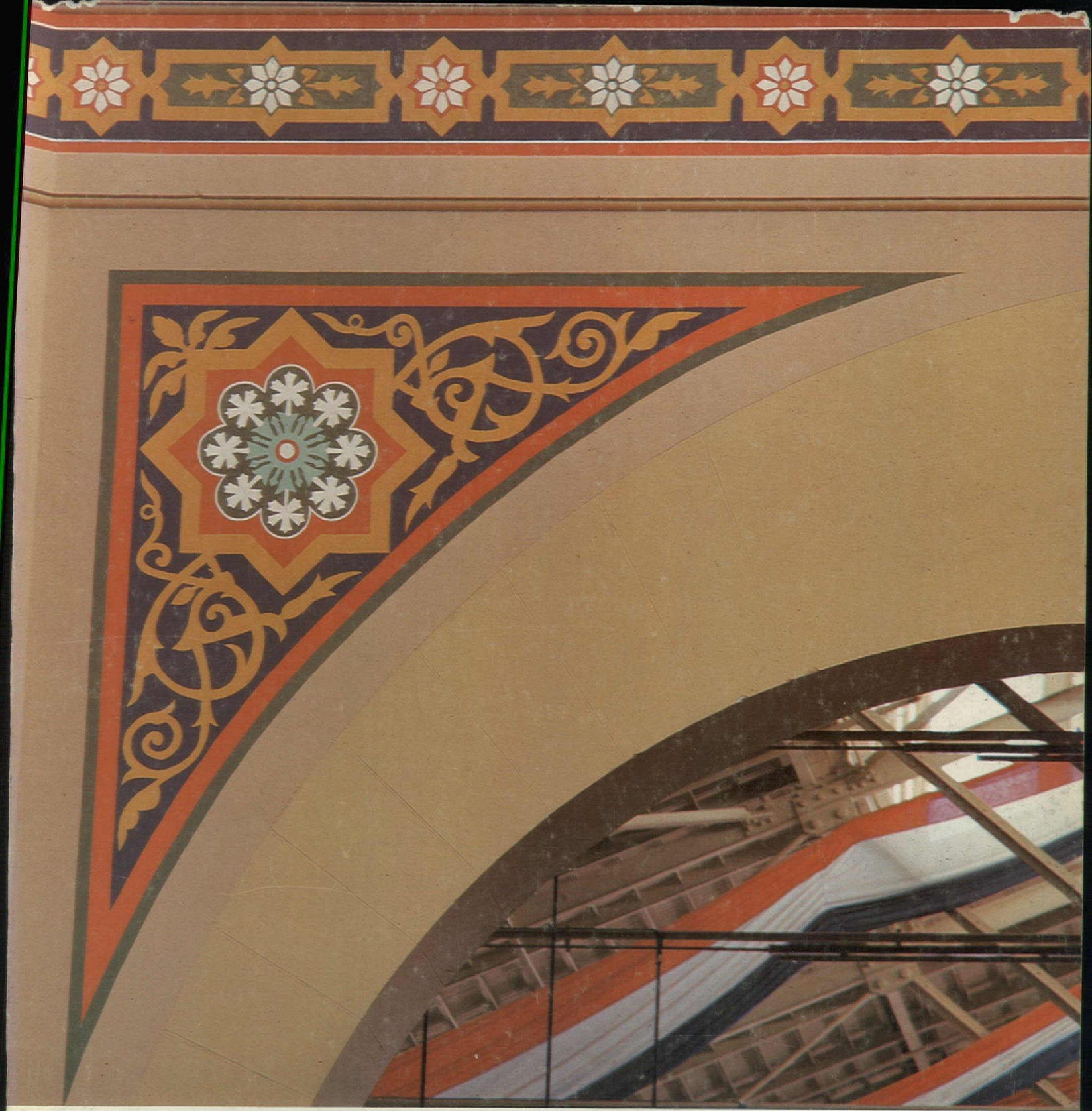


RESTORATION OF THE SMITHSONIAN'S ARTS AND INDUSTRIES BUILDING

PENNZOIL PLACE, IN HOUSTON, BY PHILIP JOHNSON AND JOHN BURGEE
SOLAR HOUSES FOR THREE ALL-WEATHER SITES IN THE NORTHEAST
BUILDING TYPES STUDY: INDUSTRIAL BUILDINGS
FULL CONTENTS ON PAGES 10 AND 11

ARCHITECTURAL RECORD

NOVEMBER 1976 11 A McGRAW-HILL PUBLICATION FIVE DOLLARS PER COPY

This pendant fixture, movable to many points in the room, provides both quality task lighting and substantial energy savings.

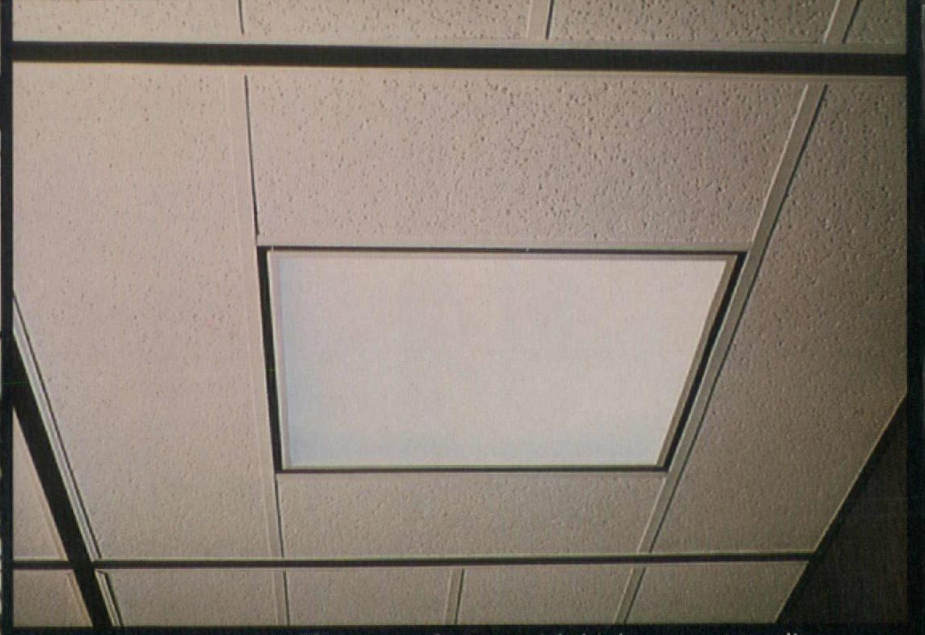
The Synercon™ 60 Ceiling System from Armstrong. A new standard of design flexibility produces a new high in energy savings.

The Synercon 60 Ceiling System from Armstrong is all new from the grid to the board, from the lighting options to the air handling. More important than even its newness, however, is its innovation. Innovation that serves to increase design flexibility, decrease energy consumption, and enhance lighting quality.

The new lighting starts with a pendant fixture designed to provide highly efficient task lighting that can save as much as 65% in electrical costs when compared to conventional-type recessed troffers. It accommodates two 40-W lamps which result in 70 or more footcandles at the work surface and is offered with a special double lens that controls brightness and effectively beams the light exactly where it's needed. What's more, with the fixture suspended, the ceiling is 100% acoustical material.

With the Synercon 60 Ceiling System, however, that's only the start. Because there are two other lighting options as well. The newly designed recessed troffer you see above that also saves energy because it normally requires fewer fixtures than competitive systems. And the energy-efficient sodium fixture has been

Lighting includes 14" x 48" troffer (2- or 3-lamp) with standard or polarized lens; parabolic louvered fixtures (8- or 16-cell).



Further lighting is this 29"-square fixture with high-pressure sodium lamp, offered with standard or polarized lens or parabolic louver.

Air-handling options include air boot and bar for constant-volume systems as well as two variable-volume systems designed for energy savings.

specially designed to control brightness without seriously reducing the lamps' efficiency. Optional polarized lenses with these fixtures can further lower energy requirements as well as improve lighting quality by reducing veiling reflections.

With all three systems, the lighting efficiencies result in both immediate and long-term cost reductions. To deliver 70 footcandles, the pendant fixture can require only .9–1.0 watts per square foot; the high-pressure sodium, only 1.4–1.5; the standard troffer, only 1.9–2.0.

The new grid is three inches wide, with a flat flange, and features a 1⅝" black reveal that extends down the side of the recess and takes partition studs. It has a five-foot on-center hanging capability and can be 100% slotted for air distribution.

The new board is nondirectional Cortega™ which, combined with the flat grid design, produces a subtle, unobtrusive look. A new super acoustically efficient board called Silok™, shown in main illustration, is also available for use in open plan spaces.

The new air handling gives you a choice of a high-capacity five-foot-long air bar designed for constant-volume systems as well as two variable-volume systems—each with two options—that save energy in several ways. They require no reheat, thus saving the cost of reheating cooled air. They need no external power to operate either valves or thermostats. And by reducing air quantities, they allow a reduction in the size of ductwork and fans.

With all its newness, innovation, and energy efficiencies, the Synercon 60 Ceiling System gives you a sum total of flexibility you've never had available before. In fact, this new system offers so much, we think you'll want to read about it in depth. Write us now for all the technical details. Armstrong, 4208 Rock St., Lancaster, Pa. 17604.

For more data, circle 1 on inquiry card

Quiet Zone® II flooring from Armstrong. A combination of cushioned comfort and vinyl practicality that adds up to one beautiful prescription.

People who walk on it know it for the nice underfoot comfort. People who wheel equipment on it know it for the smooth, taut surface. And people responsible for the hospitals and nursing homes in which it's installed know it for the special characteristics that help meet all the requirements of the Hill-Burton Act regarding smoke-generation and flame-spread limits. And everybody who looks at it knows it's beautiful. That's Quiet Zone II Vinyl Corlon® from Armstrong.

Start at the top, and Quiet Zone II gives you a hard-working vinyl wear layer that's built to take heavy traffic and embossed to help hide traffic scuffs. Go to the bottom, and Quiet Zone II gives you a vinyl foam backing with a refreshing resilience that makes standing or walking easier and quiets noise more effectively than any conventional vinyl floor covering.

In Quiet Zone II, practicality is built right in along with all its other benefits. Seams are readily sealed to provide essentially a seamless floor. Spills wipe up, promoting constant cleanliness. And as for meeting Hill-Burton requirements, Quiet Zone II has an ASTM E-84 flame-spread rating of 75 or less and an average NBS smoke density of 450 or less — as well as a Flame Propagation Index of less than 4.0 in the UL-992 Chamber test.

Quiet Zone II comes in rolls six feet wide and up to 75 feet long; in three different designs — Random Texture, Houndstooth Check, Grand Central; and in a total of 13 colorings. One of which can make this remarkable floor covering fit like the beauty it is into the beauty of your surroundings. To learn more, write Armstrong, 310 Rock St., Lancaster, Pa. 17604.

For more data, circle 2 on inquiry card

FROM THE INDOOR WORLD® OF Armstrong

Letters to the editor

Your excellent editorial on the AIA ethics debate (June 1976, page 13) caught the essence of what was so eloquently expressed on both sides of the issue. You have done a real service to those who did not attend the convention and who will themselves be debating the issue at the chapter level.

George S. Lewis,
Executive Director
New York Chapter, AIA

I read with interest the July, 1976 editorial concerning "family architects." I wholeheartedly agree that too many projects are conceived and designed by those not qualified to do so.

In line with the editorial, I would suggest that architects themselves are in need of a "family code consultant." As fire protection engineers and building code consultants, we find all too often that we are consulted after plans have been submitted for permit and have been turned down by the plans examiner because he has found a code violation. Even worse, construction is sometimes stopped because a code violation which was not identified during the plans examination, was discovered during construction. We are then called in to attempt to solve the problem.

The "family code consultant" would provide a valuable service to the architect by periodic review of work in progress to spot potential code violations and offer solutions. This would be done at minimal disruption to the plans already in progress. This "early review" of work in progress can save considerable time and money later in the design stage. By using a "family code consultant" the architect can be reasonably assured that the plans he submits for permit will be issued without delay.

Leslie Strull, P.E.
Rolf Jensen & Associates, Inc.
Deerfield, Illinois

I read your July editorial with delight, and after noting the enthusiastic response in the September issue, *must* write to you. Because: you were describing me!

I am a "family architect"—the community G.P. architect! Sometimes I have been referred to as the "game room specialist," since I live in a growing Pittsburgh suburb with growing families. When the time comes to spread out, I'm there!

One year I remember the "cathedral ceiling" fad was in full swing and I was working on 9 jobs at once. Then there is the pseudo-mansard fad that I have fought and won in several instances. Remodeling and restoring older structures is a great part of my work, and has been for many years. I have been local consultant or done drawings for Y.M.C.A., halfway homes, schools, churches, parks, trails, etc., and feel that this is a very rewarding service.

All this, though, has not kept me from many "big jobs": ski resorts, nightclubs, restaurants, community buildings, etc. Neither has all this kept me from rearing a family of 6 children with a loving and understanding husband, and continuing my profession as a good architect. They point out to their friends with pride buildings as we drive by—"My mother designed that!"

Please accept my belated reply, and know that we are alive and appreciated. Thank you.

Claire M. Bassett, R.A.
Professor at the
Butler County Community College,
Department of Architecture

Your editorial "Straight talk about straight talk on holding those specs" (mid-August 1976) hits the mark. I am certain that other quality manufacturers appreciate your wisdom as well.

Reaching the architect, while understanding his pressures, will take our mutual efforts. Toward that end we are encouraging our force of architectural salesmen to quote your editorial wherever possible.

L. R. Hendrickson, Manager
Advertising and Product Promotion
H. H. Robertson Company

Did William Marlin check the dictionary when he described the "fulsome" form of Fumihiko Maki's architecture? I don't think he meant to call Maki's restrained work "extravagant, elaborate, insincere."

G. Randolph Hudson
Rea, Hayes, Large & Suckling
Altoona, Pennsylvania

Reply: *According to Webster's Second, the obsolescent definition of "fulsome" is "full, copious, abundant," but, in more modern usage, it means what Mr. Hudson says it does. Which is not what we meant, certainly. As one who has had to eat many words, readers may be reassured that Mr. Marlin has been sentenced to a year's rations of yet another one (and has finally bought a copy of Webster's Third).*—Ed.

Calendar

NOVEMBER

3-4 Third Annual Computer Graphics Conference and Equipment Display at the Engineering Society of Detroit. Contact: Engineering Society of Detroit, 100 Farnsworth, Detroit, Mich. 48202.

7-9 The Second Symposium on Research Applied to National Needs sponsored by Rann 2, The National Science Foundation. Contact: Rann 2 Headquarters, 1501 Wilson Blvd., Rm. 600, Arlington, Va. 22209.

8-10 General Electric's Special Advanced Residential Lighting Seminar, Nela Park. Contact: Manager, Lighting Education, General Electric Lighting Institute, Nela Park, Cleveland, Ohio 44112.

9 American Iron and Steel Institute seminar, "Design and Construction of Elevated Steel Structures for Mass Transit Systems," Sheraton-Chicago Hotel. Contact: AISA Mass Transit Seminar, American Iron and Steel Institute, 1000 16th St., N.W., Washington, D. C. 20036.

17 Tour of the Solar Energy projects by ERDA (Energy Research & Development Administration), bus trip beginning and ending at the Atlanta Airport. Contact: Doris J. Wallace, APEC Executive Office, Grant-Deneau Tower, Suite M-15, Dayton, Ohio 45402.

18-19 APEC's (Automated Procedures for Engineering Consultants, Inc.) regular meeting, Tampa Airport Host International Hotel, Tampa, Fla. Contact: Doris J. Wallace, APEC Executive Office, Grant-Deneau Tower, Suite M-15, Dayton, Ohio 45402.

18-19 New York University's School of Continuing Education seminar "Energy Conservation in Plants," Chicago. Contact: Ms. Heidi E. Kaplan, Information Services Manager, Dept. 14NR, New York Management Center, 360 Lexington Ave., New York, N.Y. 10017.

18-20 "The Technical Design of Solar Thermal Systems for Buildings" sponsored by the University of Colorado's Center for Management and Technical Programs, Boulder, Colo. Contact: CMT, Box 3253, Boulder, Colo. 80303.

30-December 1 New York University's School of Continuing Education seminar, "Energy Management in Buildings," Houston. Contact: Ms. Heidi E. Kaplan, Information Service Manager, Dept. 14 NR, New York Management Center, 360 Lexington Ave., New York, N.Y. 10017.

DECEMBER

1-2 The Construction Research Council's Second Annual Meeting, Holiday Inn O'Hare Kennedy, Chicago. Contact: Construction Research Council, 1000 Vermont Ave., N.W., Washington, D.C. 20005.

ARCHITECTURAL RECORD (Combined with AMERICAN ARCHITECT, ARCHITECTURE and WESTERN ARCHITECT AND ENGINEER)

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Quotations on reprints of articles available. Every possible effort will be made to return material submitted for possible publication (if accompanied by stamped, addressed envelope), but the editors and the corporation will not be responsible for loss or damage.

EXECUTIVE, EDITORIAL, CIRCULATION AND ADVERTISING OFFICES: 1221 Avenue of the Americas, New York, N.Y. 10020. Other Editorial Offices: 425 Battery Street, San Francisco, Cal. 94111.

PUBLICATION OFFICE: 1221 Avenue of the Americas, New York, New York 10020. Second-class postage paid at New York, New York 10001 and at additional mailing offices.

OFFICERS OF McGRAW-HILL PUBLICATIONS COMPANY: Gordon L. Jones, president; Paul F. McPherson, executive vice president; Gene W. Simpson, group vice president; senior vice presidents: Ralph Blackburn, circulation; John B. Hoglund, controller; Ralph R. Schulz, editorial; David G. Jensen, manufacturing; vice presidents: James E. Boddorf, planning and development; Edward E. Schirmer, marketing administration.

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ASSOCIATED SERVICES/McGraw-Hill Information Systems Co: Sweet's Catalog Files (Architectural, Engineering, Light Construction, Interior Design, Industrial Construction and Renovation, Plant Engineering Extension, Canadian Construction), Dodge Building Cost Services, Dodge Reports and Bulletins, Dodge/SCAN Microfilm Systems, Dodge Management Control Service, Dodge Construction Statistics, Dodge regional construction newspapers (Chicago, Denver, Los Angeles, San Francisco).

THIS ISSUE is published in national and separate editions. Additional pages of separate edition numbered or allowed for as follows: Western Section 32-1 through 32-4. POSTMASTER: PLEASE SEND FORM 3579 TO Fulfillment Manager, ARCHITECTURAL RECORD, P.O. Box 430, Hightstown, N.J. 08520.

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It's the newest addition to top-of-the-line architectural ceilings from the manufacturer with the top-of-the-line reputation. Highspire Travertone. The noncombustible mineral-fiber ceiling tile from Armstrong that provides a whole new dictionary of meanings for words like "quality" and "elegance."

Produced by an exclusive process that endows it with a deeper, richer textured surface, Highspire Travertone gives you the look of luxury any way you look at it. And it's available in 12" x 12" tiles as well as in 24" x 24" tegular-edged units that are installed in an exposed-grid system.

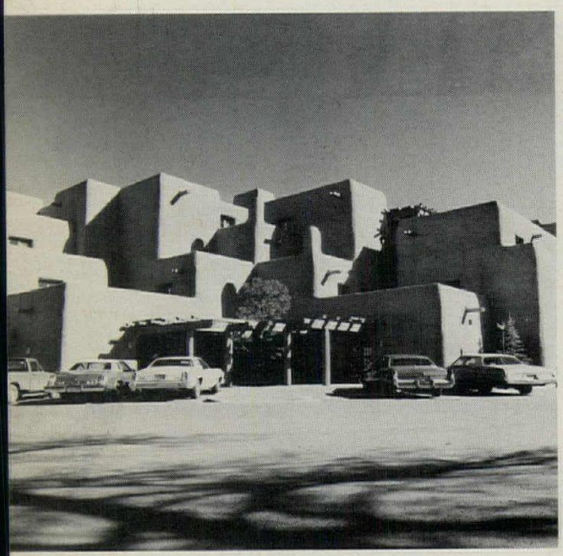
So when first class is the only way to go, Highspire Travertone could well be the only one you'll want to go with. To learn more, write Armstrong, 4207 Rock St., Lancaster, Pa. 17604.

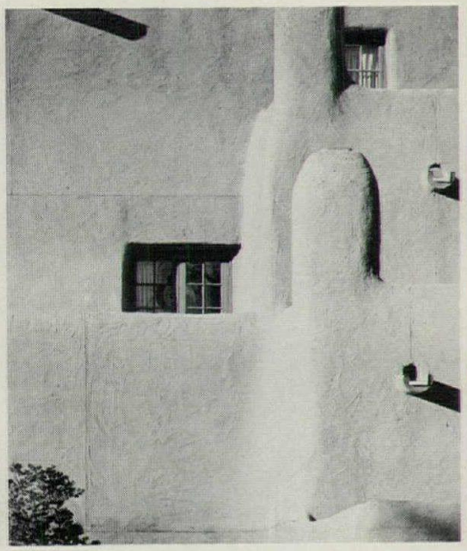
FROM THE INDOOR WORLD® OF

Armstrong

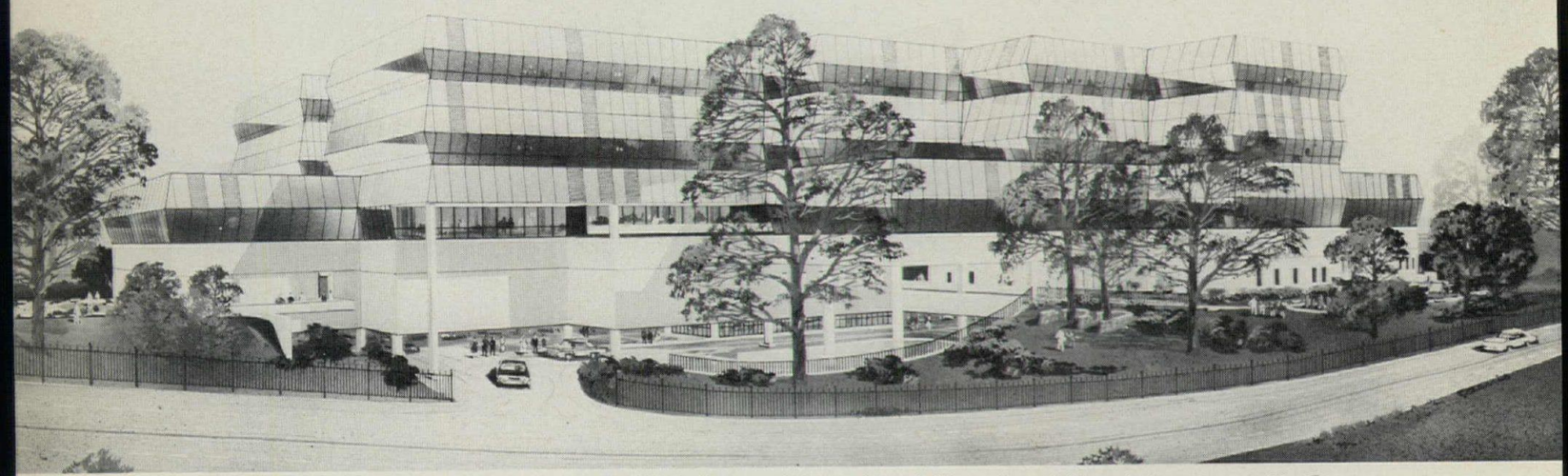
For more data, circle 3 on inquiry card

How Bell's Building Industry architectural integrity

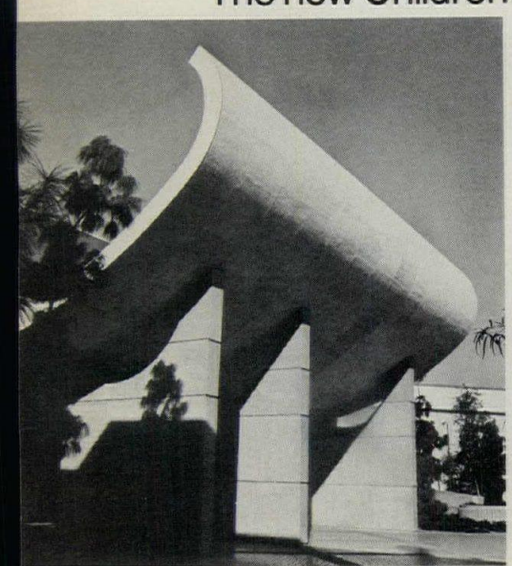


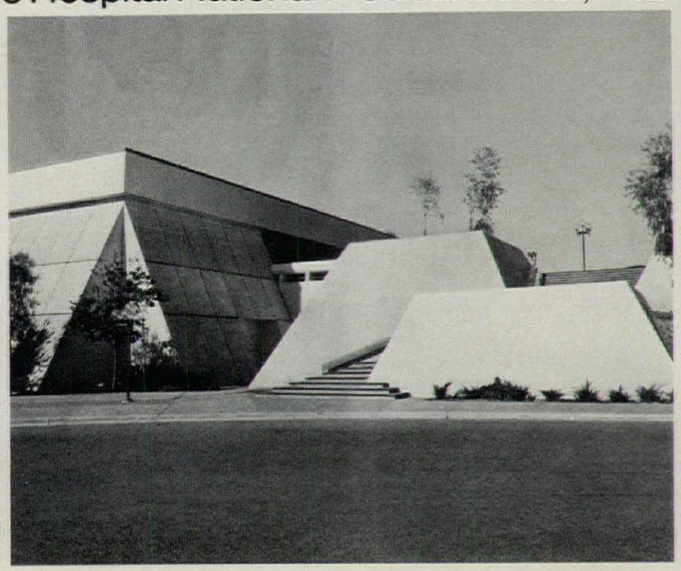


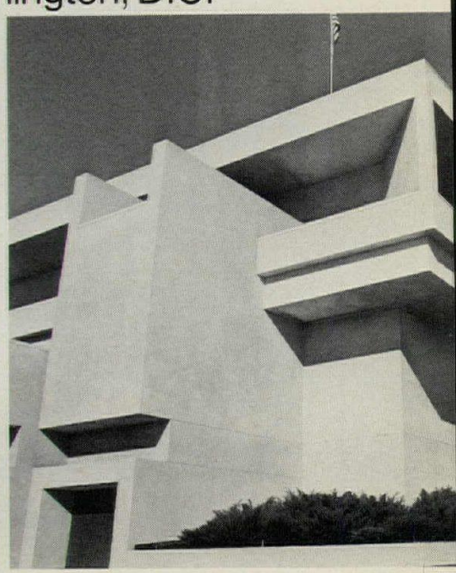
The Inn at Loretto, Santa Fe, New Mexico. A new Best Western hotel.



The new Children's Hospital National Medical Center, Washington, D.C.







The MetroCenter, Phoenix, Arizona. A new 312 acre Westcor shopping mall.

Consultants help you save and the budget.

When a Bell Building Industry Consultant sits down with you at the design concept stage, you may be saved redrawing, respecifying and even renovating a new structure.

At The Inn at Loretto, for instance, Roger Bybee, the hotel's consulting electrical engineer had this to say: "In working with Bell's Building Industry Consultants, we got away from the 'stock plan' approach to construction, and designed a system specifically tailored to the architectural concept of the project."

Noel E. Kroncke, administrator, Children's Hospital National Medical Center, and Leo A. Daly III, vice president of the architectural firm of Leo A. Daly, agreed: "The Building Industry Consultant provided Children's Hospital with a preplanned telecommunications capability that is as adaptable as the building itself. The system will accommodate whatever future needs hospital management can envision."

Alfred H. Fast, project architect for Westcor, assessing Bell's contribution to the MetroCenter shopping mall: "Because of the Building Industry Consultant, we're not going to face redundant situations—tearing up concrete or knocking down walls because adequate provisions weren't made in the initial stages."

In every case, the Bell team took total responsibility for communications design, installation, maintenance and repair. So before you begin your next project, call 201-221-4000 collect. And we'll put you in touch with the Building Industry Consultant in your area.

When you work with the Bell System, Bell is the only communications company you have to work with.

TOTAL RESPONSIBILITY

Bell System

VULCRAFT IS NOT AFRAID OF SCALING NEW HEIGHTS.

The job was the six-story Cities Service Building in Houston, Texas.

The plans called for a framing system using precast concrete beams and columns, plus steel joists.

But the plans changed. That's when Harvey Construction Company, the general contractor, asked Vulcraft to rise to the occasion.

The first thing Vulcraft did was assist in the redesign of the multi-story building to incorporate joist girders rather than precast concrete beams.

Once the redesign was completed, Vulcraft joist girders and steel joists gave Harvey Construction a number of advantages.

Both Vulcraft products were delivered quickly. On March 7, 1975, the approved drawings were given to Vulcraft. By March 14, the joists and joist girders had been delivered to the job site. All 329 tons of them.

At the job site, the joists and joist girders were easily erected, saving valuable time. In fact, they were all in place only one month and two days after they were brought to the site.

But time wasn't the only important thing saved. Money was saved too, because joist girders were less expensive than precast concrete beams.

That's how Vulcraft helped Harvey Construction make short work of a six-story building. And Vulcraft can help you do the same.

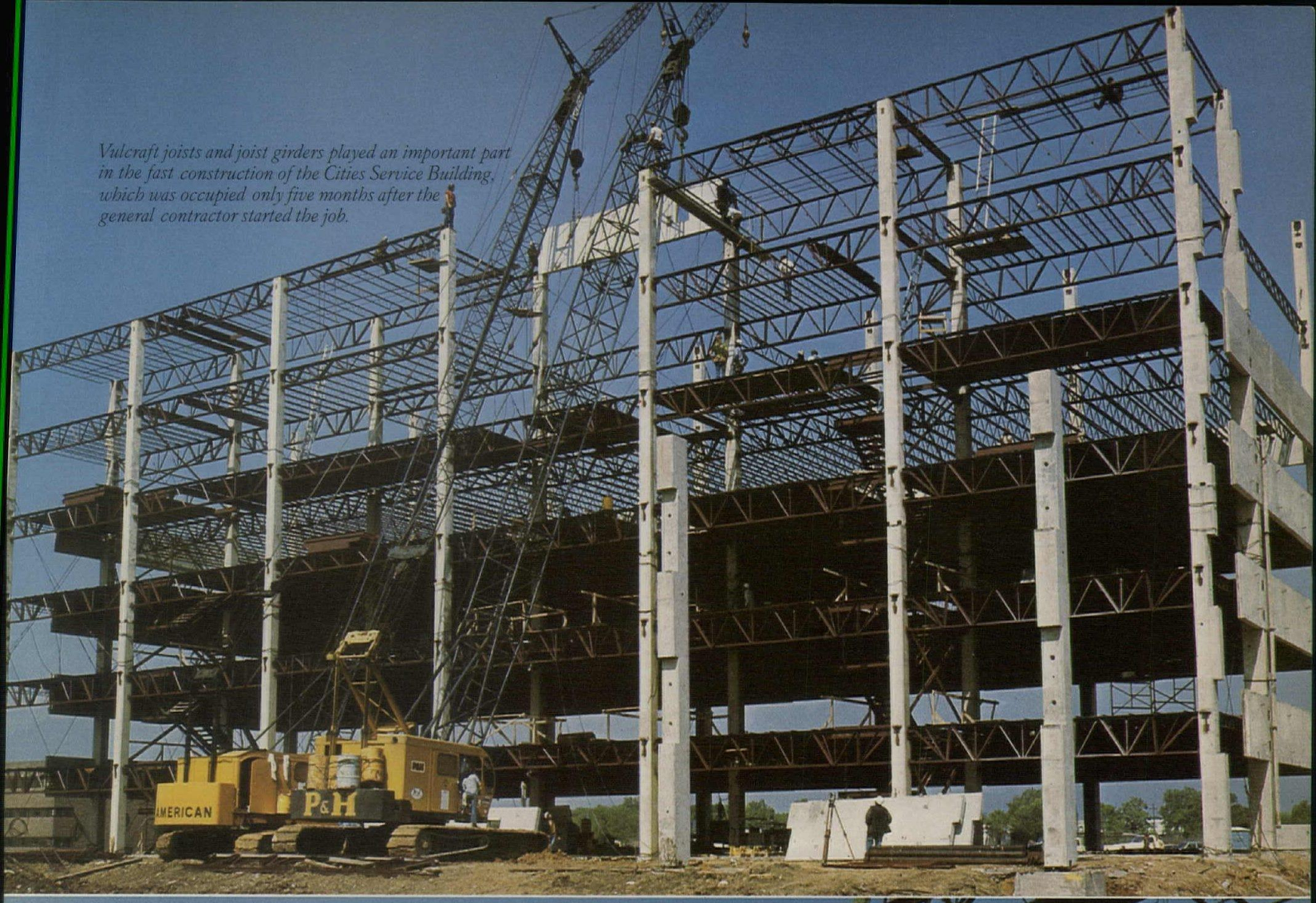
Just contact your local Vulcraft representative. Or write Vulcraft, P.O. Box 17656, Charlotte, North Carolina 28211 for your Joist & Joist Girder Guide. (See Sweet's 5.2/Vu.) Or call (704) 366-7000.

You'll find out we're not afraid of tackling tall orders.

VULCRAFT
A Division of Nucor Corporation

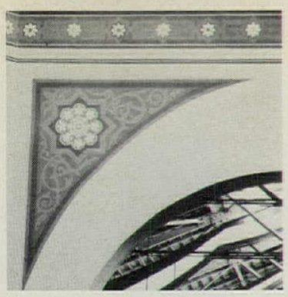
Building Owner: Gerald D. Hines Interests. General Contractor: Harvey Construction Company. Architect: Richard Fitzgerald & Associates. Consulting Engineers: Mitchell Systems and Krahl & Gaddy. Steel Fabricator: Nu Way Steel, Incorporated.

For more data, circle 4 on inquiry card



Vulcraft joists and joist girders played an important part in the fast construction of the Cities Service Building, which was occupied only five months after the general contractor started the job.

All Vulcraft joists and joist girders were erected easily and quickly. In fact, they were all in place only one month and two days after they were brought to the construction site.



Cover: Arts and Industries Museum
Smithsonian Institution, Washington, D.C.
Architect: Hugh Newell Jacobsen
Photographer: Robert C. Lautman

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instead of letting things happen

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From the Economics Department of McGraw-Hill Information Systems Company, the forecast for building is optimistic: the potential lies in apartment, commercial and industrial construction.

75 Building costs

The Dodge Building Cost Services introduces a new publication of commercial building component costs based on 500 new structures.

FEATURES

89 Evoking the spirit of 1876 for a display of Victoriana

The great but neglected Arts and Industries Building of the Smithsonian Institution has been renovated for the Bicentennial. It now holds a new exhibition of Victorian artifacts designed to give the experience of having lived 100 years ago. The architect in charge of the remodeling was Hugh Newell Jacobsen, who has successfully created a 19th century context for the show.

95 Planning the really-big suburban office building

At slightly over 3 million square feet, the United Services Automobile headquarters in San Antonio is larger than many noted urban skyscrapers. Designed by architects Benham-Blair & Affiliates, it shows one successful approach to planning that solves problems seemingly inherent in large horizontal buildings.

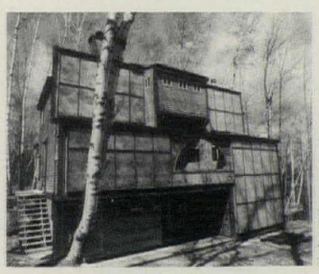
101 Pennzoil Place Houston, Texas

Central to the story of Pennzoil is not only the genius of Johnson/Burgee, but also the conviction of developer Gerald Hines that quality design and engineering can, despite somewhat higher front-end costs, be feasibly amortized by keener, quicker public response and, of course, signed leases.

111 Three solar houses

A number of factors are now making solar heating more interesting to residential architects and their clients.

112 Private residence in Vermont by Sunshine Design.



Robert Perron

114 Speculative house in New York by Raymond, Rado, Caddy & Bonington.

116 Kelbaugh residence, Princeton, New Jersey by Douglas Kelbaugh.

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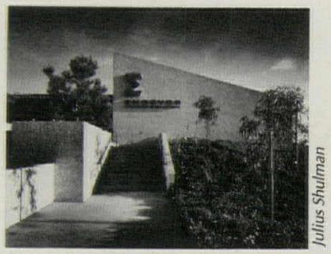
While there has been a noticeable rise in renovation of industrial facilities in recent years, there is renewed interest on the part of owners for all-new facilities. The collection of projects presented in this study represent some imaginative solutions to the problems that continually plague large manufacturing companies both in the United States and abroad.

119 Trio Industries, Inc. Shelton, Connecticut
Shreve Lamb & Harmon, architects.

122 Endevco Electronics Corporation San Juan Capistrano, California
William Kenneth Frizzell, consulting architect.



Julius Shulman

126 John Deere & Company Engine Works Waterloo, Iowa
Smith, Hinchmann & Grylls Associates, architects.

128 Radio Corporation of America Glass Plant
Circleville, Ohio
Haines Lundberg Waehler, architects.

130 Carlsberg Brewery Northampton, England
Knud Munk, architect.

ARCHITECTURAL ENGINEERING

133 Heat pump gets by with less energy by making ice summer and winter

A hybrid heat-pump system designed by engineer Robert G. Werden for a 60-bed VA nursing home in Wilmington, Delaware makes ice in an "energy bank" to reduce energy consumption and costs. The refrigeration system makes ice in winter to get heat when the outdoor air is too cold for an air-source heat pump. And it makes ice in summer at night for daytime air conditioning.

136 Community center is the largest solar heating/cooling installation

Over 10,000 square feet of solar collectors in a saw-tooth configuration on the roof of the Shenandoah Community Center will produce 90 per cent of the heat for the heating season, and 60 per cent of the cooling.

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NEXT MONTH IN RECORD

Building Types Study: The home towns come back
The December special issue of RECORD deals with one of America's most significant architectural subjects: towns and small cities across the country, having suffered from varying degrees of blight and neglect, are beginning to be rehabilitated. Consortiums of architects, mayors, bankers and businessmen are joining forces to rescue their home towns. Beyond esthetic considerations, these revitalizations are designed to arrest the flight of business and industry from older environments, and from the people who live in them.

Shakertown Panels win the cedar shake sidewall race.

What's the fastest way to install cedar shakes and shingles? With Shakertown Panels.

In fact, you can apply Shakertown Panels on sidewalls as much as 70% faster than individual shakes and shingles. But that's where the difference ends.

Because once they're in place, they look, last and insulate just like individual shakes and shingles. That's because 8 foot long Shakertown Panels are made of #1 grade shakes and shingles permanently bonded to a wood backing.

With Shakertown Panels you get all the things you like about individual shakes and shingles. Of course, there's one thing you won't get, and that's high labor cost. So why not find out more? Write us.

Shakertown® Panels

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On making things happen instead of letting things happen

I had the very good fortune to be in the audience for two very good and thoughtful speeches during the last month. One was by futurist Alvin Toffler, who spoke to a meeting of McGraw-Hill chief editors. The other was by Martin Friedman, president of Formica Corporation, at the Producers' Council annual convention in Phoenix.

From very different points of view both talks were about change—and what we ought to be doing about change.

Toffler, as readers of "Future Shock" will remember, sees change occurring not at the "accelerating rate," which is enough for all of us to worry about, but at a "surreal rate." He argues (and from a not-at-all-political point of view) that at least some of the systems on which the American way of life is based are not just troubled at the moment, but coming apart at the seams. Specifically, he asked us to consider whether our "life support systems"—like energy, welfare, cities, and health care—are not cracking. He pointed out that the world economy is oscillating far more wildly than it has in the past; that cynicism towards political systems is worldwide; and that in general almost all of our industrial systems (including the markets for building) seem more unpredictable than ever. He cited unstable markets (which of course anyone in construction knows about), rapid making and breaking of relationships (such as shorter-term labor contracts) and even an unstable rate of inflation. He argued too that the increasing demand for diversity—for example, the demand of blacks, and French Canadians, and Scots, and the Welsh, "to maintain their identities and still get a piece of the action"—is forcing on us more and more first-time-ever decisions; the establishment of policy for which there is no precedent. Conversely, the homogeneity which created "mass markets" and "mass attitudes" seems to be disappearing—and from the point of view of most industries that is perhaps the most difficult change of all. His point is as basic as this: There is no longer, for example, The American Way of Life—there are lots of American Ways of Life.

One example he chose to illustrate his "surreal change" bears directly on housing and indirectly on quite a lot of architecture: the changing family structure. He pointed out that one of seven children today is being raised in a one-parent household; and that the "traditional American family" now co-exists with communal families, childless families, a great many one-child families, unmarried couples—all of which need housing that wants to be different from the mass single-family house market that made the housing industry after The Big War and has been aided by subsidies and income-tax advantage ever since. Question: Can the industry tool up to serve such a diverse market not just to its advantage, but to the advantage of those "new model" families?

In his talk, again made from an entirely different point of view, Martin Friedman also talked about the acceleration of change—and asked the assembled manufacturers serving the industry why they didn't get on with trying to "make it happen, rather than let it happen."

Said Friedman: "[Our problem] is now to strive to maintain and improve the standard of living for an already sophisticated and affluent society; while at the same time we face new restrictions—energy, raw material shortages and their spiraling costs, land use, pollution and environmental impact—and cope with challenges that we've never faced so clearly before." (As Toffler said: "first-time-ever decisions . . . and establishment of policy for which there is no precedent.")

Some of the challenges: "The American public today is dissatisfied with the building industry—with all business for that matter. It's proven time and time again in polls. . . .

"I believe," Mr. Friedman said, "that the building industry has the creativity, the boldness, and the ability to innovate and satisfy the demands of our expectant and skeptical public. But we must begin to turn our abilities on. . . . Conventional wisdom will no longer suffice; we must question everything . . .

"We cannot wait around for government to come to grips with the crises of energy, of land use, of water supply and pollution controls. . . . What is needed for the building industry and our total economy is a rebirth of the inventive and pioneering spirit. . . . Nothing just happens, people make things happen. . . . Construction represents 12 to 15 per cent of the nation's total gross national product—and with such a major portion, we can if we work together direct the destiny of our industry."

And *that* would be a change worth fighting and working for. —*Walter F. Wagner, Jr.*

What's a glass building doing where it's hot enough to grow oranges?

Squeezing air conditioning costs.

Independent Square rises 37 stories into the heat of the Florida sky. Yet, behind the six acres of glass that skin its surface, people work comfortably—oblivious to the temperatures outside.

The glass that helps make it possible is our coated LOF Vari-Tran® in Thermopane® insulating units. It affords a breathtaking view, while keeping air conditioning costs well within sight.

In fact, the owners of all-electric Independent Square found that Vari-Tran added up to a yearly energy savings of 2,880,925 kilowatt-hours, or $47,000, when compared with ordinary ¼" clear glass and light drapes. They also discovered they could reduce the capacity of the heating and cooling plant in their original plans by 590 tons.

Looking at it another way, this fenestration with a 70% vision area of 1-108 Vari-Tran compared well with a fenestration using 30% clear glass with a balance of insulated spandrel.

If you'd like to make a comparison, contact an LOF architectural representative. He'll put our computers to work on a spec sheet for your building. For more detailed information on LOF glass products, refer to LOF's Sweet's Catalog—"Glass for Construction."

Or, write Marty Wenzler at Libbey-Owens-Ford Company, 811 Madison Avenue, Toledo, Ohio 43695.

Owner: The Independent Life and Accident Insurance Company
Architects: Kemp, Bunch & Jackson Architects, Inc.
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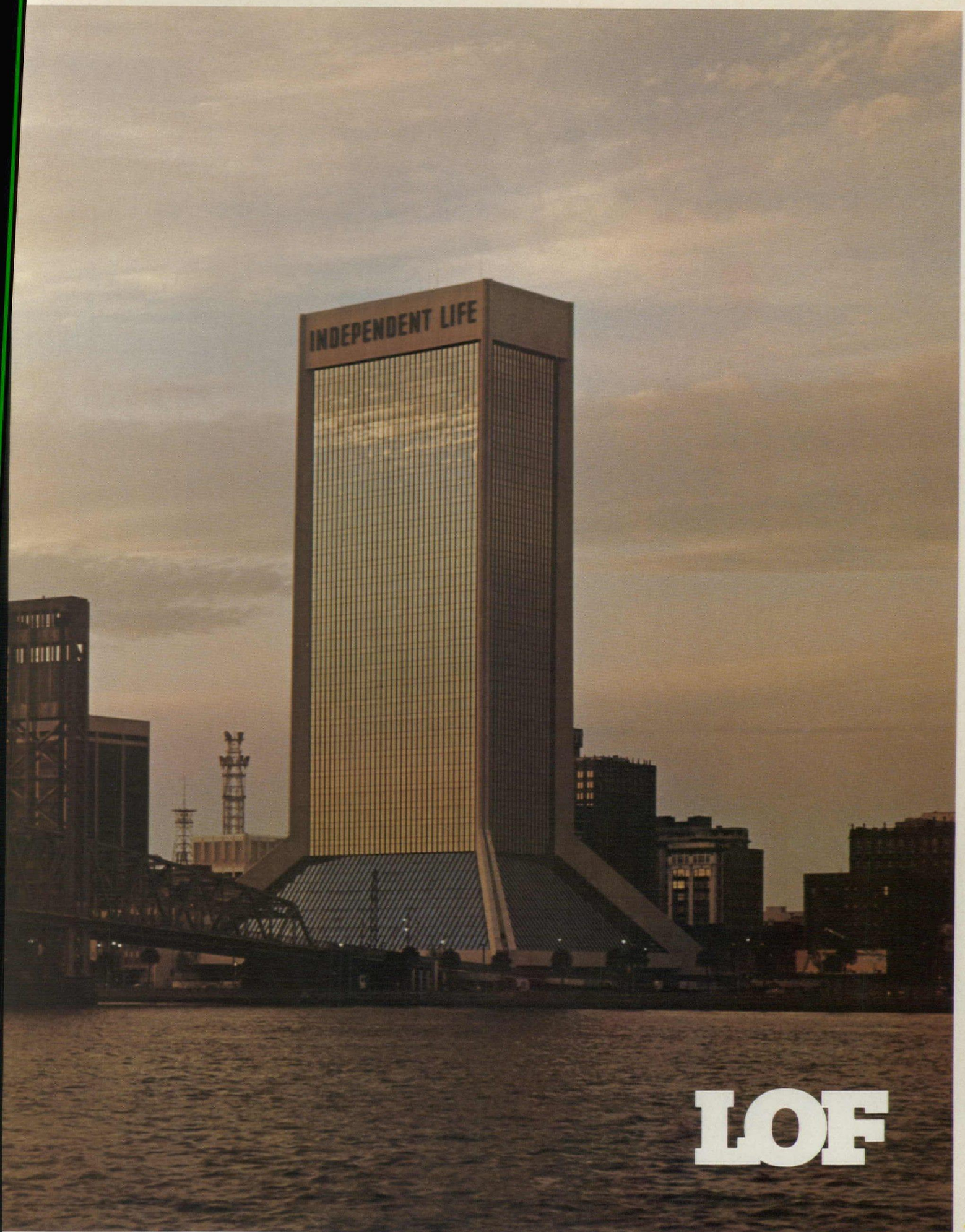

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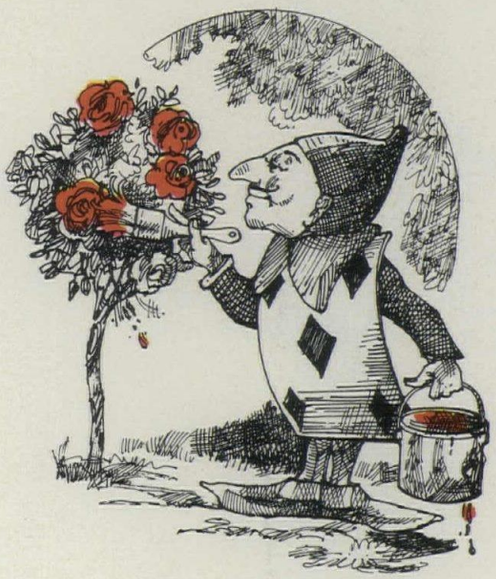
A Touch of Wonderland for the Basic Building

Tight Money Breeds Tough Customers

Designing buildings that will sell is no tea party these days. Americans take a hard... cost conscious... look at every detail you incorporate. But that doesn't mean your specifications have to be as plain as a rabbit hole.



A Little Beauty Goes a Long Way

Salesmen probably tell you a dozen times a day that their items will make your designs sell like hot cakes. On and on, they paint their roses red. But just consider this: Legacy doors work for you in *every* room of the structure. Its rich, deep-embossed grain on hardboard so delights the eyes and hands that few people can walk by one without running a hand over its surface.

Of Course It Has to Last and Last

You'd be mad as a hatter if you chose doors that just looked good but couldn't take the abuse of day to day use. No worries; Legacy is tough. It's 50% again as dense as natural wood and is prefinished with a highly stain and mar resistant coating. Legacy looks good a long long time. Maybe forever.

All of Which Means Legacy Stands Alone

Oak-tone

Walnut-tone

It was true when we first introduced Legacy; it's still true today. Oak-tone or walnut-tone, Legacy's deep embossed grain is unmatched. Priced well below solid real wood doors and just a bit above lauan and unfinished birch, Legacy puts a touch of Wonderland into every room at a cost that will make both you and your clients smile like Cheshire cats.

For the names of quality door manufacturers using Legacy write: Masonite Corporation, 29 North Wacker Drive, Chicago, Illinois 60606. Or consult your Sweet's 1976 File.

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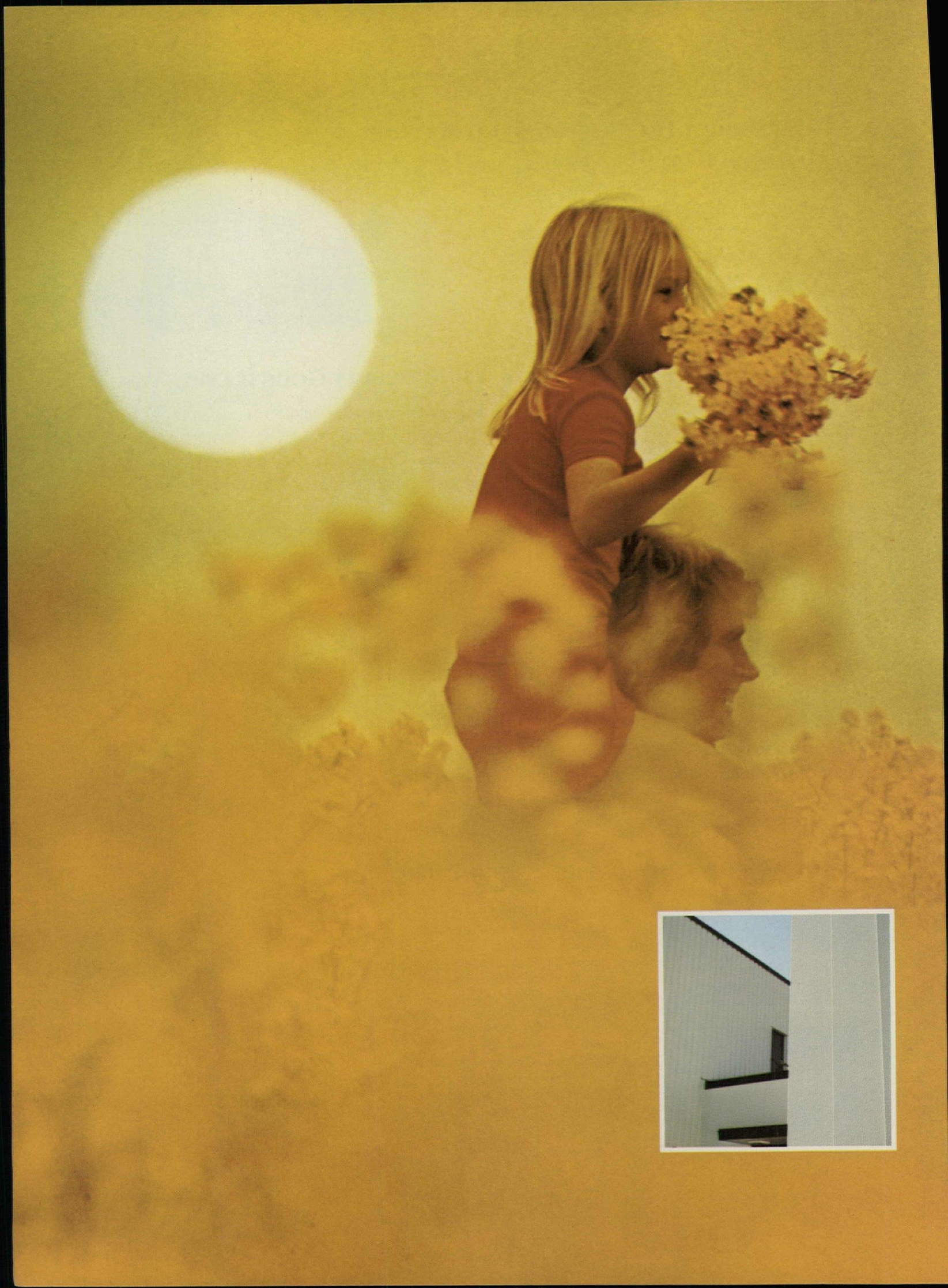

Will your statement endure until she's old enough to appreciate it?

The architect works with time and nature to take space and create a building where generations can live and work in harmony with their environment.

During the past ten years, Fluropon® has made a major contribution to architectural design. Fluropon* is the leading Kynar 500® fluorocarbon coating formulated full-strength to assure maximum longevity of the metal panel finish.

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But beyond the practical benefits, a beautiful work can make an enduring statement for the architect himself: here is a place where men and women want to live their lives.

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Write for complete information on Fluropon Architectural Coating, including technical product specifications, colors and uses.

*Fluropon meets Pennwalt license requiring 70% Kynar 500, Pennwalt's registered trademark for its polyvinylidene fluoride resin.

Fluropon®: The full-strength fluorocarbon finish for architects who want to make an enduring statement.

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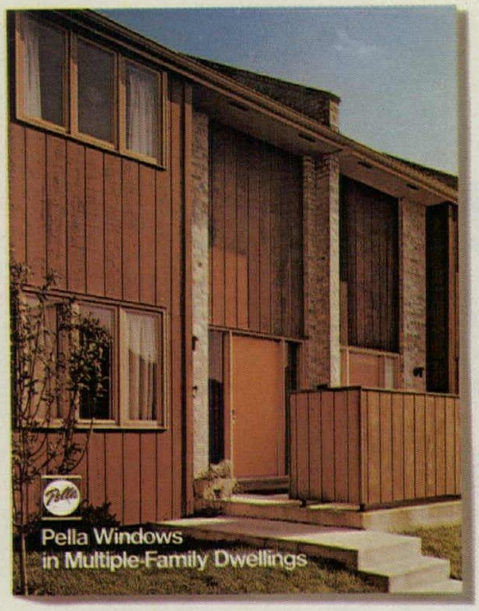
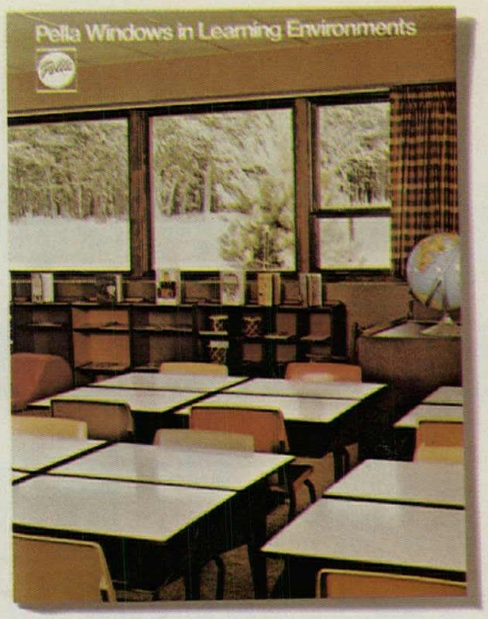
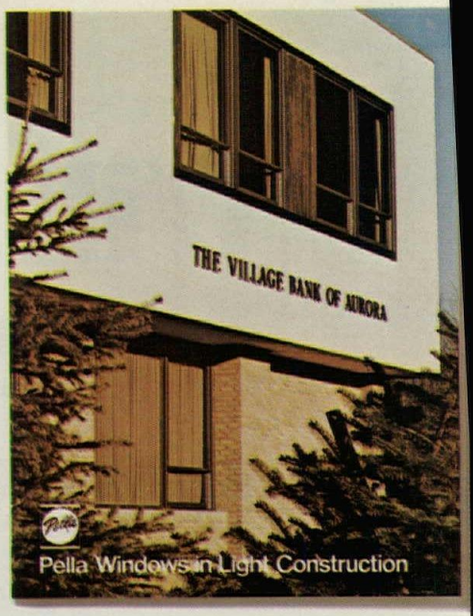


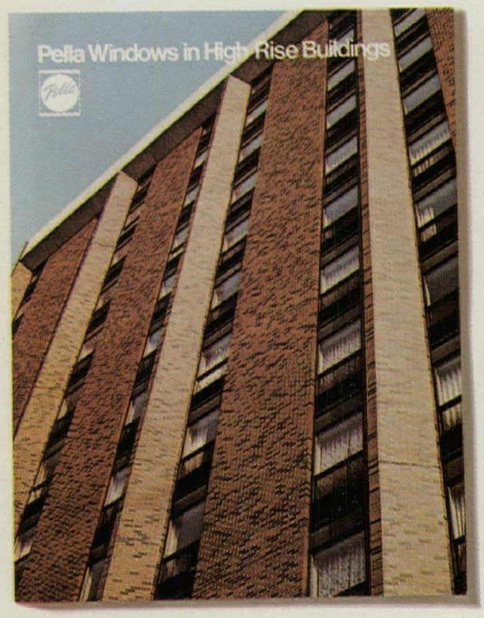
Multiple-Family Dwellings — Pella Wood Windows can help give apartments and condominiums a non-commercial feeling.



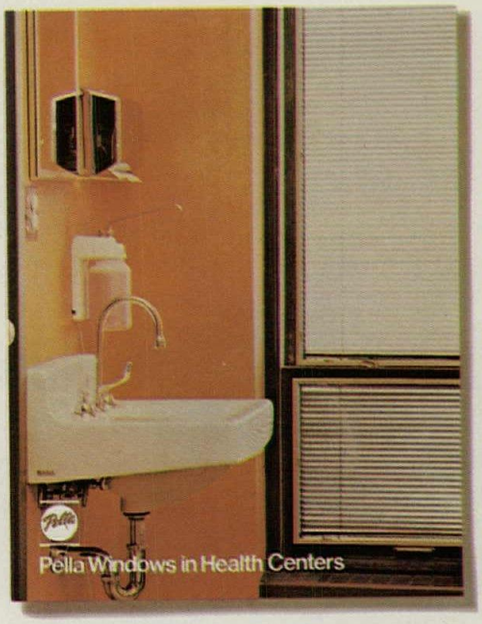
Learning Environments — shows how Pella Windows are being used to create the kind of warm, home-like environments students prefer.



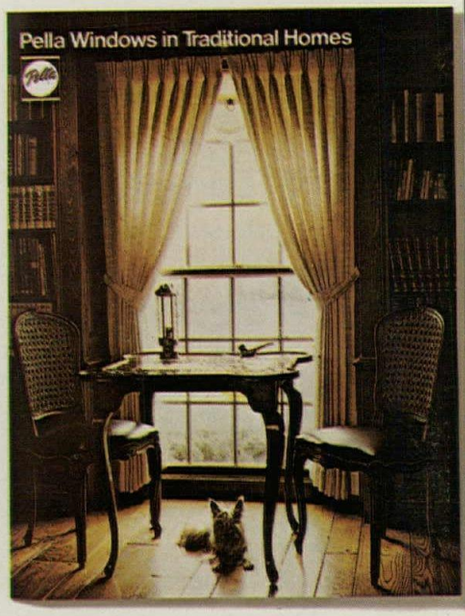
Light Construction — illustrates how Pella Windows and Sliding Glass Doors contribute to the architectural theme of a variety of building styles.



High-Rise Buildings — Pella Clad Windows combine the beauty of wood inside, with the low maintenance of aluminum outside.



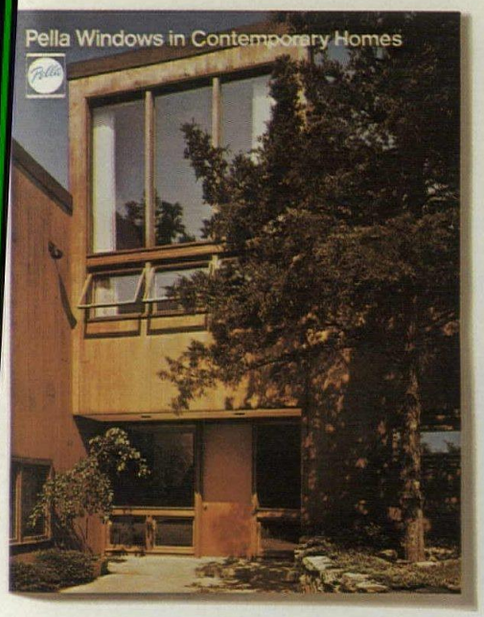
Health Centers—Pella Windows help health centers, hospitals, and homes for senior citizens project a feeling of comfort and security.



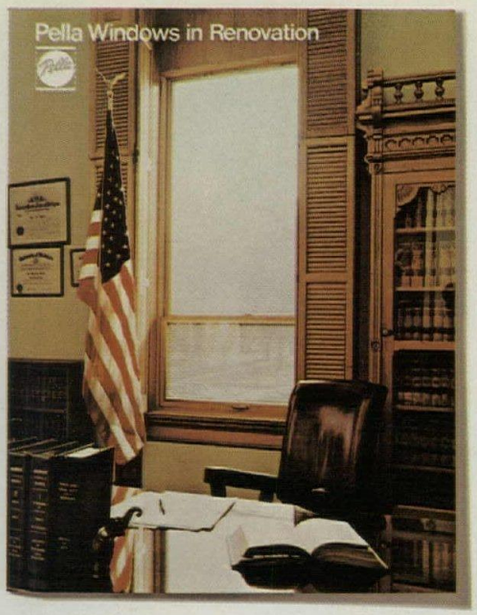
Traditional Homes — Pella takes a close look at the types of windows best suited to the traditional home.

If it involves windows and doors Pella has written the book.

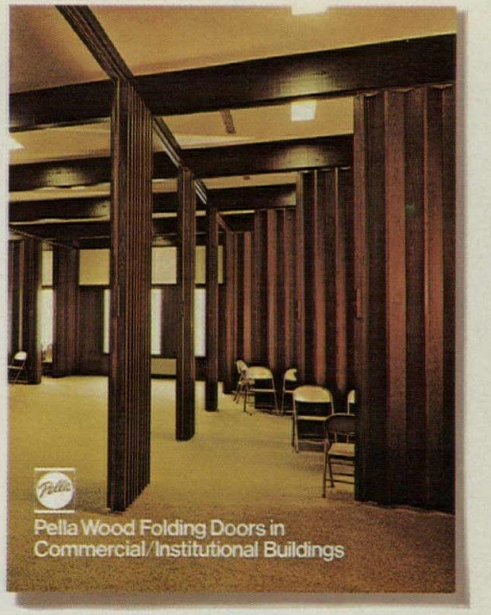
Free for the asking.



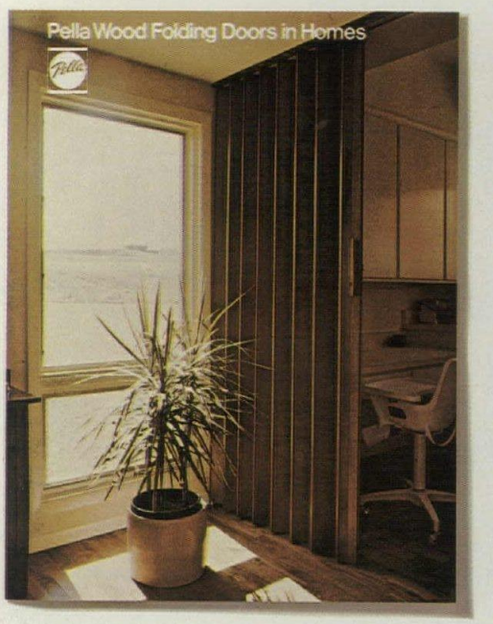
Contemporary Homes — shows how our window styles work equally well with a wide array of contemporary architectural designs.



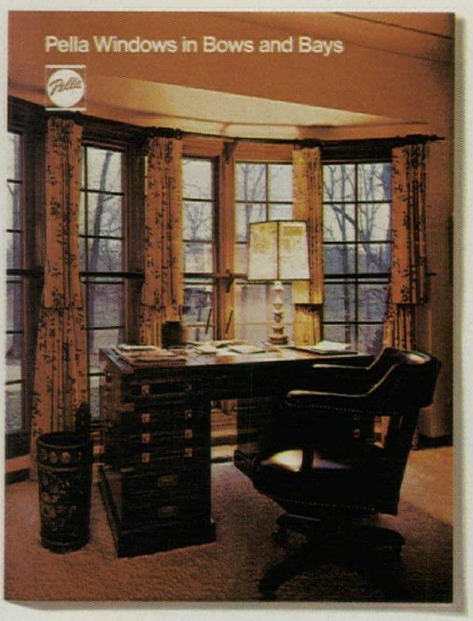
Commercial Renovation — Pella Windows can help preserve the original character and dignity of elderly court houses, hospitals, office buildings.



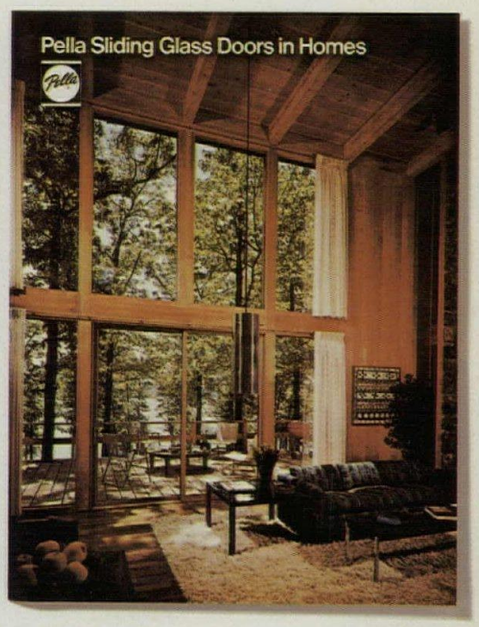
Folding Doors in Commercial/Institutional Buildings — attractive, functional, durable... Pella Folding Doors close off or divide space beautifully.



Folding Doors in Homes — use Pella Wood Folding Doors and save the cost of dropped headers and stub walls on your next project.



Bows and Bays — these arrangements are an important architectural element. This brochure contains a good selection of classic examples.



Pella Sliding Glass Doors in Homes — provide the drama of floor-to-ceiling glass along with weathertightness and smooth operation.

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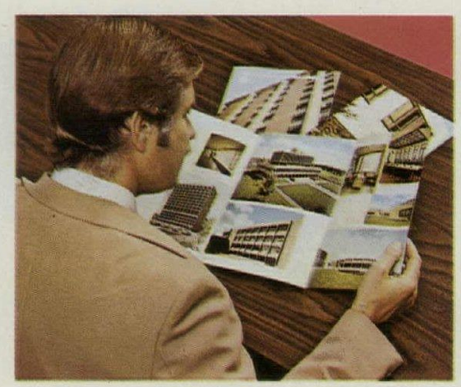

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This is an industry breakthrough.

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It's a roof insulation board never before available. One with all the advantages of urethane: thin profile, lightweight, ease of handling, meeting all of today's more exacting requirements for insulating values. And with a Class 1 fire rating.

Celotex Thermax® Roof Insulation. It is a strong, lightweight roof insulation board with a foam core (reinforced with glass fibers) sandwiched between two asphalt-saturated asbestos facer felts.

It gives you the high insulation values of urethane, plus fire rating, without requiring a second product like perlite, foam glass or fibrous glass between it and a steel deck.

Superior insulating efficiency. 1.2 inches - thick Thermax Roof Insulation boards give approximately the same insulation value as 3 inches of cellular glass, 2½ inches of perlite or 1⅝ inches of fibrous glass. Because of this insulating efficiency, Celotex recommends Thermax Roof Insulation be applied in single thickness.

Lightweight. Compared with other FM-rated roof insulating materials providing the same insulation value, Thermax boards are 3 to 6 times lighter. That's up to 75% less deadload factor. The advantages are obvious: you can reduce the size and gauge of roof supports, have greater flexibility in choosing heating and air-conditioning equipment, reduce the size of metal or wood facia around roof perimeters. And still have that Class I fire rating.

Are there any disadvantages? No. It does not cost any more, it is easy to cut and handle, gives more footage per truckload, uses less warehouse space and requires less handling.

We started out by saying we had an industry breakthrough. We'd like to prove it to you. Contact your local Celotex sales representative, or call John Hasselbach direct: Commercial Roofing Department, The Celotex Corporation, Tampa, Florida 33622.

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Today's architects are meeting new challenges in the international market. They need architectural building components from a company that knows that market.

Because experience counts.

And Kawneer has vast experience in the international market. Look over the partial list of world installations in this ad to get an idea of how much experience we have.

In fact, wherever you go in the world, you will find Kawneer curtain wall systems, entrances, windows and facings.

And for good reason. At Kawneer, we've had over 70 years of experience designing and manufacturing architectural products. So we've refined and improved our products to achieve an unparalleled level of standardization. That means standardized components, plans and materials wherever in the world you're building. That's what it takes to meet international specifications. For maximum ease of installation and operation without unnecessary complications.

Each of Kawneer's worldwide manufacturing plants — not offices — is a fully integrated operation with extrusion, anodizing and fabricating capabilities.

We employ 3500 people in our 10 worldwide manufacturing plants, with 2,500,000 square feet (23,000 sq. meters) of manufacturing and warehouse space to process 80,000,000 lbs. (36,287,761 Kilograms) of aluminum every year. So Kawneer can provide on-time delivery of all components to the job site.

When you're building anywhere in the world, don't let little details become big headaches.

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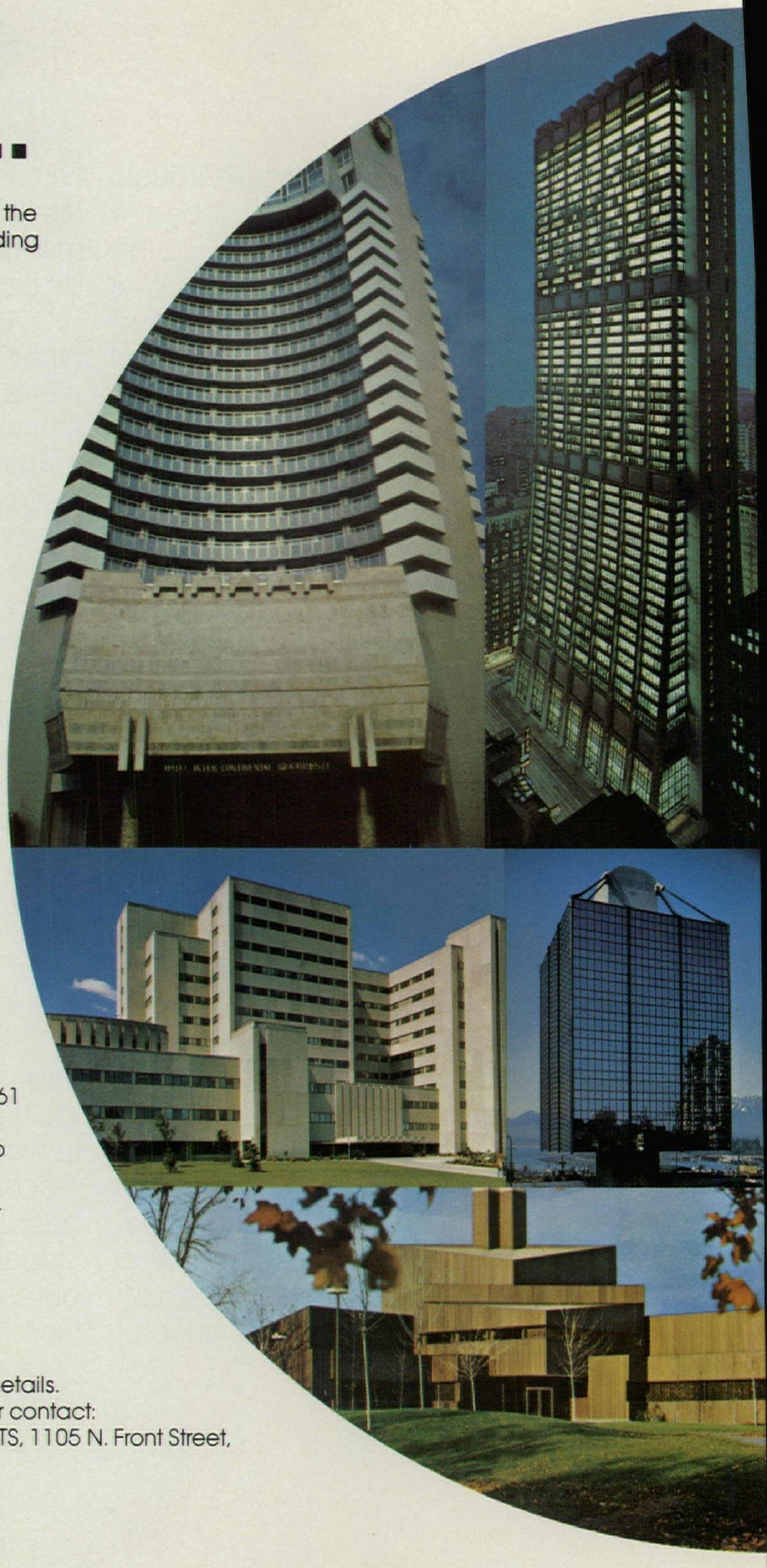

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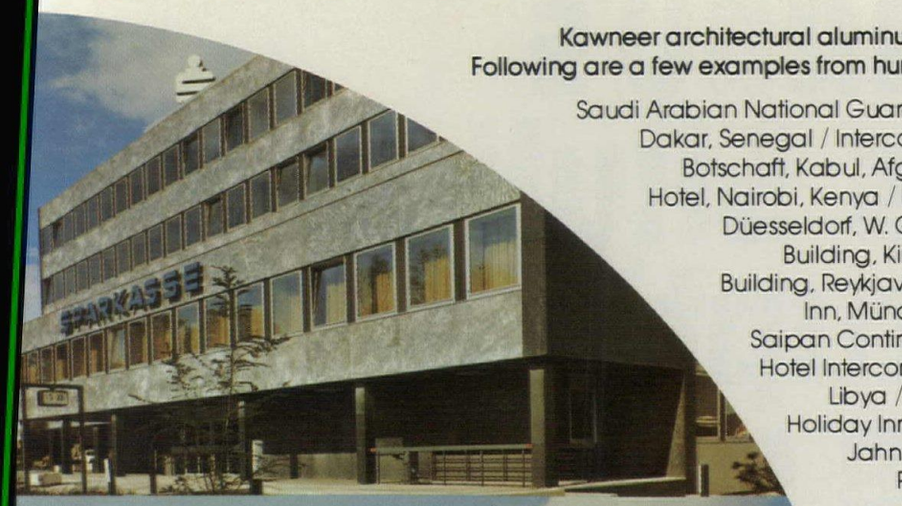

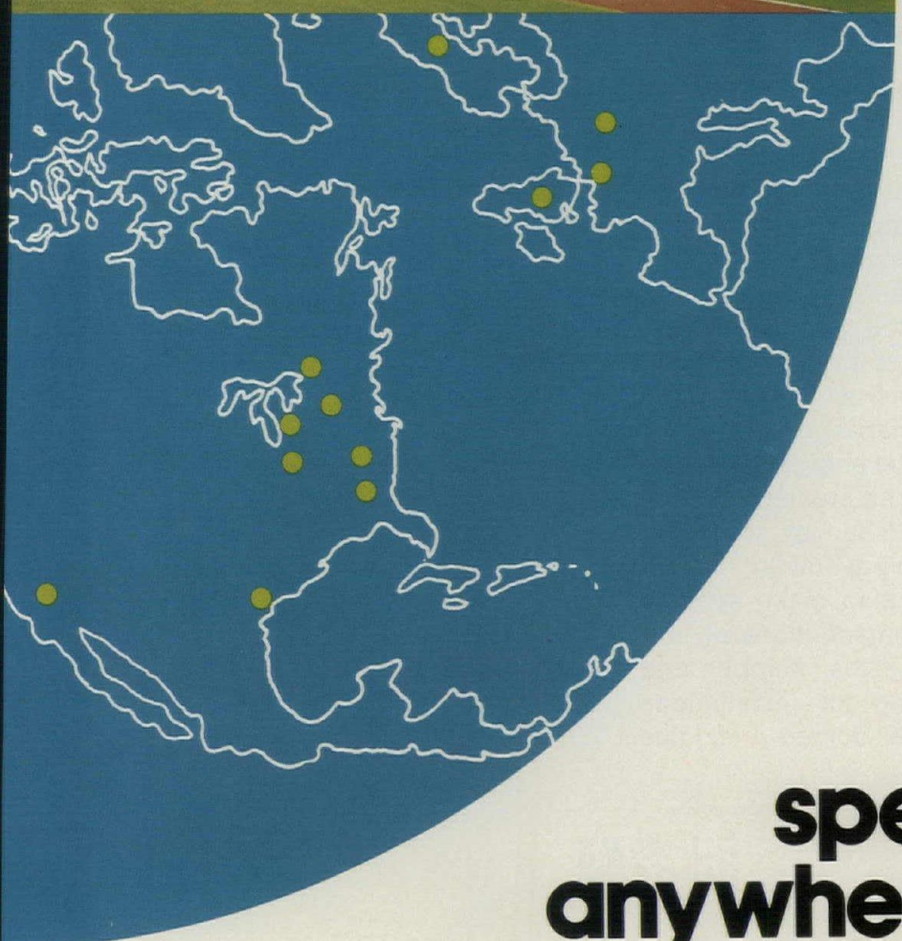

Kawneer architectural aluminum products are found in installations all over the world. Following are a few examples from hundreds of buildings where Kawneer products are used.

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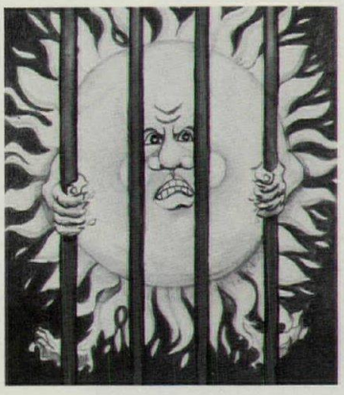
A Plexiglas skylight can be your connection to the world's largest free source of energy. Naturally and beautifully!



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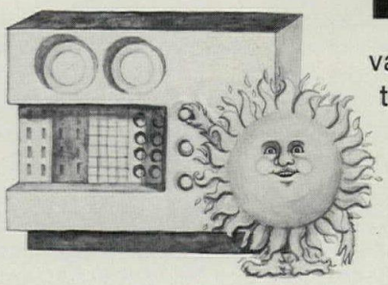

of Plexiglas brand acrylic plastic are effective energy savers. We now offer you proof that your Plexiglas skylight can both provide and conserve energy.

With our new SUN (Skylight Utilization Network) computer program, we'll evaluate all the energy variables associated with the domed Plexiglas skylight installations you have in the planning stage right now—then provide you with a free technical analysis of the energy advantages of each installation.

