo Courtesy of: Billy Hustace

LEARNING OBJECTIVES

1. Identify differences between prescriptive and performance-based design of fire protection systems for structural steel buildings, including a brief history of their use.
2. Understand the details and impacts of fire as it relates to structural steel and how performance-based design can improve the design by reviewing key terms and analyzing ASTM E119.
3. Gain knowledge of information and processes generally required to submit and obtain approval for performance-based design of fire protection systems by reviewing summaries of the relevant sections of ANSI/AISC 360-16 and NFPA 5000.
4. Increase awareness of resources available to assist in performance-based design of fire protection systems for structural steel buildings.

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INTRODUCTION: PRESCRIPTIVE VS. PERFORMANCE-BASED DESIGN

The value of prescriptive specifications versus performance-based design is currently under debate in the AEC community in the U.S. A prescriptive approach can be taken where the architect or fire protection engineer will determine the minimum fire-resistance rating for the elements in the building. These are based on the requirements of the prescriptive sections of the applicable building code which are determined by the construction type for the applicable occupancy groups and fire separation distances, explains Shane Cherney, P.E., FPE, LEED AP BD+C, fire protection engineer, HDR (Omaha, Neb).

"Once this has been established, the architect will work with the fire protection engineer and structural engineers to balance aesthetic, economic, and performance factors for achieving the required fire-resistance rating of the building elements," he says. "Additional design development factors, such as flexibility for future changes in occupancy, may require the fire-resistance rating of building elements to exceed the minimum requirements."

"In a prescriptive approach, designers select materials and assemblies to meet fire resistance using appropriate methods," explains Maria E. Moreyra Garlock, P.E., P.D., Professor, Civil and Environmental

Engineering, Princeton University, in the 2016 AISC T.R. Higgins Lectureship Award presentation, "Get Fired Up: What Structural Engineers Should Know About Fire Design." These requirements, which have been derived from standard fire tests, are delineated in ASTM E119 *Standard Test Methods for Fire Tests of Building Construction Materials*.

While prescriptive approaches have been the norm for many years, more and more building teams are recognizing the benefits of a performance-based approach to fire and life safety design. Unlike typical prescriptive fire protection designs, which do not consider the structural response, Garlock explains that performance-based design for fire—also known as fire safety engineering—considers the real fire and the real response of the structure to that fire. Based on the principle that a building structure, as a whole, will perform better than its individual elements, performance-based design approaches the building based on how it will perform, as opposed to the prescriptive approach that focuses on how the building is constructed.

Performance-based design offers the best opportunity for broader input from the entire project team, in particular from the fire protection and structural engineers. Because structural engineering knowledge is not required with prescriptive design, the primary domain falls under the architect. However, with performance-based design, the engineer needs to be more involved, as does the authority having jurisdiction (AHJ). Jeff Tubbs, P.E., FSFPE, Principal & Project Director, Arup (Boston), explains that performance-based designs for steel buildings require that the fire protection engineer perform a hazard assessment to determine fire scenarios and overall fire size in order to develop the credible worst-case fire exposure to the structure.

"Then computer simulation models can be used to calculate smoke temperatures and the heat transfer to the structural members," he notes. "This results in a prediction of the steel temperature based upon the hot gases from the fire and a determination of the loss in structural capacity. The structural engineer then determines the structural performance based upon the structural capacity at the corresponding fire temperatures."

A performance-based approach also offers the advantage of evaluating situations that are beyond the normal scope of prescriptive

Architecturally exposed structural steel commonly uses intumescent coatings as a method of fire protection. The World Trade Center Transportation Hub (The Oculus) achieved prescriptive design requirements with the use of intumescent coatings. Photo Courtesy of AISC

code-based design, i.e., designs limited to the single fire-temperature curve in the ASTM E119 standard. Sharing some overall best practices, Cherney says, "the key with performance-based design is to engage all stakeholders early in the project development process to identify goals [and] establish performance metrics, emergency scenarios, alternative design options, and finally to document the final design solution for stakeholder approval." Cherney adds that fire protection engineers specialize in this process and can facilitate the effective application of pursuing this approach to fire protection design.

A BRIEF HISTORY: DEVELOPING PERFORMANCE-BASED APPROACHES FOR FIRE SAFETY

In the U.S., prescriptive design is currently more common than performance-based design; however, outside of the U.S., performance-based design is well-developed and more commonly used for fire safety engineering. In the U.K., prescriptive specifications were deemed too narrow to meet all the requirements of fire safety and performance. According to *The LPC Design Guide for the Fire Protection of Buildings* (2000), which replaced the *LPC Code of Practice for the Construction of Buildings* (1996), "it is important that protection decisions are not merely based on prescriptive requirements aimed at life safety or reduced insurance premium costs. A much broader approach taken from a wider risk management perspective in which the likely impact by fire on the assets of the business, the company's trading position, and the environment is fully assessed should become standard best practice."[1]

The LPC Design Guide further maintains that specifications aimed solely at compliance with codes and standards may not prevent major damage to the structure after a successful evacuation. Performance-based design and its increased collaboration between specifiers, contractors, clients, and insurers, however, can help to accomplish life safety by "provid[ing] all parties with the opportunity of discussing and developing the most cost-effective passive and active fire protection measures appropriate to the specific property and business protection needs."[2]

The focus of performance-based design in terms of fire safety extends beyond the U.K. to all of Europe. The Society of Fire Protection Engineers (SFPE) conducted a survey across 21 countries in Europe in 2014, covering subject areas ranging from education to regulations to how broadly fire safety engineering was in use. Performance-based design is embedded in the SFPE's definition of fire safety engineering. The SFPE maintains that "to successfully facilitate fire safety engineering on a national basis, several components are recognized as vital. These are:

- qualified practitioners, a product of education, certification programs, and other measures,

There are three key considerations when creating a fire protection plan: life safety, fire suppression, and protection of the structure. (Pictured the Marvin Gaye Recreation Center) Photo Courtesy of Hoachlander Davis Photography

GLOSSARY

ASTM—formerly known as American Society for Testing and Materials; this international standards organization develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services

American National Standards Institute (ANSI)—a private, not-for-profit organization dedicated to supporting the U.S. voluntary standards and conformity assessment system and strengthening its impact both domestically and internationally

Fire load—the amount of combustible material in the compartment

International Code Council (ICC)—a nonprofit association that provides a wide range of building safety solutions including product evaluation, accreditation, certification, codification and training; develops model codes and standards used worldwide to construct safe, sustainable, affordable and resilient structures

P(F|D,I)—probability of failure given the occurrence of ignition and development of a structurally significant fire

Performance-based design (PBD)—building design and construction based on performance requirements; for example, energy efficiency, seismic load, and fire situations as opposed to the traditional prescriptive approach found in many building codes

Prescriptive design—method to determine the minimum fire-resistance rating for building elements, based on meeting the applicable building codes, including IBC, NFPA, and local codes

Qualification testing—testing based on results of ASTM, UL, or other industry-recognized laboratory

Structural fire engineering—also known as performance-based design for fire; considers the real fire and the real response of the structure to that fire

Structural integrity—the ability of the structural system to absorb and contain local damage or failure without allowing it to develop into a progressive collapse that involves either the entire structure or a disproportionately large part of it.

- a legal and regulatory environment allowing for PBD , e.g., a performance-based building system, and
- appropriate guidelines for the use of FSE [fire safety engineering]."[3]

In many countries surveyed, fire safety engineering had been part of the building regulatory system for some time. Iceland first permitted fire safety engineering in 1975. England and Wales followed suit in 1985, and Belgium and Sweden adopted it in 1994. The degree to which fire safety engineering guidelines, education, and certifications exist varies from country to country.

Other countries outside of Europe have also embraced performance-based fire protection design. Following an extensive review of other systems in use around the world, Australia adopted a performance-based system in 1996. In a 2017 article called "Celebrating 21 Years of the Performance-based Code," the Australian Building Codes Board said the move was designed to give the country's AEC community the freedom "to explore new innovations, new technologies, and new materials and enable more functional, economical, adaptable, and aesthetically pleasing buildings while still delivering on the safety, health, and amenity requirements of the code." The authors say that while the former prescriptive code made sure building designers' submissions complied with regulations, it was "not conducive with enabling an environment and culture of innovation, creativity, and collaboration."[4]

U.S. Adoption

Comparatively, the U.S. has been slow to adopt performance-based design. Possible reasons for this may be the many jurisdictions involved. There is no federal building code, and states and cities manage the regulatory building systems. While the International Building Code (IBC) is a standard adopted frequently by the AHJ, it is mostly based on prescriptive design practices. The local AHJ must approve a performance-based design.

According to an article in the *Journal of Fire Protection Engineering*, current guidelines in use are "generic" in nature. There is a lack of a body of scientific studies on fire performance as it relates to a performance-based design of all building materials, and "the selection of acceptance criteria and fire designs is more a 'collegial political' choice than an outcome of a real characterization and treatment of the fire risk in the building." In theory, this indicates that "within the same community, three different engineering firms can develop three different designs for the same building project, each of which results in different levels of risk in terms of occupants, property, and mission [i.e. goal]." It further indicates that if a project were to be moved to a different community, "the same designs could be accepted or rejected based solely on the perspectives of the different stakeholders involved." The authors proceed to discuss the challenges involved with establishing a robust performance-based design framework that is needed to address fire risks to safety, properties, and businesses.[5]

As recently as 2018, a task force from the American Society of Civil Engineers (ASCE) put together an article titled "Advocating for Performance-Based Design" that says that prescriptive specification can be considered outdated and unsuited for many of the pressures placed on today's design community. Structural engineers are not always able to fully leverage data and analysis and design software due to prescriptive requirements. The article's authors state that "in an era when we face multiple demands on our designs—safety, economy, serviceability, sustainability, robustness, and unreasonable schedule demands—we are constrained to follow a prescriptive path to a solution that often does not optimally satisfy expectations." However, the authors also note, "while not every structure will warrant the method, with time and exposure, performance-based design processes will become an accepted protocol for structures that can benefit from this practice."[6]

The authors of the ASCE article proceed to state that most structural design procedures in the U.S. currently "evaluate

design acceptability through conformance to prescriptive criteria on materials, configuration, detailing, strength, and stiffness. Such criteria are deemed to result in structures capable of achieving acceptable performance without clearly defining the performance expectations. Furthermore, the engineer using such prescriptive procedures does not explicitly verify the ability of the structure to achieve the desired performance."[7] The performance goals are never specifically stated, defined, or verified as part of the prescriptive specifications.

Although current building codes in the U.S. are based on prescriptive design, the ICC and National Fire Protection Agency (NFPA) have moved to include performance-based design in recent years.

Together, the SFPE and NFPA developed a design guide titled *Engineering Guide to Performance-Based Fire Protection*. The second edition of the guide, published in 2007, seeks to provide "a flexible process for performance-based design and the assessment of building fire safety, within both prescriptive and performance-based code systems."[8] More recently, in 2015, the SFPE published *Performance-based Fire Safety Design* to further help stakeholders understand how a building will perform in the event of fire. It "identifies key attributes of performance-based design; reviews the advantages and disadvantages of performance-based design over specification-based prescriptive design; and provides a series of steps offering a framework/process for performance-based design."[9] Such resources can help architects, engineers, and designers create best practices when designing for fire performance.

This article continues on http://go.hw.net/AR052020-1. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. In a(n) _____ approach, designers select materials and assemblies to meet fire resistance ratings using appropriate methods.
   a. Performance-based design
   b. Architect-centric
   c. Prescriptive
   d. None of the above

2. Overall, current building codes in the U.S. are based on:
   a. Prescriptive design
   b. Performance-based design
   c. Fire engineering
   d. All of the above

3. If a fire escalates, the rate at which it spreads is dependent upon which of the following factors?
   a. Ventilation conditions
   b. Effectiveness of fire barriers
   c. Timeliness of detection
   d. All of the above

4. Steel fire protection materials function either to solely insulate or absorb energy. Which of the following materials are commonly used as prescriptive fire protection methods for structural steel framing systems?
   a. Spray-applied fire-resistive materials (SFRM)
   b. Fire-rated board
   c. Intumescent coating system
   d. All of the above

5. Gypsum- or concrete-based products are types of _____ that are common energy-absorbing materials used to insulate steel.
   a. Spray-applied fire-resistive materials (SFRM)
   b. Fire-rated board
   c. Intumescent coating system
   d. None of the above

6. A basic objective of performance-based design is that it considers the structure as a _____ rather than _____ assemblies or materials.
   a.Piece; part
   b. Whole; individual
   c. Fire-based; steel-based
   d. None of the aboved

7. The term, _____, defines the ability of the structural system to absorb and contain local damage or failure without developing into a progressive collapse that involves either the entire structure or a disproportionately large part of it.
   a. Structural integrity
   b. Passive fire design
   c. Active fire design
   d. Prescriptive design

8. An alternative to structural fire resistance design by analysis is _____:
   a. Fire model
   b. Qualification testing
   c. Performance testing
   d. Risk assessment

9. A _____ should be used to determine the temperatures within the structural members due to the heating conditions.
   a. Heat transfer analysis
   b. Building occupancy permit
   c. Technical analysis of data
   d. Structural model

10. Which of the following is a valuable component of appropriate modeling software?
    a. Fire protection information
    b. Risk assessment
    c. Information on streamlining permitting processes
    d. Both A & B

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DESIGN SOLUTIONS FOR RESTROOM PRIVACY

Presented by:

BOBRICK

BUILDING VALUE SINCE 1906

LEARNING OBJECTIVES

1. Understand the factors that have contributed to privacy as a design expectation in many building types.
2. Understand different toilet partition design solutions and their varying degrees of privacy.
3. Review cost-benefit analyses and construction implications of privacy solutions.
4. Review ADA compliance considerations associated with privacy toilet partition design.

CONTINUING EDUCATION

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INTRODUCTION: A HISTORY OF RESTROOM PRIVACY AND ACCESSIBILITY

Through the centuries, many have debated ideas of restroom privacy and accessibility. For instance, the idea of gender-segregated public restrooms was introduced in 1739 at a ball in Paris; the restrooms were viewed almost as a novelty. Gender-segregated restrooms eventually became law in the United States in 1887, when Massachusetts took steps to ensure that employed women had separate private restrooms available to use in the workplace.

In 1990, the Americans with Disabilities Act was passed, creating the need for compliant, accessible restrooms for all. By 2013, 150 universities and a number of high schools had gender-neutral restrooms installed. As of 2018, international building and plumbing codes include "gender-neutral" restrooms as proposed by the AIA, ensuring safe, dignified access to public restrooms for all.

Privacy as a Design Expectation

Shifting attitudes are compelling designers and building owners to double down on privacy efforts. For example, gender inclusivity and ensuring transgender or non-binary individuals have a safe, private restroom available to them not only creates an atmosphere of inclusivity but also reduces legal liability in areas and buildings where laws have been passed.

Beyond all-gender restrooms, patrons desire more privacy, especially those who have various health and/or personal needs, such as caregivers, nursing mothers, elderly individuals with health issues, and those who suffer from chronic health conditions, like diabetics who require insulin injections.

For others, privacy is important in relation to personal safety. For example, parents with

children want to feel confident that their child is safe and within sight while they are occupying a toilet compartment. This is also true in educational environments where harassment can be a consideration. From a personal safety standpoint, individuals may also feel vulnerable to camera phones in the restroom. Today, camera phones allow people to take photos covertly. In 2018, for instance, a man in San Diego was caught under the toilet compartment trying to sneak a photo of somebody in an adjacent compartment. Even those taking selfies can unintentionally capture more than originally intended.
In addition to parental and technological concerns, there have also been documented incidents of individuals stealing purses and jackets by simply reaching over bathroom doors. All of these concerns underscore the importance of privacy in public restrooms.

A patron's experience in the restroom can influence their overall impression of a building and likelihood of returning to a store or restaurant. Patrons care about privacy, and by extension, so do many business owners and the design professionals who serve them.

Gaps

Gaps between toilet compartment doors and stiles, and the resulting lack of privacy, have long been a particular source of patron complaints. This is typically a consequence of toilet partition material selection. For example, with metal toilet partitions, the gaps are due to configuring toilet compartment layouts to the size of restrooms using standard size doors, panels and stiles manufactured to whole-inch dimensions. The average gap size on the hinge side is 0.160 inches, and the average gap size on the keeping side is 0.215 inches.

The standard 12-inch floor clearances on partition doors can be seen as excessive and allow people to easily peek underneath to see if the toilet compartment is occupied. Gaps between doors and stiles allow for visibility not only from the outside in, but also from compartment to compartment, creating awkward, uncomfortable moments between strangers and co-workers. Large gaps can be an issue when it comes to closing and locking doors, creating the anxiety-ridden potential for a door to accidentally swing open if the latch does not fully secure.

Without any codes that regulate gap width or door width, there has been little impetus to enhance partition design. In fact, gaps are often a consequence of the manufacturing process. Some toilet partition components materials are produced in stocked widths, which do not allow precise matching to room dimensions. Additionally, the installation process and quality of doors and stiles can produce larger gaps than desired—especially between the door hinging or latch side. Fortunately, there are many types of privacy solutions to help address these pain points.

THE TWEET STORM FOR PRIVACY

Many patrons have expressed their desires for bathroom privacy—or their dissatisfaction with the privacy offered—on social media. Twitter has proven the ideal platform for some end users to voice their concerns:

- "Is it too much to ask for public bathroom doors that dont [sic] have 2 inch gaps when closed??"
- "It's 2019; why do bathroom stalls still have gaps? Do I need to call my congressman or something?"
- "anyone know why the gaps in the bathroom doors at french press are so big. i have made eye contact with so many people. a small child can fit through it. please i just want to pee in peace"
- "I'm sorry but who decided toilet stalls should be designed with visual gaps so you can make a sliver of eye contact with every human that walks into the bathroom?! I need names."
- "The fact that even the nice ass hotels in Vegas have gaps between the bathroom doors is real humbling cuz not even rich people escape the pure terror of someone peering into the stall"
- "They can make motion activated faucets, hand dryers, and soap dispensers, but still can't close the gaps in the bathroom stalls."

All of these Tweets point to the unpleasant, daily reality of lack privacy in a variety of settings and environments. They also indicate that a business's reputation can be tarnished by poor bathroom design.

Commercial Office Solutions

Banks

Mid-Class-B to premium Class-A commercial office spaces may require additional privacy to enhance satisfaction and safety, as well as to create a more pleasant experience for employees and visitors alike.

In 2017, the global headquarters of a publicly traded bank in Pasadena, California, underwent a major renovation to provide a comfortable, positive morale-building experience for their employees. Designing for privacy was key in order to ensure all employees felt comfortable in the space. The bank was able to achieve a high sense of privacy with a European-style toilet cubicle system with occupancy indicators, self-closing doors, and interlocking door and fascia panels to eliminate sightlines. A representative from the architectural firm said, "The partitions create an almost room- like environment."

Prestige Buildings

Privacy is often seen as an extension of quality design and can create an exclusive, private and comfortable experience. Some prestige commercial offices spaces may require high-end

design in addition to privacy due to the status of the company or the clientele that visits the building regularly.

For a renovation of the restrooms at the iconic television and film studio Sony Picture Studios in Culver City, California—which hosts tenants like Columbia Pictures and other A-list production companies—the architect was able to achieve a sophisticated look with a high degree of privacy by using European-style toilet cubicles with interlocking flush-front door and fascia panels to eliminate sightlines and occupancy indicators, complemented by luxurious finishes and a cubicle system that appears to "float" due to its recessed foot pedestals. More unique materials, such as glass, can also be used for prestige buildings to reinforce a luxurious aesthetic.

In addition to providing users with privacy, maximum height, and no-sightlines solutions, a flush façade is created when all of the cubicle doors are closed. Design professionals striving for a well-designed, clean, minimalistic look can leverage privacy toilet partitions to create this flush-front exterior aesthetic that features front fascia panels, stiles, and doors with uniform material thickness, often utilizing visually interesting finishes with solid colors or patterns.

Educational Facilities

Educational facilities, such as universities and high schools, may require additional privacy considerations, especially when creating all-gender restroom solutions, including those in dorms, libraries and other spaces that multiple genders occupy.

Vashon Island High School, a school just outside of Seattle, renovated both a boys' and girls' restroom into two all-gender restrooms—the first of their kind in Washington state.

Increased height 72" panels, no-sightline integrated doors and stiles and lower floor clearances support inclusiveness and privacy. The principal remarked, "Making bathrooms all-gender is the safest and clearest way to prevent students from having to explain or justify their bathroom use to anyone."

All-Gender Restrooms

California is one of the states that has passed laws regarding gender-inclusive bathrooms. Many facilities in California have adopted the restrooms, regardless of whether they were required to by law. One facility that made the change is The Moffitt Library at the University of California, Berkeley, which was originally designed in the late 1960s. In 2016, the university completed a renovation that included gender-inclusive bathrooms.

Prior to construction, the university president declared the renovated library needed to feature gender-inclusive toilet rooms that were individual and "room-like," so no individual could reach under or over a door or panel with their cell phone or selfie stick. The new restrooms feature high-privacy, integrated no-sightline privacy doors and stiles with floor-to-ceiling doors and extended height panels to enhance user privacy, support gender-inclusive design and promote peace of mind. In addition, the university was able to achieve this high level of privacy with no drywall and the use of minimal trades due to the materials selected.

GLOSSARY

American Disabilities Act (ADA)—civil rights law passed in 1990 that prohibits discrimination in public life (schools, work, transportation, etc.) against those with disabilities

Extended Height Toilet Compartments—feature panels that are made to fit the height of the restroom; high level of privacy; cost is mid-range to high-end

Extended Height Panels and Door—extended height privacy compartments consist of 72-inch high doors and panels with nominal 4-inch floor clearance and come with standard or full-height hardware

Fully Enclosed with Drywall Compartment—involves the use of framing and drywall to create floor to ceiling partitions on both the fronts and sides of each toilet compartment; high level of privacy; high cost

Gender-neutral—suitable for any gender

Increased Height Toilet Compartment—typically consist of 72-inch-tall panels; this classification includes standard toilet partitions with taller options, as well as many European-style cubicle systems; provide medium privacy; cost is mid-range

Individual Toilet Room with Lavatory—individual restrooms where all necessary fixtures are self-contained; highest level of privacy; highest level of cost

Integrated, No-sightline Privacy Doors and Stiles—have routed edges that result in an interlocking design with no sightlines; they come with standard or optional full-height hardware. These configurations typically produce flush styling across a series of doors and stiles to produce a well-designed, clean aesthetic

Non-binary—spectrum of gender identities that are not solely masculine or feminine

Standard Toilet Compartment—known for a large amount of floor clearance, as well as large gaps between doors and stiles; however, these issues can be addressed with the addition of taller, no-sightline doors and stiles; cost ranges from low to mid

ALL-GENDER BY STATE

All-gender restroom design underscores the scale of the privacy issue. For instance, consider this map. A number of states and municipalities have passed laws that protect transgender individuals and others who wish to use the restroom of their choice within public facilities.

The states in teal have passed anti-discrimination laws that require public facilities to accommodate certain individuals who wish to use the restroom of their choice rather than the sex listed on their birth certificate. The states in orange have pending legislation. The states in grey have no pending legislation on the issue.

Currently, no states restrict access to some public bathrooms by individuals who identify with a gender that is not on their birth certificate. While North Carolina passed such a bill in 2016, it was repealed in 2017.

Note that these features can be equally valuable to gender-inclusive restrooms as they would be to traditional mens' or women's rooms.

Another example is the University of California, Fullerton, which needed an all- gender restroom solution in 2017 that would serve the building's diverse user groups while achieving the utmost privacy. A no-sightline partition system with occupancy indicator latches delivered privacy and practicality. Floor-to-ceiling, 106-1/2-inch doors were employed to create a room-like environment, without the additional trades, cost and construction implications associated with fully enclosed walls and single-user restrooms.

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QUIZ

1. The Americans with Disabilities Act (ADA) was passed in _____.
   a. 2020 b. 2010
   c. 2000 d. 1990

2. These compartments feature panels that are made to fit the height of the restroom. They offer a high level of privacy, and their cost is mid-range to high-end.
   a. Extended height toilet compartments
   b. Fully enclosed with drywall compartments
   c. Increased height toilet compartments
   d. Standard toilet compartments

3. These compartments are known for a large amount of floor clearance, as well as large gaps between doors and stiles. Their cost ranges from low to mid.
   a. Extended height toilet compartments b. Fully enclosed with drywall compartments
   c. Increased height toilet compartments d. Standard toilet compartments

4. These compartments typically consist of 72-inch-tall panels; this classification includes standard toilet partitions with taller options, as well as many European-style cubicle systems. They provide medium privacy, and their cost is mid-range.
   a. Extended height toilet compartments b. Fully enclosed with drywall compartments
   c. Increased height toilet compartments d. Standard toilet compartments

5. These compartments involve the use of framing and drywall to create floor to ceiling partitions on both the fronts and sides of each toilet compartment. They offer a high level of privacy and are high cost.
   a. Extended height toilet compartments b. Fully enclosed with drywall compartments
   c. Increased height toilet compartments d. Standard toilet compartments

6. Many made-to-order partition materials have a side-to-side _____ inch tolerance, which means little to no gaps.
   a. 1/3 b. 1/4
   c. 1/8 d. 1/16

7. Extended height privacy compartments consist of _____-inch high doors and panels with nominal 4-inch floor clearance and come with standard or full-height hardware.
   a. 72 b. 17
   c. 56 d. 80

8. Which of the following is a trade that could be required when constructing a restroom?
   a. Plumbing b. Electrical
   c. HVAC d. All of the above

9. When constructing a gendered restroom, _____ are the best choice in terms of increased privacy and cost.
   a. Extended height toilet compartments b. Fully enclosed with drywall compartments
   c. Increased height toilet compartments d. Standard toilet compartments

10. The Ambulatory Accessible Toilet Compartment has a depth of ____ inches minimum.
    a. 30 b. 40
    c. 50 d. 60

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ENGINEERING A HIGH-PERFORMANCE ROOFING SYSTEM FOR STEEP PITCH ROOFS

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LEARNING OBJECTIVES

- Identify key characteristics of roofing systems that prevent roof deterioration and damage, providing protection to the occupants within the structure.
- Examine "sequential" layout options for assemblies of steep sloped roofs.
- Recognize the attributes of a high-performance roofing system, including composition, construction practices, and lifecycle.
- Evaluate best practices in detailing steep slope roof systems to mitigate special conditions.

CONTINUING EDUCATION

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THE BASIC CHARACTERISTICS OF ROOFING SYSTEMS

The NRCA Roofing and Weatherproofing Manual defines a roofing system as "a system of interacting roof components, generally consisting of a membrane or primary roof covering and roof insulation (not including the roof deck) designed to weatherproof and sometimes improve the building's thermal resistance." When the term "roof assembly" is used, this involves "an assembly of interacting components, including the roof deck, vapor retarder (if present), roof insulation, and roof covering."[1] The roofing system, then, is a part of the roof assembly with the difference being that the roof assembly also includes the roof deck. The deck is defined as "the structural surface to which the roofing or waterproofing system (including insulation) is applied."[2]

A vital component of any roof assembly is the pitch of the roof, which is either flat/low

or steep. It is possible to determine pitch by calculating "the number of inches it [the roof] rises vertically for every 12 inches it extends horizontally. For example, a roof that rises 6 inches for every 12 inches of horizontal run has a 6-in-12 pitch."[3] Geographical location, budget, and desired aesthetics are all important considerations when designing a new roof and determining its pitch. In general, low-slope roofs can be constructed more inexpensively than more steeply pitched roofs; however, low-slope roofs tend to need more maintenance over their lifetimes. Steep-slope roofs might cost more upfront, but the materials used to construct them are typically more durable.

The Whole Building Design Guide (WBDG) defines a low-slope roof as "those roofs with a slope less than or equal to 3:12 (25 percent). However, with the exception of metal roofs, most low-slope roofs have a slope of about 1/4:12 (2 percent) slope. It is recommended that low-slope roofs have a slope of 1/2:12 (4 percent) where possible."[4] Low-slope roofs will also usually include a weatherproof membrane. The WBDG defines steep-slope roofs "as those roofs with a slope greater than 3:12 (25 percent)." As opposed to low-slope roofs, steep-slope roofs will include a watershedding

GLOSSARY

Batten—commonly used to hang and fasten clay and concrete tiles to the roof deck

Deck—the structural surface to which the roofing or waterproofing system (including insulation) is applied

Low-slope Roof—those roofs with a slope less than or equal to 3:12 (25 percent); with the exception of metal roofs, most low-slope roofs have a slope of about 1/4:12 (2 percent) slope; it is recommended that low-slope roofs have a slope of 1/2:12 (4 percent) where possible

Plywood—made from thin layers of wood adhered together, each with its grain at right angles to adjacent layers for greater strength and dimensional stability

Positive Drainage—the drainage condition in which consideration has been made for all loading deflections of the deck, and additional roof slope has been provided to ensure complete drainage of the roof areas within 24 hours of rainfall precipitation

Roof Assembly—an assembly of interacting components, including the roof deck, vapor retarder (if present), roof insulation, and roof covering

Roofing System—a system of interacting roof components, generally consisting of a membrane or primary roof covering and roof insulation (not including the roof deck) designed to weatherproof and sometimes improve the building's thermal resistance

Steep-slope Roof—those roofs with a slope greater than 3:12 (25 percent)

Underlayment—applied over a roof deck prior to the application of roof tile; an underlayment performs two primary functions: it provides temporary weather protection until the tile is installed, and it provides a secondary weatherproofing barrier should moisture migrate below the tile

Vapor Retarder—a broad range of roofing materials, which are used to control the flow of water vapor from the interior of the building into the roof system

roof system. *The NRCA Roofing and Waterproofing Manual* discusses the differing needs of low- and steep-slope roofs, stating that steep-slope roofs are "typically composed of many individual pieces or components installed in a shingled fashion. Watershedding roof systems function with gravity to shed water from one course to the next, thereby draining roof surfaces. Asphalt shingle, clay and concrete tile, slate, wood shake and shingle, metal shingles, synthetic products, some metal panel roof systems and fiber cement products fit this category."[5]

Regardless of the pitch, all roofs should be designed and built "to ensure positive, thorough drainage." Positive drainage can be defined as "the drainage condition in which consideration has been made for all loading deflections of the deck, and additional roof slope has been provided to ensure complete drainage of the roof areas within 24 hours of rainfall precipitation."[6]

"SEQUENTIAL" LAYOUT

1. Sheathing Requirements*

When most people think of a roof, shingles or tiles come to mind. However, the roof is not just simply shingles or tiles, rather the roof has many elements designed to protect the home. One critical component is roof sheathing (also known as roof decking). Sheathing is a material that goes on top of the structure (including trusses and beams). Sheathing creates the base of the roof and is critical to creating a proper roof structure. Choosing the proper roof sheathing/decking that is suitable for the fastening and installation of roof covering is important. The type, grade, thickness, and installation of materials used for roof decks should conform to the requirements of the relevant local building codes of practice and regulations. The roof deck should be a stable, smooth, and solid surface where underlayment and roofing materials can be easily and securely installed. The roof deck must be strong to

- Support the roofing materials and workers
- Safely resist impact loads from roof loading
- Hold constant loads, such a heavy snow
- Provide resistance to wind force
- Anchor the fasteners of the roof system

*All these conditions must remain effective during the service life of the roof system.

Types of Decking Materials

A. Plywood

Plywood boards are made from thin layers of wood adhered together, each with its grain at right angles to adjacent layers for greater strength and dimensional stability. Usually there are an odd number of layers so that the grain of the outside layers run together.

Points of note during installation:

1. Install the boards with staggered vertical joints, parallel to the ridgeline. The vertical joints between boards must be supported along the whole length and fastened appropriately.
2. Ensure that there is enough support between two rafters. (Check local building code for any regulations.)
3. Plywood panels should be installed with ¼" spacing between sheets (unless stated otherwise by the manufacturer).

B. Oriented Strand Board (OSB)

Cross-orientated layers of thin rectangular wooden strips or strands, compressed and bonded together with waterproof exterior-grade binders, are formed into wide mats. The layers are oriented like plywood and may have three to five layers. The outside layers are

longitudinally arranged to increase the strength and stiffness in the direction of the alignment.

C. Wood Boards (Solid)

Instead of sheathing boards, solid wooden boards can be used. Local jurisdictions may dictate the width and thickness that is allowable. Board thickness should be a minimum of 1".

It is important to stagger the board joints. When several adjacent boards join on the same support/rafter, it is possible for deck movement and board distortion. All wood boards must be properly conditioned to be at moisture equilibrium. Never use undried, recently stripped, or concrete-form lumber.

The number of fasteners should be enough to prevent buckling. Each board must be fastened with at least two nails in each rafter.

During fastening of the wooden roof constructions, the roof rafter spacing depends on temporary and constant roof loads and on the form or shape of the roof structure, the spacing ranges from 12" up to 24" on center. Check with local building codes or static calculations for proper spacing.

Reducing Concerns of Wood Decking

When installing wood decking, it is important for the building professional to:

1. Properly ventilate the attic. This limits the amount of moisture that may be absorbed by the decking materials, and, thereby reduces the amount of swelling and shrinking of the wood.
2. Leave the roof sheathing panels (plywood, OSB) to acclimate to local humidity levels before installation. This reduces swelling after the panels are installed and avoids any possible buckling problems.
3. Space deck panels 1/8" apart on all sides when fastening them to the roof framing.
4. Immediately cover the roof panels with an appropriate underlayment after installation in order to keep the wood dry.

If there is not adequate ventilation, the wood is not acclimated to the humidity levels, and kept dry; moisture can develop which can be hazardous to the structure and occupants inside the building.

Industry Guidelines for Decking Thickness

- According to the TRI guidelines, minimum recommended requirements include 15/32" plywood or OSB, 1" for solid wood boards.
- According to MCA guidelines, steel roofing, including that for stone-coated steel, has recommended minimum requirements of 15/32" sheet material and 1" for wood planks.
- For Engineered Composite roofing, a minimum requirement is 15/32" sheathing.
- ARMA suggests a minimum of 7/16" OSB and 15/32" for plywood decking.
- Sheathing requirements can vary depending on local building codes.

Other roof decking materials:

D. Cementitious wood fiber

Cementitious wood fiber roof decks are made from coarse wood fibers bonded together with a water-resistant cementitious binder. These units offer insulating value and sound absorbing qualities in addition to providing an acceptable prefinished underside. They are supplied in the form of planks for mechanical securement to bar joists, or for application with grouted joints between planks.

E. Gypsum plank

These are factory-formed units, usually tongue-and-groove, and metal bound. The manufacturer's recommendations should be followed carefully in design of the supporting structure and in placement and attachment. Pre-cast gypsum provides a satisfactory base for nailing. Fasteners to be considered should be approved by the fastener manufacturer, the deck manufacturer for suitability. Certain fasteners may require predrilled holes. Contact the fastener manufacturer for detailed installation instructions.

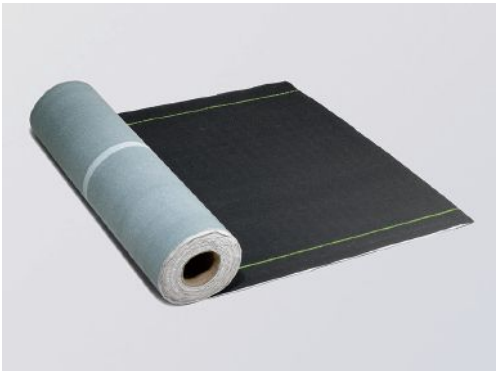
F. Lightweight concrete

Properly placed poured structural concrete decks of good mix can provide a satisfactory deck for application of most roof systems. Control joints properly installed, and a relatively smooth surface, are primary considerations. Concrete decks must be dry. The individual pieces of roof insulation are restricted to a maximum size of 4' x 4' (1.22 m x 1.22 m) when adhesive is used for attachment. Should rain occur during application, the work should be stopped and should not be resumed until the deck has been found to be dry.

G. Insulation boards

These deck systems consist of a lightweight, corrugated, structural steel decking with a rigid roof insulation board and a proprietary gypsum board. All three components are screwed together forming a rigid deck system. Check with the manufacturer's Technical Service Department for approved manufacturers and specific requirements regarding this deck type.

NOTE: These materials (D, E, F, and G) may need additional design concerns to ensure the appropriateness of use with a given roofing material. In many cases, they are not acceptable as a roof deck for direct application of asphalt shingles.



2. Underlayment ("Protect"/Prevent Water Damage)[7]

With any roof system, building codes and the NRCA recommend, and many jurisdictions require, the use of underlayment which is applied over a roof deck prior to the application of roofing material. An underlayment performs two primary functions: it provides temporary weather protection until the roof is installed, and it provides a secondary weatherproofing barrier should moisture migrate below the roof system. The water-resistant and water shedding abilities of the underlayment vary according to application and roofing material used. The inclusion of underlayment can further help prevent water getting trapped under roofing materials such as shingles by ensuring that the water drains off the roof rather than leaking into the structure. Additionally, the inclusion of underlayment complies with building code and helps to prevent the intrusion of dust and insects into a home. Asphalt-saturated felt, rubberized asphalt, and non-bitumen synthetic are all mechanically fastened underlayments, while bituminous is self-adhered.

A. Asphalt-saturated Felt

In residential, steep-slope applications, one of the most common underlayments is asphalt-saturated felt. It can be either fiberglass or organic and made from a cellulose base. Organic underlayment is more common than fiberglass. Such felts are mechanically fastened with a variety of fasteners. While water-resistant, asphalt-saturated felt underlayment is not waterproof. According to the NRCA, "There is also a more viscous 'coating grade' asphalt that is applied to the felt after the saturation process in some products. This makes for a more fire resistant and weather resistant product." Asphalt-saturated felt is also inexpensive, easy to install, and available in two thicknesses: 15- and 30-pound. Saturated felts have limited life spans and should not be left exposed to the elements for long periods of time.

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QUIZ

1. Which of the following factors is an important consideration when designing a new roof and determining its pitch?
   a. Budget
   b. Geographical location
   c. Aesthetics
   d. All of the above

2. _____ base-mat has the benefit of scrim reinforcement for added slip resistance, even when wet.
   a. Bituminous
   b. Non-bitumen synthetic
   c. Rubberized asphalt
   d. Asphalt-saturated felt

3. _____ is considered "best" underlayment.
   a. Felt
   b. Ice and water shield
   c. SBS modified saturated felt
   d. Synthetic woven or unwoven

4. Steep-slope roof coverings include which of the following?
   a. Clay shingles and slate
   b. Metal panels and shingles
   c. Engineered composite shakes, slates, and shingles
   d. All of the above

5. Which type of roof covering can be described as providing the appearance of natural wood or slate but Is often more durable and affordable?
   a. Metal panels and shingles
   b. Asphalt shingles
   c. Engineered composite shakes, slates, and shingles
   d. None of the above

6. To help ensure long-term integrity of a roof system by preventing water, snow, debris from entering the system, it is recommending to specify:
   a. Step and counter flashing
   b. Water removable flashing
   c. Battens
   d. None of the above

7. Roof eaves overhanging a wall are recommended to be ____ or greater to provide the greatest protection of water damage.
   a. One foot
   b. Two feet
   c. Three feet
   d. Four feet

8. Because these types of roof products are non-combustible, which type of roof covering often receives a Class A fire rating?
   a. Stone coated steel roofing
   b. Composite roofing
   c. Clay and concrete roof tile
   d. Wood shake

9. In many climates, _____ save much more cooling energy in summer than they lose in heat loss in the winter.
   a. Warm roofs
   b. Cool roofs
   c. Dynamic roofs
   d. Eave-based roofs

10. Which roofing material, due to its material composition, is shown in accordance with ASTM E96/E96M to be impermeable to water and in accordance with ASTM C272 to experience no weight gain when in contact with water?
    a. Stone coated steel roofing
    b. Composite tile
    c. Clay and concrete roof tile
    d. Wood shake

SPONSOR INFORMATION

SMARTER INNOVATION

UNDERSTANDING THEORIES OF EXNOVATION TO ADOPT NEW INNOVATIONS, OVERCOME RISK AVERSION, AND BUILD BETTER DECK

LEARNING OBJECTIVES

1. Explore the concept of exnovation and how it relates to the life cycle of innovation processes.
2. Identify the categories of organizational risks, which includes the adoption of innovation, and consider strategies for overcoming risk aversion.
3. Analyze the role that regulation plays in creativity and innovation.
4. Examine innovations in decking materials and the ways in which these products contribute to safety, the environment, and performance and aesthetic goals.

CONTINUING EDUCATION

AIA CREDIT: 1 LU/HSW

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INTRODUCTION

For those in architecture, engineering, construction, and design, adoption of innovative products or processes, or even innovation itself, can potentially be curbed by codes, regulations, and risk aversion. Writing for the Dallas AIA, Jeff Forbes defines risk aversion as "a tendency to go to great lengths to avoid potential losses; to focus more on short-term consequences than long-term effects."[1] He discusses a disconnect between architects and the actual building process, as well as the threat of litigation on innovation and risk taking. For architects, engineers, designers, and builders alike, however, it is possible to take risks safely, to leverage regulations to inspire innovation, and to use products that have both short- and long-term benefits to clients, end-users, and the environment.

"THE EXNOVATION CONUNDRUM"

"Innovation," the introduction of new things, new ideas, or new ways of doing something, has become buzzworthy to the extent that "innovation is good, and more innovation is better." John R. Kimberly, researcher and professor at the University of Pennsylvania, discusses the divides between the perception of adopters of innovations into three categories: innovators, early adopters, and laggards. In his work, he uses the definition of innovators as "the small number of pioneers who are way ahead of everyone else and who adopt first;" early adopters as "the next wave of adopters, somewhat slower to adopt, but who, nonetheless are to be congratulated for their courage and vision;" and, laggards as "those poor timid souls who either wait until they see that it's safe for them to adopt or, worse still, who never adopt at all."[2] These divisions and portrayals of adoption and innovation referenced are tongue in cheek, and he goes on to develop a complex view of innovation that includes a term he coined in 1981: exnovation.[3]

Exnovation has been defined by some as "the opposite of innovation." It "emerges at the end of an innovation life-cycle when process and designs which have been tried and tested to work, at least once, become standardized." In terms of architecture, the idea of exnovation can point inwards, toward the stabilization of in-house practices. Some believe that exnovation harms innovation in that it, perhaps, prevents creative external collaboration and a refusal to push beyond what has been standardized.[4]

Kimberly, however, views exnovation as an opportunity at the end of the innovation life cycle where existing practices are "discarded

or purged" in order to allow an organization time to "adopt different and fresh thinking." Exnovation should permit organizations with the opportunity to "jettison what is no longer relevant and [open] the space to create something more relevant to a current project."[5] In more recent years, other researchers have embraced the term to mean that "once a process has been tested, modulated and finally super-efficiently mastered and bested within the innovative circles of any organization, there should be a critical system that ensures that when this process is replicated across the various offices of the organization, the process is not changed but is implemented in exactly the same manner in which it was made super-efficient."[6]

In short, exnovation can be summarized as "the process of eliminating the unsustainable, irrelevant or unsuitable to constantly improve and renew the innovation process."[7] Exnovation, then, is not necessarily about stopping further innovation but about putting efficient processes or practices into use. It is about embracing and implementing useful innovations rather than simply innovating to excess.

This distinction is vital to Kimberly's definition and relevant to the AEC community. Kimberly maintains that the focus of exnovation should not be on the extent to which one innovates but instead on the extent to which a useful innovation is adopted. He states, "Often as not, when something new is introduced, that which it is designed to replaced is not, in fact, replaced."[8]

A recent survey of approximately 400 senior managers at companies with 5 employees or more were questioned about their companies' level of willingness to engage with new technologies or innovations. Many found "the range of innovative products on offer" to be "intimidating." Other leaders found it difficult to find "'products that can truly deliver on their lofty promises'" and ultimately "'add real value to internal operations and, by extension, customers.'" Further tied up in these dynamics is the attempt to balance risk and reward.[9]

TAKING RISKS SAFELY: IDENTIFYING RISKS VS. RISK AVERSION

An article in the *Harvard Business Review* discusses the general nature of risk management in various institutions. It examines "rules-based" approaches to risk management and identifies when it might be necessary to adopt an alternative approach. The article further identifies three major categories of risks: preventable, strategy, and external.[10]

Preventable risks are internal, "arising from within the organization, that are controllable and ought to be eliminated or avoided." Preventable risks include, for example, illegal or unethical behavior from employees or managers or the breakdown of routine operational processes.[11]

The second category of risk, strategy risks, can be defined as "a company voluntarily accept[ing] some risk in order to generate superior returns from its strategy" and can "enable companies to take on higher-risk, higher-reward ventures." Research and development, including the innovation of new products and processes, qualify as strategy risks. Such risks cannot be managed through rules-based control. Instead, organizations should prepare for negative outcomes that may occur from taking the risk.[12]

Finally, external risks include those outwith a company's control. For some industries, these risks include natural and political disasters. Because such events are not preventable, risk management "must focus on identification […] and mitigation of their impact."[13] While all of the risks outlined by the *HBR* are applicable to the AEC industry, strategy risks are most applicable to the creation, adoption, and implementation of new products and processes.

