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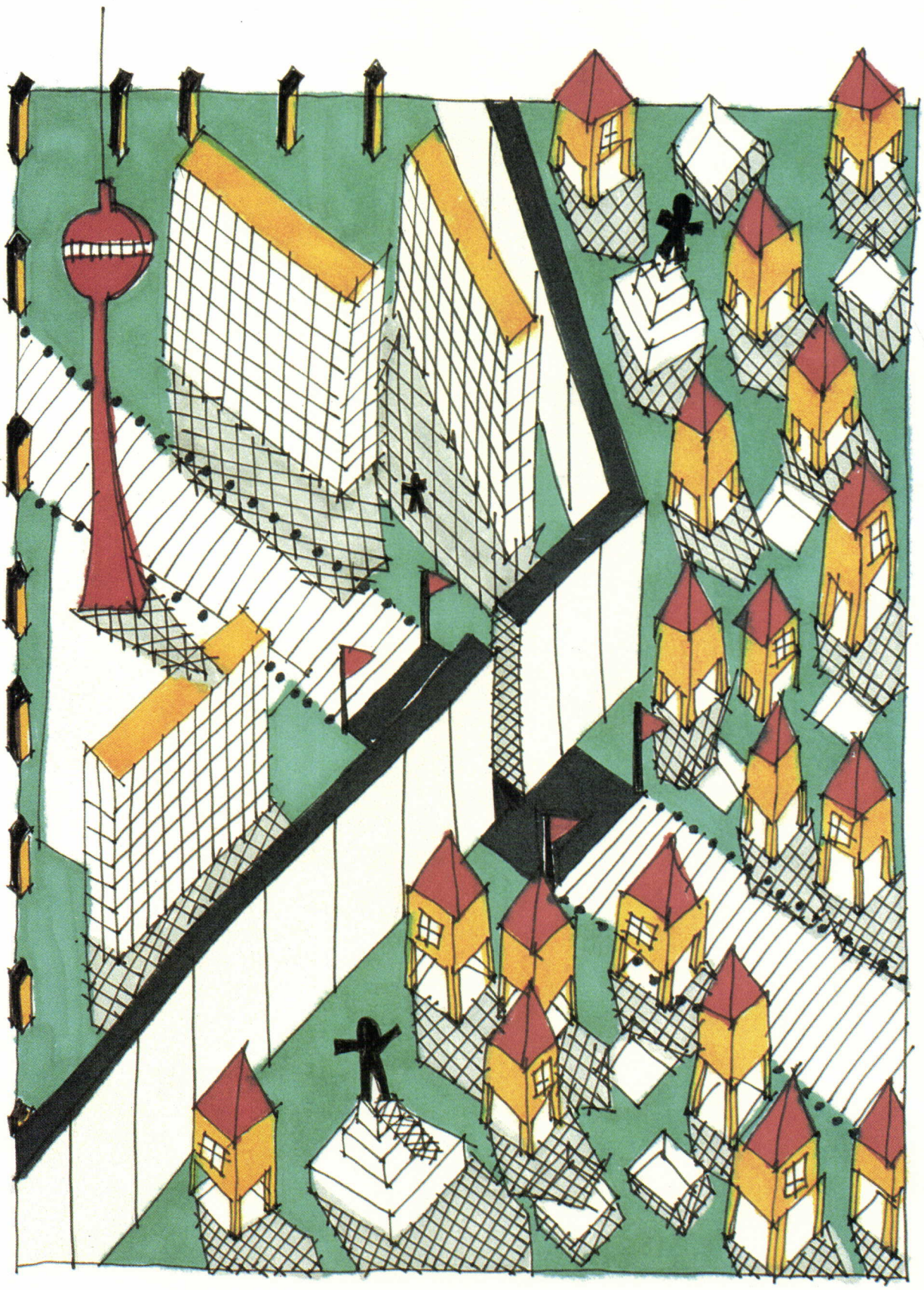

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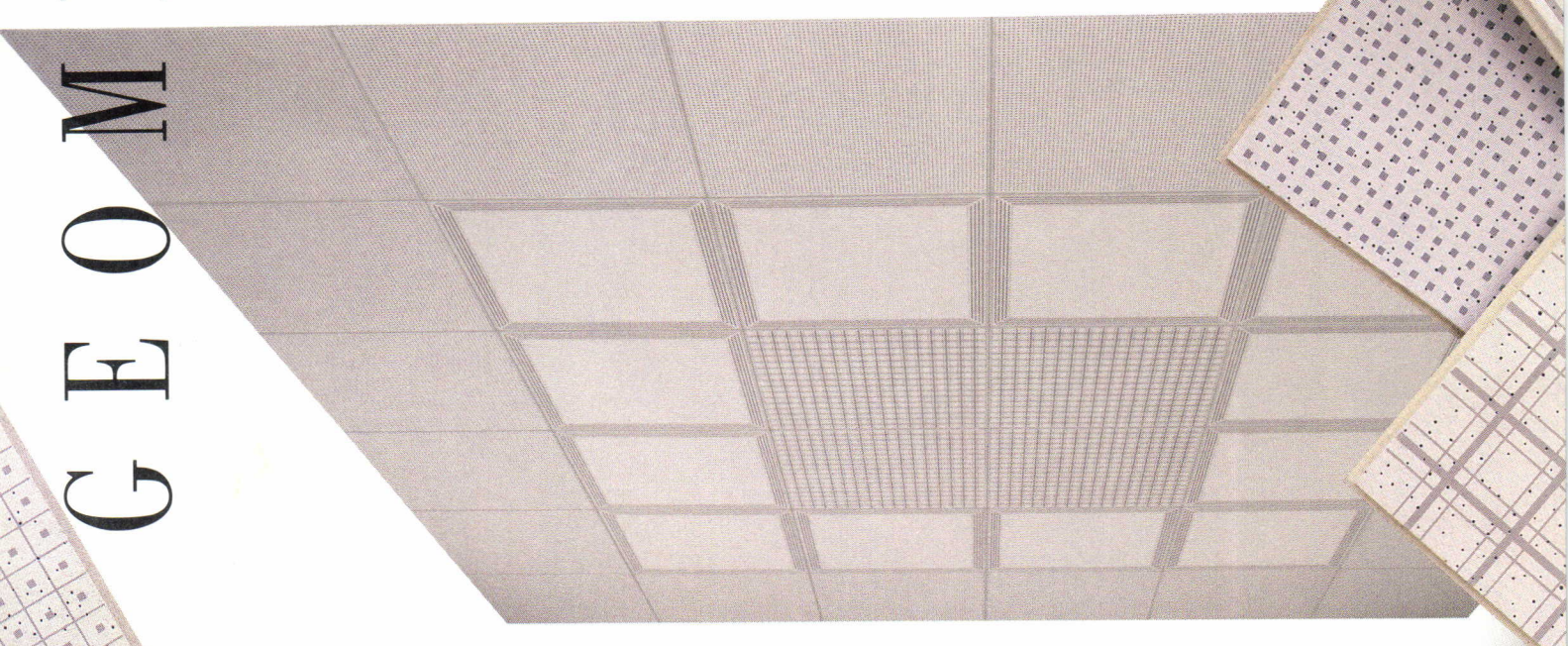

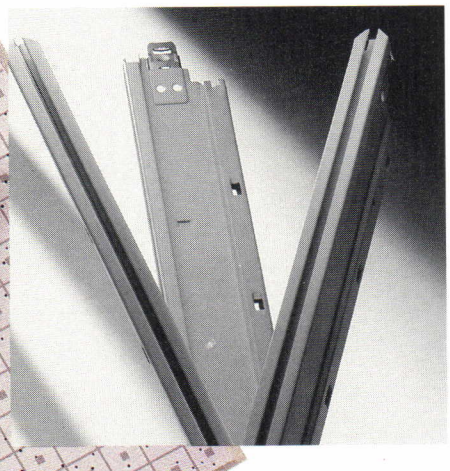

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Says Walter Mystkowski, Dean Witter's first vice president for architecture, "We decided to connote prestige by embellishing the interior furnishings.

A tall order.

Government

Seven Schemes Proposed to Complete Federal Triangle

The Pennsylvania Avenue Development Corp. has unveiled seven proposals to complete the Federal Triangle, the government's massive classical revival office complex that was left unfinished after construction was halted in downtown Washington during the Great Depression. The 11-acre site is the last remaining undeveloped major parcel of land along Pennsylvania Avenue.

The building complex will be a mixed-use project accommodating a maximum of 3.1 million gross square feet (1.3 million occupiable feet of space) and housing government offices, the quasi-public International Cultural and Trade Center, the Woodrow Wilson International Center for Scholars, a Wilson memorial, and exhibition area, shops, restaurants, and a performing arts center.

Given the demands of the program and constraints of the site, the seven architects (or teams of architects) developed remarkably varied proposals. In addition, the PADC design guidelines mandated that the new development "be designed in harmony with historical and government buildings in the vicinity . . . reflect the symbolic importance and historic character of Pennsylvnia Avenue and the nation's capital . . . and represent the dignity and stability of the federal government." Although each of the schemes is conservative and contextual and draws heavily from a neoclassical vocabulary, the key urban design issues and spatial configurations of the proposals differ widely, as do interior allocations of functions.

The Federal Triangle is a 70-acre complex of nine government buildings on a triangular site bounded by Pennsyvlania Avenue, Constitution Avenue, and 15th Street. With the exception of the Richardsonian Romanesque Old Post Office building (1893-1899) and the Beaux-Arts District of Columbia building (1904-1908), the buildings of the Federal Triangle were constructed in a classical revival style between 1927 and 1938.

All seven schemes incorporate limestone exteriors, terra-cotta tile roofs, and vertical window patterns, and all approximate the heights of the existing buildings.

In keeping with the original concept for the Federal Triangle, whereby a team of architects formulated the overall scheme along with design guidelines for individual buildings, the proposal submitted by a team billing itself as "The Great Plaza Partnership" is a collaboration among several prominent architects headed by David Childs, FAIA, of Skidmore, Owings & Merrill. The team includes Hammond Beeby & Babka; Devrouax & Purnell; Allan Greenberg; Frank Gehry, FAIA; Patrick Pinnell, AIA; Adrian Smith, FAIA; Dennis, Clark, & Associates; and Andres Duany & Elizabeth Plater-Zyberk. Their

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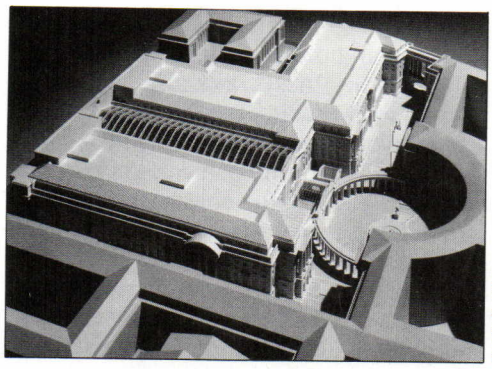

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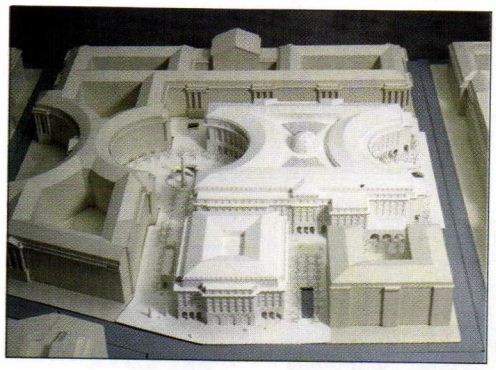

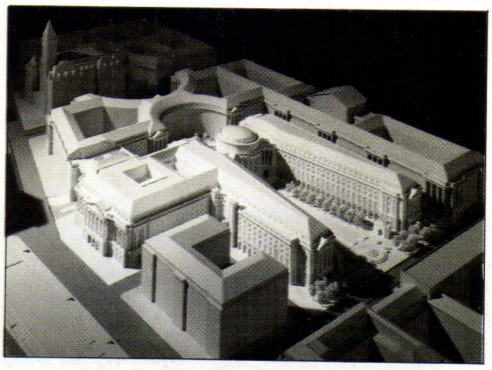

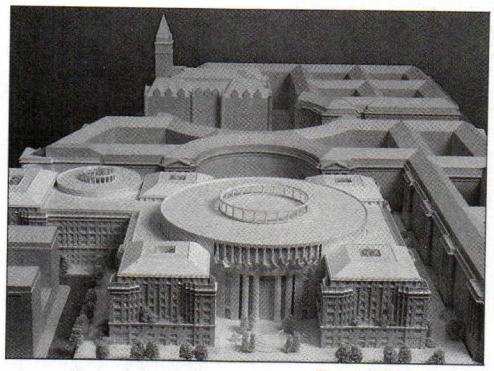

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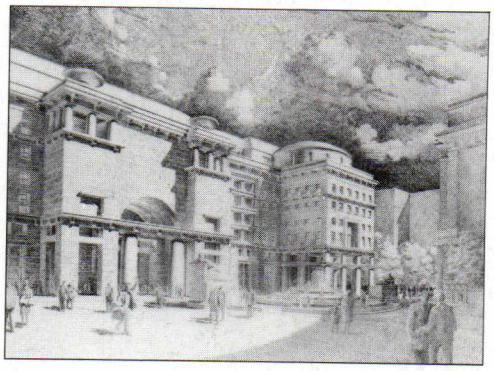

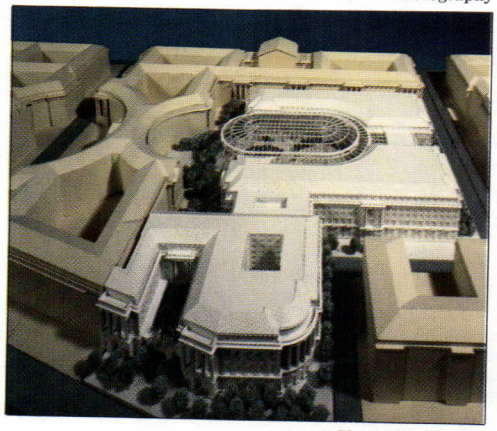

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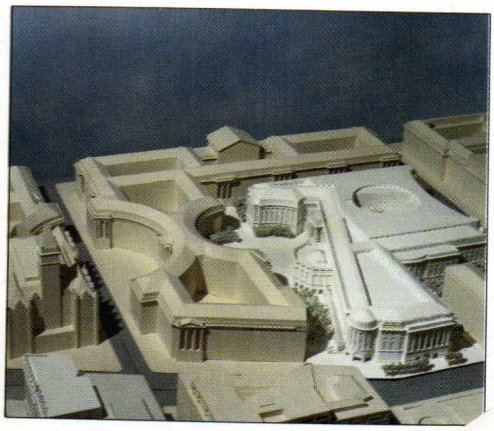

Nathaniel Lieberman

Seven Federal Triangle proposals, clockwise from top right: Skidmore, Owings & Merrill et al.; Michael Graves; I.M. Pei & Partners; Hellmuth, Obata & Kassabaum; Hardy Holzman Pfeiffer; Harry Weese & Assoc.; and Kohn Pedersen Fox Associates.

Government *from page 17*
scheme retains the great plaza, a central, 100,000-square-foot, open landscaped courtyard, as originally envisioned in the Bennett Plan of the 1920s. Fronting Pennsylvania Avenue, the design features a bridgelike structure with offices over 13th Street. Gehry's contribution is a dramatic cylindrical space with a series of ramps, which would serve as the ICTC central space.

The second proposal, Kohn Pedersen Fox's, features a central courtyard that, with a freestanding, semicircular colonnade, completes the Triangle's original western hemicycle. The central open space is an arcade, running on the east-west axis, with a steel-and-glass, pitched-roof skylight.

The scheme by Hardy Holzman Pfeiffer & Associates would include a series of corner cylindrical structures with a larger, skylighted cylinder as the central space.

The most atypical spatial arrangement is the proposal by I.M. Pei & Partners. Rather than complete the existing hemicycle, Pei would place a diagonal arcade running through the site with a cone-shaped, glazed skylight covering the Cultural Center's courtyard. The Pei proposal incorporates for the Woodrow Wilson Center an unbuilt exhibition space designed by Frank Lloyd Wright in 1920.

Michael Graves's design calls for the creation of two freestanding buildings: the curving form of the Wilson memorial would face Pennsylvania Avenue.

The scheme by Hellmuth, Obata & Kassabaum is also broken into two sections, with columned porches on either side. A conical skylight within the canopy covering a grand court marks the intersection of the axes and view corridors.

Harry Weese & Associates submitted a respectful and conservative scheme similar in many respects to Weese's proposal for this site some eight years ago.

In 1987 Congress authorized the construction of an office building for the Federal Triangle site and gave PADC responsibility for conducting a competition and selecting a private development team to construct the building. Rather than holding a traditional design competition, PADC invited developers teamed with architects to submit proposals that would incorporate a relatively new federal building arrangement wherein the developer pays for the construction, leases the building back to the government, and in no more than 30 years turns the building back over to the government. This arrangement is similar to the selection and financing process for a new federal judiciary building by Edward Larrabee Barnes, FAIA, (see March, page 40), to be located adjacent to Union Station.

With the construction of the Federal Triangle one of the government's central office complexes, second in size only to the Pentagon, will be completed after more than 60 years, and the last major missing link in the 25-year revitalization of Pennsylvania Avenue will be filled. Although the PADC board making the selection includes no architect, the selection committee is expected to weigh heavily the urbanistic and architectural elements of the proposals rather than any short-term financial advantages of the various schemes.

—Lynn Nesmith

Three More New Memorials Proposed For Nation's Capital

Reflecting the nation's growing spirit of patriotism, proposals for three new memorials for Washington, D.C., were unveiled within a month. Four designs were selected as finalists in a competition for a Women in Military Service Memorial, and the winning scheme for a Korean War Veterans Memorial was unveiled. In addition, the design for a Law Enforcement Officers Memorial was announced. A rash of memorials commemorating such diverse people and groups as black Revolutionary war patriots, journalists killed in

continued on page 20

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Government *from page 18*
wars, Merchant Marines, Kahlil Gibran, and Mahatma Gandhi are also in various stages of planning.

The Women in Military Service Memorial will be located on a four-acre site at the Arlington National Cemetery Memorial Gate (a semicircular entry wall designed in the 1920s by McKim, Mead & White). The competition program called for restoration of the plaza area and an educational center and archives to be built below grade. The top three finalists were awarded a $10,000 prize; a fourth team was selected as an alternate and invited to submit a scheme in the second stage.

The scheme by Gregory Alan Galford and Maria Louise Antonis of Philadelphia would place a row of small open air "contemplative" spaces along the top of the hemicycle and a recessed bowl with spiraling pathways in the plaza.

Michael Arthur Manfredi, Marion G. Weiss, Ellen D. Sands, and Thomas Schumacher of Washington, D.C., proposed a semicircular series of tall glass pylons.

The third scheme, featuring a rectilinear arrangement of 49 bronze trees in the center of the courtyard, was created by Teresa Norton, Cleve Harp, Sergio Chavarria, Pete S. Christman, Martha Enzmann, David Overholt, and Ming T. Shaing of Tybee Island, Ga.

The entry by Stephen D. Siegle and Margaret Derwent of Chicago would place the education center behind the hemicycle and was cited for "including and recognizing the entire site in a most convincing manner."

The scheme for the Korean War Veterans Memorial was selected through a national design competition, which drew 543 entries. The winning proposal was designed by Don Alvaro Leon and John Paul Lucas, associate professors of architecture at Pennsylvania State University, with landscape architects Veronica Burns Lucas and Eliza Pennypacker Oberholtzer.

Unveiled with fanfare at the White House by President Bush, the winning scheme is an almost literal depiction of an infantry platoon moving through a battle. The focal point of the design is a tall flagpole with an American flag flying, to be approached by a narrow pathway flanked by 38 gray granite statues of soldiers. The memorial will be located in Ash Wood, southeast of the Lincoln Memorial and across the reflecting pool from the Vietnam Veterans Memorial.

The Law Enforcement Memorial is planned for an open landscape plaza near Washington's Judiciary Square. Local architect Davis Buckley's proposal incorporates double curving rows of linden trees to define the memorial with the names of the officers killed in duty carved in low stone walls under the trees. The scheme is arranged on a north-south axis to accentuate the glorious Pension Building to the north and the old City Hall building to the south.—Lynn Nesmith

Copyright Office Calls for Protection for Architecture

The U.S. Copyright Office of the Library of Congress presented a study to Congress in June that in part calls for modification of the copyright law with respect to works of architecture. The proposal comes on the heels of the United States becoming the 80th member of the Berne Convention, an international copyright-protection body formed in 1887 in Berne, Switzerland.

Through the current union—the 1971 Paris Act of the Berne Convention—nationals of member countries may obtain copyright protection in other member countries. The Paris Act specifies protection of literary and artistic works, including "every production in the literary, scientific, and artistic domain, whatever may be the mode or form of its expression." The agreement includes works of architecture, plans and sketches relative to architecture, and three-dimensional works relative to architecture.

Members of Congress wanted to change the U.S. copyright law as little as possible yet still make the law equivalent to the Berne Convention. Congress found that the U.S. copyright law may not adequately protect works of architecture. Reluctant to legislate in an area where very little information was then available, Congress requested the Copyright Office to conduct the study presented in June.

Register of Copyrights Ralph Oman, who presented the report June 19 to Rep. Robert W. Kastenmeier (D-Wis.), chairman of the House subcommittee on courts, intellectual property, and the administration of justice, said that the report contains four possible policy actions:

- Create a new subject matter category for works of architecture in the Copyright Act and legislate appropriate limitations.
- Amend the Copyright Act to give the copyright owner of architectural plans the right to prohibit unauthorized construction of substantially similar buildings based on those plans.
- Amend the definition of "useful article" in the Copyright Act to exclude unique architectural structures, and thereby allow copyright protection for certain exceptional buildings but not "run-of-the-mill" tract housing.
- Do nothing and allow the courts to develop new legal theories of protection under existing statutory and case law, as they attempt to come to grips with U.S. adherence to the Berne Convention, which expressly requires protection for works of architecture.

The report makes clear that the U.S. copyright office expressed no preference for any particular solution, legislative or otherwise, in putting together its report. The summary did conclude, however: "We recommend that Congress hold additional hearings and give further serious consideration to enacting additional protection for works of architecture."

The full report is available from the U.S. Government Printing Office.

AIA announced on the day the study was released that it will ask Congress to improve copyright protection for architects. "An increasing number of lawsuits have been filed over the unauthorized 'copycat' construction of houses and apartment buildings," an AIA release stated. "Current copyright law has proved to be only partially effective in those cases."

Also on the day of the study's release, representatives of the Frank Lloyd Wright Foundation submitted copyright applications for selected Wright-designed buildings, including the Guggenheim Museum. The copyright office reports it will decide "at a later date" whether to register those buildings.—Douglas E. Gordon

Education

New Guidelines Announced for Interior Design Education

A new set of standards for interior design education has been established by the Foundation for Interior Design Educational Research. These guidelines are scheduled to take effect in September.

The new standards contain two major changes from previous versions, according to Ron Veitch, chairman of FIDER's standards committee and professor of interior design at the University of Manitoba in Winnepeg, Canada.

The educational course work and content units that describe the common body of knowledge of interior design have been changed to reflect current life safety issues, codes, and standards.This information was garnered from practicing professionals through FIDER's research over the past decade.

For the first time, FIDER standards require that student competency and output be criteria for accreditation of an interior design program, Veitch said. Instead of reviewing course input, evaluators will look at tests, assignments, and design projects for evidence of student proficiency that indicates their readiness for practice. FIDER has tested this new procedure at two universities, and Veitch says it appears to be very workable.

The new guidelines designate three lev-

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Education *from page 20*
els of accreditation. The first professional degree level is for programs that provide academic preparation for professional interior designers. It is intended as the first step in a sequence that includes formal education, entry-level experience, and satisfaction of a qualifying exam.

The postprofessional master's degree, designed for educators, is geared to programs that provide research or create work opportunities within the context of interior design. These advanced educational programs culminate with a graphic or written thesis, and the common body of knowledge of the first professional degree level is a prerequisite.

The final level of accreditation is that for preprofessional assistant. Programs at this level are typically two-year and prepare students for positions as design assistants, merchandisers, delineators, estimators, etc.

As the need for an accreditation program for schools of interior design became apparent, FIDER was established in 1971 to set such standards and guidelines. The National Council of Interior Design Qualification, an organization that prepares examinations to test interior designers, soon followed.

There is still much variety in educational programs—in their content and direction and even in the various departments where interior design programs are located. FIDER's goal is to establish a minimum standard for these programs, but the task is enormous.

At last count only 88 of more than 430 interior design programs were accredited, and 70 of the FIDER-accredited programs are at the baccalaureate level—nine are independent, 15 are a part of architecture schools, 15 are with fine arts, 28 are in home economics departments, and three are otherwise classified.

"We are behind architects in setting our standards, but architecture had to go through the same kind of process," said Shirley Singer, president of the Interior Design Educators Council and director of interior design programs at Lousiana State University. She expects that within 10 to 15 years virtually all graduating interior designers will come from accredited programs.

Presently, it is not possible to require that all interior designers come from accredited schools because there are not enough of them in each state. "We are taking steps to correct that as fast as we can," Singer said.

A goal under consideration is to require by 1995 that any candidate taking the NCIDQ qualifying exam to have graduated from an FIDER-accredited program. Satisfaction of the exam is required for membership in the American Society of Interior Designers and the Institute of Business Designers, the two industry professional associations.

—Elena Marcheso Moreno

AIAS Honors Architecture Educators and Students

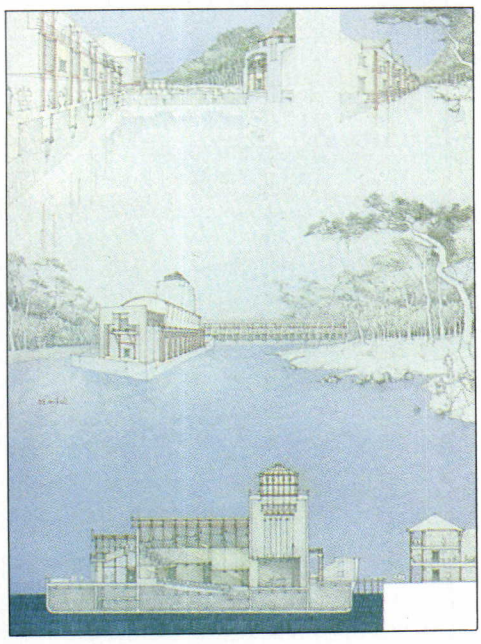
The American Institute of Architecture Students has presented 1989 national educator honor awards to Alfred Caldwell, the Mies van der Rohe visiting professor at Illinois Institute of Technology, and David Lewis, assistant professor at Mississippi State University.

Caldwell joined the faculty at IIT in 1944 and has also taught at Virginia Polytechnic Institute and the University of Southern California. A practitioner as well as an educator, Caldwell maintains a private practice and worked under Jens Jensen from 1926-31 and Mies van der Rohe from 1944-59. He also served as city planner for the Chicago Planning Commission and superintendent of parks for Dubuque, Iowa.

An honor award was also presented to David Lewis. Prior to joining the Mississippi State University faculty, Lewis was a visiting assistant professor at the University of Florida and an instructor at the Georgia Institute of Technology. His professional experience includes work at Niles Bolton & Associates, Jova Daniels Busby, and Ward Associates.

AIAS also announced the winners in the second annual GE Superabrasives student design competion for a hypothetical cultural exchange center in Beijing, China, utilizing granite as a primary building material. The competition drew over 300 student entries from more than 100 schools in eight countries.

First place was awarded to Brendon Ng of the University of Oregon (shown above right). The major components of Ng's scheme included a garden, classrooms, a library, and a floating theater. The winning



design incorporated an existing lake and the natural landscape of Beijing's Ritan Park.

Matthew Wayne Harris of the University of Arizona was awarded second place, and third place was awarded to Fanny Lee also of the University of Oregon.

In addition, AIAS announced winners of a national student design competition for a riverboat center, sponsored by the National Roofing Contractors Association. The program called for a building with the roof as primary structural and design element; the site was located on the banks of the Mississippi River in the French Quarter of New Orleans. First place was awarded to David Martinelli of the University of Illinois at Champaign/Urbana. Thomas Angell also of University of Illinois won second place. Third place went to Kenneth Duerholz and David Valenta of Catholic University, Washington, D.C.

Conferences

Symposium Explores Recent Museum Building Boom

Despite the evident concern over budget cuts, tax law changes, and a slowing economy, museum professionals remain optimistic that the museum building boom of the 1980s will continue into the 1990s. This is evidenced by the number of participants attending two seminars on building-expansion programs and renovation projects at the 84th annual convention of the American Association of Museums (AAM), held in New Orleans at the end of June. Both sessions were filled to capacity with standing room only, each session having some 350-400 people in attendance. The audience in the second session had not attended the first session, and members of both audiences almost unanimously expected to initiate building programs. The two panels that conducted the sessions were clearly overwhelmed by the unexpected audience response.

The delegates, representing more than 2,000 institutions around the country, came together to discuss the direction of museums, zoos, historic houses, and sites in the 1990s. Faced with the fallout from the 1986 Tax Reform Act now apparent at state and local levels, the museum community is actively seeking alternative funding in order to maintain and even expand existing museum programs. The success of these endeavors is evident in the number of cultural building programs under way or scheduled for the next few years.

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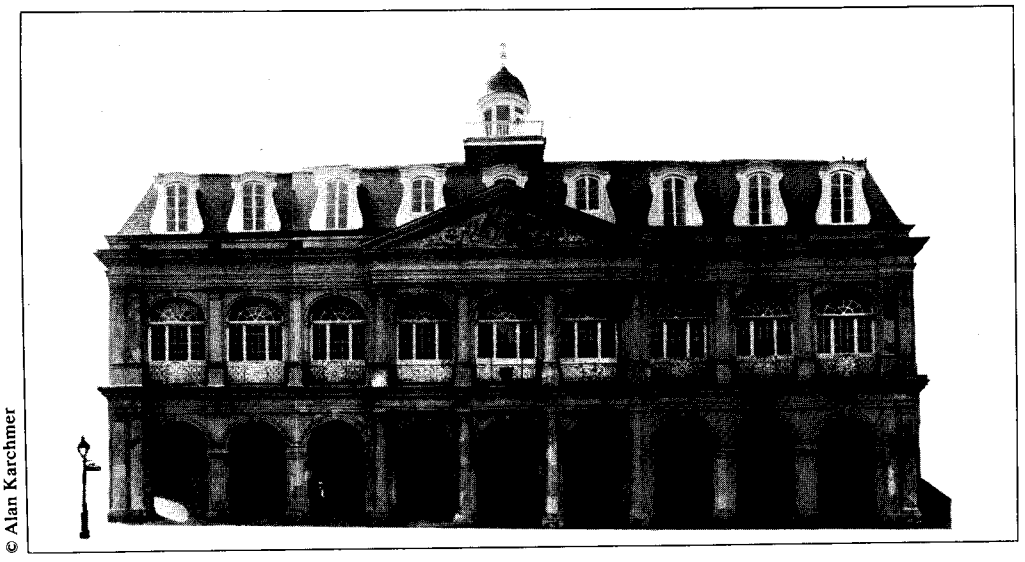

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On May 11, 1988, only two weeks after the 200th anniversary of a fire that destroyed the previous Cabildo, a workman's torch sparked a fire that consumed the third floor roof addition to the 1795 New Orleans Cabildo. The Cabildo, now the Louisiana State Museum, was designed and built by Don Gilberto Guillemard to house the short-lived Spanish colonial government. Both the Cabildo and the Prespytere, its sister building that frames St. Louis Cathedral on Jackson Square were built as imposing public buildings following classical models with flat roofs and central pediments. In 1847 both buildings were given their step Mansard roofs, reminisent of the older French Heritage that has always dominated the region. The composite photograph above shows the main facade as it looked before the fire, with the 1847 mansard in place.

Conferences *from page 22*

The theme of the conference "Crossroads: Museums in the '90s"—and its location were timely choices providing the delegates with a firsthand look at how a city rich in cultural institutions has dealt with economic stress. New Orleans is a case study in contradictions—exactly the kind of contradictions that characterize the museum community in general. As was pointed out by Joel Bloom, president of AAM, "Despite the [region's] economic slowdown, the museum community in New Orleans is booming with the addition of the $40 million Audubon Zoo Aquarium."

The New Orleans aquarium, located at the foot of Canal Street on the Mississippi River, will be the focal point of a new, 16-acre riverside park. It is only one part of a major expansion-renovation program taking place at the Audubon Zoo. This project, with its high urban visibility and its emphasis on educating the public on the importance of conserving local ecological systems, perhaps best represents the direction anticipated by museum professionals in the 1990s. As Peter Raven, director of the Missouri Botanical Garden in St. Louis and the conference keynote speaker, said, "Museums are no longer mere temples for the display of objects but rather dynamic centers of knowledge with the task to educate the public and promote internationalism in a world that now depends on its very existence at an international level."

Also discussed, in a seminar entitled "Let There Be Light: The Role of Natural Daylight in Museums," were the pros and cons of using daylight to illuminate museum objects. A five-member panel with varying views was otherwise in agreement that too much uncontrolled natural light has been used in museum design over the past 15 years.

Steven Weintraub, president of Art Presentation Services in New York City, pointed out that even with UV filter glass harmful levels of radiation continue to penetrate museum interiors. He also cautioned against the trend of using natural daylight for the display of contemporary works of art.

According to Weintraub, contemporary paintings are at higher risk than Old Masters since pigment loss is greatest in the early life of a painting. The problem with 20th-century art is compounded also by the use of questionable new materials.

The panelists concluded that combining natural and artificial lighting provides the best solution for illuminating museum interiors. They cited Louis Kahn's Kimbell Museum in Fort Worth, Tex., as exemplary. Controlled natural lighting in the Kimbell provides ambience, while artificial lighting illuminates the art objects.

Panelist Gordon Anson, lighting consultant for the National Gallery of Art in Washington, D.C., illustrated the complexity of combining natural and artificial illumination, given the potential of artificial light to create color discrepancies and jarring spatial imbalances. He concluded by saying that there is no perfect lighting solution but rather an art of compromises. Natural light, he said, should be controlled in museum design, but he also recognized it as a valuable asset and as especially appropriate in areas not intended for the display of artwork.—STEVENS R. ANDERSON

Mr. Anderson is a free-lance writer in Mobile, Ala.

BRIEFS

Architectural Reference Guide
The 1988 edition of *The Architectural Index* contains an index of ARCHITECTURE, *Architectural Record, Progressive Architecture, Builder, Interior Design, Interiors, Journal of Architectural Education, Landscape Architecture,* and *Custom Builder.* General articles are listed by subject, and building articles are listed by architect, location, and building type. Copies are available for $20 from The Architectural Index, P.O. Box 1168, Boulder, Colo. 80306.

Veterinary Hospital Design Winner
Gretchen Zarle, a graduate of the University of Tennessee college of veterinary medicine, and Tom Potts, a student at the University of Tennessee school of architecture, won first place for their veterinary hospital design in a competition sponsored by Hill's Pet Products. The annual national contest is for teams consisting of an architecture student working with a veterinary medicine student.

Flooring Design Winners
John Catlin, AIA, of Boston, won the grand prize in American Olean Tile's ceramic tile flooring design competition. In addition, four first prizes were awarded to Charles Morris Mount of New York City, John Mann of Atlanta, Eric J. Rosenberg of New York City, and Robert Lidsky of Wyckoff, N.J.

Fulbright Hosts Wanted
The Fulbright scholar-in-residence program is inviting American colleges and universities to host a visiting scholar from abroad. Institutions are to submit proposals for visiting scholars in the humanities and social sciences or in professional specializations with an international focus. The program provides round-trip travel for the grantee, a monthly stipend, and some expenses. The host institution is expected to share some costs. The deadline for proposals is Nov. 1. For more information contact the Council for International Exchange of Scholars, 3400 International Dr. N.W., Suite M-500, Washington, D.C. 20008.

New York Arts Fellowships
The New York Foundation for the Arts has awarded architecture fellowships of $6,000 to Elizabeth Diller, Christopher Doyle, Cameron McNall, Davidson Norris, Carol D. Oster, and Michael Rouillard. Applications for the 1990 fellowships are now being accepted.