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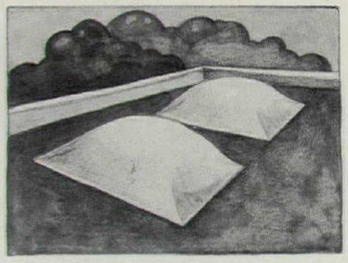

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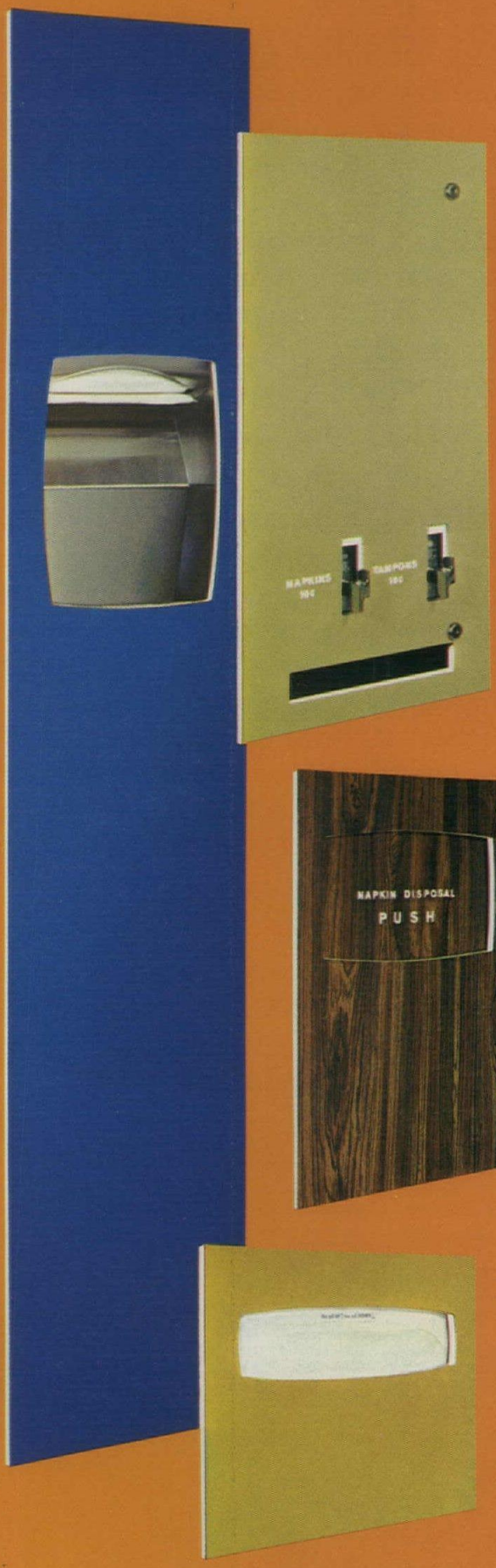

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Bobrick combines its quality stainless steel washroom accessory cabinets with heavy duty laminated plastic doors... in a wide choice of colors and wood grains. The result is bold color and clean functional styling... to create a new look for today's washroom.

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Today's demands for energy conservation pose a tough problem in engineering building temperature control systems. On one hand, building owners want low first costs and low energy bills. On the other hand, building occupants want – and deserve – a comfortable working environment. Is there a way to meet both demands?

Honeywell has a happy and practical answer to this dilemma. It's called Limited Control Range. LCR, for short. This unique control concept is built into a line of pneumatic thermostats designed to meet Department of Defense energy limitation requirements. They can be used on virtually any type of mechanical system.

Most importantly, LCR thermostats help save energy without really sacrificing comfort.

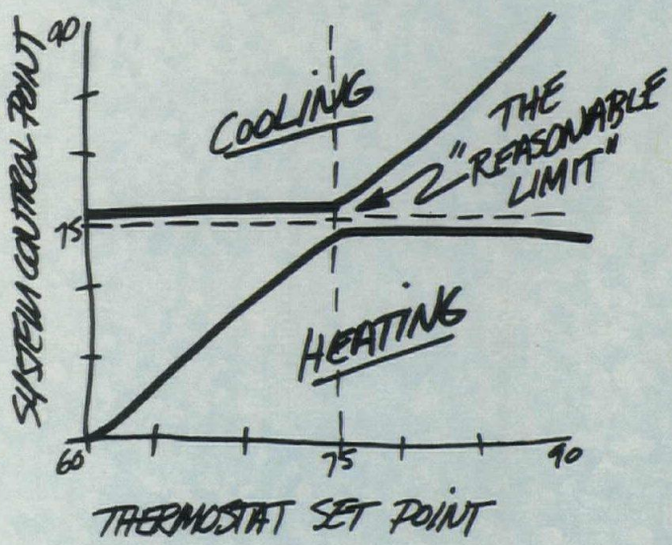
The people problem: Miss Frost and Mr. Burns.

The LCR concept recognizes and effectively controls a major cause of building energy waste: the habits of people. All too often, people overreact to feelings of coolness or warmth that may be only temporary or even psychological. An unhappy Miss Frost feels "chilly" and turns her thermostat up to 78° for a quick increase in warmth. A busy Mr. Burns feels "hot under the collar" and cranks his thermostat down to 68° for hurry-up cooling. Both have gone to extremes they may want to correct later. All over the building, all during the year, such unnecessary temperature demands overload the heating and cooling system. And energy costs soar.

The answer: some reasonable limits.

Simply stated, LCR thermostats limit the temperature control point for heating or cooling, or both, within a reasonable, comfortable range. The dial has no frustrating mechanical stops, but turning it beyond the control limit merely effects a benevolent deception.

It's a good business to run a fine-tuned building.



As you can see from the diagram, an LCR thermostat with an upper limit of 75° during the heating season will not demand heat beyond that space temperature. No matter how high Miss Frost cranks the dial. Similarly, during the cooling season, an LCR stat limited to a low of 75° will not demand cooling below that point, even though Mr. Burns sets it lower.

Eliminating the "fiddle factor" brings important benefits.

By controlling needless temperature demands, LCR minimizes load peaks, helps keep energy use stable. It allows virtually any HVAC system to operate at more energy-efficient levels. And, as energy rates rise, real dollar savings will rise with them.

Skeptical? Get the facts.

Energy savings and comfortable temperatures. That's a big claim for our exclusive LCR thermostats, and we don't expect you to buy it out of hand. But we've got the details, facts and figures to prove it. To get them – fast – just look up your local Honeywell comfort controls specialist in the phone book. His number's in the white pages under "Honeywell Commercial Division." He's there to help you. Call him now.

Honeywell

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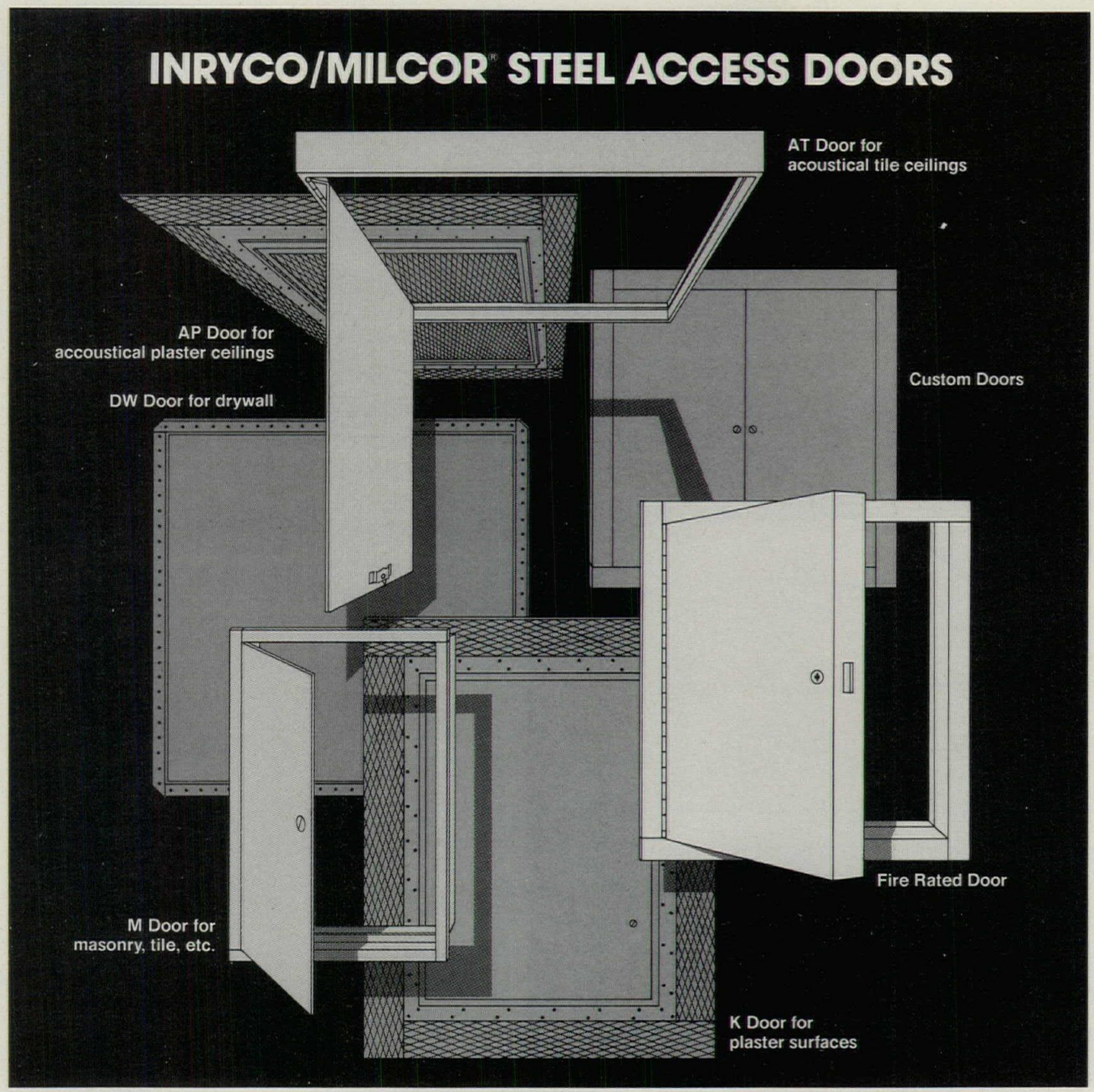

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Inryco/Milcor Steel Access Doors for walls and ceilings provide service openings in any type of surface without encroaching upon design. They are carefully made, rigidly constructed, durable and dependable.

Our offering includes: fire rated doors, in sizes up to 48" x 48", to help you meet code requirements... ceiling doors which, when covered with acoustical tile or plaster, contribute to sound control... flush panel doors, in styles for plaster, drywall and masonry, which can be finished to blend inconspicuously with the surrounding surface.

There are 58 standard units to choose from—most of them readily available at one of our nationwide stocking locations near you. And each year we produce thousands of doors in non-standard sizes and modified designs to satisfy special needs.

For complete information, see Sweet's, section 8.12/Inr. Or write for catalog 33-1 to: Milcor Division; INRYCO, Inc.; Dept. L, 4033 West Burnham Street; Box 393; Milwaukee, Wisconsin 53201.

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ENERGY-SAVING WINDOWS: CASE STUDY

St. Paul Public Library Renovation
Architect: Glenn Erickson, City Architect
Windows: DeVAC dual-glazed Thermo-Barrier
U Value: .52
Air Infiltration: One-fifth of Standards

Window replacement improves aesthetics...more than pays for itself, reducing steam usage 40%

Windows were causing problems in this 60 year old classic downtown St. Paul, Mn. building: frost melting to damage walls and books; drafts and windblown dust coming through; unsightliness of deteriorating paint and putty; excessive cost of potential air conditioning.

New DeVAC windows retained the style of the original with muntins and curved tops custom fabricated. Installation was made during the winter while the library was in full use, with little or no discomfort.

Here are some of the energy-saving results:

- Steam usage cut 40% over comparable heating seasons (resulting in 19% dollar savings despite 35% steam cost increases)
- Needed air conditioning equipment tonnage reduced 37.5% resulting in immediate purchase savings plus sizable annual operational savings. Installation starting May, 1976.
- Humidifiers ran 60% of the time. Probably won't run at all this season.

Other cost-reducing benefits include elimination of painting, easier window washing, reduced interior maintenance and cleaning needs, improved employee comfort and efficiency. All DeVAC windows can be washed automatically.

Required costly maintenance; old windows inefficient. Wide muntins cut visibility.

DeVAC installation has permanent color, clean lines, low .52 U value and low air infiltration.

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DeVAC®

Get Details
Complete case study and DeVAC energy-saving story available with return of coupon

CASE STUDY: DeVAC WINDOWS

DeVAC, Inc., 10074 Highway 55, Minneapolis, MN 55441 Phone: (612)542-3400

I'd like the details on this St. Paul Public Library project and to know more about the energy-saving potentials of DeVAC Windows for:

☐ Modernization ☐ New construction

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Forma2Wall is now available in infinitely variable modules up to 60 inches wide in painted or anodized aluminum and up to 48 inches wide in painted or stainless steel. It spans up to 16 feet without subframing. Aerospace technology makes possible its honeycomb core, stressed skin design and the absolute quality control of its consistently flat, totally smooth appearance. There is no oil canning or rippling in Forma2Wall. Design freedom and final appearance is enhanced by recessed joinery free of surface seals. ICBO approval permits use in noncombustible construction.

Get the whole story, write:
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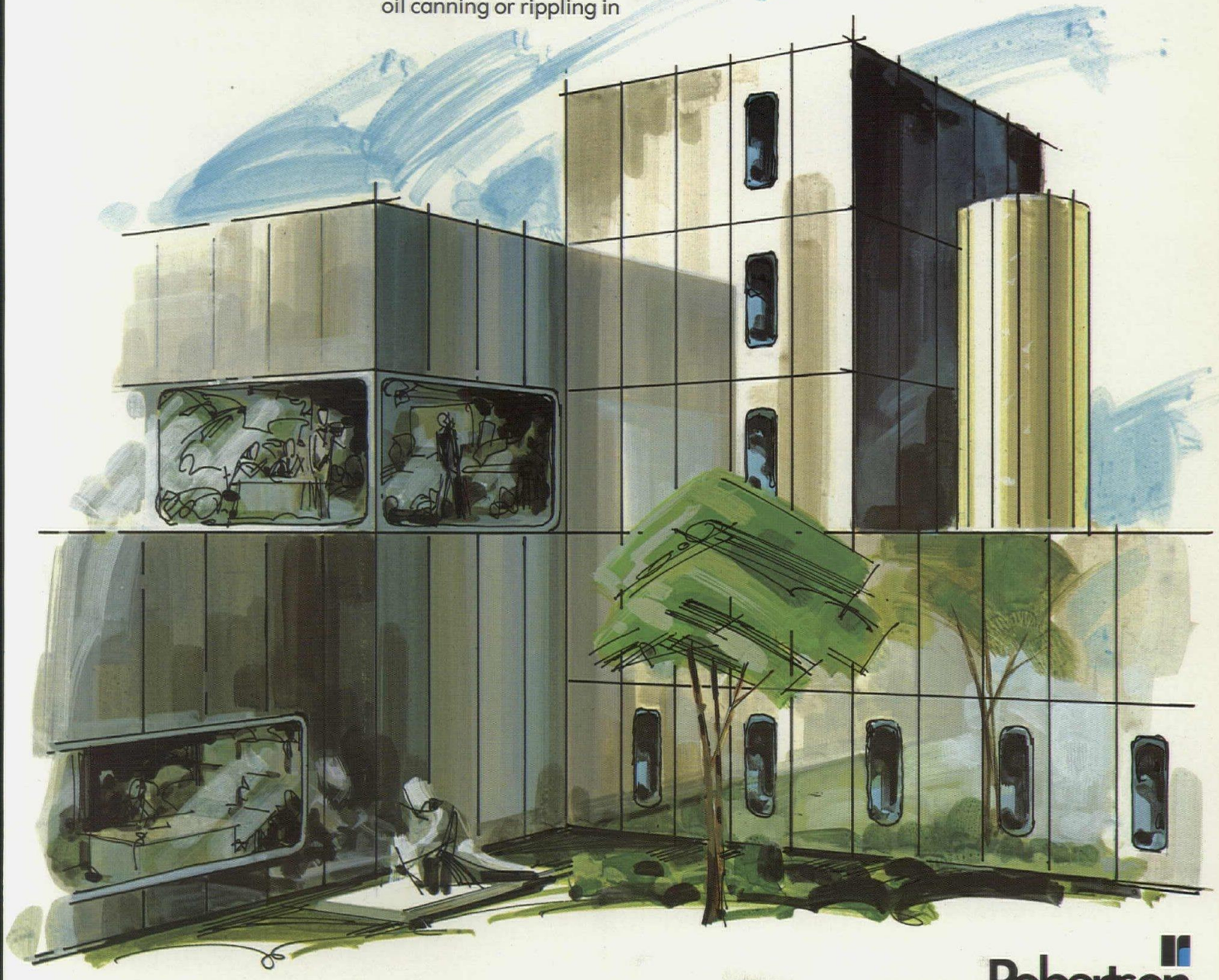

Robertson

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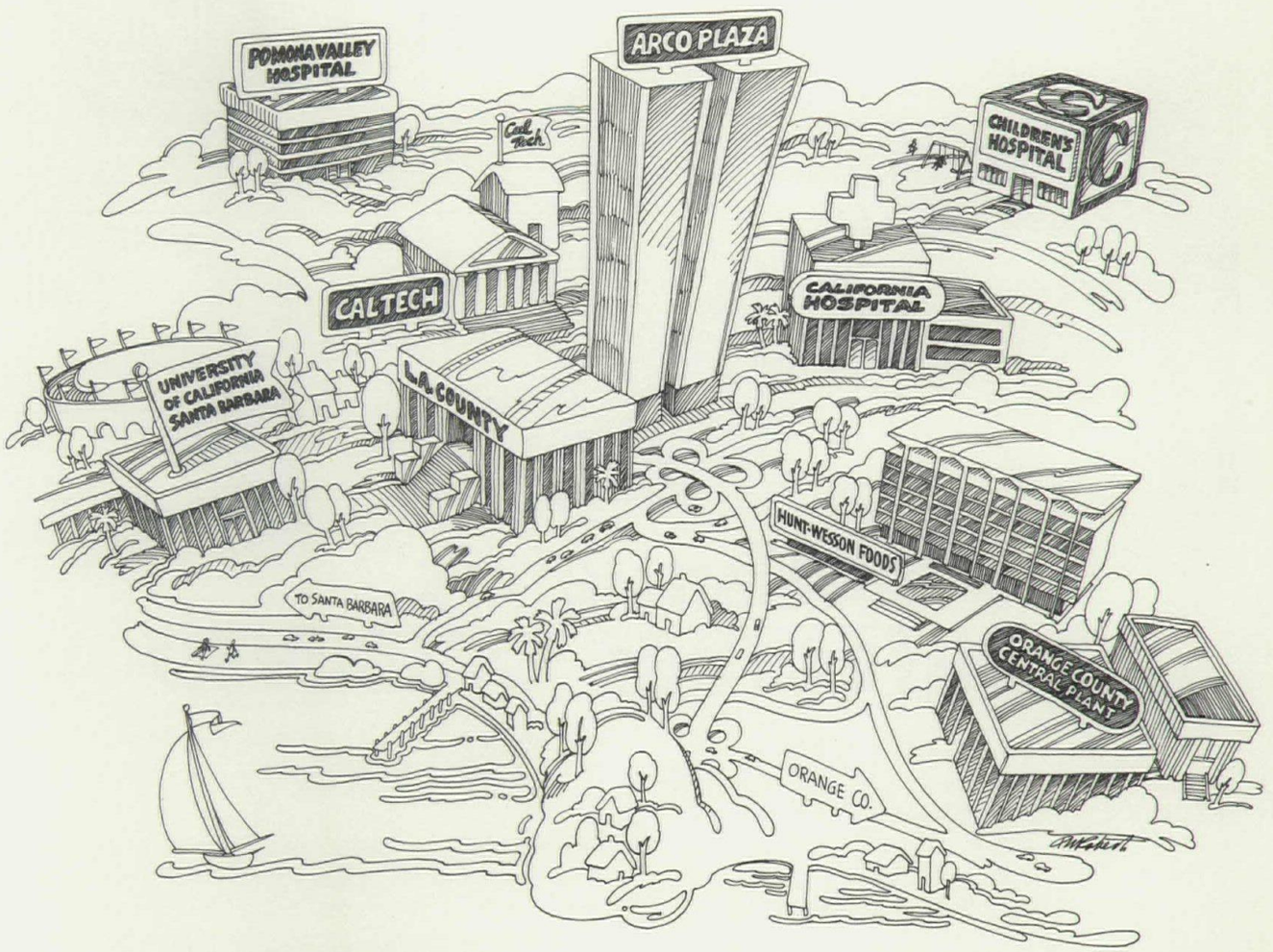
We'd like to thank these people for turning us down.



By turning down their natural gas consumption, these organizations earned the Gas Company's CONCERN award. And our thanks.

Working with the Gas Company, they examined their specific energy uses and found ways to decrease their natural gas consumption.

Some of the steps they took were simple changes in operating procedures. Like shutting off areas in their buildings that weren't in use. Raising their chilled water temperatures and lowering washroom water heater thermostat settings. And adjusting and cleaning their equipment.

Some of the companies found that by modernizing their combustion equipment and installing heat exchange devices they were able to realize substantial savings in energy. And money.

Your organization can probably help ease the energy crisis too. Call our Gas Company Representative for some suggestions on gas-saving techniques.

We can't guarantee as dramatic an improvement as some of our award recipients enjoyed.

But we'd like to give you the opportunity to turn us down anyway.

Concern®

Conserve Our Nation's Crucial Energy Resources Now

SOUTHERN CALIFORNIA GAS COMPANY

Contact your Gas Company representative for the free booklet "How to Save Energy in Commercial Buildings."

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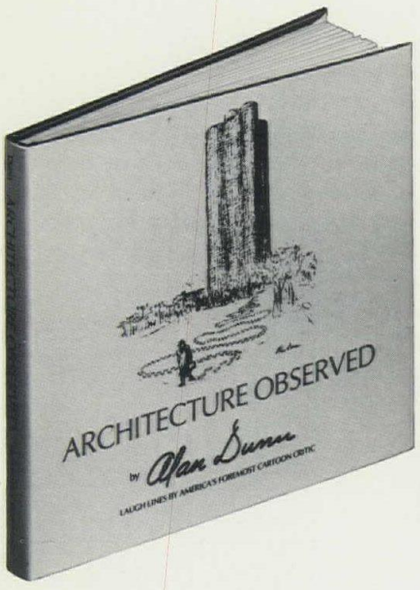
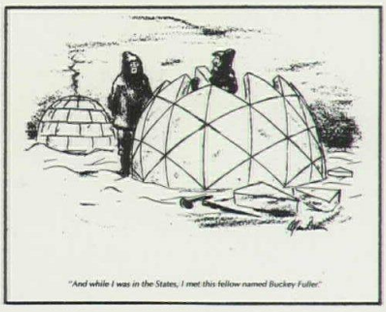
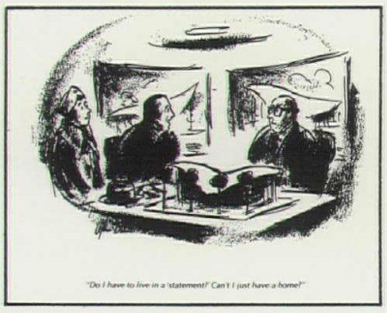
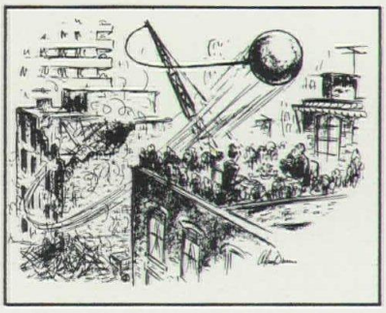
An architectural laugh-in

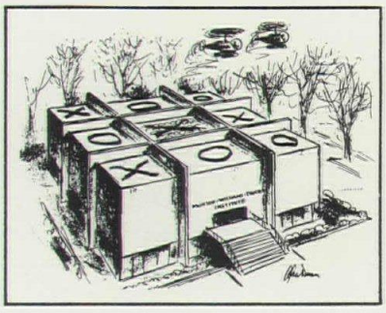
...by the cartoonist who Mumford called "a better architect than the architects"











Alan Dunn's ARCHITECTURE OBSERVED

Here in one sparkling collection are the best of Alan Dunn's incomparable architectural cartoons. For over 40 years the drawings of this award-winning cartoonist formed some of the most telling architectural criticism of our times. Dunn's finely-pointed pen punctures the balloons of pretention of the profession—leading Lewis Mumford to observe "he is obviously a better architect than the architects . . . he exposes."

140 of Alan Dunn's mirthful masterpieces are arranged into eight chapters: "Suburbia Observed" . . . "Urbia Observed" . . . "The Status Race" . . . "Architects and Clients" . . . "Architec-tonics" . . . "Observed from Afar" . . . "Creatures in Creativity" . . . "Final Observations". Architectural fads, cliches and jargon are lampooned with wit and style by an artist whose humor always contained a large measure of truth.

Alan Dunn was awarded the American Institute of Architects' Architectural Critics' Citation in 1973 for this collection representing the highlights of his unique artistry and recognizing his place among the most perceptive commentators on the architectural scene in the 20th century.

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NEWS REPORTS
BUILDINGS IN THE NEWS
HUMAN SETTLEMENTS
REQUIRED READING

Good news on the construction front came from the Department of Commerce in mid-October, when it announced that housing starts in September hit an annual rate of 1.814 million units (after adjustment for seasonal variations). Not only was this a 17.6 per cent improvement over the August figure, and a 39.1 per cent improvement over September 1975—it was the best single month for housing since February 1974, with its 1.881-million annual rate. Much of the strength of the housing figure derived from apartment building, where an annual rate of 415,000 units marked a 48.2 per cent increase over August, following a 47.4 per cent increase over July. For an extended view of construction in 1977, see Dodge/Sweet's economist George Christie's Outlook on page 65.

The American Institute of Architects has issued a major national policy statement on housing. Among the recommendations made by the Institute's special Housing Task Force: Federal action to maintain a steady flow of residential mortgage credit and of housing starts; subsidies for new and rehabilitated housing for the poor; new approaches to the persistent problem of urban slums, including the demolition of unsalvageable abandoned housing and the coordination of public and private renewal efforts; the promotion of local machinery for land-use decisions, and the reduction of local real-property taxes; the elimination of inhibiting standards and an increase in productivity in housing development. Single copies of *National Housing Policy: The American Institute of Architects* are available free from the AIA Public Relations Department, 1735 New York Avenue, N.W., Washington, D.C. 20006.

The General Services Administration last month dedicated its much-heralded energy-conserving office building in Manchester, New Hampshire. Details on page 34.

The State of Wisconsin has adopted a "prescriptive" energy conservation code for new buildings, following the inability of any of the concerned parties to devise a feasible "energy budget" standard. Details on page 35.

The Boston Society of Architects rededicated a memorial plaque to Louis Henri Sullivan at the architect's birthplace, 42 Bennet Street, Boston. Originally dedicated in 1946, the plaque was mislaid when the building was demolished, and then found this summer by two students at the Boston Architectural Center.

Charles Moore and Jurg Land have been named joint heads of the Architecture/Urban Design Program at the School of Architecture and Urban Planning, University of California at Los Angeles. Mr. Moore was formerly head of the architectural departments at Yale and the University of California at Berkeley; Mr. Lang has been a member of UCLA's architecture faculty since 1970.

The University of Michigan has named Jonathan King Director of the Architectural Research Laboratory of the College of Architecture and Urban Planning, and Professor of Architecture. Mr. King was most recently senior vice president of Caudill Rowlett Scott, Houston architects, and earlier was with Educational Facilities Laboratories, Inc.

Lowden Wingo will become Director of the School of Urban and Regional Planning at the University of Southern California. Mr. Wingo is presently Associate Dean of the School of Public and Urban Policy at the University of Pennsylvania, and Director of that school's Public Administration Program.

The New Jersey Society of Architects has lent its support to a state referendum to allow casino gambling in Atlantic City. At its convention, the society overwhelmingly approved a resolution offered by its South Jersey Chapter, which argued that "casino gambling would be an immediate catalyst for the construction of new hotels and restoration of existing hotels and related facilities."

The Illuminating Engineering Society has bestowed its Distinguished Service Award on Der Scutt, AIA. Mr. Scutt, a partner in the New York City firm Poor, Swanke, Hayden & Connell, is the first architect to be honored with the society's national award.

The Institute of Business Designers Carolina Chapter seeks entries in a Student Design Competition for its Fifth Annual Student Design Rally, to be held in High Point, North Carolina, in February. The competition, open to interior design students, covers contract interiors and product design, and carries $2,000 in awards. For information: J. Robert Snypp, Competition Chairman, 34 11th Street, Northeast, Atlanta, Georgia 30309.

Three "National Trust Main Street Towns" will be selected in a competition sponsored by the National Trust for Historic Preservation. The selected Midwestern towns will receive assistance from the Trust in the revitalization of older business districts. Groups eligible for the January competition include Chambers of Commerce and businessmen's groups in "towns of architectural character" with a population of 5,000-65,000 in the following states: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, North Dakota, Ohio, South Dakota and Wisconsin. For information: Robert B. Carter, Main Street Project, National Trust for Historic Preservation, Midwest Office, 407 South Dearborn Street, Suite 710, Chicago, Illinois 60605.

GSA's energy-saving office opens in New Hampshire

The General Services Administration's showcase for energy conservation in buildings—an $8.7-million Federal office building in Manchester, New Hampshire—was formally dedicated last month amid predictions that all future buildings will borrow ideas from the structure's design.

The building is heavily instrumented and will serve as a laboratory for energy efficiency design and mechanical equipment. It is equipped with two energy-saving mechanical systems with variations on each floor and different lighting systems. It features a 4,600-square-foot roof-mounted solar collector, dual-glazed and shaded windows, and a heat recovery system.

The National Bureau of Standards intends to monitor the building's energy performance for at least three years to help designers determine which of the alternative systems and designs are most useful in reducing energy consumption.

GSA now asks its designers for buildings consuming no more than 55,000 Btu per gross square foot per year. But the Manchester structure is expected to perform far better than that, despite its location in a relatively cool climate.

The 176,000-square-foot building is cube-shaped to minimize heat loss and gain, and has a dramatically reduced window area and shading devices to limit heat transfer. Nonuniform lighting averages just two watts per square foot, rather than the normal four to five watts. High-pressure sodium lights are installed in some locations.

The solar collector, which cost $416,000, has four rows of panels that can be adjusted from a 20-degree to an 80-degree tilt as the seasons change. GSA says the collector will furnish nearly all the energy needed to heat and cool the building in "moderate" weather. Year-round, the solar system is expected to provide 20 to 30 per cent of the energy requirement for domestic hot water and heating and space cooling.

Architects of the structure were Nicholas Isaak and Andrew C. Isaak of Manchester. Dubin-Mindell-Bloome Associates, New York City, were the energy conservation and solar energy consultants. Davison Construction Co., Manchester, was the principal general contractor.—*William Hickman, World News, Washington.*

Government underpays A-Es, says COFPAES report

"Work done by architect-engineers for Federal agencies does not yield adequate returns," a management consulting firm has concluded. The firm, Case and Company, Inc., of San Francisco, says the too-low yield is a result of Federal regulations governing allowable overhead and profit.

The report prepared by Case researchers does not imply that government agencies intend to exploit A-Es. But it argues that "there are economic factors inherent in A-E firm practice which are not adequately reflected in guidelines and regulations" on overhead and profit.

A-E projects undertaken for Federal agencies may be unprofitable for three different, but related, reasons, Case says:

- Direct project costs may not be properly reflected in the compensation amount because the agency-client may require more professional services than private clients.
- Indirect administrative costs generated by a specific government project or by some categories of projects may be higher than the firm normally encounters.
- The portion of the project compensation which contributes to overhead and profit on a government project may be too low to provide its proper share of the amount needed by the firm to recover its overhead expenses and earn an appropriate profit.

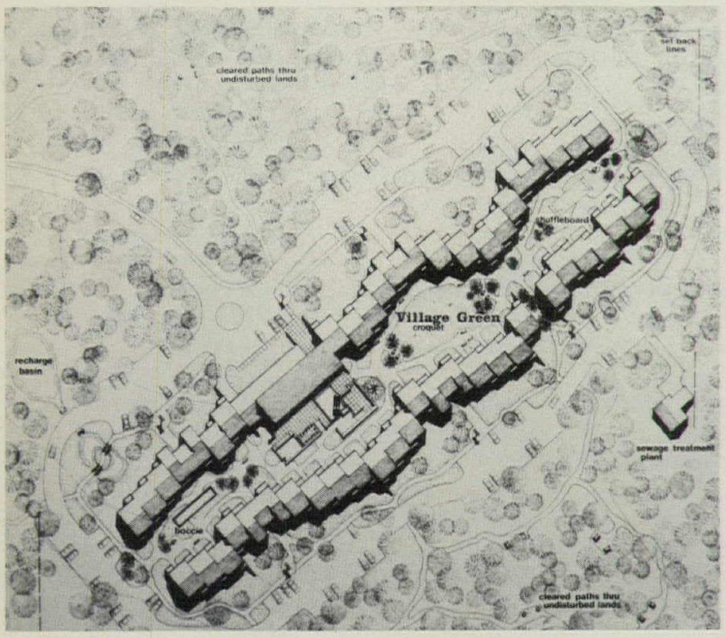
Case was hired to prepare the report for the Committee on Federal Procurement of Architect-Engineer Services (COFPAES), a lobbying organization supported by the American Institute of Architects and four engineering societies.

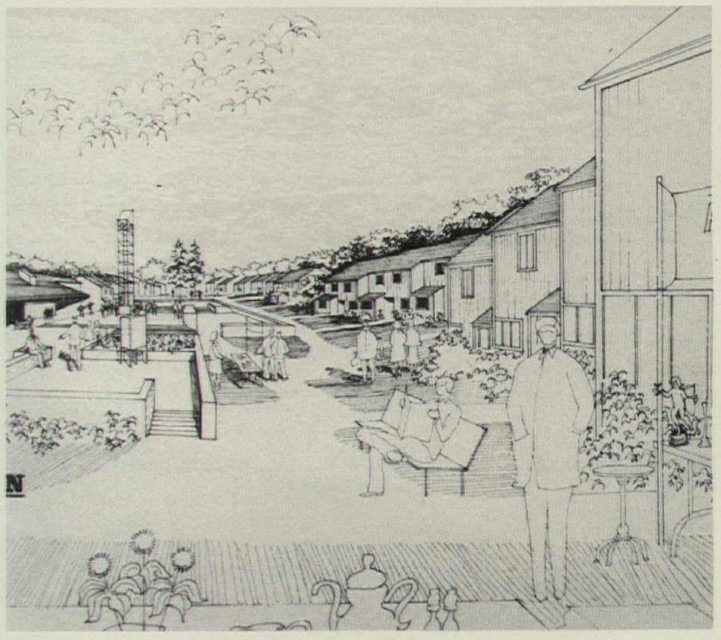
COFPAES plans to use the report as ammunition in its discussions with the General Services Administration, as administrator of the Federal procurement regulations, on the whole subject of allowable costs.

In an unrelated development impacting on Federal procurement of A-E services, an engineering society is beginning to worry about the effect of a newly enacted Federal "sunshine" law, which outlaws most closed-door meetings. Specifically, the American Consulting Engineers Council thinks the General Services Administration's public advisory panel will be handicapped if it is forced to operate in public sessions.

ACEC's government affairs chief, Larry N. Spiller, questions whether the advisory panel—which screens and ranks A-E firms for given projects—can function adequately if principals from firms under review are present to listen to the discussion.

Spiller notes that there are provisions for closing meetings, but his organization thinks it would be appropriate for GSA to seek a specific exemption for its A-E selection panels.—*William Hickman, World News, Washington.*





New York State Association of Architects sponsors a design competition—for a *real* project

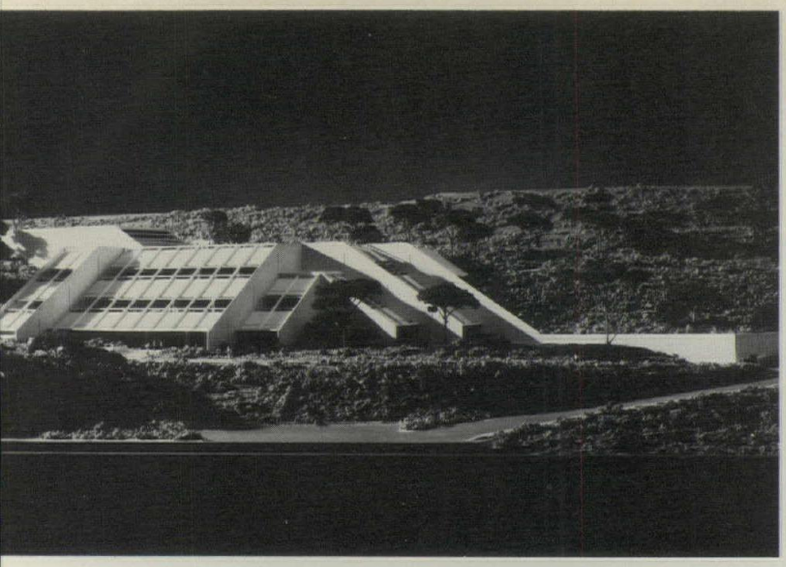
The Yonkers, New York, firm Fleagle & Kaeyer has received first prize, and the commission, in an architectural competition for the $4.8-million St. Joseph's Village for Senior Citizens, to be built in Long Island by the Roman Catholic Diocese of Rockville Center. Design team included Richard E. Kaeyer, John S. Garment and Robert C. Seitz.

The unusual aspect of this competition was its sponsorship: it was conducted as a public service by the New York State Association of Architects, the State Organization of the American Institute of Architects, and was open only to members of the NYSAA/AIA.

This marks the second occasion on which the NYSAA/AIA has taken such an initiative to provide professional advice to groups planning design competitions—and to secure commissions and prize money for its members. In 1972, the association sponsored a competition for an apartment complex for the aging to be built in Utica. (In that case, however, the association's Development Corporation, using funds from HUD and from the state's Division of Housing and Community Renewal, was the prospective client.)

Commenting on their selection of the Fleagle & Kaeyer entry, the jurors called the design "a novel concept . . . in which the elderly can live independently, safely and in comfort," and they approved the concentration of units, which leaves large areas of the site in their natural state.

Bertram L. Bassuk received the $1,500 second prize; a $1,000 third prize went to Secundino Fernandez.



Prestressed Concrete Institute honors twelve buildings in its design awards program

The Prestressed Concrete Institute Awards Program, the 14th that the Institute has sponsored, this year honored 12 buildings and "miscellaneous structures," as well as seven bridges. All of these structures were recognized for their "esthetic expression, function and economy."

Among the honored buildings and their designers:

United Services Automobile Association Office Complex, San Antonio—Benham-Blair & Affiliates, Inc. (architect/structural engineer); Citizens Bank Center, Richardson, Texas—Omniplan Architects Harrell & Hamilton (architects), Datum Structures Engineering, Inc. (structural engineers); Alaska Airlines Headquarters Building, Seattle—Kirk, Wallace, McKinley, AIA & Associates (architects), KPFF Consulting Engineers (structural engineers); Washington State University Stadium, North Stands, Pullman—Naramore Bain Brady & Johanson (architects), Skilling Helle Christiansen Robertson (structural engineers);

South Oklahoma City Junior College, Oklahoma City—Jones-Hester-Bates-Baumeister, Inc. (architects), Eudaley & McMinimy & Associates (structural engineers); Marine Research Library, Scripps Institution of Oceanography, La Jolla, California—Liebhardt, Weston and Goldman (architects), Kariotis and Kesler (structural engineers) (above left); Hotel Toronto, Toronto, Ontario—Neish Owen Rowland & Roy, and Reno Negrin & Associates (joint-venture architects), SWR Engineering Limited (structural engineers);

Home Federal Savings & Loan Association, Marion, Ohio—Burris, Lockwood & Tangeman Architects, Inc. (architects/structural engineers); Center for Creative Studies, College of Arts and Design, Detroit—William Kessler and Associates, Inc. (architects), Robert Darvas and Associates (structural engineers) (above right); San Diego State University Parking Structure—Delawie, Macy & Henderson, AIA, and Paderewski-Dean & Associates (joint-venture architects), George R. Saunders & Associates (structural engineers).

Louis de Moll, FAIA, president of the American Institute of Architects, was chairman of the jury for buildings, and engineer Lester A. Herr, Chief of the Bridge Division, Federal Highway Commission, the jury for bridges.

Wisconsin enacts energy code for new construction

Nobody likes it, but Wisconsin is now officially enforcing an energy conservation code for all new buildings. After more than a year of wrangling between the state, construction trade unions and environmentalists, the energy conservation standards permanently took effect late this summer. And the story of Wisconsin's struggle illustrates the obstacles encountered by proponents of performance ("energy budget") standards as they oppose the imposition of prescriptive ("building envelope") standards for fuel consumption.

The standards state that newly constructed buildings cannot lose more than 13 Btu per square foot of exterior surface per hour. This rule makes Wisconsin one of the few states to enforce the so-called envelope approach to energy conservation in new construction.

The 13 Btu standard was first instituted in January 1975, but complaints from trade unions caused the state to suspend the standards in June 1975.

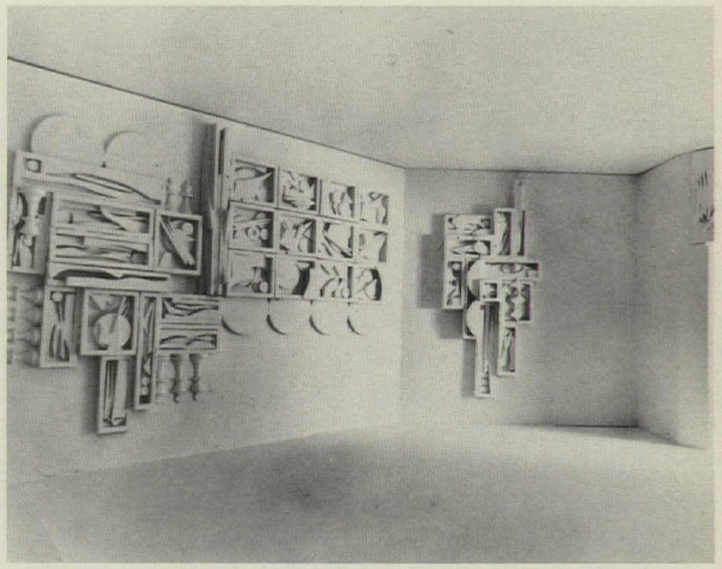
A special committee made up of industry and labor leaders then looked into the problem and agreed earlier this year that the "energy budget" approach would be more precise and fair to builders.

The hitch in the committee's recommendation was that nobody could decide what the standards for the energy budget should be. The committee looked to Ohio for guidance, since that state pioneered the energy budget approach. Ohio's standards, however, which were to become effective July 1, were postponed because of the same uncertainty.

Through inaction, the 13 Btu standard has automatically become law again in Wisconsin. The committee and trade unions are unhappy because they are back to the original code, and environmentalists are unhappy because, they say, the code isn't strict enough. State building officials are also unhappy, because they too preferred the energy budget concept.

There is some hope of making everybody happy, however. A policy statement in the new permanent rule says the state will convert to the energy budget approach as soon as possible. Wisconsin Building Division officials say they will ask for money to conduct a study to determine at what levels the energy budgets should be set.

The code also makes allowances that cheer the environmentalists a little. Buildings using innovative energy systems such as wind or solar energy are allowed heat losses above the 13 Btu standard.—*David Haskin, World News, Madison.*



Louise Nevelson designs a chapel for a New York church

A model of Louise Nevelson's sculptured chapel for St. Peter's Lutheran Church in New York City was unveiled last month. The church, designed by architect Hugh Stubbins, is presently under construction, sharing a site with the Citicorp tower (see RECORD, mid-August 1976, pages 66-71).

The church, known in New York as the "jazz church," enjoys a reputation for its cultural activities, particularly in music and the performing arts. The Nevelson commission represents the church's new interest in the fine arts.

The chapel is described by the pastor of St. Peter's, the Rev. Dr. Ralph Edward Peterson, as "a white environment which has focus on the Good Shepherd." The sculpture will be a composition of white-painted wood forms on white walls, with a cross of gold leaf and white wood as a focal point.

Mrs. Nevelson is also designing the church's altar, vestments, and a sanctuary light.

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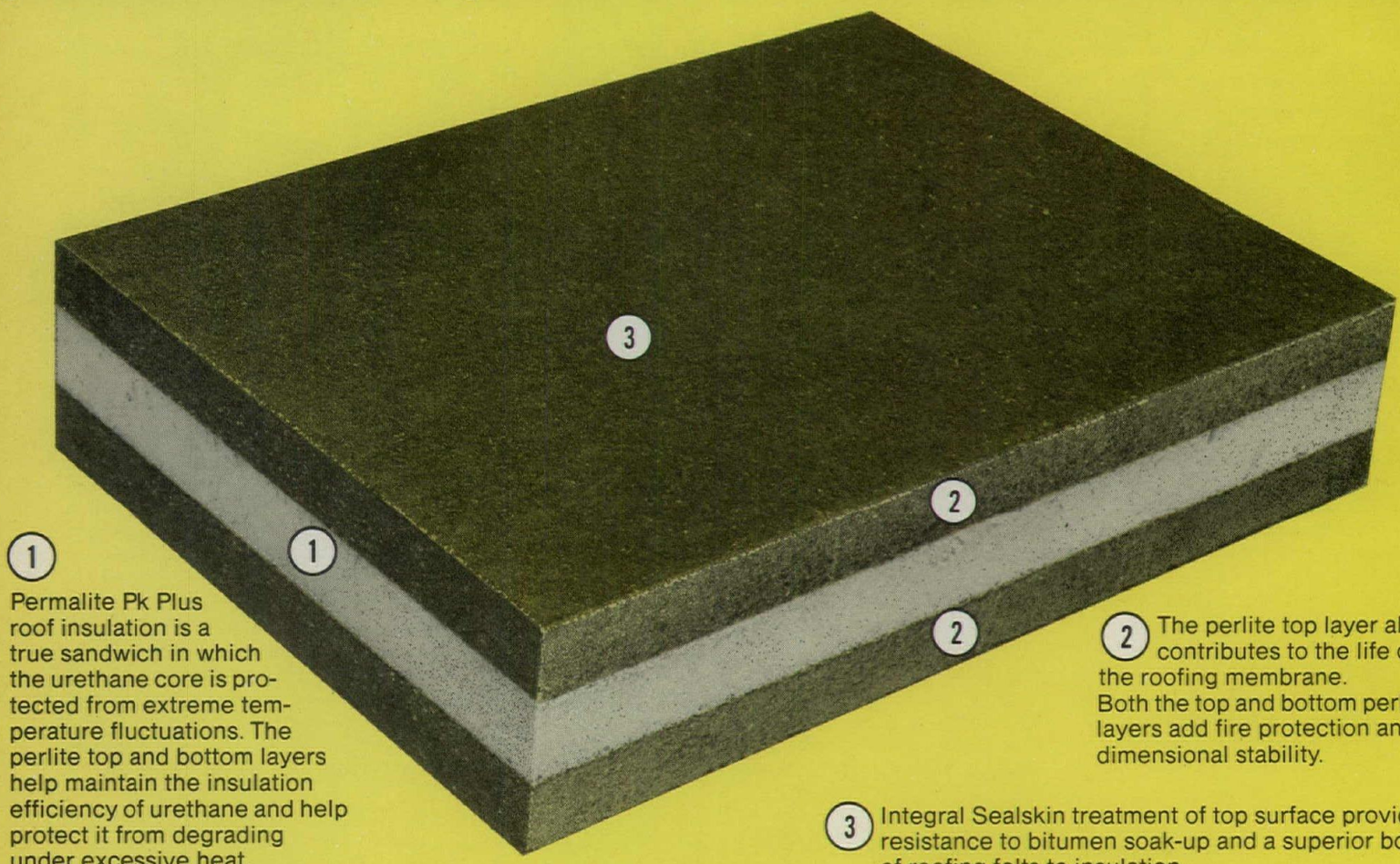

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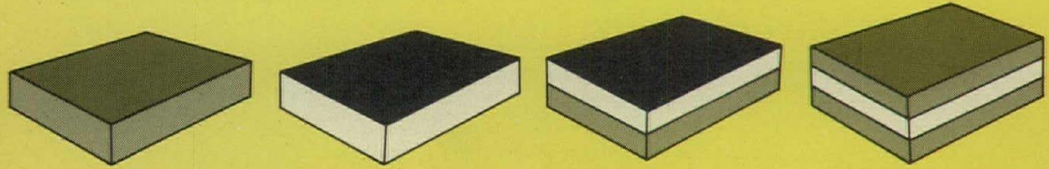

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Cooper-Hewitt Museum moves into the Carnegie mansion

The Cooper-Hewitt Museum, the Smithsonian Institution's National Museum of Design, opened its new home to the public on October 7. Housed in the former Andrew Carnegie mansion on New York's Fifth Avenue (one block north of the Guggenheim Museum), it is one of the world's great collections of the decorative arts.

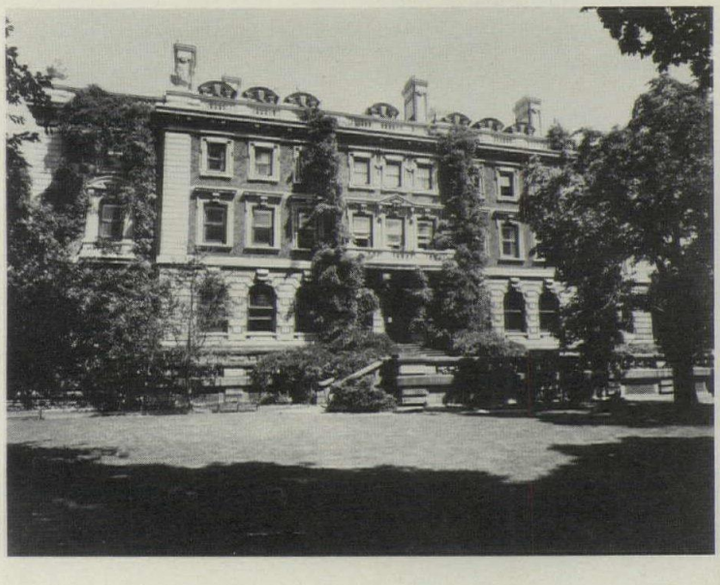
Hardy Holzman Pfeiffer Associates, Hugh Hardy, partner-in-charge, performed the $2.5-million renovation of the mansion, which was originally designed by Babb, Cook and Willard in 1901 and which cost $1 million less to build than to remodel. The interior and exterior detailing of the house have been left virtually intact, with major changes made in non-public areas or for building and fire-code compliance. A new, multi-story wing on a site adjacent to the mansion is planned for future expansion.

Although an undistinguished example of the architecture of its period, the Carnegie mansion is one of the last of the freestanding houses that once lined Fifth Avenue, and represents a rare reversal of trends in New York City real estate. Cooper-Hewitt director Lisa Taylor successfully withstood offers to give the museum several floors of a proposed multi-use high-rise to be built on the site of the razed mansion. "We want to be good neighbors," said Mrs. Taylor, and added that future expansion would preserve the scale and character of the neighborhood.

The museum was founded in 1897 by the granddaughters of industrialist Peter Cooper and was housed in the Cooper Union building on New York's Lower East Side. Among the hundreds of thousands of objects of all descriptions owned by the Cooper-Hewitt—among them textiles, wallpaper, ceramics, furniture and birdcages—are an important collection of architectural drawings and a collection of architectural details and woodwork.

The museum's opening exhibition, "Man Transforms," was conceived by Austrian architect Hans Hollein, and contains works by nine other architects and designers: Nader Ardalan, Peter Bode, Buckminster Fuller, Murray Grigor, Arata Isozaki, Richard Meier, Karl Schlamminger, Ettore Sottsass and Oswald Ungers. Each has created an "environment" in another of the mansion's rooms, with the museum's permanent collection out on loan to 26 other New York museums for the duration of the exhibition.

Other forthcoming exhibitions of architectural interest include the collection of wood models of the architecture of Andrea Palladio that has been touring the United States; an exhibition of designs for and objects from John Nash's Royal Pavilion at Brighton; a show on 200 years of American architectural drawings; and future editions of the "Immovable Objects" walking tours of New York City architecture.—*Martin Filler.*



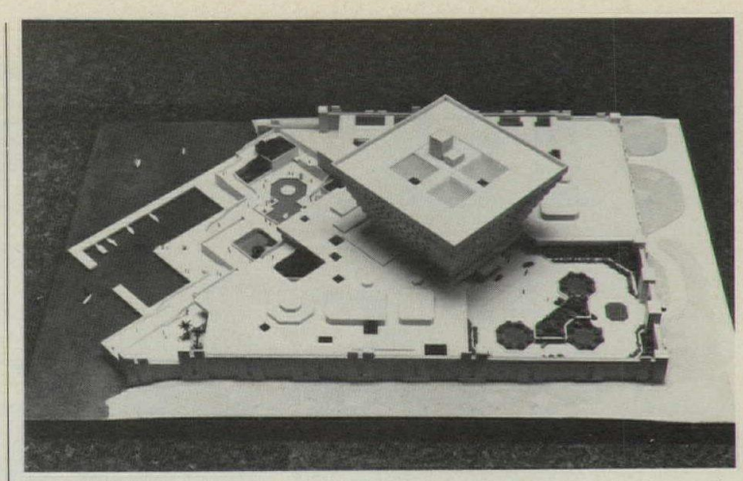
GSA offers the states access to its expertise

The Federal government is formally launching a program to explain its construction design techniques to state and local governments. Officials at the General Services Administration hope that these government units will reciprocate by offering the Federal government the best in technology developed at their level.

In a series of regional seminars, GSA plans to offer its technology on energy conservation, fire safety, building security, construction and project management systems, performance specifications, building maintenance and custodial standards, and value management.

GSA technology has long been available informally to state and local governments, but there has never been an organized, formal effort to encourage its use.

GSA's Public Building Service is managing the intergovernmental effort.—*William Hickman, World News, Washington.*



Abu Dhabi conducts a competition for a luxury hotel

The London architectural firm Rothermel Cooke won the £27,000 (roughly $43,000) first prize for the design of a luxury hotel at Abu Dhabi on the Persian Gulf. The international competition for the £90-million (about $144 million) complex was sponsored by the United Arab Emirates Development Bank.

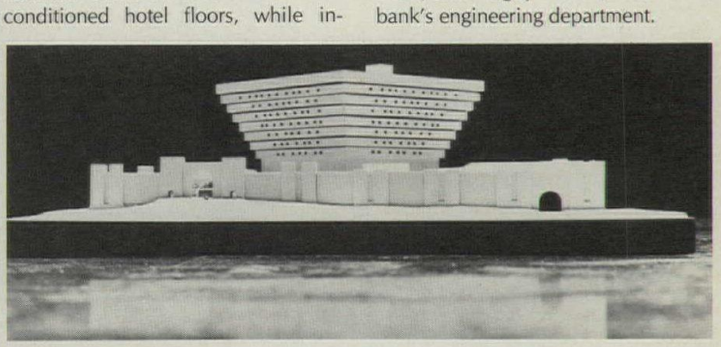
The first phase of the hotel, which was planned for future expansion, calls for 220 bedrooms and suites, as well as a conference center, nightclub, cinema and such recreational facilities as gymnasium, sauna, swimming pool, bowling alleys and outdoor sports.

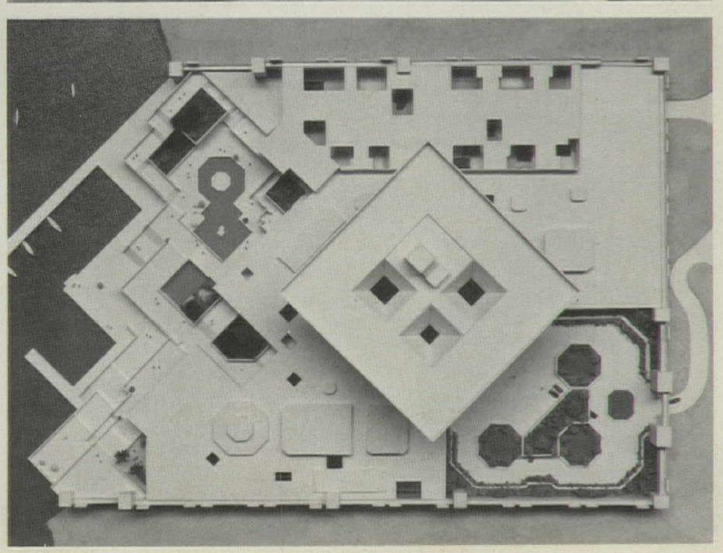
The waterfront site, located 2½ miles from downtown Abu Dhabi, will be surrounded by a wall on all but the seaward side, in order to set the complex apart as something of a sheltered small town.

An inverted pyramid housing hotel bedrooms will provide the major visual focus for the site. The building form will create sunshades for the air-conditioned hotel floors, while inverted coffers at the roof will admit light to the central courtyard. Interior walkways will give access to lounges, bars and shops built around a system of small courtyards (at top of aerial photograph). Toward the boat basin, a series of terraced gardens and pools (including a swimming pool) extends interior space to the outdoors. At the hotel's entrance, a landscaped forecourt covers a parking garage.

The perimeter wall carries ductwork, car parking ventilation and other services—and provides a walkway for promenades along its top.

The competition, approved by the International Union of Architects (UIA), was judged by five jurors: architect Pierre Devinoy, representing the UIA; architect Trevor Dannatt, representing the Royal Institute of British Architects; architect Ralph Rapson, representing the American Institute of Architects; Mahmoud Safwat, general manager of the UAE Development Bank; and Magdy Younis, head of the bank's engineering department.



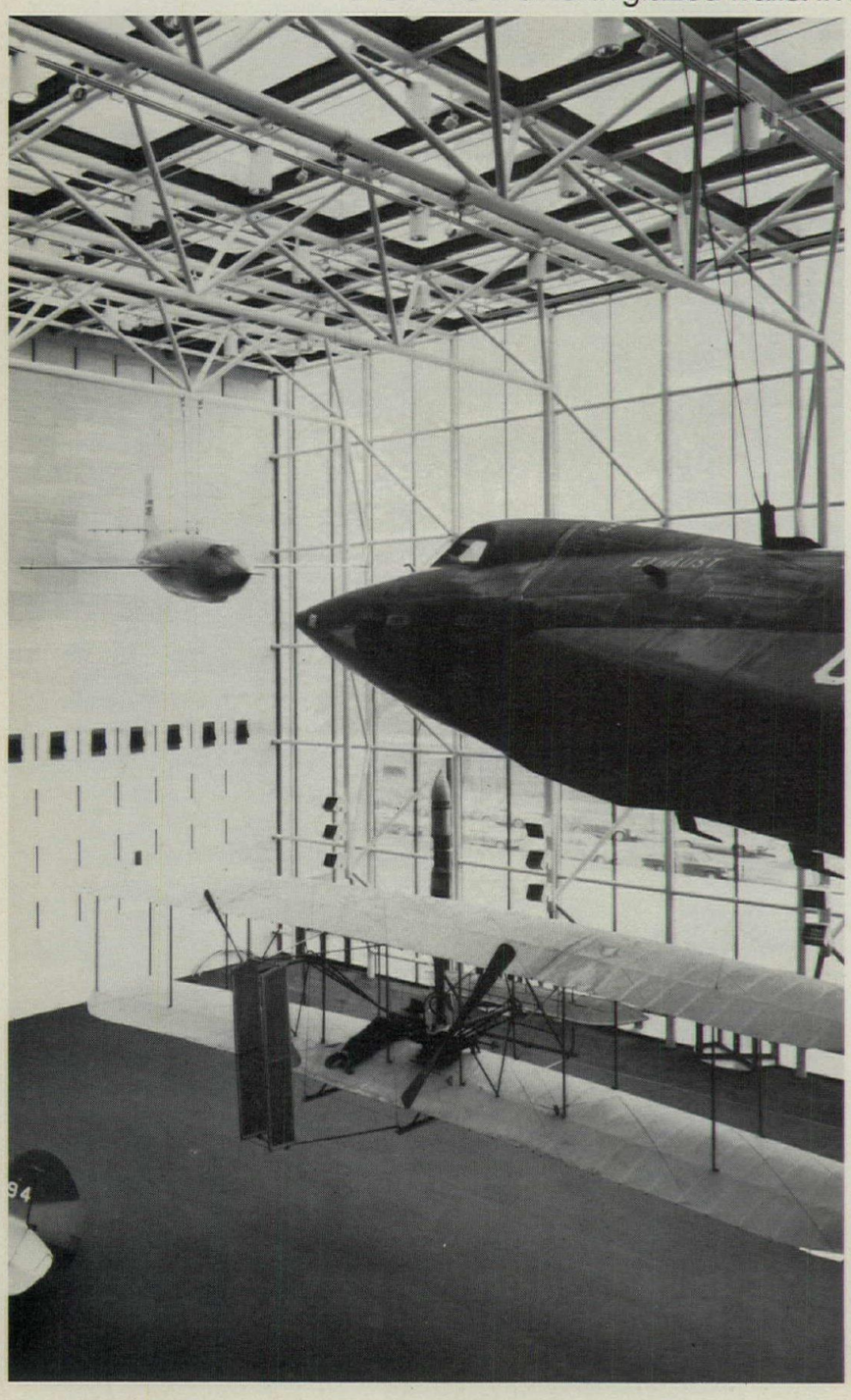


There's a new Steel Pipe:

Strength

"We looked for a structural system to support the roof loads of three open galleries and the north glazed walls. In these applications steel pipe had a number of advantages. First, it presented a uniform appearance and preserved the light, open character of the galleries. This, of course, allowed unobstructed views of the mall through the glass walls. Second, the pipe truss system could carry suspended loads — up to 8,000 lbs. per truss. Finally, the pipe had a symbolic relationship to the aircraft industry, appropriate to the museum's magnificent display of air and space vehicles."

— Hellmuth, Obata & Kassabaum, Inc.

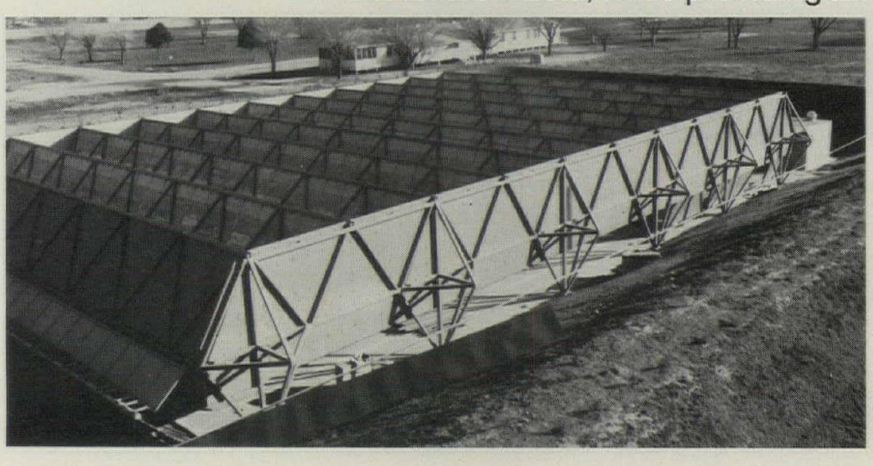


The National Air and Space Museum, Washington, D.C.
Hellmuth, Obata & Kassabaum of St. Louis—Architects

way to look at Structurally

Savings

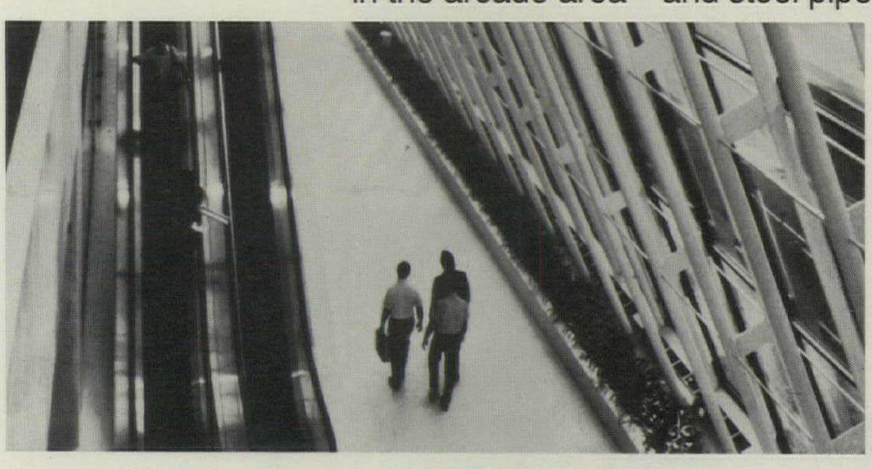
"We were looking for a way to cut costs. The use of the tubular shape reduced materials waste, while providing an extremely efficient structural cross section. The truss/column system, made entirely of steel tubes, simplified connection details. Erection was also simplified since pairs of truss units could be shop welded, transported directly to the job site and erected intact. Finally, field welds were required only as spot connections between units."
—ABST Grothe Architects, Inc.



25 Point Firing Range,
Yosemite Junior College District, Modesto, Calif.
ABST Grothe Architects, Inc. of Modesto—Project Architects

Space

"We were looking for an economical way to meet the fire sprinkler requirement in the arcade area—and steel pipe provided it. Because the top chords of the truss system were hollow, we found that they made ideal housings for sprinkler lines. Not only was this practical, but, with only the sprinkler heads protruding, it was esthetic as well."
—JV III (Joint Venture Architects Koetter Tharp, Cowell & Bartlett/Caudill Rowlett Scott/Neuhaus & Taylor), Project Architects



1100 Milam Building, Houston, Texas
JV III of Houston—Project Architects

And More

If you'd like to take a more in-depth look at steel pipe in structures, two manuals are now available from the Committee of Steel Pipe Producers. One, the "Design Manual for Structural Tubing" (cost $2.25), has been prepared to assist you in selecting the best structural components for a given design problem. And, the newly published companion piece "Tentative Criteria for Structural Applications of Steel Tubing and Pipe" (cost $2.00), offers specific criteria for the design of tubular sections used in tension, compression, bending or torsion members. Choose either or both of these useful manuals, and they will be forwarded promptly. For your copies, please enclose a check or money order and make payable to:

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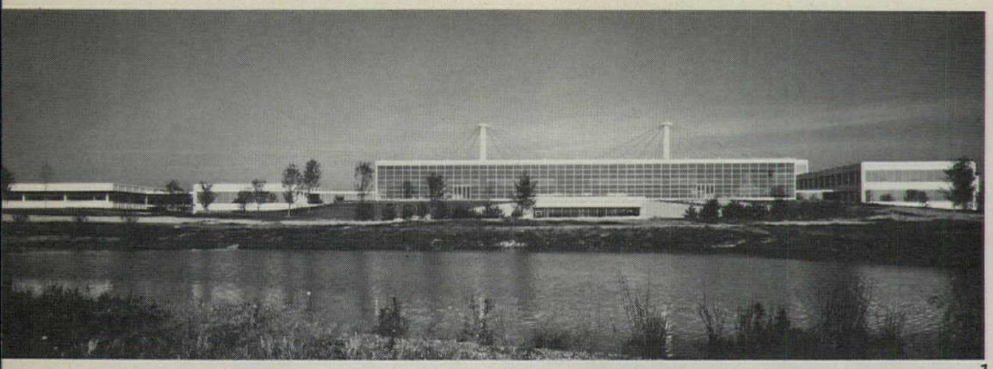

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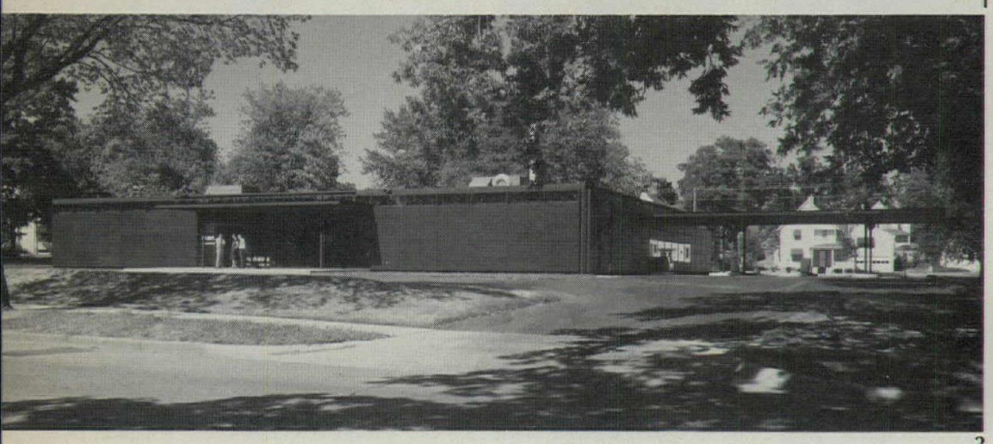

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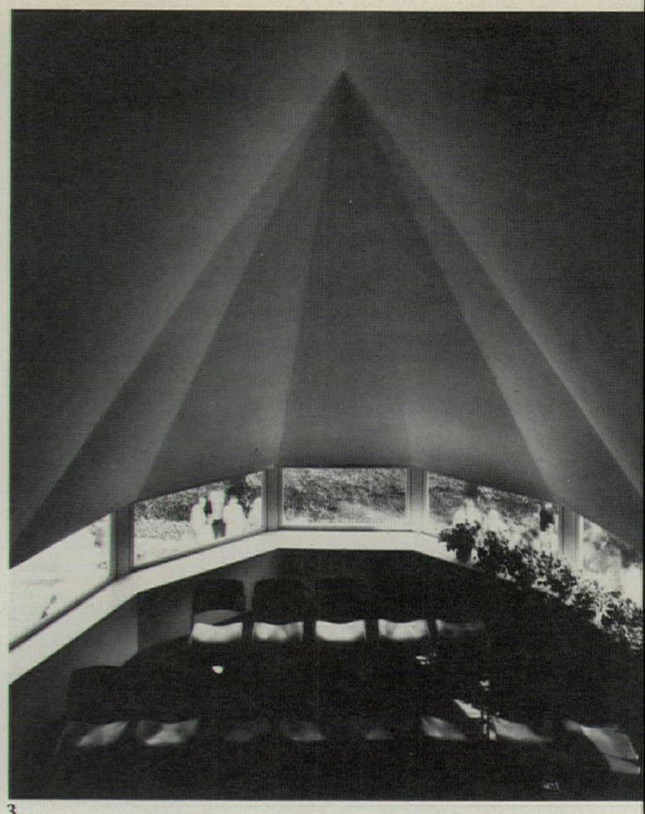

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Chicago chapter, AIA, honors its members' work

The Chicago Chapter of the American Institute of Architects bestowed 14 Distinguished Building Awards in its 1976 Honor Awards Program. Selected by a four-man jury composed of Gunnar Birkerts, FAIA, John Entenza, former editor of *Arts and Architecture* magazine, Ralph Rapson, FAIA, and Paul Rudolph, FAIA, the buildings were shown in photographs and models at the Art Institute of Chicago from September 16 through October 17. The buildings, along with the jury's comments, include: **1.** Baxter Corporate Headquarters, Deerfield, Illinois, for Travenol Laboratories, Inc.—Skidmore, Owings & Merrill, architects: ". . . a complex building with many ideas . . . a bold concept carefully detailed." **2.** First National Bank of Ripon, Wisconsin—Hammond Beeby and Associates, architects: "A strong plan concept demonstrating excellent detailing and good use of materials." **3.** Beidler Conference Room, Glessner House, Chicago, for the Chicago School of Architecture Foundation—Hammond Beeby and Associates, architects: "The reuse of this simple space reflects the exterior volume of the house [designed by H.H. Richardson], and demonstrates nice control and sensitive detailing. . . ." **4.** Mr. and Mrs. Edwin Bush House, Telluride, Colorado—Booth and Nagle, architects: ". . . admired for its simplicity and its straightforward solution, with fine control and spatial order." **5.** The Greenhouse, Chicago, for Lincoln Park Eleven Associates—The Office of Gertrude Lempp Kerbis, FAIA, architects: "A thoughtful and carefully designed urban residential complex which is well integrated with surrounding buildings." **6.** Levy Weiss Housing Complex, Lake Delton, Wisconsin, for Jewish Community Centers of Chicago of the Jewish Federation of Metro-Chicago—Jaeger, Kupritz Ltd., architects: "A small-scale project with distinct housing modules. . . . Good human scale and character." **7.** First National Bank of Albuquerque—Harry Weese and Associates, architects: ". . . a very discreet building which

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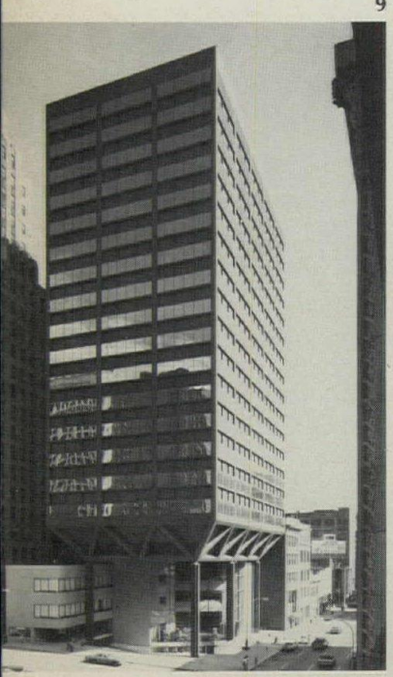

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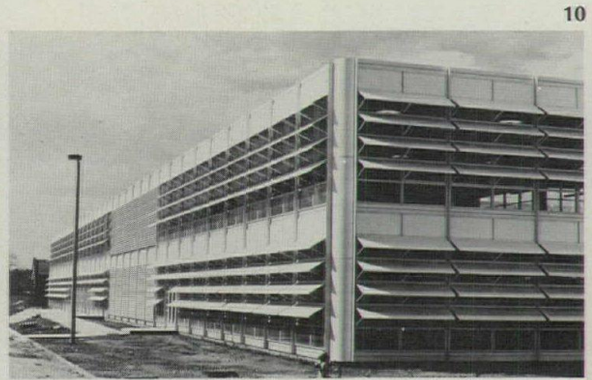

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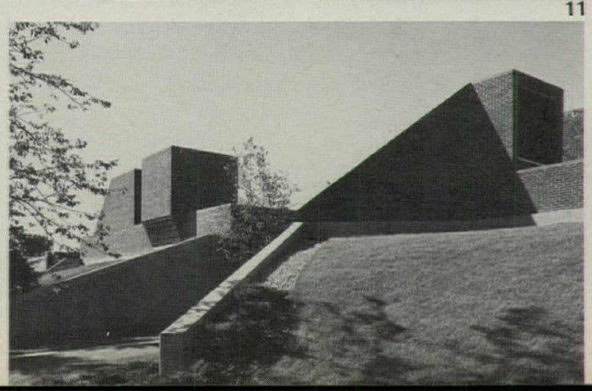

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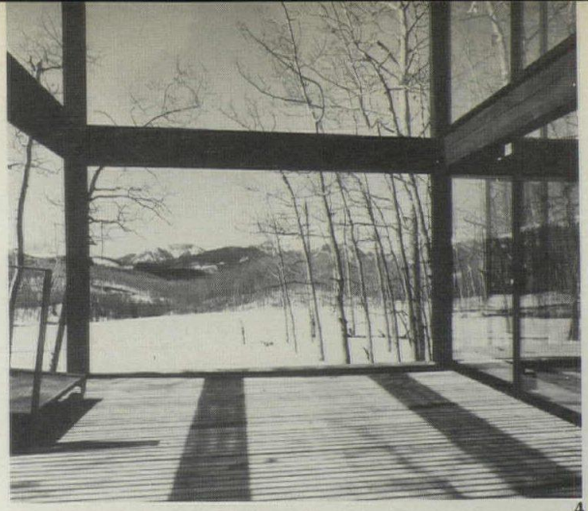

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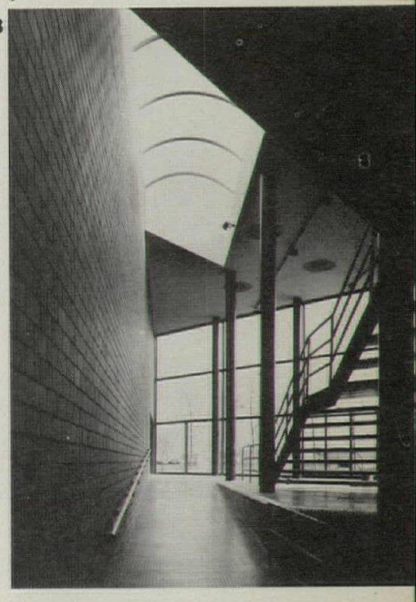

defines the space of the street and simultaneously turns the corner. Building interior reflects careful planning. . . ." **8.** Freedom Hall, Park Forest, Illinois, for Village of Park Forest—Booth and Nagle, architects: "An unpretentious solution demonstrating straightforward planning and good control of materials and detail." **9.** Mercantile Bank Building, Kansas City, Missouri, for Walnut Associates—Harry Weese and Associates, architects: ". . . the base of the building successfully opens the corner. The building meets the ground in an admirable manner. . . ." **10.** Auraria Learning Resources Center, Denver—C.F. Murphy Associates, architects: "A refreshing and highly imaginative solution; a straightforward warehouse of books, with little pretention. . . ." **11.** Central Services Facility Generator/Boiler Building, Lake Forest Hospital, Lake Forest, Illinois—O'Donnell Wicklund Pigozzi Architects, Inc., architects: ". . . deserving commendation for its successful relation to existing Georgian buildings. The man-made landscape is applauded." **12.** Sears Tower, Chicago, for Sears, Roebuck and Company—Skidmore, Owings & Merrill, architects, (see RECORD, October 1972, pages 97-104): ". . . commended for its innovative structural design and as a solution to a highly complex urban building problem." **13.** Hampden Court Residence, Chicago—Booth and Nagle, architects: ". . . imaginative use of space in a very narrow building." **14.** Navy Pier Restoration, Chicago, for Public Building Commission of Chicago—Jerome R. Butler, Jr., AIA, city architect: ". . . functional changes and restoration [show] how new uses can be given to an older structure."