Overcoming Risk Aversion

In seeming contradiction to theories of risk management and understanding risk is the idea that "disruptive change is the path to success." This implies the need for constant innovation, the abandoning of old habits, and a quest for new business models. An article in *The Chronicle of Higher Education* maintains there are currently

GLOSSARY

Bamboo-plastic Composites (BPCs)—co-extruded deck products that are both ultra-low maintenance and environmentally friendly; their two primary components are 55% sustainable bamboo fiber and 35% recycled plastic

Early Adopters—the second wave of adopters, somewhat slower to adopt new innovations

Exnovation—"the process of eliminating the unsustainable, irrelevant, or unsuitable to constantly improve and renew the innovation process"

Innovation—the introduction of new things, new ideas, or new ways of doing something

Innovators—"the small number of pioneers who are ahead of everyone else and who adopt first"

Laggards—"those […] who either wait until they see that it's safe for them to adopt or […] who never adopt at all"

Polyvinyl Chloride (PVC)—low thermal stability, high brittleness, low flame spread index, releases highly toxic hydrogen-chloride when it burns, and ca start to degrade at temperatures above 158°F (70°C)

Regulation—"formal and informal norms and expectations that social actors generate about how to act in particular social contexts"

Risk Aversion—"a tendency to go to great lengths to avoid potential losses; to focus more on short-term consequences than long-term effects"

Wood-plastic Composites (WPCs)—composite materials made of wood fiber/wood flour and thermoplastic(s); WPCs are produced by mixing ground wood particles and heated thermoplastic resin

two disparate views of risk: "as a threat to be warded off and as a value to be celebrated."[14] In answer to that dilemma, an article in Entrepreneur notes that risk-taking should be done only when all the options have been examined and the risks have been calculated.[15]

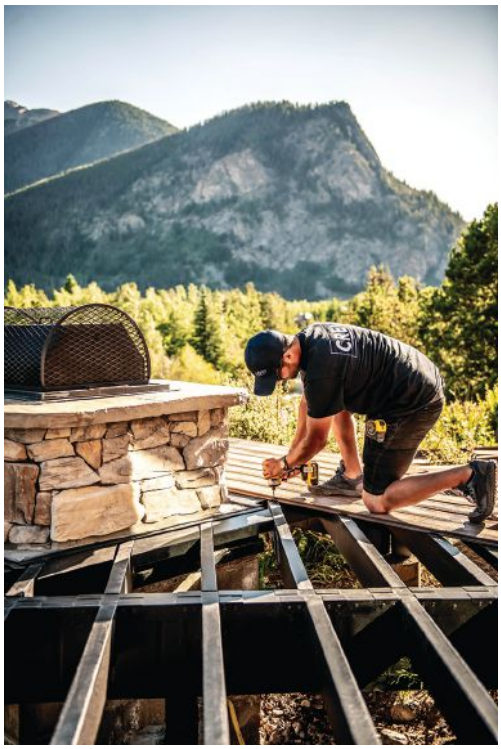
Striking this balance is particularly important in the AEC industry. The potential for loss of life, the threat of litigation, the pressure to complete projects on-time and on-budget, and myriad other issues all factor into the industry's tendency to be risk averse. Extreme risk aversion, however, can lead to decreased productivity. A McKinsey and Company report has noted that "labor productivity growth in construction has averaged only 1 percent a year over the past two decades, compared with growth of 2.8 percent for the total world economy." Among the reasons attributed to this disparity are "mismatches in risk allocations and rewards" and "inadequate design processes and underinvestment in skills development, R&D, and innovation."[16]

Construction Executive elaborates on the McKinsey report's findings, noting, "The

construction industry deals with many issues—low productivity, slow adaptation, lack of collaboration and fear of innovation are a few. Most of these problems influence each other as well as the entire business. No collaboration means fragmented communication and sluggish productivity."

Another study, "Mitigating Risk in AEC Project Execution: Perspectives from Principals, Counsel and Insurers," conducted by software firm Newforma, analyzed the AEC industry from three stakeholder viewpoints: "risk sources for A/E firms, the search for solutions in the form of business practices and supporting technologies, and possible avenues to mitigating risk." The study ultimately concludes, "Fear of liability and strong aversion to risk exposure were cited as the primary cause of the industry's declining productivity. Lack of communication between different parties involved in projects has been ensured by the compartmentalizing of responsibility. The maintenance of business processes and project execution processes that further isolation between the different parties has become the norm as it allows each party to shift accountability to others in the asset-creation value chain." These fears and fragmented communication, in turn, led to increased errors.[17]

Conversely, a greater exposure to liability was found to reduce the severity and likelihood of errors on a project. In other words, abandoning old practices of risk aversion and instead adopting new methods of managing risk can ultimately lead to better project execution. *Construction Executive* states, "Forward-thinking jobs promote creativity and open communication. When people are receptive to risk, it's easier for them to envision a project's success rather than its failure." While not all risks lead to success, the process of risk taking can lead to learning opportunities and new strategies for future successes. In these



instances, it is also important to distinguish between "productive failures" that "yield practical solutions and new ideas" and unproductive failures that "cost a company time and money."[18]

In addition to these general strategies, the McKinsey report notes seven distinct areas where innovative firms are succeeding in boosting productivity: "They are reshaping regulation; rewiring the contractual framework to reshape industry dynamics; rethinking design and engineering processes; improving procurement and supply-chain management; improving onsite execution; infusing digital technology, new materials, and advanced automation; and reskilling the workforce."[19]

The McKinsey report also recommends a collaborative approach between owners, contractors, specifiers, and government to boost productivity. Owners, who are traditionally risk averse, need help navigating the market and understanding the ways in which more productive methods or newer products can lower costs or help projects remain on-schedule. Specifiers must therefore have knowledge of opportunities to implement new processes, recommend innovative products, or change procurement practices to facilitate budgets and schedules. Governments,

too, have the opportunity to positively affect change through regulation. For instance, as demand rises, markets are becoming more transparent and disrupting trades, making the need for "productivity-enhancing technology, [processes, and products] more pressing."[20]

REGULATIONS AND INNOVATION

While regulations have the potential to incite positive change, the debate over whether or how regulations limit innovation or enhance it is one that is common among the AEC community and ranges from publications in scholarly journals to articles in *The Atlantic, The New York Times, The Washington Post*, and a bevy of architectural magazines. Some decry "political interventions in the design and development process," claiming they "serve to delimit and define the scope of activities of architects." Others claim that "far from the rule and regulatory basis of architecture undermining the capacities of architects to design, they are the basis for new and challenging activities that open up possibilities for reinventing the actions of architects."[21]

One study suggests that regulations and codes have shaped architecture from its earliest periods, whether the regulations were governmental, religious, or socio-cultural. These various codes and regulations range from those "seeking to influence the formal structure of settlement patterns, to prescriptive building regulations specifying detailed elements of design in relation to the safety of building structures." The study defines regulation, broadly, as "formal and informal norms and expectations that social actors generate about how to act in particular social contexts."[22] Regulations, therefore, are not limited to laws but also embody societal norms and expectations.

QUIZ

1. According to the course, the idea of "eliminating the unsustainable" can be termed
   a. Innovation
   b. Risk Management
   c. Exnovation
   d. Risk Aversion

2. Which of the following is a category of risk as identified by the Harvard Business Review?
   a. Preventable Risk
   b. Strategy Risk
   c. External Risk
   d. All of the above

3. Research and development, including the innovation of new products and processes, qualifies as which type of risk?
   a. Preventable Risk
   b. Strategy Risk
   c. External Risk
   d. None of the above

4. According to the McKinsey report, "labor productivity growth in construction has averaged ___ percent a year over the past two decades."
   a. 1
   b. 2
   c. 3
   d. 4

5. Comparatively, the world growth economy has averaged _____ percent a year over the past two decades.
   a. 1.8
   b. 2.8
   c. 3.8
   d. 4.8

6. Regulations and codes have been seen as
   a. "Serving to delimit and define the scope of activities of architects"
   b. "The basis for new and challenging activities that open up possibilities for reinventing the actions of architects"
   c. Shaping architecture from its earliest periods
   d. All of the above

7. BPCs are comprised of _____ sustainable bamboo fiber and 35% recycled plastic.
   a. 35%
   b. 45%
   c. 55%
   d. 65%

8. Wood-plastic composites were first introduced to the decking market in the early _____.
   a. 1970s
   b. 1980s
   c. 1990s
   d. 2000s

9. BPC product profiles are created using _____.
   a. PVC
   b. HDPE
   c. LDPE
   d. PLA

10. Which generation of decking is particularly prone to moisture, creating conditions for slipping?
    a. First Generation Composite Decking
    b. Second Generation Composite Decking
    c. Second Generation Composite Capping
    d. Newest Generation of BPC Decking

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SELECTING THE RIGHT FIREPLACE: STEPS TO SUCCESS

Presented by:
HEAT&GLO
No one builds a better fire

Consumer research confirms that homebuyers want fireplaces; however, not all fireplaces are created equal.

LEARNING OBJECTIVES

1. Learn the value of fireplaces in new homes and renovations, as well as the ways in which fireplaces can help earn LEED credits.
2. Understand distinguishing features of various fireplace design styles, including traditional, modern, and fusion.
3. Explore fireplace trends and technologies such as controllable heat and connectivity.
4. Discover three key steps that lead to the specification and design of the best fireplaces for different clients, homes, and styles.

CONTINUING EDUCATION

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INTRODUCTION: THE RIGHT FIREPLACE

Imagine a client stepping into the kitchen of their newly built luxury custom home. Their senses ignite with the details, décor, and elegance of the space. The natural stone countertops are top-shelf granite, and the custom pendant lighting dances from the ceiling above the open concept layout. The colors are two-tone, wood cabinets mixed with pops of navy-blue walls bringing in a modern flavor distinctly on trend for 2020. The flooring is premium cork, and the true divided light windows provide a prestigious accent to the walls. The kitchen boasts an expansive dual fuel stove range with six high-performance burners—an appropriate set up for a homeowner who loves to play chef and entertain. Finally, to top it all off—a compact mini refrigerator squeezed in the corner, the kind one might find in any undergrad dorm room across the country.

Even those who are not educated in the art of architecture and design can discern that the size, grade, and capability of the appliance, in this case the refrigerator, does not match the design intent, project goals, or end-user expectations for the space.

The concept of product tiers or grades is not new. Yet, across U.S. housing markets architects, designers, builders, and homeowners are specifying, purchasing, and installing the proverbial "mini fridge" in the form of base-level fireplaces, regardless of the property or space in question.

The analogy is not perfect: Unlike the refrigerator, which is commonly understood to be an entity of its own in the greater mechanics of the kitchen (in both design and function), the fireplace is often confused with the wall in which it is installed. To most, they are one and the same. In retail showrooms, model homes, and builder selection centers, fireplaces are commonly staged on a wall with a mantel, stone set, hearth, and perhaps other features or furnishings to drive consumers to buy the entire package. These features are most often sold as a bundle, leading to consumer confusion and causing the fireplace to be overshadowed by the other elements that are included. This method of feature packaging has led to widespread misunderstanding about the importance of the appliance itself.

Weak flame, lackluster design, and no components to marry to the larger decorative theme of the space are qualities endemic to those fireplace models coined "builder boxes"

by the hearth industry. While a minimum viable product may make sense for some entry level homes, the "builder box" has become an unfortunate default being used as a universal hearth solution. The ramifications of having chosen the wrong fireplace soon become apparent once end-users get a moment to focus on the details. Unlike a refrigerator, a fireplace is a structural element, and replacing it once installed can be costly and difficult.

This course aims to look at the fireplace category as a tiered good, better, best structure while providing knowledge about the aesthetic and performance characteristics that qualify a model at each level. "Grades" or tiers of fireplace will be analyzed to determine what will work best for various homeowners and projects.

THE VALUE OF A FIREPLACE

Quantitative national surveys and in-depth interviews have found that people value the warmth, ambiance, aesthetics, and emotional impact a fireplace brings to a home. According to a recent study, 40% of home buyers are willing to pay at least $1,400 more for a house if it includes one or more fireplaces.[1]

Across each age, income level, and region of the U.S., homebuyers frequently rate fireplaces as a "must-have" feature: 97% are interested in a fireplace, 81% want a fireplace, and 68% maintain a fireplace is essential. The reasons for wanting a fireplace, ranked in order, are that it adds safe and clean warmth to the house, creates a relaxing and inviting environment, adds to the home's décor, increases the value of the house, and enables unique designs for every room of the house.

In general, fireplaces are part of a much larger concept based around enjoyable living; they provide an escape from the busy-ness of the outside world as well as a focal point around which people can gather for love, life, and relaxation. They enable homebuyers to better imagine future moments and memories that will be created in their new home, as fireplaces are related to thoughts of hosting parties, playing board games, enjoying the holidays, and watching football.

Beyond emotional desires for a fireplace, many homebuyers view fireplaces as an interior design focal point. A fireplace can serve both as a visual and decorative centerpiece to provide a room with unique or dramatic aesthetics. Homebuyers further appreciate other features such as the ability to control heat, flame and log realism, ease of use, remote controls, and accent lighting.

Home values, too, are increased by fireplaces. *Marshall & Swift Residential Cost Handbook* notes that a gas fireplace adds between $3,000 to $6,000 to a home's appraised value, and the *2016 Houzz Landscaping Study* states that 90% of real estate agents maintain that an outdoor fireplace will increase a home's value.

Today, the fireplace category offers many possibilities—allowing for installs in rooms such as the bedroom, bathroom, and kitchen.

GLOSSARY

Design Flexibility—having the ability to decorate with a variety of options including combustible materials above and/or around the fire.

Fire Art—innovative models that do not produce much or any radiant heat and instead act as a piece of artwork in the room, offering a visual aesthetic.

Internet of Things (IoT)—permits everyday objects to communicate with one another by sending and receiving data.

Linear Fireplaces—deliver strong, contemporary design elements; often feature a ribbon of flame, providing both warmth and ambiance; available in a variety of sizes and typically range from 36 inches to 6 feet.

Modern/Contemporary—unrestricted by geometry; often linear, square, or multi-sided, and their unique, decorative fronts range from ultra-slim minimalistic to dramatic and chunky; typically have glass, porcelain, or metal interior panels in reflective, fluted, or perforated styles. Instead of logs, these fireplaces have glass rocks, polished stone, beads, or a combination.

Near Field Communication—emerging technology that enables users to place two gadgets together so they can communicate.

Passive Heat—allows heat to disperse naturally in the room, reducing surface temperatures.

Smart Fireplaces—new fireplace technologies utilize smart home technology; heat management technology allows users to distribute the warmth from the fireplace inside or outside of the house; televisions can be placed closer to the fireplace; can intuitively adjust to homeowner needs; can be equipped with blue tooth speakers.

Traditional Realism—manufactured fireplaces that replace true masonry-built wood burning fireplaces. These fireplaces have a large, clean-face viewing area and are square, rectangular, or arched in shape. The interior panels are molded to mimic the look and texture of brick in the refractory, and the fireplaces feature ceramic logs crafted from the casts of real wood.

Transitional Fusion—an "up and coming" trend; can be achieved by using a modern fireplace style with traditional furnishings, finishes, and accessories.

Approximately 68% of real estate agents believe that fireplaces can increase the value of a home, and more than 83% see that value as increasing by anywhere between $1,000 and $4,999.[2]

Fuel Types for Different Applications

One of the main reasons fireplaces have become so universally accessible is due to the multitude of fuel types now available. The Hearth, Patio & Barbecue Association (HPBA) comments on the different types of fuel for fireplaces, noting that real wood fires provide ambiance with sights and smells that cannot be replicated; gas offers end users convenience and immediate warmth simply by flipping a switch, and electric provides heat without limiting placement or venting.[3] Pellet, ethanol, and gel fireplaces are also available.

Certain areas of the United States limit or outright ban wood burning types. Specifiers should leverage this type only for very specific properties in markets where they are allowed. Pellet, ethanol, and gel fireplaces are still considered "niche" fireplace types by most consumer buyers. Architects will find that gas and electric fireplaces are often the most desirable types to specify for a number of reasons including design versatility, model variety, code compliance, and their contribution to LEED and other green building criteria.

Some premium models more advanced than others. Here we see a gas model with no glass front and equipped with Bluetooth enabled speakers, delivering a unique sensory experience.

Adding Value to Green Building with Fireplaces

LEED, developed by the U.S. Green Building Council (USGBC), is "the most widely used green building rating system in the world" and seeks to ensure "electricity cost savings, lower carbon emissions and healthier environments."[4] It provides credits in the areas of energy, air quality, water, and waste. Fireplaces can contribute to the energy efficiency and indoor air quality categories of LEED through models that are direct vent and have electronic ignitions. This makes some fireplaces eligible for better and best practice credits as described under LEED Table 29, *Fireplace and stove combustion-venting requirements*.

Such fireplaces allow for intentional heating; specific rooms that are in frequent use can be heated instead of an entire house. Various technologies, including flame modulation, permit precise control over the amount of heat released. Modern electric fireplaces offer optional heating and do not rely on the combustion of fossil fuels to produce it. Additionally, many suppliers in the U.S. now offer their customers the option of buying renewable electricity.

Placing the Fireplace

New technologies allow fireplaces to be incorporated nearly anywhere in the home. Often-thought barriers such as limited square footage or shallow wall depth are no longer obstacles.

For example, it is possible to have a fireplace built into an exterior wall and used as an interior focal point or to have a fireplace built into an interior wall, such as an island or a room divider; these see-through placements are particularly helpful in defining spaces within an open layout. While multi-sided fireplaces are not new, many of their layout options are. For instance, corner, 4-sided, round, pier, and bay units are all possible. Fireplaces in interior walls can even be used as both structural and decorative elements. Bedrooms, bathrooms, and kitchens are also all viable spaces for fireplaces, as is the outdoors. It is now safer, too, to incorporate artwork or even a TV above a fireplace with or without a mantel.

In short, fireplaces are no longer relegated to living areas such as great rooms and dens. Most modern direct vent gas fireplaces do not

Direct vent gas fireplaces offer the most versatility in placement and come in a plethora of styles and configurations including see-through, bay, and pier models. Multi-sided options occur in the mid-range and premium product tiers.

require a chimney, which provides even greater flexibility in placement. Furthermore, exhaust system technology uses vent runs that can allow up to 110 feet and 11 elbows. This allows for installation flexibility so that fireplaces can be installed anywhere within the structure, located exactly where desired.

Consumer Concerns

An electric fireplace, like the one shown here, would be an ideal selection for a small condo or attached living project where gas is not an option

While many homebuyers are willing to pay more for a house with one or more fireplaces, there are other consumers who perceive drawbacks to fireplaces. Some might feel fireplaces are too hard to clean or upkeep, present safety/fire hazards, have the potential to leak air, are expensive, or that they would ultimately not be used. Specifically, many consumers believe wood burning fireplaces to be messy and are concerned about the safety of gas fireplaces. Other consumers believe their home might look dated with the incorporation of a fireplace or that fireplaces are not energy efficient.

This article continues on http://go.hw.net/AR052020-9. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. According to a recent study, _____of home buyers are willing to pay at least $1,400 more for a house if it includes one or more fireplaces.
   a. 20%
   b. 30%
   c. 40%
   d. 50%

2. _____ of home buyers are interested in a fireplace.
   a. 50%
   b. 65%
   c. 78%
   d. 97%

3. If homeowners are concerned that an older fireplace looks dated and want to increase resale value, real estate agents recommend:
   a. Renovating the fireplace rather than removing it
   b. Painting the fireplace
   c. Turning it into a decorative fireplace
   d. All of the above

4. Which of the following design types can be described as a manufactured fireplace that replaces true masonry-built wood burning fireplaces? These fireplaces have a large, clean-face viewing area and are square, rectangular, or arched in shape.
   a. Traditional realism
   b. Modern/contemporary
   c. Transitional Fusion
   d. Fire art

5. Which of the following design types can be described as unrestricted by geometry? These fireplaces are often linear, square, or multi-sided, and their unique, decorative fronts range from ultra-slim minimalistic to dramatic and chunky.
   a. Traditional realism
   b. Modern/contemporary
   c. Transitional Fusion
   d. Fire art

6. Which of the following design types can be described as an "up and coming" trend? This style can be achieved by using a modern fireplace style with traditional furnishings, finishes, and accessories.
   a. Traditional realism
   b. Modern/contemporary
   c. Transitional Fusion
   d. Fire art

7. The need for primary heat from fireplaces has been generally reduced due to:
   a. Better insulated buildings
   b. HVAC technology
   c. Cheaper building materials
   d. Both A&B

8. Outdoor fireplaces are becoming popular added features in the outdoor living space due to:
   a. Variety of styles and options available
   b. Ambiance and warmth created during evenings and cooler seasons
   c. Availability of fireplaces that are approved for outdoor usage
   d. All of the above

9. _____ of real estate agents claim an outdoor fireplace can increase the value of a home, and the 2018 American Society of Landscape Designers Annual Residential Landscape Architecture Trends Survey maintains that fireplaces/firepits are the number one most popular outdoor design element.
   a. 90%
   b. 80%
   c. 70%
   d. 60%

10. Which of the following is the first step in specifying the right fireplace?
    a. Make the match between fireplace, homeowner, and home
    b. Understand room and proportion use
    c. Understand homebuyers' needs and wants
    d. Understand generational differences between homebuyers

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STRENGTH THROUGH TRANSPARENCY

HOW CONCRETE EPDS ARE DRIVING DOWN CARBON FOOTPRINT

Presented by:

BUILD WITH STRENGTH

Figure 1. Adrian Smith + Gordon Gill Architecture uses Life Cycle Assessment (LCA) and Environmental Product Declarations (EPD) to measure and reduce environmental impacts of the buildings they design. Through specifying Global Warming Potential targets in their design documentation and calculating overall embodied carbon using product specific EPDs, they are able to achieve significant Life Cycle Carbon reductions. For example, in the five buildings around Al Wasl Plaza, the central exhibit at Dubai Expo 2020, they were able to achieve considerably greater reductions than the 10% required by USGBC to meet the LEED Building life-cycle impact reduction points.

LEARNING OBJECTIVES

1. Understand terminology and concepts relevant to a sustainable future, such as environmental product declarations (EPDs), life cycle inventory (LCI), and life cycle assessment (LCA), and the concrete industry's transparency and sustainability initiatives.
2. Assess the roles of LEED v4, ASHRAE 189.1, the International Green Construction Code, and Architecture 2030 in driving transparency in the AEC industry.
3. Analyze concrete's contributions to LEED v4 Materials and Resources, as well as how to specify concrete for LEED v4.
4. Discover innovative technologies and concrete products and the ways in which they contribute to sustainability efforts alongside responsible sourcing and material ingredient disclosures.

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INTRODUCTION

By 2060, it is estimated that approximately 6.6 billion people—two thirds of the world's anticipated population—will live in cities. Architecture 2030, a non-profit organization established in 2002 dedicated to sustainable, carbon-neutral planning and design in the built environment, maintains, "To accommodate this tremendous growth, we expect to add 2.48 trillion square feet (230 billion m^2) of new floor area to the global building stock, doubling it by 2060. This is the equivalent of adding an entire New York City every month for 40 years." Climate goals, including meeting the emissions reduction targets set by the Paris Agreement, cannot be met without structures being designed to meet zero-net-carbon standards.[1]

Currently, buildings are responsible for approximately 39% of annual global greenhouse gas (GHG) emissions. Building operations alone results in 28% of the annual global CO_2 emissions. The other 11% of the annual global CO_2 emissions results from building materials and construction, or embodied carbon. Embodied carbon, is "the CO_2 emitted during the extraction, manufacture, and transport of building materials and products, and the construction of buildings and infrastructure," Three building materials are responsible for more than half of these emissions: steel, aluminum, and concrete.[2]

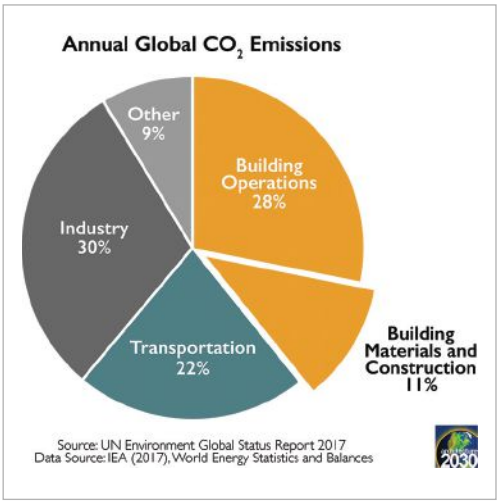

Figure 2. Embodied carbon emissions from the building sector produce 11% of annual global GHG emissions. Image: Courtesy of Architecture 2030.

These three building materials are some of the most widely used building materials on the planet. "Modern building materials play a key role in building modern society—providing shelter and infrastructure to support our quality of life. But, this quality of life comes with significant environmental burdens," says Dr Chris Drew, Director of Sustainability, Adrian Smith + Gordon Gill Architecture (AS+GG).

Drew goes on to explain that concrete is used in every building designed: whether a building's structural system is concrete frame, steel frame, mass timber or other system, concrete comprises a significant portion of the structure (foundations, shear walls, floors, etc.) and thus a significant portion of the embodied impacts. The concrete industry, however, is taking the lead in driving initiatives toward a sustainable future through transparency and innovative concrete solutions with positive results.

The Rising Demand for Transparency

Transparency, as defined by Underwriters Laboratories (UL), "requires that companies share insight about what their products contain, how they are made, and what impact products may have on the community, environment, and end users."[3] From a broader perspective, all market sectors are beginning to disclose sustainability-related product or enterprise information in response to market demand. The Consumer Goods Forum, an organization that brings together consumer goods retailers and manufacturers across the globe "to secure consumer trust and drive positive change," credits "mass education, mass media, and massive scandals" for driving market demand for transparency.[4]

Building professionals and companies are in a unique position to address and help resolve consumer trust issues as well as climate concerns. The projected increase in building stock presents those in the industry with great design, planning, and construction opportunities. For instance, since 2005 the U.S. building sector has already succeeded in reducing operational carbon emissions despite adding over 30 billion square feet of building stock.[5]

In addition to the reduction of operational carbon, it is equally important for the AEC industry to reduce embodied carbon in infrastructure, buildings, and materials. Architecture 2030 notes that over the next 10 years, embodied carbon will surpass operational carbon unless building professionals work to lower emissions. Edward Mazria, founder and CEO of Architecture 2030, states, "Embodied carbon will be responsible for 72% of CO_2 emissions [from all the buildings built between now and 2030] and operational carbon 28%."[6] As Blaine Brownell, director of the M.Arch. program at the University of Minnesota, emphasizes, "[A] building's overall embodied carbon is inextricably linked to the composition of the products from which it is built."[7]

LCAS, LCIS AND EPDS

Frances Yang, Americas Region Sustainable Materials Leader for Arup notes, "Disclosure is an interesting mechanism. You can't improve what you're not measuring."[8] As the AEC industry moves towards a more holistic perspective of transparency and sustainability, concrete producers have responded to product disclosure inquiries specifically though environmental product declarations (EPDs).

Life Cycle Assessments (LCAs) and Life Cycle Inventory (LCIs)[9]

Life cycle assessment, or LCA, is the investigation and evaluation of the environmental impacts of a product, process or service. LCA evaluates all stages of a product's life and considers each stage interdependently. Figure 4 provides a schematic of a typical product manufacturing process. Inputs include raw materials and energy. Life cycle stages include raw material acquisition, manufacturing, product use, and finally, recycling or waste management. The outputs, many of which impact the environment negatively, include atmospheric emissions, waterborne wastes, solid wastes, co products and other releases.

LCA is the most comprehensive approach to determining the environmental life cycle impacts of a product and can be used as a tool to make decisions that could result in lower environmental impacts. Per the International Organization for Standards (ISO) 14040 and 14044, LCA is conducted in four distinct phases:

- Goal Definition and Scoping—Define and describe the product, process or activity being analyzed.
- Inventory Analysis—Identify and quantify energy, water and materials use and environmental releases. Environmental releases may be solid waste, air emissions and wastewater discharges.
- Impact Assessment—Assess the potential human and ecological effects of energy, water and material usage, and the environmental releases identified in the inventory analysis.
- Interpretation—Evaluate the results and select the preferred product or process.

The first phase, Goal Definition and Scoping, is relatively simple since one can generally

Figure 3. The design team for the San Francisco International Airport expansion used Life Cycle Assessment (LCA) to quantify and reduce environmental impacts. They used product-specific EPDs to demonstrate that the low-cement concrete mixes had significantly lower impact than baseline mixes from the region. As a result, the project earned 3 points for meeting the LEED v4 LCA credit. Architect: HKS; LCA consultant: Arup; Structural Engineer: Rutherford & Chekene; Image: Courtesy of HKS.

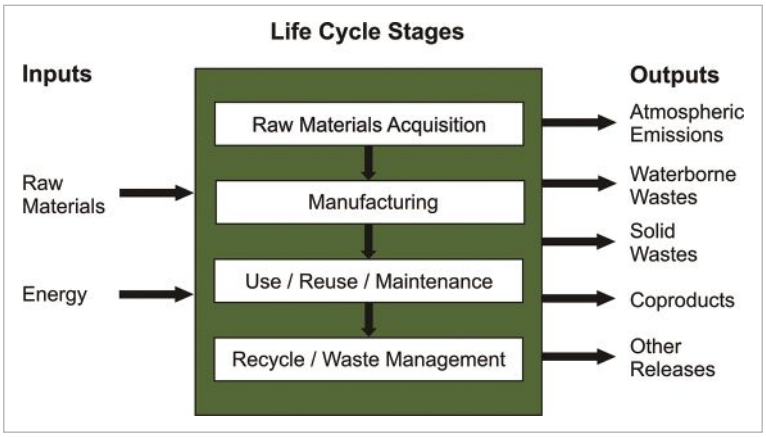

Figure 4. Life cycle stages, inputs, and outputs for Life Cycle Assessment (adapted from the U.S. Environmental Protection Agency (EPA)).

identify and define the product or process being analyzed. The second phase, Inventory Analysis, often called life cycle inventory (LCI), is more difficult since one must have the capability to measure and account for all inputs and outputs from a particular product or process. In many cases, it is relatively easy to measure the inputs to a product or process, but it becomes much more difficult and expensive to measure environmental releases or outputs. The third phase, Impact Assessment, is the most complex phase of an LCA. In this phase, one attempts to equate the environmental releases identified in the Inventory Analysis phase to their potential human and ecological effects.

The U.S. Environmental Protection Agency (EPA) developed the Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI) that allows for the examination of the potential for impacts associated with the raw material usage and chemical releases resulting from the processes involved in producing a product.

Environmental Product Declaration (EPD)

An Environmental Product Declaration (EPD) can be thought of as a nutrition label for a product, but instead of providing information such as calories, fat content and carbohydrates, an EPD provides information about environmental impacts such as global warming potential, smog formation, and water use. EPDs are third party verified (certified) reports published by product manufacturers that provide quality assured and comparable information regarding environmental performance of their product.

Generally, industry trade groups help develop a Product Category Rule (PCR) that provides instructions on how to conduct the Life Cycle Assessment (LCA) in order to produce EPDs that are consistent across a product category (such as concrete, carpeting, ceiling tile, etc.). Generally, plant or site-specific data are more desirable for conducting an LCA for the product, however, industry average data are sometimes used if site specific data are not available.

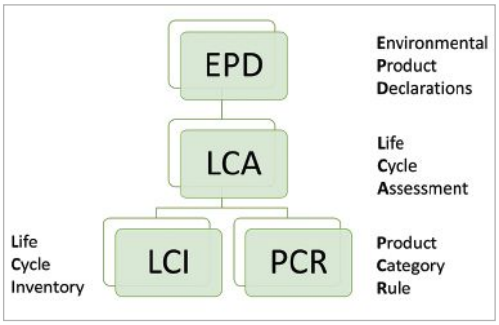

Figure 5. EPDs are developed by conducting an LCA on a product using a PCR and LCI data.

There are three types of EPDs defined by ISO standards, type I, II and III. The type depends on the degree of third-party verification and endorsement. The concept of developing EPDs for products is relatively new in the building products industry. Not many industries have developed the requisite PCRs or published reliable LCI data. Perhaps a reason for this is that not many project specifications or standards have required EPDs until recently.

Standards and initiatives such as LEED v4, Architecture 2030 Challenge for Products, ASHRAE 189.1 and the International Green Construction Code (IgCC) require a combination of EPDs for products and LCAs for whole buildings as a way to demonstrate transparency and ultimately superior environmental performance. These standards require Type III EPDs which amounts to "nutrition labels" for products. Type III EPDs must follow the ISO 14025 standard.

Ideally, LCAs for products are conducted for the entire life cycle or from "cradle-to-cradle." However, for many products, their impacts during the use stage are minimal or life cycle inventory data for the use stage is difficult or nearly impossible to obtain. In some cases, it may be preferable to conduct partial LCAs such as "cradle-to-gate" type analyses where only the first two life cycle stages, raw material acquisition and manufacturing, are included since this data is needed to conduct the more comprehensive whole building or full life cycle LCA for a building or other structure.

Putting Concrete into the Mix

By conducting LCAs, the concrete industry has created a robust directory of EPDs.[9] Collectively, the concrete industry is the building materials product leader regarding disclosing cradle-to-gate environmental impacts. These efforts provide national coverage as the industry is responding to growing architectural, engineering, and construction inquiries for disclosure.

To prepare its members to respond to product disclosure trends, the concrete industry has developed many resources through significant collaboration and engagement efforts, including the following:

- Industry-wide environmental product declarations (IW-EPDs)
- Regional environmental impact benchmarks
- Became an EPD program operator to facilitate product-specific EPDs
- Created a network of EPD developers and verifiers possessing leading software tools to expediently deliver EPDs to the construction market

GLOSSARY

Athena Sustainable Materials Institute (ASMI)—a "membership-based non-profit research collaborative bringing life cycle assessment (LCA) to the construction sector"

Consumer Goods Forum—an organization that brings together consumer goods retailers and manufacturers across the globe "to secure consumer trust and drive positive change"

Embodied Carbon—"the CO_2 emitted during the extraction, manufacture, and transport of building materials and products, and the construction of buildings and infrastructure"

Environmental Product Declaration (EPD)—an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products

Life Cycle Assessment (LCA)—"compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle"

Life Cycle Costing (LCC)—a cradle-to-grave life cycle approach that looks at the financial costs associated with a product rather than its environmental impact

Life Cycle Inventory Analysis (LCI)—"phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle"

Life Cycle Impact Assessment (LCIA)—"phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product"

Product Category Rule (PCR)—"product-specific calculation requirements and methodologies for the background Life Cycle Assessment (LCA) reports that ensure consistent data collection, analysis, and reporting in an EPD"

Transparency—"open, comprehensive and understandable presentation of information"

- Facilitated engagement and collaboration with concrete producers to meet the product disclosure criteria in LEED v4
- Worked with Athena Sustainable Materials Institute (ASMI) to gather process data to conduct a comprehensive life cycle inventory (LCI) of concrete plants, a life cycle assessment (LCA), and an IW-EPD that was verified by NSF International
- Represented concrete through the IW-EPD that is typically used on residential, commercial, and public construction projects in different climate zones and in different markets. The EPD encompasses concrete for a variety of applications, strengths, durability classes and slumps (or slump flows), and regions. The EPD also provides environmental impacts for 72 concrete mix designs ranging from 2,500 psi to 8,000 psi with a wide variety of alternative cement replacement scenarios.

The concrete industry discloses regional environmental benchmarks as well. Working with the Athena Sustainable Materials Institute (ASMI), the average environmental impacts for eight different regions in the U.S. were calculated. This offers national coverage of concrete producers capable of supporting LEED v4 projects. These benchmarks represent the environmental impacts of products with varying strengths for different applications and exposure conditions, which can then be used to compare environmental impacts to those of the industry baselines.

Overall, demands from the AEC industry and helping the design community pursue LEED v4 Materials and Resources credits have been primary motivations for the concrete industry to engage in transparency initiatives. EPDs from concrete producers continue to increase, and concrete material suppliers have developed EPDs for raw materials such as cement, aggregate, and supplementary cementitious materials (SCM). Using benchmark reports, concrete producers can compare their products' environmental impacts to those of the industry average mixes in order to reduce environmental impacts and offer greater contributions to LEED v4 projects. Importantly, Frances Yang of Arup maintains, "There is greater disclosure, now, about building materials and collecting those disclosures, and the next step is obviously making use of them. I feel that the concrete sector is starting to do that. It's not only about transparency right now. It's also about making better products available."[10]

QUIZ

1. Buildings are responsible for approximately ____ of annual global greenhouse gas emissions.
   a. 9% b. 19%
   c. 29% d. 39%

2. According to the ISO, an EPD can also be referred to as a type _____ environmental declaration.
   a. I b. II
   c. III d. IV

3. Which of the following is a life cycle approach that looks at the environmental impacts of a product, process, or service?
   a. PCR b. LCC
   C. LCA d. EPA

4. Which of the following is a phase in an LCA study?
   a. Inventory analysis b. Impact assessment
   c. Interpretation d. All of the above

5. The LCI is the _____, or inventory analysis phase of the LCA.
   a. First b. Second
   c. Third d. Fourth

6. LEED v4 has ____ main credit categories.
   a. 3 b. 4
   c. 5 d. 6

7. The _____ LEED v4 credit stipulates the use of more sustainable materials and incentivizes manufacturers who provide information on how products were produced and what materials they contain.
   a. Indoor Environmental Quality b. Materials and Resources
   c. Sustainable Sites d. Water Efficiency

8. Using concrete can potentially influence ____ of 55 LEEDv4 credits and prerequisites.
   a. 5 b. 10
   c. 15 d. 25

9. Members of the concrete industry have lowered their carbon footprint by _____ in 5 years.
   a. 13% b. 10%
   c. 5% d. 2%

10. The concrete industry has more product specific EPDs than any other industry by far, over _____.
    a. 5,000 b. 7,000
    c. 10,000 d. 22,000

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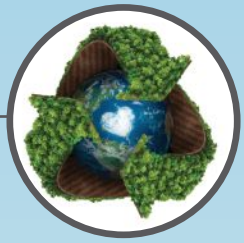

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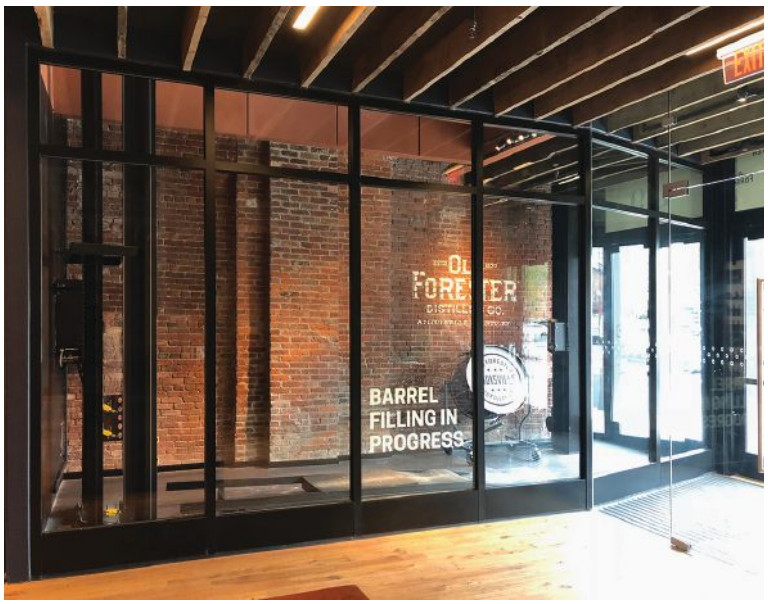

One of the areas where fire resistive glazing was specified was in the three floors that open into the Barrel Conveyor to give visitors an opportunity to view this unique piece of equipment.

LEARNING OBJECTIVES

1. Review the history of fire rated glass and explore several case studies where modern fire rated glazing was used to transform unique commercial and institutional spaces.
2. Understand the difference between fire protective and fire resistive glazing, and review two case studies where fire resistive products were used in residential and hospitality projects.
3. Examine how fire rated glazing can transform education facilities and offices into collaborative, well-lit spaces.
4. Discover the importance of fire resistant glazing in also providing increased security features such as blast resistance, bullet resistance, forced entry resistance, and clear sight lines in institutional facilities.

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CASE STUDY ONE

Fire Rated Glazing Gets Visitors 'In the Spirit' of Historic Bourbon Distillery
Old Forester Distillery
Louisville, KY

As America celebrated National Bourbon Day on June 14, downtown Louisville also celebrated the highly anticipated grand opening of the Old Forester Distillery. This event is also touted as a triumphant return of America's first bottled bourbon in continuous production by the same family before, during, and after Prohibition to Whiskey Row. Known as the historic epicenter of bourbon making, Whiskey Row once had 89 bourbon related-businesses occupying about two blocks of Main Street. Today, Old Forester's new $45 million, 70,000-square-foot distillery is in the same building that it occupied over a century ago—with a few upgrades, of course.

The unique task of designing an immersive visitor center with a fully-operational distillery, cooperage, and bottling line was given to Bravura Architects in Louisville, KY. To achieve this, the designers used glazing throughout the building to provide views of the operation. In areas where fire ratings are required, they specified fire resistive glass and framing that met ASTM E-119/UL 263 to provide as much clear views as possible.

One of the areas where fire resistive glazing was specified was in the three floors that open into the Barrel Conveyor to give visitors an opportunity to view this unique piece of equipment. "The goal was to provide guests with a visual connection to better understand the product and process flow within this working distillery, while still meeting the ratings for this 3-story shaft," says Ed Kruger, the project architect at Bravura Architects.

To achieve this, the design team specified a transparent fire resistive wall using 60 minute fire resistive glazing in fire resistive aluminum framing on the second floor of the Barrel Conveyor so visitors can see where the barrels are filled and brought down to the main floor.

Fire resistive glazing was also used to create drama and suspense between the Welcome Area and the sky-lit atrium, which houses the 'heart' of the distillery. "The client wanted to bring diffused light from the atrium into the Welcome Area, and had wanted this signature wall to be a dramatic, lit element within the space that would celebrate the brand's founder. Because retail is on the other side of this glass wall (which is the end of the tour), we didn't want tour guests to see the final dramatic reveal of the still and the 4-story atrium until the very end," says Ed. "Thus, the translucent film obscures the view, allows light to flood that

area, and provides a background to the focal signature element." To achieve this, 60 minute fire resistive glazing and aluminum framing were used, as well as steel temperature rise doors to create the 1-hour wall separation.

There were also some 60 and 90 minute temperature rise doors in the building, and the designers wanted to keep the open and transparent design while meeting fire code requirements. "Along the tour path, the goal was to have full-lite glass doors to create a fluid transition between spaces as much as possible. However, fire-rating requirements meant that these openings then had to have the special fire rated glazing, doors and frames," says Ed. To maximize the vision area of these temperature rise doors, the architects specified ASTM E-119/ UL 263 rated 60 and 90 minute fire resistive glazing instead of ceramics or other fire protective glazing that is limited by code to 100 square inches.

CASE STUDY TWO

Chicago Starbucks Reserve Turns Stair-Climbing Into Unforgettable Experience Using Fire Rated Glass[3]
Starbucks Reserve Roastery, Chicago, IL

The Starbucks Reserve Roastery in Chicago's Magnificent Mile first opened in November 2019, marking it as the sixth Starbucks roastery globally and the third in the United States. Standing five stories tall, the 35,000 square foot facility is the world's largest Starbucks. The roastery offers an immersive experience where patrons can ride spiral escalators surrounding a 56-foot cask for 360° views, catch master roasters and baristas impart their vast knowledge on the artistry and science of coffee, and ponder at an incredible, 4-story mural by Chicago artist Eulojio Ortega.

