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ENGINEERED TO MAKE A DIFFERENCE

Dear Colleagues,

October 2021: More than 18 months into a worldwide health crisis, there is hope that we're finally emerging from the COVID-19 pandemic. With many lessons learned during this difficult time and with thoughts to share, the healthcare team at Jaros, Baum & Bolles is pleased to join in the celebration, in conjunction with ASHE, of Health Care Engineering Week.

ASHE has themed this year's celebration, "Engineered to Make a Difference", an opportunity to recognize—and honor—the important role that facility team members have in reshaping healthcare infrastructure toward ensuring a safe, robust, flexible, and efficient environment for all patients, visitors and staff within hospitals. Drawing on the knowledge gleaned in the past year and a half, facility engineering teams are focusing on reinforcing aging infrastructure with robust infrastructure systems flexible enough to handle everything from everyday care to emergency surges in care requirements. Increasing the complexity of the current moment, as states are adopting carbon reduction policies, healthcare infrastructure designs are faced with new variables that need to be considered in order to reduce carbon footprint, increase energy efficiency and effect the electrification of building heating and cooling systems—all under the banner of readiness for the next healthcare crisis, whatever that may be. The role that these decision makers play at this point in time will, per this year's theme, "make a difference" and reshape the support of ever-changing healthcare delivery models, enable healthcare facilities to quickly adapt to emergencies, and continue to facilitate the safe operation of healthcare institutions.

We also celebrate everyone's amazing efforts as we continue to provide our clients with both technical support as well as thought leadership, providing innovative ideas and approaches toward delivering well thought out, serviceable, maintainable and flexible design solutions. Cutting-edge technologies in cooling/heating systems, air delivery methods and heat recovery are presenting new design options for consideration. Infrastructure design approaches are giving healthcare institutions more flexibility as buildings are developed as long-term assets. And yes, information technology has now become our fourth utility.

Each day next week, a new design concept will be featured to inform and inspire our clients as they consider the options and strategies for creating the best healthcare environment possible:

- **Monday:** Emergency Conditions Considerations and MEP Design
- **Tuesday:** Ambulatory Care Future Flexibility
- **Wednesday:** Facing Dramatic Changes with Calm Flexibility
- **Thursday:** Post-COVID and The New Normal
- **Friday:** Preplanning for Rapid Deployment: WiFi 7

As a new addition to our 2021 Health Care Engineering Week celebration, we encourage everyone to register for the online educational seminar, *Building Electrification: The New Frontier for Building Performance*, which will be presented on October 26, from 2:00 - 3:00 p.m., EST by our in-house energy/deep carbon reduction team. Click here to register.

JB&B's thought leadership pieces for previous Health Care Engineering Weeks can be viewed by clicking here: 2019, 2020.

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NATIONAL HEALTH CARE FACILITIES AND ENGINEERING WEEK

EMERGENCY CONDITIONS CONSIDERATIONS AND MEP DESIGN

The need for healthcare facilities to provide continuous care is challenged by emergency and disaster events that force them to operate outside of typical design criteria. Whether it's a COVID-19 spike, a mass casualty event such as a bus crash, or a statewide blackout due to freezing temperatures, hospital capacity and capability is particularly challenged during a crisis. It has become more critical than ever for institutions to take a proactive approach to addressing the need for flexible and robust designs to ensure that hospitals can provide for the community when they are needed most.

Earlier this year, the Facility Guidelines Institute released a document providing guidance on designing healthcare facilities that can respond and adapt to emergency conditions. The document encourages institutions to consider the building when creating a proactive rather than a reactive disaster plan. What we've seen so far is that a disaster happens and everyone jumps and starts modifying the building. We need to work with the hospital to envision its worst-case scenario so that we can install systems that are ready for such an incident. We shouldn't be making hurried decisions and designs under stress about things we can be prepared for. Of course, ultimate flexibility can require a significant capital budget, so working with the hospital, a Hazard Vulnerability Assessment can help the team prioritize which critical systems to invest in. A hospital in an urban environment might need to consider airborne terrorist attacks. Certain locations dictate design more related to hurricanes or rising sea levels, while others may need to be prepared for the impacts of wildfires.

