College of Architecture and Urban Planning,
University of Washington
Seattle, Washington

An Adaptable Community Aquatic Center

2nd Place Entry in the 2005-2006 ACSA/AISC Student Design Competition

by **Rebecca L. Roberts**

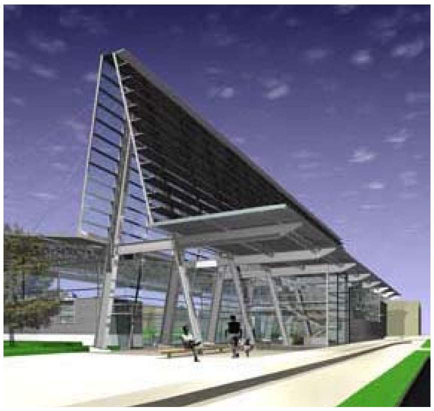

Figure 1: **The main public entry from the street.**

The 2005-2006 ACSA/AISC Student Design Competition challenged students to explore the use of steel as the primary structural material in the development of a design for a Community Aquatic Center. The program requirements included a natatorium with three pools, spectator seating and concessions, wet classroom, administration and lifeguard space, as well as other support spaces. Given a hypothetical site, **form•Z** proved valuable early in the design process as a means through which to synthesize fragmented site information into a comprehensible whole.

Observing water as an adaptable element that changes its form and state in response to its environment, a concept of adaptability was applied to this project. The design is that of an element which may transform in response to internal or external demands. The linear, rigid forms of the primary steel structure juxtapose the transformative nature of the enclosed water. This design explores the potential adaptability of a community

A Student Design Competition in a Tectonic Studio by Richard E. Mohler, AIA

This project was completed in the context of a required, ten-week, second year design studio at the University of Washington. The course, generally referred to as the tectonic studio, is taught in conjunction with a design development course, the principal requirement of which is the construction of a large-scale section model of the studio project in week seven of the term. The pedagogical intent of both courses is to reveal to students the tectonic implications of their design decisions while introducing them to the potential of tectonics as a conceptual impetus for design. The ACSA/AISC student design competition provided an ideal framework with which to pursue these goals. In addition, the competition, with its limited presentation format, compelled students to rigorously define their conceptual positions and the means by which they were represented.

The illustrated project exemplifies the pedagogical intent of the studio in both process and result. Conventional and digital drawing and modeling techniques, including **form•Z**, were employed throughout its inception, development and presentation. **form•Z** was used to model the hypothetical site and explore potential building strategies within it. Once a site/building strategy was established, conventional and digital drawing techniques were employed to quickly assess variations on the 'mast and roof' diagram. A critique with an invited structural engineer mid-quarter led to the 'A-frame' mast, which provided greater strength and stability than other variations. A ¼" = 1'-0" physical model of this condition served to confirm the structural integrity of the design and clarify joints between structural members and between structure and enclosure.

Beyond this stage, digital modeling with **form•Z** provided the most comprehensive understanding of the design's spatial and tectonic potential and prompted several design revisions. For example, the triangular form of the masts, which had previously extended through the roof to be exposed on the exterior, were instead clad in continuous glazing and exposed within the building. The resulting vertical section at the upper level reinforced the conceptual and spatial importance of the community space on this floor and allowed the structural diagram to be legible from within as well as outside the building. The physical model was, in turn, dismantled and reassembled in response to the revisions explored in **form•Z**. **form•Z** modeling also enabled the development of a vocabulary of clear and consistent details accommodating a wide variety of conditions throughout the project to a degree that would not be feasible using hand drawings or other means of two dimensional representation.

The use of the **form•Z** model in presenting this project was particularly successful. The quality of light and transparency one would experience in the space was portrayed to a degree not attainable with less sophisticated modeling programs. **form•Z**'s ability to clearly render details and connections afforded an essentially seamless integration of the digital model images with photographs of the physical model within the presentation.