Ortega's artwork is a progressive piece that pays homage to farmers and coffee-growing regions, exhibiting the art and life of coffee planting, selecting, and processing. The mural, brilliant for conveying the story as visitors go from floor to floor, is interestingly located in an exit stairwell.

Traditionally, stairwells are enclosed in opaque walls, leaving them dark, isolated, and rarely utilized unless in an emergency. This is where the architects masterfully blended their creativity with their knowledge of advanced building material technology. To allow the mural to be visible through multiple floors, encourage stair usage, and meet fire rated code requirements, the architects redesigned the 2- hour stairwell using transparent, floor-to-ceiling butt-glazed glass walls with the largest tested and listed fire resistive glass panels available.

Each floor of this stairwell tells a story about coffee-growing, which is on full display thanks to the floor-to-ceiling expanses and butt-glazing capabilities of 120 minute low iron glass with superior clarity.

To meet all the design and code requirements, the architects selected 120 minute fire resistive glazing for oversized and butt-glazed applications, which eliminated the need for obstructive vertical mullions and allowed for maximum transparency. The largest individual glass panels were over 10' tall and over 4' wide, which was easily accommodated by the system's tested and listed size, the largest in the industry (133" maximum clear view height or width; 7,980 sq. in. maximum clear view area).

As standard glass tends to have a slight blue-green tint from the iron induced from the glass manufacturing process, low-iron, ultra-clear glass was used for its superior clarity, improved color neutrality, and high visible light transmission. These properties were integral in highlighting Ortega's vibrant artwork and transforming what would have been an ordinary stairwell into a significant element of this Starbucks's immersive experience.

To ensure transparency and consistent high clarity with the accompanying entrance system, the 90 minute fire resistive ultra-clear glazing was also used in the vision panel of a temperature rise door. This allowed architects to exceed the 100 sq. in. door vision panel code limitation that applies to fire protective glazing like ceramics that are typically used as vision panels in 60 to 90 minute temperature rise doors. The system was supplied in a custom finish to blend seamlessly with Starbucks's bronze palette.

The outcome is a clear, code-compliant stairwell that flaunts Ortega's masterpiece and transforms ordinary stair-climbing into a truly one-of-a kind Starbucks experience.

HISTORY OF FIRE RATED GLASS[2, 4]

Wired Glass

For over 100 years, wired glass was the only fire-rated glass available. In traditional wired glass, the embedded wires hold annealed glass in place during the fire test to achieve a fire rating. Although the wires give the appearance of strength, the wires actually weaken the glass, making it half as strong as ordinary window glass. Wired glass breaks easily on human impact, exposing razor sharp wires that can trap a victim's limb in the opening and increase the severity of the injury.

In 1977, the Consumer Product Safety Commission (CPSC) enacted federal safety glazing Standard 16 CFR 1201 to protect people from injury due to accidental impact with glazing. Because adequate fire-rated glazing products were not available at the time, wired glass was granted temporary exemption. The product was still allowed in fire assemblies that met a lower impact standard, with the acknowledgement that it would realistically only protect children younger than five years old.

After the International Code Council (ICC) studied wired glass injury data in 2001, the ICC adopted code changes to eliminate the safety glazing exemption for wired glass. Since 2003, IBC has required that all glazing (including fire rated glass) in potentially hazardous locations within educational facilities must comply with CPSC impact-safety standards. In 2004, this was applied to all building types. Industry innovation was the main driving force behind IBC changes to strengthen safety glazing requirements, as products entered the market that met both the fire and the CPSC impact safety requirements of the code.

Clear Solutions

Now there are clear, non-wired fire and safety rated glazing options. These products meet all the fire and safety requirements of the code while outperforming wired glass in many ways. Clear and affordable, specialty tempered products can meet CPSC Category II, the highest federal impact safety standard, and some products can also provide additional partial protection from the dangerous transmission of radiant heat, a benefit that neither wired glass nor ceramics provide. Specialty fire protective glazing can also be used in 60- and 90-minute temperature rise doors up to 100 square inches, as it meets CPSC impact safety requirements.

For the ultimate in design flexibility, clear fire-resistive options combine large clear view areas with maximum fire and impact safety. Before, the only option for 1 and 2 hour walls would have been a conventional solid wall. With advanced fire resistive glazing able to perform just like a gypsum or brick wall, designers can now have large areas of clear transparent fire resistant glass that increases security, provides lighting, reduces noise, and allows aesthetic design flexibility.

CASE STUDY THREE

Porsche Design Tower Sets a New Standard of Cool with the Help of Fire Rated Glass[5]
Porsche Design Tower
Sunny Isles Florida

Perhaps no other residential high-rise has created more buzz than the highly anticipated Porsche Design Tower in Sunny Isles, Florida. A collaboration between Dezer Development and the Porsche Design Group, the 60-story, 132-residence luxury tower designed by Sieger Suarez Architects promises to deliver a new standard of cool.

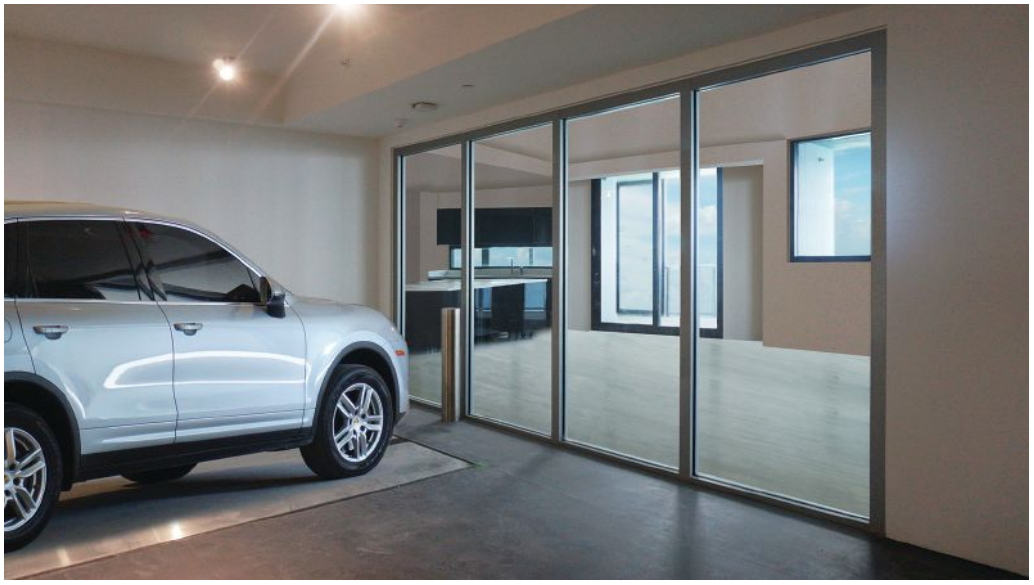
Porsche Design Tower features a unique, first-of-its-kind amenity that allows residents of this 60-story luxury residential project to park their cars in glass-walled sky garages adjacent to their units. The residents will ride their car into one of three Dezervators, a patented, fully automated glass elevator designed by Gil Dezer and his team of engineers. They will remain in their car securely and enjoy oceanfront views as they ascend to their unit. At that point, their vehicle is shuttled to a glass-enclosed carport adjacent to their residence. This allows them to leisurely unload their groceries or shopping items.

Glazing is predominantly used in several areas, as a priority was placed on clear views and transparency in the building's overall design—including applications where fire-rating requirements are mandated in the building code. In Section 713 of the IBC, shaft enclosures are required to have a minimum fire-resistance rating of not less than two hours when connecting four stories or more, which was the case for Porsche Design Tower. To meet code requirements and ensure that the ocean views were available, architects specified 120 minute fire resistive glazing with aluminum curtain wall framing for the 2-hour segmented wall starting from the lobby. The curtain wall framing system is engineered for multi-story spans of glass and is fully vetted for exterior performance with static and dynamic water pressure testing, air infiltration testing, thermal cycling and condensation evaluation, and structural, seismic, and interstory displacement testing.

In Section 406 of the IBC, a 1-hour separation is required between a parking garage and dwelling unit. However, since the sky garages for each unit are connected to the 2-hour elevator shaft, the separation between the garage and the living space must follow the more stringent 2-hour fire resistive requirement. To meet code and enable residents to view their cars from their living room, architects specified 120 minute fire resistive glazing in aluminum fire resistive framing for all of the units.

This glazing has the largest tested and listed clear view area for any 2-hour fire resistive glazing product in the industry with 4,876 sq. inches. This was an important feature that allowed the architects to use more glass and less framing, especially with individual glass lites requiring clear views up to 4,674 sq. inches each. The curtain wall and architectural framing systems were supplied in a silver finish to match the adjacent non-rated systems. Durable and structurally sound, its sharp, clean edges and uniform sightlines enhanced the building's sleek design. The framing systems can be supplied either knocked-down, assembled, or unitized depending on the project's needs and job site conditions.

When Porsche teamed up with a high-caliber developer like Dezer Development and an award-winning design firm like Sieger Suarez Architects, the creative process sizzled. The iconic, waterfront Porsche Design Tower welcomed residents in 2016 and is now admired across South Florida.



Porsche Design Tower features a unique, first-of-its-kind amenity that allows residents of this 60-story luxury residential project to park their cars in 2-hour rated glass-walled sky garages adjacent to their units. Glazing is predominantly used in several areas, as a priority was placed on clear views and transparency in the building's overall design—including applications where fire-rating requirements are mandated in the building code.

UNDERSTANDING THE DIFFERENCE BETWEEN FIRE PROTECTIVE VS. FIRE RESISTIVE GLAZING

Fire Protective Glazing

Fire protective glass is tested to NFPA 252/257 or UL9/UL 10B/10C and designed to compartmentalize smoke and flames and is subject to application, area, and size limitations under the IBC. Fire protective glass is typically used in doors and openings up to 45 minutes and cannot exceed 25% of the total wall area because it does not block radiant heat transmission.

In addition, fire protective glass such as ceramics and wired glass have limited use in 60 to 90 minute temperature rise doors and 45 to 90 minute exterior openings depending on fire separation distance. They are prohibited altogether as sidelites, transoms, and openings in 1 and 2 hour interior fire walls, fire barriers, and enclosures for shafts, exit stairways, etc. because they cannot block radiant heat (readers can refer to the 2012/2015/2018 IBC 716 Tables for guidance.)

GLOSSARY

Fire Protective Glazing—fire protective glass is tested to NFPA 252/257 or UL 9/10 B/10 C typically used in doors and openings up to 45 minutes and cannot exceed 25% of the total wall area because it does not block radiant heat transmission

Fire Resistive Glazing—fire resistive glazing is tested to ASTM E-119/ UL 263 and compartmentalizes smoke and flames, and blocks the transmission of dangerous levels of radiant heat through the glazing; As a result, it can be used in wall and door applications 60 minutes and above without the size limitations that apply to fire protective glass

Fire Barrier—a fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained

Low-Iron Glass—glass manufactured with very low iron content so it does not have a green tint like standard float glass; used for its superior clarity, improved color neutrality, and high visible light transmission

Temperature Rise Door—a fire-rated door that limits the heat transfer through the door for a period of 30 minutes; temperature rise ratings indicate the maximum rise above ambient temperature on the non-fire side of the door, and are listed for 250, 450, or 650 degrees Fahrenheit

ASTM E-119/UL 263—testing that determines the fire resistance ratings of building elements, components, or assemblies

Wired Glass—glass manufactured with wire mesh inlaid in the glass to prevent it from shattering and breaking when exposed to high temperatures; to prevent the spread of flames and smoke on the non-fire side

Safety Standard for Architectural Glazing Materials Standard 16 CFR 1201—a Consumer Product Safety Act Standard that attempts to reduce or eliminate risks of injuries associated with walking, running, or falling through or against glazing materials. The standard applies to glazing materials used or intended for use in a wide variety of architectural products

Special Purpose Deluge Sprinklers—a fire protection system with unpressurized dry piping and open sprinkler heads that is directly connected to a water supply; when the system is activated by a heat or smoke detection sytem, a deluge valve releases water to all the open sprinkler heads

United Facilities Criteria (UFC) 4-010-01—the Department of Defense (DoD) Antiterrorism Standards for Buildings that act as a mandatory guideline to mitigate the threats of terrorism against buildings and ensure the safety of the individuals that inhabit them

This article continues on http://go.hw.net/AR052020-11. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. _____ was the only fire-rated glass available for over 100 years.
   a. Wired glass
   b. Ceramic glass
   c. Low-iron glass
   d. None of the above

2. Specialty fire protective glazing can be used in _____ temperature rise doors up to 100 square inches, as it meets CPSC impact safety requirements.
   a. 45-minute
   b. 60-minute
   c. 90-minute
   d. 120-minute
   e. Both B and C

3. In which case study did architects specify 120 minute fire resistive glazing in aluminum fire resistive framing for all of the units to meet code and enable residents to view their cars from their living room?
   a. Starbucks Reserve Roastery
   b. Old Forester Distillery
   c. University of Wisconsin
   d. Porsche Design Tower

4. Fire protective glass is typically used in doors and openings up to 45 minutes and cannot exceed _____% of the total wall area because it does not block radiant heat transmission.
   a. 10
   b. 15
   c. 25
   d. 45

5. _____ glass is prohibited altogether as sidelites, transoms, and openings in 1 and 2 hour interior fire walls, fire barriers, and enclosures for shafts, exit stairways, etc. because it cannot block radiant heat.
   a. Fire protective
   b. Fire resistive
   c. Low iron
   d. None of the above

6. 21c Museum Hotel's design featured a glass floor on the 2nd level; in order to comply with fire rated code requirements, the transparent floor needed to meet a _____ fire resistive rating.
   a. 45 minutes
   b. 60 minute
   c. 90 minute
   d. 120 minutes

7. _____ glazing compartmentalizes smoke and flames, and blocks the transmission of dangerous levels of radiant heat through the glazing, so can be used in wall and door applications 60 minutes and above up to the maximum size tested.
   a. Fire protective
   b. Fire resistive
   c. Wired glass
   d. None of the above

8. ASTM E-119 standards apply to all fire-resistive wall materials, where the temperature rise on the non-fire side cannot exceed an average of _____ degrees Fahrenheit.
   a. 100
   b. 150
   c. 200
   d. 250

9. Building codes in the US limit ceramics and other fire protective glazing to _____ square inches the vision panels of 60 to 90 minute doors in interior exit stairways, ramps, and exit passageways regardless if the building is fully sprinklered.
   a. 50
   b. 100
   c. 125
   d. 150

10. What event prompted the General Services Administration (GSA) to establish blast criteria for all glazing used in federal buildings?
    a. 9/11
    b. Oklahoma City Bombing
    c. Atlanta Olympics Bombing
    d. Boston Marathon Bombing

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THE SUSTAINABLE DESIGN AND RESPONSIBLE SUPPLY CHAIN MANAGEMENT OF TERRAZZO LIGHT MANIPULATING MATERIALS

Presented by:

Sensitile®

LEARNING OBJECTIVES

1. Analyze the importance of corporate social responsibility and the effect a manufacturer's supply chain can have on society and the environment.
2. Explore how innovation in both the supply chain and material production have an impact on a product's life cycle.
3. Examine the responsible supply chain process of innovative Light Manipulating Materials and how it can help projects achieve LEED credits and other sustainable design goals.
4. Review several case studies where Light Manipulating Materials were used in LEED-certified projects.

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CORPORATE SOCIAL RESPONSIBILITY

Corporations were much maligned in recent history for operating under money-hungry business models that didn't consider the well-being of employees, stakeholders, or the environment. Under such fire, some began to implement socially responsible business practices, which became known as corporate social responsibility (CSR), a sometimes-loaded term. There isn't a standard definition for CSR, and for some companies, it stopped at corporate philanthropy or a pet project that boosted the brand name more than creating meaningful value.

Today, it's understood that to compete globally is to do business differently than in the past and CSR now goes way beyond just a company-positive marketing claim. CSR is integrated into corporate strategy and growth, and it becomes more relevant each year. This push is led by increasingly savvy consumers who are demanding to know the environmental and health repercussions of the products they buy. Corporate social responsibility is one way to hold a company accountable for the impact its products have on the environment and local communities, and to ensure that impact is positive and creates value.

For more innovative companies, CSR is a means of achieving sustainability on a greater scale. It is, therefore, part of corporate strategy and growth as much as financial benchmarks. In 1998, the concept of a "triple bottom line" emerged, linking social and environmental aspects with the financial value of a business.[1] Sustainability in business is more than just a trending topic; CSR and product transparency directly correlate to a company's financial performance.

Some products are more sustainable than others. Whether due to naturally occurring raw materials and a supply chain process that's more carbon neutral, or due to intensive research and tweaks in product sourcing, manufacturing, and distribution, the environmental impact of products matters. A type of sustainable product that helps architectural design projects increase their LEED footprint is terrazzo—a composite material used in floors, walls, countertops, and other custom projects—infused with fiberoptic light channels.

This course will help readers understand the importance and relationship of CSR to the supply chain, how innovations in the supply chain can improve overall sustainability, and how these developments paved the way for a centuries-old product, terrazzo, to enhance a commercial design project's LEED status when it's combined with an innovative, new light manipulating technology.

ROLE OF SUPPLY CHAIN IN CSR

Ten years ago, most executives associated CSR and sustainability with a positive brand reputation. The link between sustainability and

Throughout a product's life cycle, the impact of sustainability can be felt from sourcing raw materials to changing how distribution is done.

GLOSSARY

Active Light: Any artificial lighting system that illuminates an indoor environment, whether through electricity or solar panels.

Corporate Social Responsibility (CSR): The theory and practice of companies integrating social, community, and environmental concerns into their business operations to stay accountable to themselves and stakeholders.

Cradle-to-Grave: Represents the entire life cycle of a product, from sourcing raw materials to reuse and disposal.

Environmental Product Declaration (EPD): A document that is registered and independently verified that communicates transparent and comparable information about the life cycle environmental impact of products.

Eutrophication: The process of water becoming enriched with too many minerals and nutrients from run-off, and eventually depleting the water's oxygen; harmful chemicals present in building products can contribute to this process.

Health Product Declaration (HPD): A standardized, independently verified form that discloses the potential chemicals of concern in products by comparing ingredients to a set of priority "hazard" lists based on the GreenScreen for Safer Chemicals and additional lists from other government agencies.

Life Cycle Assessment: A technique for determining the potential environmental impacts of a product throughout its life cycle; calculates the environmental footprint of a product at each life cycle stage.

Passive Light: Any architectural element that uses sunlight to illuminate indoor environments without the use of electrical lighting or solar panels or reflecting natural sunlight deeper into the environment with other elements, such as mirrored walls or light colors.

Regrind: Material that has undergone at least one processing method, such as molding or extrusion, and the subsequent sprue, runners, flash, rejected parts, etc. are ground or chopped.

Volatile Organic Compounds (VOCs): Potentially harmful chemicals emitted as gases from certain products; can cause adverse health side effects.

the supply chain wasn't clear.[2] The supply chain is still one of the most difficult pieces of the business to link to sustainability, but in doing so, there are many benefits and advantages. Throughout a product's life cycle, the impact of sustainability can be felt from sourcing raw materials to changing how distribution is done.

Although sustainable supply chains are less resource intensive, greater efficiency and sustainability are mutual goals to maximize the resources available.[3] Besides the financial benefits of a more streamlined bottom line, companies with sustainable supply chains also experience added value through[4]:

- More stakeholder satisfaction
- Positive customer feedback
- Improved employee morale
- Higher sales
- Lower risk profile
- Better quality products

Sustainability in the supply chain extends far beyond the business that's trying to implement such practices. On a larger scale, CSR also impacts:

- Human rights
- Fair labor practices
- Environmental protection and progress
- Anti-corruption measures

These are all areas defined by the United Nations Global Compact, the self-proclaimed "world's largest corporate sustainability initiative." It is a worldwide framework consisting of more than 9,500 companies in more than 160 countries to drive change and awareness across its ten sustainable development goals by the year 2030.[5]

The four areas outlined above impact corporate sustainability in a variety of ways. Human rights are considered a pre-requisite for sustainability. The supply chain needs to prioritize gender and race equity which can be hard to identify in a typical supply chain. Fair labor practices should be targeting suppliers that exploit workers with poor living conditions, low wages, and long hours.

Manufactured products all impact the environment in some way; however, a sustainable supply chain will find ways to incorporate recycled materials and reduce overall environmental impact.

Finally, addressing corruption in the supply chain is important. The practices of bribery, extortion, and fraud are unsustainable for a profitable business on their own. In addition, these practices pose significant legal risks and direct money and resources away from the business.[6]

Due in part to increased government involvement, sustainability and CSR have been evolving. In the past, incentives for pursuing sustainable practices were the driving force encouraging manufacturer compliance. While there are still incentives available, it is also important to note that fines and penalties are enforced for non-compliance. Laws govern minimum practices in many areas, and regulations help ensure most companies pass a minimum set of requirements. Being proactive and having a strategy for sustainability and corporate citizenship is as much a competitive advantage as a requirement for business in the not-so-distant future.

Measuring material health is done by tracking a product's life cycle and environmental impact from the point of raw material extraction to disposal; the product's environmental impacts determine its relative health.

WHAT IS PRODUCT LIFE CYCLE?

The supply chain, with all its intricately linked moving pieces, may be the most difficult to innovate, but it's also where impacts to product life cycle can be felt most directly. It matters where a product originated and how its materials affect the environment during different stages. Measuring material health is done by tracking a product's life cycle and environmental impact from the point of raw material extraction to disposal; the product's environmental impacts determine its relative health.

All products go through five stages of lifecycle development:

1. Raw material extraction
2. Materials processing and manufacturing
3. Distribution
4. Use
5. Disposal at end-of-life

Identifying and implementing innovations in the product life cycle impacts the supply chain and extends efficiencies and energy savings from one area to another.

Life Cycle Assessment

A life cycle assessment evaluates ways in which resources are consumed to bring a product to market as well as resources it consumes, or contributes to, when it reaches end-of-life. To understand a product's sustainable qualities, a LCA must be performed. The LCA process takes a cradle-to-grave or cradle-to-cradle approach and analyzes a range of activities to measure environmental impacts on areas including but not limited to:[8]

- Ozone depletion
- Soil and water acidification
- Eutrophication
- Fossil fuel usage
- Water and/or air pollution

The purpose of an LCA is to identify and prioritize product or process improvements. Each LCA has four stages:[9]

1. Define goal and scope: how much of a product's life cycle will be considered and what purpose the LCA serves
2. Conduct inventory analysis to describe material and energy flows within the product's life cycle and environmental interaction
3. Perform impact assessment using data from Step 2 and determine a product's contributions to or depletions of environmental resources
4. Arrive at the final LCA assessment

LCA as a decision-making tool is becoming more prevalent. Government regulations are demanding more transparency and accountability for direct and indirect production impacts, which is one reason why LCAs are more relevant now than in the past. More businesses are also voluntarily participating in worldwide certification and accreditation initiatives, such as ISO 14000, to find ways to improve existing processes and create new ones. Finally, companies are being judged on their environmental stewardship whether through consumer and government procurement demands. Due to these demands, the need to be sustainable is considered necessary to do business.[10]

The benefit of being classified as "sustainable" is a circular system that is actively seeking ways to improve, innovate, and increase energy outputs for the betterment of public health.

TECHNOLOGY AND PRODUCT LIFE CYCLE

Research and Development (R & D) is soaring in companies that want to promote innovative environmental practices, and tech is at the core. The goals of R&D are to use fewer natural resources and less energy, as well as other sustainability goals. Manufacturers are challenged to either create new products and processes that perform better in a circular economy, or to examine existing ones and make them more energy efficient.

Examples of ways that tech is innovating the supply chain through product life cycle are highlighted below.

At the Raw Material stage:

- Downsize products to use less raw material
- Use recycled products

At the Processing and Manufacturing stage:

- Implement energy conservation measures
- Conserve and recycle raw materials
- Reduce air and water pollution

At the Distribution stage:

- Simplify packaging or introduce eco-friendly packaging
- Streamline distribution and transportation
- Use low-pollution delivery vehicles

At the Use stage:

- Make products that consume less energy
- Make products that don't need as many ancillary materials during use, like water or power

At the End-of-Life stage:

- Develop products designed for easier recycling
- Lower the amount of hazardous substances that will end up in landfills

Alternatively, companies are also making changes to existing products and their respective life cycles to meet new sustainability goals. This looks different depending on the stage of product development.

ROLE OF PRODUCT TRANSPARENCY

Another key piece of CSR and supply chain innovation is the growing need for transparency. Being clear and open about a product's origins and the path to the consumer is important from a sustainability perspective as well as governmental regulations and public perceptions.

Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs) are two ways to achieve transparency. EPDs document a product's environmental impact at each life cycle stage. HPDs track potentially hazardous material ingredients. Disclosures like these help manufacturers improve their processes, which enable distributors and consumers to make more informed choices about the products they sell and buy.

EPDs take the information from LCAs and compile a standardized form that calculates a product's environmental footprint throughout its life cycle. To create an EPD, first identify a product category rule, or develop a new one. A third party will complete the LCA, which is combined with LCA results. A third party then verifies the EPD's accuracy. Once the verification process is completed, which may take months, the EPD can be registered and published.[11]

Manufacturers use HPDs as an inventory form, and architects can request the form to include in documentation submitted for for LEED certifications.HPD version 2.2 was published in May 2019 and is the most current version applicable at the time of this publication. An HPD form has six sections[12]:

1. Summary
2. Product contents and related hazards
3. Other certifications and compliance data
4. Installation and/or maintenance requirements
5. Notes and explanations from the manufacturer
6. Reference list for hazards

An architects' role in this process is to analyze the information from EPDs and HPDs and incorporate it in the design phase of a project. Designers can assess a product's environmental and human health impacts during its creation, use, and reuse potential. When specifying products, it's helpful to know which components contain health hazards and how best to offset them in the built environment.

Architects can identify sustainable materials through a product's:

- Environmental impact
- Reuse potential
- Impact on carbon emissions during end of life phase
- VOC emissions
- Disclosure forms and product labels through LCAs, EPDs, HPDs, and others

Product transparency and disclosure not only optimize products and production processes, but also ultimately improve the environment and quality of life for all. Innovations in the supply chain are translating to better corporate environmental stewardship. Sustainability, CSR, supply chain management, and product life cycle are more intertwined than ever before.

PRODUCTION PROCESS FOR SUSTAINABILITY[13]

Terrazzo, a composite material with a cement or epoxy binder mixed with chips of marble, granite, quartz, and other materials, has been around for centuries. Terrazzo Light Manipulating Materials contain at least 20 percent post-consumer waste for LEED credits. It is a sustainable product with a variety of uses in commercial and high-end residential applications.

The supply chain process for terrazzo begins by locally sourcing raw materials. Recycling and upcycling are integrated into all aspects of the production process, from procurement to shipping. Terrazzo Light Manipulating Materials contain regrind, a recycled material that contributes to the product's overall sustainability. The manufacturer of Terrazzo Light Manipulating Materials has design, prototyping, and production all under one roof and can maximize the amount of regrind used in new material design and find other efficiencies in their production process. Prototyping and manufacturing terrazzo in-house limits excess material and reduces product waste. This lack of outsourcing provides complete control over material sourcing, process efficiency, employee safety, and product quality.

When producing cementitious terrazzo using water dependent processes, run-off and use of potable water are minimized with a closed loop grey water recycling system. Using an efficient water recycling system the manufacturer of Terrazzo Light Manipulating Materials uses the same amount of water as an average single family home.

QUIZ

1. The concept of a triple bottom line links _____ and _____ aspects with the financial value of a business.
   A. Social / environmental
   B. Public / environmental
   C. Community / environmental
   D. Social / humanitarian

2. The United Nations Global Compact defines four areas that corporate social responsibility impacts. One of these areas is:
   A. Local economies
   B. Minimum wages
   C. Developing countries
   D. Fair labor practices

3. All products go through five stages of life cycle development. The third stage is:
   A. Manufacturing
   B. Processing
   C. Distribution
   D. Use

4. The purpose of a Life Cycle Assessment is to identify and prioritize _____.
   A. Cost savings areas
   B. Product or process improvements
   C. Efficiencies in sourcing raw materials
   D. Better ways of doing business

5. Light manipulating material in the built environment creates a sensory experience without the use of any:
   A. Eco-friendly packaging
   B. Recycle raw materials
   C. Products that consume less energy
   D. Additional power or electricity

6. The best terrazzo material on the market today contains at least _____ post-consumer waste for LEED credits.
   A. 10 percent
   B. 15 percent
   C. 20 percent
   D. 25 percent

7. Optical grade resins used in light-manipulating materials are specified due to their:
   A. Toughness
   B. Transparency
   C. UV Stability
   D. Both A & C

8. Effects of infusing terrazzo with light changes includes:
   A. Light-Filtering
   B. Interactive
   C. Light-Emitting
   D. All of the above

9. One benefit of internal fiber optics and light transfer is that the lighting is always:
   A. External to the material
   B. An improvement to the processes
   C. Raw material transfer
   D. Impactful to the environment

10. Which LEED credit focuses on reducing concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment?
    A. Indoor Environmental Quality
    B. Building Product Disclosure and Optimization
    C. Construction and Demolition Waste Management
    D. None of the above

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TRANSFORMING THE AMERICAN KITCHEN THROUGH QUALITY, INNOVATION, AND DESIGN

Presented by:

WOLF
SUB-ZERO
COVE

The kitchen is widely considered the hub of the home.

LEARNING OBJECTIVES

1. Review the challenges new businesses face and why they often fail.
2. Identify short- and long-term strategies that can help an organization survive challenging economies, rapid technological transformations, and societal changes.
3. Examine how one kitchen appliance manufacturer has survived and oftentimes led the industry through innovation, craftsmanship, and customer service.
4. Explore why and how the American kitchen has evolved throughout the 20th and 21st centuries, including how it is used, designed, and transformed by technology and innovation, creating efficiency for the end-user and establishing aesthetic standards for the home.

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REASONS FOR FAILURE

During the Great Recession of 2008, Americans lost $9.8 trillion in wealth between the drop in value of their homes and retirement accounts. The stock market lost nearly $8 trillion, and global economic growth shrank by 4%, roughly the equivalent of $2 trillion. Unemployment hit 10%.[1] Business closings reached 253,000 by the end of 2008 and did not return to pre-recession levels until the middle of 2011. The number of new companies opening was at 236,000 at the end of 2006 and dropped to 192,000 in 2009.[2]

Astronomical societal and economic challenges, however, only comprise a small percentage of the reasons why businesses might fail or struggle to remain both relevant and successful.

In terms of larger companies attempting to create new businesses, those in leadership positions have discovered that new ventures "face innumerable barriers." For them, success requires a balancing act between new business ideas, technologies, and "well-established systems, processes, and cultures." Along with the balancing act comes risk, undependable financial forecasts, and other uncertainties.[3]

Many of these factors, combined and unbalanced, make new business ventures unsustainable. *Entrepreneur* provides the numbers, noting that "70 percent of all businesses with employees fail within 10 years." The U.S. Bureau of Labor Statistics has determined that 20 percent of small businesses fail within their first year, and approximately 50 percent of small businesses fail by the end of their fifth year. By the tenth year, only 35 percent of small businesses are still operational.[4] Lending Tree states that regardless of economic downturns, including during the Great Recession, failure rates have remained fairly consistent in recent decades.[5]

An analysis conducted by CB Insights determined 20 primary reasons why new businesses fail:

- No market need—42%
- Ran out of cash—29%
- Wrong team—23%
- Outcompeted—19%
- Pricing or cost issues—18%
- Unfriendly user product—17%

Homeowners have a variety of wants and needs when it comes to form and function.

- Product without a business model—17%
- Poor marketing—14%
- Ignored customers—14%
- Mistimed product—13%
- Lost focus—13%
- Disharmony among team and/or investors—13%
- Pivot gone bad—10%
- Lack of passion—9%
- Failed geographical expansion—9%
- No financing or investor interest—8%
- Legal challenges—8%
- Didn't use network—8%
- Burned out—8%
- Failure to pivot—7%

Identifying reasons for failure, however, can lead to identifiable factors for success.[6]

SUCCESS AND SURVIVAL IN THE SHORT AND LONG TERM

Some business professionals recommend paying attention "to small changes before they turn into insurmountable threats."[11] Following this advice could mitigate many of the threats to new business ventures discussed previously. When in "survival mode," some general ideas to sustain a business in the short term include implementing a hiring freeze, reducing benefits and conducting layoffs, switching focus/industry, developing a contingency plan, curtailing research and development, and stopping new equipment purchases and new product roll-outs.

Open kitchen design has single-handedly transformed the kitchen.

In addition to warding off threats and taking potentially drastic measures, however, businesses can more proactively and positively survive recessions, economic downturns, or other periods of hardship. These strategies in business include the following:

- **Diversification:** Some professionals have compared business models to stock portfolios, stating that if a "business offers a range of products to a broad range of customers," it will "insulate [itself] from the fallout if one of these areas hits a rough patch."
- **Increasing revenue:** Resourcefulness and creativity can help leaders to cultivate new markets. In direct contrast to the advice mentioned in the paragraph above, this strategy is about innovation and a refusal to become complacent.
- **Cutting costs:** This strategy requires business owners and leaders to evaluate different areas of spending and advises

CONSTRUCTION STARTUPS

Different industries have different survival rates. For instance, the Bureau of Labor Statistics states that the social services and healthcare industries have the highest growth at an average of 2.3 percent annually and are the fastest growing sectors. Construction, on the other hand, was shown to have only a 26.5 percent success rate in the first 10 years of launching a new business.[7]

It is important to note that the construction statistic stems from research covering the years 2004 to 2014.[8] In this instance, the recession played a large role in the failure of construction companies. The housing market was "ground zero" of the crisis, where homeowners with subprime or problematic loans were forced to default. As housing prices plummeted, homeowners lost their properties to foreclosure. The market has since recovered, and new research done on the success rates of construction companies has emerged. Perhaps surprisingly, these numbers appear worse than those during the recession.[9]

Of the "1,012,350 building, heavy/highway, and specialty trade contractors operating in 2014, only 722,281 were still operating in 2016." That equates to a failure rate of nearly 30 percent. An article in Construct Connect cites the following six reasons for new construction business failure:

1. **Capital and cash flow:** Because significant money is tied up in assets such as tools, equipment, or ongoing projects, there might not be enough ready money to leverage when needed. In terms of cash flow, projects should be billed on time in order to ensure that payments are received on time, and project budgets should be well managed.
2. **Project performance:** Determining the profitability of projects should occur prior to signing a contract and beginning construction. Having the right leadership, workforce, and equipment is then crucial to delivering a project on time and on budget.
3. **Failure to plan:** Having a business plan that includes a company's core competencies, as well as outlining specific goals and objectives is essential.
4. **Growing too fast:** A company that grows too quickly without having the resources or expertise to deliver can fail. Research, planning, and incremental increases in projects can help resolve this issue.
5. **The wrong people:** Turnover is a well-known problem in the construction industry. If employees are not engaged and valued, they will most likely lose motivation. Providing competitive salaries, benefits, and training can help to offset this issue.
6. **Failure to innovate:** Companies ranging from Sears to Blackberry have gone bankrupt in part due to their inability to innovate or adapt quickly. Construction companies should look to utilize relevant technologies and digital tools.[10]

GLOSSARY

Cutting Costs—this strategy requires business owners and leaders to evaluate different areas of spending and advises new owners to determine ways to "tighten up" and "improve their bottom line," noting that innovation and other positive changes cannot occur if they cost as much as they earn.

Diversification—some professionals have compared business models to stock portfolios, stating that if a "business offers a range of products to a broad range of customers," it will "insulate [itself] from the fallout if one of these areas hits a rough patch."

Fitted Kitchen—"fitted cabinetry and appliances helped create a more purposeful and beautiful interior design […]. The invention of labor-saving devices, time-saving tools, with better kitchen designs and more stylish, matching options made the kitchen a source of pride."

Frederick, Christine—(1883–1970) an American home efficiency expert, advertising consultant, and consumer advocate who "conducted a series of experiments and studies to determine the optimal layout of appliances, work surfaces, and storage in a domestic kitchen."

Galley Kitchen—describes layout of some small apartment kitchens.

Improving Cash Flow—this can be done by securing low cost lines of credit, working with or incentivizing customers to pay on time, and ensuring there is adequate money on hand for emergencies.

Increasing Revenue—resourcefulness and creativity can help leaders to cultivate new markets. This strategy is about innovation and a refusal to become complacent.

Long-term Survival Strategies—produce the highest quality products/services possible; invest in research and development that will result in state-of-the-art technology and innovation; invest in people and machinery that will result in high-quality craftsmanship; utilize third-party testing to ensure products not only meet codes and standards, but exceed them to ensure lasting performance of products and consumer satisfaction; practice top-notch customer service to retain customers; and, acquire new business, if necessary, to remain at the top of the industry

Planned Obsolescence—a product quickly needs to be replaced and repurchased either due to changes in design, lack of replacement parts, or the use of inferior materials.

Schütte-Lihotzky, Margarete—(1897–2000) the first Austrian woman to become an architect. She believed that "housework was a profession and deserved to be treated seriously as such" and considered "making housework easier […] a form of emancipation for women."

new owners to determine ways to "tighten up" and "improve their bottom line," noting that innovation and other positive changes cannot occur if they cost as much as they earn.

- Improving cash flow: A final example of a survival strategy is improving cash flow. This can be done by securing low cost lines of credit, working with or incentivizing customers to pay on time, and ensuring there is adequate money on hand for emergencies.[12]

Long-term survival strategies recommended by experts include some overlap to those proposed above in addition to different approaches:

- Produce the highest quality products/ services possible
- Invest in research and development that will result in state-of-the-art technology and innovation
- Invest in people and machinery that will result in high-quality craftsmanship
- Utilize third-party testing to ensure products not only meet codes and standards, but exceed them to ensure lasting performance of products and consumer satisfaction
- Practice top-notch customer service to retain customers
- Acquire new business, if necessary, to remain at the top of the industry

Willingness to adopt relevant new models, processes, and technology and devise new innovations are key to long-term success.

Looking at All the Data[13]

While the strategies just listed provide sound advice, researchers from Dartmouth decided to delve deeper into company survival rates. The researchers analyzed all 29,688 companies listed on the U.S. stock market from 1960 to 2009 and divided them into 10-year cohorts. They then examined how many of the companies were in business five years after they began. Their extensive study confirmed "longevity is decreasing: Companies that listed before 1970 had a 92% chance of surviving the next five years, whereas companies that listed from 2000 to 2009 had only a 63% chance, even when the researchers controlled for the dot-com bust and the Great Recession."

After determining that corporate "mortality rates" were on the decline, the researchers sought to figure out why businesses were failing and how leaders could prevent it. They analyzed a variety of financial data but focused on expenditures on physical assets such as plants, equipment, and organizational capital, including personnel, patents, research and development, and intellectual property. It was found, on average, that firms "listed after 2000 spent more than twice as much as earlier firms (in percentage terms) on organizational capital and half as much on physical assets." Researchers viewed this as a "double-edged sword," stating, "'The good news is the newer firms are more nimble. The bad news for these firms is that their days are numbered, unless they continually innovate.'" Not having an array of costly assets like factories, warehouses, and suppliers and instead relying on "ideas" like digital services can make many modern companies more agile but simultaneously create urgency around innovation.

The urgency for innovation, the researchers maintain, is due to the fact that "idea"

companies are "vulnerable to quick imitation." They provide real world examples to bolster this perspective, pointing to the organization app, Evernote, that was quickly replicated by Microsoft OneNote, Apple's Notes, Google Keep, and Simplenote and further comment that "Skype, FaceTime, Viber, Jitsi, and Google Hangouts all battle in the video chat area." The researchers maintain, "'Creative destruction has always been a force to be reckoned with, but in the physical world, the cycles were longer […] in the technology-based sectors, the cycles have accelerated.'"

The researchers offer three strategies for longevity based on their findings: "First, companies could incorporate both technology and physical products into their business models to gain an edge; their competitors couldn't then simply hire programmers to quickly create me-too services." They give the example of Amazon, whose warehouses and stock inventory provide protection from potential competition.

Next, "companies could strive for business models that include strong network effects." Facebook is an example. Even when other platforms were developed, like Google+, users were hesitant to leave Facebook because they already had an established network. Leaving would require users to start from scratch, uploading photos and reconnecting with the same people. The researchers' third recommendation is to "increase focus on continual innovation." Willingness to adopt relevant new models, processes, and technology and devise new innovations are key to long-term success.

Finally, the researchers commented on the tendency of many CEOs to focus on the short term, stating, "'People blame Wall Street for this pressure, but in fact Wall Street demands that you look for a healthy balance between the short term and the long term. […] Otherwise you're not going to be there after the short term.'"

This article continues on http://go.hw.net/AR052020-8. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. The U.S. Bureau of Labor Statistics has determined that _____ of small businesses fail within their first year, and approximately 50 percent of small businesses fail by the end of their fifth year.
   a. 5%
   b. 15%
   c. 20%
   d. 25%

2. Which of the following is a reason for new construction business failure?
   a. Project performance
   b. Failure to plan
   c. Failure to innovate
   d. All of the above

3. Which of the following short-term business survival strategies involves securing low cost lines of credit, working with or incentivizing customers to pay on time, and ensuring there is adequate money on hand for emergencies?
   a. Diversification
   b. Improving cash flow
   c. Cutting costs
   d. Increasing revenue

4. Prior to 1970, companies had a _____ chance of surviving the next five years.
   a. 63%
   b. 20%
   c. 57%
   d. 92%

5. A ____ relies on two separate, self-containing cooling systems to keep food fresher and preserve frozen food longer.
   a. Dual Refrigeration System
   b. Dishwasher
   c. Microwave
   d. None of the above

6. The modern kitchen became possible due to which of the following reasons:
   a. Consumer Inefficiencies
   b. Mass Production Ability
   c. Women in the workforce
   d. Both B & C

7. _____ 's work focused on ergonomic efficiency and ideals of "rational design, optimal work surfaces, color, and smart storage" in the kitchen.
   a. Christine Frederick
   b. Margarete Schütte-Lihotzky
   c. Frederick Winslow Taylor
   d. None of the above

8. As many as ____ of home remodeling projects relate to kitchens, and homes on the market listed as having "luxury kitchens" have been found to sell more quickly and at higher prices than similar homes in the same area.
   a. 50%
   b. 60%
   c. 70%
   d. 80%

9. The 1980s and 90s saw the growth in popularity of the kitchen island and place to display new technologies such as _____.
   a. Dishwashers
   b. Refrigerators
   c. Food processors and trash compactors
   d. Coffee machines

10. Fitted kitchens" started to become popular in the _____ as the invention of labor-saving devices, time-saving tools, and better kitchen designs became options.
    a. 1980s
    b. 1940s
    c. 1950s
    d. 1960s

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INTERIOR EXTRUDED ALUMINUM TRIM BRIDGES COMMERCIAL AND RESIDENTIAL PROJECTS

Presented by:

XTREME INTERIOR

Architect: Kegan Flanderka / Base Design Architecture (Las Vegas, NV—IBS & Trade Show Village, 2020)

LEARNING OBJECTIVES

1. Examine the ways in which commercial interiors are driving multifamily and single-family residential design trends.
2. Explain how extruded aluminum trim products are utilized in both commercial and residential interiors to enhance drywall surfaces and provide a modern design element.
3. Discuss the various profile and finish options that are available for interior aluminum trim products and review installation considerations.
4. Explore case studies where interior extruded aluminum trim was specified.

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INTRODUCTION

Commercial and residential interiors are crossing sectors and influencing interior design trends. The creation of a home-like ambiance is becoming increasing popular in the hospitality industry, while multifamily residential buildings are making better use of communal spaces. Extruded aluminum trim can help to create a modern design element as well as create an aesthetic that is transferable between public, private, commercial and residential spaces.

