

A student team proposes a unique way to make Olympic athletes feel right at home.

Thinking Inside the BOX

BY EILEEN BURKE AND RUSTY KUCHER

AS THE DAY APPROACHES when the International Olympic Committee (IOC) will announce its decision for the 2016 Summer Olympics host city, many Chicagoans are making plans to prepare for the potential influx of thousands of people into their already crowded city. More than 17,000 athletes and coaches from all over the world may make Chicago their home for the six weeks of training and competition, yet as quickly as they may descend upon the city, they will leave it to return to their home countries around the world. The Chicago 2016 Bid Committee has offered viable solutions to the Olympic housing challenge, but a team of students participating in the Interprofessional Projects (IPRO) Program at Illinois Institute of Technology (IIT) in Chicago has developed an innovative solution of their own in steel.

The IPRO project team has been working for four semesters to explore the concept of adapting steel shipping containers to create affordable housing. The multidisciplinary team includes students from architecture; civil, architectural, electrical, mechanical and materials engineering; political science; psychology and other fields. As part of this investigation, the team has created a sustainable and affordable housing plan designed to serve the temporary needs of thousands of Olympic athletes throughout the course of

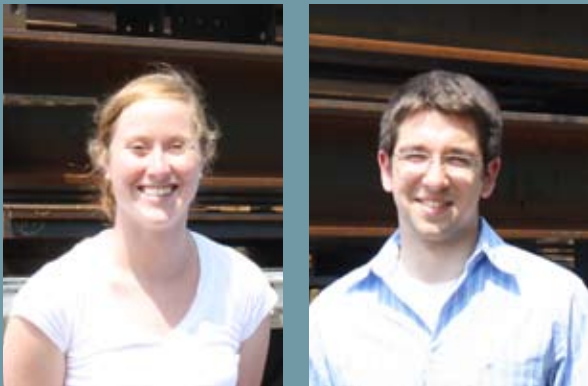
the games, while at the same time providing the city with affordable housing unit options after the Olympic Games conclude.

The team of students has developed a design that uses intermodal steel building units (ISBUs), i.e., steel shipping containers, as the core structural module for the housing complex. These units will be integrated as a cohesive, small village just south of Chicago's Loop near McCormick Place and on the site that is already proposed for Olympic housing. Ultimately, these units can be disassembled and repurposed to provide a unique affordable housing solution for several Chicago-area communities. ISBUs are an extremely economic and viable solution, as there is a surplus of them in the United States that can be acquired at a cost that is compatible with the plans for 2016 Olympic housing and subsequent market-rate housing in the Chicago area.

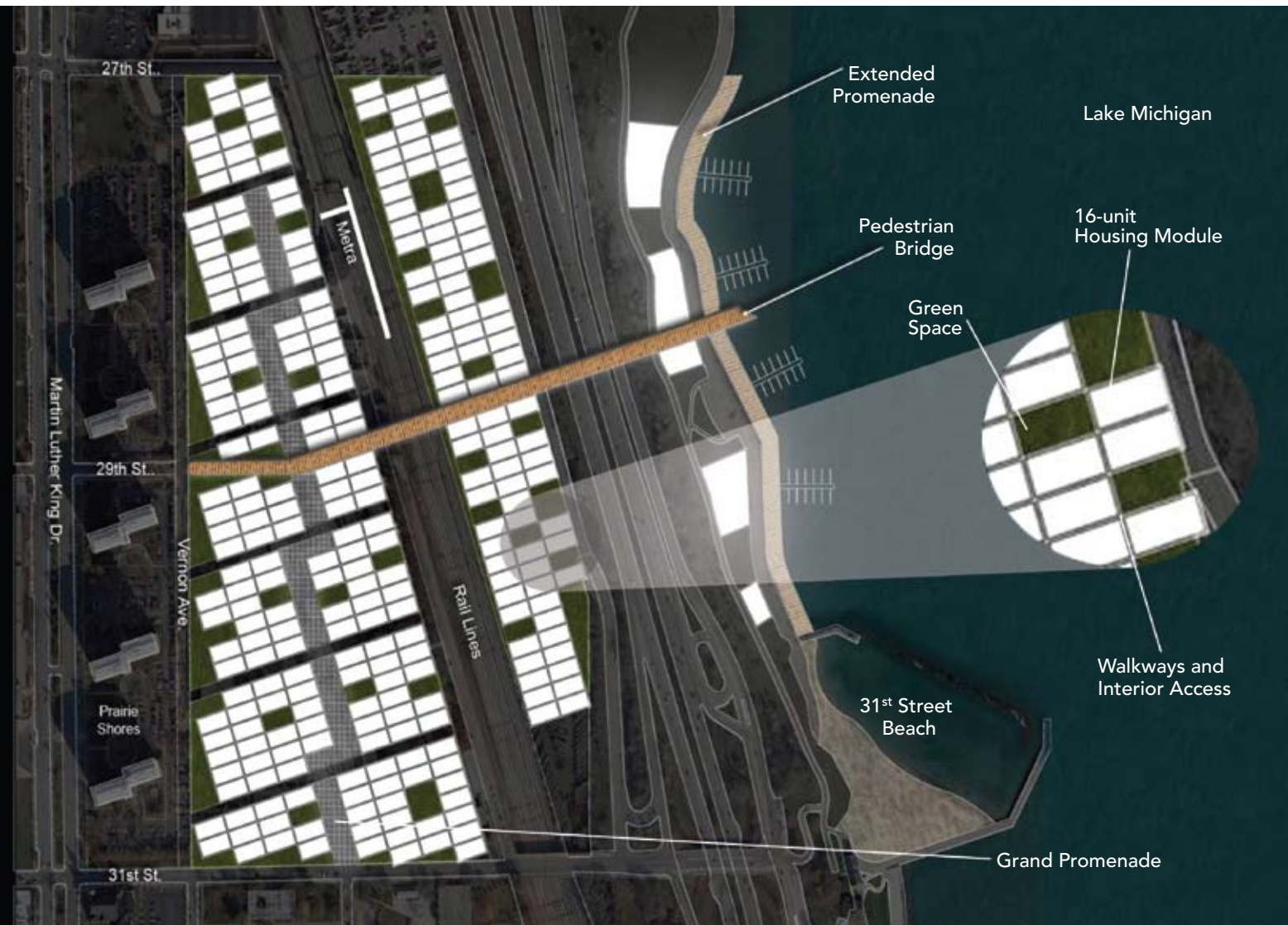
As with any project, there are many design requirements and restrictions, including minimum requirements set forth by the IOC that an Olympic Village must satisfy. The Village must accommodate approximately 17,000 athletes, technicians and other Olympic staff. Each occupant must have at least 153 sq. ft of gross living space, and there cannot be more than two beds per room, although there must be 600 single bed rooms. Half of the units must comply with the accessibility requirements of the Americans with Disabilities Act (ADA) to accommodate Paralympic athletes. Aside from these Olympic Village-specific design limitations, the local building code also must be satisfied. Given that each standard shipping container has an internal clearance of 8 ft, it is also a design challenge to meet the minimum 7.5-ft interior height clearance requirement. Shipping containers come in several larger heights, but the budget and scale of the project has limited the design to 8 ft.

