

Innovations in

modular

healthcare facilities

“Modular” has come a long way from the “construction trailer” era, with some particular advantages for rural facilities **BY ROLF HAARSTAD, AIA, AND KEVEN O'BRIEN**

Curry Health Network, which serves rural communities on Oregon's south coast, decided earlier this year to replace the outdated facilities at Curry General Hospital in Gold Beach. Like many hospitals, it planned to continue treating patients in its original buildings while its new facility was constructed on the same three-acre campus. For Curry, the situation seemed especially challenging at first because existing buildings consume most of the site, leaving little room for construction activities. Understandably, administrators and staff were concerned about delivering patient care on a campus full of building materials, equipment, and debris.

Then, Curry's board learned about modular construction. Because components are manufactured offsite, they determined that a modular approach would significantly reduce disruption of the campus while accelerating the project's schedule. Curry General recently joined the growing number of institutions that are overcoming time, space, and budget obstacles by going modular.



Figure 1. ©Williams Scotsman, Inc. | willscot.com

Modular Evolution

The modular building industry has made great strides since the mid-1990s, when its products were often considered not much more than temporary jobsite trailers. Used mainly for administrative functions, modular facilities were typically box-like structures, with few options for exterior finishes.

Over the past five years, modular construction has been widely applied to stand-alone practitioner clinics and buildings for renal care, physical therapy (figure 1), and other healthcare specialties (figure 2). Structures with environmental controls and floors that can bear heavy loads are now available to accommodate the high-tech equipment of MRI and nuclear medicine labs.

The modular industry has also begun designing components for specific functions, such as surgical suites and patient rooms, which can be configured to create multiuse facilities. At Fort Lewis in Washington State, for example, modular building company Williams Scotsman developed a dental clinic with customized subspecialty areas, such as dental workstations and an oral surgery recovery room (figure 3).

Other recent innovations relate to the exterior appearance of modular structures. Whether a facility is flanked by historic buildings, designated as an anchor for a modern urban area, or sited

in front of a mountain range, numerous exterior treatments are available (figure 4).

In short, in contrast to the temporary solutions of a decade ago, today's most sophisticated modular buildings are multistory, multifunction structures made from the same long-wearing materials as conventionally built facilities. Featuring spacious lobbies and light-filled rooms, new modular buildings reflect current trends in patient care. Curry General's new 25-bed critical access hospital, for instance, will include private patient rooms and views of nature—therapeutic elements that studies have shown contribute to speedier recoveries.

Although applying modular principles to entire hospitals is a new phenomenon, interest is steadily rising, especially among rural health systems. The remainder of this article discusses the reasons why.

Budget Management

Escalating expenses are hitting healthcare systems at a time when aging infrastructures are costly to maintain and can no longer accommodate the medical and technological advances that keep hospitals competitive. Rural hospitals, which typically lack professional fundraising staffs and do not have access to a large donor base, are at a particular disadvantage. Depending on a hospital's location,



Figure 2. ©Williams Scotsman, Inc. | willscot.com

the cost of construction labor alone can make traditional facilities impractical. Were Curry General, for example, to go the stick-built route, the contractor would be hard-pressed to find enough qualified labor locally to complete the project, and the cost of importing workers from larger cities would be prohibitive.

The good news is that efficiencies created in manufacturing modular components can make healthcare construction more affordable. Along with the physical components that arrive at the jobsite comes the technical expertise that goes into the design and production process. This expertise would be substantially more expensive were a remote hospital to build a facility from scratch. For that reason, modular buildings offer rural institutions exceptional value.

With advance planning, some modular elements of critical access facilities can be classified as equipment rather than real property, which can have positive implications for depreciation and cash flow. Examples of this would include interior modular partitions and ceiling assemblies typically used for patient rooms and baths.

In addition to containing costs, off-site manufacturing of modular components protects the integrity of a building's design and helps ensure the quality of construction on the most challenging parts of the job.

Time-to-Occupancy

The time required to complete a facility is related to its budget. If a hospital can begin operating in 12 months versus 24 months, the entire economic profile of the project changes. The faster facilities are up and running, the faster an organization can start generating revenue.

While modular buildings may conserve time during the design phase, construction is where hospitals see the greatest acceleration. Concurrent construction methods, which involve preparing the site while components are being manufactured, can shave up to 50% off a project timeline, depending on a building's complexity.