In sum, the selected project embodies an exceptionally successful use of **form•Z**. This was largely due to its integration with physical drawing and modeling in a fluid and cyclical design process. From an instructor's perspective, the only shortcoming of the program was its tendency to task the student owned hardware it employed. **form•Z** simply took significant time to regenerate a rendered image when views were changed. This tended to limit the extent to which the project could be reviewed within the timeframe of a desk critique.

aquatic center in the following ways:

- Response to programmatic demands, providing enclosure or extension of activity space related to functional nature and season.
- Response to environmental conditions, adjusting the quality of ventilation and daylighting of interior spaces.
- Response to structural demands and gravity through the development of a suspended roof system, producing an open spatial condition.

The use of both digital and analog media provided valuable exploration of these goals for adaptability, addressing functional, environmental, structural, and tectonic, issues. These components of design were investigated both through a physical sectional model (Figures 6) and a digital model which showed the urban context (Figure 2). Working with a digital 3D model allowed simultaneous exploration of site response and tectonic development, providing a visual representation of how these elements worked within the overall design.

Adapting to programmatic demands, the building acts as a dynamic organism which provides full enclosure during cool seasons, and opens outward for warm-weather activity (Figures 3b, 3c). With the north wall withdrawn, the site becomes a single large space for activity, defined by main building masses to the south and west, and dense landscaping to the north and east. The interrelation between interior and exterior space is blurred, providing accessibility to and visibility from the natatorium. This activity "room" extends in layers through the covered space of the building to the open-air exterior, with seating elements integral to the structure of these spaces. Spectator seating cantilevers from the masts which support the roof structure, while benches at the entry porch are attached to the same steel masts. Exterior seating steps upward from the cast-in-place concrete foundation, adapting to a different structural condition. While a physical model provides an abstracted representation of the structural system and its plausibility for resisting forces, a digital model