Taking all of these design requirements and integrating them within an established plot of land is another obstacle that has faced the IIT IPRO team. The land set aside for the Olympic Village is on the site of the former Michael Reese Hospital near Chicago's lakefront and McCormick Place. The site is an ideal location with easy access to the city, the lake, and the core of the Olympic venues; however, its size and configuration pose an additional challenge for the IPRO team.

One of the IPRO team's initial concepts represented a high-rise temporary structure on the site with units in an octagonal pattern. This design, however, required the use of elevators and the team decided that erecting elevator shafts in the units for the short six-week Olympic period could not be justified. Instead, the IPRO



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team's conceptual design for 2016 Olympic housing consists of a low-rise community solution without elevators, ranging four floors high, distributed across the expanse of the site. Lower-cost external ADA-compliant modular lifts would provide access to upper floors.

From an engineering standpoint, the use of steel containers poses its own challenges. A shipping container is used to safely and securely transport goods from one place to another. Using these containers for housing causes some concern as they are much lighter than typical structural systems. Nonetheless, the containers and the connections between them must satisfy the dead, live, wind, and other loading requirements. Because two containers make up one unit, one long wall must be cut out completely from each container so that they may be joined. A standard metal-stud wall will be used for room partitions within each unit.

From a mechanical point-of-view, the container must be properly insulated to maintain a cool interior environment during a hot Chicago summer, and keep out the cold in the winter. A rigid foam board, R-16 insulation will be used on the interior of exposed walls for the temporary setting. In the subsequent permanent housing scenario, insulation also will be added to the exterior of the container along with a façade of the owner's choice.

Because the temporary Olympic housing is going to be disassembled, relocated, and reused for permanent housing after the 2016 Olympics, plumbing, HVAC and electrical connections must be

Above: The proposed site plan for the Olympic Village features a variety of common spaces including lakefront access and recreational areas.

Below: For the Olympic Village, a typical four-level housing module will consist of 32 steel containers transformed into 16 housing units.



Images by IPRO Program at Illinois Institute of Technology



Above: It's difficult to distinguish the kitchen/dining area of a permanently installed ISBU dwelling from a traditional residence.

Right: Athletes will experience all the comforts of home in their temporary housing at the Olympic Village.



Images by IPRO Program at Illinois Institute of Technology.

designed for easy and reliable assembly and disassembly. A forced air, heating/cooling system will be installed in each unit to satisfy the individual needs of each residence. The whole system must be designed in a way that achieves the short-term goals associated with Olympic housing, while not compromising the long-term needs associated with subsequent use as affordable housing. The system must offer a strong value proposition for its intended long-term occupants and assure a fair resale value in the marketplace.

Using intermodal steel building units as the primary building blocks of a temporary Olympic Village has the potential to be an extremely sustainable and affordable solution. Recycling the ISBUs to create affordable housing not only reduces their surplus within the United States, but their original function as shipping containers permits easy relocation to areas where they can be converted into permanent, affordable housing.

As Olympians from around the globe prepare for the next Olympic Games, many are also anticipating the announcement of the host city for the 2016 Summer Olympics. Little do they know, however, that they may be staying in a housing structure that has traveled as far as they have. **MSC**