Artists' Fellowship Awards
The New York Foundation for the Arts has awarded six architecture fellowships of $6,000. The winners are Elizabeth Diller, Christopher Doyle, Cameron McNall, Davidson Norris, Carol D. Oster, and Michael Rouillard. □

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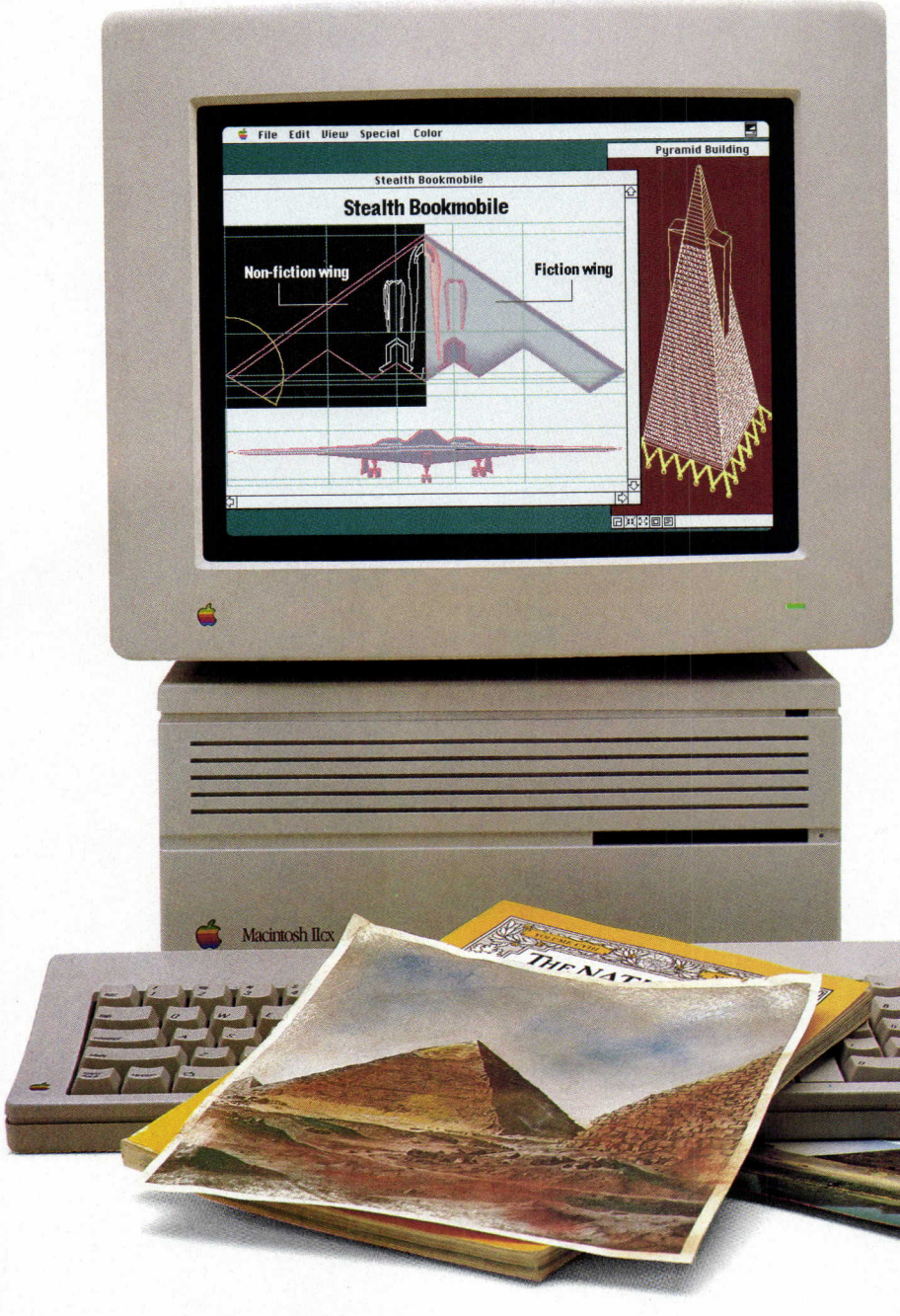

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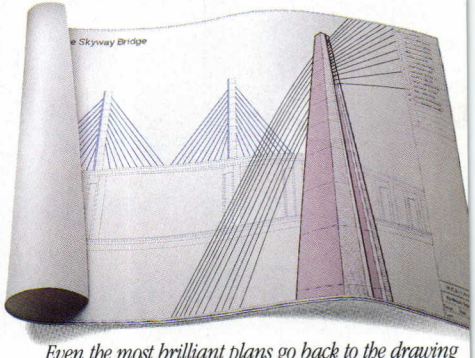

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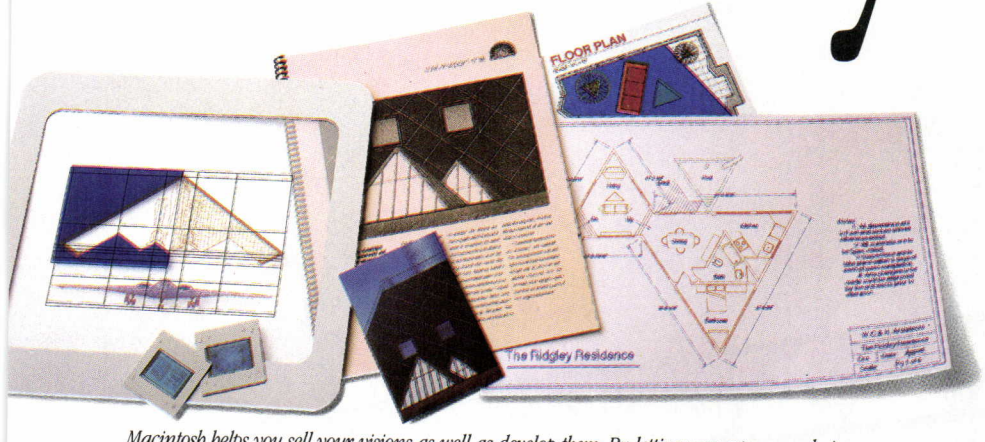

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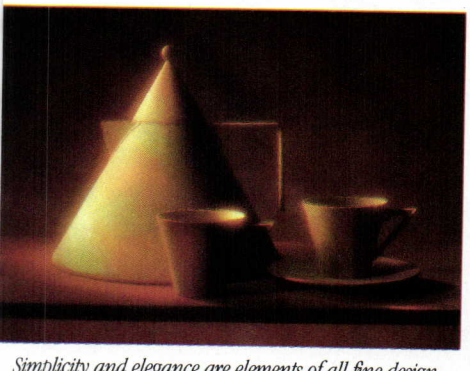

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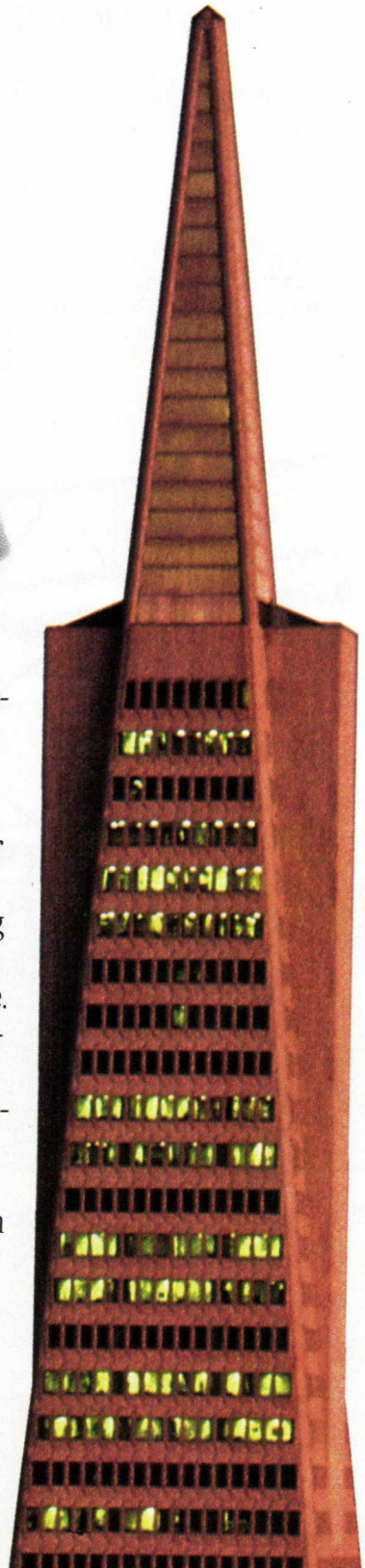

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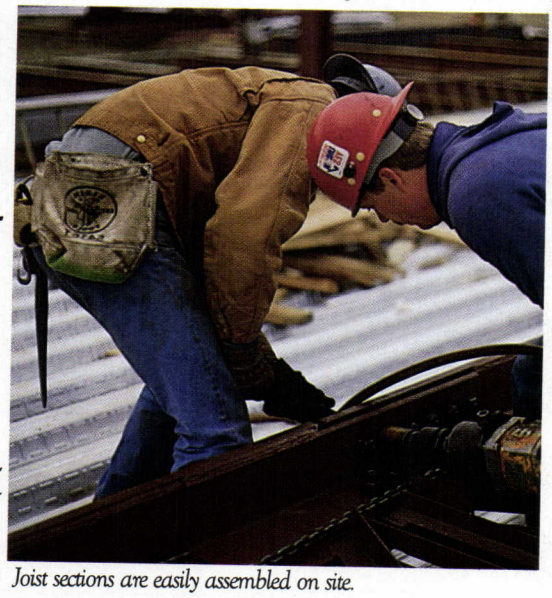

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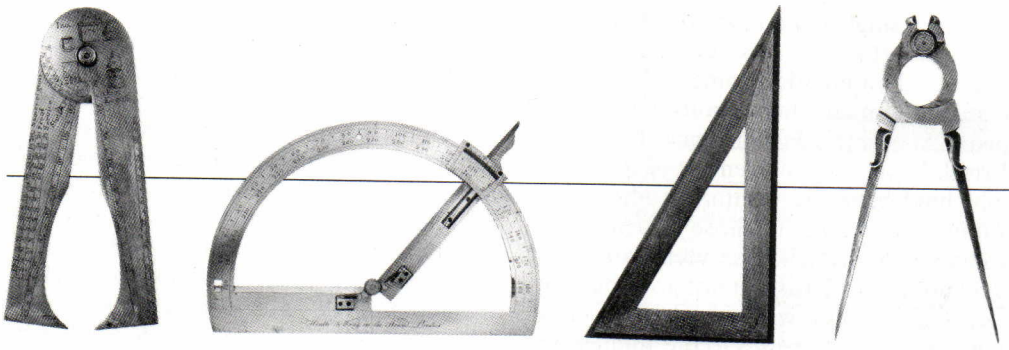


BOOKS

An Author Communicates Her Fascination with Tools of Drawing

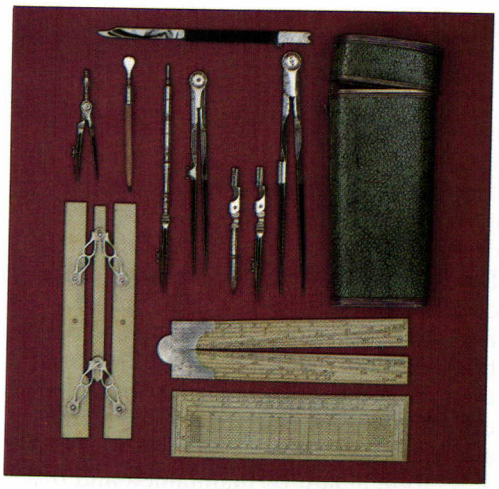
Drawing Instruments 1580-1980. Maya Hambly. (Sotheby's Publications, $45.)

Encouraged to a large extent by the excellent exhibition of drawing instruments by Maya Hambly in 1982 for the Royal Institute of British Architects, interest in the tools of the trade of architects and engineers has increased considerably over what it was only a few years ago. Examples, both splendid and pedestrian, appear regularly at auction houses and antiques fairs, and dealers have discovered a ready trade in them. Prices have risen to such a degree that anyone interested in acquiring a collection of drawing instruments, or even a few pieces, would do well to educate himself or herself before setting off to make purchases.

This latest addition to Sotheby's series of scientific instrument reference works is a one-volume course on virtually all one might need to know, at least as a beginner. For the reader with more knowledge and experience, the book will augment and deepen the pleasures that can be gained from an involvement with the collection and study of drawing instruments.

Building upon the useful little exhibition catalogue she prepared in 1982, Hambly has carefully constructed a lucid and entertaining history of the various technical instruments developed over the past 400 years for the preparation of geometrical drawings. As architectural drawings are themselves now being appreciated as works of art or fine craft and are commanding prices of no mean significance, it is appropriate that the tools for creating those drawings also are attracting increasing attention.

Hambly is a practicing architect who knows from personal experience how these instruments are used, and who has developed a fascination with the forms these mechanical contrivances have taken over four centuries. Seeking to convey to others the information and delight that led her to form a modest collection of drawing instruments for herself and to assemble and display the instruments accumulated by England's professional architectural organization, she has structured the volume as a ready substitute for a guided lecture tour of these artifacts.



Top, assorted drawing instruments. Above, shagreen-covered case with silver instruments probably by Peter Dollond (1730-1820).

She begins her book with a lively overview of the history of drawing instruments and their makers. She includes many biographical details about these crafters, who usually made other sorts of instruments as well, thereby rendering the book of interest to a wider audience. Hambly follows this section with a chapter on each of the functional tasks drawing instruments are called upon to perform, thus allowing the reader to see how the professional drafters used each type of tool in their activities and craft.

The first functional category covers tools essential for drawing lines—ruling pens and lead holders—examples being shown from Roman and medieval times as well as from more recent periods. The next section, logically enough, encompasses the instruments for creating and dividing circles. These dividers, compasses, and other devices are the most commonly used and thus can be found in the greatest variety. Shown are the several forms of folding and multipurpose compasses and several exceptionally elegant ornamented dividers from the 17th century.

Perhaps the most complex and visually interesting instruments are the early machines for creating ellipses and volutes. A particularly elegant example in brass, signed by John Farey of London and dating to the early 19th century, contrasts with a sleek, modern device in plastic and chrome that functions in exactly the same manner.

Set squares and parallel rules are given brief but adequate mention, followed by a chapter on measurement. By their nature, measuring scales require lines, numbers, and often identifying words as well. Thus, even the simplest can be opportunities for visual enhancement. With simple stamping of the lettering or with finely engraved calligraphy, identification of the maker or at least a reasonable date of manufacture can be discerned through careful observation of the lettering style.

Pantographs, proportional dividers, and other instruments for copying, reducing, and enlarging drawings are given their due, as are the various types of sectors and aids to drawing in true perspective.

Perhaps the most visually rewarding section of Hambly's book is the one that describes and illustrates the sets of instruments that have been assembled with carrying cases. These range from the simplest students' sets to spectacular presentation cases in silver, gilded brass, or with elaborate decorative ornamentation. Some of these dazzle with their complexity and size, often having been created for a wealthy amateur to demonstrate the breadth of his interests and knowledge. Others, such as a gilt brass set in a lushly decorated gilt case on feet formed as angels' heads, circa 1570, are better classified as *objets de vertu* than as utilitarian objects.

Elaborate multitiered wooden cabinets of instruments obviously far too heavy to be easily carried are shown, along with convenient pocket cases of tortoiseshell or shagreen trimmed in silver. The range is staggering; it extends even to a small set of drawing instruments concealed within the handle of a leather-covered and silver-mounted walking stick.

For the curious reader or the serious collector, Hambly has obviated the need to search out the many obscure books touching upon the subject, as she has thoughtfully included well-reproduced copies of the important drawings of instruments from those books. These elegantly

continued on page 32

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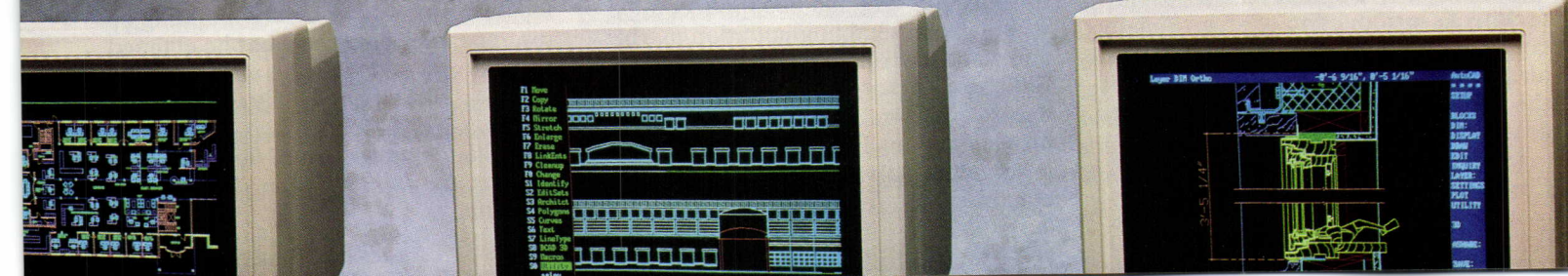


ARCHITECTURE

There is something particularly obscene about the recent revelations concerning the plundering of HUD resources by so-called consultants politically connected to the Reagan Administration. A panel of realtors, not a notoriously liberal group, placed the blame for the current housing crisis of the poor squarely at the feet of that Administration. The idea of on the one hand withdrawing funds for housing the poor and on the other letting these funds fall into the grasp of well-heeled friends is outrageous, even to those of us who have erected internal barriers to outrage in the '80s.

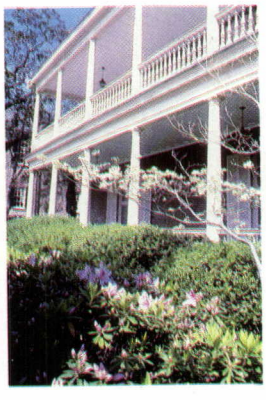
The incumbent President has been preaching, with clear conviction, the virtues of volunteerism, and they are many. He is taking well-considered steps toward encouraging volunteer efforts in the housing area, and they already are starting to pay off. But there is just as clear a need for a strong federal role in housing the poor. This is a national problem, and it is only the national government, through the great vacuum cleaner of the federal income tax, that can muster the considerable resources necessary to deal with it.

Of course there is the budget deficit that is another legacy of the previous Administration. Those opposed to federal spending on the poor point to the financial debt that we are passing on to future generations. But we are passing on other debts as well—to the ill-housed, the underfed, the undereducated—that may be as dangerous and destructive.—*D.C.*

'As It Stands, a School in Balance'

Clemson's architecture program keeps a strong core.

By Robert A. Ivy Jr., AIA



Imagine a school in balance: where a strong tradition coexists with innovation, where the campuses are both small-town and urban, where faculty and students share mutual respect, where architectural education is valued but considerate of the total development of the individual, where a strong sense of identity frees faculty and students to explore, where student work ranges from traditional solutions to spiritual pilgrimage. Would such a school be an architectural Eden? Visit Clemson University and see.

Clemson, home of South Carolina's only school of architecture, lies poised between the Atlantic Ocean and the Blue Ridge mountains (visible on a clear day). The South Carolina Piedmont, a progressive, prosperous area in the small state, forms a link in the Interstate chain that begins in Atlanta and continues through Greenville and Spartanburg, S.C., up to Charlotte, N.C. Nineteenth-century states' rights advocate John C. Calhoun farmed the acreage that eventually became the site of Clemson University, today a 14,000-student land grant institution.

The white columns of Calhoun's home remain a symbol for the role tradition plays at the school. Significantly, Lee Hall, the International Style headquarters of the college of architecture, lies within sight of Calhoun's home, tied to the center of campus by walkways and sightlines. Lee Hall announces its priorities by turning its face outward toward Lake Hartwell and the mountains while centering its activities inward around two courtyards—part of the whole campus, but independent.

Traditions at the college of architecture at Clemson really date from the arrival of Dean Harlan McClure, FAIA, in 1955. South Carolina architects had sought a distinct, strong architecture program, which previously had been a part of the engineering faculty. McClure's reforms were significant: by the first year of his tenure, the program had become fully accredited; by the second year, it was a separate school within the university. He brought an interdisciplinary approach—planning, urban development, and public service were important aspects of a total program, as was an active fine arts program within the school. He established a visiting lecturer series, set up an innovative graduate health care course, and founded an active European campus.

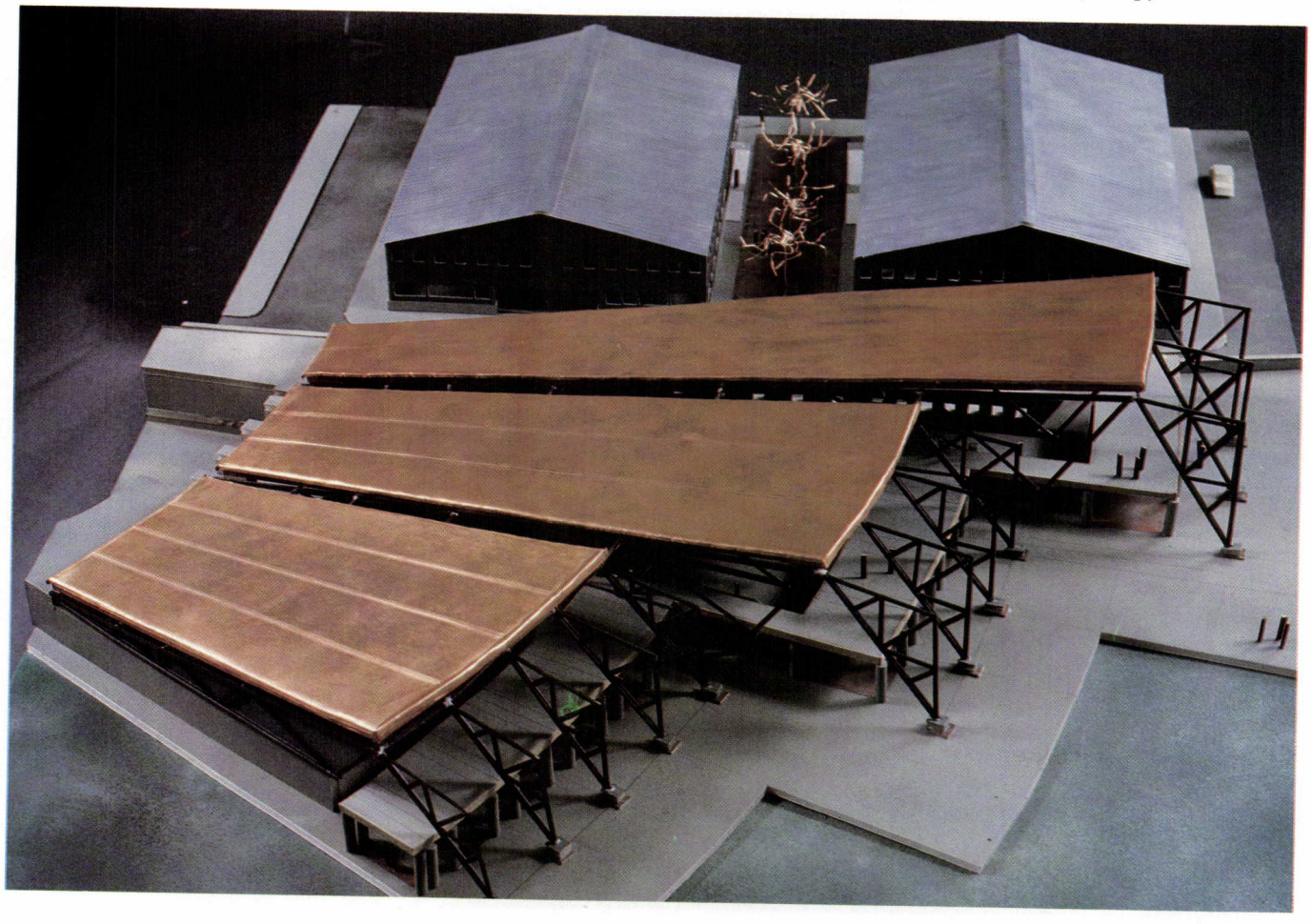
The current dean, Jim Barker, AIA, inherited an established program that has spread to five departments on three campuses. At the center of the college organization lies the department of architectural studies, comprising 350 undergraduates and 80 graduate students in a "four plus two" system. Architectural studies are enriched by the presence of allied disciplines.

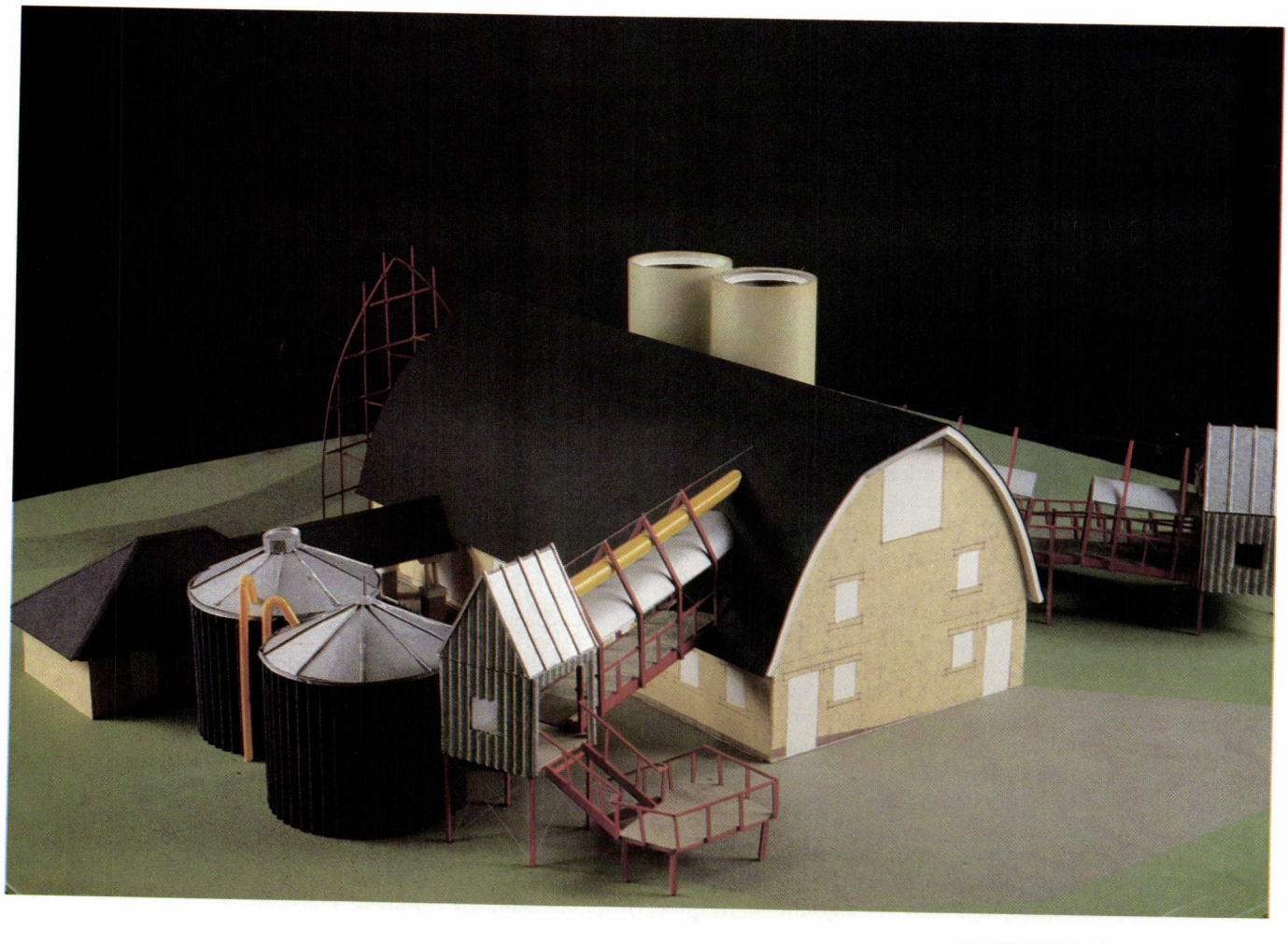
Visual arts and history, from drawing to graphic design, is housed in studios within Lee Hall. The studio artists bring new ideas and physical assistance to struggling students. John Acorn, professor in the visual arts department, recently summed up the complete integration of programs when he passed a student display and remarked, "I don't know if that is a fine arts project or an architecture student's work."

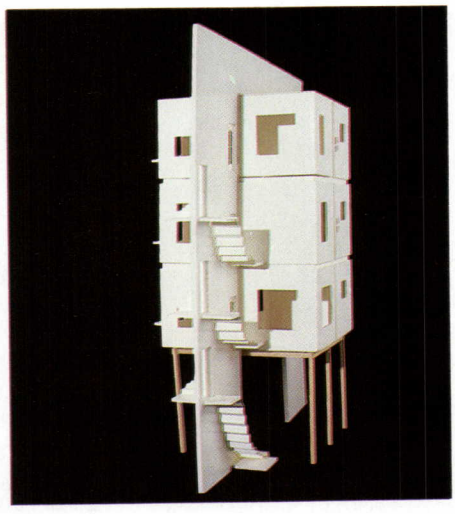
Other disciplines housed in Lee Hall bring their own strengths. Planning studies (35 students, five full-time faculty) and landscape architecture (a new program, not yet a department) are smaller than building science, a 26-year-old program with 105 undergraduate and 25 graduate students. All share the same building; all share classes, library, woodworking shop, gallery space, and teachers, forming, according to Dean Barker, "an interconnected web."

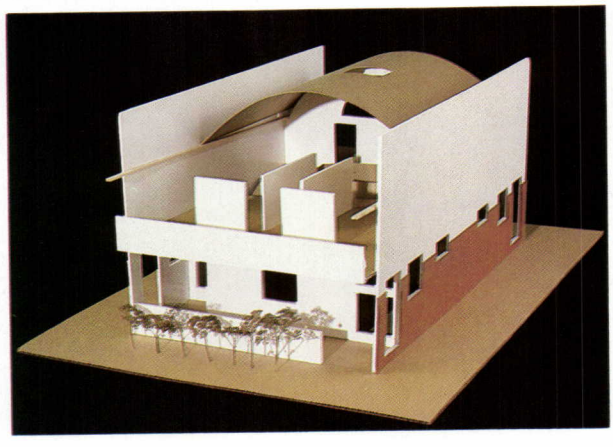
Another inheritance from the McClure era is a strong faculty. Three Clemson faculty members have been recipients of the prestigious ACSA distinguished faculty award: McClure has been

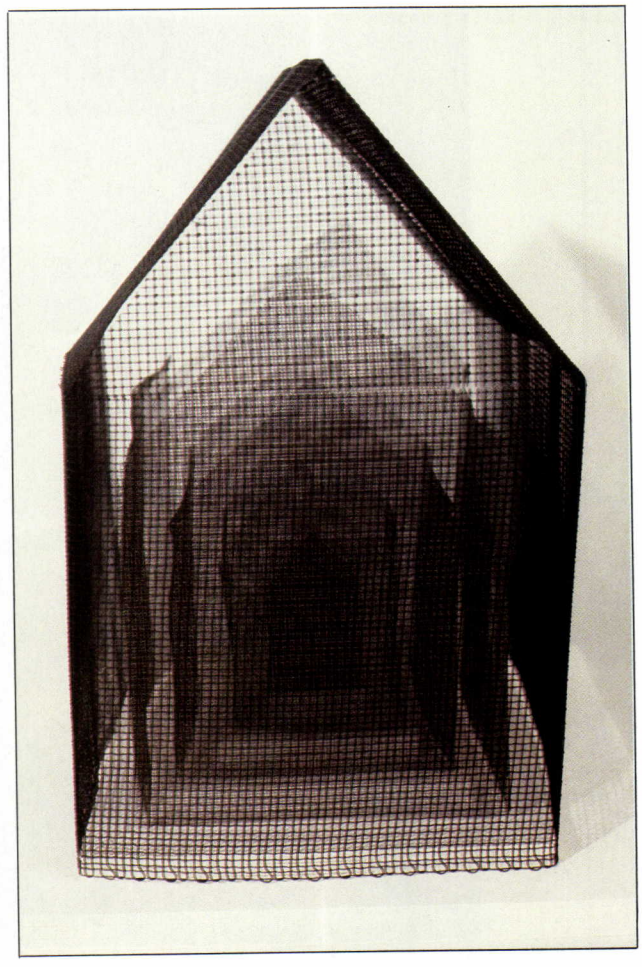
Facing page, bottom, Clemson's Charleston Center, where students spend a semester studying the urban environment; top, 'Music, Architecture, and a Juxtaposition of Culture,' thesis by Doug Rackley. Below, 'Greenville Technical College' by first-year graduate student Barbara Clement; bottom, first-year graduate project for 'De Le Howe School' by Dale Lee, Earle Hungerford, and Jerry Hupy.











Top, 'Concept of Dwelling' project for Myrtle Beach hotel district by fourth-year student Norrie Cooper; bottom, 'Concept of Dwelling' project for Greenville Textile Hall by fourth-year student Lisa Lanni; far right, form and space study by John Hinds, second year.

joined by professors Harold Coolidge (architectural history) and Peter Lee, the current director of graduate studies and a 1989 winner. Barker's task was to reinvigorate the faculty while retaining the best of his inheritance. Today the faculty numbers 45, and, while many are Clemson graduates, a large contingent is from other schools, other states, and abroad. Thirteen new members joined the faculty in 1988-89; many of them are assistant professors.

By all accounts Barker is succeeding. "Barker has the ability to get things done. He will not allow us to be isolated," says John Jacques, AIA, head of the department of architectural studies. The Barker/Jacques team frequently is cited by students as "making a difference" and "bringing excitement." In any diverse, changing organization, potential conflict is best resolved by listening, and at Clemson the students praise teachers and administration, saying that "the door is always open. They are concerned about what students think. They are student advocates, good listeners."

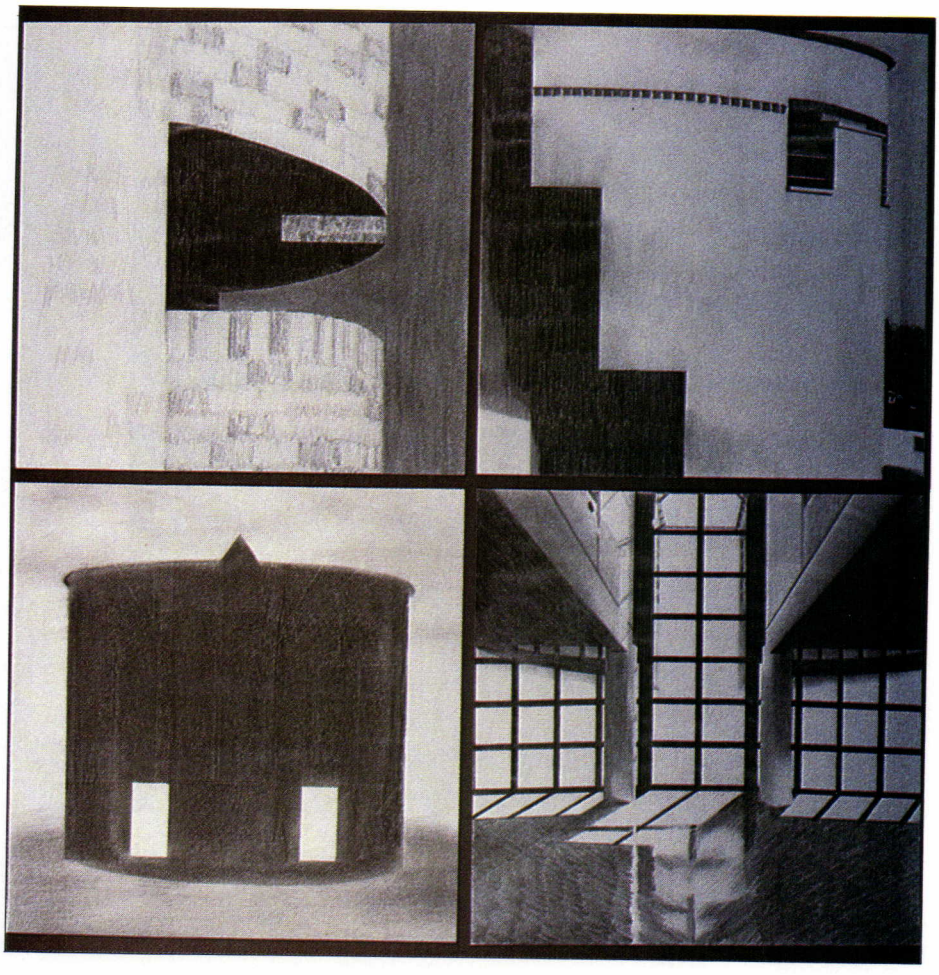
The result of this faculty/student dialogue is trust, not easily won from the skeptical young, who report a "sense of family" at the school. The students' own families tend to be middle-class and stable, producing "the brightest and best student body in the entire state system," according to Jacques. Architecture candidates at Clemson share high statistics: average SAT scores approach 1,200, and the college is able to be selective. But high test scores alone are "not a panacea," says McClure. "The brightest students are not necessarily the most creative."

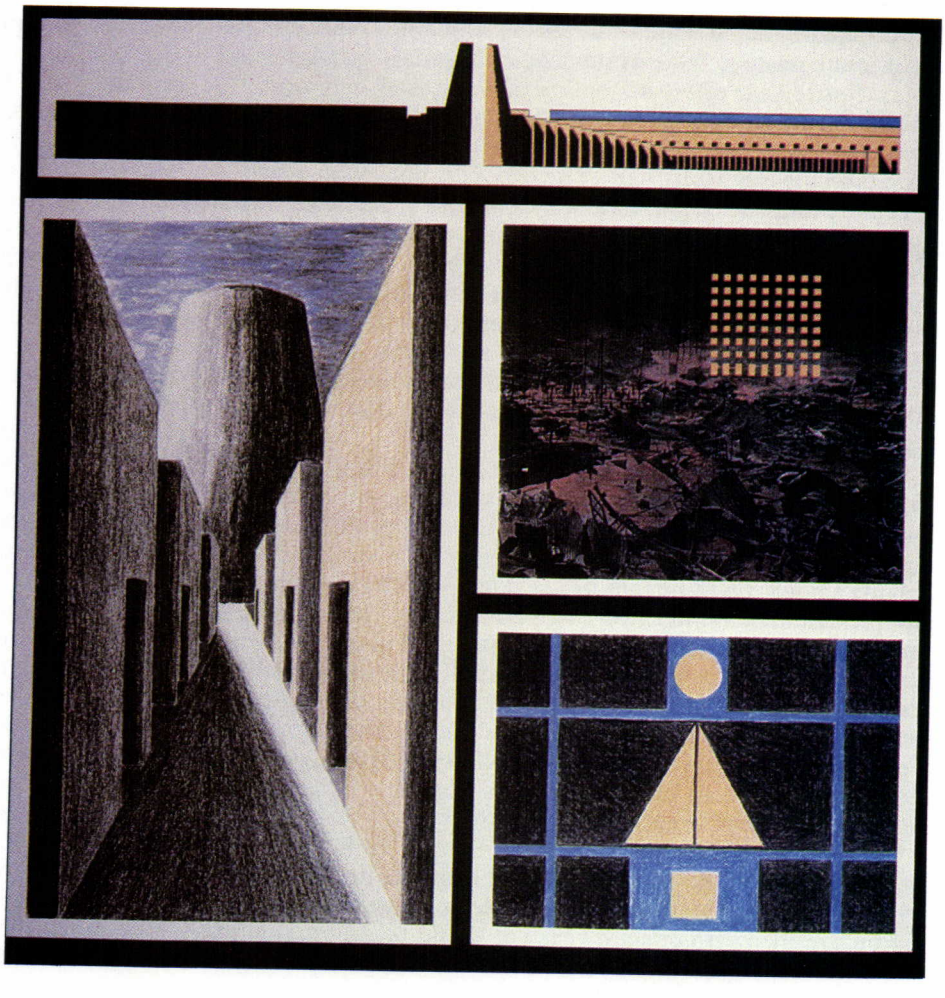
Most students are from South Carolina's small towns (approximately 65 percent of undergraduates), although many are from out of state, drawn by the school's reputation and low cost. Undergraduate tuition for out-of-state students was an unbelievable $2,565 per semester in 1988, and men and women came from nearby North Carolina and Georgia as well as from the Northeast. Pennsylvania, Delaware, and New Jersey accents frequently are heard in the corridors. Women make up 33 to 40 percent of the student body; minorities are not well represented. The homogeneity of the student population prompted professor Teoman Doruk to call for more students "from outside the state."

Although they have attained admission to a preprofessional program, "the [undergraduate] students are not certain that they want to become architects," says Charleston faculty member Whitney Powers. The four-year undergraduate education at Clemson is therefore more broadly based, "building security and self-knowledge," responds Barker. The students are encouraged to explore the full range of university offerings, from fraternities and sororities to theater groups and student leadership positions. The architecture school currently boasts a leader of the campus Red Cross, a varsity football team member, and an NCAA champion track and field athlete. By the time students have worked in professional offices and have returned to campus for graduate school, they are ready for the intense commitment demanded of the professional degree.

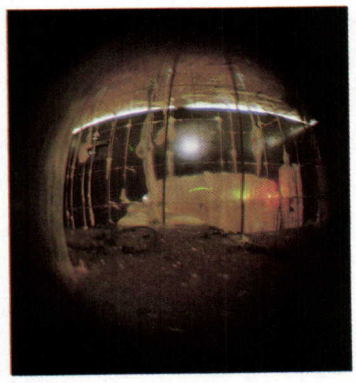
Graduate students assist the five faculty members who teach first-year design to a mix of 100 students including not only future architects but also landscape architects, art majors, and future building science students. For a typical first-year project, called "Can City," students were asked to bring in old cans, invent a city built of these remnants, think up reasons why the new place existed, and videotape the process. The students were introduced to a theory of place making and encouraged to draw from the strengths of their own backgrounds.

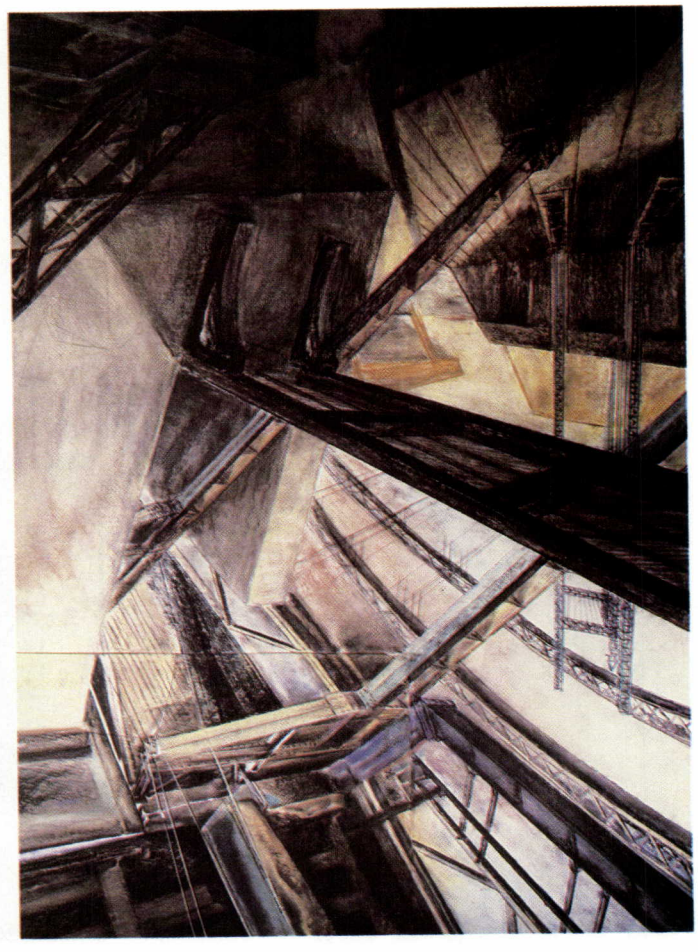
The second year finds students designing a series of projects that has included Professor Don Collins's "Five by Five" project, an exploration of the nature of topography, in which a quadrant was extracted from a map, the land characteristics were explored, and a building was inserted into the landscape. The third year emphasizes real architecture, with short projects of 10,000 to



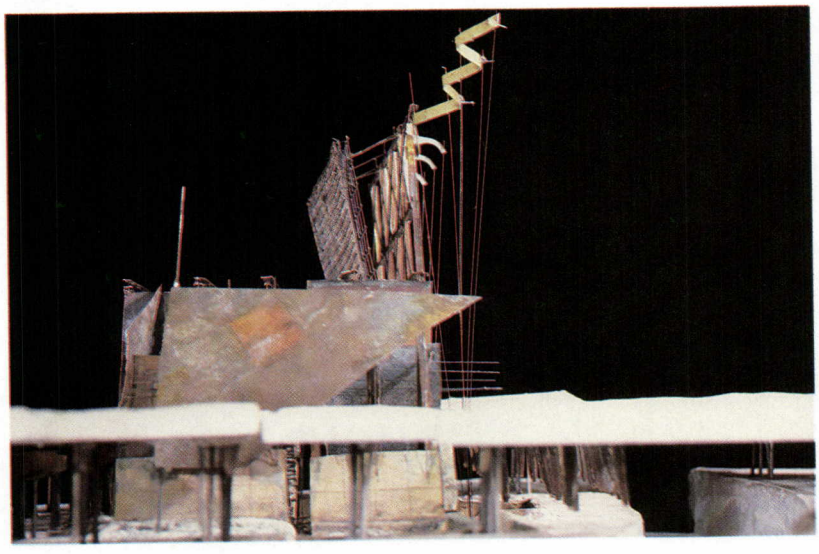


Top, light and material study by second-year student Gabriela Baumgartner; bottom, light and material study by second-year student Jim Atkinson; both with Tim Rice as critic.