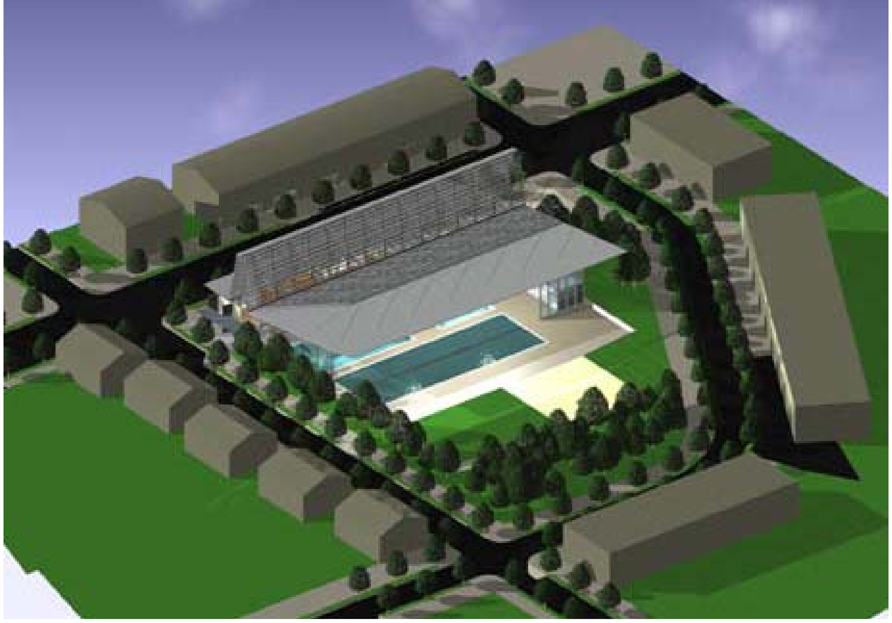

Figure 2: **The project blurs the boundary between interior and exterior.**

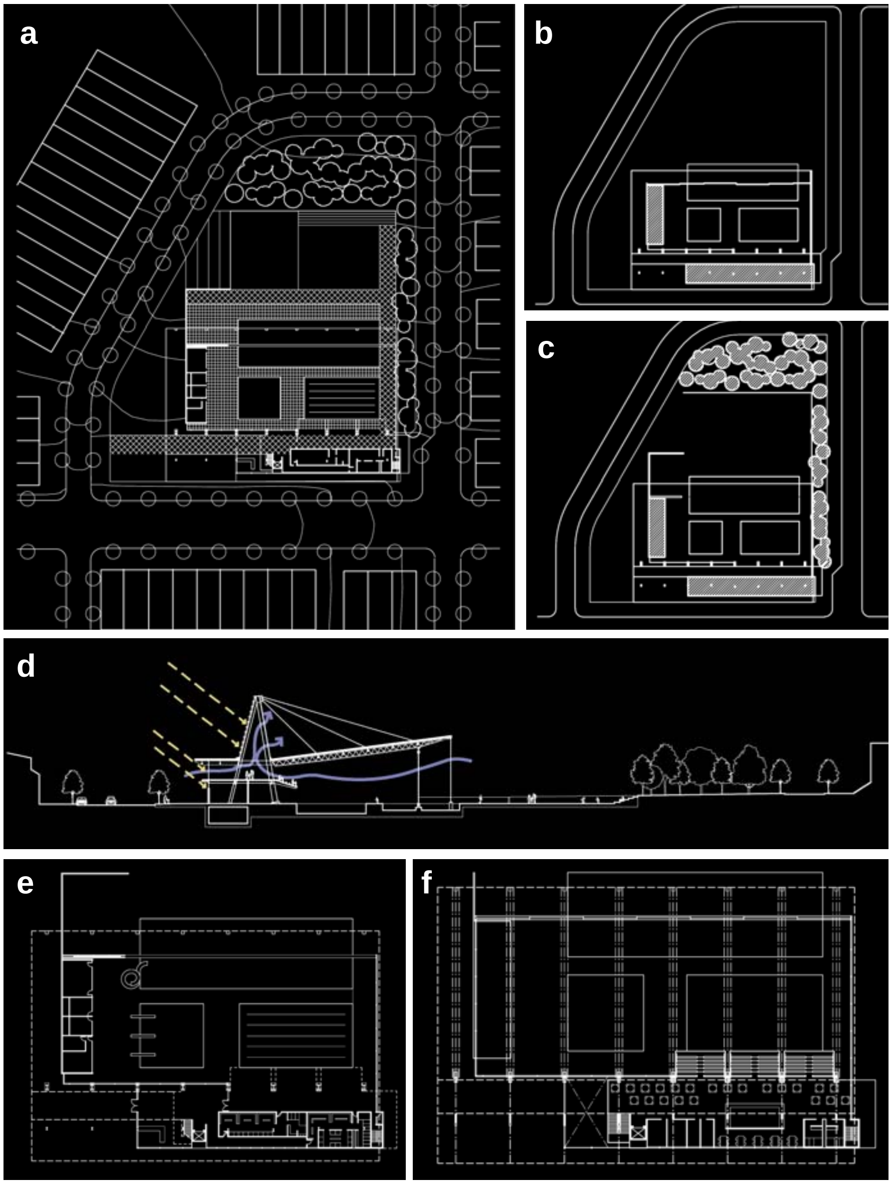

Figure 3: **(a) Site plan; (b) spatial enclosure; (c) spatial extension; (d) site section; (e) ground floot plan; and (f) second floor plan.**

completed with form•Z best provides a realistic graphic representation of materials and the structural integration of the whole.

