Learning to Construct Ideas

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"...Why buildings instead of projects? Why work instead of a theoretical discourse? I believe that in the crude reality of built works one can see clearly the essence of a project, the consistency of ideas. I firmly believe that architecture needs the support of matter; that the former is inseparable from the latter. Architecture arrives when our thoughts about it acquire the real condition that only materials can provide. By accepting and bargaining with limitations and restrictions, with the act of construction, architecture becomes what it really is..."

- R. Moneo, The Solitude of Buildings, Harvard University Press (1985)

"Technology is the answer, but what is the question?"

- Cedric Price

This paper describes the teaching objectives and strategies employed in a required construction course at Arizona State University. The course has evolved over a period of several years, motivated by a desire to establish and maintain a productive and provocative relationship between issues of making and the students' work in the design studio.

In the early part of the last century, before the establishment of formalized education, architects in the United States learned their trade principally by working for other architects. Technical information was assimilated "in the context of' the project itself. However, the formalized curriculum often found today separates the technical and the design aspects of the profession through separate courses. Indeed, this compartmentalization is institutionalized in the structure of many architecture firms. While it can be justified, this separation tends to suggest that the process is exclusively a linear one, proceeding from "imagining" to "developing" and finally to "building". Reestablishing a productive dialog between issues of construction and general design issues involves weaving the two subjects together rather than stitching; by using the language of the design studio when discussing issues of making, and by encouraging the provocative application of issues of making in the students' own work. To do this, the teaching strategies employed in this course attempt to place the familiar labels of construction and design within the broader context of "making."

The course exposes the students to specific detailed scenarios (case studies) that illustrate the non-linear nature of the process. When a relationship between technical and design issues is placed in the broader social, economic and institutional context within which architects must work, this relationship takes on tactical and strategic significance. As a result, the course has three distinct but related objectives:

OBJECTIVE 1 - MATERIALS AND METHODS

The first objective of the course is to provide exposure to the basic principles, conditions and requirements for the construction of buildings. This includes issues that affect all construction, including responses to natural phenomena such as gravity and weather, the nature of construction materials, the use of materials in combination with one another to form the systems and sub-systems inherent in all construction, and a survey of selected standard products. Since a great deal of material must be covered in a relatively short time, exposure to sources of information becomes an important aspect of the course. This objective is addressed primarily through assigned readings in the required textbook (Edward Allen's Fundamentals of Building Construction) as well as a portion of the weekly lecture period devoted to a summary of the reading material.

OBJECTIVE 2 - DESIGN AND CONSTRUCTION

The second objective is to convey an understanding of how this basic information relates to the process of design. It is essential for the students to understand that the design intentions can and should be sustained and enriched throughout a project's development. Unfortunately they are all to often diluted, misunderstood, or contradicted as they are "constructed." While the design intentions provide a context for the selection and configuration of materials and systems, the design intentions should also be established with an understanding of the possibilities and limitations of various materials and assemblies. To establish a relationship be-

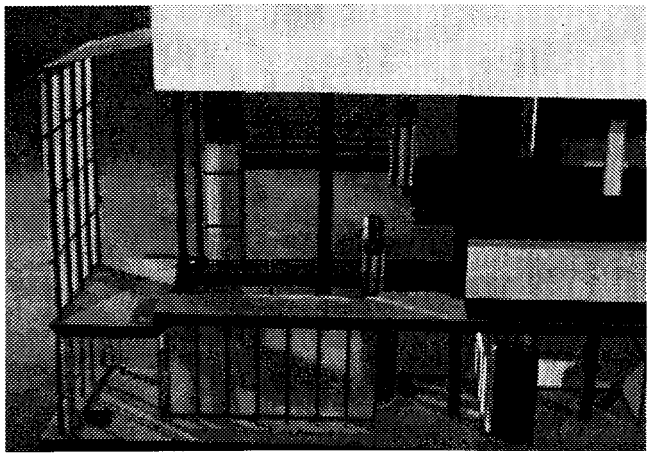

Fig. 1. Maison de Verre @ 1/2" =1'

tween design issues and issues of construction, specific projects are presented as case studies during each of the weekly lectures, some drawn from the author's own experiences in practice. The case studies serve also to establish the larger context within which design objectives were established and the project constructed.