Right, conceptual thesis project, 'Boston Visions,' by student Mark Kogut; far right and below, 'Atlanta Underground Theater,' thesis project by student Roger Deweese.



20,000 square feet in which students examine how concepts of architecture relate to the environment, to materials, and to texture.

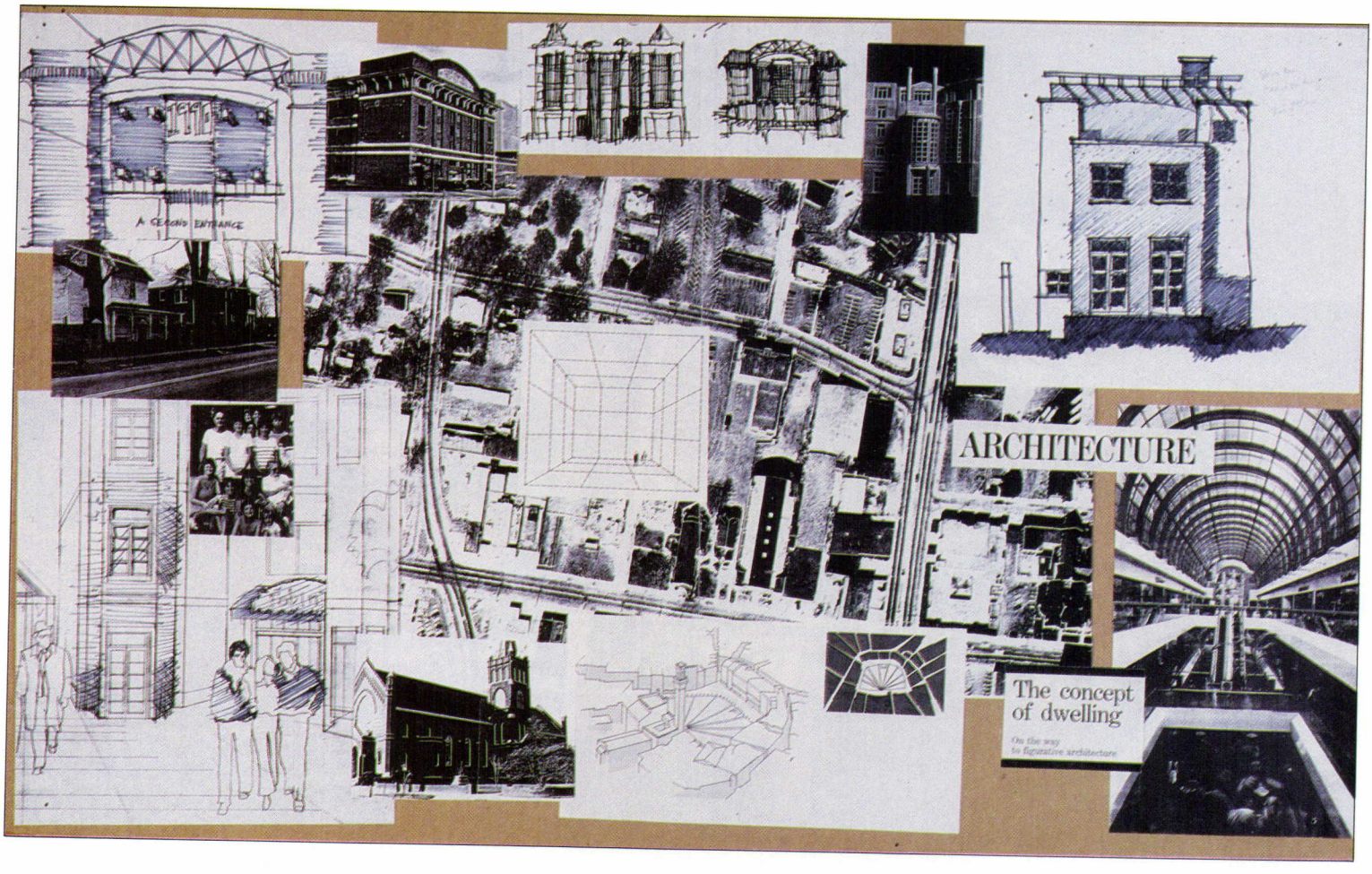
The fourth year offers the option of a semester in South Carolina's architectural treasury, Charleston. "What better lab could you have?" says practicing Charleston architect and program director Ray Huff, AIA. The school is housed in a fine 19-century residence adjacent to the College of Charleston, where students take required and elective coursework through a reciprocal arrangement. The 15 third- and fourth-year undergraduates who participate in the program for one semester meet a critic five days per week in an intense program that includes a Tuesday night session with practicing local architects. Although the semester is not specifically dedicated to urban design, the city of Charleston is the catalyst for many of the semester's design projects.

Spring, which powders the green Piedmont hills with azaleas and dogwood blossoms, touches each student, particularly during Spring Week, an event that unifies the college's five departments in a single effort. This past spring, Christian Norberg-Schultz's book *The Concept of Dwelling* provided a subject for group examination. Matt Rice, assistant professor in the second-year program, gave students the assignment of reading Thornton Wilder's *Our Town,* of building a small-scale town, writing a history of the town, and making a small building to fit into the town center. Other students did designs for the elderly, prepared a plan for the renovation of a textile hall in Greenville, and studied native American lodges. Lectures (this year by Norberg-Schultz) and social events completed the week.

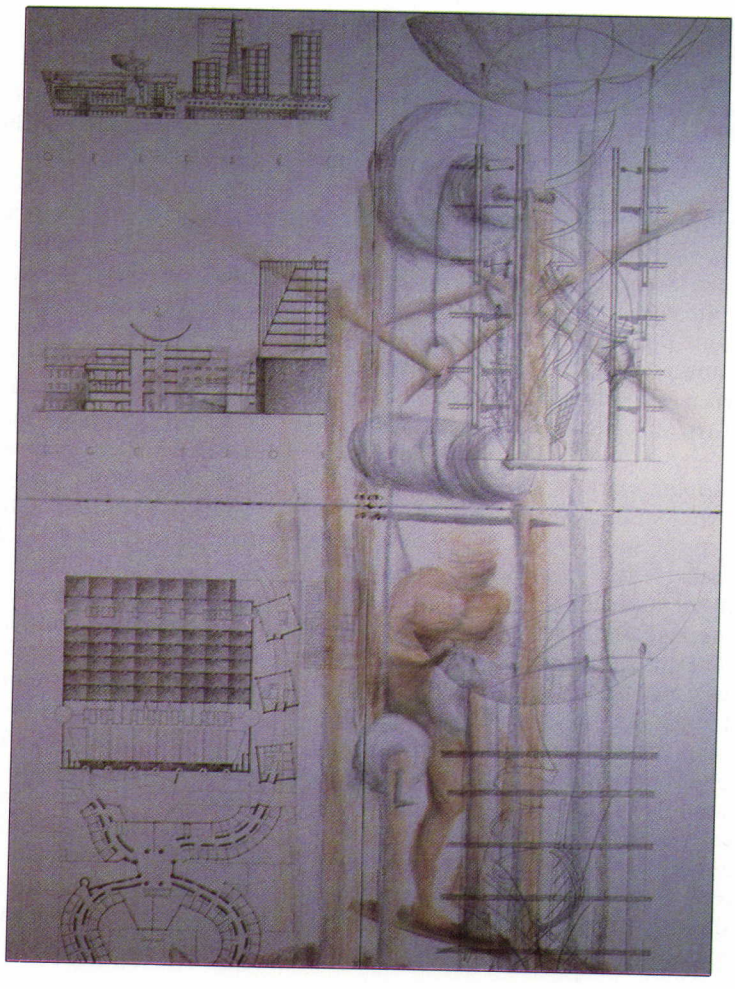
Clemson spring inevitably becomes South Carolina summer, when students are deliberately pushed from the nest. The college determined several years ago that the graduate program would not be merely a fifth or sixth year but would be different in its spirit and its demands. The first demand is acceptance: only 30 percent of applicants are admitted. Of the 80 students in the graduate program, "most have been away for two or three years working," says Peter Lee, professor and director of graduate studies. One thousand hours of practical working experience will be necessary to graduate. Lee adds that "roughly 25 percent have attended other institutions," so most are former Clemson graduates who have returned.

Graduate students seem to thrive on the atmosphere, where they exult in the discovery that, as one said, "no parallel bar is necessary." The graduate faculty members share students during the first year, providing short problems in which they investigate the nature of theory and application. Their projects are as different as their individual interests: Lee frequently undertakes projects with a literary basis, referring to a "balance of intuition and the practical." Professor Yuji Kishimoto, by contrast, cites a "stripping of self, an exploration of the nature of light, of rhythm, and of structure." Friday afternoons are devoted to pinup reviews with faculty, a tradition that sometimes draws undergraduates for the more controversial sessions.

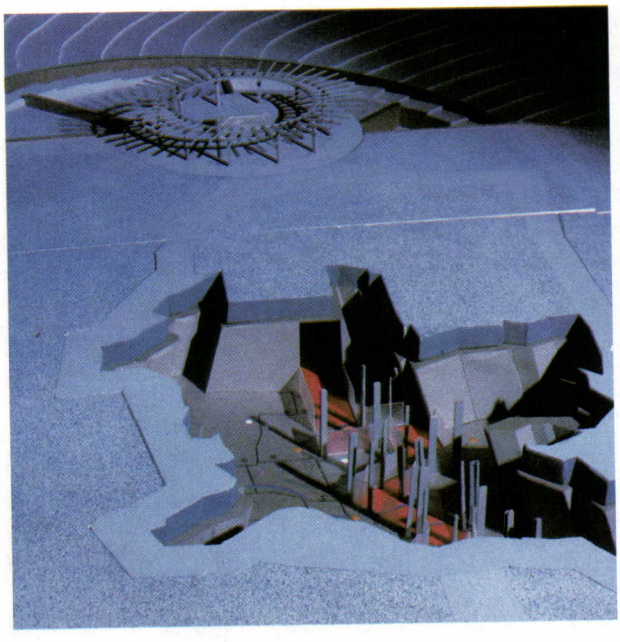
Some 13 to 15 graduate students each year enter Clemson's health care specialty. This 20-year-old program, initiated by Professor George Means, FAIA, focuses on the "integration of physical design with patient care techniques," says Ken Russo, professor and director of graduate studies in architecture and health care. Both physical and mental health care systems are considered in the syllabus, which includes coursework in administration and health care programming and contains a hospital internship requirement. Many topics are introduced by outside agencies such as the American Hospital Association. The topics deal with real needs and actually funded problems. For a recent project entitled "An Inter-American Health and Wellness Community for Advanced Medicine" in Caguas, Puerto Rico, students visited the Caribbean island and proposed a sweeping

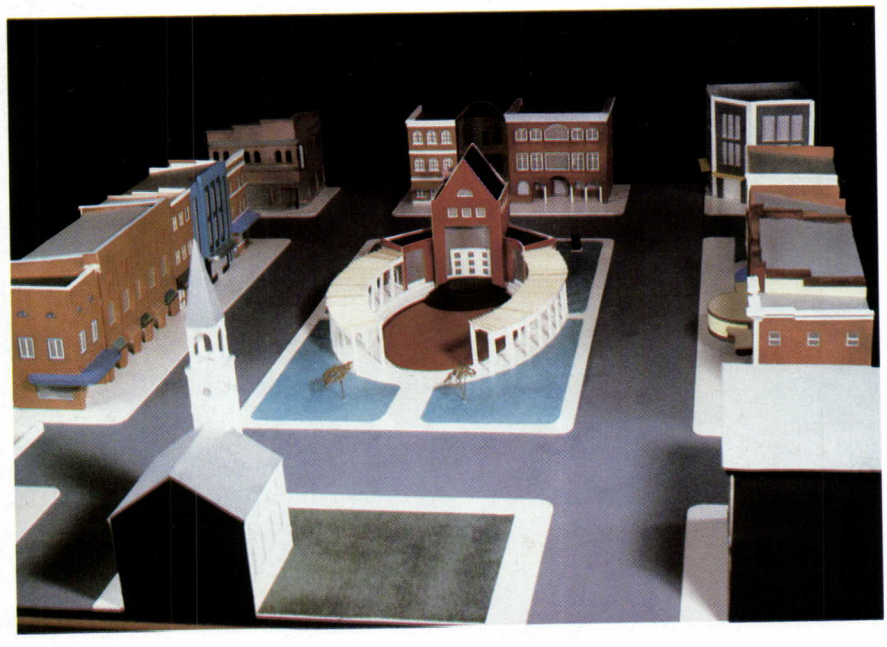


Above, 'Concept of Dwelling' for Greenville Textile Hall by fourth-year student Jim Babinchak; right, 'Oncological Complex at Johns Hopkins,' thesis project by David Damon.



Below, left, 'An Interpretive Gallery for Appomattox Court House,' thesis project by Blair Smith; right, 'Concept of Dwelling' for an imaginary South Carolina town by fourth-year student Tommy Ingram.





new Pan-American medical community to be centered there.

More than 700 Clemson graduate students have spent one semester of their first year at the Charles E. Daniel Center, a villa set in a luxurious garden high above the harbor of Genoa, Italy. The program has been headed since its inception by a former colleague of McClure's, professor Cesare Fera. Fera declares that the center's purpose is "to allow students to examine the physical reality of a European city by the sea." Students live together in the Villa Danieli, sharing meals and housekeeping duties, frequently traveling and sketching throughout the surrounding cities, learning "design through history," Fera says. A resident Clemson professor joins the staff each year in Genoa, providing an American counterpart to the visiting European lecturers—practicing architects who augment classes in contemporary European architecture and Renaissance and baroque architecture.

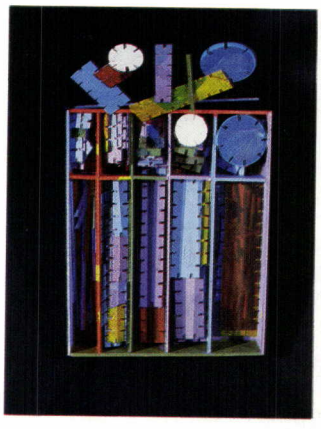
By the second year of graduate work, when the traces of Italian accents have receded, each student selects a professor to work with for the duration of the thesis work. Thirty-seven final projects were presented in 1989—four from health care, the rest from other studios. Diversity of student interests showed through the work. While there was some drifting toward poststructuralism (which fared extremely well with stronger students, vapidly with the weaker ones), there was a richness and a range of competence to all the projects in Professor Durham Crout's studio.

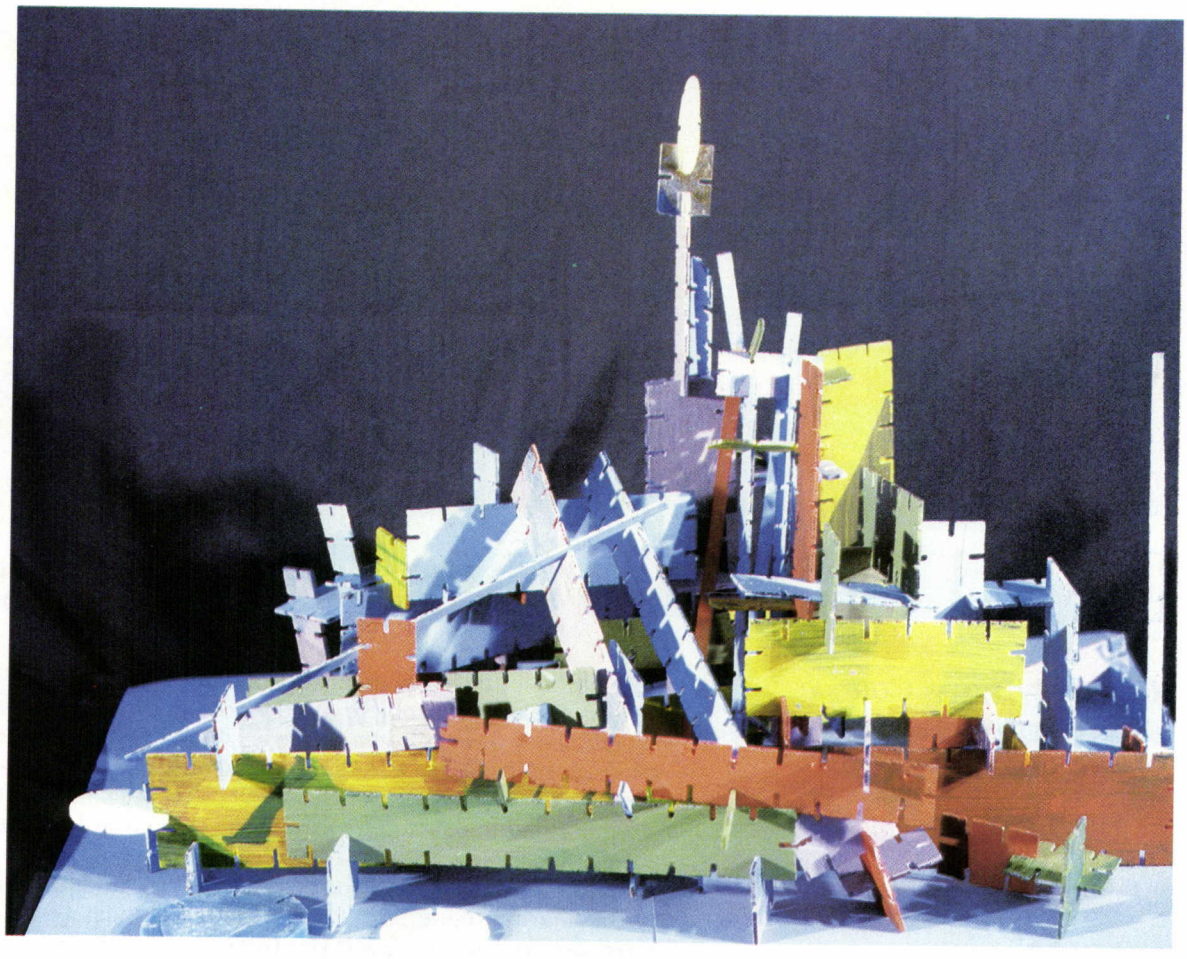
Successful thesis candidates tend to become active alumni, strong supporters of the school, and major determinants of the school's direction. Their support of the Clemson Architectural Foundation resulted in the establishment of the Genoa and Charleston centers and has provided funding for visiting distinguished critics (Antoine Predock, FAIA, and the three principals of Taft Architects) and other forms of enrichment. Clemson alumni "meet each other all over the country," says Earle Gaulden, FAIA, an alumnus and a principal in the Greenville firm of Craig, Gaulden & Davis. The pull of Clemson is strong: former students frequently return to campus as graduate students, teachers, visiting practitioners, or/and assistants to graduating seniors enmeshed in thesis presentations.

Eden is not without its critics. Some professors, particularly those fresh from five-year programs, chafe at the lack of total commitment at the undergraduate level; championship football remains the undisputed king of the hill. South Carolina architects from other institutions mentioned the "tight-knit" nature of the alumni and the school, a tendency to leave others out of the conversation. Some said they thought the school inbred, with Clemson graduates returning to teach. Students and teachers complained that Lee Hall needs expansion, that its studios are crowded. Although the college has produced respected professionals for 30 years, professor Joe Young asked rhetorically, "Why hasn't Clemson produced any star graduates?"

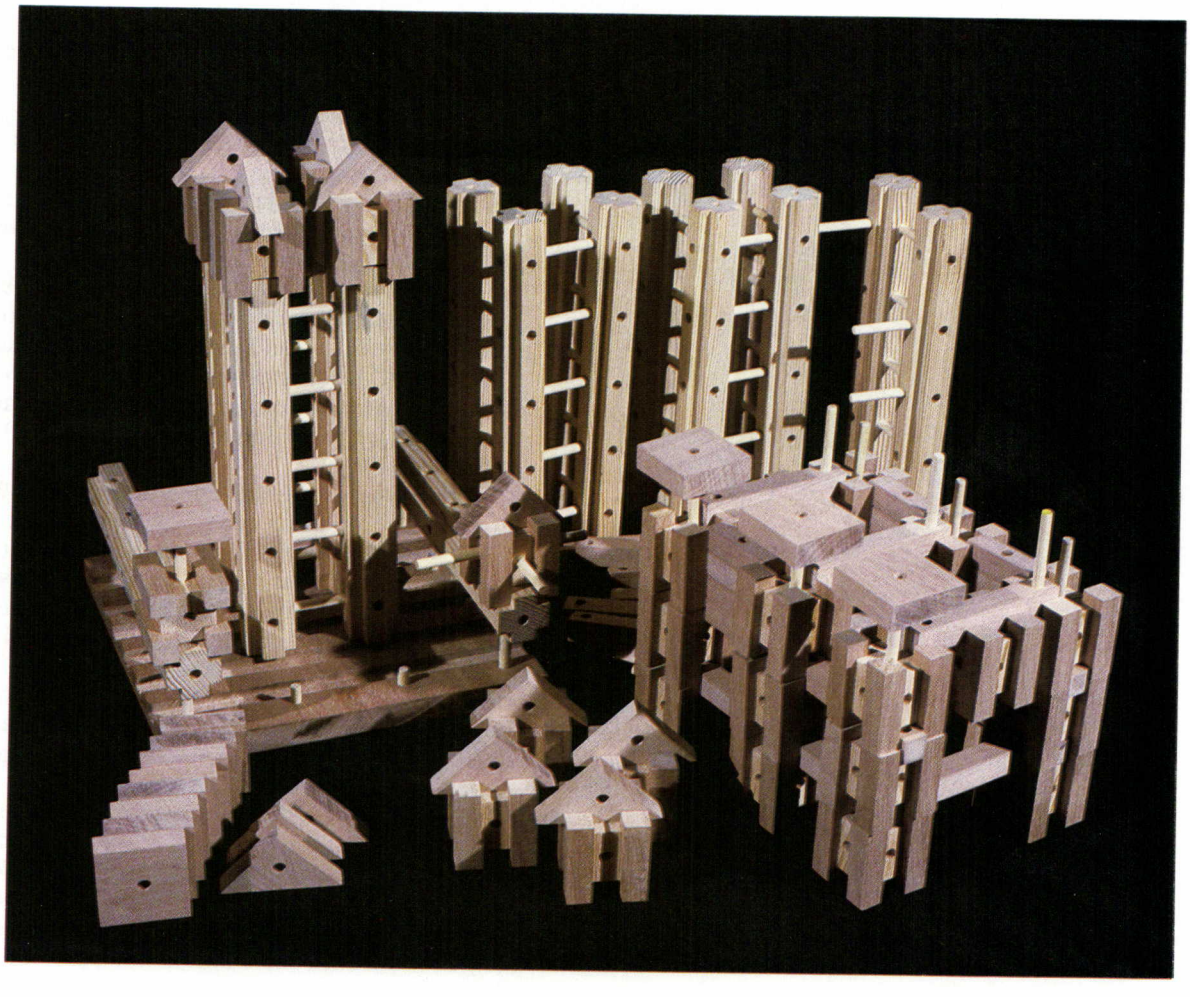
The answer to Young's query is that a star is born every minute. If the thesis projects, the "concept of dwelling" projects, the drawings and sculptures that line the corridors of Lee Hall, or the Villa Danieli are any indication, those stars will shine. They are being launched by an institution that is giving them a strong base of instruction while encouraging them to reach within and then beyond themselves.

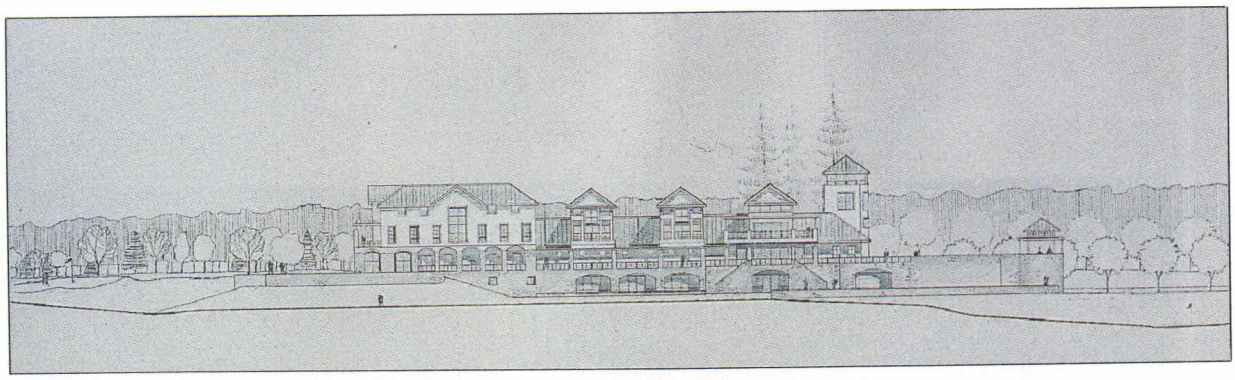
The architecture program that Harlan McClure began in 1955 has come full circle. A new administration has taken over the house, cleaned it, and brought new life, new ideas, and new energy. As Barker says, "The idea was to keep the core strong enough. Then we could venture out." The future of Clemson's architecture program, he says, depends on "a strong work ethic and strong students, [to which] we add enrichment and new faculty." The dean is describing Clemson's architecture program as it stands, a school in balance. □

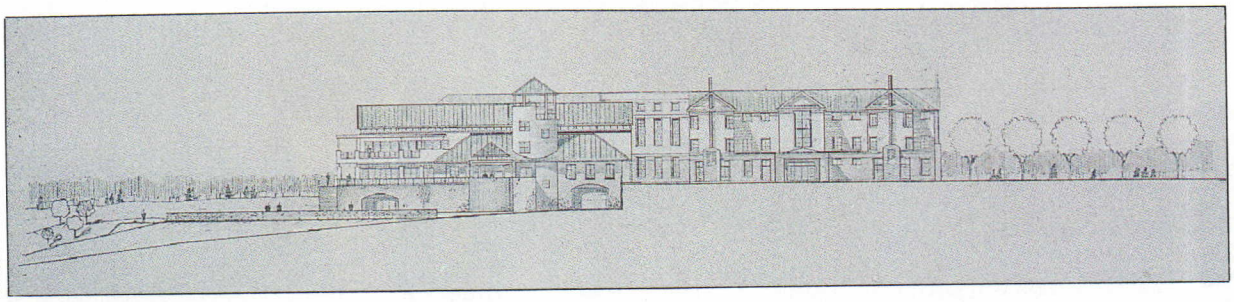




Above and top right, 'An Architectonic Toy,' project with Taft Architects, by student Xuelei Qian; below, 'Toy' by student David Moore.







James Roche

Below, Roger Williams College division of architecture's building, completed in 1987. Left, thesis design for a country club by John Guinan.

Pulled Up by Its Own Bootstraps

Roger Williams College, architectural David.
By Michael J. Crosbie

The architecture program at Roger Williams College in Bristol, R.I., is a textbook example of how dedication, hard work, and an efficiency of means can revive a school that was on the verge of shutting its doors. Added to this, of course, is the commitment of the college administration to cultivating an architecture program that appears to be raising the standard of education for the entire institution. The "Roger Dodger Country Day School," as it was known to those awesomely intellectual types at the nearby Rhode Island School of Design just a handful of years ago, is now giving RISD a trot for its money, as some students indicated to me that they chose Roger Williams over RISD.

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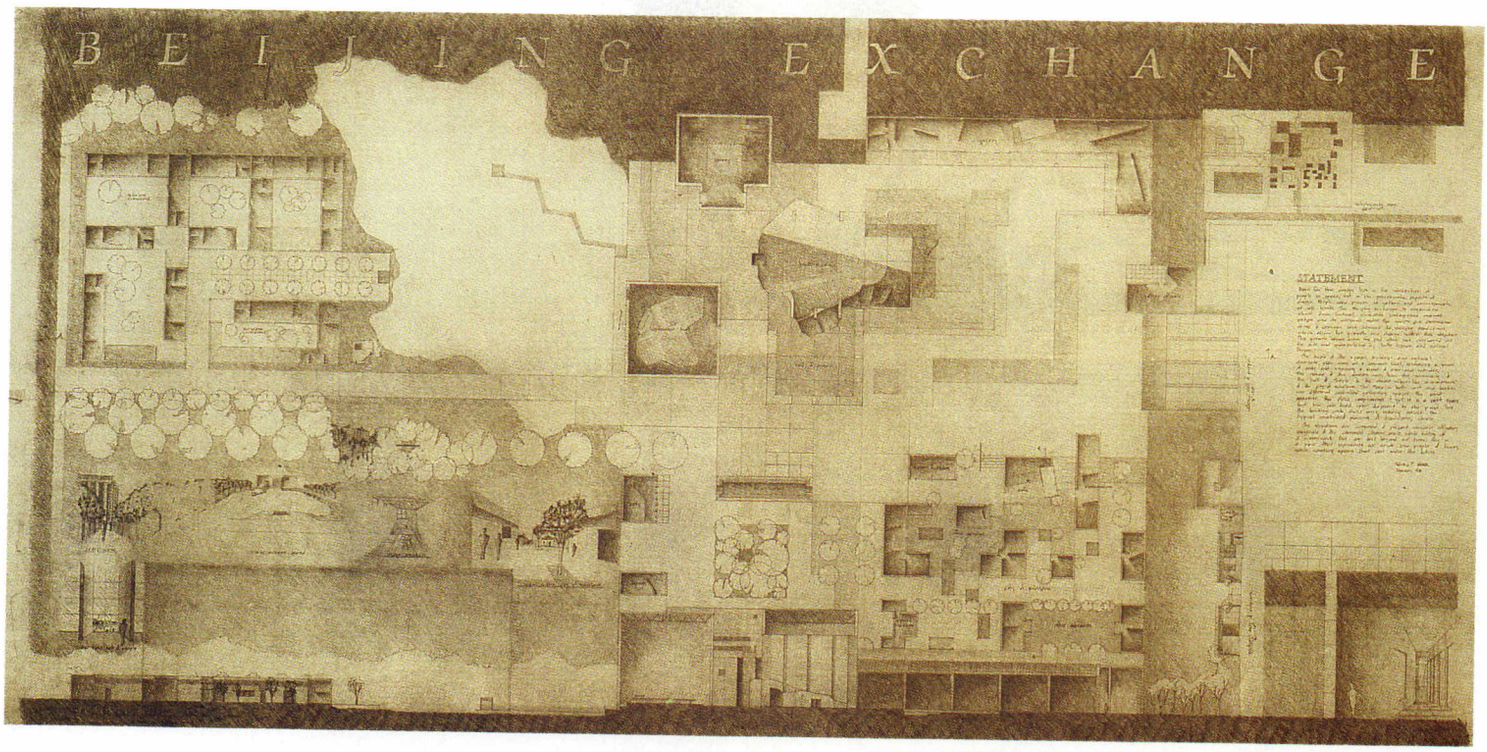
The miraculous resuscitation of the architecture program at Roger Williams has been due in large measure to the college's shrewd choice of Raj Saksena, AIA, as its director in 1983. At that time the program was part of the division of engineering and technology, offering a four-year nonprofessional Bachelor of Arts in architecture, and had 150 students and five full-time faculty. Saksena arrived from the Boston Architectural Center, where he had taught for 16 years, had served on a number of the center's committees, and was one of the authors of the BAC's education plan that led to its accreditation in 1971. Educated in India and at Georgia Tech, Saksena had practiced both abroad and in this country, including three years with Paul Rudolph, FAIA.

"The most important thing on the faculty's mind was potential accreditation," recalls Saksena of his first impressions of the school. "I pointed out to the president and the dean that what they were getting into was serious business. The accreditation process was one in which there were no guarantees. Institutions prosper or suffer by their reputations, and the worst thing for an institution to do is to fail to meet an announced goal. If we didn't meet the goal of accreditation, the architecture program would be gone, but it would put the entire institution under a cloud and might cause serious damage to the whole college."

On Saksena's first day as director, the school was visited by an NAAB team. "I said that I didn't know a lot more than they did about the school," remembers Saksena, "so we'd look at it together." The new director compiled a 10-item list of the most pressing issues that needed to be addressed with respect to accreditation, including new facilities and a library and slide collection.



James Roche

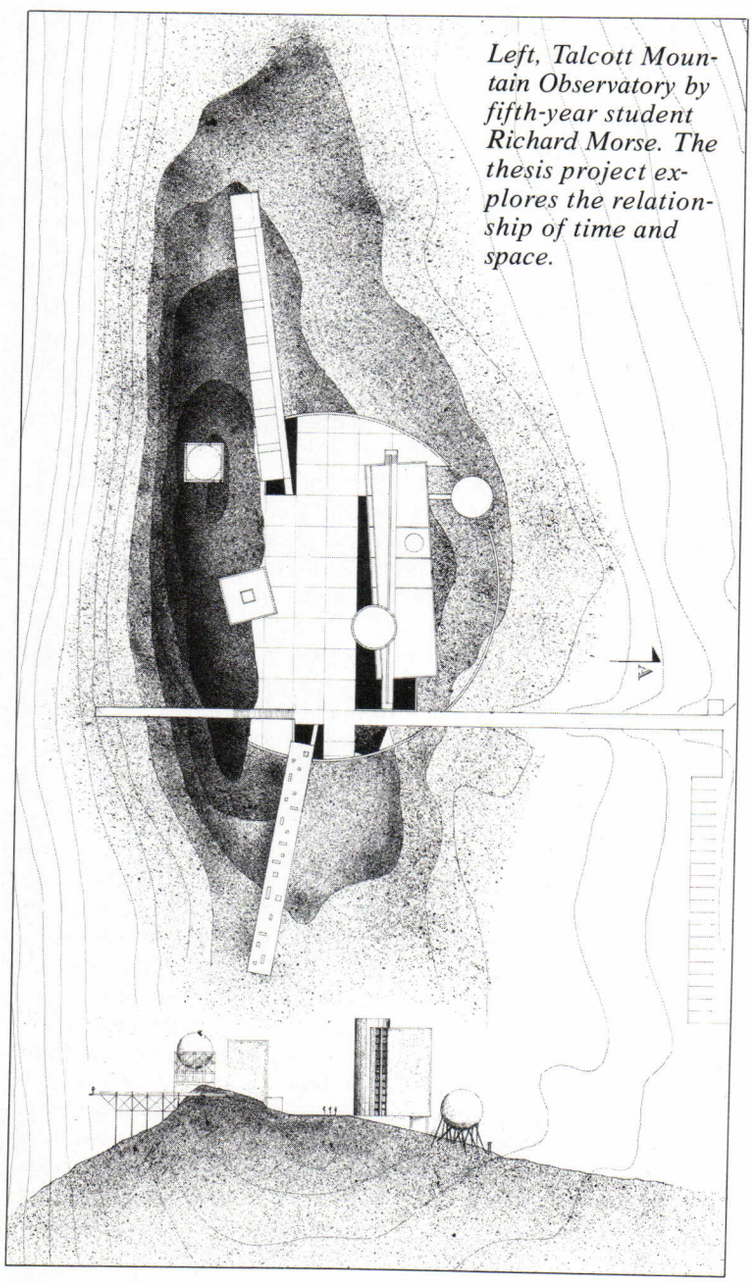
Above, design for a cultural exchange center in Beijing, China, by fourth-year student Kevin Shea. The scheme uses a common dimensional unit, which can be used for expansion.

The NAAB team gave the school a three-month extension on its deadline for submitting a new education plan. Working with faculty members Zane Anderson, AIA, and Roseann Evans, Saksena churned out a report and attempted to nail down the college's commitment to a new building and library. Only hours before the report's deadline, the college's board of trustees unanimously voted to allocate money for the new building and the collection. The report was approved by NAAB, clearing the way for the first visit leading to accreditation of a new five-year bachelor's program in 1985.

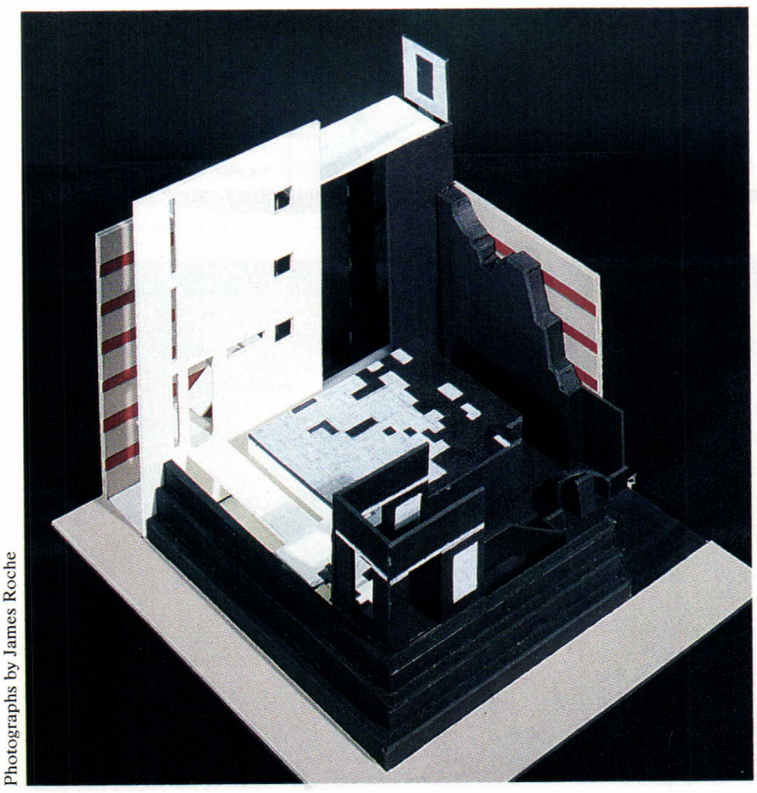
But the school still had a long way to go. It shared two classrooms with the English department, and its design studios were quartered in an old elementary school 15 miles away in Portsmouth, R.I. Every day a bus would pick students up on campus, cross the narrow bridge over Mount Hope Bay, and shuttle them to Portsmouth. Another shuttle would bring them back to Bristol for dinner, and yet another out to the elementary school for late-night studio work. The Portsmouth building was a funky setting for an architectural school, recalls faculty member Paul Donnelly, AIA. "I used to bring architect friends from Boston, and they'd come to this little grammar school and here was this underground school of architecture going on and they loved it. We'd have crits out in the corridors. They said there was really something really wonderful about this."

