Students Build Sustainable Home for a Wounded Warrior

In the fall of 2011, students and faculty from the School of Architecture and Planning began working on their entry for the U.S. Department of Energy Solar Decathlon. But beyond building an efficient house, the students’ goal was to build a home — a place of solace and healing for a wounded veteran.

Over eight days in October up to 4,000 people a day toured a house designed and built by Catholic University architecture and planning students for the U.S. Department of Energy (DOE) Solar Decathlon. But one tour on the final day of the international competition meant the most to the student designers.

To anyone else at the decathlon site in Orange County Great Park, in Irvine, Calif., the approaching figure was just like many visitors that weekend. He was unassuming — wearing khaki shorts and sunglasses — and walked a white Labrador on a leash.

He was actually the person members of Team Capitol DC were most eager to meet. He was their client — a post-9/11 veteran — for whom they had intentionally designed and built their home. They had spent two years discussing every detail — from paint color to decking material — with this person in mind.

Finally, they were ready to show the fruits of their labor to the judge who mattered most to them.

A Home, Not a Showpiece

Simply being chosen to compete in the decathlon — a biennial event that challenges students to design, build, and operate solar-powered houses that are attractive as well as cost and energy efficient — was like winning a competition. Before entering, the team had to familiarize themselves with a 70-page rule book. They submitted a request for proposal that was reviewed, scored, and ranked by the DOE. Forty teams submitted proposals in 2011 and 20 from around the world were chosen for the 2013 decathlon.

Team Capitol DC found out it was accepted for the decathlon early in 2012. It was the first team from Washington, D.C., to earn a coveted spot in the competition.

To them, “sustainable” also meant their house must be built for a specific person to actually live in so that it served a purpose beyond the contest. They decided to design a home with
a veteran in mind, and began searching for a veterans organization to take possession of it after the competition.

Keeping the theme of sustainability in mind, the students looked for an option that would avoid the need to ship the home far from the decathlon site. They chose Wounded Warrior Homes, a nonprofit in Southern California that serves medically discharged, single men and women of the armed forces with traumatic brain injury (TBI) and post-traumatic stress disorder (PTSD).

“This is what we’ve been building for,” said Amanda Stacy, CUA student in the joint Master of Architecture (M.Arch.) and Master of Science in Sustainable Design (M.S.S.D.) program and MEP (mechanical/electrical/plumbing) coordinator for Team Capitol DC. “We built a house to be a home. Not just a showpiece for a one-week competition.”

Learning Along the Way

The CUA architecture students competed in the Solar Decathlon as Team Capitol DC, together with engineers, interior designers, and landscape architects from George Washington University and communications students from American University. They were the only team made up of three universities.

“It took a huge amount of expertise to mount such a complex effort,” said Randy Ott, dean of the School of Architecture and Planning. “Without the skills and resources of the three schools that make up the CUA, this project would never have come to fruition. We had the full range of talents necessary to make this happen.”

Recognizing that the students had varying backgrounds, they partnered with experts andCrough Center for Architectural Studies. They would pore over design sketches, revisit the planned timeline for construction, and discuss what donors each school had contacted and what materials had been acquired through donations. In addition to raising enough funding to build a house, they also had to figure out how they could transport it across the country.

As time passed, discussions became more focused on the details of building. “This was more of a learning experience than I could have hoped for,” said Kyle Noell, M.S.S.D. student and Team Capitol DC construction manager. Noell said he had to figure out how to prepare for worst-case scenarios. Although the team might achieve a consensus, he said, “We’ve learned that it was always a balance of economy, sustainability, and time. You can’t do it all.”

A Multifaceted HARVEST

Early in the process, the team named its house HARVEST HOME. In the joint Master of Architecture (M.Arch.) and Master of Science in Sustainable Design (M.S.S.D.) program. “Coordinating with contractors and incorporating engineering systems are not typically things you do at a small firm,” she said.

Architecture alumnus Sean McTaggart,
There was only one crack in the drywall they had to repair. "It's a rare opportunity to work on a job site like that and see how a building comes together through both design and construction," he said. "They are usually two separate worlds."

**Negotiating a Wide-Load Journey**

After the team spent six months constructing their house, they had about six days to take it apart. The day after they were finished building the home — and after a house blessing and send-off celebration — disassembly began so the house could fit on two flatbed trailers to be transported to the competition. The house had been built in two modules that were connected in a hallway so that it could be taken apart more easily for the cross-country trip.

The moment Bobby Blabolil, M.Arch. and M.S.S.D. student and Team Capitol DC project manager, had been looking forward to most came when the crane loaded the house onto the trucks for the journey. To Blabolil, this signified that they had completed the project and were ready for competition.

In the spirit of always being prepared for worst-case scenarios, Blabolil and classmate Jeremy Haak followed the house from coast to coast. They wanted to be able to respond immediately if anything went wrong, and they were eager to document the eight-day trek for the other members of the team.

Most of the bumps in the journey occurred while the trucks were still in D.C. Hoping to leave first thing in the morning, the team grew anxious as the drivers were delayed more than four hours because of issues with permits for transporting large loads through the city. The convoy of four large trucks and Blabolil's personal vehicle were slowed down again in Tennessee because wide loads can't drive in the state on Sundays. And on the way into Arizona, the larger module was held up at border patrol for four hours because of its size. Blabolil and the other trucks stopped and waited for it to catch up Friday night before driving into California.

As soon as they arrived at the competition site, Blabolil met up with students who had flown to California earlier in the week. "We cut open the shrink wrap and hopped in to survey the damage," he said. "There was only one crack in the drywall they had to repair.

### Competition

As the competition began, the team remained confident that they would perform well. They were the first team to connect to the solar decathlon village's "microgrid," signifying that their electrical systems were fully installed and operational.