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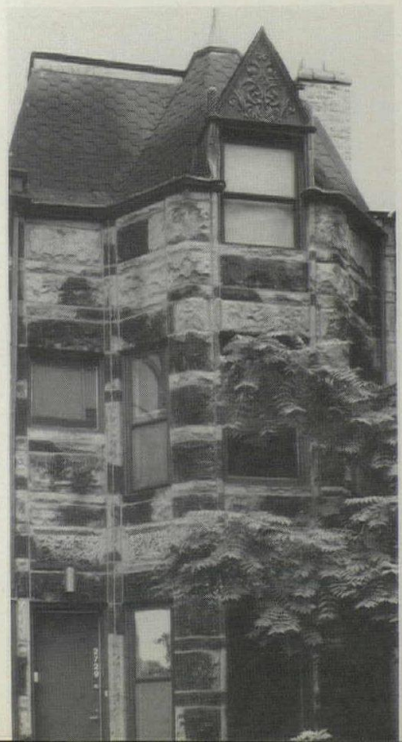

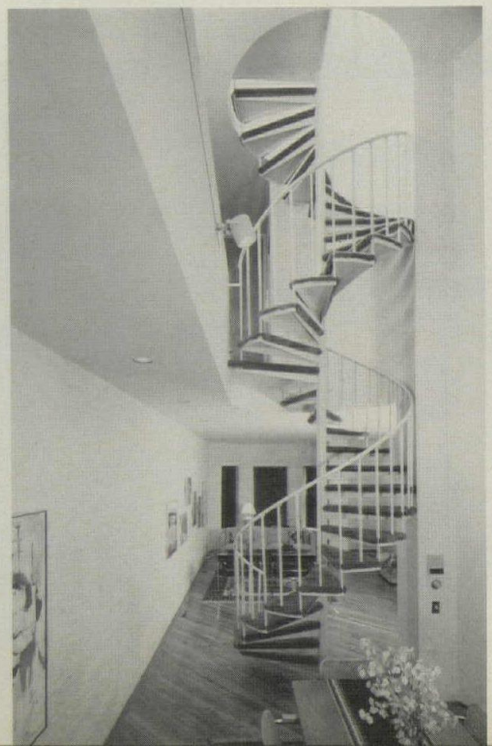

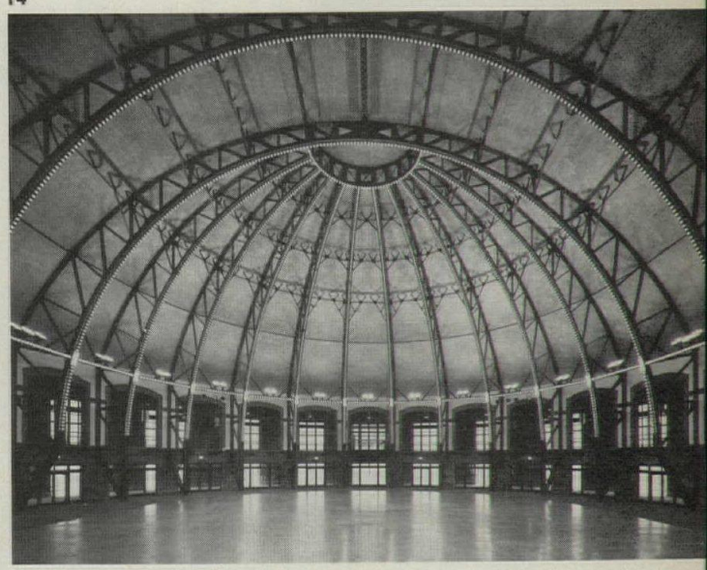

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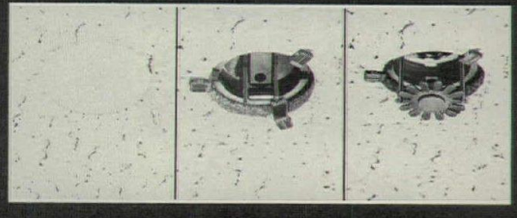

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Usonia

FRANK LLOYD WRIGHT'S USONIAN HOUSES: *The Case for Organic Architecture, by John Sargeant; Whitney Library of Design, New York, 1976, 207 pages, illustrations, $24.50.*

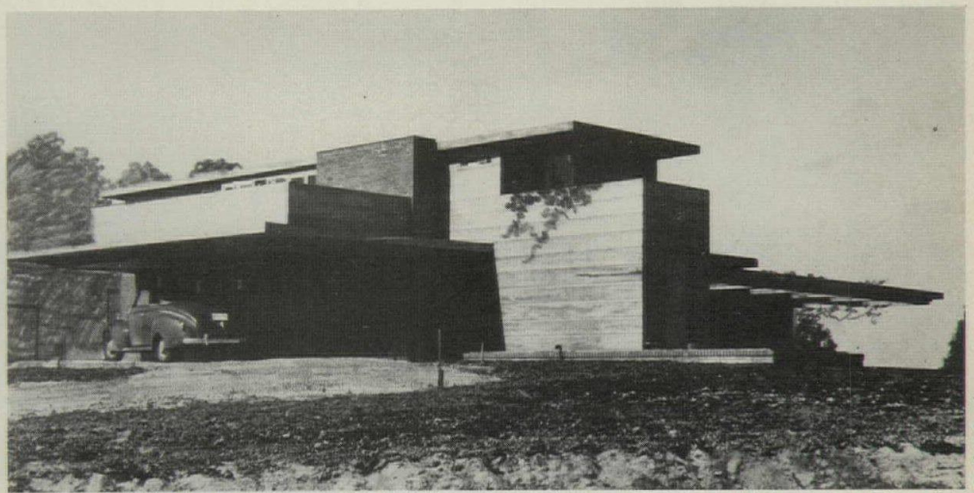
Reviewed by Edgar Tafel

Working on Frank Lloyd Wright's Usonian houses in the later '30s as a Taliesin apprentice was for me more than the ordinary routine. One sensed that Mr. Wright felt he was both searching out a new way of life for America via the single-family house and the automobile, and also creating new systems of building. For some 40 years before he had designed in modules or units, and the Usonian houses were to him but a continuum.

For one who was not there—and for a Britisher—John Sargeant has compiled, from a long distance and at hand, a creditable array of material that is more than of passing interest to the interested. Without access to Taliesin files, he feels hampered in obtaining sufficient information and cooperation. The argument will go on and on about the appropriateness of Taliesin's withholding access to such material; Taliesin is inundated with seekers of information, and to open the files generally would be impossible. Taliesin is a private architectural office and school, without aid from foundations, government, etc.; its files are its own.

Sargeant's coverage spills beyond the Usonian houses themselves into Frank Lloyd Wright's other projects of the time (though why he ends with the work of Bruce Goff is a mystery).

Building the Usonian houses in the late 1930s was no small achievement. For nearly ten years of the Great Depression, there had been almost no building of any sort at all. General contractors had no experience, and they could not estimate and finance buildings. Taliesin apprentice William Wesley Peters was the general contractor on two of the Usonian houses; I was more than construction manager on three—making out payrolls, ordering materials, and subcontracting. The millwork was often ordered from one outfit in New Jersey, and it was the basis of fabrication and construction for the whole house. The same company also fabricated built-in furniture, tables, chairs, and benches. We had one roving builder, building house after house, from California to New York. His salary was $50 a week. The on-site resident apprentice received $12.50 a week, plus room and board.



Herbert Jacobs

Progress photograph of the Schwartz House under construction, in Two Rivers, Wisconsin, embellished in pencil with foliage by Frank Lloyd Wright.

Edgar Tafel

Frank Lloyd Wright inspecting the floor heating pipes in the Jacobs House, Madison, Wisconsin.

Any new building system has problems, and Mr. Sargeant almost avoids them for reasons of his own (maybe because he wasn't there?): exterior tight mitres don't stay tight, and three-inch walls aren't conducive to electric conduit and are skimpy for bearing. Second-story complications arose, and the "typical detail" sheet became flooded with atypical details. But in the Usonian houses, here is the creation of the "carport," the open-plan kitchen, the living room that is really used for living rather than for show, floor heating, the basementless house, orientation to privacy, and so on. Despite Frank Lloyd Wright's commitment to an indigenous and local architecture, however, the Usonian house was the same from Massachusetts to California, with stops in between.

On wonders why, in Mr. Sargeant's book, so many plans are shown without identifying the rooms. But the photographs are fine, and they give a depth of coverage, from foundations to air views of the buildings.

Edgar Tafel, who practices architecture in New York, lectures frequently on the work of Frank Lloyd Wright, and has recently made a film and organized a travel exhibit for USIA. Currently he is at work on a biography of Wright to be published by the McGraw-Hill Book Company.

Also received

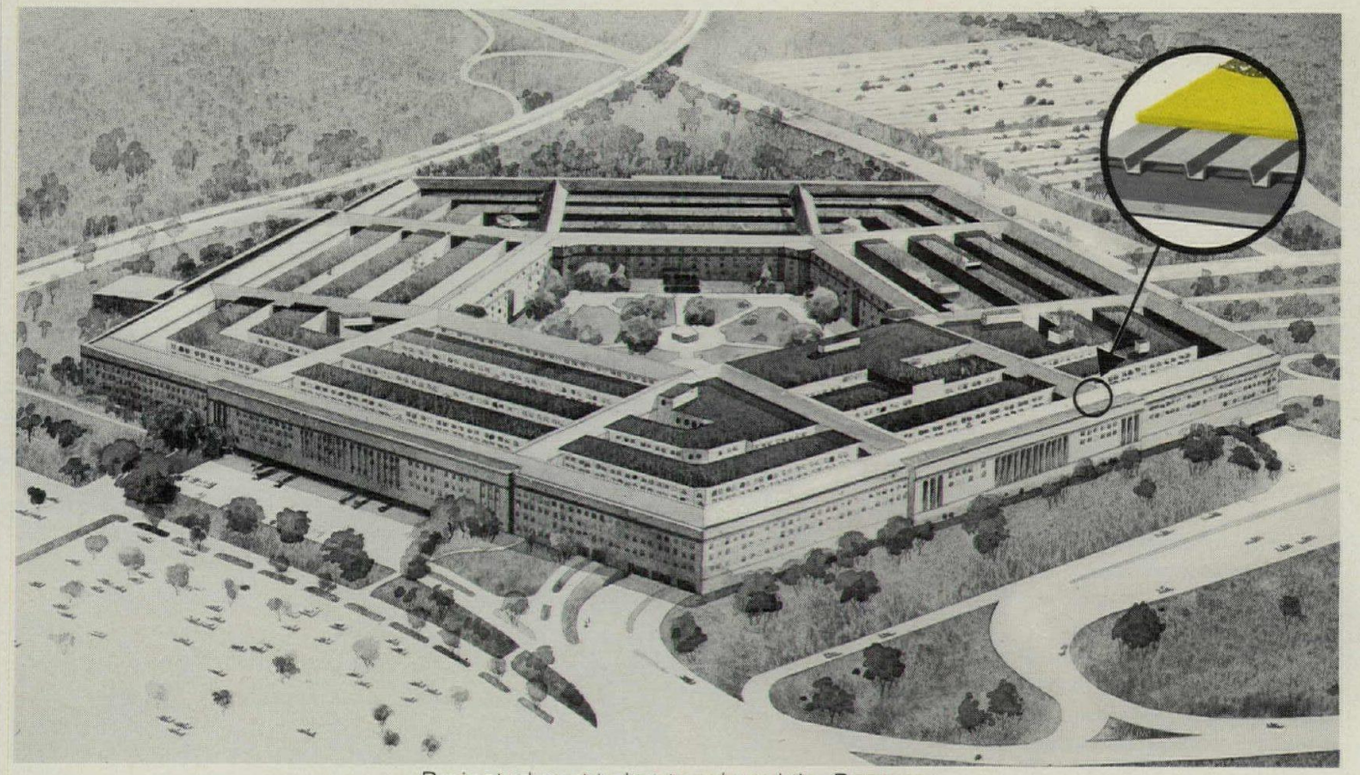
TEMPLES OF DEMOCRACY: *The State Capitols of the U.S.A., by Henry-Russell Hitchcock and William Seale; Harcourt Brace Jovanovich, New York, 1976, 339 pages, illustrations, $29.95.*

One of the more notable bicentennial treats in architectural publishing is the appearance of this new book by William Seale and Henry-Russell Hitchcock. State capitols are assumed to be a uniquely American building type and the history of their design and construction to be a significant saga that parallels the social history of the nation.

The book is also, tangentially, an important essay in architectural symbolism, as the authors point out in the very beginning: "Skyscrapers and state capitols are America's unique contributions to monumental architecture. The skyscraper is a product of function and structure; the state capitol owes its special character to symbolism."

The book contains good photographs of all 50 state capitols (the first time that this has happened in a history book, according to the publishers) and some drawings—but, unfortunately, not plans of all 50 capitols.

Insulation is



Projected cost to heat and cool the Pentagon
for the next 20 years, if it were built today using only 15/16-inch Fiberglas roof insulation:

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The Pentagon—world's largest office building.

If it were being designed by *today's* architects for *today's* soaring heating and cooling costs, we trust it would have the specifications of the version on the right.

This version has a full 2¼-inch layer of roof insulation, instead of the thinner layer that has been usual for offices, schools, stores and other commercial buildings for the past 20 or 30 years.

Using thicker 2¼-inch Fiberglas*

*T.M. Reg. O.-C.F.

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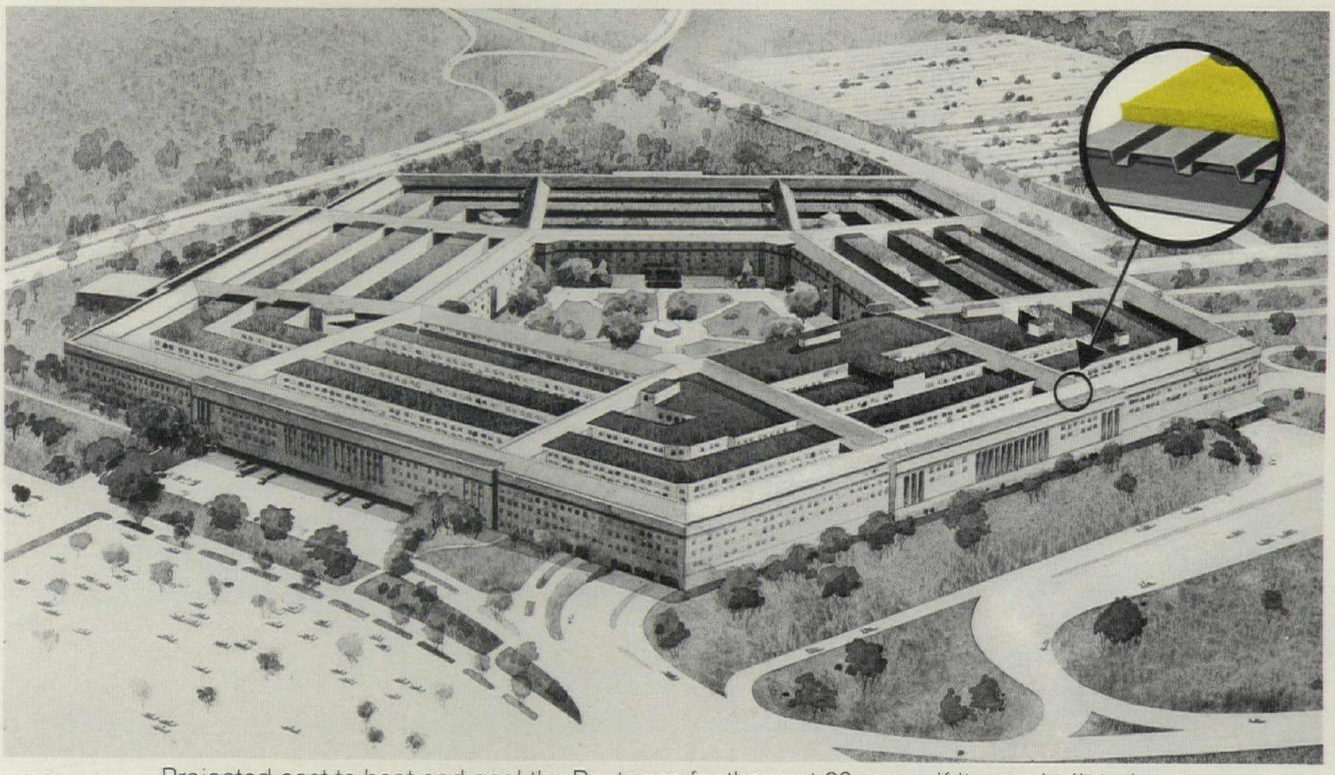

Projected cost to heat and cool the Pentagon for the next 20 years, if it were built today using thicker 2¼-inch Fiberglas roof insulation (*after* allowing for the cost of thicker insulation!):

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1. It saves on energy costs. Estimated savings per year, based on gas heat and electric cooling in the Washington area, with a projected increase in energy costs at 7% per year and estimated future savings discounted at 10% per year: $66,697 — or $1,333,954 every 20 years.

2. It saves on construction costs. The estimated first cost of this energy-tight Pentagon would be *lower* than if the less efficient version were built! Reason: the improved thermal performance of the roof would permit use of smaller-capacity, *less costly* heating and cooling equipment. Amazingly, the estimated savings would be large enough to cover the added cost of the thicker roof insulation *twice* over.

Important: Thicker Fiberglas roof insulation also makes sense when it's time to re-roof *existing* buildings. It should pay for itself in a few years, then go on saving thousands in fuel bills for years to come.

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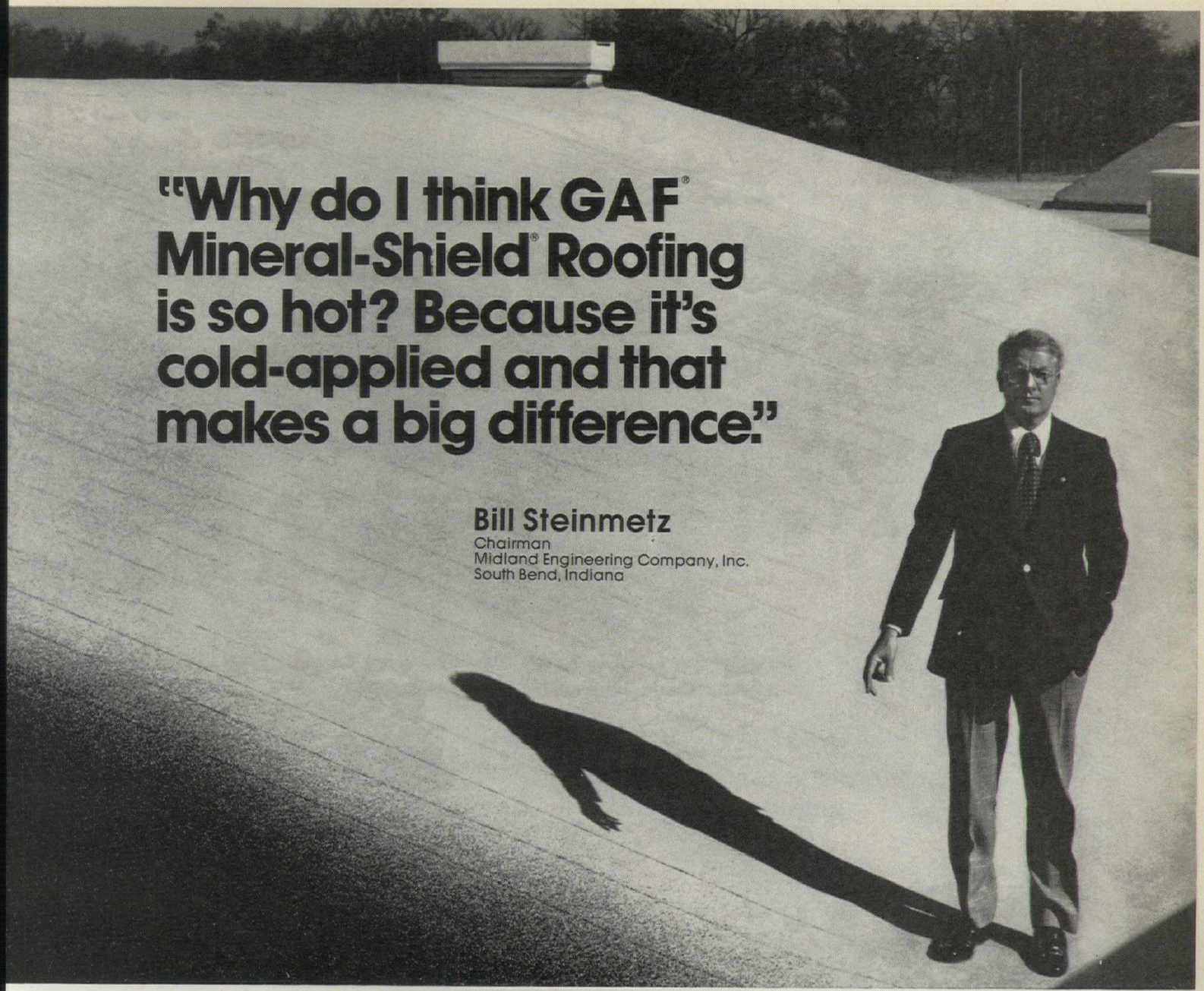

"Why do I think GAF® Mineral-Shield® Roofing is so hot? Because it's cold-applied and that makes a big difference."

Bill Steinmetz
Chairman
Midland Engineering Company, Inc.
South Bend, Indiana

"A play on words, hardly," Mr. Steinmetz continues. "We've been thinking cold around our company for over six years now. With some 400 cold process roofing jobs under our belt, we know that Mineral-Shield roofing performs. Not only can we recommend it with complete confidence to our customers, but we have also found through our extensive job experience that there are many advantages and benefits to the roofing contractor.

"Because Mineral-Shield is cold-applied, the need for heating kettles and tankers is eliminated. Also gone are hot luggers, felt layers, and gravel spreaders. In fact, a contractor's job equipment needs are reduced substantially and the cold process application equipment can easily be towed to the job site by conventional pick-up truck. The economics of this are obvious...less handling, faster job set-up, less equipment maintenance, not to mention the elimination of lost time due to accidents or burns.

"What really sold us on GAF Mineral-Shield Roofing system is that it works! And after all, that's the name of the game whether you're looking at it from the point of view of the owner, roofing contractor, or architect."

GAF Mineral-Shield is a modern cold-applied built-up roofing incorporating multi-plies of roofing membrane plus layers of roofing mastic and a surfacing of white mineral granules, usually applied by mechanized spray equipment. All components—roofing membrane, mastic and granules—are factory-finished under rigid GAF quality control. A Class "A" Underwriters' Laboratories Rating is available. Guaranteed by GAF when applied according to published specifications.

GAF® GAF Corporation
Industrial Roofing and Waterproofing,
140 West 51 Street,
New York, New York. 10020

☐ Please send me further information on GAF Mineral Shield Cold-Applied Roofing.

☐ Please have a representative call. TA-AR-116

Name _____

Firm _____

Address _____

City _____ State _____ Zip _____

GAF® Mineral-Shield® Roofing

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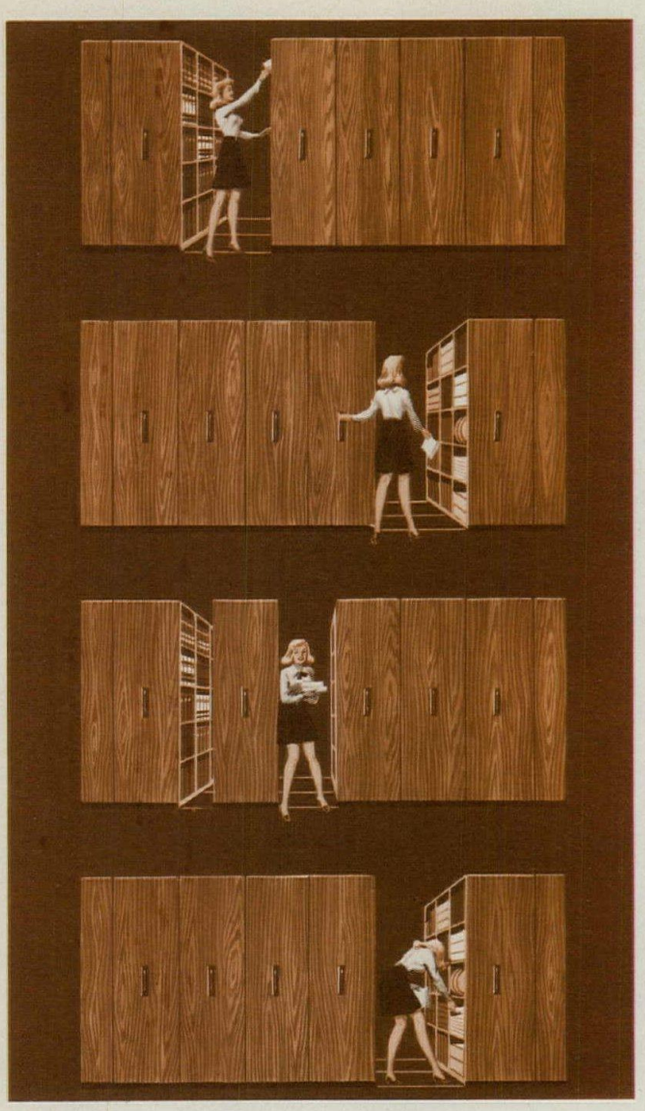

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the file with the movable aisle!

If you tried to provide your clients with this much storage or file space using ordinary files or shelves, you'd need 6 aisles and up to 4 times the floorspace. FULLSPACE does it with just one aisle that opens where it's needed. Furthermore, when the aisle is opened, all the space on both sides is exposed, greatly reducing access time.

But there's more to FULLSPACE than space-saving and efficiency. High quality finishes in handsome wood grains or colored laminates create handsome furniture that complements any decor.

Want more information? Write today, or call us collect.

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now...meet smoke regulations with special VPI solid vinyl tile

VPI's popular Vinylast® and Terralast® patterns are now available in special smoke retardant formulations to meet local building codes, as well as fire safety regulations for federally funded health care facilities.

Independent laboratory tests conducted in accordance with Appendix II, NBS Technical Notes 708, show smoke generation ratings of less than 450. In addition, flame spread ratings are less than 75 when tested according to ASTM E-84. Both patterns are offered on special order in the same 10 colors as regular Vinylast and Terralast.

rely on VPI quality

Like all VPI solid vinyl tile, smoke retardant Vinylast and Terralast are quiet and comfortable under foot, have excellent indentation recovery, and are resistant to most chemicals. Each tile is Micro-squared™ for virtually seamless installation.

The pattern extends through the entire thickness, so it can't wear off for the life of the tile. Installation with VPI "dead-set" adhesive ensures a positive hold, with no lateral movement or shrinkage. Write today for details.

51-324

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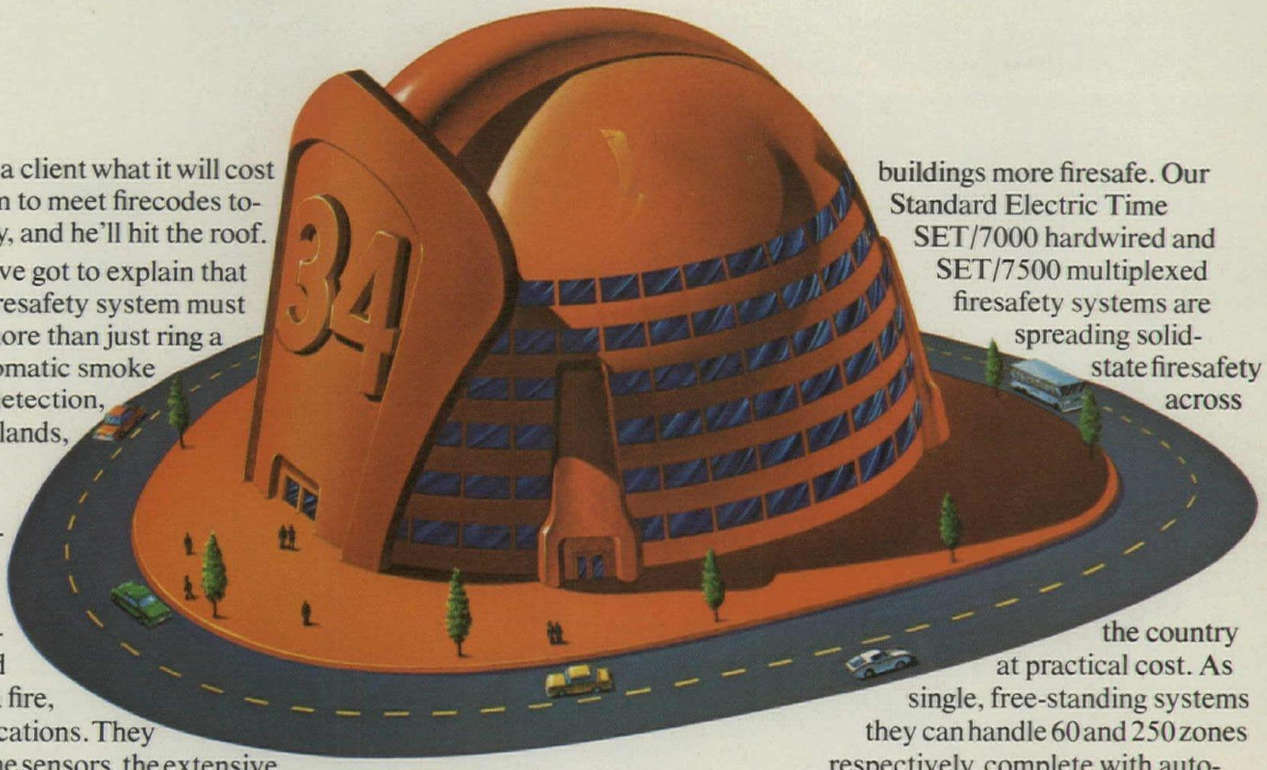
Announcing a Firesafety System That Pays for Itself



Tell a client what it will cost him to meet firecodes today, and he'll hit the roof.

You've got to explain that today's firesafety system must do a lot more than just ring a bell. Automatic smoke and heat detection, firesafe islands, elevator control, smoke exhaustion, pressurization, locating and tracking a fire, communications. They add up. The sensors, the extensive wiring, a sophisticated console panel.

Now tell him about the Johnson Controls JC/80 computerized firesafety system—*the firesafety system that pays for itself.*

It Pays for Itself, and Thensome

It pays for itself because the same computer, the same control

center, the same multiplex wiring can be used to monitor and control every other automated system in his building—heating and cooling, security, lighting, communications and clock systems. And it can save literally thousands of dollars a month by delivering automated energy-saving programs for enthalpy switchover, nite set-back, start/stop, supply air reset, chiller plant control, and load shedding.

More Than Just Firesafety, It's Income

In the average building the basic JC/80 system—computer, multiplex wiring, and control center—*pays for itself in less than three years in energy savings alone!* And because these savings continue non-stop throughout the life of the building, they can defray the *entire* cost of a modern firesafety system in another 3 years or less. From here on, what it saves is *income*.

At Johnson Controls we're doing a lot to help make America's buildings more firesafe. Our Standard Electric Time SET/7000 hardwired and SET/7500 multiplexed firesafety systems are spreading solid-state firesafety across the country at practical cost. As single, free-standing systems they can handle 60 and 250 zones respectively, complete with automatic communications, elevator recall, ventilation and fire door control. And of course they can be "stacked up" to handle many more zones if required.

But if your client wants firesafety that pays its own way, let him in on the Johnson Controls JC/80 system. It gives him a flexible, sophisticated firesafety system that not only pays for itself, but pays continuing dividends in years ahead.

And he can't do better than that.

For more information on firesafety systems, call the Standard Electric Time or Johnson Controls office in your area. Or write, R.J. Caffrey, Vice President-Marketing, Systems & Services Division, Johnson Controls, Inc., Reference M-3, Box 423, Milwaukee, Wisconsin 53201.

JOHNSON CONTROLS

Prime source of problem-solving systems.

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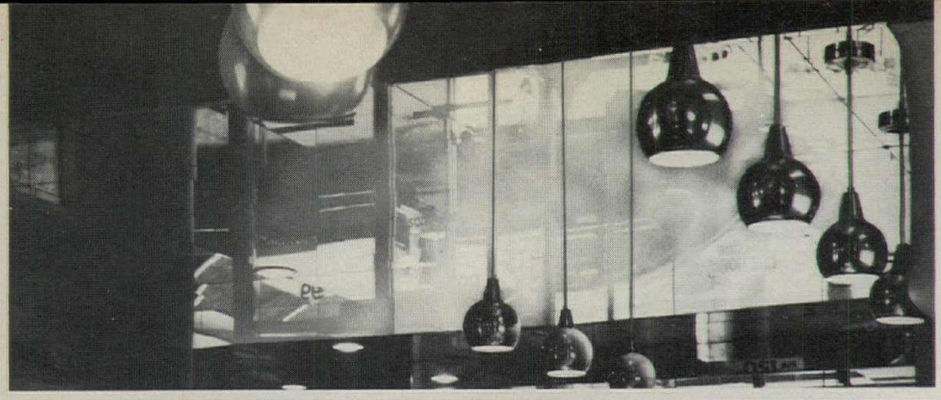

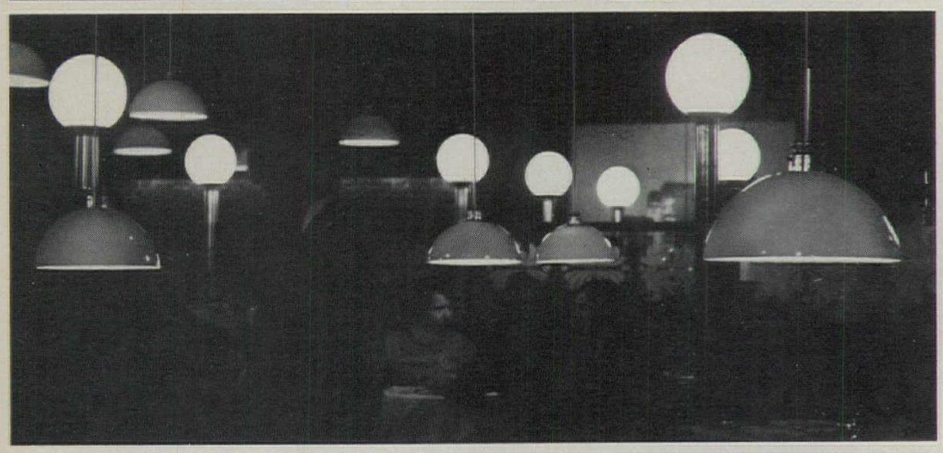

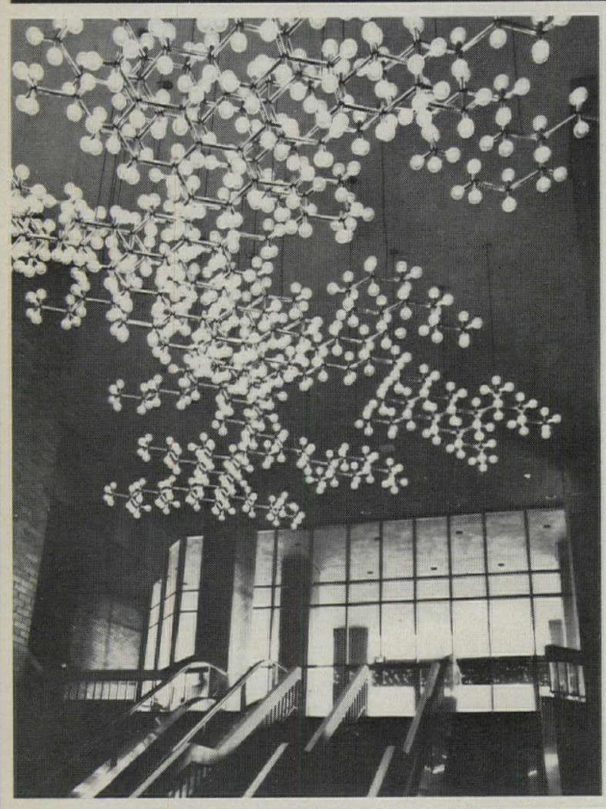

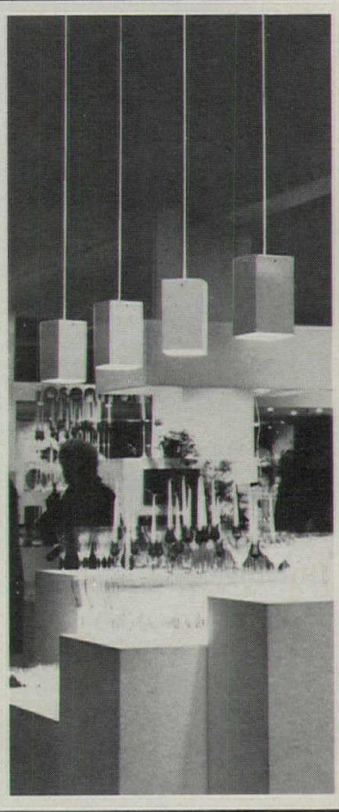

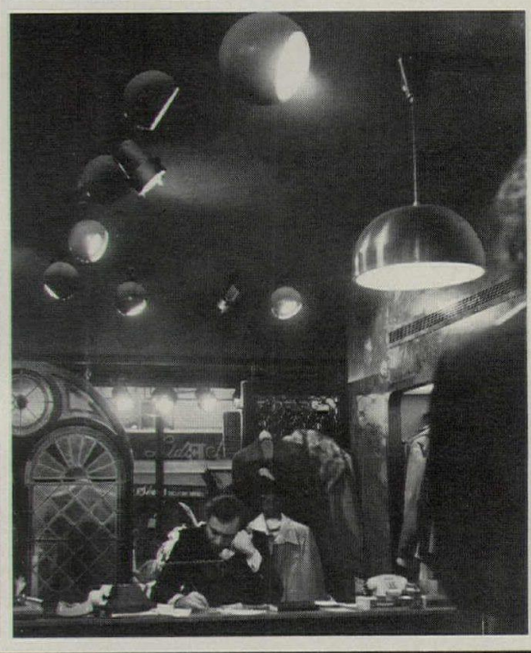

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Constructed to your design. Or designed for your construction.
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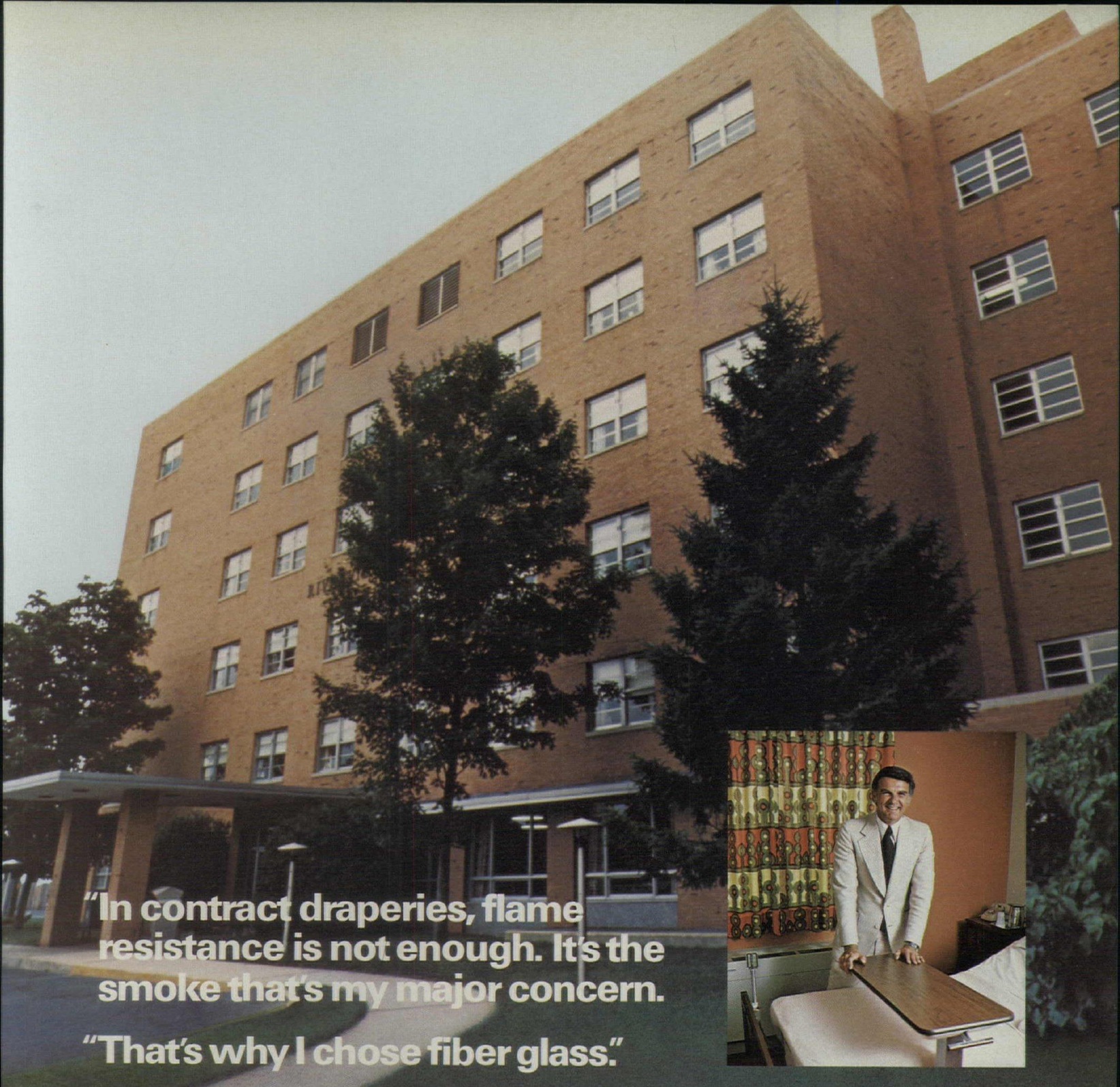


"In contract draperies, flame resistance is not enough. It's the smoke that's my major concern.

"That's why I chose fiber glass."

Only fiber glass offers the optimum in *both* flame and smoke resistance. While fire may destroy, it's smoke that causes most of the human casualties in fires in buildings. That's why Mr. Pawlowski chose fiber glass for Riverview Hospital's draperies.

The fabric shown above meets all applicable flammability standards. It will not support combustion, drip nor continue to burn after heat or flame is removed—because fiber glass yarns are naturally and permanently resistant to combustion.

Even more important, properly finished fabrics woven from these yarns emit no significant amount of smoke when exposed to flame or intense heat. This is not true of many widely used contract fabrics.

How does all of this stack up with any other drapery fabric you might be considering?

For a sample of the Riverview Hospital fabric and for information on other fire- and smoke-rated drapery fabrics, write PPG Industries, Inc., Fiber Glass Division, One Gateway Center, Pittsburgh, Pa. 15222.

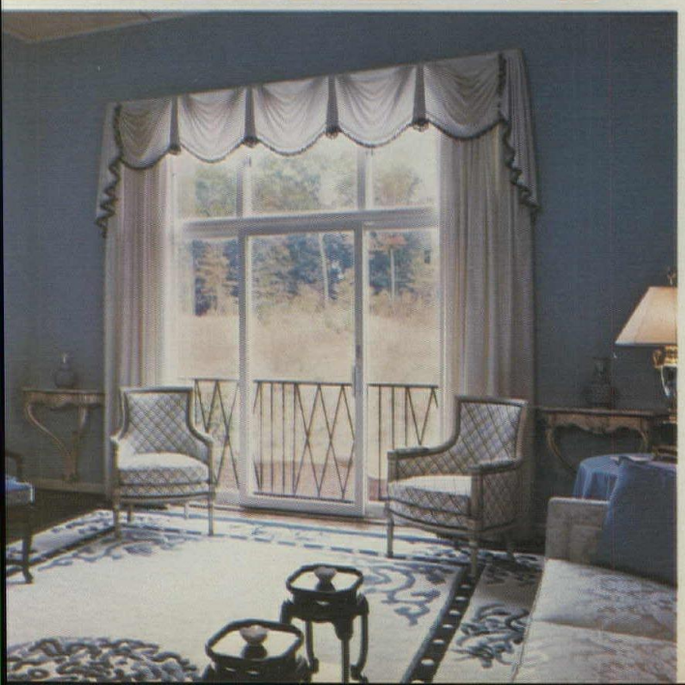
PPG: a Concern for the Future

John K. Pawlowski, Administrator
Riverview Hospital
Red Bank, N.J.

Draperies of PPG Fiber Glass
by Flamex Fabrics, Hicksville, N.Y.
Pattern: Keyhole, on basic fabric Exeter
by Rosco Products, Inc., Boston, Mass.

Fiber Glass PPG INDUSTRIES

For more data, circle 30 on inquiry card



The gliding door that's built like an Andersen® Window.

Some architects like to think of gliding doors as big windows you can walk through.

That's why, when they specify snug-fitting Andersen® Windows, they also insist on Andersen Gliding Doors.

Because, like their window counterparts, these neat, trim gliding doors with insulating safety glass are built to reduce heat loss and to save on owner fuel bills.

In fact, Andersen Gliding Doors can reduce heat loss due to air-infiltration by up to 30% compared to similar glazed doors that only meet industry air-infiltration standards.

But there's more than potential fuel savings about these solid, smooth-sliding, walk-out windows.

There's the rich, warm feeling of spaciousness they bring to a room. And the charm, character and elegance of an interior wood trim that can be stained or painted to complement any decor.

There's special locking hardware, too. With two-panel Andersen Gliding Doors, the operating panel locks directly *into* the frame.

And you have a choice. Andersen Gliding Doors are available in Primed Wood, in a new Terratone color polyurea finish and in white Perma-Shield® vinyl-clad wood.

For more details, see Sweets, File 8P. Or call your Andersen Dealer or Distributor. He's in the Yellow Pages under "Windows." Or write us.

The beautiful way to save fuel.

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ANDERSEN CORPORATION BAYPORT, MINNESOTA 55003

AW®

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WATTS NEW

ENERGY MANAGEMENT VIEWS FROM THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION VOL. 1 NO. 1

ENERGINEERS* NEEDED IN BICENTENNIAL ERA

Since the founding of our country, our economic energy base has shifted to different fuels several times. Between the Civil War and the turn of the 20th century our energy base shifted from wood to coal. By World War II our energy base had shifted to oil and gas. Now, another shift is taking place.

U.S. production of oil and gas has peaked and world production of these fuels is estimated to peak before the end of the century. Our shift to oil and gas was a natural one because these fuels are convenient to use, cleaner to burn, and easier to distribute than coal. The shift away from oil and gas will not be a natural one because the alternatives mean acceptance of less desirable fuels, e.g., a return to our abundant coal reserves and the rapid expansion of relatively undeveloped nuclear electric power generation. But these are our only economical alternatives in the short run. Without massive restructuring during the Bicentennial era, the chance of an abrupt halt to our way of life is a real threat.

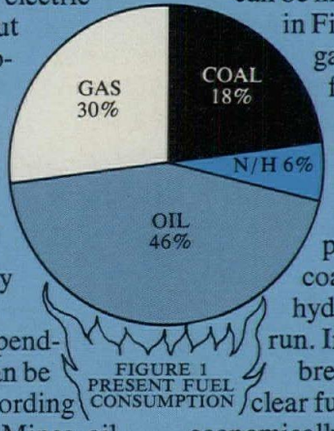


FIGURE 1
PRESENT FUEL CONSUMPTION

Our dangerous dependence on oil and gas can be seen in Figure 1. According to the U.S. Bureau of Mines, oil and gas supply about 76 percent of our fuel use. Coal, which geologists estimate could supply our needs for several hundred years, accounts for only about 18 percent of our fuel production. Nuclear and hydro sources account for only about 6 percent and have had a somewhat erratic record so far. Clearly, we need to mount a crisis-level effort to convert our economy to the fuels that are in large domestic supply: coal and nuclear. Just as clearly, we need to develop methods of using these fuels in ways that will insure their maximum longevity and the health and safety of our population within some acceptable level of risk. The one thing we cannot do is wait much longer to get started. Our scarcest resource of all—time—may be running out rapidly.

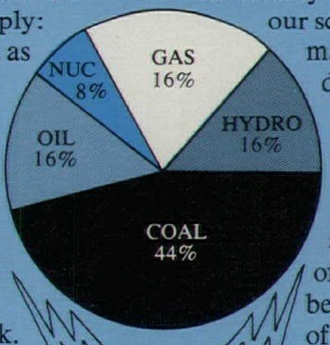


FIGURE 2
ELECTRIC GENERATION SOURCES

The case for shifting our economic dependence to electricity can be made simple by the data in Figure 2. Use of oil and gas presently account for only about 32 percent of all electric generation and is declining. Electricity can and must be expanded from the use of coal, nuclear fission, and hydro sources in the short run. In the long run, the breeder reactor and nuclear fusion may become economically feasible, while other less promising methods such as use of winds, tides, and direct solar conversion may gain wider use. All possible research and development priorities should be devoted toward these objectives.

In the meantime, all users of energy and those responsible for the design and construction of new facilities must become energineers. Energineers are people professionally competent to conserve our scarce oil and gas, manage the growth in demand for additional energy sources, and accelerate the development of new economical, safe alternatives. But most of all, energineers must be dedicated to the task of achieving a new state of independence; independence from the threat of strangulation of future growth through foreign control of our vital sources of energy.

This is the most energy intensive nation in the world, and for it to survive and grow in its present form it must continue to employ energy in ever expanding volume. It will take a new generation of energineers to insure that our fuel resources are used efficiently and that new supplies are available as needed. They may well be the patriots of the national Bicentennial era.

*Energineers . . . designers, specifiers, users and installers of energy efficient building systems.

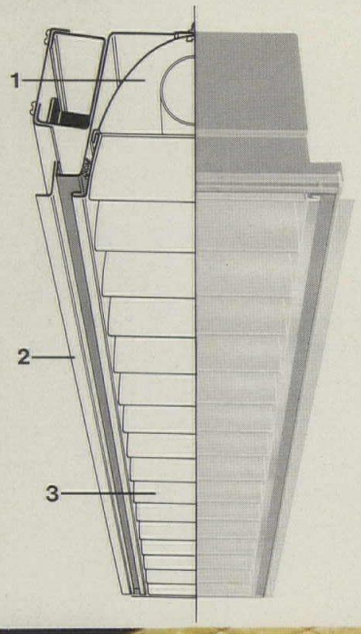
The beauty of Alcoa Coilzak in parabolic luminaires is the beautiful way it controls light.

Parabolic luminaires are esthetically pleasing, in the design of the fixture and in the type of light they dispel. This is particularly important where people work, read or shop, where low visual brightness contributes to a comfortable atmosphere. The secret is precise light control, made possible because the reflective material in quality parabolic systems is Alcoa* Coilzak lighting sheet. Note that we said *lighting sheet*. In a properly designed luminaire, reflectivity is only part of the story. Controlled image clarity and reflective diffusion are just as important. Alcoa Coilzak sheet is an Alzak®-finished reflector material that meets precise reflectivity and gloss standards.

Operating costs of a parabolic lighting system can be low. Because of its efficient light distribution, a properly planned system may require fewer luminaires, resulting in low electrical loadings. Savings in cleaning maintenance are possible also. Parabolic luminaires do not require a lens and the unique design, plus the static-free Coilzak louvers, resists soil and dust accumulation.

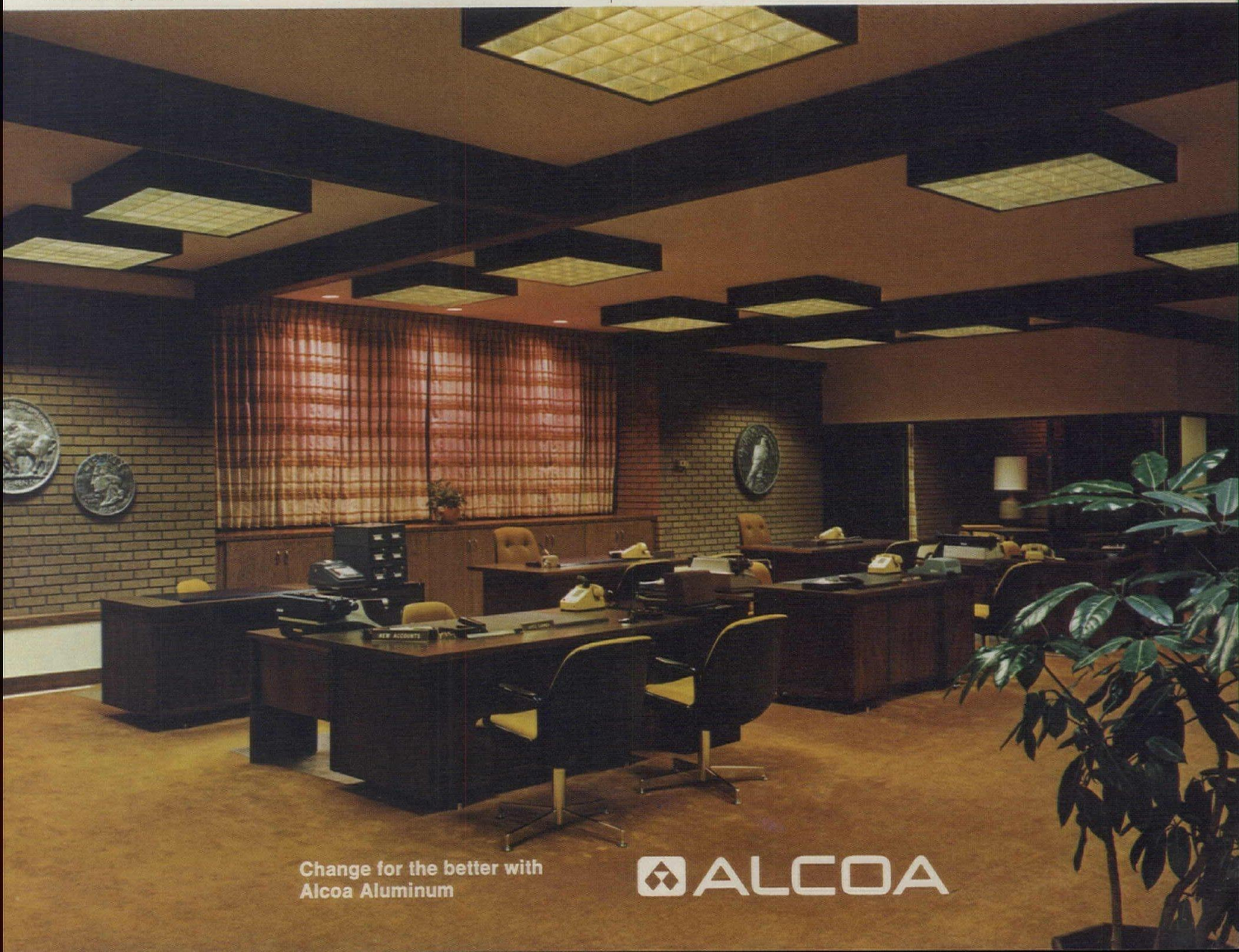
For more information on the many beautiful advantages of Coilzak lighting sheet in parabolic luminaires, write Aluminum Company of America, 551L Alcoa Building, Pittsburgh, PA 15219.

*Registered Trademarks of Aluminum Company of America



1. One-piece constructed Coilzak reflector with accurately controlled parabolic shape.
2. Extruded aluminum trim.
3. Coilzak parabolic baffle assembly.

Photo courtesy Columbia Lighting, Inc.



Change for the better with Alcoa Aluminum

ALCOA

Expressions in Masonry

A biological research tower, a building for which there is no historical precedent, is given human scale and historic reference by brick.

Concrete masonry units enclosing apartments provide protective firmness and the detail interest of hand-layed units.

Two expressions of the beauty and flexibility of masonry by Ulrich Franzen, FAIA.

International Masonry Institute
Suite 1001, 823 15th Street, N.W.
Washington, D.C. 20005
202-783-3908

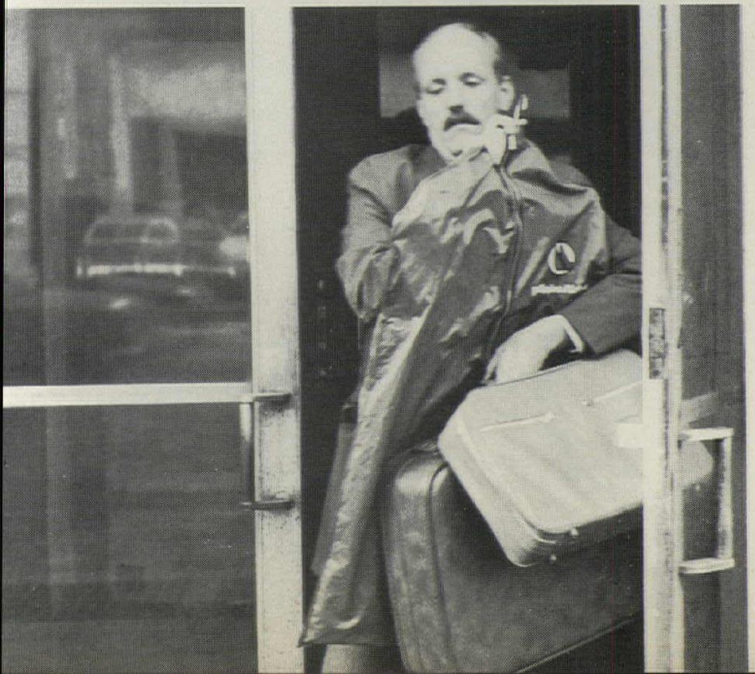
Research Tower, College of Veterinary Medicine, State Colleges, Cornell University, Ithaca, N.Y.
Architect: Ulrich Franzen & Associates

William Street Apartments, Wesleyan University Middletown, Conn.
Architect: Ulrich Franzen & Associates

Photographs: David Franzen

Some things we just hav

o cope with. Or do we?



Just stand outside a building sometime and watch what happens.

Then think how an automatic entrance could eliminate all that congestion. Keep traffic moving. Even enhance the very look of the building.

Obviously you devote a lot of time to an entrance. You probably consider it the symbol, the focus of your building. By thinking one step further, you could make it all the more inviting.

Next time, think of the Stanley Magic-Door® people. The people who originated the whole idea of automatic entrances some forty-five years ago. And are still the leaders in the business. Stanley Door Operating Equipment, Division of The Stanley Works, Farmington, Connecticut 06032.

STANLEY®

helps you do things right

For more data, circle 33 on inquiry card

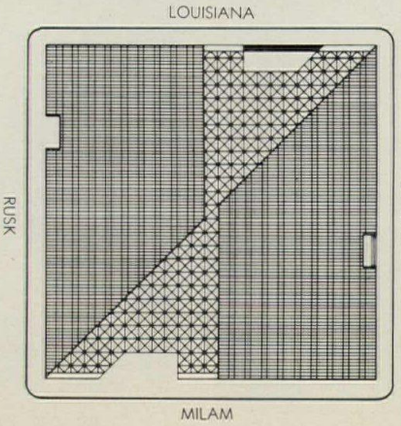
Owner: Gerald D. Hines Interests, Houston
Architects: Johnson/Burgee, New York, N.Y.; S. I. Morris Associates, Houston
Structural Engineer: Ellisor Engineers, Inc., Houston
Fabricator: Mosher Steel Co., Houston
Erector: Peterson Brothers Steel Erection Company, Houston
General Contractor: Zapata Warrior Constructors, Houston

"We have chosen not to cut the top of the buildings off in the usual fashion against the sky, but rather to silhouette a counterpoint of strong diagonal massing."
—Philip Johnson, Architect.

(1) The use of stub-girders enables the air-conditioning ducts to be carried through the built-up girder system without requiring any web penetrations. The stub sections act compositely with the 3-1/4-in.-deep concrete topping placed over the galvanized steel floor deck.

Each trapezoidal tower measures 120 ft wide, a maximum of 250 ft on the long side, and 130 ft on the short parallel side. The fourth side is angled 45 degrees to the parallel sides.

(2) An eight-story, glass-enclosed courtyard connects the towers at their base. The see-through enclosure provides continuity of design, as well as an airy, visual experience for persons entering the building.



PENNZOIL PLACE...showcase for steel construction

"Stub-girder" design provides construction economies; reduces overall story height.

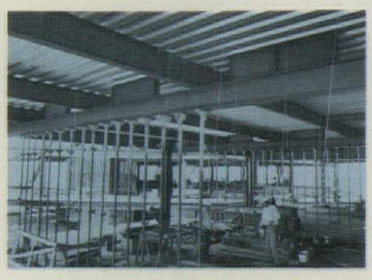
Pennzoil Place, designed by Johnson/Burgee and S. I. Morris Associates, adds a bold, new architectural dimension to the Houston skyline. Rising 516 ft above grade, the twin, 37-story trapezoidal towers of Pennzoil Place contain a total of 1.8 million sq ft, making it the city's largest office complex. A retail mall and a three-level garage are located below the plaza level.

Steel speeds construction. The project's building program was based on a 24-month construction schedule. Several basic structural systems were considered during the early design phase, but steel was selected because of its ability to be erected more rapidly.

The system adopted utilizes a welded rigid steel frame on the perimeter, and concrete shear walls in the core. Three additional welded bents, located near each 45-degree corner, minimize torsion.

According to the engineers, "The steel frame was erected quickly and was well coordinated with the construction of the core."

Stub-girder system cuts material costs. The stub-girder flooring system, a relatively new development in structural design, offers a number of advantages for buildings with a minimum width of 100 ft and clear spans in the range of 35 to 40 ft.



(1)

The stub-girder concept resembles a Vierendeel truss system. The composite concrete and steel floor deck system forms the top compression chord of the Vierendeel and a high-strength steel section forms the bottom tension chord. Stub pieces, shop-welded to the bottom tension chord and connected to the composite concrete and steel floor deck system by welded stub-type shear connectors, serve as the verticals of the Vierendeel.

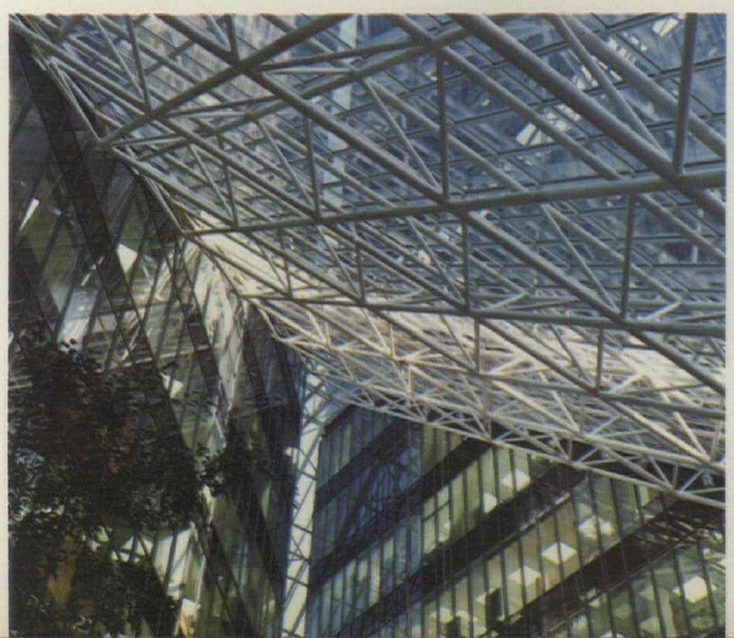
The unusual floor-framing system enables the air-conditioning ducts to be carried through the built-up girders without requiring any web penetrations. This increases the structural depth of the girder without adding a penalty for increased height. Result: significant economies in structural steel. It's estimated that stub-girders reduce structural steel quantities by approximately 2.5 lb per sq ft compared to conventional framing systems.

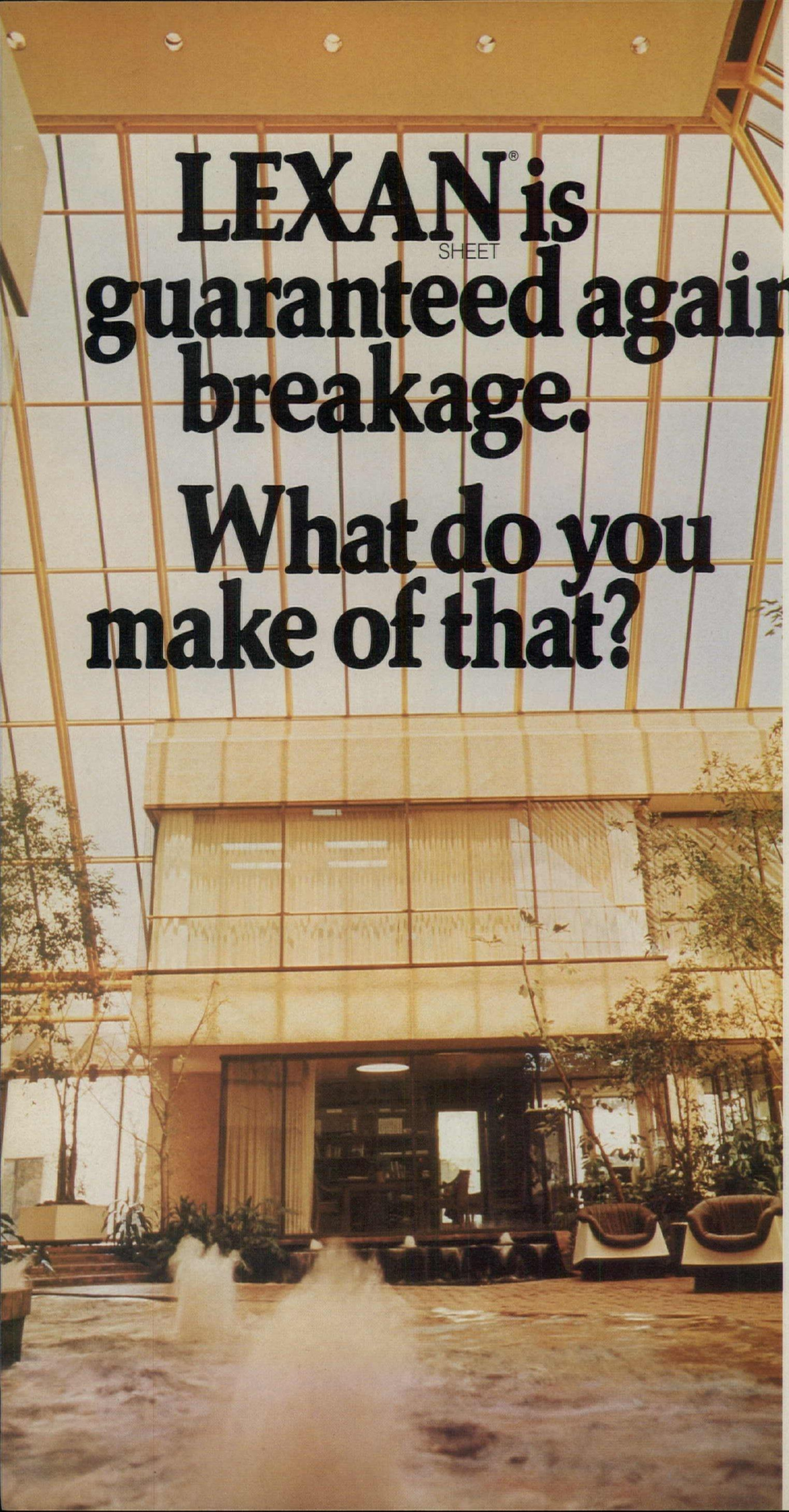
And because building height is reduced, savings result in other construction items, such as curtain walls, elevator ropes, and electrical and mechanical equipment.

What's more, because the continuous floor beams can be easily positioned atop the girders, erection proceeds more rapidly than usual.

Our Sales Engineering Division offers a variety of technical and advisory services. For example, our preliminary frame analysis program is designed to help you select the most favorable steel framing system for your building. It also enables you to compare steel framing against competitive materials.

(2)





LEXAN® SHEET is guaranteed against breakage. What do you make of that?

Whatever you make of it will withstand the worst punishment possible. LEXAN sheet is guaranteed against breakage,* even under the blows of a sledgehammer or the onslaught of a steamroller. That means lower replacement costs, more economy. LEXAN sheet is UL listed Burglar Resistant, complies with the Safety Glazing A.N.S.I. (Z97.1) standard and OSHA requirements. And new F-2000 flame-retardant grade meets the highest standards for reduced flammability.

There's LEXGARD® bullet-resistant laminate which meets UL ballistic level ratings up to a .44 Magnum (UL 752 standard).

For industrial glazing PROTECT-A-GLAZE™ sheet offers an attractive, clear and tinted, translucent glazing for durability with economy.

And architects are finding more and more applications. LEXAN sheet is being used for lighting panels and lenses which are light weight and provide high light transmission.

Tough skylights.
LEXAN sheet's high impact resistance, clarity, and weather resistance make it ideal for durable, attractive skylights.

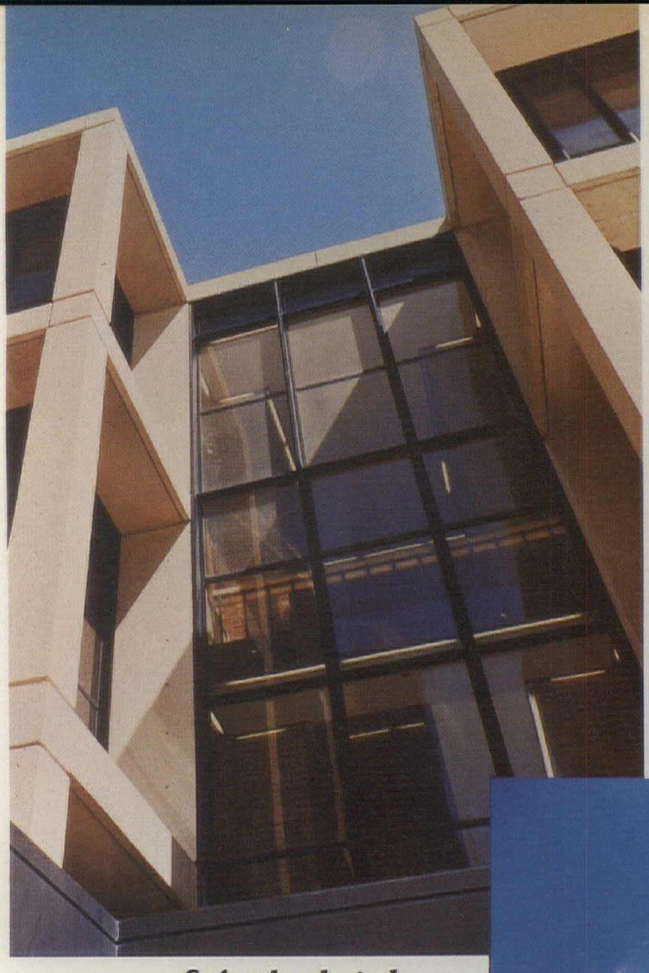
Photo: Nashville House
Nashville, TN
Architect: Robert Lamb Hart/HKS

NOTICE:

LEXAN® SHEET IS THE LEAST COMBUSTIBLE SAFETY GLAZING PLASTIC SHEET BUT WILL IGNITE WHEN EXPOSED TO AN IGNITION SOURCE IN EXCESS OF 800°F (426°C).

FOR MAXIMUM SAFETY...

- Advise local fire officials of LEXAN glazing installations.
- Consider sprinkler systems for additional safety.
- Check local codes for construction applications.
- Observe fire precautions similar to wood.
- Consider emergency access sash construction.



Safe school windows.

In school systems throughout the USA, LEXAN sheet secures buildings against vandalism and theft, with LEXAN sheet providing up to 25% more insulation than comparable thicknesses in glass.

Photo: Walt Disney Magnet School
Chicago, IL
Architect: Perkins & Will

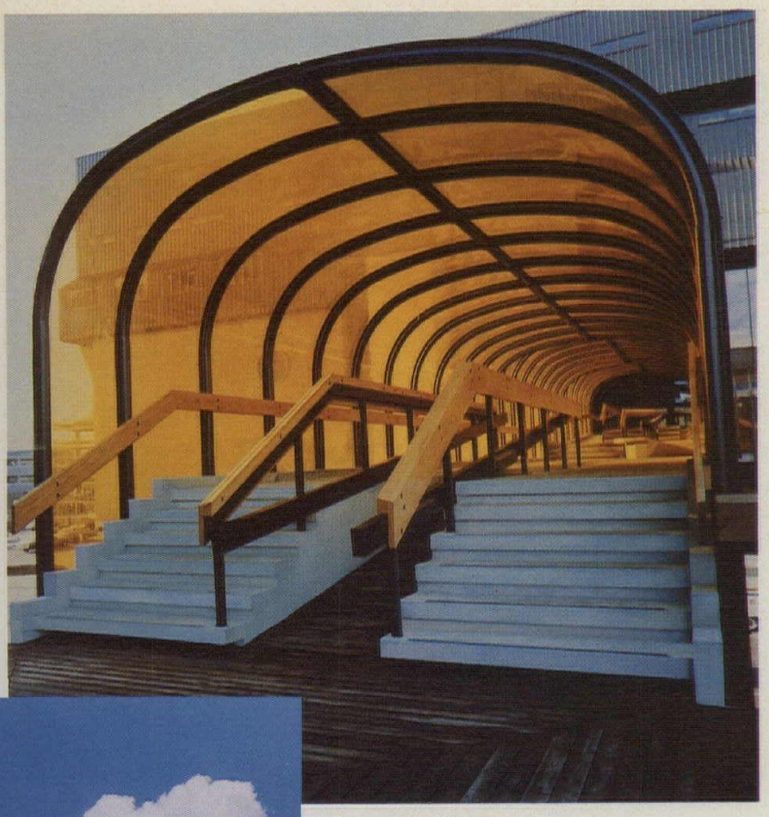


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Photo: Provincial Court & Remand Centre
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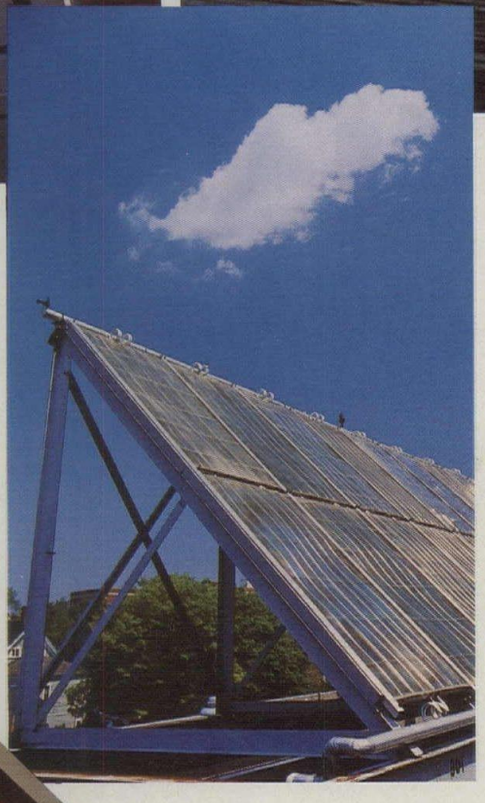

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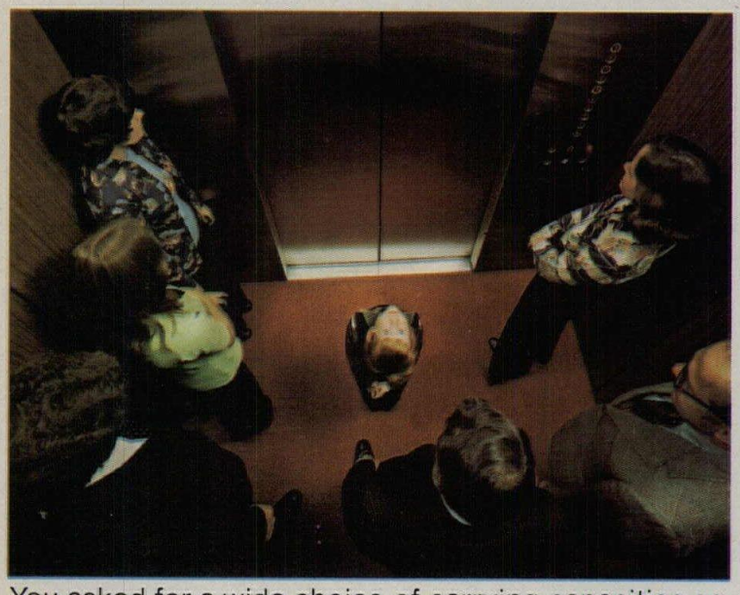

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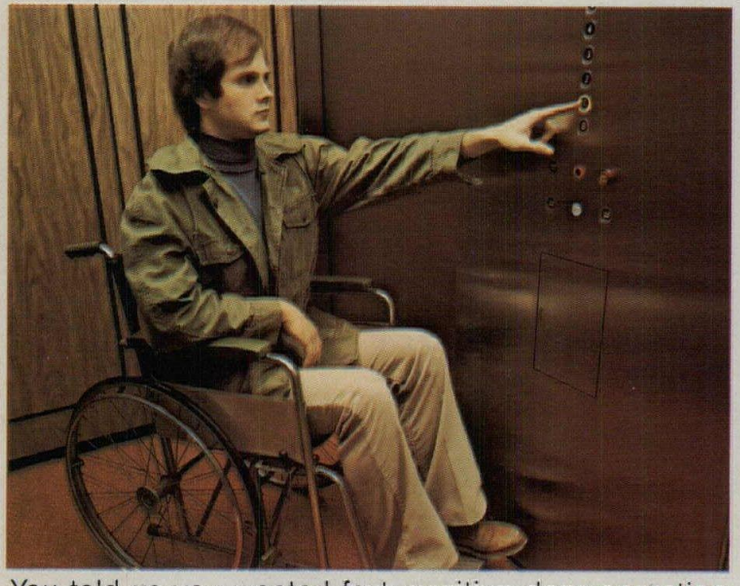

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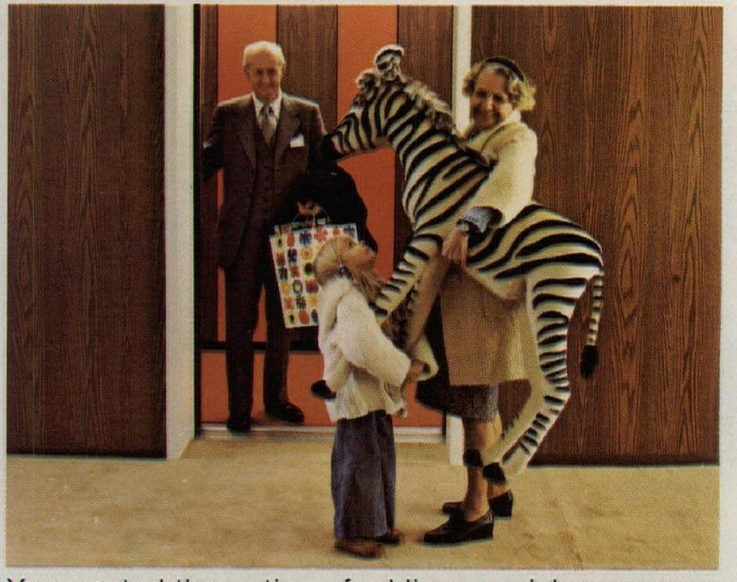

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CONSTRUCTION MANAGEMENT
BUILDING COSTS
BUILDING ACTIVITY

Dodge/Sweet's Construction Outlook: 1977

". . . not as good as it should be, but better than anything the industry has known for quite some time."

Prepared October 1976 by the Economics Department, McGraw-Hill Information Systems Company; George A. Christie, vice president and chief economist.

In 1975 the housing market brought the first sign that the depressed construction industry was turning around. In 1976 this expectation was confirmed by a tenuous recovery of nonresidential building. And now 1977 could be the year it all pays off.

History gives us some clues to what *should* happen next. The experience of previous cycles strongly suggests that both housing and nonresidential building will continue to expand on these beginnings. The experience of the current cycle suggests that this potential is clearly there.

The typical recovery pattern of past cycles offers up to three years of expansion following each decline. To the extent that the recession of the mid-1970s was a lot longer and a lot deeper than its predecessors, this recovery might also run a good bit longer than the three-year average. That's certainly the case if the existence of room for expansion is any criterion. Excess capacity is something the construction industry has in abundance right now. Even after more than a year of recovery, unemployment in the building trades is still above 15 per cent, and most building products manufacturers are still using only 70 to 75 per cent of their capacity. That leaves a lot of room at the top.