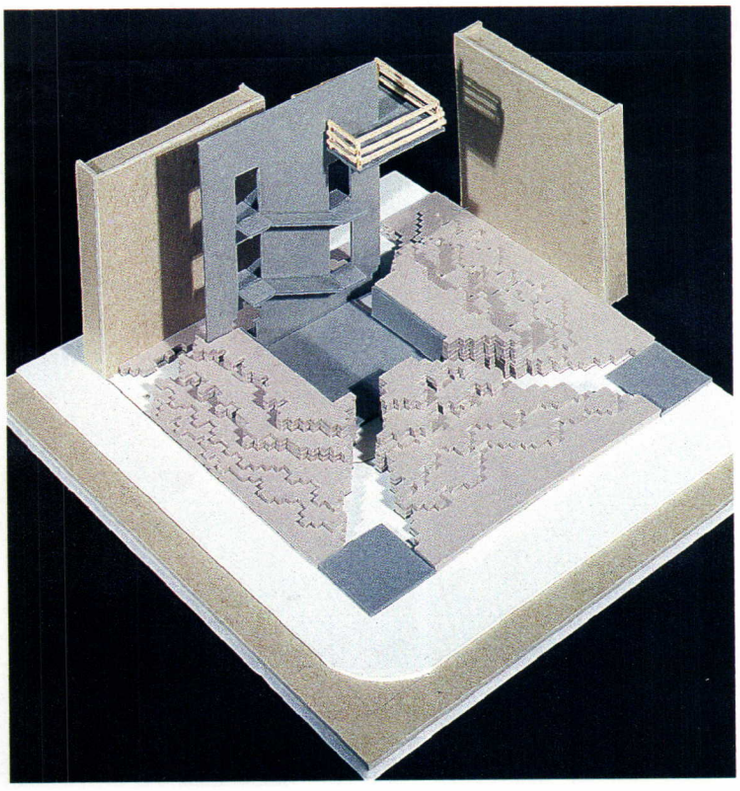
With no library or slide collection, a minuscule periodical room in the old cafeteria, and studios scattered throughout pint-sized classrooms, the grammar school stratified the student body. Today's graduating students recall with relish the "respect" that underclassmen had for the fifth-year class. "The upperclassmen were kings," says one fifth-year student. The thesis studios in the school's basement constituted a mysterious inner sanctum open virtually by invitation only.

The new building has changed all that, radically altering the way the students think about themselves and their work. Kite Palmer Associates' competition-winning design houses all five studios in one large space (see Aug. '88, page 84). The building's west wall jogs in four sections to give some territorial identity to the studios. But other than that the space is a free-for-all with drawing boards embedded in the designer-built triple-decker shantytowns that grow in most architecture studios.



Left, Talcott Mountain Observatory by fifth-year student Richard Morse. The thesis project explores the relationship of time and space.





Photographs by James Roche

Both students and faculty agree that the program is free of a dominating design ideology—the consensus is that many theoretical stances can be entertained within the realm of architecture that is humanly scaled, addresses some programmatic requirement, and has a sense of being buildable. "The idea is to design a program so that students are free to choose their own kind of emphasis, where they will learn what interests them," explains third-year design critic Ulker Copur. "A student who is interested in technology should be able to graduate from here with a good, solid background. If a student is interested in theory, there is a place for that student also. Each student digests the knowledge and finds his own way."

The students credit the diversity of the program to the faculty. By and large it is a faculty of practitioners. There are approximately a dozen full-time faculty members and twice that many adjunct. The school draws its adjunct faculty from Rhode Island, Massachusetts, and Connecticut, with nearly half coming from Boston. In a variation of the BAC model of predominantly part-time faculty, Roger Williams offers a wealth of teaching talent with a relatively small full-time staff. The faculty has a refreshing absence of arrogance (as does the student body) and impresses one as a convivial collection of dedicated educators. "There's a great deal of camaraderie among the faculty," says Zane Anderson, who has taught at Roger Williams for eight years. "My only other experience was at RISD, where there are warring camps, and you get to know the people who think the same way you do and you're apt to get scalped by everyone else."

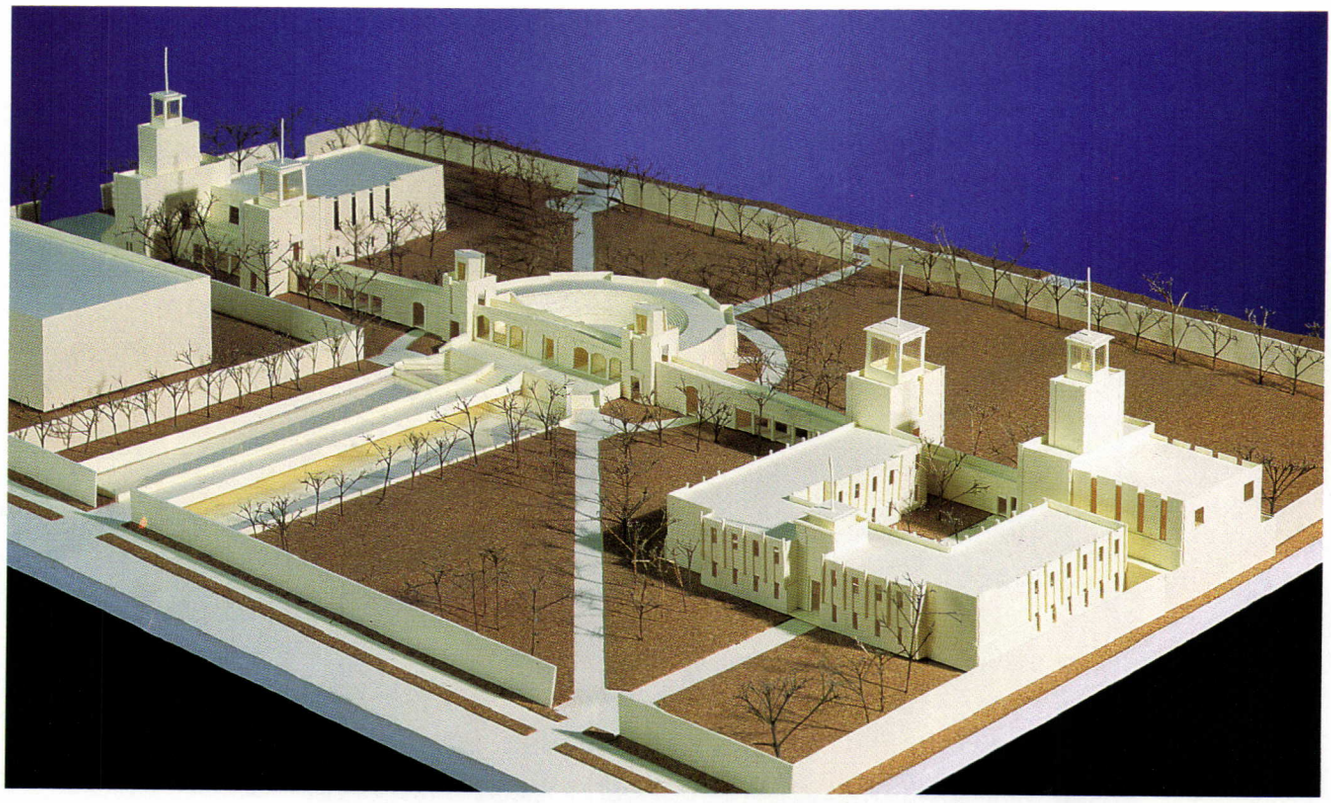
The structure of the curriculum and the distribution of the faculty within it is a meaty example of the integration of support courses in history, structures, mechanical systems, materials and methods, and professional practice with studio work. The support courses in any given year are taught by the same people who are the studio heads in that year. The classic feuding between lecturers and studio critics that is the norm at most architecture schools is nonexistent here. The studio problems are overlaid with requirements drawn from the support courses, so that, for example, a final design presentation might include a large-scale model of a wall section, integrating the materials and assemblies material into the studio project.

An exciting addition to the curriculum next summer will be a foreign studies program. The six-week program will split time between Turkey and Greece and will be headed by Ulker Copur, who studied architecture in Turkey, and Eleftherios Pavlides, who has practiced architecture in Greece. "There are two kinds of abroad programs," explains Pavlides, "studios and history/theory. This will be a history/theory format." Copur adds that the time will be structured with lectures, seminars, and study of historic buildings and sites, but also with visits to architects' offices to view contempory work and methods of practice.

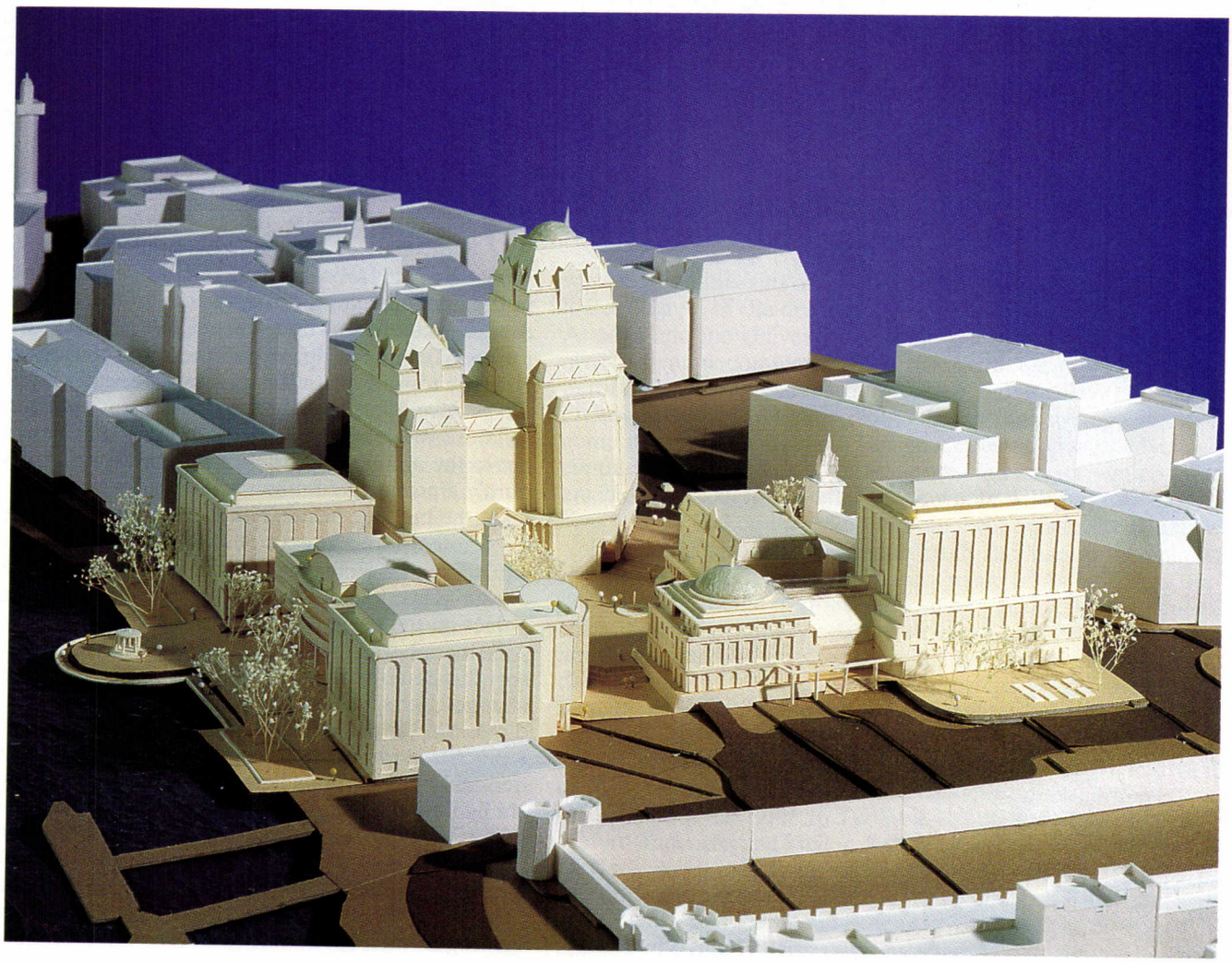
Students admitted to the program (which will be limited to a dozen and half) must have completed the first two years of the architecture program, which will orient them to the foreign program's goals. By the end of the second year students have been exposed to cultural and climatic design issues, have developed a facility for sketching, and have had four semesters of history. "We're interested in the idea of different buildings from different epochs contributing to a sense of place," says Pavlides. The program will be open to architecture students outside Roger Williams, thus providing an added dimension of learning with colleagues from different backgrounds.

On the downside, nearly all of the students and faculty complain about the quality of the college's liberal arts offerings, known as Gen Ed. "It doesn't seem very challenging," was the appraisal of many students. "The course work outside the school is a generalized, medium-to-low-grade college experience," remarked one faculty member. Gen Ed courses are open to the entire college, and students must take nine courses out of only a dozen to choose from. Some have opted to skip the college's offerings and take summer courses at other colleges that can be transferred. Saksena defends the principle of the Gen Ed program but admits that it "needs to be strengthened."

The academic upgrading of Roger Williams College, which would lead to better courses, may in fact be under way, thanks to the meteoric improvement of the architecture program. College Dean Malcolm Forbes refers to the architecture division as "the jewel in the crown," adding that, in the future, "I'd like to be able to say that all of the other programs at Roger Williams were of equally high quality as the architecture program. I say that at the risk of offending everyone else." Forbes, who is a frequent visitor to juries at the school, was favorably impressed with the architecture students when he visited their new building after 10 o'clock one night to find "a beehive of activity. There is a vitality about the whole program as evidenced by the students, the faculty, and the building." Others on campus also have noticed, and, according to the architecture students and faculty, there is a certain sense that other college departments do not want to appear outdone. It's no longer a secret that the architecture school at Roger Williams College is one to watch. □

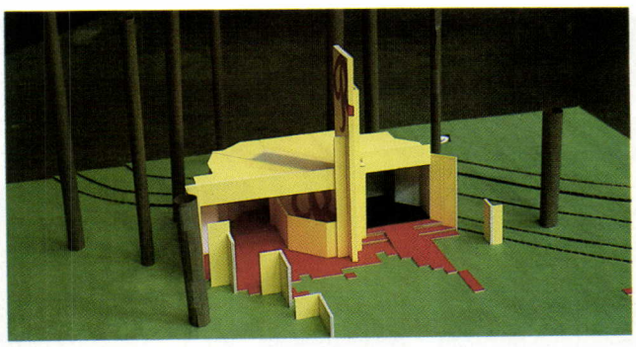


Facing page, left and right, projects for a 'War Memorial in Cubopolis' by first-year students Christine Tonreault and Mark Hester, respectively. The urban site was to be the setting for a memorial that would symbolize war and allow an elevated vantage point for distant views. Above, a cultural exchange center in Beijing, China, by fourth-year student Paul Stafford is composed with classical symmetry. The program for the project was developed as an international student competition by the American Institute of Architecture Students. Below, urban design project for a waterfront site in London by third-year students Sean Donadio, Mark Firnkes, Richard Hughes, and Michael Moruzzi. The London project was designed in conjunction with a project for Boston's Fan Pier, drawing parallels between the two cities' orientation toward waterfront development and the cultural impact on the projects.



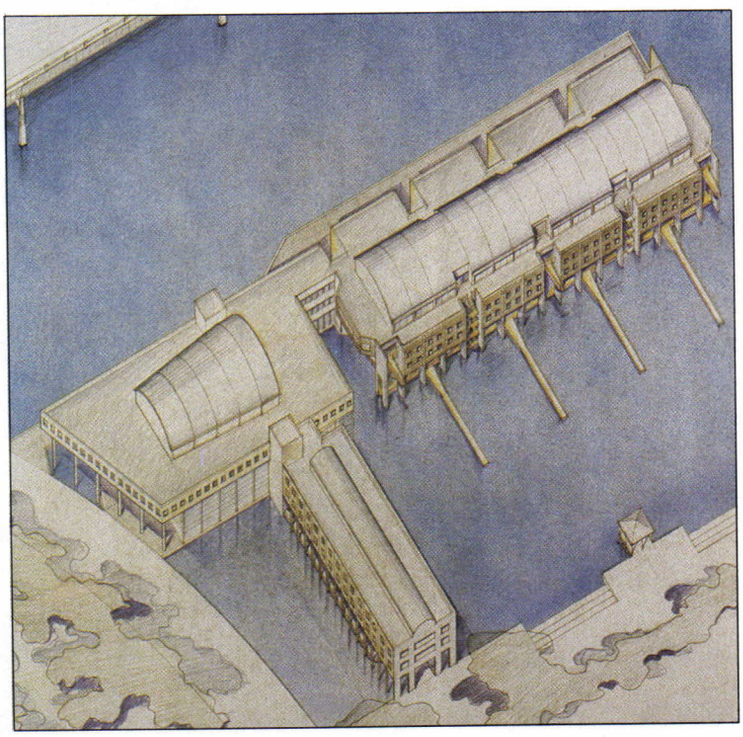
building that wraps around a large, skylighted atrium. In many

the region's most socially and urbanistically significant building



Above, model by first-year student Clarence Secright for J. Donnette's studio course. Below, third-year M. Arch student Monica Lake's design entitled 'Marine Academy;' advisers A. Bystrom and D. Miller.

The design for the floor-based lighting fixture shown below was developed by student Chris Keyser in a nonstudio course taught by Marietta Millet and Larry Hahn.



collection, the Pike Place Market, from obliteration through urban renewal. Countless other graduates have contributed to the tradition of well crafted design that flourishes in the Northwest. In recent years, Norman Pfeiffer and Steven Holl have become prominent in their very different ways on the East Coast design scene.

These are the assets that Kelbaugh has built upon. While impressive, they tend to be peripheral to an architecture school's basic mission. They can support and enrich a successful program but cannot create or substitute for one. By going virtually outside academia for its chairman, the school was acknowledging problems at its core.

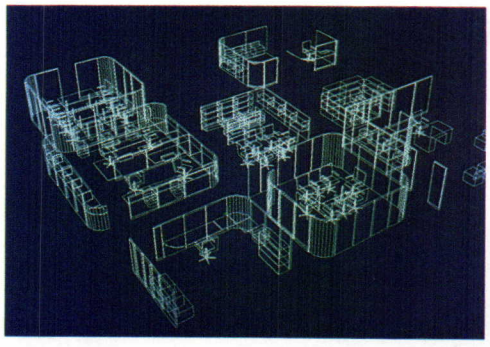
Foremost among these was, and still is, a top-heavy faculty. During Kelbaugh's incumbency, between 70 percent and 85 percent of the teaching positions have been tenured. There is not one assistant professor on a teaching roster of 55. The quality of this faculty varies considerably. Peter Miller, a member of the school's visiting committee and owner of the region's only architecture bookstore, says that the department "had a lot of tenured professors at a time when it would have liked to be lighter-footed." Steven Holl, who graduated in 1971, says that "tenure was always a problem." And, while he found teachers such as Steinbrueck, Zarina, Folke Nyberg, Werner Seligman, and historian Herman Pundt extraordinary, he says there also have been "tons of dead wood," causing "a spiritual drain." He concludes that "the school needs new blood."

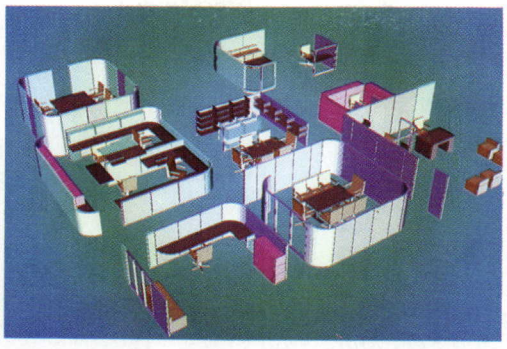
The school's structure and administration also are problematic. Neither the relationship between departments of the college nor that of the architecture department to the college is easy to fathom; it seems almost as though the place were structured in such a way as to make its administrators indispensable. The college has four departments: urban design and planning, landscape architecture, building construction, and architecture. The last accounts for more students and faculty than the other three combined, and there is little interdisciplinary activity; so the notion of a coherent college is somewhat wishful, especially at the undergraduate level, and in certain ways favors the smaller department at the expense of architecture.

Creation of the college structure led to abandonment of the B. Arch. program in favor of a 2-2-2 system, with the first two years spent on general studies within the university, the next on courses in the college of architecture and urban planning, culminating in a B.A., and the final two on an M. Arch. as a first professional degree. This arrangement is said to reflect the famous "Princeton Report" on architectural education in the late 1960s, but Bernard Spring, one of its authors, says that the report never explicitly advocated such a system.

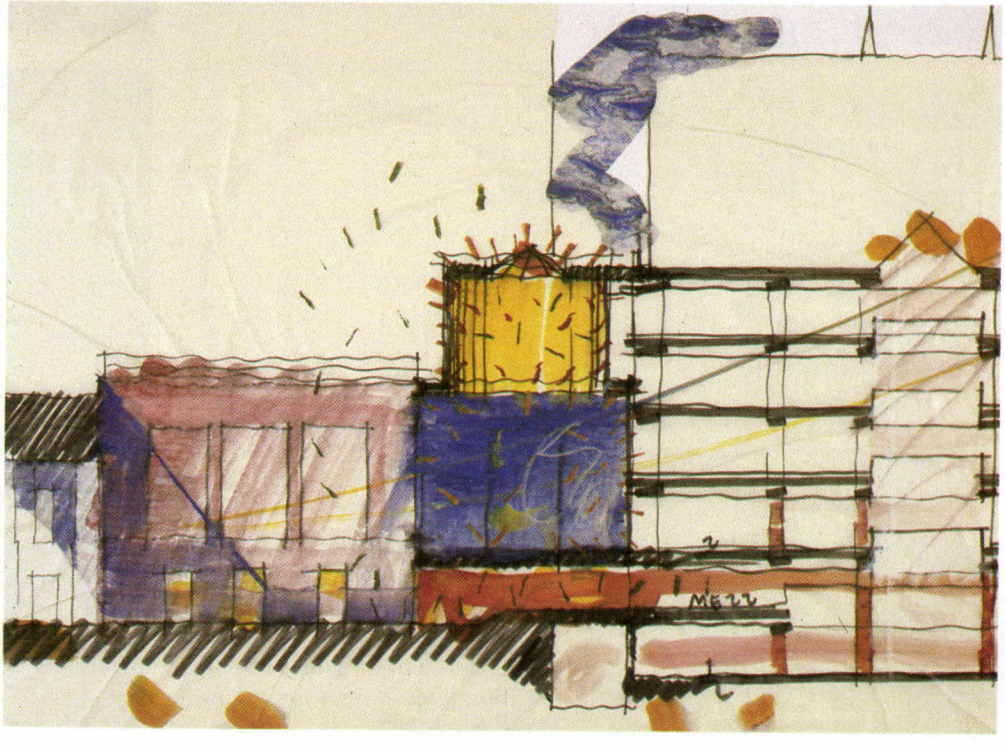
The nonprofessional bachelor's degree, wherever it is conferred, tends to invite dilettantism, and UW's is no exception. The B.A. can reflect any one of about 10 minors but does not specify a major. Kelbaugh explains, "It's not a degree *in* anything, but rather one *from* the CAUP." A younger faculty member says, "The problem with the B.A. is that the students don't love architecture." Although numerous, the undergraduates themselves feel isolated from the school. Gordon Varey, the CAUP dean, feels that the B. Arch. system may have been more effective than the present one.

Architecture's low degree of identity and autonomy is not





Above, two views of a group CADD project in a studio under the direction of professor B. Johnson. Right, one of the drawings in Jeff Johansen's thesis project entitled 'Full Block: Strategies for the Design of a full Block Commercial Development.' Johansen's advisers were Doug Kelbaugh, Tom Bosworth, Richard Moehler, and Jeff Ochsner.



helped by the college administration. Gordon Walker, a member of the school's visiting committee and formerly a candidate for the chairmanship that went to Kelbaugh, says, "I don't envy what he's gotten into there. . . . Gordon Varey is a problem. He's a nice man but lacks vision as a dean and doesn't share information effectively." Students find Varey inaccessible and comment: "I've only met the dean once." "He should be more approachable." "People ought to be able to recognize him." One student demurs: "He's approachable, but people don't know it."

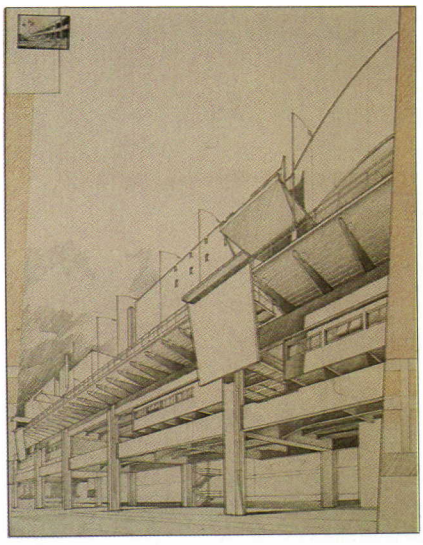
Faculty members see Varey as private, evenhanded, focused on the details of administration, and lacking any strong vision. Kelbaugh feels he has not assigned enough new faculty positions to the architecture department. This is a sore point, since the chairman has had few vacant positions to fill.

Much of the problem stems from a lack of resources. As a public institution, the University of Washington is under the control of the state legislature. And, although the Puget Sound area is well educated and sophisticated, the rest of the state is less so. One administrator observes, "Eastern Washington is the only place where the John Birch Society operates a bookmobile." During the 1970s, conservative legislators responded to student unrest by cutting the university's budget, and in the early '80s the university made further staff and student reductions. Architecture felt those cuts strongly; it now has only three-quarters as many positions as it had in the '70s. Although the faculty-student ratio has been maintained at a good level, this shrinkage and a noncompetitive salary scale have narrowed the department's scope and potential. Within this unpromising context, Varey has been reactive rather than assertive. Only lately has he sought significant outside funds for the college, and he has discouraged chairmen from raising money for their own departments.

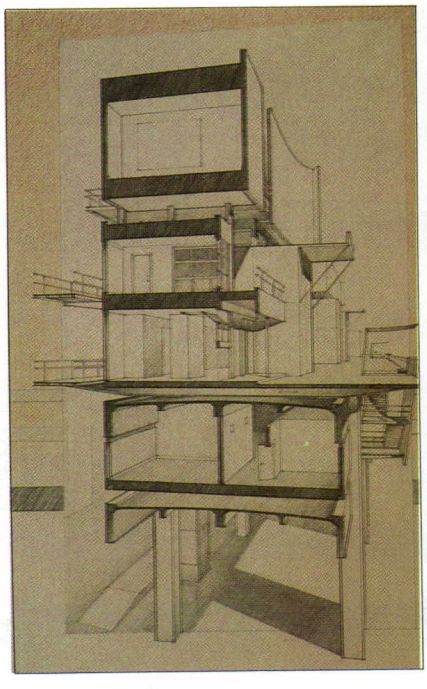
These are the obstacles that Kelbaugh has needed to overcome. Unable to address the central problem through faculty appointments, he has relied on ingenuity and energy to deal with that and more peripheral issues. Rather than making one or two major and permanent changes, he has vitalized the school through many smaller and often transitory interventions. One example is his ubiquity. Just as students feel shortchanged by insufficiently visible faculty and administrators, they appreciate Kelbaugh's accessibility and his consistent attendance at reviews and social functions. More broadly, he has communicated a sense of forward momentum and commitment. One student says flatly, "Doug Kelbaugh is the reason that I'm here."

At the start of each fall quarter, he delivers a lengthy and wide-ranging "State of the Onion Address" dealing with the many-layered nature of architecture and his positions on current issues. Far from concise—one faculty member says these talks "cover everything that Doug has thought about over the last year"—they nevertheless convey to the students a sense of the shifting directions of architectural thought.

Kelbaugh's own concerns have evolved from energy consciousness to wider issues of physical, social, and cultural context, and he believes that those have become the department's guideposts as well. Several months ago, he proudly told me that the architecture program was based on typologies and critical regionalism. But during my visit no one brought up these topics without prompting, and they didn't seem to play any great role in the



The two drawings to the left, are part of student Mark Wolf's presentation for his thesis project: 'Alaska Way Viaduct—Framework for an Urban Campus.' Wolf's advisers for his thesis project were J.G. Minak, D. Kelbaugh, and R. Mohler.



Center, a project entitled 'Panorama' by student A. Maskin as part of the Architecture in Rome study program. Right, undergraduate student Matthew Waddington's design for the Red Hook Brewery.

year-end studio projects. One of the better students even said, "I've never heard of them." This illustrates the difference between running a practice and running a school. In the former, one can enforce a policy quickly and directly, but in the second it takes time, academic and bureaucratic deftness, and creation of consensus, and it may finally depend on uncontrollable factors such as open positions and availability of the proper specialists.

While fundamental and long-term changes have not yet been achieved, the chairman nevertheless has raised morale and brought to the school a previously missing sense of excitement. He has used his limited open positions to engage local practitioners at fractional appointments, thus introducing many new faces and a sense of the outside world and strengthening the school's ties to the professional community. He also has brought people in from greater distances for shorter periods, stretching the department's resources through networking and reciprocal favors. As one student put it, "Doug Kelbaugh has lots of great friends, and he has managed to bring in very high-quality visiting people without a budget." In one case, Steve Badanes of Jersey Devil conducted for one quarter a design-build studio that resulted in the construction of an impressive functional sculpture that quickly became known as the "staircase to nowhere." This cantilevered structure acts as a sitting and sunning place as well as a focus for an otherwise loosely defined plaza along the path between Gould and Architecture halls.

Weeklong design charrettes usually start off the spring quarter. The most recent one, which addressed the lack of public restrooms in downtown Seattle, was organized largely by the students after being suggested by the Downtown Neighborhood Council. (A greater involvement with civic and community issues has been another of Kelbaugh's accomplishments.) Another charrette, on housing the city's homeless, had teams led by Lucien Kroll, Henning Larsen, and Joseph Esherick. Two charrettes were held in Italy and dealt with hilltowns and Turin's Po riverfront. The students' travel expenses to the latter were subsidized by the host city.

The most ambitious charrette, cosponsored by the University of Minnesota, was based on San Francisco architect Peter Calthorpe's ingenious "pedestrian pocket" proposal for restructuring suburbia to reduce dependence on the automobile. Four teams took a 90-acre site abutting a planned light-rail transit line in suburban Auburn and designed a compact, mixed-used civic and business center that merged with medium-density housing and park space. Altogether, 60 students worked on the project, led by eight teacher-practitioners fron UW, Berkeley, the University of Minnesota, Penn, and Yale, including Calthorpe, Harrison Fraker, Daniel Solomon, and Mark Mack. The results of this exercise are being published in a book by the Princeton Architectural Press. Kelbaugh also has fought internal battles to support *Column 5,* a student publication that was begun during his regime.

The goal of these enrichment efforts is to raise the level of students' design ability. Kelbaugh says, "Design quality has noticeably improved in three years. I thought it would take longer." One of his changes has been to reduce studios from four days a week to three, so that practitioners would find it more feasible to teach without shortchanging their firms. Even so, the studio output is highly inconsistent. There is no dominant or stereo-

Facing page, top right, students building the 'Stairway to Nowhere' during a design build studio taught by Steve Badenes of Jersey Devil. This page, the finished product.

typical "school style," which is all to the good, but neither is there a reliable minimum level to the work.

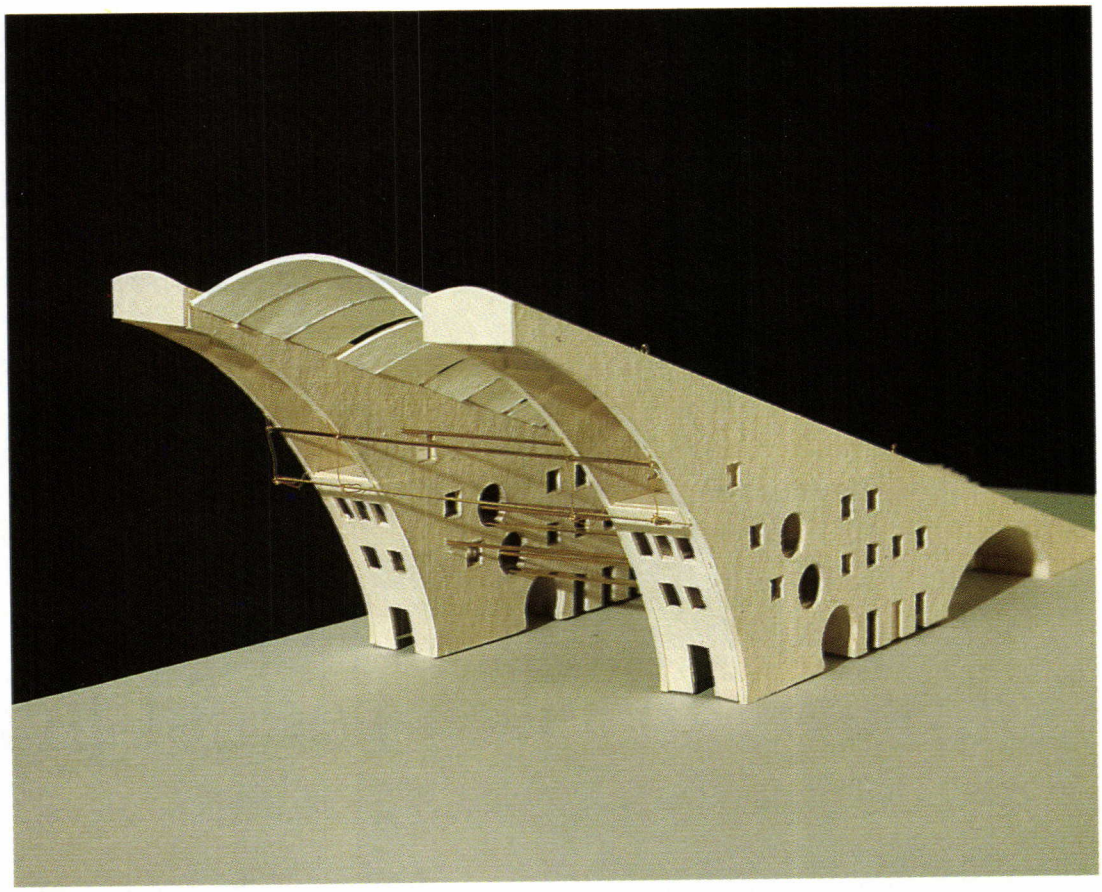
In courses taught by academics, presentation technique often lags behind the quality of the design and never exceeds it. Conversely, in studios taught by practitioners the designs often do not come up to the level of presentation and at best will only equal it. Nor is there as much progress within the design sequence as one would expect. An early studio might produce subtle and poetic responses while a later one could yield awkwardly diagrammatic projects. The best work would stand out in any institution. However, there seems to be no guarantee of minimum competence. A final graduate studio can produce structurally irrational projects as well as sophisticated ones, and that failing can go unremarked upon at a review.

The quarter system may add to the problem. Some instructors will assign as many as four to six exercises in a nine- or 10-week course, and this is not likely to produce good results. Kelbaugh would prefer a semester system but concedes that the changeover would be too expensive.

Two of the strongest design classes don't even deal with buildings. Bolstered by the fine metalworking shop, a three-credit nonstudio lighting course consistently produces impressive lighting fixtures. A notably successful furniture design and fabrication course based on the wood shop can be taken as the final design studio. This can divert good students from what should be their culminating effort before the thesis. Kelbaugh has considered limiting this class to the summer quarter, as in the case of an annual playground design-build studio, so that it won't compete with architectural design.

He also would like to make deeper changes in the design sequence, such as lengthening the three-year graduate program by one or two studios, of which one would be interdisciplinary, and make the thesis an honors program. In his estimation, the department needs more money and a younger faculty. He would like to see an endowed chair in design, or even two, which would be filled by distinguished visitors. Somehow, he would like to make the program more general and yet more rigorous: "I believe that the M. Arch. is a generalist degree that prepares its holder to lead an interdisciplinary team; on the other hand, we have to do what we do better.

"I came with dreams of turning this program into a world-class one, but, while we've stood still in terms of faculty positions, the dean's office has expanded. The present administrative system is poor. There should be a dean of architecture who answers to the president and has his own budget." But that day, if it will ever come at all, is still far off. In the short term, the chairman must hope that a highly regarded faculty prospect won't turn down the school's offer because the salary is too low by East Coast standards, and he wonders if he can possibly get to see as many reviews as he'd like that day. The UW architecture department has emerged from its doldrums, but it's not clear how much further it can go. If dreams count for anything, the answer is a long way, but, if mundane realities carry the day, then it may already be in sight of its destination. □



Right, fifth-year student Nancy Carpenter's design for an airport in Lynchburg, Va., completed during her studies at the Washington-Alexandria center.

or more years, depending on their background and pursuits. For both graduates and undergraduates, programs for studying abroad, in urban settings, or in small-town and rural situations provide a bridge between scholastic endeavors and the world to which those lessons are applied.

The five-year Bachelor of Architecture program comprises four major parts: three semesters of foundation studies, three semesters of professional studies, three semesters of undergraduate thesis work, and one semester of off-campus study.

Foundation students study in what is called the "design laboratory" in three four-hour studios per week, plus a general lecture once a week. Foundation studies curricula, spaces, and projects do not appear sequentially logical or linear. Then again, they are not supposed to. The faculty members, who teach as a team, favor a heuristic approach based on educator Jerome Bruner's models of "learning spirals," instead of step-by-step learning.

"All the [foundation studies] teachers coordinate their programs; each lab is independent, but some projects are collaborative in that all the labs do them," says Ron W. Daniel, associate professor and chairman of foundation studies. "We find there are cycles to the kinds of problems we give. Sometimes the problems are a fairly strict set of constraints and other times there are lots of decisions to be made by the students." The students document a semester's worth of thought processes on a continuous roll of tracing paper, which counts as part of their grade for the studio.

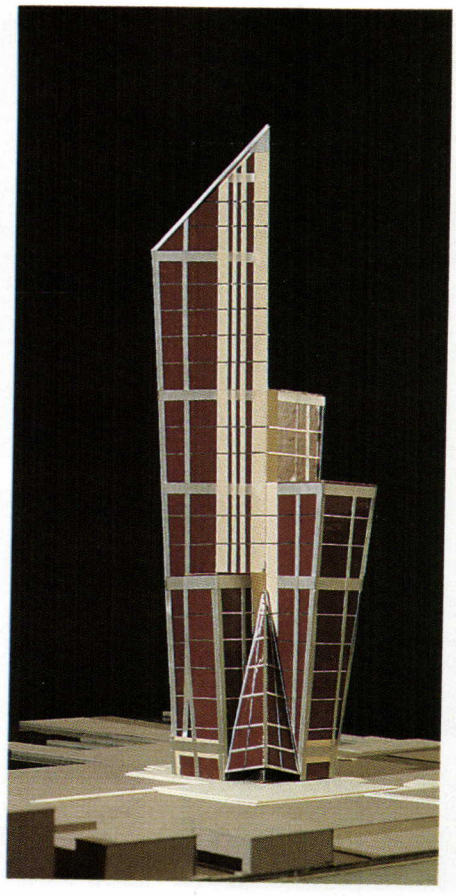
Another important part of the foundation studies is the exploration of appropriate media for expression. Well-equipped workshops include photography, film, video, audio, silk-screen, plaster, metal, wood, and color. The preponderance of different materials and the breadth of expression within a single design lab project are remarkable. (It can get wild. One team of students videotaped a shadow dance, set to original music and cacaphonic crashings, to represent the integration of creative energy into the design process. Somehow, though, you know intuitively that it works.)

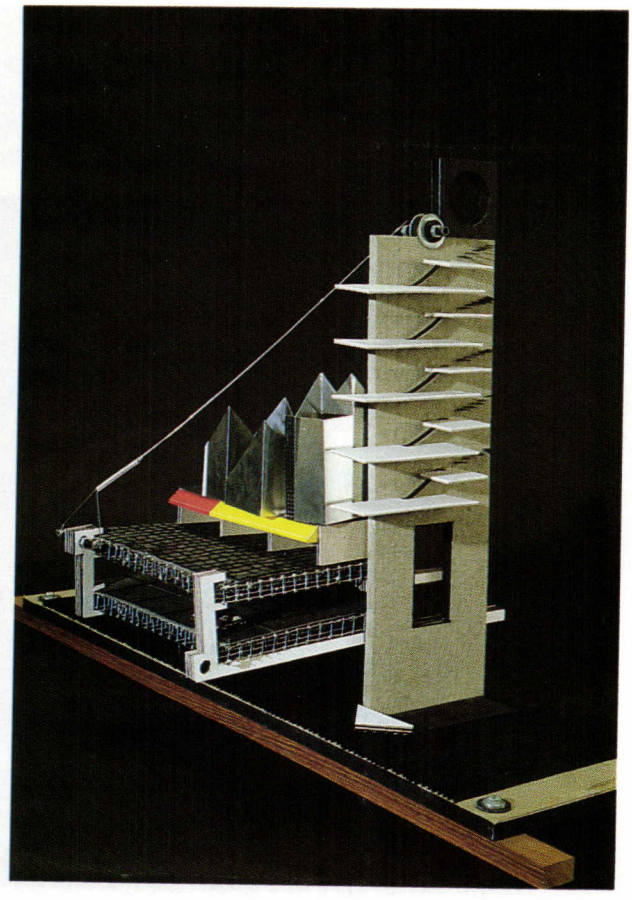
In this framework, when students need to draw, they learn to draw through their own initiative. Daniel explains, "We consciously have resisted any external drawing course because those courses usually are not tied to the fact that a drawing is related to an idea. The students learn different types of drawings from necessity of expressing that idea. Then they have a vested interest in learning drawing, as opposed to undertaking an artificial exercise."