COMMERCIAL INTERIORS, RESIDENTIAL DESIGN TRENDS

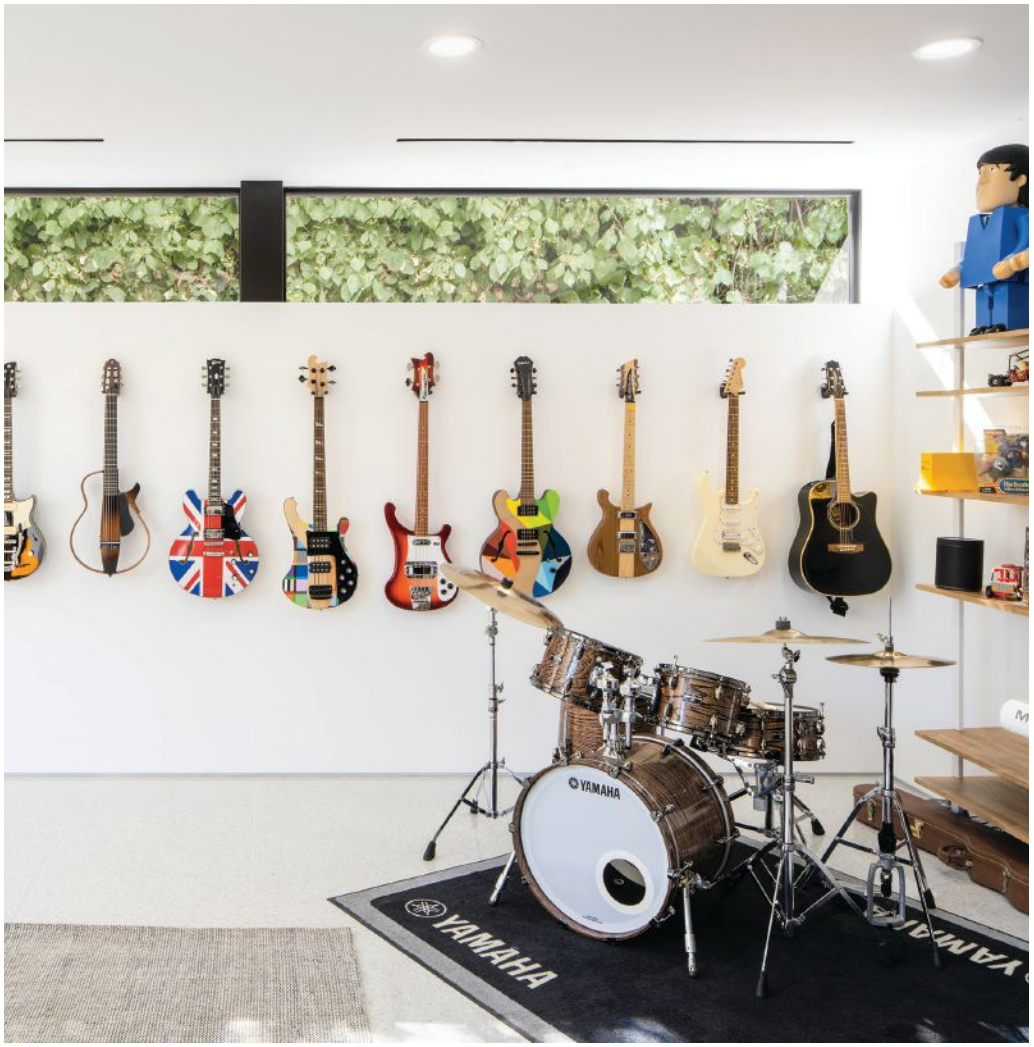
Public and private spaces are becoming blurred. Not only has social media made it easier to share private details about life with a variety of acquaintances, but people are also changing the ways in which they work, live, and are entertained. For example, many people are now working from home, converting spaces inside their houses into more elaborate offices. Residential kitchens, too, have become more elaborate, incorporating commercial equipment and design trends.

Similarly, the hospitality sector is transforming public spaces such as lobbies, dining rooms, and hotel rooms, into spaces that echo residential settings. John Tobin, Shawmut's Director of Hotels, discusses New York's Smyth Hotel, stating, 'We created spaces that aren't traditional, that are more relaxed,' further noting that the hotel's lobby is divided into a living room, den, library, and evening bar. Other hotels, too, have incorporated home-like elements into their design, ranging from the lighting in lobbies and dining rooms creating a warm ambience to producing more elaborate "experiences" in public spaces that encourage guests to spend more time in them.

Writing for MULTIFAMILY EXECUTIVE, Lauren Shansey states that "This experience strives to evoke a sense of place, comfort, and depending on location, will project adventure, relaxation, [or] escape." There is also the sense that guests not only want to feel at home but want experiences that are reflective of their personalities and tastes.

Many modern hotels also now provide more extensive kitchen amenities, gyms, and "residential-style extras" like doormen, maintenance, and laundry services, blurring the lines between luxury condominium living and a traditional hotel experience. In both instances, as in many new multifamily builds, the focus is on the occupant, and the creation of mixed use spaces combining areas to work, live, and be entertained is on the rise.

It is this focus on the creation of experiences and communal living areas that has translated back to multifamily and residential design trends. The realization for many designers is that people have the same needs, wants, and preferences when they travel as they do at home. Designer Jamie Drake notes that "… upscale boutique hotel guests are the same residential clients he designs for and who look for the same amenities



Architect: Dan Brunn (Bridge House—Los Angeles, CA)

at home as on the road." No matter which space people inhabit, many look for the same levels of comfort, aesthetic, and community. In hotels, guest rooms are getting smaller, just as in multifamily residential, the size of apartment units is shrinking. The square footage saved from the individual rooms or units is being put to use as communal spaces where guests and residents can interact and share unique experiences.

In corroboration with these trends, the 2018 Consumer Housing Insights Survey, conducted by the National Multifamily Housing Council, found that Americans prioritize technological services, such as strong cell phone service or a fast Internet connection in any housing arrangement. The study also noted that Americans have a proclivity for community features, including outdoor spaces and gyms. Many American multifamily residents have also claimed to want interior features like better appliances.

In an article written for *Interiors + Sources*, author Stephanie Clemons provides data demonstrating that designers themselves are no longer categorized by whether they are "commercial" or "residential" designers. Instead, they are more broadly "interior" designers, and 50% of respondents to Clemons' survey have stated that they work across disciplines.

Translating Commercial Architectural Details to Residential Design

Some of the trends that transcend sectors are noted by interior designer LaMar Lisman in *New Home Source*: 'The hospitality industry is continually a leader in the forecast of color and design material trends and, not surprisingly, closely followed by the residential design market. Commercial colors and materials tend to be bolder and design driven, making them a fit for the residential client that likes to stay ahead of the curve.'

Some of the colors and materials involved in these new trends include "soothing" wall colors such as shades of aqua, gray, or blue and dark wood tones; hints of metallic in artwork and accessories; curtains for warmth and privacy; chairs, chaise lounges, or other seats within bedroom areas; and granite countertops in bathrooms and kitchens.

Additional bathroom design in hotels that has carried over to multifamily housing includes accessories like rainfall showerheads, high-end fixtures, and the use of wood and bamboo rather than simple white tile. Communal areas are also starting to feature amenities like spas, steam rooms, and infinity pools, echoing luxury hotels and resorts.

In kitchens, the trend of stainless steel appliances continues, and some multifamily residences are being built with communal kitchens that can be used for private events. Other common areas include specialized zones for shooting pool, watching TV, or playing

GLOSSARY

Aluminum Reveal—create an appealing recess that allows installation vertically, horizontally, or diagonally

Corner Trim Profiles—made with PVC, rubber, or aluminum; aluminum offers additional design features

Double Flange Reveal—provides a visual impact as well as protection for the bottom of the wall material

Extruded Aluminum—process of shaping aluminum into objects with definitive profiles for a variety of applications

Flush Base—addresses wall protection issues and minimizes dust collection

Gypsum Board—drywall; gypsum core and a paper facing

Reveal Base—separates and exposes the joint between materials; popular technique in modern architecture

Reveals—either side of a surface of an aperture in a wall for a door or window

Square Reveal—used to create shadow lines or to break/separate materials; do not provide a structural function; decorative

Square Tapered Channels—use a unique tapered square edge that creates a dynamic look when paired with an insert piece

video games. Some multifamily buildings even come equipped with social directors and fitness instructors. Business, too, has its place in these residences, and some have conference rooms or communal areas where occupants can set up their laptops and work.

In general, *Metal Construction News* claims that "Millennials are […] placing an increased emphasis on design as a deciding factor in where they choose to live, leading multifamily housing developers to look for distinct architectural features to stylize their projects in competitive apartment and condominium markets."

As hotels and multifamily residences draw inspiration from one another, the lines between public and private spaces continue to blur. Guestrooms in hotels and apartment and condo layouts in multifamily residences are varied; lobbies and communal areas offer more than just a place to sit; and both sectors strive to create experiences for residents and guests.

CROSSING THE LINES: EXTRUDED ALUMINUM TRIM

Architect: Wayne Braun (Houston, TX)

One specific product that is being used in both commercial and residential interiors is extruded aluminum trim. Extruded aluminum trim products have evolved through the decades alongside interior design trends. The newest iteration of products is sustainable, durable, lightweight, and easy to use.

Extruded aluminum trim can be used on interiors for a multitude of purposes:

- Sculpt interior walls
- Separate wall materials
- Provide architectural detail
- Create horizontal and vertical lines
- Contribute to a modern aesthetic
- Provide clean intersections of drywall
- Supply protection and a finished edge for vertical drywall or panel corners

In general, extruded aluminum trim products are used to create subtle, sleek design details. Simple reveals and transitions can be applied to walls and ceilings and floated in flush with a gypsum board surface or installed with panels such as wood, glass, or tile work. No matter how the trim is used, the final effect creates the appearance of fine metalwork at a fraction of the cost of having it designed, detailed, and fabricated.

Most aluminum trim is made of 75% recyclable aluminum, which is lightweight, highly resilient, and will not rust, corrode or chip. The trim comes in a variety of metal finishes or pre-primed so it can be painted the same color as the walls for minimalist shadow lines. These options allow designers to make the trim part of the surface and blend—or a feature itself that becomes the most impactful element of a well-designed space.

Some manufacturers offer specially designed plastic or rubber corner bumpers in places like hotels, offices, or communal spaces. But these are cheap and do not offer pleasing aesthetics nor protection from damage. Aluminum corner pieces, however, come in a variety of shapes to fit almost any need whether elliptical, oblong, round, or otherwise.

In general, architects, designers, and builders are using extruded aluminum trim in interior applications for a variety of reasons. Not only are the structural lines attention-getting, but they also complement wood and stone; when painted, extruded aluminum trim can further provide a contrast to the "soothing" tones mentioned above that are commonly used in hotels and multifamily applications.

Advantages of Extruded Aluminum Trim

Aluminum trim is fire-resistant and non-combustible. Even at extremely high temperatures, extruded aluminum trim does not produce toxic fumes. It also does not rust because it is protected by its own naturally occurring oxide film. Furthermore, aluminum trim products pose no health risks or physical hazards and are exempted by the Occupational Safety and Health Administration (OSHA) from the requirement of publishing material safety data sheets.

Aluminum trims can withstand greater daily abuse than most materials as they are stronger, maintain their shape better, and are less vulnerable to damage than non-metal alternatives. Using aluminum adds durability and longevity to construction, whereas materials such as PVC deteriorate over time.

Aluminum trims, when anodized or with a polished finish, are more aesthetically pleasing than other materials and provide the designer with a greater ability to match a finish with doors, windows, frames and other design elements. Additionally, extruded aluminum trims install straight and true. Since aluminum trim products were designed specifically to enhance drywall construction, while taking into account the typical design and construction of commercial interiors, they provide more solutions to design aesthetics.

For example, in the design and construction of commercial interiors, 5/8-inch-thick drywall on metal studs is still the high-value, low-cost mainstay for defining the perimeter of spaces, creating separation, and working as a flexible substrate for limitless embellishments. Extruded aluminum trim products were designed and manufactured to enhance the practical aspects of drywall construction and transform it into a design medium that can make it the feature, focus, and most impactful element of a well-designed space.

Quality aluminum trim products are also precisely manufactured under extreme tolerances to produce highly refined results without master craft skilled labor. With the cost of construction continuously rising, schedules shrinking, and field skill sets diminishing, designers and architects are constantly looking for ways to create unique spaces that leverage budgets, schedules, and craftsmanship availability.

ALUMINUM INTERIOR TRIM PROFILE AND FINISH OPTIONS

Extruded aluminum trims are manufactured in profiles starting at 0.050 in thickness, which is thin enough to be bent at a slight curve (when applying to studs during installation), yet thick enough that it cannot be bent with ease at certain tempers. Profiles can be made stronger and thicker for most applications as needed.

Additionally, complex shapes can be realized in one-piece extruded aluminum sections without having to employ mechanical joining methods. The resultant profile is typically stronger than a comparable assemblage and less likely to loosen over time.

All trim work can be applied to walls and ceilings and floated in flush with a gypsum board surface or installed with panels, such as wood, glass, and tile work. Although the profiles are designed to be taped and floated, a fabric can also be utilized that can be wrapped around the channel, or the fabric can be cut and applied with an adhesive. To facilitate a successful installation, it is important to read the construction drawings to ensure correct layout and placement and, where necessary, make sure that blocking has been provided.

Baseboard Detail Options

The baseboard detail is one of the more prominent details to consider in interior design as it serves to cover the joint between the finished wall and floor. It also protects a highly trafficked area of an interior space from wear and tear.

Extruded aluminum bases are typically installed horizontally and are available in a range of styles to satisfy a variety of design requirements. A standard base detail is generally a 3 ½-inch profile installed on top of the drywall. In some applications, a quarter round is used as a flooring joint between the flooring itself and the baseboard for aesthetic appeal. Some modernists have questioned the utility of the traditional baseboard; consequently, a number of contemporary options have evolved that provide the design community with more options.

No Baseboard Detail Options

One option is to eliminate the baseboard completely which creates a simple, minimalistic aesthetic. A baseless option reduces the material, installation, and finishing costs of a conventional baseboard. However, the downside is that the wall base is more susceptible to damage from foot traffic and equipment; therefore, it is generally used in industrial or commercial applications where there is minimal foot traffic and less risk of damage. Additionally, eliminating the baseboard requires taping of the lower edge of the drywall; there is less tolerance for error in the drywall finishing process. The joint between the wall and floor should be kept open with a ¾-inch reveal (shadow line) to allow the surfaces to move independently.

QUIZ

1. In hotels and multifamily residences, occupants look for which of the following?
   a. Experiences
   b. Enhanced Communal Areas
   c. Increased Technological Services
   d. All of the Above

2. _____ of respondents to Clemons' survey state that they design across disciplines.
   a. 25%
   b. 50%
   c. 75%
   d. 100%

3. Extruded aluminum trim can be used to do which of the following?
   a. Sculpt Interior Walls and Separate Wall Materials
   b. Provide Architectural Detail and Create Lines
   c. Contribute to a Modern Aesthetic and Provide Clean Intersections of Drywall
   d. All of the Above

4. Most aluminum trims are made from _____ recycled aluminum.
   a. 25%
   b. 50%
   c. 75%
   d. 100%

5. Extruded aluminum trims are manufactured in profiles starting at _____ in thickness.
   a. 5
   b. 0.5
   c. 0.05
   d. 0.005

6. Which corner varieties are available in aluminum?
   a. Square and Radiused
   b. Round and Elliptical
   c. Square and Tapered
   d. All of the Above

7. Anodized aluminum _____.
   a. Cannot Peel or Chip
   b. Is Weaker than Naturally Oxidized Aluminum
   c. Does Not Permit Coloring or Sealing
   d. Both B and C

8. Aluminum is constructed from _____ to _____ post-industrial and post-consumer scrap.
   a. 75% to 100%
   b. 50% to 75%
   c. 25% to 50%
   d. 0% to 25%

9. Dan Brunn, architect of Bridge House, was initially inspired by the _____ at the Breakers.
   a. Master Bedroom
   b. Motor Court
   c. Interior Design
   d. Gardens

10. An electrochemical conversion process in which the aluminum is immersed in an acid solution through which electric current is passed is known as:
    a. Anodizing
    b. Electrification
    c. Oxidization
    d. Extrusion

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AIA Architect

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Interior Monologue

The inside of a building is so much more than a collection of finishes.

Annie Chu, FAIA, is a self-described champion of interior architecture. As a founding principal of Chu+Gooding Architects in Los Angeles and a professor at Woodbury University, she leads both her practice and her students with the guiding principle that—despite the mindset of many "traditionally trained" architects—interiors are so much more than just a collection of materials, finishes, and furniture. "Statistics from the Environmental Protection Agency say we spend more than 90% of our day indoors," she says, "so why would architects not think seriously about these spaces?" Since the COVID-19 pandemic caused firms across the country to reevaluate existing projects, Chu says that as of now, all five of her firm's construction sites are open.

As told to Steve Cimino

I gravitated to architecture when I entered Rouen Cathedral in 1979. I felt the immense heft and volume of the stone-hewed interior; it planted a seed. In 2014, at my first visit to La Tourette, I walked into the chapel, sat down, and wept; the interior experience was searingly profound. Perhaps those of us who entered architecture because we feel spaces, as compared to those who approach it from primarily an intellectual place, will be drawn to interiors.

If you asked architects, "Can you design an interior?" most of them would say, "Sure!" I believe most architects, through a lack of knowledge of the discipline, have a deep-seated misunderstanding of what interior really is. I don't know if they can grasp the broad and deep knowledge necessary to craft an interior experience that resonates with the intimate scale of being human.

Architecture is a centuries-old discipline—it has had multiple lifetimes to develop theory and canon—whereas interior design is only a century-old university degree. We are still developing nomenclature for discourse. Consider the copious disciplines that interior design engages: structure, materials, mechanical, electrical, plumbing, acoustics, lighting, well-being, sustainability, psychology, transportation design, biology, chemistry, color, and much more. If one thinks color is easy, consider Picasso's quote at the end of his life that he still did not know color. I'd call interiors a fathomless and promiscuous discipline: synthesizing an abundance of needs and expertise to deliver layers and systems for the most scrutinized and impactful 90% of your day.

I'd like to see the academy retool design studios to expose students to broader areas associated with architecture. Since half of our students don't end up in traditional practice, why are we only teaching to the test? The traditional role of the architect needs to evolve, making space for interdisciplinary diversity and rejecting traditional labels of male/female for architecture/interior. It is time to recommit to the noble mission of architecture as art-plus-service by advancing the design of the continuum of spatial experiences. AIA

AIAQ&A

CREDIT: RACHEL KAPISAK JONES

Architects Are Combating COVID-19 With Site Adaptation

An AIA task force aims to create health care spaces for those who need them most.

By Andrew Coffman Smith

In the midst of the COVID-19 pandemic, American architects are putting their ingenuity to work by helping to quickly identify and adapt buildings and spaces into temporary health care facilities for an influx of patients.

Convention centers like Manhattan's Javits Center have been converted into makeshift hospitals while parking garages have been turned into critical care units or emergency triage stations. Design professionals have helped erect an emergency field hospital made up of tents in New York City's Central Park. And still other buildings—previously used for a variety of purposes—are now serving as quarantine locations for people exposed to the novel coronavirus.

"This is not just about designing a converted space," says Molly Scanlon, FAIA. "This is about leveraging our advanced problem-solving abilities and technical skills to rapidly convert a non-health-care setting for change of occupancy during a pandemic."

Scanlon is an environmental health scientist with more than 25 years of experience in planning, designing, and constructing health care facilities as a health care architect. She is now director of standards, compliance & research at Phigenics, an independent water management company.

As the appointed member of the Design and Health Leadership Group at The American Institute of Architects' Academy of Architecture for Health, Scanlon chairs AIA's COVID-19 response task force. Her team is charged with developing tools to inform public officials, health care facility owners and architects on site adaptation for accommodating patients—both those with COVID-19 and other illnesses—at alternative care sites.

Ahead of the April 6 release of the task force's first briefing, we spoke with Scanlon on what architects can do during this crisis and what skills they may be asked to use in adaptively reusing existing spaces.

What has been asked of architects so far during this crisis and what has the industry's response been?

Health care architects have been working on this problem since January when health care institutions and other clients called them for help because it was unknown what the government's response would be.

Health care providers asked health care architects to come up with ways to adapt their hospital systems and to put up temporary structures. They've also been determining space allocations for repurposing within alternative care sites and shuttered buildings.

What roles can other architects play in curbing the pandemic?

If a building that you previously worked on is being commandeered and adapted for health care needs, you might want to offer a helping hand by pairing up with a health care architect. We have heard from some facility managers that it's not helpful to have architects directly calling the facilities themselves to offer services. They're a little overwhelmed right now. However, architects can contact health care architects, contractors, or state and local authorities.

And if your firm was the architect-of-record for a building under consideration as an alternative care site, you're probably the best person to assist with site adaptation because you would have important background knowledge about the building.

Each state may differ, but architects ought to know that New York Gov. Andrew Cuomo compiled an inventory of large facilities to be designated for COVID-19 and non-COVID-19 treatment and inquired about local firm knowledge of those facilities.

What are some challenges that architects are facing in this crisis?

In health care design, architects typically respond to building codes. And so, we always come at it from, "This is the minimum standard of care in assessing the quality of the built environment."

However, what is that minimum response during a pandemic? I'm finding that no one seems to have defined this lower threshold for health care operations in a non-health-care setting. This is a challenge we are working to resolve.

What should architects be doing to prepare for both an expected surge in the number of COVID-19 cases and a prolonged fight amid economic uncertainty?

Call your colleagues and try to logically place your expertise within ongoing efforts. If you don't have relevant expertise, volunteer in your community and use your problem-solving skills. It's also important to stay in your swim lane.

Some architects are concerned about liability and stepping in during an emergency. Health care design and construction requirements have to be relaxed state-by-state regarding construction and to avoid increasing your legal liability.

What other precautions should architects be taking during this pandemic?

We need people taking time for self-care. This crisis is emotionally challenging for health care architects who are working near health care workers on the front lines. Other architects need to be sensitive to the emotional impact this is having on their colleagues. They will need emotional support and other architects need to be ready to step up when they are asked.

What has Phigenics's experience been in this crisis?

As a water management company, we've been called in by government and private health care facilities to verify and validate that water systems and water quality are appropriate for patient care settings in repurposed, previously shuttered spaces and alternative care sites. As the surge is increasing, our specialty services are increasing for rapid testing response.

The concern is if you take a COVID-19-infectious person who is already immunocompromised, and you place them in a dormitory that was shuttered for two years and then activate the water system, they might survive COVID-19—only to die of Legionnaires' disease.

Another problem is that all these hotels and other buildings are now sitting largely empty and their owners have to maintain those buildings until the economy returns. AIA

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The American Institute of Architects

CREDIT: ELENA XAUSA

AIAFeature

Design in the Time of COVID-19

The business of architecture has been derailed by a pandemic, but have remote offices changed the work of design?

By William Richards

Perception was reality in the early days of the COVID-19 pandemic, as the metastasizing cases outside of China prompted xenophobia, dread, and the schadenfreude of doomsday preppers. But reality surpassed perception once stock prices tumbled, unemployment hit record highs, and 2008 started to feel like a warm-up lap rather than the main event for this generation of workers.

In late March, the AIA Research and Practice team projected a 15% decrease in revenue among firms in April, on the heels of a 10% decrease in March. They also reported that more than two-thirds of firms saw prospective projects slow or stop. As cease-work orders and stay-home orders by state and local governments roll out, this number will likely go up, but the true impact of lost potential is unknown.

Long-term implications for the AIA's Architectural Billings Index (ABI), where design activity leads nonresidential construction activity by 9-12 months, is also unknown. "The ABI reflects average conditions in a normal cycle, but now we've just stopped," says AIA Chief Economist Kermit Baker, HON. AIA "and how and when it will start over is unclear. If this is a two- or three-month work stoppage, there won't be that much damage to the economy, fundamentally."

"The longer it drags on," he says, "the greater the chance that businesses will cease to operate."

We have always known more about the economics of this pandemic and less about the impossibly aggressive and mercurial virus itself. Yet, it is unclear if this pandemic will result in a multi-month recession or a multi-year depression. The Trump Administration's daily press conferences in March squared off equally against both the economic policy response and the public health response to COVID-19, arguing that to attack one head of the chimera and not the other would have dire consequences. After the S&P 500 reached its March low and after passage of the CARES Act, April's media coverage turned fully to the virus, which had already ravaged New York City and began to take lives in record numbers across the country despite social distancing, robust hygiene guidance, the gradual rise in testing capabilities, and quarantine protocols.

Despite it all, architects, like millions of other workers, still had jobs to perform. They still do, and as more and more firms have adopted telework policies—voluntarily or involuntarily—it raises questions about how the work of design itself will be affected by this pandemic. As the virus recedes, what will be the lasting impact on studio culture and the engine of architectural production?

(You May Now) Whistle While You Work

Bonstra|Haresign is a 32-person firm in Washington, D.C., whose principals Bill Bonstra, FAIA, and David Haresign, FAIA, reported to the office each day during the early days of the pandemic until the April 1 stay-home order issued by the District of Columbia. Their employees, however, began teleworking—from the couch, the kitchen table, and the basement—in mid-March without any interruption in their productivity, says Haresign, but with a big change in how work flowed.

"My portfolio is full right now, and I'm working on the design side, and the throughput is quick—sketching, talking, and working things out virtually," he says. "But, I don't have the benefit of watching the design process unfold in front of me. That interaction is gone, as connected as we all are now online. Now,

AIA Feature

CONTINUED

something will just appear in front of me after several hours in development and I didn't really have the benefit of seeing it evolve. It's just led to a different rhythm in the day."

That rhythm might well have some business advantages, however. "We've seen an increase in our staff utilization rate. It's not a lot, but it's noticeable," says Raymond Manning, FAIA, CEO and president of Manning Architects, who runs offices in New Orleans and Dallas, and a storefront office in Baton Rouge. "Everybody reports every morning on what they're doing, and it makes them more intentional about what they want to accomplish, and based on that, we can more easily direct and redirect them."

Manning's 20-person firm was more prepared than most to pivot to full-time teleworking during the pandemic. Hurricane Katrina made sure of it.

"When I evacuated New Orleans 15 years ago, I had three physical backup tapes of the server in my pocket. Now, everything is in the cloud," Manning says.

"We had a fairly seamless transition, owing to our existing hurricane contingency plan," says Manning Architects project manager Tighe Kirkland, ASSOC. AIA. "Like so many companies are doing, you pivot," she says. "You have to become peripatetic and nomadic, and you have to develop the ability to reestablish yourself easily. It's a paradigm shift, but it's an OK shift—so much so that we're even now questioning the relative value of a physical office."

What does this mean for the work, itself, though, if the work is a product of a specific studio environment?

Studio means individual designers working in concert and collaboratively with others to design a project under the leadership of a principal or manager. It is predicated on the balance between unstructured and open-ended experimentation and design inquiry. Conversely, it is also predicated on the highly structured divisions of labor that ensure profitability of the project and, by extension, of the firm as a whole. Studio means sketching with a Micron pen and the serendipity of juxtaposition. It's chipboard, it's glue, it's the smell of printer ink, and it's the flecks of CNC dust. It's also precise measurements and merciless deadlines, change orders, and half-eaten salads.

To put it another way, the studio environment is fundamental to the profession's pipeline as a way of working and as a tribal language, and it is the most visible quality that sets architecture apart from other majors in school and many other professions in practice. In 2016, the American Institute of Architecture Students released a special report on the state of studio culture, what defines it, and why it matters based on interviews with faculty members and studios. One respondent said simply, "Studio culture holds the architecture world together, it gives everyone involved a mutual understanding of each other's fundamental being."

This mutual understanding is based, though, in an individual's rite of passage: surviving and thriving in a shared space—day and, sometimes, night. "We lived and died by our studio projects—we didn't leave and sometimes slept there at night—and I just can't imagine to have be asked to go home, especially during my thesis year," says Kirkland, who graduated from the Rhode Island School of Design in 2005. "It would have been shattering to me."

Tightening Up and Loosening Up

The psychological hurdle of remote working for circumspect employers has always been about productivity, which is as true for architecture firms as any other profession—and perhaps more so, when projects last years and involve dozens of contractors, subcontractors, and consultants. Loss of momentum or a slipped deadline are liabilities in the time-is-money model.

John Marx is the Chief Artistic Officer and a design principal at Form4 Architecture, a 42-person firm in San Francisco that switched to remote working on March 17. He says the transition has been relatively easy, but doesn't quite replicate the camaraderie of the studio.

"What I miss most are my somewhat indulgent long lunches with employees and my partners, where relationships deepen," Marx says.

Form4 specializes in, among other things, workplace architecture and interiors, and counts several Silicon Valley tech giants including Netflix, Facebook, and Google as clients whose own experiments with unconventional office culture are legendary. Smoothies, yoga, and foosball aside, these companies are nothing if not productive in how they maintain and evolve their platforms, data collection, and data analysis to maximize profits and minimize problems.

Like these companies, Marx's team has also learned how to tighten up and loosen up, simultaneously.

"Everyone seems to be highly productive in my office now. Among the people I'm working with, they seem to be more efficient than before. On the other hand, video meetings have meant that even clients are letting go of the idea that you might see someone's furniture at home or see their kids run by."

Is this a sustainable productivity model for a reimagined studio arrangement? The jury is still out.

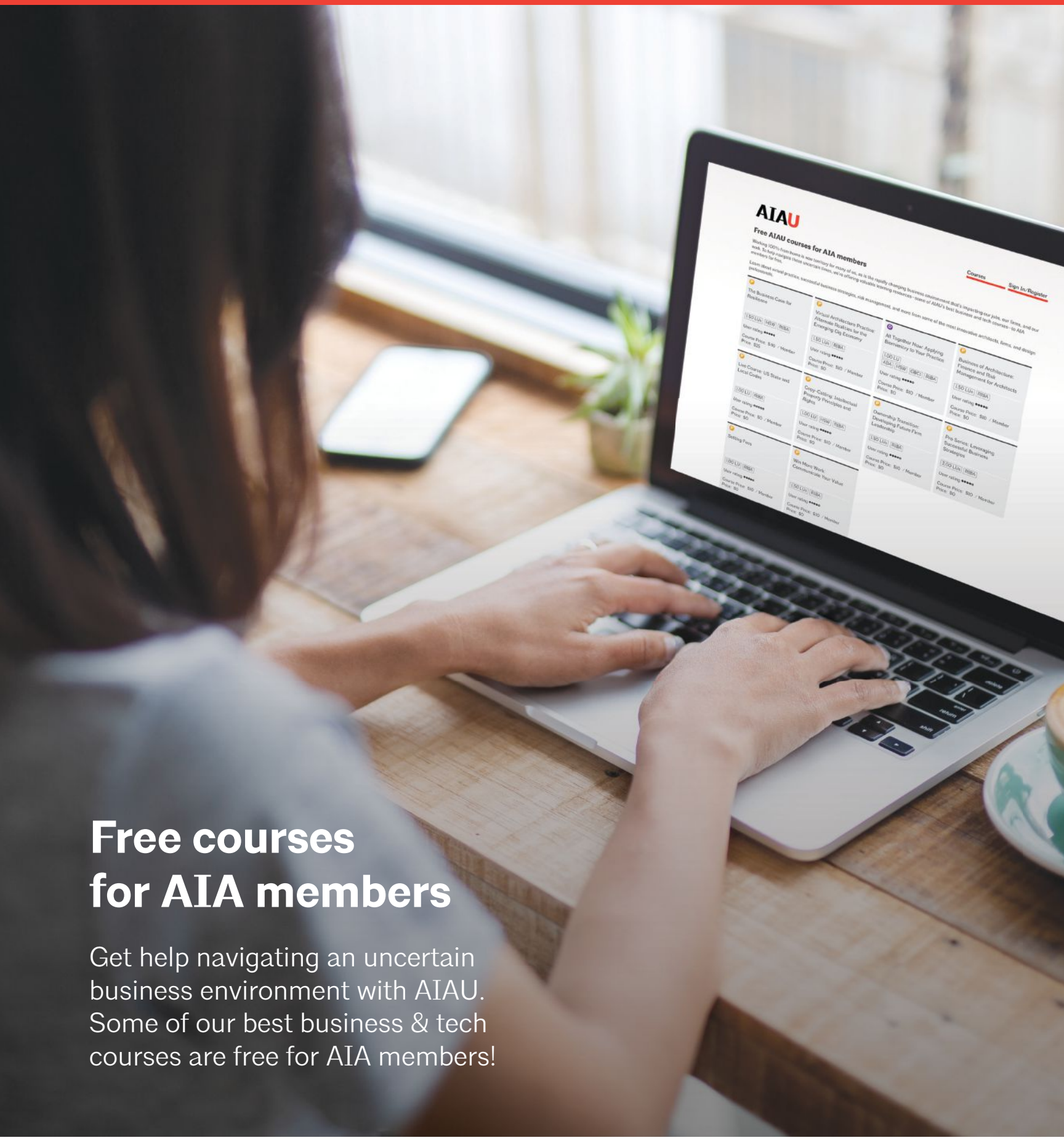
"It's not so bad from a pure design point, and I don't see this taking down the creative side of things," says Marx, who has been working on existing projects with his team with native digital files and hasn't, yet, started a new project remotely. "Now, when we start something from scratch, I don't know how we'll work together. Normally, we'd all sit down in the beginning and I'd sketch out what will happen with this blank site. But, I have to do that on video now."

Process aside, new work habits for all Americans will force programmatic change, which will, in turn, create new opportunities for architects to design for adaptation. Telemedicine, once a novel feature of health insurance plans, is ubiquitous and will make preventative health care more accessible (and probably more impersonal). Infectious diseases, and their unpredictability, suggest flexible health care facilities that can scale up or scale back with a day's notice. How this will change the requirements for a health care project's campus will be an area of growth for the industry and architects.

If modern sanitation came into its own in the late 19th century, modern sterilization will become an obsession for some at first and, eventually, an unremarkable social norm for all. But, how that figures into everyday public spaces and places will also provide new leads for design thinking. The line between public and private health will also shift, and collective welfare will drive personal habits, backed by policy and a sense of probity. Architects, too, have a hand to play at all levels of that debate.

Within design more broadly, the humble face mask will be elevated as art, artifice, and accoutrement suitable for any occasion. Automation and artificial intelligence will speed the inevitable transformation of the economic middle class, for better and for worse. They will also make post-disaster supply chains more efficient and recovery less hampered. Architects also have a hand to play at all levels of that debate.

Through remote working, architecture firms might well find new efficiencies, reduce their overhead, and increase their staff utilization rates. But firms are also advised to find new opportunities beyond a new way of working together in this health crisis. The next crisis could depend upon it. AIA



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AIAFuture

Meeting a Challenging Moment for the Design Professions

By Kermit Baker, HON. AIA, and Katherine Flynn

Since mid-March, every major industry in the United States has felt the shock waves of shuttered offices, mandatory telework—and in some cases, even layoffs—as federal, state, and local governments implemented social distancing policies in a bid to contain COVID-19. While architects can reasonably be expected to adjust to designing remotely in the short-term—moving presentations and collaborative design sessions to video calls, working with colleagues in Revit from home—the long-term impacts of shrinking client budgets and stop-work orders on the larger AEC industry are still evolving. As of late March, Jeffries Financial Group, which has developed a weekly activity indicator based on common social and business behaviors, estimated that business activity was only at about 36% of normal levels. In the longer term, architects and the nation at large may be dealing with a fractured economic landscape, with no clear answers about its condition when it does ultimately bounce back.

In the short-term, architects are already seeing clear signs of a slowdown. March brought fewer new design projects as compared to their expectations entering the month—50% of firms reported that their number of new projects was down. The percentage increased to 59% regarding inquiries for future design work.

In the realm of residential design and homebuilding, which has historically been an accurate leading indicator of economic cycles both heading into a downturn and coming out of one, an AIA survey indicates that the industry will see activity cycle down for at least the next several months. Looking forward to April, 92% of residential design firms expected revenue declines, and over two-thirds of firms (69%) anticipated that the revenue falloff would exceed 10%.

At nonresidential architecture firms, revenue for March was an estimated 10% lower than expectations at the beginning of the month, while April was expected to be 15% below previous expectations. On the residential side, the numbers were a bit higher; 70% of residential firms indicated that inquiries for new work declined in March, and 78% of firms had already seen slowing or stoppage of projects.

Two-thirds of responding firms in the nonresidential survey reported that they had seen prospective project inquiries or negotiations for new projects moving more slowly or completely stopping due to issues related to the COVID-19 outbreak, with 17% saying that many prospective projects had

CREDIT: RACHEL KAPISAK JONES

slowed or stopped, and 50% saying that some projects had slowed or stopped. However, 33% reported that at this time, all prospective projects were still moving ahead as expected.

In the larger construction industry, contractors are likewise seeing a slowdown in project activity. A survey conducted by Associated General Contractors of America in April found that 65% of respondents reported project delays or disruptions. Respondents reported that these delays were caused by a variety of reasons: problems with deliveries of materials or equipment; shortages of workers for either the contractor or subcontractors; shortage of personal protective equipment; potentially infected persons visiting the jobsite; or delays in obtaining permits, certificates of occupancy, inspections, or other approvals.

If your firm has experienced or is currently experiencing a loss of business due to the ripple effects of the pandemic, you're certainly not alone. In total, three-quarters of firms have seen problems with current projects due to COVID-19, with firm revenue declines expected to accelerate in the coming months.

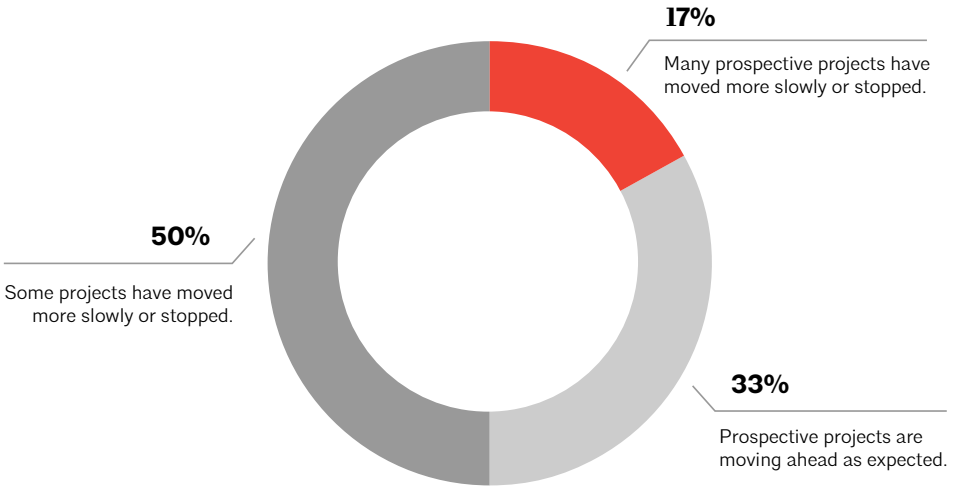
Day-to-Day Impacts

On a smaller—but still critical—scale, firms largely made the transition to remote work for the majority of their staff, with just under half (48%) indicating that all, or almost all, of their employees were working remotely, while 31% reported that some were working remotely. Few firms reported a major impact to their staff due to family/personal reasons, but 15% of firms said that this situation has caused at least some of their staff to be unable to work at all.

The largest share of firms, 79%, said that they were limiting in-person client meetings, and/or moving those meetings to virtual meetings. But so far, few firms have made active changes to redesign their office space to implement social distancing, probably primarily because so few staff are currently working in the office. And while nearly half of firms have implemented temporary work-related travel restrictions, just 19% have implemented a strict no-travel policy for work in the foreseeable future.

Two-thirds of firms report slowing or stoppage of projects due to COVID-19

Percentage of firms reporting change in prospective project inquiries or negotiations for new projects



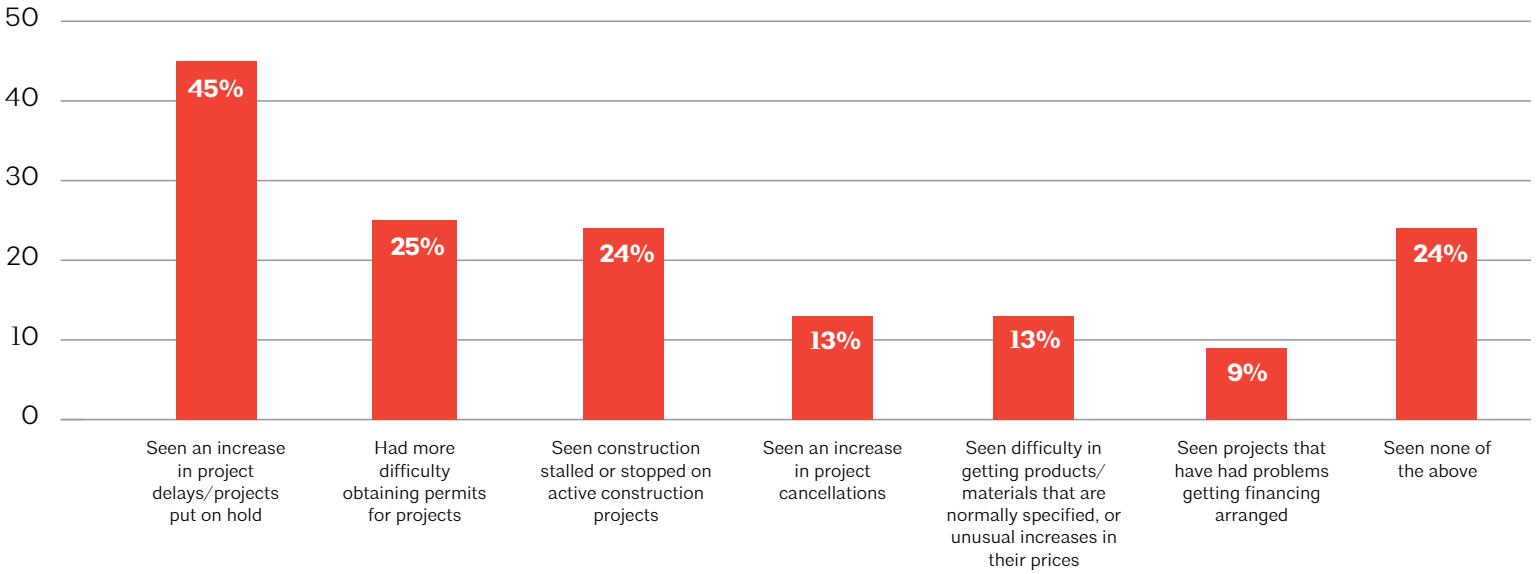
Data from survey conducted of AIA firm leaders from March 17-23, 2020

Federal Assistance

The good news, for the time being, is that monetary and fiscal policy has ramped up significantly in an effort to avert economic hardships across every sector of our economy. In March, the Federal Reserve Board initiated two interest rate cuts, bringing the short-term federal funds rate effectively to zero. Additionally, it committed to providing necessary liquidity to keeping financial institutions afloat and to purchasing short-term and long-term debt as necessary to stabilize the economy. The CARES Act

Three-quarters of firms have seen problems with current projects due to COVID-19 pandemic

Percentage of firms reporting problems with current projects over the past month



Data from survey conducted of AIA firm leaders from March 17-23, 2020

AIAFuture

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94% of overall firms expected revenue declines, and over half of firms (57%) anticipated that the revenue falloff would exceed 10%.

provides approximately $2 trillion in funding for programs to support an economy-boosting response to COVID-19. The policies in the legislation most helpful to architects include the creation of a $349 billion loan program for small businesses, the establishment of a $500 billion lending fund for impacted industries, $100 billion for hospitals, and a significant boost to worker unemployment insurance benefits, including expanding eligibility and offering workers an additional $600 a week for four months on top of what state unemployment programs pay.

The size of the stimulus program, about three times as large as the TARP fund approved to deal with the fallout from the 2008–2009 Great Recession, underscores the federal commitment to shoring up the economy, as well as the perceived extent of the difficulties that the economy is likely to face in the coming months.

Looking Ahead

In the surveys that AIA conducted, residential firms had a much higher share of firms that reported estimated revenue losses of at least 25%. Almost a third of residential firms (30%) expected revenue losses of 25% or more in March following the COVID-19 outbreak, with the share of respondents increasing to 43% in April, while only 13% of nonresidential firms expect a loss of 25% or more in March and 25% in April. Firms located in the Northeast were more likely to expect revenue losses of at least 25% compared to firms in other locations.

