

PROJECT ADMINISTRATION DATA SHEET

ORIGINAL REVISION NO. _____

Project No. D-48-623 GTRI/GIT DATE 11 / 23 / 83

Project Director: Dr. Craig Zimring School 1255 Architecture

Sponsor: Florida Agricultural & Mechanical University
Tallahassee, FL

Type Agreement: Purchase Order No. 819975

Award Period: From 10/1/83 To 12/31/83 (Performance) _____ (Reports) _____

Sponsor Amount: This Change 4-15-87 Total to Date
Estimated: \$ _____ \$ 70,000*
Funded: \$ _____ \$ 70,000*

Cost Sharing Amount: \$ 3,690 Cost Sharing No: D-48-313

Title: "Post-Occupancy Evaluation of the New School of Architecture Building-
Florida A & M University"

ADMINISTRATIVE DATA

1) Sponsor Technical Contact:	OCA Contact	John W. Burdette ext. 4820
<u>Edward T. White</u>	2) Sponsor Admin/Contractual Matters:	<u>James Galbraith</u>
<u>School of Architecture</u>		<u>Capital Programs</u>
<u>Florida A & M University</u>		<u>Board of Regents State of Florida</u>
<u>Tallahassee, FL 32307</u>		<u>301 Collins Building</u>
<u>(904) 599-3244</u>		<u>Tallahassee, FL 32301</u>
		<u>(904) 488-5251</u>

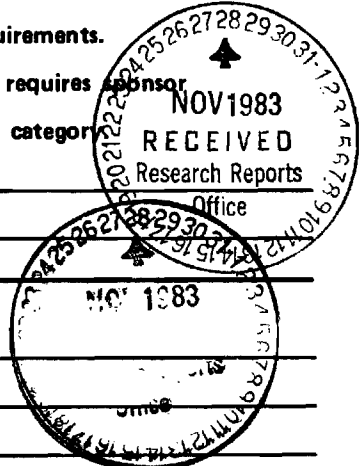
Defense Priority Rating: N/A Military Security Classification: N/A
(or) Company/Industrial Proprietary: N/A

RESTRICTIONS

See Attached _____ Supplemental Information Sheet for Additional Requirements.
Travel: Foreign travel must have prior approval - Contact OCA in each case. Domestic travel requires _____ approval where total will exceed greater of \$500 or 125% of approved proposal budget category.
Equipment: Title vests with None Proposed

COMMENTS:

*Includes \$1,603.89 in contingency funds.



COPIES TO:

- | | | |
|---------------------------------|---------------------------------|---------------------|
| Project Director | Procurement/EES Supply Services | GTRI |
| Research Administrative Network | Research Security Services | Library |
| Research Property Management | ✓ Reports Coordinator (OCA) | Project File |
| Accounting | Research Communications (2) | Other <u>NEWTON</u> |

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 10-1-87

Project No. D-48-623 School/Dept. Architecture

Includes Subproject No. (s) N/A

Project Director(s) Dr. Craig Zimring GTRC /

Sponsor Florida Agricultural & Mechanical University

Title "Post-Occupancy Evaluation of the New School of Architecture Building-
Florida A & M University"

Effective Completion Date: 4-15-87 (Performance) 4-15-87 (Reports)

Grant/Contract Closeout Actions Remaining:

- None
- Final Invoice or Final Fiscal Report
- Closing Documents
- Final Report of Inventions
- Govt. Property Inventory & Related Certificate
- Classified Material Certificate
- Other _____

Continues Project No. _____ Continued by Project No. _____

COPIES TO:

- Project Director
- Research Administrative Network
- Research Property Management
- Accounting
- Procurement/GTRI Supply Services
- Research Security Services
- Office of Contract Administration (OCA)**
- Legal Services

- Library
- GTRC
- Research Communications (2)
- Project File
- Other _____



POST-OCCUPANCY EVALUATION
FLORIDA A&M UNIVERSITY
SCHOOL OF ARCHITECTURE

FINAL REPORT

Project Overview, Results and Recommendations

PROJECT STAFF

Project Management

Min Kantrowitz
Project Manager
Min Kantrowitz and Associates

Craig Zimring
Principal Investigator
College of Architecture
Georgia Institute of Technology

Edward T. White
Project Officer
Institute for Building Sciences
School of Architecture
Florida A&M University

Project Associates

Richard D. Barnes
Department of Psychology
Randolph-Macon Woman's
College

Jon Sanford
College of Architecture
Georgia Institute of Technology

Bettye Rose Connell
College of Architecture
Georgia Institute of Technology

Robert Shibley
Caucus Partnership

Jay Farbstein
Jay Farbstein and Associates

Lynda Schneekloth
Caucus Partnership

Jean Wineman
College of Architecture
Georgia Institute of Technology

Additional Research Staff

College of Architecture,
Georgia Institute of Technology:
Jaepil Choi
Deborah Hayes Hyde
William Von Ingle

Jay Farbstein and Associates
Richard Schmidt

Caucus Partnership:
Ellen Bruce

School of Architecture, Florida A&M
University:
Dan DeForge
George Downs
Kevin Kennedy
John Nation
Stewart Nelson
Vickie Newcomb
Larry Rubin
Jim Stolz
Dan Swaby
Chris Wenzel

Task Force Members
(Attending at least one meeting)

Jim Bullard, Office of General Services, Department of Health and
Rehabilitative Services

Donnell Carter, Director of Physical Plant, FAMU

Gene Chick, Department of Education

Bill Corley, Florida State Senate

Alex Fairley, Winchester/CRS

Jim Galbraith, Board of Regents, State University System

Diane Greer, Florida Association/American Institute of Architects

Dick Hoag, School of Architecture, FAMU

Paul Kelley, Department of Education

Tom Knowles, Director of Physical Plant, FSU

Paul Krone, Department of Education

Bob Lamison, Director of Facilities Planning and Construction, FAMU

Jerry Martin, Board of Regents, State University System

Richard Meadows, Winchester/CRS

Paul O'Connell, Bureau of Construction, DGS

Linda Owens, Florida Department of Education

Peter Rumpel, Clements/Rumpel/Assoc.

Art Rubin, National Bureau of Standards, Washington, D.C.

Bill Wiencke, School of Architecture, FAMU

ACKNOWLEDEMENTS

We would like to thank the faculty and students of the Florida A&M School of Architecture for their continued interest, participation and support.

CONTENTS

EXECUTIVE SUMMARY		3
INTRODUCTION		7
The Settings Studied	11	
Approach and Definition of Issues	15	
METHODS		18
Conceptual Framework for the POE	19	
Project Phases	24	
Methodological Steps	26	
RESULTS		29
Image	30	
Functioning of the Building for Occupants	32	
Performance of the Building	42	
The Building-Delivery Process	52	
RECOMMENDATIONS		63
Recommendations about the FAMU School of Architecture Building	64	
Recommendations about the Building-Delivery Process	66	

EXECUTIVE SUMMARY

Project Goals

This Post-Occupancy Evaluation (POE) is one result of a 1980 mandate of the Florida State Legislature aimed at using the new energy-conserving Florida A&M School of Architecture building project as an opportunity to test a number of innovations in building design and delivery. A national project Team was selected to conduct the research. The team in turn organized an Advisory Task Force composed of key decision makers from the Florida State Government, Florida A&M University, and the FAMU School of Architecture, identified several issues to be addressed in the evaluation.

- o In what areas does the building best meet the objectives specified in the program concerning building image, energy conservation, increased building use, promotion of social interaction, and twenty-four hour security?
- o How does the building function in terms of maintenance and durability?
- o How well did the innovative building-delivery system function?
- o How easily can the building accommodate changing needs of the School of Architecture or other future occupants?

Phases Of The Project

The project was a collaboration between a national multidisciplinary team of consultants and the School of Architecture. It took place in four phases: (1) Pre-Move Evaluation, (2) Construction Monitoring, (3) Settling-In Evaluation, and (4) Evaluation One Year After Occupancy. Over a three-year period the project team examined the former building occupied by the School of Architecture, analyzed the new building construction process, studied the newly occupied School of Architecture as occupants settled into it, and finally visited the building for a final assessment after more than a year of occupancy. The team used questionnaires, interviews, observations, walk-throughs, analysis of plans, documents and photographs at each point in the process. Rather than looking only at the building as an artifact, the project focused on process, seeking to learn lessons about how key decisions in the building delivery process were reflected in the performance of the final building.

Results

A. What Have We Learned About The Building?

1. *The building program is satisfied by the design.*

The building is seen as a landmark in the community and as an asset in promoting a national reputation for the School of Architecture.

- o The users are satisfied: Faculty and students like the building and use it heavily.
- o The building is a valuable teaching tool.

2. *There are costs to satisfying the program the way this design does.*

- o The experimental energy and HVAC system has strengths and weaknesses: The system works well in the mechanical mode and passive heating mode, but not in passive cooling.
- o The building is difficult to maintain: Because of the complex design and wide range of materials, maintenance and repair will be expensive.
- o Changing uses could pose a serious problem in the future: Although many spaces in the building can be used for multiple purposes because of the exposed mechanical system it will be difficult to subdivide most spaces.

B. What Have We Learned About the Building Delivery Process?

1. *The delivery process used for this building resulted in both problems and advantages.*

- o The programmatic requirements evolved during design. Verbal negotiation superceded the original written program. The design program did not always anticipate the actual needs of faculty and students. In some cases, the program was perhaps overly general about needs for flexibility.
- o There was a shortage of School of Architecture staff time devoted to the project. It was sometimes difficult for the School of Architecture (as client and user) to devote sufficient staff resources to enable them to adequately monitor the design.
- o Funding delays created great difficulty in budgeting and scheduling.

- o The value engineering process contributed to substantial cost reduction but created difficulties with the match between the energy system and its controls.
- o The use of a construction manager was valuable in light of the complexity of the design.
- 2. *A variety of benefits resulted from the post occupancy evaluation process.*
 - o Findings assisted the School with fine tuning of the building.
 - o The evaluation held up a mirror to the building process, providing feedback to the State and generating suggestions for improvement.
 - o The POE process resulted in additional positive attention being focused on the School, the building, and the State of Florida.
 - o The evaluation increased awareness of POE within the FAMU School of Architecture and provided an ongoing case study for the School's classes.
 - o The POE enhanced communication among the organizations involved in the state building delivery process.
 - o This experience demonstrated the POE process to State agencies, particularly the departments of Corrections and Education; the Department of Education's POE program was informed and reinforced.

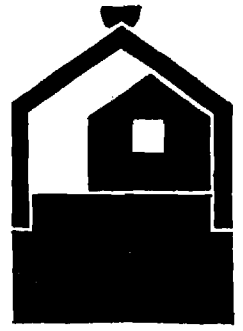
Recommendations

A. For The Building:

- o Continue the POE process, including additional monitoring of energy use.
- o Increase attention to maintenance, including work plan, training, and scheduling to prevent deterioration of the building.
- o Formalize methods of using the building as a teaching tool.
- o Continue to publish results of building studies as a way of promoting and enhancing the image of the School, University, and State.

B. For The Building Delivery Process:

- o Improve the programming process for State buildings through increased involvement by user agencies with professional support.
- o Improve design review and building acceptance procedures, to ensure continuity of client/user input and satisfaction of user needs.
- o Examine building maintenance and repair procedures, especially maintenance training and scheduling.
- o Create building use manuals, including information on functional use and information to assist in creation of a maintenance training program.
- o Evaluate building standards for cost effectiveness, utility, and safety.
- o Establish a state-wide building POE program after the evaluation process is further demonstrated and more familiar, this might be a field-oriented program with aid given by experienced evaluators in centralized agencies such as the Board of Regents, Department of Corrections or Department of Education.



Introduction

In 1980, the Florida State Legislature, concerned that state-owned buildings be of highest possible quality and be delivered quickly and efficiently, decided to try a number of innovations for the new School of Architecture Building at Florida A&M University. They allowed the Board of Regents to select the architect by competition, hire a construction management firm and track the planning, construction and occupancy of the building. As part of this process the School of Architecture and Board of Regents selected a national multidisciplinary team to conduct a Post-Occupancy Evaluation (POE) to examine the process of design and construction and to evaluate the completed building.

This Final Report summarizes those findings. It highlights the building's successful aspects as an attractive addition to the campus and as a strong symbol of the School of Architecture. It describes how some innovations contributed to the effective functioning of the building, while others resulted in problems which can be avoided in the future. The report is meant to be useful to a variety of audiences, including the State Board of Regents and other state agencies for updating space standards and building delivery processes, by faculty, staff and students at the FAMU School of Architecture for continually fine-tuning the building to meet their needs, by architects and others interested in learning about some of the new design features of the building applicable to the design of similar buildings, and by the educational/academic community interested in the wide range of design and building evaluation issues addressed in this study.

The legislative mandate resulted in a large number of activities, reflecting the School's interest in using the new building project as an opportunity to conduct research, teach and involve students, and provide exposure for the School and University. Some of these products and activities are listed in Figure 1. These projects have had additional benefits in that they have helped foster communication between state government departments about building evaluation, maintenance scheduling and training and other issues and have caused re-examination of building standards that may unnecessarily encumber the building delivery process.

Of the many issues examined during this Post-occupancy Evaluation, several major themes emerged. The building itself, as well as the building delivery process, were instructive. The report is organized to reflect these issues. In addition to this Final Report, a Technical Appendix is available upon request that contains detailed results, data gathering instruments and protocols, Task Force reports and other background information.

No attempt was made in this project to assign credit or blame. Rather, the team adopted a "lessons-learned" approach aimed at aiding management of the School of Architecture building and programming, design, construction and management of future Board of Regents projects.

This data was collected in the four phases illustrated in Figure 2. This approach allowed the team to understand the School's experience in their old quarters and to track construction and occupancy.