It is chaos tamed. The students say they love it, even though sometimes they are confused. But they're supposed to feel that way occasionally, Daniel counters. "We feel that we're doing something wrong if the students are not confused for a while. Of course, there's a difference between being confused and being ready for a mental institution. If we perceive that a student is frustrated, we try to work with him or her to get out that frustration. Also, early in the semester the students start to feel that they know everything, so we think it necessary to assign some things that are destined to be challenging. So we reintroduce confusion. That's the nature of architecture."

There are now 160 students in the first year. The number of students accepted into the program is limited by the physical space. Faculty, students, and administrators alike are quick to point out the lack of room for the college, although there also is the feeling that the crowding has its positive side. For instance, the placement of the studios makes for interesting interactions between first-year students and their more advanced classmates. (Professors may suggest such adjacencies, but work-space placement is at the students' initiative.) The younger students are drawn, by fascination or necessity, to the older ones, who often teach the novices particular skills. The younger ones, in return, willingly provide "grunt work" in terms of inking or model building. "I felt like his slave," one student reports on his first-year experience of working with a fifth-year student. "He was so demanding. But I learned so much from him, I'd do it again in a minute."

In the three-semester professional studies program, Architecture I, which follows foundation studies, second- and third-year students take design studio, a lecture series on human dimensions and perceptions of architecture, statics, materials, structures, energy-flow technology, lighting, environmental sciences, and electives to meet university requirements in humanities and social sciences. "This is when they learn such things as coping details, the joints between the roof and the walls, and keeping water out," says Dennis J. Kilper, professor and chairman of Architecture I. "Virtually every student project investigates the way





These models also are studies completed at the center. To the immediate right is a high-rise tower for the New York City waterfront designed by Norman Schwartz, fourth-year student from Florida A & M. To the far right is an urban bridge near Washington, D.C., by Henry Hollander, a fifth-year student from VPI.

materials or elements may be put together, but expressly in the desire to achieve something greater than mere construction. We also do case studies, with teams of about three to five students each studying about 10 different buildings. They go through the building, top to bottom, and interview the architect, clients, and users of the building. Then we get the working drawings and the specifications, they conduct an analysis, and do a formal presentation."

Many second- and third-year students are part of the so-called warehouse contingent, a group of 150 students overflowed from Cowgill Hall. They work closely packed in a large, bright, high-ceilinged converted food warehouse about three-quarters of a mile from Cowgill. Being at the warehouse creates an "out-group" sense of togetherness, as evidenced by official warehouse T-shirts silk-screened and worn by the students. Also, their studio classes are slightly larger, but this is not necessarily a problem, explains Donna W. Dunay, associate professor and one of the five faculty members based at the warehouse. "With up to 50 students in a studio, we find that someone always is coming up with good ideas," she says. "But for architecture students, a lot of activity goes on at night, and that's a problem way out here."

In the third-year projects. which are broken into specific design exercises, there is not enough time to develop a whole building package. The students consequently develop their building "parts" further in other courses. Also, competitions are acceptable alternatives to studio exercises. "In the short studio exercises, we give the students presentation guidelines and deadlines so they get used to how offices work," says Kilper. "Part of the learning process is for the students to work like professionals and stop thinking like students."

The fourth and fifth years are Architecture II, in which the students have more latitude in choosing studio topics and faculty with whom to study. "At the end of third year, we post what faculty are teaching in which studios and areas," says Robert J. Dunay, AIA, associate professor and chairman of the program. "The next year, the students choose where they locate their desks according to what studio they're in. Faculty members assign projects fairly autonomously, in the sense that there is no one assignment we give to all fourth-year students. But there are some common points—for instance, a lecture every week and constant dialogue and readjustment among faculty."

Robert Dunay says that the fifth year is, in a sense, a graduate year even though it is part of the undergraduate program. "Students are expected to undertake independent study. While still in their fourth year, each student negotiates with two faculty to serve as their advisers. They select faculty with whom they have a rapport and/or from whom they can learn certain expertise. That student/faculty partnership has a commitment to produce a fifth-year thesis. It can be very specific in terms of a program, site, and specific set of requirements, or it can be more of a general question the student has about architecture."

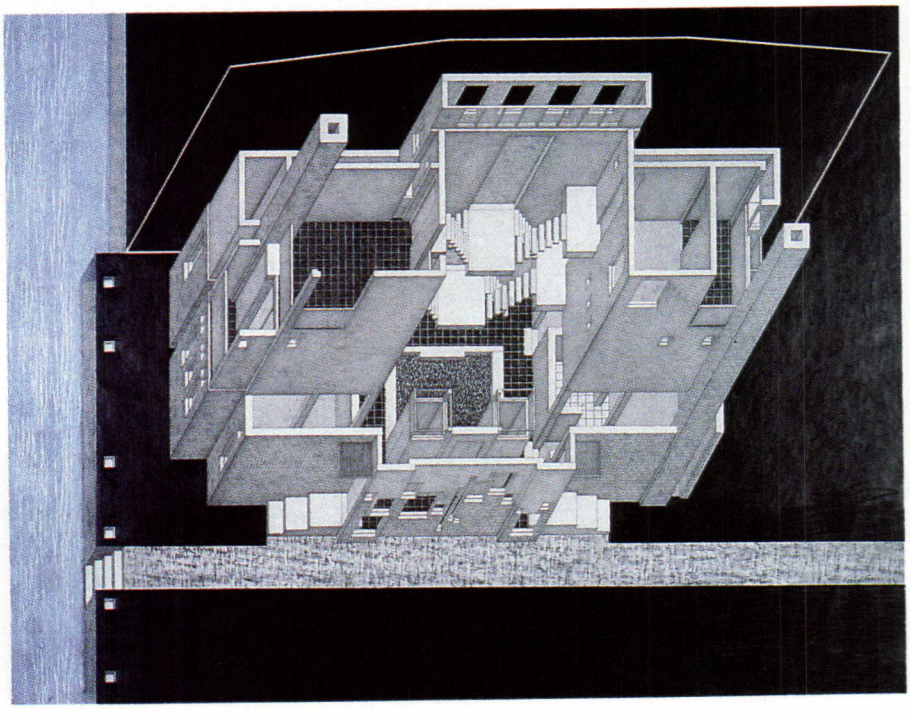
Recently the school has begun to require that the fifth-year students leave a folio of their work to the school, in much the same way that graduate students contribute a copy of their thesis. "They can keep a record of a project over the course of a year, or they can keep a portfolio of their five years of work, or it can include projects from outside," says Dunay. The students think this record keeping is a great idea—"instant job portfolio," one said.

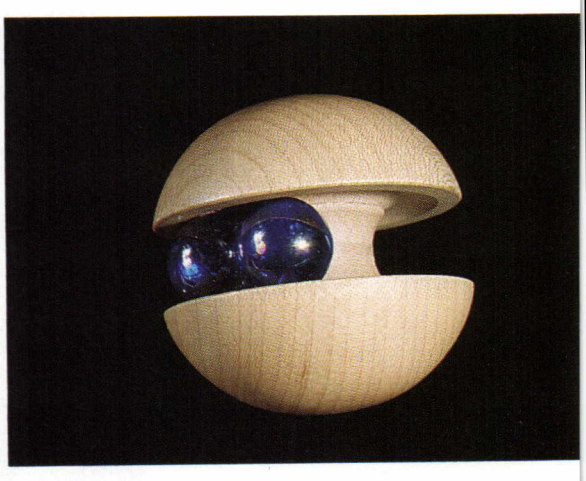
The graduate program, with 165 students, is a large component of the school. "By far, the largest program in the graduate school is the three-and-a-half-year master's program, which awards the professional degree to those people with a baccalaureate degree in a discipline other than architecture," explains William W. Brown, professor and chairman of graduate studies. "We have a class of 30 to 35 each year from all over the country. Some have previous design experience, and some do not."

As might be expected at Virginia Tech, heavy emphasis is placed on design in the graduate program, which in fact has a "total immersion" first-year design studio, eight hours a day, five days a week. The graduate professors say it's like an introduction to working in an office, but professionally oriented, not practice oriented. "The students actually are learning the fundamentals of basic design—shape, color, texture, form, and manipulation of those media that will enable them to conduct those studies," says assistant professor Scott Poole. "We treat the studio as a holistic introduction to architecture, so that we do many things within that framework. They learn drawing, site planning, and the fundamental concepts of structures. But we don't segment those things out into separate one-hour blocks of courses."

What the graduate program does and does quickly, Poole explains, it to switch the way an English or math major works

Below, design for a house in Venice by fourth-year student Amy Cleary. Right, this page, wood toys by first-year graduate students Bonnie Reich (above) and Mark Weiss (below). Facing page, study models completed by students in the foundation studies program.





and thinks. "We move them from using a verbal or mathematical/scientific language into a visual and structural language. It only takes about one day of trying to talk their way around a subject to make the students realize that they have to find ways to deal immediately with the new language. That's one of the things about our three-year program that is particularly successful—we realize that the practice of architecture is very broad, and we try to allow the students to take directions that will reinforce their individual strengths."

The second year of the graduate program places greater emphasis on integrating technical subjects into the design lab. The students take courses in materials and methods of construction, building technologies, and structures and have the obligation to bring their newfound knowledge into the design studio, for example, by detailing of their building designs. After they have developed a basic confidence in architectural design, they undertake individual design theses. Their thesis subjects range widely, from town scale to building scale.

The graduate program also has an NAAB two-year degree for students from other schools that offer a four-year baccalaureate degree, and a one-year program, which traditionally has served graduates of five-year schools. Many are Virginia Tech graduates who return to school after several years of practice to study in a specialized field, such as CADD or advanced technologies.

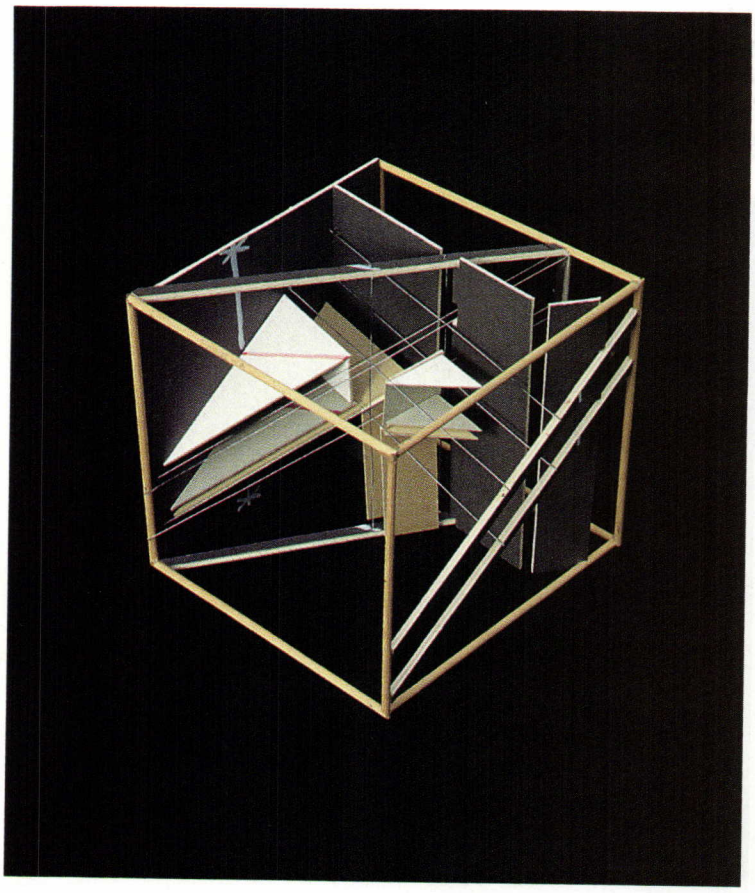
Three years ago, a two-year Master of Science in architecture was added to the curriculum for students who wish to earn a graduate degree in a research-based program rather than a more traditional design program. The M.S. candidates enter the program with a first degree in architecture (or a discipline related to architecture) already under their belts. There are about a dozen students in the program, and they conduct individualized programs of research in specialized areas compatible with the school's areas of expertise, such as CADD, building technologies, or human environmental factors. "The Master of Science graduates can make specialized contributions to the profession without being licensed architects," says Brown.

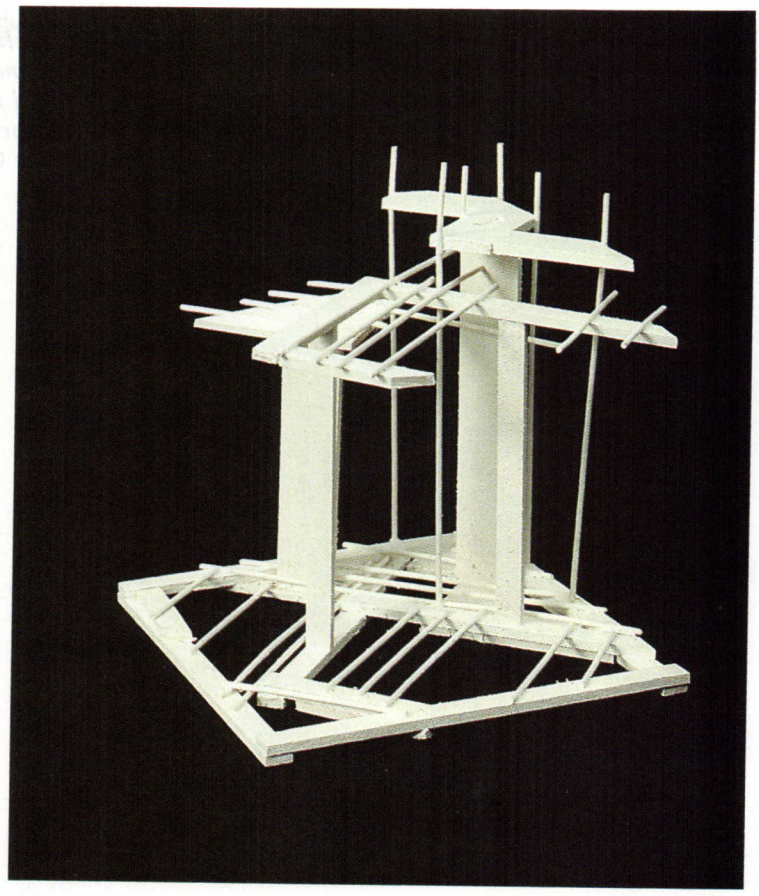
All students are expected to spend one semester on "externship" off-campus, usually but not necessarily after the fourth year. One of the places they can do this is just down the road on the main street of Blacksburg, in the multidisciplinary Community Design Assistance Center (CDAC), which celebrates its first birthday this year. Director Patsy Eubanks Owens, assistant professor of landscape architecture, says, "It's really hard to teach community involvement unless you have real-life situations, and the center is the response to a dream to have these situations and also provide assistance to the communities, mostly in rural southwestern Virginia, that couldn't afford it. Already we have seven ongoing projects, and 10 students working. There is a downtown revitalization plan, a town park, a 20-year town growth plan, a school yard, and a community complex with recreation for the elderly, day care, and a doctor's office. We have 15 potential projects waiting in the wings."

About a third of the VPI&SU students fulfill their externship requirements through participation in school-sponsored trips to Europe during the spring, summer, and fall sememsters. "A lot of schools have study-abroad programs, through which they cross the ocean to study architecture and to study Europe," says Olivio Ferrari, a VPI&SU distinguished professor and director of the program. "But basically, we want our students to use their energies in any way they choose to become better architects. We don't go to chase down monuments or the latest buildings. For example, if a student feels that in three weeks he or she has to compare the size of sidewalk stones throughout Europe, that's O.K. with us—as long as it makes architecture."

Before the trip, Lucy Ferrari, Olivio Ferrari's wife, teaches a crash course to the prospective travelers on "cultural studies"—language, food, art, textiles, how to get around a place, shopping—everything that is not directly architecture. A typical "Euro-semester" starts with 30 to 50 students in Zürich, with everything arranged through the school: transportation, food, and two-star hotels (the students like to have their own showers, Olivio Ferrari says.) They travel as a group on a bus through Italy, searching out little-known sights in preference to tourist havens, and then to their home base in Lugano or Basel in Switzerland. Then it's on to independent travel schedules. When the students return from Europe, they are required to make a presentation of their findings.

One of the side benefits of the Europe trip is that it helps students find jobs in European offices. But when they return, Ferrari says, "they find that their home towns are as rich as the towns in Europe. The biggest change in them is that they discove





that there is a vernacular architecture in their own backyards."

The faculty who participate in the program agree that one of the most important lessons the students learn is the areas of their personal strengths and where they need to build up their skills. "We want everyone to find his or her own experience in Europe—the capacity that he or she has to serve architecture. A public school like VPI&SU should encourage this divergence, and the Europe program gives our students free time and trust to develop themselves," Olivio Ferrari says. He feels that this kind of freedom is especially important to students of today, who tend to be more concerned and cautious about their careers. "The [demanding] curriculum squeezes out their time. We have to protect the students so that their schooling doesn't interfere with their education."

Each student we talked with who had participated in the Europe program unhesitatingly called it the best thing they have done with their education so far. They particularly were pleased with the blend of structured time and the chance to go off on their own, or, as one student phrased it, "they give you a palette, and you pick your own colors." Ronchamps and La Tourette are favored stomping grounds. One student traveled alone to Budapest and other places in Hungary; another joined a small group on an excursion to Dessau and all over East Germany.

Considering the intensity of the Europe trip and the bustling creativity that pervades the islands of architecture on the VPI&SU campus, it is difficult to believe there's another whole "continent" of urban excitement for the students to conquer. This is the nine-year-old Washington-Alexandria Center, located in the historic district of Alexandria, just across the Potomac River south of Washington, D.C., and a convenient transportation hub with direct links by subway, bus, air, and highway to Washington and beyond. Director Jaan Holt is justifiably proud of the contrasts he and a dedicated group of faculty have consciously created as an added dimension to the Blacksburg experience. "When the students first come, I tell them that the center is new every year," he says. "We have new faculty and students, and a fast rate of evolution, because there is no inertia to maintain what's happened before. That has always given us a great advantage."

The concept of a metropolitan center for Blacksburg, Holt explains, manifested itself as a need after he had served six years as chairman of architecture on the main campus. He became director of the Washington-Alexandria Center six years ago (Thomas Regan, a Tech alumnus and now dean of the school of architecture at the University of Miami at Coral Gables, was director for the first three years). During Holt's second year, the university bought the building that now houses the center. "It was the first building for academic use [VPI&SU] ever bought off-campus. It went well, and they bought the faculty house during the second year," Holt says.

It has been the acquisition of these facilities and subsequent facilities (an apartment building, a small professional building, and the new office building into which the school's main operations will move next year) that has allowed the center to set up its unique consortium of schools: besides Virginia Tech, the California Polytechnic Institute at San Luis Obispo; Miami University in Oxford, Ohio; and Oxford Polytechnic in Oxford, England. It is no coincidence, Holt says, that all the member schools are large, academically excellent, and located in areas remote from a city.

This year, there were 90 students at the center—half from Virginia Tech and half from other consortium schools; half graduate students and half undergraduates. Each year, each member school sends 10 to 15 students (all fourth-year, fifth-year, or graduate students) and a faculty member, who quickly become integrated into the center's operation. The studios are determined by the projects the students have chosen instead of by their school affiliation, and the faculty divides up accordingly. Each studio works on its own, periodically making presentations to the whole group. "Our one rule is that everyone—faculty and students—religiously attends our all-school meetings every Monday," Holt says. "Then we disperse. We breathe in on Mondays, and then we breathe out."

Holt likes the disparity that results from mixing faculty and students from different schools. "The students get into arguments because of their different pedagogical backgrounds. I think this is superbly healthy, because it broadens their view of what really is happening in the world. For instance, it's helpful for the Virginia Tech students to be exposed to the more social view of the British students. Then the British students see the Virginia Tech students' skills in design and ask, 'Why shouldn't the social programs have the best design?'"

If you're concerned about the secondary emphasis placed on

Kaleidoscope

Photographs © Timothy Hursley/The Arkansas Office

House Steps Lightly but Dramatically Down a Hillside

Viewed from below, the tall, glassy rear elevation glistens on its tree-covered slope like an embedded crystal washed clean by the rain. In contrast, the front elevation is low and relatively opaque, a cluster of mostly boxy forms clad in crisp, striped clapboard.

Kenneth Neumann, FAIA, fragmented this house on its difficult site in Franklin, Mich., so that it dodged and blended with the mature trees. He limited the height to an average of 27 feet for the four elevations (and clad it in clapboard) to meet requirements of the historic district in which the house lies. He tailored the interior to the needs of his own family of five, which in a few years will shrink to just himself and his wife, artist/sculptor Beverly Neumann, who wanted a studio with north light. Kenneth Neumann says the design reflects his "compulsive desire to have the house look ordered and under control."

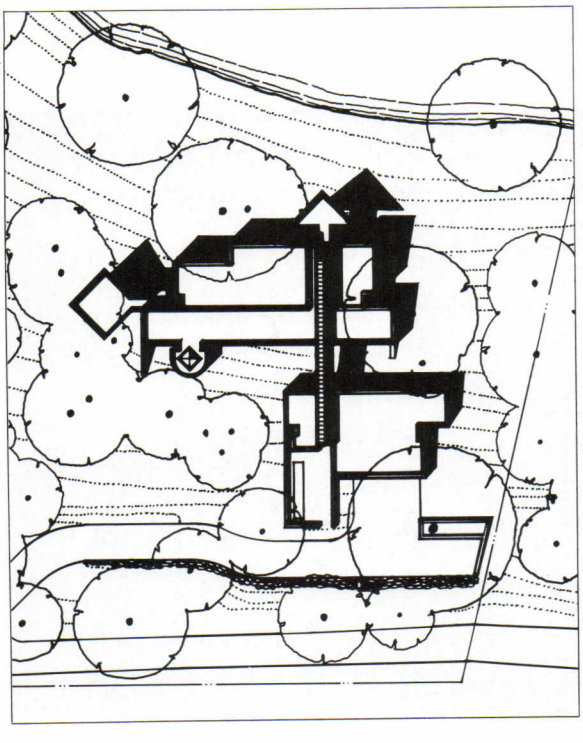
Franklin is a Detroit suburb that dates from 1820. Within a 1920s subdivision is the Neumanns' property, 1.5-acre parcel that drops 50 feet from the front drive to a pond at the rear and previously was considered too steep to build upon.

Neumann, principal in Neumann Smith & Associates, negotiated the slope with two freestanding boxes linked by an enclosed bridge. The box on the south side, closest to the driveway, comprises the garage and entry foyer; the second box, long and thin, is divided into two segments. The segment closest to the hillside contains the more purely functional spaces—kitchen, breakfast room, laundry room, bathrooms, and stairs. The northern segment, slightly narrower and expressed on the narrow east and west ends by glazed vertical notches, comprises the living and dining rooms on the top floor; family room, master bedroom, and studio on the second; and children's bedrooms on the first.

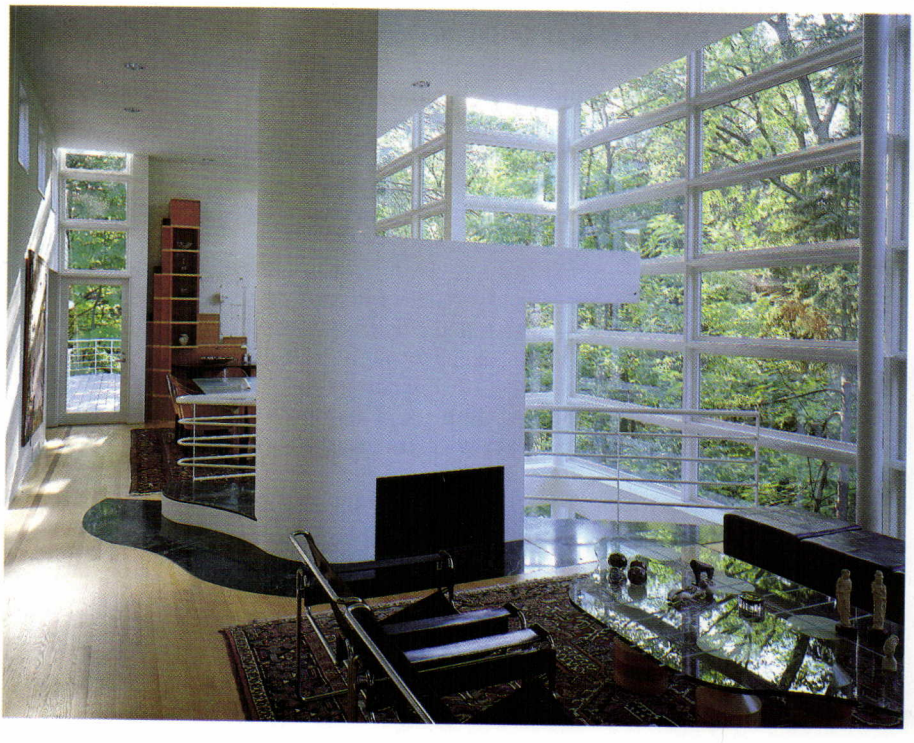
A linear glazed peak marks a spine through the top floor. Courtyard, front door, foyer, and bridge line up with a vertical notch in the glassy north wall. The quiet payoff is the vista from 30 feet above the placid pond.—Allen Freeman

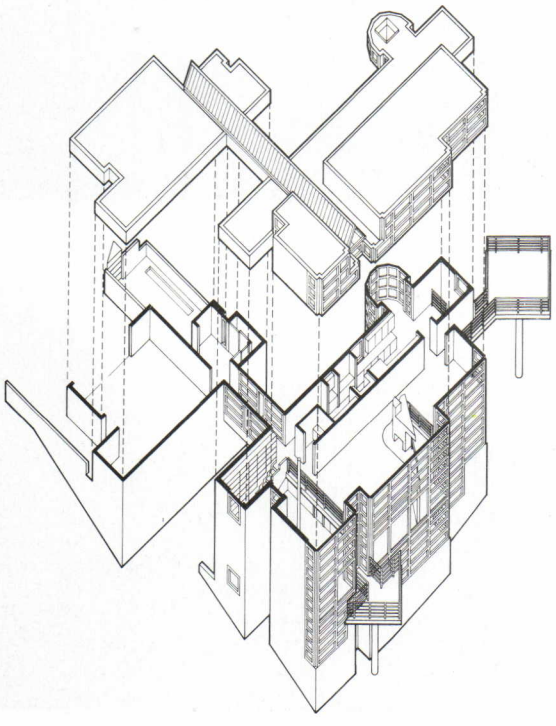
Left, the open north elevation reveals the artist/sculptor's studio on the second level. Below, the view from the southwest shows the bridge connecting the two main parts of the house. The entrance and garage are at far right in this photo.

Immediately below, the end of the entry axis on the top floor. In this photo the living room is at left, the family room is on the floor below, and part of the rear deck (the arrow at top of site plan below) can be seen through the window wall. Sculpted object and wall piece are by Beverly Neumann. The two smaller



photos at the bottom of this spread show the extremes of the living room. Axonometric is exploded to reveal top floor plan. Steel columns support the window wall, which is made of standard components; the rest of the house is wood frame construction. Below, the rear deck off the family room on middle floor. □





'Traditional and Reassuring' Mix of Forms and Materials

Photographs © Gregory Murphey

This weekend cottage near Chicago is a miniature all-American hybrid. The concept (formal, symmetrical), forms (dormers, gables), and materials (clapboard, standing-seam metal) are a traditional and reassuring mix. With everything scaled down, the house seems a happy little tribute to 1920s suburban grandeur.

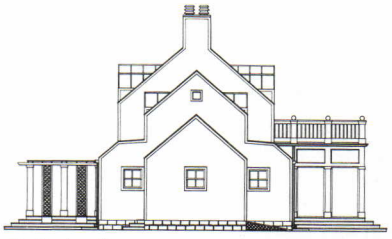
It is located in meadow and forest land just back from Lake Michigan's eastern shore in Michigan. The architect, Margaret McCurry, AIA, of Tigerman McCurry, sees its cladding and rooflines as extensions of the local vernacular, its stately character and steel roof as reflecting the owner's fondness for certain planters' houses along the Natchez Trace.

The interior centers on a living-dining room with a simple fireplace, ample bookcases, and cozy window embrasures. The ceiling steps up from a snug seven feet around the room's perimeter to 10 feet in the center. That along with porches just outside French doors and deep casement windows—a screened porch on the west and a trellis-covered one on the east—contribute a feeling of expansiveness.

The south end of the first floor is given over to two guest bedrooms; the north end comprises a bathroom and the cathedral-ceilinged kitchen. Access to the master bedroom and bathroom, occupying the entire second floor, is through the kitchen, an arrangement that allows the rest of downstairs to be zoned for the privacy of overnight guests. The stairs also provide a place for dinner guests to sit and chat with the cook during meal preparation.

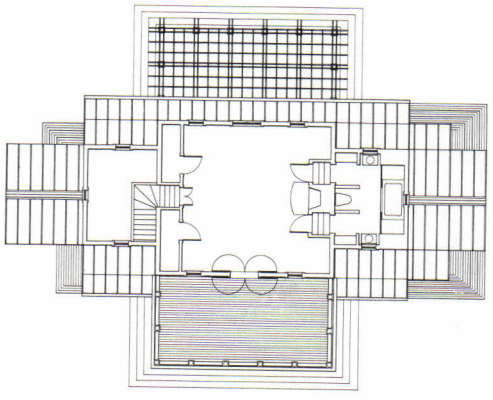
The master bedroom, directly over the high-ceilinged living room, fits closely under the high gable and its dormers so that you have to descend several steps into the adjoining bathroom in the north wing. This house is picturesque, but also tight, trim, and unsentimental.—Allen Freeman

Top, a trellis marks front of the house. Above left, screened porch at rear is topped by a sun deck off master bedroom.

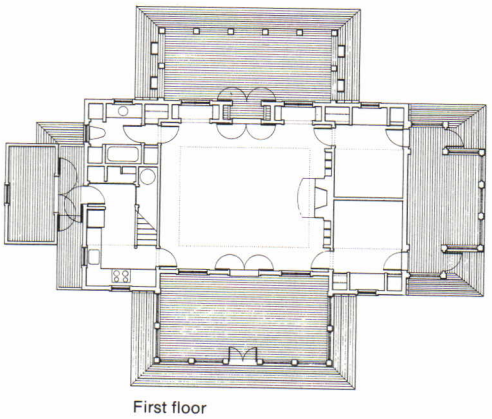


North elevation

Above right, glass doors to bedrooms flank fireplace in living-dining room. Right, staircase descends into the kitchen.

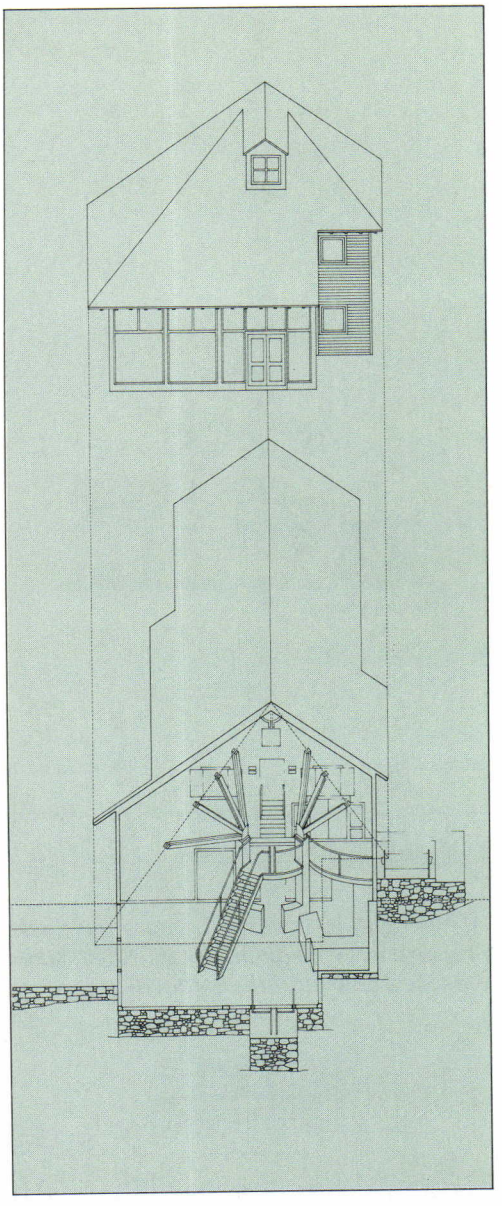


Second floor



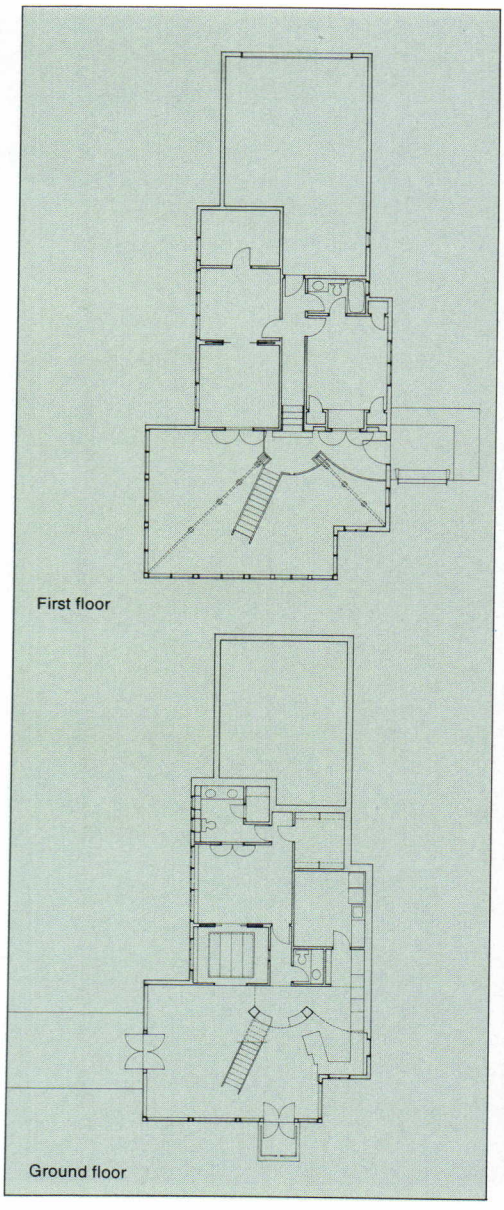
First floor

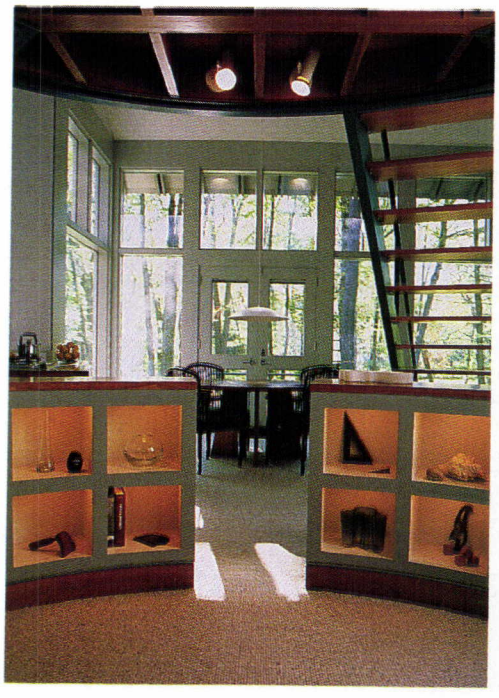
Substantial House Seems an Elfin Cottage in the Woods



Above left, arched roof and bench mark the front door. Exterior cladding is cedar clapboard and trim; roof is asphalt shingles. Left, the open end elevation. Facing page, two views of the large room.

Photographs by Scott Dorrance© Home Magazine Publishing Corp.





As with other houses by the Pennsylvania firm of Bohlin Powell Larkin Cywinski, this house seems inspired by the Brothers Grimm. It nestles in a fern-carpeted forest in northeastern Pennsylvania at the point where a higher deciduous woodland gives way to a more exotic streambed lowland. The house's front facade stretches wide but seems wee. The roof, shallow of pitch and deeply overhanging, raises an eyebrow over the front door and draws you near. A funky steel-and-wood bench at the door seems made for a sprite or an elf.

Interior design focuses on a single space. Just inside, you are on a steel-framed corner balcony in an unexpectedly large room and realize for the first time that this is a two-story house and that you have entered on the second floor. You overlook the lower level and great, open vistas through two window walls that meet at the opposite corner. Supporting the cathedral ceiling are a pair of wood fan struts radiating from steel brackets capping the balcony's legs. The struts are bold, irregular geometry—one has three branches, the other four. They are strong presences that subtly express the asymmetry of the interior plan. A steel and cherry wood stair descends into the living room/dining room/kitchen. A guest bedroom and office overlook the big room through shuttered openings; the master suite with hot tub is below.

—Allen Freeman

A Traditional Japanese House Rises from a Florida Marsh

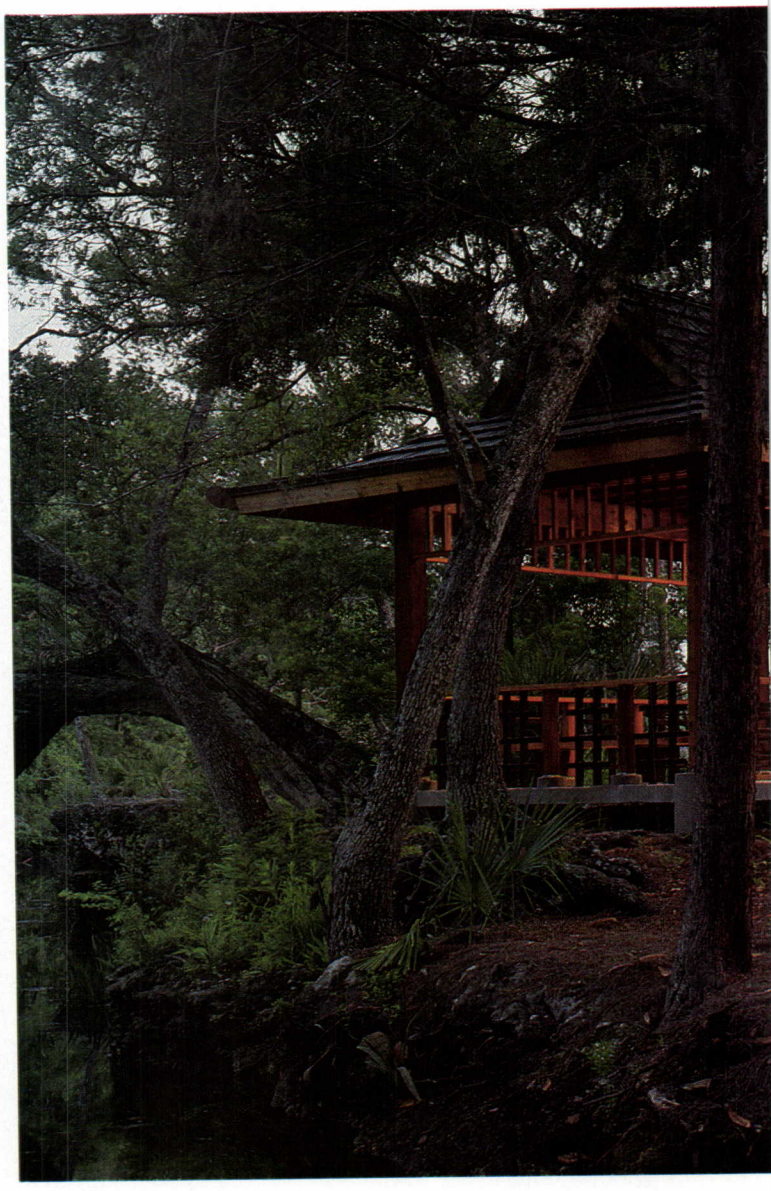
This is a retreat in a remote northern Florida village for a south Georgia businessman who appreciates traditional Japanese architecture. He selected the site next to tranquil tidal marsh waters for its hoary pines and cedars, craggy limestone outcroppings, and a tiny island that has been connected to the shore by a footbridge. The architects are a husband and wife team, Nettie Bacle, AIA, and Masao Yamada, AIA, who normally conduct separate practices in the Tampa area. They positioned the house at water's edge and bermed the lot's north and west sides to shield the dwelling from the road while creating room for a private garden.