Figure 3. ©Williams Scotsman, Inc. | willscot.com

Flexibility

Staying competitive in healthcare requires anticipating and responding to market changes. With the rapid development cycles of medical and technical innovations, it is not unusual to hear about hospitals tearing out construction that was completed just a few years earlier. Facilities that allow institutions to adopt new technologies and flex to the needs of the marketplace give hospitals an edge on the competition and may enable them to improve medical outcomes.

Offering both adaptability and scalability, modular facilities provide a new perspective on master planning. Ideally, modular solutions give hospitals the ability to "plug and play," swapping outdated modules for new ones without having to demolish an entire facility. For example, a modular component designed for administrative functions could be exchanged for a component



Figure 4. ©Williams Scotsman, Inc. | willscot.com

that has been customized for imaging equipment; if the hospital later acquires a new piece of equipment with a heavier magnet, it could exchange the original module for one that meets the new load requirements. Because they can reconfigure and seamlessly add new components, institutions avoid creating a labyrinth of structures as the hospital expands.

Reusability and Safety

The flexibility of modular facilities ultimately increases the efficiency of capital expenditures because components can be reused. For example, a module can be added to an overstressed emergency department in one building and then, once the ED has been expanded, the module can be moved to another ED where it is needed. This

also reduces the need for major construction and renovations, which can compromise the safety of patients and staff as they attempt to navigate around a dusty, noisy construction site.

Modular solutions further enhance patient safety by making it easy to standardize workflows, traffic patterns, room configurations, and interior fittings. This, in turn, lowers the institution's risk profile during construction, while boosting staff efficiency.

Paradigm Shift

When an innovative product or technology emerges, people are inclined to apply an earlier, familiar mindset to it. That is why cars were first called "horseless carriages" and computers are "connected to a wireless network."

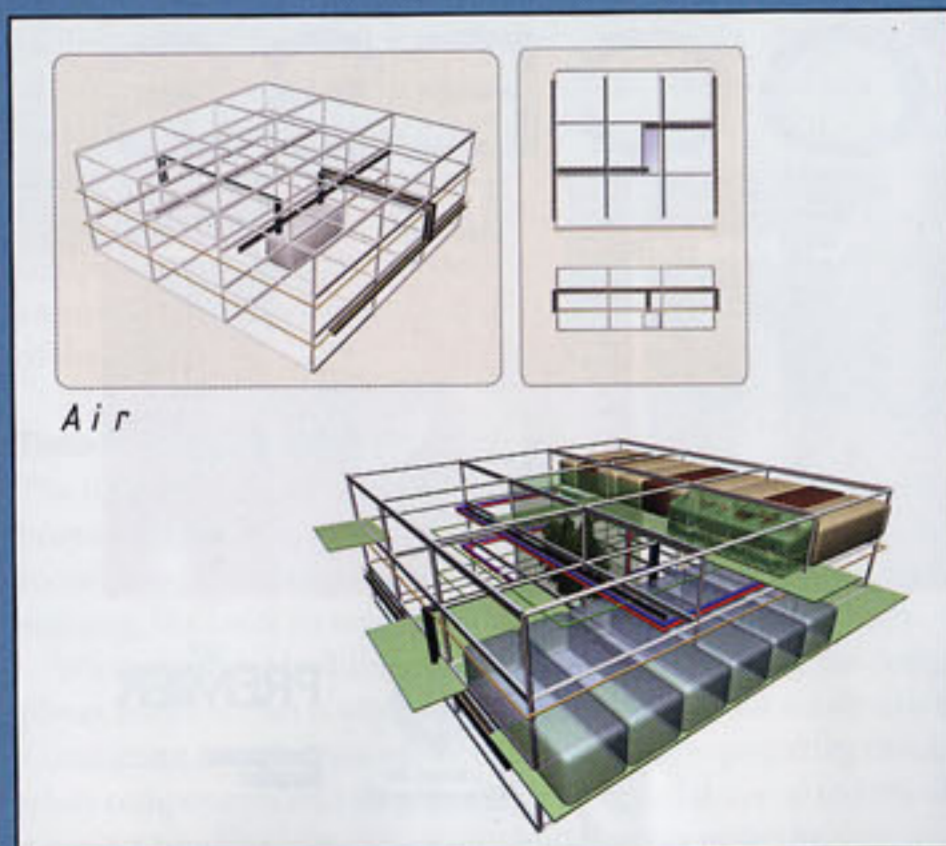


Figure 5. ©Hord Coplan Macht, Inc.