BUILDING SCHEDULE**POE PROJECT****INDIRECT
BENEFIT**

1980	<ul style="list-style-type: none">o Project initiated: Programmedo Legislative Funding (Planning)o Design Competitiono Architect Selection		<ul style="list-style-type: none">o National PR
1981	<ul style="list-style-type: none">o Design of Facility	<ul style="list-style-type: none">o Architect's Design Rationale	<ul style="list-style-type: none">o Presentation at National AIA Meeting (Arch in govt)
1982	<ul style="list-style-type: none">o Legislative Funding Construction & Furni- ture)	<ul style="list-style-type: none">o SOA. Formulate POE Project Strategy	
1983	<ul style="list-style-type: none">o Construction	<ul style="list-style-type: none">o Competition to Select POE Consultanto Consultant Selectiono Construction monitoringo Task Force Meeting #1	<ul style="list-style-type: none">o National P.R.o Collection of POE Materialo EDRA Reporto ASTM Meeting Report
1984		<ul style="list-style-type: none">o Regents Project Flowo Pre-move Study	<ul style="list-style-type: none">o POE workshop at Ga Tech.o Governor's Design Awards Symposium on POEo EDRA Report
1985	<ul style="list-style-type: none">o Move-in	<ul style="list-style-type: none">o Settling-in studyo Task Force Meeting #2o Context issues studyo Interviews with key participants in design and constructiono Study of CM Processo POE of new SOA. Buildingo Check against Regentso Construction documents analysiso Project File Search	<ul style="list-style-type: none">o Newspaper articles (Jax/Tall)o FA/AIA Awardo Progressive Arch articleo EDRA Reporto Fla. arch articleo Progressive Archo AIA Journal articleo EDRA Report
1986		<ul style="list-style-type: none">o Interim Reporto Task Force Meeting #3o Final Report	

THE FAMU/POE PROCESS

	Pre-Move	Construction	Settling-In	One Year After Occupancy
Rationale	The old building was studied at two times prior to the move to understand previous experience and expectations.	The construction process was monitored to see why changes were made and if they affected the design.	The new building was studied two months after occupancy to check on the settling-in process.	Most of the data collection occurred a year after occupancy to understand the building's image, use, energy system, etc.
Method	<ul style="list-style-type: none"> o Questionnaire of students, faculty, and staff. o Touring interviews with students, faculty, and staff. o Observations of the behavior of all building users. o Measurement of temperature, noise, and light. 	<ul style="list-style-type: none"> o Attendance of all construction meetings. o All change orders logged. 	<ul style="list-style-type: none"> o Touring interviews with students, faculty, and staff. o Interviews with building engineer, construction managers, and others. o Inspection of the building. o Faculty impressions and experience logged. 	<ul style="list-style-type: none"> o Touring interviews with students, faculty, and secretarial and custodial staff. o Interviews with FAMU's Dean, Head of Maintenance, Campus Planner, and others. o Observation of behavior of all building users. o Measurement of temperature, noise, and light.

THE SETTINGS STUDIED

The Florida A&M School of Architecture was created in 1974 and accepted its first students in 1975. As a new school it sought to develop the "basics," such as good architectural design courses and substantial technical offerings, but also to focus on specialty areas not yet commonly offered by established schools. These include training for government employment and specializations in architectural programming, post-occupancy evaluation and low-cost construction.

The school offers five degrees: a pre-professional Bachelor of Science, a five-year professional Bachelor of Architecture, an eight-semester Masters for students with other backgrounds, a Masters for students who already have a professional degree, and a two-year Masters degree.

The school opened with fifty students in 1975 and currently has 220 (200 are undergraduate and twenty are graduate students). It is expected that the school may eventually have as many as 350 students.

Prior to construction of the new building, the School of Architecture was housed in Bannaker, a three-story rectangular building located at the extreme northwest corner of the campus. This masonry building was originally designed as a general classroom building. The School of Architecture moved into the building in 1975 and occupied approximately 15,000 square feet of space. The first floor was dedicated to classrooms, conference, and administrative functions, while the upper two floors contained a mixture of offices, studios, and labs. Faculty offices were shared by two or three faculty, and were interspersed among the studio and lab spaces.

Most areas were lit with overhead fluorescent fixtures, although some faculty, staff and students added personal task lighting. Windows were narrow, fixed pane, vertical slits. Elevators and fire stairs were in a central circulation core.

Bannaker was not well-suited to the needs of an architecture school. Aside from being cramped (by the early 1980's, the Dean estimated it provided only about one-third of the needed square footage), there was little natural light, poor ventilation and no common meeting spaces. Faculty shared small offices located next to design studios. The architecture library was located in another building. Because it was the shortest route to parking, the most popular entry was through the loading dock. Overall, in a questionnaire, the building was poorly rated by students, faculty and staff.

The new building resulted from a complex process (which is discussed further in the Design Process section). Unlike most BOR projects, the architect was chosen through a design competition. Although the original intention was to choose an architect rather than a design, the design of Clements/Rumpel/Assoc.'s final competition entry was quite close to the final design. (The reasons for this include the high image impact of the competition entry, limited design fees, and communications problems during the competition and design process.)

Because of the building's complexity and unusual materials and details, a construction management firm was hired to supervise construction. A number of the original design features were altered during value engineering including the brick clad base and steel framing and corrugated steel and fiberglass cladding of the upper story. This dispersed plan and the use of varied materials resulted in many intersecting parts that required careful detailing.

The new Florida A&M School of Architecture Building was completed in 1984. It is a 61,580 square foot structure housing faculty and staff offices, instructional areas, a library, computer lab, lecture hall, and auxiliary spaces.

The building is located on a sloping site along a major campus road on the edge of campus. Spaces requiring complete climate control, such as the library, computer lab, and lecture hall, are partially buried into the slope. Offices, design labs and technical spaces are housed in four wings perpendicular to this brick-clad spine. A clear distinction is made between the brick clad base and the steel framing and corrugated steel and fiberglass cladding of the upper story.

The finger plan helps to distinctly separate the faculty offices/administration area and the studio and lab areas. Individual eighty-four square foot faculty offices overlook the administrative area. The small size of faculty offices (less than the 125 square foot state minimum standard) allowed the space to be used jointly by faculty for small conference rooms. Studios are relatively small and are intended to accommodate about sixteen student work stations. Courtyards and covered balcony areas provide additional flexible-use areas.

Skylights and south-facing light shelves reduce artificial lighting requirements. Operable windows and glazed thermal chimneys, with operable vents and wind assisted ventilators, reduce the use of mechanical heating and cooling systems.

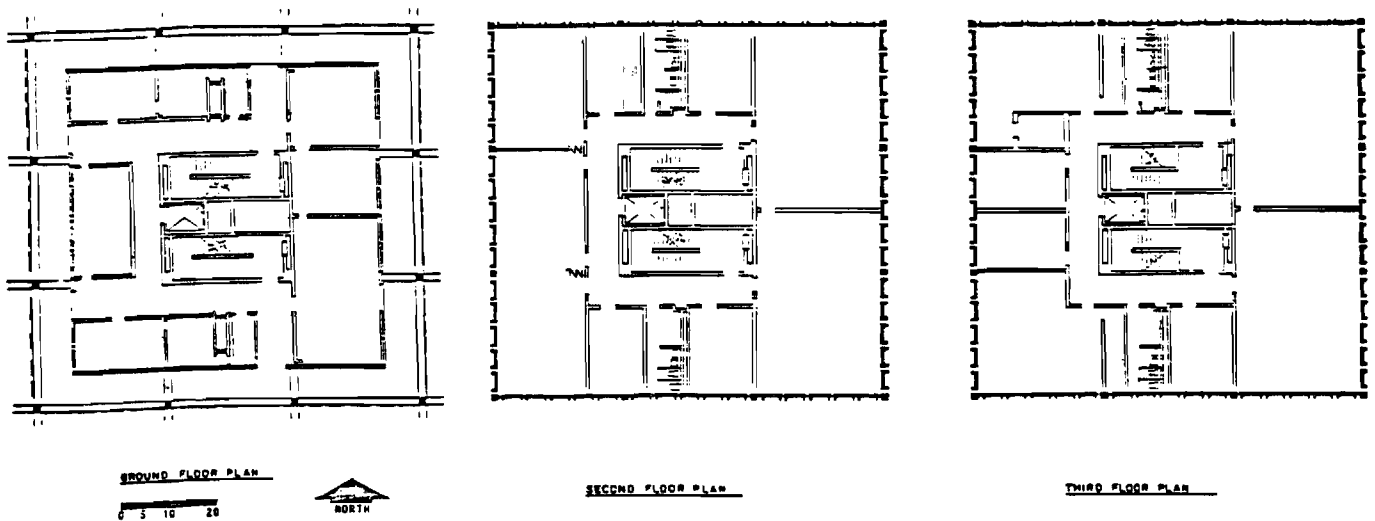
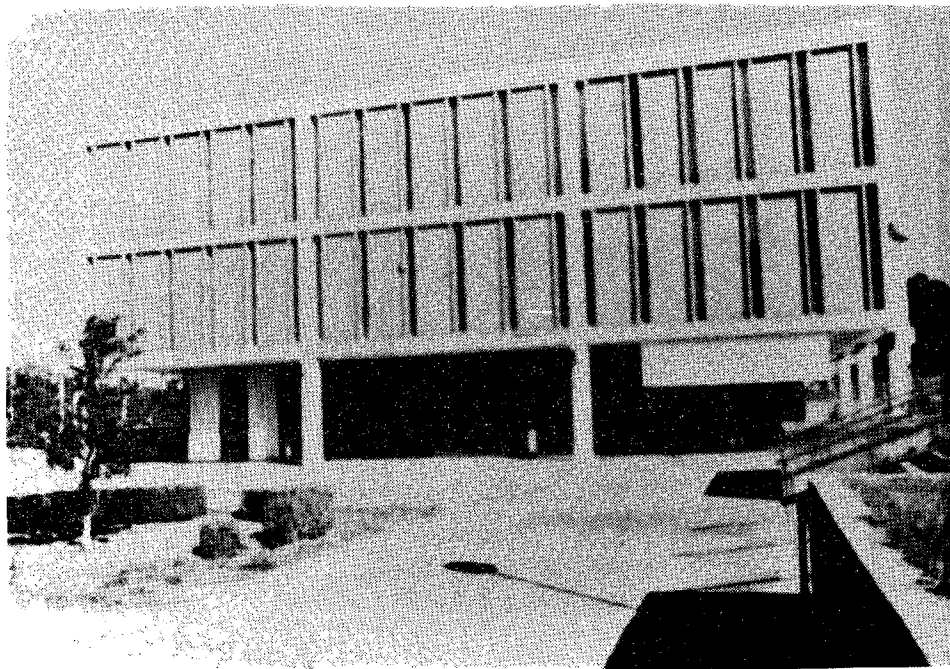


Figure 3a: *The old building, a general classroom building, was cramped and inflexible but provided easy opportunities for students to talk to faculty.*

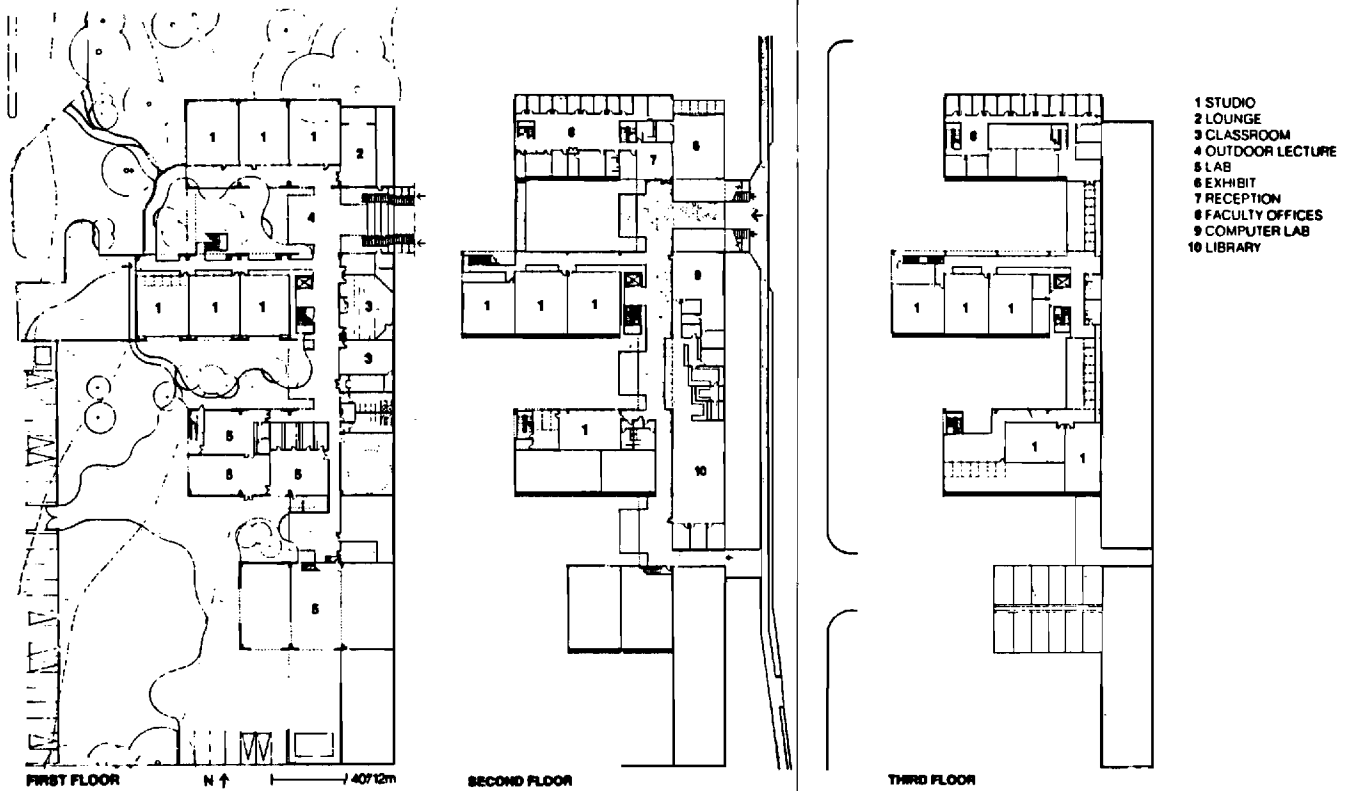
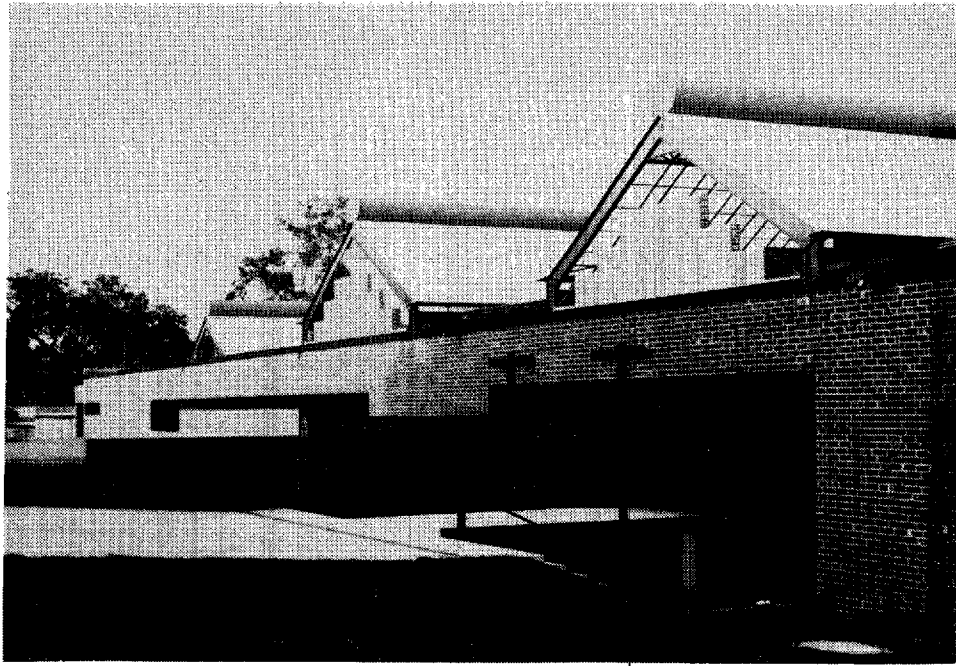


Figure 3b: *The new building presents a forceful, well-liked image but its complexity may present longterm maintenance and flexibilty problems.*

APPROACH AND DEFINITION OF ISSUES

The FAMU School of Architecture Post-Occupancy Evaluation (POE) project differs from many other POE's in several ways. Responsibility for all phases of the project, from identification of issues, through data gathering and analysis to implementation planning has been shared between the Project Team and students, faculty and key decision-makers from the University and State of Florida.