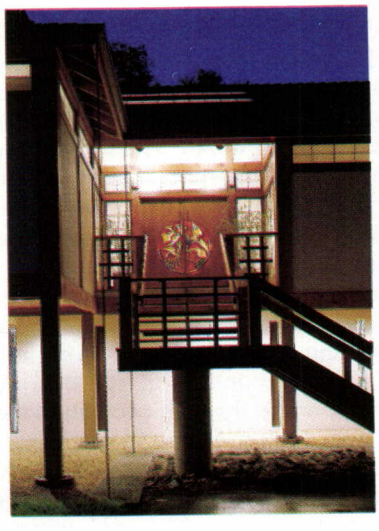
Yamada, who did preliminary design as consultant to his wife (Bacle did final design and contract documents), says he found the site compatible with his native Japanese idiom, and the idiom—with overhanging roofs for shade, sliding screens and doors, and raised living areas—appropriate to the tropical climate. The lot is only six feet above sea level, so the habitable parts of the house had to be set on a platform and elevated at least another nine feet, with the level below the platform designed so that floodwaters can pass through the walls unrestricted.

Construction is Western red cedar posts and beams with exterior stuccoed concrete block infill at ground level and infill of stucco plaster on metal lath above the platform. The interior, designed on the standard 6x6-foot Japanese module, is exposed natural wood framing with drywall infill painted white or covered with grasscloth. There is a sloped wood ceiling in the living room and wood trim throughout, including doors and a grille transom above shoji screens that divide the living and dining areas. Translucent insulated shoji transoms and entry sidelights, and skylights of the same material, bathe the interior with a serene natural light.

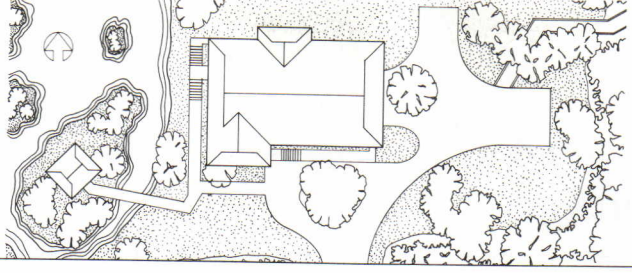
Also mitigating the tropical sun is the roofline that extends over all sides of the house. The master bedroom and living room facing east and south have deeper overhangs because they are edged by a linear balcony. These rooms offer placid views over the water and through the trees.

A Japanese-style pavilion inhabits the little island, which is reached by a beautifully simple arched concrete bridge. From the island the house appears very Japanese. But you also see an affinity with the raised cottages of the bayous. It seems a happy synthesis of the two.—ALLEN FREEMAN

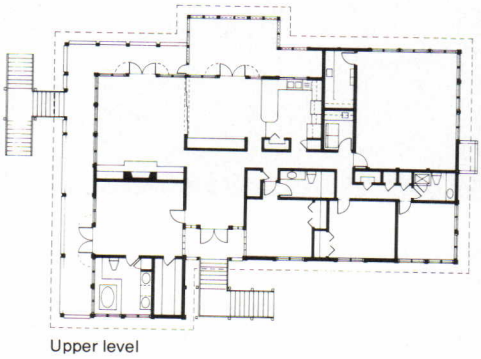




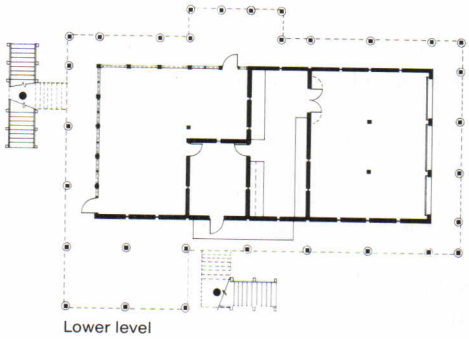
Large photograph is view from the northwest across the footbridge. Right, the east elevation. Far right, the living room with shoji screens opening to the dining room. Above, the front door.



Photographs © Joel Bustamante



Upper level



Lower level

An Alden Dow Masterpiece Adjusted to Family Change

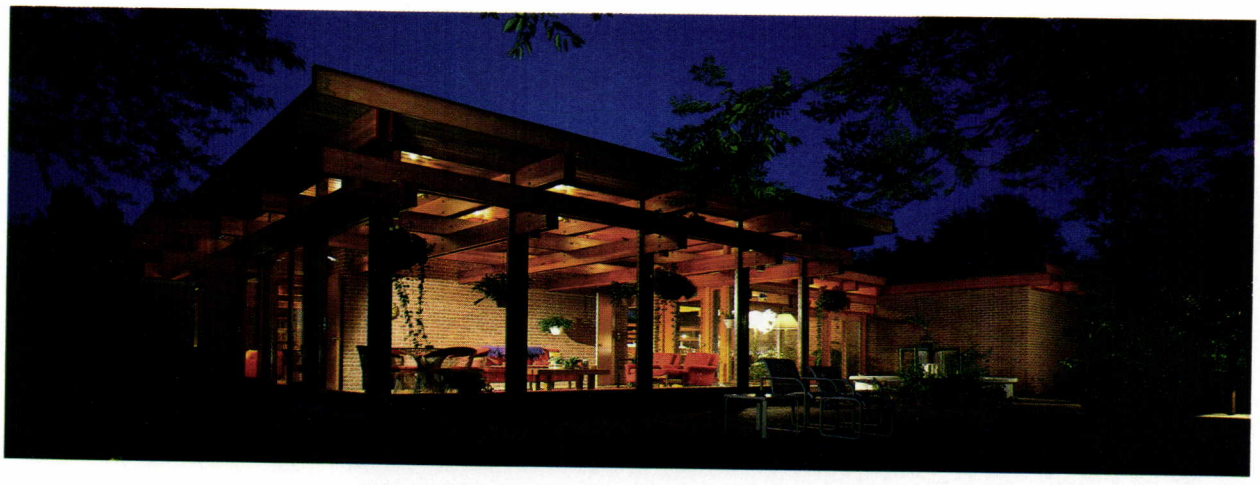
Photographs © Balthazar Korab Ltd.

Sometimes it's best to keep things in the family, where they can be cherished and grow richer with age. Such seems to be the case with the Riecker house in Midland, Mich., designed by Alden B. Dow for Margaret Riecker (a favorite niece) and her husband, John. Dow designed the house for the couple with the stipulation that it be their home for life, and, almost 30 years later, they still love to be living in it.

The 6,800-square-foot house nestles into a slight rise on three acres of land that fronts a small lagoon. The Rieckers' longtime tranquil relationship with the house and its waterside site was interrupted temporarily in 1986 when a massive flood necessitated refurbishing all the interior paneling. Transforming the upset to an opportunity, the Rieckers decided to redesign and update portions of the house's interior. They kept the work in the "professional" family, and turned to William H. Gilmore, AIA, one-time assistant to Dow and now president of Dow Howell Gilmore Associates Inc., of Midland, to enhance the original concepts embodied in the design.

Gilmore had two strong partis on which to build. First, Dow's apprenticeship with Frank Lloyd Wright shows in the Riecker house's lean, horizontal lines, simple massings, open plan, and extended use of beautiful exposed wood. Second, like Wright, Dow was enchanted with the architecture of the Orient, and he wove bits of its persona into his own style. (The window frames, of course, are red—but Chinese, not Cherokee.) "I felt from the very beginning that my role was only supportive to the basic facility that Alden had created . . . that a great work of art should be carefully nurtured and respected," said Gilmore.

Gilmore enhanced the house and updated it functionally first by redesigning the kitchen and adding large skylights both in its ceiling and in the large, screened porch. The side-by-side bedrooms for the children (who are now out on their own) were

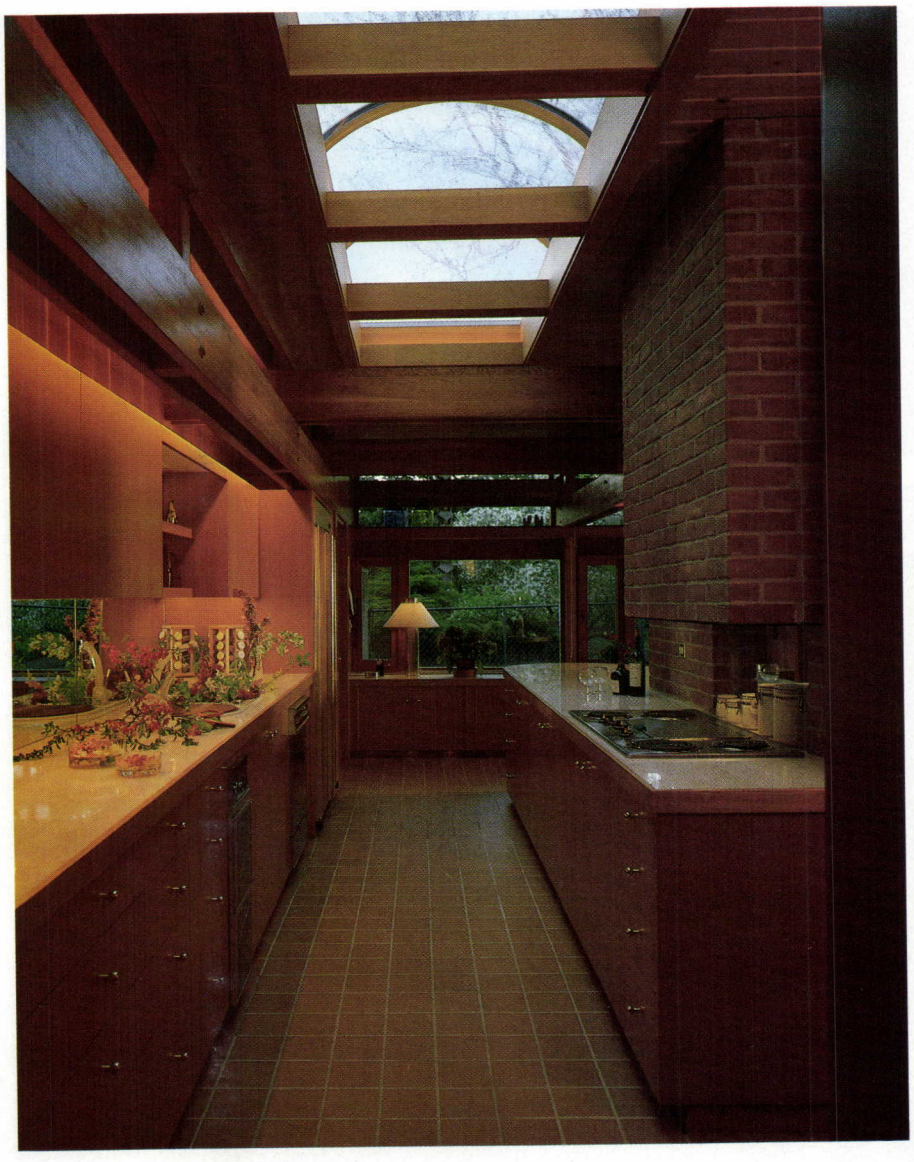


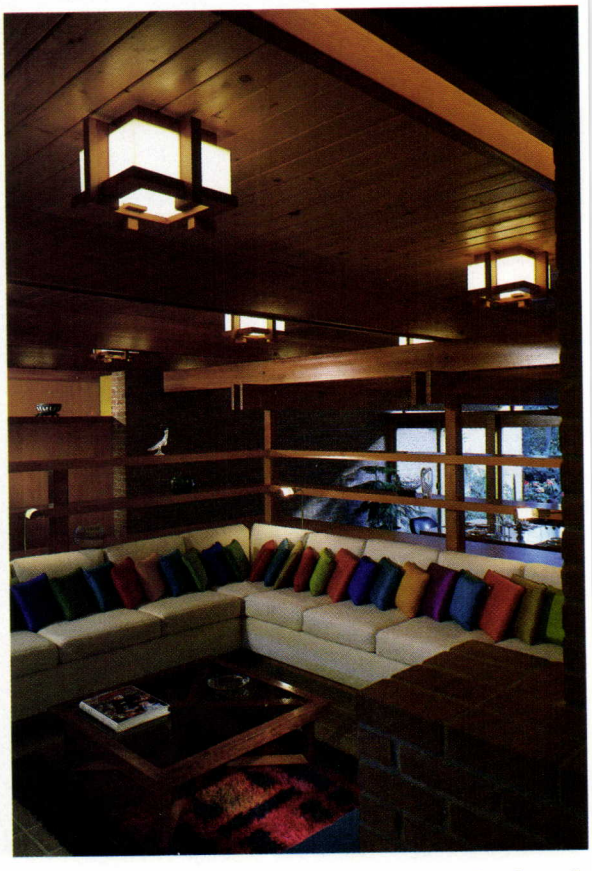
combined into a media room that boasts architect-designed casework installed to house state-of-the-art audiovisual equipment. Foldout beds create a guest room when needed.

Gilmore also carved a "room within a room" conversation space out of the existing step-down living room that is the center and heart of the house. He designed the furniture for this space, as well as many new pieces for other areas of the house. Another intriguing feature is Gilmore's ingenious lighting design, which incorporates fluorescent tubes into the crisscrossed, laminated beams. John Riecker describes the effect as "a glow in the evening like that of the surface of a violin or cello."

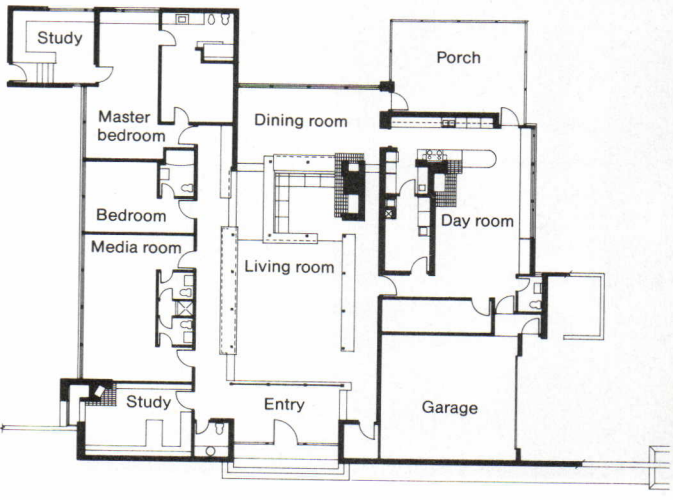
Faithful to one of Dow's tenets, the new furnishings in bold, bright colors include the royal purple carpet in the living room, red furniture in the family room and kitchen, and 100 silk pillows from Thailand adorning the built-in couches of the conversation room.—M. Stephanie Stubbs

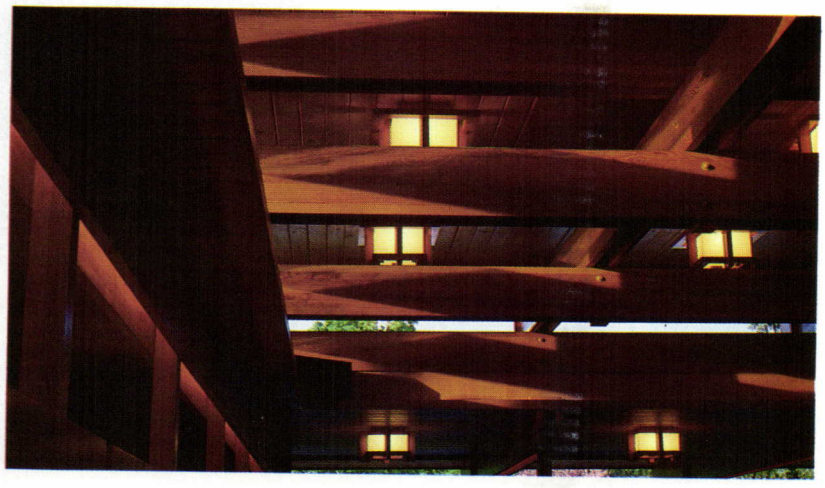
Facing page, the Riecker House front elevation shows Dow's concern for integration of house and landscape. The newly skylighted screened porch, as seen from the terrace, is shown in the top photo on this page. Above, an interior view of the porch.



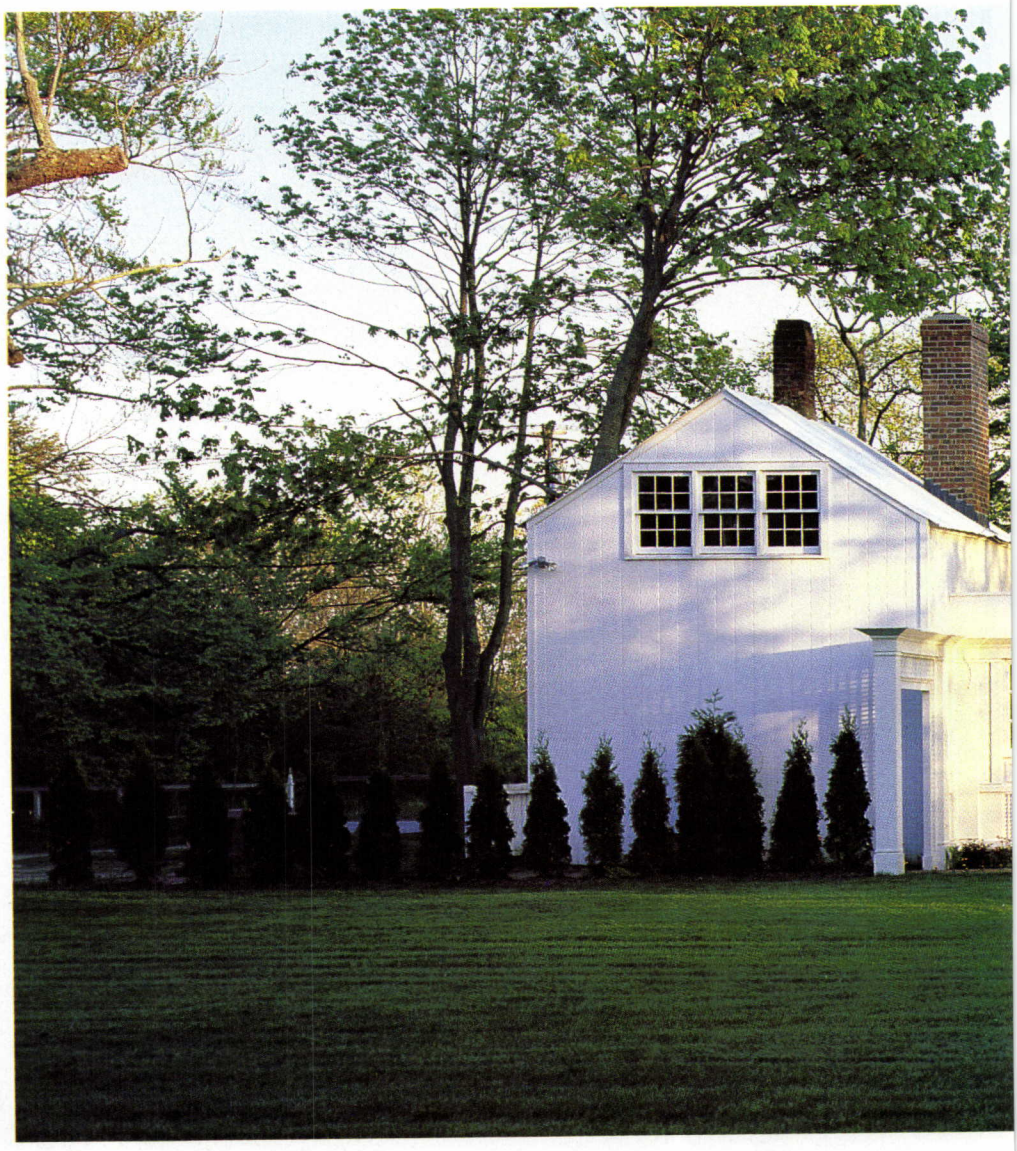


This page, clockwise from top: the completely redesigned kitchen, with its room-length skylight; the 'room within a room' conversation space, replete with architect-designed furniture; the media room, created from two bedrooms. Facing page, top, adjacent to the kitchen, the re-created dayroom incorporates new lighting, furnishings, and casework; below, fluorescent luminaires within existing ceiling beams create a soft, warm glow. □

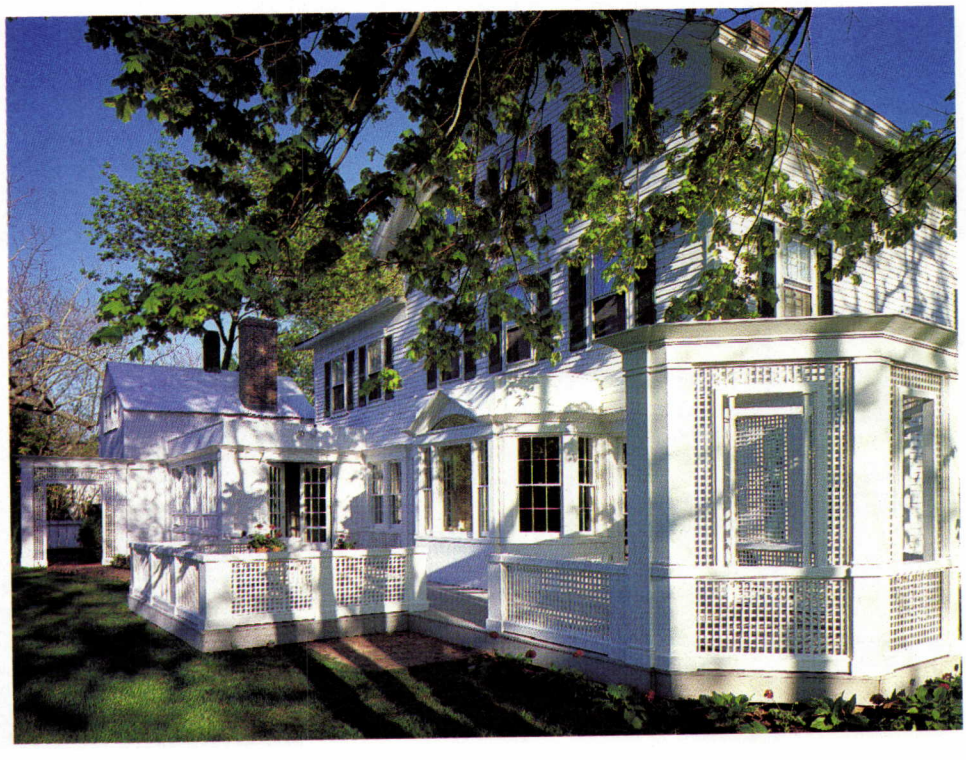

Study
Master bedroom
Bedroom
Media room
Study
Dining room
Living room
Entry
Porch
Day room
Garage



Fine, Old Farmhouse Made Even Better Through Design



Above and above right, 'before' and 'after' views of the north elevation facing the meadow. Right, the deck, which the architect considers both 'a garden room and an entrance court' to the house.



Before its renovation, this large, rough farmhouse-cum-rooming house on Long Island was untouched by anyone with an educated design sense. David Hanniford Mitchell, AIA, brought exactly that. His makeover is knowing and appropriate, clear and beautiful.

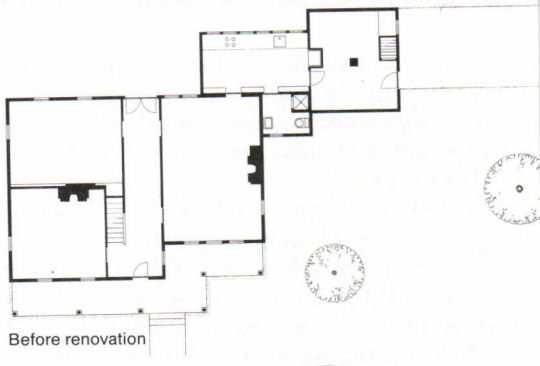
The house's origins are unknown. More than likely it was assembled—on Main Street in the little town of Remsenburg—from three unrelated pieces, with the two-story wing and tack house brought to the site and attached to the circa-1870, three-story section. A linear porch of comic structural detailing mitigated the meanness of the front elevations; the rear elevations rose starkly from flat meadowland. Because the front door stands only 20 feet from the busy street, the client wanted the house reoriented toward the rear. This north side is where the architect concentrated the exterior modifications, which center on a deck.

At a height established by the top of the first-floor windows, Mitchell created a cornice that anchors the stepped and staggered rear elevations and draws them into a coherent composition. Beneath this line he designed a set of themes and variations. The cornice projects from the house, at the east end drawing away perpendicular to the facade to form the crown to an arch and at the west end extending as latticework crown. The lattice, punctuated by window-sized voids, wraps 180 degrees around the end of a deck and then steps down as a low screen in front of the deck. Fenestration, formerly awkward and arbitrary, is now rhythmic and seems logical. Execution is flat and fairly rudimentary, derived from the nature of a board and the capabilities of a carpenter on the site; design richness is in the relationships of the pieces, which, as you pull away from the house, accumulate, interrelate, and dance.

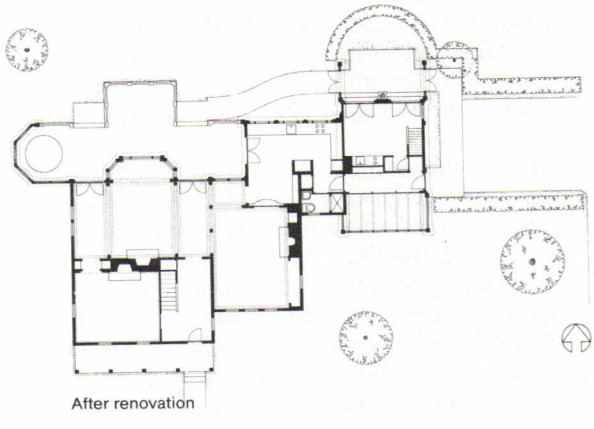
More wonderful things occur inside. Mitchell opened up boxy, claustrophobic rooms into flowing spaces that still maintain discrete identities. He tied them together thematically with each other and with the deck ensemble through use, again, of simplified woodwork. But there are little variations—perversions, really—in traditional vocabularies. The wood trim is plastic rather than static; its role is to contribute a sense of space rather than to express structure or just to decorate. So beams don't pretend to rest on capitals; instead, columns extend into concave undersides of beams, and the capitals are like gaskets. And chair rails, instead of stopping at columns, overlay them, becoming part of the column system.

Mitchell's contribution to the house is respectful, cerebral, and vigorous, but not overrefined. The house remains true to itself. When I saw it this past spring, the exterior paint was beginning to weather and the interior was furnished with pieces more casual and less precious than those in the photographs on the following pages. Neither diminished the experience of the architecture—Allen Freeman

Below, the living room with its bay window flanked by French doors. Bottom, the dining room from the living room. Note subtle shifts of spaces in 'before' and 'after' plans. Facing page, across the rear of house.



Before renovation



After renovation

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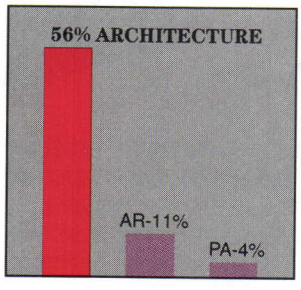

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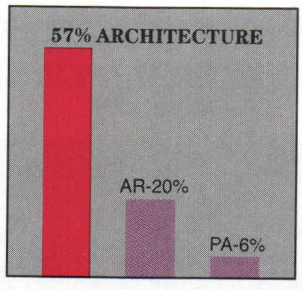

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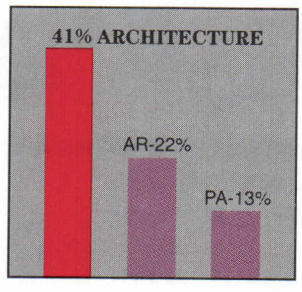

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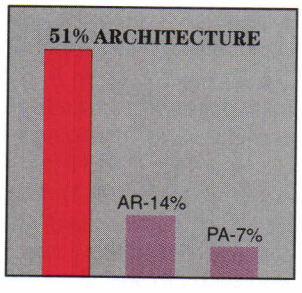

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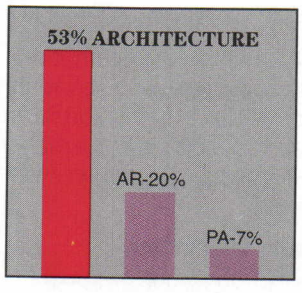

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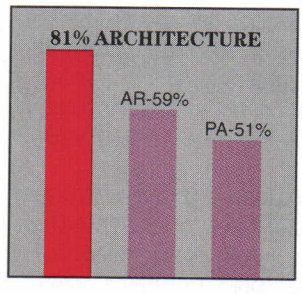

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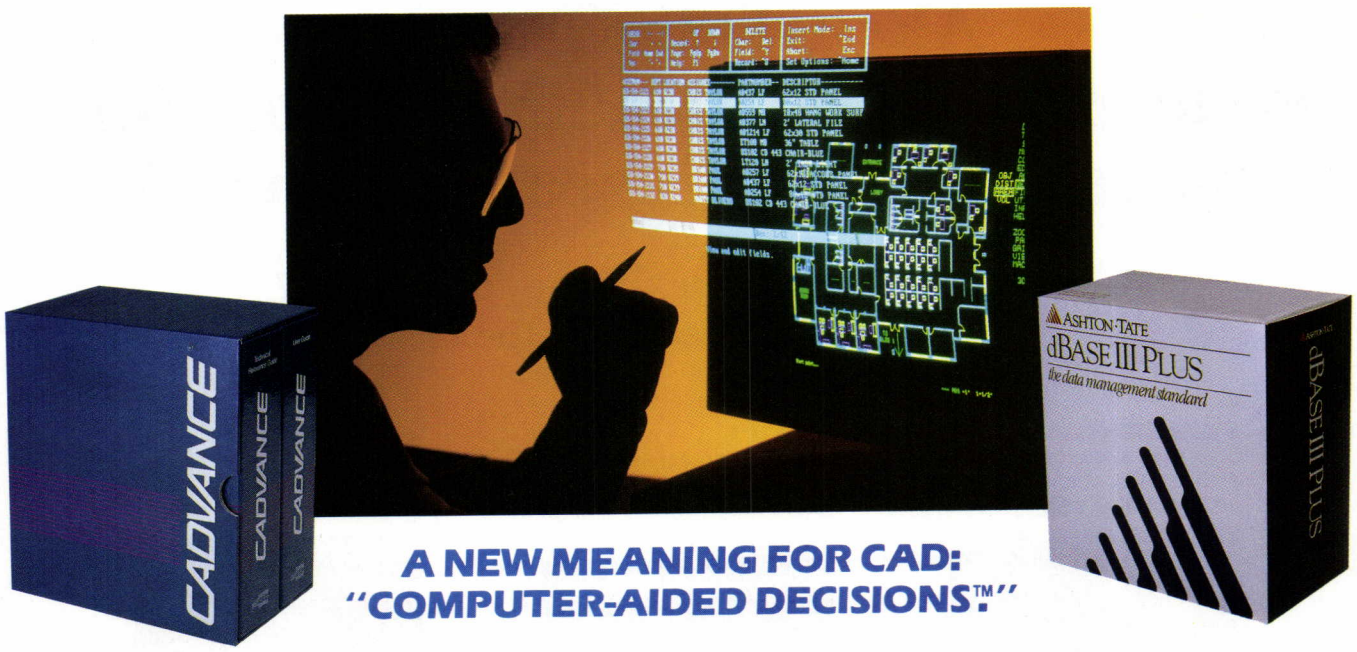

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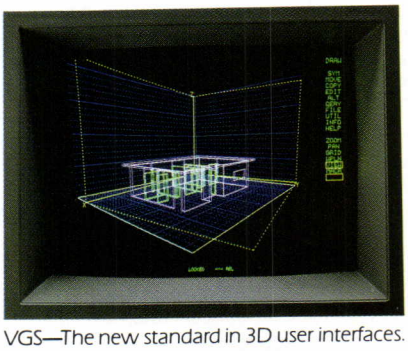

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How the Schools Are Teaching The Uses of Computers

By Oliver R. Witte

Computers are changing the way architecture is being taught. Whether the changes are fundamental or just a matter of technique is debatable, but the trend clearly is toward an increasingly pervasive influence—from advanced technology courses to design studios at all levels. The impetus for change is coming primarily from students and employers. Most architecture schools have not taken a leadership role, although competitive forces between schools and even within schools are expanding the role of computers in architectural education.

This article focuses on the effects of the computer on the teaching of design. Deans and other faculty members at dozens of schools interviewed for this article agreed that the computer already has become a routine part of the teaching of subjects such as structures, materials, methods of construction, feasibility, and drafting. Indeed, those kinds of subjects were the computer's points of entry into the curricula of most colleges. However, more fundamental changes brought on by the computer are those affecting the quality of design, the way students think about architecture, and the forms they choose to express their solutions. The computer is raising philosophical and practical issues as lofty as the meaning of architecture and the role of education and as mundane as budgeting.

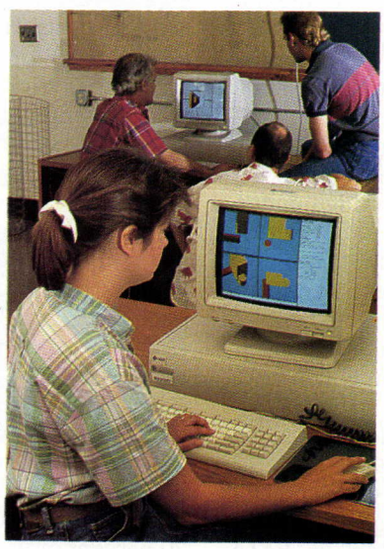


Photo courtesy the University of Texas

Learning design on computers at the University of Texas.

Administrators, deans, and faculty members are just starting to come to grips with the proper place for computer-aided design in an academic environment. Computers are appearing in schools the same way they are appearing in offices: brought in sometimes by individuals, sometimes by one or more low-level managers with access to a budget, sometimes by management with little or no planning, and sometimes by management with careful planning. The manner of introduction has a subtle but definite influence on the computer's perceived role.

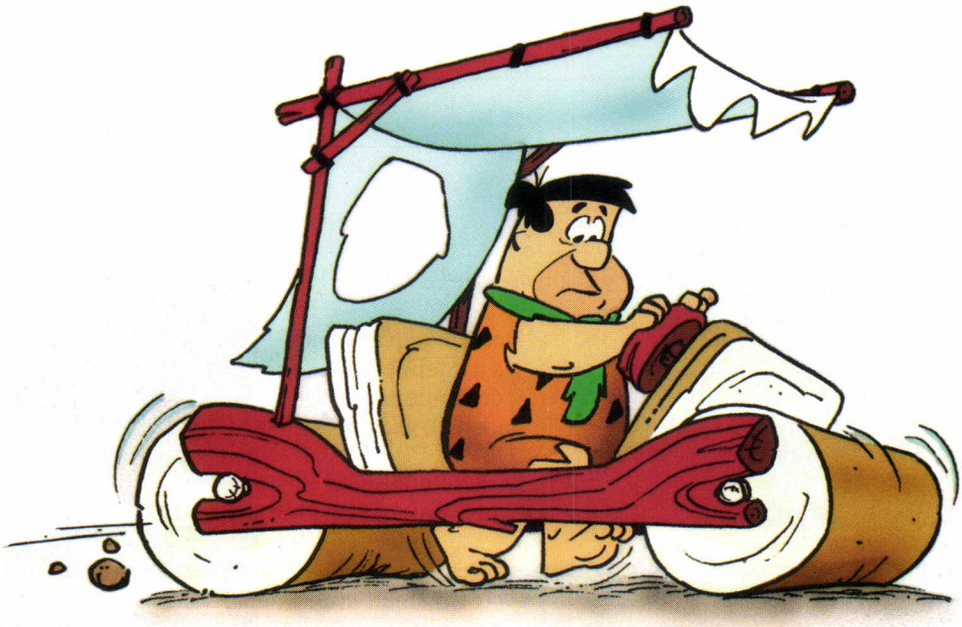
At one extreme, some faculty members dismiss the computer as having little or no impact on architectural design education. The principles of proportion, harmony, programming, needs analysis, and development of form have nothing to do with machinery, they say. Buildings that function well flow from a careful analysis of the needs of the client. The contribution of architecture is 90 percent at the beginning. The real emphasis of the school is on the early phase—coming up with the form of the building. Architecture always will be architecture, whether a computer is involved or not. Skepticism is the easy path because few good designers on a faculty are eager to teach the mechanical skills of operating a computer or running a specific piece of software.

At the other extreme, some faculty members say that historically a new technology has generated a new architecture. Computers enable researchers to approach architecture for the first time as a knowledge-based discipline, they say. Students who begin with a three-dimensional model investigate design in a different way. By enhancing the students' ability to understand concepts such as light, texture, and form, computers can improve the quality of their design. Given the opportunity to explore more alternatives, students become more venturesome and often discover schemes that are innovative without being outrageous. By enabling students to manage simultaneously more aspects of building performance, such as energy use and cost, computers make them better designers. Enthusiasm comes naturally because the computer helps students express their design ideas spatially so their teachers can understand them and thus provide more meaningful criticism.

In the middle are faculty members who regard the computer as a tool—extremely helpful and highly influential, but not really the point. Multiplying alternatives and bits of information does not similarly magnify judgment, they say. Although the computer might help to refine a design, it doesn't necessarily alter the way architecture is taught. Perhaps the computer provides the potential to do better buildings, but so far the evidence is sketchy.

From a practical standpoint, the moderates argue that it makes sense to employ the computer where it offers an advantage but that it does not make sense to abandon traditional teaching methods and basic drawing skills.

The debate over computer-aided design in architectural education mirrors the debate over computer-aided design in academic research. Critics charge that it is too commercial, but defenders reply that their purpose is precisely to defend the technology against commercial exploitation. But shouldn't a research program focus not just on how to use CADD software but on what it should be? Perhaps, goes the answer, but that approach leads to the production of computer scientists; development work



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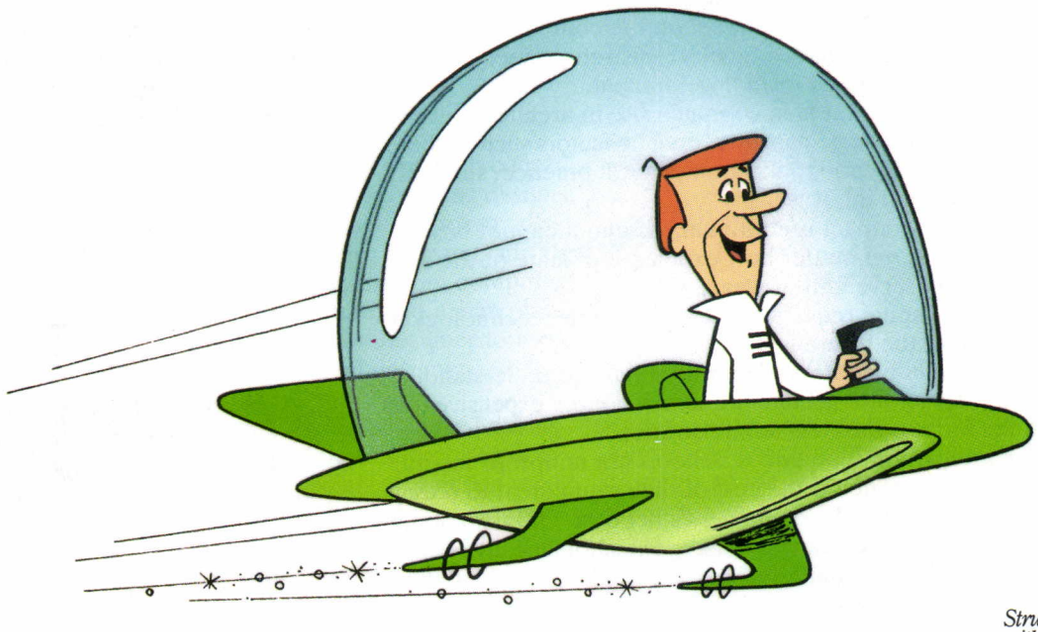

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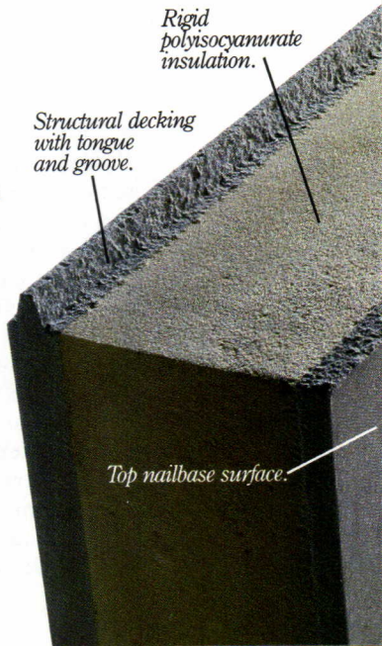


Circle 70 on information card

Cleansing the Land We Build Upon

Much of it is 'booby-trapped by toxic wastes.'
By Forrest Wilson

Forrest Wilson

We're running out of 'out.' Out is where my parents threw their garbage. They threw the garbage out. You can't throw your garbage out anymore. Out is where your children are going to live, where your grandchildren are going to live."— bioethicist Willard Gaylin, interviewed by journalist Bill Moyers.