In the early stages of the 10-part competition, the team placed well. Although they didn't place first in any individual contests, they earned enough points to hang on to a first-place overall ranking for several days, and were in the top three of the people's choice category for most of the competition.

The team slipped in the rankings when the results of market appeal and affordability were announced. Fearing that the judges may have misunderstood the narratives the team provided about their intended occupant, team members debated whether it was worth it to file a protest. Other teams had filed protests, but up to this point no team had earned back any additional points. With only minutes to spare in the 24-hour deadline for filing a protest, the students submitted their argument. They would later learn they earned back two points.

On the morning when the results for the seventh element of the competition — architecture — were to be made public, Team Capitol DC gathered with the other teams in an airplane hangar in the Great Park. As the descriptions of winning houses were read, students wondered if they could be one of the top three competitors.

Spirits sunk when that morning's award ceremony was over and the team didn't earn a trophy. It fell to eighth place. Team members raced back to HARVEST HOME and gathered in groups to review the jury members' remarks. They studied the notes to see why they didn't place higher. Several days later at the closing ceremony, they would learn that the cumulative scores for the competition were the closest in the history of the solar decathlon.

Team Capitol DC placed seventh overall out of 19 teams. Most of the teams came from the U.S., though two were from Canada and two were from Europe. Home field advantage didn't help, as the Austrian team emerged victorious. Team Capitol DC placed in the top five for six of the 10 contests: communication, energy balance, home entertainment, appliances, comfort systems and hot water.

Approximately 30 points (out of 1,000) separated Team Capitol DC from the first-place team. And every house that competed was net plus (creating more power than it used).

"The competition started with objective, technical contests that involved the reading of instrumentation," Grech said. "Because of their background in the M.S.S.D. program, many of our students had a good understanding of those technical criteria (probably better than the students in other teams). The juried contests (architecture, market appeal, engineering, communications and affordability) kicked in a few days later. They are, by definition, more subjective. The judges did not always agree with or understand our priorities in design, so they did not score us as high as we had hoped."

The students and faculty of Team Capitol DC gathered every morning on the deck of HARVEST HOME to review what would happen that day and talk about where the team stood in the rankings. At one of the last meetings — which was held around the Harvest Table — the team spokesperson, Claire Amosworth, M.S.S.D. student and competition manager, rallied the decathletes, saying, "This is our Harvest. It’s time to reap what we’ve sown. It’s time to celebrate."

The last night of competition the students gathered in HARVEST HOME. They sipped sparkling cider and snacked on cheese and tomatoes that were grown in the planters around the house's deck. Mia and Steve Roseberry of Wounded Warrior Homes presented engraved wooden plaques to each of the three schools on Team Capitol DC that read, "Thank you for the support. We will continue your legacy." As the students gathered around to read the inscriptions one remarked, "This is better than a first-place trophy."

**HARVEST Becomes a Home**

On the final day of public tours, a handful of students were sweeping the floor and washing handprints off the windows from the previous day's tours. Several students from the landscape design program at George Washington University carried bucket after bucket of water around the decks to all the plants. Others sat around the Harvest Table folding the last box of brochures to hand out that day.

But a cloud of anxiety hung in the air as the students waited for that moment when
Tours led by Team Capitol DC during the Department of Energy’s 2013 Solar Decathlon included six stops: Harvest Table, mechanical room, living room, kitchen and bathroom, bedroom, and deck.

“Within HARVEST HOME lies a story behind every board, every piece of flooring, and every grain of wood,” read a sign at the entrance to the house.

Harvest Table
Located on the deck, the Harvest Table was designed by students to offer an extension of living space outdoors. Water flows down a trough in the center of the table. Along the trough grow edible plants and herbs that the occupant can incorporate into meals.

Mechanical Room
The house was designed to be — at minimum — net zero (a building that creates as much energy as it consumes). However, the house performed at the solar decathlon competition as a net positive home, producing more energy than it used.

Living Room
The flooring throughout the house is 100 percent repurposed. Students in a course on sustainable materials harvested the wood from a 140-year-old church in Ohio. (See web extra)

Noting that the first occupant of the home is Catholic, Steve Roseberry, co-founder of Wounded Warrior Homes, said, “For the veteran to know that the floor of his home is from a 140-year-old church, that can give him some grounding and help him to heal.”

After meeting with veterans and mental health practitioners, the students chose purple and green as accent colors in the house. These colors offer psychological benefits associated with healing, renewal, tranquility, and balance.

Kitchen and Bathroom
The kitchen and bathroom were both designed to be universally accessible. They feature lower countertop heights and spaces (such as the sink) that easily accommodate a wheelchair.

Opposite the kitchen are sliding louvered doors containing the Harvest Shade Screen. Students worked with professional engineers to create the series of horizontal louvers that react to heat and close in order to passively shade the building from bright light and the heat of the sun. When the louvers cool, they open to allow light to enter.

Bedroom
The bedroom offers a private space. The interior layout was designed with accessibility in mind. Pathways are wide enough for a wheelchair. Soothing touches of purple and green are repeated in this space.

Deck
Outside the bedroom is a private deck positioned so that the occupant can enjoy the rising sun in the morning while having a cup of coffee or breakfast. Next to the deck grow edible plants native to Southern California. The plants are grown in movable milk crates so that the plants’ height can be adjusted easily if a person is unable to bend down or needs to access them from a wheelchair.

A cistern collects rainwater diverted from the roof in addition to water used inside the home in the bathroom sink, shower, and dishwasher. This water is reused for irrigation.

At the request of the veteran, we are not revealing his name and photo.

For more information, visit the team website teamcapitoldc.org.

Web Extra: To learn more about reclaimed materials and view a video and a photo gallery of HARVEST HOME, visit cuamagazine.cua.edu.