The project team organized an Advisory Task Force consisting of key decision-makers from the Florida State Government, Florida A&M University and the FAMU School of Architecture who were concerned with the School of Architecture building and were responsible for implementing POE in future projects. This Task Force told the team which themes and issues were most important to them, as the individuals responsible for designing, managing and evaluating this and future buildings. These issues, as well as the goals for the building specified in the program and the needs of the School as revealed by pre-move research, served as the major issues investigated (see Figure 4).

Pre-Move Studies

The purpose of the pre-move data collection was to identify goals and expectations for the new building. This also helped the POE Team understand how the School of Architecture operated in their old quarters and how they expected to operate in the new facility.

Students, faculty and staff participated in walk-through interviews, filled out questionnaires, and were observed in ongoing activities over a four-day period. The results of this phase suggest that the issues identified in the program and by the Advisory Task Force were of genuine concern to students and faculty. Students and faculty generally rated the image of the classroom building as inappropriate, yet liked the quonset hut, which had large shop for the low-cost construction program. The "hands-on" image of the hut was valued as was the visibility of the model houses and other objects produced by the program. The classroom building was stuffy, often too hot or too cold, and its sealed windows and centralized mechanical system offered occupants little ability to change conditions in an individual lab or office.

The building was used relatively little by students and faculty, presumably because they found it unattractive, uncomfortable and it did not support them in getting their work accomplished (e.g., lighting was poor and not enough space was provided). It was rated a poor workspace overall, with the exception of the quonset hut.

Figure 4:

**EVALUATION ISSUES PROVIDED BY THE ADVISORY TASK FORCE
AND PROGRAM**

1. Does the building provide a high impact, forward-looking image that can be a positive symbol for the School?
2. Does the building function well for the students, faculty and staff as well as an extended group of users such as professional architects and maintenance staff? Specifically:
 - a. In what ways does the building support the day-to-day activities of the School?
 - b. How does the building itself serve as a teaching tool?
 - c. How does the building contribute to the security of persons and possessions?
 - d. How does the building encourage formal and informal social interaction by students, faculty and staff?
3. Does the building perform well technically? Specifically:
 - a. What can be learned from the performance of the experimental HVAC system?
 - b. How flexible is the building, and for what purposes?
 - c. What can be learned about the maintenance, upkeep and long-term operation of the building?
4. How did the innovative building-delivery system function? Specifically:
 - a. What were the impacts for the eventual design of the programming and architect selection process?
 - b. What changes occurred during construction?
 - c. What were the consequences of the building-delivery process on occupancy by the School of Architecture?

In addition to the informal educational opportunities afforded by several unusual ad hoc meeting places such as the stairwell or the loading dock, there were differences of opinion over whether the placement of faculty offices next to design labs was desirable. It provided students considerable contact with faculty yet did not encourage faculty to interact with each other or to conduct activities without interruption. There was little disagreement among faculty about sharing offices: they disliked it. In the new building, small (eighty-four-square-foot) private offices are segregated into the administrative wing.

Security was a concern. Small items were stolen and there were occasional robberies. As a result, students had posted signs over doorways in lab spaces such as "Lock Door when DeStudioing." On the other hand, students complained about the inaccessibility of locked spaces such as the computer lab, yet when the spaces were open, they received little use.

In general, students, faculty and staff were fairly negative about the old building. Having originally been designed as a laboratory building, it was ill-suited to be adapted into an architecture school and this showed. It looked like all the other buildings around it; there were few social or jury/pin-up spaces and design labs were small and enclosed. The result was that neither students nor faculty spent a great deal of time doing their work in the building.

Issues to be Studied

The pre-move studies supported the choice of the issues identified by the Task Force and clarified them. This resulted in issues to be addressed in the later stages of the Post-Occupancy Evaluation which can be categorized as indicated in Figure 5.

Figure 5: Evaluation Issues

1. *Building Issues*
 - Image*
 - Function*
 - Social Interaction*
 - Teaching Tool*
 - Task Support*
 - Building Performance*
 - Energy*
 - HVAC*
 - Maintenance*
 - Flexibility*
2. *Building-Delivery Process Issues*
 - Program*
 - Design*
 - Construction*
 - Occupancy*

This chapter, *Methods*, provides an overview of the conceptual framework for the POE Project -- which focused on learning lessons about decision-making at every step of the building-delivery process -- and describes the phasing and methods used in the project

CONCEPTUAL FRAMEWORK FOR THE POE

Simply stated, the goals of the project were to assess both building quality and the building-delivery process in order to *improve decision-making about State buildings in the future* in addition to *fine-tuning the School of Architecture and aiding in its long term management and use*. Findings from this project were intended to be helpful in making better decisions about a range of building characteristics such as decisions about room sizes and arrangements, decisions about materials and finishes, and decisions about spatial requirements. This emphasis on decision-making helped provide a structure for the project. In defining the issues for further investigation, the project team identified key decisions at each step in the building-delivery process. Decisions that were significant, controversial, or potentially important for other buildings were high

For example, a programming decision was to make faculty offices smaller than normal (seventy-five versus one hundred twenty square feet; this was increased to eighty-four square feet during design) and to use the space saved for conference rooms. The project team evaluated this decision not as a way of assigning praise or blame, but rather as a way to see if such decisions might be appropriate for future Board of Regents or State buildings.

At each stage in the building-delivery process, decisions are made concerning *building characteristics*: the specific features that make up the building such as size, function, number, spatial relationships, materials, equipment, and so on. These building characteristics in turn affect *performance qualities* such as durability, efficiency and user satisfaction. A major focus of the project was to evaluate how building characteristics (for example, eighty-four square foot faculty offices) functioned in terms of performance qualities (efficiency, faculty satisfaction, etc.).

There were at least five potential influences on decisions made at each step of the building-delivery process: (1) *regulatory requirements*, including Board of Regents requirements, building codes, etc.; (2) *institutional policies/concerns*, including FAMU's present and future plans for the campus, its basic approach to education, etc.; (3) *School of Architecture considerations*, including curriculum, research goals, anticipated teacher-student contacts, etc.; (4) *other major participant*

interests, including principally, the architect, construction manager, Board of Regents architect, Campus Planner and others; and finally, (5) *occupant behavior and attitudes*, such as the ways students and faculty are expected to use the building and their expected responses to it.

Figure 6 illustrates these influences on the building decisions as well as the four phases of the building-delivery process. Each specific cell in the matrix represents input by a specific influence or agent (e.g., "regulatory requirements") to a specific set of decisions (e.g., "programming"), and represents issues to be evaluated. (For example, choices about room size for university buildings were evaluated. The impacts of these choices may influence space standards and other regulatory inputs into programming. This matrix served as a valuable organizing scheme for the project through the identification of broad research issues and specific questions to be addressed within each issues area. Figure 7 illustrates several building characteristics and performance indicators studied in this project.

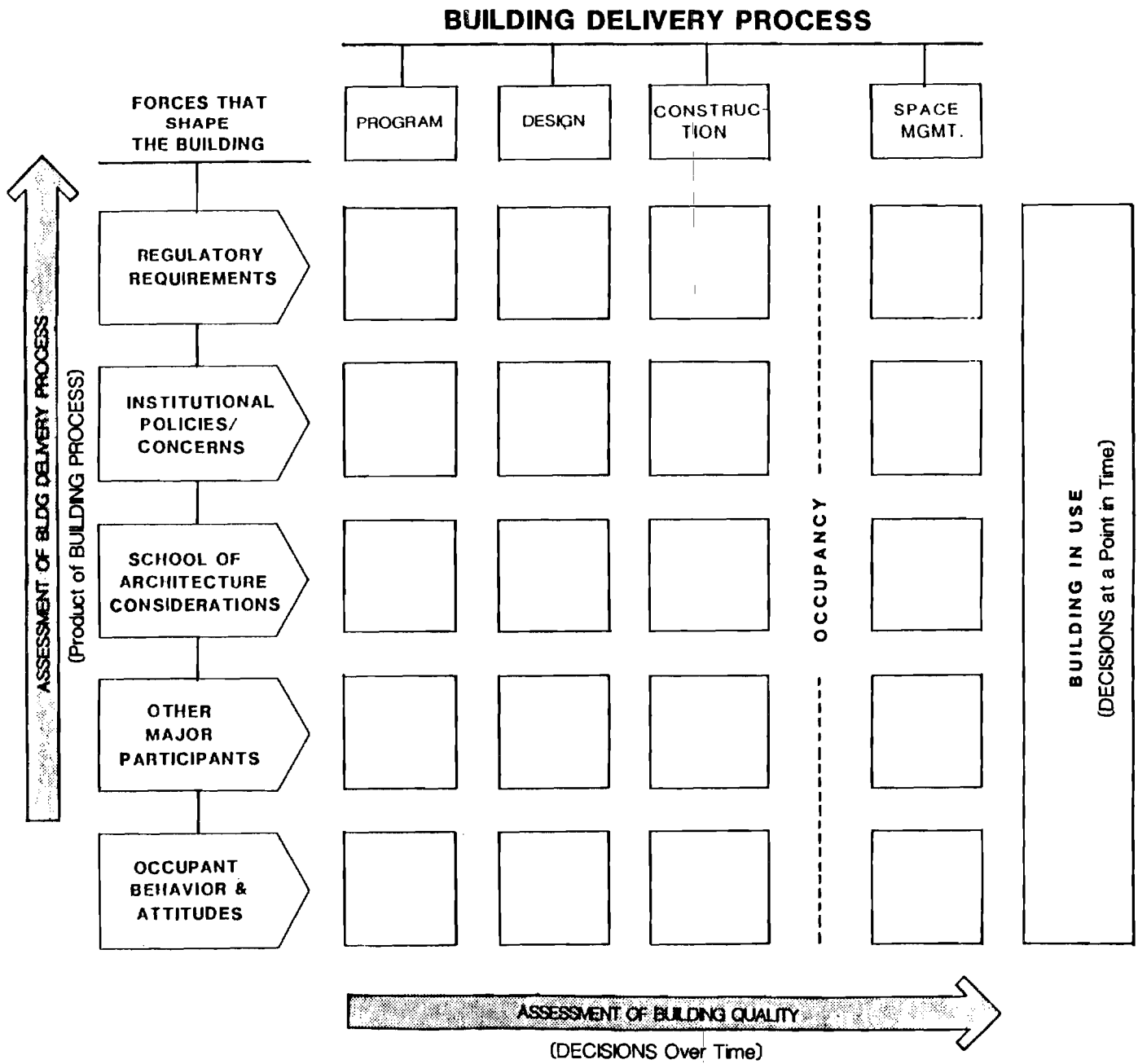


Figure 6: Influences on Building Decisions. Each step in the building-delivery process involves many decisions that can be informed by evaluation. These can be analyzed by the step in the process and by the interests that should be represented.

Figure 7: Building Characteristics and Performance Indicators Studied

Building Characteristic

Performance Indicators

Building Function Issues For Occupants

- o Image/Aesthetics
 - o What is desirable?
 - o Is it appropriate?
 - o Does user have ability to personalize the space if appropriate?
 - o Is the space inviting?

- o Function/Use
 - o Does the building/space facilitate the range of activities that occur in the building?
 - o Were assumptions about activities appropriate?

- o Spatial Organization
 - o Is the separation/integration (visual/-acoustic) of activity spaces effective? (Is this desirable?)
 - o Are multiple points of entry desirable?
 - o Are locations of subareas desirable?
 - o Are there adequate sightlines (within the space and to other spaces)?
 - o Is there an adequate degree of enclosure?
 - o Is there adequate circulation?
 - o Is there flexibility to accommodate change in use or reorganization of space?
 - o Does space facilitate the desired type of interaction (e.g., formal - teacher/-student, informal- socializing)?
 - o Is the space/building accessible?
 - o Is the space easily found (e.g., is signage available and legible)

- o Size/Capacity
 - o Can the building/space accommodate current and projected uses?
 - o Is the building/space flexible enough to accommodate expected multiple uses?

- o Number of Spaces
 - o Are there enough (too many) spaces of a given type to accommodate current and future needs?
 - o Is there flexibility in increasing or decreasing the number of spaces of a given type as needed?

o Spatial Relationships

- o Is the location of the building/space desirable?
- o Is it accessible to the appropriate building spaces?
- o Is the building/space visible to and from other spaces? Should it be?
- o Is access controllable, if needed?
- o What are the consequences (disadvantages and advantages) of the location?

Building Performance Issues

o Materials/Finishes

- o Are they appropriate for the building/space in terms of image, safety, cost, comfort, durability, maintenance, ease of use etc.?

o Furnishings/Equipment

- o Are the number, size, type, maintainability, and durability of furnishings/equipment appropriate (e.g., blackboards, pinup space, work surfaces, tables, chairs, desks, display/exhibition, typing tables, computer workstations, shelves, telephones, projection screens, AV equipment)?

o Building Systems

- o Are lighting, HVAC, acoustics, telephones, electric outlets, water connections and switches adequate and appropriate for the building/space?
- o Does the user have the ability to control the conditions? (Is this desirable? e.g., Can the room be darkened?)
- o Is the space easily found (e.g., is signage available and legible)?

PROJECT PHASES

Over a three year period, the project examined the former building occupied by the School of Architecture, analyzed the new building construction process, studied the newly occupied School of Architecture as occupants settled into it, and finally visited the building for a final assessment after more than a year of occupancy.

Pre-Move

The team started gathering information before the move into the new building. In the School's former quarters, the POE team studied physical conditions (temperature, light, noise levels) and building use patterns, conducted walkthroughs with staff, faculty and students to have them specify places in the building which were used or experienced in certain ways, and asked users to complete questionnaires about the "old" building and their expectations about the new one.

Construction Monitoring

The team analyzed the programming documents for the new building, then monitored the building construction process through attending construction meetings and analyzing change orders, field notes and changes to other construction documents. Through interviews with the architect, construction manager, and client representatives, the team examined issues related to the innovative nature of the construction process.

Settling-In

Ten weeks after initial occupancy, the team visited the School to monitor the settling-in process and meet with the Advisory Task Force. Issues identified during the walkthroughs with students, staff and faculty conducted during that visit were compared with expectations and programmatic intent.

One Year after Occupancy

The team performed a follow-up set of building use analyses and physical conditions studies. The team walked through the building with faculty, staff, custodial staff and students to discuss their uses of and experiences with the building. Published articles in the professional and popular press and the School's promotional materials were analyzed. The Advisory Task Force met again to clarify their priorities and discuss application of the information.