Another thing about this recovery that supports an outlook for continued expansion: its early narrowness. Through mid-1976 a very large part of whatever passed for recovery in construction was confined to just a few categories: single-family homes, electric utilities and public works. That still leaves plenty of potential in the traditional "late bloomers": apartment, commercial and industrial building—all good bets for next year.

So, going into 1977, there's a strong circumstantial case for expanding construction demand. On the surface, at least, next year shapes up as one of those periods when all the self-reinforcing elements of the cycle pay off biggest. There's even the hint that it might last through much of 1978.

Considering all the grim news the construction industry has had heaped upon it for the past several years, that's pretty heady stuff. Unfortunately, though, for every forecast that's ever been made, there are at least three ways to go wrong, and this one's no different. So here they are, the flaws in the most encouraging forecast that circumstances have allowed in quite a while:

- **The economy**—How serious is the mid-1976 "pause," and what will it take to get the recovery going again? To sustain it through 1977?
- **The election**—A change in the Administration would mean a change of economic priorities. How would this affect the construction outlook for 1977? Beyond 1977?
- **Inflation**—Today's construction dollars buy only three-quarters of what they bought as recently as 1973. Is the recovery only a mirage of cheap dollars?

The economy: the reluctant recovery

Some see the mid-1976 pause as only one in a series of alternating "spurts and pauses" that will typify the economy's recovery for the indefinite future. Others fear that the mid-1976 slowdown may be the beginning of the end of the recovery. Still others view it in Pollyanna-like fashion as a "pause that refreshes."

The facts of the mid-1976 slowdown of output and the consequent rise of unemployment have been widely publicized. To be sure, the nine per cent rate of recovery in the opening quarter was hardly sustainable for very long, and was due in large part to the turnaround from inventory liquidation to inventory accumulation—a well-known phenomenon that normally adds a lot of leverage to the early stage of recovery. But the weak rate of expansion that followed this early burst of activity hasn't been enough even to absorb the growth of the labor force, much less move the economy toward full employment; and it strongly suggests that something is missing from the recovery.

What might this something be? Fiscal thrust, perhaps. Also consumer confidence. And business capital spending. All are absent from this recovery in some measure.

The mysterious shortfall of Federal spending during 1976 by some $10 billion or more below the already tightly budgeted amount plainly contributed to the economy's slowdown. The mid-year rise in unemployment has dampened enthusiasm in the consumer sector. Until some more of the slack is taken up in industrial capacity, there's not much incentive for manufacturers to launch a new capital-spending boom.

None of these obstacles in the way of renewed recovery is insurmountable, however. Last July Congress overrode the veto of a major public works bill, and more recently has secured a $3.7 billion appropriation to make it effective. A reversal of the rising unemployment rate, along with the diminishing inflation, is what is most needed to restore consumer confidence. And although there is little likelihood of a boom in capital spending next year, the prospect for a reasonable increase in this hitherto sluggish area improves steadily as more and more unused capacity is gradually brought into use. (More on this later.)

There seems, then, to be enough support in the various parts of the economy to revive the faltering recovery—probably by the end of 1976. But instead of a strong expansion backed up by stimulative monetary and fiscal policy, this recovery lacks such support and is vulnerable to intermittent relapse. The implications for the 1977 construction outlook: at this stage of the construction cycle, the recovery of the nonresidential building market requires vigorously expanding business activity. The alternative—a restrained economy—means that some of the potential in 1977 for commercial and industrial building will not be realized.

The election: important differences

What difference will it make to the construction business if Mr. Carter evicts Mr. Ford from the White House? Is there enough difference in their economic philosophies, priorities, and policies to alter the course of the construction cycle? And if there is, will it show up in 1977?

The differences in the two candidates' approaches to economic issues have been thoroughly debated. Mr. Ford has clearly shown that he considers inflation to be the nation's main economic problem, and austerity (tight money and tight budgets) the remedy. The inevitable consequence: a halting, stretched-out recovery, with high unemployment, excess industrial capacity, and a curb on social programs (e.g., housing subsidies) until inflation is brought down to an acceptable rate.

Mr. Carter's stand is considered vague by some and flexible by others; but to the extent that he endorses his party's official platform, he is committed to a priority system that puts full employment and economic growth ahead of inflation—a goal that implies monetary and budgetary activism (particularly in the areas of housing, cities, energy and the environment).

These are important differences. Construction is an industry whose main sources of nourishment are, first and foremost, the money markets, and second, a broad range of public programs. It is obvious how the *policies of containment* (however necessary) that have been in effect for the past few years have amounted to a starvation diet for many kinds of construction. What remains to be seen is whether a change to *policies of stimulation* could restore vigorous growth to this and other


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adversely affected industries without setting off a new wave of inflation. This choice is at the very center of the election issues.

Should Mr. Carter be elected, how soon might his administration be expected to produce a change? For several reasons, it's hard to see how he could have much influence over the outcome of most of 1977. For one thing, he's locked into a Ford budget all the way through next October. For another, the conservative chairman of the Federal Reserve Board, Arthur Burns, can stay on through all of 1977 even if Gerald Ford goes. Besides, Mr. Carter has already indicated that he intends to proceed cautiously in budgetary matters, "phasing in" new programs while eliminating obsolete ones.

This suggests that even if the nation elects a new president, it won't make much difference in the short run. Next year will be a transition year, reflecting more the policies of the past than of the future. But a change of administration could make a considerable difference between 1978 and 1980—especially to the construction industry. It could mean the difference between stagnation and growth.

The inflation hangover

The contrast of two simple facts goes a long way toward showing the extent to which inflation has distorted construction markets in recent years. One is that by mid-1976 more dollars were being spent for new construction than ever before—even more than in the pre-recession boom years of 1973 and 1974. The other is that the physical volume of new construction at mid-1976 was still only about three-quarters of what it was in those pre-recession years. In other words, the "recovery" of the construction industry during 1975 and 1976 has been mostly on paper.

Over a somewhat longer period of time the erosive effect of inflation on construction has been even more pronounced. Prior to 1970, when cost pressures were relatively moderate, the average size of most types of nonresidential buildings was showing an upward trend—a key factor affecting the growth potential for building materials demand. But since 1970—as costs began to soar—that rising trend reversed itself. The average size of newly-built nonresidential buildings has been declining, slowly at first and then more steeply as inflation hit its peak around the mid-70's.

The extent of the "shrinkage" over this period has been considerable—roughly one-third, from an average of nearly 16,000 square feet per project in 1970 to the current (1976) average of just about 10,000 square feet. And although the rate of inflation in construction has receded significantly over the past year, there hasn't—as yet—been any noticeable rebound in average project size. But there are signs that the declining trend is leveling off. What this implies about the strength of the recovery of nonresidential building over the next year or two is complex, but important.

If the average size of nonresidential building projects holds steady in 1977, total square footage of new work will more closely parallel the expected increase in dollar valuation than it has in recent years. But while diminishing inflation may finally be bringing to an end the adjustment the building market has been going through by way of shrinking building size over the last half-dozen years, it won't restore the old (pre-1970) square foot/project relationship. The change in the nature of the demand for construction since 1970 is one of the legacies

1977 National Estimates
of Dodge Construction Potentials

Nonresidential Buildings	1975 Actual	1976 Preliminary*	1977 Forecast	Per Cent Change 1977/76
Contract Value (millions of dollars)				
Office Buildings	$ 4,036	$ 3,850	$ 4,250	+10%
Stores & Other Commercial	5,353	6,400	7,800	+22
Manufacturing Buildings	6,849	3,900	4,450	+14
Total Commercial & Manufacturing	$16,238	$14,150	$16,500	+17%
Educational	$ 5,914	$ 5,100	$ 5,150	+ 1%
Hospital & Health	3,761	4,700	4,850	+ 3
Other Nonresidential Buildings	6,067	6,200	6,725	+ 8
Total Institutional & Other	$15,742	$16,000	$16,725	+ 5%
Total Nonresidential Buildings	$31,980	$30,150	$33,225	+10%
Floor Area (millions of square feet)				
Office Buildings	109	105	112	+ 7%
Stores & Other Commercial	308	350	405	+16
Manufacturing Buildings	148	155	185	+19
Total Commercial & Manufacturing	565	610	702	+15%
Educational	152	122	117	− 4%
Hospital & Health	65	77	76	− 1
Other Nonresidential Buildings	182	186	191	+ 3
Total Institutional & Other	399	385	384	−%
Total Nonresidential Buildings	964	995	1,086	+ 9%

*Eight months actual; four months estimated.

Residential Buildings	1975 Actual	1976 Preliminary*	1977 Forecast	Per Cent Change 1977/76
Contract Value (millions of dollars)				
1- & 2-Family Homes	$25,444	$34,900	$36,300	+ 4%
Apartments	4,710	7,800	11,700	+50
Nonhousekeeping Residential	1,115	1,150	1,300	+13
Total Residential Buildings	$31,269	$43,850	$49,300	+12%
Floor Area (millions of square feet)				
1- & 2-Family Homes	1,180	1,475	1,450	− 2%
Apartments	229	375	525	+40
Nonhousekeeping Residential	33	35	40	+14
Total Residential Buildings	1,442	1,885	2,015	+ 7%
Dwelling Units (thousands of units)				
1- & 2-Family Homes	845	1,075	1,050	− 2%
Apartments	241	400	600	+50
Total Housekeeping Residential	1,086	1,475	1,650	+12%
Nonbuilding Construction				
Contract Value (millions of dollars)				
Highways & Bridges	$ 8,872	$ 8,000	$ 8,800	+10%
Utilities	7,474	9,500	11,000	+16
Sewer & Water	6,531	6,600	7,700	+17
Other Nonbuilding Construction	5,576	3,900	4,300	+10
Total Nonbuilding Construction	$28,453	$28,000	$31,800	+14%
All Construction				
Contract Value (millions of dollars)				
Total Construction	$91,702	$102,000	$114,325	+12%
Dodge Index (1967 = 100)	166	185	207	

*Eight months actual; four months estimated.

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RESIDENTIAL BUILDING

During 1976 the thrust of the residential building market shifted from single-family building to apartments. In 1977 just about all of whatever push is left in housing after two years of cyclical expansion will be coming from the multi-family side of the market.

One-family homes

After leading the building business out of its recession through most of 1975, single-family housing starts plateaued at a rate of just over a million units early in 1976. It was about then that the housing market began to flash some early warning signs, and builders—for once—seemed to be paying attention. Without any particular squeeze on the supply of mortgage money (which is what usually chokes off a housing upswing), new home sales began to soften just a bit in the spring, causing the inventory of unsold units to edge up. The market was saying that production of a million units a year was just about enough to satisfy demand—at least at the average price ($45,000 plus) at which 1976 homes were selling. For the following six months the rate of one-family housing starts held steady in the narrow range of 1.0 to 1.1 million units.

A continuing demand for one-family homes of slightly more than a million units a year is easily supported by the arithmetic of demography. And the fact that the housing cycle of 1975-76 has (so far, at least) managed to avoid its usual tendency toward excess is reason enough to expect that the current one-million-plus rate of starts is sustainable until something comes along to disturb the delicate equilibrium.

One such disturbance might be the housing industry's recurring nightmare of a credit crunch. However, in view of savings and loan liquidity and the limited demands on the credit market for business financing, the likelihood of disintermediation in 1977 is remote. The cost of credit will remain high, but long-term interest rates will at least be stable for the near future.

Another potential disturbance—and a more welcome one—would be a stronger commitment on the part of the Federal government to the support of housing for low- and middle-income families. Increased subsidization could add an extra layer of housing demand that is presently priced out of the market. Such a development is, of course, a possibility, but its probability remains low (and its predictability is even lower). So next year's potential for one-family housing has to be hedged a bit—it amounts to a basic one million units plus whatever latent demand might be brought in through a step-up of subsidy programs.

Apartments

If the single-family market is now bumping against its practical ceiling, further expansion of the residential cycle depends heavily on getting something going in apartments. That's not as hopeless as it sounds, because there's more happening in the multi-family market than is generally recognized.

Conventional wisdom holds that apartment development has been unprofitable, and therefore stagnant ever since the recession hit bottom. A closer look, however, shows that

1977 Regional Estimates
of Dodge Construction Potentials

Northeast
Connecticut, District of Columbia, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Eastern Pennsylvania, Rhode Island, Virginia, Vermont

Contract Value (millions of dollars)	1975 Actual	1976 Preliminary*	1977 Forecast	Per Cent Change 1977/76
Nonresidential Buildings				
Commercial & Manufacturing	$ 2,724	$ 2,200	$ 2,600	+18%
Institutional & Other	3,695	3,700	3,800	+ 3
Total	$ 6,419	$ 5,900	$ 6,400	+ 8%
Residential Buildings				
1- & 2-Family Homes	$ 3,895	$ 4,200	$ 4,500	+ 7%
Apartments	1,037	1,400	2,200	+57
Nonhousekeeping Residential	156	150	200	+33
Total	$ 5,088	$ 5,750	$ 6,900	+20%
Nonbuilding Construction				
Highways & Bridges	$ 1,340	$ 1,500	$ 1,800	+20%
Other Nonbuilding Construction	4,048	4,300	4,800	+12
Total	$ 5,388	$ 5,800	$ 6,600	+14%
Total Construction	$16,895	$17,450	$19,900	+14%

Midwest
Northern Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, North Dakota, Ohio, Western Pennsylvania, South Dakota, Wisconsin, West Virginia

Contract Value (millions of dollars)	1975 Actual	1976 Preliminary*	1977 Forecast	Per Cent Change 1977/76
Nonresidential Buildings				
Commercial & Manufacturing	$ 3,163	$ 3,700	$ 4,400	+19%
Institutional & Other	3,953	4,000	4,150	+ 4
Total	$ 7,116	$ 7,700	$ 8,550	+11%
Residential Buildings				
1- & 2-Family Homes	$ 6,065	$ 8,400	$ 8,700	+ 4%
Apartments	1,175	2,400	3,400	+42
Nonhousekeeping Residential	166	350	350	—
Total	$ 7,406	$11,150	$12,450	+12%
Nonbuilding Construction				
Highways & Bridges	$ 2,501	$ 1,800	$ 2,000	+11%
Other Nonbuilding Construction	4,585	5,400	6,200	+15
Total	$ 7,086	$ 7,200	$ 8,200	+14%
Total Construction	$21,608	$26,050	$29,200	+12%

*Eight months actual; four months estimated.

South
Alabama, Arkansas, Florida, Georgia, Southern Illinois, Kansas, Louisiana, Mississippi, Missouri, North Carolina, Nebraska, Oklahoma, South Carolina, Tennessee, Texas

Contract Value (millions of dollars)	1975 Actual	1976 Preliminary*	1977 Forecast	Per Cent Change 1977/76
Nonresidential Buildings				
Commercial & Manufacturing	$ 5,167	$ 5,300	$ 5,950	+12%
Institutional & Other	4,593	5,100	5,425	+ 6
Total	$ 9,760	$10,400	$11,375	+ 9%
Residential Buildings				
1- & 2-Family Homes	$ 9,322	$12,550	$12,900	+ 3%
Apartments	1,050	1,700	2,700	+59
Nonhousekeeping Residential	409	300	400	+33
Total	$10,781	$14,550	$16,000	+10%
Nonbuilding Construction				
Highways & Bridges	$ 3,140	$ 2,900	$ 3,200	+10%
Other Nonbuilding Construction	6,125	5,900	6,900	+17
Total	$ 9,265	$ 8,800	$10,100	+15%
Total Construction	$29,806	$33,750	$37,475	+11%

West
Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming

Contract Value (millions of dollars)	1975 Actual	1976 Preliminary*	1977 Forecast	Per Cent Change 1977/76
Nonresidential Buildings				
Commercial & Manufacturing	$ 5,184	$ 2,950	$ 3,550	+20%
Institutional & Other	3,501	3,200	3,350	+ 5
Total	$ 8,685	$ 6,150	$ 6,900	+12%
Residential Buildings				
1- & 2-Family Homes	$ 6,162	$ 9,750	$10,200	+ 5%
Apartments	1,448	2,300	3,400	+48
Nonhousekeeping Residential	384	350	350	—
Total	$ 7,994	$12,400	$13,950	+12%
Nonbuilding Construction				
Highways & Bridges	$ 1,891	$ 1,800	$ 1,800	—%
Other Nonbuilding Construction	4,823	4,400	5,100	+16
Total	$ 6,714	$ 6,200	$ 6,900	+11%
Total Construction	$23,393	$24,750	$27,750	+12%

*Eight months actual; four months estimated.

Fesco-Foam roof insulation will save the owners of the building on this site $21,800 the first year and $70,514 in 20 years.

Here's a perfect example of how spending a little more on the front end can lower building costs substantially in the long run.

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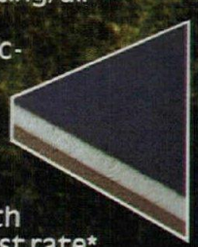
Fuel costs will also go down dramatically—with savings of $1,800 the first year and $50,514 over the 20-year life of the roof. This is based on an escalation of 10% in fuel costs for the next 5 years. Net savings will add up to $70,514 with a present worth value of $40,629 based on a 10% interest rate.*



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even in 1975—the year when apartment starts just refused to budge from their low 250,000 rate from the first quarter to the fourth, (while one-family building was recovering nicely)—the situation wasn't as dormant as it looked. Despite the appearance of stagnation in the national totals of multi-family building, there was plenty of action at the regional level.

Following the steep decline through all of 1973 and 1974, apartment building in the West turned up at the very end of 1974 and was rising all through 1975. In the Midwest the turn came in the spring of 1975, and in the Northeast it occurred in the fall. But in the South, where the 1972-73 boom had been most excessive, 1975 was a year of continuing decline which was finally reversed only in the early months of 1976.

The net effect of these conflicting cyclical patterns may have given the national totals a look of stagnation in multi-family building, but the fact is that 1975 was a year of substantial recovery. By the time the last of the four regions had turned up, the national apartment totals were beginning to reflect the dynamics of the situation. From a rate of only a quarter million units in January, apartment starts passed 400,000 units shortly after mid-1976 and were still rising.

The outlook for housing

With single-family building steady at its current one million rate, apartment starts will continue to rise over the next several quarters toward a limit of between 600,000 and 700,000 units. This rate is likely to be reached around the middle of 1977, after which the housing cycle will flatten out. But should multi-family starts exceed this rate for any length of time, there could be a market correction in 1978.

In 1976—a downward-revised total of 1,475,000 units (1,075,000 one- and two-family units and 400,000 apartments)*

In 1977—a total of 1,650,000 units (1,050,000 and 600,000).

NON-RESIDENTIAL BUILDING

The nonresidential building market consists of a wide variety of different structure types that divide conveniently into two basic sub-groups: business facilities and institutional buildings. The former, which is highly sensitive to economic conditions, gives the nonresidential total its cyclical character. Institutional building, on the other hand, lends stability to the category.

In the two years between 1973, when nonresidential building was at its all-time peak, and 1975, the bottom of the recession, total square footage of nonresidential work declined by one-third. Since more than 90 per cent of that decline was concentrated in commercial and industrial construction, this is obviously the place to look for most of the gain now that the non-residential building cycle is on its way up again.

Commercial and industrial buildings

▪ **Manufacturing building** reached its cyclical turning point in the middle of 1975, but the recovery that followed has been so weak that a full year later the rate of building (measured in square feet of floor area) was still only 15 per cent above the recession low . . . and still only half the 1973 pre-recession peak.

Getting idle existing capacity into production is, of course, a prerequisite to expansion, and the severe 1974-75 recession left manufacturers with an unusually large excess of capacity to take up. By mid-1976, however, capacity utilization was finally approaching the critical 80 per cent mark, and the prospect for a sizable increase in business capital spending in 1977 was firming up. And then, just when the normal pattern of later-stage recovery seemed to be belatedly taking shape, the recovery itself turned soft.

It is still much too early to conclude that the recovery has run its course already, but the chilling atmosphere of uncertainty brought on by the slowdown is, alone, enough to dampen enthusiasm for capital expansion. Before the recovery lost its momentum, there was a potential for as much as 200 million square feet of new manufacturing construction in 1977. Now it begins to look as though some of that expansion may be deferred to 1978, and a somewhat lower total—about 185 million square feet—will be realized next year instead.

▪ **Retail building** has been paralleling the recovery of housing through 1975 and 1976 with only a short lag. So far, after six quarters of expansion, contracting for stores and other retail facilities has made it about one-third of the way back to the strong pre-recession level, but with one-family housing now leveling off, the upswing in retail building will be losing some of its thrust by the end of 1976. The 1977 estimate of 405 million square feet implies a near-steady rate of contracting throughout the year ahead.

▪ **Office building** is the only one of the major categories of commercial and industrial building that has yet to show a clear upturn since stabilizing early in 1975 at a rate of 105 million square feet—only half the pre-recession annual level of construction. Considering the surplus of office space that exists—especially throughout the Northeast and the South as a result of the over-development of those regions in the early and mid-1970s—there is still little prospect for anything more than a normal increase next year beyond the current minimum level of building.

Institutional and other buildings

▪ **Educational building** changed from a growth market to a slow-grow market and now, finally, to a no-grow market as enrollment growth diminished over the past decade. Until recently, inflation and the changing mix of educational facilities (a larger proportion of college buildings) forestalled the inevitable by generating more dollars even though square footage of building was declining. But in the past few years, as the student population actually began to shrink (not just grow slower), the school building market began to cave in. Since 1974, when classroom and other educational construction was still as high as 175 million square feet, contracting has dropped off by nearly one-third to the current (1976) rate of only 122 million square feet. Over the same period, the decline in the annual dollar value of new construction has amounted to more than a billion dollars.

There is, of course, a minimum amount of educational building needed for replacement, for relocation, and for the constantly changing age composition of the student population. This base level of construction is estimated at something like 100 million square feet per year. Admittedly a "round number," this nevertheless indicates that most of the adjustment in construction to declining enrollments has already occurred. Although the nation's school population is projected to keep shrinking well into the 1980's, further cutbacks in building will be smaller than the ones experienced in 1975 and 1976. The estimate for 1977: 115 million square feet.

Is there enough potential for gain in the other categories of institutional building to offset the inherent weakness of the large educational building market? Probably, but not much more than that.

▪ **Hospital building** stabilized (with the exception of a dip in 1975) at 75-80 million square feet per year back in 1970.

▪ **Public buildings** got a boost of between five and 10 million square feet annually from revenue-sharing; but not growth beyond that initial impact.

▪ **Religious building** stopped declining several years ago, but certainly isn't growing.

Out of the entire group, only . . .

▪ **Recreational building** (stadiums, indoor tennis courts, theaters, etc.) has anything that

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resembles an upward trend.

Congress' override of the President's veto of the bill funding most of the Federal government's social and health programs, the last-minute passage of the renewal of revenue-sharing, and the special appropriation for public works should keep a pretty solid base of public support under the construction of hospitals, public administration buildings, and even recreational facilities for the next couple of years—at least enough to offset inflation and sustain the present rate of square footage.

The outlook for non-residential building

Once the recovery of nonresidential building that took hold early in 1976 regains its momentum, contracting will advance about nine per cent in square footage, and 10 per cent in dollar value during 1977. Virtually all of the *real* gain next year will be coming from commercial and industrial construction.

After two years of recovery, nonresidential square footage—at 1,086 million in 1977—will still be only three-quarters of the 1973 peak, while the inflated dollar value will be at a new high of $33.2 billion.

NONBUILDING CONSTRUCTION

The combination of energy demands and anti-recession public works spending triggered a boom in nonbuilding construction in the middle of the 1970s. Response to the energy crisis came in the form of the multi-billion-dollar trans-Alaska pipeline and stepped-up contracting for electric power plants. The recession shook loose several billions of impounded Federal funds, temporarily boosting highway and sewer construction.

Together these two events lifted contracting for nonbuilding construction to unprecedented heights for the two-year span between mid-1974 and mid-1976. By the summer of 1976, however, most of their effect had been dissipated, and contracting for utilities and public works settled back to the former level.

Utilities

Since as far back as 1970, the electric utilities have been contracting for a surprisingly steady 15 *major* ($100 million or more apiece) new generating plants each year. The only exceptions to this pattern: 1972, when environmental concerns delayed the start of some work, and 1975, when the rate of construction ran a bit over the average—presumably in response to the energy crisis.

With a dozen major new projects reported so far in 1976, the current year seems to be right about on the 15-per-year average. But even though the number of new power facilities has settled back from the 1975 high of 17, the dollar value in 1976 will exceed any prior year's amount by a wide margin. (In fact, the cumulative contract value at the end of eight months of 1976—$8.0 billion—was already greater than the total for all of 1975). What put the 1976 value so far ahead was the start of four projects that will cost over a billion dollars apiece.

Although these four super-projects aren't yet typical of today's new power plants (there are still more $200-$300 million units being built than billion dollar ones), it's pretty clear that future power needs are being met by the construction of larger, higher-capacity facilities rather than a greater number of smaller units. Considering the complexity of bringing a generating plant from design to operation, and the fact that ecological problems don't increase in proportion to the size of the facility, bigness seems the practical route to go.

So another 15 or 16 large projects in 1977 (only a fraction of the large backlog of planned and ready work), at still higher average cost, could bring total utility contract value next year to $11 billion. But with more and more individual jobs reaching a billion dollars in cost, that's an estimate with a lot of elasticity.

Public works

Highway and sewer construction, with their reliable sources of financing—the long-established Highway Trust Fund and the newer EPA Fund—should be a couple of the steadiest of all types of construction. In fact, however, they are among the most volatile. The reason: their use as a means of implementing government fiscal policy. Turn them on when the economy needs some extra stimulation; turn them off when inflation threatens.

In the recession year of 1975, the public works tap flowed freely for a while. For two consecutive quarters both highway and sewer contracting advanced sharply on the strength of supplementary Federal money. Then they dropped off just as sharply in the closing months of the year as the burst of extra financing subsided. Back to a more normal level of activity in 1976, contracting for public works has been running behind 1975's reinforced total.

But suddenly it's pump-priming time again. With the economy's recovery faltering on the eve of elections, the President "reluctantly" signed a $3.7 billion appropriation for public works—money to fund the Public Works Act of 1976 which Congress passed over his veto last July. Unlike the 1975 money that was channeled directly into highway and sewer construction via the trust funds, most of this special appropriation will be made available to local governments for a wider variety of projects. A recent survey of the mayors of 75 cities showed, however, that the vast bulk of projects that are ready to start, except for their lack of financing, not surprisingly runs heavily to roads and sewers, with only a smattering of police and fire stations and libraries, and an occasional tennis court. So it would seem that this maneuver will lead—by a slightly different route—to much the same result achieved in 1975: a temporary surge of road and sewer construction to provide jobs in an industry with unusually high unemployment. Speed is the essence of the Public Works Act of 1976, and its main impact should be felt in the closing months of this year and in the first half of 1977.

The outlook for nonbuilding construction

After a year of consolidation (1976) following two years of energy boom, nonbuilding construction is ready to advance again. Utilities are the category of greatest uncertainty, and will determine whether next year's nonbuilding construction gain will be nominal or sizable. The estimate at this early date: up 14 per cent to $31.8 billion in 1977.

TOTAL CONSTRUCTION

In 1977 all three major construction markets will be advancing. Housing's gains will be extended by an expansion of apartments, while one-family building levels off. Nonresidential building will get a boost as commercial and industrial building makes a partial recovery. And nonbuilding construction will be getting some temporary stimulation from the new public works program.

What's more, inflation will be taking a smaller bite out of new construction than it has in recent years. Among the important things that happened in 1976 was the lessening of the severe erosion of the relationship between cost and square footage—especially in nonresidential work.

There are also some qualifications about 1977. Without the strong Federal commitment to urban redevelopment that existed in the early 1970s, housing production faces a ceiling far short of its former peak. Industrial and commercial construction will advance only cuatiously in the uncertain economic environment of 1977. And the public works money will be turned off at some point, just as it was turned on at election time.

It adds up to a year of good cyclical expansion in 1977—not as good as it should be, but better than anything the construction industry has known for quite some time.

Monokote® fireproofing provides basic protection for Detroit's Renaissance.

The farsighted men behind this spectacular urban complex recognized that, no matter what combination of sprinklers, smoke detectors and other devices are used, there can be no trade-off in basic structural protection. And that's why you'll find Monokote® fireproofing in the Renaissance Center.

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For complete information on fireproofing that is as basic as the steel it protects, contact your local Zonolite Monokote representative or write Construction Products Division, W. R. Grace & Co., 62 Whittemore Avenue, Cambridge, Massachusetts 02140. In Canada, 66 Hymus Road, Scarborough, Ontario M1L 2C8.

Owner: Renaissance Center Partnership, Detroit, Michigan; Architect: John Portman, Atlanta, Georgia; General Contractor: Tishman Construction Co., New York, New York; Fireproofing Contractors: The Berti Co., Detroit, Michigan; Service Art Co., Detroit, Michigan; McNulty Bros. Co., Chicago, Illinois.

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Dodge study on commercial-building costs

Dodge Building Cost Services has prepared a specialized report on "Manufacturing/Office/Warehouse Building Costs" for use by owners and others who expect to build new office or plant space. The cost data in the report includes detailed listings for more than 500 recently-built structures.

Corporate financial officers and other business executives can also use the data to determine the replacement value of their company buildings, which they must now report to comply with a recent ruling by the Securities and Exchange Commission. The 288-page report also includes the following types of data:

- Average building costs for low-, middle- and high-quality construction of different types of structures; the same cost figures for major components such as roofs, walls and electrical systems; and the percentage of the total cost that each component represents.
- An index of 183 cities for making cost adjustments that reflect local labor and material prices.
- Case histories on more than 40 buildings, which contain costs of completed construction for comparison with contract award prices and identification of trends in actual costs.

The price of the "Manufacturing/Office/Warehouse Building Costs" is $72 prepaid plus the appropriate state sales tax. Purchasers may send mail orders to Dodge Building Cost Services, Room 2051, McGraw-Hill Information Systems Company, 1221 Avenue of the Americas, New York, N.Y. 10021.

INDEXES: November 1976 — 1941=100.00 (except as noted)

Metropolitan area	Cost differential	Current Indexes: non-res.	residential	masonry	steel	% change last 12 months
U.S. Average	8.5	561.7	527.3	554.1	540.3	+08.3
Atlanta	7.5	664.6	626.5	654.5	641.3	+09.7
Baltimore	8.5	594.5	558.9	578.4	566.7	+00.7
Birmingham	7.3	558.6	519.5	548.8	537.3	+22.9
Boston	9.0	562.6	531.6	564.5	547.3	+08.3
Buffalo	9.1	593.9	557.6	584.5	567.8	+02.7
Chicago	8.3	643.7	605.7	635.1	619.0	+13.4
Cincinnati	8.8	617.3	580.8	602.7	589.7	+10.7
Cleveland	9.0	641.4	603.5	630.1	615.0	+19.2
Columbus, Ohio	8.2	564.7	530.3	562.0	545.2	+06.6
Dallas	7.9	542.9	525.7	539.4	525.0	+07.8
Denver	8.4	622.4	585.5	616.2	603.0	+11.2
Detroit	9.8	623.6	594.0	621.0	604.5	+03.3
Houston	7.4	521.3	489.5	509.9	500.9	+06.5
Indianapolis	7.8	522.5	490.6	514.3	503.5	+13.2
Kansas City	8.7	553.9	523.4	544.9	532.7	+07.5
Los Angeles	8.5	687.5	628.4	670.6	652.7	+13.3
Louisville	7.6	557.7	523.7	549.2	536.5	+11.0
Memphis	8.4	540.4	507.4	525.5	512.8	+00.7
Miami	7.9	599.2	570.8	595.4	582.5	+06.0
Milwaukee	8.7	684.3	642.5	679.9	656.9	+12.6
Minneapolis	8.9	569.9	536.1	564.9	549.1	+04.8
Newark	9.0	515.6	484.1	513.0	499.9	+04.2
New Orleans	7.5	541.3	510.9	531.8	522.8	+08.1
New York	10.0	593.7	552.0	580.5	570.4	+08.8
Philadelphia	9.1	585.1	557.4	578.2	566.2	+02.0
Phoenix (1947 = 100)	8.2	318.5	299.1	314.9	306.6	+05.7
Pittsburgh	8.9	531.6	500.1	521.6	510.6	+03.3
St. Louis	8.7	543.6	513.1	539.3	527.5	+01.5
San Antonio (1960 = 100)	7.6	221.1	207.6	216.2	212.1	+10.1
San Diego (1960 = 100)	8.7	255.0	239.4	251.8	245.5	+15.6
San Francisco	9.6	838.6	766.5	832.7	802.9	+08.9
Seattle	8.6	584.9	523.4	570.3	551.4	+10.7
Washington, D.C.	8.4	548.4	514.9	541.6	526.0	+04.7

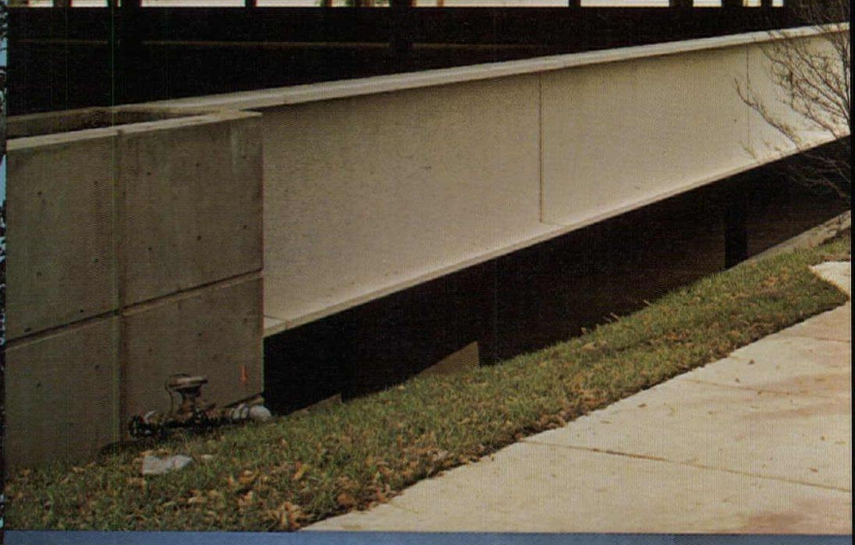
Cost differentials compare current local costs, not indexes, on a scale of 10 based on New York

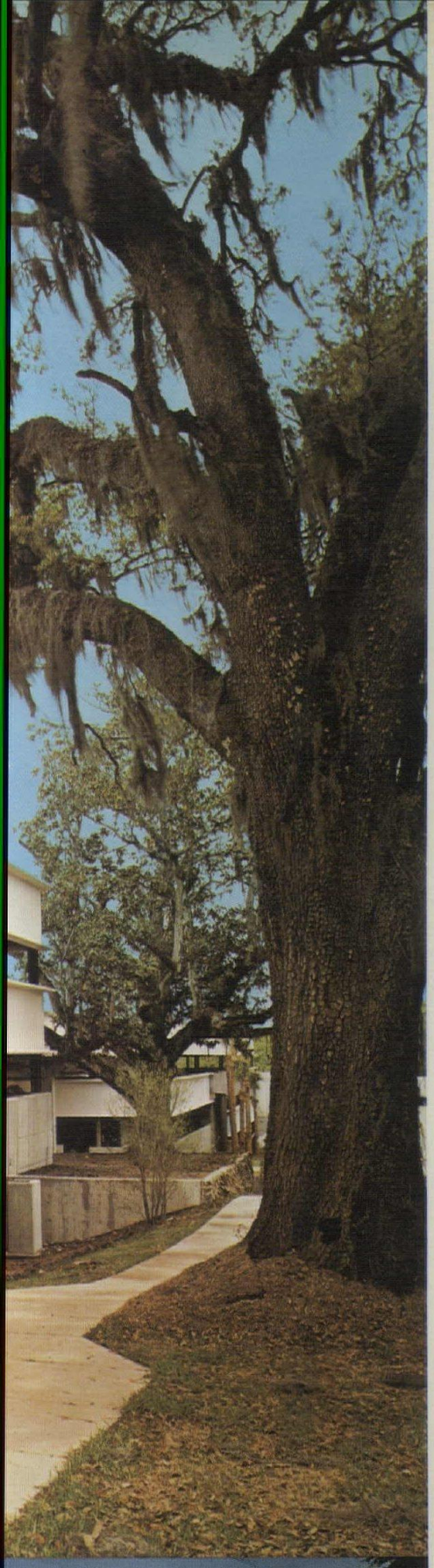
Tables compiled by Dodge Building Cost Services, McGraw-Hill Information Systems Company

HISTORICAL BUILDING COST INDEXES—AVERAGE OF ALL NON-RESIDENTIAL BUILDING TYPES, 21 CITIES — 1941 average for each city = 100.00

Metropolitan area	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975 (Quarterly) 1st	2nd	3rd	4th	1976 (Quarterly) 1st	2nd	3rd	4th
Atlanta	329.8	335.7	353.1	384.0	422.4	459.2	497.7	544.8	575.0	583.8	585.3	597.2	598.7	602.6	604.1	655.6	
Baltimore	280.9	295.8	308.7	322.8	348.8	381.7	420.4	475.5	534.3	538.7	540.2	579.6	581.1	609.7	611.2	583.5	
Birmingham	270.7	274.7	284.3	303.4	309.3	331.6	358.3	402.1	421.2	438.6	440.1	447.4	448.9	469.0	469.5	550.4	
Boston	262.0	265.7	277.1	295.0	328.6	362.0	394.4	437.8	462.5	484.1	485.6	511.7	513.2	535.7	537.2	554.4	
Chicago	320.4	328.4	339.5	356.1	386.1	418.8	444.3	508.6	529.6	539.2	540.7	558.6	560.1	560.3	561.8	633.7	
Cincinnati	278.3	288.2	302.6	325.8	348.5	386.1	410.7	462.4	500.1	518.0	519.5	549.1	550.6	602.9	604.4	608.3	
Cleveland	300.7	303.7	331.5	358.3	380.1	415.6	429.3	462.2	509.5	516.6	518.1	529.5	531.0	578.7	580.2	631.4	
Dallas	266.9	270.4	281.7	308.6	327.1	357.9	386.6	436.4	477.9	488.3	489.8	498.1	499.6	506.1	507.6	537.0	
Denver	297.5	305.1	312.5	339.0	368.1	392.9	415.4	461.0	510.0	530.4	531.9	552.1	553.6	580.3	581.8	614.5	
Detroit	296.9	301.2	316.4	352.9	377.4	409.7	433.1	501.0	538.7	554.4	555.9	596.0	597.5	615.1	616.6	615.7	
Kansas City	261.0	264.3	278.0	295.5	315.3	344.7	367.0	405.8	444.9	481.1	482.5	507.6	509.1	523.8	525.3	545.8	
Los Angeles	302.7	310.1	320.1	344.1	361.9	400.9	424.5	504.2	531.8	546.7	548.2	592.6	594.1	599.1	600.6	671.6	
Miami	284.0	286.1	305.3	392.3	353.2	384.7	406.4	447.2	485.5	499.5	501.0	557.4	558.9	588.1	589.6	591.0	
Minneapolis	289.4	300.2	309.4	331.2	361.1	417.1	412.9	456.1	488.6	513.9	515.4	536.5	538.0	548.3	549.8	562.6	
New Orleans	259.8	267.6	274.2	297.5	318.9	341.8	369.7	420.5	442.1	463.5	465.0	493.2	494.7	522.8	524.3	533.3	
New York	304.0	313.6	321.4	344.5	366.0	395.6	423.1	485.3	515.3	524.1	525.5	532.0	533.5	539.4	540.9	579.3	
Philadelphia	286.6	293.7	301.7	321.0	346.5	374.9	419.5	485.1	518.5	531.5	533.0	566.0	567.5	581.8	583.3	577.7	
Pittsburgh	271.1	275.0	293.8	311.0	327.2	362.1	380.3	424.4	465.6	475.2	476.7	508.0	509.5	508.5	510.0	524.8	
St. Louis	288.3	293.2	304.4	324.7	344.4	375.5	402.5	444.2	476.7	497.5	499.0	527.4	528.9	542.7	544.2	535.6	
San Francisco	386.0	390.8	402.9	441.1	465.1	512.3	561.0	632.3	672.5	716.0	717.5	751.8	753.3	790.1	791.6	819.3	
Seattle	275.0	283.5	292.2	317.8	341.8	358.4	371.5	424.4	450.2	472.5	474.0	513.6	515.1	525.9	527.4	569.0	

Costs in a given city for a certain period may be compared with costs in another period by dividing one index into the other; if the index for a city for one period (200.0) divided by the index for a second period (150.0) equals 133%, the costs in the one period are 33% higher than the costs in the other. Also, second period costs are 75% of those in the first period (150.0 ÷ 200.0 = 75%) or they are 25% lower in the second period.





The steel-framed, long-span system: a natural choice for five new Florida parking garages.

Five new open-deck parking garages, accommodating up to 3,402 cars, are serving Florida's state employees in Capitol Center—a complex of government offices in Tallahassee.

The steel-framed, long-span concept was chosen over competitive systems for reasons combining economy, construction speed and aesthetics.

From the start, sites were selected and the respective structures designed with every intention of preserving visual harmony with the existing buildings and landscaping of Capitol Center. The happy result of this careful planning is that most of the trees are still there!

THE GREATEST ECONOMY

As many as eight different structural systems were used as models for evaluation. This in-depth study, which examined construction speed as well as material costs, showed that structural steel framing with composite cast-in-place concrete decks had the potential for the greatest economy.

The decision proved wise. Construction cost per car is figured at approximately $2,400—a unit cost substantially lower than comparable facilities in Florida.

NO FIRE PROTECTIVE MATERIALS NEEDED!

One of the decisive elements in establishing the low-cost estimate for the steel-framing system was the fact that the steel structures could be left exposed and unprotected—except for painting.

Changes in the regulations of a number of building codes (and fire insurance rates) have been effected through a research project carried out at Scranton, Pa., under the auspices of the American Iron and Steel Institute. The dramatic and fully documented Scranton Fire Test was an actual auto burnout in a normally occupied open-deck public parking garage. It confirmed the results of previous tests: *an automobile fire in these structures is a low-hazard fire.*

STANDARD MODULE

For all the five facilities (named Alpha, Beta, Gamma, Delta and Epsilon) the designers selected a standard bay module, which proved to be a major factor in cost-cutting.

Each bay measures 55-ft. wide with a 20-ft. distance between columns and a floor-to-floor height of 10-ft. These dimensions allow angle (58 degrees) parking for standard-size cars and perpendicular parking for compact cars.

Self-parking is, of course, made easier by this amount of long-span, column-free space.

3,446 tons of ASTM A36 steel went into the five facilities which, together, have a floor area of 1,074,909 sq. ft. Only two column sizes were used throughout: W10 x 49 and W10 x 72. All beams are W24's with the majority weighing 68 lbs. per linear foot. Design loads are 50 psf for roofs and floors.

United States Steel is ready to help you with your design of a long-span, open-deck garage. For a Structural Report on the Capitol Center Parking Garages, and for further information, write to U.S. Steel, P.O. Box 86 (C614), Pittsburgh, Pa. 15230. Or contact a USS Construction Representative through your nearest USS Sales office.

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De Leuw Cather, Associates, Chicago, Ill.
Schweizer Associates, Winter Park, Fla.

Steel Fabricators: Joint venture organization:
Musselman Steel Fabricators, Inc., (Prime Coordinator), Tampa, Fla.
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A major problem with traditional firestop sealants is that even if they don't burn in a fire, they release quantities of toxic fumes. Stable Dow Corning RTV silicone foam greatly reduces this toxicity, and reduces the total amount of smoke combustion products released.

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To seal cable gaps, simply inject the easy-to-mix liquid components into the dammed penetration. The material expands to three or four times the volume of its liquid constituents and sets up in 3 to 4 minutes. Excess can be trimmed off with a knife. That's all there is to creating an airtight fire penetration seal.

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Dow Corning RTV silicone foam is an effective, economical firestop. And if you're not sure how important that is, ask your insurance man. He'll tell you how you can save in case of an actual fire.

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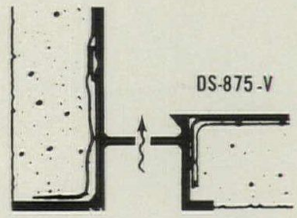

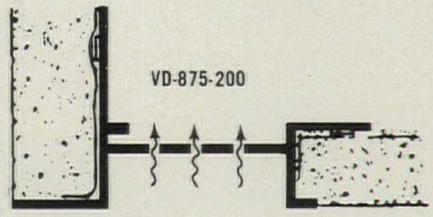

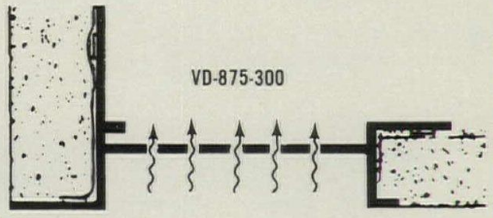

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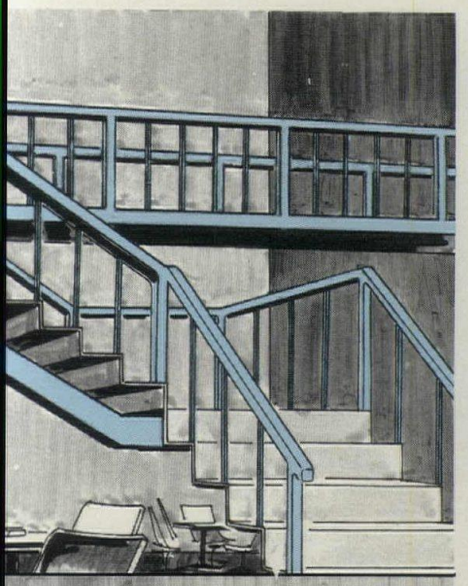

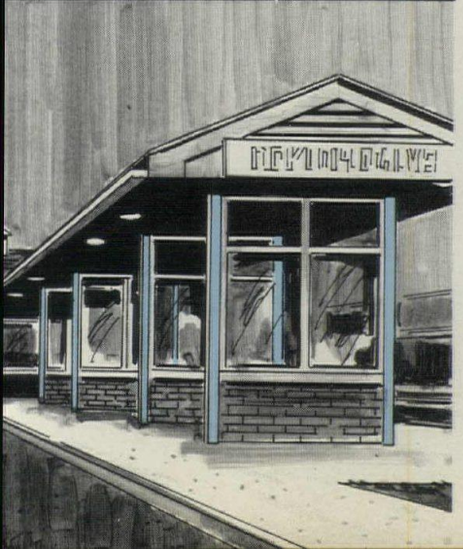

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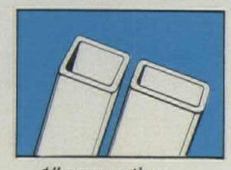

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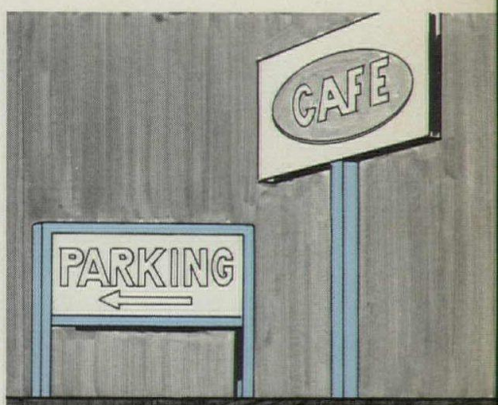

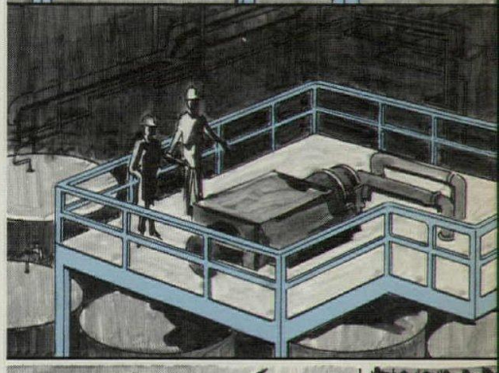

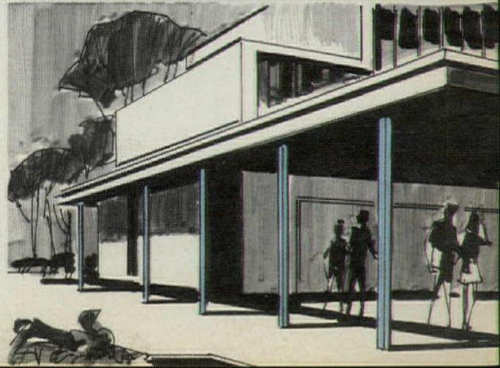

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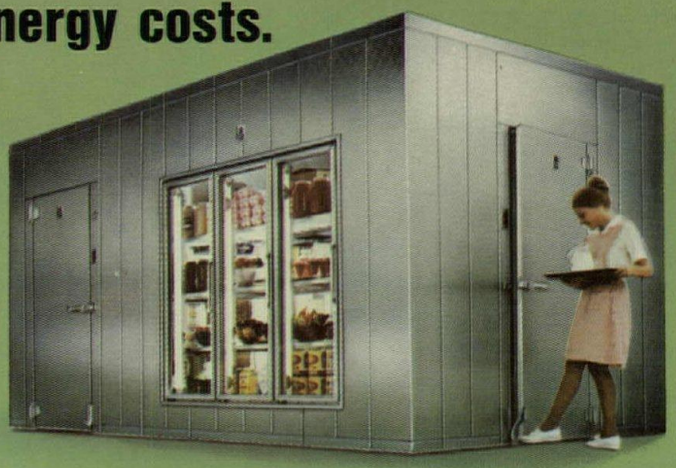

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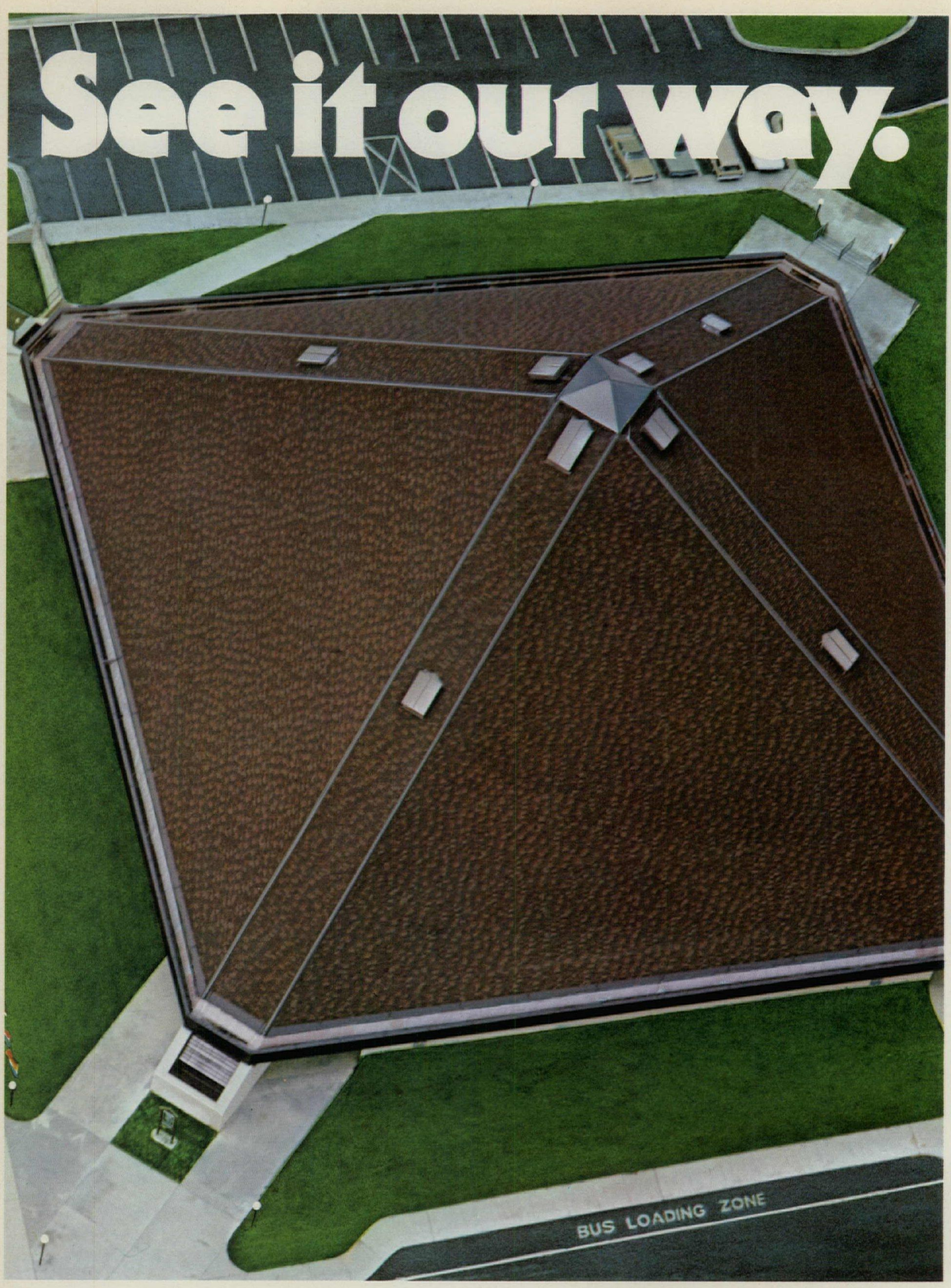
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Glasstex

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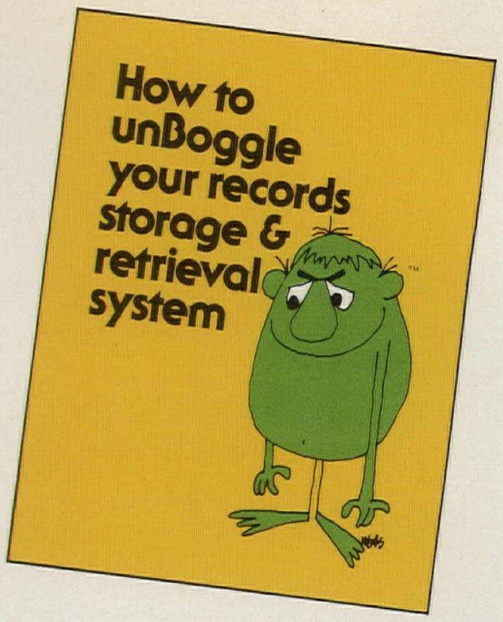

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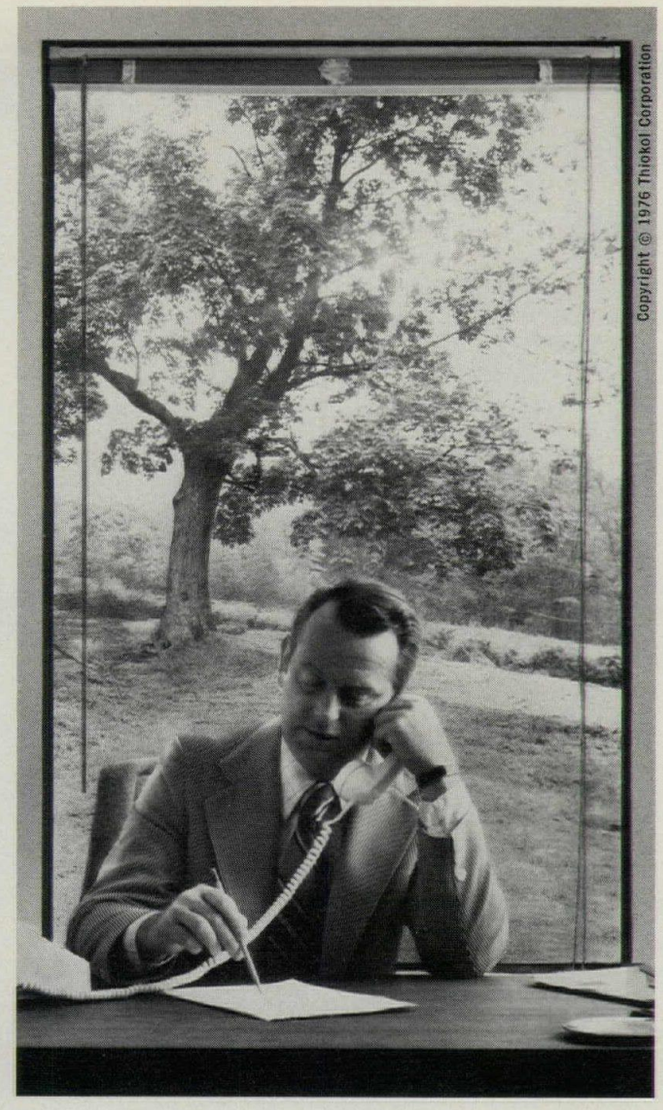

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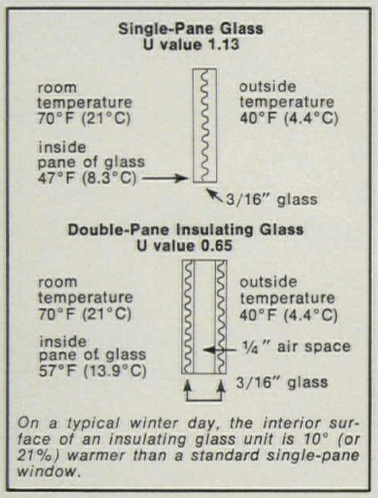

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Charles Eames made these chairs timeless classics.

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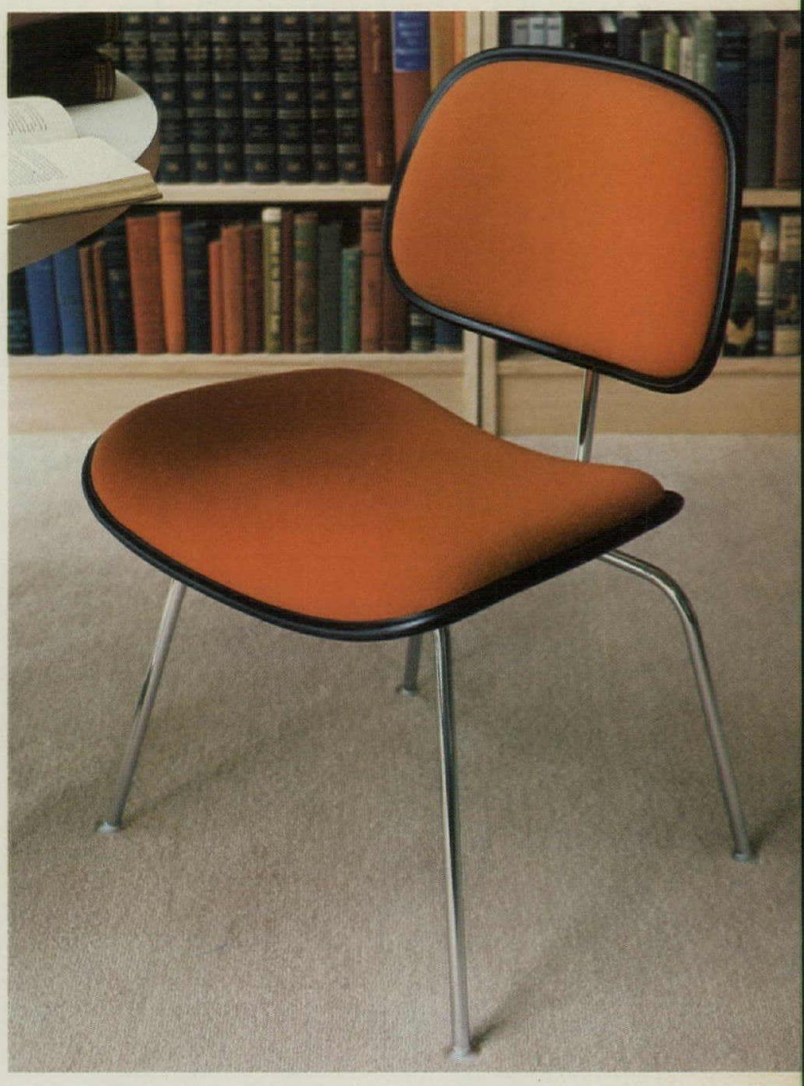

Charles Eames didn't design this chair to sit in a museum. It was designed for people to sit in it. Not just people who visit, own or work for wealthy companies. It is priced competitively with lesser chairs.

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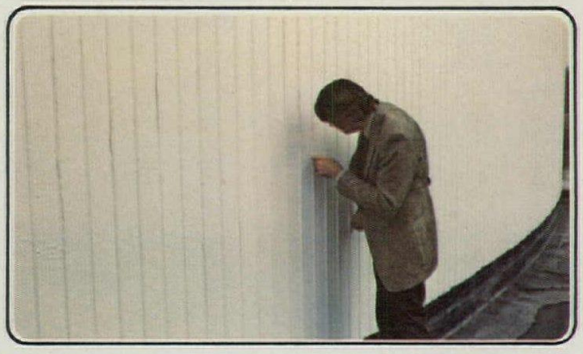
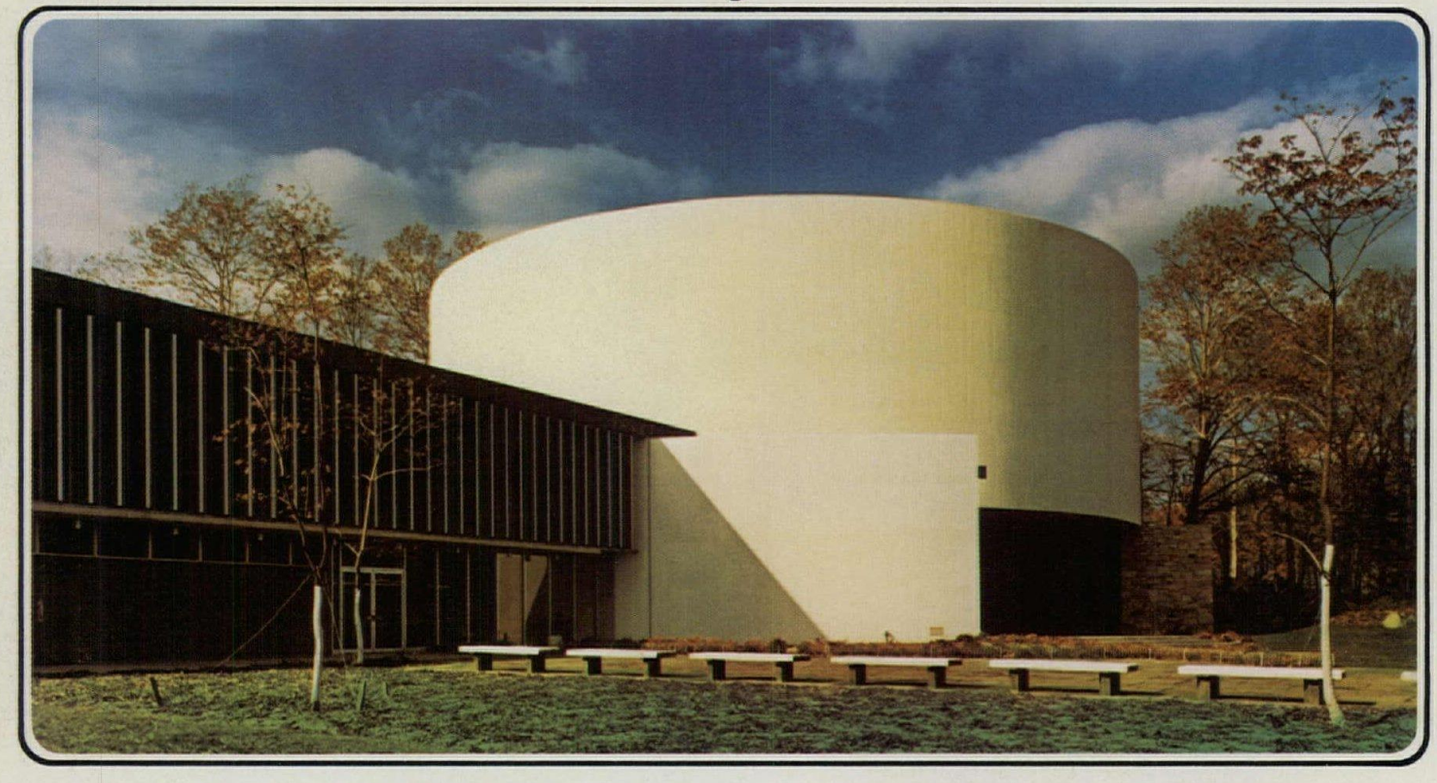


...and still will 16 years from now.



Visitor's Center & Cyclorama Building, Gettysburg National Military Part, Pa.
Arch: Richard J. Neutra & Robert E. Alexander, Thaddeus Longstreth Assoc. Painting Cont.: Ralph E. Jones, Inc. Harrisburg, Pa.

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Robert C. Lautman photos

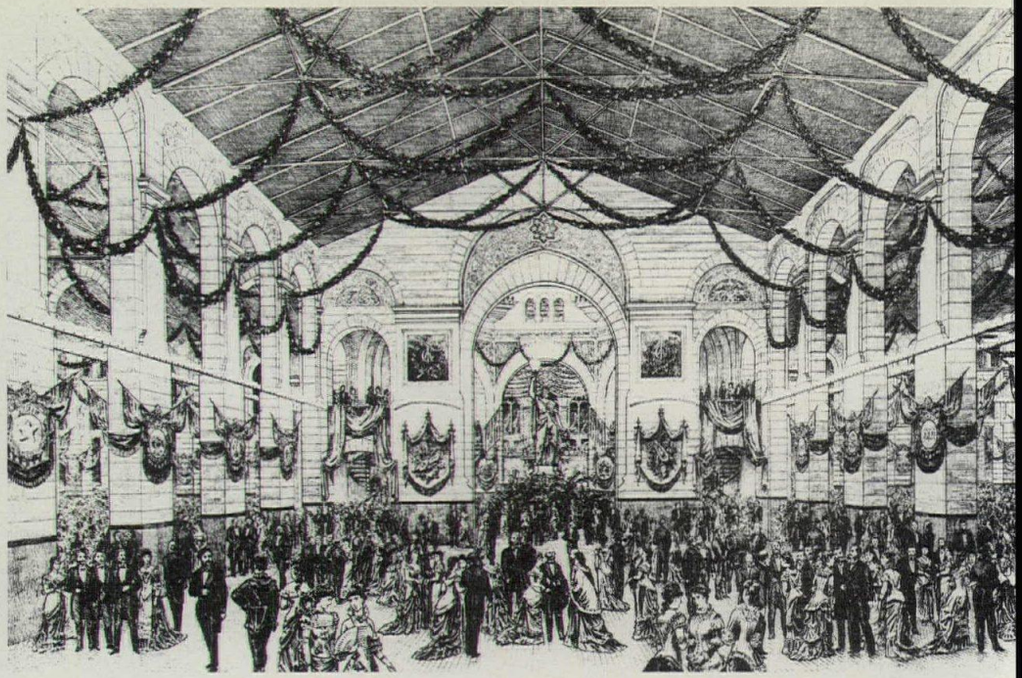
EVOKING THE SPIRIT OF 1876 FOR A DISPLAY OF VICTORIANA

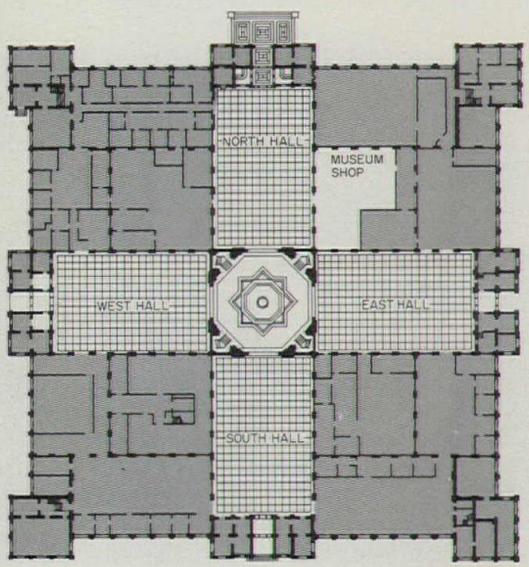
The Arts and Industries Building of the Smithsonian Institution was begun in 1879 and opened soon after. With guidance from the Smithsonian's architectural and engineering staff and consulting architect Hugh Newell Jacobsen, the great but tragically neglected old building has been renewed for the Bicentennial. The museum's curators have installed an entirely new exhibition of Victorian artifacts, some of which were originally shown to commemorate the nation's 100th birthday at the famous 1876 Exposition in Philadelphia. The new exhibition has been designed less to teach about the past than to give the experience of having been in it. Its great popular success owes much to the behind-the-scenes work of Jacobsen, who elected not to attempt a literal restoration of the interiors, but to recapture the essence of their late 19th century expression.—*M.F.S.*

The "exposition" as an idea is a 19th century phenomenon originating in the desire on the part of government and industry to inform and excite the public about technological and industrial advance. So important culturally were these exhibits devoted to the products of industry, that the most important of them gave a name to and thus helped define the style of the time. Until the end of the 19th century, styles were named after kings, emperors and an occasional queen. Now, most classifiers in the fields of 19th and 20th century architecture and the fine and decorative arts will, wherever possible, label the design of a period with the name of its most important exhibition. Thus we have the style of the Paris Exposition Universelle of 1900, which has its roots in some of the artifacts shown in London's Great Exhibition of 1851 held in Joseph Paxton's Crystal Palace. In the United States, the revival of neo-classicism was heralded by the Chicago World's Fair of 1893.

Less famous but of great cultural importance, nonetheless, was the 1876 Exposition in Philadelphia's Fairmont Park. No previous fair had so effectively presented the growing inventive genius of the United States. The Arts and Industries Building in Washington, D.C. was originally constructed by the Smithsonian to house box car loads of objects from this exposition, which had been transported from Philadelphia by steam engine and dumped on the Mall. (Most of these artifacts were eventually discarded). This year, in honor of the Bicentennial, the Smithsonian has used the Arts and Industries Building as the setting for an exhibition that evokes the spirit of the 1876 Centennial. The show includes approximately 25,000 objects of this period, 15 per cent of which are actually from the Centennial Exposition.

A careful restoration of the Arts and Industries Building was long overdue and the installation of the Bicentennial exhibit made it essential. Before Victorian structures began to reemerge as objects of beauty and curiosity, the Arts and Industries Building had been treated with contempt, in part because of the ascendance of the neo-classic style launched at the 1893 Chicago World's Fair just noted. Even when it opened, in 1881, it had not been thought very much of in spite of the fact that it was the first government building to be electrified. It had the misfortune of having been built cheaply (for $3.20 per square foot) and was indeed Washington's most inexpensively constructed public building. Designed by Adolph Cluss and Rudolph Schulze, who had been doing schools, it was their first major structure, and they rigorously kept costs down. Cruciform in plan with four similar facades, it has no basement and an open steel joist ceiling. Except for the central rotunda and the four entrance halls, which were laid in encaustic tile, most of the floors were originally of wood.





The drawing above shows the west hall as it appeared in 1881, the year the Arts and Industries Building opened. The occasion was the Inaugural Ball for President James Garfield. The balconies that appear in the recent photo (opposite page) were added around 1910. The design of the new stencils over the arches is similar to those in the drawing and were based upon careful study of old photographs with a jeweler's loupe. The plan (left) is current, and shows a Victorian fountain, added by Jacobsen, where a fountain always should have been, but never was before. All of the artifacts (below and right) have been painted and shined to look like new.


U.S.

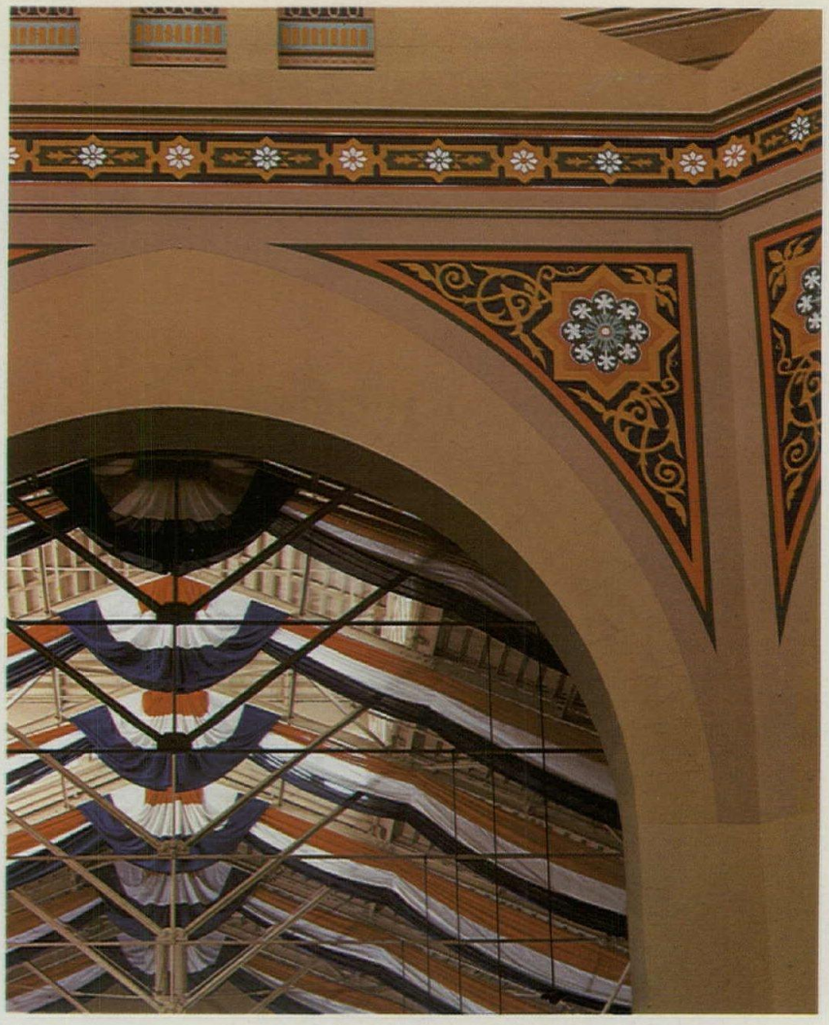
Early records indicate that the building was exceedingly uncomfortable. In the first nine years, ten Smithsonian employees died of influenza and the damp wood floors laid on grade were blamed. These floors were gradually replaced with marble tiles.

In the 95 years that have elapsed between the first opening day and the spring of this year, the fine old building has been altered many times, but never until now in a way which even observed, much less enhanced, its true esthetic qualities. Because of his successful restoration for the Smithsonian of the Renwick (RECORD, July 1972), architect Hugh Jacobsen was commissioned by Paul N. Perrot, Assistant Secretary for Museum Programs, to deal with the now recognized esthetic and stylistic aspects of the current remodeling. Meanwhile the in-house Office of Facilities Planning and Engineering Services was hard at work solving the general problems connected with heating, ventilating, air conditioning and upgrading the physical fabric of the structure.

Jacobsen began by considering and then dismissing the question as to which of its many past guises the interior should be restored, because the interiors had never been decorated in a unified style. "They had hacks back then too," says he, "and they made mistakes." No single interior renovation, as examined in old (1880-1890) photographs with the aid of a jeweler's loupe seemed just right to Jacobsen, but some of the details did, including the encaustic tile floor, already mentioned, which had been removed and discarded except for the west entry hall. The problem as Jacobsen saw it was to select, assemble and reproduce only those details which best evoked the spirit of the Victorian structure. A literal restoration of the interiors as they appeared at any one time would not only have been prohibitive in cost, but also an esthetic disaster.

A comparison of the photographs of the renovation (in color) with early photographs (black and white) indicates that Jacobsen's approach has been successful. Although he did not design the exhibition itself (this was done by the Arts and Industries Building's curatorial staff), Jacobsen and his project architect, Paul B. Pavlovich, were responsible for the stenciling, flooring, hardware, colors, fenestration, doors, graphics and lighting (other than the hanging chandeliers). The interior colors match samples discovered under seven or eight layers of paint. The colors of the stenciling (see cover) were selected in the same manner with the aid of extensive reading of contemporary correspondence in the Smithsonian Institution archives.—*Mildred F. Schmertz*

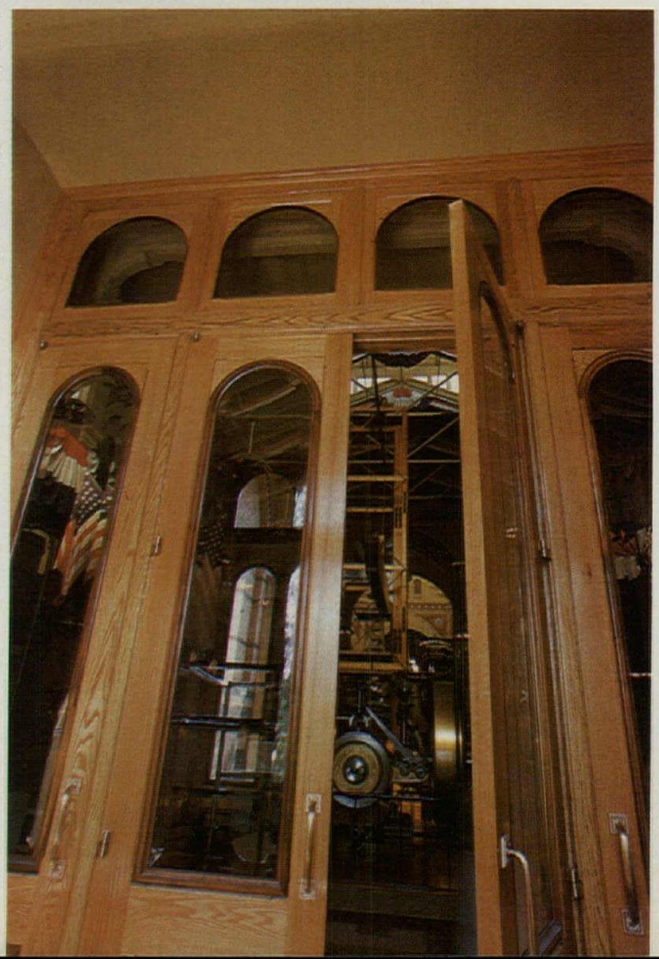
ARTS AND INDUSTRIES MUSEUM, Washington, D.C. Owner: *The Smithsonian Institution.* Architect: *Hugh Newell Jacobsen—Paul B. Pavlovich* (project architect); associated architects: *The Smithsonian Institution, Office of Facilities Planning and Engineering Services, Engineering and Design Branch—William L. Thomas* (architect-in-charge). General contractor: *Grunley-Walsh Construction Co., Inc.* Principal subcontractors: *H. & R. Johnson, Inc.* (ceramic tile fabricator); *Standard Art Marble and Tile Co.* (tile installer); *Myers-Christiansen Co.* (wall stencilwork).



The old photograph (left) was made on a glass negative, now cracked. It shows the original encaustic tile floor in the central rotunda, and the decorated frieze below the dome. The photos (above and at right) show the new Jacobsen designed stencils, the newly installed Victorian fountain, and the new encaustic tile floor. The process of duplicating the old tile floor was a formidable one. Determining the exact sizes, shapes and color was difficult as Jacobsen and his team had only a half dozen or so original photos to work from. Finding the source for the encaustic tile was particularly difficult since the method of producing it had been universally abandoned in the mid-thirties. Enquiries were sent to almost all tile firms in the United States, Europe and Mexico. Only two firms were willing to experiment with encaustic tile production, and after one year of these experiments, the job was given to H & R Johnson, Inc., in Great Britain, who are the successors to the firm which laid the original tiles in the Arts and Industries Building. In brief, the re-discovered process consists of stamping a so-called "green" tile with a patterned die, firing it, filling the depressed area with one or more pigmented clays and refiring it.


