

Office building design has changed

COVID, employee well-being and **indoor air quality issues** have all changed the way office buildings are designed

CSE: What's the biggest trend you see in office buildings?

Daniel Donahoe: Stay-at-home orders during COVID-19 have accelerated the adoption of remote working and hybrid scheduling. With that, buildings need to be able to seamlessly flex between full to partial occupancy. Meanwhile, employees are looking for ways to engage with counterparts in their homes and offices simultaneously. To enable this level of flexibility and connectivity, we're seeing increased demand for technology that can accommodate mobility and allow for staff to collaborate from anywhere.

Working from home has also reduced the occupied load in current office buildings. This is contributing to higher heating, ventilation and air conditioning systems efficiency, especially for chillers and boilers that operate at a higher part-load efficiency.

Tyler Jensen: A focus on employee well-being. Buildings are investing in upgraded air filtration, enhanced ventilation, secondary air purification, air quality monitoring systems and other measures to help make employees feel safe and comfortable returning to the office. Further, buildings are improving amenities and adding perks

that encourage employees to work from the office rather than from home.

Gerald Williams: The most significant trend I have seen in office buildings is that since the outbreak of the COVID-19 pandemic in March 2020, there has been a widespread reluctance for many, if not most, workers to return to the office environment. This may be due to new restrictions on public gatherings, mask mandates and social distancing and a general concern for personal safety from the risk of contracting the virus.

With Zoom, Teams and other video conferencing tools now available, many people are discovering that they can be as productive from home as they were in the office every day, without the wasted time and money of a daily commute. As a result, many people now work entirely from home or through a hybrid model where they only go into the office once or twice a week for in-person meetings and to take advantage of office resources like a color printer.

CSE: What trends do you anticipate in the next six to 12 months?

Tyler Jensen: Newer office buildings will continue to differentiate themselves with higher-performing ventilation systems and improved amenity and retail

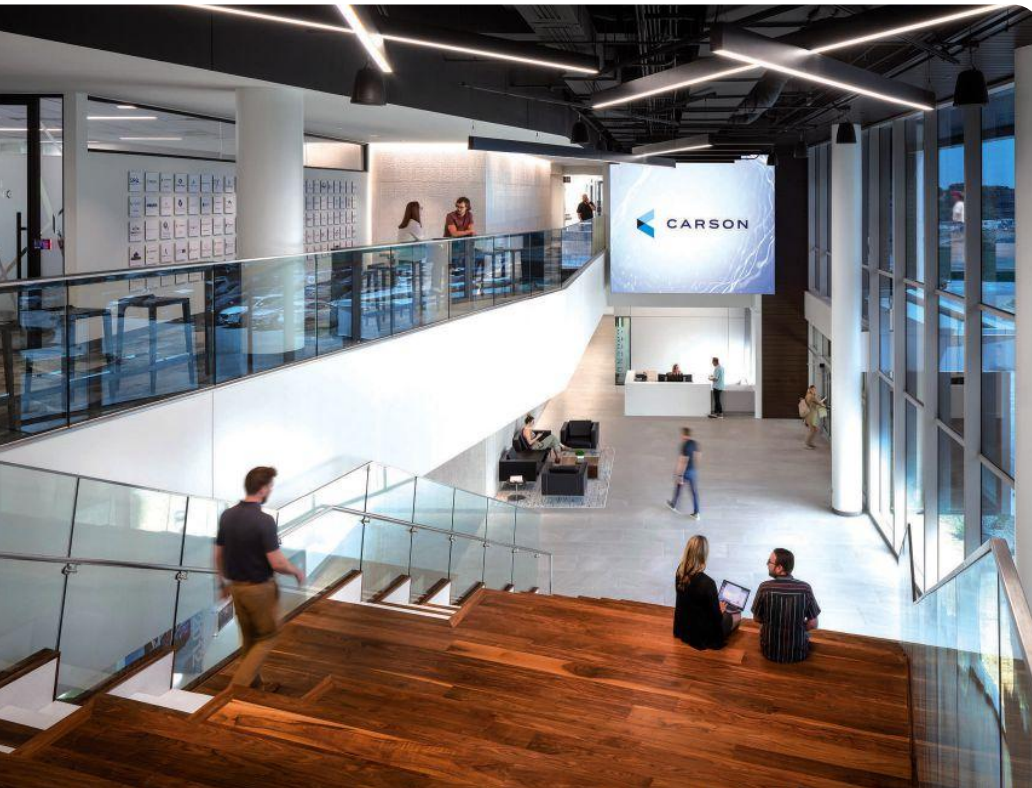
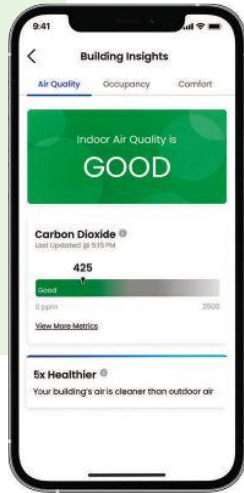