METHODS

The project team used a wide range of research methods. These reflected the multiple goals of the client who wanted a research process that actively involved the School and important decision-makers, yet was also rigorous and scientifically defensible. As a result, the project team

organized the Advisory Task Force which met three times over the course of the project and relied heavily on walkthrough interviews. These interviews helped and faculty feel they were a part of the process and that their concerns were heard and understood. These participatory "self-report" measures were balanced by observation and physical monitoring which allowed a more quantifiable data to be gathered.

Advisory Task Force Meetings

Three meetings were held with the Advisory Task Force to discuss project goals and research methods, review preliminary findings, and address general concerns about the evaluation process.

The sequence of interactions with the Advisory Task Force was as follows:

Step One:

Potential members were interviewed to determine individual interests and to select a task force with a good cross section of experience and concern. Selection was in consultation with the FAMU School of Architecture. Categories of individuals considered for selection include FAMU and School of Architecture administration, members of the Board of Regents, representatives for the Office of Capital Projects, design decision makers, representatives from the State of Florida, elected officials and maintenance personnel.

Step Two:

The initial Task Force meeting was conducted to determine the basis for detailed planning of procedures for POE implementation. The Task Force addressed such questions as the importance and relevance of evaluation information, the kind of information they needed from such an effort, information use and benefits, obstacles to effective use of evaluation results, and recommended strategies for overcoming the identified obstacles.

Step Three:

The Task Force reconvened to perform a proposal review on the Work Plan, making suggestions for improvements and implementation. It also reviewed the progress of the work and made final recommendations on questions and approaches just prior to the initiation of Phase II evaluation activities.

Step Four:

The final set of meetings between the Team, School of Architecture and Advisory Task Force discussed the POE findings on-site to help make them immediate and relevant. Walking through the building, the team and users identified how final building features, use and maintenance patterns, physical conditions, and user satisfaction were related to the processes of building procurement, design, construction and use. The challenge for the future is to learn from the successes and problems associated with this process and the building it produced, and to build even better and more successful buildings.

METHODOLOGICAL STEPS

Figure 8 illustrates the major methodological steps in the project, illustrating the balance between qualitative and quantitative methods. Further detail on the team's subjective assessment is provided below in the section entitled "Usefulness of the Methods Employed for Future Projects." The Appendices provide samples of the data-gathering instruments and more detailed results.

- o Conduct settling-in study Problems and issues that arose shortly after move-in were documented through faculty logs, individual interviews with administrators and the building manager, and walkthroughs with staff, faculty and students.
- o Conduct 2nd Task Force Meeting A second meeting was conducted to review progress and suggest directions for post-move data collection
- o Study construction process Construction process was analyzed using construction monitoring notes, interviews with Construction Manager, Dean, Project Architect
- o Study context of site The relationship of the building to outdoor areas, surrounding campus buildings and the neighborhood was analyzed through a site visit and interviews
- o Interview key decisions-makers (Post-occupancy) The Design Architect, Campus Planner, BOR Architect and School of Architecture Dean were interviewed to document the design and construction management process and their reactions to the final building
- o Perform post move studies One year after occupancy, the building was studied using: individual interviews with the Dean, Assistant Dean, Campus Planner, Chief of Maintenance, Building Manager; walkthroughs with Faculty, Students, Custodial Staff, Office Staff; observation of student and faculty activity, measurement of noise, light and temperature levels
- o Conduct 3rd Task Force Meeting A final Task Force meeting was held to review results and consider how the POE results and process may be made most useful for further Bor and State activity
- o Analyze data and formulate recommendations Project was completed



Results



IMAGE

The FAMU School of Architecture was only five years old when their new building was programmed. The administration and faculty hoped that the new building would help establish the School's reputation among professional architects and educators and contribute to the school's student recruitment effort. The administrators and faculty were also hoping for a building that would communicate to students the School's approach toward architecture. As expressed in the design competition program, the building was to express "optimism, courage, humility, belief in architecture, professionalism, pride, openness and frankness, future orientation, dedication to service, unique quality, and an expression of a building on the 'leading edge'."

The school got what it asked for with respect to image. Whereas it is difficult to directly evaluate whether the building has achieved this long list of goals, its positive reception by the popular and professional press, design awards and reactions by students, faculty, administrators and staff all suggest the building has successfully provided an interesting, engaging and photogenic image. Both newspapers and architectural magazines have lauded the building's visual interest and complexity. They have also commented on its success in relating to the residential neighborhood to the east and the greenhouses to the west.

The building has won a Florida American Institute of Architects Award for design. The jury consisted of internationally known architects.

In addition, the reactions gathered by individual and walkthrough interviews suggest the image of the building is well received by students, faculty and others. The building has become a major stop on tours of Tallahassee by students and faculty and several students and faculty commented that they go out of their way to drive by the building at night just to see it. According to students and faculty, the building is also evidently a campus landmark. Even the campus planner and chief of maintenance -- who anticipate possible long term repair and custodial problems with the building (because of the many kinds of joints and materials and inaccessibility of some areas) -- are pleased with the image and are finding it an exciting place to be.

Some aspects of the image resulted in negative impacts on the comfort, usability and maintainability of the building. These are discussed in following sections.

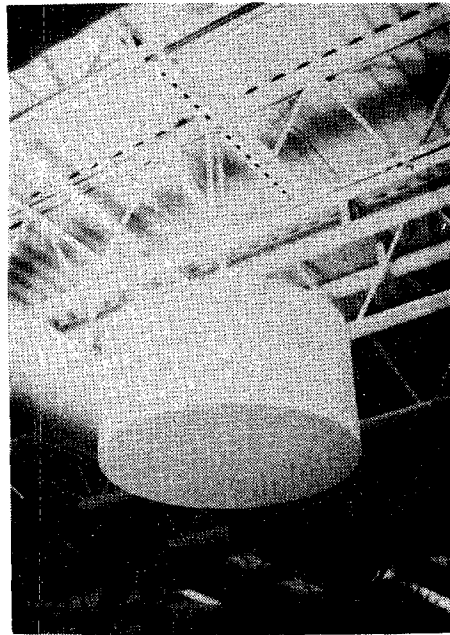
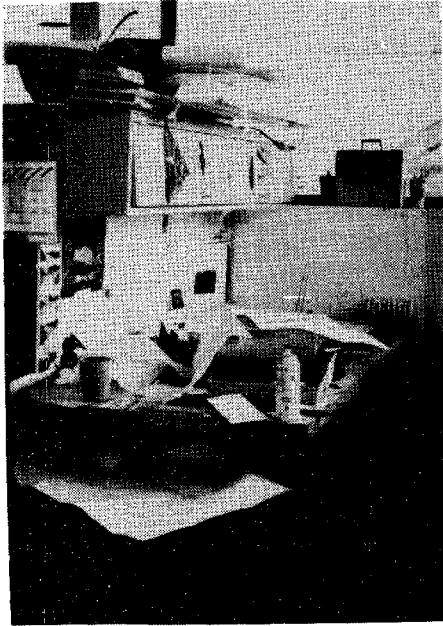


Figure 11: *Students found design studios to be dark and stuffy, with the metal halide lights producing an annoying hum. The work stations were well received.*

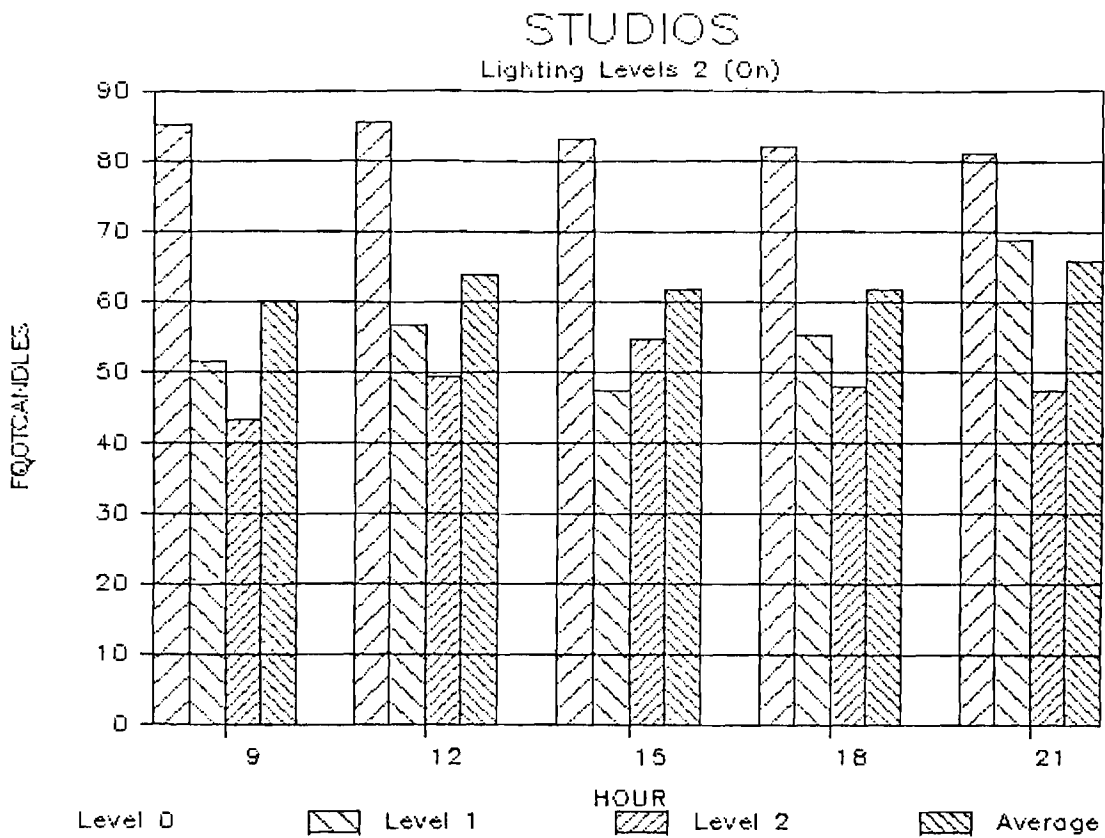


Figure 12: LIGHT LEVELS IN DESIGN STUDIOS WITH LIGHTS ON. *With task lights on, the lighting levels varied but were generally adequate.*

Number of People Using Studios in the Old and New Buildings

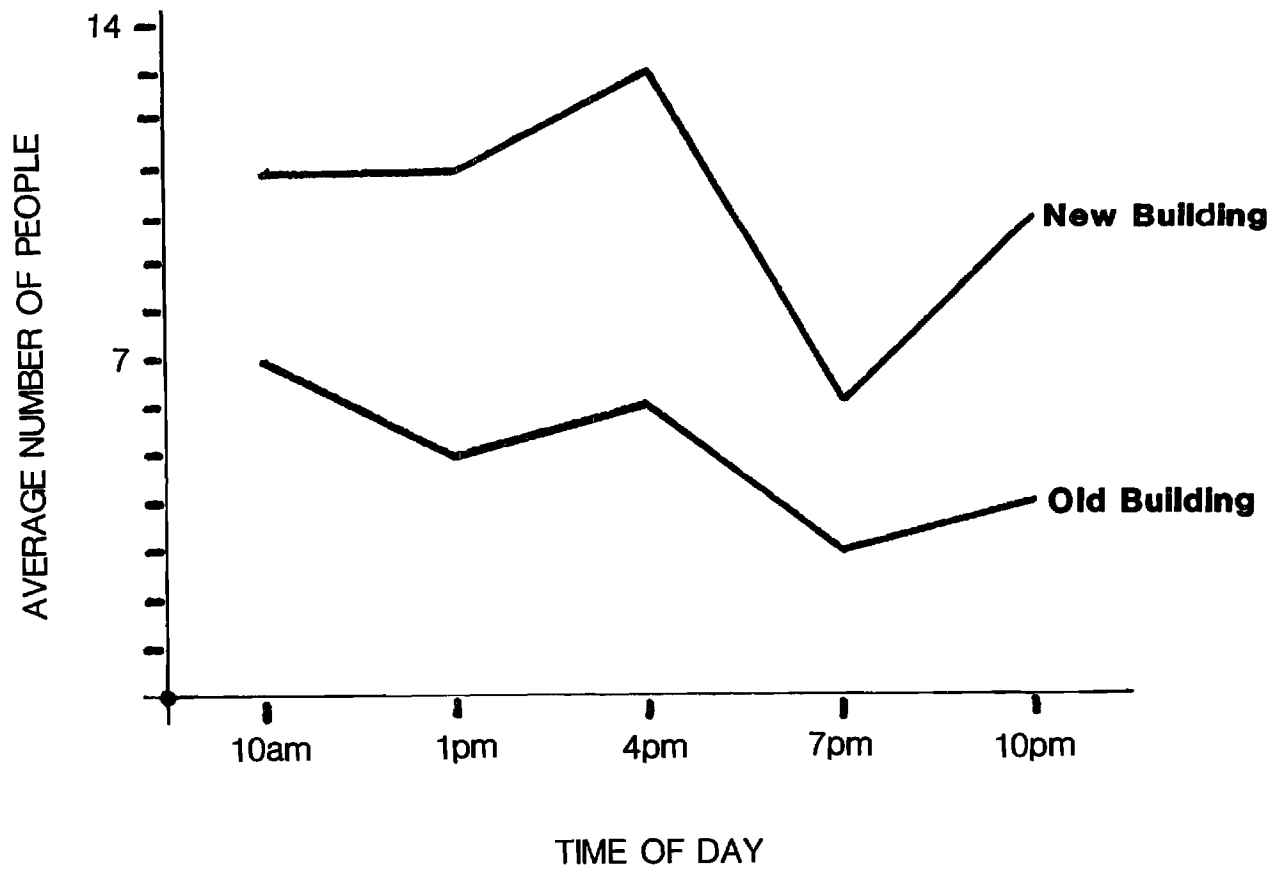


Figure 13: Number of People using Studios in the Old and New Buildings.
The studios in the new building were used by more people and were used more for after-hours work, satisfying a major programmatic objective.

The Building as a Teaching Tool

The building is used as an example in architecture classes. The design competition program laid out fairly general goals for the educational value of the school: the building was to demonstrate steel-frame construction and leading-edge design. The design architect, Peter Rumpel, felt that by exposing the mechanical system and joints between materials, the building could be used actively as a teaching aid and that students could visually trace the workings of the HVAC system and details of the construction. This has occurred, and the building is frequently used as an example, especially in technical classes.

As is discussed below in the "Performance" section, there are some costs of exposing the HVAC system and joints. The exposed HVAC makes it hard to subdivide spaces if needed because any changes to the HVAC system must be visually attractive. The complex joints were hard for the building trades to craft and may result in maintenance problems. One professor said however, "We learn from the successes in this building, and we learn from its problems. What more can we ask?"

Security

Unlike many other buildings, an architecture school is open and used over a twenty-four hour day and on weekends. Students keep expensive tools and personal items in the building and enter and leave at odd hours. In the School's previous quarters, security was a high concern -- there were several personal attacks and numerous small thefts and acts of vandalism - and safety was an important goal in the new building.