FRANCE

The budget permitted the restoration of only one of the Arts and Industries Building's four facades, and the front entry (above) was the logical choice. The work included cleaning and renewing the ornamentation, replacing damaged brick in the vestibule and installing a new set of oak and walnut doors (right). The old photograph (left) served as one of the references for the exterior restoration.



SKYSCRAPER ON ITS SIDE: ANOTHER "BIGGEST" FOR TEXAS

Already one of the world's larger office buildings, the United Services Automobile Association's suburban San Antonio headquarters is planned for growth. As such, it illustrates developed solutions to problems of function and amenity in a really big linear building that can be extended indefinitely. Essentially a string of semi-independently functioning units, the building was designed by architects Benham-Blair & Affiliates to overcome the restraints on personal communication between various areas that are separated by vast distances—areas that would be connected by high-speed elevators in vertical construction. And in the process, the building has produced some unique benefits that argue advantages for the horizontal decentralized plan.—*C.K.H.*


USAA

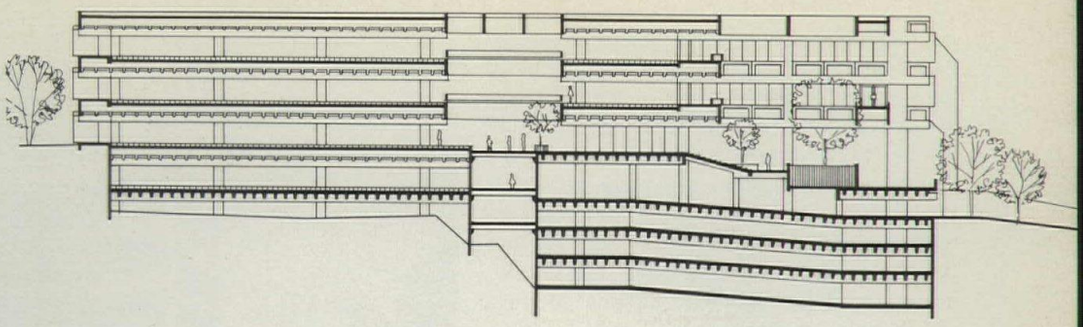
Typical of the business expansion in this country's Southwest, the San Antonio-based United Services Automobile Association has outgrown numerous local buildings in its 50-year history. Organized to provide insurance for military officers and their dependents, the company now occupies a new 3-million-square-foot headquarters in which it intends to stay. Architects Benham-Blair & Affiliates have designed a linear building that is currently over a third of a mile long, and which can be indefinitely extended along the ridge of its nearly 300-acre site.

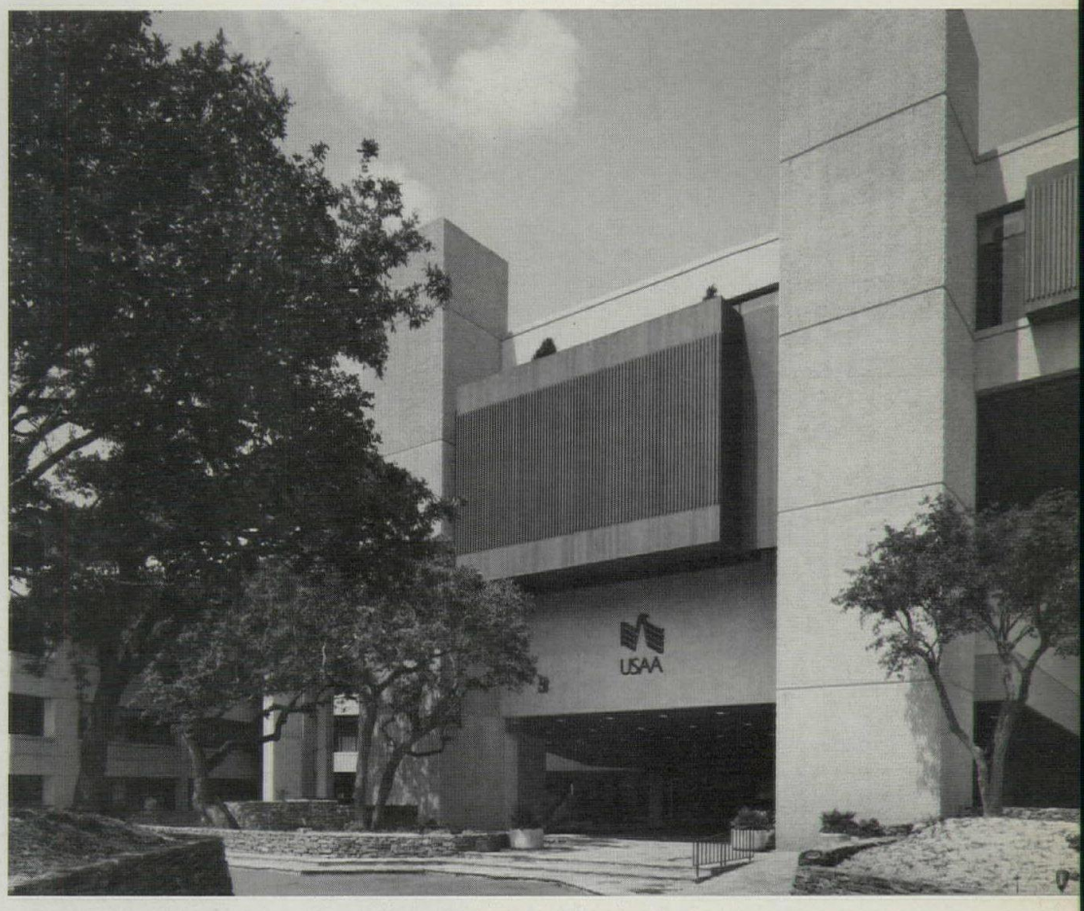
Inherent in the concept is a linear distribution of basic functions. Parking spaces for 2,600 cars, which occupy the first three levels of the building (see section), are arranged along the entire building's length so that workers' desks can be close by, and walking distances minimized. Above the cars, a level of services is centered on a building-length passenger and vehicular corridor, and supplies the basic needs of the upper three floors of offices. Here, a vast volume of mail is transported on automated cars that rise to predesignated areas. Under the service-level corridor, a utility corridor carries pipes and cables, and supplies air distribution units (projecting metal-clad elements on the facade) from the main utility room at the north end of the building.

To solve potential problems of horizontal communications over long distances, the offices are divided vertically into four semi-independent functioning units. Here, the activities on each 36,000-square-foot floor within a unit relate more directly to those above and below than to those adjacent. The resultant primarily-vertical communications are by high-speed escalators, which continue down to the garage levels to complete each unit's self sufficiency. The concept, of course, also provides the basis on which the building can be expanded in the future.

Each such group of offices is connected horizontally by a "shopping-mall-like" corridor, which is punctuated by three-story-high "courts" at the center of each group. These courts have glass roofs allowing the growth of plants and trees, and each is a focus of the largely unpartitioned work areas that open directly into it. Besides providing a sense of light and spatial change within the building's 340-foot width, the courts also provide a sense of identification as each has a different interior design by architects Neuhaus + Taylor. They also compensate for otherwise minimal ceiling heights (to conserve on exterior wall areas) and for limited exterior views. The minimal fenestration is caused by the placement of both the air-handling units and the stairs on the exterior walls (to provide maximum-sized unobstructed work areas).

The majority of the office areas are planned for flexible use, so that expansion of related departments can replace unrelated departments (which in turn can be moved farther away). Spaces with fixed uses include the executive offices (on the top floor over the entrance), extensive computer and telecommunications facilities, a library and a large auditorium. In addition to these business-related spaces, the building offers a large number of employee-related facilities, which are becom-





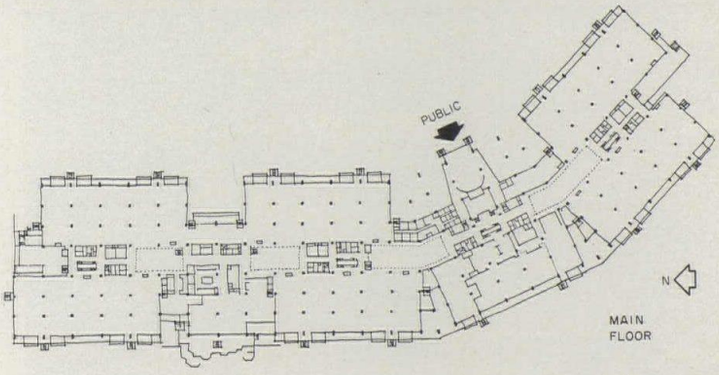
Large central "courts" (photo, far left) provide focuses for each of the segmented portions of the building. Within each portion, circulation is mainly vertical between the lower level parking garage and related office floors above. Because the main public entrance (photo, above) is located on the uphill side of the buildings, it provides a deceptively small-scale image. Here visitors pass between water-gardens (photo, left) before reaching the door. The warm-colored, precast concrete sheathing helped win a recent Precast Concrete Institute award for the building. Dark-colored anodized aluminum panels cover the many air-handling units on the exterior of the building.

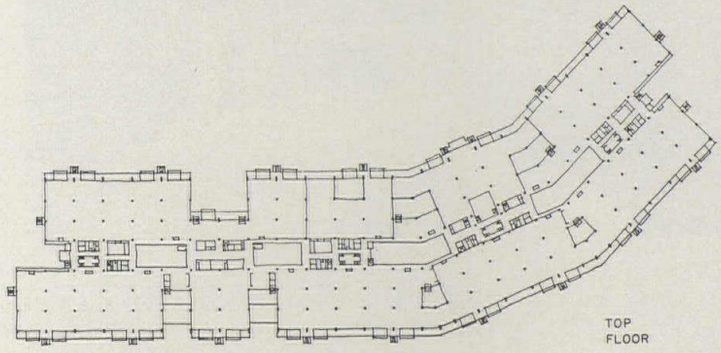
ing more common to some degree in suburban-isolated headequarters. In keeping with the concept of decentralized planning, there are two cafeterias, each of which serves about half of the building's currently planned 6,000 employees. An effort has been made to distribute serving locations and tables (especially in one room with varied levels) to reduce the impersonal impact of such big rooms. Classrooms are provided for night-time training courses, and there is a gymnasium, a post office and a general store (which is especially useful because employees work on ten-hour shifts for four days a week).

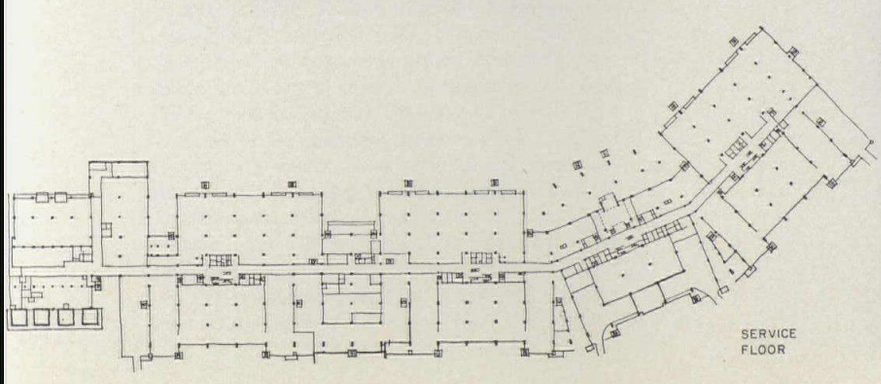
Despite the general flexibility in the building's planning, Benham & Blair did a great deal of research on USAA's detailed needs before the decision was made to proceed into working drawings. In order to speed construction, foundations were begun six months after the contract documents, and much of the major materials and equipment were purchased at about this time. Early construction work (under individual contracts administered by the architects) and the early purchase of materials have been estimated to have saved approximately $8.5 million. (The final cost of the building was $100 million.) Construction began at the end housing the main mechanical room, so that workers could occupy the completed sections before the entire first phase was complete.

While the garage levels were built with a concrete structure spanned by prestressed "tees," a composite steel and concrete construction was selected for the upper part of the building. The original intention was to have column-free work areas for maximum flexibility, but costs determined the introduction of columns in bays of 40 by 60 feet. These are spanned by open-web steel trusses that accommodate the unusually large number of cables and ducts. Intermediate framing is connected to the longer trusses only at the quarter points and not at the centers to reduce bending. The shorter trusses are connected to double, precast concrete, bottom members that act in structural concert. These project below hung ceilings to visually define smaller areas within the vast work spaces. Columns are steel, encased in poured concrete. Accordingly, it was possible to construct the entire building in steel first, and to proceed with other phases of construction while the concrete was added to bring the structure to full strength. Subfloors are concrete fill on metal deck, over which the raised finished floor is constructed of carpeted, removable metal panels for access to utility connections. (USAA estimates that every employee moves within the building on the average of once a year.)

Design was accomplished with the extensive use of models, which culminated in the erection of a small portion of the actual construction that would become a separate claims office. Here, construction methods and finishes for the precast concrete sheathing could be tested. Some buildings were left over from the ranch that originally occupied the site. These include the main house, which is now used as a corporate guest house, and the stables, which are used for maintenance. Much of the site is in a natural state.







A large part of the building's true extent is evident in the photo above. Here—as seen from the west—the building follows the natural ridge on the site. A man-made lake (foreground of photo, above) has been created at the main entrance gates. Two large cafeterias (one shown in photo, opposite) are part of the numerous employee facilities provided by the company.

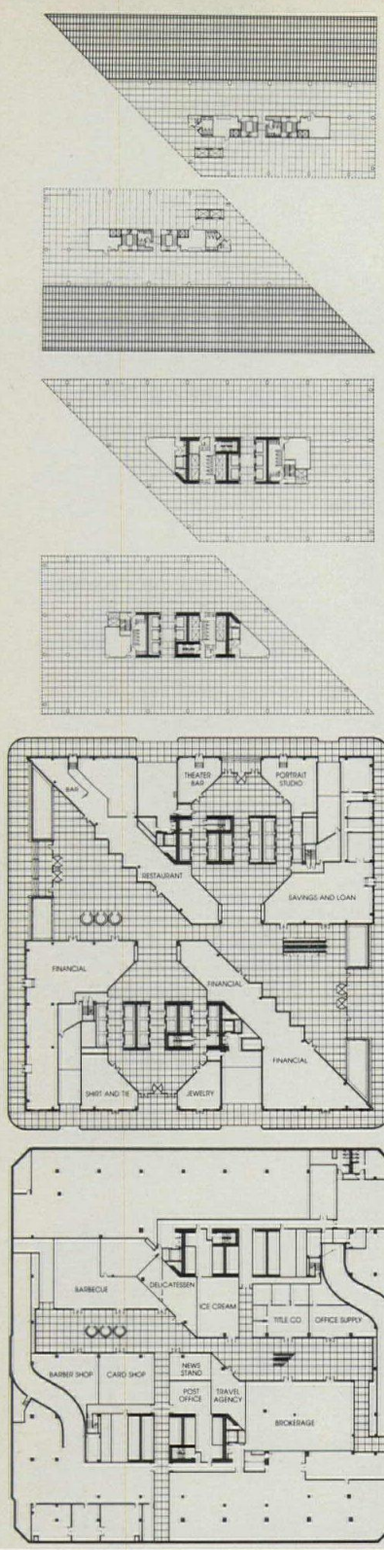
A large part of the office space is unpartitioned. Constant relocation of personnel is made easier by carpeted access panel flooring. A store for employees occupies one of the courts (photo, above). The massive main utility room (photo, right) supplies the air handling units—distributed along the building's exterior—through a one-third-mile-long utility corridor carrying pipes and ducts.

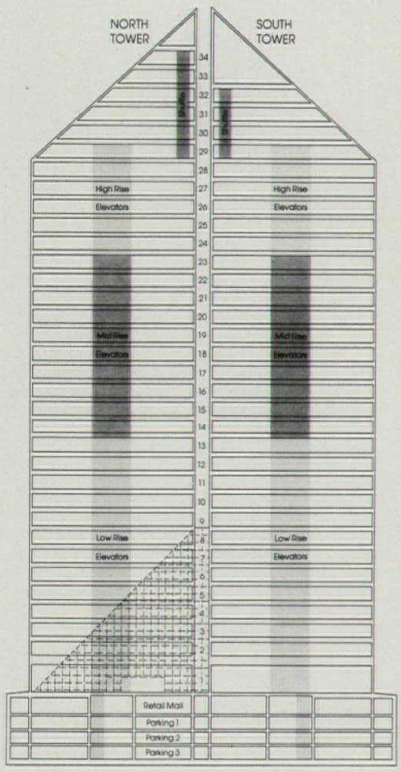
UNITED SERVICES AUTOMOBILE ASSOCIATION OFFICE COMPLEX, San Antonio, Texas. Architects and engineers: *Benham-Blair & Affiliates, Inc.—principal in charge: Allen Poppino; project manager: Donald Gunning.* Interior design architects: *Neuhaus + Taylor (for specific areas of the building)—principal-in-charge: Marcus Tucker; project director: James Ferrar.* Consultants: *C. P. Boner & Associates* (acoustical); *James Keeter* (landscape); *Howell Design Corporation* (program); *Project Administration Services, Inc.* (construction management); *Lashober & Sovich, Inc.* (kitchen); *Hubert Wilke, Inc.* (audio-visual); *Peter Callins & Associates* (physical fitness and recreation); *Associated Art Consultants* (art); Evans and Hillman (lighting). General contractor: *Henry Beck Corporation.*

Richard Payne photos except where noted

PENNZOIL PLACE

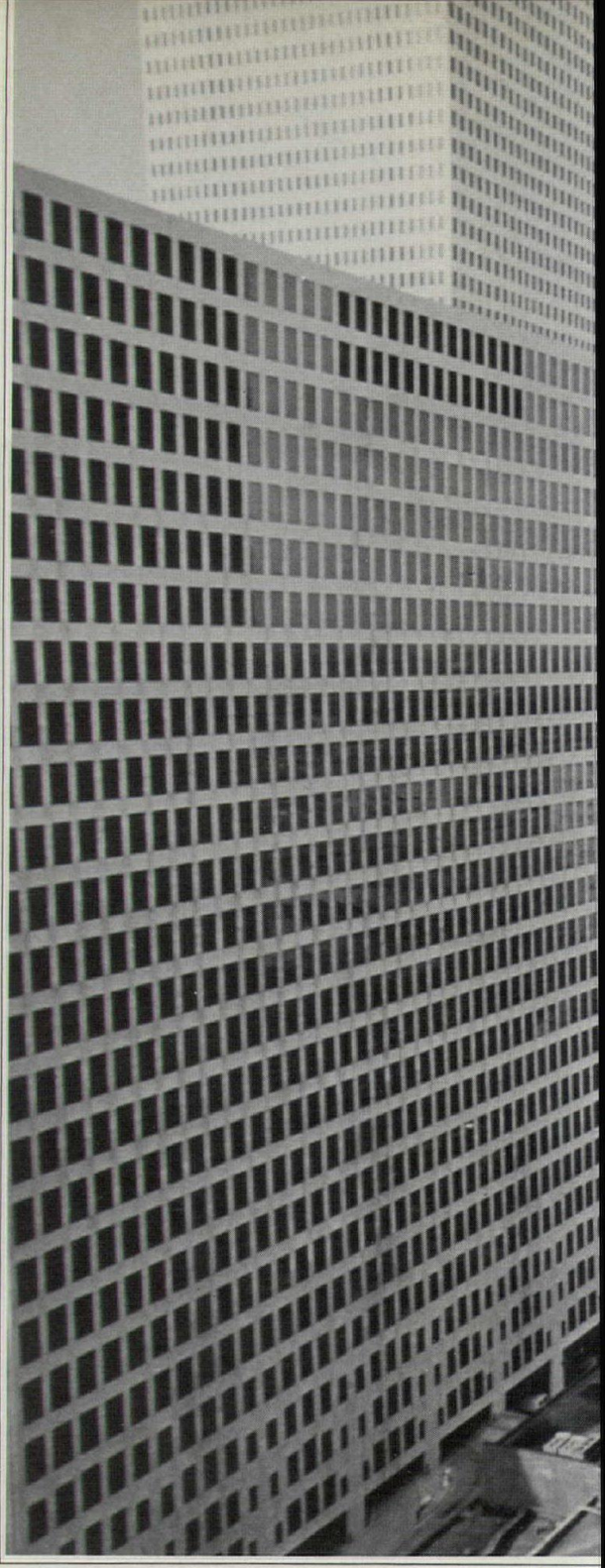
What premium does the owner or developer of a building pay for innovative architecture? What risk does he assume in hiring a firm that is generally considered to be one of the most creative and consequential of our time? What trade-offs between economics and esthetics occur in establishing a believeable bottom-line? Dovetailing the design perception of Philip Johnson and John Burgee with the exacting developmental process of Gerald D. Hines, Houston's Pennzoil Place gives some answers.





Pennzoil Place consists of twin 36-story towers, trapezoidal in plan, that are mirror images of each other. At groundside, these define connected triangular plazas that are enclosed by 45-degree slopes of glass, supported with white-painted trusswork of steel. The plaza and lower concourse contain a mix of commercial activity. The towers thrust vertically through the plaza spaces to the 29th floor where they repeat the 45-degree angle theme.

Steve Anderson



Houston is where statistics sprint and megadensities of commercial construction have increased leasable floor area from nine million square feet in 1960 to a whopping forty-five million now. This year it is celebrating its 140th birthday.

The twin trapezoidal towers of Pennzoil Place, rising 36 stories or 495 feet, accounts for 1.4 million of this leasable space, and is about the best birthday present that a city could hope to get. In plan, section, and elevation—from all around, in fact—Pennzoil rises from its block-square downtown site, 250 feet on a side, with a flourish of forty-five-degree angles in a geometric exercise worthy of Euclid. Its over-all *parti,* as one reads it on the Houston skyline, has been called among other things, "the ultimate milk carton." Which is apt enough, since Houston was laid out in 1836 by a newspaper publisher named Gail Borden who obscured his reputation as a city planner by going off and inventing condensed milk. Working without instruments, he managed, in seven weeks, a simple, convenient grid, defined by streets 80 to 100 feet wide, that has been ingratiating speculators and developers ever since.

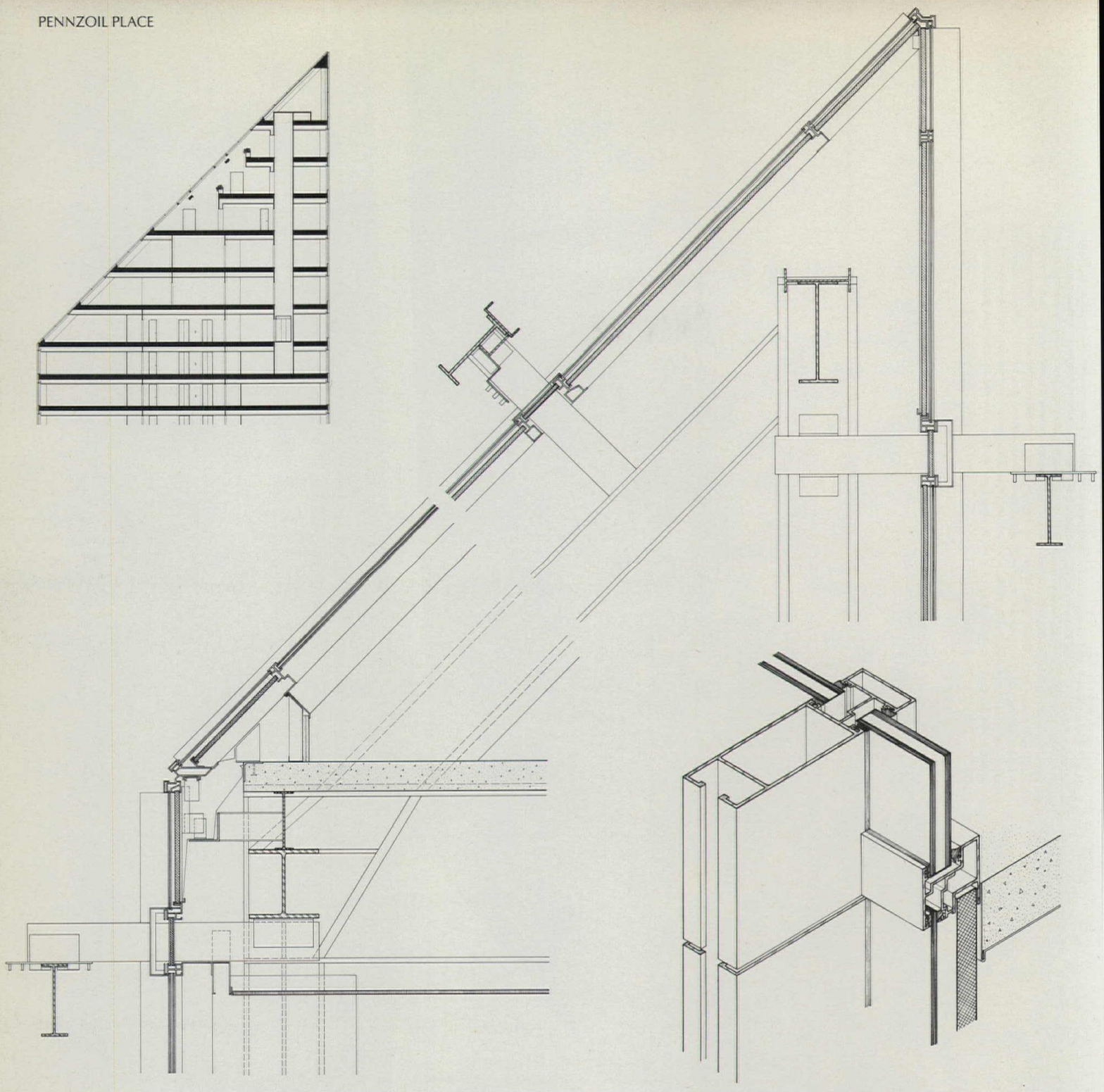
In a city that must be counted, more than America's seventh largest, the apogee of the oil, energy, and aerospace industries, Pennzoil peaks out with *two* apogees. The two identical shapes, flip-flopped to be mirror images of each other, are separated by a skyscraping slit of space, ten feet wide, and, down at groundside, by a landscaped air-conditioned plaza that takes up 27 per cent of the 62,500-square-foot site in the form of two right-angled triangular areas—this space being what is left over after the two trapezoidal-plan towers.

The plaza, or two plazas to be more precise, contains 36,000 square feet of commercial space, including that of the concourse level below, which interconnects with a pedestrian

tunnel system that threads below the streets. The plazas are enclosed by truss-supported slopes of glass which slant skyward, at forty-five degrees, to the eighth floor. Here the slopes join, the ten-foot slit starts, and the towers are seen to thrust vertically through the white-painted filigree of steel trusswork—straight up to the 29th floor. At this level, the "wall" becomes a "roof," as the skin of the towers, composed of bronze-tinted glass and anodized aluminum, breaks from the vertical at yet another forty-five-degree angle rising to the apogee of each shape. These topside slopes enclose executive offices and suites—six of them in the north tower, four in the south. Reached by shuttle elevators, these tiered spaces, with stepped-up mezzanine levels, represent a fundamentally new slant on the old story about starving in a garret.

The concrete shear-wall core of each welded steel-frame tower contains utilities and the banks of elevators, but, more to the point of rentability, this permits minimal columns and beams; the result, maximum leasable open space of 20,500 square feet per floor. Of the three banks of elevators serving each tower, six move between the 2nd and 13th floors, five between the 14th and 23rd floors, five between the 24th and 36th floors, plus those special shuttles "up in the garret."

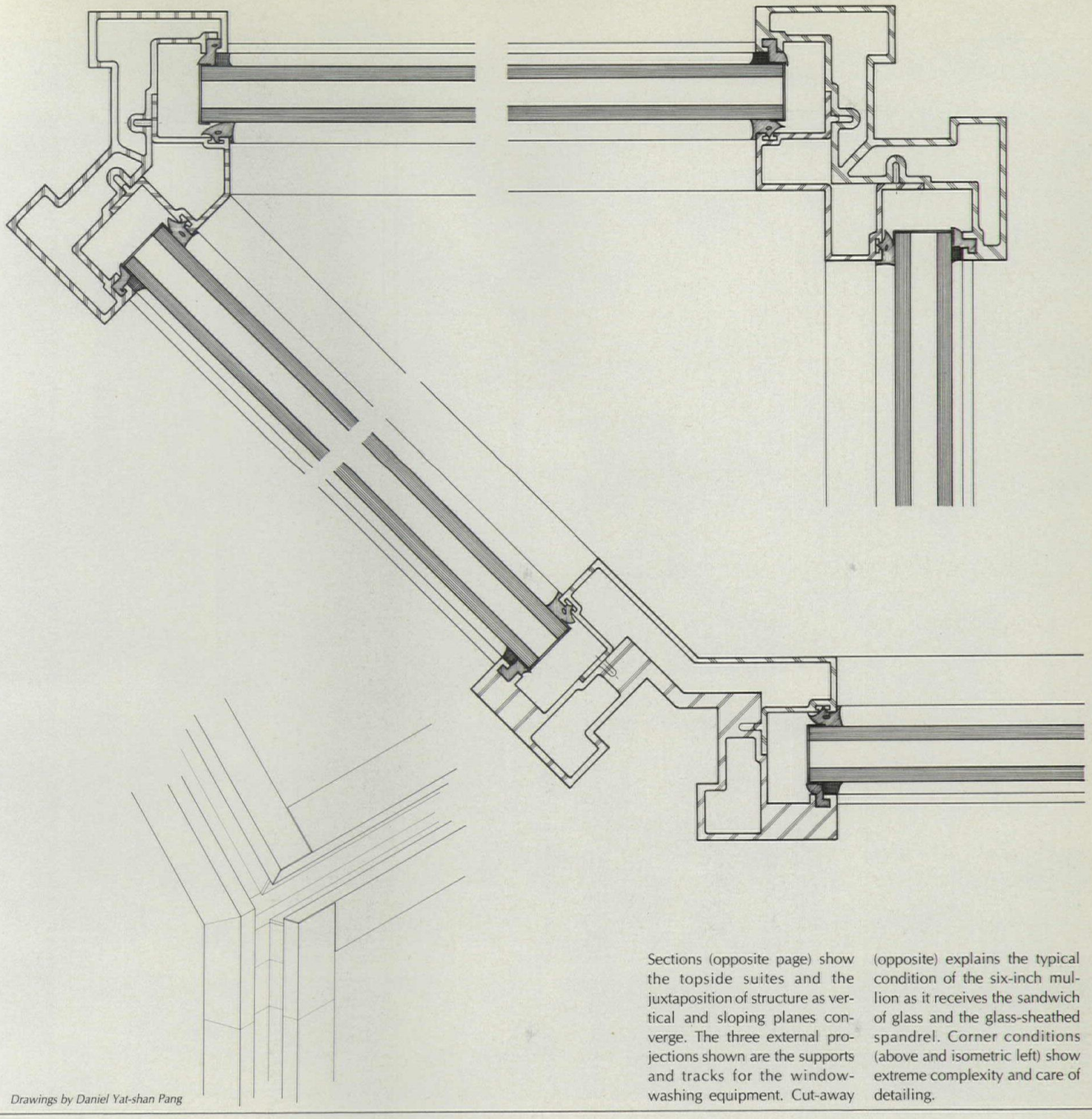
Thus the configuration of Pennzoil, its towers and enclosed plazas nudging right out to the bounding sidewalks, makes intensive use of its site: 550 parking spaces are taken care of on three subsurface levels. The plaza provides temperature-controlled year-round comfort amidst the unholy heat and drenching humidity of Houston, creating a kind of "city room" in which a mix of people and purposes can rub elbows. Convenient linkage with any of nine downtown blocks (and 14 buildings) by way of the two concourse-level tunnels, 12 feet wide



and 8 feet high, will make Pennzoil a primary ventricle in the city's circulation system. Although the cost of the tunnels is around $4,000 a foot—the one leading east to the Houston Club Building is already open, the one to the south is awaiting future development of that block—heightened accessibility is thought to be justification enough for the added cost. And in the case of the eastern link, positively posh with carpeted walls, recessed lighting, and granite floors, half of its cost has been picked up by the Texas Commerce Bank, which, like other enterprises about town, saw the wisdom in having a piece of Pennzoil's action.

This "action" includes aspects of Gerald D. Hines' approach as an owner and developer that many of his competitors wish they could have a piece of. Word has gotten around, and accurate it is, that the Hines organization got Johnson/Burgee's elegant, exuberant composition constructed for something under $28.50 a square foot, not including the land. It is also true, with rents ranging from $9.50 to $10.50 a square foot, that he is thus getting two bits to 50 cents more than other prestige buildings about town; some of those are having trouble leasing. Not so at Pennzoil, which was 60 per cent leased by the time of groundbreaking, four years ago, and 97 per cent leased by the time of occupancy last winter. What went *right*?

What went right is that architecture was given a chance to make the difference that it *can* make by a man who firmly believes, and has proven, that the difference is this: leasing space, or not leasing space. Especially during what some of Hines' staff describe as "the fall madness," there is constant reconnaissance for the best, the brightest architectural talent—not only for upcoming projects but also for those way down the road. Not that Hines is consciously creating a "stable" of geniuses to call on when the occasion arises, but he is keeping



Drawings by Daniel Yat-shan Pang

Sections (opposite page) show the topside suites and the juxtaposition of structure as vertical and sloping planes converge. The three external projections shown are the supports and tracks for the window-washing equipment. Cut-away (opposite) explains the typical condition of the six-inch mullion as it receives the sandwich of glass and the glass-sheathed spandrel. Corner conditions (above and isometric left) show extreme complexity and care of detailing.

after the freshest thinking in the field, ferreting out those whom he senses would be sympathetic to the challenge of creating quality design within strict controls of time and cost controls. "No architect, however ingenious or imaginative, can be held accountable if the figures don't work out. If they don't work out, only we can be held accountable," Hines insists. "To be conscious of cost, as everyone in this business must be, is one thing—but not the main thing. To be conscious enough to *control* cost, every step of the way, to be conscious enough to research your market, to be conscious enough to know your materials, their pricing, when to buy, and in what volume—these are the main things. What is more, this is the kind of consciousness that allows brilliant buildings to be built, not the kind that prevents them."

Philip Johnson adds, "We architects have to understand more fully, as John Burgee and I certainly came to understand more fully, that the structure of decision on the business side of architecture can be every bit as creative, every bit as much an 'art,' as the structure of decision on the design side. With a client like Gerry Hines, who can show that paying a little more at the front-end can result in *getting back* a whole lot more in the long-run, the camel can at last stick its nose into the tent, and, in the field of big-time commercial development, the tent flap has been closed to us architects for a long time. I would rather be a camel than a prostitute anyday."

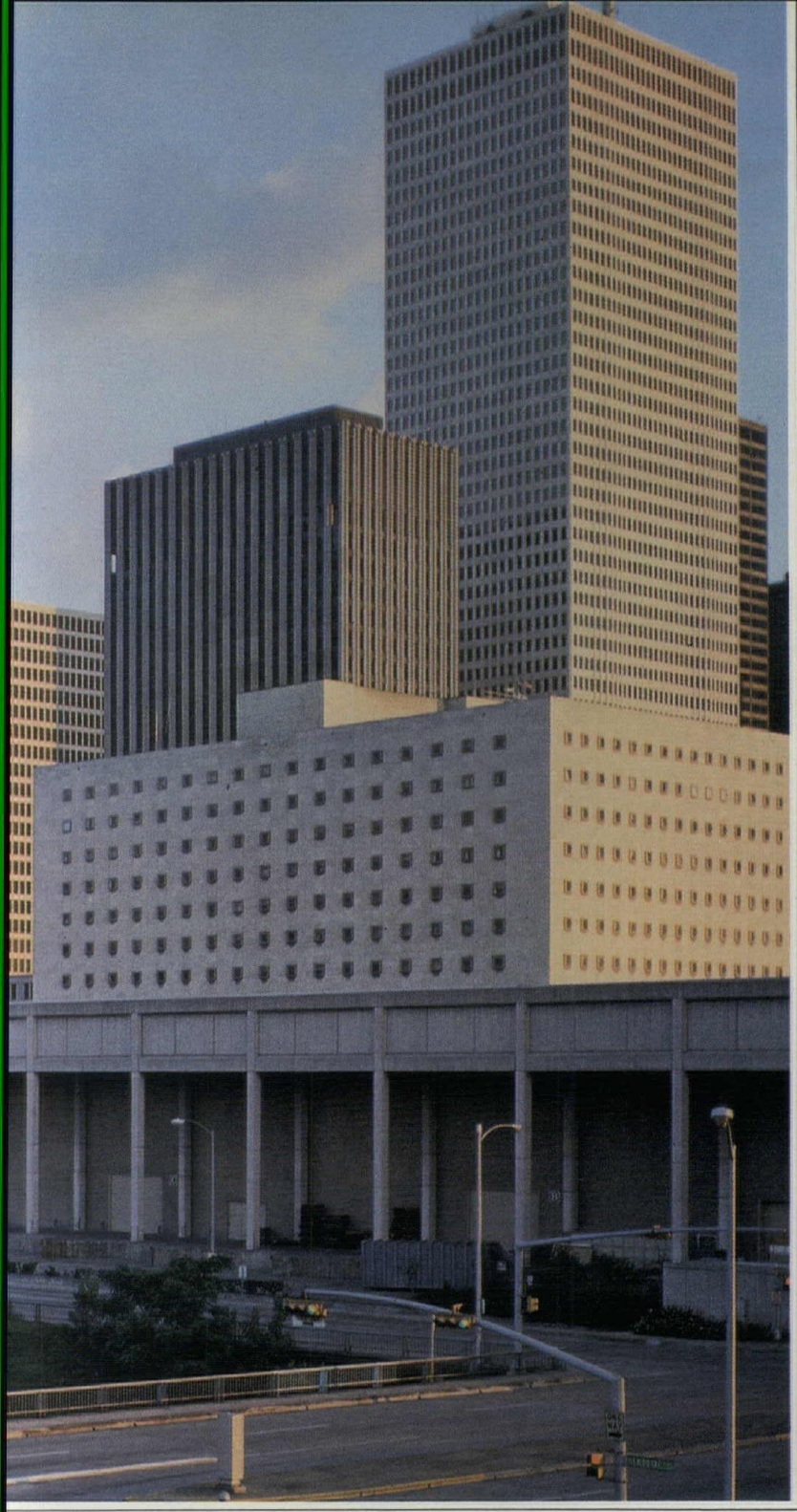
The reason that this particular camel got to stick his nose into this particular tent is that the Hines team, rather than building some spiffy slab and *then* seeking somebody to lease it, was, with its financially heady track-record over the last 20 years, approached by one of the biggest would-be tenants in town, the Pennzoil Company, headed by chairman J. Hugh Liedtke, and, from there on in, big oil called the

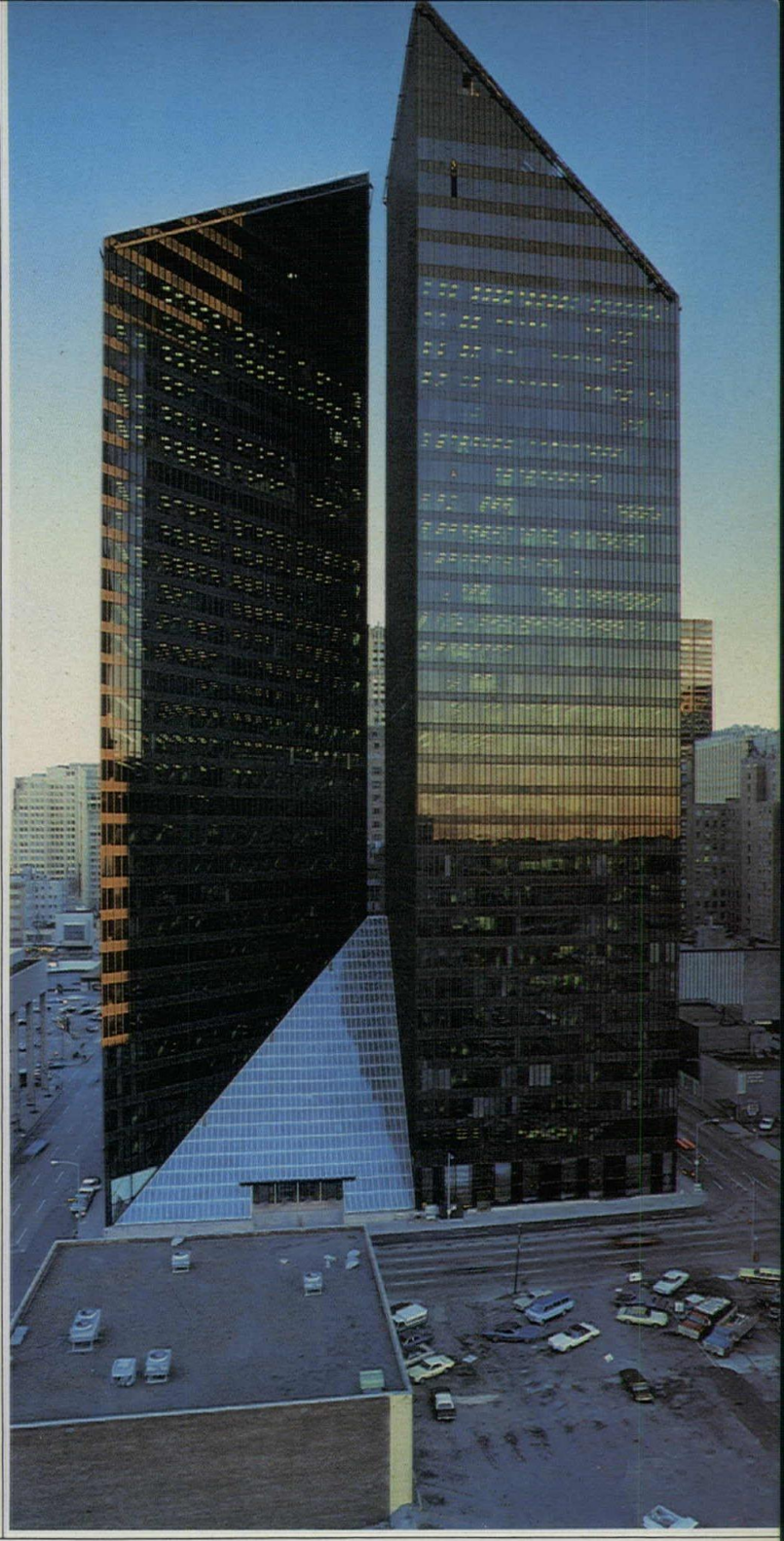
shots. Liedtke wanted an indelible, dramatic image for his growing concern, and he wanted it right downtown—nearby cultural enclaves like Jones Hall for the Performing Arts, or the Alley Theater; nearby the spate of recent high-rise office buildings to the east and south, including Hines' own Two Shell Plaza, one block south, and the towering One Shell Plaza, two blocks south—both by Bruce Graham and Fazlur Khan of the Chicago office of Skidmore, Owings, & Merrill.

Liedtke also had some very definite design ideas. He didn't want another "cigar box," as he put it, with one of those boring "flat tops." Nor was he especially taken with tall buildings, or with light, shiny metals. Johnson/Burgee—who were already at work for Hines on a now-completed office building called Post Oak Central (page 110), the first of several for a site near Hines' 33-acre Galleria complex—were finally brought in, associated with the well-known Houston firm of S. I. Morris Associates.

Leidtke, at the time, was saying that he needed only 400,000 square feet, while Hines was figuring on more like 1.2 million; the answer, of course, come up with some more tenants. "This altered the entire image of the venture," Hines recalls, "and with multiple major tenants, we needed to come up with a design with a multiple image. Philip and John came back with one, all right."

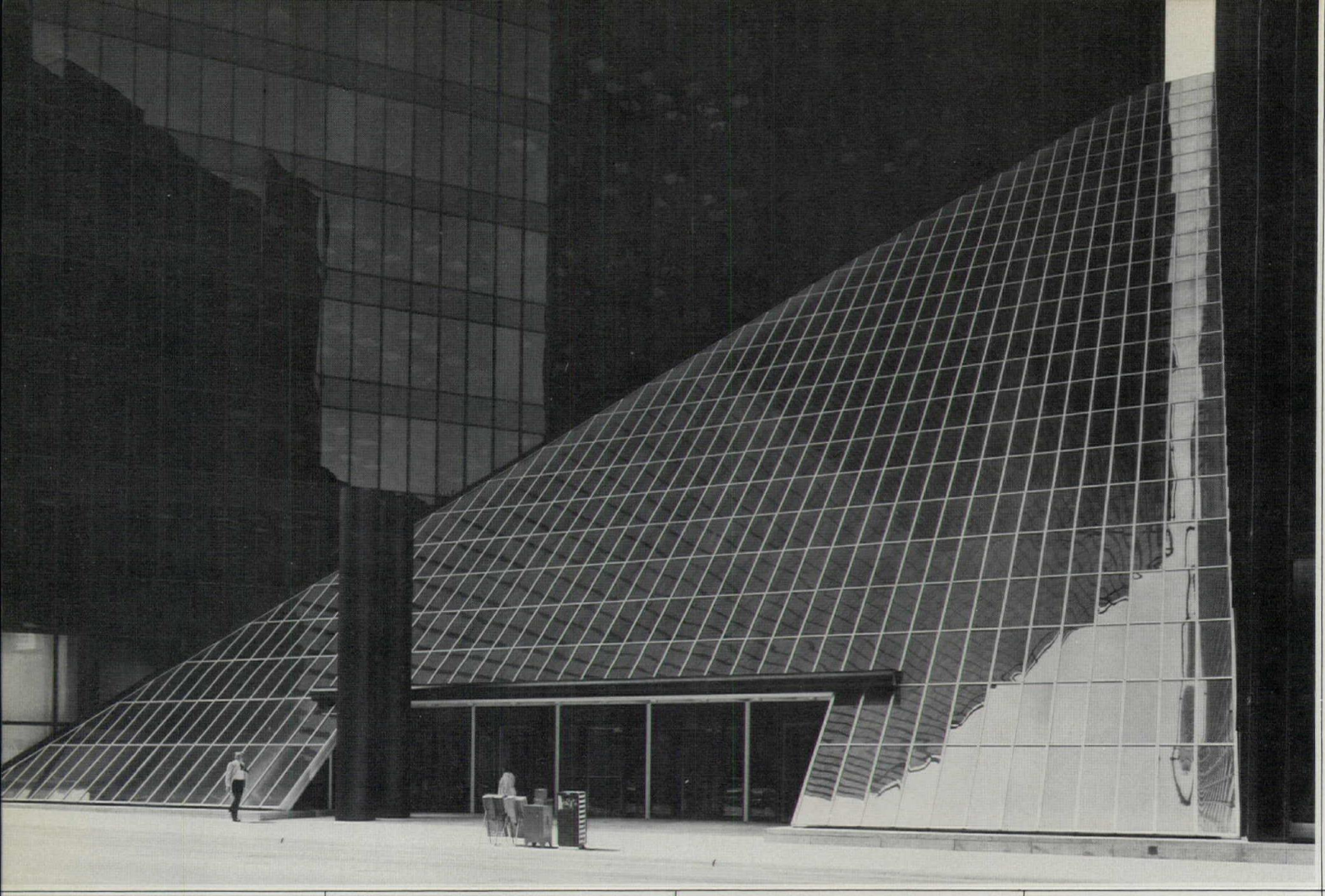
With the twin-tower scheme in town, the study model having arrived, someone recalls, in a Seagram box, Hines set about constructing his tenant mix. Pennzoil, reconsidering its projections, signed up for 615,000 square feet in the first tower, and the United Gas Pipeline Company came in for a few floors as well. The Zapata Corporation signed up for 10 floors in the second tower, and the Houston office of Arthur Andersen, the big accounting firm, signed up for six more. That is what is known, in par-

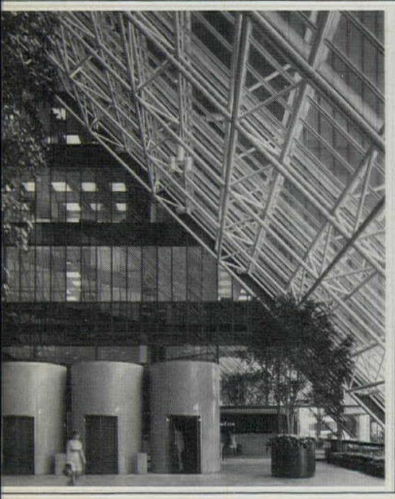


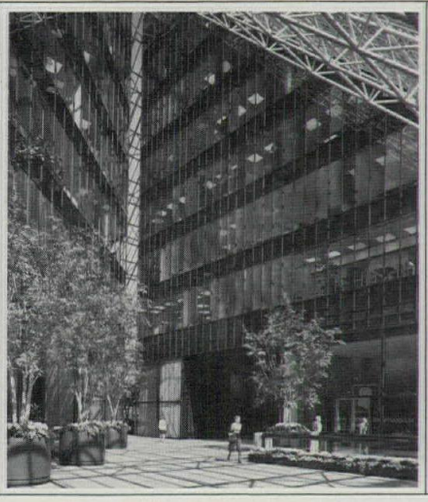


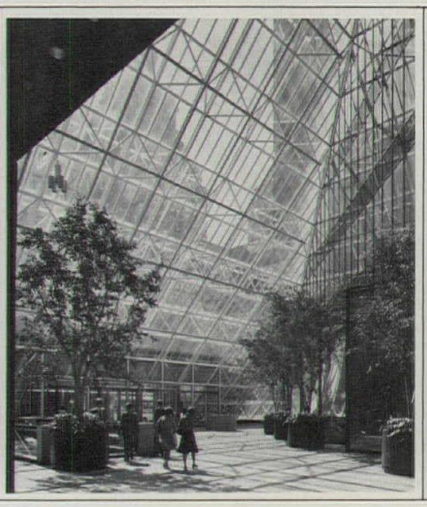
lance, as "preleasing." It may also be described as "reducing risk." For with Johnson/Burgee's "pointy tops, those parrot beaks," as Johnson prefers to describe them, Hines not only got most of his project spoken for but also the clinching $60-million mortgage, based on 75 per cent of the building's value. It is important to point out that this "value" was based on the river of revenue from those signed leases—not on Hines' costs. These costs, though higher than those associated with the usual bargain-basement box, are reflected by rental rates, but the Johnson/Burgee design was so disciplined, with every aspect scrutinized for maximum economy, that those rates, confounding the worries of committed tenants, are really a bargain in themselves.

This extra increment of cost, meaning rent, was kept as low as it was through careful cost analysis of features that would have been considered, in conventional development circles, as completely dispensable. Those pointy tops, for example. Not only did they present special problems in design detailing on construction (see structural drawings, pages 104, 105), but the Hines team was properly concerned about all that sunlight bringing on overloads on the air-conditioning system. So the architects worked out a glazing system on the slopes to cut down the heat. Also, to assure cheaper maintenance and easier tenant renovations down the road, Hines went along with the generous provision for 13-foot floor heights. Another premium was paid for the visual character of the skin itself, for the client, major tenant, and architect agreed that the last thing Houston needed was another mirror-sheathed building. Johnson/Burgee wanted people to be able to see inside, thus making the towers seem more permeable and friendly from the surrounding streets. And they wanted the expansive exterior surfaces to offer a warmer, textured tone. "We have twice as









The geometry of Pennzoil creates stunning spatial experiences, as in the offices of the law firm of Bracewell & Patterson, designed by Jeffry Corbin and Linda Pinto of Caudill Rowlett Scott (top). Public spaces include a banking room, looking out on the covered plaza (above left), and a commodious lower concourse (above right) with elevator access to the upper plaza and the parking levels below. Pennzoil's massing meets the street as the glass slope above the plaza (opposite) angles directly to the sidewalk, supported by steel trusswork.

many mullions as almost any other building," Johnson exults, "but Gerry, understanding our point, said 'let's look into what it's going to cost,' and they found out that it wasn't that much difference. You see, the thing about working for such a client is that he figures cost *with* the architect, as crucial design features are considered, not when they've been laid on the table for the moment of truth." The "premium" for the skin? About 25 cents a square foot.

An example of this give-and-take is the white-painted steel truss work that supports the glass enclosures above the plaza. The architects preferred to grind the welds, which now show up through the paint, and an estimate was even taken on the bottom three rows of the truss to see how much grinding them would cost. "Well, we found out it was going to cost something like $12 a weld," Johnson says, feigning horror, "and we sure weren't going to stomp our feet up and down." The "premium" for these skylights? About 40 cents a square foot.

Yet another premium, though a minor one, was paid for in providing for an elevator design, departing from Johnson's now venerable cab for the Seagram Building, the details of which had reappeared at the firm's IDS Center in Minneapolis. These new cabs have walls of copper plate that have been treated, by a slurry process, with powders of bronze and nickel. During firing, and as the slurry burns out, the copper becomes corroded, and what is left is a rich, rough, and tactile finish—so rich, rough, and tactile, in fact, that a secretary, having leaned against the surface, recently got her hairdo tangled with it and could not be extricated until a Good Samaritan came running with some shears. Metal hand rails, running waist-height around the cabs, have since been installed. These cabs are used in both the elevator banks of the towers and in the three circular kiosk-shaped lifts that connect the west plaza area

Hedrich-Blessing

Steve Anderson

with the concourse and parking levels below grade. These "kiosks," which are cut off just above the elevator doors, have caused some consternation among unknowing visitors. One gentleman recently spent at least five minutes standing in front of them, alternately looking at people disappearing inside the cabs, and then gazing upward at the surrounding towers with a perplexed look on his face. Finally, he asked a guard, "Could you tell me which of these I take to the 23rd floor?" One man's amenity is another man's humor.

In use, the plazas represent one of the most successful people-oriented spaces yet devised hereabouts, while, from the surrounding roadways, their sloping enclosures give the impression of a communal, unifying base for the two towers that sprout up through the geometry. So there are really two aspects of Johnson/Burgee's preoccupation with the "processional" element. One is the range of experience and encounter that one has on foot, moving up to or around Pennzoil, then penetrating its geometry as one walks through to the opposite street or into the elevator lobbies. The second processional element is more subtle but, in automobilistic Houston, wholly suitable. That is to say, there is an equally intriguing range of experience and encounter with its geometry as one hurls along the freeways that encircle downtown. As Johnson explains, "The complexity and diversity of the design as it is perceived by people far exceeds the directness and simplicity of the means we used to achieve it. As pure shape, you see, Pennzoil offers the least in means, for the most in essence, in the framework of economic constraint. Straight walls, or 45-degree slanted ones. You can't even say there is a 'roof' because the 'roof' is marked by a crease in the wall." The "premium" for shape? About 80 cents a square foot.

Shown below, at the right, with Philip Johnson, Gerald Hines has completed a second office building by Johnson/Burgee, Post Oak Central. A 24-story curved-corner composition of reflective silver glass with alternating bands of charcoal anodized aluminum, its smooth-finished silhouette of set-backs is meant to be the first of several such towers in this vernacular of updated deco detailing.

Steve Anderson

PENNZOIL PLACE, Houston, Texas. Owner: *Gerald D. Hines Interests.* Architects: *Johnson/Burgee.* Associate architects: *S. I. Morris Associates.* Engineers: *Ellisor Engineers* (structural); *I. A. Namen & Associates* (mechanical/electrical). Contractor: *Zapata Construction Company.*

With all the gurus of post- or even anti-modernism around these days, fascination for geometry may seem a bit old-fashioned. But Johnson remains adamant. "I am interested in shape, damn it, *shape.* And I'll tell you why. I am interested in shape, basic prismatic shape, because it lets you get right away to the core of what big office buildings are about—wrapping up the required amount of space in as economical a skin as possible, doing so in such a way that people will want to identify themselves with the building by renting some of that space. This way, shape can enclose room succinctly and leave room for sparing innovation at the same time. And this way, too, shape acts as a marketing implement. The only way you *do* pay for innovation is if you don't rent the space fast enough. The only way you *do* take a risk is if you settle for standards of design that result in the cutting of costs, or of corners, in such a way that a building ends up looking like any other building and, because of all that cutting, costing more to operate and maintain in the long run." It would appear, from this assertion, that Johnson, who started out as a celebrant of the *idée fixe,* has become a celebrant of something quite more to the point of commercial dictates. "There are no rules," he reminded an audience recently, "only facts."

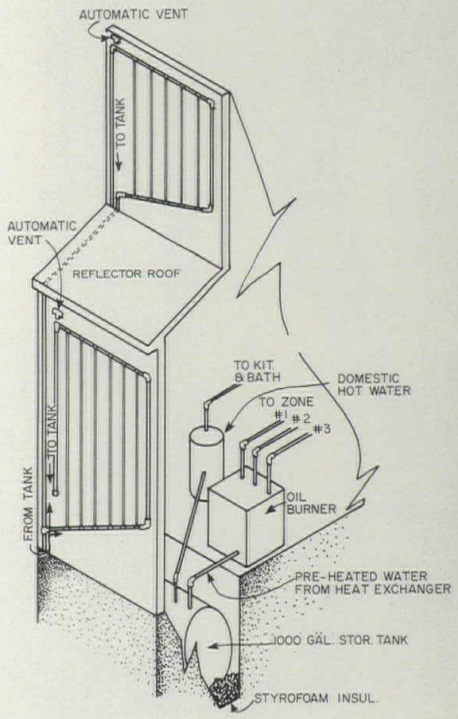
Those facts, as Johnson/Burgee and S. I. Morris Associates were given to understand them, were enough to bend most architectural teams out of shape. What they have built, in the name of "honest structural expression," may be said to be bent in response. But working closely with Hines associates John Harris and Ben Franklin, the team was able to work out the touchy structural details, building half-scale models of some of them, to assure both practicability and economy. Because of the basic shape, there were only a few common conditions of structure that had to be resolved, particularly the details of the four corners which, as Hal Weatherford of S. I. Morris says, "were practically hand-made." The so-called "skew ridge" at the top of each tower, where the "roof" cuts down to the vertical walls at 45 degrees, was, as Weatherford chuckles now, "a real dude"—and the last to be detailed.

This step-by-step costing, with design details and their budgetary ramifications constantly cross-referenced, was matched by similar innovation during construction. Curtis Lynge of Zapata Construction, seeing after things on the site which quickly became the biggest hole Houston had ever seen, worked out a method of excavation that called for pouring the bounding walls of concrete *down,* as digging proceeded, beginning with a cap beam of concrete tied around the site. This pour-as-you-go approach cut down on the redundancy of trades on the site, saved a month's time, and $300,000 or so. Another smart move was made in pouring the concrete mat. And at $2 a yard, any savings is a help. There were five pours in all, and between night work and plenty of ice to keep the concrete cool, appreciable savings of time and money were achieved. One worker on the site, still finishing up tenant space in the top slopes for occupancy this spring, said, "I took one look at the design for this when it was announced and muttered to myself, 'I pity the poor s.o.b. who has to build this.' Well, look at me now. I guess you could say it's been a real hoot, and, what is more, I think the excitement of tackling a job so tremendous and so different turned a lot of the boys on. Why, it's been enough to make you want to be an architect."

In no small measure, Gerald Hines' most significant accomplishment goes well beyond his genius at conceptualizing the intertwined concerns of architectural design, financing strategy, and marketing. What he has done is create the set of conditions that make good design possible—a procedural template that more clients, supposedly concerned about the bottom-line, could benefit from. Furthermore, he'll go out of his way to get advice on how to do it even more effectively and dramatically. Not long ago, on a quiet Saturday afternoon at his lair atop the office building at the Galleria, he asked one architectural critic, who was supposed to be interviewing *him,* "What is it, exactly, that invites your involvement in a structure? Is it the size or location? Its functional efficiency or financial success? Or is it the design itself? We are in the business of building not only successful buldings but also *exciting* ones. The two go together, as I have come to see it. And I would really like to find out, from people who are in the business of assessing what people in my business build, what it is that makes a structure noteworthy. What must be present in a building to cause a critic to *want* to examine it, to talk with those who did it, and to share its lessons with the public? I am trying to augment the experience of living and working in cities, and I need that kind of information to interject in our way of doing things."

That is almost enough to make a critic, or an architect, have hope. For the partnership between design and dollars needs to be much closer, and better informed, if the general range of buildings is to be improved. In times that are scaring even front-rank developers, Hines has documented, with the completion of Pennzoil, how that partnership can work and how a concern for dollars can, in fact, assure conscientious, individualistic design. Not only does his leasing and cost record garner the attention (and support) of top lenders, many of whom have been habitually cold to design because "it will cost too much," but Hines' liquidity is at the top of the charts according to financial experts in the building industry. Why? Because excellence and talent, from the start, were a requisite, not a risk. Which is why he will give the green light to such unfamiliar conceptions as Johnson/Burgee's slanting, "parrot beak" tops.

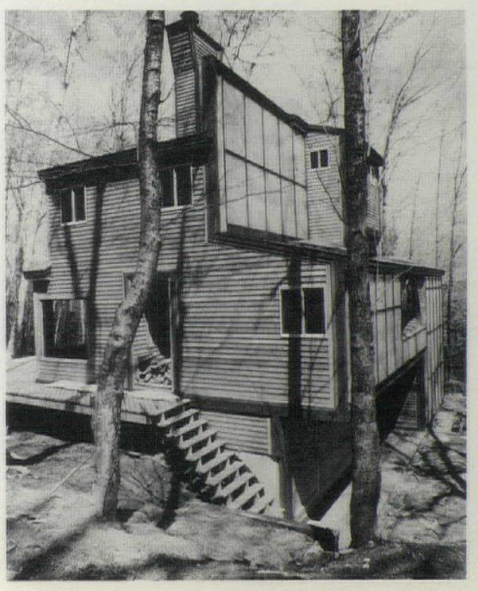
For a while, some people around Hines' shop worried that the slants, what with Houston's torrential rains, might end up turning Pennzoil into a water sculpture with deluges of the sidewalks. But with some study, it was determined that the air movement around the building would completely dissipate the rain drops—and the slants stayed. As it turns out, Gerald Hines got a monument to liquidity, anyway. And the profession of architecture got a monument to the difference it can make in a world which needs it. —*William Marlin*



Robert Perron photos

SOLAR HOUSES

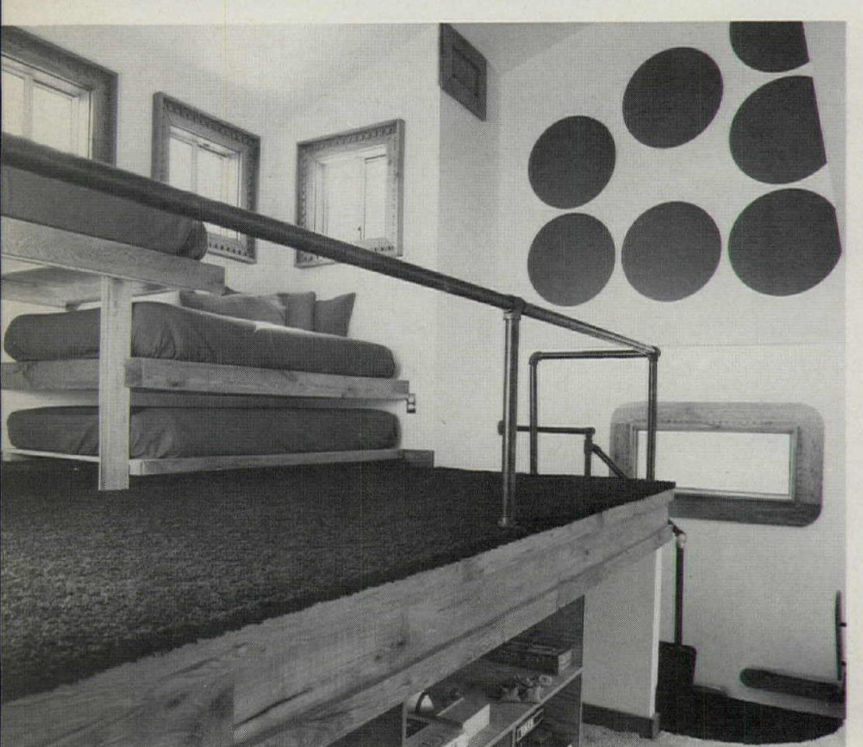
FOR THREE ALL-WEATHER SITES IN THE NORTHEAST

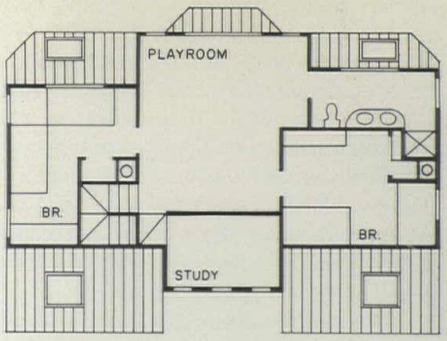


Solar heating, as a concept, has been around a long, long time. But because solar energy, when collected at the earth's surface, is both dilute and intermittent, its architectural application, until recently, has been sharply limited. Today, however, with increasing environmental concern, with more intensive research, with technical improvements and, most important, with the soaring costs and uncertain availability of fossil fuels, architects and their clients are looking at solar heating with new interest.

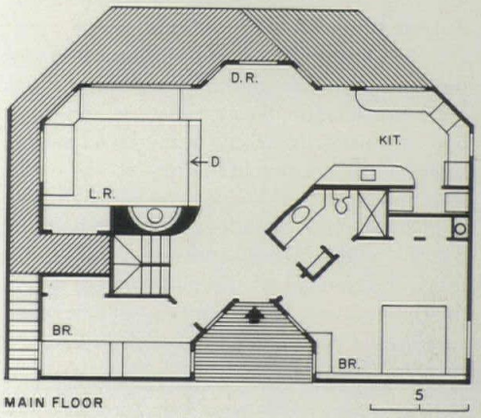
Here are three houses that reflect this growing concern. Each is strikingly different in program, form and adaptation for solar use. And none is located under the cloudless skies of Arizona or New Mexico. The first (photo above) is a weekend house in the mountains of Vermont. The second is a year-round built-for-sale house north of New York City. The third is a passive application in a suburban Princeton house. All are somewhat intuitive in design and all make comprehensive use of siting, materials, and a variety of design skills to minimize their reliance on backup heating. What they represent, as a group, are the kinds of solutions that the profession must be prepared to provide on this increasingly crowded, resource-depleted planet—*Barclay Gordon*

Robert Perron photos

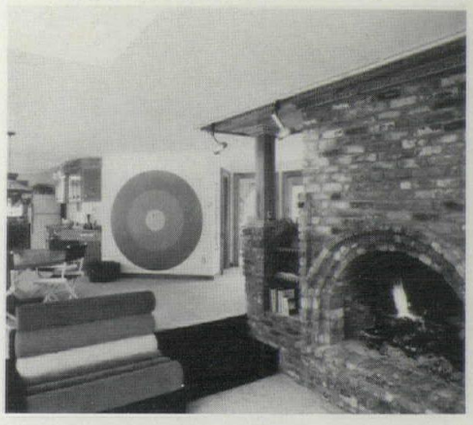




SECOND FLOOR



MAIN FLOOR



ON A VERMONT MOUNTAIN, AN INTEGRAL SYSTEM FOR SOLAR COLLECTION, STORAGE AND TRANSFER

Okemo Mountain, in Ludlow, Vermont, has an elevation of 3700 feet, winter temperatures that sometimes do not rise above 15 F for periods as long as 21 days, and a winter sunshine factor in the range of 40-45 per cent. These chilling conditions make the mountain a magnet for weekend skiers, like the owners of this house, but sorely challenge the solar designer. Architects Ric Weinshenk and Martha Poole of *Sunshine Design* accepted the challenge and designed this strong-massed, 3000-square-foot weekend house in a birch grove on this gently sloping, windswept site.

The solar collection system is integral to the design rather than imposed on it. Backed by a layer of insulating foam, the system is a grid of ¾-inch copper pipe and ⅜-inch refrigeration tubing shielded on the outside by two 1/16-inch thicknesses of fiber glass with a ¾-inch airspace between. The visual result is the series of opaque panels that are the predominant feature of the south elevation. The whole collector surface is about 1000 square feet (or ⅓ the floor area of the house) and it faces just east of due south to take advantage of the morning sun. Water, passing through the collector, is heated then returned to a 1000 gallon storage tank where it awaits circulation to the boiler by way of the heat exchanger.

Because the principal view is to the north, more than the minimum number of openings occur on this elevation, but all windows are double glazed and fitted with custom-designed, almost airtight insulating curtains that can be drawn to trap heat at night or when the house is not in use. This window treatment, combined with six inches of insulation in the stud walls and 12 inches at the roof, produces an R factor of ± 20 for walls and 30 for roof.

Additional heat is provided by a fireplace—not just by radiation but by a heavy heating coil that serves as an andiron and keeps a flow of heated water going to the storage tank whenever the fireplace is in use.

Beyond its mechanical invention, this Vermont house is spatially lively and fresh in its graphic images. It was built at a cost of $32 per square foot including furnishings, equipment and sitework.

PRIVATE RESIDENCE, Ludlow, Vermont. Architects and builders: *Sunshine Design*—Ric Weinshenk, partner-in-charge.

FLAT PLATE COLLECTORS MEET AT LEAST HALF THE DEMAND FOR HEAT IN A NEW YORK HOUSE

This house, now nearing completion at a site 30 miles north of New York City, is interesting because it indicates how a conventional developer's plan can be remassed and adapted for solar heating. The need to appeal to a broad market of potential buyers led to a program that includes four bedrooms, separate living and dining rooms, family room and two-and-a-half baths. This program produced about 2400 square feet plus basement and a two-car garage.

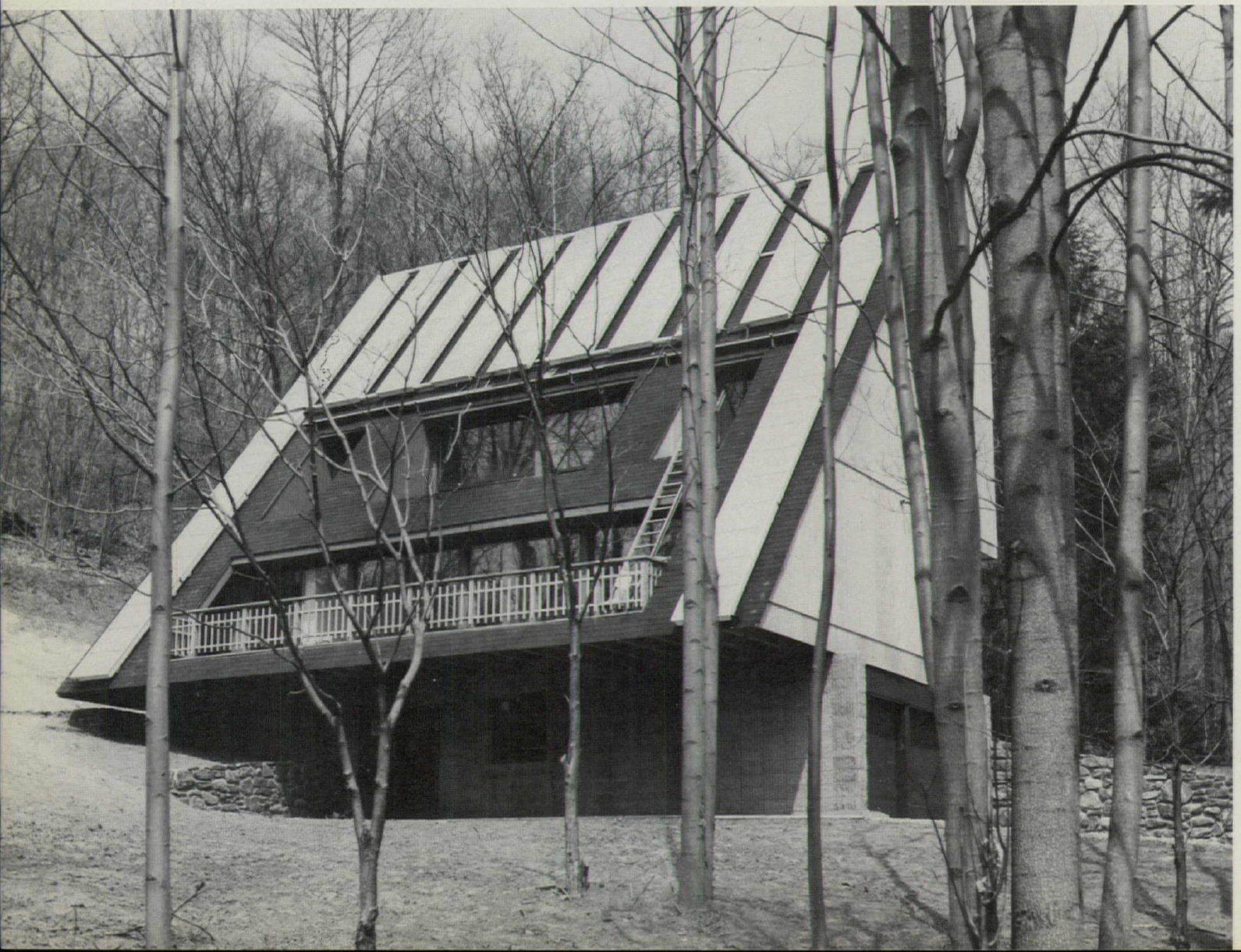
The decision to use solar collectors, together with the sloping site, suggested to architects Raymond, Rado, Caddy & Bonington a compact volume and a stacking of elements. Six inches of glass fiber insulation fill the wall cavities and 12 inches are applied at the ceiling of the second floor and at the first floor under the deck. This heavy insulation, coupled with a modest use of glass, keeps heat loss to about 100,000 Btus per hour—this in a region with an average winter temperature of 42F and approximately 4900 degree days.

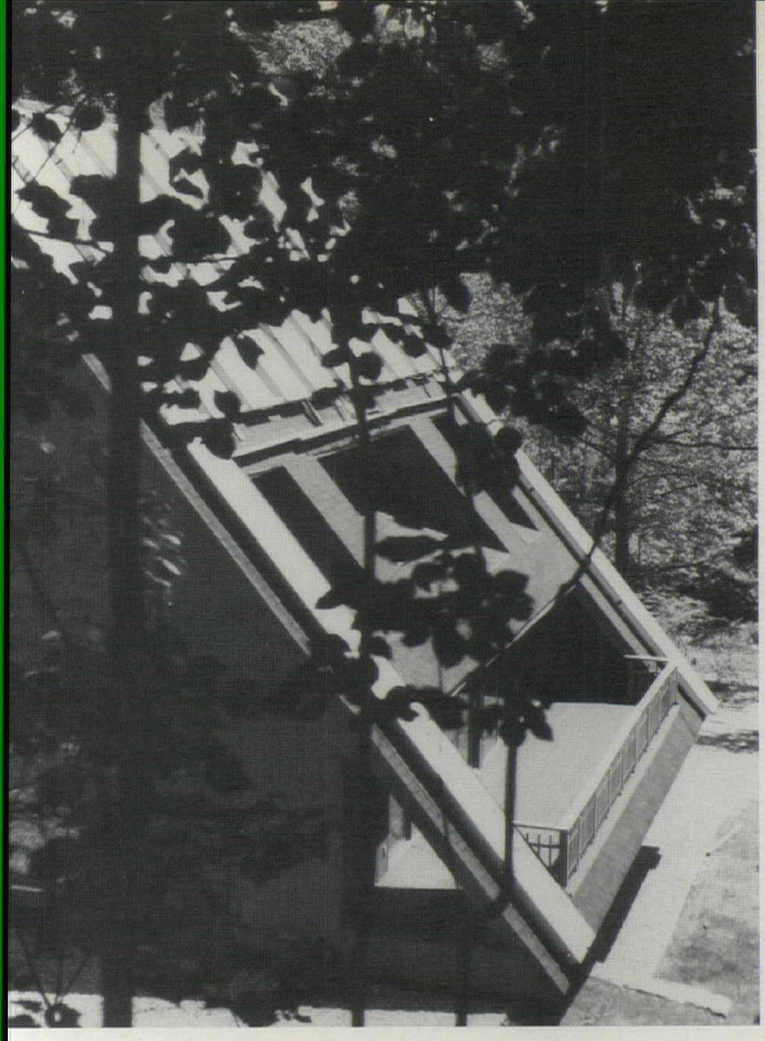
The deeply-sloping roof faces just west of due south and is inclined at 50 degrees—an angle assumed to be optimal for solar collection at this latitude. This roof is fitted with a system of flat plate aluminum collectors with a surface area equal to nearly one half the square footage of floor space to be heated. The liquid medium (water treated with an antifreeze solution) is picked up in manifold pipes between the collectors, then conveyed to a heat exchanger in the basement. Here the heat is transferred to a conventional forced-air distribution system before being recirculated to the collector system on the roof. To protect against a protracted period of overcast or rainy weather, a standby oil-fired heater trips on automatically when the water temperature in the storage tank has dropped below useable levels for space heating. Both solar and conventionally-generated heat are of course distributed by the same system of ducts.

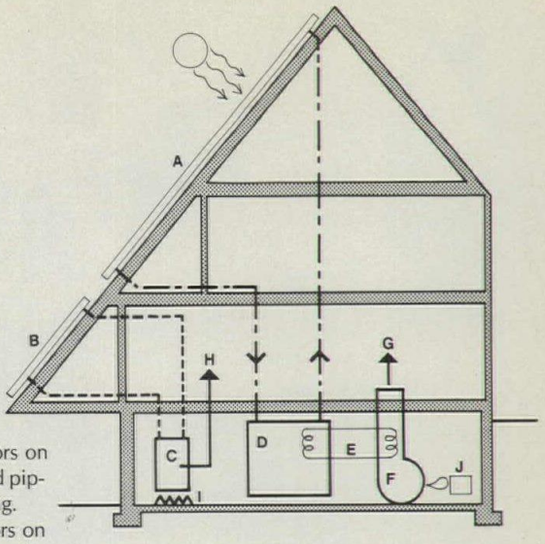
Domestic hot water demands are also met by a solar system and backed up by an electric heater. The two backup systems might theoretically have been unified but, in this instance, discrete systems were more economical.

Apart from the solar-heating collectors, their mechanical adjuncts, and the heavier level of insulation, the construction and selection of finishes is typical of the better quality built-for-sale housing in this region. The roof is finished in asphalt shingles, the walls are clad in textured plywood siding except at the foundation, where ribbed concrete blocks were used. The site had no special treatment except the removal of a few close-in trees that otherwise would have filtered the sunlight before it reached the collectors.