In addition to the retractable north wall partitions, several elements allow for adaptability to environmental conditions. Combined with operable windows in the skylight and clerestory of the south elevation, this transformative enclosure creates a breezeway of continuous natural ventilation during appropriate seasons (Figure 3d). Likewise, interior partitions provide thermal separation between the natatorium space and enclosed program elements along the south side of the building. Operable louvers on the south elevation and skylight allow solar control within work spaces and the second-floor public space, while vegetation provides daylighting control on the eastern and western ends of the building. Digital capabilities allowed for the exploration of lighting and shading effects, providing a preliminary assessment of the requirements for controlling natural light.

The design of the suspended roof structure strives to create a primary interior space that is column-free on its north side, giving this space the ability to literally extend, uninhibited, to the exterior. The a-frame configuration of wide-flange steel masts and tiebacks support the suspension of long-span tube-steel triangulated trusses over the natatorium (Figure 4). An adaptation of the larger scale pin connections which attach the steel trusses to the masts, a series of clevis connections join suspension rods and cross-bracing to plates set within the all-weld connections of the mast structure. Second-floor program elements are supported on cantilevered beams extending through the depth of the a-frame. The cafe space provides a sense of verticality and visibility of the roof structure through a skylight, while also serving as a vantage point from which to see the extension of uninterrupted space stretching horizontally to the exterior (Figure 6). The robust structure serves as an indication of the building's significant role in community events and activity.

