“REBAR”: Making the Ordinary-Extraordinary

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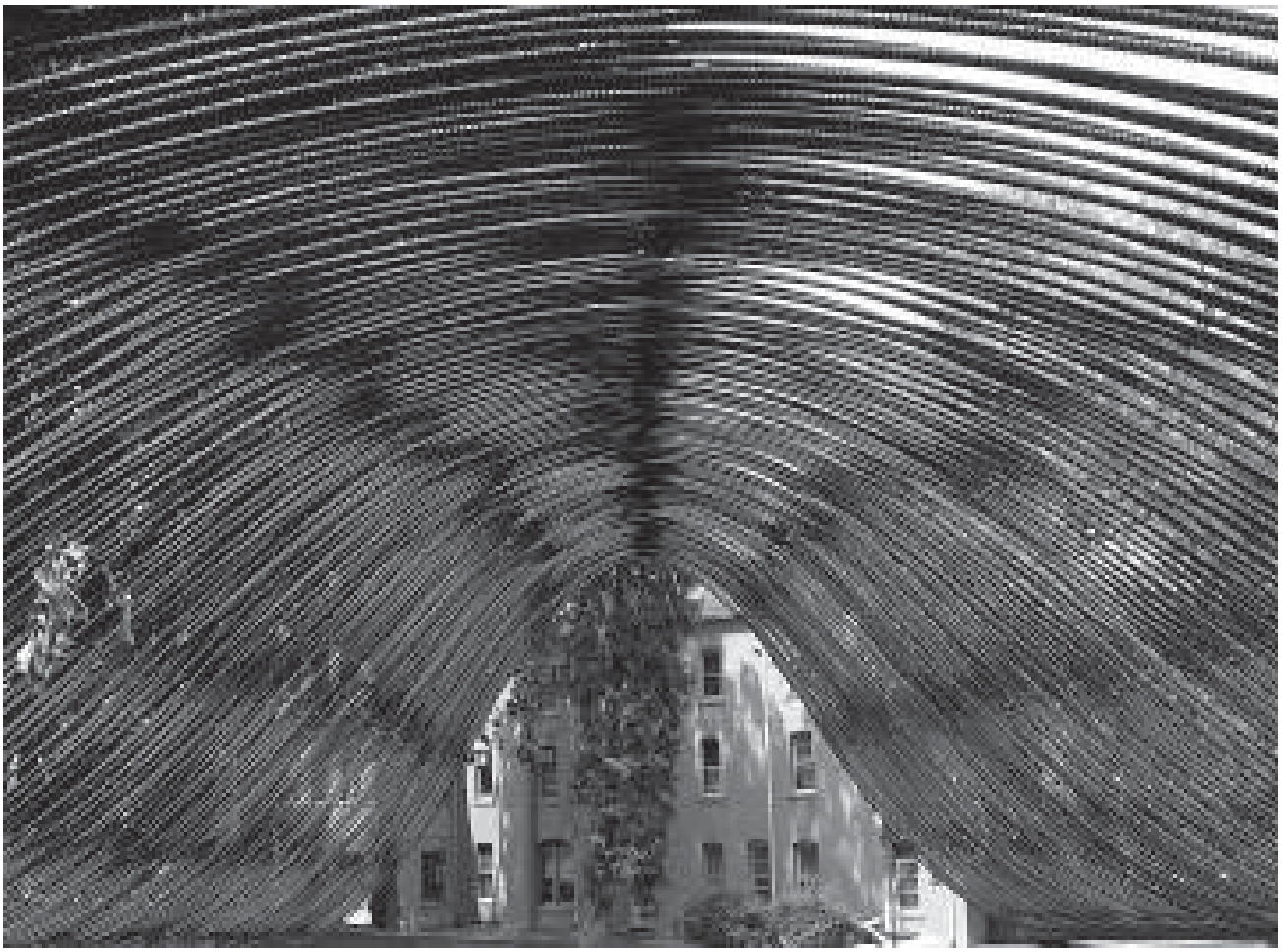