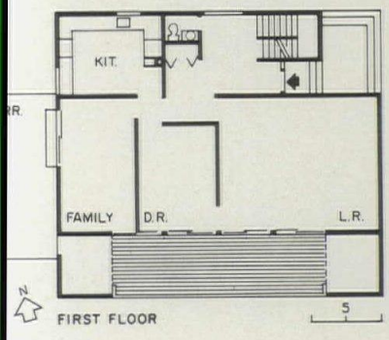
HOUSE in New Castle, New York. Architects: *Raymond, Rado, Caddy & Bonington;* structural engineers: *Weidlinger Associates;* solar energy collection system: *General Energy Devices, Inc.;* Builders: *John Reventas and Carlo Ventimiglia.*

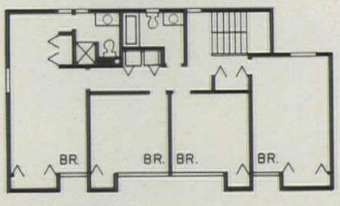


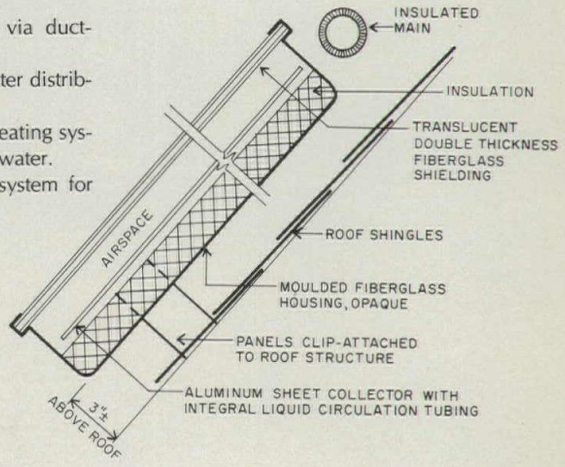




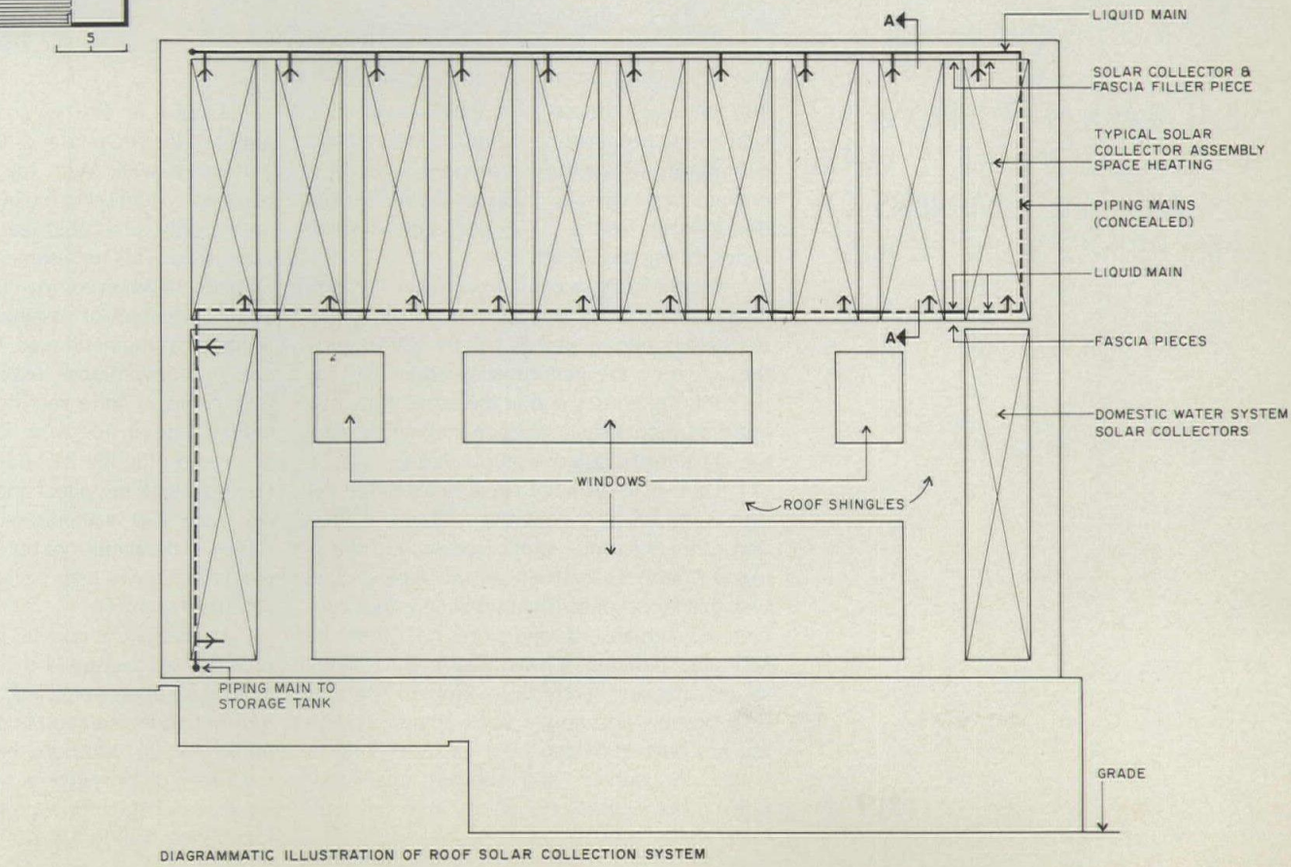
A. Flat-plate solar collectors on roof and heat transfer liquid piping system for space heating.
B. Flat-plate solar collectors on roof and piping system for domestic hot water.
C. Hot water heater—domestic hot water.
D. Heated water storage tank —space heating.
E. Heat transfer piping system.
F. Warm air furnace.
G. Heat distributed via ductwork system.
H. Domestic hot water distributed to fixtures.
I. Standby electric heating system for domestic hot water.
J. Standby oil heat system for space heating.



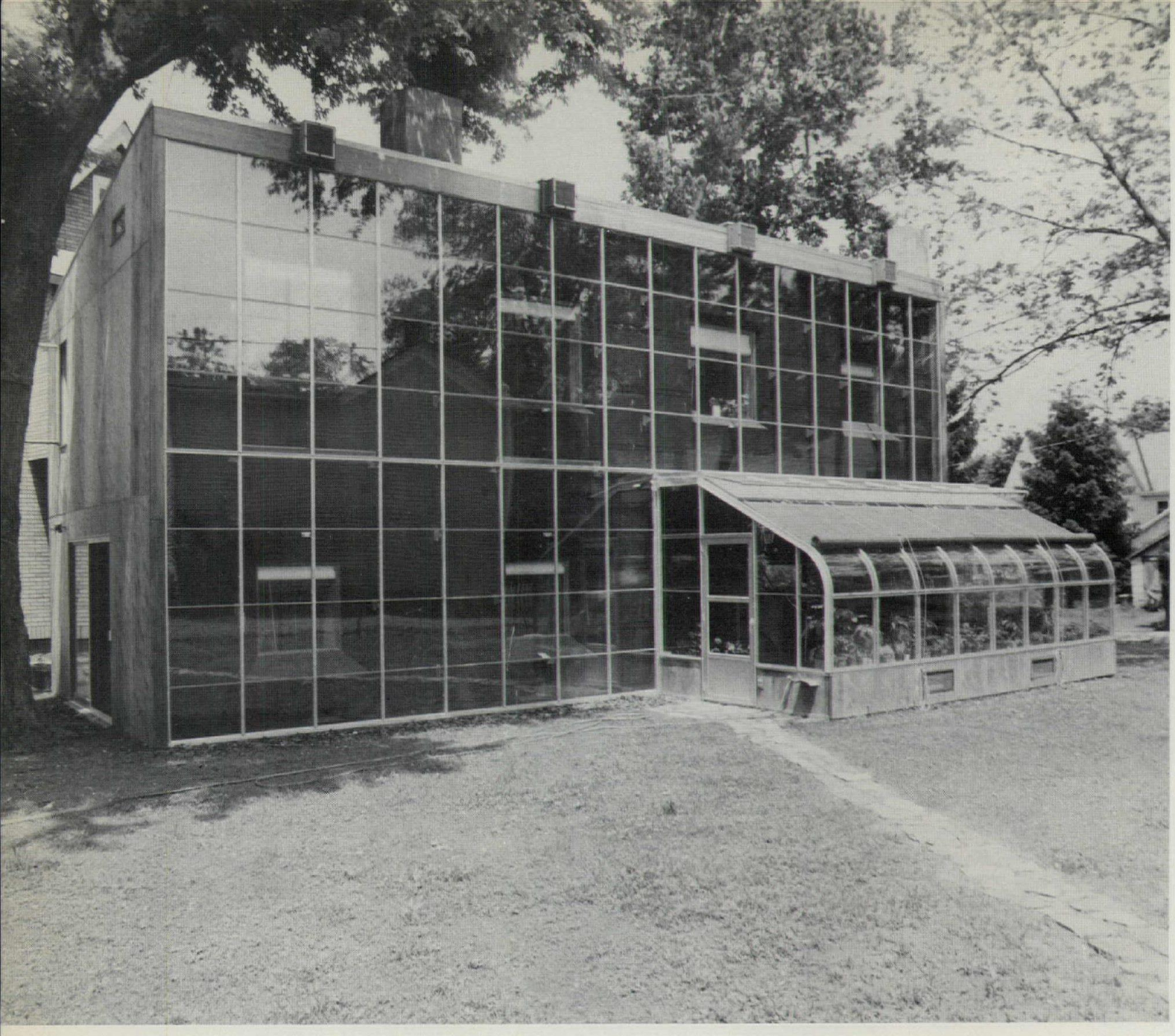




SECTION A-A
THROUGH COLLECTOR



DIAGRAMMATIC ILLUSTRATION OF ROOF SOLAR COLLECTION SYSTEM



HEAT RADIATED FROM A HUGE CONCRETE WALL WARMS THE OWNERS OF THIS PRINCETON HOUSE

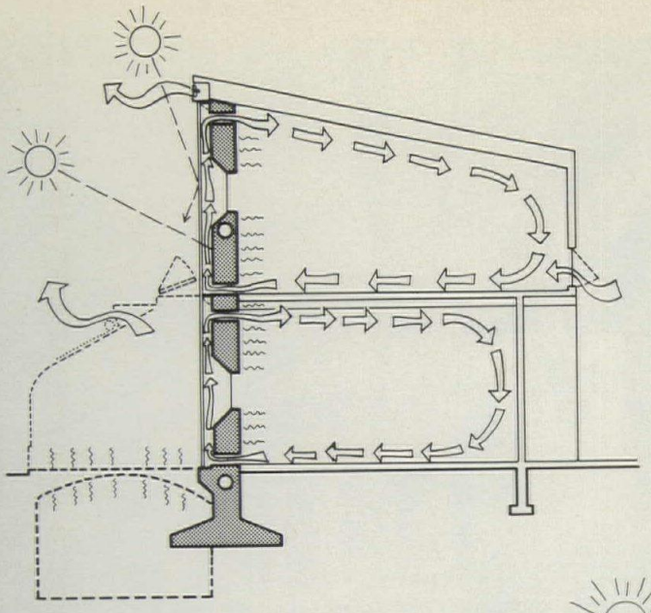
The Kelbaugh house is a 2100-square-foot, year-round residence in suburban Princeton, a community with a 40 degree north latitude, a climate that typically includes 5100 heating degree days, and a 50-55 per cent sunshine factor during the winter.

By obtaining a zoning variance, the Kelbaughs were able to push the house to the northern boundary of their 60- by 100-foot lot, thus clearing the pattern of shadows cast by neighboring houses and at the same time, giving the lot an ample outdoor space instead of the usual mishmash of shallow yards.

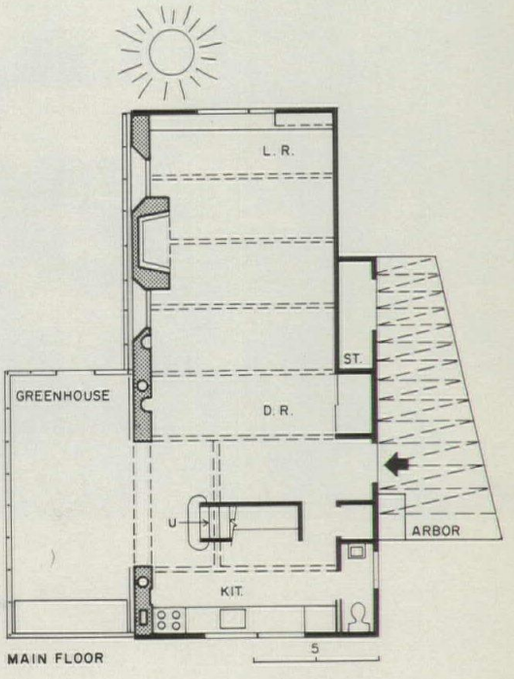
The key to the solar capabilities of the design is the massive concrete wall, an adaptation of the "Trombe wall" (see section drawing) set back six inches from the glass curtain wall that faces south. The 600-square-foot concrete surface absorbs and stores heat from the sun and radiates it continually into living spaces that are nearly uninterrupted spatially both upstairs and down. Back-up space heating has been provided by a gas-fired, hot air system, independent of the house's solar capabilities, but with ductwork cast into the concrete wall.

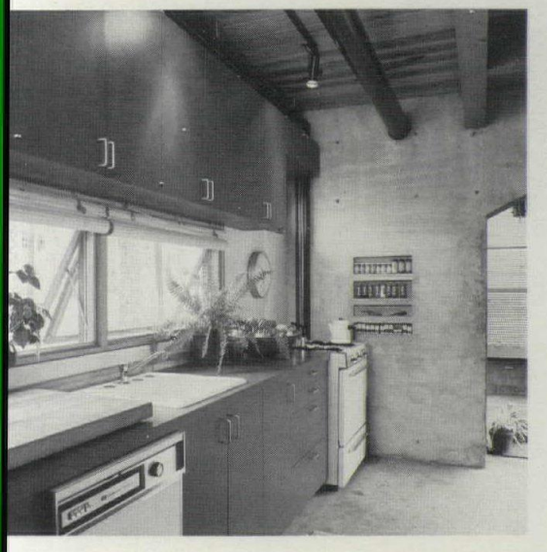
During its first winter (a mild one with about 4500 degree days), the Kelbaugh house performed well. With the thermostat for the back up system set in the 60-64 F range (58 F at night), only 338 cubic feet of natural gas was consumed. This represented a saving of nearly 75 per cent when compared with the estimated 1220 cubic feet of gas that would have been required to maintain a 65 F daytime temperature by conventional heating. And these savings came at little sacrifice to comfort. The temperatures inside were allowed to swing 3-6 degrees during the 24-hour cycle to allow the concrete wall to collect and discharge its heat. Auxiliary 250-watt infrared heaters were installed in the bathroom but seldom needed and the fireplace was used several times a week for localized comfort.

Insulation, of course, is critical. Kelbaugh provided an average 4-inch wall insulation of cellulosic fiber (recycled newspaper) and a 9½-inch roof insulation that achieved an R factor of 40. In addition, he used a one-inch thickness of polystyrene (two inches would have been better, he reports) on the perimeter foundation wall to a depth of two feet. The re-



Cool air passes, near floor level, through a slot in the concrete wall and is heated as it rises through the narrow space between the glazing and the wall. It re-enters the space through slots at ceiling height. Circulation through the room is by gravity convection. In summer, the narrow space is vented at the eave. When gravity convection does not suffice, four small fans are employed.



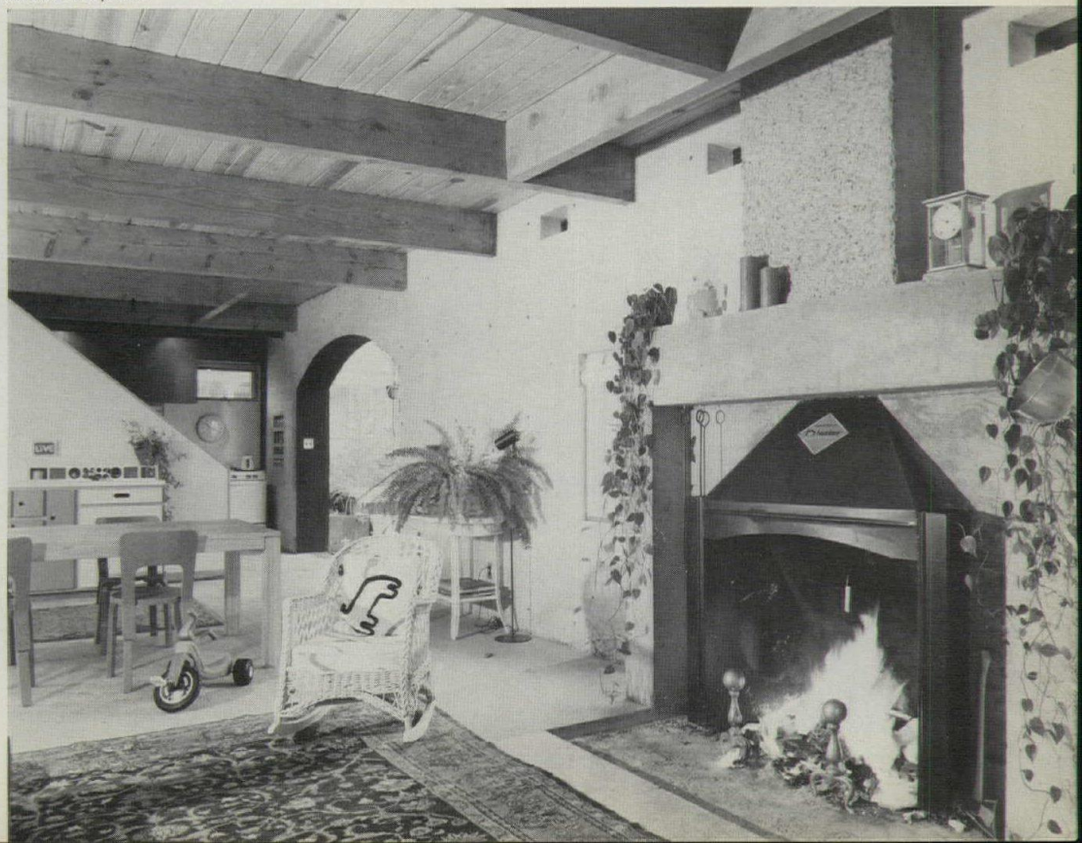


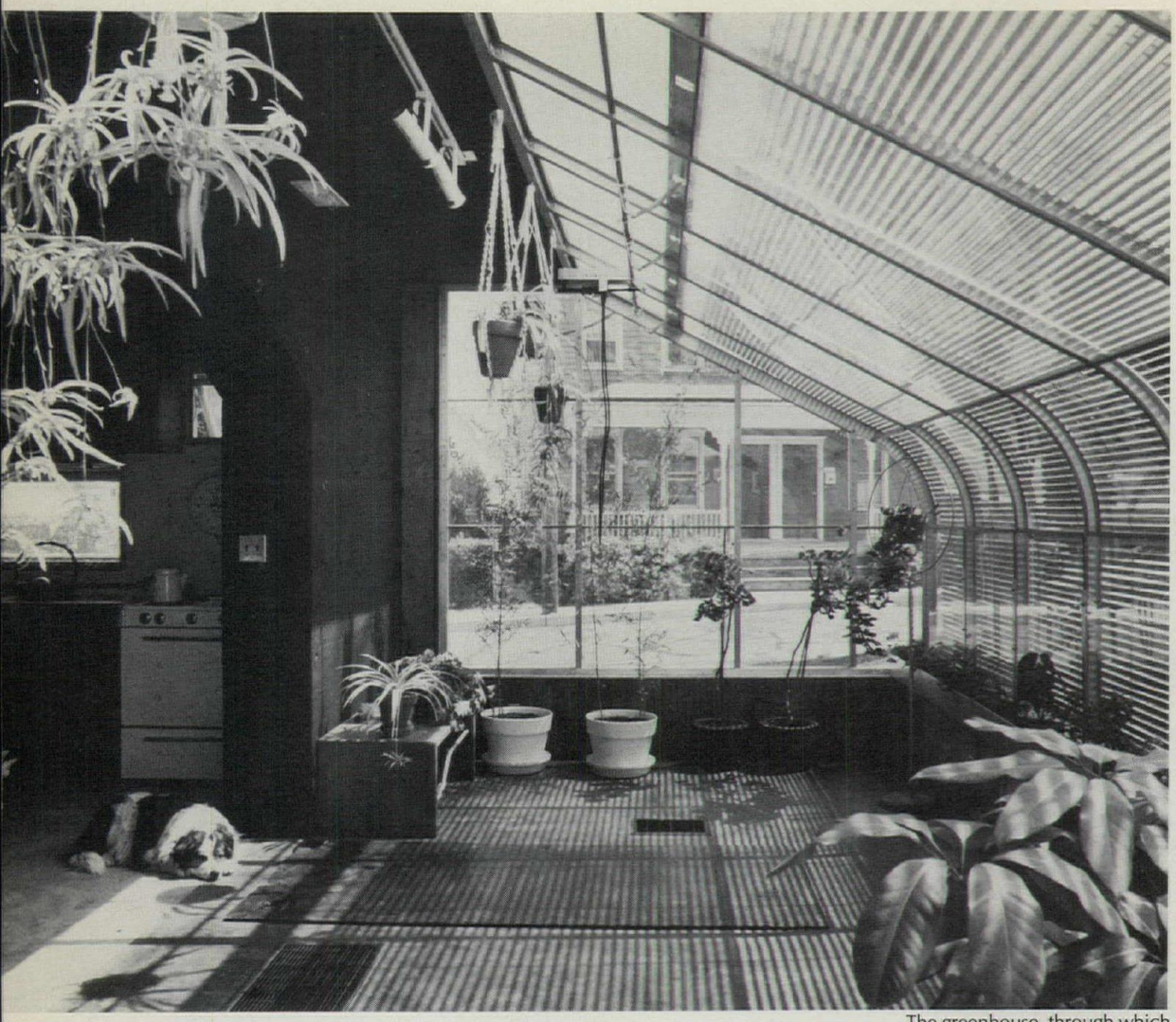
Robert Perron photos

sultant heat loss, by conventional analysis is about 75,000 Btu per hour—32,000 of which is lost to the small greenhouse on the south face of the building. After double glazing this greenhouse, and fitting it with rolling shades, the loss should be considerably less next winter. Other adjustments and fine tuning will follow to balance temperature differentials between upstairs and down. With refreshing candor, Kelbaugh says that if he was beginning again, he would enlarge the eave vents and/or install operable windows in the south wall to increase cross ventilation.

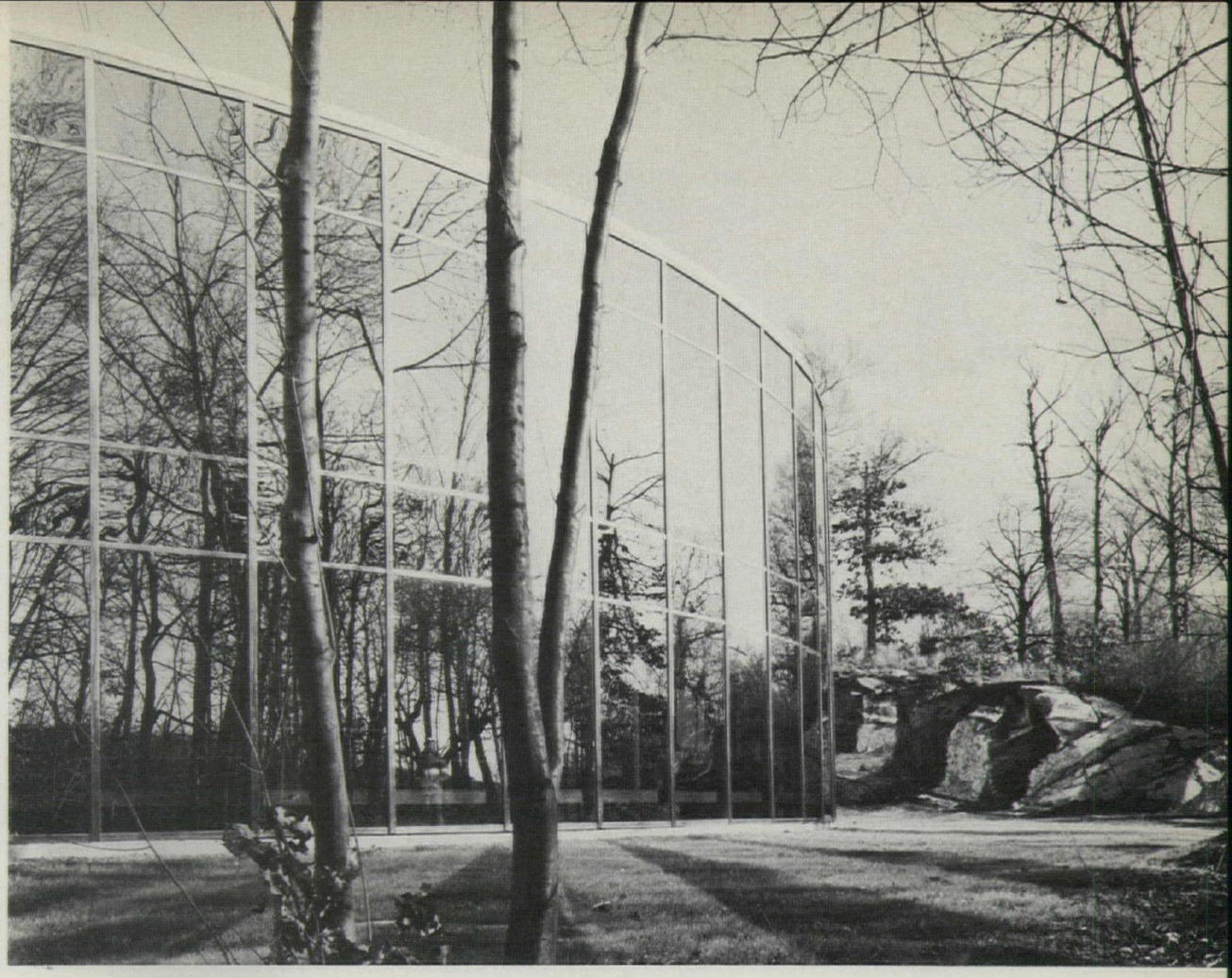
As the photos amply indicate, the Kelbaugh house is much more than just a struggle for energy efficiency. Though it is frankly experimental, it is nonetheless a tightly disciplined piece of design with the kind of apparent simplicity that only comes with close study and careful refinement. Questions raised by its presence among the more indulgent residential forms of the past must be measured against the lessons it can yield to those interested in a less energy-extravagant future.

KELBAUGH HOUSE, Princeton, New Jersey. Architect: *Douglas Kelbaugh*. Contractor: *Nathan Bard*.





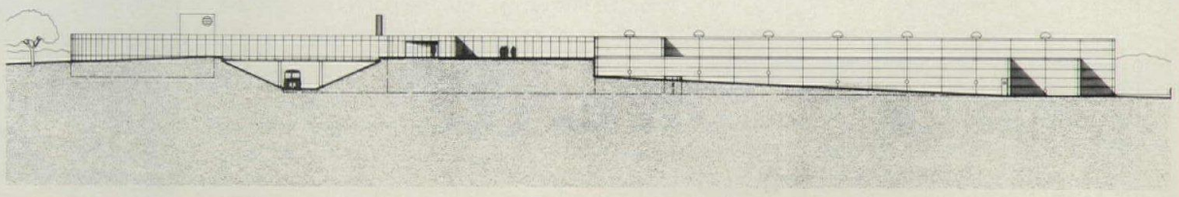
The greenhouse, through which about half the heat loss of the house occurs, experiences a wide fluctuation in diurnal temperatures. Kelbaugh has taken steps to stabilize this condition by double glazing the wall and will add drums filled with water to retain further heat. The drums will double as plant stands.

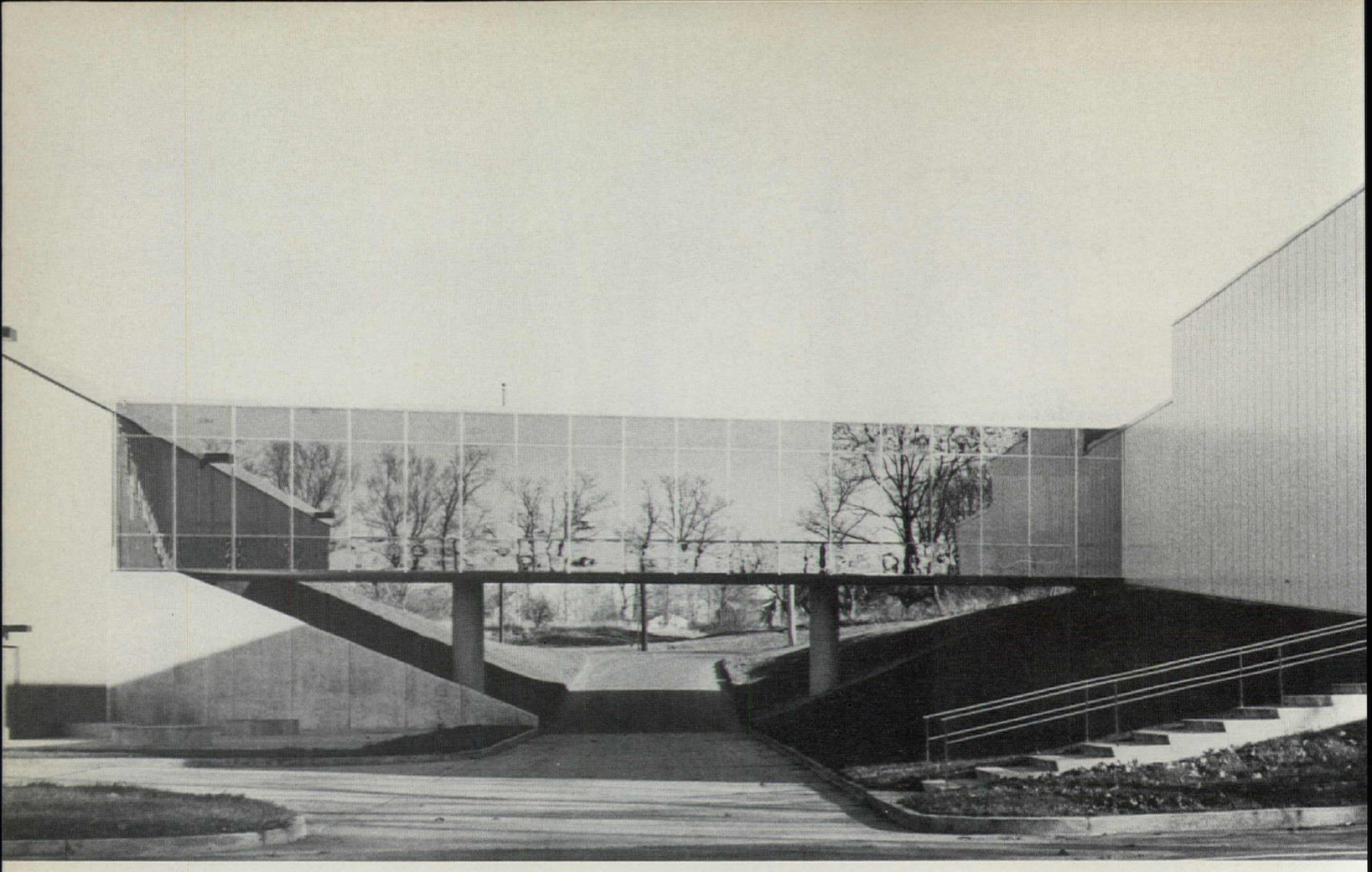


BUILDING TYPES STUDY ® 495

INDUSTRIAL BUILDINGS

While renovation of industrial facilities has been the norm in recent years, there has been renewed interest by owners to construct all-new plants. But the problems the owners must face have expanded, including the factors they must consider when seeking out potential sites. Studying the available energy situation, transportation access, the area's "quality of life," availability of labor, and even if the site is located in a state that encourages industry to settle or expand. Of the myriad kinds of industrial facilities, one kind—the large, manufacturing complex—has had to confront its own special, individualistic problems. The examples in this study represent some imaginative solutions to those problems that plague industrial complexes in the United States and abroad.





TRIO INDUSTRIES
SHELTON, CONNECTICUT

This new industrial facility for Trio Industries, a manufacturer of metal building products, provides a first-hand example of the products the company fabricates. This selection of appropriate materials, combined with thoughtful site planning, has produced an esthetic building that respects the scale of its surroundings.

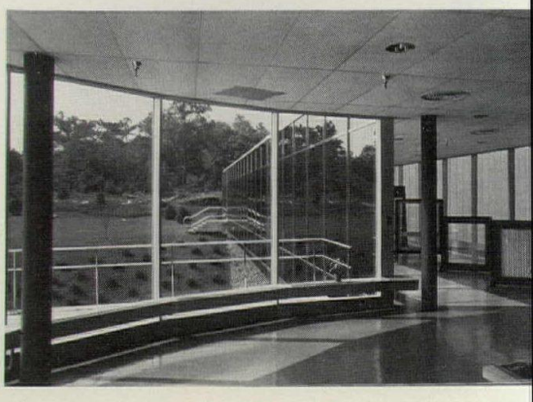
Due to excellent site planning, the building was positioned to take advantage of topographic contours on the 13-acre site. The building is shielded from view from an adjacent highway to the west by natural land variations, and from a residential area to the north by trees. It is only highly visible from one direction (a residential area to the east) so it was imperative to visually reduce its bulk from that angle. This was achieved by sinking the major portion of the eastern wall below grade so only the upper portion could be seen on the crest of a knoll.

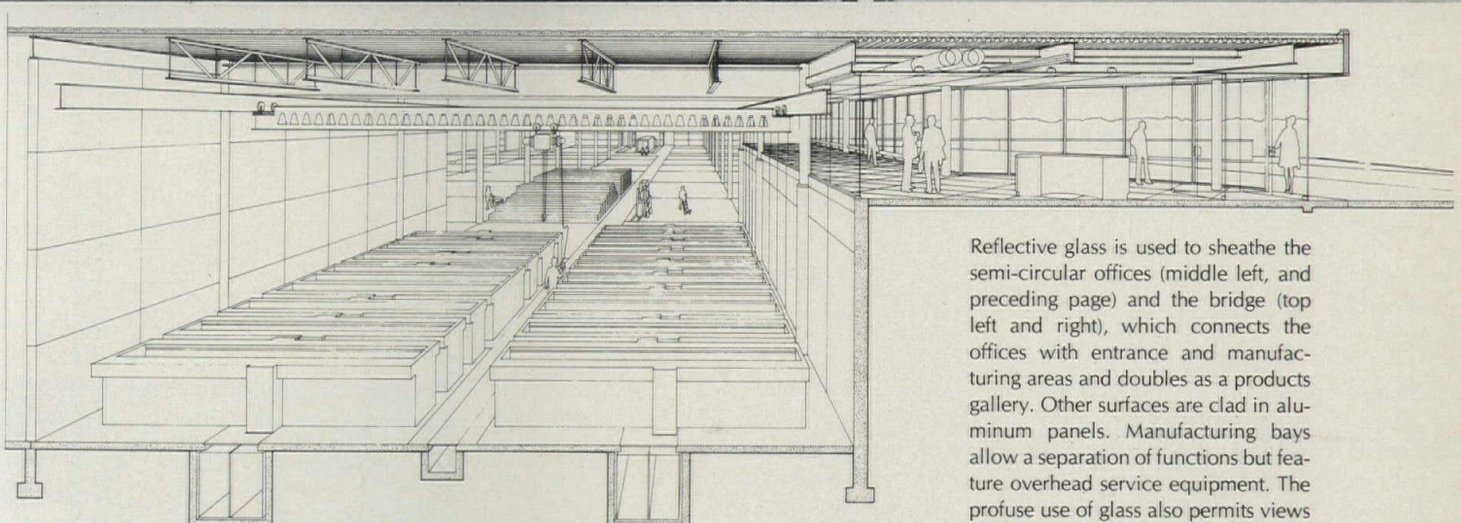
The interior function is based on a circulation system with two linear assembly bays, separated by a service spine with twin overhead traveling crane bays. A 5-foot-square modular grid is the base on which the layout is programmed, with all facets of the plant a multiple of it. In addition to the open assembly bays, operational flexibility is facilitated by two shipping and receiving stations (one is located so it can be solely used by outside firms on a contract basis when using the electrochemical facilities). Mechanical, electrical and process services are distributed through an open-web truss purlin roof system.

Chrome reflective glass—in this instance, an appropriate use of reflective glass—reflects wooded surroundings and helps to minimize the visually prominent portions of the building.

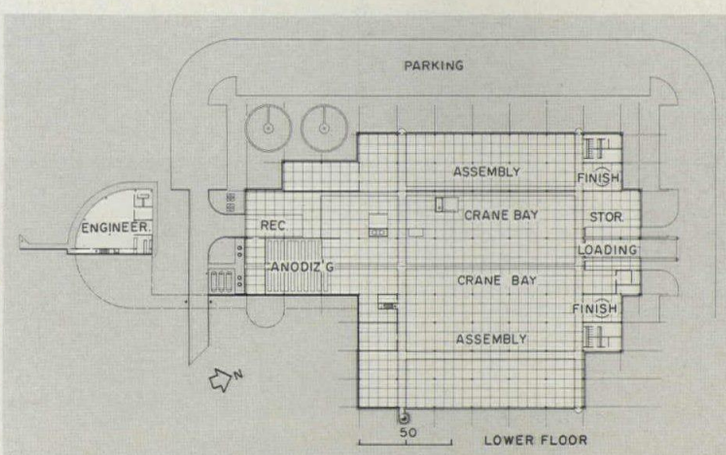
Construction of the plant was one of the first industrial expansions funded under Connecticut's new "self-sustaining" program of the Connecticut Development Commission. The program allows an industry to float a bond that is guaranteed by the state and has a tax-exempt status. In effect, the state is in partnership with the industries until the bonds are paid off, thus promoting business and industry.

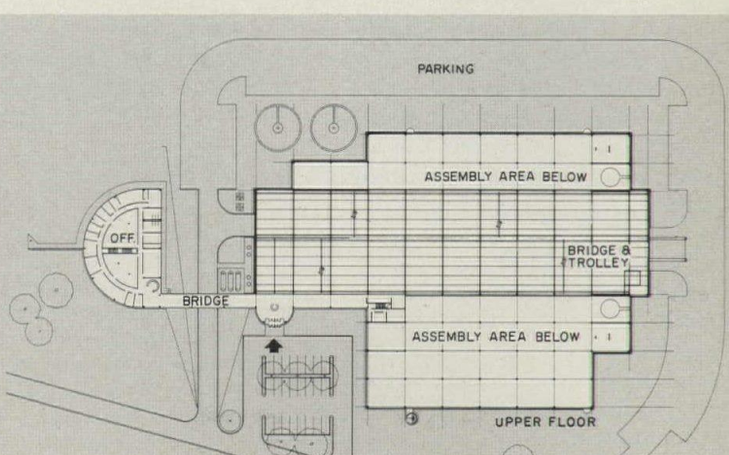
OFFICES AND MANUFACTURING FACILITY FOR TRIO INDUSTRIES, INC. Architects: *Shreve Lamb & Harmon Associates.* Engineers: *Ames and Selnick* (structural), *Sigmund-Kaplan Associates* (mechanical/electrical).

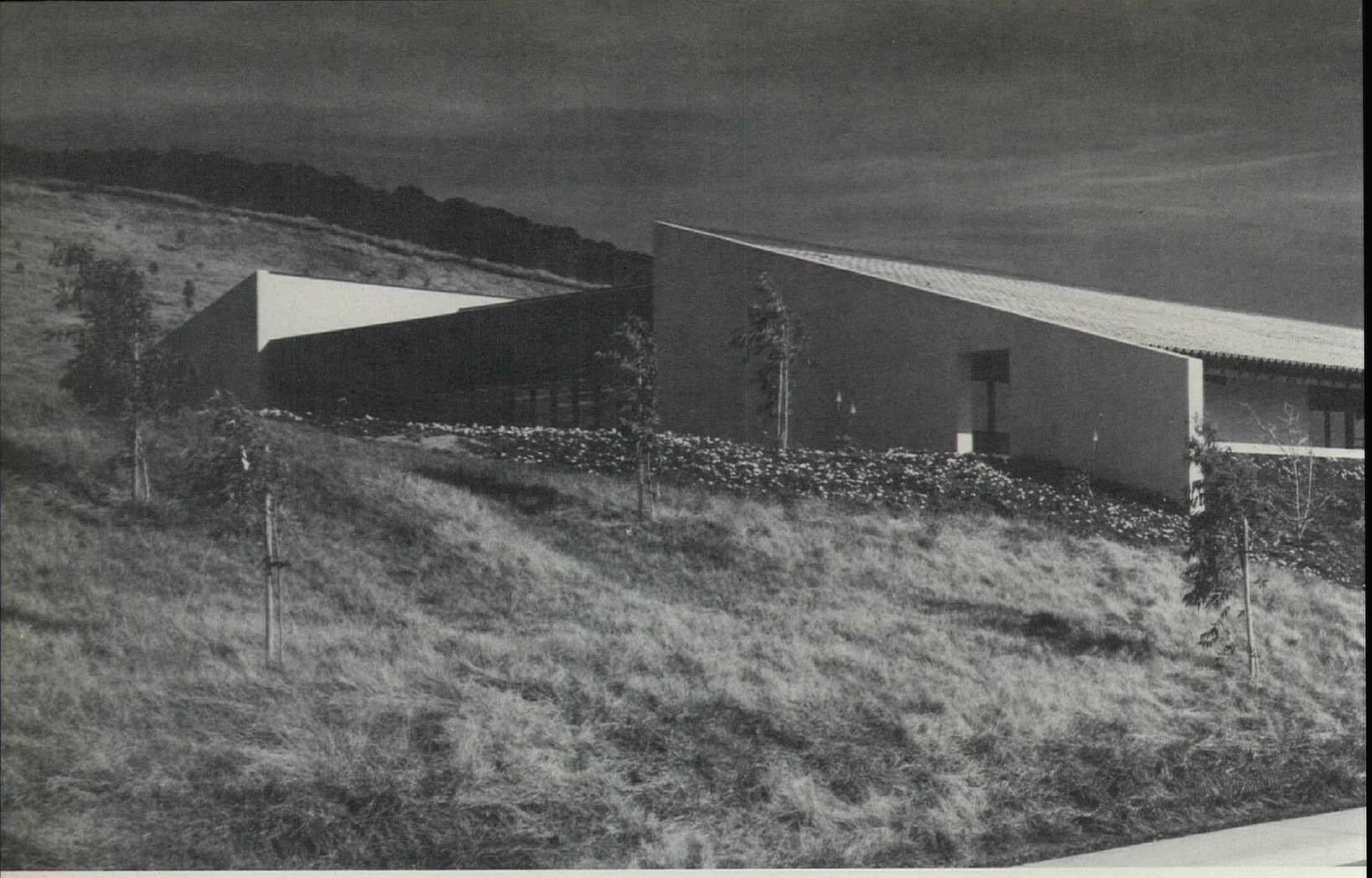




Reflective glass is used to sheathe the semi-circular offices (middle left, and preceding page) and the bridge (top left and right), which connects the offices with entrance and manufacturing areas and doubles as a products gallery. Other surfaces are clad in aluminum panels. Manufacturing bays allow a separation of functions but feature overhead service equipment. The profuse use of glass also permits views from the interiors, as exemplified by the entrance lobby (bottom left).







ENDEVCO ELECTRONICS
SAN JUAN CAPISTRANO, CALIFORNIA

The total visual effect of this industrial building in southern California was dependent on the architects' solution to minimize the building's impact on the surrounding, rolling hills filled with groves of orange trees. The design solution to visually reduce the building's bulk was simple, in that the building was set into a hilltop and surrounded by earth berms, to an elevation of two feet above the main floor level. From the roadway below, only five feet of the vertical wall can be seen above the berms because long, low overhangs extend from the building, shading perimeter walkways. Parking areas are also hidden behind berms and landscaping.

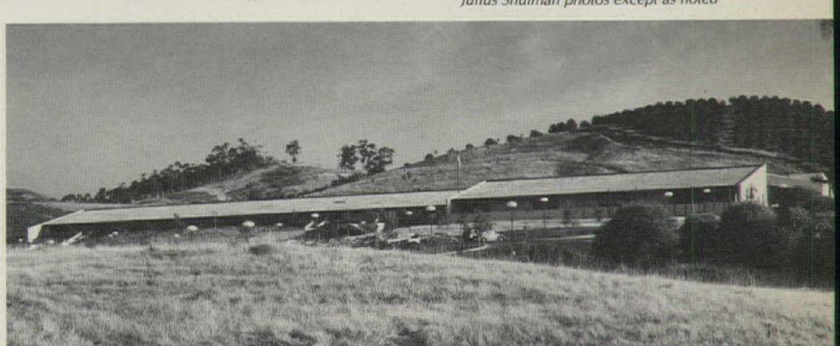
A five-point criteria for selecting a site, established by the client, was totally satisfied by this 29-acre site, south of Los Angeles, formerly part of the Rancho Los Cerritos. Endevco stipulated that the site must be in a semi-rural, suburban area; but near a large metropolitan center; be non-typical; comparatively smog-free and allow space for expansion of facilities. The location brought, however, additional city-imposed design regulations, which mainly required a tile roof on the structure. While many of the city's buildings were designed in an early California Spanish style, this building is only reminiscent of that style, for it is contemporary in spatial concepts, use of materials, and detailing.

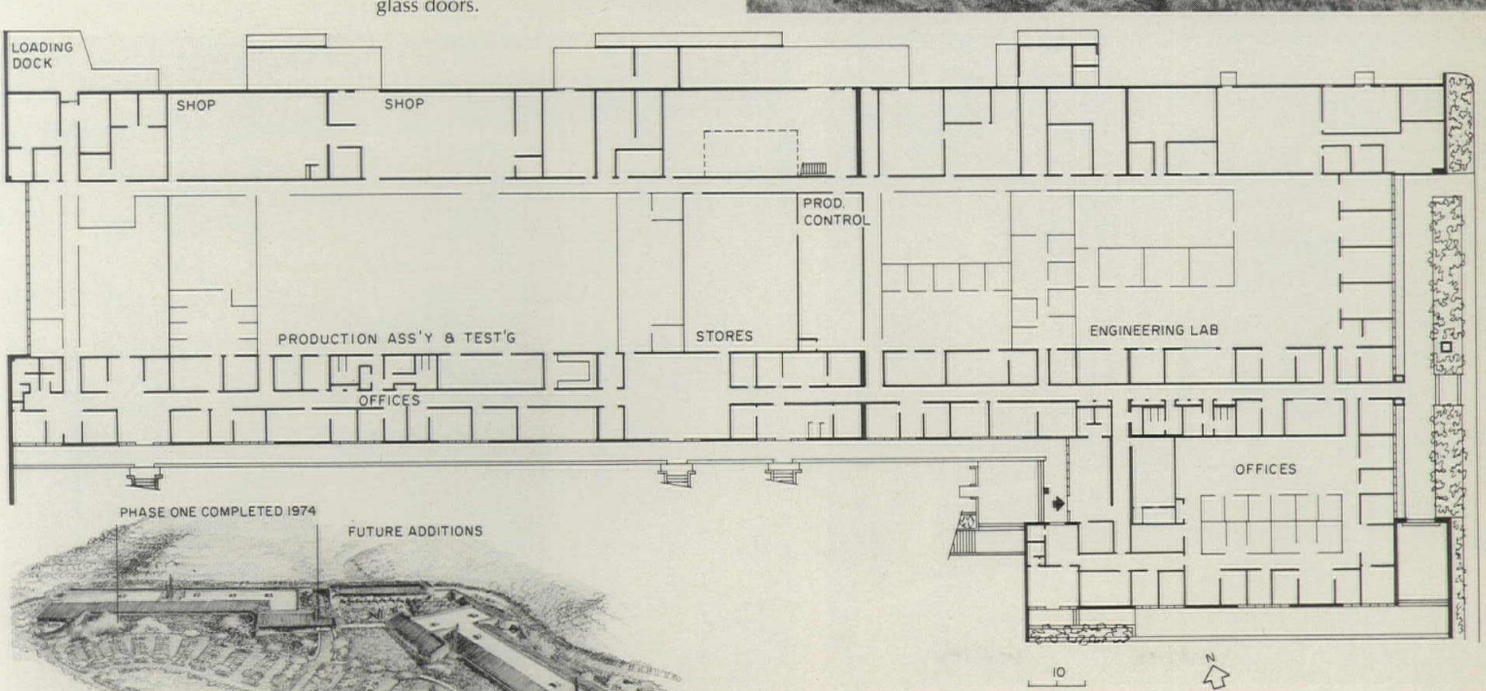
The initial phase of 75,000 square feet, housing 400 employees, will be followed by additional research and engineering space and expanded employee facilities, including dining areas and a glass-enclosed plaza between the buildings. The second phase will add approximately 175,000 square feet.

ENDEVCO ELECTRONICS DIVISION OF BECTON-DICKINSON & COMPANY, San Juan Capistrano, California. Architects: *O.K. Earl Corporation.* Consulting architect: *William Kenneth Frizzell* of *Ahrens Di Grazia Frizzell* (design). Engineers: *O.K. Earl Corporation.* Consulting engineers: *Converse, Davis & Associates* (soils), *Milea, Inc.* (mechanical), *Electric Service and Supply Company* (electrical), *Barnett, Salit & Salit, Inc.* (civil). Landscape architects: *Hahn-Hoffman-Schmidt.* Interior design and graphics: *Design West.* General contractor: *O.K. Earl Corporation.*

Julius Shulman photos except as noted

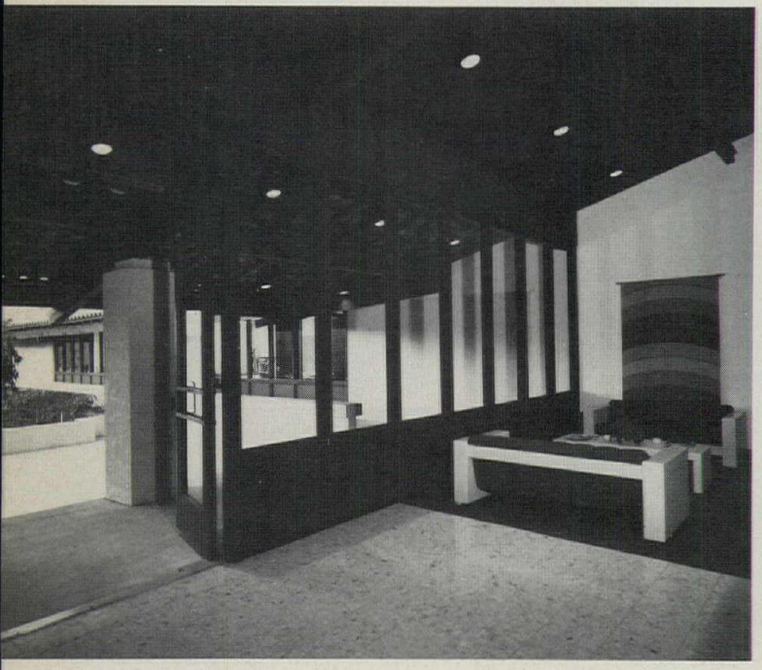
A low silhouette on the hillside from all directions (top and right) was mandatory to minimize the visual impact of the building on neighboring agricultural lands. Forceful structural wood beams and overhangs (top and middle left) reinforce the horizontal line set by the red tile roofs. Exterior walls of white stuccoed concrete block, offset with colorful roof and end sections (middle and bottom left), are glass enclosed, with a splash of color in red glass doors.





Bert Kaltman

A variety of spaces are required because of business functions—research, engineering and assembly sections are needed to produce medical, research, industrial and aerospace instruments. The main production assembly room (below right) features a large 68- by 500-foot free-span space. The work areas are separated from the open corridors by partial dividers. One of the main corridors (right) demonstrates a color and graphic approach to enliven long corridors (this one with a red carpet and ceiling; the ceiling is of reflective material). The employee cafeteria and lounge (top) has a view to the Pacific Ocean. Future plans for phase two include expanding the employee facilities, and specify a glass-enclosed plaza, to be located behind the entrance lobby (below left). Ninety percent of the interiors are carpeted for acoustical reasons. Quality control stations are located throughout the plant to check every stage of production and assembly.



Daniel Bartush photos

JOHN DEERE & COMPANY BASIC ENGINE PLANT
WATERLOO, IOWA

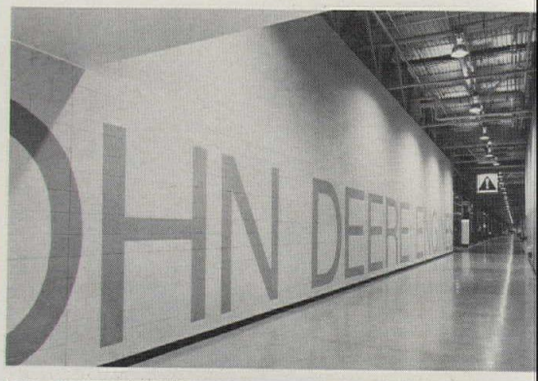
A carefully conceived total design package has simplified and organized an immense manufacturing plant for diesel engines (that have a full range of applications, including farm tractors, harvesting machines, construction and irrigation equipment). For a 140-acre site on the outskirts of Waterloo, Iowa, Smith, Hinchman and Grylls has designed a plant that encompasses 930,000 square feet (23 acres under one roof) and is more than one-third mile long (1800 feet). A 24-hour operation, the building is all-electric, and the company is so energy conscious that there is a re-use of heat generated by the test cells (areas where equipment is quality-control tested); there are also other extensive conservation measures.

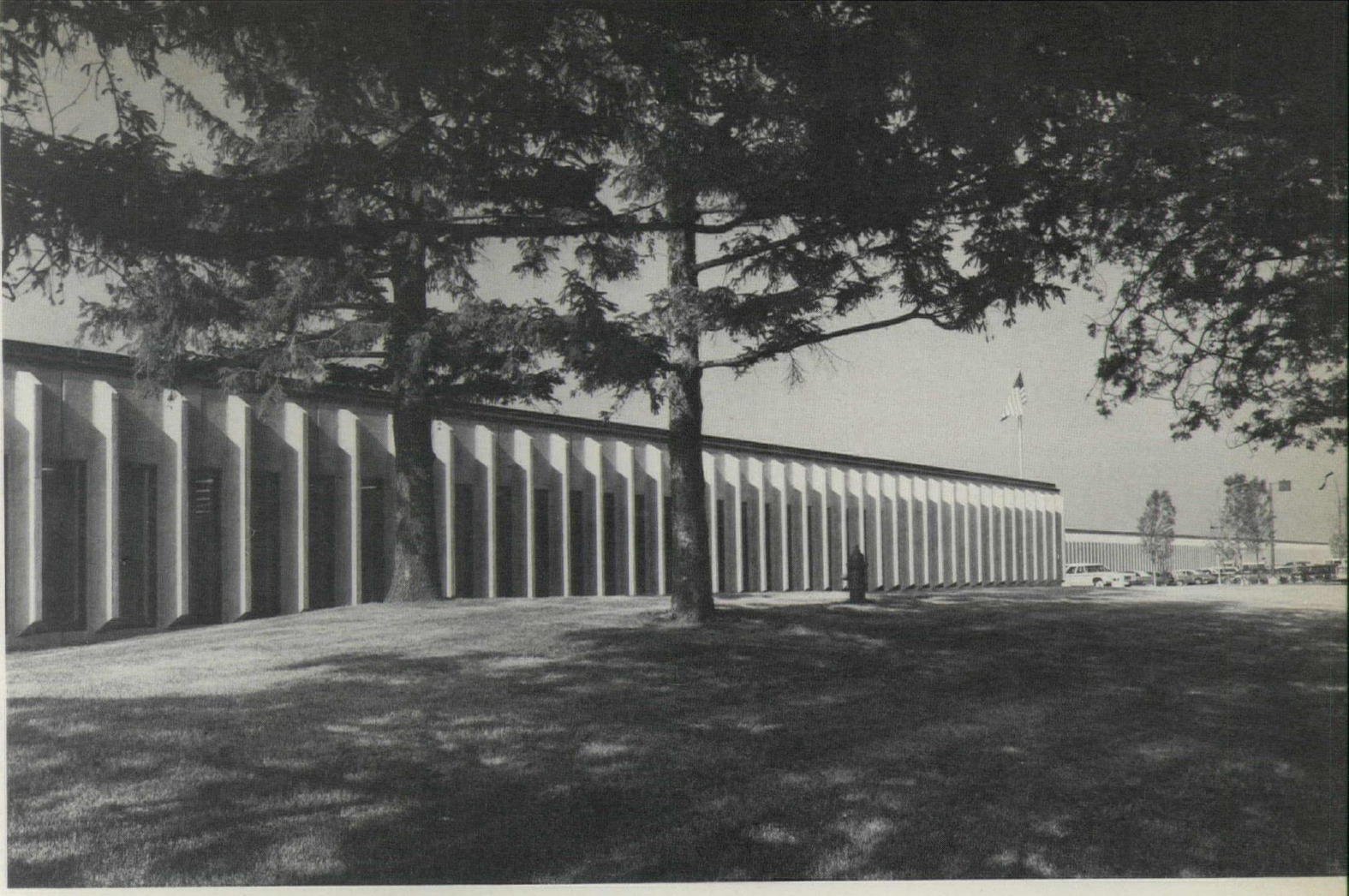
With these dimensions the question of the proper approach to the exterior becomes very important. Exterior walls are precast, steel reinforced, concrete double-T panels that have been sandblasted. The vertical fin panels reduce the visual impact of the building but also lend a lively texture and pattern (with changing light conditions) to the horizontal line. A setback enclosure on the roof, running the length of the building, eliminates unsightly roof clutter and presents a simple roof line.

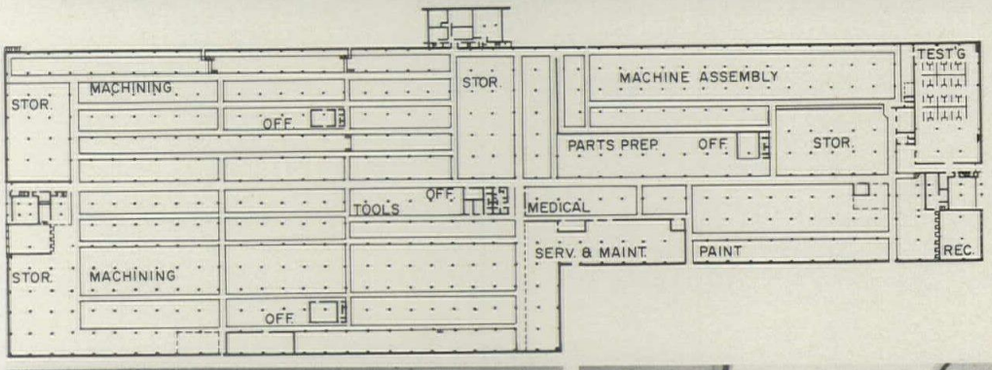
A coordinated interior design program produced bright and colorful (yellow, orange, blue and green) spaces and a varied graphics presentation. Work areas are color coded as well, as are certain kinds of machinery. Symbols are used on most signs—all designed to be clear and simple, promoting safety, efficiency and clarity.

The work flow moves from the west (machinery operations) to the east (shipping). For certain operations special flooring and mechanical systems carry away coolants, chips and shavings automatically by means of a slightly sloped floor leading to a sunken trough. Machines and men are placed on a special level platform above the sloping floor.

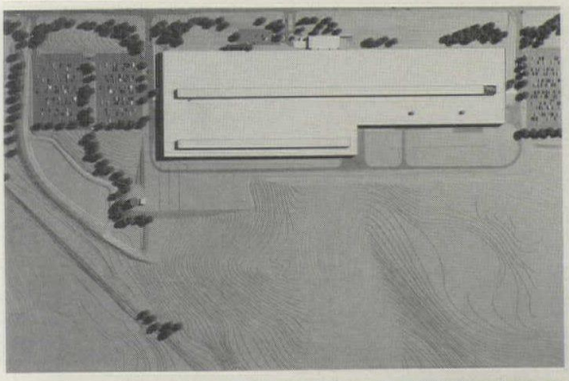
JOHN DEERE & COMPANY BASIC ENGINE PLANT, Waterloo, Iowa. Architects and engineers: *Smith, Hinchman & Grylls Associates, Inc.* Landscape architects: *Johnson, Johnson & Roy, Inc.* Interior design and graphics: *Smith, Hinchman & Grylls Associates.* Construction management: *Ragnar-Benson.*

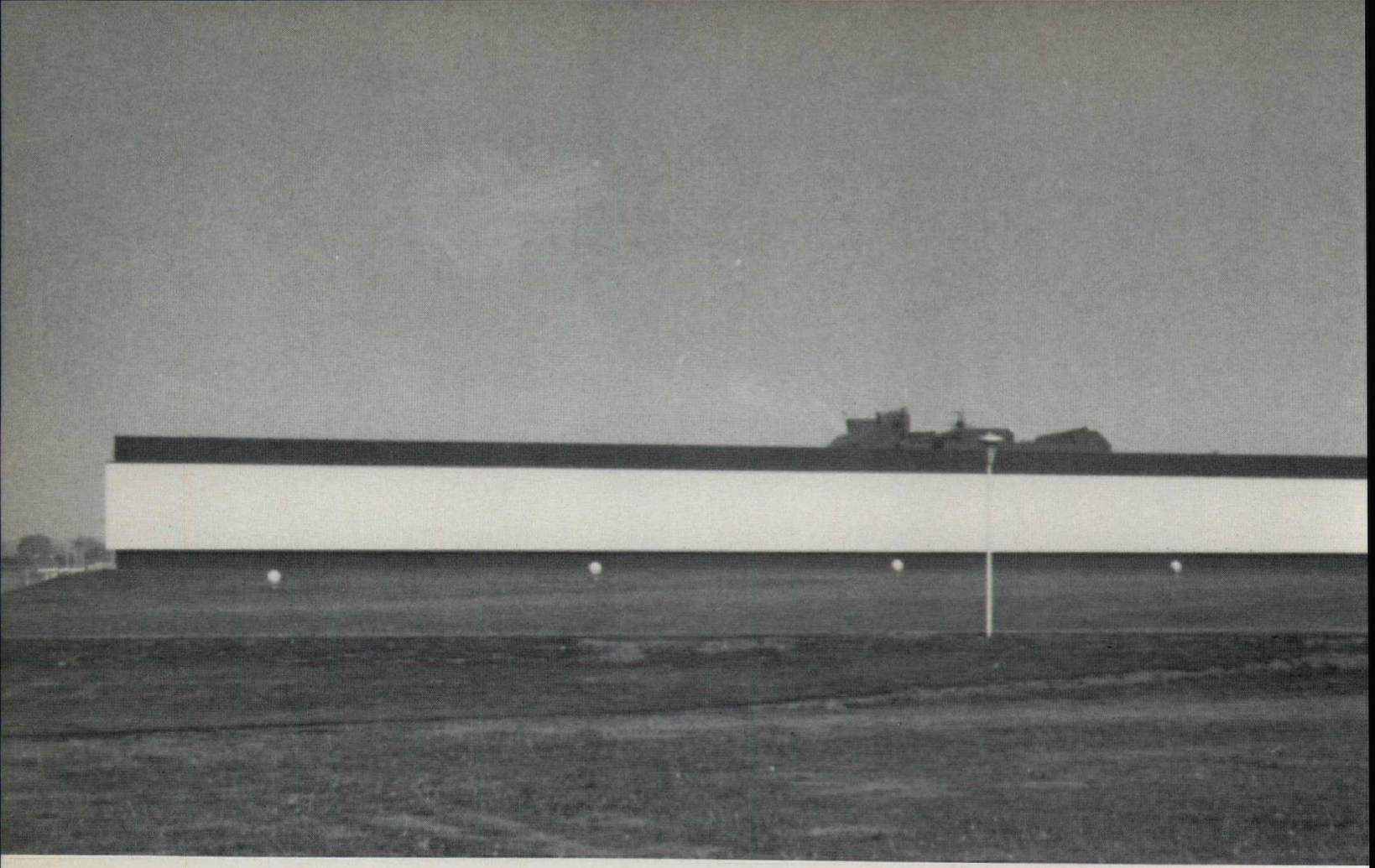






A close look at the concrete double-T exterior panels demonstrates the pattern of light and shadow on such a huge building. Graphics are varied, seen from supergraphics in the entrance corridor (middle left) to the banners on the assembly floor (bottom center). A computerized communications office is centrally located on the work floor (bottom left). Two cafeterias (one shown below) are located at the ends of the building for the convenience of the employees.





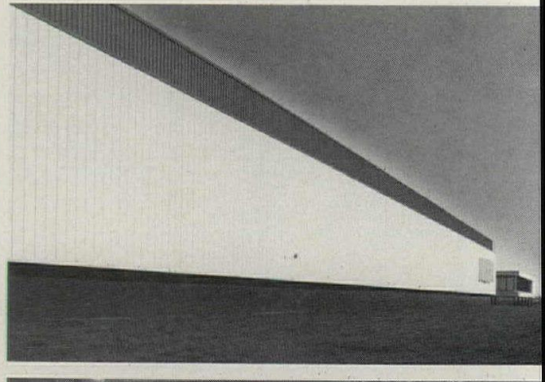
RCA GLASS PLANT
CIRCLEVILLE, OHIO

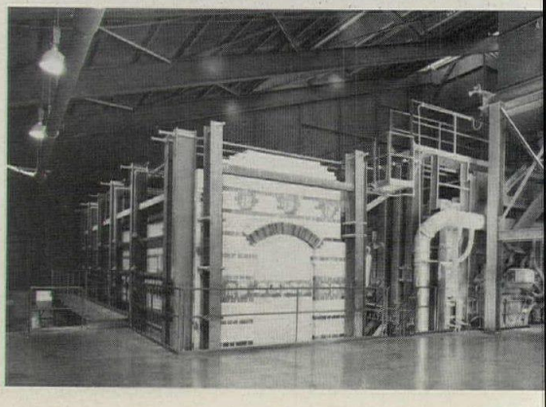
Designed to simply wrap around the industrial process of a glass manufacturing plant for RCA, this building unpretentiously reflects that process and visually strengthens its horizontal nature on an open, expansive (formerly a pig farm) site. As it is impossible to camouflage a manufacturing, warehouse, office and laboratory complex of this size (approximately 300,000 square feet), the architects emphasized its horizontality by sheathing the exterior of the plant with two-colored metal siding. A broad, dark band at the roof line, contrasting with white panels, sharpens the edge of the building while also hiding necessary, but unsightly, roof-top mechanical equipment.

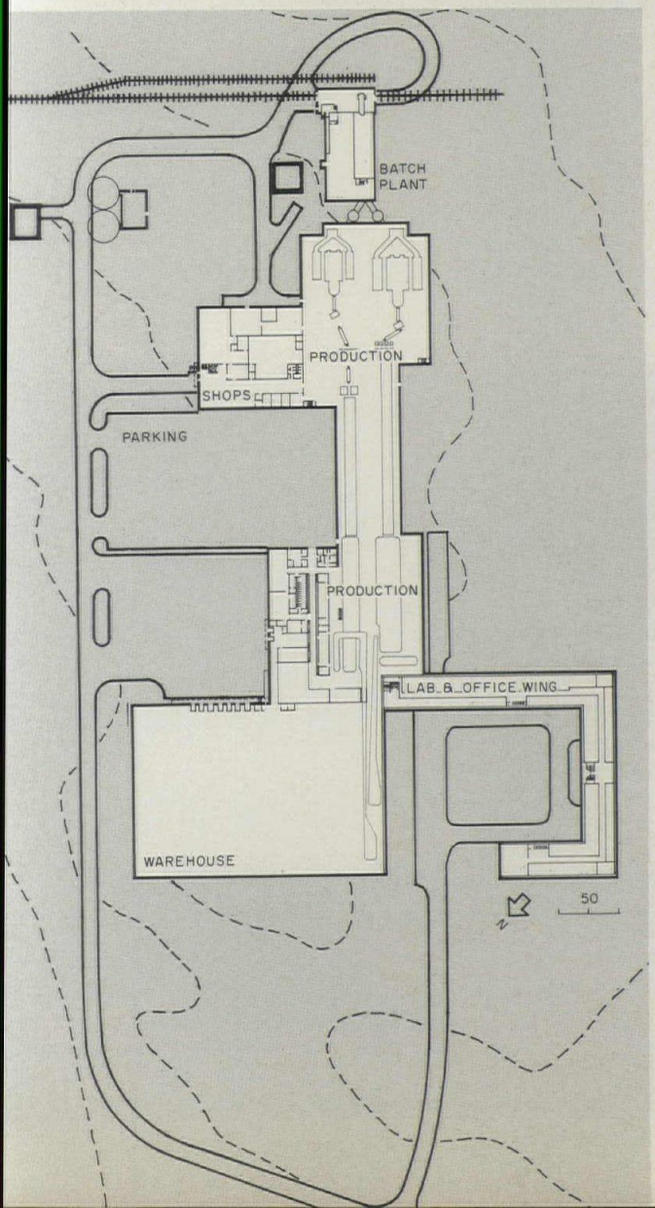
Two distinct internal manufacturing areas—for hot and cold processes—required different spatial and mechanical design considerations. The hot process (where material is mixed, heated in a furnace and positioned in a cooling area) is fully automated, while the cold process area (handling and distribution of the product) requires employee attention. Varying air quantities for dust-free and climate-controlled areas needed fresh air and air-conditioning systems. Organized for maximum flexibility and expansion, ceiling heights vary from 18 to 40 feet and bay sizes accommodate the separate function and linear flow established by RCA's engineers and a consulting process engineering firm. Special emphasis was placed on designing the cold process areas, for this is where most of the employees work. Color-coding of equipment and areas brighten the windowless plant and simplify circulation throughout the building.

Connected to the manufacturing plant is an office and laboratory wing—a glass curtain-wall building, elevated one story to align with the roof of the plant and to obtain better views of the countryside. It nearly encircles a landscaped parking area, courtyard and main entrance, and lends diversity to that corner.

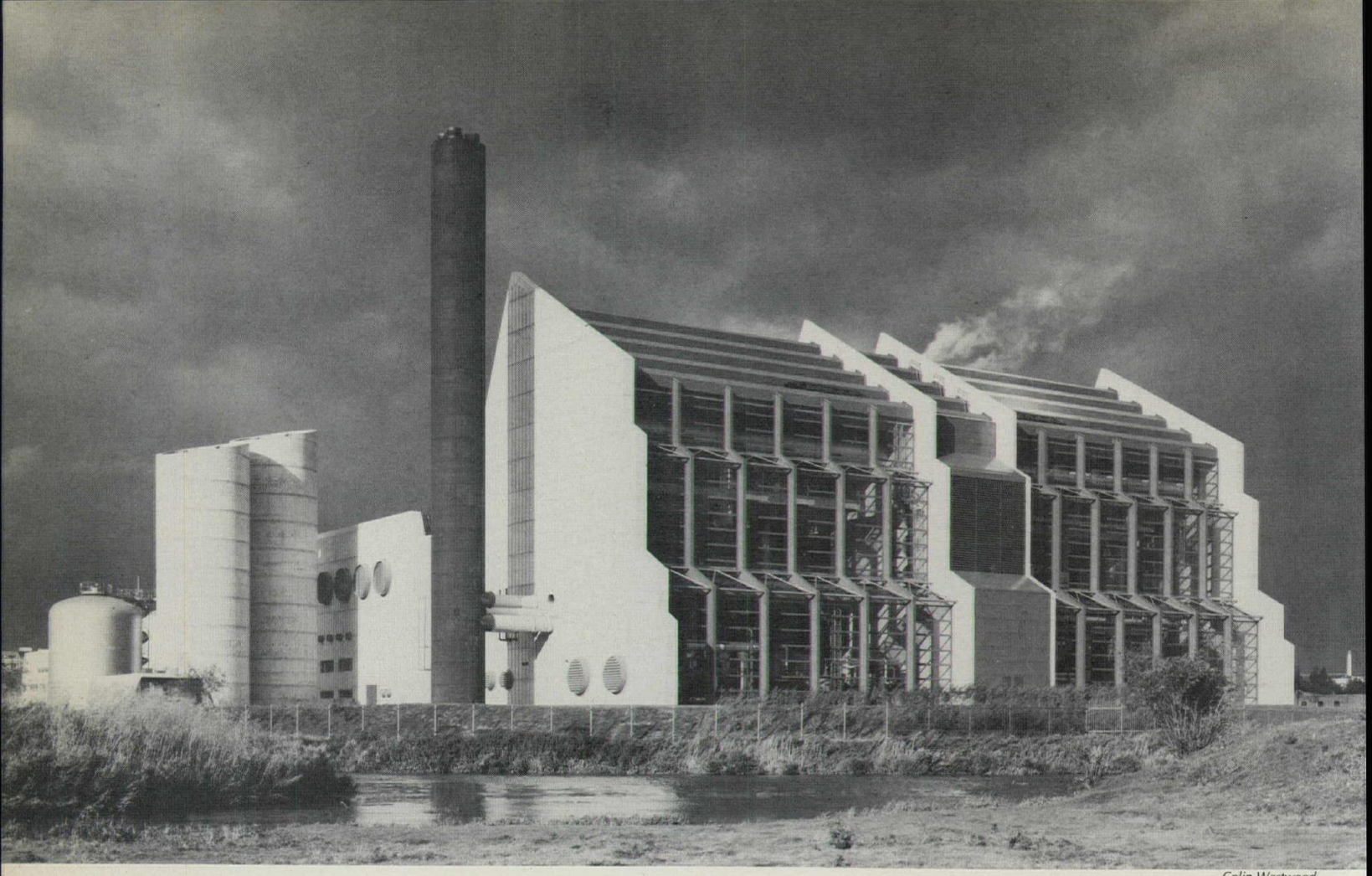
RADIO CORPORATION OF AMERICA GLASS PLANT, Circleville, Ohio. Architects: *Haines Lundberg Waehler.* Engineers: *Haines Lundberg Waehler (structural/mechanical/electrical/site), Henry F. Teichmann, Inc. (process engineering).* General contractor: *Ragnar-Benson.*







The strong horizontal nature of the building is strengthened by use of contrasting gray and white bands of colored metal siding (top and middle left). A curtain-wall office and laboratory wing (below) is elevated one-story to express the horizontal nature of the engineering process and provide broader views. The manufacturing process includes the use of steel-framed furnaces (bottom left), in continuous use for years. Elevated access ladders permit repair of equipment.



Colin Westwood

CARLSBERG BREWERY
NORTHAMPTON, ENGLAND

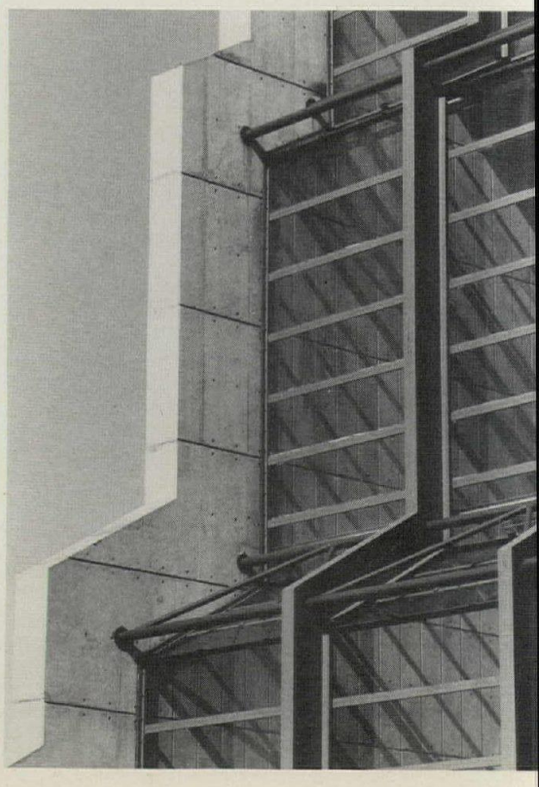
In an area to be redeveloped near the center of Northampton, England (a town north of London), a unique brewery design for Carlsberg Brewery Ltd., is one of the first new structures in the area, and will, no doubt, be an impetus for more development. The riverside site is also used for recreational purposes and has a foot path that follows the river. At the completion of stage 1, facilities included a long, low portion encompassing fermenting cellar, workshops, bottling hall and storage areas; a higher portion housing fermentation tanks; and the tallest section of the building housing an "energy center" (mechanical room) and brewhouse. The focal point of the complex is an 85- by 231-foot glass facade split into two sections by ventilation equipment, designed in ziggurat fashion, which faces south towards the river.

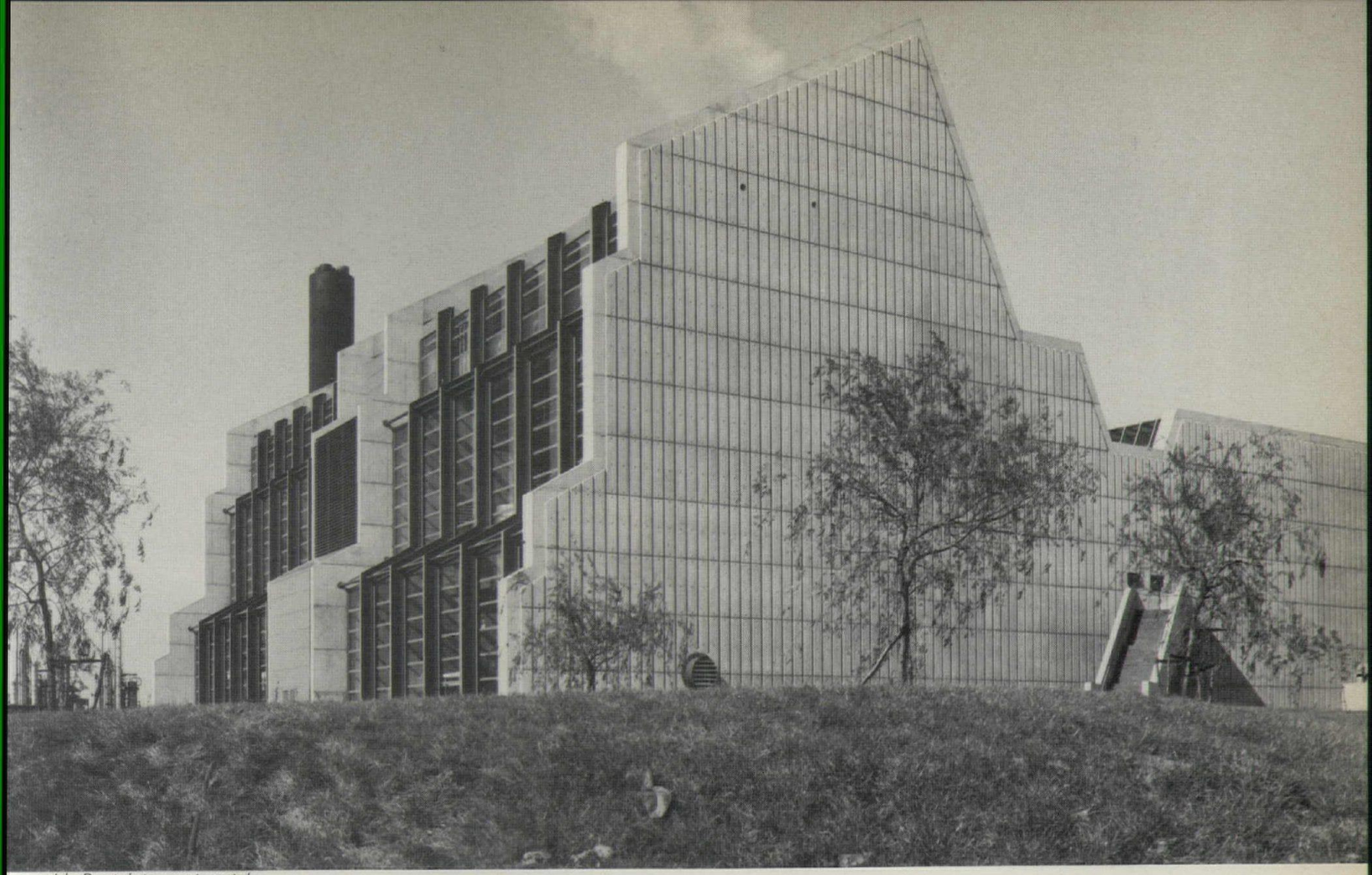
The architect's primary objectives were to express the function of the brewing process and to allow for future expansion and layout changes. Special functions—the malt silos, chimney, water tanks and storage tanks—have been separated from the main structure, permitting independent expansion if necessary. Running along the west wall is a corridor that connects all the production areas. Service platforms are located on the top floor, and offices, cafeteria and other employee facilities are on the ground floor levels, facing towards the river as it curves to the west.