The economic prospectus for architecture and the larger AEC industry is steeped in uncertainty. In past times of economic hardship and ambiguity, architects have gotten creative in shoring up their business by offering a bevy of supplemental services like code compliance consulting and detailed cost estimating. It remains to be seen whether this kind of resourcefulness will be necessary in the months ahead. AIA

AIAPerspective

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Growing From Adversity

We are not defined by the challenges we face, but by how we meet them.

Ordinarily, May evokes thoughts of spring, and if we are lucky enough, the summer days ahead with family and friends. This isn't an ordinary year. COVID-19 has dramatically altered the rhythm of our days and will continue to reshape our lives in ways we can't foresee. That can seem overwhelming, disheartening, and frightening unless we remember that we are not defined by the challenges we face, but how we meet them personally, professionally, and as citizens of the global community.

The fact is that despite the ongoing COVID-19 global health emergency and the grim news that it brings, it is still spring. It is still a time of rejuvenation and growth, and a physical reminder of the indomitable power of the human spirit to renew itself and to grow from adversity.

Make no mistake, COVID-19 has acquainted us all with varying degrees of loss: From the transitory loss of workplace camaraderie and the routine closeness of friends and family members, to the permanent loss of COVID-19 victims, including more than a few leaders and pioneers in our profession.

The numerous firms that have repurposed their 3D printers to create face shields and other critically needed but scarce medical supplies are just one example of architects taking action during the early days of the pandemic. To help support efforts like this, we've formed member-led task forces, with a common mission to position the profession to help lead during this crisis and play an integral part in the recovery.

The task forces include: The Rapid Response Safety Space Assessment Task Force, chaired by Molly Scanlon, FAIA, which is refining best practices for identifying and converting existing buildings into temporary health facilities; the Implementation and Community Outreach Task Force, chaired by Rose Grant, AIA, which will support components' efforts to mobilize local architects, to implement recommendations of the temporary facilities task force, and identify community response and recovery efforts; and the the COVID-19 Business Task Force, co-chaired by Dan Hart, FAIA, and Mark Levine, AIA, which is focused on identifying primary challenges and finding solutions to the economic disruption.

Based on the spirit of collaboration, ingenuity, shared sacrifice, and self-reliance I've seen and heard so far—from our professional organization, component leaders, members, and AIA staff—I am convinced that we will do more than meet the many challenges ahead; we will grow.

Some of the lessons learned could even have positive impacts over the long term—particularly when it comes to climate progress. Scientists have cataloged the sudden plunge in greenhouse gas emissions caused by the large-scale substitution of telework and staying home for commuting and travel. Of course no one would have chosen to reduce pollution under such tragic circumstances—and, thankfully, stay-home orders won't be permanent—but the change does help demonstrate that dramatic environmental progress is possible.

Scientists also point out an instructive parallel between the pandemic crisis and the climate crisis: If you wait until you can see the impact, it is too late to stop it. Climate experts like Elizabeth Sawin, co-director of the think tank Climate Interactive, explain that "the public is coming to understand that in that kind of situation you have to act in a way that looks disproportionate to what the current reality is, because you have to react to where that exponential growth will take you." I know that architects will be instrumental in translating these lessons into positive change, just as our profession is stepping up during the health crisis.

I have never been prouder to be an architect or part of AIA. The last several weeks have shown me the full measure of our members, our profession, and our professional organization. The weeks and months ahead will determine how we move forward amid the uncertainty, grief, and confusion caused by the COVID-19 public health emergency. The response so far fills me with optimism. It is clearer than ever to me that when we look back at spring 2020, we will be proud of our efforts to make our world better, safer, and healthier for all. I look forward to working with you to build that brighter future.

Take care of yourselves and your families.

Jane Frederick, FAIA, 2020 AIA President

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“All Mies knows is that guff about his concept, and in the Kendall County Courthouse, that doesn’t go down. I tell you, we had him sweating blood.”

The Farnsworth House on Trial by Eric Wills

It had started as a dream, the collaboration between Edith Farnsworth and Ludwig Mies van der Rohe. She a Chicago doctor, he one of the great midcentury architects, they met in 1945, at a dinner party. When Mies agreed to design a country retreat for her in Plano, Ill., she wrote that "the effect was tremendous, like a storm, a flood, or other act of God." Together they aspired to create an enduring work of architecture—a shared passion that reportedly spilled over into an affair. In 1951, when the house was completed, *Architectural Forum* was rapturous in its praise, calling it "a concentration of pure beauty, a distillation of pure spirit" that has "no equal in perfection of workmanship, in precision of detail, in pure simplicity of concept."

By then the dream was over. Mies initially had anticipated a cost of $40,000, but after it soared to more than $74,000 (nearly $740,000 today), Farnsworth refused to settle the outstanding balance. ("My house is a monument to Mies van der Rohe and I'm paying for it," she griped to her nephew.) Their dalliance long over, architect and client faced off in court, their private falling out becoming an ugly public feud. The house itself also ended up on trial, its critics as vociferous in their condemnation as the acolytes had been in their praise. Frank Lloyd Wright, who had been an early supporter of Mies after he had emigrated to America from Germany, eviscerated his former friend in the pages of *House Beautiful*, railing against "poverty-stricken glass-box architecture" that casts a "communistic shadow … over our own [American] tradition."

Farnsworth had launched her own broadside, diligently recounting the house's many flaws in the same magazine: the roof leaked; heating oil from the

Edith Farnsworth (left) at the house she built with Mies

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Photo of Farnsworth reviewing plans of the house with Myron Goldsmith, a key piece of evidence during the trial

boiler collected on the windows; the fireplace vented properly only when the door was open. "The truth is that in this house with its four walls of glass I feel like a prowling animal, always on the alert," Farnsworth griped. "I wanted to do something 'meaningful,' and all I got was this glib, false sophistication."

The dramatic tale of the famously taciturn architect, his disenchanted client (and spurned lover?), and the celebrated house they created together gets a new telling in Alex Beam's *Broken Glass: Mies van der Rohe, Edith Farnsworth, and the Fight Over a Modernist Masterpiece*, published in March by Random House. Beam, a *Boston Globe* columnist, builds his narrative from archival research and countless documents, including 3,800 pages of trial manuscripts as well as Farnsworth's journal and letters. If the book suffers from bouts of repetition, as descriptions and events are reintroduced across the chapters, a little forbearance pays off because Beam has been rigorous in his reporting (he even interviews two locals who had taken French lessons from Farnsworth in Plano). The result is an intimate portrait of the dynamic between architect and client, and how they managed to give rise to an object of refined beauty—and a backstory alive with architectural intrigue.

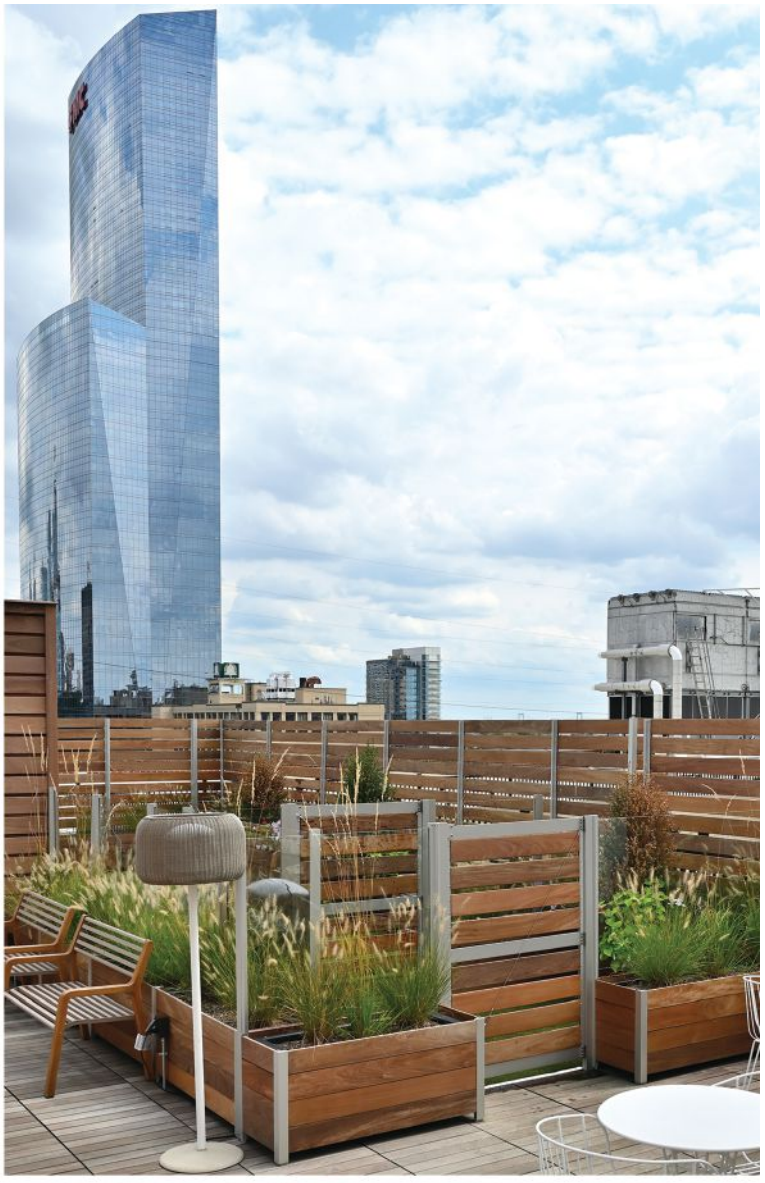
"Quality Control Theatrics"

Perhaps the collaboration was ill-fated from the start. Here's Mies on client relations: "I think we should treat our clients as children." Or, more expansively: "Never talk to a client about architecture. … Talk to him about his children. That is simply good politics. He will not understand what you have to say about architecture most of the time. … Most of the time a client never knows what he wants."

Farnsworth, a leading kidney researcher in Chicago (she was both a clinician and a professor at Northwestern University Medical School), knew what she wanted, and giving Mies carte blanche wasn't it. When she consulted with Chicago architect Harry Weese about what color the curtains should be (he favored brown, Mies wanted natural Shantung silk), Mies's response, as reported by Myron Goldsmith, the project architect: "If I would have known she would be so difficult I would have never touched the house."

If Farnsworth attributed to Mies some form of celestial power in the beginning, she soon came to regard it as pretentious sleight of hand. Consider the architect's "quality control theatrics": Mies, who had sourced travertine for the house's floor and deck (no small contributor to the rising costs), sat in a

MYRON GOLDSMITH FONDS; CANADIAN CENTRE FOR ARCHITECTURE



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blue canvas deck chair as the slabs, supplied by the Carthage Marble Corp. in Missouri, were paraded by him—"each man carrying a slab of stone like the precious painting before the eyes of a divine appraiser," as Farnsworth recalled. After he sorted them into three categories—first quality, second quality, and reject—a debate ensued about which pile was in fact first quality, and the ceremony devolved into farce.

Randolph Bohrer represented Farnsworth at the trial (Mies filed suit for the outstanding balance; she countersued for malpractice), but given his scathing assault on the architect—and on Modern architecture—it may as well have been Tom Wolfe. Hadn't Mies added the "van der Rohe" to his name in an attempt to suggest some relationship to royalty? Wasn't he a publicity hound more interested in fame than functional architecture? Mies's lawyer intervened during the worst of it: "I object to counsel shouting at this witness and badgering him. I want the record to show that he is standing within 3 feet of the witness, pointing his finger at him and yelling at him."

Publicly, at least, Bohrer maintained that he had gotten the best of Mies: "[He] didn't know anything about steel, its properties or its standard dimensions. Not about construction, or high school physics, or just plain common sense. All he knows is that guff about his concept, and in the Kendall County Courthouse, that doesn't go down. I tell you, we had him sweating blood."

Farnsworth fared no better on the stand, claiming that she never had reviewed plans of the house—until a photo emerged revealing the lie. In the end, even though the house's roof had started leaking *during* the trial, appearing to reveal a significant defect of construction, the special master presiding over the case ruled in Mies's favor, awarding him $12,934.30 in unpaid bills and commissions and requiring Farnsworth to pay for the cost of the proceedings. The verdict required approval from a judge, and when that was slow to come, and Farnsworth launched her public offensive, the two parties finally settled, four years later, for $2,500.

COURTESY FARNSWORTH HOUSE; THE NATIONAL TRUST FOR HISTORIC PRESERVATION

The house now furnished as Farnsworth originally had it: without any Miesian designs

A Serendipitous Second Chapter

Mies may have prevailed, but he had done Farnsworth no favors with his decision to use single-pane glass for the house, which led to predictably outlandish heating bills; the lack of air conditioning and operable windows (just two in-swinging hoppers); the absence of ducts along the glass, which caused the windows to fog up in winter—much like driving a car in a rainstorm without wipers, Farnsworth alleged. When it was time to move in, she rejected the Mies-designed furniture the architect had envisioned for the space (Barcelona chairs, a Brno chrome-and-steel coffee table, a dining room set of MR tubular chairs) and instead outfitted it with Danish furniture, wicker chairs, Chinese art, and thick-piled Moroccan rugs that covered the travertine.

Farnsworth had the misfortune of being assertive and accomplished in an age when, at best, that could earn her a reputation as difficult, and at worst—well, here's Philip Johnson of all people on the matter: "God, who could sleep with that woman? None of us could figure it out." As for Mies, he had the good fortune of preceding #MeToo, abandoning his wife, three daughters, and a mistress, Lilly Reich, when he came to America, then taking up with a new lover who bookended his fling with Farnsworth. Who could blame Farnsworth for feeling conflicted about the house, the unraveling of her relationship with Mies (professional and otherwise) clearly coloring that perception? "She felt it was impractical, but she loved it and she loved being out in the country," remembered one of her French students. "In a certain way it was tainted, but she also took great pride in it."

As Beam suggests, the Farnsworth House had a far more fortuitous second act. In the late 1960s, Peter Palumbo, a British developer, was visiting Chicago to recruit Mies to design a London skyscraper (a project that Palumbo's former polo teammate, Prince Charles, he of the anti-Modernism crusades, would later torpedo), when he chanced upon an ad in the *Chicago Tribune*: For sale, Farnsworth House, Fox River. Palumbo remembered the house from an architecture

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lecture at Eton College, and in 1972, he purchased "the faded beauty," as he called it, which had suffered the "ravages of time and neglect and bitterness applied to it." Palumbo restored it, fixing the roof, rewiring it, and working with Dirk Lohan, FAIA, Mies's grandson, to furnish the interior much as the architect had originally intended; he also added new conveniences, including electric heat and an air conditioning system.

The house had always been an aesthetic triumph. On the inside, the structure seems to all but disappear, becoming a tranquil backdrop for the contemplation of nature; from the outside, it appears to levitate above the plain through some magnetic force, an illusion created because Mies had any traces of welding removed from the connections between the supporting columns and the beams. "It was incredibly serene," Palumbo wrote. "It was quite a wonderful place, when it rained or when there was an electrical storm it became very exciting. It was like being inside a lotus flower—you could sit in a thunderstorm and never get wet."

The House as Patient

As the Farnsworth-Mies trial ended, so does Beam's book—with a whimper: an account of Farnsworth living out her final years in Italy, in a villa she purchased outside Florence. One admires her astonishing capacity for reinvention: As an expat, she left medicine for the literary world, becoming an acclaimed translator of the poetry of the Nobel Prize–winning Italian Eugenio Montale.

Mies and Goldsmith had also wanted to reinvent the Farnsworth House, as Beam recounts, mass-producing it for the middle class. The 50 x 50 House, as the architects called it (they also contemplated 40 x 40 and 60 x 60 versions), was intended to cater to families who could adapt the open-floor plan to suit their lifestyle. Like so many prefab solutions of the era, the plans never became reality, but the need they responded to remains more pressing than ever.

It's an unexpected ambition to associate with the Farnsworth House and its spiraling costs, and the question that lingers is how Beam's book informs our understanding of the project's complicated legacy. After a 2016 visit, Jacques Herzog, HON. FAIA, delivered this appraisal: "It's an interesting and instructive statement, containing a lot of things for which Mies became famous … but as a house for a woman living here in the wilds, in a wild and isolated piece of nature, it's absurd. … It's a home for ghosts." He continued: "You cannot use this house except as a museum. It's so expensive to maintain; it's like a patient in the hospital."

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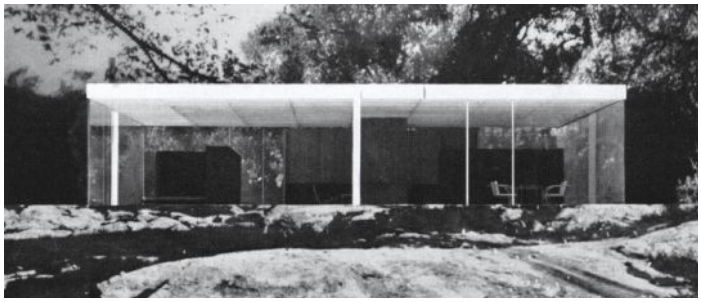
Too scathing an indictment, perhaps, but Herzog is not wrong about the ghosts (the spirits of Mies and Farnsworth shall forever animate the space) and about the house as patient—stable, but in need of work. The National Trust for Historic Preservation, which purchased the house in 2003 when Palumbo listed it for auction at Sotheby's (the price: a cool $7.5 million), now operates it as a museum and has



The 50 x 50 House, never built

embarked on a $10 million restoration that will also build an endowment for the property. Contingent on fundraising appeals and approvals from Landmark Illinois, which has a preservation easement on the site, the project includes preservation work—replacing the roof, repairing the radiant heating system, restoring the outdoor terrace—as well as "flood mitigation" efforts. The Fox River, just 75 feet away, has inundated the house on four separate occasions, the last time in 2008, leaving costly damage in its wake.

If the house suffers from an original sin, it was the decision by Mies's office to raise it only 5 feet 3 inches above grade—a calculation made after consulting with the Army Corps of Engineers and county flood-control officials, and measuring the high water level on a neighboring property where the swimming pool had once flooded. Mies chose a site so close to the river because he was drawn to a 200-year-old black sugar maple (he wanted the tree, now gone, to help shade the house), and he remained adamant even though Farnsworth had argued for a spot on a nearby hill, and a contractor had warned about flooding: "That is precisely what we want to show," Mies responded, "that we can combat that. It's easy. You have a canoe there, and if it floods, you take the canoe to the house. It isn't much. It's an adventure, but that belongs to life."

The adventure that followed defied anyone's imagining (a 1996 flood spirited away Palumbo's Andy Warhol silk-screen portrait of Elizabeth Taylor, never to be retrieved), and Goldsmith later accepted blame: "Certainly, had we been a little smarter, had I been smarter, because it was finally my responsibility, we

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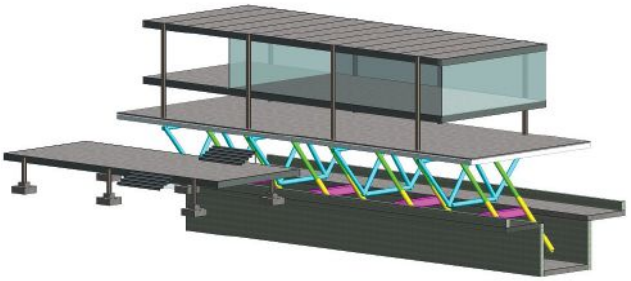

Silman's proposal: a house elevated by hydraulics

A flood circa the 1950s

could have set it above the highest flood, but there was a little casualness about this because the highest flood was just barely within memory of the old-timers around there."

The Trust is pursuing a bold (and controversial) solution, commissioning the structural engineering firm Silman (see page 198) to design a hydraulic system that can raise the structure when the waters rise. The Farnsworth House appears poised to go high-tech, in the process becoming a pioneering case study in preservation. Which seems fitting given how it so perfectly encapsulates the optimism of postwar America: the fervent belief, at the rise of technological age, that man could bend nature to his will, and the equally fervent belief, as reflected by the 50 x 50 project, that elegant design could be affordable for the masses. The Farnsworth House is having a moment—a movie is also now in the works, starring Ralph Fiennes as Mies and Elizabeth Debicki as Farnsworth—and it has lost none of its cultural resonance, even if it is now a museum piece, even if it represents a dead end in a hyper-reductionist strain of glass-box Modernism. Because what a dead end it was, what a marvelous dream, even if the dream lasted but a moment.

TOP: COURTESY SILMAN; BOTTOM: EDWARD A. DUCKETT COLLECTION, RYERSON & BURNHAM LIBRARIES, THE ART INSTITUTE OF CHICAGO

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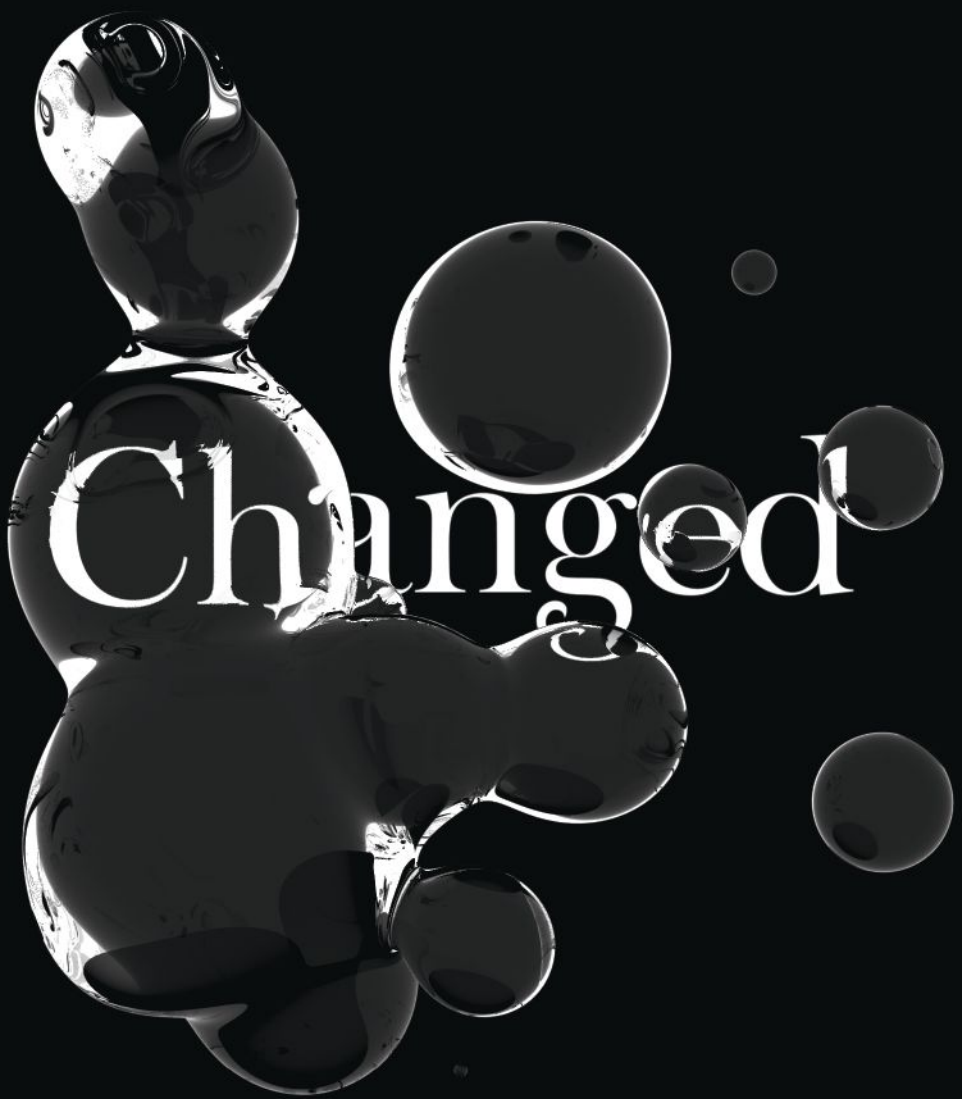
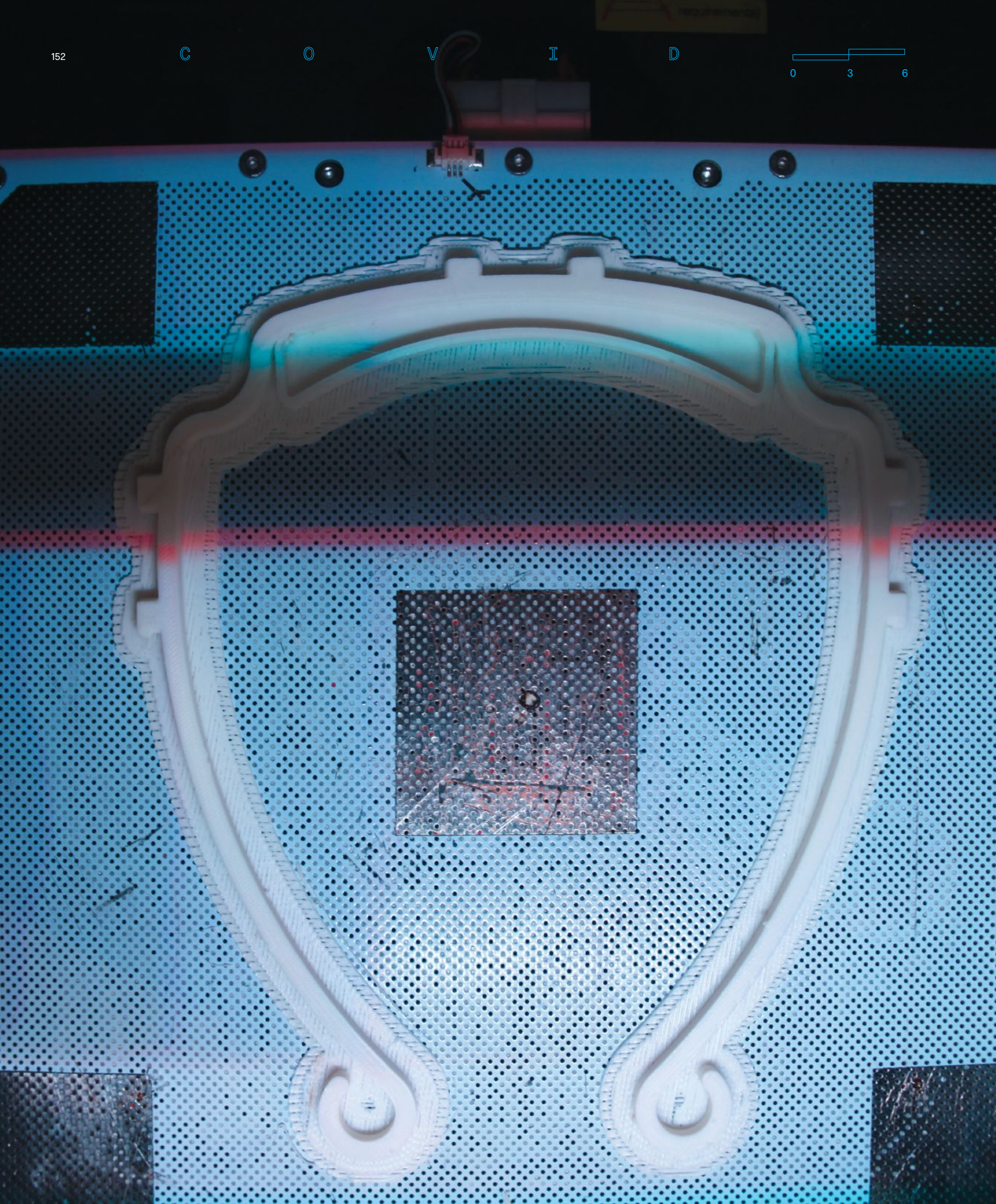


Social distancing, quarantine, isolation ... The surfaces we touch, the very air we breathe, now carry the threat of infection. The measure of a man, which Plato long ago defined by personal character, is now firmly fixed at 6 feet apart, beyond the reach of a potentially disease-laden hand or expulsion of bodily fluid. The coronavirus is a spatial phenomenon, and it demands architectural solutions.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19 Power of the Printer

How informal networks of architects mass-produced simple yet lifesaving devices—and in the process charted a new course for humanitarian design.

TEXT BY KARRIE JACOBS

Since the turn of the 21st century, the desire to do good has been one of the defining attributes of design culture. What young architect doesn't want to create something—whether it's a prefab shelter to be deployed in disaster areas, a tiny house for a homeless person, or a shipping container converted into a mini-hospital—that will make life better for someone?

That impulse has produced plenty of high-flying architectural activism, including the scores of houses, designed by the likes of Morphosis and David Adjaye, HON. FAIA, for Brad Pitt's Make It Right Foundation in post-Katrina New Orleans, or the nifty flat-pack houses Andres Duany, FAIA, designed to be shipped to Haiti after that island was devastated by an earthquake.

Such star-powered activism may be well intentioned and make for good copy and irresistible clickbait, but the best solutions—whether in response to some disaster or a long-standing social issue—are often less-overtly seductive. What was really needed post-Katrina wasn't an architectural showcase (the houses are now the subject of a class-action lawsuit over shoddy construction), but a federally funded program to build a large quantity of simple homes to systematically replace the thousands that were lost. Similarly, Haiti didn't need imported flat-pack

houses so much as seismically upgraded versions of the island's default concrete-block buildings, which residents could build themselves. After the 2010 earthquake there, I interviewed Elizabeth Hausler, an engineer who founded an organization, Build Change, dedicated to teaching rudimentary seismic strategies to local builders in earthquake-prone regions around the world—in essence, improving the local approach and vernacular. "This is why Build Change doesn't win a lot of these cool, prestigious awards," Hausler told me at the time. "What we do is very low-tech. It's not very fancy. It's not really anything new. It's just improving an existing technology, but by doing that we reach so many more people with locally appropriate solutions."

Surprisingly, one of the first places to celebrate this deeper, less sexy architectural response to cataclysm was the Museum of Modern Art. In a 2016 exhibition, *Insecurities*, MoMA looked at the world's refugee crisis from a design perspective. The show placed limited emphasis on stand-alone solutions, the sort of beguiling designs that fare so well on Instagram. Instead, the curators devoted significant wall space to more systematic approaches like the "planning and design toolkit" that Ennead Architects partner Don Weinreich, FAIA, and his colleague Eliza Montgomery, AIA, devised for refugee communities. The idea was that the places where refugees lived—often for years—shouldn't be thought of as "camps"; they should instead be regarded as cities, and designed with an appropriate level of thought and calculation.

A Potent Symbol of Architectural Activism

Today, the COVID-19 pandemic has revealed our own country to be as unprepared for disaster as the nations to which we customarily send aid. There is a shortage of essential supplies, the personal protective equipment—masks, gowns, and gloves—that we now familiarly refer to as PPE. Some of the paucity is because of the federal government's shocking lack of foresight and logistical know-how, and some of it is because much of our manufacturing capacity has, over the last 40 or 50 years, moved steadily offshore. Cheap and disposable goods, like surgical masks, tend to be made in China.

In the unprecedented chaos of the moment, the symbol of architectural activism has quickly become the face shield. It's a remarkably simple object, a clear visor held in place by a plastic harness that offers another layer of protection to medical personnel who already have their mouths and noses covered by surgical masks. It has little to do with architecture per se, but it can be easily fabricated with the tools of the trade.

You'll still find shipping containers or prefab boxes smartly configured for the crisis circulating on social media, but the more powerful and significant response has been the harnessing and repurposing of the 3D printers and CNC cutting machines that have, over the past decades, become staples of architectural practice. As V. Mitch McEwen, an assistant professor at Princeton University's School of Architecture, puts it: "We are fabricating what we can as quickly as we can."

It's a highly dispersed undertaking, but if there is a central hub, it might be the Cornell University lab presided over by Jenny Sabin, whose practice generally probes the border of architecture and material science. She is Cornell's Wiesenberger professor in architecture and the director of graduate studies in the Department of Architecture.

When I spoke with Sabin in early April, she had been fabricating face shields for a little over a week. She explained how the idea quickly caught on: "Last Tuesday, I received an email from a colleague and collaborator in engineering here at Cornell, Kirstin Petersen. She had an urgent request from Weill Cornell Medicine in New York City. They were specifically requesting the shields. By the next morning, with the support of my dean and our staff, we were able to open up our main digital fabrication lab as well as my lab. By 10 a.m., we had all 10 of our printers in our main digi-fab lab, and the printers in my lab, running. Then I sent an email out to our faculty, staff, and students. Those that had printers started printing. And then we sent it out to some of our alumni architects in New York City, at KPF, Studio V, Gensler, Weiss/Manfredi … and they responded immediately and then they sent it out to their networks … and all of a sudden we had BIG and Grimshaw firing up their machines."

The design of the mask, circulated in open-source files, comes from a Swedish company called 3DVerkstan. "Weill Cornell Medicine had tested some versions and approved this design," Sabin said. "And this one is particularly good because it's simple, it's actually relatively comfortable, and it prints very quickly and efficiently."

Within days, Sabin's team was able to deliver the first batch of masks to the hospital, loading them on a university bus that normally transports students between Ithaca and New York City. The Cornell lab and a network of students, alumni, friends, and colleagues fabricated 1,000 face shields within the space of a week, more than satisfying Weill Cornell's immediate needs; the leftovers have been donated to an organization called NYC Makes PPE, an ad hoc alliance of health care professionals and DIY manufacturers, including architects, that distributes shields, cotton masks, and other gear to hospitals, EMTs, and nursing homes.

PREVIOUS SPREAD AND TOP: COURTESY JENNY SABIN LAB/CORNELL UNIVERSITY DEPARTMENT OF ARCHITECTURE; BOTTOM: COURTESY ALVIN HUANG/USC SCHOOL OF ARCHITECTURE

The informal network of architects and students making face shields, as pictured on the following two pages: Jeremy Limsenben of ANX Office; Brian Prinzen of Quadrangle; Bernardo Schumacher of Bjarke Ingels Group; June Grant of Blink!LABArchitecture; Elizabeth Hanna of Brandon Architects; Iliya Muzychuk, Heather Akers, AIA, and Jeffrey Huber, AIA, of Brooks + Scarpa; Joel Hopler of Florida Atlantic University School of Architecture; Juan Villarreal of Brooks + Scarpa; Lorcan O'Herlihy, FAIA, of Lorcan O'Herlihy Architects; Yao Lu of Cornell University; Frances Aquino of Cal Poly Pomona; two unidentified architects at CannonDesign; Benjamin Steeper, Francois Guimbretiere, and Jon Sanders of Cornell University; Joseph Podolski, AIA, of DLR Group; Carlos Pompeo of the University of Michigan Taubman College of Architecture and Urban Planning; Emery Martin and Kerstin Hovland of Electronic Countermeasures; Joey Shimoda, FAIA, and Susan Chang, AIA, of Shimoda Design Group; Victoria Cuan; Alvin Huang, AIA; Rachel Hamilton, AIA; Alex Jamroz; Thomas Gin, ASSOC. AIA; R. Scott Mitchell, ASSOC. AIA,

Jenny Sabin


Alvin Huang

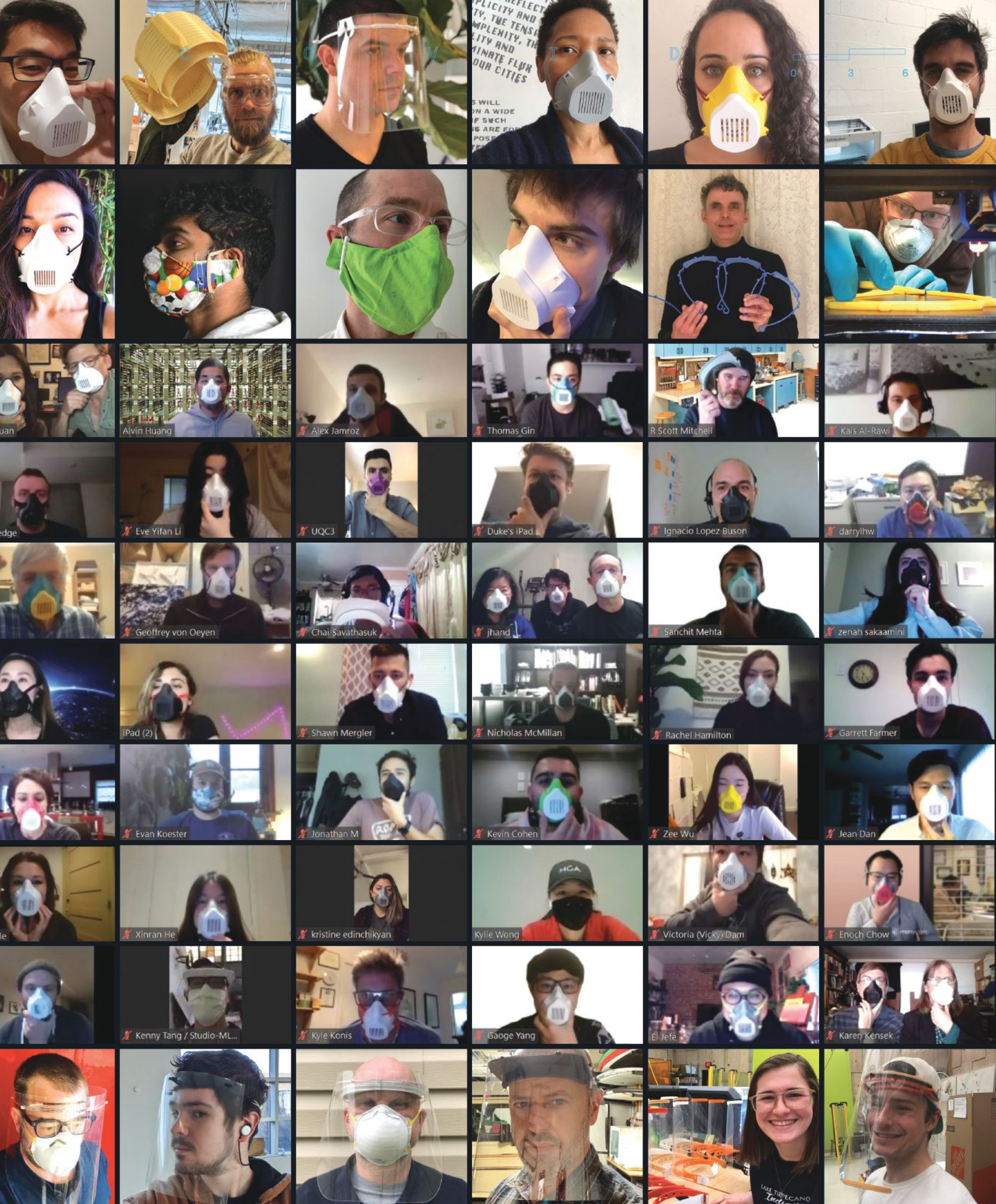
Another fabrication hub has emerged on the West Coast, at the University of Southern California in Los Angeles. Alvin Huang, AIA, director of the graduate architecture program, teamed up with Darryl Hwang, an assistant professor of radiology and biomedical engineering, to develop and 3D print "pseudo N95 masks" and protective face shields, tested and approved by the university's Keck Hospital. When I reached Huang, he'd enlisted 243 volunteers with access to 3D printers throughout Southern California. "In about two weeks, we've produced about 2,000 masks and 1,000 face shields," he told me, "which we felt pretty good about—until we found out what the burn rate on the masks is and what the needs of the city are. Something like 15,000 masks a day. Which means we're not even making a dent."

Huang has started talks with the office of Los Angeles Mayor Eric Garcetti, trying to accelerate mask production. His proposal: the 1,000 schools that are part of the Los Angeles Unified School District should each be given four 3D printers to produce masks or whatever else is necessary, creating "a huge print farm of about 4,000 printers that would allow us to produce 26,000 masks a day." Post-pandemic, those 4,000 machines could become be part of the schools' STEM curriculum.

The current epidemic has made it alarmingly clear that our remaining manufacturers, because of fragmented supply chains, simply can't produce the goods we desperately need. In their place, networks—both human and technological—have transformed a simple tool into a potentially scalable solution. The architectural profession, more than just supplying aspirational imagery or proposals for buildings that might be relevant, some day, is working together—more or less anonymously—as a loosely knit collective to produce a modest, lifesaving object. "One of the things that's been, I think, just so powerful," Sabin observes, "is the democratic and networked space that we're working with. One 3D printer is not going to make an impact, but if you have hundreds of people within a cluster contributing, you can actually really make a difference in terms of delivering on a gap in the supply chain."

At Princeton, McEwen is operating a super-efficient CNC device to cut acetate for the 3DVerkstan face shield. "We can do that 20 times faster than most people, the shield part," she says. She is starting to have trouble sourcing the big rolls of the material that are normally available from craft shops, but she remains committed: "I think it's an architect's responsibility to step in the same way that architects were stepping in after the 1918 flu epidemic when they

of Gigante AG; Kais Al-Rawi, AIA; John Rutledge; Eve Yifan Li; Ignacio Lopez Buson; Joe Wise of Wildwood Institute for STEM Research and Development; Geoffrey von Oeyen, ASSOC. AIA, of Geoffrey von Oeyen Design; Chai Savathasuk; Sanchit Mehta; Zenah Sakaamini; Helen H.; Shawn Bergler; Nicholas McMillan; Garrett Farmer; Evan Koester. ASSOC. AIA; Kevin Cohen; Zee Wu; Jean Dan; Emily Doyle; Xinran He; Kristine Endinchikyan; Kylie Wong of HGA Architects; Victoria Dam, ASSOC. AIA; Enoch Chow; Kenny Tang of Studio-MLA; Kyle Konis, AIA; Gaoge Yang; Karen Kensek; Ashley Morgan Hastings, ASSOC. AIA, of Arup; Louis Hom of Ithaca Generator; Matias del Campo of the University of Michigan Taubman School of Architecture and Urban Planning; Taimur Gibson; Warren Techentin, FAIA, of Warren Techentin Architecture; Dulce De LaPaz of KFA Architecture; Garret Wood Sternburgh of the University of Michigan Taubman College of Architecture; Jonathan Watts, AIA, and Manuel Vanegas of KFA Architecture; Asli Oney of KPF Makerspace; Rawad Abi-Monsour of LCDG Architects; Grace Hsieh of Perkins Eastman;


Alvin Huang
Alex Jamroz
Thomas Gin
R Scott Mitchell
Kais Al-Rawi
Eve Yifan Li
UQC3
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Ignacio Lopez Buson
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Geoffrey von Oeyen
Chai Savathasuk
jhand
Sanchit Mehta
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Shawn Mergler
Nicholas McMillan
Rachel Hamilton
Garrett Farmer
Evan Koester
Jonathan M
Kevin Cohen
Zee Wu
Jean Dan
Xinran He
kristine edinchikyan
Kylie Wong
Victoria (Vicky) Dam
Enoch Chow
Kenny Tang / Studio-ML...
Kyle Konis
Gaoge Yang
El Jefe
Karen Kensek

became obsessed with light and air. We need to be obsessed with something else [now]. We need to be obsessed with materials and supply chains and access."

In the Real World, I See Tents

Many of the other architectural responses to the pandemic have been even more subtle than the face shields. I recently interviewed the writers Geoff Manaugh and Nicola Twilley, who have been researching the architecture of disease-control for their forthcoming book, *The Coming Quarantine* (see page 164). One of the consistent features of buildings and places that are designed to manage contagions is the emphasis on controlling air circulation so that it doesn't transmit disease. In ancient lazarettos, air was directed "through the positioning of windows and arcades and entrances and exits," Twilley told me. In more modern facilities, it's about mechanically controlling air pressure.

Consider the Rush University Medical Center in Chicago. It was designed by Perkins and Will in response to the anthrax attacks following September 11, and the growing concern that there could be more mass casualty events in the future. According to a recent *Washington Post* article, it's configured to "control airflow to entire sections of the structure to prevent cross-contamination." In the emergency room, for example, each bed is enclosed within its "own set of thick glass doors to seal it off, with a negative-pressure air system to prevent infection from escaping into common areas."

The hospital receives COVID-19 patients in an outdoor ambulance bay, a makeshift triage that features pandemic-specific tents manufactured by a company, FSI, that sells gear for firefighting and hazardous materials mitigation. Forget the shipping containers beautifully configured as triage centers or the clever prefab pop-up hospital rooms (two of the flashier responses to the pandemic); in the real world, I see tents.