Figure 1. View from within structure called “rebar” on Lehigh University Campus

CREATIVE COLLABORATION

This collaborative project engaged students in the exploration of rebar, a commonly used construction material, in ways that blurred boundaries between the disciplines of art, architecture, and engineering. The artist/architect, Frank Fantauzzi, was chosen as the first visiting faculty for what is intended to be a series of design/build projects in our department of art and architecture because of

his critically acclaimed work focusing on site-specific urban interventions that aim to disclose the parallels between social and tectonic structures. As well, important consideration was given to his evident ability to engender a sense of group ownership through creative collaboration with students and professionals. As an architectural faculty at the University of Buffalo, Frank is familiar with abandoned industrial landscapes and appreciates the inherent beauty within their material nature. Lehigh University overlooks the renowned Bethlehem steel plant. Many of the greatest pieces of architectural construction, including the Empire State Building, the Chrysler Building, the Golden Gate and Verrazano Bridges, were realized by steel produced here. With the influx of competitively produced foreign steel and smaller companies not burdened by expensive union workers and top-heavy management structure, the Bethlehem mills closed in 1997, leaving behind a piece of American history and a vast industrial landscape slated for major transformation, a bountiful source of inspiration for our first design/build visiting artist/architect.

Figure 2. ATLSS Research Center testing strands of rebar for bending

I initially proposed a project inspired by a visually intriguing image of an abandoned room at the Bethlehem Steel site, "The Welfare Room." In it, steel baskets once used to hold personal items of the employees are suspended in mid-air at staggered heights just as they were left when the mills closed in 1997. The now empty chalices evoke the soul of each worker. We posed the question to our students; "How does one memorialize this haunting room in an architectural design translation?" Each student began investigating possible means of transferring this ready-made installation to a place designed to amplify its potency.

During the early stages of this project we engaged in many conversations about the history of steel production and how Lehigh University played a significant role in expanding the exploration and testing of these new processes. To further explore methods and materials, we toured our Center for Advanced Technology for Large Structural Systems (ATLSS) and became fascinated by the capabilities of the Structural Testing Lab and the possibility of engaging their expertise. What began as a collaborative effort between art and architecture grew to include engineering. The "rebar" project, exploring conceptual and material transformation, emerged.

Figure 3. Testing height and deformation during installation of structure on site

This was a rare opportunity for thirteen students, primarily from art and architecture, to work alongside world-class engineering experts. We began by investigating an ordinary material, steel rebar, commonly used to reinforce concrete, by conducting a series of studies exploring the inherent properties of rebar, including its flexibility and strength. Frank Fantuzzi, as our Artist-in-Residence, and the Lehigh students sought to test certain assumptions in order to more fully understand the latitude of this structural material. The studies, carried out by Dave Altemus, Joe Cheszar, John Hoffner, Roger Moyer, and Richard Sause of the ATLSS Center at Lehigh University, performed at 2/3-scale, estimated the forces and deformations required to produce sculptural form sketched by Frank that would use 30 ft lengths of ¾ inch diameter rebar.

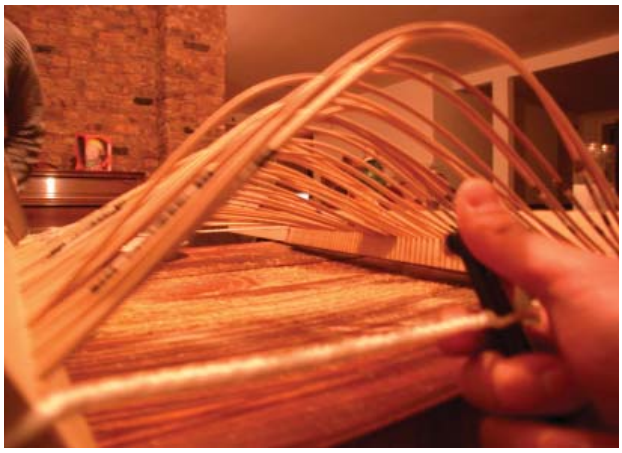

Figure 4. Model of proposed structure by Frank Fantauzzi and icebergprojects.com

Figure 5. Presentation to Richard Sause by Frank Fantauzzi, James Cathcart & Anthony Dong

After exploring the deformation of a standard piece of rebar in the lab, we bundled several pieces together. By compressing each end of the bundle toward the center, similar to when a folded belt is pushed together to snap on the rebound, we discovered natural contours the rebar took under compressive forces. By elevating the importance of the material imagination in the creative design process, we transformed the ordinary into an extraordinary poetic architectural construct.

Once we received the results of the ATLSS Center tests Frank returned to Buffalo to engage in a series of design investigations with his collaborative design partners, James Cathcart and Anthony Dong, (icebergprojects.com).

Several weeks later, they returned to Lehigh, bringing with them a large and rather unwieldy model strung with heavy gage wires stretched between two pieces of wood.

The students reconvened to watch in anticipation as Frank activated the model by twisting a small piece of wood, tourniquet fashion, thereby pulling the two parallel pieces of wood together at one end to transform the rectangle into a trapezoid. The construct seemed to inhale as it formed into a graceful compound curve. The "backbone of a whale," one student whispered. "It seems alive," another commented. In wonder about what we had just witnessed we immediately began to consider, "how are we going to build this?"