Architects no longer can assume their foundation problems are restricted to the soil's load-bearing capacity, granular or cohesive qualities, or ability to drain. The earth built upon may be booby-trapped with toxic wastes. Toxic land legislation is too recent to distinguish patterns of litigation, but, like death and taxes, litigation is inevitable.

This is a brief description of the changed composition of the earth we build upon and the developing technologies proposed to make it safe for human habitation.

The Superfund Amendments and Reauthorization Act (SARA) was signed into law on Oct. 17, 1986. The five-year, $8.5 billion program provides federal authority and resources to address the nation's uncontrolled hazardous waste site problems.

It all sounds familiar. It should. It happened before. About 3.6 billion years ago, the entire planet was a hazardous waste site covered with substances deadly to oxygen-breathing, carbohydrate-nourished creatures. The SARA is an attempt to see that it does not happen again. SARA and the host of federal, state, and local laws it has inspired are rapidly changing the conditions of land ownership, while the new technologies proposed to purify hazardous sites threaten to alter drastically the composition of the earth upon which buildings are built.

Of the 66,000 chemicals used in the United States today, the Environmental Protection Agency lists 60,000 as potentially hazardous to human health. The poisons have been dumped or buried for years on the theory that they would lose their venom. They have not. No one knows the amount of toxic throwaways spread, dumped, and buried on the land, but the EPA says that at least 6 billion tons of poisonous waste have been disposed of in this fashion since 1950. A ton of hazardous waste could be piled next to each one of the 247 million people in the United States and another ton added each year. This is where it will be put unless we can find means of disposing of it.

Toxic wastes as defined by the EPA include ignitable, corrosive, or dangerously reactive materials. They are found in paint sludge from appliance factories; dregs of chrome and nickel from metal-plating shops; spent raw materials for varnish, carpet cleaning, and detergents; solvents from dry cleaning; and degreased microchips. Mercury in exhausted watch batteries, butane residue in disposable cigarette lighters, and lye in empty cans of oven cleaner can be added to the list of all the little niceties that make us clean and pretty. This is in addition, of course, to the leftovers from basic necessities such as atomic weapons manufacture and the operation of nuclear reactors.

Congress did not pass the Resource Conservation and Recovery Act to regulate the generation, transportation, and disposal of hazardous wastes until 1976. In 1980, the U.S. Surgeon General declared an environmental emergency and called it a "ticking time bomb primed to go off." Congress created a "Superfund," allocating $1.6 billion for a five-year, cleanup crash program that expired on Oct. 14, 1985. During the early Reagan years, less than 20 percent of the program's funding was spent on site cleanup. On the day of Superfund's expiration, *Time* magazine reported that the money was "dribbled away . . . on a mismanaged effort that served only to reveal the almost unimaginable enormity of the task ahead."

So-called reputable companies had dumped their waste where they saw fit for generations. But the toxic garbage did not stay put. Thousands of disposal sites were located on wetlands and

Courtesy of Hazcon Engineering, Inc.

Rocks are made from a blend of contaminated soil and sludge with cement and a proprietary ingredient called 'Chloranan' that results in a concretelike mass that immobilizes the contaminants. Left, good land and contaminated soil; right, the contaminants locked into an immobile toxic building block.

Courtesy of Hazcon Engineering, Inc.

floodplains, and many communities discovered there could be more than one Love Canal, for they too were living on poisoned earth.

Today the cleanup of contaminated land has become part of architectural practice. Lending institutions demand assurance that the land they finance is free of toxic wastes before they lend, and developers find they cannot borrow or build until they have this assurance. The Office of Technical Assessment (OTA) estimated the cost of cleanup could run easily to a $100 billion and probably more. An initial price tag of $1,100 per U.S. household ought to be high enough to make the nation take the problem seriously.

And apparently we are. The Superfund law was renewed in 1986 under new leadership and with enough teeth (some say fangs) to put bite in its rulings. The courts now dump on the dumpers. They find owners of land with toxic waste liable for its cleanup whether they dumped it there or not. Owning land as a corporation is not a shield. In some cases, courts have held corporate officers personally liable. Some laws have superliens, which can be placed on the owners' personal property to force them to clean hazardous sites.

More than 40 states and territories have funded cleanup and waste management programs patterned after the federal government. Tough property transfer laws modeled on New Jersey's Environmental Cleanup Responsibility ACT (ECRA) have been passed, often with drastic results.

"The general impression after ECRA was passed was that all land sales of industrial property came to a screeching halt," says Robert Finke, architect and vice president for development of Hawthorn Realty Group of Chicago. "Purchasers no longer buy only a parking lot and a building but also potential problems buried five owners ago."

Although former industrial sites are the most obviously suspect, no land can be assumed safe. Single-family residential areas slated for redevelopment today may have been built, and often were, on former industrial land where poisonous contaminants were indiscriminately disposed. The water table around harbors, rivers, and streams has been thoroughly poisoned by centuries of discharge and dumping. The land under buried petroleum tanks almost always is contaminated. Even idyllic farmland may hide unpleasant surprises—small-town dry cleaners for years have paid farmers a dollar or two a barrel to bury used cleaning solvents in their pastures.

New laws state sellers must tell buyers what was dumped. To conceal this information is fraud. Developers are forced to face problems accumulated for 150 years, says Finke. "When industries were dispersed and chemicals were comparatively innocuous the problems could be avoided, but no longer." In the sovereign state of California, a law known as Proposition 65 reverses caveat emptor (let the buyer beware), which until now has been the guiding ethic of trade and commerce. Manufacturers, dumpers of noxious wastes, and vendors of carcinogenic substances must disclose their activities openly with signs and labels.

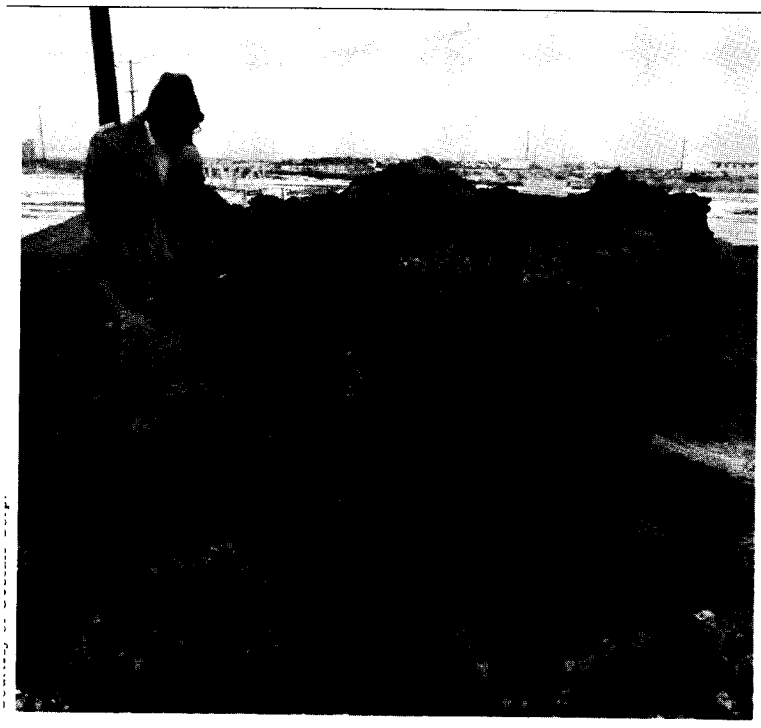
"Architects as professionals are placed in a bind," says Ralph Bennett, a Maryland architect. "If you discover toxic substances you must tell the owner. Earth contamination constitutes a flaw in title search. Owners who would like to plead ignorance find it a distinct disadvantage to retain a professional."

Architect George Calomiris, practicing in the Washington, D.C., area, has designed a number of auto-related service buildings. He now finds banks and lenders extremely cautious. "Lengthy tests with lawyers lurking in the background increases costs, time, energy, and expense," he says. "Some land will bankrupt its owners." The costs of cleanups are too large to factor into the price of the land. The land underneath a building can change it from an asset to a liability, says Calomiris.

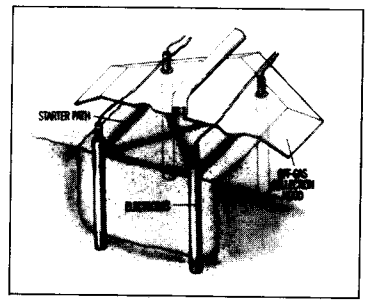
The Environmental Protection Office of the City of Toronto is building a data base of potentially contaminated sites, listing them on the basis of toxicity and persistence of contamination. The information becomes part of the property data base available to planners, architects, builders, developers, and lenders.

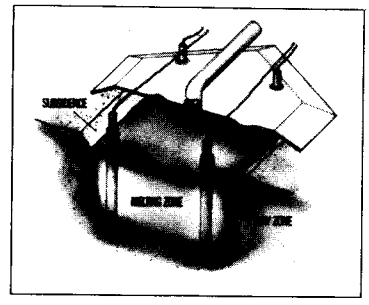
Stringent prohibitions on land disposal of hazardous wastes went into effect in the United States on Aug. 8, 1988, and again in June 1989. By May 1990, disposal of all hazardous wastes will be restricted by law. But restricting the dumping of new hazardous wastes is only half the problem. The other half is cleaning up what has been dumped.

Of the 30 cleanup technologies the EPA had examined by 1989 under its innovative technology SITE program, eight used heat, four were biological, six locked the poisons in solid masses, three used chemicals, six used physical forces, and three combined several of these methods.

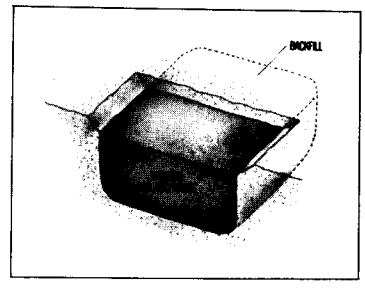


Drawings courtesy of Geosafe Corp.





Left, implanted electrodes melt soil to desired depth. Organic wastes are destroyed; metallic and other inorganic materials are incorporated into glass.



Vulcanisation—Scientists at the Solar Energy Research Institute laboratory in Golden, Colo., and at Sandia National Laboratories in Albuquerque, N.M., in a system described in the June 1989 issue of *Scientific American,* were using sunlight as a cleansing agent to purify industrial waste in groundwater. The contaminated water is mixed with titanium dioxide as a catalyst and is pumped through Pyrex tubes at the focus point of trough-shaped mirrors. The ultraviolet energy in the sunlight converts the contaminants to benign substances. The catalyst is filtered and recycled.

The labs estimated purification costs at a dollar or two per thousand gallons. Air stripping would be cheaper, but it dumps the toxic residue into the air. Sun treatment gets rid of them.

At Sandia labs, solar power has been used to convert toxic chemicals to fuel. The sun's heat is used with a catalyst. A dish-shaped reflector generates temperatures of 1,472 to 1,832 degrees Fahrenheit (800 to 1,000 degrees Celsius), focused on the catalyst and chemicals. Heat and catalyst convert wastes to gases that can be converted to fuels. The chlorine waste from the process is valuable as industrial hydrochloric acid.

A solar furnace demonstrated at the White Sands missile range in New Mexico can focus light at an intensity of 300 suns. The furnace focused on a quartz vessel containing dioxin renders it harmless. The ultraviolet rays of the sun also will destroy dioxin at 1,382 degrees Fahrenheit (750 degrees Celsius), considerably less heat than required by EPA incinerator standards.

A poor man's obsidian—Obsidian, prized by primitive people for cutting tools, can be as common as poisoned dirt. GeoSafe Corp. of Kirkland, Wash., can make a reasonable substitute for $330 dollars a ton. The technology, called in-situ vitrification (ISV), converts contaminated sludge into a crystalline lava by using intense heat. Airborne combustion products are collected under a pressurized "capture hood" and treated.

The intense heat is generated in an electrical network. Electrodes are placed into the ground in each corner of a 20-foot square. Current is applied at 4,000 amps and 400 volts. Temperatures reach as high as 3,600 Fahrenheit. Organic wastes are pyrolized and inorganic wastes are fused as part of the solidifying mass. A chemically stable, inert obsidian "pie" of glass will remain for a million years and, if covered with topsoil, will grow daisies.

A huge brick in the ground—Hazcon of Katy, Tex., gave a demonstration of rock making in October 1987 at the Douglassville Superfund site near Reading, Pa. The company blended contaminated soil and sludge with cement and a proprietary magic ingredient called Chloranan. The creation was a concretelike mass that immobilized the contaminants.

Cores taken after 28 days tested at compressive strengths of 200 to 1,500 psi. The material has since been improved, says company president Ray Funderburk. The mass is now hard enough to use for roads and building foundations. A Swiss firm is conducting tests to see if it will withstand European winter conditions. Funderburk's "wonder sludge" has passed four hundred-hour freeze-thaw cycles without degradation. Normal concrete would not survive that, Funderburk claims.

The additive changes the chemistry of the cement to an almost impermeable matrix that creates its own moisture barrier, Funderburk says. A mass of toxic dirt from a construction site can be processed and repoured into the ground for a foundation far better than the poured-in-place concrete normally used, he says.

Scientists at the State University of New York's Waste Management Institute of the Marine Sciences Research Center on Long Island are experimenting with 4 x 4-foot "tetrapods" made from incinerator ash to cement the Hazcon mixture. They hope it can be used to halt or retard shoreline erosion.

Freeze-dried toxics—CBI Freeze Technologies Inc. of Plainfield, Ill., and Freeze Technologies Corp. of Raleigh, N. C., separate contaminants from aqueous waste by freezing. The operating principle is that when water freezes the ice crystal structure naturally excludes all contaminants from the water molecule matrix. The hazardous wastes are cooled below freezing, and the water crystals therefore are separated from the hazardous constituents.

A gasser—Liquefied gases (propane and carbon dioxide) remove organic constituents from sludges, solids, and liquid wastes as solvents that turn to gas. The vapor is recompressed and conventional distillation is used to recycle the solvents and concentrate organic constituents. A Superfund demonstration was conducted at New Bedford Harbor over a 30-day period in September 1988 to extract organic toxics but not heavy metals. The test proved successful.

Below, rotting trees in a swamp outside Baton Rouge, La., result in pollution caused by dumping of stagnant water.

Forrest Wilson

Below, unanalyzed industrial waste in Puerto Rico is identified by an investigative engineer as 'yuck.'

Dead algae strainers—A polymer made of nonliving algae is used by Bio-Recovery Systems of Las Cruces, N. M., to remove toxic metals. The idea is simply that complex metals are toxic because they disrupt the metabolism of the cells by binding to them, says Dennis Darnell, president of the company. The polymers are carbohydrates, metal-binding agents. The metals dissolve in water and bind to them. Heavy metals are absorbed by cell surfaces. Once the surfaces are saturated the polymers are removed and the metals disposed.

Proprietary sludge eaters—Detox Industries of Sugarland, Tex., has developed a process of degrading organic contaminants in a water/sludge/soil matrix through the application of proprietary, naturally occurring nonpathogenic organisms. This involves the accelerated growth of these microorganisms and inoculation into the matrix. The result is a systematic biodegradation of the contaminants over a relatively short period of time, usually two to four months.

Some like it hot, very hot—Westinghouse Electric Corp. has a mobile pyroplasma arc unit that uses an electric arc in an oxygen-deficient atmosphere to produce plasma gas at temperatures from 9,000 to 36,000 degrees Fahrenheit (5,000 to 15,000 degrees Celsius). These high temperatures break down chemicals in the waste to their atomic state. The atoms then recombine into hydrogen, carbon monoxide, hydrogen chloride, nitrogen, particulate carbon, and carbon dioxide. The product gas is scrubbed with caustic soda to neutralize and remove acid gas and to remove particulate carbon. The system is computer-controlled, and the entire unit is contained in a 48-foot trailer.

Toxic sauna—Toxic Treatments of San Mateo, Calif., removes volatile and some semivolatile organics from soil by using steam and heated air to strip the contaminants. A mobile unit uses drills that have been modified to allow for the expulsion of steam and air through the cutting blades.

The soil first is made permeable by the blades on the drills. Then steam and air are injected to strip the organic contaminants and carry them to the surface. A shroud covers the treatment area to trap and transport the stripped volatiles to the treatment trailer. The water and organics in the gases are condensed and then separated and recovered.

The slow burn—Ultrox International of Santa Ana, Calif., proposes the use of UV/oxidation technology and equipment to oxidize organic compounds found in groundwater. Ultrox's process uses combinations of ultraviolet radiation, ozone, and hydrogen peroxide to oxidize organic compounds in water. The final products of the reaction are salts, water, carbon dioxide, and possibly some organic degradation products.

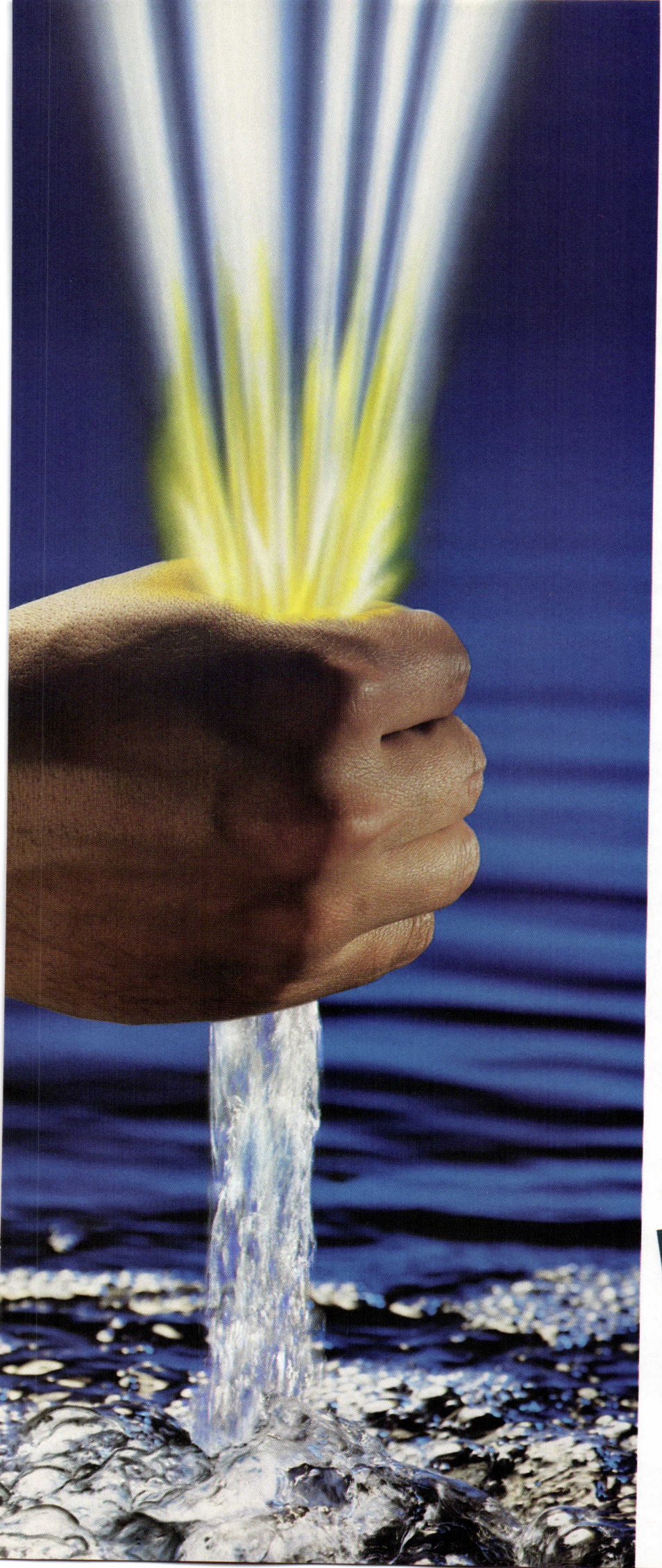
Warm up and burn—Weston Services of West Chester, Pa., uses a low-temperature, indirect heat process to volatilize the contaminants from the soil, followed by high-temperature incineration of the exhaust fumes in an afterburner. The process can remove eight tons an hour and is designed to remove organic contaminants with high volatility.

Genesis has been duplicated in the search for solutions to the waste disposal problem. The age of volcanism when the earth was born and the later ice ages have been replicated, obsidian forged, and new rocks concocted. The slow, patient, cleansing action of natural rain and chemicals over centuries has been simulated in 24 hours, and geysers of hot steam have been injected into the earth instead of shooting out of it, as if turning Yellowstone Park's Old Faithful upside down.

The threat is real and terrible and solutions are ingenious, extreme, and final. Some of the costs are enormous, and the consequences of their application are changes in the very nature of the earth built upon. Obsidian beds and chunks of artificial stone conceivably can serve as solid building foundations, but they limit the use of the land thereafter. Responses to natural action, such as the release time of toxic gases, response to ultraviolet rays, and thermal cycles, are not known.

This is the first time since the energy crisis that so much public attention, money, and effort have been focused on an environmental problem. The results of energy research irrevocably changed our ideas and deepened our understanding about building and architectural form.

The only information today describing reconstituted toxic earth is in manufacturers' literature. Reliable testing determines, as it should, that the new materials are no longer a threat to human safety. But there are not, as yet, any new entries in *Graphic Standards* advising designers how to build on the new obsidian, freeze-dried toxics, or earth gnawed by microorganisms. A new building science may be emerging. We can only hope we will learn as much from it as we did from the energy crisis. It may, however, be enough if we learn never to do it again. □



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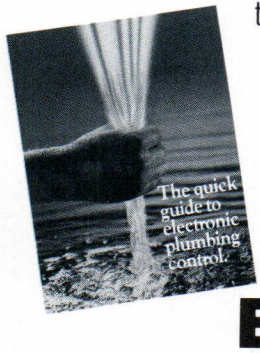

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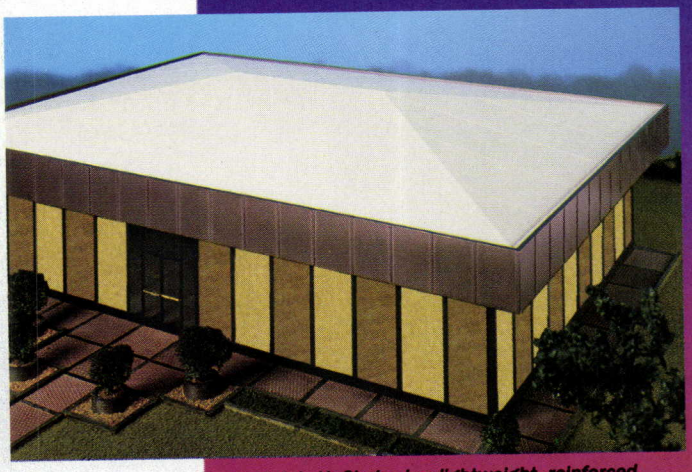

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Evaluating Roof Insulation Systems

By Steve Hardy

Insulation plays a major role in almost every new roof and reroofing system installed today. While insulation fulfills its purpose of reducing heating and cooling costs, it may also cause problems such as accelerated membrane deterioration, moisture condensation, and thermal stresses due to expansion and contraction of the roof membrane. Like so many elements of the roofing industry, insulation is in a state of radical change, reevaluation, reformulation, and redevelopment. New types are appearing and old types are being phased out. Some of the major problems of insulation facing us today are dimensional stability, chlorofluorocarbon contamination of the atmosphere (see March, page 125), and thermal drift.

For the architect choosing a roofing insulation system, it may be helpful to establish a baseline of insulation performance. First and foremost, roof insulation should have a high heat resistance value while remaining as thin as possible. This value should remain constant throughout the life of the system. A first step to choosing effective insulation is deciphering the four major values—K value, C value, R value, and U value—that indicate the ability of an insulating material to resist heat transmission. All express the resistance of heat flow, measured in BTUs.

The *K value* of a material is the amount of heat energy transferred through a one-inch-thick, one-foot-square piece of material in one hour, when there is a temperature difference of one degree Fahrenheit from one side of the material to the other. The K value is an indicator of heat conductivity, and the formula for computing it is: K = BTU/ sq. ft. x inch x hour x degree Fahrenheit. The *C value* measures heat conductance through materials of any thickness. (If the material is one inch thick, the C value and the K value will be the same.) Many materials also have an aged C value, indicating what this value should be in years to come as the material experiences thermal drift and loses some of its insulating properties. The *R value* is a material's thermal resistance to heat transmission. Where the C value tells us a material's heat conductance, the R value tells us the material's heat resistance (which is the same thing said backwards R =1/C). The *U value* indicates a building system's total heat conductance, taking into account various parts of the building, and can combine the roof, insulation, air spaces, and ceiling finishes. To get the value of U, the R values of all these components are added together and divided into 1. U = 1/total Rs. If possible, U values should be determined by the designer.

"Thermal drift" indicates loss of the insulation's transmission resistance capabilities as it ages. Causes and methods of calculation for thermal drift are hotly debated topics. Over the past decade, numerous tests have been conducted, many committees formed, and numerous values for aged insulation published, retracted, republished, and disputed every time. One recent study by the Society of Plastics Industry (SPI) is entitled "Rigid Polyurethane and Polyisocyanurate Foams: An Assessment of Their Insulating Properties." The study and consequent paper conclude that thermal drift is caused mainly by infusion of air into the insulation board, although diffusion of the blowing agent (chlorofluorocarbon gas) into the atmosphere also is a factor. The report states further that nonpermeable facers, such as aluminum foil, are the strongest deterrent in reducing thermal drift, by retarding the flow of air into the insulation and helping to restrict the chlorofluorocarbon gas from diffusing out.

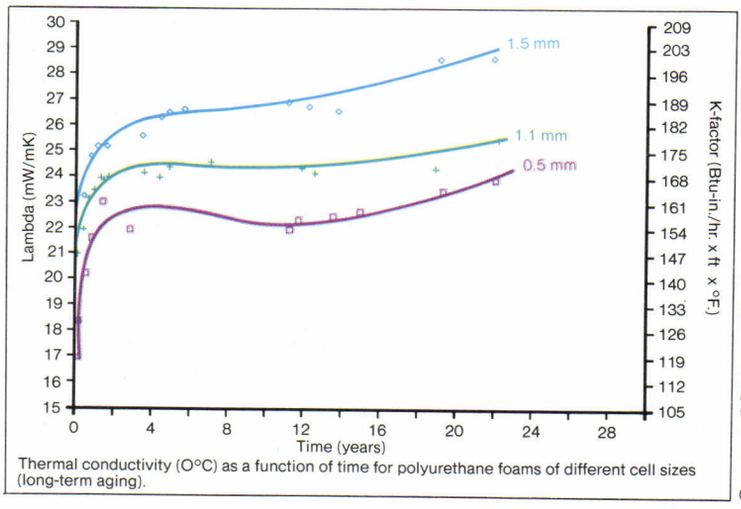
SPI contends that the following factors contribute to thermal resistance or to thermal drift: initial insulating power of the foam; foam density; thickness of the cell walls and size and orientation of the cells; type of foam and polymer; thickness of the foam; temperature and humidity to which the foam is exposed during use; and uniformity of the foam at the interface between the foam and the facing.

Thermal drift seems to stabilize within two to three years, but samples evaluated as long as 22 years after installation show a very slight degree of thermal drift still occurring. Thermal drift has occured more quickly in insulation installed under black membrane roofs, because of the higher temperatures. In time, however, the projected end R values are much the same as for foam insulation under reflective roofs in cool climates.

The National Roofing Contractors Association (NRCA), after years of study and deliberation, has recommended that a service life R value of 5.56 per inch thickness of insulation be used to calculate the insulation value of plastic foam insulation over a 20-year life cycle. Some believe this is not a conservative enough value, while others think generically grouping all plastic foam insulations together is not fair. In conclusion, many people in the roofing industry believe far too much is made of thermal drift. The topic is unsettled and can add fuel to the fire when manufacturers compare products. But by 1992 chlorofluorocarbons (CFCs) will be banned.

Other major considerations include these:

- The insulation must have adequate compressive strength and density for its chosen application.
- Panels should have dimensional stability to avoid shrinkage, warping, and curling even if exposed to moisture or high humid-



Thermal conductivity (O°C) as a function of time for polyurethane foams of different cell sizes (long-term aging).

Courtesy of Society of Plastics Industry

Mr. Hardy, a consultant with offices in Austin, Tex., and Baton Rouge, La., derived this article from his series Technical Roof Materials and Procedures Made Simple.

CFC from the cells. This causes loss of thermal efficiency, and resulting off-gassing may create blistering under the roof membrane. On the positive side, ISO insulation has good compres-

wood, gypsum, or metal, to name just a few. The type of facer chosen can give the board better compressive or tensile strength, a higher fire rating, or reduction of thermal drift. □

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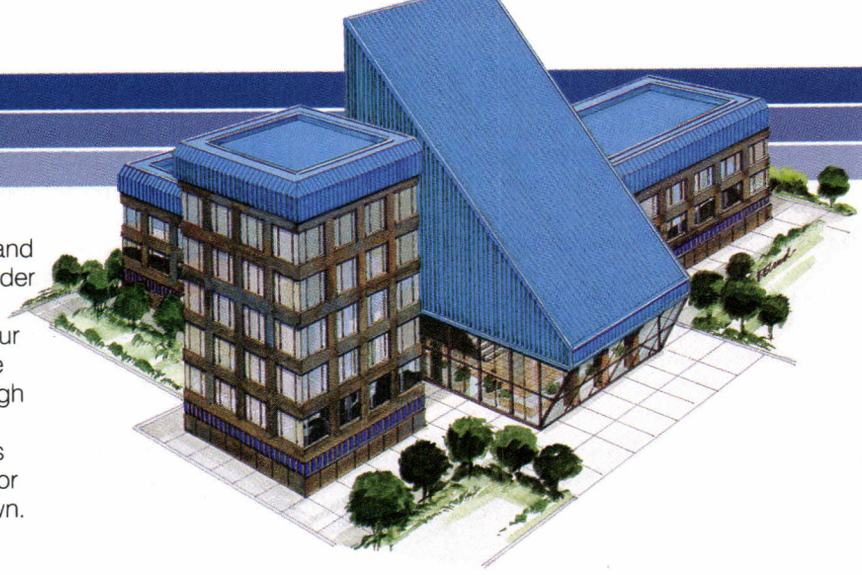

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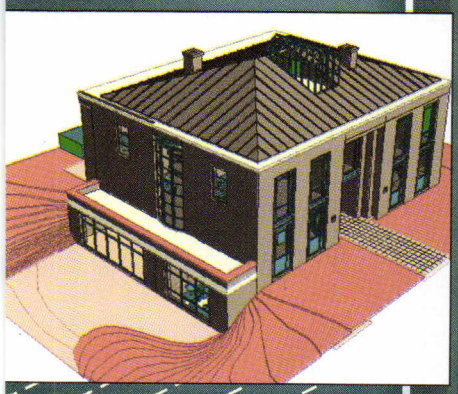

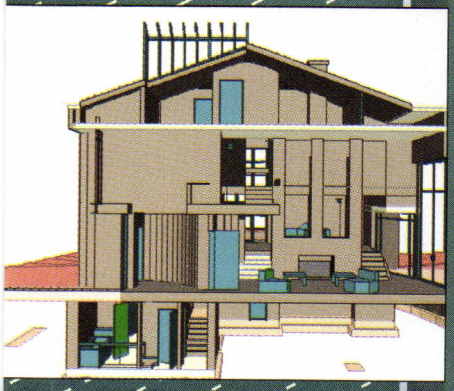

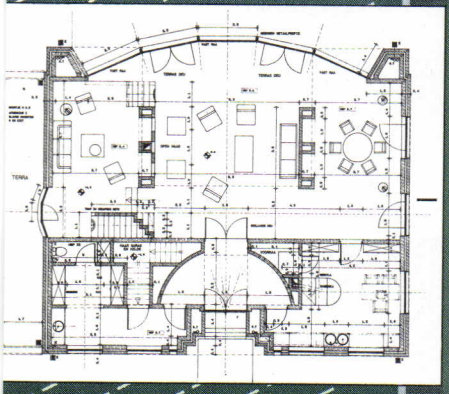

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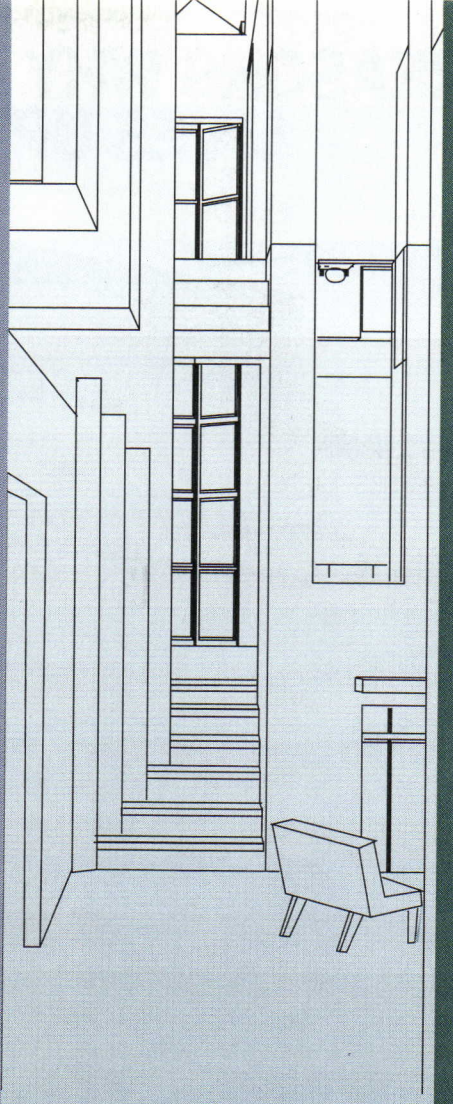

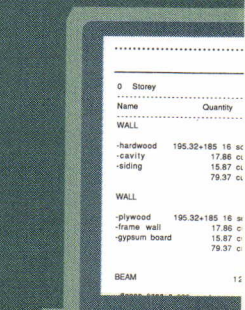

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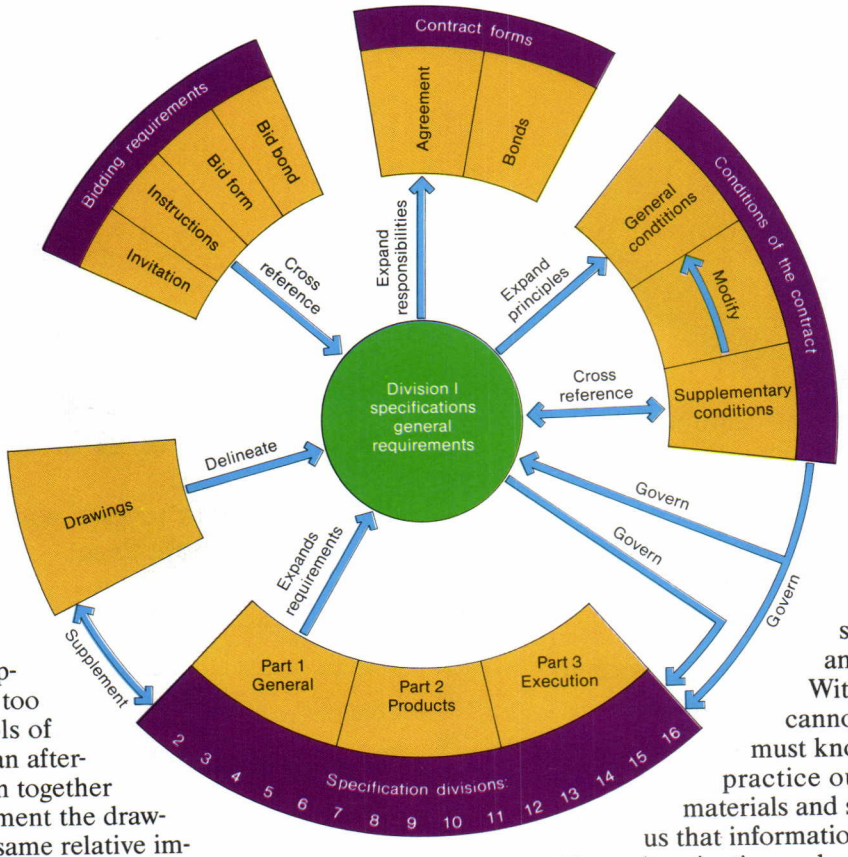
Of Specifications, Liability, And the Process of Construction

Specs as the stepchild of architecture.
By Christine Beall, AIA



Specifications always have been the stepchild of architecture. In the Intern Development Program (IDP), for example, it is hard to miss the blatant discrepancy between the 155 "value units" required for graphic construction documents and the 15 required for written specifications (see Aug. 1988, page 118).

Unfortunately, this discrepancy reflects the attitude of too many architects and schools of architecture that specs are an afterthought, a document thrown together at the last minute to supplement the drawings. IDP, in fact, gives the same relative importance to specifications as it does to "office procedures" (also 15 value units). With this kind of attitude, it is no wonder that professional liability insurance rates are soaring.

While the drawings can delineate design, shape, size, and detail, it is the specifications that control quality of materials and installation and define responsibility for the various aspects of the work. The first thing an architect will grab when there is a problem during construction is the specs, hoping that he or she is "covered." In arbitration and litigation over construction disputes, it is the specifications that attorneys on both sides pore over searching for quality standards, responsible parties, and protective clauses. It's frightening to think of trying to defend yourself in a lawsuit with a document that may have received less than 10 percent of your time and attention. The work may not be considered glamorous, but it is essential to the practice of architecture.

Although we architects think of ourselves primarily as visual artists, our education must include some exposure to building and construction technology. Without this knowledge, we cannot build our dreams. We must know something of science to practice our art. Basic courses in materials and specifications not only give us that information but teach us to combine it with our imagination and creativity. Learning how buildings go together teaches us how they might go together better or differently. Knowing the properties of a particular material may suggest uncommon or unique applications in design.

Some students couldn't care less about practical matters. Others at least think they can gain something from an education in construction documents, that their education may be broadened beyond the ivory tower. Schools of architecture, however, tend to rely on the goodwill of the profession to complete the students' *basic* education as on-the-job training.

The design process requires progressive identification and documentation of the "emerging design concept." Design drawing and technical specification development require effective and continuing communication between team members from schematic drawings to construction documents. The spec writers or

Ms. Beall is a practicing architect and specifications consultant in Austin, Tex.

specifications consultants should become involved early in the project. Throughout the process, they may contribute important research information to assist in both design decisions and budget control. Specifiers should not be brought on board at the last minute to put a slapdash project manual together just so the project can go out for bids on time. The price you pay is in multiple addenda, inaccurate bids, excessive change orders, cost overruns, unhappy clients, and sometimes lawsuits.

Not every architect has the patience and tenacity to become a good spec writer any more than every architect has the skill and creativity to be a designer. However, every architect, no matter what the position on the project team, should understand the specifications process and the organization of specifications information just to be able to find his or her way around a spec and understand what is there. Architects also must be able to communicate design information effectively to specifiers, and to do that they first must understand what the specifier needs and what function the specifications serve.

Conversely, a good specifier must have a thorough understanding of construction materials, systems and methods, building codes, ordinances, and the basics of construction law. With this information, he or she can assist the design team in decision making with regard to technological applications, material selections, and cost control.

Twenty-five years ago, there was no standard method for organizing the information that goes into a project manual. Every architect and every engineer seemed to have a different system. This made it difficult for the contractor to find information and bid the work accurately, and the architect had no simple way of checking to see that the documents were thorough and complete. Today, the Construction Specification Institute's 16-division format is the most widely accepted system of organizing information in the construction industry. Even Sweet's Catalogs finally have switched to this format to make product research and information retrieval much simpler.