If there has been a big aesthetic statement during the crisis, at least a design-related one, it's the image of the Javits Center in New York after its conversion into an overflow hospital. The pristine line of white cubicles, each equipped with a hospital bed, a floor lamp, and a folding chair, looked like a conceptual art piece or some type of novel glamping facility. Javits, a generally unloved building, with its 760,000 square feet of exhibition space, appeared strangely beautiful. Maybe it was jury-rigged into place by the Army Corps of Engineers and FEMA—my questions about who designed it went unanswered by those agencies—but I suspect that an architect might have been involved.

In London, a similar project, the conversion of the ExCeL exhibition center into the Nightingale NHS Hospital (see page 168), which will have 4,000 beds when fully outfitted, was partly the work of BDP, a British architecture firm that had previously completed a study anticipating this kind of pandemic-related response. BDP's template for turning expo centers into hospitals isn't especially alluring—it looks like an IKEA instruction sheet filled with specialized details about how to handle things like "medical gases." But the genius of the design is how it works with what's already there: "The bed heads and service corridors have been constructed from a component system that is usually used to construct exhibition stands," as the firm explained on its website. In other words, BDP is constructing hospital rooms with the kit of parts normally used to build trade-show booths. The end result—in particular the panels used to divide the space—look a lot like what's on the floor at Javits.

BDP's conversion of the ExCeL center (or the Army Corp's transformation of Javits) may not, in Elizabeth Hausler's words, "win a lot of these cool, prestigious awards," but it's precisely the kind of architectural thinking that's necessary right now. I'd love to see firms come up with templates for other underused building types: arenas, hotels, condo towers filled with unsold apartments. The unflashy pragmatism that's hard-wired into the architectural profession has begun to assume unexpected glamour.

As grim as things are right now, we're getting a glimpse of society in general and architecture in particular that we don't often see. It's not the altruism that's a revelation so much as the pragmatism, the willingness and ability to confront workaday problems. As Manaugh told me: "I think that that kind of creative emergency thinking reveals that we already are surrounded by many spatial solutions to many existing societal problems, they're just not possible yet politically."

The adaptive reuse of surplus buildings, whether they're parking garages, exhibition halls, or condo towers, and their near-instant conversion, without a lot of flourish or fanfare, into things we need, could presage the future of architectural activism. It's a future, McEwen argues, that should also be the focus of the profession's leadership: "I'm seeing folks who have small emerging practices, really step up, using their equipment and their offices to get these face shields out. And I just want to see us take that energy and move it into things like housing and public housing. Because PPE is not the only shortage in the middle of this wealthiest country in the world."

COURTESY OYLER WU COLLABORATIVE

Patrick Tighe, FAIA, of Tighe Architecture; Rachael Henry of the University of Michigan Taubman College of Architecture; Ed Chew; Richard Lee of USC Architecture; Charles Harris, AIA, of Skidmore, Owings & Merrill; Joshua Cameron of Western University of Health Sciences; Jackie Krasnokutskaya of Weiss/Manfredi; Abbi Naylor of Tracy A. Stone Architect; Ersela Kripa and Stephen Mueller of Texas Tech University College of Architecture; Edan Kadribegovic of Lehrer Architects; Jason Kelly Johnson of Futureforms and California College of the Arts; Teddy Shropshire of Partisans; Richard Sewell of Northern Virginia Community College's Fab Lab; James Krueger, AIA, of HMC Architects; Anna Lukens, Michael Stanley, and Bryan Dellett of Iowa State University; Sergio Saucedo of Weiss/Manfredi; Jenn Hamrick, ASSOC. AIA, and Julia Mandell, ASSOC. AIA, of Wilson Associates.

Jenny Wu of the Oyler Wu Collaborative in Los Angeles

As the Virus Spreads, Architects Are Building Health Care Infrastructure Capacity

Practitioners across the country are providing urgently needed solutions for health care, medical, and public sector clients in crisis.

TEXT BY KATHARINE KEANE

It is clear that the United States was not—and is not—prepared to deal with a global pandemic. Neither our health care systems nor our medical facility infrastructure were designed to handle the influx of critically ill patients as COVID-19 spread through the population.

First responders have been working tirelessly to provide medical care, source critical medical equipment, and encourage the general public to stay home and help flatten the curve of infection. Officials are also scrambling to find space to treat overflow COVID-19 patients and house health care personnel. In New York City, the 1.8 million-square-foot Javits Convention Center was converted into a 1,000-bed facility and a temporary field hospital was erected in Central Park, among other measures. Navy hospital ships docked in New York and Los Angeles, where city officials converted the LA Convention Center into a 2,600-bed facility. Hotels and university dorms across the nation were offered for increased capacity. After launching pilot programs in Italy and France, Airbnb announced it aimed to provide housing to 100,000 first responders in the United States.

While many cities have turned to the Army Corps of Engineers, the Federal Emergency Management Agency, and local response teams to plan and execute the reuse of alternative facilities, architects, designers, and engineers have also volunteered their expertise or are being brought into the fold. ARCHITECT spoke with teams from SmithGroup, Perkins and Will, CannonDesign, and NBBJ about how they are contributing to these efforts in this unprecedented time.

Understanding the Challenges

The greatest issues facing first responders and health care facility managers are "capacity, equipment, and staff," says NBBJ principal Bryan Langlands, AIA. "All three are required to deliver appropriate care to patients in a manner that is efficient and safe for staff."

However, unlike China, South Korea, and other countries that instituted nationwide protocols for addressing the crisis, the U.S. has largely left facility planning, equipment sourcing, and overall pandemic response to individual states. With varying health care systems and building codes at play in each jurisdiction, professionals acknowledge that a universal solution to increase COVID-19 infrastructure is virtually impossible.

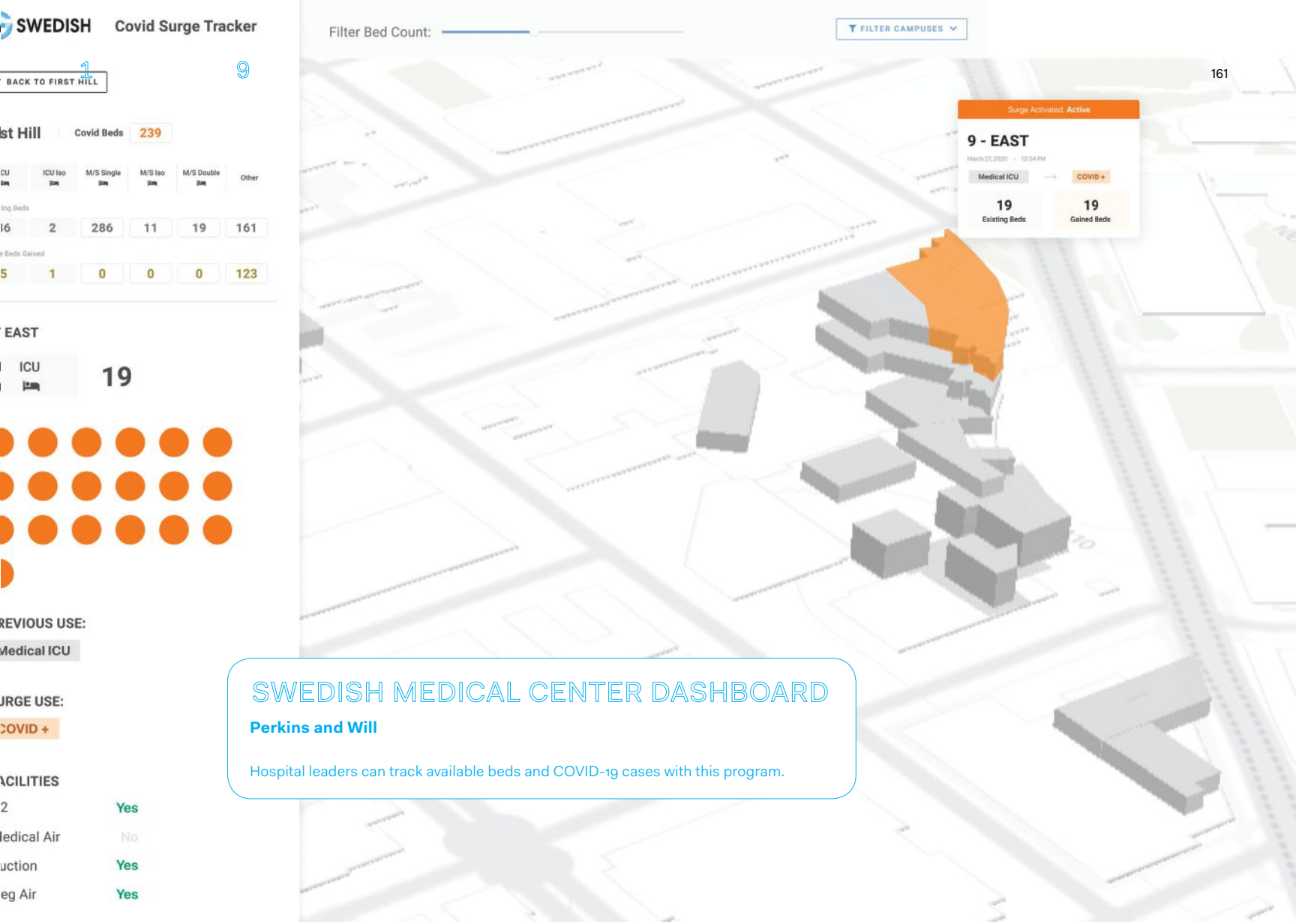
"Part of the challenge in this country right now is that we have 50 ways of doing health care and 50 different ways of regulating health care," explains Juliet Rogers, president of CannonDesign's Blue Cottage health care planning practice. "Whereas we can put out information and ideas, we can't necessarily call them recommendations, because they might not meet the codes in every state."

To best understand the challenges different health care systems are facing, Rogers started by picking up the phone and calling existing or former clients to offer support. "These teams have had their incident command centers set up since early March and they're exhausted," Rogers says. "So, we're just trying to provide extra sets of hands, eyes, ears, and ideas wherever we can."

For Seattle-based Perkins and Will principal Brad Hinthorne, AIA, assisting his clients in the Pacific Northwest—one of the first regions in the U.S. to experience a surge of COVID-19 patients—had little to do with design plans or construction in the early phases. Instead, hospital systems needed help organizing incoming data. "It really started with helping them get real-time data of how many places they could accommodate cases across their system," Hinthorne says. To address this need, Perkins and Will created dashboards with "graphics that their C-suite could use in their command center to help manage the day-to-day work they were doing," he says.

Perkins and Will has also been fielding calls from health care clients "asking about how they can rework their MEP systems to make more patient

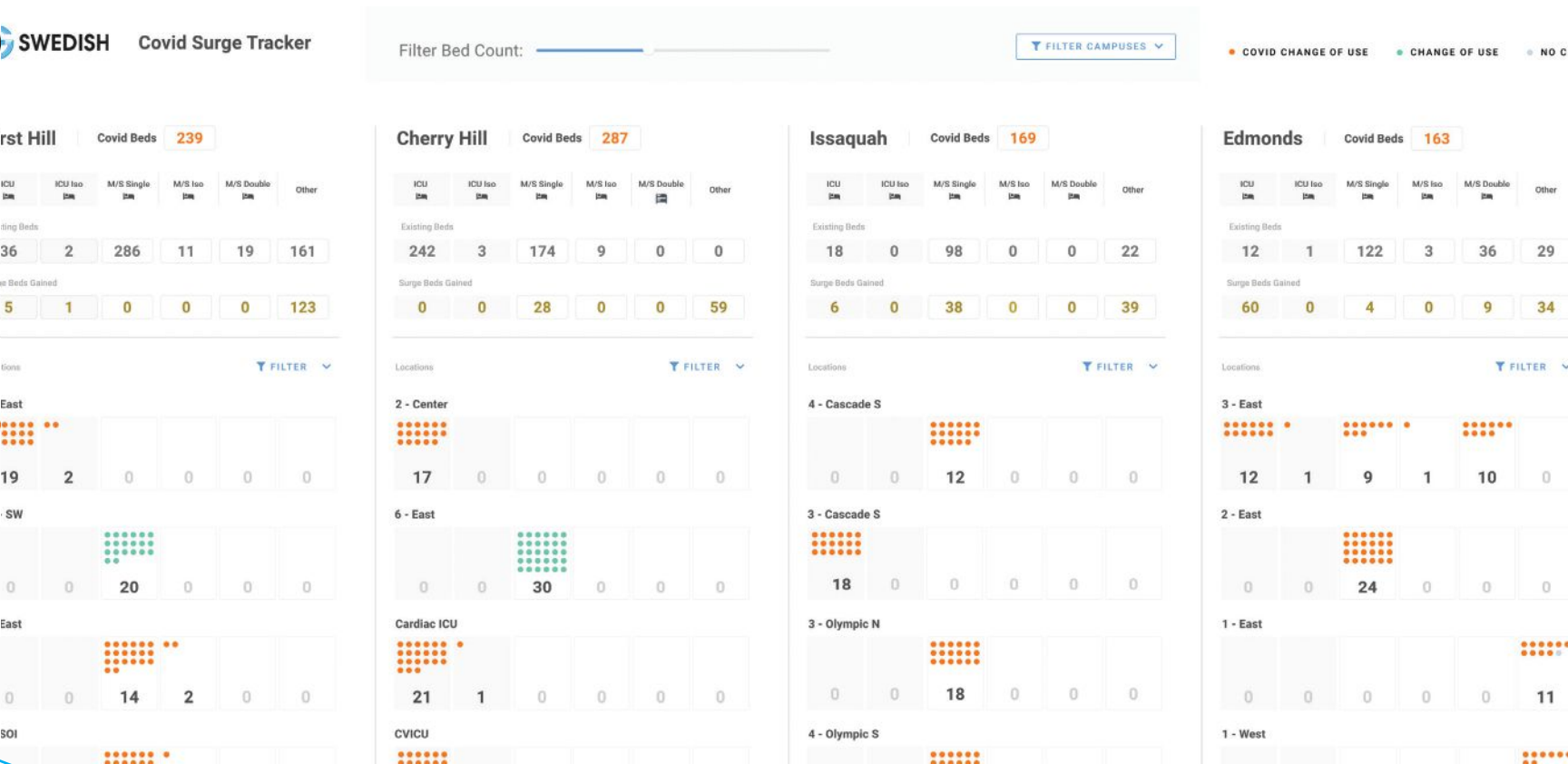
COURTESY PERKINS AND WILL



SWEDISH MEDICAL CENTER DASHBOARD

Perkins and Will

Hospital leaders can track available beds and COVID-19 cases with this program.



rooms negative pressure," says Marvina Williams, a registered nurse and health care operations specialist based in Perkins and Will's Atlanta office. "They're looking closely at how they can turn patient floors into negative-pressure floors for really sick patients that have COVID-19 symptoms."

Finding Solutions

Some hospitals were designed with the capacity to convert emergency rooms and non-critical care units to rapid-response and intensive care units. As an example, Williams points to the Rush University Medical Center in Chicago, which Perkins and Will designed for bioterrorism and surge preparedness. At Rush, doors to the ambulance bay can be closed to create a COVID-19 triage area to limit exposure to other emergency room patients. In case of a surge, the ER was designed to be acuity-adaptable, with structural columns fitted with electrical outlets and to handle medical gases. "The emergency room is divided into three zones and set up for cordoned-off negative-pressure areas," Williams explains. "If 20 beds are needed for negative pressure, they can do that. If they need 20 more, they can continue on."

However, the reality of quickly transforming or creating more urgent-care facilities to address COVID-19 surges is sobering. "Even if you wanted to do it by hospital room, the majority of the infrastructure on a campus is not designed for these types of loads," Hinthorne explains. Instead, cities and hospital systems are setting out to optimize existing infrastructure and invest in alternative spaces for less critically ill patients. "Creating critical care settings outside of a hospital is incredibly challenging," Rogers says. "We would get more value from using non-hospital settings for supporting lower acuity care, for supporting non-infectious care, for supporting staff who need a place to sleep."

This is exactly the approach that Los Angeles has adopted in the conversion of its convention center into a 2,600-bed "hospital decompression site" for COVID-19 patients, with the help of SmithGroup.

Rush University Medical Center patient rooms are acuity-adaptable.

The partnership began with an urgent text from Christopher Hawthorne—chief design officer of the city and former *Los Angeles Times* architecture critic—to SmithGroup vice president Bonnie Khang-Keating, seeking speculative test-fit plans for the space. "We pulled a team of about a dozen architects and engineers together to jump into this exercise of using the LA Convention Center to free up beds in the hospitals for those high acuity patients, transferring patients with low acuity to the convention center," Khang-Keating explains. In 24 hours, the team led by Francisco Owens, AIA, put together plans for a maximum capacity, low-acuity care facility.

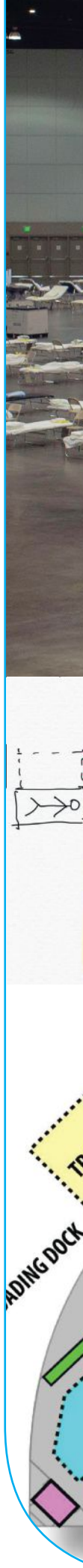
"We engaged with SmithGroup to understand what is a smart layout for this type of facility to be able to maximize the space," says Jasson Crockett, manager of economic policy in the Mayor's Office of Economic Development. "It was really helpful to be able to turn to SmithGroup and have them bring in the expertise from the architectural side, the electrical considerations, and HVAC considerations, especially given the concerns around COVID-19's ability to spread through HVAC within a building. These are things that we probably may have gotten to, but it would have taken us a lot longer to figure out."

Lessons to Learn

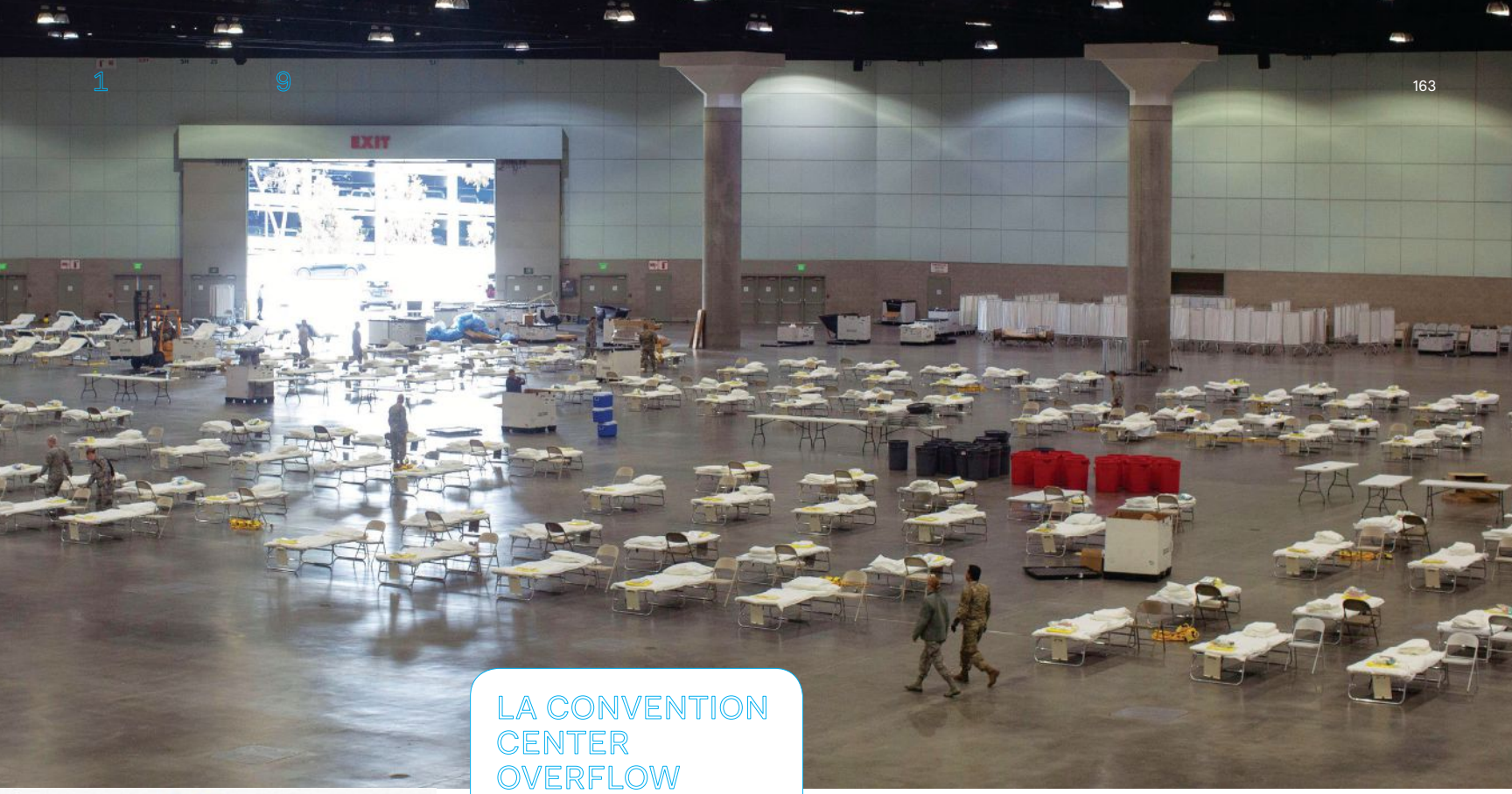
While it is difficult to conceive of a reality after this pandemic passes, these teams are also tracking their findings and best practices to share with cities that experience later COVID-19 surges and for future design projects. Perkins and Will's client Providence Health & Services—which operates 50 hospitals in the country, including the Swedish Medical Center in Seattle—is already sharing relevant data and lessons across their various facilities.

Additional design interventions and strategies are sure to follow as information on disease transmission becomes more readily available. "Our next focus is to reduce the amount of items to touch in the first place," Langlands says. "This means, where possible, removing unnecessary equipment and adapting to more hands-free technologies to do things like open and close doors, turn lights on and off, and open garbage cans. Smooth surfaces without crevices are important, along with exploring materials with inherent properties that have shown promise in providing environments that are hostile to viruses and organisms, like copper and silver."

"As we're planning the next wave of projects, we can all pretty much guarantee that there's going to be a lot of discussion on what we should be doing differently to adapt or when we create new facilities," Hinthorne says.



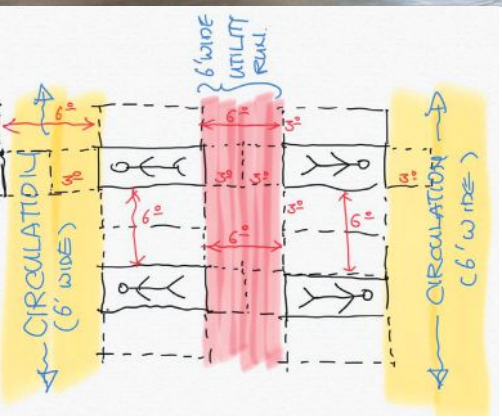
LEFT: JAMES STEINKAMP; OPPOSITE TOP: STAFF SGT. CRYSTAL HOUSMAN/U.S. AIR NATIONAL GUARD; OPPOSITE BOTTOM: COURTESY SMITHGROUP



LA CONVENTION CENTER OVERFLOW MANAGEMENT STUDY

SmithGroup

This 2,600-bed "hospital decompression site" proposal includes spaces for low-acuity patient beds and medical staff.



The Architecture of Quarantine Is No Longer a Thing of the Past

Geoff Manaugh and Nicola Twilley on the timely book they're now writing.

INTERVIEW BY KARRIE JACOBS

A decade ago, when Geoff Manaugh and Nicola Twilley first started researching what would become their forthcoming book, *The Coming Quarantine*, they never imagined that they'd be finishing it during a global pandemic. By the time the book is published next spring (by MCD, a division of Farrar, Straus & Giroux), the title will likely need to be revised to reflect the idea that quarantine is neither an exotic relic of the past nor part of some dystopian future, but rather a familiar part of our lives.

Manaugh is perhaps best known as the writer behind BLDGBLOG, a long-running (since 2004) compendium of ideas in architecture and design. He's also the author of the 2016 book, *A Burglar's Guide to the City*, published by FSG Originals. Twilley, his wife, a *New Yorker* contributor and the co-host of the podcast Gastropod, is "deeply obsessed" with refrigeration, the subject of her forthcoming book *The Birth of Cool*, to be published next year by Penguin Press.

Karrie Jacobs spoke with the two writers from their home in Los Angeles.

You couldn't have anticipated completing work on your book on quarantine while in quarantine. But you're in LA, which is currently under lockdown. Have the current circumstances altered your thinking about the subject?

Manaugh: For me, at least, it definitely brings home just how complicated it is to try to get everyone on the same page in terms of social distancing, isolation, and quarantine. It's very easy to expect everyday life to go on as usual and to go socializing or to do the things that one would have done normally, only to confront the surreal absence of those opportunities, such as seeing grocery stores, even local convenience stores, that are closed versus other places that seem to be open, like a liquor store that we drive past a lot. So it's just strange to see what survives in quarantine and what doesn't.

Twilley: Having been to a bunch of high-level [pandemic] simulations involving senators and the CDC and the World Health Organization, and seeing this now play out in real time, a lot of the questions that were left at the end of the simulations—like, will the American people go for this?—are questions that we're dealing with in real time. People said, *Well, we'll lock people down* or *We'll impose this kind of restriction on movement* and other people in the simulations would say, *I don't know that that's going to fly in America*. And we're seeing this debate happen in real time.

When did you start thinking about the subject quarantine and why does it interest you?

Manaugh: About 11 or so years ago we were traveling for some teaching opportunity that I had down in Sydney, Australia. There was a big, sprawling quarantine complex on a peninsula that had actually been repurposed as a semi-luxury hotel [called Q Station]. At the time, quarantine seemed like this outdated approach to disease control that was no longer used. And the idea [was so interesting] that all of these beautiful old structures, these very remote, isolated places that had been very well-suited for what they did medically, that now it makes them ideally suited for a total different kind of touristic experience.

So, we really started thinking about quarantine from a spatial, geographic, and architectural point of view and that led to the exhibition that we put together at Storefront for Art and Architecture that opened almost exactly 10 years ago. That was called *Landscapes of Quarantine*.

That was a group show where you had architects contribute ideas, conceptual pieces?

Manaugh: It was more than just architects. It was very interdisciplinary. The idea was to take quarantine as a kind of scenario and then task people in different disciplines: How would this affect a novel you might write or a stage that you might design or a building you might design?

ASAH PEARSON

CENTRAL COMMISSARY

CAW Architects

Featuring a 30,000-square-foot kitchen, an education center, and a 1.5-acre urban farm, the Oakland Unified School District's Central Commissary in Oakland, Calif., was originally scheduled for completion this summer. However, when the Alameda County Community Food Bank reached out in early March for assistance in providing meals to locals amid the COVID-19 crisis, the designers from Palo Alto, Calif.–based CAW Architects and the construction team accelerated the build-out to allow for temporary occupancy, making the space operational within two weeks. "Architecture has the power to impact urban planning and design on issues related to a region's resiliency and ability to respond to emergencies," said CAW principal Brent McClure, AIA. He should know: Since the facility's opening, the Oakland Unified School District and the food bank have provided some 5,000 meals per day to those in need. —KATHARINE KEANE

And was there a particular disease outbreak, like SARS, that prompted you to start thinking about quarantine again?

Twilley: No, it was more that I think we realized there was just so much that had come out of this three-month-long studio that we did with this multidisciplinary group. There was so much still there that we wanted to revisit.

When we started seriously doing the research for the book, even the World Health Organization was, like, *Oh, yeah, quarantine. Tool from the past. We don't even really think of it as a realistic thing anymore.* I spoke to the woman who's the director of pandemic and epidemic diseases at the World Health Organization and she practically laughed at us when we said we were writing about what quarantines would look like in the future. Because to her it was historic.

And so that's another thing that's been really interesting about this current moment: It's still the only tool we have in some circumstances.

In your research, were there models of quarantine that especially intrigued you? Are there things you came across that were either horrifying, or brilliant, or fascinating?

Manaugh: What interests me actually is the fact that it's so consistent over time and that it's constantly being tweaked—we change maybe the number of days that you're being held away from other people; or we change the number of people you can be held with; or we change the floor plan slightly of the hospital, or the lazaretto, or the place where people are being quarantined. But there's just something to me about the fact that it is this very consistent idea of creating a spatial and temporal buffer before people can come back into society. And it's how that abstract algorithm takes on architectural shape that I think was one of the most interesting things to me, because we were able to see it by visiting some of the oldest quarantine stations ever constructed in Europe.

And what did they look like? What was the model?

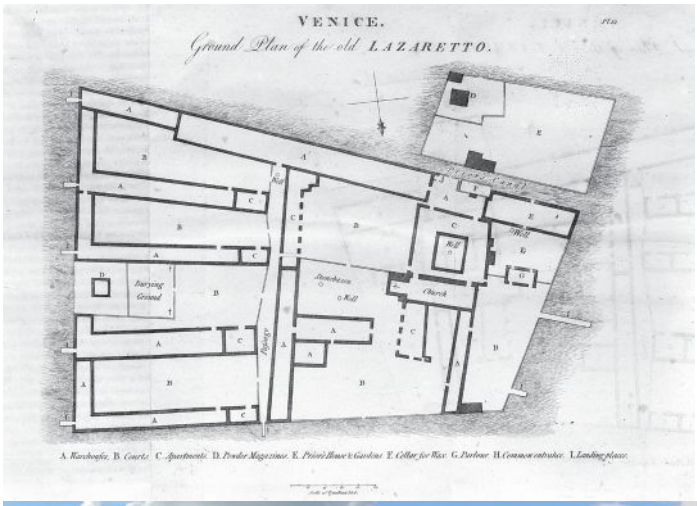
Manaugh: I think that you get a kind of standard sense of fairly remote structures. Often, at first glance, you would assume that they were a fortress of some kind, possibly a prison or jail. But there's a kind of architectural language of isolation and protection.

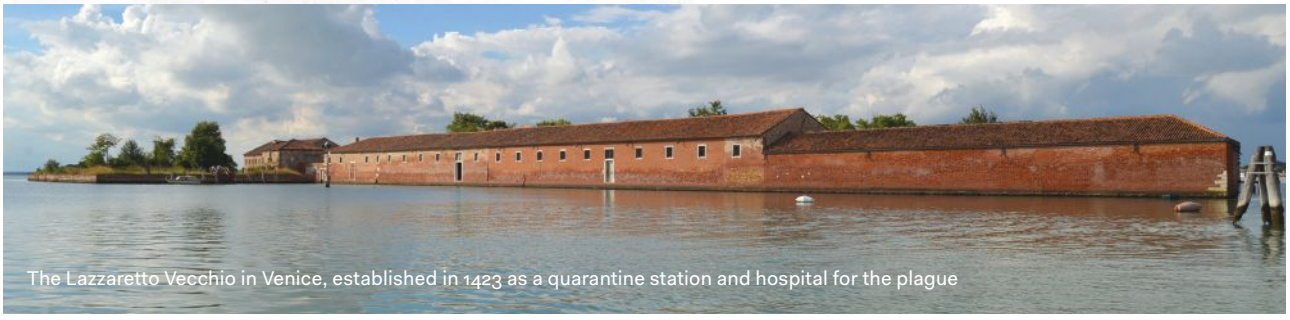
And have a lot of them become luxury hotels or just the one in Australia?

Manaugh: Some have been torn down, obviously. Others have been converted into theaters or restaurants or luxury hotels, but often they're on islands just off the coast of the city. Or they're out on a peninsula that's just beyond the reach of the municipality. I think there's this kind of spatial language of quarantine, where things are meant to happen out on the edges or be pushed out beyond the limits of the city or where people would normally congregate.

Twilley: And the other thing that's consistent is this idea of circulation. You get negative and positive [air] pressure in the most sophisticated quarantine facilities today. But you can see the same concerns articulated architecturally in the earliest quarantine facilities, but they're done through positioning of windows and arcades and entrances and exits. So there is this concern with flow and circulation.

And you can see, even right now, people now trying to redesign the flow of their shops, for example, to control and prevent circulation and contact; they are in the moment redesigning those commercial flows into quarantine flows. And it's a particular kind of way of thinking about space that, as Geoff said, is consistent over time, even though it manifests slightly differently.





The Lazzaretto Vecchio in Venice, established in 1423 as a quarantine station and hospital for the plague

TOP: COURTESY WELLCOME COLLECTION; BOTTOM: NICOLA TWILLEY

Someone writing about your project brought up Venice as the original quarantine city. It's an island and you could close the bridges and all of that. And I realized that so is Manhattan. If you wanted to close off Manhattan, it wouldn't be that hard to do.

Manaugh: Well, it's funny, those two cities have a lot in common in terms of being archipelagos and having that ability to create isolative barriers between different neighborhoods. So, yeah, you could do the John Carpenter scenario of *Escape from New York* and close the bridges and build a wall around Manhattan, create this isolated world of quarantine or, for that matter, an isolated world of health.

Venice isn't truly the place of origin, which is actually Croatia. The city of Dubrovnik pioneered the idea of quarantine, historically speaking. But Venice was the laboratory of invention and innovation.

Are there clear connections between quarantine and architecture, ways that quarantine has shaped architecture or that architecture has shaped quarantine?

Twilley: One of the public health experts we spoke to was talking about the difficulty of preparing for quarantine and pandemics in general. And talking about the need to embed dual mandates in public planning. And I think we're seeing that happen now as gyms and conference centers are being transformed into big Wuhan-style [facilities]. This is where people who are infected but don't need to clog up our hospital ICUs can go. And you think, well, perhaps there would have been a way to make those more functional or more easily transformable. You can't build an entire separate infrastructure to sit there empty in case of a pandemic, but you can build a shadow pandemic architecture by thinking through your needs. Can you mandate that these large structures are transformable? The capability is there and so thinking about the ins, outs, drop-off, pickup—building that into the design of a conference center from the start would have been the really smart thing.

Manaugh: Thinking about things like recessed or subfloor electrical outlets for setting up individual treatment bays or even plumbing, so if you wanted to have hand-washing facilities, you could just tap into a previously unused parallel plumbing system that would be underneath the floor.

We sit around and act as if there are no solutions for anything, whether it's epidemic disease or it's homelessness. And then all of a sudden at a flick of a switch, we're turning either underused or abandoned buildings or temporarily unused buildings like hotels into places to house the homeless or to house people in a quarantine and bringing hospital ships into the port or harbor area to expand hospital capacity.

And I think what's so interesting about that is the solutions already existed. They were around three months ago before the coronavirus hit. And I think that that kind of creative emergency thinking reveals that we already are surrounded by many spatial solutions to many existing societal problems. They're just not possible yet politically.

A lazaretto in Ancona, Italy, completed in 1743

One thing I thought was fascinating in all of this was how Wuhan shut down a city of 11 million. Is that something that you paid attention to as it was happening?

Manaugh: Definitely. As recently as just two months ago, we were ending the book with a look at the future of quarantine. And so the idea was to use a thought experiment to look ahead in five or 10 years with the way that things are moving, with smart homes and with surveillance technology etc., to try to imagine where quarantine might be down the road.

And what was so interesting with what was happening in Wuhan, and China in general, was the realization that the future of quarantine is now. We are already seeing the implementation, almost overnight, of things that we saw as being several years away, if not a decade in the future, where you can combine this big data approach to tracking people, their temperatures, the people they've met, the places they've been. Even how far they might have been outside certain stores to see if they were a risk to the people inside. All of these things that seemed really futuristic and kind of dystopian and almost like a science fiction movie suddenly were happening in Wuhan.

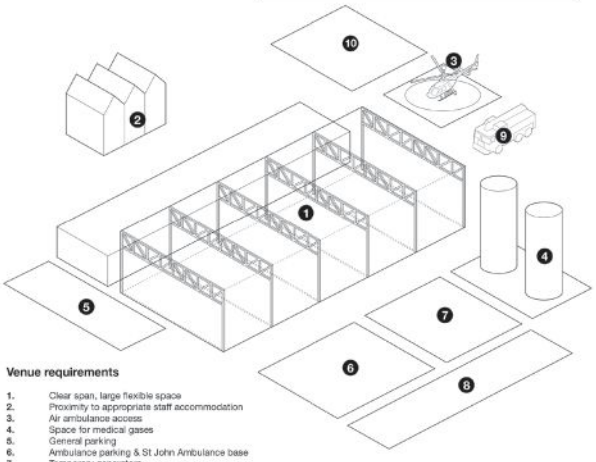
It brought home the realization that all the things that I thought were in the future are here already and in fact can be implemented overnight if you have the right political structure.

C O V I D

0 3 6

1. SCOPE OUT

Large barn type spaces with flat floor areas for the ICU wards and triage(dirty), adjacent space for storage, pharmacy, staff break out and WCs (clean) and don/doff areas in between(clean/dirty)

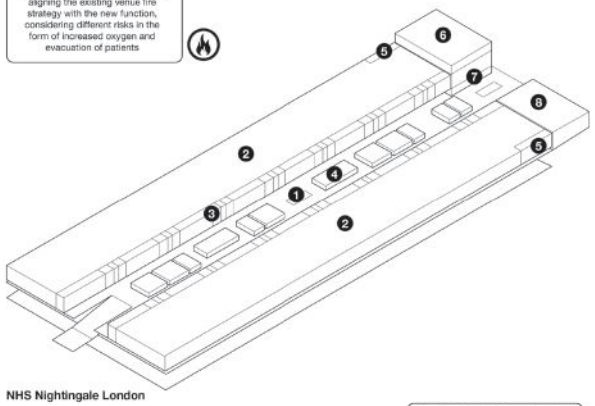


Venue requirements

1. Clear span, large flexible space
2. Proximity to appropriate staff accommodation
3. Air ambulance access
4. Space for medical gases
5. General parking
6. Ambulance parking & St John Ambulance base
7. Temporary generators
8. Space for staff changing and showers
9. Fire strategy consideration is key from the early stages
10. Additional space to accommodate CTs (at least two for resilience) and temporary mortuaries

2. LAY OUT

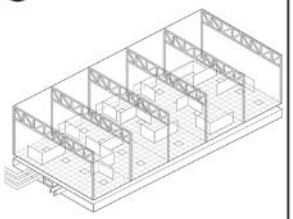
It is essential that an **NHS fire officer** is involved from early stage, aligning the existing venue fire strategy with the new function, considering different risks in the form of increased oxygen and evacuation of patients



NHS Nightingale London

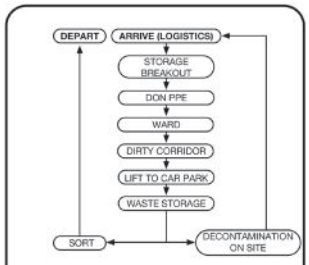
1. Central boulevard
2. Ward
3. DON/DOFF areas
4. Pharmacy (extends to top floor)
5. Triage
6. CT / Diagnostics
7. Mortuary
8. Staff canteen

Wayfinding and signage is key to assist staff in operation and make sure people stay in the allocated flow channel to avoid accidentally entering a dirty area

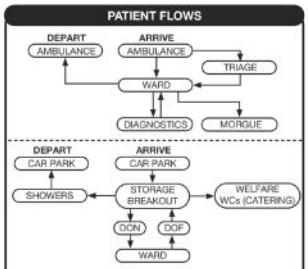


Space should be easily reconfigured and highly serviced

FLEXIBILITY & SERVICE INFRASTRUCTURE

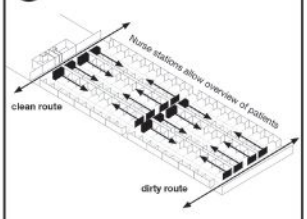


EQUIPMENT FLOWS

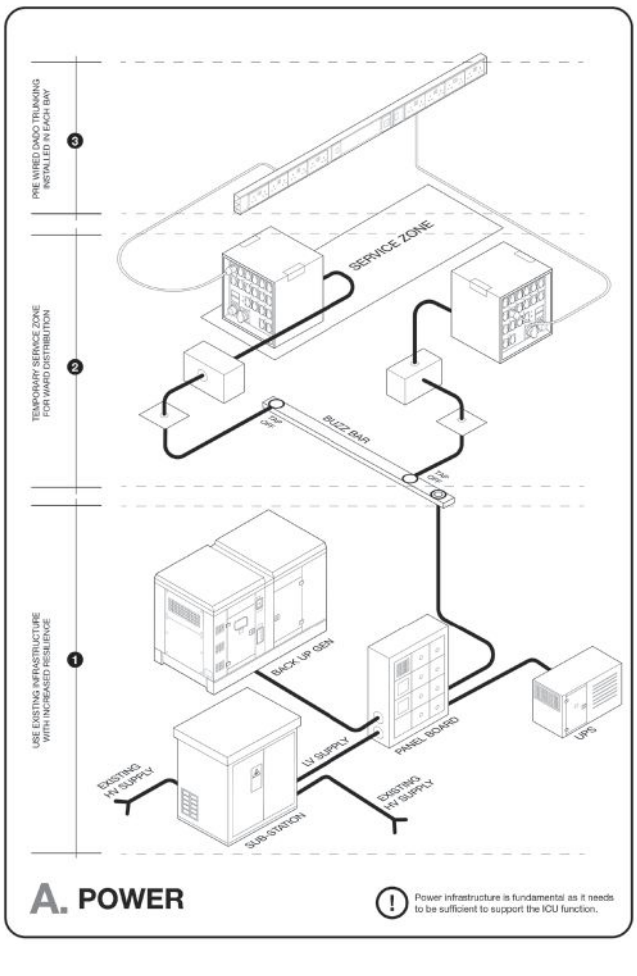


CLINICAL STAFF FLOWS

Primary consideration should be given to **infection control** separating clean and dirty areas.

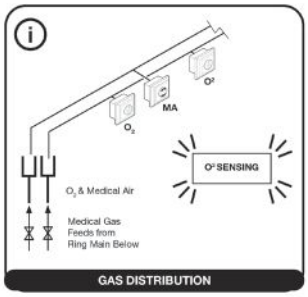


TYPICAL WARD ARRANGEMENT

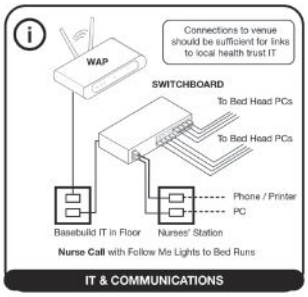


A. POWER

Power infrastructure is fundamental as it needs to be sufficient to support the ICU function.