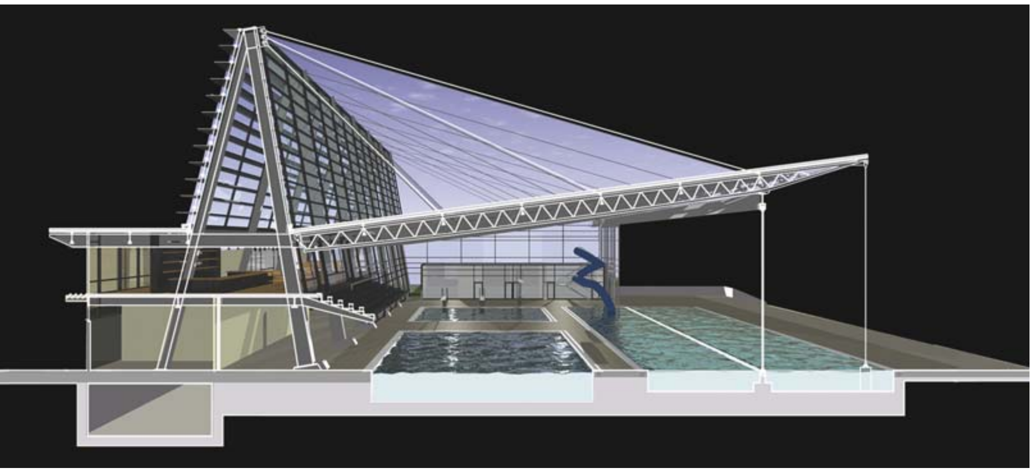

Figure 4: **Section perspective view showing structure and spatial relations.**

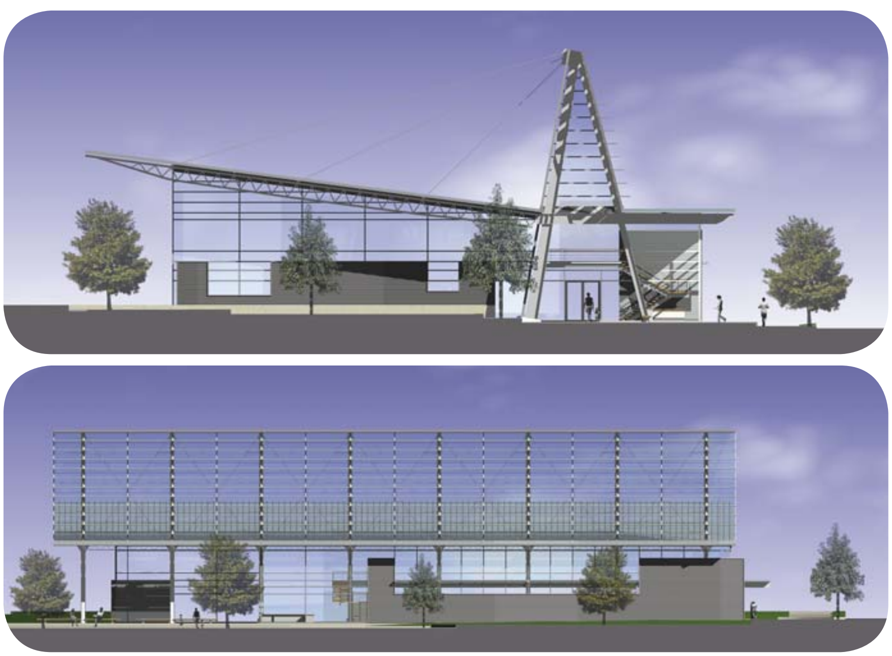

Figure 5: **West (top) and south (bottom) elevations.**

Figure 6: **A physical tectonic model for exploring structure and details.**

For this project, form•Z was most useful as a tool for generating the final representation. As a submission for the ACSA/AISC Student Design Competition, it was critical that the final product be both clear and interesting, as the presentation would not have the benefit of an oral explanation. The explanatory renderings provide an effective illustration of the ideas and development of design, enhancing the understanding of the intended experience of the building through texture, materiality, and light. Such a comprehensive description is not easily obtained through other means, and provided a crucial advantage where entries were restricted to still images with a limited amount of display space. The digital images presented a convincing representation of structural integrity, demonstrating steel's ability to gracefully span a significant distance and provide programmatic flexibility. The use of light and shadow brings viewers to the human scale, illustrating how the concept of adaptability led to a response to human needs relative to their environment. Enhancing renderings with Adobe Photoshop and composing presentation boards with Adobe Illustrator led to a compelling, succinct display that successfully conveyed the important ideas and goals of the project.