The 16 divisions are basic groupings of related construction information, and they are fixed in both number and title. Regardless of the project type or location, the 16 divisions always remain the same. If there is no work required within a division, then that division simply is not used in the specification. However, the remaining divisions are not renumbered. The unused division is listed in the table of contents and marked "not used."

Each division consists of a group of related sections. Each section covers one portion of the total work, describing a particular material or product and its standards of installation and quality control. A section does not necessarily relate to the work of a single subcontractor. It is not the prerogative of the specifier to define the work of individual trades, because different contractors may subdivide the work differently among subcontractors and their own crews. Responsibility for the total project remains with the general contractor no matter how the work is divided.

CSI's 16-division "Masterformat" provides specific section names and numbers so that it is both clear and obvious where different categories of information belong. Each section is given a five-digit number, the first two digits of which refer to one of the 16 divisions. For instance, the number 05120 refers to a section in Division 5, Metals.

Each specifications section must answer three questions:

- What are the interrelationships between this section and the remainder of the work?
- What are the products, materials, and systems involved?
- How are these specific products and materials incorporated into the work?

The section format groups this information into three distinct categories or parts, which are fixed in both name and number: Part 1, General; Part 2, Products; and Part 3, Execution. Thus, there are actually three distinct levels of organization within the specification. The general categories of divisions are subdivided into sections that are specific to the project, and each section is further subdivided into three parts. This hierarchy of organization makes it easy for the specifier to place information within the project manual, and just as easy for the user to retrieve information.

There are four different methods of specifying: descriptive specifications, which define the exact properties of materials and methods of installation without using proprietary names; reference standard specifications, which require a product or process to be in compliance with certain established standards; proprietary specifications, which call out actual brand names and model numbers of the selected products and materials; and performance specifications, which give the required results and the criteria by which the performance should be verified.

Descriptive specifications are detailed, written descriptions of the required properties of products, materials, and pieces of equipment and the workmanship required for their proper installation. Manufacturers' names are not used. When a descriptive specification is used, the burden of performance is assumed by the specifier. Just as a simple example, the specs may call for a concrete mix of four parts coarse aggregate, two parts fine aggregate, and one part cement with a .5 water/cement ratio, and may imply a 28-day strength of 3,000 psi. If the contractor delivers concrete to the project site that conforms to the design mix but will not withstand a 3,000 psi load, the contractor cannot be held responsible because only the design mix was specified.

Descriptive specifications once were used widely. However, as projects have become more complex and better reference standards are made available, fewer people opt for this method. It can be a lengthy and tedious process to describe the necessary products and workmanship in sufficient detail, and doing so increases the design team's liability.

Reference standard specifications use reference standards that are set by authority, custom, or general consensus and are established as accepted criteria. These standards are published by trade associations, government and institutional entities, and private industries such as the American Society for Testing and Materials (ASTM). Other commonly used reference standards are those of the American National Standards Institute (ANSI), American Concrete Institute (ACI), Sheet Metal and Airconditioning Contractors National Association (SMACNA), and Concrete Reinforcing Steel Institute (CRSI), as well as federal specifications.

Reference standards are incorporated into the specifications by reference to a number, title, or other identifying designation. The provisions of standards referenced in this manner become a part of the project manual, just as though they were included in their entirety. The use of reference standards has both assets and liabilities. Their incorporation can save the specifier the work of writing an elaborate and lengthy text. In order to avoid the potential liabilities involved, the specifier must know the standard, incorporate it properly, and enforce its requirements. The standard must be reviewed for compatibility, duplication, and conflict.

Some reference standards contain choices. ASTM C216-88a,

for example, covers three grades and three types of face brick. If the selections are not made by the specifier, they automatically are forfeited to the contractor, and the product submitted may not be suitable as intended by the architect.

To incorporate a standard properly, the specifier must include the name of the authorizing organization, the title, and the date of issue.

Proprietary specifications identify the selected product by the manufacturer's name, model number, type designation, or other unique characteristics. Even though the manufacturer's name may not be mentioned, a specification also is considered proprietary when the product specified is available only from one source. The advantages of proprietary specifications are close control of product selection, the ability to prepare more detailed and complete drawings based on manufacturer's data, a shorter specification, and simplified bidding because of narrowed competition. Disadvantages include elimination of competition, specifying products with which the contractor may have had little or no experience, and favoring of certain products and manufacturers over others.

Proprietary specifications, however, can be either "closed" or "open." In a closed proprietary spec, only one product is named and described but several others are named as options. In open proprietary specifications, prices are requested for specified alternates, substitutions and cost adjustments may be proposed by the contractor, and other products not named may be allowed as substitutions after approval by the architect or engineer.

The federal government and other public entities forbid the use of closed proprietary, or exclusionary, specifications except under special circumstances. Most public laws require that proprietary specifications name at least two manufacturers or trade names followed by the words "or equal." Nonrestrictive specifications can be developed from descriptive, reference standard, proprietary, or performance specifications or from a combination of these methods. With descriptive and performance specifications, care must be taken to ensure that stated requirements can be met by several manufacturers or suppliers. Failure to take such care will make the specification restrictive even though no proprietary name has been used.

Performance specifications specify the end result rather than the means to the end; for example, requiring cured concrete strength as minimum 3,000 psi is performance specifying. A performance specification is defined as a statement of required results with criteria for verifying compliance but without limitations on the methods for achieving those results. All of the desired end results must be specified, because an incomplete performance spec can result in a major loss of control over the quality of the materials, equipment, and workmanship going into the project.

Performance specifying was first conceived in the 1960s as a means of encouraging innovation from manufacturers of systems for schools. The U.S. Department of Housing and Urban Development sponsored Operation Breakthrough as a research and development project to try to stimulate a variety of technologies for low-cost housing construction.

Performance specifying, however, is not limited to systems building, but can be applied to narrow-scope building elements such as curtain walls, HVAC systems, or pre-engineered buildings. In these instances, the specifier has chosen the type of component desired and is soliciting the most favorable solution from the industry. Performance specifying can be very risky if extensive research has not gone into the project and if the specifications themselves are not tediously inclusive of all the necessary criteria.

Regardless of the form or type of specifications selected for a particular project, there are certain basic requirements that are essential to success. The specifications are, after all, a means of communication. As such, their language and style must be clear, concise, and complete. A haze of unnecessary words around the description of a system or process is a cue that the specifier/architect doesn't know what he or she is talking about. Don't try to intimidate a contractor with big words and legal phraseology; it only adds to the bid prices. If you have something to say, say it clearly so that there is no misunderstanding about the responsibilities involved. Do not establish an adversarial relationship through inappropriate specification language.

Be concise. Use the active rather than the passive voice to give commands to the contractor. The entire specification is addressed to him or her, so there is no need to keep repeating, "the contractor shall." Simply say what you want. "Provide hot-dip galvanized, corrugated veneer anchors complying with ASTM A153, Class B2 coating. . . . Paint all wood doors with one coat wood primer and two coats interior alkyd enamel as specified in Section 09900. . . . Thoroughly wet all forms before placing concrete. And so on."

To minimize professional liability during the construction phase, remember that construction means and methods are the responsibility of the contractor. If you tell the contractor exactly how to do the job, you assume responsibility for the results.

Quality of construction, design integrity, and professional liability all hinge on the preparation of good, comprehensive specifications. Unless some reasonable amount of time is given to teaching architecture students the nature of materials and their proper use, architects will be at the mercy of manufacturers' representatives whose primary job is to sell a product. While some representatives are very professional and thoroughly versed in the properties and capabilities of their products, others may have been selling shoes the week before and may know almost nothing about their products except what is in the literature.

Practicing architects, whether they will write the specifications themselves or not, must know enough to communicate critical information to the specifier. A failure to communicate can create conflicts between the drawings and specifications or result in omissions of important information. All architects, in order to protect themselves professionally, need a thorough understanding of construction materials, systems, and methods; an understanding of basic construction law; knowledge of insurance and bonds as they relate to the construction industry; and familiarity with building codes and ordinances. The specifications must be carefully planned and executed, just as the graphic documents must be clear and comprehensive. Good specifications produce lower bids and generate fewer lawsuits.

Unfortunately, with the availability of "master specifications," some schools and professionals have taken an attitude that they no longer need to worry about specs. However, specifying is not a simple matter of buying Masterspec or Spectext and photocopying the needed sections. Someone who knows what he or she is doing must edit these documents to relate to the project. I have seen too many documents of late that were printed verbatim from the master without regard to applicability to a specific project. The specs contain a great deal of extraneous information and numerous omissions and are impossible to bid accurately. No matter how automated the systems become, someone in the firm always must be knowledgeable enough to assemble a high-quality, professional document unless you want to spend your profits on attorneys' fees and liability insurance premiums. □

The Resurging Craft of Decorative Glass

Decorative glasswork has experienced a renaissance in the last two decades. Despite its popularity among hobbyists, it remains a highly specialized commercial craft. Architects who decide to use decorative glass in their buildings will want to work very closely with the crafters and therefore should know something of basics.

Stained glass generally tops the list of decorative glasses. Of course the glass isn't "stained" after it's produced; it is colored during manufacture by the addition of metal oxides, such as copper or manganese. The amount of color throughout a sheet of glass usually is uniform. The stained effects result from irregularities in the thickness of the glass, which produce varying densities of color.

Hand-blown "antique" glass and machine-made or rolled glass are the two types generally used in leaded windows. Hand-blown glass is produced in smaller quantities and hence is more expensive than rolled glass. The differences between the two go beyond quantity and price, however. Hand-blown glass generally is softer and therefore easier to cut. A single sheet of hand-blown glass can vary in thickness from under one-eighth inch to over one-quarter inch, making it difficult to assemble with a single-size came (an extruded metal strip with an H-profile). Machine-made glass, on the other hand, is uniform in thickness but generally harder.

Hand-blowing of glass was introduced in the 19th century, in the belief that it was the same method used to produce medieval stained glass. A large bubble of glass is blown with a blow pipe. The bubble then is cut down one side and laid in a heated, annealing oven. The product, after several hours in the oven, becomes a flat sheet of glass. Hand-blown glass may not be as uniform as machine-made glass, but its irregularities, crystal clarity, bubbles, and imperfections give it richness and dimension.

There are several terms that describe various effects that can be created with hand-blown glass. Crackle glass refers to a webbed pattern created by quickly dipping the hot glass in water. Seedy glass describes a sheet that is sprinkled with small bubbles that catch and scatter light. Seedy glass is produced when the glass is blown before the silica sand, borax, and pot color are completely refined. Flashed glass is double-layered, comprising a thick, clear base and a thin, colored veneer. Light passing through the two layers visually mixes the colors.

Machine-made glass also has a vocabulary to describe the different effects impressed on it. One of the most common is cathedral glass, which is transparent and textured. The machine's rollers impress patterns or textures on one side of the glass in order to diffuse and scatter light. The other side (called the cutting side) is smooth and medium-hard.

Opalescent glass, another common type of machine-made glass, is translucent and marbleized. (Machine-made opalescent glass should not be confused with hand-blown, opal-flashed glass, or the handmade opalescent glass made famous by Tiffany.) Smooth on both sides, virtually opaque, and the hardest of the machine-made glasses, opalescents normally are made by mixing white with one or more colors.

For an architect directly involved in selecting decorative glass, there are several points to keep in mind. First, select the glass for its color and texture—those warps, bubbles, and imperfections are assets, not structural defects. Of course, if the window is going to be viewed from a distance, textured glass isn't as important as it is for a window viewed close at hand. However, if you are after light diffusion, texture again is important.

If you have a tight budget or if you simply want a uniform effect, select machine-made glass. But, whatever kind of glass you decide on, examine it in the same light in which it ultimately will be viewed.

The glass color and texture also should be chosen with respect to the amount of light the room receives. Pale colors and textured glass help diffuse light and increase visibility in dark rooms; dark, deeply colored glass can be used in brightly lighted rooms. Generally, machine-made glass that has been rolled or pressed with an overall pattern will transmit translucent, diffusing light. Hand-blown glass, on the other hand, has a good deal more clarity and transparency.

Finally, do not use flashed glass where it will come in contact with high heat, because the flashed layer has a tendency to pull back from the base layer.

Glass painting

Painted glass is different from stained glass in that the color of painted glass actually is applied to its surface. A centuries-old craft, glass painting was and still is used to depict figures, images, and motifs in a level of detail impossible with stained glass.

The motifs are created with vitreous paint. Ground glass, containing silica, alumina, borax, lead, and a pigment oxide (or a combination of metallic oxides) makes up the vitreous powder. The powdered color is combined with an appropriate mixing agent, such as water and gum arabic, and then is painted on the glass. The glass is fired in a kiln, fusing the paint to the glass surface. To build form with light and dark or to create textures, each layer of paint is applied and fired separately from the next layer—a complicated, labor-intensive process.

Etching and carving

Etched glass is produced either by abrasive blasting or by wearing away the glass surface with acid. Each level of etching produces a different effect. Light etching, most commonly referred to as frosting, slightly penetrates the surface for a translucent effect. Visibility through frosted glass ranges from translucent to opaque. Medium etching penetrates deeper into the glass surface, adding some dimension and depth of field. Glass that has been medium-etched transmits some light but presents an opaque surface. Generally, light and medium etching can be executed on tempered, insulated, or float glass, as well as glass block. For both, the thickness of the glass is not normally a controlling factor.

However, when the etching becomes deep enough to produce a certain amount of relief in the glass surface, it becomes "carving," and the glass thickness becomes important. Float or laminated glass must be at least ¼ inch thick before it can be subjected to light carving. A lightly carved glass surface is opaque with shallow relief, making it ideal for intricate decorative patterns. As the carving gets deeper, the glass has to be thicker. Medium carving

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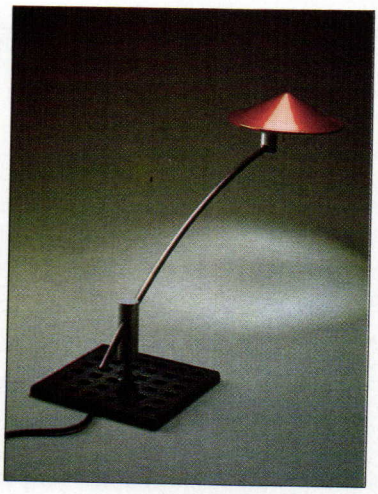

Italian Pendant Lamp
A new pendant lamp from architect Pier Guiseppe Ramella provides direct and diffused light for a family of fixtures, including a small-scale, nine inch companion series. The all-glass Zefiro lamp, left, comes in a variety of color combinations of blue and white.
Atelier International Lighting
Circle 404 on information card

Dual-Intensity Light
The China low-voltage task lamp, above, designed by architect and industrial designer Stephan Copeland for Atelier, is the first lamp designed outside of Italy for the ai collection. China's reflector and reflector housing is of spun aluminum. The stem is brushed stainless steel; the reflector and stem support silver enamel, and the cast iron base a smoked dark-gray enamel. The aluminum shade comes in metallic red or anthracite baked enamel.
Atelier International Lighting
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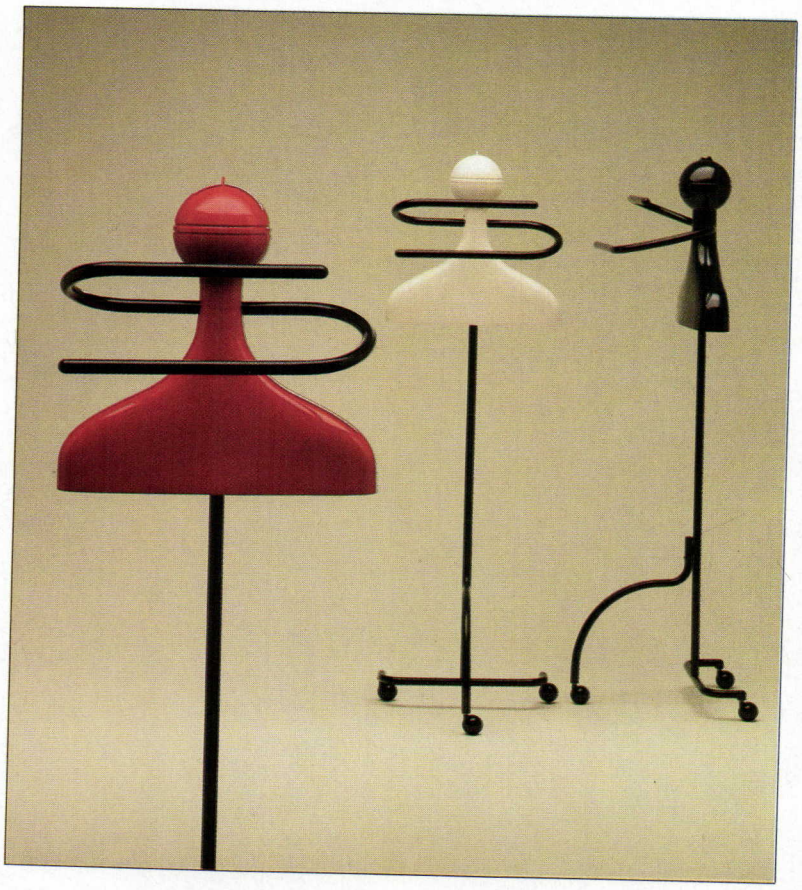

Coat Rack
Anna Castelli Ferrieri's valet, or "silent servant," right, designed for Kartell, has arms that can be manipulated several ways to accommodate a wardrobe. Its head comes with a tray to hold small items. The frame is of black painted steel, and the body is available in white, black, or red.
Kartell
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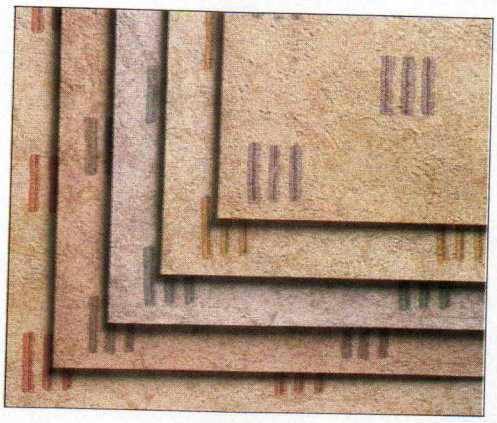

Vinyl Wall Covering Book
A wall covering book from Koroseal provides a selection of 27 patterns, three of which are borders that coordinate with the wall coverings. Shown at left is the pattern "Bar Hopping," available in six color combinations. All wall coverings are UL-listed, with a Class A fire rating, and contain Early Warning Effect mildew inhibitors and antimicrobics.
Koroseal Wallcoverings
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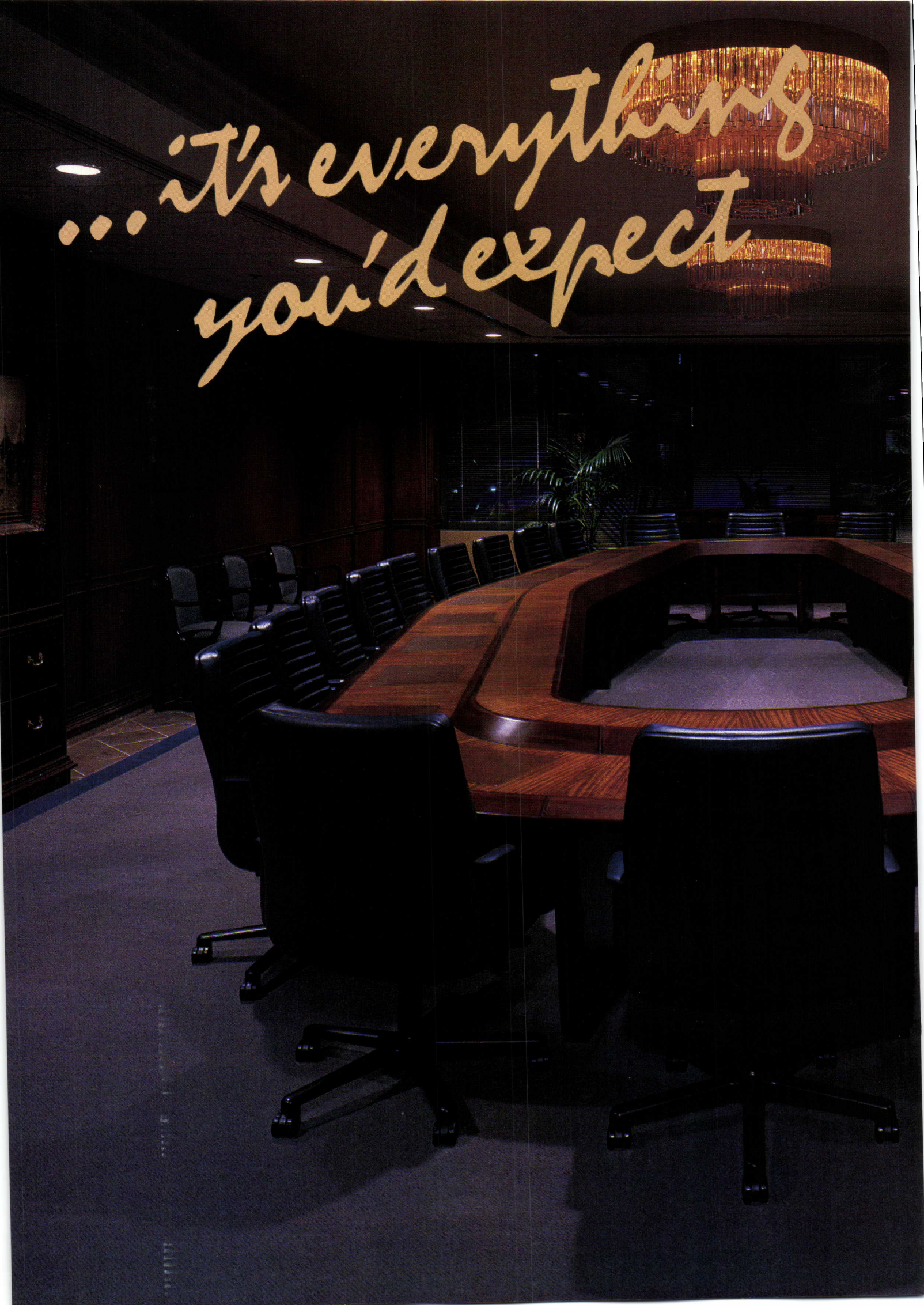
Products *is written by Amy Gray Light*


...it's everything you'd expect

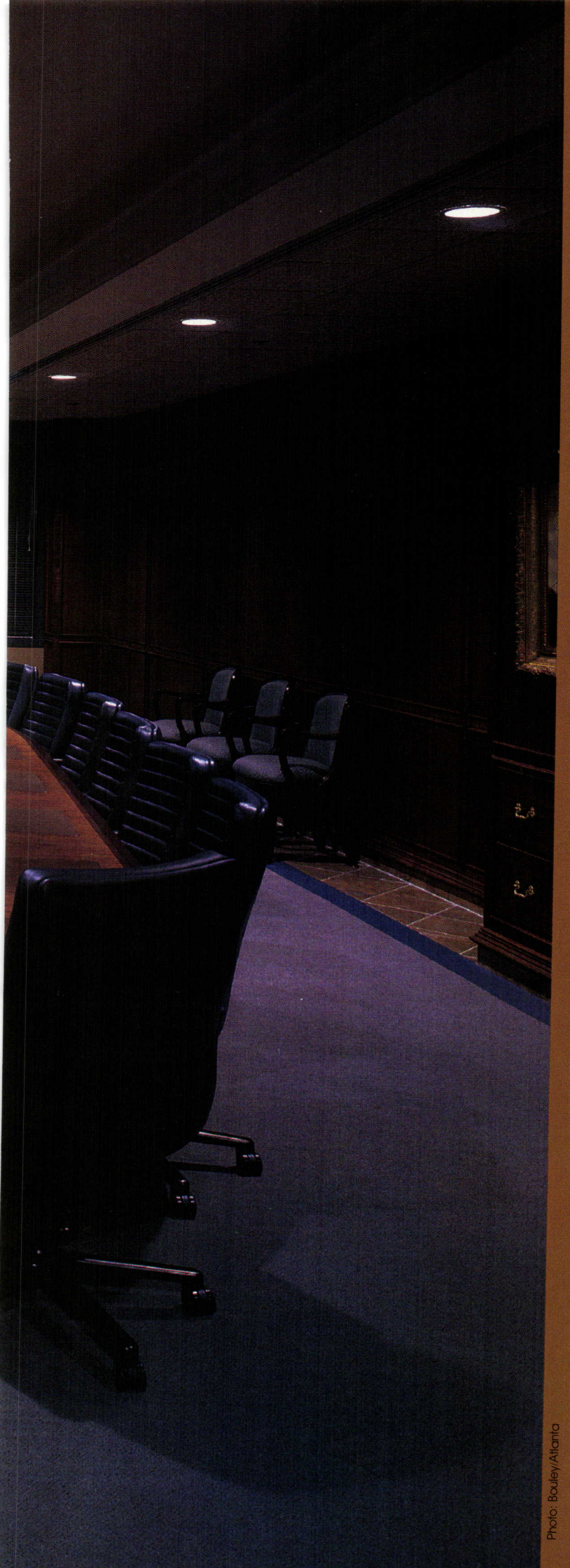


Photo: Bouley/Atlanta

...and more!

The executive boardroom of the Colonial Financial Center in Montgomery, Alabama. A strikingly elegant focal point where appearance is everything, from the classic mohogany and cherry paneling to the rich accents of Italian marble, brass, and inlaid leather. And on the floor, plush "Bristol Pointe" carpeting from Bentley Carpet Mills. Specified by designer Howard Tutwiler, Jr. because it was made exclusively with Ultron® 3D nylon from Monsanto.

"We needed a carpet as fashionable as the room itself, but were unwilling to sacrifice serviceability for appearance. Ultron® 3D gave us both, and two years later it looks the same as the day it was installed."

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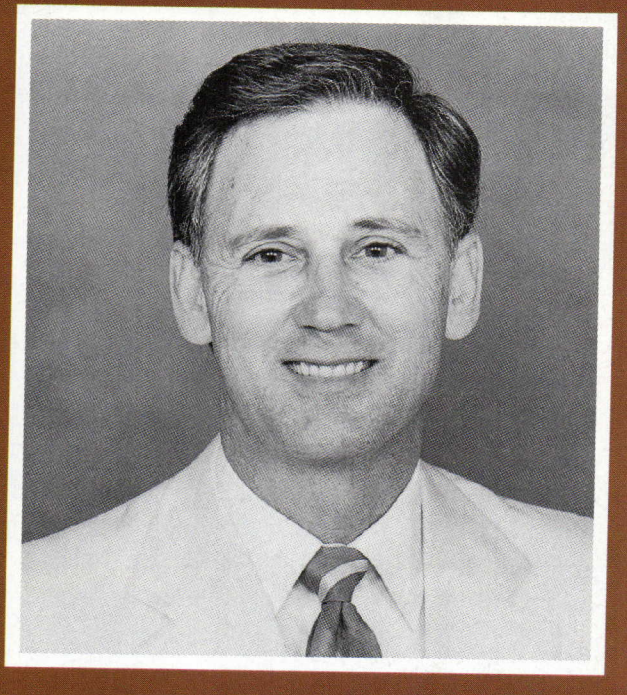

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The Next Chair
The Next Chair, introduced by Interna Designs USA and designed by Richard Penney, is a wood chair targeted for both large contract projects and residential environments. The solid maple chair with its molded plywood back builds upon the simple stool concept. The back has a small amount of flex and a subtle contour for support. An armchair version has arms that angle downward for additional comfort.

The Next Chair comes in a wide choice of finish combinations and custom cutouts in the back. The chair also can come with contrasting finishes on the back, arm, and main frame of the chair as well as more conventional finishing.
Interna Designs USA
Circle 405 on information card

Ultra-Lightweight Chair
A very lightweight chair made of space-age materials is the Softlight, designed by Alberto Meda for ICF and introduced at the Westweek show this year in Los Angeles. The chair is made of carbon fibers and aluminum sandwiched together, and the frame has an elastic back and seat.
International Contract Furnishings Inc.
Circle 407 on information card

Four-Outlet Receptacle
Bryant Electric, a division of Westinghouse Corp., introduces the Quadplex four-outlet receptacle that requires only three terminations (line, neutral, and ground) to energize four outlets and reduce installation time, according to the manufacturer.

The Quadplex is constructed of Lexan and designed for new and retrofit applications. It fits a variety of commonly used boxes and can be used for both flush or surface mounting.
Bryant Electric
Circle 406 on information card

Roofing Video
The Asphalt Roofing Manufacturers Association has produced a video, available on VHS or in a sound/slide format, presenting the recommended roofing practices of the asphalt shingle industry.

The presentation covers the proper application for both new and retrofit roofing construction, showing deck preparation, removal of old roofing, shingle application methods, fastening recommendations for both nails and pneumatically driven staples, hip and ridge applications, and valley and flashing treatments. Playing time is 21 minutes, and the cost, including postage and handling, is $40 for the VHS videocassette and $125 for the sound/slide version.
Asphalt Roofing
Manufacturers Assoc.
Circle 408 on information card

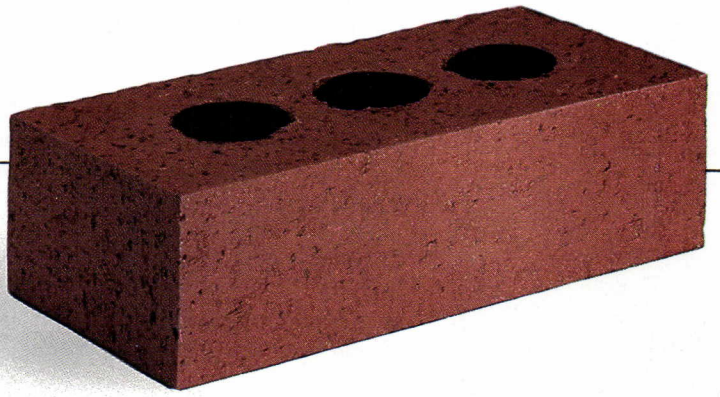
Rugged Outdoor Fixture
Holophane's Terralux bollard STIA square or asymmetrical distribution lighting fixture for outdoor use features a unique lighting pattern that allows for maximum fixture spacing and uniformity for walkways or low-level lighting areas. The unit has a sturdy extruded aluminum housing and a die-cast mitered top cap. A polycarbonate refractor shield guards against vandalism. The 70- and 100-watt light source comes in either high-pressure sodium or metal halide. The fixture is UL listed.
Holophane
Circle 409 on information card

Storage and Retrieval System
A new drawing reduction system from Du Pont makes it easy to store and retrieve architectural and engineering drawings. With the Macromaster system, full-size A/E drawings can be reduced to 8½x11-inch sheets to fit into a standard three-ring binder. As many as 300 drawings reduced to Macromaster sheets can be held in a 1½-inch-wide, D-ring binder. The sheets come in two forms: a film positive made of whitened translucent mylar and a film negative. The sheets are designed to be nonaging and so may be used for archival purposes, eliminating the need for full-size record copies. The film negative becomes the archive and can be stored in a remote location. New originals can be created when needed, and enlargements of the sheets can be made using a standard office copier. The format is said to be easy to work with when transferring drawing information to a computer data base for reference, and the sheets can be faxed or scanned.
Du Pont Company
Circle 410 on information card

Products continued on page 12

Sixty second guide to Belden Brick:

COLORS

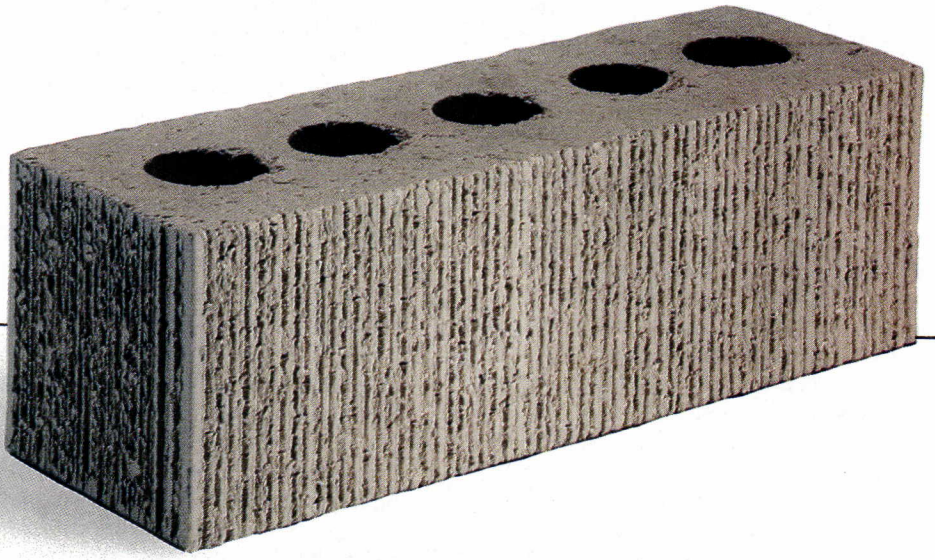


Belden Brick is made in over 116 colors that include 2 choices in black, 28 browns, 7 tans, 8 buffs, 3 creams, 18 grays, 16 pinks, 26 reds, and 8 whites.

In addition, it is made in 12 different textures, although not all our brick is made in the same range of textures.

Belden also offers a choice of extruded brick or molded brick (with the character of hand-made brick.) Each category includes a wide range of colors and textures providing more than adequate design latitude.

SIZES



Belden Brick is predominantly made in thirteen different sizes, representing the spectrum of Belden Brick colors and textures. Your design opportunities are broadened by the availability of virtually every Belden Brick color choice as pavers.

SHAPES

We've made hundreds of different shapes to provide special structure details, and a week seldom passes without our custom-making a new special shape to meet individual design requirements. If you need an "impossible" special shape to complement the brick structure you're planning, call Belden. We've seen the impossible become reality.

THE BELDEN BRICK COMPANY
700 W. Tuscarawas Canton, OH 44701
Telephone 216-456-0031

THE Belden Brick COMPANY
CANTON, OHIO 44701

"We Do More Than We Have To"

Circle 108 on information card

Sanitary Floor Drains
The Drehmann Paving and Flooring Co. offers a patented, variable-height drain manufactured specifically to solve the sanitary floor and drainage problems of the food processing and pharmaceutical industries.

The drains are made of hot-dipped, galvanized cast iron to resist most acids and chemicals and come with 1-, 2-, and 4-inch interchangeable drain bands to fit into the body flange for assured waterproofing. An inner perforated strainer as well as an outer strainer with either perforated or bar-type gratings is provided. A stainless steel basket can be furnished with a 4¾-inch band. The drain's 11-inch square top will accommodate massive volumes of wash water and other industrial liquids, and the drains can be lifted out for easy cleanup and maintenance. The units can be adapted to all drainage systems and all new or existing flooring including brick, tile, and monolithic floors.
Drehmann Paving and Flooring Company
Circle 427 on information card

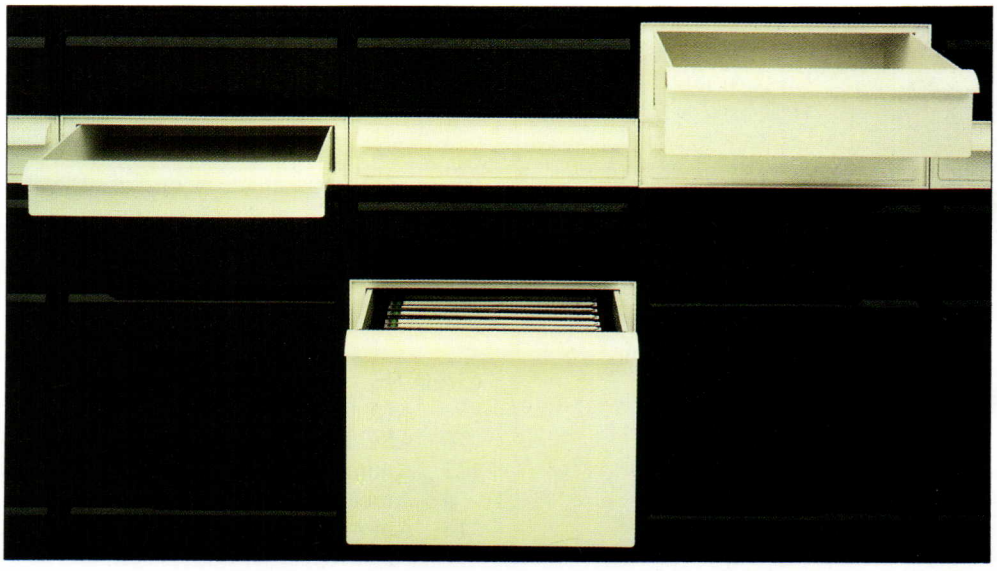
Efficient New Heat Pump
Carrier Corp. introduces the HydroTech 2000 heat pump. The new pump combines space heating and cooling, as well as domestic water heating, in a variable-speed design. HydroTech 2000's variable-speed system and compressor are designed to quickly bring the room to the temperature desired while the compressor slows down its speed to maintain that temperature. Variable speed also gives the advantage of humidity control—when cooling is done at low speeds, more moisture can collect on the indoor coil and drain off. With its refrigerant-to-water heat exchanger, the system can supply most of a house's hot water using waste heat from space cooling in the summer, and during the winter it will heat the house and domestic water as well. When neither heating nor cooling is required, the pump will run without the indoor fan coil, making hot water with little energy use. The heat pump is compatible with the manufacturer's HomeZone system of motorized dampers and multiple thermostats for maintaining different temperatures in different parts of the house.
Carrier Corporation
Circle 428 on information card

Exterior Interlocking Wall System
The Innovative Design Research division of the National Concrete Masonry Association has developed a modular landscaping system available through the NCMA under the trade name Terrastop. The Terrastop system comes in several thicknesses, finishes, and colors and weighs less than 40 pounds per block. The mortarless system is self-aligning, has built-in drainage weeps, and may be erected plumb or on different slopes with or without reinforcement. Terrastop can be used to create planters, terraces, curbs, steps, and screens, without the use of pins or the need to cut units for 90-degree corners.
Innovative Design Research, div. of the National Concrete Masonry Assoc.
Circle 429 on information card

Award-Winning Armchair
The Be Bop Relax armchair from Allibert won two awards at the 1988 Casual Furniture Market in Chicago: one for best of show and the other for design excellence.

The two-tone colored chair is of molded resin and features a wide seat and back with ventilation holes for comfort, along with broad armrests. The casual furniture is designed not to rust, corrode, fade, yellow, peel, or blister outdoors. The colors are part of the resin material, so no refinishing is necessary. Arms and upper back of the chair come in yellow, blue, red, green, dark or light gray, and white, while the seat, lower back, and legs are white. A side table/footstool with complementary styling is available.
Allibert Inc.
Circle 430 on information card

Stacking Drawer Units
Modular, stacking containers, right, were designed by Simon Fussel for Kartell. The units are available in three heights, the tallest of which includes a file-holding set. Each drawer has a special seat for casters, which are supplied on request. The containers are made of ABS plastic and come in white, yellow, black, red, green, or in a black and white frame with clear drawers.
Kartell S.p.A.
Circle 431 on information card



Fire-Safe, Weatherproof Shake
A new alternative to wood shakes from Gerard Roofing Technologies simulates traditional hand-split wood shakes, yet has strength and longevity based on its makeup of preprimed, corrosion-resistant steel, permanently polymer-bonded with stone granules. The Gerard shake is designed to weigh less than most concrete or clay tiles, and it can be installed over an existing shake or shingle roof.
Gerard Roofing Technologies Inc.
Circle 432 on information card

Heat Exchangers
Yula Corp. custom heat exchangers for pharmaceutical, food, and sanitary plant environments range from four to 60 inches in diameter and up to 40 feet in length. The exchangers feature full drainability, milled heads, crevice-free construction, and a double tube-sheet design with tube ends roller-expanded and seal-welded into double serrated tube-sheet holes, polished or electropolished stainless steel surfaces, and sanitary fittings.
Yula Corporation
Circle 433 on information card

Radiant Tube Heaters
RSTP-17 infrared gas-fired radiant tube heaters from the Space-Ray division of Gas-Fired Products are said to be up to 30 percent more energy-efficient than forced air units. The heaters warm objects directly through the use of tube heaters that have a heat-treat calorized steel tube emitter. Units operate at tube temperatures averaging 900 to 1,000 degrees Fahrenheit. A monitoring light system provides on-line diagnosis and maintenance on the units. The tube heaters can be thermostatically controlled individually or in groups.
Gas-Fired Products Inc.
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