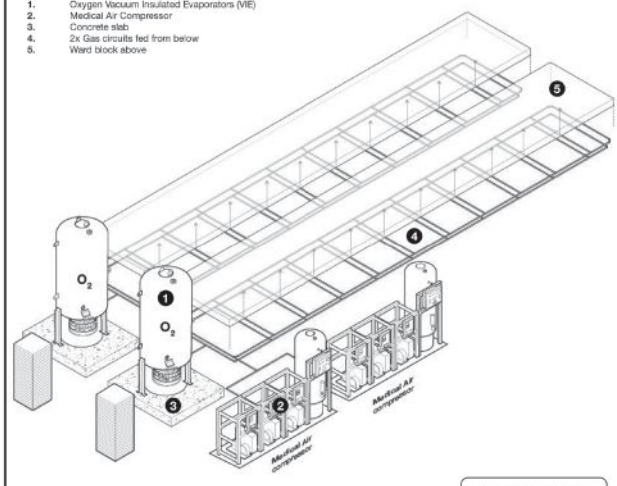
GAS DISTRIBUTION



IT & COMMUNICATIONS

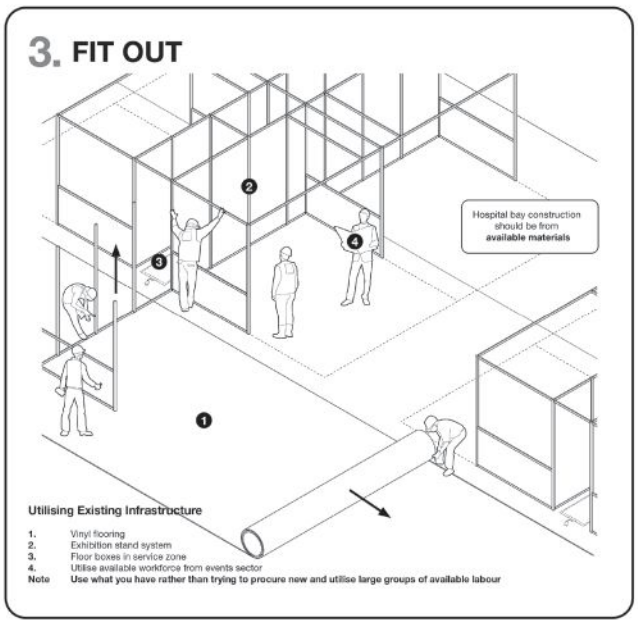
Servicing Strategy

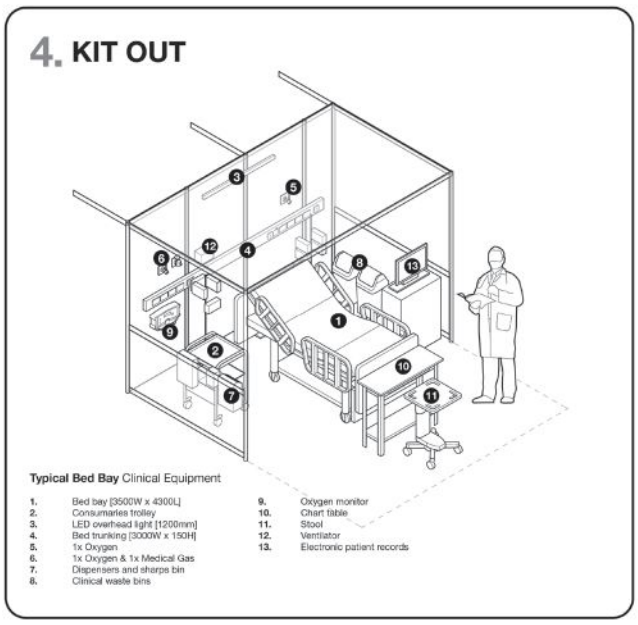
1. Oxygen Vacuum Insulated Evaporators (VIE)
2. Medical Air Compressor
3. Concrete slab
4. 2x Gas circuits fed from below
5. Ward block above

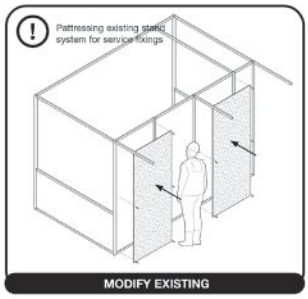


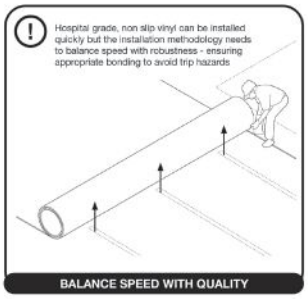
B. MEDICAL GASES

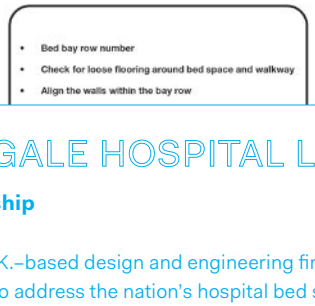
The provision of a **resilient oxygen infrastructure** is crucial to Nightingale hospitals.

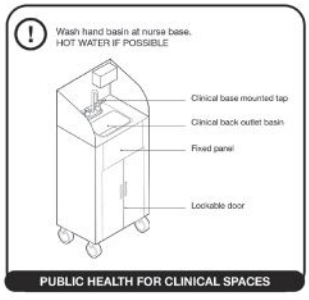


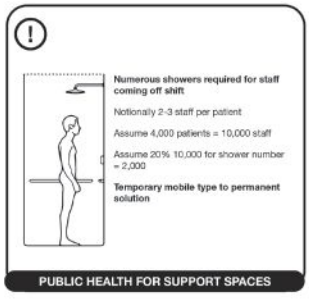


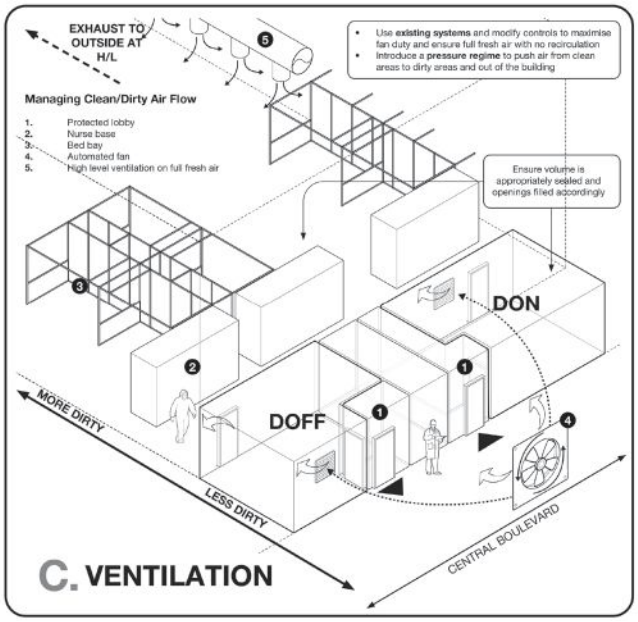








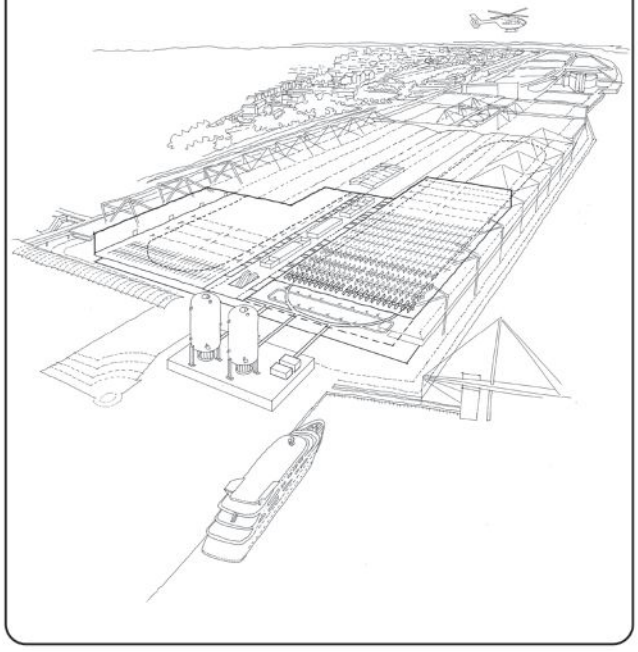




NHS NIGHTINGALE HOSPITAL LONDON

Building Design Partnership

In late March, Manchester, U.K.–based design and engineering firm BDP responded to a call for ideas to address the nation's hospital bed shortages with a study exploring the conversion of exhibition centers into temporary ICU facilities. The country's National Health Service took note and decided to convert London's ExCeL conference center, which has nearly 1 million square feet of open exhibition space, into a temporary crisis hospital for 4,000 patients, with BDP's help. "We worked closely with clinicians to ensure that every bed can be fitted with all the equipment required to treat seriously ill COVID-19 patients and be cared for by dedicated staff in full PPE equipment," says principal James Hepburn. "However, it is the scale, timeframe, and purpose of this emergency facility that distinguishes it from any previous health care projects." —KATHARINE KEANE



COURTESY BUILDING DESIGN PARTNERSHIP

Reducing COVID-19 Transmission in the Built Environment

Seeing a need to understand the potential role of building infrastructure in transmitting the novel coronavirus, a team of scientists and building technology experts fervently began reviewing more than a decade's worth of microbiology research. Within a week, they submitted a draft for journal publication. Here's an excerpt of their final paper.

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In December 2019, SARS-CoV-2, a novel CoV that causes coronavirus disease 2019 (COVID-19), was identified in the city of Wuhan, a major transport hub of central China. The modes of transmission have been identified as host-to-human and human-to-human. While many of the precautions typical for halting the spread of respiratory viruses are being implemented, other less understood transmission pathways should also be considered and addressed to reduce further spread. Preliminary evidence suggests that environmentally mediated transmission may be possible—specifically, that COVID-19 patients could be acquiring the virus through contact with abiotic built environment surfaces.

Environmentally mediated pathways for infection by other pathogens have been a concern in buildings for decades, most notably in hospitals. Substantial research into the presence, abundance, diversity, function, and transmission of microorganisms in the built environment has taken place in recent years. More than a decade of microbiology research is reviewed here to provide knowledge into the control and mediation of common pathogen exchange pathways and mechanisms in the built environment with as much specificity to SARS-CoV-2 as possible.

COVID-19 Transmission and the Built Environment

Most humans spend 90% of their daily lives inside the built environment. Built environments serve as potential transmission vectors for the spread of COVID-19 by inducing close interactions between individuals, by containing fomites (objects or materials that are likely to carry infectious diseases), and through viral exchange and transfer through the air. The occupant density in buildings—influenced by building type and program, occupancy schedule, and indoor activity—facilitates the accrual of human-associated microorganisms.

Viral particles can be directly deposited and resuspended due to natural airflow patterns, mechanical airflow patterns, or other sources of turbulence in the indoor environment such as foot fall, walking, and thermal plumes from warm human bodies. These resuspended viral particles can then resettle back onto fomites. Evidence suggests that fomites can be contaminated with SARS-CoV-2 particles from infected individuals through bodily secretions, contact with soiled hands, and the settling of aerosolized viral particles and large droplets spread via talking, sneezing, coughing, and vomiting.

Research and preliminary data suggest that SARS-CoV-2 can potentially persist on fomites ranging from a couple of hours to five days depending on the material. The virus appears to survive longest at a relative humidity (RH) of 40% on plastic surfaces (with

> *Adapted from "2019 Novel Coronavirus (COVID-19) Pandemic: Built Environment Considerations to Reduce Transmission," mSystems, April 7, 2020. Excerpted and modified under the creative commons Attribution 4.0 International License. See the full text and complete references at doi.org/10.1128/mSystems.00245-20.*

a half-life of 15.9 hours) and shortest in aerosol form (half-life of 2.74 hours); however, survival in aerosol was determined at a RH of 65%. Survival of SARS-CoV-2 at 40% RH on copper (half-life of 3.4 hours), cardboard (half-life of 8.45 hours), and steel (half-life of 13.1 hours) collectively fall between survival in the air and on plastic.

However, it should be noted that there are no documented cases thus far of a COVID-19 infection originating from a fomite. While transmission of COVID-19 has been documented only through respiratory droplet spread and not through deposition on fomites, steps should still be taken to clean and disinfect all potential sources of SARS-CoV-2. For a conceptualization of SARS-CoV-2 deposition, see FIG. 1.

Based upon previous investigation into SARS, spread through aerosolization remains a potential secondary transmission method, especially within the built environment. Mitigation of viral transmission through built environment air delivery systems often relies on inline filtration media. Most residential and commercial buildings utilize a minimum efficiency reporting value of 5 to 11 (MERV-5 to MERV-11), and in critical health care settings, MERV-12 or higher and HEPA filters are used. MERV-13 filters have the potential to remove microbes and other particles ranging from 0.3 to 10.0 microns. Most viruses, including CoVs, range from 0.004 to 1.0 micron, and some have been observed in coagulated aerosols less than 1 micron in size, necessitating more effective filtration techniques to reduce transmission potential against pathogens such as SARS-CoV-2. Furthermore, no filter system is perfect. Gaps in the edges of filters have been identified by a hospital investigation to be a contributing factor of the failure of filtering systems to eliminate pathogens from the shared air environment.

Control and Mitigation

Even though viruses may be found in aerosols of a size that can penetrate high efficiency filters, ventilation and filtration are important in reducing the transmission potential of SARS-CoV-2. Proper filter installation and maintenance can help reduce the risk of airborne transmission. Higher outside air fractions and air exchange rates in buildings may help to dilute the indoor contaminants from air that is breathed within the built environment. This may be achieved by further opening outside air damper positions on air-handling units, thus exhausting a higher ratio of indoor air and any airborne viral particles present.

There are some cautions to consider relative to these modified building-operation parameters. First, increasing outside air fractions may come with increased energy consumption. In the short term, this is a worthwhile mitigation technique to support human health, but building operators are urged to revert to normal ratios after the period of risk has passed. Second, not all air-handling systems have the capacity to substantially increase outside air ratios, and those that do may require a more frequent filter-maintenance protocol. Third, increasing airflow rates that simply increase the delivery of recirculated indoor air, without raising the outside air fraction, could potentially increase the transmission potential.

Increasing evidence indicates that humidity can play a role in the survival of membrane-bound viruses, such as SARS-CoV-2. At typical indoor temperatures, an RH above 40% is detrimental to the survival of many viruses, including CoVs in general, and higher indoor RH has been shown to reduce infectious influenza virus in simulated coughs. Based upon studies of other viruses, including CoVs, higher RH also decreases airborne dispersal by maintaining larger droplets that contain viral particles, thus causing them to deposit onto room surfaces more quickly.

Fig. 1
Conceptualization of SARS-CoV-2 Deposition
(A) Once an individual has been infected with SARS-CoV-2, viral particles accumulate in the lungs and upper respiratory tract. (B) Droplets and aerosolized viral particles are expelled from the body through daily activities—such as coughing, sneezing, and talking—and nonroutine events—such as vomiting—and can spread to nearby surroundings and individuals. (C, D) Viral particles, excreted from the mouth and nose, are often found on the hands (C) and can be spread to commonly touched items (D) such as computers, glasses, faucets, and countertops. There are currently no confirmed cases of fomite-to-human transmission, but viral particles have been found on abiotic built environment surfaces.

Although the current ventilation standard adopted by health care and residential care facilities, ASHRAE

170-2017, permits a wider range of RH from 20% to 60%, maintaining an RH between 40% and 60% indoors may help to limit the spread and survival of SARS-CoV-2 within the built environment, while minimizing the risk of mold growth and maintaining hydrated and intact mucosal barriers of human occupants. Indoor humidification is not common in most HVAC system designs, largely due to equipment cost and maintenance concerns related to the risk of overhumidification increasing the potential of mold growth. Implementing central humidification may be too time intensive to implement in response to a specific viral outbreak or episode. Therefore, targeted in-room humidification is another option to consider.

Building ventilation source and distribution path length can affect the composition of indoor microbial communities. Introducing air directly through the perimeter of buildings into adjacent spaces is a ventilation strategy that does not rely on the efficacy of whole-building filtration to prevent the network distribution of microorganisms. A similar approach can be accomplished through distributed HVAC units, such as packaged terminal air-conditioners, frequently found in hotels, senior housing facilities, and apartments, or through perimeter passive ventilation strategies such as perimeter dampered vents.

However, for most buildings, the easiest way to deliver outside air directly across the building envelope is to open a window. Window ventilation not only bypasses ductwork but also increases outside air fraction and total air-change rate as well. Care should be taken to avoid exposing occupants to extreme temperature profiles, and caution should be taken where close proximity would promote potential viral transfer from one residence to another.

Light is another mitigation strategy for controlling the viability of some infectious agents indoors. In a study simulating sunlight on influenza virus aerosols, virus half-life was significantly reduced from 31.6 minutes in the dark control group to approximately 2.4 minutes in simulated sunlight. In buildings, much of the sunlight spectrum is filtered through architectural window glass, and the resulting transmitted ultraviolet (UV) light is largely absorbed by finishes and not reflected deeper into the space. Therefore, further research is needed to understand the impact of natural light on SARS-CoV-2 indoors; however, in the interim, daylight exists as a free, widely available resource to building occupants with little downside to its use. Administrators and building operators should encourage blinds and shades to be opened when they are not needed to actively manage glare, privacy, or other occupant comfort factors.

While daylight's effect on indoor viruses and SARS-CoV-2 is still unexplored, spectrally tuned electric lighting is already implemented for disinfection indoors. UV light in the region of shorter wavelengths (254-nanometer UVC) is particularly germicidal, and fixtures tuned to this part of the light spectrum are effectively employed in clinical settings to inactivate infectious aerosols and can reduce the ability of some viruses to survive.

Airborne viruses that contain single-stranded RNA (ssRNA) are reduced by 90% with a low dose of UV light; the UV dose requirement increases for ssRNA viruses found on surfaces. A previous study demonstrated that 10 minutes of UVC light inactivated 99.999% of CoVs tested, including SARS-CoV and MERS-CoV. However, UV germicidal irradiation (UVGI) has potential safety concerns if the room occupants are exposed to high-energy light. For this reason, UVGI is safely installed in mechanical ventilation paths or in upper-room applications to indirectly treat air through convective air movement. More recently, far-UVC light in the 207- to 222-nanometer range has been demonstrated to effectively inactivate airborne aerosolized viruses. While preliminary findings appear favorable to not cause damage to human skin and eyes, further research must be conducted to verify the margin of safety before implementation. Implementing targeted UVC and UVGI treatment may be prudent in other space types where individuals that tested positive for COVID-19 were known occupants, but routine treatment may have unintended consequences and should be implemented with appropriate precaution.

Spatial configuration of buildings can encourage or discourage social interactions. In recent years, Western society has valued design that emphasizes a feeling of "spaciousness" indoors, whether at home through the use of open plan concepts or at workplaces that harness open office concepts that intentionally direct occupants to nodes of "chance encounters," thought to enhance collaboration and innovation among employees. While these spatial configurations are culturally important, they may inadvertently enhance opportunities for transmission of viruses through designed human interaction.

Space syntax analysis demonstrates a relationship between spatial disposition and degrees of connectivity (FIG. 2) and has been shown to correlate with the abundance and diversity of microbes within a given space. Understanding these spatial concepts could be part of the decision-making process of whether to implement social-distancing measures, to what extent to limit occupant density, and for how long.

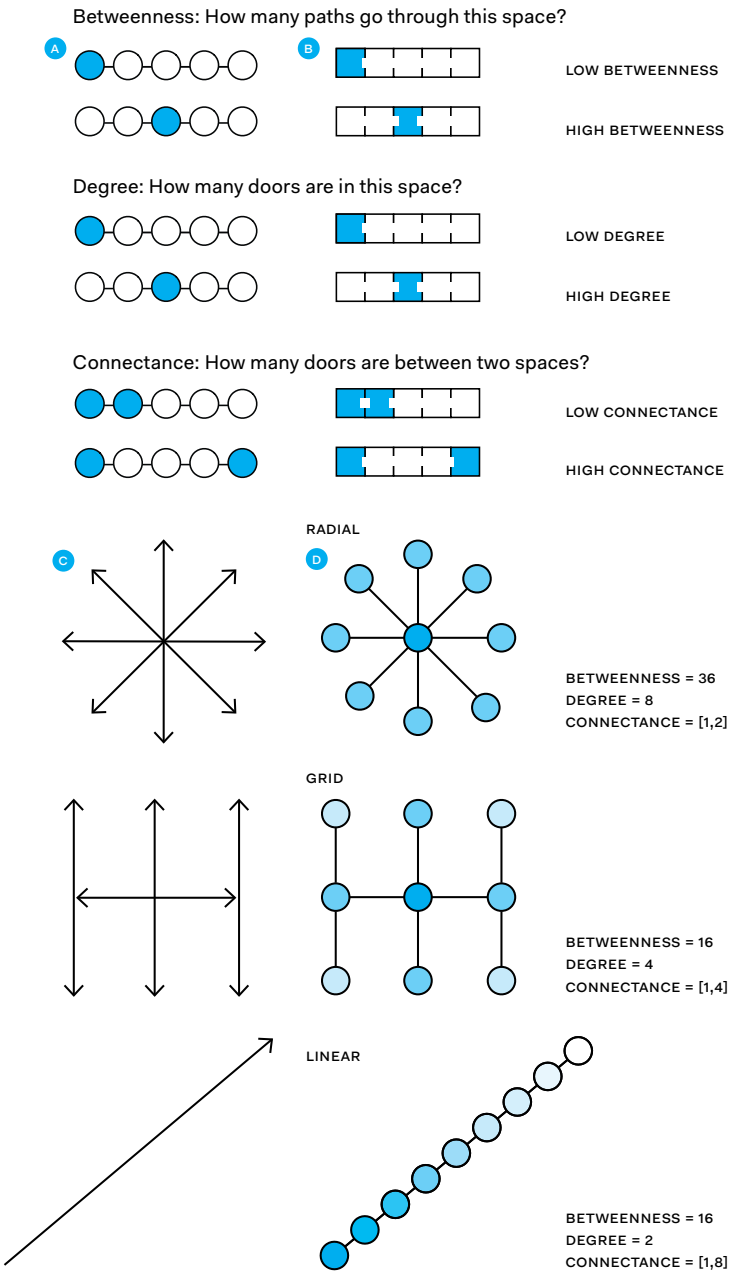


Fig. 2
Spatial Connectivity, Highlighting Betweenness and Connectance of Common Room and Door Configurations
(A) Classic network representation uses circles and lines. (B) The architectural translation of networks uses rectangles. Shaded areas correspond to a measure of betweenness (the number of shortest paths between all pairs of spaces that pass through a given space over the sum of all shortest paths between all pairs of spaces in the building), degree (the number of connections a space has to other spaces between any two spaces), and connectance (the number of doors between any two spaces). (C) The arrows represent possible directions of microbial spread as determined by the layout of the built environment. (D) The circles represent the current knowledge of microbial spread based on microbial abundance through built environments as determined by layout. Darker colors represent higher microbial abundance, and lighter colors represent lower microbial abundance.

Special Considerations for Health Care Settings

Health care and hospital facilities have limited options for social-distancing measures to prevent infectious spread, and they also often co-house patients with vastly different requirements from the built environment around them. For example, high-risk immunocompromised patients are often kept within protective environment (PE) rooms, positively pressured to limit outside airborne infectious agents from entering. However, this pressurization differential also increases the likelihood that aerosols in the patient room will migrate into the higher traffic corridor space when the door is open, involuntarily exposing health care workers, other patients, and visitors.

In comparison, airborne infection isolation (AII) rooms utilize a negative pressure differential relative to the corridor space and adjacent rooms, directly exhausting room air to the building exterior. The same negative pressure can involuntarily expose the room occupants to airborne pathogens from occupants of the corridor space. Both PE and AII rooms may be designed with an anteroom that is used as an additional buffer between common areas and protected spaces to prevent pathogen spread and provide a location for hospital staff to apply and remove personal protection equipment. However, anterooms are not required for PE or AII rooms and exist in only some facilities. They use significant additional floor area, therefore increasing costs, and increase the travel distance as well as the visual barrier between patients and the medical care team. These trade-offs might be reconsidered in future design and operational protocols given the high costs of pandemics and the critical role of health care environments during these times.

The majority of hospital patient rooms are not inherently designed with airborne respiratory viruses in mind. Renewed consideration should be given to general facility design to fulfill various requirements for different patient conditions and operational requirements during both routine conditions and disease outbreaks. One such consideration includes separating the means of thermal space conditioning from ventilation provisions, a strategy that can also facilitate increased energy efficiency. Furthermore, future designs should reconsider the best way to triage and complete initial assessment of patients that present symptoms related to airborne viruses to minimize exposure to areas with other patient types.

In planning for the future, architects, designers, building operators, and health care administrators should aspire for hospital designs that can accommodate periods of enhanced social distancing and minimize connectance and flow between common areas, while also affording flexibility for efficient use of space during normal operating conditions.

Educators Adapt, and Find Pedagogical Opportunity

With stay-at-home orders keeping universities shuttered, architecture faculty and staff are inventing news ways of teaching and learning.

TEXT BY KATIE GERFEN

Architectural education has always been predicated on spending long hours in the company of one's professors and fellow students. But in mid-March, when states and cities began to mandate social distancing in response to the COVID-19 pandemic, the same packed-to-the-gills, open-plan studios that have defined design schools for more than a century suddenly became their biggest liability. The stay-at-home orders that soon followed forced universities to close, confronted residential college students with the new reality that "home" could no longer be on campus (with all of its attendant resources), and required instructors and institutions to pivot their methodologies in order to keep teaching.

It wasn't easy: "The last month has been the most stressful of my career and I know that I am not alone in that," Jonathan Massey, dean at the University of Michigan's Taubman College of Architecture and Urban Planning in Ann Arbor, Mich., said in early April. But, several weeks into the new world order, the clouds started to lift. "Things are resolving themselves in ways that let us plan forward," Massey says, though he acknowledges that much remains unknown about the pandemic's lasting effects.

Emergency Response

When schools shut down in-person instruction, they had to answer the "how" of distance learning—and quickly. "The transition was an abrupt shift from a community engaged in high-level face-to-face teaching and learning to what I think of as 'emergency remote teaching,'" Massey says. Michigan adapted in just four days, using an infrastructure cobbled together from existing G Suite workflows, the learning management system Canvas, and other online tools. "It was hard on faculty, and even harder on students who, in many cases, had to relocate in parallel," he says.

At the University of California, Berkeley's College of Environmental Design, acting dean Renee Chow, AIA, says that same adjustment happened in just two days, starting March 9. "We all appreciate it now, but at that time, the messaging was different about how serious this was. California was ahead of it." What gave Chow's team a leg up, in part, was a disaster plan that had been developed and deployed to deal with closures due to the poor air quality during the Northern California wildfires in September 2018 as well as the rolling grid shutdowns implemented to prevent more fires in the fall of 2019. Though those situations were more brief and not all professors had to transition to remote instruction, "the campus knew about the infrastructure we could use," Chow says.

Disaster preparedness also helped the Tulane University School of Architecture in New Orleans. "We're probably the best prepared for this because of Katrina," dean Iñaki Alday says. "We were already doing training sessions on teaching remotely," in anticipation of hurricane season in August. When COVID-19 hit instead, Tulane immediately asked all professors to revisit their syllabuses and reenvision them for remote teaching. The school halted classes for one week, the maximum amount of time, post-Katrina, that Tulane will allow closure in response to a natural disaster—during which students relocated. Prior to COVID-19, students were making a required transition to desktop computers to ensure maximum computing power. As part of its disaster plan, the university shipped these computers to students' new addresses, and set up virtual PCs to provide extra computing power for those still using laptops.

Rapid Prototyping

Architects are trained to quickly iterate designs to improve on ideas and systems; that skill served professors well as they worked to morph an ad hoc set of digital tools into a holistic methodology. "A lot of people are talking about using the word 'online teaching' to describe what is happening now, but that is planned ahead of time, and organized according to a different set of paces, modalities, and expectations," Massey says. A complication for architecture schools

COURTESY UNIVERSITY OF CALIFORNIA, BERKELEY

has been accommodating the many types of courses offered. Holding remote lectures and seminars is relatively straightforward with a videoconferencing service such as Zoom. More site- and task-specific courses require some ingenuity. For design-build and digital fabrication, which rely on special facilities and equipment, a transition to digital, rather than physical, modeling is the only option.

The toughest nut to crack has been the cornerstone of architectural education—the studio. "Everyone said, 'You can't do it,'" Chow says. "At first everyone was using PowerPoint, but the fact that it required images to appear sequentially was difficult. So we started using other software programs until we found ones that work. It is different, but we are doing it."

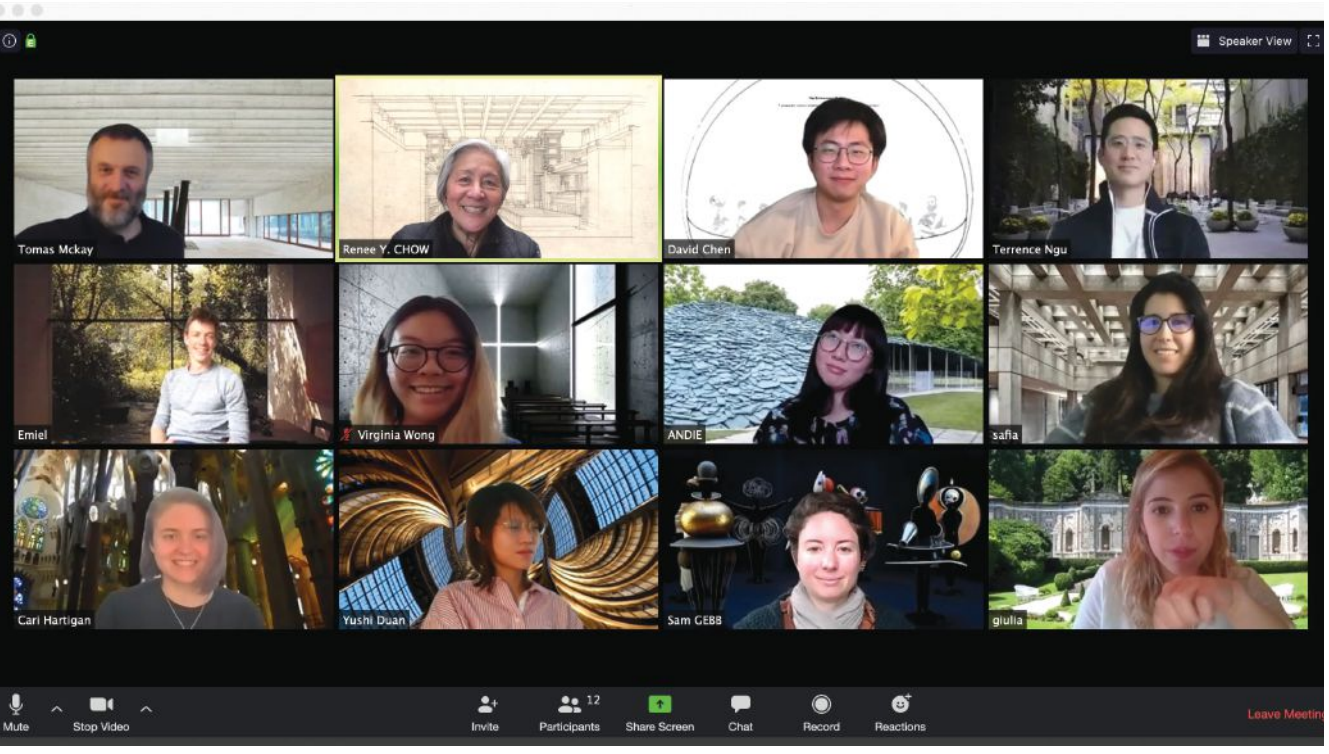
While technical hurdles can be overcome, what has proven harder is re-creating the camaraderie and connection of studio. This semester, students got to develop a rapport in person early on, but it has been a challenge to keep students engaged as studios have migrated online, Alday says: "Four hours in person is easy, but four hours online is very hard." To try to combat this, Tulane is exploring a combination of synchronous and asynchronous learning, especially for core studios. All students and the professor will meet at the appointment time for a kickoff. Then they break into smaller sections for discussion, or schedule one-on-one desk crits with the professor. Breaking the four-hour block into a combination of big group, small group, and individual interaction in a systematic way helps to keep students focused, Alday and his peers are finding, as do more frequent—even daily—deliverables that help track the progress of their work.

But not all students are the same: "With 650 students in our college, we're seeing patterns across the board," Massey says. "For some, it's a struggle to engage, but other students find the communication more to their liking."

At Berkeley, Chow's team is administering a series of online surveys to the undergraduate and graduate students to see how they are weathering the transition. An initial response rate of only 25% of graduate students prompted administrators to reopen the poll, but the first-round results showed that 35% rated the remote learning situation "good to very good" and 50% reported it to be "fair." The remaining 15% who are finding it difficult are now in direct contact with faculty to try to improve the situation. "Some of the impediments, not surprisingly, are increased anxiety, crowded living situations, and lack of Wi-Fi bandwidth or hardware," Chow says.

Silver Linings

There are only four programs in the country that offer entirely online degree programs. So the scarcity of prescriptive ideas about online architectural education means that faculty is getting creative with new formats. For example, Tulane professor and cultural geographer Richard Campanella decided that if a stay-at-home order meant he couldn't take his New Orleans Geography for Architects students into the field, he would bring the field to them. "He drove



A graduate option studio at the University of California, Berkeley meets via Zoom; each person chose a different architecturally significant virtual background to enliven the meeting.

150 miles around New Orleans with a camera, recorded narratives, and is editing it into a documentary series," Alday says. "Seeing it on screen is not the same, but it has other values."

Likewise, Taubman faculty, staff, and students are innovating ways to foster engagement from afar—and not just in the classroom. With just a week of prep time, the staff orchestrated a virtual career fair in which nearly 100 employers interviewed students for jobs. A cherished spring exhibition of student work is still happening, albeit on a website that was "built by one of our faculty members on the fly," Massey says. Another faculty member hired a graduate to build an online community space where studios can share information about their own work—replicating, as much as possible, the experience of dropping in on a crit as you walk through the halls.

In addition to the technical innovations, remote education has other potential upsides—subtle ones, perhaps, but capable of allowing educators to improve their skills. "As a teacher working remotely, you have to be explicit in a way that you don't in person, when you can look at people's eyes—particularly in design," Chow says. "I think it will make us, particularly architects, better communicators and teachers."

The Path Forward

As this academic year draws to a close, schools are all asking similar questions: When can face-to-face instruction resume? And what will the future of architectural education look like? For now, many programs—including those at Berkeley, Michigan, and Tulane—are planning on a combination of face-to-face and remote instruction for the fall 2020 semester, with the acknowledgment that in-person learning will have to change in the mid to long term. "There will be all kinds of new public health measures, and there will be students, faculty, and staff who say, 'I don't want to be packed into studio desk by desk the way we used to,'" Massey says.

Looming budgetary concerns add another layer of complexity: "When I talk to administrators, the concern is the budget for next year," says Michael Monti, executive director of the Association of Collegiate Schools of Architecture. "Schools don't know what's happening. I've heard predictions of budget cuts from 10% to 25%," which could take place over one to three years, he says. A major factor will be whether or not students are allowed to return to campus come fall. "The concern about not having students in person is that you lose the room-and-board fees, which pay for a lot of things," Monti says. "It can have a cascading effect down the line."

The situation is particularly worrying as remote education—in addition to introducing potential benefits—is also highlighting extreme inequities in the system: "Students and schools have different resources, and this could disenfranchise a lot of students," Monti says. "Students of color and native students historically don't have the same levels of access. And in architecture, which, as a field, struggles with access and diversity, this stands to be a potential setback."

Tulane School of Architecture professor and associate dean for research Richard Campanella recorded hours of documentary-style virtual field trips around New Orleans for a geography course that is forced to meet remotely because of COVID-19.

COURTESY TULANE SCHOOL OF ARCHITECTURE

Massey hopes that combining in-person and remote learning may, in fact, bring needed perspective to a tradition of education that struggles with balancing the extreme positives of deeply interactive learning with the extreme, and exclusionary, negatives of demanding hours and overwork.

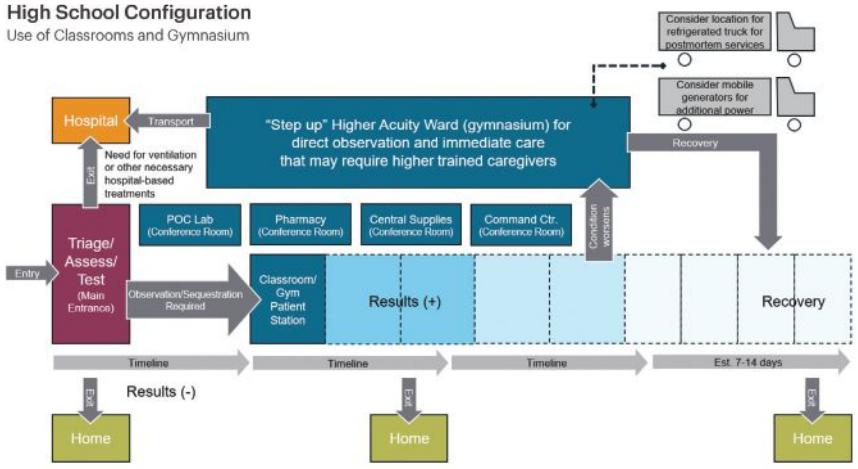
"I've been thinking about the gravitational slingshot: In a space movie, when your damaged ship is drifting toward a black hole, you use those last few ounces of fuel to set a gravity-assist course so the pull of the black hole, instead of consuming you, puts you on a new trajectory," he says. "How can we respond to this pandemic by serving students better, rather than making them learn on terms set by previous generations? Maybe they have caregiving responsibilities, or a part-time job that is difficult to schedule around, or a disability. I believe there are accessibility and inclusion gains to be made by selectively adopting online and face-to-face methods in new combinations."

Summary Description	Now	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Status Reports Day 7	Day 8	Day 9	Day 10	Day 11	Ready to Activate Day 12	Training/Simulation Day 13	Go Live Day 14	Daily Debrief Ongoing
Identify facility (with structural implications) and clinical partner and negotiate agreements with governmental entities.																
Form joint clinical, design and implementation team and identify leader																
Mobilize, identify objectives, orient team and assign responsibilities																
Remove unnecessary furniture and loose materials in the classroom and gyms. Desks may be used as bedside tables. Window coverings may remain if hard-surfaced and cleanable like mini-blinds, otherwise remove.																
Equip each classroom with necessary patient care supplies and equipment (may have to use non-traditional equipment based on availability).																
Set up hand cleansing stations and personal protective equipment stations outside of each classroom, and inside if enough are available.																
Prepare support service areas with workstations, supplies, equipment, medications, as spaces, soiled prep areas, etc.																
Prepare conference or meeting rooms to function as Command Center by setting up office spaces, phones, printers, scanners, etc.																
Evaluate electrical services and modify/implement plans. Ensure that likely electrical load in each classroom is provided. Consider auxiliary power for HVAC systems (whole building coverage would be ideal).																
Where needed, subdivide multi-stall toilets into female and male sections.																
Assess WiFi capabilities and modify/implement plans.																
Evaluate the need to adapt any other technology systems and modify/implement plans.																
Evaluate mechanical systems for individual rooms and large areas and modify/implement plans.																
Set up a portion of the gym for step-up care with available beds, portable medical gases, enhanced electrical availability, equipment and supplies.																
Identify and prepare a morgue area.																

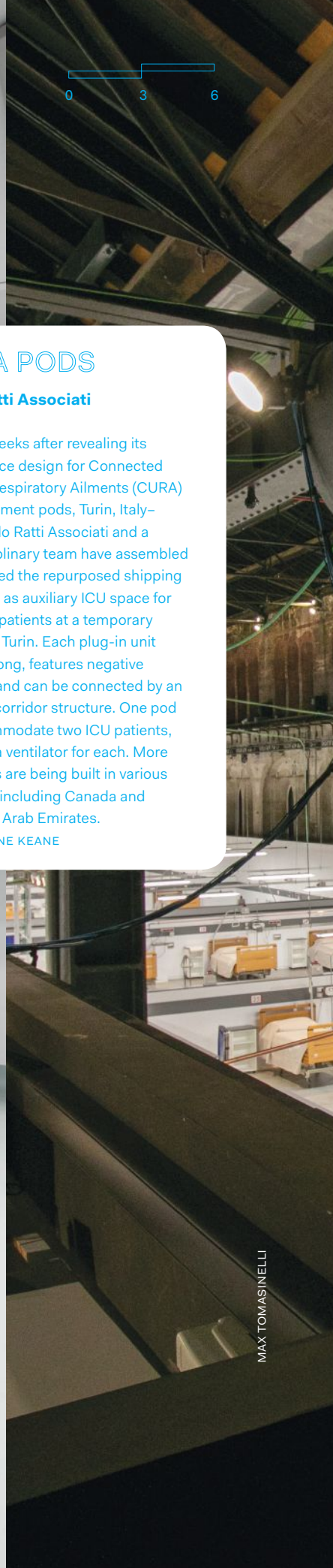
SCHOOL CONVERSION

HKS

In a recently released concept study, Jason Schroer, AIA, Stan Shelton, and Jennie Evans of Dallas-based HKS propose repurposing local high schools into alternative care sites for quarantining COVID-19-positive patients and convalescing low-acuity patients. The strategy would allow hospitals to focus on urgent care. According to the authors, high schools are viable options for this purpose because they are designed for adults, typically feature centralized MEP systems and convertible spaces such as gymnasiums, and would require minimal intervention or construction compared to other building types. —KATHARINE KEANE



COURTESY HKS



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CURA PODS

Carlo Ratti Associati

Just four weeks after revealing its open-source design for Connected Units for Respiratory Ailments (CURA) biocontainment pods, Turin, Italy–based Carlo Ratti Associati and a multidisciplinary team have assembled and installed the repurposed shipping containers as auxiliary ICU space for COVID-19 patients at a temporary hospital in Turin. Each plug-in unit is 20 feet long, features negative pressure, and can be connected by an inflatable corridor structure. One pod can accommodate two ICU patients, including a ventilator for each. More prototypes are being built in various countries, including Canada and the United Arab Emirates.

—KATHARINE KEANE

MAX TOMASINELLI


CURA
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Guide to Remote Work and Team Management During—and After—COVID-19

Architects are rapidly adapting their workflows to the new normal. This guide sets out some best practices for remote work and communication for both the near and long term.

TEXT BY EVELYN LEE, AIA, AND JE'NEN CHASTAIN, ASSOC. AIA
EDITED BY WANDA LAU

If nothing else, the COVID-19 pandemic has shown us that we can conduct some, or most, of our work from anywhere. And architecture is not the exception. In 2017, Global Workplace Analytics found that 3.4% of the U.S. workforce, or 4.7 million people, were already telecommuting, a 91% increase from a decade prior. As of early April, 62% of employed Americans are now conducting their duties at home, according to Gallup. Perhaps more interesting, 59% of those individuals would prefer to continue working "remotely as much as possible once public health restrictions are lifted."

And why not? Study after study has found that teleworkers are equally if not more productive and happier. Now that firms have established telework processes and invested in technology infrastructure, the future of work looks inevitably to be more remote.

Successful business continuity depends on firm culture and agility, wherever the employees are located. Discovering what works for your own company will depend upon the culture you have built and the people you work alongside. In the meantime, the most important thing we can do now is express empathy—for our colleagues, for our employees, for our managers, and for our clients. We are in this together.

Firmwide Best Practices for Remote Work

If it hasn't already, the rapid shift to remote work will ultimately change your current office environment and culture, strain the typical work schedule, and redefine how your teams interact successfully with one another. Take this current opportunity to test and build agility into your firm, rethink the way you work, and continually challenge your existing operating procedures for the short and long term. What follows are ideas for setting up remote work for your entire practice with specific tips thereafter.

Update and upgrade your software. When you're reviewing platforms for overall team management, keep in mind that the right mix of tools will likely differ for small and large firms. Identifying your needs will be an ongoing progress, but assume that one platform will not fulfill everything. As a starting point, you will need software to support the core functions listed to the right.

Radically rethink your meeting schedules. During the first several weeks of remote working, you've likely experienced an increase in the number of meetings on your schedule as well as in the amount of time you spend on videoconferencing applications. This type of employee experience becomes increasingly hard to manage when your workforce is now at home, wearing more hats than ever. Embrace a do-more-with-less approach.

- Audit all of your recurring meetings. Remove yourself or cancel any that no longer serve a purpose. You can always re-create these later if needed.
- Reduce meeting frequency. Try moving weekly team meetings to biweekly, and biweekly meetings to monthly.
- Embrace brevity. Limit one-on-one meetings to between managers and their reports. Keep them at 30 minutes.

Conduct more effective meetings. Reconsider how, when, and why you meet, with the goal of maximizing time to get individual work done. You will find that by reducing meeting overhead, you will actually increase people's ability to be productive and, in turn, to become better teammates.

- Be prepared. Distribute agendas and preliminary readings for any meetings at least 24 hours beforehand.
- Set clear goals up front. For example, "This meeting will be successful if … ." Make sure to include a recap and next steps, and then share them in the team communications channel after the meeting.
- Cluster meetings during a certain time of day. This allows people to free up the rest of their time for productive work, caregiving, and other activities.

> *This guide has been adapted from an online living document. Find the latest version, which includes remote work policies shared by firms of varying sizes, at bit.ly/ARpoaC19.*

Project and Team Management Tools

- Cloud-based CAD/BIM/construction administration
  Autodesk BIM 360
  Bentley ProjectWise
  SketchUp Shop
  Graphisoft BIMcloud
- Cloud file storage
  Dropbox
  Box
  Google Drive
- Collaborative documentation, reporting, and presentation platforms
  Microsoft Office 360
  Google G Suite
  Adobe Creative Cloud
- Creative process collaboration
  Morpholio
  Google Jamboard
  Ideo Shape
  Miro
  Mural
- Project and/or client management
  Asana
  Monograph
  Deltek
  Newforma
  Trello
- Team communication through messaging
  Google Hangouts
  Microsoft Teams
  Slack
- Videoconferencing
  Zoom
  GoToMeeting
  Microsoft Teams
  UberConference
- Knowledge management, for large firms
  Confluence
  Guru
  Bloomfire

Best Practices for Managers for Remote Work

Supporting a fully remote team can be daunting. You may be accustomed to just swiveling your desk chair or poking your head above a partition when you want to talk to a co-worker. The strategies and best practices listed below can help ensure your team members are productive, happy, and confident in their roles and responsibilities. Ultimately, you know your team best. Leverage your knowledge of your team dynamics and individual working styles to support your employees in a way that makes the most sense.