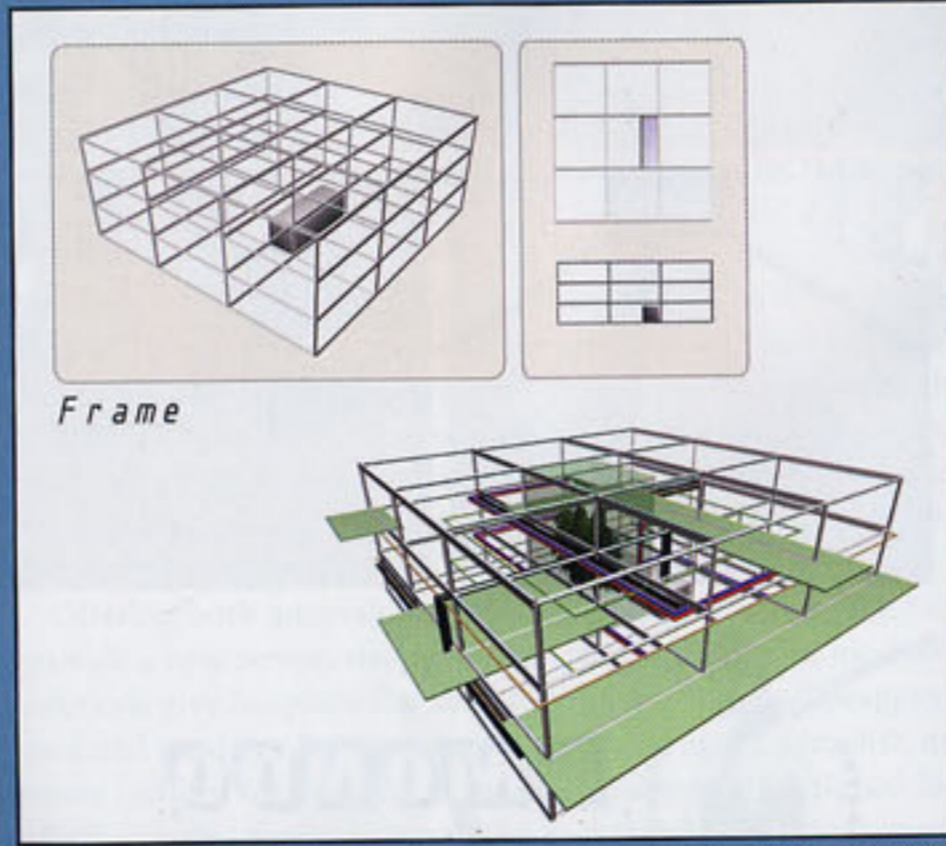


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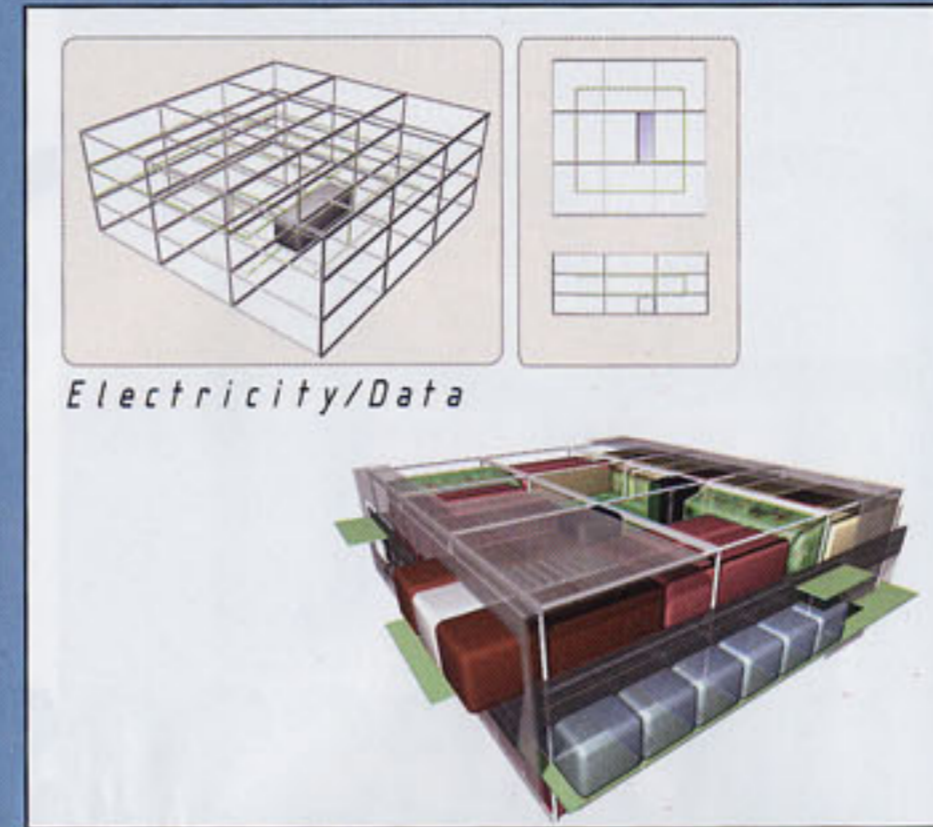