The program and design sought to achieve safety by exposing potential perpetrators on brightly lit outdoor hallways and stairs, by clustering functions used at off-hours and by employing a highly programmable computerized card-lock system. These strategies have apparently worked. Students and faculty report feeling safe even at night, and there are few reported thefts or acts of vandalism.

The strategy of grouping actively used areas around the first courtyard to focus after-hours activity has yet to be proven. Whereas it is presently used for late night frisbee games and other break activities, the courtyard is not yet landscaped and the student lounge opening onto the courtyard is not yet fully furnished. When these are completed and when outdoor furniture is installed, there should be more activity in the courtyard.

Similarly, as of Spring 1986, the card lock system had not been installed. If this system works as expected, it should allow very specific access to rooms, such as allowing sophomores access to the computer room on Thursday from 2:00 to 4:00. The system will also record who enters and will allow analysis of the usage of facilities. Even with conventional locks, having outside doors to studios allows students twenty-four hour access to their locked studios by providing them with keys to a single studio.

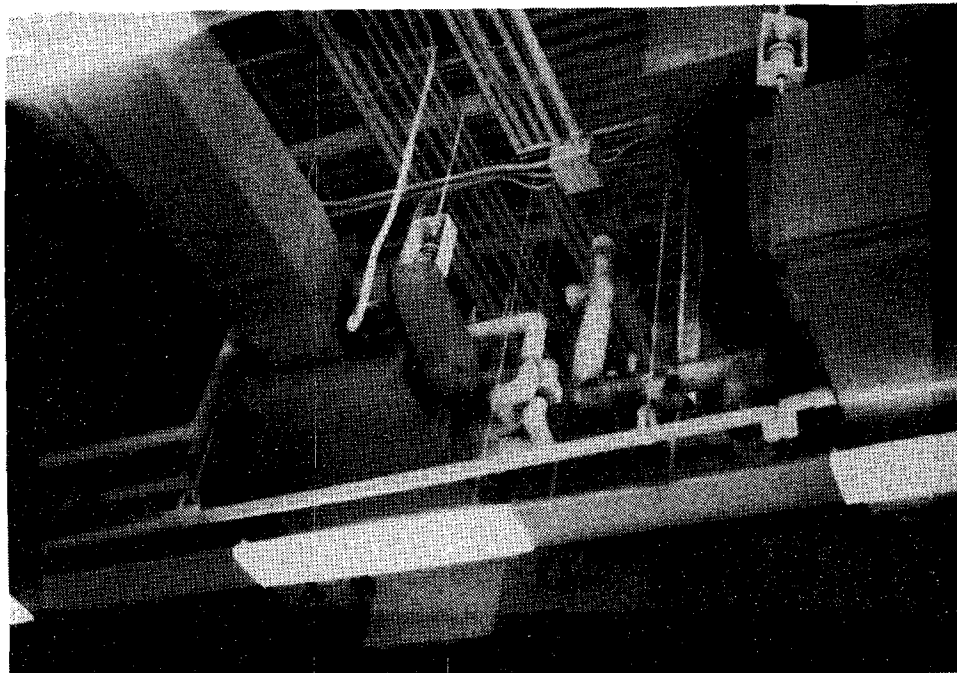
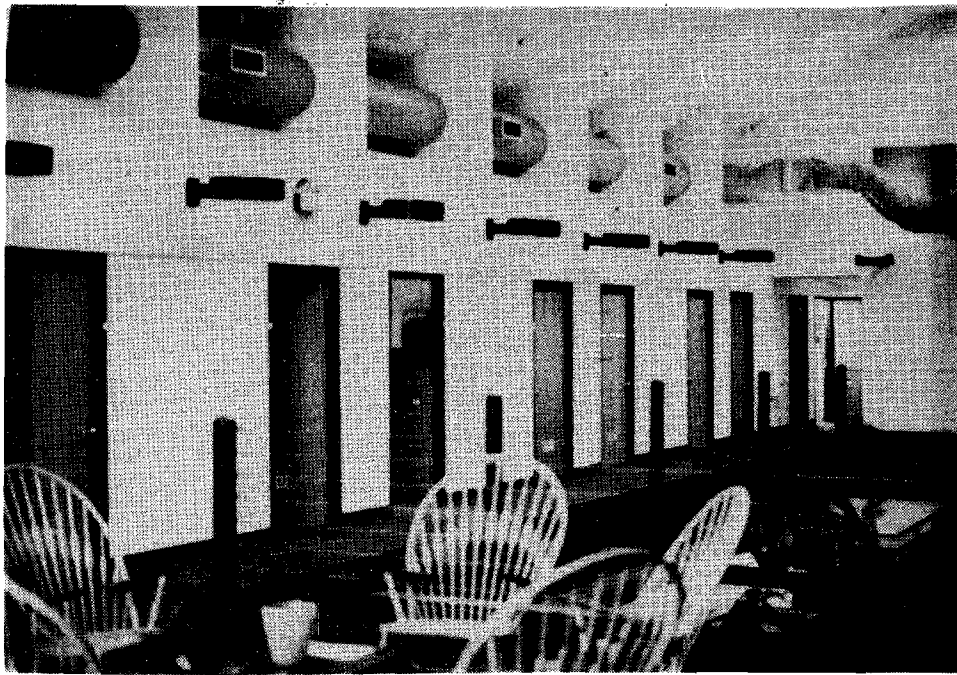


Figure 14: *The steel-frame construction, exposed mechanical system and detailing are frequently used as instructional examples in the School's classes.*

Part of the increased security of the School is also probably due to the pride of ownership in a new building. Students, faculty and staff like the image and impact of the building and report they are more likely to challenge intruders and to refrain from damaging the building.

Social Interaction

An important programmatic objective for the building was to promote interaction among students, faculty and staff. The old building had many problems including a lack of common gathering space. However, because faculty offices were next to studios and most people entered the building through the loading dock, it was easy for students to talk to faculty informally. (By the same token, several faculty stated it was hard to get work done in their office.)

For the new building the decision was made to group faculty in an administrative wing to increase faculty collaboration. Students were expected to check in with a receptionist who then would call the faculty member.

Faculty report they see each other more often in the new building and that they interact more. Despite greater distance from their offices, the observation data suggest that faculty spend about the same amount of time in studio in both the old and new buildings. A faculty member was in each studio about one-third of the time.

Staff members, who were housed in the open atrium space overlooked by faculty offices initially were very concerned about privacy. With time and the addition of high quality partitions, their concerns have lessened.

Students do not like what they perceive to be isolation of faculty and are particularly resentful of the receptionist system. (This is not a problem during cold weather since the reception area is unoccupied because it is too cold. Students go directly to faculty offices.) The rationale for using the receptionist is to limit access to the copy room on the first floor.

Whereas most students and faculty feel social interaction is enhanced by the ability to see one another on the open walkways, some report greater isolation of students from faculty due to the "wing" organization of the building. Graduate students, for example, must go out of their ground floor studio and up three levels to converse with most of their professors.

Students and faculty are enthusiastic about the openness of the plan. They enjoy the easy relationship between interior and exterior spaces and often take advantage of good weather to hold classes and meetings outside. The stairs to the street from the first courtyard form a natural amphitheater and sessions with the whole school are frequently held there.

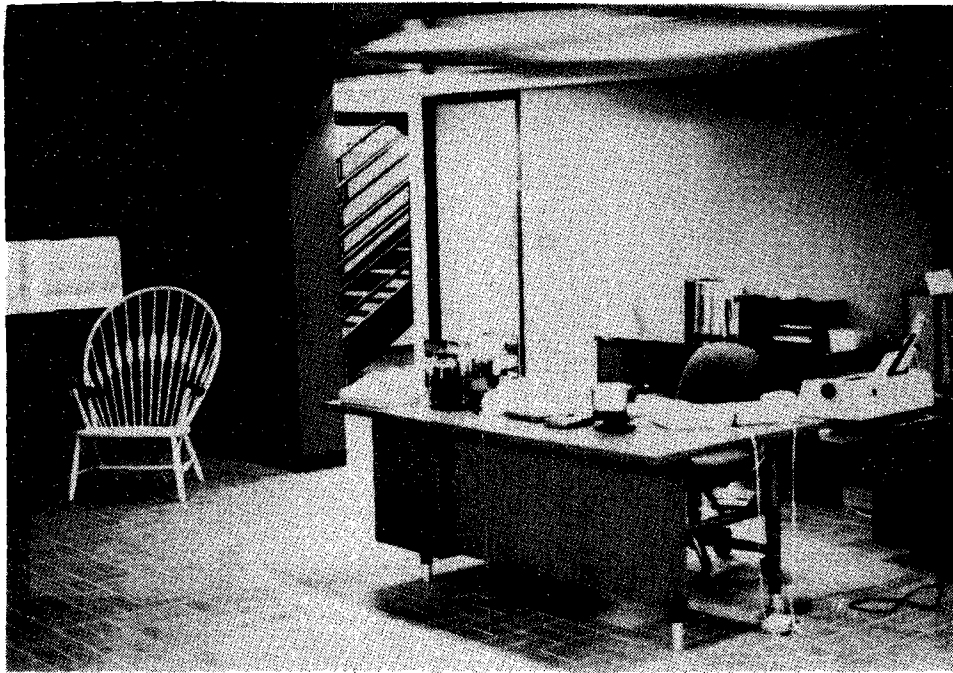


Figure 15: *The courtyards and easy inside-outside movement provide many opportunities for socializing. Students dislike having to check in with a receptionist before talking to faculty.*

Summary: How Well the Building Functions for Occupants

The building supports the activities of occupants in a number of ways. Combining small individual faculty offices with unscheduled conference rooms has worked well. The building is used as a teaching tool, is perceived as much more secure than the old building, and the easy inside-outside flow is appreciated by students and faculty.

There have been some costs of the programmatic and design decisions. Studios are perceived as dark and relatively uncomfortable. Exposed mechanical systems and construction details may limit future flexibility in subdividing spaces and may result in maintenance problems.

PERFORMANCE OF THE BUILDING

Despite the fact that the users are satisfied, the building image is positive and the building is a valuable teaching tool, there are some costs to satisfying the program the way the building does. The environmental control system is only a partially successful solution, the building is difficult to maintain and future flexibility could be awkward. The complexity of the building design clearly contributes to these problems.

The complex building form of the FAMU School of Architecture Building was not a surprising result from a competition program which stressed innovative design concepts and a strong, memorable image. In addition to the visual complexity of this building, it is technically complex, characterized by an experimental HVAC system and a multitude of intricate building construction details connecting a wide variety of materials. This complexity caused some problems in building construction and is causing others in technical operation.

The complexity of the completed building design was apparent from the earliest stages. The architect's competition submission was conceptually identical to that of the completed building design. The unique, futuristic look stated as desirable in the competition program was interpreted in the competition submission as a somewhat "high-tech" aesthetic, with an innovative energy system and a highly imageable plan. The many materials and joints necessary in this high surface-to-volume ratio building were all apparent in the earliest sketches. These design decisions were made in the spirit of the competition program's concept of having the building make a statement about the character of the school and of being able to use the building as a teaching tool.

During the design phase, the possibility of simplifying the initial complexity of the proposed design was derailed by a poor client - architect relationship. There were early misunderstandings about how much the competition submission was to be reflected in the finished design and about the adequacy of fees for redesign. The architect resisted client attempts to have the building significantly redesigned. According to interviews with the client, the overriding concern of the architect in the design of the construction details was the appearance of the building. At the completion of contract documents, there was client concern about

the complexity of the design, the durability and watertightness of the details and the clarity of the working drawings. As a result, the construction management method was selected for the building process rather than the conventional competitive bidding method.

The variety of materials used in the building is an important issue in terms of construction detailing. Some construction problems related to connecting one type of material to another, for example how to mount flat-backed fire protection equipment on corrugated metal. Others related to the thousands of joints in the building and the use of a large number of types of caulks and seals to connect them.

The construction management firm dealt with twenty-three subcontractors during construction, in addition to owners representatives from the Board of Regents, FAMU Campus Planner and the School of Architecture. There were mechanical, structural, electrical and plumbing/fire protection engineers, civil engineers, and consultants in landscape architecture and passive solar design.

Detailed field notes and change order documents from the construction phase were analyzed and capture some of the complexity of the construction process. It is clear that numerous construction detailing problems were solved on site. For example, one change order refers to cutting penetrations in a beam to allow passage of pipes and ducts, and another notes conflicts between sound traps grills and entry lights. Many construction problems occurred directly as a result of the complexity of the building where details were left out of plans or drawn incorrectly. The number of entities involved with construction also increased the complexity of the construction decision process. For example, the decision to use homosote or impregnated cork for tack surface was changed at least three times between programming and building completion. The costs of building complexity need to also take into account added labor costs as building materials were customized (for example, sheetrock had to be cut to fit duct work) and as unclear or unusual details were interpreted.

The complexity of this building influences its performance in many ways. Three of these themes to be discussed here: the experimental HVAC system, ease of maintenance and flexibility.

Experimental HVAC System

The experimental energy and HVAC system has strengths and weaknesses. It is working well in the mechanical mode and in passive heating but the passive mode does not serve the cooling needs of the users. (This occurred partially because the value engineering process reduced the scope of the energy control system but did not realign the overall system design.)

One programmatic goal for the new building was to develop an energy conservation strategy that would take advantage of Tallahassee's pleasant climate while demonstrating energy efficient design to students, faculty and other architects. The previous building, which had been viewed as

hot, dark, and stuffy created heightened expectations for comfort in the new building. There had been little natural light in the studios, and overall, students and faculty felt they had lacked control over ambient conditions. These factors increased occupants' desires for thermal comfort, natural light and user control in the new facility.

The HVAC system was supposed to be a 'leading edge design', experimenting with state-of-the-art knowledge about passive solar cooling and heating in the warm, humid Tallahassee climate. The design response for the new building combined an innovative passive solar energy strategy (south facing vented solar thermal chimneys), coupled with a complex computerized energy control system, used uniformly throughout all four wings of the building.

As originally conceived, the building was to operate in one of three modes, either mechanical heating, mechanical cooling or natural ventilation, depending on the season. This implies, for example, that mechanical cooling and ventilation would not occur during the same day. The central chiller was to be shut down during moderate seasons. The passive cooling system depended on the thermal chimney drawing out warm air during moderate seasons. The thermal chimneys are designed to "preheat" air during the cold weather. Paddle fans would increase interior air movement and a desiccant bed would be used for dehumidification. The design concept for the passive system was based on the experience of its use in a residential project in the northeast where, according to the passive design consultant, it seemed to work well. Although he acknowledges the system might provide only marginal thermal performance, the educational value of the system as demonstrating an approach to passive design was of primary concern.