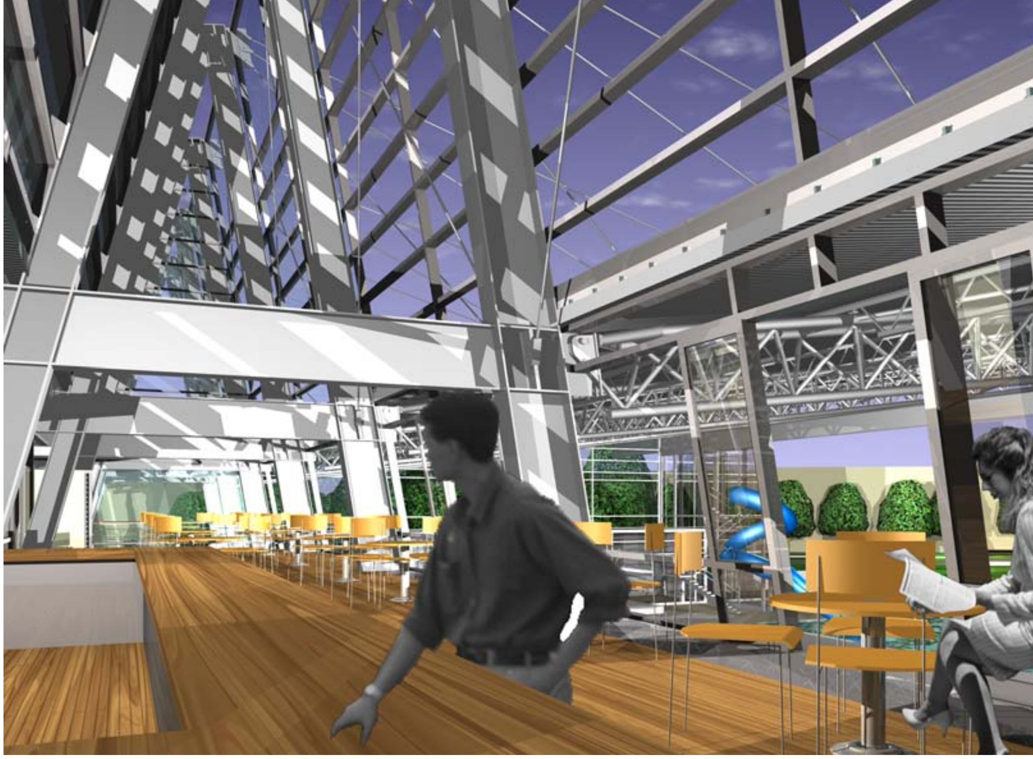

Figure 6: **The Cafe space provides a view of the glazed A-frame structure.**

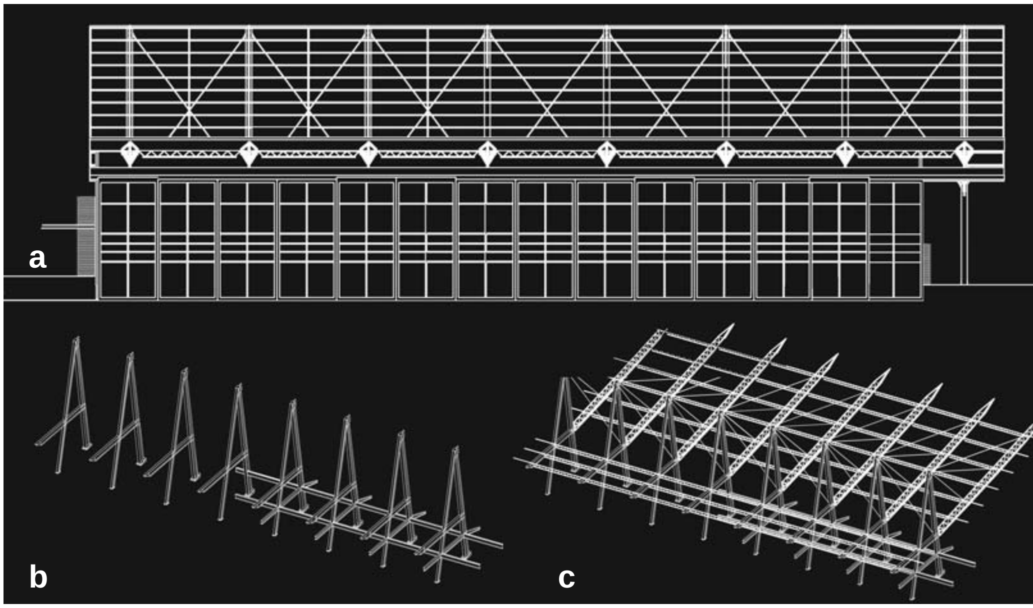

Figure 7: **Structure: (a) north elevation, (b) primary frame, and (c) roof.**

Rebecca Roberts is a student in the Master of Architecture program at the University of Washington in Seattle. She received her Bachelor of Science in Architecture from the University of Maryland, College Park. Prior to pursuing her Masters Degree, Rebecca worked at Design Collective, Inc. in Baltimore, MD. There she contributed to various architecture and urban design projects, including several public charrettes for urban revitalization. She received a 2nd Place prize for her entry in the 2005-2006 ACSA/AISC Student Design Competition. The project has been published in the ACSA/AISC Student Design Competition book, as well as the University of Washington's Skin 3.0 publication of student work. Email: beckylr@u.washington.edu.

Richard E. Mohler, AIA, is an Associate Professor of Architecture at the University of Washington and a principal of Adams Mohler Ghillino Architects in Seattle. He received both Bachelor of Arts and Master of Architecture degrees from the University of Pennsylvania. Mr. Mohler's academic responsibilities include teaching graduate level design studios and advising master's thesis students. His architectural practice, which specializes in residential and small-scale commercial projects, has been recognized through local and regional AIA awards, national design competitions and publications.