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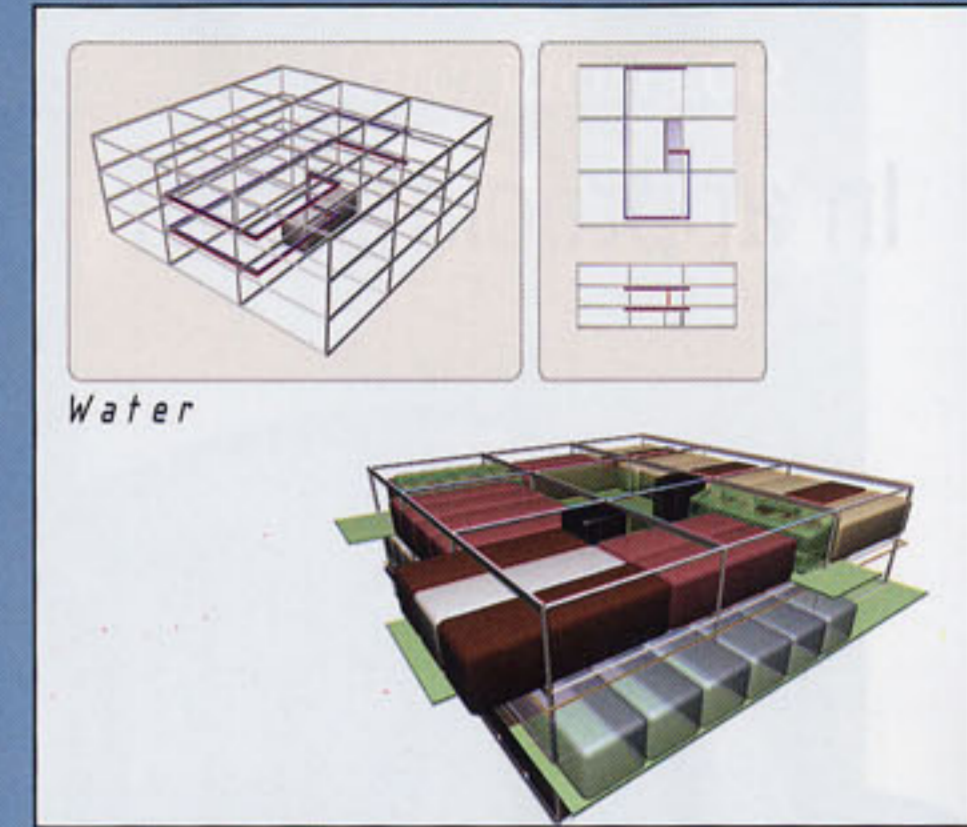


Figure 8. ©Hord Coplan Macht, Inc.

The same applies to modular facilities, which are still at an early stage in their adoption. Designers have tended to think of it in terms of the traditional parts of a building (ceiling, walls, floor, etc.), but are now beginning to take a different approach to modularity. For example, instead of placing electrical and mechanical systems above the ceiling—a challenge because transported structures must meet height restrictions—one module could be a stand-alone mechanical unit that feeds the rest.

ModularSystem1 is a concept developed by Baltimore-based architecture firm Hord Coplan Macht for "plugging in" building systems, starting with the frame (figure 5), then adding air (figure 6), electricity (figure 7), and water (figure 8). The model also allows expansion of a hospital by adding a second (figure 9) and third grid (figure 10).