As a result of a series of necessary cost cutting decisions during design, a number of features of the HVAC system were eliminated or altered. The desiccant bed and paddle fans were eliminated completely. Other components of the system (the fully controlled solar thermal chimneys, three modes of space conditioning and computer controlled environmental controls system) are installed only in some portions of the building. The resulting system, an innovative one to begin with, became even more difficult to understand because it is inconsistent throughout the four wings of the building. The computer based controls for the HVAC system are quite complicated to understand and reprogram. However, it may be difficult to ever provide thermal comfort using the system as built for several reasons. Evaluation results indicate that the experimental HVAC system as built has a number of problems with both user comfort and effective operation. Initially, there were a number of "settling-in" problems contributing to initial negative user response to the system, including difficulties in "tuning" the system and a major power outage during which the manual override for the system was unworkable.

Although the recorded temperatures stayed quite constant (see Figure 16), thermal comfort is major complaint of students, faculty, and staff. They reported being often too warm or too cold, perhaps because of ventilation problems, with little ability to control conditions either mechanically or

through adjustments such as opening windows. The studios have little natural lighting, except when the computer operated panels between the thermal chimney and studio space open for ventilation. Some students have taken the situation into their own hands by dismantling the computer-operated panels and opening them manually to use them as a light source.

Humidity is a major drawback to the success of the passive cooling system. Students complain that if drawings are left out for any length of time they bubble and curl due to humidity. In the ventilating mode, (activated automatically when the temperature falls below 75 degrees F.), warm air is pulled through the thermal chimney and out the ridge ventilator. Humidity absorbed by interior materials while the system is in the ventilating mode puts additional load on the system during mechanical cooling, potentially offsetting energy savings. In addition, if the thermal chimney is not charged by the sun while the building is in ventilating mode, such as occurs at night or on a cloudy day, sufficient passive cooling does not occur. While this might not have been a problem in a building with a more usual nine-to-five occupancy pattern, such as a professional office building, it has resulted in numerous complaints from architecture students who often inhabit the building around the clock. (Note: it had originally been hoped that adequate night-time cooling would be provided by the wind-assisted ridge ventilation.)

The building structure contributes to the problems with the HVAC system. Heat conducts into mechanically cooled space in the summer and out of heated space in the winter. Steel trusses penetrate the buildings' skin. Steel columns are common to both interior and exterior walls. Steel studs and trusses transfer heat from the thermal chimney to interior spaces without a thermal break. On a sunny day, as one walks across the studio space a clear temperature differential can be felt, with the wall adjoining the thermal chimney radiating heat to the interior. In the winter, the steel members in the interior of the thermal chimney are exposed to air temperatures around 120 degrees F. (and thus expand), while the exterior steel members facing north are exposed to 40 degrees F. air (causing contraction of the steel). With a number of visible cracks in gypsum board and at joints there is concern about the long-term effects of thermal stress on the building.

There is a question whether the complex computer-run system is appropriate for a state-owned educational building. The original program for the system had many "bugs" and has had to be reprogrammed to meet occupant needs and to provide for greater overall energy efficiency. The system required a fully trained building engineer to run it and no such person was available at the university. Fortunately, the school of architecture has faculty who understand the system and have taken on the responsibility of operation. It would be questionable to assume that other university departments would have comparable expertise available.

The actual energy efficiency of the system may be studied in the future now that the system is tuned. Energy monitoring should show whether the energy savings associated with the reduced use of the passive cooling mode are worth continuing. However, given the problems described above, it is questionable whether the educational value alone of using the experimental passive solar cooling system is worth the trade-off in occupant discomfort.

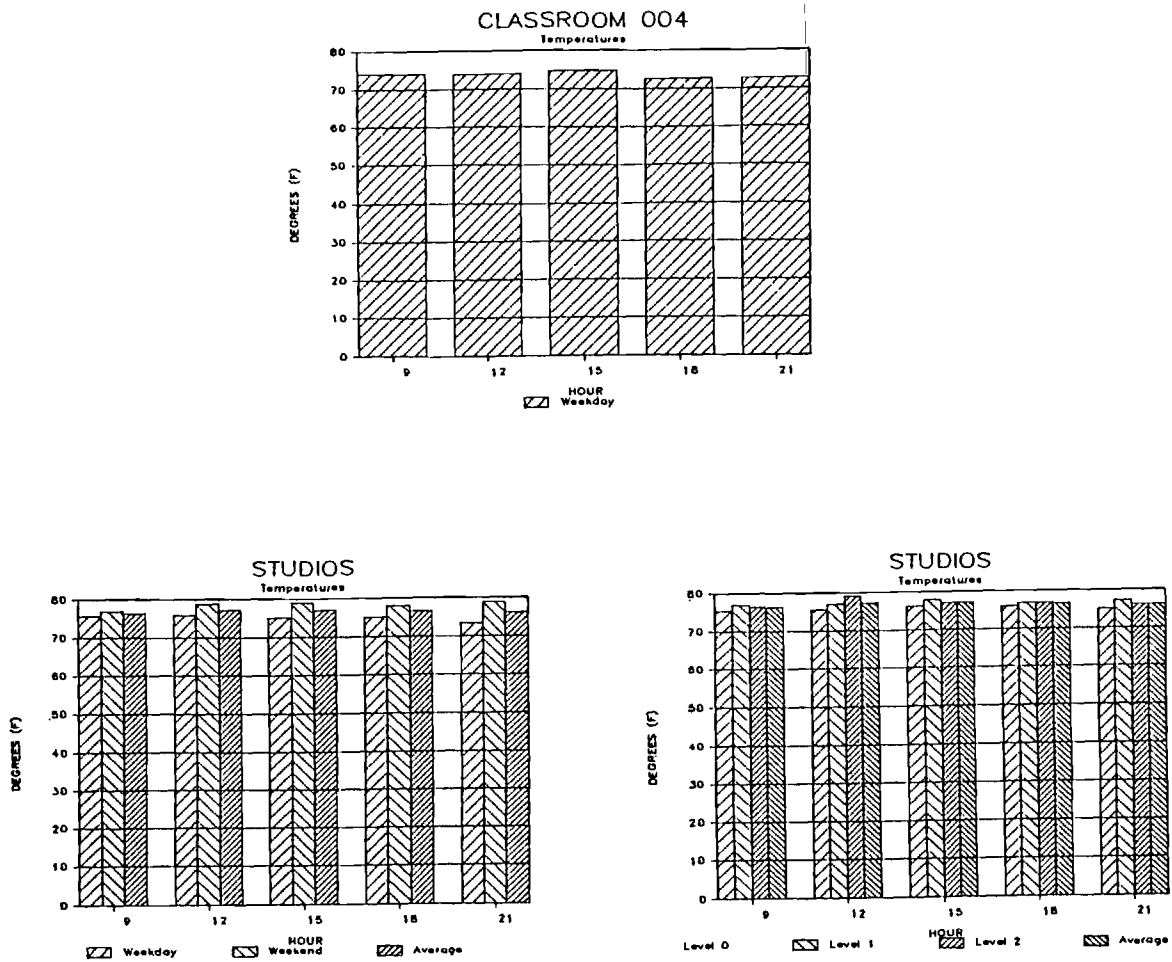


Figure 16: Temperatures in Studios and Classrooms. *Although there were many complaints about the new building being too hot or cold, the temperature was very constant during the two-week monitoring period in late March 1986. Faculty and students may have been sensitized by comfort problems in their old building, and by humidity and ventilation problems in the new building when the solar chimney was not charged by the sun.*

Maintenance and Building Operation

The building is difficult to maintain. Custodial costs will be high or the building will deteriorate more rapidly than the norm; repair costs are also likely to be high. This particular approach to designing a building with a strong image involved a complex design and a wide range of materials, both of which contribute to high custodial and repair costs.

Like most state universities, FAMU has a minimal maintenance budget, and durability and ease of maintenance are major concerns. Part of the building's visual interest is in the variety of materials. That variety led to unusual and complex construction details causing problems for construction trades inexperienced with them. The complexity is also contributing to maintenance problems. For example, leaks attributed to problems with joint sealants were common during the first year of use. There was also some question about the long term durability of some materials such as fiberglass not previously used in Board of Regents' buildings. Custodial staff are also concerned about the difficulty in cleaning the relatively inaccessible exposed steel trusses and HVAC duct work. Special equipment will be necessary to gain access to them for maintenance or repair.

Complexity of operation is a significant issue for this building, in terms of technical building function, as well as in terms of preventive maintenance, repair and custodial care

The technical functioning of the School of Architecture building requires a fairly sophisticated knowledge of the interactions between building systems, as well as knowledge of the computer-based environmental control system. The assumption of this type of knowledge being available may be acceptable for the present use of the building, where environmental control sophistication could easily be assumed to be present in the Architecture School faculty, but is probably unrealistic for other future uses.

Preventative maintenance programs are rare in university systems, but this building probably depends on one for optimal functioning. The building demands a level of maintenance knowledge, skill and supporting supplies and equipment that is both rare and expensive. During the first year of building occupancy a number of leaks due to joint problems developed. Joint materials (sealants and caulks) will need ongoing maintenance. They decay over time, and will need to be replaced. The number and variety of joints in the building make this a very large, costly and intricate task. While preventive maintenance would be much less costly than repair, it is not available. Repair of the innovative, involved building HVAC system will also be costly and difficult, adding to the higher life cycle cost of this complex building.

Custodial care is an important component of building maintenance. FAMU maintenance personnel were concerned about the durability and maintainability of some of the building materials. For example, the fiberglass

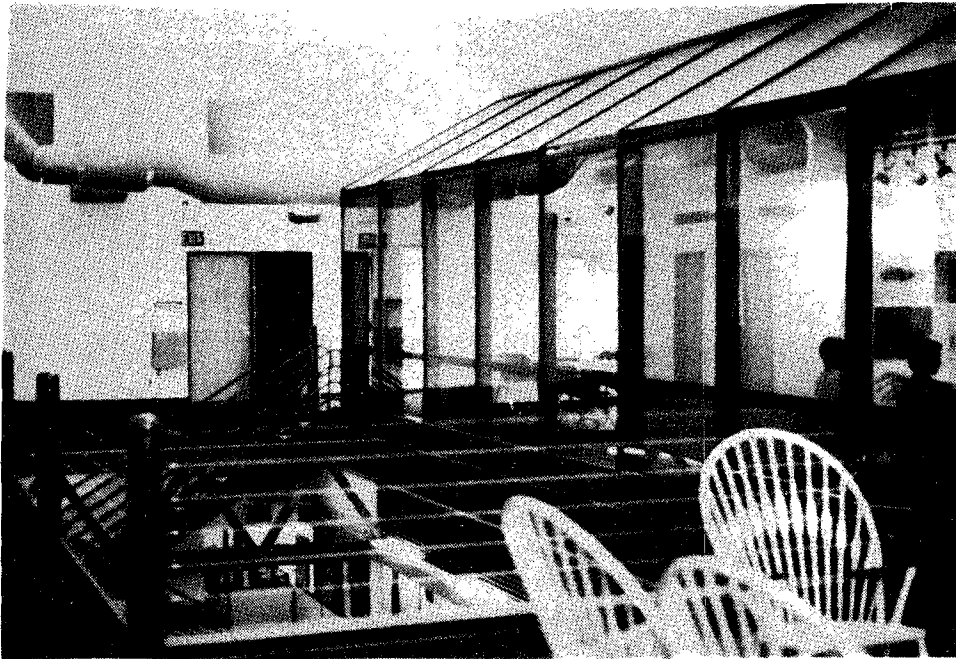


Figure 17: *Maintenance is complicated by exposed surfaces that are hard to clean and by complex joints and details.*

panels covering the thermal chimneys appear yellow after only one year of occupancy. This is apparently due to the build up of pine pollen inside the space, causing a difficult cleaning problem. Maintenance personnel also mentioned that the external circulation system means that outside dirt is more frequently tracked into interior spaces, increasing need for cleaning. They complained that the relatively inaccessible location of some building features (such as exposed steel trusses, HVAC duct work, light fixtures) makes routine custodial jobs much more difficult, time consuming, hazardous, and costly. In addition, since architecture students are usually "hard" on buildings, building maintainability is of even greater than usual importance.

Flexibility

Changing uses for the FAMU School of Architecture Building could pose a serious problem in the future. While many of the spaces are amenable to multiple uses, they are not able to change size with ease (for example, studio sizes are fixed, faculty offices are small and not easily enlarged). Three types of flexibility were evaluated: versatility of current use, expansibility and convertibility. Although flexibility was a major programmatic objective, the building is less flexible than had been hoped. The relatively small studios, holding about sixteen workstations, make it difficult to schedule unusually small or large classes. The exposed HVAC makes it difficult to move partitions or further subdivide spaces. However, the fifty foot structural spans allow studio walls to be removed without major changes in structure or mechanical systems. There are few multi-purpose type spaces, making reuse by other types of occupancies more difficult. Since architectural teaching philosophies also change, multi-purpose "loose fit" spaces serve the flexibility requirement of versatility and expansibility. The same is true for convertibility, since university buildings are frequently adapted for use by other schools or departments over their useful life.

There are three different ways to look at the issue of the flexibility of the FAMU School of Architecture Building:

- o **Versatility** - How specific is the match between characteristics of a space and the way occupants want to use it? Are the spaces in the building able to be used in a variety of ways?
- o **Expansibility** - Can the building accommodate an enlarged architectural student body and an expanded menu of class and studio offerings in the future?
- o **Convertibility** - How easily can the building be modified for other types of uses and users?

Versatility

A number of spaces within the FAMU building are designed quite specifically to meet a defined set of needs, (there was a "tight fit")

and in fact work well when they are used that way, while other spaces were designed for one particular use but are used differently, resulting in some problems. The multipurpose spaces intended to accommodate a variety of activities work well and are heavily used. This section discusses the versatility of a variety of areas of the building and concludes that areas designed as "tight fit" have much less versatility than "loose fit" areas.

The exterior spaces were intended for multiple uses - socializing, circulation and teaching. They are heavily used for all of these various purposes. Exterior spaces used for routine educational activities like juries, however, cannot be used during the uncomfortable weather common in Tallahassee in some seasons of the year. Faculty offices, on the other hand, are designed for a narrow range of functions. Their size and layout precludes using them for other activities. Faculty complain, for example, that student projects cannot be stored in individual faculty offices. The conference rooms designed to compensate for small faculty offices by providing alternative meeting/counseling space are used as intended. They are also frequently used as classrooms, due to lack of sufficient classroom space elsewhere in the building, their proximity to faculty offices and their intimate scale. When used as classrooms, the conference rooms do not work well. They overheat (from increased internal gains from larger numbers of people than anticipated) and lack adequate ventilation. Users also complained that they cannot be used to show slides, since there is no provision for darkening the spaces.

The classroom located at the lab areas had originally been planned to be a studio, but was pressed into use as a classroom. As a result, there are several problems with it: the acoustics are poor, the ducts are too low, there is insufficient pin up space and it cannot be darkened easily to show slides.

The studio spaces were intended to allow considerable flexibility of use. The ambient lighting and furniture "cubicles" do provide opportunities to rearrange student workstations. Students have built-in places to sleep in some studios. The studios were designed for quite small groups of approximately sixteen; groups larger or smaller than that cannot be easily accommodated. As a result, some studios are overcrowded, so that workstation locations encroach on the "assembly spaces" intended for group discussions and juries. In addition, small design details, like the raised outlet boxes on studio floors, interfere with optimum versatility.

