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HVAC

MEETING FUTURE NEEDS

The Universal Grid/HVAC Design

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Kaleida Health's Clinical and Medical Research Building: Gates Vascular Institute and UB Clinical Translational Research Center/Incubator employ the universal grid.

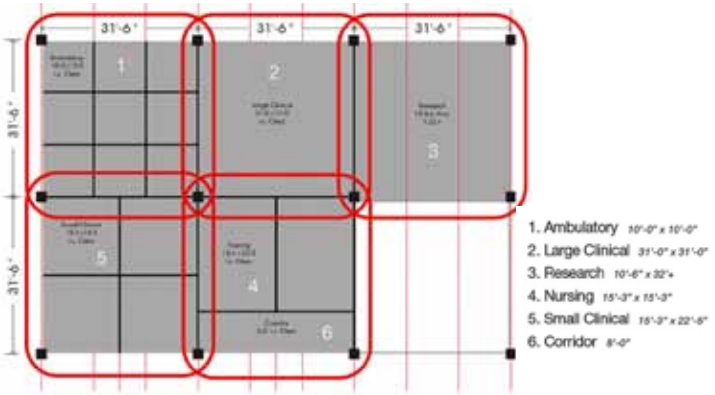
There has been much emphasis given to the role of HVAC systems with regard to infection control, indoor environmental quality and energy use—and rightly so. However, there has been too little emphasis given to the significant role that a properly conceived and designed HVAC system plays in the ability of the facility to respond to future changes—the majority of which are unknown today.

At Cannon Design, HVAC systems designs are integrated into a "Universal Grid" system used for facility planning—a recipe for success that imagines the structure of healthcare delivery 100 years into the future, and a design approach that allows for radical adaptability in meeting these future challenges.

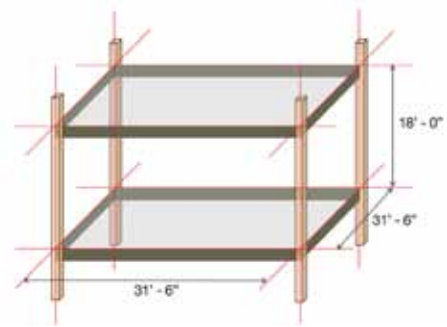
The "Universal Grid" theory begins with a universal planning module that is 31'-6" x 31'-6" x 18" floor-to-floor, with all engineering systems integrated into this grid. The concept is simply one of planning and designing healthcare buildings within a precise 3-D grid, in order to achieve measurable advantage in initial capital cost, speed to market, operating economy and future adaptability. Dimensions of the grid have been determined by detailed development of multiple clinical room prototypes, which ultimately form the plans of these buildings, and by the lifecycle benefit of sustainability optimized engineered systems.

With Universal Grid applications, HVAC ductwork distribution is comprised of supply air, return air and exhaust air headers that parallel the grid and allow complete flexibility for the HVAC needs of any type of space—now or in the future. The ductwork headers, traditionally referred to as "mains," run parallel to the grid and "stretch" full size for longer distances than traditionally sized mains to provide ease of future changes. Branch ducts of approximate required size are connected to these headers to serve individual rooms.

The result is spaces with close proximity and access to the modularly sized supply, return and exhaust air systems. Therefore, if the



The universal grid floorplan has been used as the building block for prototypical designs of a wide range of healthcare functions. This includes multi-acuity inpatient nursing care, ambulatory care, wet-bench research, clinical research, offices, surgery and interventional radiology.



The universal grid-planning module comprises an optimum set of vertical and horizontal dimensions for the structural bay of a building.

function of a space or even an entire floor changes, or if codes are modified to require more air changes in a space, the HVAC distribution system is adaptable to these changes.

The system modularity and flexibility continues back to the head-end air handling units and exhaust fans, also "headered" together, allowing multiple air-handling units and exhaust fans to serve common duct distribution systems. The 18-foot floor-to-floor height allows "vertical zoning" of the HVAC components, along with the electrical, plumbing, fire protection and technology systems—a key concept in today's sustainably designed healthcare facility.

While similar concepts in modular planning have failed to yield results as compelling, the Universal Grid theory—developed around all current state-of-the art physical and functional parameters that apply to over a dozen prevailing space prototypes in the health sciences environment—has proven to be far more successful. The flexibility of the HVACs system's—and similarly, the electrical and plumbing systems—modular grid design, complements this flexible space planning.

This approach not only allows for future changes to air quantities, but also provides redundancy, assuring the loss of any single piece of HVAC equipment does not result in the loss of space conditioning in the facility—all accomplished at no additional cost.

A solution to the elusive goal of "future-proofing" healthcare, the Universal Grid module communicates the importance of addressing: When is the future? How do we imagine it? And what does it mean for the way we design facilities today? These are all essential questions that must be addressed in planning and designing HVAC systems.

Ductwork header layout.

The Gates Vascular Institute and UB Clinical Translational Research Center/Incubator with views of basement HVAC and penthouse HVAC equipment rooms.

APPLYING THE UNIVERSAL GRID: A CASE STUDY

The Kaleida Health, Clinical and Medical Research Building: Gates Vascular Institute and UB Clinical Translational Research Center/Incubator, is a one-of-a-kind facility planned as a cornerstone of a world-class academic medical center. The 477,000-square-foot facility supports academic programs from regional universities and recruits top medical talent. It was envisioned as an institute that would be capable of drawing patients from the region and beyond.

In addition to the horizontal flexibility of the headered duct systems, there is also vertical flexibility throughout all eight floors. Typically, HVAC air-handling equipment would have been located on a mid-level floor of the tower allowing vertical ductwork to efficiently feed up and down from the center. However, this approach allocates valuable middle floor space to mechanical equipment. In this project, half of the equipment is located in the penthouse and fed down to the mid-level. The remaining equipment is located in the basement and fed up to the mid-level. This frees the middle floor for program space, while affording the same vertical distribution efficiency as housing the equipment in the middle of the tower.

The limits of the Universal Grid concept are continuously explored. In its ultimate form, it is believed it will enable buildings to morph both outside and in. They should prove more cost efficient, more flexible, faster to build, more functional and enduring.

Chip Berry, P.E., LEED AP, is a principal at Cannon Design. As leader of the Mechanical Engineering Group, he has been a major contributor to the growth of the firm's engineering practice. An authority in sustainable design, dating to the groundbreaking 1980's solar-responsive Occidental Chemical Center, Berry continues to lead green design efforts through the implementation of building information modeling.

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