Exploring the Constructability of 'Imagined' Realities

By **Thomas Fowler, IV**, Associate Professor
California Polytechnic State University, *San Luis Obispo, California*

In the third year of the 5-year Bachelor of Architecture Program, **form•Z** is used as the preferred 3D digital modeling tool. **form•Z** is used with a range of other 2D digital media (Photoshop, etc) along with 3D traditional-digital media (physical models, plan & section drawings) that allows the architecture students to go back and forth between multiple mediums during the design process. This particular methodology has the advantage of revealing more quickly and more clearly, weaknesses in the developing project as well as inconsistencies between a student's original intentions (for example about how daylight will change the character of a space) and what is revealed in their work as the design evolves. Being able to use **form•Z** to early on simulate the actual mood of space via the source and quality of day and electric lighting along with the textures and vocabulary of the building's skin provides a great complement to the 3D physical model studies that are initially generated. Students early on in the quarter, start to understand the building constructability implications of their digital models.

The department's curriculum, from the second year forward requires that the same group of students that enroll in a "building technology studio" (e.g., design development and environmental control systems courses) to also enroll in the corresponding architecture design studio. The two courses, sometimes with different instructors, meet in the same studio space on alternating days. In the case of the third year design studios that I teach, from the earliest exercises in the 10-week period, **form•Z** becomes an integral digital design tool that students use in the exploratory assignments that are provided in both these courses. Early investigations in both studios are strategically limited to predetermined issues, freeing students to explore and represent these issues in provocative ways, while not burdening them with all of the complexities of a building problem at the outset. As an example, in the coupled design development course or environmental control system (ECS) course students, often working in groups of 2-3, first develop a precedent analysis of a building's skin and digitally model detail in **form•Z** and materials as a way of learning about the components parts that might be applied to a future project that they will work on in the design studio. At the same time this is being done, students are also building a large-scaled physical 3-D model along with 2D traditional drawings as a way of understanding the connection of actual simulated material and textures to actual building constructability concepts.

Chris Talbott

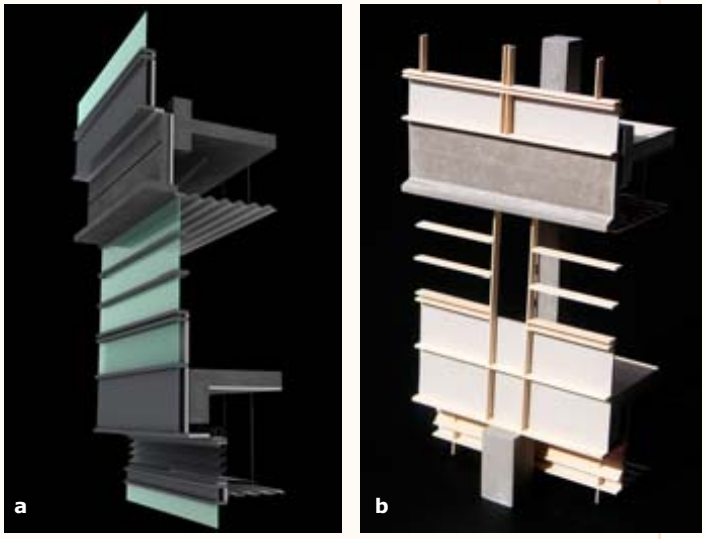


**Figure 1: Samples of precedent studies:
(a) form•Z model and
(b) physical model.**

The integration of design and building constructability issues converge on an actual building, not until the midpoint of the quarter when the studio project's program is reveled in entirety. This is a different model from many studios, where students are given a program and site on the first day of class, and quickly develop the "parti" and devote the rest of the quarter or semester to developing the building in its entirety. **form•Z** plays an important part of students being able to understand the "kit-of-parts" of precedent study of early exercise into the individual building project later on in the quarter. So these later exercises such as "Skintegration" require students to consider how this vocabularies may be translated into building elements (in this case a building's skin), and how these elements may be transformed or rearranged depending on the thermal consequences of orientation, materials and so on. For the last weeks of the quarter, students in the design studio are required to develop the project in detail from lessons learned early on in the quarter.

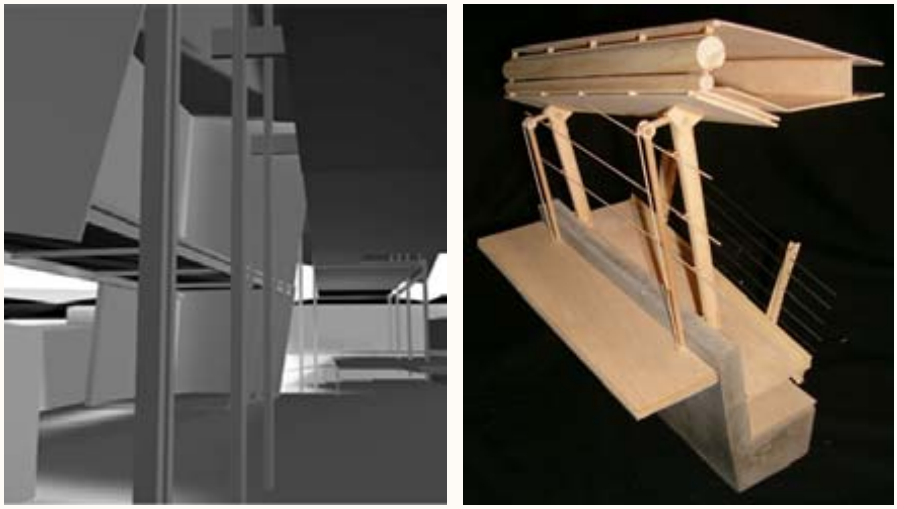
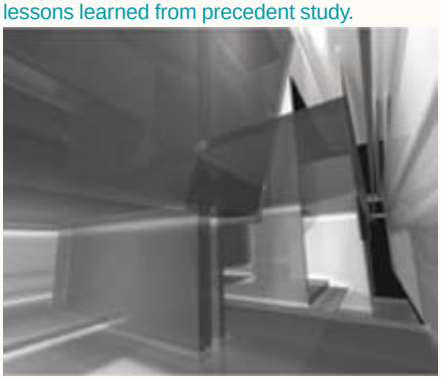