The exhibit area is heavily used as intended and well liked. Moveable lights increase flexibility. The only recommendation to improve that space was to use spotlights instead of floodlights. The green house, although designed for a very specific use, lacks a drain, and so is used primarily as an extension of the exhibit space.

The auditorium furniture is moveable, instead of the more usual fixed arrangement. Users enjoy the flexibility of arrangement this allows. Maintenance personnel also said this made the job of cleaning easier.

Library spaces were described as quite flexible, with both large and small spaces available. The ability to dim the lights increased the perceived versatility of the space. Students specially mentioned enjoying using the small rooms in the library.

The student lounge is used for a wide variety of activities, including juries, lectures, and storage. The space itself is quite flexible but, until appropriate furniture was available, it could not be used well for its designated function.

Expansibility

How well can the building accommodate changing needs of the architecture school? The architecture school is growing and changing. The labs and technical support areas of the building have considerable potential to absorb and support these changes, but the studios, library, classrooms and faculty offices are currently filled almost to capacity.

The design provides a large amount of square footage for workshop, laboratory, and technical areas since the School of Architecture intends to reinforce and expand its offerings in these areas. A heliodon room, for example, was programmed and constructed despite the lack of such equipment at the time. After more than a year of use as a storage room, funding for an artificial sky is finally becoming available. This foresight is evidence of some expansibility. However, other functions of the school have already exceeded built capacity, most noticeably classrooms. Spaces originally intended for use as studios, lounge, and conference rooms are regularly used as classrooms. To the extent that these rooms were designed for other purposes, they function less well as classrooms (e.g., they lack blackboard space, pin up space, darkenability).

The fifty foot structural spans do allow studio walls to be removed without changes in structure or mechanical systems if larger spaces are desired in the future. Subdivision into smaller spaces, however, is made difficult by the exposed HVAC system. The school may not be aware of this fifty foot grid and/or may be reluctant to start tearing down walls in a brand new building. This reluctance to "tamper" with space may contribute to other apparent flexibility problems, such as insufficient pin up space. The regularity of the structural system also reduces its flexibility, since double sized studios are the next largest alternatives to single sized ones.

Convertibility

Functionally, the faculty offices, conference rooms, secretarial areas, auditorium, library, computer room and classrooms can easily be used by other schools or departments within the university if desired in the future. Studio spaces, workshops and laboratories would have to undergo considerable conversion for reuse. The more difficult issues for convertibility are the technical performance of the building and its symbolism. Technically, the problems with HVAC system control, materials performance and skin/structure joints can be understood, examined and

perhaps even enjoyed by architecture faculty and students. Few, if any, other university departments would have these characteristics. The programmatic concern to be able to use the building as a learning laboratory, may interfere with easy convertibility. Symbolically, the building has a strong presence on campus which other groups could easily adopt. The exposed structure, cable, thermal chimneys, etc. give the building a somewhat "technical" look, which would be more appropriate to some types of adaptive reuse than others.

Summary: Performance of the Building

The complexity of the building has provided a strong and well-liked image for the building but also created a range of problems during construction and some potential problems for long-term maintenance and operations. The flexibility of the building has yet to be determined but may be limited because of the exposed mechanical system and the highly specific design of some areas.

THE BUILDING DELIVERY PROCESS

This section reviews the building delivery process for the School of Architecture on a step-by-step basis. The first section provides an overview of the building delivery process; the following sections review each step in the process: Programming and Design Competition; Design; Construction; Occupancy.

The School of Architecture building project did not reflect the usual Board of Regents (BOR) building-delivery process. The architect was selected through a competition, and a construction manager (CM) was used rather than a competitive-bidding process. (The CM was not involved in the design phase, however, except for "value engineering.") The relationship among the principal parties of the project -- the owner, architect and contractor -- were complicated by the owner being a government organization and by misunderstandings about the goals of the design competition. (Whereas the owner expected the building to be completely redesigned after the competition, the architect felt the design competition was successful and that inadequate fees were provided for redesign.)

The Capital Improvements Office of the BOR served as owner during design and construction. The Capital Improvements Office usually writes the contracts between the State and the architect/engineers (A/E) and the contractor or construction manager. On this particular project, the Department of General Services wrote the A/E contract and assigned it to the BOR. (This is no longer the procedure.)

The University, through its Campus Planning Office, administers the contracts. The Capital Improvements Office does not have sufficient staff to perform this function. The BOR also feels that it is in the best interests of the University to administer the contracts for the construction of its own facilities.

The owner also includes the part of the University which will use the facility being built, in this case, the School of Architecture. Because of the architectural expertise of the School, it played a more active role in the design and construction of the project than is customary for an academic unit. The Dean of the School was the individual most involved in this capacity.

The construction manager, Winchester-CM, also acted as a contractor and became involved in the project after the construction documents were complete. At that time they reviewed the construction documents and recommended various changes which were subsequently incorporated into the documents by the architect. Nevertheless, the initial bids on the project were over the building budget and Winchester-CM recommended further cost-cutting changes in a second round of "value engineering." The firm was also hired by the BOR to construct the building. The actual construction was done entirely by twenty-three subcontractors with whom Winchester-CM contracted directly.

The architect was the firm of Clements/Rumpel/Associates. Peter Rumpel was involved primarily in the early phases of the design and Harley Parkes primarily in the development of the construction documents.

The responsibility of overseeing the construction was shared by the architect and the CM. In this respect, both architect and CM were acting directly as agents of the Owner. The duties of each part in this area were articulated in their respective contracts with the BOR. The responsibility of the architect was basically to answer questions about the interpretation and intent of the design. The A/E firm was required to visit the construction site at least bi-weekly. This responsibility was shared between Peter Rumpel and Harley Parkes.

A building project as complex as this one calls for a well-integrated approach from the outset. In this case such an approach was lacking. For example, the architect was not involved in programming and the future building users, maintenance staff and CM had little role in design development. Despite the architects' recommendations to hire the CM at the outset of the project, the CM was brought in late "to save the project" when the client already perceived problems. As a result, a somewhat confrontational relationship was established with the design architect. If the team had been set up earlier it might have defused some tensions and have provided better coordination during the value-engineering cost-cutting.

In general, however, the use of the CM process was well received by all participants as an appropriate process for complex projects.

The Program and Design Competition

The facilities program prepared by the School of Architecture was assembled quickly to meet a funding deadline but was still more specific than are typical BOR programs. It established the requirements for image,

building function for occupants, and building performance described in the previous section entitled "Approach and Definition of Issues," and stated the necessary performance of each space type.

The final design fits the program reasonably closely. However, because the competition-winning design emerged as the final design, there were some discrepancies. (The program provided for the competition was much briefer and more conceptual than the actual facilities program.) For example, relatively little storage space or area to take up projects was provided. While the competition was not analyzed by the POE team, another team studied it in some detail. They found that goals of the competition shifted while it was in process, making it difficult to apply a consistent set of criteria in choosing a solution. Whereas the original intention was to choose an architect rather than a design, the competition program in fact was a brief version of the actual building program and the winning competition entry closely resembled the final design for the building. Both the client and architect felt that this type of competition limited their flexibility later in the design process. The design consequently did not respond to the entire program while the client felt that the selection process needed to do a better job of detecting the design flexibility of the architect, i.e., the extent to which the designer will consider and re-evaluate previous design decisions.

The design program did not always anticipate the actual needs of faculty and students. In some cases, the program was too general such as about needs for flexibility, and in others, there were unintended consequences to the program statements, such as the negative reaction of students to the separation of faculty from studios, and the initial reaction of the secretarial staff to the lack of privacy in their open atrium offices.

Moreover, the programmatic requirements evolved during design. As the project proceeded, verbal negotiations over-rode the original written program statements. As the building process proceeded, the original written program became less useful as a statement of the School's goals and intentions.

The consequences of the programmatic decisions also clearly demonstrated potential conflicts between different "users" of the building. Whereas the School wanted a photogenic building with a strong image -- which they received -- this emphasis has complicated and increased the expense of long term maintenance and operations for the University.

Design

A key problem which arose in the design phase was participation by the client. Whereas collaboration between architect and client (beyond the written program) is vital to producing a responsive building, the client felt that poor communication caused difficulties in getting design ideas changed. Most importantly, it was expected that the competition scheme would be reworked, and it was not. As a result, the designer might have been less responsive to the needs of the School expressed during design development than if the building was being designed "from scratch" (for

example, for storage, pin-up space in the labs, detailing of the mechanical system). However, the architect has stated that insufficient funds were provided for extensive further design development.

The client can also be involved in debugging plans before bidding and construction. However, several individuals in the School charged that although the architect was conscientious during the documentation phase, there were communications problems with the client regarding assembly, construction details and weather-proofing. Many areas were not detailed and problems with detailing resulted, at least in part, from the complexity of the design. Most prominently, finishes, construction details and ductwork were in need of better design attention. The consequences were a number of logistical problems and excessive costs in construction.

Construction

Because of the complexity of the building and the anticipation of later change orders, builders added a significant cost factor to the bids. Consequently a CM was hired to oversee construction and minimize both problems and change orders.

Detailing problems in construction arose from the design of such a complex building. Many of the joints were difficult to craft and were not standardized. As a result, each problem was a new one. For example, no less than twelve different types of caulk conditions were needed for the joining of many different types of materials. A law suit by the sheet-rockers delayed landscaping for many months.

In response to concerns about how and why construction changes were made and what effect they had on the original program and design as well as whether or not generalizable lessons could be learned from this experience, the POE team monitored change orders and interviews were conducted by FAMU faculty member Peter Stone.

In conducting the construction review, three sources of information were tapped:

1. **Revisions to the Contract Documents (Appendix F).** This list was prepared by the construction manager in order to simplify and reduce costs in the design.
2. **Addenda to the Contract Documents.** The primary data source was the list prepared from the project files by a FAMU graduate student who also commented on their likely impact (Pre-Award Change and Problem Schedule).
3. **Change Orders.** The primary source of information about the change orders was the list prepared from the project files by a FAMU graduate student who also commented on their likely effect (Post-Award Changes and Problems Schedule). Samples of the forms used in the two schedules are attached.

4. **Interviews with major participants.** The Dean, Construction Manager, Campus Planner, BOR Architect, Design Architect and others were interviewed.

In assessing changes to the building, two main types of effects have emerged, those relating to user function or perception and those on the physical fabric and technical performance of the building (up-keep, maintenance, durability, etc.). Each change was reviewed in light of programmatic requirements and intentions, singling out those which would appear to have had a potential effect. However, it has been impossible to determine with certainty the effects of all documented changes. Thus, this analysis provides points of departure for further investigation.

The changes which have been identified which appear to relate to user function include those which concern thermal performance and HVAC systems, security, finish carpentry and materials durability, drainage, and damp-proofing.

HVAC and Thermal Performance.

Program Goals. A program goal was to "demonstrate 'state-of-the-art' techniques in passive heating, cooling, ventilation and lighting systems." Other related goals are to "utilize advantages of the area's climate," and to "present image of 'leading edge' quality of school." This clearly was the basis for selection of the design from the competition.

Energy is also emphasized in the program's recommended environmental quality standards. "The standards presented here define ideal environmental qualities at the least energy cost... The ability to provide automatic and manual control of space condition (sic) throughout the facility (i.e., active and passive lighting, thermal and ventilation system) is seen as a major design criteria." Comfort was also seen as important: "Environmental factors have a significant impact on teaching and learning process."

The program also emphasized the ambient environment: "The visual, sonic, spatial, thermal, and atmospheric environment all affect teaching efficiency and student receptivity, as well as staff and faculty efficiency in other tasks. Space temperature and lighting requirements are of utmost importance in designing education facilities."

Changes and their likely effects. A long list of HVAC changes can be found in the revisions to the contract documents. The net effect appears to have been to remove most of the sensors and controls which would allowed automated operation of the building. This may have contributed to the relatively low comfort levels experienced by building users. This is critical in a passive solar building, where greater thermal swings and more occupant involvement may be needed. Other related changes involved removal of vibration isolation. This may have had a negative effect on the acoustics of spaces bordering mechanical rooms.

Security

Program goals. A goal of the program was to "reduce threat and impact of theft and vandalism (building, school property and individual possessions)." Related goals were to "accommodate twenty-four hour access to design labs with minimum compromise of building security," to "accept and accommodate predictable activities unique to architecture (charette, twenty-four hour use, juries, model display, individualized work spaces, etc.), and to provide all parking on site." The school will be storing a great deal of valuable equipment which is particularly susceptible to theft.

Changes and their likely effects. The documented pre and post-award changes are all improvements: adding an alarm to the library door and a keyed access system. However, there appear to have been other changes which are not recorded in the documents which involve removal of gates at the library. Security may have been compromised, although no such problems have been reported.

Finish Carpentry

Program goals. The program contains extensive discussion of storage needs and display areas: "Surface should be provided in maximum practicable amounts, especially in areas that will be used for display and juries. Finishes should be chosen to allow pin-up, tape-up throughout most student areas without damage to the finish." Under room-specific design requirements, pin-up space is required for the meeting room, classrooms, design labs ("pin-up space in large quantities as possible is the only requirements for wall finish"), environment technology lab, computer lab, jury space/student lounge ("largest amount of pin-up space possible should be provided"), and exhibition space "(large amount of pin-up wall surface required").

Changes and their likely effects. Again, all changes appear to contribute to achieving goals. These include adding storage and the addition of plywood to walls in the exhibition room as well as the change in tackboard surface from plastic-impregnated cork to homosote, although the latter may not hold up very well.

Changes related to physical fabric. The changes which we have identified which appear to relate to the physical fabric of the building include those which impact materials durability, drainage and damp-proofing.

Materials Durability

Program goals. The program states that materials selected should "remain largely unmarred by use normal to a school of architecture (pin-ups, clutter, paint, glue, etc.)." A critical issue identified by the program concerns "durability, forgiveness and replaceability" of materials and finishes.

Changes and their likely effects. Some of these programmatic recommendations, for example the ability to pin up or tape on most wall surfaces, were never applied to the original design. Some changes would appear to improve durability, especially in exterior applications. Other changes are of uncertain effect. For example, flooring in an unspecified location was replaced with brick pavers. While they may be attractive and durable, acoustic problems could arise. Also, brick facing was deleted at the bridge where the concrete replacement may be less attractive.

Drainage and Damp-Proofing

Program goals. None are stated.

Changes and their likely effects. Several changes relate to underground water and drainage, though their effect is unclear. On the one hand, foundation drainage was removed to save money. On the other hand, an underground spring was discovered during excavation and footing drains were added to take water away from the foundation. If changes are not adequate, water could penetrate the building or differential settlement could occur.

In sum, there appear to have been a number of changes during construction which can be expected to have an impact on user function and physical performance. Many of these have been improvements, while others can be expected to detract from user response or long-term performance.