Resiliency and flexibility are most often the consideration tied directly to MEP/IT systems. Some of the design upgrades that may be most valuable to an institution are:

- Providing universal patient rooms that meet the electrical and medical gas needs of higher acuity patients than the typical patient population.
- Central air handlers that have capabilities for high filtration levels or higher outside airflows.
- Heating and cooling backed by multiple utility sources (gas, electric, steam) and captive onsite storage in case of a power or gas outage.
- When geographic location puts the building at risk for water loss, providing onsite storage of domestic water taking patient use and cooling equipment requirements into account.
- Elevated or redundant critical infrastructure above anticipated flood elevations.
- Pressurization control to contain expanded areas requiring airborne infection isolation.
- Upsized central medical gas systems to allow for surge conditions or evolving patient needs.
- Implementation of WiFi 7 to compensate for additional traffic during surge conditions.

Having proactive solutions and systems firmly in place is the best safeguard against events that seem to come out of nowhere.

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AMBULATORY CARE FUTURE FLEXIBILITY

Factors such as an aging population, telehealth, insurance requirements, and more accessible care are impacting how ambulatory care is delivered, and therefore also influencing the approach toward space renovations and new outpatient construction. These needs must be juggled with construction costs, higher standards for healthcare space design, more stringent construction and energy conservation codes, and emerging pressures for carbon footprint reduction. Recognizing the importance of total cost of ownership as patient and healthcare delivery methods needs evolve, it's important to leverage the design to maximize flexibility. Typical medical office buildings will transform from simple doctor offices/exam rooms to more imaging, higher care acuity such as infusion and dialysis, advanced procedures and ambulatory surgery as complex patient care shifts from a hospital to an ambulatory environment.

MEP infrastructure design should consider provisions for the flexibility to support higher acuity of medical care. Considerations when planning and programming a flexible new medical office building include:

- Robust air handler systems capable of higher-than-code air filtration and redundancy, including multiple fans and cross-connecting systems.
- Flexibility to convert floors from plenum return to ducted return without disrupting central systems and the ability to make floors/zones positive or negative pressure.
- Dedicated air handlers for future high-acuity procedure floors and/or surgical suites.
- Planning for roof-level exhaust fans and risers to support future specialty spaces such as clinical labs and or USP pharmacy spaces.
- Allocations for future quench vent risers to accommodate increased imaging needs.
- Three-branch emergency power in addition to normal power to support not only life safety loads but critical care and equipment loads.
- Fuel oil storage to support more than code-minimum run time.
- Central UPS power systems to support critical IT and clinical modality functions.
- Expandable medical gas system skids capable of adding an additional pump/compressor to increase capacity as need arises.
- Space allocations at the ground floor level for central "mini-bulk" oxygen storage that can easily be converted in the future if needed.
- Careful analysis of technology requirements, as these buildings rely more and more on low-voltage systems, including master-planning the size, location and quantity of IDF closets on each floor.
- Careful analysis of energy conservation measures and carbon neutrality to align with emerging policy and lifecycle cost considerations.
- Review of emergency conditions planning needs, such as a possible "pandemic mode".

As new medical office buildings are being programmed, it's our responsibility as the MEP design community to communicate these ideas to our design team partners and healthcare clients for the team to make the best decisions possible in each unique situation.

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FACING DRAMATIC CHANGES WITH CALM FLEXIBILITY

Climate change is all around us: the news, policy, companies, mandates. It's coming at us from all angles—and building owners and engineers need to take action.

For hospitals, though, reduction of carbon emissions doesn't come easy. Hospitals are complex organisms with requirements that are more challenging than a typical building: specific environmental conditions, air changes, 24/7 operation, noise, resiliency, and urban environments; specific processes, such as sterilization, that require high temperatures; and the cost of upgrades and operational costs associated with electrification of processes. All these things make it really hard to reduce hospital emissions. But it's important to recognize that you don't want today's constraints to prevent viable carbon reduction in the future. Beware of some voices in your head that might be getting in the way:

- *"This is overwhelming. What are the first steps?"* Energy reduction is the biggest first step. We have seen time and time again that every building has low-cost items that can be done to reduce energy. And the way to figure out the best way is via retro-commissioning and energy audits, which can help make sure that you're focusing on the right things: the low-hanging fruit. Remember that energy reduction solutions can help reduce carbon emissions and utility bills.

- *"Electrify my steam system? Are you crazy?"* Electrification on an existing campus isn't as easy as just flipping a switch. It's important to evaluate which systems actually need to be provided with steam and where conversion to alternatives is possible. Consider utilizing low-temperature hot water for reheat systems with reclaimed heat from a central chiller plant. Or evaluating where it might be feasible to implement adiabatic steam-free humidification. A new building may be able to limit steam usage to just central sterile processing requirements.