FIGURE 1: Carson Headquarters in Omaha, Nebraska, is an example of innovative, high-performance design achieved through visionary architecture and highly refined engineering. Courtesy: AJ Brown Imaging, LEO A DALY

FIGURE 2: ESD developed a rapid building wellness assessment to help building owners and facilities personnel evaluate their existing building systems and operations and identify areas for modification that could improve indoor air quality in line with industry guidelines. Courtesy: ESD



offerings. As tenants return more to those newer office buildings, older buildings will look for ways to catch up. I anticipate more repositioning work in existing buildings such as lobby renovations, amenity upgrades and HVAC improvements.

Daniel Donahoe: Spaces will shift from more individual or private spaces (offices and workstations) to more flexible shared spaces that support functions people cannot get at home — namely, collaboration, socialization and learn-

ing for filter efficiency, but we're seeing office buildings with MERV 13 ratings.

Gerald Williams: The traditional open office environment, with rows and rows of cubicles stacked together with short partitions, may become a thing of the past. People working in close proximity is not ideal for preventing the spread of airborne diseases, but is also no longer practical with so much of our daily business performed through video conferencing media. Even

with good headphones, having multiple people talking into microphones next to each other can be distracting and counterproductive. The traditional meeting method of gathering people in small conference rooms is still perceived as unsafe, so the prolific use of video conferencing may become a permanent fixture of daily office life.

Participants



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Stay-at-home orders accelerated the adoption of remote working and hybrid scheduling. Buildings need to seamlessly flex between full to partial occupancy. —Daniel Donahoe

ing. Employees have become completely untethered and float between spaces supported by state-of-the-art audiovisual and lighting that enhances the interior environment. Smart buildings allow for all spaces in a floor plate to react to changing outdoor conditions immediately, with systems reacting in real time to provide optimal comfort for occupants.

Post-COVID, we're seeing an increased focus on the health impacts of the building, especially with indoor air quality. Owners are paying more attention to ASHRAE recommendations for HVAC systems. For example, pre-COVID, they would be happy with a MERV 8 rating

We may see a trend toward more individual offices instead of an open cubicle format as a means of isolating individuals from one another to prevent the spread of airborne disease. Individual offices are also more suitable for participating in virtual environment meetings and activities. New hybrid work models give employees who want or need to return to the brick-and-mortar offices a higher level of personal protection and productivity as underused spaces get converted into private, walled rooms.

CSE: How are you working with building owners and facilities personnel to ensure workers can

safely return to office buildings after COVID-19 shutdowns?

Gerald Williams: Even with the apparent success of transitioning to the virtual meeting environment, there continues to be a need for people to meet in person on occasion. As facility design engineers, it is incumbent on us to develop meeting places that address the safety concerns of people with respect to the spread of airborne diseases. As a result, this may completely change the way typical office HVAC systems are designed and operated.

Before the pandemic, environmental air distribution systems were designed with air diffusers that provided high



FIGURE 3: This is a rendering of the Amazon Arlington Campus from 15th and Eads Streets. Courtesy: ZGF Architects

throw and turbulence for good mixing of the colder air with the warm room air as a cost-efficient way of cooling the space. Costly, fresh outside air was kept to a minimum, per ASHRAE 62.1 standards and used mainly as a means for diluting volatile organic compounds, volatile organic compounds, from building materials, carbon dioxide by people exhaling and other odors that may be generated in the indoor environment.

With the desire to help prevent the spread of airborne particles and pathogens, a new approach to office environment HVAC design may need to be considered.

Daniel Donahoe: Owners are definitely looking for improved indoor air quality. We are recommending increasing filter efficiency as per the ASHRAE recommendation. Existing and older fan systems may not have adequate fan power to meet the increased filter efficiency, which would lead to frequent fil-

ter replacement.

Companies are also working to maintain cleanability and adequate social distancing, but that is just the tip of the iceberg. COVID-19 has fundamentally changed workplace strategy for many employers. Offices must now appeal to workers by offering something people cannot recreate at home — authentic connection to colleagues in spaces that appeal to employees in new ways. Spaces must be comfortable, easy to use and visually appealing. Amenity spaces that provide natural light, connections to the outdoors, ways to unwind and socialize are becoming the norm.