OBJECTIVE 3 - TACTICS AND STRATEGIES

The third objective of the course builds on the first two. Beyond a knowledge of materials and methods and the ability to use this knowledge to sustain and develop design intentions, there remains a political, strategic and tactical nature to the process itself. The design and construction process is increasingly complex, and involves individuals and forces that are largely unforeseen or beyond the "control" of the architect. It is nevertheless possible (and perhaps necessary) to engage the political and tactical dimension of a project. To do this, the "givens" of a project (technical, material, logistical, political, programmatic) must not be considered merely as constraints to be circumnavigated or resisted in a defensive posture, but rather made a part of the design process. The design process then becomes a design "strategy", with the ultimate aim of sustaining and even enhancing the project ideas as they are constructed. For this reason, the forces that make up the larger context of any project (programmatic, technical, political, logistical) are not presented as obstacles, but are instead discussed and presented as essential and powerful allies in the process of constructing the ideas. Constraints, when considered as opportunities, become active and fruitful sources for many of the more provocative and resilient ideas of a project.

The strategic and the tactical nature of the process has been addressed in several ways. When presenting case studies, the full range of issues involved in the formulation of project ideas is discussed when possible, including the political, economic and institutional context within which the project was commissioned, designed and built. In this way, specific relationships may be established between general design intent and a specific detail, or a particular

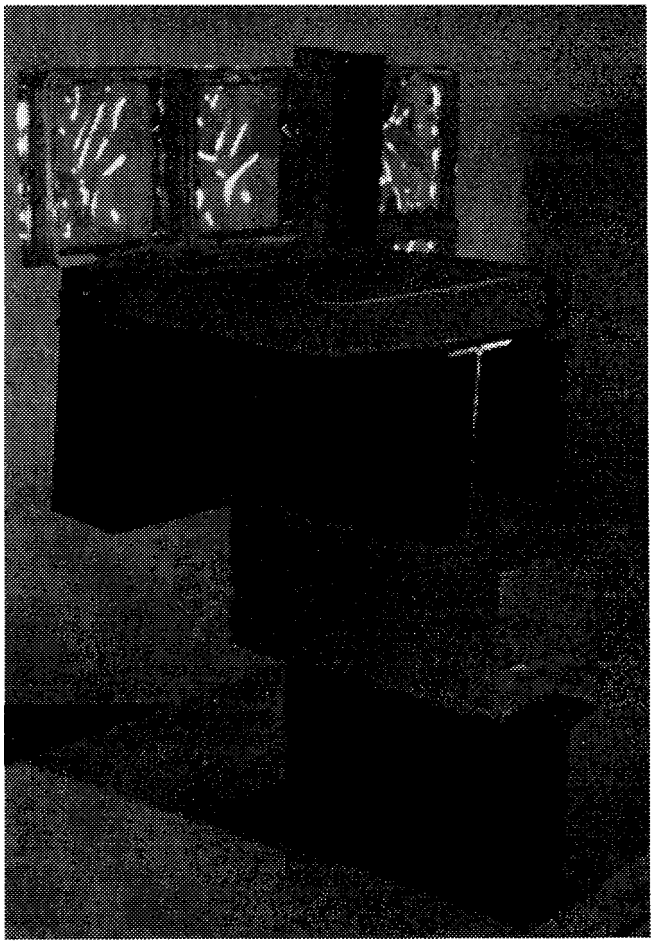

Fig. 2 Maison de Verre, full-scale detail

technical decision may be shown to have a strategic or tactical significance in the construction process. Occasional lectures are given by local practitioners, and they are encouraged to identify specific relationships between context, design intent and construction strategies. Visits to construction sites have taken place at least once, and occasionally several times each semester and have been an opportunity to expose the students to a great deal more than a construction process. When the site visit takes place in the company of client representatives and contractors as well as the architect, the visits have been an important opportunity to discuss the encounter between the design objectives and the construction process. Unfortunately, it has become increasingly difficult to organize site visits, particularly for large groups of students.

STUDENT WORK

Student assignments are intended as a complement to the lecture material. It is important to note that the nature of the required assignments described below were developed for an overall class size of approximately 65 students. Indeed, one of the most significant factors affecting the nature of the student assignments has been a search for an effective way

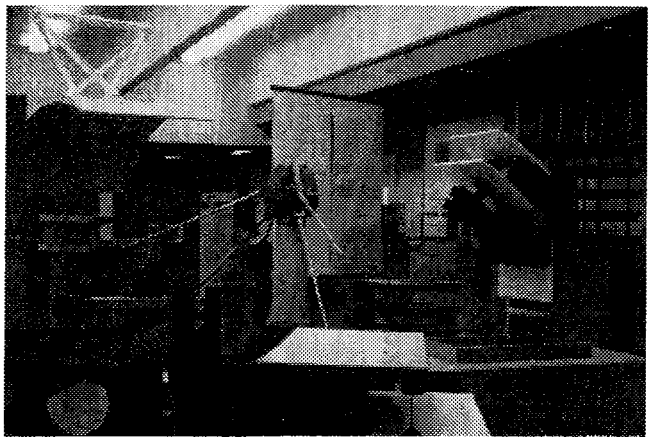

Fig. 3. Juxtaposition of projects

of dealing with the class size. Despite problems, group exercises have been effective.