- *"How am I going to do this work in an active hospital?"* This can be an overwhelming task. Developing a deep carbon reduction master plan can help with targeted implementation and inform MEP scope for clinical projects. For example, if an operating room is being renovated, consider the air handler serving that particular operating room as well whether the system as a whole can be improved by introducing heat recovery.

The bottom line is: the pain points don't have to be that painful and the urgency of making necessary changes can be ameliorated by the flexibility of available solutions. It's a time to keep your eye on the prize. Reaching carbon reduction goals might be a target priority for new construction or, for an existing facility, an evolving effort spanning years. The solution may be challenging, but it can be achievable if the institution makes it a priority.

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POST-COVID AND THE NEW NORMAL

Since 2020, HVAC designers and building operators have been tasked with managing urgent, evolving, and critical airflow needs to adjust for COVID-19's impact on hospitals. For many institutions, this meant taking a step back on energy- and carbon-reduction goals to implement the strategies necessary to meet the facility's patient needs. Given the design parameters guiding modern healthcare facilities, central air handling systems need to be inherently robust, but this doesn't have to be at the expense of energy use and operational needs.

We now can evaluate what safety measures were implemented and what makes sense to continue to use in the current landscape. When it comes to elements such as humidification, heating coils, cooling coils and airside economizer, minor changes can be made to increase the resiliency of your facility to protect against airborne pathogens such as COVID-19. These design considerations include:

- If your facility doesn't have above-code air filtration, upsizing the fan capacity in the AHU to handle higher static pressure loads can facilitate a Day Two filter swap. Evaluate when a higher filtration is most beneficial to the institution, and only use that higher static configuration when necessary.

- Many air handling units in healthcare facilities are configured for airside economizer mode, which allows the unit to operate at 100% outside air, providing the benefit of increased ventilation and energy savings. Consider upgrading select heating and cooling coils to provide 100% outside air at a range of seasonal temperatures to provide pandemic-capable areas. A minor modification in the coil selection can provide year-round flexibility without impacting day-to-day operation.

- Upsizing your humidifier section to be able to provide beyond code-minimum parameters can reduce the spread of microscopic particulate in the air and slow the airborne spread of disease and has the added benefit of increased overall wellness for everyone in the facility.

- Variable volume and tracking-pair VAV controls on a room or zone basis allow spaces to be converted to positive or negative pressure spaces with a few tweaks at the building management system (BMS) front end. The benefit of these system types is that they allow you to deliver pandemic-driven higher energy use operation only when it's needed.

- With enhanced VAV controls coupled with the potential to increase filtration and/or ventilation at the central air handling units, consider the quality of the air being delivered to the space in terms of equivalent air change rates. Evaluate if there is opportunity to save pressure drop seasonally when you have higher equivalent clean air change rates.

Implementing any or all these strategies will begin to strike the balance between facility readiness and energy conservation, two key elements of the evolving New Normal.

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PREPLANNING FOR RAPID DEPLOYMENT: WIFI 7

Globally we have seen an increase in disasters, both natural and human-initiated. Whether the cause is related to the climate, a virus, or human error, each can profoundly impact society, particularly its healthcare systems. Many institutions are not equipped to provide medical care when a massive surge in patient care taxes their infrastructure.

Given this, the implementation of smart healthcare has never been more urgent or more prominent, facilitating rapid deployment of health services for both patients and healthcare providers. This includes private and secure remote healthcare and telemedicine applications, along with connectivity of Internet of Medical Things (IoMT) devices. So how do we accomplish this when more than half of total IP traffic today is wireless?

SMART HEALTHCARE: MAKE ROOM FOR WIFI 7

WiFi 7 (802.11be) will have an extremely high throughput and extremely low latency, supporting 30 Gbps (3x WiFi 6). This will provide ubiquitous communication for high-throughput applications such as 4K/8K video, VR/AR and cloud computing. These technologies can help develop a strong communication infrastructure for the smart healthcare system with extreme reliability, connection continuity, network scalability, and flexibility for rapid response.

Though WiFi 7 isn't slated to be released until 2024, deployment will require preplanning in both renovations and new facilities. With a maximum cabling distance of 250 feet, the placement of Technology Rooms may need to be reconsidered to support this deployment. This is a conversation to be had with your Technology Engineer now so that you can be sure your new or existing facility is infrastructure-ready for what's to come.