Figure 2: Samples of project's in progress interior wall, using lessons learned from precedent study: (a) form•Z **model and (b) physical model.**

Figure 3: Sample physical model of Project's in Progress immersive view of space using lessons learned from precedent study.



Following are some of the lessons learned in using **form•Z** to assist with building technology Integration In the design studio:

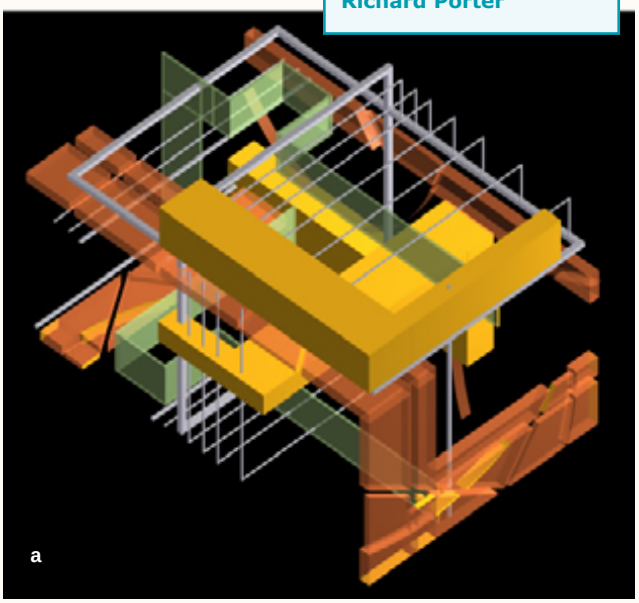
• To have students work in groups and to digitally model in **form•Z** the work of others (precedent studies) as a way to begin the quarter relieves pressure of immediate creative authorship, or, in other words, the necessity of an "overnight genius solution." Instead, students go through a process where graphics and analyses are quickly developed and become powerful tools for later design work. With the "Daylight Precedent" or the "Skin Detail Precedent" for example, although it is true the buildings the students studied all have qualities that defy description, they are at the same time tangible and definable. Materials and their reflectances, dimensions and profiles can be measured, and natural light in interior space can be studied. Accurate models made by the students help enormously in understanding how light works in buildings, something they began to translate in their own design work.

• An immediate immersion in ECS or building constructability issues related topics in the first few weeks of class set the tone for the quarter. Using **form•Z** helped students to understand the architectural implications of certain materials in early precedent studies.

• Students quickly identify shared qualities and the differences of digital models generated in **form•Z** and 3-D physical models. Students can translate a consistent formal language that can articulated and developed into a design studio project.

• A goal as students moved from the generation of an architectural vocabulary to a building design is to have them quickly digitally model in **form•Z** the visible energy and environmental performance implications of their design as they develop wall section detail of the design. The ideas of reconfiguring the initial wall section detailed studied as it relates to the student's evolving design project architectural vocabulary is strongly encouraged. This allows students to develop a preliminary consideration of building materials, glazing areas and so on as they able to translate what is in many cases a rich kit-of-parts vocabulary into something that is compelling architecturally and that also shows a strong send of building systems integration.

Richard Porter



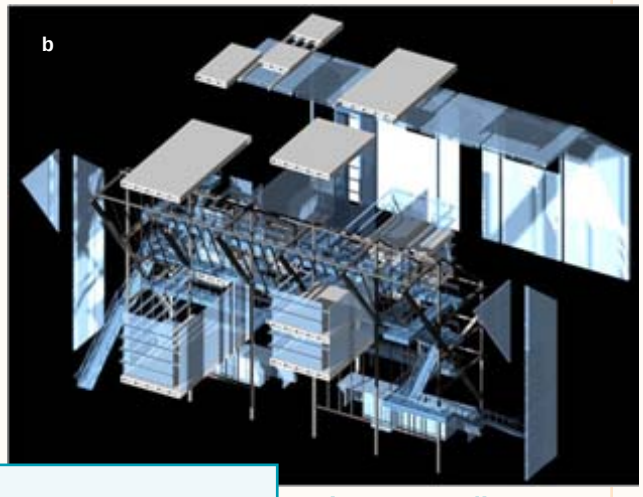


Figure 4: Media Center construction details