Exercise 1

In the first of two required exercises, the class is divided into 8 groups, each made up of approximately 7 students. Each group selects or is assigned a building for study. The group conducts a detailed investigation of the building, eventually producing analytical documents as well as large-scale models and drawings. The exercise provides the opportunity for a more thorough understanding of the issues involved than that which can be obtained through a 'casual' investigation, because it requires a careful study of documents describing the building (construction documents as well as published articles). It should be noted that earlier attempts to base the exercise on published drawings and details were frustrating for the students. Since then, the selection of projects is based in part on the availability of thorough documentation in the form of detailed design drawing sets or working drawings. For many of the students, this problem provides their first opportunity to thoroughly examine a set of construction documents. Occasionally, a few frustrated students will write eloquently about the importance of a clear and concise set of documents!

Each group organizes itself to produce the following:

a) a detailed model of a portion of the building, at a scale of 1/2"=1'. This scale is significant, in that it provides the opportunity to see an overall view of a space or set of spaces at the same time as a relatively detailed rendering of the separate elements that configure the space or spaces. This model examines the relationship of "spatial whole" to "parts" (See Fig.1.).
b) a set of plans and sections that document the portion of the building studied above, using a graphic language common to all 7 projects. The intent of this component of the problem is to provide a basis for the comparison of the different buildings. Through these drawings, the "pattern" produced by a load-bearing structure can be instantly distinguished from that produced by a frame-and-infill structure.

Fig. 4. Student project by Russell Combs

c) a full-scale model of a portion of the above (See Fig.2.). This model establishes a direct relationship to the scale of the body, and in doing so provides the students with a datum that enables them to better understand the scale of the building as a whole. It also provides an opportunity to investigate the geometry of a detail or to examine issues of sequence and assembly. The full-scale detail could provide an opportunity to use actual building materials. However, past experience has shown that producing a small building fragment with actual materials does not necessarily provide a clear notion of the behavior of the materials themselves, nor does it give an indication of the difficulties of deploying them on a building site. However, the full-scale models do provide a very effective means of examining the scale of elements as well as an effective means of examining the geometry of complex building elements and sub-assemblies.
d) an analytical component that is relatively open-ended. The intent of this portion of the problem is to explore and present project-specific design and construction issues. It

is here that the students must reveal what is particular to the project being studied, and devise the most appropriate way ofdocumenting what they have found. This has taken the form of model(s), drawing(s), text(s) as well as recorded interviews with architects, contractors and clients.

Overall, the work must provoke a relatively thorough understanding of the buildings as well as an ability to discover and illustrate specific situations where the architect's intentions were sustained (or perhaps subverted) through the construction process. The collective display of finished projects fulfills an important role. Within a given project, the students are able to see a progression of scale from overall building (drawings) to portion of building (1/2" models and drawings) to a full-scale fragment (models and drawings). This juxtaposition provides an understanding of the scale of the entire structure. The juxtaposition of different projects at the same scale invites comparison "across the grain" of projects (See Fig.3.). This juxtaposition allows the group to study the relative size and "texture" of the various projects.

Exercise 2

In the second required project, the students are given the opportunity to individually apply the insights gained in the first exercise to the development of a portion of their own studio project. The required format is 1/2"=1' in models and drawings, to facilitate direct comparison with the works studied in the first problem. The students furnish a statement of their design intentions and a discussion of how their project has addressed the issues of "making." The students are encouraged to develop their projects horizontally, by considering a variety of issues, as well as vertically through the detailed investigation or resolution of individual aspects of their solution (see Fig. 4)

CONCLUSION

The course structure described here is the result of a desire to establish and maintain a productive and provocative relationship between issues of making and the students' work in the design studio. Several factors make this relationship difficult to establish. The existence of separate design and construction courses tends to territorialize the discussion of making. As a result, one must make the effort to involve ideas in a discussion of techniques of construction, and at the same time bring the issue of making to the studio in a way that does not appear to be at odds with the realm of ideas. The notion of constructing ideas implies the simultaneous consideration of both, a relationship seen as rich in opportunities.