During a recent charrette at Hord Coplan Macht, designers explored the concept of a rural critical-care hospital composed of a structural grid holding specialized modules that could be removed, regrouped, and replaced to create the facility configuration that best meets patient needs at the time. Internal courtyards, created by voids around the modules, would maximize light and ventilation. The structural skeleton could be modified to correct for sloping sites and, through component attachments, the skin could be customized for different physical contexts.

Although just a diagram at this stage, the building's modern aesthetic is no accident. Modular construction done in this fashion embodies the modern qualities of intuitive structure, unadorned forms, and universal space. It is also no accident that healthcare organizations, perhaps more than any other institution, embrace a modern and technologically advanced aesthetic as a reflection of their state-of-the-art caregiving.

Future modular capabilities will offer healthcare institutions, especially those in rural communities, an increasingly wider range of options for building beautiful, modern facilities more quickly, more safely, and less expensively. **HD**

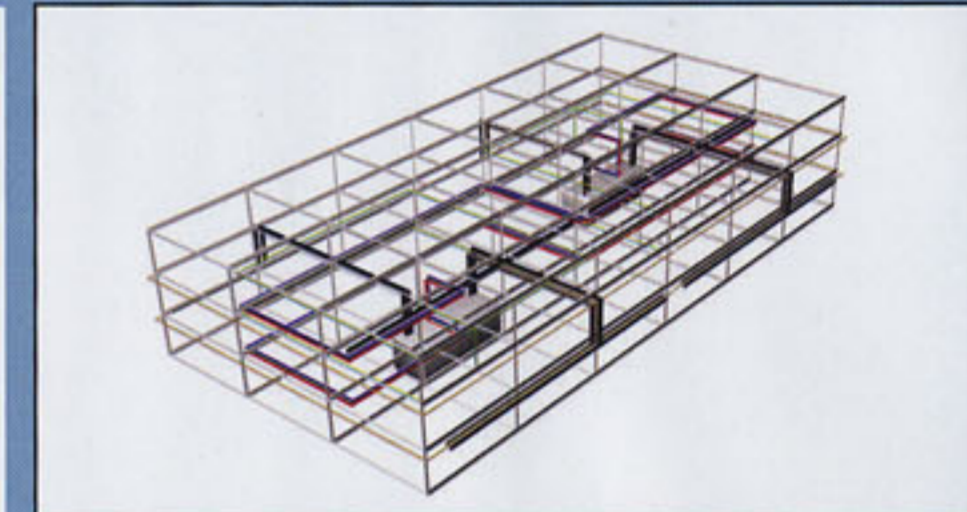


Figure 9. ©Hord Coplan Macht, Inc.

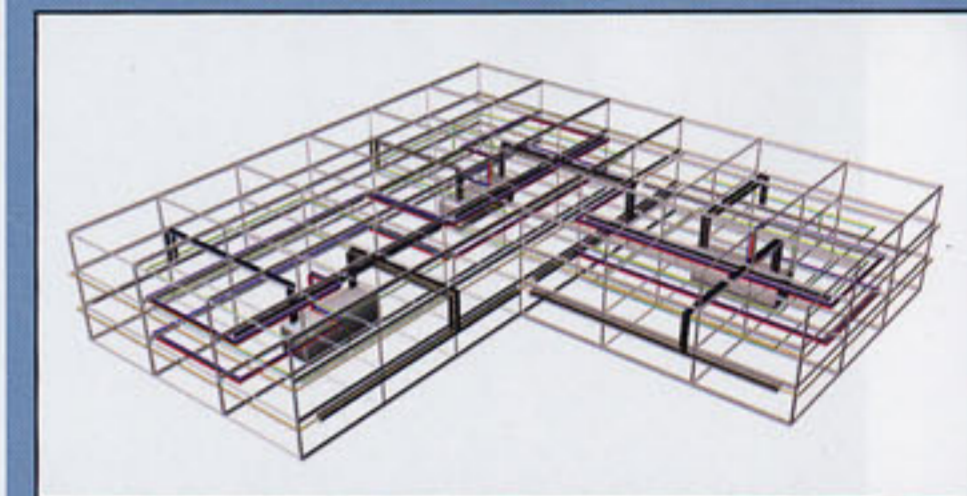


Figure 10. ©Hord Coplan Macht, Inc.

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