Figure 6. Lehigh students preparing for placement of footings

Figure 7. Lehigh students preparing rebar for welding during installation

Figure 8. Help from friends and students from Buffalo to thread rebar into the perimeter steal beams

Figure 9. "rebar" takes life as post tensioning rods pull the two perimeter beams together

At this point in the design process it was very important to engage the engineers from ATLSS in this excitement in order to have their invaluable assistance in the fabrication and installation of "rebar". We arranged a meeting with Richard Sause, director of ATLSS, and presented our model for his review. It was as if we were once again young children in a giant playground; our shared spirit of wonder and level of exhilaration rose as the model was activated once again. The simple form of multiple parallel pieces moved in unison to form a complex and most natural hyperbolic contour. WOW! ! We were now all ready to make it happen.

Site selection was the next task. We looked at several spaces on campus, each presenting a particular challenge. In the end we chose a gently sloping site, situated between the architecture and the engineering buildings, that also served to create a symbolic bridge between our two disciplines. Numerous students traverse this space frequently on their way between classes, providing the exposure and daily interaction that we desired.

After receiving approval from the university we began to survey the lot. We calculated the proper foundations necessary to transfer the loads of the 30' x 30' structure and starting digging the footings. It was very important to me that our students be involved with every aspect of this project from discussions about load calculations to the physical loading of wheelbarrows with dirt removed to prepare for the footings to be poured. No matter how difficult the task, there was never a problem in getting students to work; their enthusiasm about the project was unbounded. Frank returned to the Lehigh campus approximately every two weeks while in the interim, I coordinated the project with the engineers and arranged for our students to complete a set of scheduled tasks for Frank to review upon his return.

The framing for the footings were prepared in the shop and installed at their proper placements on the site. We consulted with our engineers and relied on our architecture and engineering majors to verify that construction specifications were followed.

The rebar was appropriately installed at specified locations within the frames. It was interesting for everyone to observe and acknowledge that the traditional use of rebar, as a strengthening device within our concrete footings, would soon support the non-traditional use of the material as an aesthetic conceptual transformation. The innovative application and transformation of this common element elevated our excitement; "rebar" would soon have in its day in the light.

While the footings were being poured the steel beams were being fabricated at the ATLSS Center. Once they were delivered to the site they were fixed temporarily to steel plates bolted to the footing projections.

Now began the complicated game of threading the rebar rods into the intricate pattern Frank had devised after many experimental trials in model and

Figure 10. Post-tensioning rods applied to front opening of the grid and slowly cranked.

Figure 11. Engineering consultant welding the beam into place.

drawing. The perimeter beams were numbered and the students began the process of interweaving rebar. Frank invited several of his students and friends from Buffalo to help with this process. After an arduous three-day weekend, the scene was set for the "big squeeze."

"The Big Squeeze"

Now that the 30 by 40-foot wide interwoven grid of rebar was constructed on a flat plane with the ends of the rebar threaded and welded into two perimeter steel I-beams, we all prepared for this next event. Lehigh students, faculty, and other onlookers watched with a look of puzzlement and consternation; Frank and "our gang," poised with their cameras and great expectation. The engineers brought out the big guns as they prepared the stage for the "big squeeze." The post-tensioning rods, added to the front opening of the grid, were slowly cranked by enormous pressure, monitored meticulously by the engineers, causing the once rectangular grid to form into a trapezoid.

As the post-tensioning rods slowly drew the front face of the rectangle together, the rebar ribcage seemed to inhale slowly, over a period of 12 hours, to arch 12 feet above the ground at its highest point. As the rebar assumed its final form, intersections of rebar were welded together to increase strength and integrity of the structure.

Video cameras broadcast the event on a closed cable channel throughout the campus and on several outside web casts. This seemingly organic structure assumed its presence upon a once placid field of grass.

This phenomenal space, transformed by light and shadow, and seasonal change that alternately highlights the thin rebar ribs with snow and ice or the green of the grass contrasting the rust of the rebar now activates the site.

It stands as a symbol of wonder for passersby and acts as a formal architectural shell for student gatherings and official occasions. The common material 'rebar,' was transformed from ordinary into extra-ordinary, assuming a lasting presence on the Lehigh campus, paying homage to steel and the art of collaboration in the form of an extraordinary poetic architectural construct.

Figure 12. View of design/built structure called “rebar” on Lehigh University campus with architecture building in the background