Tyler Jensen: We developed a rapid building wellness assessment to help building owners and facilities personnel evaluate their existing building systems and operations and identify areas for modification that could improve indoor air quality in line with industry guidelines. Many buildings increased ventila-

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—Gerald Williams

tion rates and HVAC operating hours in line with ASHRAE guidelines and were able to achieve goals with minimal capital expenditure. Some building owners wanted to go further and differentiate their assets by providing best in class indoor air quality. Our team worked with one client, Riverside, to deploy a state-of-the-art indoor air quality program at three office towers (one existing, two under construction) consisting of MERV 15 hospital-grade filtration, increased ventilation rates, secondary air purification and a 24/7 year-round air quality and pollutant measurement and verification system.

CSE: Tell us about a recent project you've worked on that's innovative, large-scale or otherwise noteworthy.

Brad McNiff: Metropolitan Park, the first phase of Amazon's HQ2 development in Arlington, Virginia, is a 2.2 million square foot Class A office project spread across two 22-story towers, connected by an ~800,000-square-foot underground parking garage. GHT partnered with ZGF Architects and other design professionals to design the new project, which is being managed and developed by Seneca Group and JBG Smith, respectively.

Several sophisticated MEP systems were needed to meet the project's aggressive sustainability goals, including a premium efficiency central chilled water



FIGURE 4: Tech center and lab mechanical, electrical and plumbing design and construction support services by CRB for a confidential client. Courtesy: CRB

plant optimized around the campus load profile derived from energy modeling, dedicated outdoor air systems with sensible cooling fan-powered terminal units, water-to-water heat pumps to reclaim heat from building condenser water loops for domestic hot water heating, greywater and stormwater recycling systems and foundation dewatering heat exchange systems.

Tyler Jensen: We are working on a 700,000-rentable-square-foot, 30-story office tower in Denver for Riverside Investment and Development with Goettsch Partners architects. The building is currently in design and will break ground in Q1 2022. We have previously worked with this same team on multiple office towers in Chicago, but we were presented with a unique challenge in Denver due to the stringent energy code requirement to be 24% better than International Energy Conservation Code 2018.

The market demand is for a highly glazed envelope with floor-to-ceiling views, which can be a challenge for energy performance. Extensive energy modeling was used to confirm that code could be met with a high-performance curtain wall coupled with highly efficient mechanical, electrical and plumbing systems. The primary HVAC system consists of a dedicated outdoor air system (with increased ventilation rates for indoor air quality benefit) and a water-source variable refrigerant flow system for space heating and cooling. The end result will be a best-in-class, highly efficient building that achieves the desired aesthetic and will be attractive to potential tenants.

Daniel Donahoe: Carson Headquarters in Omaha, Nebraska, is an example of innovative, high-performance design achieved through visionary architecture and highly refined engineering. Clad in electrochromic glass, the high-tech building skin bathes the interior in healthy daylight, yet occupants experience very little glare or heat gain. With no need for window coverings, dramatic vistas are available in every season. Natural daylight renders truer colors, skin tones and textures, enhancing the circadian rhythms of occupants. All this while reducing energy consumption — 15% less for HVAC and 74% less for electric lighting. A post-occupancy evaluation confirmed performance using illuminance meters, spectrometers and other devices. On the hottest days of summer, the building was still 19% more efficient.

CSE: How are engineers designing office facilities to keep costs down while offering appealing features, complying with relevant codes and meeting client needs?

Tyler Jensen: The best way is to use solutions that can reduce first costs while also improving energy performance needed to comply with energy codes and certification programs like U.S. Green Building Council LEED. For office HVAC systems, we are using low-temperature air and water distribution systems with a high

2 Fast Facts

- ▶ Building automation systems are being implemented in some office buildings.
- ▶ Many codes and standards must be followed, including those from ASHRAE, International Code Council and NFPA.

delta T to achieve that goal. Low-temperature air systems can provide the required cooling capacity with lower air volume. Smaller fans, shafts and ductwork reduces the first cost and also provides significant fan energy savings. Similarly, high delta T water distribution systems reduce installed pump and pipe sizes and also provides pumping energy savings.

Daniel Donahoe: Supply chain issues are driving cost conversations, especially where the unavailability of a certain product can cause delays in the project. We've had to remain flexible to pivot to different building systems or materials, designing around access and lead times. We are specifying the products that are most available and have the best lead times and changing design accordingly to maintain schedule and cost.

For example, we recently switched from using a variable frequency drive motor instead of an electronically commutated motor on a fan because there was an 18-week lead time for the ECM, compared to four weeks for the VFD. Avoiding delays is critical to saving on cost. **cse**