Future expansion includes building an administration building to the east and expanding as needed more brewery, fermenting and employee areas northward towards the main axis road by demolishing an old brewing facility that is no longer in use. Some landscaping is planned.

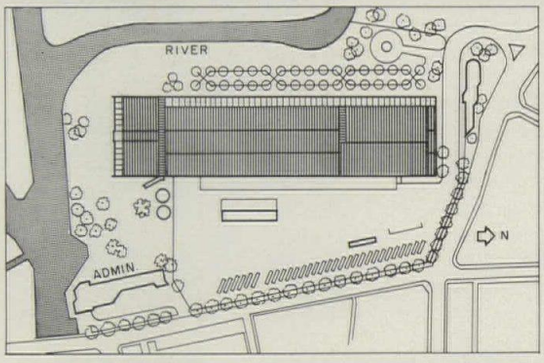
The three chief materials—concrete, steel and glass—unite to form what the architect calls a "calm and neutral frame around the machinery."

CARLSBERG BREWERY, Northampton, England. Architects: *Knud Munk—Egil Ladsten, Borge Nissen, project architects.* Engineers: *Ove Arup & Partners* (structural/foundation/mechanical/electrical). Interior design, landscaping, graphics: *Knud Munk.* Consultants: *Ove Arup & Partners (lighting/cost).* Management contractor: *George Wimpey.*

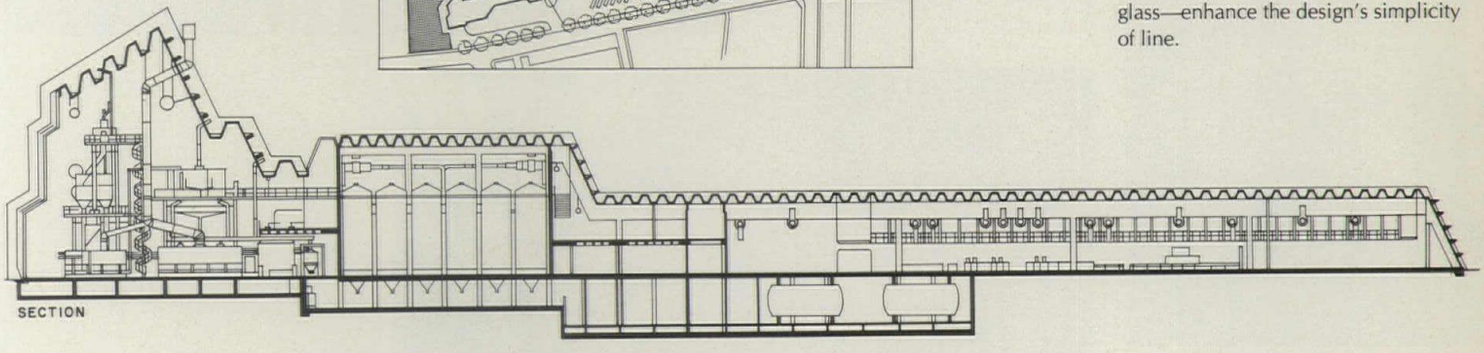




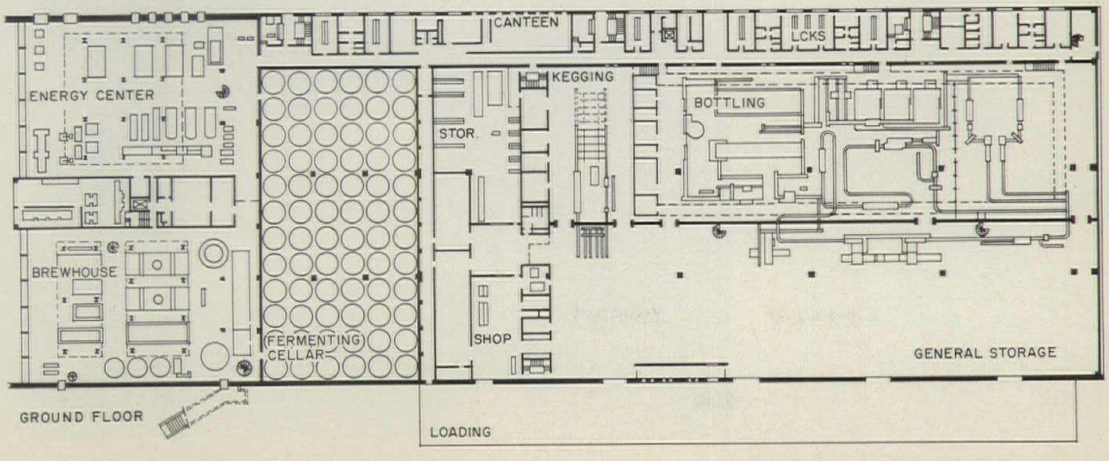
John Donat photos except as noted



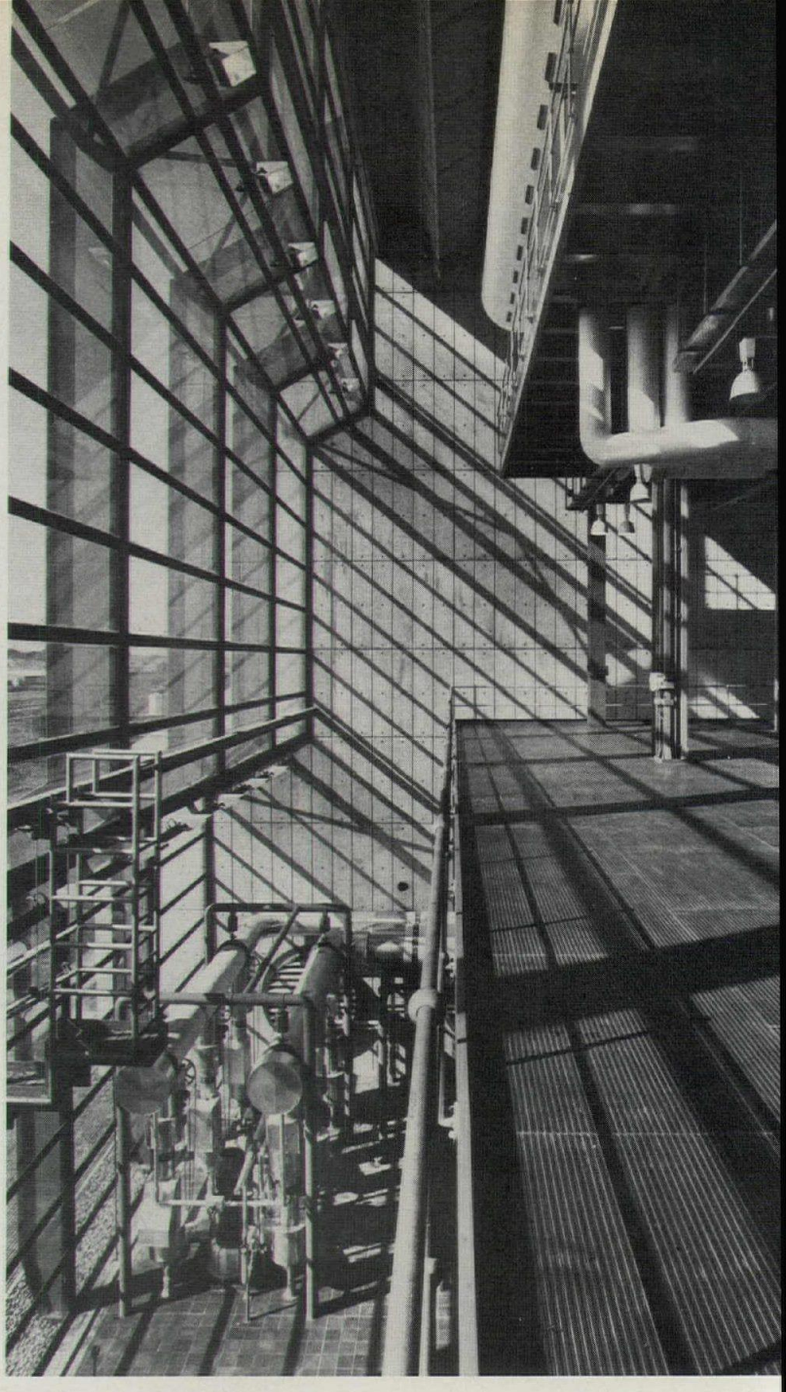
The powerful form of this new brewery in England is enhanced by its highest wall of glass (separated into two sections by ventilation equipment). The decreasing height of building sections from this wall is a result of the process functions—with the "energy center" and brewhouse in the highest section. The rusticated pattern of the concrete (top right) and combination of materials (bottom left)—concrete, steel and glass—enhance the design's simplicity of line.

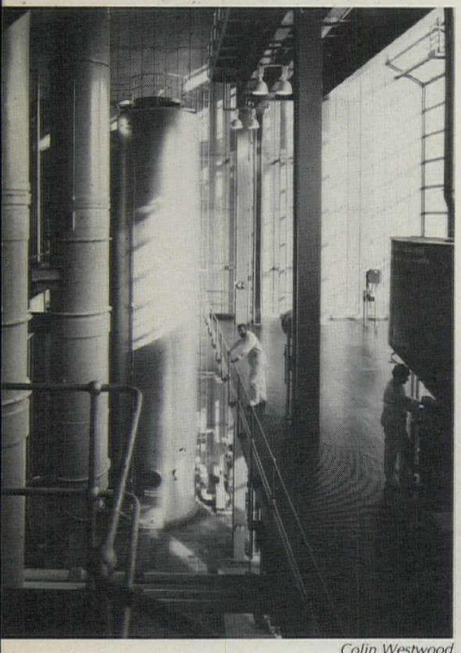


SECTION



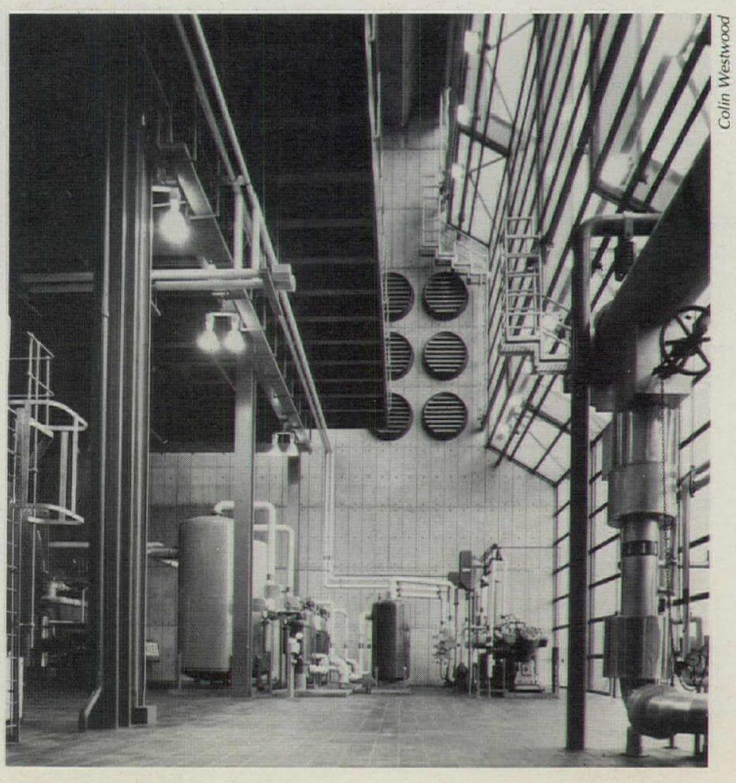
GROUND FLOOR





Colin Westwood

A dramatic skylit corridor (top left) runs parallel to the brewhouse and "energy center," a stop on the visitor's tour. The brewhouse (left) contains freestanding stainless steel tanks, with columns and pipes painted red which can be seen at night through the glass wall that also encloses the mechanical spaces (top right). Significant detailing throughout is exemplified by wall service ladders (following the facade as it steps back) and circular ventilation outlets.



Colin Westwood

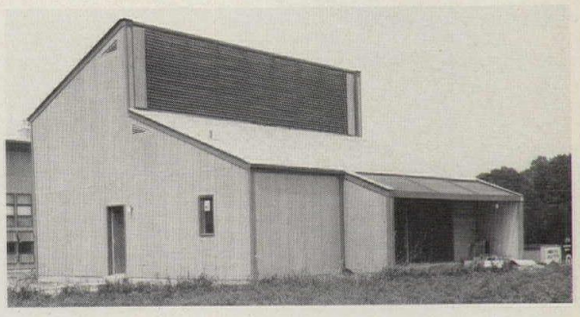
Heat pump's ice storage cuts heating/cooling costs

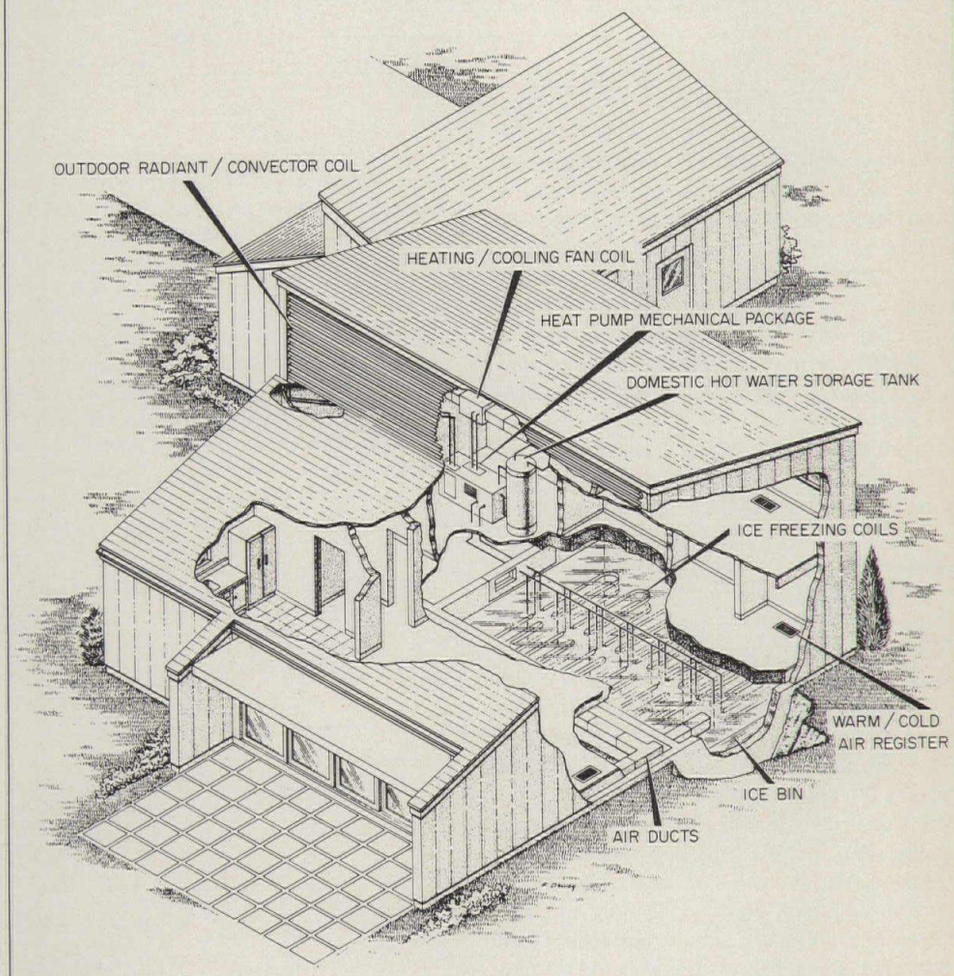
A new strategy for reducing energy costs in the heating and cooling of residential, institutional and commercial buildings that has recently emerged from ERDA's Oak Ridge National Laboratory utilizes ice-making to get Btu's for heating in the winter and "free" cooling in the summer. The approach, called Annual Cycle Energy System (ACES), takes advantage of the physical fact that 144 Btu's of heat must be extracted from a pound of 32 F water to convert it to ice, and the same amount of heat must be applied to melt the ice. A crude parallel is old-timers' use of winter-frozen ice to preserve fresh foods in the summer.

At the heart of the system is a heat pump that extracts heat from the outdoor air during the heating season until the air's temperature drops to around 40 F. When the outdoor air is colder than this it "frosts up" the outdoor coils of the heat pump with a resulting drop in the efficiency. But what if the heat pump were to make ice in a large tank when outdoor air temperatures are at freezing or below? Not only would the efficiency of the heating cycle be improved, but the ice could be built up in the tank to be melted in warm weather.

This basic idea of making ice to heat a house was suggested by engineers over 40 years ago. Credit for reviving it belongs to engineer Harry C. Fischer who, as a heat-pump engineer in the '50s, tried to interest the industry in a heat pump that made ice for heating and kept the ice accumulated for space cooling. As Fischer notes, the idea didn't "fly" because of the cost of storage for the ice and the low cost of energy. But eight months after the Arab oil embargo, Harry Fischer, then in retirement, presented his ice-storage idea to the Energy Division at Oak Ridge National Laboratory (ORNL), which had been looking for conservation approaches for building thermal envelopes, water heaters and heat pumps. ORNL, operated by Union Carbide Corporation, liked the idea and hired him as a staff consultant to pursue development. In December 1974 HUD awarded Fischer's group a $100,000 grant for the ACES project, and by February, the first test ACES system was built and operating. A month later Westinghouse Electric Corporation, which had been urged by Fischer to build an ACES system, had one installed in their domestic engineering center near Pittsburgh. Now an ACES demonstration residence (shown right) has been built in Knoxville, Tennessee as one of several houses in the Tennessee Energy Conservation in Housing program sponsored by

This ACES (Annual Cycle Energy System) house at the University of Tennessee will have its operation compared with a solar house and a conventional house. The system comprises a heat pump on the second level behind the outdoor radiant/convector coil and a 16- by 21- by 8-ft ice bin. System makes ice in winter to get heat and melts it in the summer to get cooling. To make more ice in summer, refrigerant is rejected to the outdoor coil.

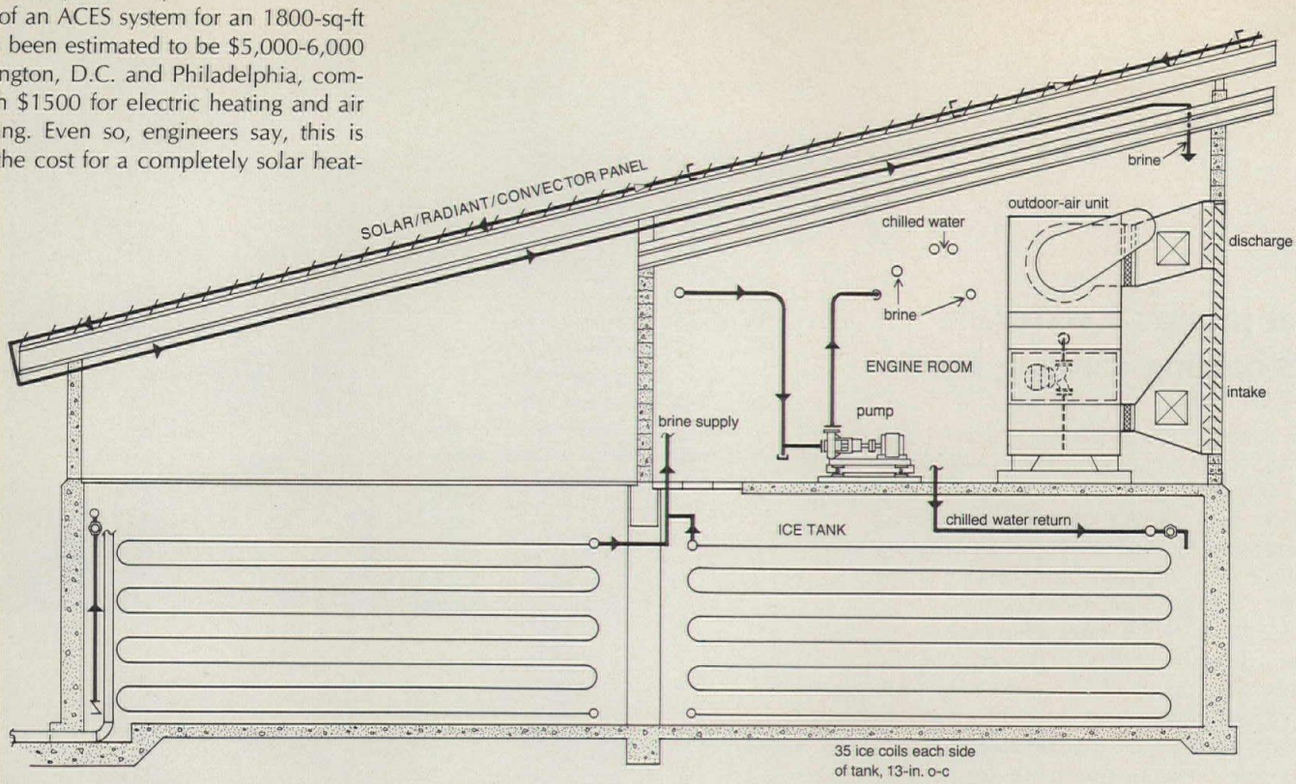




The ice bin has 1300 ft of aluminum finned tubing for its cooling coils. The ½-in. tubing and 3-in. fins are extruded as one section. Same material is used for the outdoor coil. In Knoxville, the ice bin has enough capacity to keep adding ice for the entire heating season, so there is no need for heat input from the outdoor coil. Ice made in winter will last most of the summer for cooling. When the ice has melted, the compressor will run at night to chill the tank's water.

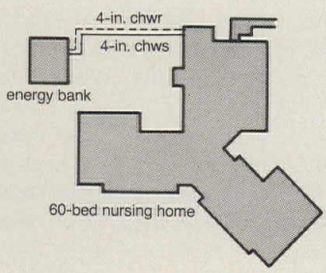
ORNL, the University of Tennessee, and the Tennessee Valley Authority.

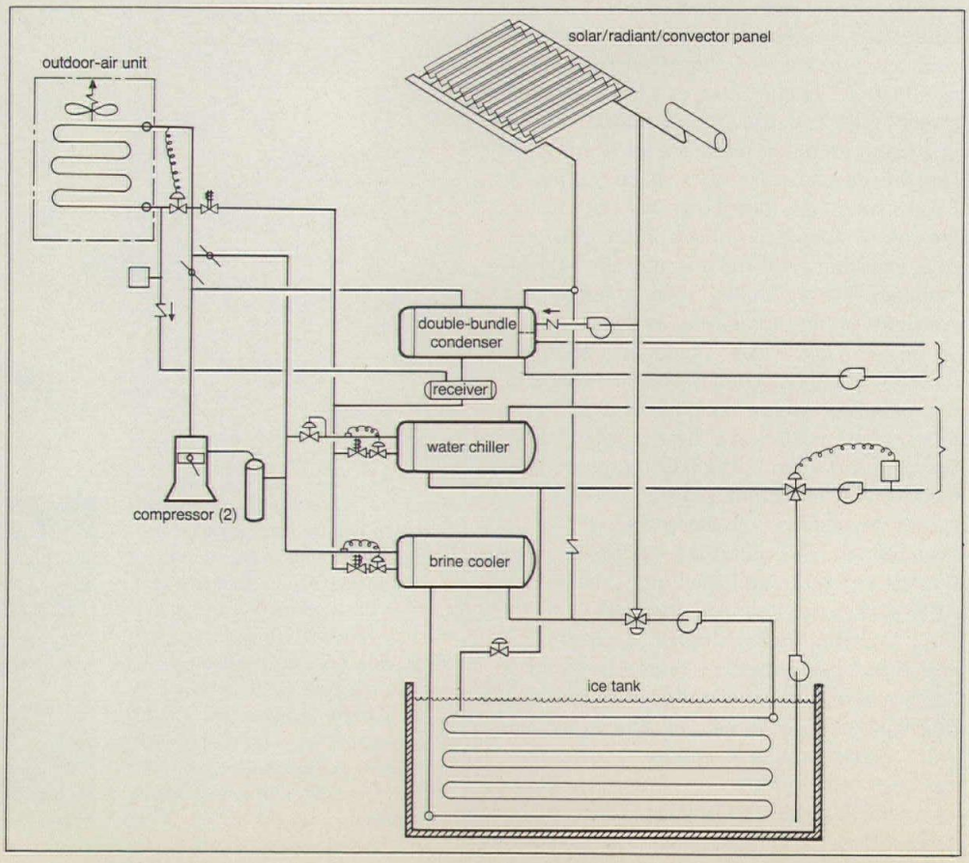
Cost of an ACES system for an 1800-sq-ft house has been estimated to be $5,000-6,000 for Washington, D.C. and Philadelphia, compared with $1500 for electric heating and air conditioning. Even so, engineers say, this is less than the cost for a completely solar heating-and-cooling system. And Oak Ridge engineers have been talking to manufacturers about application of ice-makers normally used for food preservation to reduce ice-tank costs: an ice-maker installed over a bin could merely slough off ice into the bin, eliminating pipe coils in the bin, itself. But until this is tried out in practice, some engineers will have questions about the efficacy of heat transfer from ice to water.



Because of the higher capital costs for ACES, its advocates are looking for applications in building types where owners are receptive to life-cycle costing. For this reason, they are eyeing a research installation by the Veterans Administration in a 60-bed nursing home at Wilmington, Delaware (illustrations this page). Though the nursing home had been designed when VA mechanical engineers heard about ACES, in their effort to promote energy savings they decided to have the project bid both conventionally and ACES, and brought in consulting engineer Robert G. Werden, a consultant to Oak Ridge on commercial development of ACES, to design the system. Werden—who has a long-time background in the development and application of heat pumps in commercial, industrial, school and apartment construction—has designed an "energy bank" that will provide 75 tons of cooling and 800,000 Btu of heating. Because of the storage capability of the system, not only are operating-cost economics of the heat pump improved, but electric demand can be reduced greatly by making ice at nights during the summer. A special computer monitoring the system will decide which of eight modes of operation (shown across page) will satisfy space-conditioning demands, will control storage according to season, and will choose the most economical mode as governed by both weather and season.

Because the 60-bed VA nursing home in Wilmington had been designed before VA engineers decided to use the Annual Cycle Energy System, consulting engineer Robert Werden put his "energy bank" in a separate structure. It incorporates refrigeration (heat pump) equipment, a 40- by 50- by 10-ft ice tank, a solar/radiant/convector panel, and a computer system to monitor and control the operation. During the heating season, the outdoor air unit extracts heat from the air until it drops into the 40's. At lower air temperatures, refrigerant circulates through the brine (methanol) cooler so it can make ice. The roof panel absorbs solar energy to melt excess ice in winter, and rejects heat to outdoor air and the night sky in summer.





During the heating season, the outdoor unit extracts heat from outdoor air until the weather is in the 40's (Mode 1). In its least efficient operation, this cycle has a coefficient of performance (COP) of 4.6. Cold refrigerant circulates through the outdoor unit picking up heat, and the heat of compression from the two 37.5-ton reciprocating compressors (800,000 Btu/hr max.) is rejected to the double-bundle condenser for space heating.

When outdoor air is too cold for efficient operation of the outdoor unit, the system makes ice (Mode 2). Refrigerant chills the brine (methanol solution) to water-freezing temperatures, and the heat of compression, again, is used for space heating. Ice can build up on the coils to a 6-in.-dia. "doughnut," and, in this least-efficient condition, the COP is 3.38.

When there is useful solar heat and the system is calling for heating (Mode 3), brine is circulated through the solar panel and then through the tank to melt ice. Heat from this process is added to the heat of compression of the refrigerant.

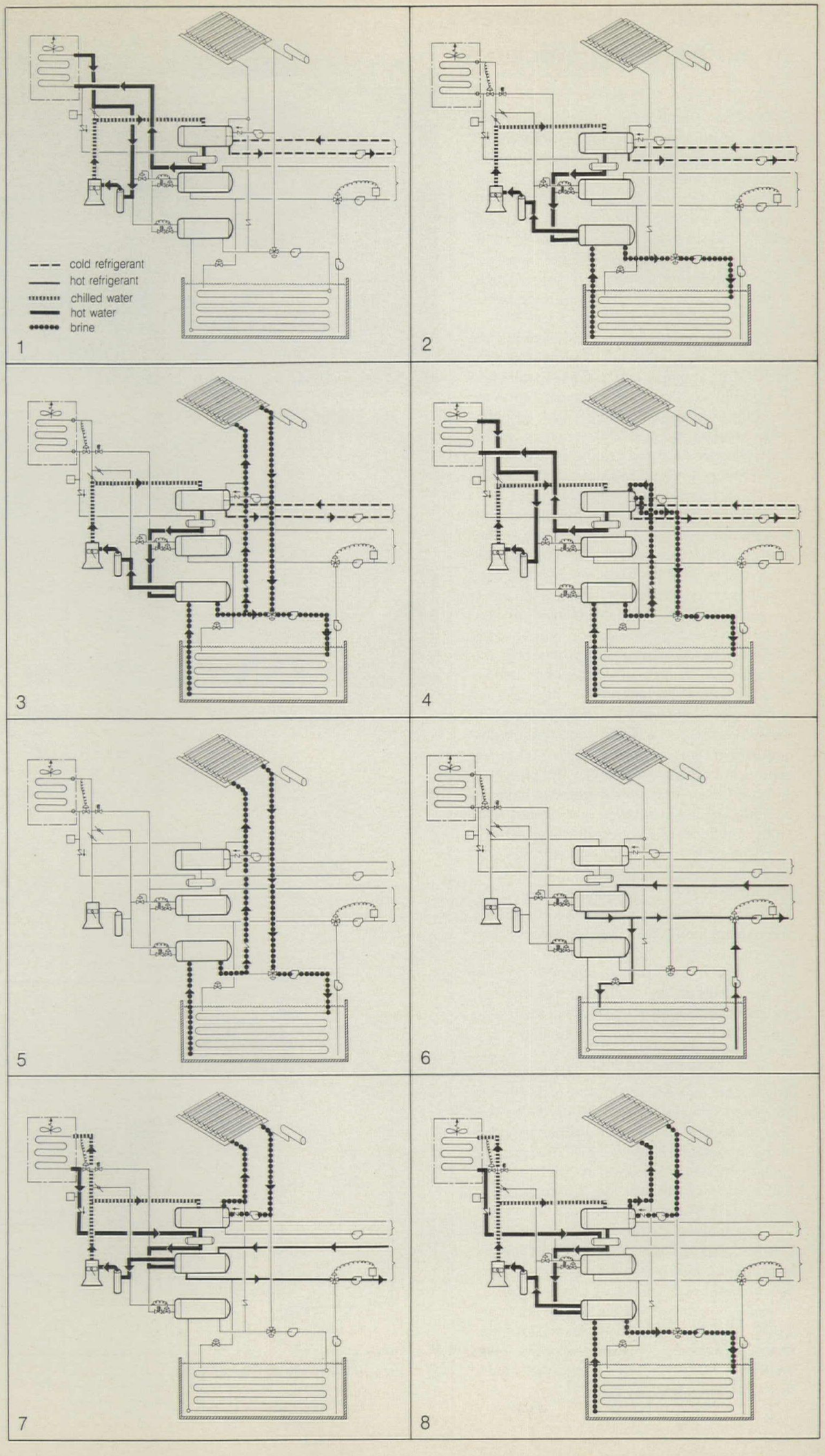
If there is more heat available from the outdoor unit than is needed for space heating by itself (Mode 4) the excess can be used to melt ice in the tank, in preparation for more freezing later.

When outdoor temperature is mild during the heating season, and the building is not calling for heat (Mode 5), solar heat can be used to melt ice in the tank, in preparation for more freezing.

At the beginning of the cooling season (Mode 6), enough ice has been allowed to build up on the coils to provide cooling for the building without any need for running the compressor.

During the warmest weather when the ice has run out (Mode 7), the cooling effect can be produced by discharging the heat of compression to the outdoor unit, and also to the radiant/convector panel if the temperature of the brine in the panel is less than that of the refrigerant in the condenser.

When nights are cool in summer (Mode 8), the system can make ice off-peak for cooling during the warm day, saving energy and taking demand off the utility.



Solar building has features to aid operating efficiency

Shenandoah Community Center, located in a HUD-backed new town 25 miles south of Atlanta, will have 90 per cent of its heating requirements, and 60 per cent of its cooling requirements, provided by 10,500 sq ft of reflector-augmented solar collectors on its saw-tooth roof. To minimize heat losses and gains, architects Taylor and Collum placed the main floor of the 54,000-sq-ft building 4 ft below grade, with the excavated soil being used for berms on all sides but north.

Engineers Newcomb and Boyd were concerned that the solar heating/cooling system be as efficient, as simple and as maintenance-free as possible. For example, freeze protection for the collectors was simplified because generally more heat is collected and stored in winter than is needed for space heating and hot water, and this can be circulated through the collectors at night to prevent freezing.

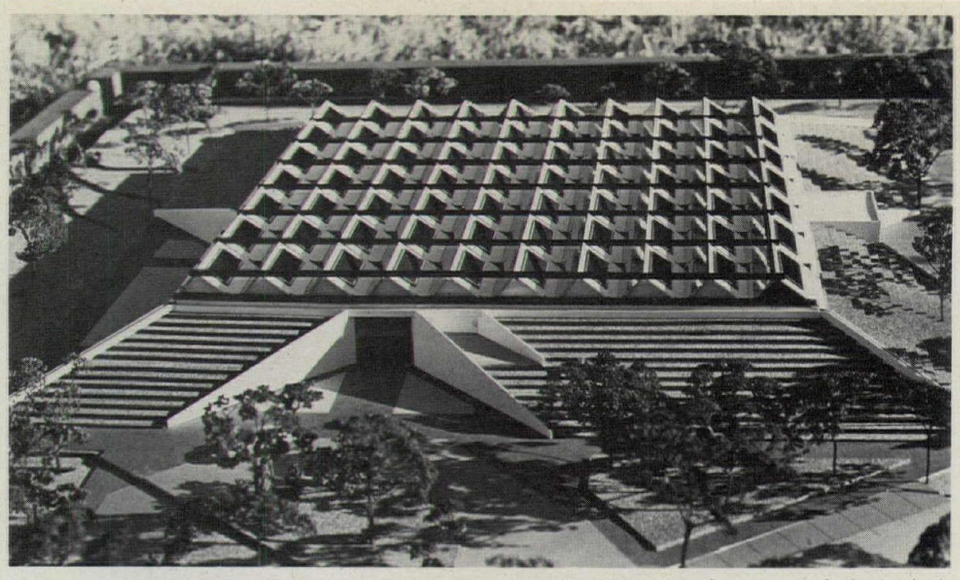
The engineers avoided complex piping systems through use of a primary/secondary pipe loop concept. Each loop has its own pump that recirculates water within it as a constant rate. Energy transferral takes place when the control system initiates opening of a valve to let water flow from one loop into another. For example, on start-up in the morning, the collector loop recirculates water until its temperature is high enough for it to be useful for space heating, hot water or for the cooling system generator. The collector loop has a buffer tank to prevent solar fluctuations (clouds) from causing the system to overcycle. The pipe-loop approach also allows energy from the boiler to be added to the heating or cooling-generator loops simultaneously with collector operation.

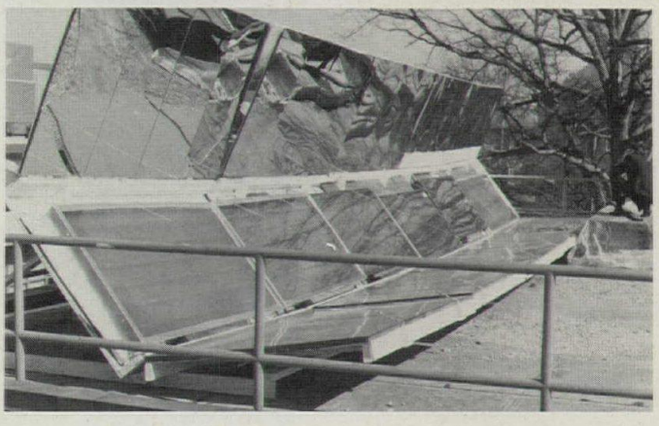
The collector/reflector system was designed by an engineering group at Georgia Institute of Technology under the direction of Dr. James Richard Williams, who also headed the design team for the ERDA-funded solar system. It comprises solar collectors with absorber plates of selectively-coated copper in double-glazed panels on the south slopes of the roof, and reflectors on the north slopes of the roof to improve collection of solar energy in the summer for the cooling system.

In summer when the collector loop water temperature exceeds 180 F, flow is diverted to the generator loop. The absorption chiller will operate from its lowest permissible temperature of about 170 F, up to 195 F. Because the chiller is rated for operation at 240 F, a nominal 200-ton chiller was needed to satisfy a peak load of 94 tons.

The building will incorporate general offices for Shenandoah Development Corporation, an exhibition hall, meeting rooms, a gymnasium/auditorium, and an ice rink.

Other members of the design team include: Wright Engineering Associates, mechanical engineers; Adams and Roberts, electrical engineers; and Jack Lynch & Associates, structural engineers.

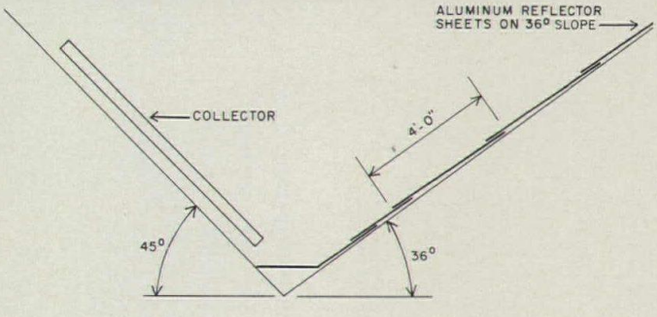


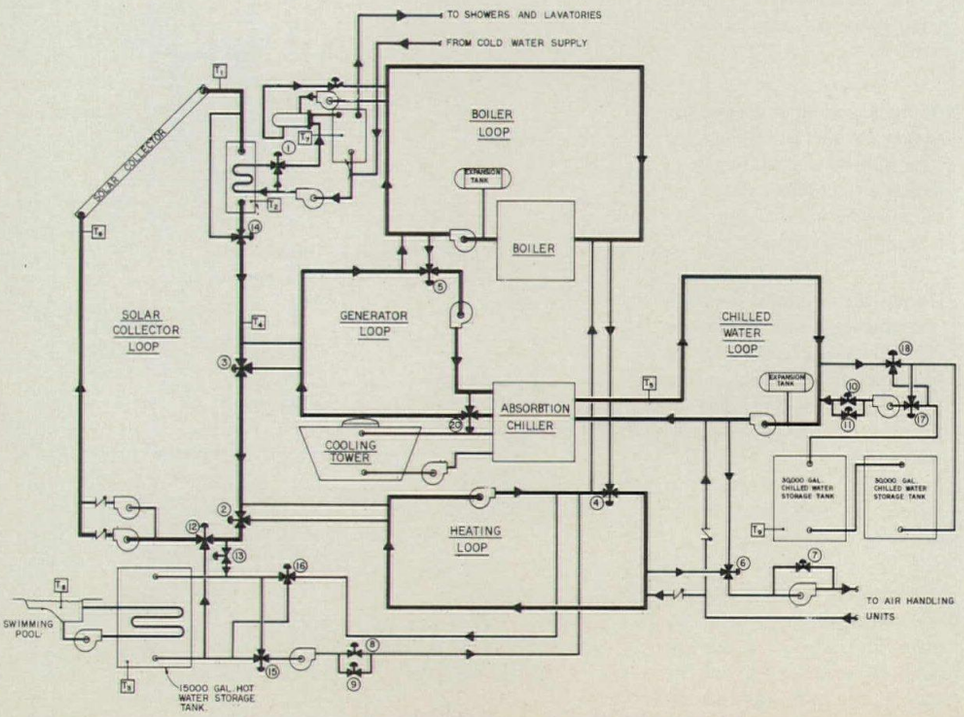


Roof structure of Shenandoah Community Center was designed to accommodate the solar-collector array. Web members of the wood roof trusses are at the angles chosen for maximum system efficiency—45 degrees on south slopes for the collectors and 36 degrees on north slopes for the polished aluminum reflectors. All walls have earthen berms except the north which is 40 per cent insulating glass.

In collector test set-up at Georgia Institute of Technology, reflectors were employed at top and bottom of the collectors, but only the lower reflectors were used in the Community Center design. Angles of both the collectors and the reflectors could be adjusted to analyze variations in performance.

Total cost of the building was $2,700,000, and ERDA funding for the solar system was $617,742.



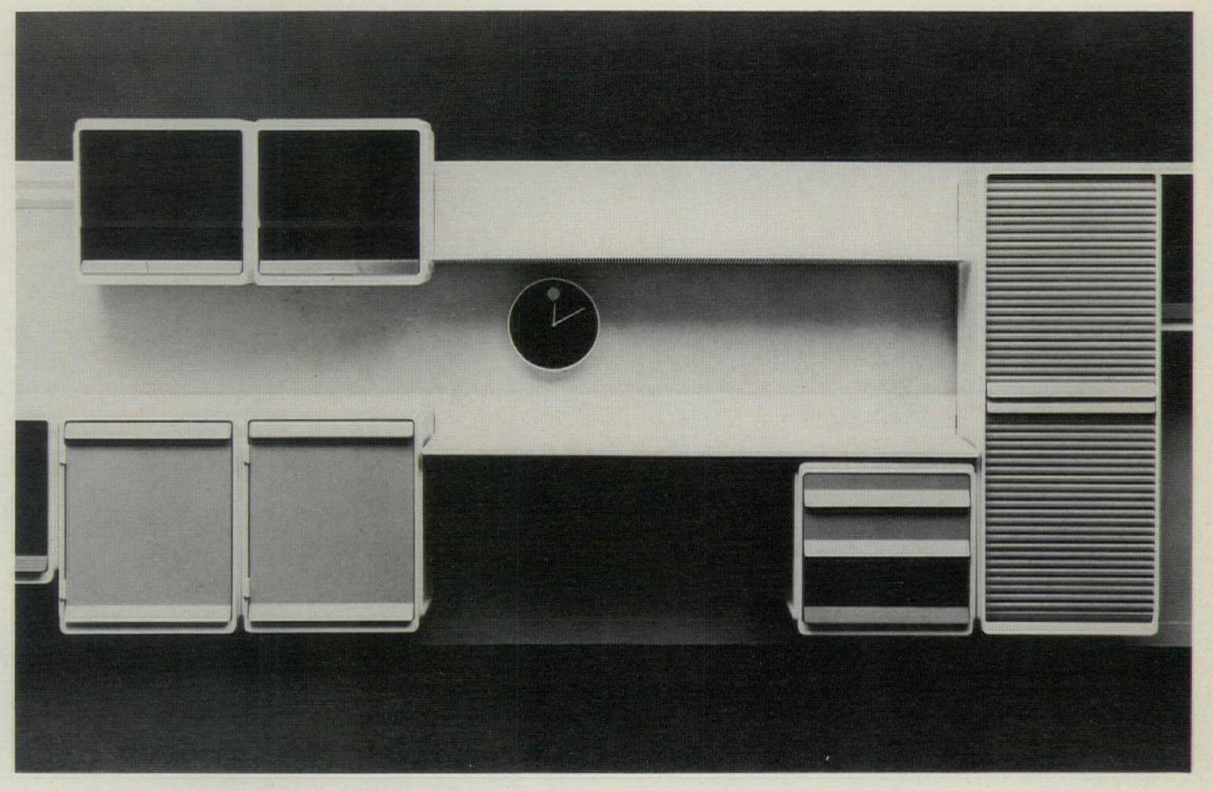


For more information, circle item numbers on Reader Service Inquiry Card, pages 215-216.

Architect-designed molded storage units

Designed for commercial and institutional materials storage by a teamed supervised by Robert A. Chervenak, FAIA, "Unicell" units can be freestanding or mounted on wall rails. The system includes: fronts, shelves, trays, drawers and subcontainers. As the user's requirements change, "Unicell" units can be repositioned simply, via transport or distribution carts. The structural foam molding process used in construction ensures dimensional stability and strength, along with resistance to acids and stains. Combined into one seamless assembly, the components are recommended for easy-to-clean storage in school, health service and other commercial and institutional applications. Drawer and lift fronts are available in a broad range of color options. ▪ Monitor Products, Tacoma, Wash.

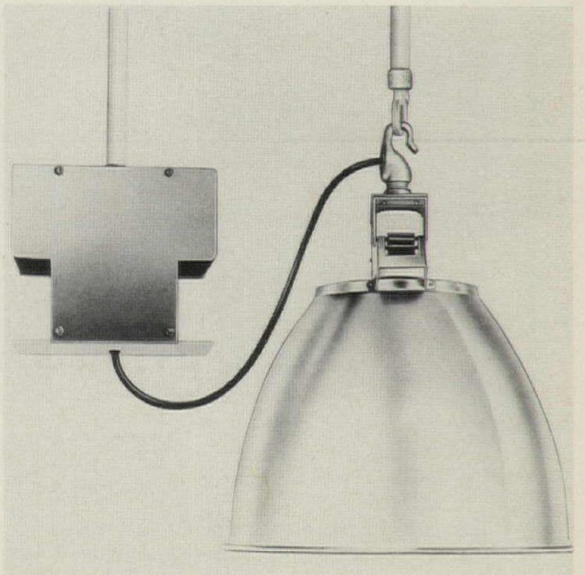
Circle 300 on inquiry card



A ply-bent patient chair adapts to all flooring

This sled base patient chair adapts to both hard-surface or carpeted floors, according to the company. It is made of Northern beech hardwood with chrome-finished ¾-in., 16-gauge steel cross tubes for durability. Seat and back cushions are removable; foam materials used are fire-retardant and meet the rigid Boston fire code. The upholstered sections are offered in numerous color and fabric options. ▪ Sauder Mfg., Archbold, Ohio.

Circle 301 on inquiry card



Industrial HID fixtures designed for remote ballasts

One of two new fixtures in the company's HID industrial line, this unit can be used where the reflector and ballast cannot be mounted as a single unit. Typical applications are high-ceiling plants which require ballasts mounted on steel beams. Not shown is a low-profile type for low ceiling installations. Both units are offered in: 150W to 1000W HPS: 250W to 1000W mercury vapor; and 250W to 1000W metal halide lamps. ▪ Benjamin Electric Mfg. Co., Sparta, Tenn.

Circle 302 on inquiry card

more products on page 145

Holophane lenses.

We make over 30 so you'll have the right one for any lighting situation.

There are no pat answers when it comes to lighting. Each project has its own set of requirements. That's why Holophane® offers you more than 30 different lenses.

We offer the right lens for classroom lighting, store lighting, low glare lighting, wall lighting and dozens of other specific applications.

Every injection-molded clear acrylic Holophane lens delivers tailored light distribution and high efficiency for energy-conscious installations. All wrapped up in a very attractive package.

Learn more about energy-efficient lighting solutions from your local Holophane representative. He's trained to meet your needs. Or, write to Johns-Manville Sales Corp., Holophane Div., Dept. AR-11, P.O. Box 5108, Denver, CO 80217.

JM Johns-Manville

For more data, circle 52 on inquiry card

For more information, circle item numbers on Reader Service Inquiry card, pages 215-216.

ENERGY CONSUMPTION / Literature describes an economical computer analysis of HVAC costs available to owners and managers of commercial and institutional buildings. The analysis program uses locally gathered information on weather conditions, building construction and mechanical systems for each individual building. When merged with the firm's own data base, variables of wall construction, systems and controls can be isolated, and recommendations can be made for optimum energy efficiency of the building. ▪ Johnson Controls, Inc., Milwaukee, Wis.

Circle 400 on inquiry card

ENAMEL COATING / *Tile-Clad II* is a two-component coating that can be used on almost any surface: cinderblock, wood, wallboard, fiber glass, steel, etc. Most applications require only two coats for a durable, ceramic tile-like finish, according to a brochure, which also includes results of fire tests. ▪ The Sherwin-Williams Co., Cleveland, Ohio.

Circle 401 on inquiry card

INTERIOR DOOR FRAMES / Installation details of aluminum door frames for interior use are given in an illustrated folder. Information is presented on finishes, hardware, sizes, and the door frame's self-mortising features. ▪ Howmet Corp., Southern Extrusions Div., Magnolia, Ark.

Circle 402 on inquiry card

MATERIALS HANDLING EQUIPMENT / An eight-page brochure describes functional applications for "In-Floor Towline Systems." In-use installations are shown; the system's ability to coordinate with other types of materials handling systems is also explained. ▪ Rapistan Inc., Grand Rapids, Mich.

Circle 403 on inquiry card

ROOF DECKING / An attractively illustrated reference catalog describes *Bond-Deck* panelized roof decking, said to combine the appearance of random-length solid wood decking with the installation efficiency of panels. Each panel consists of four individual runs of 2- by 6-ft finger-jointed tongue-and-groove decking, mounted on heavy Kraft paper. The catalog also discusses the *Shear Clip System,* a diaphragm design said to provide superior shear resistance, eliminate overlay, and save costs. ▪ American Forest Products Corp., Fresno, Calif.

Circle 404 on inquiry card

CLOCKS / Floor, mantel and wall clocks—two with matching barometers—are featured in a catalog supplement covering new additions to this line of traditional-styled clocks. Included is the "Country Tour" collection of oak and pine wall and mantel clocks, and a grandfather clock with Pennsylvania Dutch motif decorations. ▪ Howard Miller Clock Co., Zeeland, Mich.

Circle 405 on inquiry card

LIGHTING TERMINOLOGY / A 32-page publication includes a glossary of lighting terminology, a section on "General Lamp Data," and information on ballasts. ▪ Keene Lighting, Keene Corp., Union, N.J.

Circle 406 on inquiry card

HEAT EXCHANGE EQUIPMENT / A complete line of heating and cooling products for comfort control and industrial applications is described in an illustrated brochure. Included are *Zone-A-Matic* packaged heating units for oil, gas or electric firing; valance Hvac systems; finned tubing; and hydronic baseboard and fin-pipe radiation units. Industrial heat exchange equipment, liquid heaters, vapor recovery systems, etc., are also covered. ▪ Edwards Engineering Corp., Pompton Plains, N.J.

Circle 407 on inquiry card

CARPET BACKING / Architectural guide specifications for direct glue-down installation of double jute-backed carpeting are given in a four-page brochure. ▪ Jute Carpet Backing Council, Inc., New York City.

Circle 408 on inquiry card

INSTITUTIONAL SECURITY / A three-ring binder contains individual brochures on mechanical and electric locks, door hardware, room furnishings, and locking devices for secure institutions. Technical data are given on handing of locks; dimensional drawings and sample specifications are included. ▪ Folger Adam Co., Joliet, Ill.

Circle 409 on inquiry card

STOREFRONT GRILLES / Concealed overhead when not in use, rolling grilles provide complete security for store fronts, display windows, and shopping mall entrances when lowered and locked. An eight-page catalog describes three grille patterns, combining straight line motifs and hexagonal patterns, as well as the *Slat-Grille* for extra protection. Available in steel, aluminum and stainless steel, grilles are custom built for openings in old or new structures. ▪ Kinnear Div., Harsco Corp., Columbus, Ohio.

Circle 410 on inquiry card

DOOR OPERATORS / An illustrated job report describes a recent installation of automatic door operators in the elephant house at the Columbus, Ohio, Zoo. The speed, safety and strength needed for this unusual operator use are applicable to various needs in business and industry, according to the manufacturers. ▪ Air-Lec Industries, Inc., Madison, Wis.

Circle 411 on inquiry card

CONSTRUCTION ADHESIVES/SEALANTS / Eight specialized high-performance construction adhesives and sealants are featured on the *Durabond* selector chart included in a new product catalog. ▪ United States Gypsum Co., Chicago, Ill.

Circle 412 on inquiry card

STEEL LOCKERS / Single-, double-, and multiple-tier lockers, equipment locks, and basket racks are featured in a 16-page catalog. Locker colors, styles and dimensions are given for each piece; the *Van-Guard* abuse-resistant locker handle is described. ▪ Penco Products Inc., Oaks, Pa.

Circle 413 on inquiry card

CHEMICAL-RESISTANT FLOOR / An illustrated, eight-page brochure describes four systems of chemical-resistant flooring: tile or brick, metal plate, monolithics, and coatings. A chart shows chemical resistance and physical properties of resinous flooring materials. ▪ Atlas Minerals and Chemicals Div., ESB Inc., Mertztown, Pa.

Circle 414 on inquiry card

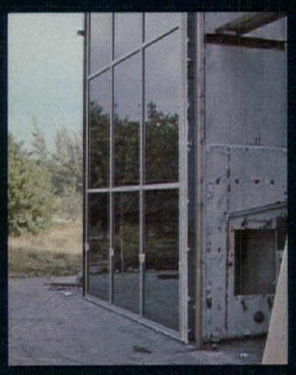
ENERGY MANAGEMENT SYSTEMS / Two fully-detailed brochures explain both programmable and *Cardlok* systems for monitoring and controlling peak electrical energy demands. *Cardlok* controls are intended for smaller installations; the system can monitor up to 160 loads at 20 levels of priority. PLC units can regulate as many as 320 loads, with up to 64 levels of priority. ▪ Allen-Bradley Co., Milwaukee, Wis.

Circle 415 on inquiry card

The Best Place To Test A New Curtain Wall System Is On Our Building. Not Yours.

That's why, at Amarlite Anaconda, we erected and tested our new CWT-550 Curtain Wall System, before we even thought about trying to sell it to you.

We knew this new thermally-improved system looked good on paper, because the Amarlite Anaconda Curtain Wall Team that designed it is made up of some of the most talented, experienced people in the business. But the true test of any structural system is how it actually performs.



So we put CWT-550 through exhaustive tests. We flooded it with water and blasted it with high pressure air currents. It didn't leak.

We checked the thermal characteristics of the CWT-550. And found that the system proved equal to 1" insulated glass.

We tried out the CWT-550's unique installation procedures, like interior glazing and improved anchoring and splicing, and found it easier, faster and more economical to install.

And we knew we had a winner.

This unique curtain wall system meets or excels every criteria that Amarlite Anaconda set for the product. It's a reverse type pressure wall system that eliminates metal to metal contact between exterior and interior. Its low profile reveal is designed for today's environmental glass. In fact, it meets all the requirements established for glazing environmental insulated glass.

So the tests are finished. And the same Amarlite Anaconda Curtain Wall Team who has designed and checked out the CWT-550 System is ready to put that system to work for you.

Just call or write for more information on this unique system that's specially designed for today's medium and high-rise buildings.

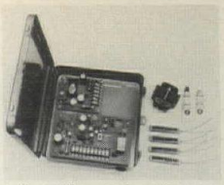
AMARLITE

ANACONDA Aluminum Division

P.O. Box 1719
Atlanta, Georgia 30301
404/691-5750

For more data, circle 53 on inquiry card

SECURITY SYSTEM / Solid-state sensors, attached to any floor beam, riser, platform, fire escape, etc., detect the very slight amount of flexure produced by an intruder. This stress triggers an amplifier signal processor to trip an alarm relay. The *Pulsor System* is said to be virtually false-alarm free: the amplifier includes a sensitivity control which can be adjusted to trip only when a predetermined weight is exerted. A single sensor can cover as much as 100 sq ft of floor space; units can be combined for security of very large areas. The *Pulsor System* is unaffected by temperature, moisture, or vibration caused by outside noises and traffic. ▪ Detectron Security Systems, Inc., Sag Harbor, N.Y.



Circle 303 on inquiry card

FLUORESCENT TROFFER / These fluorescent lighting troffers are UL-listed as "Suitable for Wet Locations"; neoprene-gasketed aluminum door frames positively seal against the fixture body. Ceiling trim is also moisture-proofed. Both acrylic and polycarbonate prismatic lenses are available; the finish is baked-on acrylic enamel. Troffers come in 1- by 4-ft, 2- by 2-ft, and 2- by 4-ft sizes. ▪ Guth Lighting, St. Louis, Mo.

Circle 304 on inquiry card

EXIT LIGHT / The "Delex-Profile" emergency exit is constructed of die-cast aluminum, and features a completely self-contained DC power source inside its 4¾- by 1¾- by 8½-in. canopy. This power pack, which operates the emergency lamps for over 90 minutes, includes an automatic solid-state charges and load transfer device. Power cells are sealed lead-acid; there is also a push-button test switch and indicator light. ▪ LCA/Devine Lighting, Kansas City, Mo.

Circle 305 on inquiry card

CONCRETE SEALER / A penetrating sealant for use on old or new concrete, indoors or out, *Nacor 333* is said to eliminate dusting, stop efflorescence, and reduce surface wear and slipping hazards. The vinyl styrene-butadrene base liquid is available in clear, green, red and gray transparent colors. *Nacor 333* may be applied on fully dry new concrete; it should prevent further deterioration of already damaged older pavements. ▪ National Asphalt Corp., Cleveland, Ohio.

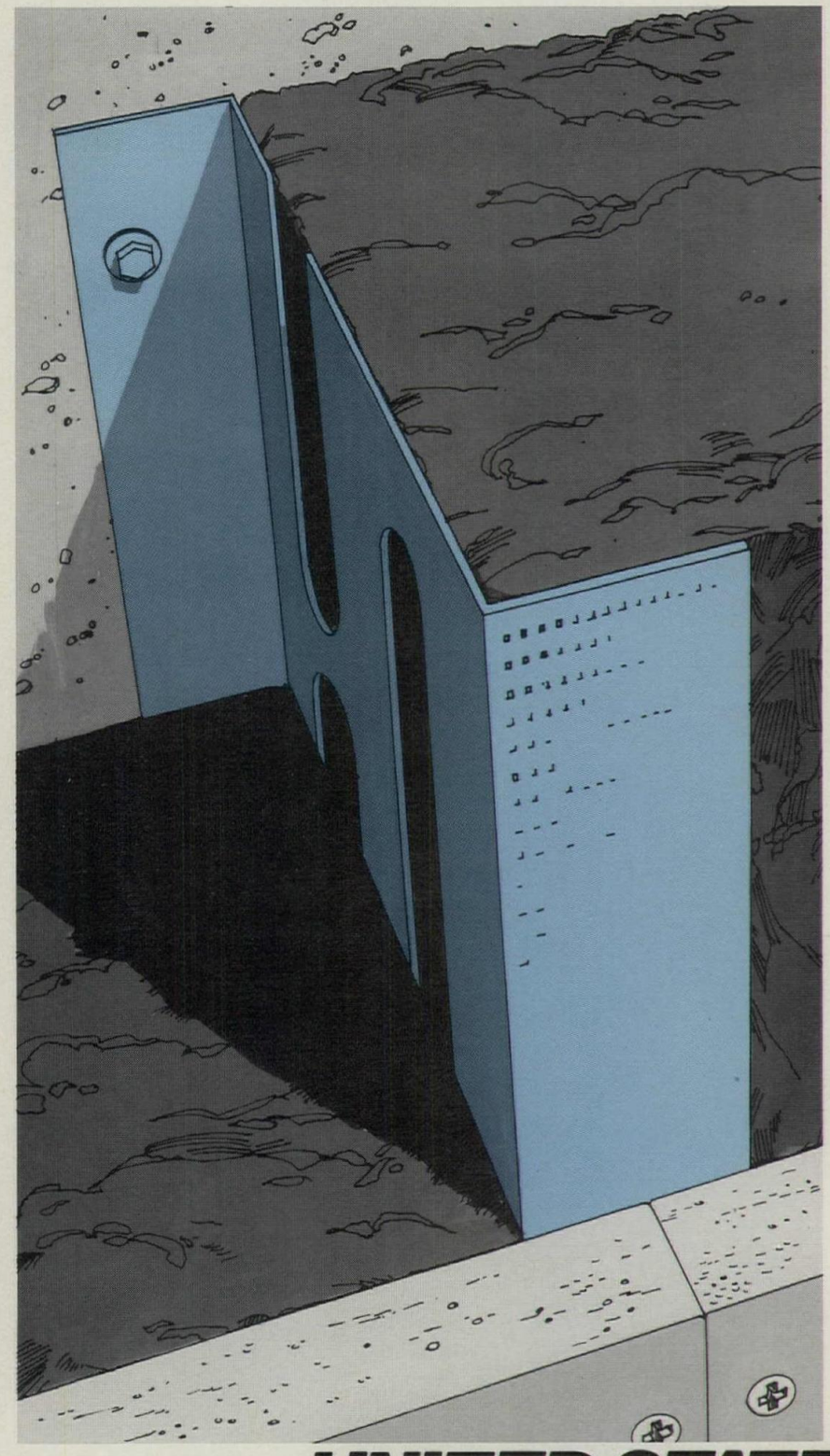
Circle 306 on inquiry card

KITCHEN CABINETS / "Woodlake" cabinets are finished in a plastic laminate that resists stains and scratches. Units contain adjustable shelves, all-wood drawers, side-mounted roller bearing suspension and self-closing hinges; all parts are said to be virtually maintenance-free. ▪ Excel Wood Products Co., Inc., Lakewood, N.J.

Circle 307 on inquiry card

more products on page 147

New USG® Z-Furring Channels build a positive case for energy savings!



■ **POSITIVE ATTACHMENT.** Gypsum panels screw to Z channels that attach directly to concrete; hold more securely than systems with metal over insulation where "fishhooking" of pins can occur.

■ **POSITIVE FIRE PROTECTION** is the direct result of this extra security attachment system.

■ **POSITIVE FASTENER COST REDUCTION.** One size concrete fastener used for all thicknesses of insulation.

■ **POSITIVE THERMAL TRANSFER REDUCTION** is afforded by the exclusive slotted design of these superior furring channels.

USG Z-Furring Channels are now available in 1″, 1½″, 2″ and 3″ depths to meet today's demands for increased insulation to boost U-factors in masonry walls. These corrosion-resistant channels are formed from hot-dipped galvanized steel; take THERMAFIBER® Z-Furring Blankets, rigid polystyrene, or urethane insulation; minimize effects of structural stresses and help prevent wicking of moisture to inside surfaces. Call your USG Representative, or write now for latest literature complete with updated U-value charts.

United States Gypsum, 101 S. Wacker Dr. Chicago, Ill. 60606 Dept. AR-116

Send free copy of new USG Z-Furring Channels brochure to:

Name_____

Title_____

Firm_____

Address_____

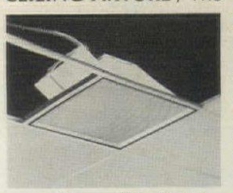
City_____ State_____ Zip_____

UNITED STATES GYPSUM

BUILDING AMERICA.

For more data, circle 55 on inquiry card

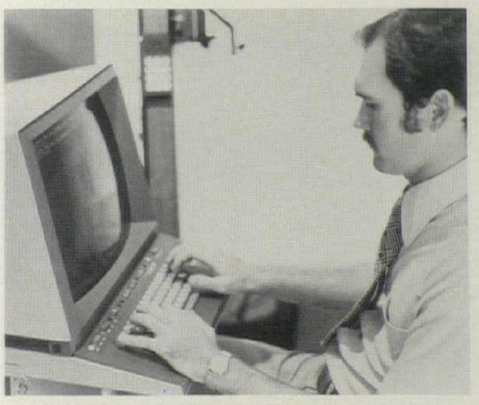
CEILING FIXTURE / The "Innovator I" 2- by 2-ft fixture accommodates air return or static functions, and can use mercury, metal-halide and high-pressure sodium lamps. Construction features include separate insulated capacitor and ballast housings, both easily accessible through the lamp chamber. A clear prismatic acrylic lens is framed in an aluminum door surrounded by a ½-in. black reveal. Fixtures are UL-listed for use in ceilings of any construction; voltages range from 120 to 480. ▪ Hi-Tek Lighting Div., Lithonia Lighting, Conyers, Ga.



Circle 308 on inquiry card

SANDWICH PANEL / These 2-in.-thick panels consist of two metal skins and an all-welded pyramidal core; sections are available in standard 4- and 5-ft widths, and lengths of up to 20-ft. Larger panels and special shapes may be ordered. The sandwich panels are said to have a rigidity of more than 200 times that of a solid plate of the same weight. Suggested applications include cargo and materials handling equipment, scaffolds and platforms, signs, dust and fume control enclosures, and acoustical partitions. ▪ Wirecomb, Inc., South El Monte, Calif.

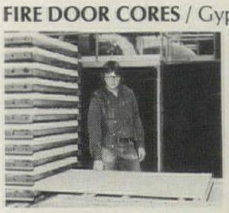
Circle 309 on inquiry card



AUTOMATIC DRAFTING / The "Auto-Draft" system uses a graphics processor to transmit information to an automatic plotter. Equipped with a four-pen holder, the plotter draws finished electrical schematics, process flow diagrams, charts, etc. The computer itself, with a cathode ray tube display screen, stores completed drawings and details. Several console work stations can be operated by draftsmen using the single automatic plotter. ▪ Auto-Trol Corp., Denver, Colo.

Circle 310 on inquiry card

FIRE DOOR CORES / Gypsum, kiln dried, cured and sanded, is now being used as core material in fire doors approved by both ICBO and BOCA for use in high-rise buildings, hospitals, schools, etc. Standardized at 1½-in.-thick, the cores are sized for 2-ft 8-in. by 6-ft 8-in., 3-ft by 6-ft 8-in., and 3-ft by 7-ft. doors. Specific edging and face veneers have been tested and approved for use with the gypsum fire door core. ▪ Gypsum Div., Georgia-Pacific Corp., Portland, Ore.



Circle 311 on inquiry card

more products on page 149

'SUPERNATURAL'

Contempo Dance Pavillion, Project Architect: R. Duell & Associates

Magical 'Shapes' Made Real By Helios Tension.

Fanciful curvilinear tensioned membrane structures are part of the "magic" of Magic Mountain. At this unique family amusement center in Valencia, California, colorful shade structures by Helios Tension Products play dominant roles at the Contempo Dance Pavillion (above) and the Wizard's Village (right). They are also practical, providing shelter and beauty... economically.

When your imagination conjures up exciting, never-seen-before roof shapes, Helios Tension Products are the people to talk to. We're specialists in helping architects translate fresh ideas into reality. Our expertise includes design, engineering, fabrication and erection. We offer a total, comprehensive service unmatched in the U.S.

If you have a project where a membrane structure may be the answer, or if you would simply like more information, write and tell us. Dept. A11, Helios Tension Products, Inc. 1602 Tacoma Way, Redwood City, CA 94063. Tel. 364-1770. Telex 345590.

HELIOS TENSION PRODUCTS, INC.
Soft Shell Structures Division

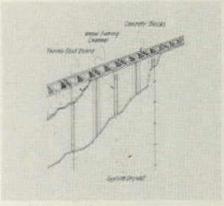
AREA LIGHTING / A champagne-glass shaped diffuser is featured in the design of these incandescent fixtures for civic centers, malls or plazas. A twist-turn locking ring secures the globe to the base; the fixture can be mounted directly onto a 1½-in-diameter tenon, or, with an adapter, to larger diameter poles. "Champagne Lite" comes with clear, translucent, bronze or smoked-shade diffusers; standard metal surfaces are matte black enamel. ▪ ITT Landmark Lighting, Southaven, Miss.

Circle 312 on inquiry card

MODULAR BATHROOM / Significant construction savings are claimed for this self-contained bathroom unit, completely equipped with all fixtures and external plumbing, water and electric hookups. Molded fiber glass forms the walls, ceiling and shower-tub with a built-in seat. Toilet and cabinet-mounted sink have back-outlet drain above floor; also included are a medicine cabinet with mirror and light; ceiling light-fan-heater unit; tub enclosure; and all faucets, outlets, etc. Four 8- by 6-ft models are available, plus two 6- by 4½-ft half-bath units. ▪ Plasco, Inc., Albuquerque, N.M.

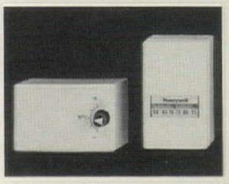
Circle 313 on inquiry card

WALL INSULATION / The *Zonolite Thermo-Stud* system consists of a rigid styrene foam insulation board in which a U-shaped metal furring channel is imbedded. This is fastened with a pneumatic nailer directly to non-load-bearing masonry walls; no vapor barrier is needed. When finished with ½-in. gypsum drywall, the wall forms a continuous insulation envelope, said to be free of thermal shorts and shadowing, and with a "U" value of 0.10. ▪ W. R. Grace & Co., Cambridge, Mass.



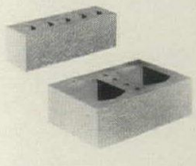
Circle 314 on inquiry card

REMOTE-RESET THERMOSTATS / Adjustments of up to nine degrees on thermostats throughout a zone or an entire building are possible with these pneumatic remote-reset units. The thermostat can be activated either manually, or automatically by outdoor air sensors. ▪ Honeywell Commercial Div., Minneapolis, Minn.



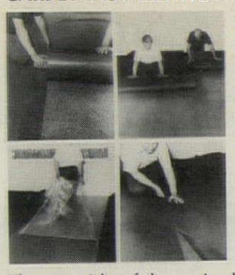
Circle 315 on inquiry card

UTILITY BRICK / This 4- by 12-in. utility brick has an earth-tone color lustre surface on one face. The brick is suitable for interior and exterior locations requiring minimum-maintenance features. Blended shades of brown, tan and beige, as well as solid colors, are offered. ▪ Stark Ceramics, Inc., Canton, Ohio.



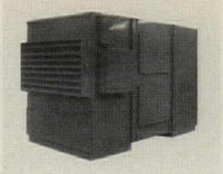
Circle 316 on inquiry card

CARPET INSTALLATION / A new method is said to permit fast, clean, and easy removal of sponge-backed carpet glued directly onto floor surfaces. With the *Lok-Lift* method, a roll of scrim material, coated on both sides with pressure-sensitive adhesive, is positioned on the floor and pressed down. The top side of the scrim has a peel-off liner; carpeting is laid on top of this, and installed section by section as the liner is peeled off the adhesive layer. Carpet is removed by peeling carpet and underlayer off the floor as one unit. Also available is a woven wall carpet with a Class "A" flamespread rating which may be installed with the *Lok-Lift* method. ▪ Commercial Carpet Corp., New York City.



Circle 317 on inquiry card

HEAT EXCHANGER / "Z-Duct 75" is a new addition to this line of air-to-air heat recovery units for industrial and commercial installations. The rooftop package shown, for hvac applications, includes a "Z-Duct" exchanger; capacities of the units range up to 6000 cfm. Units can operate at gas temperatures up to 1600 F, and a recovery efficiency in excess of 60 per cent at rated flow is claimed. Air streams are separated; removable panels facilitate cleaning of exhaust-side heat transfer surfaces. Options include evaporative cooling, waterwash systems, constant volume control, and supplemental heating and/or cooling. ▪ DesChamps Laboratories, Inc., East Hanover, N.J.



Circle 318 on inquiry card

more products on page 151

For more data, circle 57 on inquiry card

When it comes to lighting, Parabolume has a lot more than meets the eye...

MONTGOMERY WARD CORPORATE HEADQUARTERS Architect: Minoru Yamasaki & Associates; Interiors: Sydney Rodgers Associates; Electrical Consultant: Joseph R. Loring & Associates.

...like speech privacy!

In Open Plan interiors, lighting fixtures are an important part of the visual *and acoustical* environment. They must be low brightness, of course, in order to avoid intolerable glare and provide high visual comfort in the large open areas. But the fixtures must also inhibit the reflection of sound in order to assure speech privacy. Parabolume does both! Flat lenses reflect sound, much as a mirror reflects light. Voices or conversation may be directed away from the area intended. However, the complex baffle curves and contours which give Parabolume low brightness light control also serve as an effective sound baffle. Most of the sound entering the fixture is re-reflected internally and absorbed. Parabolume gives you the precise means of confining both light and conversation where they belong. Parabolume lighting: low brightness, high visual comfort and speech privacy!

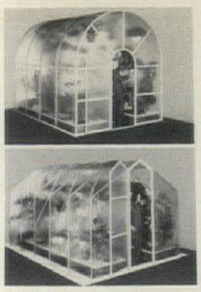
columbia lighting inc

GTE SYLVANIA

north 3808 sullivan rd ☐ ta box 2787 ☐ spokane washington 99220 ☐ (509) 924–7000

For more data, circle 59 on inquiry card

GREENHOUSE / The "Plantworks" gardening system is based on two ready-to-assemble fiber glass greenhouse units, one a geodesic-type structure designed by the architectural firm of Hellmuth, Obata & Kassabaum. The *Filon* panels used are said to offer good insulating properties, to resist structural cracking from ground heave, and to be shatterproof. Additional components include all heating, ventilation and feeding accessories necessary for hydroponic gardening. ▪ Tiffany Industries, Inc., Maryland Heights, Mo.



Circle 319 on inquiry card

ELECTROMAGNETIC BONDING / The structural foam polystyrene window shown was manufactured using the *EMABond* process to join the four sections without solvent welding. The *EMABond* technique produces an electromagnetic bond between thermoplastic materials, using induction heating to activate the bonding agent and causing a fusion of the two abutting parts. The process can also be used to bond dissimilar materials such as paper, aluminum, thermosets and glass. ▪ EMABond, Inc., Englewood, N.J.

Circle 320 on inquiry card

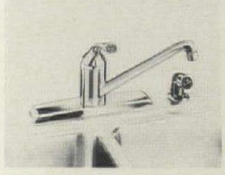
POLYCARBONATE SHEET / Drawing at the bottom of the photo shows the double-wall, hollow channel construction of *Tuffak-Twinwall* polycarbonate sheet, said to provide excellent thermal insulating capabilities. The lightweight sheet glazing product has high impact resistance, and transmits 20 per cent of natural light. *Tuffak-Twinwall* can be sheared, mechanically fastened, cut, cemented and painted. ▪ Rohm and Haas Co., Philadelphia, Pa.

Circle 321 on inquiry card

ALL-WEATHER CARPETING / The *Dimentional I and II* line of all-weather carpet is produced in interlocking fibers to build the base and pile of the carpet simultaneously, reducing costs by eliminating several manufacturing steps. *Dimentional I and II* are said to have good flame retardant characteristics; the medium-grade commercial carpet is stain-, and static-, and wear-resistant. ▪ Needle-Craft Industries, Dalton, Ga.

Circle 322 on inquiry card

FAUCETS / A new addition to the manufacturer's line of kitchen faucets is "Coronette," available in both dual handle and single lever models. These faucets have an all-brass swing spout and a three-ceramic-disc valving mechanism, said to be drip-free and backed by a ten-year warranty. ▪ Elkay Manufacturing Co., Broadview, Ill.



Circle 335 on inquiry card

SECTIONAL SEATING / Single, double, or three-seat sections are offered in this new contract seating line designed by Robert Balonick. The foam-cushioned upholstered pieces have triple-sewn seams for better wear characteristics. Lounge chair and ottoman units are also available; either tuxedo or lawson arm styles may be specified. ▪ Marden Manufacturing Inc., Chicago, Ill.

Circle 323 on inquiry card

CONFERENCE TABLES / Six-in.-radius corners and a 2¼-in.-thick rounded edge are style features of the *6700 Series* conference tables. A thin recessed line outlines the edge of the table top, which is available in a choice of solid and veneer woods. Frame and legs come in mirror or satin-finish chrome; bronze; or solid wood. ▪ Mueller Furniture Corp., Grand Rapids, Mich.

Circle 324 on inquiry card

more products on page 152

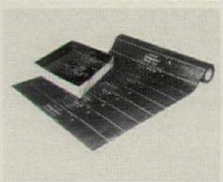
Holmes County, Ohio Training Center — Marr Knapp Crawfis Associates, Inc., architect; James Williams, Inc., contractor

PRODUCT REPORTS *continued from page 151*

ELECTROSTATIC COATING / Photo shows a section of railing on the observation deck of New York's World Trade Center (Warren Platner Associates, architects for the interior). The large curved metal sections were electrostatically-coated with *nylon 11,* a vegetable-based powder said to form a tough, adherent skin that resists marring, scratching and chipping. The finish is also corrosion-resistant and weatherproof. ▪ Rilsan Corp., Glen Rock, N.J.

Circle 325 on inquiry card

WATERPROOFING MEMBRANE / *Compotite* is a corrosion-resistant, fiber glass-reinforced asphaltic membrane for use as a tile base, shower pan, flashing, and other waterproofing applications. The material's slip-sheet construction permits stress movement on both surfaces; it is not affected by electrolytic action. *Compotite* meets requirements of Model Plumbing Codes as well as FHA/VA and Military Specifications. ▪ Composite, Los Angeles, Calif.



Circle 326 on inquiry card

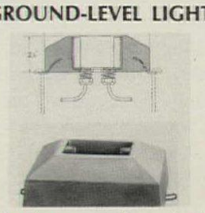
SWIMMING POOL OUTLET / This pre-wired power center provides outlets for filter pump and optional time clocks to supply the electrical needs of pools and adjacent areas. Simplified wiring needs only one conduit and one set of service conductors; each unit is UL-listed. Ground fault circuit interrupters are available, as required by new NEC articles. ▪ Midwest Electric Products, Inc., Mankato, Minn.

Circle 327 on inquiry card

STOREFRONT SYSTEM / This storefront glazing system can accommodate either ⅝- or 1-in. insulated glass (adapters available for ¼-in. glazing). The "ISF-311" has a rigid PVC slide-in thermal barrier gasket, which allows the front glazing retainers to snap onto the back member. The stick-type system comes in a variety of anodized finishes. ▪ Amarlite/Anaconda, Atlanta, Ga.

Circle 328 on inquiry card

GROUND-LEVEL LIGHTING / "Light Block" is a precast concrete pad with an integral cast aluminum splice box to facilitate installation of garden lights, "wall wash" floodlights and similar on-ground lighting. Two bend-out wire loops can be spiked into loose soil or anchored to a wire form; or an optional aluminum ground spike may be screwed through one of the holes tapped into the splice box. The "Light Block" measures 9- by 7¼- by 2⅞-in., and accepts fixtures equipped with ½-in. arms. ▪ Keene Lighting, Union, N.J.



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more products on page 155

For more data, circle 61 on inquiry card

75 YEARS
LYON
1901-1976

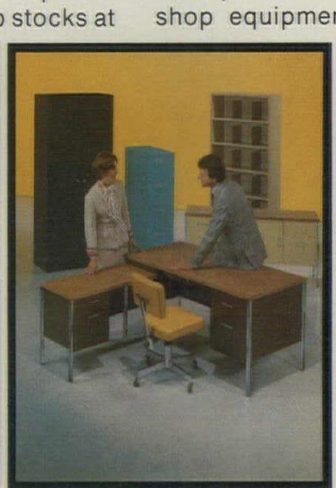
Why wait

when your Lyon dealer can ship promptly from stock?

For really fast delivery you can't beat ordering from stock on hand! And your Lyon Dealer can indeed fill many orders for both steel shop equipment and office furniture from stock. All packaged and ready to go! But even if he doesn't have exactly what you're looking for, he can always get immediate shipment from readily available back-up stocks at one of three strategic locations.

However, your Lyon Dealer has a lot more going for you than fast delivery. He can assure you your *first* choice, from a broad selection of over 1600 top quality items. He can save you time and money on combination orders for steel shop equipment and office furniture. He'll work closely with you, from ideas to delivery and your finished installation. And if necessary, he can call on Lyon field men for additional help.

So why wait? Call your Lyon Dealer now. And remember, one call is all it takes for both steel shop equipment and office furniture.