Help your team feel integrated instead of isolated. A sense of isolation can creep in during remote work, especially for folks who are not accustomed to working alone for extended periods of time.

- Create an environment for watercooler conversations. In whatever product you choose for communications, designate a project, channel, hangout, or breakout space purely for social conversation. Make it clear which outlets are for work-related communication, and which are more informal.
- Warm up team meetings with an icebreaker. Consider holding a show-and-tell for each person to describe an item in their house or a picture that's important to them. If they feel comfortable, individuals could give a virtual tour of their house.
- Celebrate success. Just because you're working remotely doesn't mean you can't recognize a job well done or a colleague's birthday. Host a virtual happy hour at the end of each week. Invite everyone to bring a favorite beverage and take turns delivering toasts.

Ask your team about their experience. Remote work may be unfamiliar to your reports. If you didn't previously hold one-to-ones with your reports, check in with each of them briefly. Sample questions are below.

- What excites you about working remotely? What scares you?
- How can I best support you through this time? Do you prefer more or fewer meetings, or email, text, or telephone check-ins?
- What might I misunderstand about your remote working style?

Be available. Employees need to know that they are being supported. In the same way that managers may wonder where their reports are during the day, employees may wonder where their managers are.

- Share your calendar. Set a schedule every week when you'll commit to being online so employees can reach out to you outside of your regular one-on-ones.
- Create office hours. Offer drop-in sessions for your reports during which they can speak to you over videoconference. If your firm uses Google G Suite, turn on the appointment feature for your office hours.

Create clarity by over-communicating. Don't make assumptions about things that may seem obvious to you. Instead, spell out the obvious. Describe exactly what you want, even if you think you're repeating yourself. Not everyone has the same information you do. We need our team members to communicate more than they might be used to, which makes modeling this behavior even more important.

- Edit and edit again. Read your messages and emails a few times before hitting send to ensure your words are driving home the point you want to make.
- Check for understanding. Close your message or email with an intentional question. "Is my request clear?" "Am I forgetting anything that you think is relevant?" "Does anyone else have further context to add?" These will help ensure everyone is on the same page and feels free to contribute.
- Leverage your one-on-ones. If you feel you are distracting your reports with frequent direct messages, try using a one-on-one channel with them to post non-urgent items and future agenda items. Encourage your reports to model this same behavior.

Insist that requests be specific. Common red flags that require intervention to attain clarity are phrases such as "Let's circle back to this"; "Great idea—let's do that"; or "Does anyone have feedback on this?" *When* should you circle back to the item? *Who* should circle back? *Who* wants to implement this idea, and *by when*? *What type* of feedback are you looking for, and *by when*? Make sure that every action item has a DDT—directly responsible individuals, a due date, and a tracking mechanism to follow up.

Press pause when necessary. Leverage videoconferencing if email threads and messaging are becoming increasingly unclear, emotions are escalating, or the right people aren't looped into the conversation. Simply call a time-out on the conversation and move it to a videoconference.

Keep everyone focused during meetings. The tendency to respond quickly to email or a text while on a videoconference is tempting, but also distracting. Make it clear that multitasking on calls is not allowed. Remote communication, like in-person communication, requires everyone on a call to be mentally present and engaged.

- Create a remote meeting policy. Write it down and discuss it during a team meeting or in channel and ask if they can commit to this.
- Aim for 100% participation in team meetings. Participation and engagement can make individuals feel included and help counter feelings of isolation. Rotate who is facilitating the team meeting.

Shift your mindset to focus on results. Remote managing often requires a switch from focusing on your employees' time, or activity-based work, to focusing on results, or results-based work. Instead of worrying about your employee's whereabouts, assign clear deliverables that are easy to assess from afar.

- Host regular stand-ups. In the communications channel or project that's dedicated to your team's work communications, ask your employees to post their deliverables, call out blockers (the issues hindering them) and dependencies (what tasks must be completed before others can go forward), and check items as they get completed. This gives the entire team visibility into each other's work and limits duplication.
- Specify custom statuses. If your communications platform allows for it, be descriptive to provide clarity on your status. Model this behavior yourself. If your kids are in home school for the morning and you can't take a call, indicate that. If you want some heads-down time, let your team know you're in focus mode.

Conduct business as usual. While the current situation might not feel like business as usual, it's important that we maintain as much stability as we can for our employees. Don't skip out on or cancel meetings last-minute—though feel free to delete meetings that you realize are unnecessary well in advance.

Best Practices for Employees for Remote Work

If you are new to the experience of working from home, particularly in a field that requires close collaboration, feedback, and check-ins, this period can feel unsettling. It's not just you. Feeling lost, uncertain, or disconnected is to be expected. As firm managers and leadership adjust business practices and assess market conditions, work protocols may change continually, and you may find that they do not have all the answers immediately. Communicate your concerns with your manager during your one-on-one or in a communications channel.

Optimize your physical work environment. The work environment you create at home can have a significant impact on your happiness and productivity. Set up your desk to be ergonomically friendly by upgrading your desk, chair, keyboard, mouse, and monitor to be more conducive to long-term work. Check with your manager to see whether your firm will cover the costs.

Videoconferencing has become a stay-at-home lifeline, especially when you have something important to discuss with colleagues. Elevate your presence by creating a distraction-free background and buying a high-quality luminaire to illuminate your face.

Set work boundaries. When you work from home, it can be hard to "turn off," because your physical environment never changes: Your workspace is the same as your life space. As a result, you might feel pressured, internally or externally, to stay online beyond normal working hours. Delineate your workday from your life, as you would if you were in an office.

- Don't work from bed. It's tempting to work from the most comfortable spot in your house—your couch, your bed, or that beanbag chair from the set of *Friends* you bought on eBay—but save these places for unwinding at the end of the workday. Designating work-free zones is instrumental to differentiating working from resting and recharging.
- Set expectations with your household. Your family or housemates may have unrealistic expectations of what "working from home" means. Make sure all parties are aligned on what the new arrangement will look like. Share your working hours with them, including the times when you cannot be interrupted.
- Create a work routine. A solid routine can help you stay on track and set boundaries that prevent burnout. The routine should include start and end times for work every day. Build in time to cook and eat, take breaks, walk around your home or neighborhood, stretch, and give your eyes a rest.

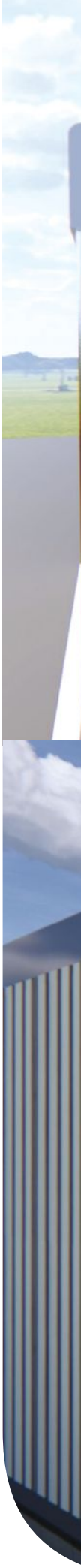
Reset expectations with your team. Remote work can shift team dynamics. Approaching this transition thoughtfully can go a long way to set yourself and your team up for success.

- Talk to your manager. How might you want to change your dynamic now? Do you want to check in more or less often? If you're used to nontraditional one-on-ones (walking, lunching, coffee), how can you replicate the benefits of these sessions remotely? What should your manager know about your remote working style?
- Know when to jump on a video call. If a conversation gets confusing or heated, call a timeout in your text-based communications and get on a videoconference. It can be easier to talk out issues and clarify next steps face-to-face.

Over-communicate. Like your manager, you should not assume everyone knows things that may seem obvious to you. See additional best practices in the preceding managers' section of this guide under "Create clarity by over-communicating."

During times of rapid change, mistakes are inevitable. Regardless of your title, own up to them if they're yours, and be empathetic to those who make them. Document important lessons to prevent other team members from committing the same mistakes.

Pandemic or not, ensuring that your business continuity plan is holistic and scalable will improve the dexterity and flexibility of your firm. Ultimately, preparing and cultivating an adaptable culture will help ensure greater longevity for your business.



COURTESY CANNONDESIGN

TEST FACILITY IN A BOX

CannonDesign

CannonDesign's modular COVID-19 testing facility proposal is designed specifically for walk-in patients in urban environments and to limit patient–provider exposure. The system can be erected on any flat outdoor surface, such as a vacant parking lot, and can be fully powered by a single household electrical outlet. "The dual-booth system is designed to accommodate alternating patient flow," the firm writes in a project description. "While one booth is occupied by a patient, the adjacent booth can undergo a 10-minute disinfection process in preparation for the next patient." —KATHARINE KEANE

The Coronavirus, Meatspace, and Architecture

As white-collar work goes remote, the paucity of virtual environments becomes more plain.

TEXT BY AARON BETSKY

I should be in China. As is the case for many designers, critics, and teachers, my trips this spring have been canceled. We're all working remotely now, a luxury that only reinforces our separation, as members of the typing and clicking class, from the working class. Isolation is just an inconvenience compared to the threats posed by the coronavirus, but it does raise questions about the fragility of our increasingly aspatial world and the value of place.

We may have built the image of a society based on competitive capitalism and freedom of movement, but the coronavirus has revealed how thin that freedom actually is. To the extent that our architecture reflects the global market and culture in its forms and functions, it also highlights the fragility of the constructs from which it arises. Most importantly, it reflects the class underpinnings of the love of place, form, and composition. The rich can afford varied and well-designed spaces anywhere; the poor must make do with whatever office, factory, housing block, or refugee camp they find themselves in.

How should architecture react? An obvious answer—beyond helping to make medical facilities and products—would be a reactionary one, which is to say, a Framptonian return to the local, limiting who designs and builds in a particular place and the materials and forms they use. That, again, only works for the affluent, because local materials are usually more expensive thanks to the effects of international competition. Another approach might be to figure out how to enrich individual experiences on isolated sites, much in the way of resort hotels and McMansions, but that would limit the essentially social nature of our existence—and, once again, cater to the rich. Finally, and most promisingly, architects might apply their approach in designing "meatspace" to the virtual world.

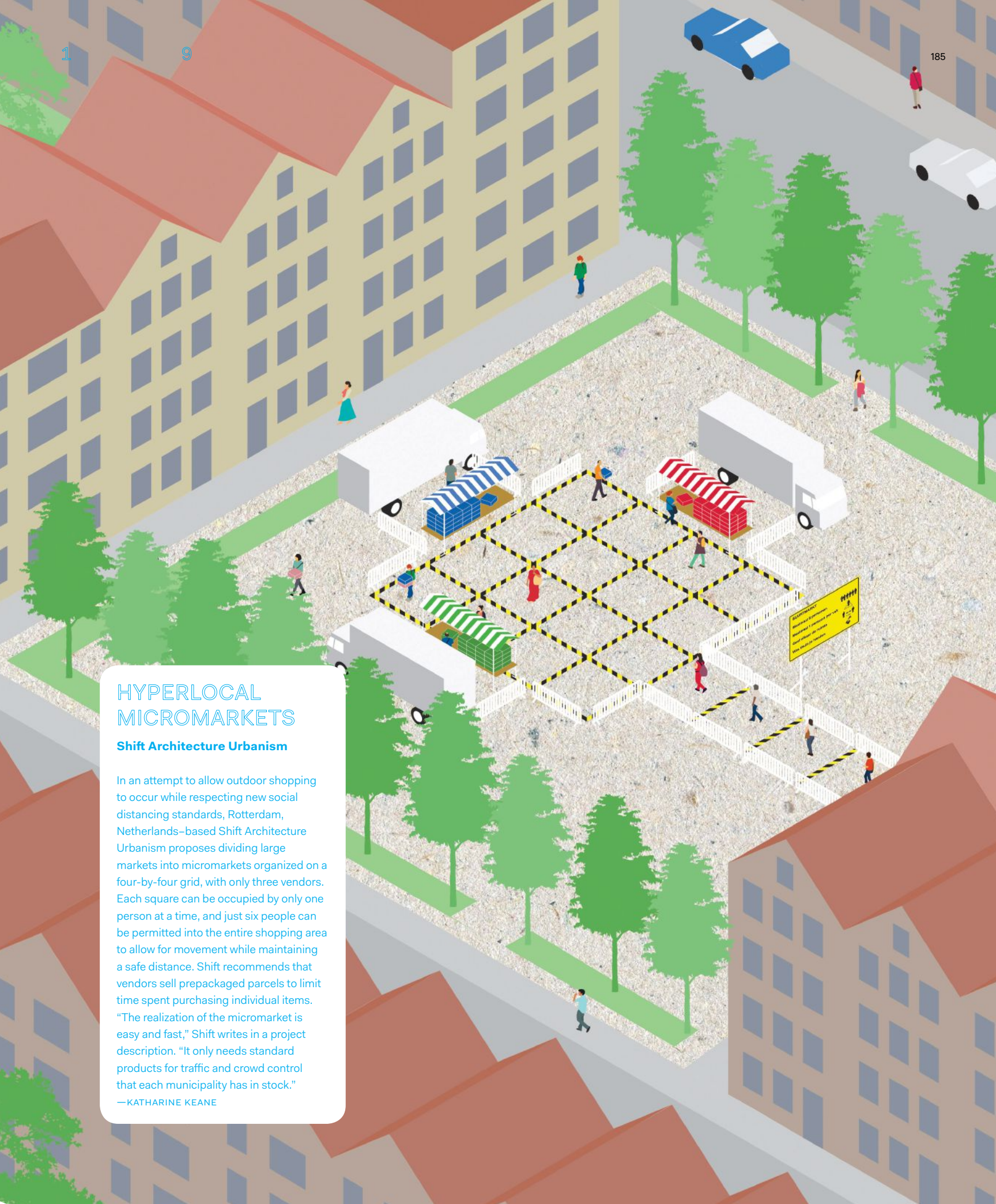
For far too long, architecture has ignored what happens on our phones, pads, computers, and other screens. Sitting through meetings marked by dull, default-design conference rooms and ugly graphics makes it even more clear to me that architects need to bring their skills and knowledge to the virtual realm, to create a feeling of belonging, of feeling at home, of making sense of the virtual space that we occupy for so many hours every day.

The digital world already has its own logic, function, and structure, which is default and mass-produced—the equivalent of your average fast food joint or social housing complex in the United States. It does not, however, have a character: a quality that can allow us to better frame our relationships with other humans and the world we all share. Name me one social space, website, or other virtual experience that approaches the complexity and specificity of good architecture. We should not make do with these soulless places online any more than we should accept them in the built world.

Ultimately, what we need is a not a retreat into isolation or a building of walls, but the creation of new windows and passageways. What painting and films can do, not to mention public architecture, is open portals into other worlds. The same is true of our online experience, even if it is multidimensional. It has encroached on every aspect of our lives; it truly absorbs us. We need to figure out its discipline, logic, and character. I do not believe that there is a fundamental difference between the world we inhabit online and one that we create with pen, pencil, and brush. We need to call on the skills of architects to connect fragments, real and otherwise, into a skein of experiences that is open to all.

Perhaps architects will spend some time, while they cannot travel to their sites or as they wait on material deliveries, figuring out how they can use their skills to improve the work and living spaces of the less affluent and less mobile. I also hope they spend time considering how to translate the sort of specialized, humane, and sensory experience we take for granted in the physical world into the online one, which is ever more central to how we live, work, and play.

COURTESY SHIFT ARCHITECTURE URANISM



HYPERLOCAL MICROMARKETS

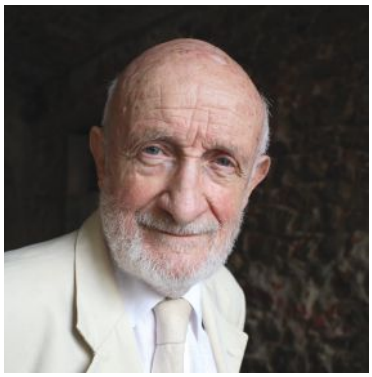
Shift Architecture Urbanism

In an attempt to allow outdoor shopping to occur while respecting new social distancing standards, Rotterdam, Netherlands–based Shift Architecture Urbanism proposes dividing large markets into micromarkets organized on a four-by-four grid, with only three vendors. Each square can be occupied by only one person at a time, and just six people can be permitted into the entire shopping area to allow for movement while maintaining a safe distance. Shift recommends that vendors sell prepackaged parcels to limit time spent purchasing individual items. "The realization of the micromarket is easy and fast," Shift writes in a project description. "It only needs standard products for traffic and crowd control that each municipality has in stock."

—KATHARINE KEANE

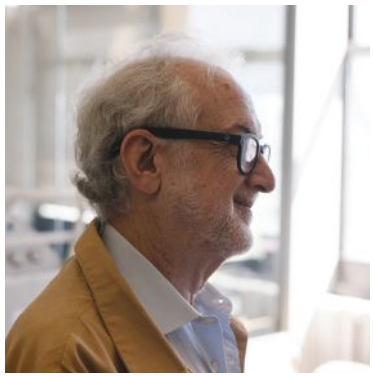
IN MEMORIAM

Vittorio Gregotti
Born Aug. 10, 1927, Novara, Italy
Died March 15, 2020, Milan



"With deep sadness I learn of the loss of professor Vittorio Gregotti," wrote Italian culture minister Dario Franceschini in a notice to the public. "A great Italian architect and urban planner who has given prestige to our country in the world. I hold the family close on this sad day." A theorist as well as a practitioner, Gregotti served as editor-in-chief of *Casabella* from 1955 to 1963 and founded Gregotti Associati International in 1974. The firm's best-known work includes the Barcelona Olympic Stadium (1988), the Arcimboldi Opera Theater in Milan (2002), and the Belém Cultural Center in Lisbon, Portugal (1993). Gregotti closed his practice in 2017, saying, "nobody cares about architecture anymore." —KATHARINE KEANE

Michael Sorkin
Born Aug. 2, 1948, Washington, D.C.
Died March 26, 2020, New York



Michael Sorkin emerged as an anti-establishment firebrand in the go-go 1980s, writing architecture criticism for fabled alternative newsweekly *The Village Voice*. As author or editor of some 20 books, principal of an eponymous New York–based architecture and planning practice, founder of nonprofit research and advocacy group Terreform, and professor and lecturer at universities in the U.S. and abroad, his insightfulness and bravery in speaking truth to power never wavered. In an interview with ARCHITECT, upon receiving the 2019 AIA Collaborative Achievement Award, Sorkin asserted the hope that his legacy would resound for encouraging "more kindness, less evil." A fitting epitaph. —K.K.

LEFT: BASSO CANNARSA/OPALE; RIGHT: AUNDRE LARROW

COVID-19, a virus best combated through physical separation, has deprived the civic realm of some of its greatest champions.

Michael McKinnell
Born Dec. 25, 1935, Salford, U.K.
Died March 27, 2020, Beverly, Mass.

Michael McKinnell, FAIA, leapt to prominence in 1962 by winning the design competition for Boston City Hall with his Columbia University professor Gerhard Kallmann. Neither was licensed, so upon winning the commission they founded Kallmann McKinnell & Knowles (later Kallmann McKinnell & Wood, and now KMW Architecture), with architect Edward Knowles. McKinnell went on to teach at Harvard and his practice grew into one of the most prestigious in the United States, receiving AIA's Architecture Firm Award in 1984. Yet for all his accomplishments, McKinnell may be best remembered for Boston City Hall and its 8-acre plaza, a landmark of Brutalism that elicits passionate reactions. —NED CRAMER

Rifat Chadirji
Born Dec. 6, 1926, Baghdad
Died April 10, 2020, London

Rifat Chadirji, HON. FAIA, reshaped Baghdad with his Unknown Soldier Monument (1959), Freedom Monument (1959) in Tahrir Square, and Central Post Office (1970). He also documented the city in some 80,000 photographs. In 1978, President Ahmed Hassan al-Bakr jailed Chadirji for denying the use of his offices for intelligence purposes. Al-Bakr's successor, Saddam Hussein, released him two years later to work on a Baghdad master plan. Chadirji came to the U.S. for a Harvard Loeb fellowship and taught in the university's philosophy department. He received the Aga Khan Award for Architecture's Chairman's Award in 1986 and Iraq's Tamayouz Architectural Lifetime Achievement Award in 2015. —MADELEINE D'ANGELO

LEFT: COURTESY THE MCKINNELL FAMILY; RIGHT: PAUL TAGGART

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AIA 2020 HONORS

The AIA's Honor Awards recognize the profession's brightest lights and most influential members, the architects who make a difference in their communities and around the world, who push the discipline into exciting new realms. We sent each of this year's winners our architect's version of the Proust questionnaire. The winners revealed something of their personalities as they reflected on their careers, the future of the profession, and the challenges posed by the current moment, from climate change to the pandemic.

> *See the full responses online at bit.ly/HonorAwards.*

EDITED BY ERIC WILLS

PORTRAITS BY ORIANA FENWICK

What's the best way to describe the personality of your practice?
Single-mindedness of purpose, hardworking, agile, and responsive.

What's the best way to describe your approach to architecture?
Our approach is one that is place-based, resourceful, and bold.

What project of yours best illustrates that approach?
The Saint Nicholas Eastern Orthodox Christian Church in Springdale, Ark.

What projects are you most drawn to?
Just about any project that has social impact and spiritual effect. Those are largely public, institutional, educational, health care, and recreational.

What was your most rewarding collaboration?
It has to be my ongoing collaboration with Ati [Johari Blackwell], my partner in design and business and life. She continually encourages me and challenges me with her insights and talent. She's been essential in our development as a firm and getting me to take more risks. I'm fortunate and grateful.

What did you learn when working as a Bible salesman during college?
I learned many things. In particular, how to think on your feet and how to relate to people from all walks of life. In the morning, I might visit with a sharecropper. In the afternoon, a millworker, and in the evening a state legislator. I learned to engage with each considering their own background, needs, and desires in a sincere and earnest way.

What jobs did your parents have?
Father was a sergeant in the Air Force; my mother kept the house and did part-time cleaning for the local church.

What would you have been if not an architect?
A cartoonist.

When did you first realize you wanted to be an architect?
When I read that most cartoonists have an alcohol problem.

What led to the founding of your firm?
A desire to be a liaison between the academy and the profession. To practice what you preach.

What's one building you wish you had done?
The Monastery at La Tourette (Le Corbusier)

What's the one project that got away?
The Cabins at Fallingwater (a competition we would have loved to have won)

What is the greatest challenge facing architects today?
With all the distractions and issues to address—social, economic, and environmental—it's important that we don't forget our core values that allow us to build well. If ultimately we don't make meaningful buildings and places that people care about, what's the point?

What is your favorite building?
The God Barn. An old barn here in Fayetteville that's since been torn down—every inch of it was covered in biblical text/graffiti. It was a humble structure with a universal message—not unlike the outsider art works of Howard Finster.

What's the last drawing you did?
I use a thick lead 9B pencil, charcoal, or conté for most any drawing I do, and most every day, and on every project we do. The last drawing I did before answering this question was a series of park structures for Hermann Park in Houston.

What does winning the Gold Medal mean to you?
It is the ultimate affirmation by and from my peers of the ethos that sustains us—which is that architecture can happen anywhere, at any scale, at any budget, and for anyone. It underscores the good work that is happening by small, impactful firms working outside the centers of fashion. It's a big win for all of us in the middle—places some folks call flyover country. By recognizing the middle this way, we unite the whole country, all of us, around the cause and importance of architecture to improve everyday life.

MEDAL

Marlon Blackwell, FAIA, founder of Marlon Blackwell Architects in Fayetteville, Ark., has built his practice around community-based projects that are delightfully ambitious and also demonstrate a keen sensitivity to place—a nearly three-decade career that has earned him the Institute's highest honor.

AIA 2020

ARCHITECTURE

Architecture Research Office, founded in 1993 by Kim Yao, AIA, Stephen Cassell, FAIA, and Adam Yarinksy, FAIA (from left to right), has pushed the boundaries of practice with its award-winning cultural projects as well as planning and fabrication work, earning the New York–based practice this year's Architecture Firm Award.

What is the firm's greatest achievement?
We take pride in our carefully curated coffee and crowdsourced selection of beers.

What's the best way to describe your firm's approach to architecture?
We create architecture that unites beauty and form with strategy and intelligence.

What projects are you most drawn to?
We are most drawn to like-minded clients who believe in the transformative power of architecture.

What's the best way to describe the personality of your practice?
There is a strict no-asshole policy within the office.

What is the importance of research to your firm?
"Research" is our middle name! By framing design as research, our approach to architecture is born out of exploration and engagement.

What impact has New York had on your practice?

Our experience working in the city and region is fundamental to our understanding of architecture's role in engaging society and place. We leverage complex constraints and urban conditions into opportunities on our projects near and far.

What is the greatest challenge facing architects today?

The greatest challenge facing architects today is that which faces the entire world—climate change. Architects have a moral responsibility to advance how we design buildings and spaces and to prioritize the long-term health of our communities and the planet.

What's the firm's most enduring tradition?

Among the many traditions cultivated over 26 years, from internal pin-ups and happy hours, to annual summer outings and pumpkin carving competitions, our gloves-off white elephant exchange each December reveals each person's true nature.

What's a typical charrette like?

Equal parts pleasure and pain.

Which five architects, living or dead, would the firm most like to host for dinner?

A dinner with Sir John Soane, Adolf Loos, Carlo Mollino, Lina Bo Bardi, and Charles and Ray Eames would make for a fun party.

What do you hope the firm's legacy will be?

We firmly believe in the positive power of architecture and lead our firm to meaningfully engage with the world. Spaces are activated through use and experience and we strive to ensure that they perform for the communities they serve, to elevate the everyday with beautiful and responsible design.

What's the one question you wish we had asked?

What is the firm most proud of? We take our role as mentors and educators seriously and are proud of the many ARO alums who have started their own amazing firms.

What does winning the Architecture Firm Award mean to you?

It is incredibly meaningful for our people, our process, and our work to be recognized as a firm by our peers. This is truly an award that celebrates the talent, care, and thoughtfulness of everyone at ARO, past and present.

AIA 2020

EDWARD C. KEMPER AWARD

Carole Wedge, FAIA, the president and CEO of Shepley Bulfinch, earned the Edward C. Kemper Award for her contributions to AIA, including her role in helping to pilot the Institute's Women's Leadership Summit and serving as chair of the Large Firm Round Table.

What explains your rise from the mailroom to CEO of Shepley Bullfinch?

I love to learn—I read all the mail—and enjoy people, clients, strategy and creativity. I love being on a team and seeing others succeed.

What inspired you to get involved with AIA?

I wanted to contribute to the profession—it is a membership organization and if you have ideas about making the profession better/more relevant/more diverse you should get involved.

What have you hoped to accomplish through your AIA advocacy?

Inspire a next generation of diverse and talented people and empower them to improve our built environment and the way buildings work, address climate change, and create beauty.

What's the best description of your leadership style?

Inclusive, honest, and loyal. I also talk too much—it can be annoying!

What progress have you seen during your career with the issue of equity in architecture?

Women have taken on more and more leadership roles. In 2004, I was the only woman CEO at the Large Firm Round Table (LFRT)—today in 2020 there are 11 women CEOs—so we went from 0.02% to 18%.

The numbers of women principals are also growing every year. The place we are most behind is in people of color in the profession. The LFRT is working with National Organization of Minority Architects to strengthen our approach to equity, diversity, and inclusion to improve those statistics. It is critical we have a diverse profession so that we may serve diverse communities.

What makes equity such an important issue?

We cannot be naive about the issues that face our communities and that we need a diverse set of perspectives and talents to address those issues. Research abounds about how diverse teams are more creative and more effective and profitable.

What is the greatest challenge facing architects today?

Last month it was talent, today it is COVID-19 and the radical change and tragedy occurring around the world.

What project of yours best illustrates your approach to architecture?

There can never be just one—its like choosing your favorite child! Firestone Library, Austin Public Library, Marquand Art Library, Marquette Law School, Georgetown Law Center, Harvard Innovation Lab, Cornell Kroch Library. And always the one I am working on now—in this case, the University of Houston Law Center.

What does winning the Edward Kemper Award mean to you?

It is remarkable to have the chance to speak about change and impact to the AIA and its next generation of leaders. My hopes and dreams are that we will become climate activists and fight for the protection of our planet and our ecosystem. It is remarkable that the silver lining of COVID-19 is the reduction of carbon and pollution around the world. I hope we can learn from that and change our behaviors for the good.

What is the most memorable moment of your teaching career?
The graduation of a Ph.D. student who had years earlier told me tearfully that the course of study was far too difficult for her to ever complete the dissertation. Shortly after graduation her dissertation was published as a book that later won prizes.

What is your teaching style?
It is a combination of demonstration and dialogue: showing how themes can be pursued creatively and asking questions that give rise to the student's thought and passions—teaching by example and by regularly revisiting basic premises.

What has changed about your style over the years?
I've come to realize the importance of "teaching moments," that alertness to a student's readiness and capacity to learn—these topics at this moment—is decisive. Early on, I felt that preparation was key. Now I see that discerning what and when a student can "catch" an idea or example is no less important.

What is the most unfortunate reality about architectural education today?
The cost of higher education is its most debilitating condition. Students struggle to meet expenses during their course of study and then struggle even more to repay loans and debts after graduation.

What is the most promising aspect?
The wide self-awareness of the students: knowing that they have a role to play in today's society, that they are being trained to act creatively and decisively in response to our most pressing issues.

What role does your research and scholarship play in your teaching?
Framing the question in reverse makes it easier to answer: My scholarship in theory and history has always sought to address topics that have arisen in studio discussions, as they move from topics specific to the discipline to experiences of contemporary life. Writing brings these topics and insights to readers beyond the immediate teaching environment.

What does winning the Topaz Medallion mean to you?
I've read some of the autobiographical comments of previous winners and am happy to see that I stand among others who have similar desires, aspirations, self-doubts, and deep commitment to architecture.

David Leatherbarrow, professor and former dean at the University of Pennsylvania's Stuart Weitzman School of Design, and a prolific author, has been honored for his 40 years of teaching and scholarship with the AIA/ACSA Topaz Medallion for Excellence in Architectural Education.

TOPAZ MEDALLION

AIA 2020

WHITNEY M. YOUNG JR. AWARD

Gabrielle Bullock, FAIA, the first African American managing director at Perkins and Will, and a leader in the National Organization of Minority Architects, has won the Whitney M. Young Jr. Award for her commitment to social issues.

What is your greatest achievement?

My greatest achievement has been work-life integration. My career and family have both been priorities for me and, though difficult and not without compromise, I've been able accomplish integration. Personally, raising my daughter has been the most rewarding.

What progress have you seen during your career with diversity in architecture?

What has been historically an overwhelmingly male-dominated profession, racially non-diverse, and largely silent on the issues of equity, diversity, and inclusion is now more gender-balanced (overall) and the issue of diversity is more amplified. We have a long way to go, but I'm encouraged by the current activity and attention.

What work remains in that area?

There still remains a huge gender gap within leadership roles and of African Americans overall within our profession. The number of African Americans has remained relatively stagnant (2% overall and 0.3% of African American women) for many years. More effort to increase access and awareness of the profession to underrepresented groups is crucial to building a diverse pipeline to achieve a profession that mirrors society.

What do you hope your legacy will be?

My main motivation to enter the profession was a desire to positively impact the lives of African Americans and people of color in my community. I was the first African American and first woman to rise to the position of managing director at Perkins and Will. As the firm's director of global diversity since 2013, my main focus has been to elevate and broaden the culture of diversity and inclusion; lead the design profession toward more equitable practices; expand the pipeline for underrepresented groups within the profession; and influence the broader society by tackling issues of equity and inclusion through our work.

What is the greatest challenge facing architects today?

During the COVID-19 pandemic, our economy, communities, and health have been negatively impacted and perhaps revealed significant biases and inequities. As design professionals our new challenge will be how to design for resiliency not only in infrastructure but of the human condition. Public health will likely be at the forefront of how we work, live, and play.

What was the greatest challenge you faced in your career?

Frequently being the "only one in the room" has been a particular challenge. In school I sometimes felt invisible. In my professional settings I learned to take advantage of the situation by shining and taking that "stage" since all eyes were on me any way.

What does winning the Whitney M. Young Jr. mean to you?

I hope that this recognition/award and others like it empower and encourage others to become change agents and make their own mark to advance diversity in our profession. In 1968, Whitney M. Young Jr. challenged AIA and its members to take action to address the lack of diversity in our profession. I'm proud to be recognized for my efforts and commitment to doing just that.

Because of her invaluable work in helping to shape the design of California's public buildings during her long career, **Rona Rothenberg, FAIA**, has earned the Thomas Jefferson Award for Public Architecture.

THOMAS JEFFERSON AWARD FOR PUBLIC ARCHITECTURE

What is your greatest achievement?
Professionally, I consider my role as a founder and leader in the development and delivery of California's historic court building program, particularly my 13 years working for the State of California's judicial branch and the outstanding buildings and planning resulting from that work, to be my greatest single contribution over my long career. When I reflect back, we had the tools for success: confident and strong leadership; sound and thorough planning; excellent resources.

What is the most memorable moment of your career?
As a young project manager at Stanford Medical Center, I was assigned to manage the design and construction of a small lab for faculty scientist (and future Nobel Prize winner) Roger Kornberg in about 1989–90. I loved working with scientists among whom Dr. Kornberg inspired a loyalty and partnership, and I realized the magic of what that could produce. I took this with me throughout my career.

What was your most rewarding collaboration?
Among the many unforgettable associations I have had in my work life, the Santa Clara Family Justice Center project team and the completed building stand out. This is because the project realized the clear, long-term vision of the Superior Court leadership to design and build a special, one-of-a-kind facility to serve families and children in a unique, highly successful restorative justice program.

What is the biggest challenge right now in public design?
Perhaps the unexpected and profound economic crises now posed by the pandemic might offer some of our fellow architects in practice a window of circumstances to change or evolve traditional thinking and training about design in a new or different way which they might not have considered before.

What role should architects play in the planning and design of our public buildings?
I think we have the collective energy, talent, and resources as a profession to participate as executives, leaders, builders, project and construction managers, and planners as well as designers, and we should rise to the challenge of finding and optimizing all of the opportunities to apply our skills in new and unusual ways to add deep value.

What does architectural happiness mean?
Construction administration is my favorite phase of the work and the most gratifying. Happiness is being on the jobsite in my vest, hat, and goggles (and pearls) working with the men and women who work as a complete team with the architect and client to build at any level.

What does winning the Thomas Jefferson Award mean to you?
I am honored, humbled and very pleased that my work and career are recognized by this special award. It is a credit to all of my colleagues, clients, and consultants who contributed to the work I facilitated and accomplished. I hope to continue to contribute to the mission of our profession for many years to come through contributions to public works and AIA.

COLLABO

The structural engineering firm **Silman** (led, from left to right, by Kirk Mettam, executive vice president; Joe Tortorella, president; and Nat Oppenheimer, executive vice president) has helped build or restore some of our most revered buildings, including Fallingwater—a legacy that earned it a Collaborative Achievement Award. (See page 133 for the firm's work on the Farnsworth House.)

ACHIEVEMENT AWARDS

DRATIVE

What has been the firm's most rewarding collaboration?
The greatest collaboration has been within the firm. The leadership has evolved in a way that we regularly challenge each other and grow together while celebrating our differences.

What does an ideal collaboration look like?
An ideal collaboration generally starts with a well understood mission, set by both the owner and design team (including the builder and their subs). If all parties commit to a basic premise, then tough decisions can be made based on the shared goals, rather than an individual party's interest. True and lasting collaboration means a lot of compromise, and this can only happen effectively when weighed against a mission or goal and not against each other.

What is your approach to working with architects?
We understand that architecture can be a vitally powerful mix of art and science. While an engineering mind can often help lend order to an architect's art, it must not simply translate art into science. Often, we pride ourselves on "speaking the architect's language" (that language is different with different architects).

What is the importance of structural engineering to architecture?
At its simplest, structural engineering can help bring out inherent order within the architecture or support a critical disorder within a design. At a higher level, a good structural engineer can facilitate evolution within the design by asking questions of the architect that forces them to consider, interrogate, and refine the design.

What is the biggest change coming to the firm in the next year?
Considering that we are writing this while all sheltered in place, the biggest changes are likely to develop minute by minute over the next few months.

What does winning the Collaborative Achievement Award mean?
It's a wonderful recognition that this simple idea that founder Bob Silman had and the present leadership promulgate—to collaborate with joy at a high level—could create a national reputation, attract an unbelievably talented staff, and foster 54 years of joy.

AIA 2020

COLLABORATIVE

What is the initiative's greatest achievement?
First and foremost, we have built two playgrounds in Lebanon. Our ambition was to provide refugee children a place to escape from their harsh reality and to give their parents hope for some normalcy by seeing their children play.

What role does collaboration play?
We are all doing this pro bono, so there is always work in progress with everyone putting in extra effort when time allows. GDI involves a collaboration between members of the Boston Society of Architects (BSA), BSA Foundation, Boston Society of Landscape Architects, as well as faculty and students from area design schools, in partnership with NGOs, international architects and craftspeople, and partners in host communities.

Why should architects care about this issue?
The sad truth is that more than 50% of refugees are children, and the average stay in camps is now well over the United Nations High Commissioner for Refugees figure of 17 years—which itself is an entire childhood. Which means that many children spend their critical developmental years in conditions of hardship and disease, and at risk of physical and emotional harm. Local governments and landowners often restrict the construction of permanent structures or public spaces, leaving many children without places to play safely or gather.

How has the initiative grown?
Since the completion of the first playground in summer 2018, GDI has grown to support three new projects: a new partnership with a local NGO in Lebanon running schools for refugee children; an ongoing relationship with an existing partner in Turkey providing innovative education, entrepreneurial development, and community-driven aid to refugee children; and a collaboration with a Boston nonprofit to develop safe spaces for immigrants and families of color in the Dorchester neighborhood through Community Preservation Act Funds.

What is the biggest change coming to the initiative in the next year?
COVID-19 and the economic and social isolation that will follow. This will exacerbate the challenges by increasing the number of refugees and stretching available resources.

What does winning the Collaborative Achievement Award mean?
This award will increase awareness of the dire state of refugees and the need for public spaces at all scales of design intervention. Hopefully it also inspires others to adopt and adapt this collaborative model so that it can become scalable and reproducible.

The Global Design Initiative for Refugee Children (GDI), chaired by Nathalie Beauvais, INTL. ASSOC. AIA, Patti Seitz, AIA, and Gretchen Rabinkin, AIA, was co-founded in 2016 with Stephen Gray, an assistant professor of urban design at Harvard, to help design safe places for refugee children around the world to play—an effort that has earned the initiative a Collaborative Achievement Award.

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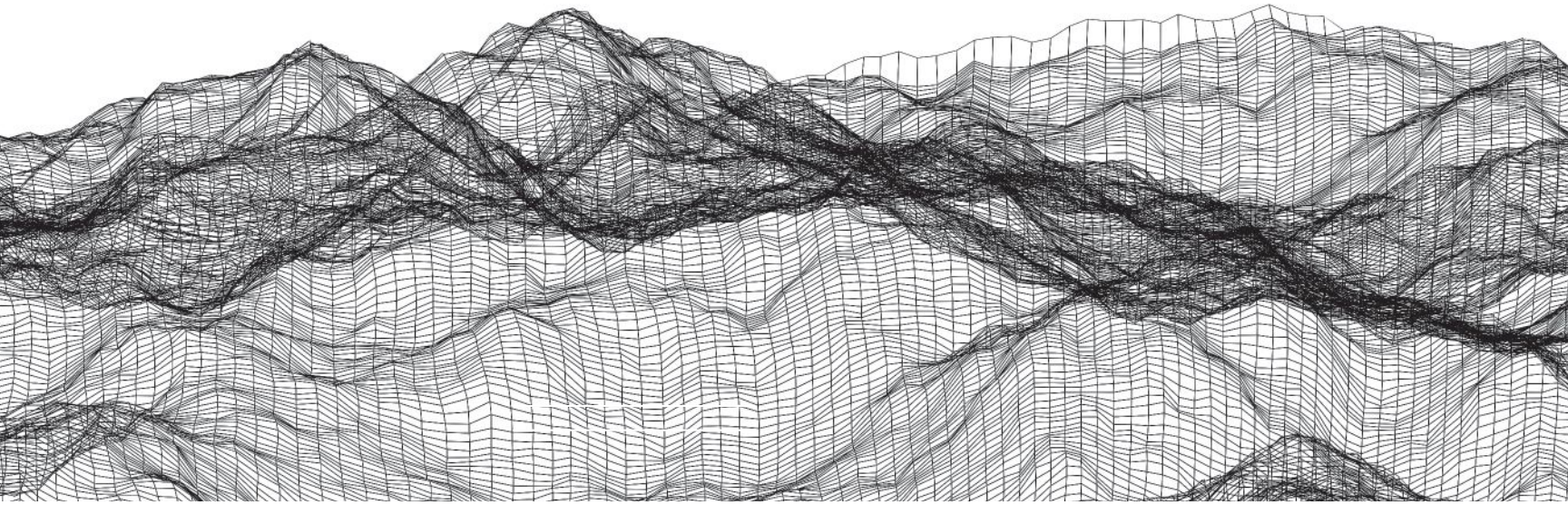

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Editorial: Architecture in Unusual Times

I assumed that 9/11 would be the singular, defining historical event of my lifetime—like Pearl Harbor, or the assassination of John F. Kennedy. Naively, it turns out. On April 3, the official death toll in New York due to the coronavirus exceeded the number of people who died in the Twin Towers, and fatalities continue to rise across the nation and around the globe. How does one respond to calamity at such a scale, and which has such terrible economic, political, and social repercussions?

What scares me, almost as much as the hardship and loss of life, are pundits' recurring invocations of Chernobyl—the suggestion being that now, as then, the systems in place cannot withstand the pressure.

A Feb. 13 essay in *The Wall Street Journal* asserted that just as the 1986 nuclear disaster revealed the rot in the Soviet system, the Communist Party of China's duplicitous reaction to the pandemic exposed the limits of General Secretary Xi Jinping's authoritarianism. As the virus spread stateside, opinion writers in *The New York Times* and *The Washington Post* drew the same analogy in reference to our own country.

Has the U.S.A. really sunk so low that it bears comparison to the U.S.S.R. at the end of the Cold War? Forty years of imperial overreach, legalized corruption, and mass disenfranchisement will do that.

The propagation of dissonant narratives and the ongoing assault on expertise have caught us in a vicious circle of mistrust and mismanagement. Systems that were struggling in steady state really are failing now, and the atmosphere of rancor and uncertainty can only make it harder to restart the economy and get society functioning again.

In such troubled times, it's tempting—and sadly, perhaps even comforting—to retreat further into denial, tribalism, and ideological posturing, when what ought to drive discourse and decision-making is evidence-based assessment of cause and effect, and consensus-building around processes and outcomes. Would that it were so simple. But we must try.

I certainly don't see architects retreating. I see them coming together.

Historically, the profession hasn't seemed attuned to crisis management—to keeping itself capable under duress of contributing to public health, safety, and welfare. Purpose and ability came and went with the economy. With climate increasingly top of mind, however, architects have been transcending their reputation as purveyors of luxury goods, and instead are embracing new methods and technologies, sharpening their business acumen, and bolstering their scientific and social bona fides. Despite the corrosion of so many other institutions, architecture is proving more resilient, and relevant, than ever.

As with climate change, practitioners are urgently developing necessary and proper solutions for combating the coronavirus, at the scale of the city, the building, and the body. Perhaps most visibly, a legion of volunteers is using digital modeling and fabrication tools to create desperately needed personal protective equipment. In this way and in many others, architects and designers are demonstrating the essential nature of their work. They are rising to the occasion with intelligence and altruism. When the sirens fade, when the emergency has finally passed, architecture will be able to look back on its contributions with pride.

STEPHEN VOSS

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PARA Activity Center, McCalla, AL Installing Contractor: R. B. Atkins & Associates Architect: Ellis Architects Distributor: Roofers Mart
Photographer: hortonphotoinc.com Profiles: Reveal panels w/ 2 pencil ribs, HWP panels Colors: Sandstone, Granite

PAC-CLAD REVEAL + HWP
METAL WALL PANEL SYSTEMS
Color: Sandstone + Granite

Playful Balance

The architects selected a combination of PAC-CLAD Reveal panels and HWP panels to add visual interest to the façade. "The intent was to find a balance between the texture and proportion of the two profiles, using the tighter, undulating panel as an accent."

-Eric Requist, Senior Project Architect, Ellis Architects

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