Occupancy

Despite the intentions of the program and the flexibility in state space standards, the fit between the building and its users appears to have achieved mixed results. For example, students feel that access to the faculty is more difficult now and whereas the design of the offices may suit faculty, this is not necessarily true for the secretarial supervisor who finds her office too small to meet with parents, students and staff and does not need all the bookshelves provided.

In addition, both routine and preventative maintenance is seen as being difficult and expensive. Removing dust on inaccessible horizontal and inclined surfaces is a problem; moreover leaks have resulted due to joining many different types of materials. Finally, access to fixtures, controls and surfaces for repair is difficult -- controls are hard to reach and lights are too high, requiring the use of hydraulic lifts or scaffolding.

Nonetheless, despite the obvious problems, the users are highly satisfied with the image and impact of the building -- perhaps the most important goal.

Benefits from the Post-Occupancy Evaluation Process

Fine-tuning of the building. The School's adjustment to the new building has been informed and assisted by findings from the POE. For example,

division and use of the secretarial and public areas has been aided by the POE: partitioning resulted at least in part from interim results of the project.

The POE held up a mirror to the building process. The evaluation provided feedback to the State on the building delivery process and generated suggestions for improvement, and especially for the evaluation, programming and commissioning processes.

Generation of positive publicity. The POE process resulted in additional positive attention being focused on the School, the building, and the State of Florida, through national advertisement of the competition, local newspaper articles, articles in national architectural journals, and presentation of the evaluation at several professional meetings.

Curriculum enhancement. The evaluation increased awareness of POE in the School of Architecture and provided an ongoing case study for the School's POE classes (from consultant selection to findings). The evaluation process probably will continue through course projects.

Improved communication. The POE process provided an opportunity for State organizations involved in building delivery such as Education, BOR, and Corrections to improve communication and learn from each other's experience and expertise.

Demonstration of the POE process to State agencies. This experience provided exposure for State agencies to the POE process. In particular, the Department of Corrections and the Department of Education were represented on the Project Task Force. The Department of Education's ongoing POE program was informed and reinforced.

USEFULNESS OF THE METHODS EMPLOYED FOR FUTURE PROJECTS

At the request of the Advisory Task Force we are providing a brief summation of our experience with the methods used in this study. In general, all of the methods employed in the study offered additional insight or increased confidence in the study findings. Figure 18 represents a subjective summation of the Team's experience about the methods used. All of the methods depend of course, on the research design and problem; other studies might not achieve similar results. Several categories are listed:

Prep, Conduct, Analysis Time: These columns reflect the relative time required for each of these steps for each method.

System Sensitivity: The relative usefulness of the method in capturing the specific qualities of the setting evaluated. (In this case, the operations, needs, expectations, etc., of the School of Architecture.)

Comparability: The usefulness of the method in achieving results that can be compared between situations (in this study, comparability between the

old building and new building and between the settling-in and post-move data-collection periods in the new building).

Talent: The degree to which experienced talent is required on the research team to achieve useful results.

Possible Bias: The degree to which the researcher's expectations, particularly vivid but non-representative comments by respondents or other problems might lead to invalid results.

A number of methods and approaches were used. In methodological terms this entire project was a field study. Unlike "true experiments" the project team was unable (and unwilling) to randomly assign people to the settings studied and had little ability to control alternative hypotheses. The methods and approaches are, of course, at different levels of analysis but are presented together for simplicity. The following are some additional comments on the methods and approaches:

Questionnaires: Questionnaires are productive in gathering large amounts of data if the issues are well understood; they are less effective for initially exploring issues or if the focus of a POE is to involve participants in decision making. In this study their use allowed a broader sample of students to respond.

Interviews: Individual interviews are very expensive but interviews with selected key participants were extremely valuable for gathering data and reporting progress.

Walkthrough Interviews: A technique developed by New Zealand evaluators and adapted somewhat in this project, the walkthrough interviews involved a facilitator and recorder who led groups of building users through the building and asked them open-ended questions such as "What goes on in this space?" The responses were illustrated on flip-chart pads and the walkthrough group consolidated and prioritized the comments at the conclusion of the tour. Walkthroughs were useful in that they were enjoyed by participants who felt they were a part of the process. It very quickly established a picture of the users' experience of the building that was mostly confirmed through other, quantitative, methods.

Observation of Activities: This produced a quantitative picture of building use that could be juxtaposed with qualitative responses. Shifting class and teaching patterns made it hard to establish benchmarks, however: What is "high use" or "low use" of an area?

Monitoring Change Orders: Given the focus of the study, on building image, function and performance, this provided relatively little yield for time expended; it would be more useful in a project-management study.

Analyze Program and other Documents: This was a highly valuable and relatively inexpensive step.

Attend Construction Meetings: See "Monitoring Change Orders"; the same comments apply.

Monitor Heat, Light, Noise: A valuable step, it was relatively expensive due to data collection and analysis time. Also, a brief monitoring of physical measures does not always relate to subjective experience because very occasional swings in conditions may color users' overall experience.

Use of Longitudinal Approach: The use of a longitudinal approach was valuable because it allowed the project team to observe the School's use of the building to evolve over time. It established a dynamic rather than static view of building performance and function.

Use of Advisory Task Force: The use of the Task Force was cost-effective and valuable in that it allowed the Task Force to guide the project as to their needs. It helped decision-makers buy in to the process by allowing them to see it unfold over three years. Lack of continuity by Task Force participants over the three years was a problem.

Collaborative Approach: A fundamental aspect of the project, the collaborative role of the School in the project allowed training of students in research and participation by a number of interested faculty.

EVALUATING THE EVALUATION:

Subjective Assessments of the Methods and Approaches Used in the POE

KEY: ● High ◐ Moderate ○ Low

METHOD/APPROACH	TIME			SETTING SENSITIVITY	COMPARABILITY	TALENT	POSSIBLE BIAS	COMMENTS
	PREP	CONDUCT	ANALYSIS					
QUESTIONNAIRE	●	○	◐	◐	●	●	◐	USEFUL IN COLLECTING LARGE AMOUNTS OF DATA IF THE ISSUES ARE WELL UNDERSTOOD
INTERVIEW	○	●	●	●	○	◐	●	
WALKTHROUGH INTERVIEWS	◐	◐	○	●	○	○	●	GETS THE EVALUATION TEAM INVOLVED WITH THE SETTING QUICKLY; MORALE-BUILDING BY GETTING PARTIC. INVOLVED WITH DECISION MAKING
OBSERVATION OF ACTIVITIES	●	●	●	○	●	◐	○	EXPENSIVE AND SOMETIMES HARD TO INTERPRET BUT ALLOWS EASY COMPARABILITY AND QUANTITATIVE ANALYSIS
MONITORING CHANGE ORDERS AND CONSTRUCTION DOCUMENTS	○	◐	○	◐	○	○	○	WAS USED IN THIS STUDY TO DETERMINE IMPACTS ON THE MAJOR ISSUES RATHER THAN COSTS
ANALYZE PROGRAM, DESIGN, CORRESPONDENCE, AND OTHER DOCUMENTS	○	◐	◐	●	○	○	●	
ATTEND CONSTRUCTION MEETINGS	○	○	○	○	◐	◐	◐	
MONITOR HEAT, LIGHT, NOISE	◐	●	◐	○	●	○	○	
USE OF LONGITUDINAL APPROACH				●	●			
USE ADVISORY TASK FORCE FOR REPORTING AND DATA COLLECTION	●	◐	○	●		◐	●	
COLLABORATIVE APPROACH BETWEEN SCHOOL AND PROJECT TEAM				●	○	○	●	



Recommendations



As a result of the analysis of all findings during complete POE findings, the evaluation team has developed several recommendations related to both the ongoing use of the FAMU School of Architecture and the building delivery process. Recommendations for the new school building include: the need to increase attention to maintenance work planning, maintenance personnel training, and additional resource allocations; the need to continue the evaluation efforts to monitor success of space allocation decisions, energy system innovations, life cycle costs of material and design decisions, and the long term effects of the highly "imageable" architecture; the need to formalize the methods by which the building is used as a teaching tool; and finally, the need to continue to publish results from all aspects of the ongoing studies of the building.

Additional recommendations relate to the building delivery process employed in the procurement of the new school. It is important to note that this project represents data on a single act of construction and does not lend itself to broad generalization. The process recommendations are based on an extrapolation of information collected from the Task Force and interviews with key personnel at the Board of Regents. These instruments and those conducted in other departments are intended to establish the basis from which more broadly based recommendations can be formulated.

In general terms, the process recommendations relate to the formulation of an approach to building which allows construction agents for the state to learn from each act of building and to systematically improve:

1. Programming for new construction
2. Design development and review procedures
3. Building turnover (commissioning) procedures
4. Maintenance/repair procedures
5. Building standards

RECOMMENDATIONS ABOUT THE FAMU SCHOOL OF ARCHITECTURE BUILDING

Increase Attention to Maintenance

Interviews and observation data demonstrate that the complexity of the structure places unusual demands on both routine custodial services and repair related to caulking, fixture replacement, and energy system operation. The increased attention can take several forms to include:

1. Tailoring the custodial services to the demands of the building and requirements of the occupants with the recognition that the building requires more than the "standard" custodial services if it is to avoid rapid deterioration.

2. Training should be given to both repair and custodial services personnel which addresses the complexity of the building, the hazards involved in the maintenance tasks, the cycle of maintenance/fixture replacement which is required to prevent rapid deterioration, and the special features of the passive energy system operation.

Continue Building Evaluation

School representatives, selected members of the Task Force and the evaluation team all recommend that evaluation activities on the new building should continue. Specific topics of interest include:

1. *The need to continue to monitor the success of the space allocation decisions with specific attention to how much flexibility is needed.* Three questions surface from student/faculty interviews which are of particular concern.
 - a. The space reduction in faculty offices is seen as positive now but will it stand the test of time?
 - b. The separation of faculty offices from studio environs is universally disliked by students and gets mixed reviews from faculty -- what are the long term effects on the school of such separation?
 - c. The lack of flexibility due to this method of construction has set the size of studios at approximately sixteen students each. As new pedagogical approaches are tried, will the limited number of students in each studio significantly limit the opportunities for alternative teaching methods?
2. *The need to monitor the success of energy system innovations.* Research on building energy performance drawn from Department of Energy studies on non-residential buildings indicates that peak energy efficiencies in new structures often take as much as five years after occupancy to achieve (Shibley and Weaver, 1982). The real performance potential of the passive innovations in this facility and the suitability of such systems in this climate will be better understood if the system continues to be monitored and adjusted to meet optimal conditions. Issues related to user control, type of automation, comfort levels, etc. all require continued monitoring.
3. *The need to evaluate the life cycle costs of materials, methods of construction, and design features not characteristic to the FAMU campus.* The new school facility represents several departures from conventional building construction at FAMU. The physical plant personnel and personnel at the Board of Regents have expressed concern in interviews that many of these features will have high life cycle costs. These predictions should be tested over the life of the facility. Once quantified, the life cycle costs can be measured

against the benefits of the materials, methods of construction and design features.

4. *The need to evaluate the long term effects of the highly "imageable" architecture.* The short term effects of the image are clear and positive but the long term effects in terms of student recruitment, the reputation of the school, and the relationship between the school and the university require further monitoring.

Formalize the Use of Building as a Teaching Tool

Faculty and Task Force members from the Department of Education both identify the desire to *further develop and formalize ways in which the building is/can be used as a teaching tool.* Much of the justification for the exposed mechanical system, exposed structure, and innovative energy system is rooted in the use of the building as a teaching tool. The faculty are only now beginning to discover the full potential of the building as a teaching tool and to develop systematic approaches to its use.

The documentation of the use of educational facilities as teaching tools could have wide implications for the full range of engineering, architectural, and construction management/trades education programs as well as more basic physics or science courses. The FAMU School of Architecture could be a leader in the further development of such teaching innovations.

Publish Results from all Aspects of Ongoing Studies

The FAMU School of Architecture building evaluation represents an important case study. The benefits of *continued investigation will keep the school viable as a teaching tool long into the future, will continue to enhance the school's reputation for careful and systematic thinking about design, and will serve as an example for other institutions on how to learn the most from each act of building.* The technical insights and important findings regarding the use of the building will be of continuing interest to academic institutions, to design/construction professionals, and to institutions with ongoing building programs. As such the results of all continuous efforts should be published in both the academic and professional press.

RECOMMENDATIONS ABOUT THE BUILDING DELIVERY PROCESS

Interviews with representatives of the Board of Regents, Planning officials at FAMU, and the academic leadership at the School as well as comments from the Task Force all lead the evaluation team to recommend the development of a broadly based building evaluation program. The intent of such a program would be to enable the State to learn from each act of building and therefore accelerate the improvement of the following processes related to State construction:

1. Programming For New Construction

School administration identified concerns during their interviews with the need for *more continuous involvement by the School during the interpretation of the program by the design architect*. They expressed some frustration about the need to be able to use the designers early design work to further inform the program. In general, there was a belief that increased participation, additional professional support for program development, and improved program procedures could have significantly improved the final program and design. The development and testing of such procedures could be a significant component of a larger building evaluation program.

2. Design Review Procedures

Both BOR and University planning officials expressed concern about their ability to influence design through the review process. The timing of reviews, the expense of possible redesign, and potential delays in the funding cycle all complicate the ability of construction or using service agencies to improve on early thinking in design. *The establishment of a building evaluation program could contribute significantly to the further development of formalized review procedures by identifying recurrent problems and including them as a routine part of project review.*

3. Building Acceptance (Commissioning) Procedures

School administrators suggested that it would have been beneficial if occupancy was delayed pending a more exhaustive punch list and a checkout procedure. *Such a process could more clearly identify problems while construction crews and contractors were more easily accessible and available to do work.* The process would also avoid having to invoke warranties to correct shortcomings and avoid the disruption of occupants after they are using the building. The development of such acceptance/testing procedures could be a major component of the broadly based evaluation program.

4. Building Maintenance and Repair Procedures

Earlier discussion on the FAMU building in particular illustrates the *need for increased attention to maintenance*. A broad program of building evaluation could formalize and inform:

- a. Training programs for maintenance/repair personnel.
- b. The development of building use manuals designed to minimize maintenance/repair costs and increase beneficial use of facilities.

5. Building Standards

The evaluation of building standards for cost effectiveness, utility and safety are critical. Often these standards are not systematically tested in actual use conditions. The legislative intent for this project and the consistent expression of interests by the Task Force all stress the need for such testing. *Again a systematic building evaluation program could contribute to the development and improvement of standards in a wide variety of contexts giving the State an increased assurance of the viability of constraints on building delivery.*

The research team proposes that the evaluation program need not be expensive to be broadly based. On the contrary, it can be a modest effort which takes maximum advantage of current procedures used to inform building in the State. It does, however, require a coordinated, interdisciplinary approach. We propose it begin with a few additional demonstration programs.

REFERENCE

"USA Central and Regional Monograph," in *Passive and Low Energy Alternatives I*, D. Bowen, (Ed.), Praeger Press, 1982.