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Look for us in the Yellow Pages under LYON "STEEL SHELVING", "LOCKERS", "SHOP EQUIPMENT" and "OFFICE FURNITURE".

For more data, circle 62 on inquiry card.

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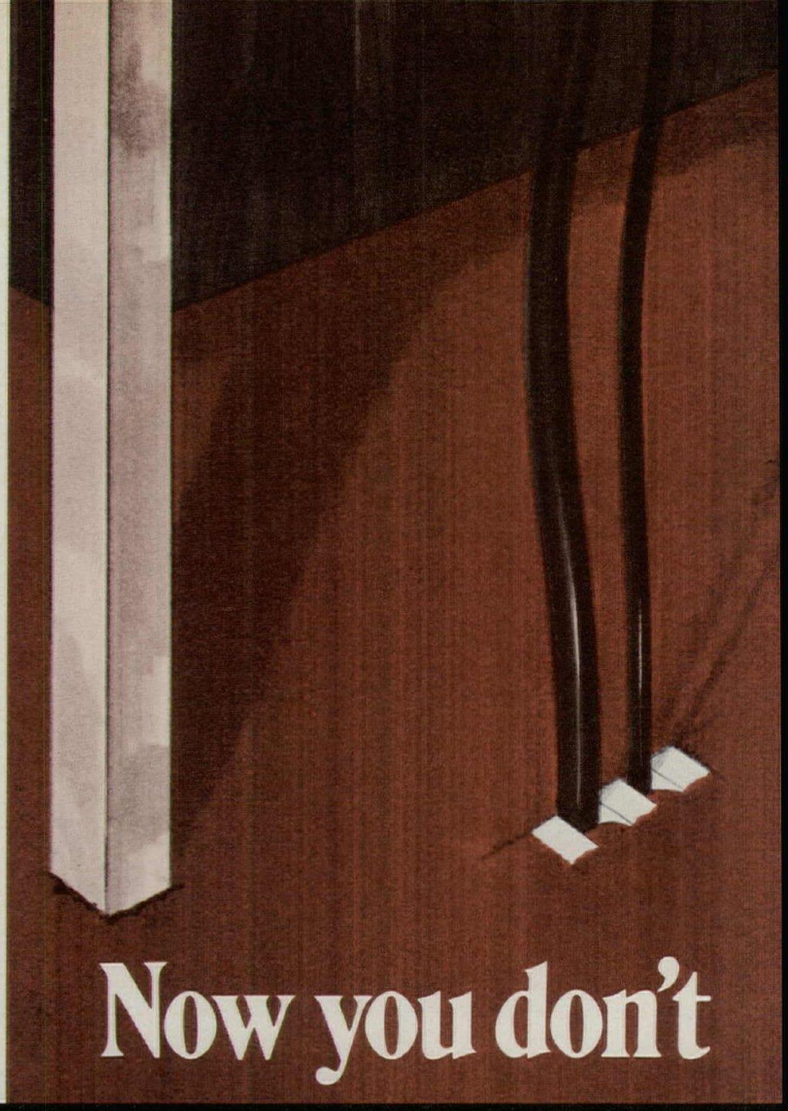
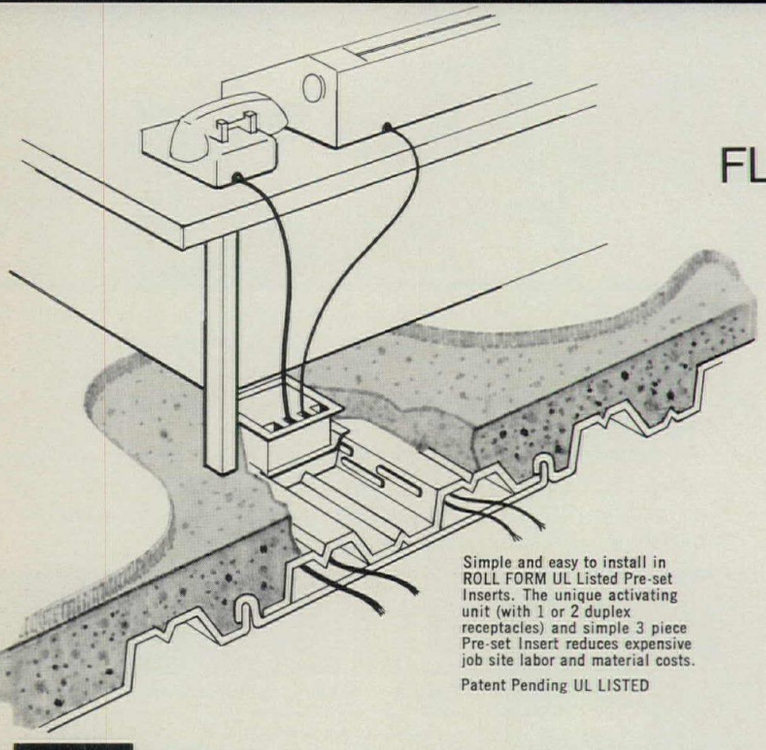


Now you don't



Simple and easy to install in ROLL FORM UL Listed Pre-set Inserts. The unique activating unit (with 1 or 2 duplex receptacles) and simple 3 piece Pre-set Insert reduces expensive job site labor and material costs.

Patent Pending UL LISTED

NEW
FLUSH SERVICE FITTING
RISES TO THE OCCASION

Roll Form's Dual Flush Service Fitting, with the exclusive Flip-top, provides easy access to electrical receptacles and communication services.

The fitting is designed for use with Roll Form's fully integrated in-floor distribution systems and provides complete office flexibility. The unit is easily installed, activated, or deactivated and moved, saving expensive on-site labor and material costs. Office changes are quick, easy and economical with no telltale carpet holes or cover plates.

Installed flush with the floor surface, it permits maintaining the smooth, handsome appearance of the floor covering. Carpeting raises with the unit's Flip-top and does not have to be peeled back for access to the unit, which allows easy placement and removal of electrical plugs.

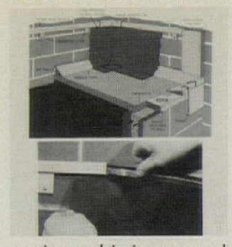
See Sweet's Arch. File Section 5.5/Rol or write for Bulletin FSF-1 with complete information.

ROLL FORM PRODUCTS, INC.
600 REED ROAD
BROOMALL, PA. 19008

Manufacturers of Complete Floor Systems and Roof Decks

For more data, circle 63 on inquiry card

ROOF FLASHING / Redesigned for faster and more effective installation, the *Tremline* roof flashing system forms a weather-tight seal between the roof membrane and adjacent parapets or walls. Elastomeric sheeting has a lock-strip which slides into extruded aluminum wall sections; this is snapped into mounting clips. There are no exposed nailheads or fasteners. The flashing acts as an expansion joint, accommodating movement between roof mat and wall. ▪ Tremco, Cleveland, Ohio.

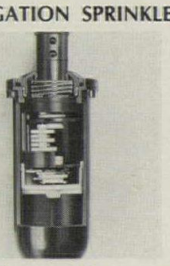


Circle 330 on inquiry card

ENERGY-SAVING LIGHTING / Low-pressure sodium lamps are used in the *Trim-Sox* line of roadway light fixtures, and are said to produce comparable light output at a substantial saving in wattage and power over other light sources. A variety of luminaire shapes is available, all with vandal-resistant acrylic lenses. Lamps range in size from 35- to 180-watt; *Trim-Sox* lamps are non-polluting and operate well in rain, mist and fog. ▪ Trimblehouse Corp., Norcross, Ga.

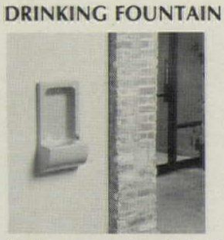
Circle 331 on inquiry card

IRRIGATION SPRINKLER / This gear-driven medium-range landscape sprinkler has housing, nozzle and cover of *Cycoloy 800* plastic. The *Celcon* gear train is sealed in lubricant; twin nozzle orifices are balanced for a uniform precipitation rate. The rotary sprinkler operates on water pressures of 30 to 50 psi; both full circle (to 94-ft-diameter) and part-circle (to 47-ft-radius) models are available. ▪ Weather-matic Div., Telsco Industries, Dallas, Texas.



Circle 332 on inquiry card

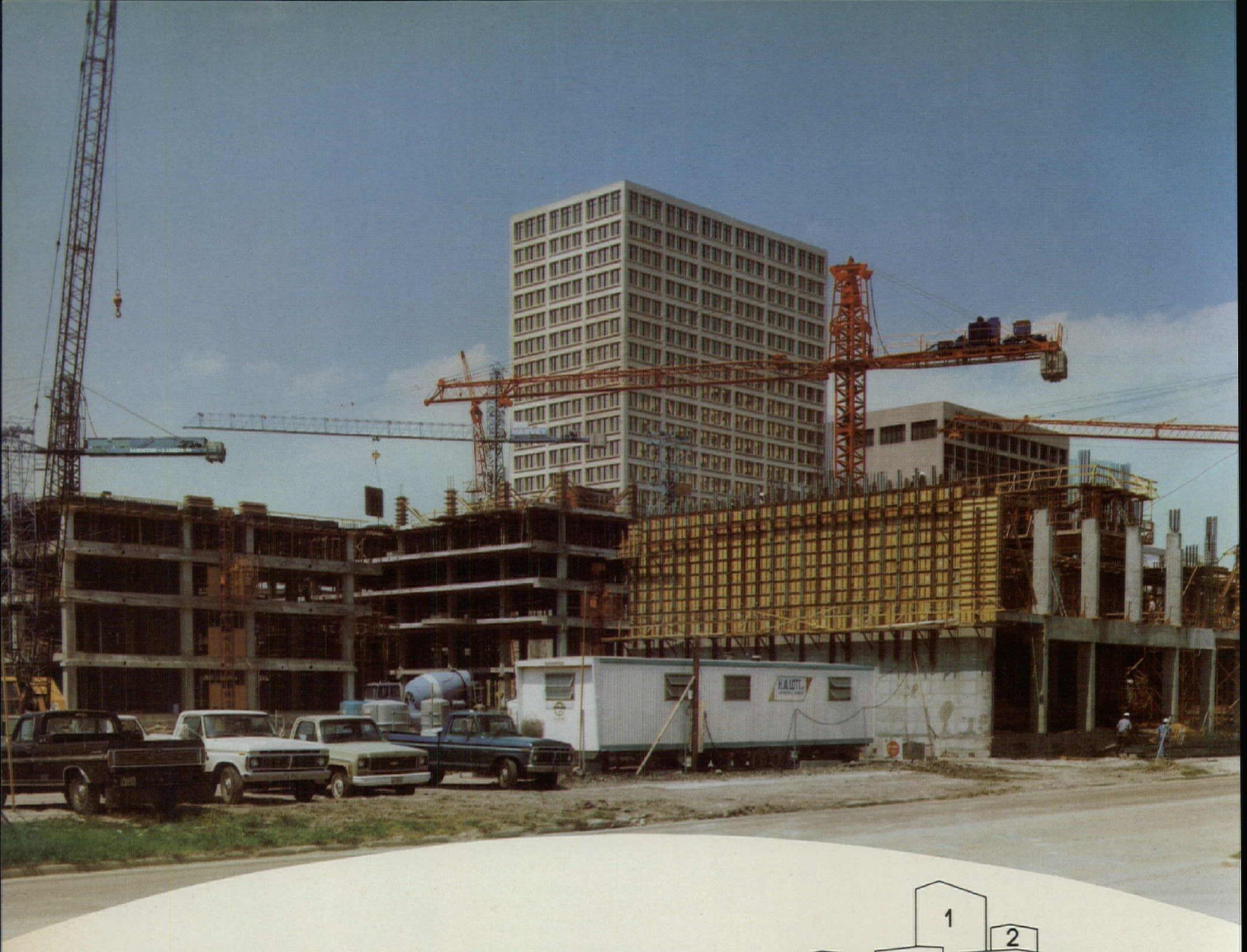
DRINKING FOUNTAIN / The "Model 2205" wall-mounted semi-recessed drinking fountain is manufactured of polyester resin, colored throughout the "polymarble" material. The fountain offers a vandal-resistant chrome-plated bubbler and a flush-mounted push-button valve. The unit is available in three colors as well as white. ▪ Haws Drinking Faucet Co., Berkeley, Calif.



Circle 333 on inquiry card

CARPET TILES / Suitable for both loose-laid installations as well as cemented-down ones, *Tretford Carpet* is now available in ½-meter-sq PVC-backed tiles. The fusion-bonded carpet tiles come in 34 colors, making possible mosaic patterns and a wide variety of floor designs. Individual tiles can be replaced in heavy-wear areas. ▪ Eurotex, Inc., Philadelphia, Pa.

Circle 334 on inquiry card



In Houston's Famous
"The Galleria" Skyline

Five Ceco formwork jobs in eight years

Contractors and owners coast to coast save on forming costs with Ceco services

Impressive architecture in concrete is adding excitement to Houston's modern, Galleria skyline. These five projects are typical of Ceco's concrete formwork in Houston over the past eight years.

With Ceco services you get simplicity, speed and reliability.

—And a firm contract price that represents cost savings to contractors and project owners.

—And performance by formwork specialists who take pride in getting the job done right.

Ceco offers economical and time-saving formwork for rib-slabs, waffle-slabs, flat-slabs, columns and beams. Services are nationwide on a local basis. For more facts, please see Sweet's or contact your nearest Ceco office.

"THE GALLERIA"
Development by the
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1. Post Oak Tower (1969)
Hellmuth, Obata and Kassabaum } *associated architects*
Neuhaus and Taylor }
Ellisor Engineers, Inc., *structural engineers*
Harvey Construction Company, *contractors*

2. Houston Oaks Hotel (1969)
Hellmuth, Obata and Kassabaum } *associated architects*
Neuhaus and Taylor }
Ellisor Engineers, Inc., *structural engineers*
H. A. Lott, Inc., *contractors*

3. & 4. Galleria II.(1976)
Hellmuth, Obata and Kassabaum } *associated architects*
S. I. Morris and Associates }
Ellisor Engineers, Inc., *structural engineers*
Harvey Construction Company, *contractors*

5. Galleria Plaza Hotel (1976)
Hellmuth, Obata and Kassabaum } *associated architects*
S. I. Morris and Associates }
Ellisor Engineers, Inc., *structural engineers*
H. A. Lott, Inc., *contractors*

CECO concrete forming services

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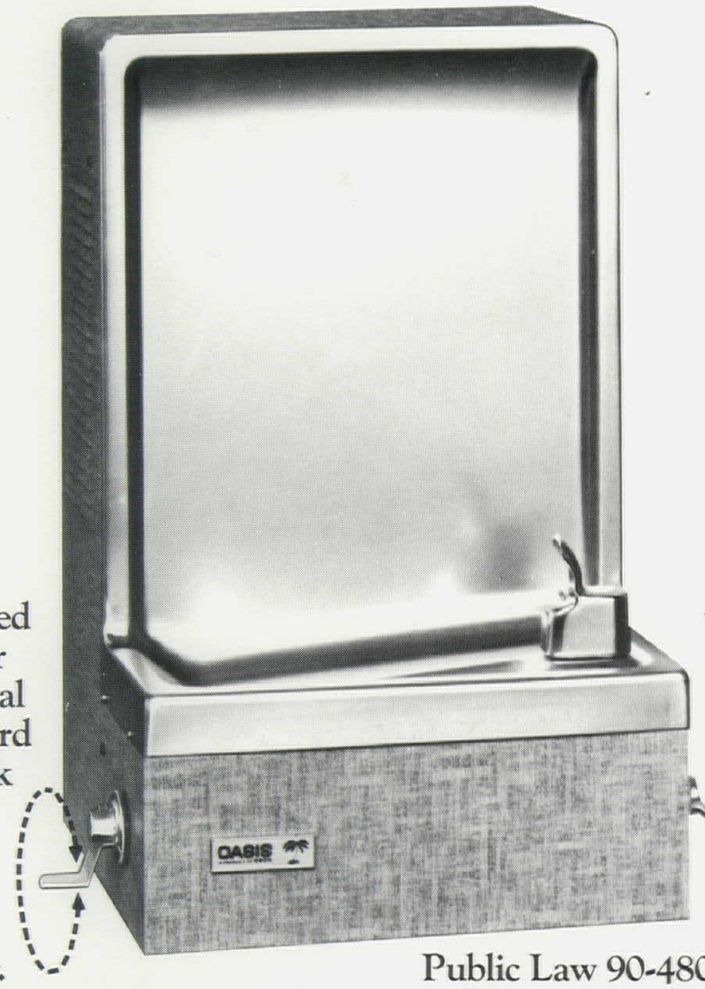
For more data, circle 66 on inquiry card

New Oasis "Soft Touch" cooler makes it easy for the handicapped to get a drink.



This new wall-mounted cooler is designed for people whose physical handicaps make it hard for them to get a drink from conventional water coolers. Wheelchair users, for example, will find it much handier.

Two "Soft Touch" levers—one on each side of the cooler—operate up or down at the slightest pressure. Either one of them will activate the bubbler, and there are no hard-to-use knobs or buttons. The levers can be positioned or re-positioned any place in a 360° circle, and their unique no-linkage mechanism needs no adjustment.

A metal plate on the bottom of the cabinet protects against injury or torn clothing. All the other famous OASIS water cooler features are there, too, and it serves seven gallons of cold water per hour. It also conforms to A.N.S.I. Standard A117.1 Section 5.7.2 and Public Law 90-480.

Call or write for a demonstration of our new "Soft Touch" Model ODP7WM-D. See for yourself how much better it is. And how it makes it easy to get a drink when it's hard to get a drink.

OASIS®
The word for water coolers.

OASIS Ebco Manufacturing Co., Columbus, Ohio 43213

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For more data, circle 68 on inquiry card

15 new clear, honest colors added to the broadest line in the laminate industry.

Now, Formica gives you solid colors in the breadth and scope you need! Each color family has been rounded out to beautifully broaden your options.

Formica's Design Center—unique in the laminate industry—has worked closely with fabricators, architects, designers and the Color Marketing Group to ensure that each color will fill a need. Not just today, but tomorrow as well.

See this spectrum of solids . . . part of the broadest line in the laminate industry. Contact your Formica Distributor now!

FORMICA® BRAND
decorative laminate

Introducing the CLEANLINE® Sprinkler.

A beautiful way to help save lives.

Now there's a new way to design in fire protection for life safety in modern high rise and other buildings without intruding upon design aesthetics. Grinnell's new CLEANLINE® Recessed sprinkler is so unobtrusive, so trim and compact, once it's installed you'll hardly know it's there.

But don't let CLEANLINE's quiet good looks fool you. Beneath that attractive closure you'll find one of the most reliable sprinkler heads in the industry. When room temperature reaches a predetermined level, the attractive closure falls away, exposing the *fast*-response Duraspeed sprinkler. As a second predetermined temperature is reached, the sprinkler activates, distributing a uniform water spray to put down a fire.

The standard finishes available are satin chrome and white. CLEANLINE Sprinklers are also offered in a variety of finishes to match any decor. All metallic finishes are UL-listed.

There's a lot more to tell about CLEANLINE. For more information and complete specifications, call your nearest Grinnell district office listed in the Yellow Pages, or write Grinnell Fire Protection Systems Company, Inc., 10 Dorrance Street, Providence, Rhode Island 02903.

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GRINNELL

GRINNELL FIRE PROTECTION SYSTEMS COMPANY, INC.

PROTECTING LIFE AND PROPERTY SINCE 1850.

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OFFICE NOTES

Name changes, new firms

Lapicki/Smith Architects, 617 Park Avenue, Baltimore, Maryland, have expanded their offices to include space at 619 Park Avenue.

Cimini & Meric and Associates, Inc. have changed their name to **Cimini Meric Burns Counce, Inc., Architects Engineers Planners.**

Haines Jones Farrell White Gima, Architects Ltd. have changed the firm name to **Architects Hawaii Ltd.**

Loebl Schlossman Dart & Hackl have changed their firm name to **Loebl Schlossman & Hackl.**

Gordon Kahn Associate Architects announce their offices are now located at 415 Lexington Avenue, New York, New York.

Emery Roth & Sons are pleased to announce the establishment of a new Houston-based firm called **Robert Sobel/Emery Roth & Sons, Inc. Houston,** located at Post Oak Central, 2000 South Post Oak Road, Suite 1410, Houston, Texas.

Haines Lundberg Waehler have a new address at Gateway 1, Newark, New Jersey.

Design Associates, Incorporated have moved their offices to 180 North Michigan Avenue, Chicago.

Iffland Kavanagh Waterbury have formed a new firm located at 104 East 40th Street, New York, New York.

Selje, Bond & Stewart have changed their firm name to **Selje, Bond, Stewart & Romberger.**

Kenneth G. Ebert, architect, announces the opening of a new firm called **Design Alternatives,** 217 South Wind, Manhattan, Kansas.

Lorrin Lee AIA has started a new architectural firm called **Lorrin Lee Associates** located at 1717 Keeaumoku #305, Honolulu, Hawaii.

Doug Meyer, AIA, has been named partner-in-charge of the Los Angeles-based architectural firm of David Jay Flood & Associates. The newly formed partnership will be known as **Flood, Meyer & Associates, Inc.**

Irwin A. Regent and Associates, Inc., architects have moved to new offices in Worcester Plaza, 446 Main Street, Worcester, Massachusetts.

Larry E. Yeakel, AIA, & Associates Inc. are pleased to announce their new firm, located at 1302 Kettner Boulevard, San Diego, California.

Sam Kiyotoki and Stan Bell AIA have formed the new architectural-land planning firm of **Kiyotoki/Bell & Associates** in Irvine, California.

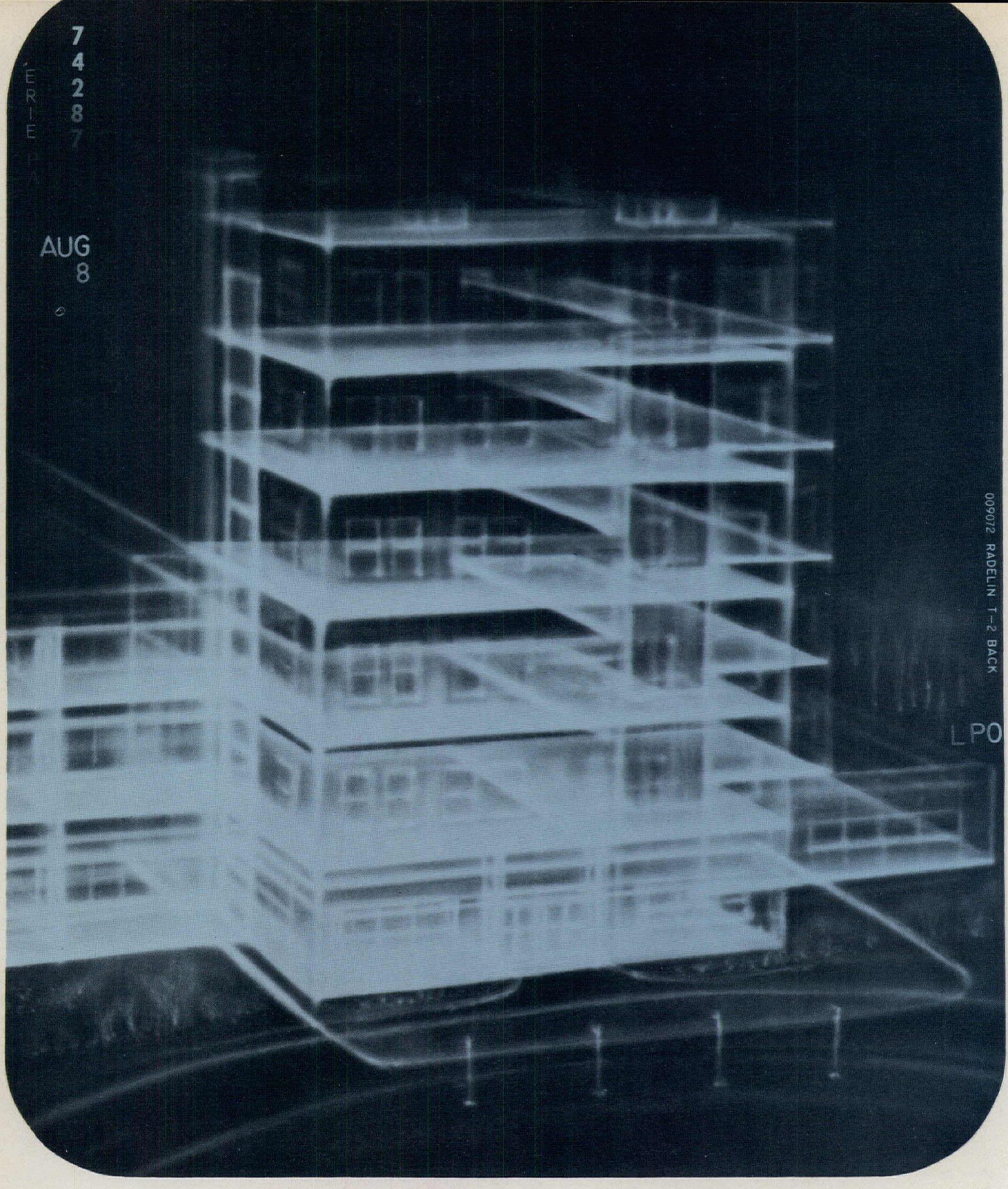
McClellan Company, consulting engineers announces the relocation of their Clearwater office to 532 South Ft. Harrison Ave., Clearwater, Florida.

New associates, promotions

Michael Baker Corporation, consulting engineers has announced the promotions of **Charles I. Homan** to assistant vice president, **Patricia M. Fabert** to assistant secretary and **Donald J. Nelson** to assistant treasurer.

Michael E. Elia and **Michael B. Landes** have been appointed electrical specification

Continued on page 201



Our patient, the hospital.

So how do you diagnose remodeling in a hospital?

Get the team together: administrators, consultants, architects and AMSCO Systems Company.

AMSCO has a lot to offer you—especially in the early stages. You see, most of our patients are hospitals.

Our diagnosis capability begins with a facilities and procedure evaluation. We tailor to your needs the widest range of material handling and processing systems available.

We work within your framework of time, space and money.

We provide single-source responsibility for a thorough program of support services.

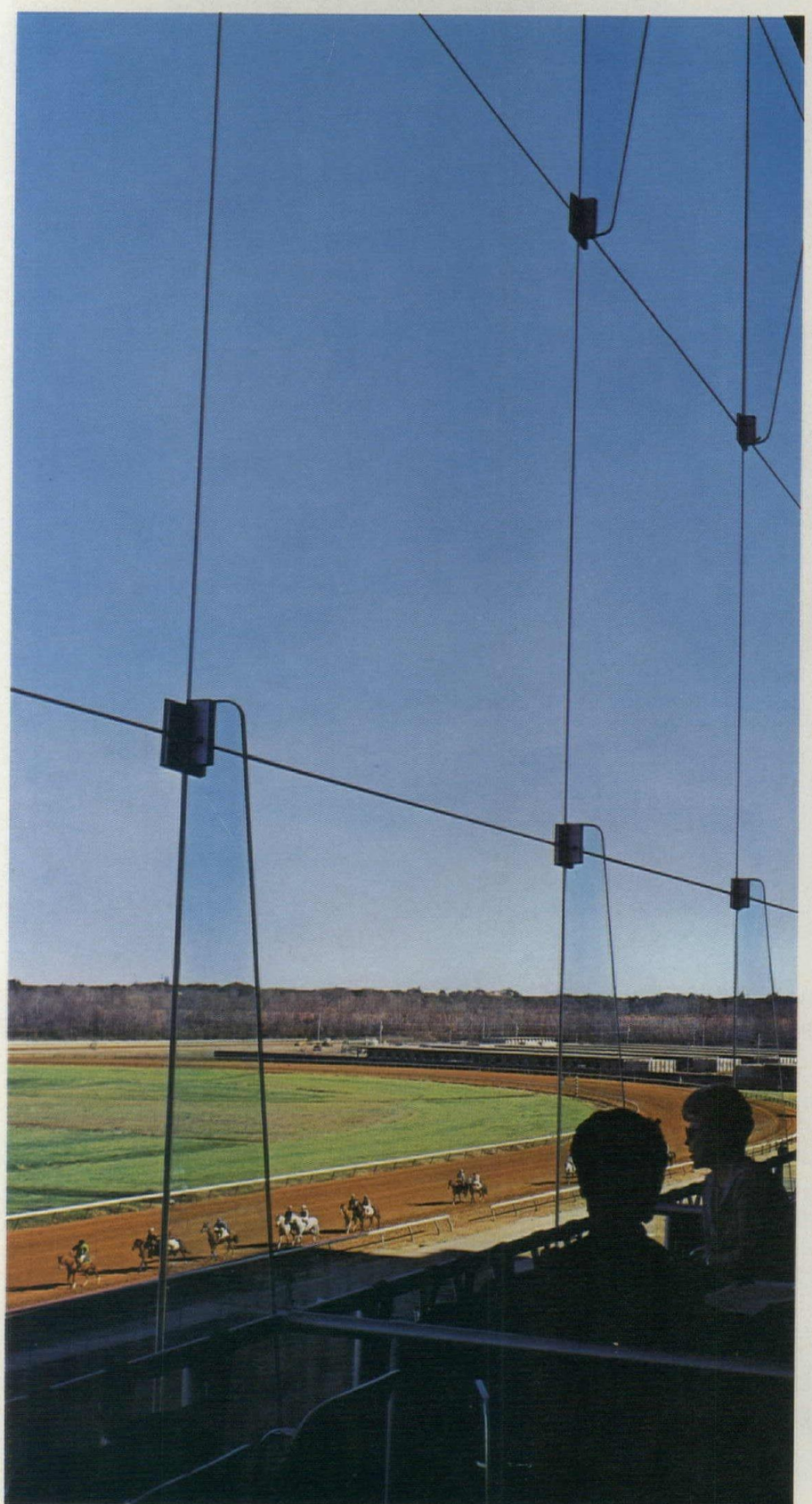
AMSCO Systems Company. Experienced in hospital remodeling as well as new construction.

For more data, circle 71 on inquiry card

AMSCO
American Sterilizer Company

ERIE, PENNSYLVANIA · 16512

10,000 racegoers shouldn't have to wear blinkers.

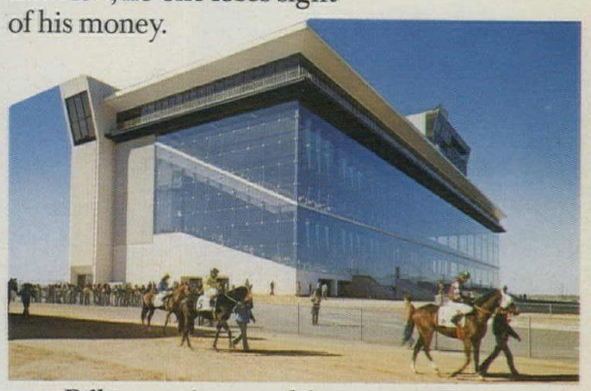


Architects: Century A.E., Houston, Texas. General Constructor: Henry C. Beck & Co., Dallas, Texas. Glazier: Binswanger Glass Company.

At the Louisiana Downs Race Track only the horses wear the blinkers.

The 10,000 spectators in the new grandstand enjoy a high, wide and handsome view of the whole course.

The Stand's 68ft high glass facia is a Pilkington 'Armourfloat' Suspended Glass Assembly System: the only suspended glazing system in the world capable of a towering 75ft. And, with no obscuring mullions to spoil the view, no one loses sight of his money.



Pilkington's assemblies are made of safety glass, especially tempered to resist sudden atmospheric changes and capable of withstanding virtually any windforce.

Because it is suspended from overhead, in the unlikely event of a plate being broken, the panels around the break remain intact, which makes life safer for spectators.

What's more, the design scope is practically unlimited. 'Armourfloat' suspended assembly systems go where you want them to go.

And the design concept has been thoroughly tested by the independant U.K. Government funded Agrément Board.

Write for fully illustrated brochure to Doug Curry, Pilkington Brothers Canada Ltd., 101 Richmond Street West, Toronto 1, Ontario. Cables: Pilkho Tor. Telephone: 416 363 7561.

And you'll discover that with the Pilkington System the sky's the limit. Well, 75ft anyway.

PILKINGTON

Glass. We make it work harder for you.

For more data, circle 72 on inquiry card

In the land of the barrel, the clothed man is king.

A parable from Provident Mutual:

In Barrelland, people barrel along obliviously, unmindful of the future, depending upon propitious fortune to see them through. Happy creatures, yet ill-prepared.

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Crocker Bank Operations Center, San Francisco, California
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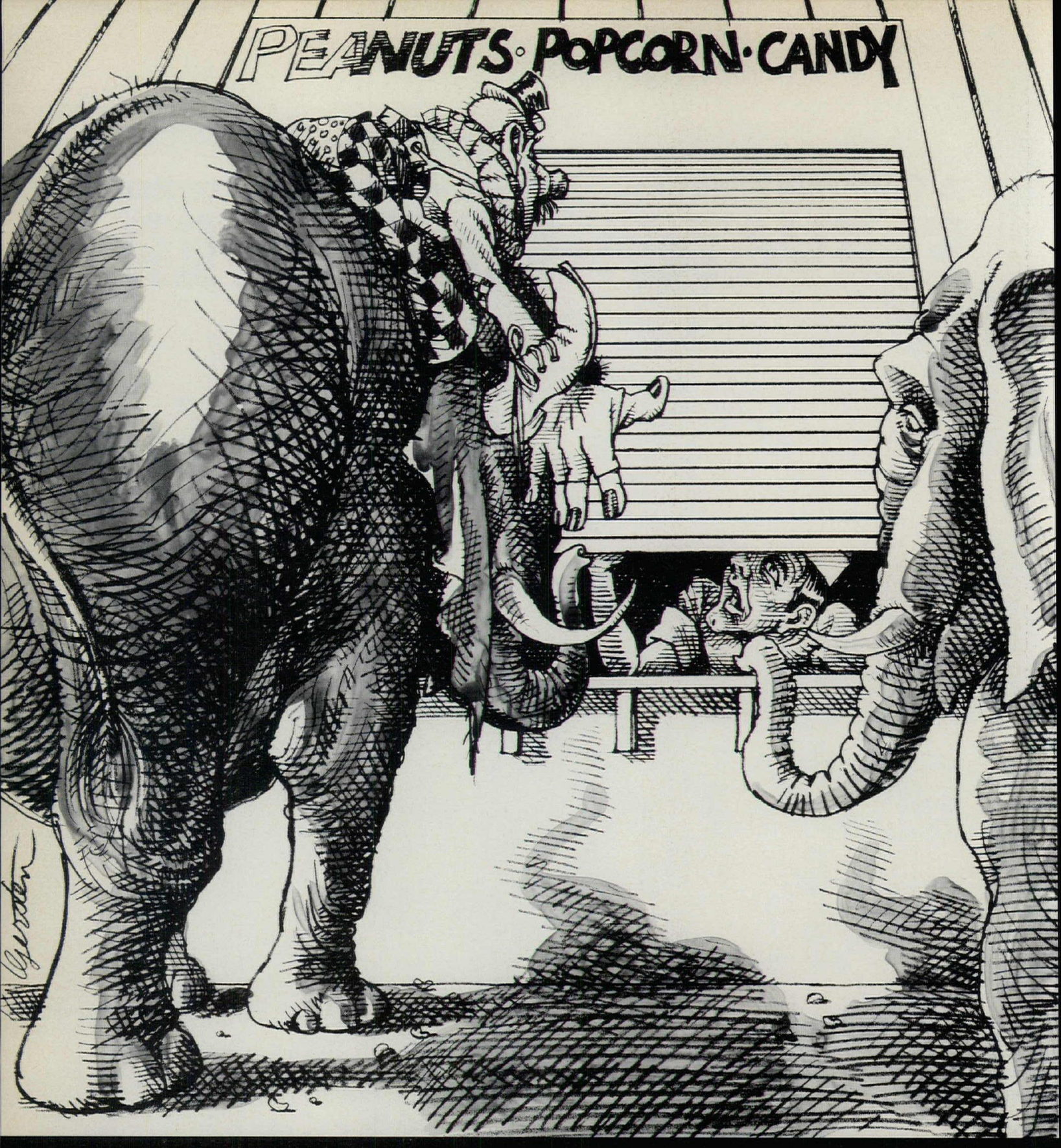

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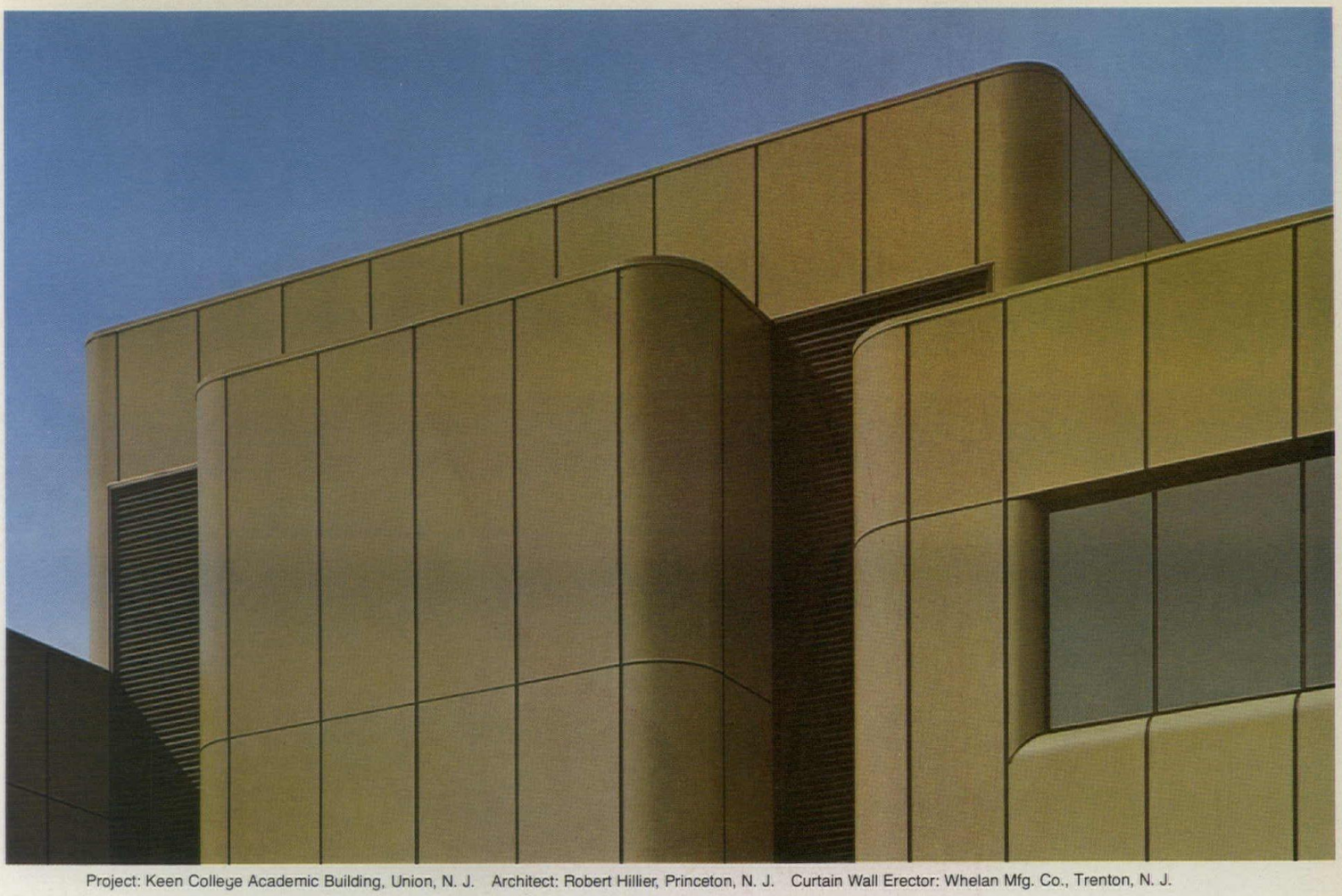

Project: Keen College Academic Building, Union, N. J. Architect: Robert Hillier, Princeton, N. J. Curtain Wall Erector: Whelan Mfg. Co., Trenton, N. J.

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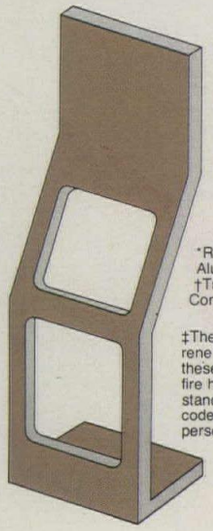

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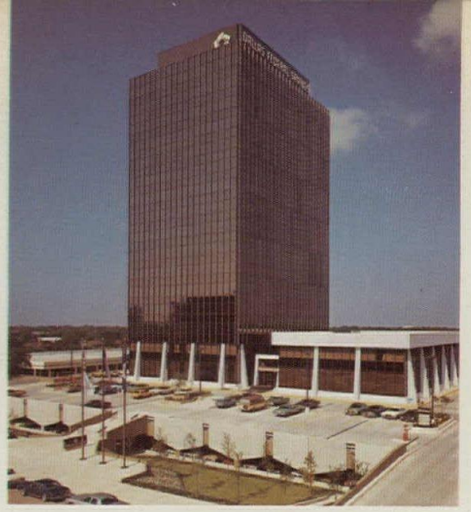

Functional accents of stainless steel for Dallas Federal Savings.

This 12-module Halsey Taylor service wall creates a focal point for the south wall, first floor, of the Dallas Federal Savings & Loan Association Tower.

The Dallas Federal corporate offices, which occupy the concourse and first two floors, contain six Halsey Taylor service wall units. All of the units are stainless steel. Two incorporate 12 modules each and four are composed of nine modules each. Functional modules consist of drinking fountain and cooler, a fire hose cabinet and a clock panel. Remaining panels are decorative.

"Our Halsey Taylor units are beautiful as well as functional," states Mr. Earnest Brownlee, Property Manager and Vice President, "and the stainless steel complements the chrome trim used throughout the building interior."

The Halsey Taylor Service Wall System conserves space, reduces the number of isolated wall cutouts normally required, and makes the location of critical building facilities easy to remember.

The wide selection of functional and decorative panels permits broad design flexibility. In addition to stainless steel and PATINA bronze-tone stainless, eight Polychrome colors are available. Functional modules include drinking fountains, clocks, directory boards, fire hose and extinguisher cabinets, fire alarm pulls, telephones, ash trays, waste receptacles, and loudspeaker grilles. All modules are standardized and any number may be included in a single station—depending on the amount of wall space at your disposal.

For complete details, specifications and a modular wall system design kit, write to Halsey Taylor Division, King-Seeley Thermos Company, Freeport, IL 61032.

Dallas Federal Savings & Loan Association Tower:

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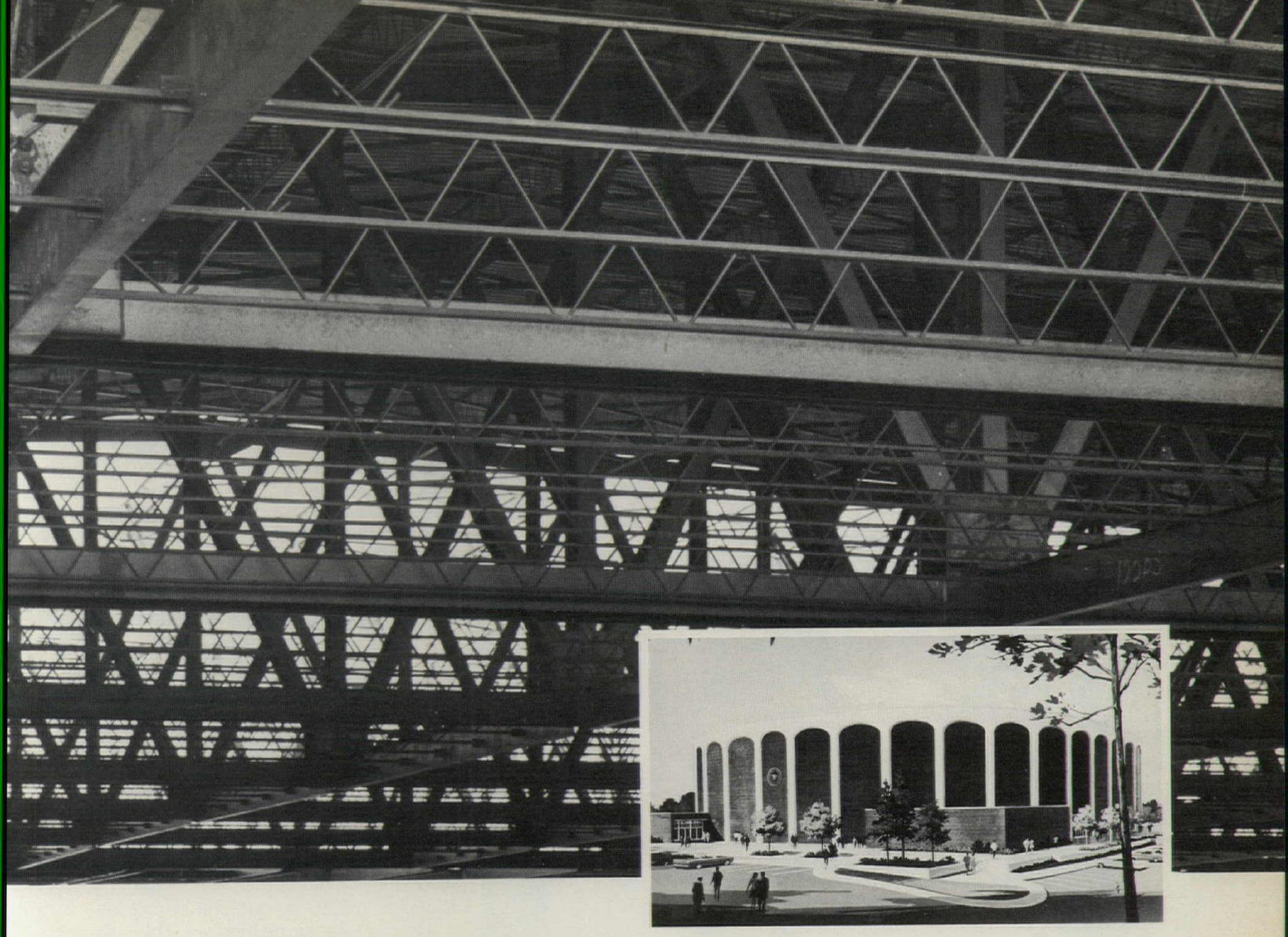


How an all-purpose building found all-purpose values in steel joists.

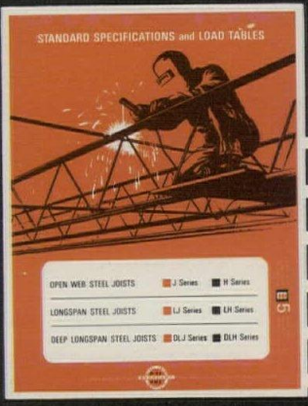
The Humphrey Coliseum at Mississippi State University is a sports arena on some nights, a center for lyceum, musical theater and entertainment-type productions on others.

To match these needs the principal architects, Brewer, Godbold and Associates, Ltd., Clarksdale, Mississippi, had to combine strength with excellent acoustics. They found steel joists, supplied by general contractors, Gresham, Williams & Johnson Co., Decatur, Alabama and the Connors Steel Company, Birmingham, Alabama, met their unique construction needs.

The spacing provided by steel joists proved exceptionally functional in supporting the required acoustical ceiling. With joist construction and the use of metal decking across the entire attic space, walkways and access to lighting fixtures became available without building expensive catwalks and railings. Further savings were enjoyed when the joists were used in place of scaffolding in hanging the ceiling.

The all-purpose advantages of steel joists paid off handsomely in the all-purpose Humphrey Coliseum.

We'd like to send you more information on how the versatility of steel joists can work for you. Our latest edition of Specifications and Load Tables gives you the facts on Open-Web, Longspan and Deep Longspan Joists. It's free. Just mail the coupon.



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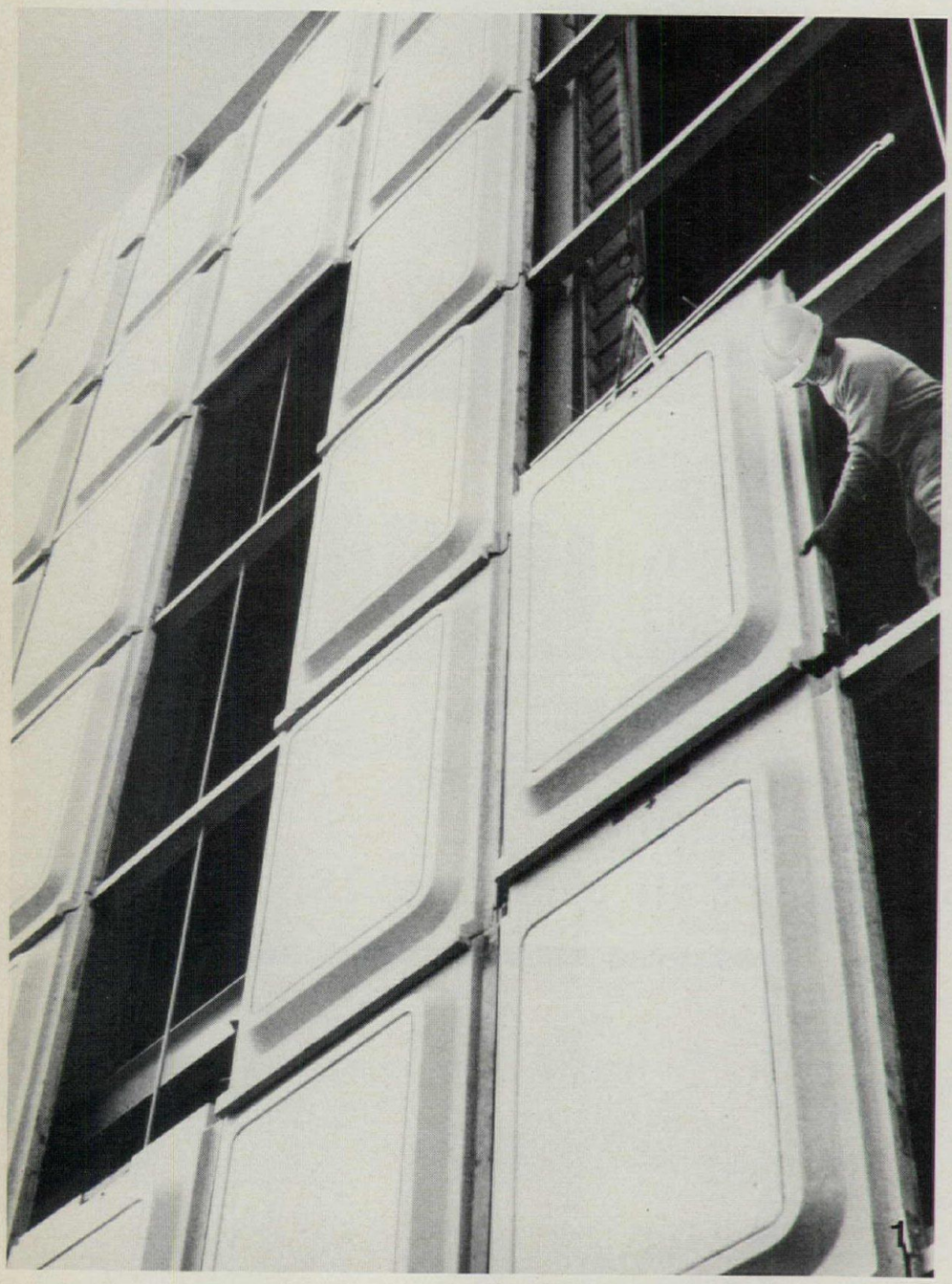

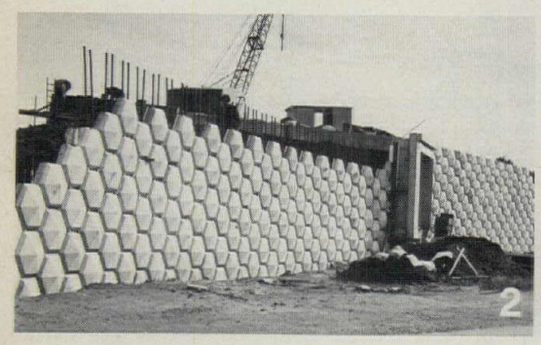

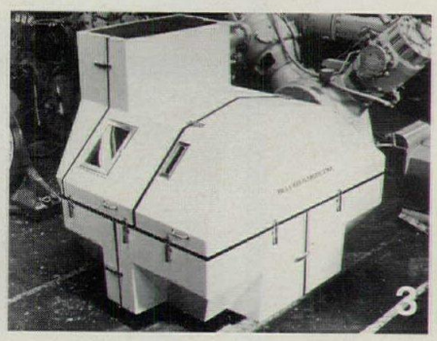

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See Sweets General Building (Architectural File) 7.5/Cem

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Matthews makes signage a fine art at the Virginia Museum.

The Virginia Museum of Fine Arts celebrated its 40th anniversary by dedicating a new North Wing, the culmination of a 10-year program.

In addition to giving the museum much-needed space, the wing helps the museum accomplish something rather unique with visitor traffic flow. The museum's exhibits are arranged in chronological order, but because of the placement of the original entrance, visitors entered right in the center of civilization's time span. Now, by entering through the new North Wing, visitors may start with the classical world of Greece and proceed straight through to the Modern World.

The North Wing houses three new galleries; one a permanent display of Art Nouveau, one devoted to a series of loan exhibitions and the last will offer a schedule of one-man exhibitions by Virginia artists. Strikingly modern, the new wing departs from the Georgian style of the original building but employs the same red brick and limestone, creating a strong visual relationship.

If there's any structure in the world where the signage must be pleasingly informative rather than loudly intrusive, it's a museum. Slapped-up signage would never do. That's why the architects and designers, aware of the need for an efficient traffic moving system, specified a complete signage program in their initial plans.

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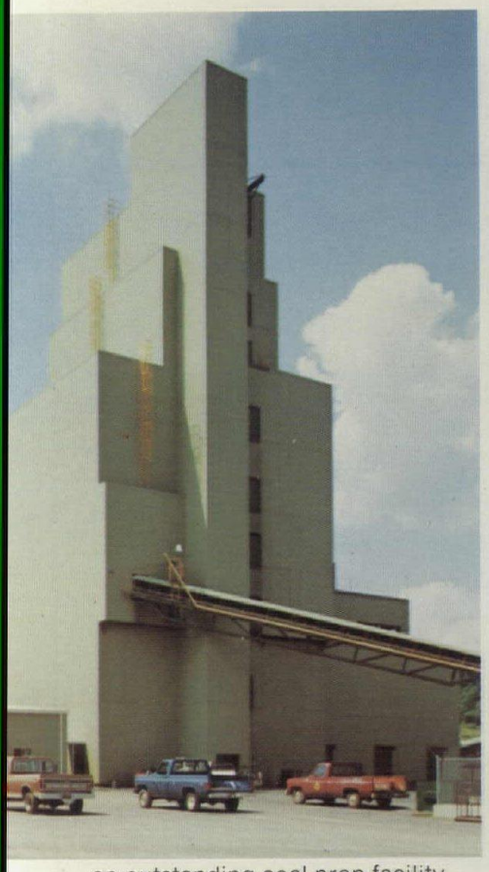

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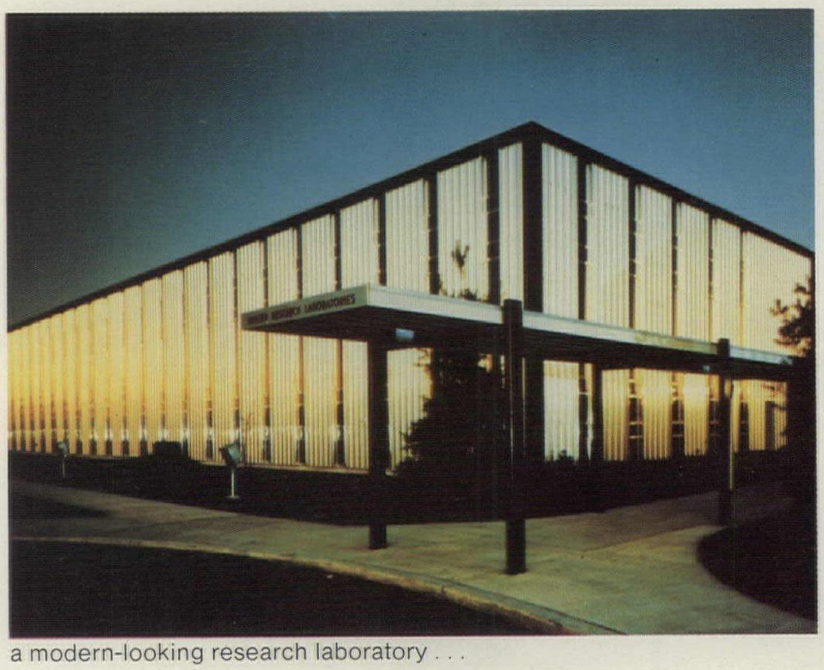

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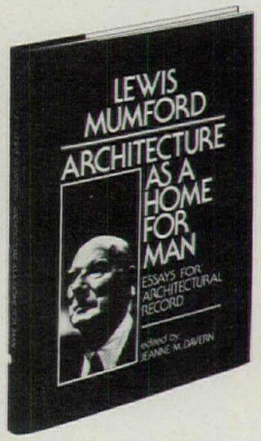

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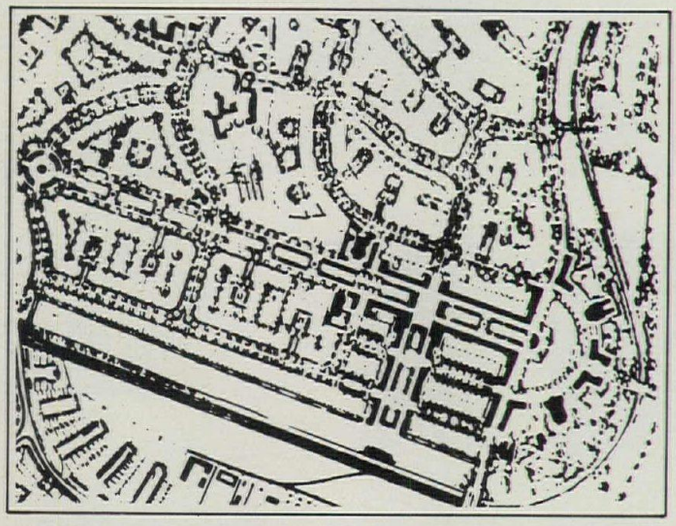

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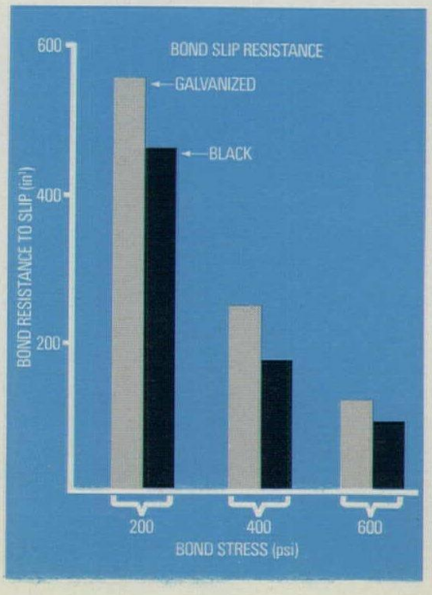

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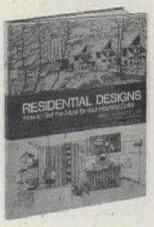

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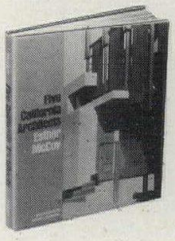

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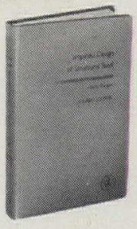

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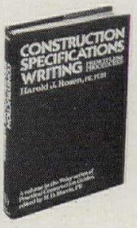

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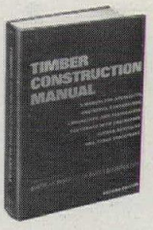

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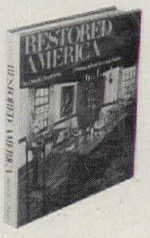

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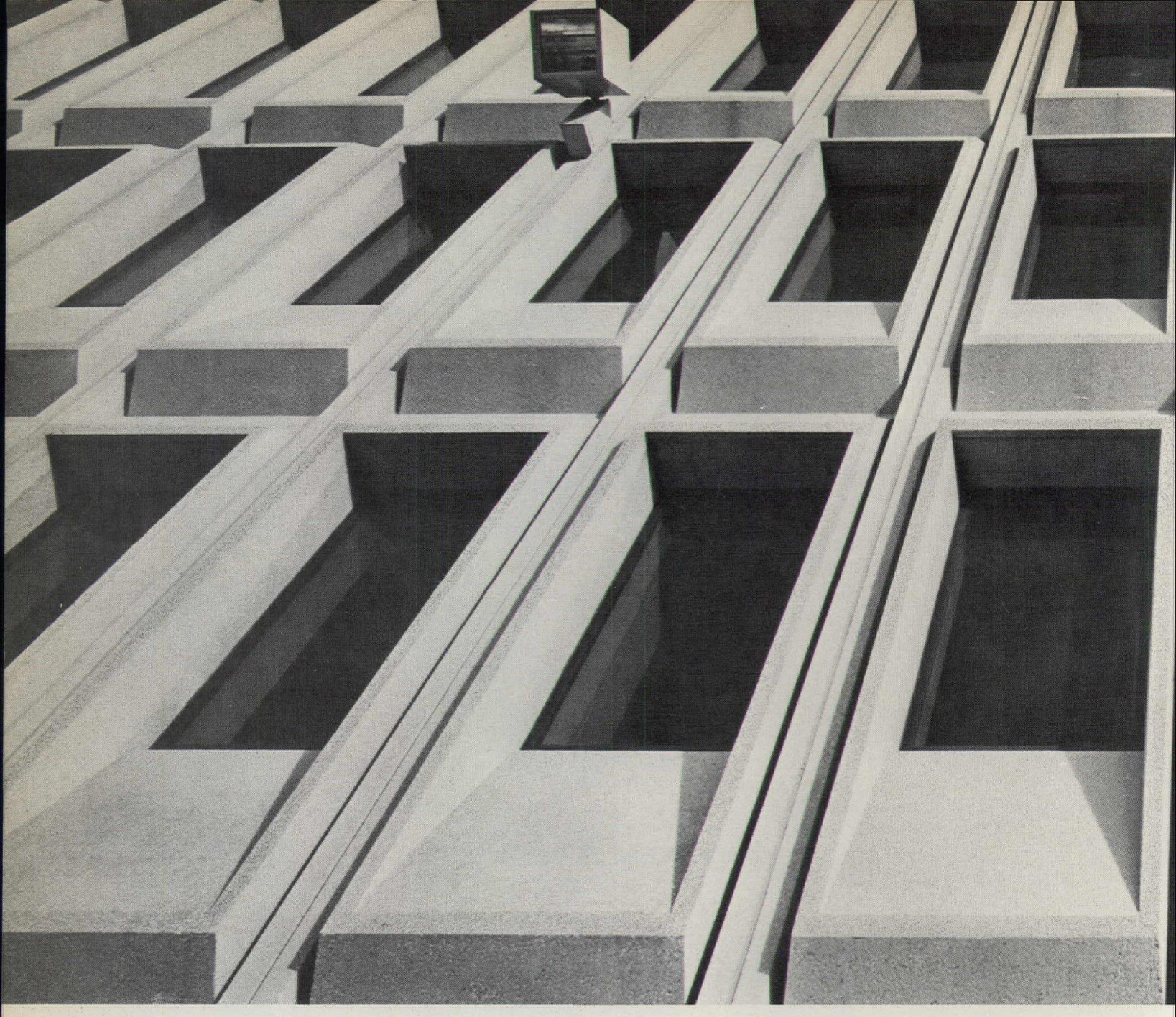

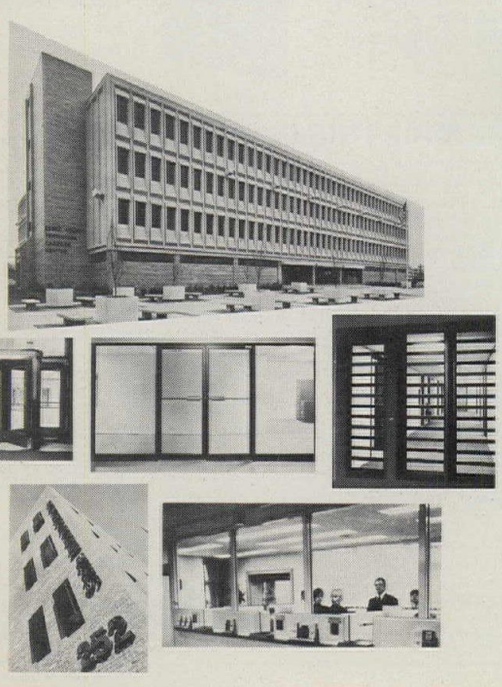

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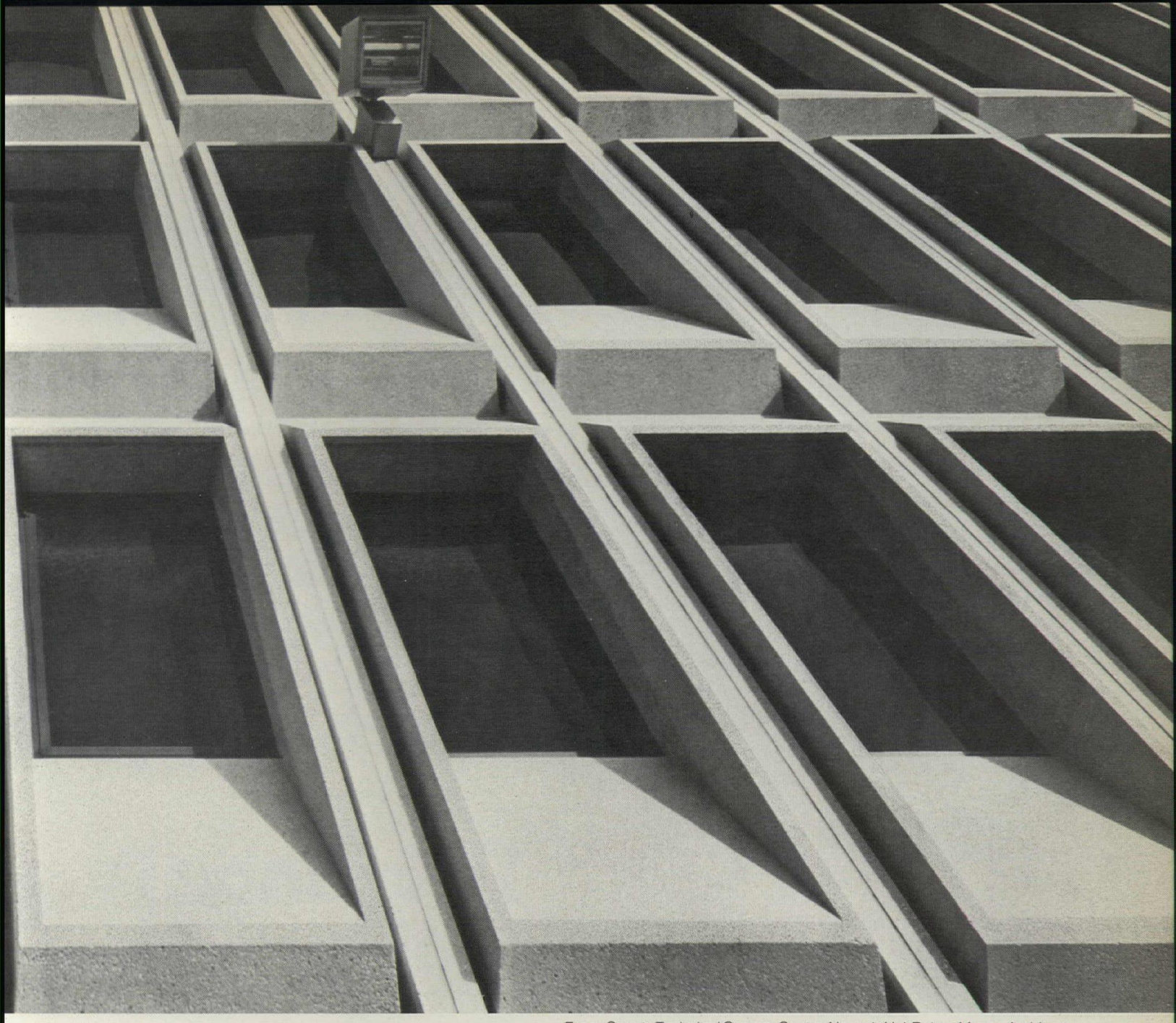

Essex County Technical Careers Center, Newark, N.J. Robert Moran, Architect

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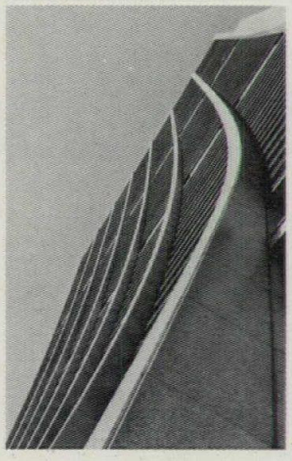

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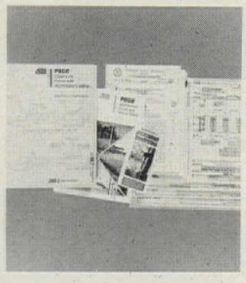

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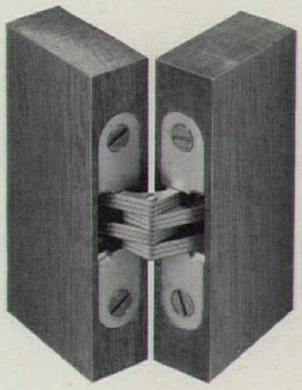

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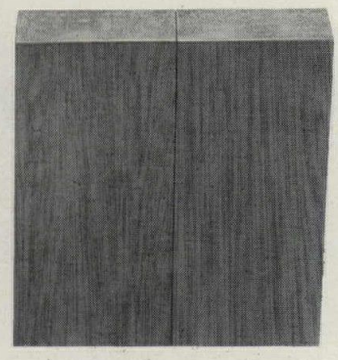

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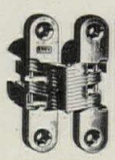

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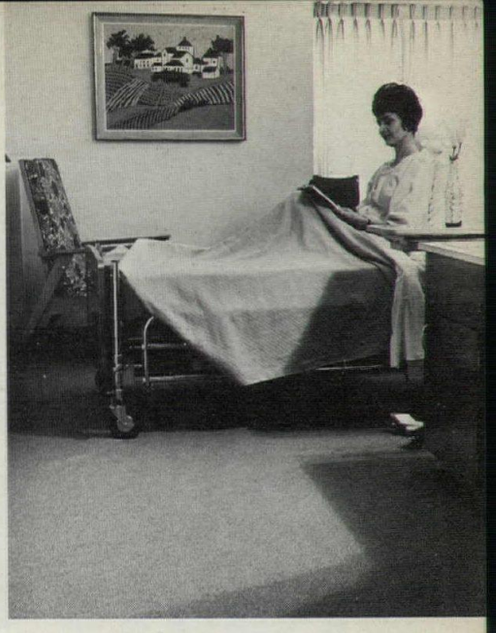

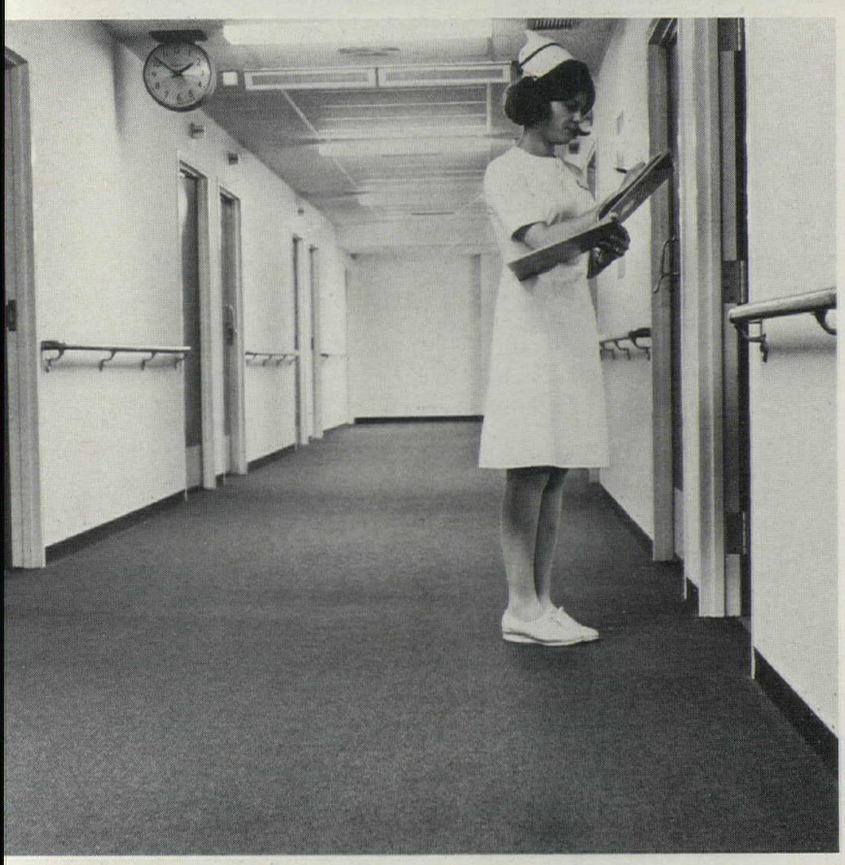

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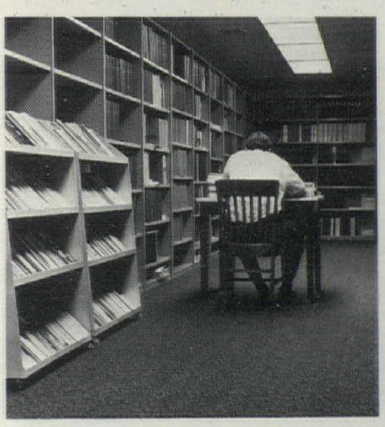

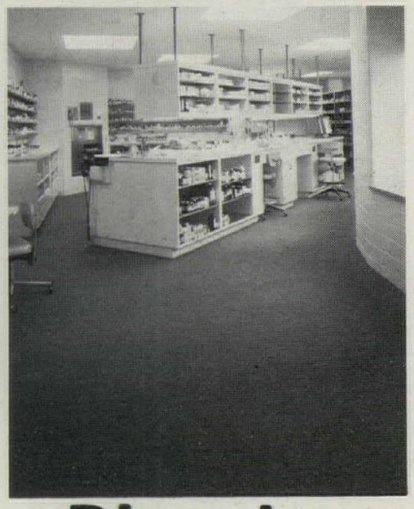

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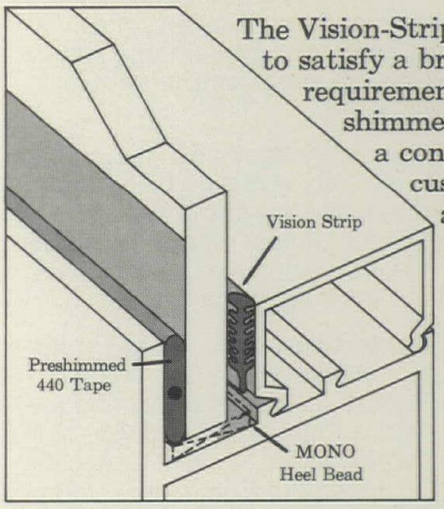
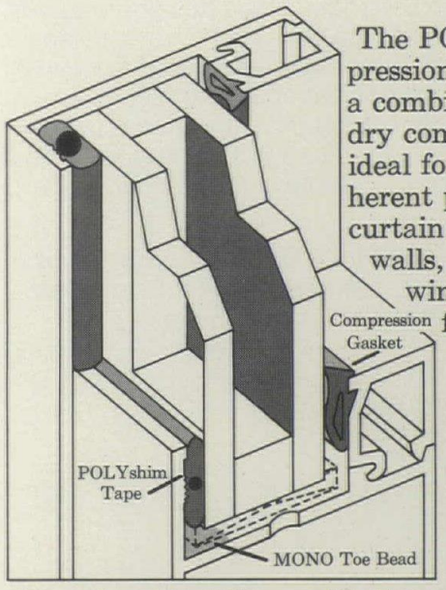
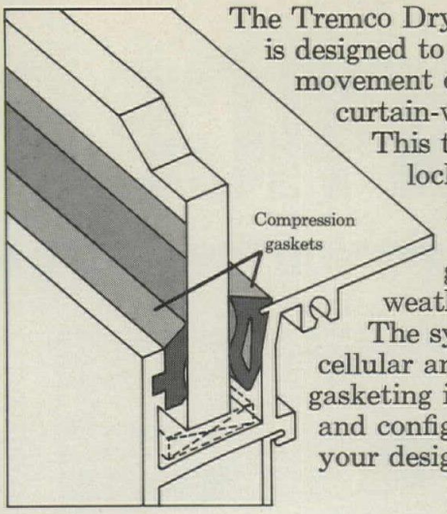


The Vision-Strip System is designed to satisfy a broad range of glazing requirements. Tremco Preshimmed 440 Tape provides a continuous shim that cushions the glass around the full perimeter and prevents pressure points and squeeze-out. A continuous heel bead of MONO sealant prevents leaks at tape corners and sash joints. The Tremco Vision Strip shims the full interior perimeter and provides a trim, clean sight line. These three components combine to give you leakfree security in a broad range of applications.



The POLY-WEJ™ compression glazing system is a combination of wet and dry components that is ideal for solving the inherent problems of stick curtain walls, rain screen walls, or offset strip windows. The preformed, highly adhesive POLY-shim® tape provides a continuous shim for even windload transfer. The POLY-WEJ neoprene gasket is engineered for high dimensional stability and held to close manufacturing tolerances to deliver trouble-free compression glazing. Maximum security for the whole system is assured by using MONO at all critical points.



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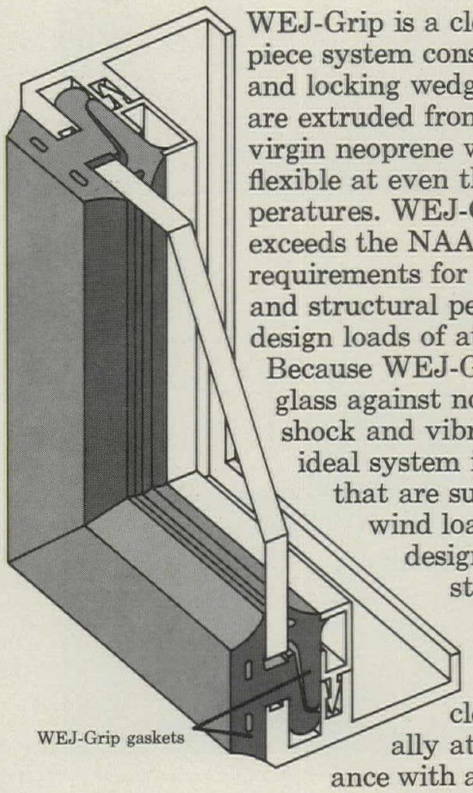

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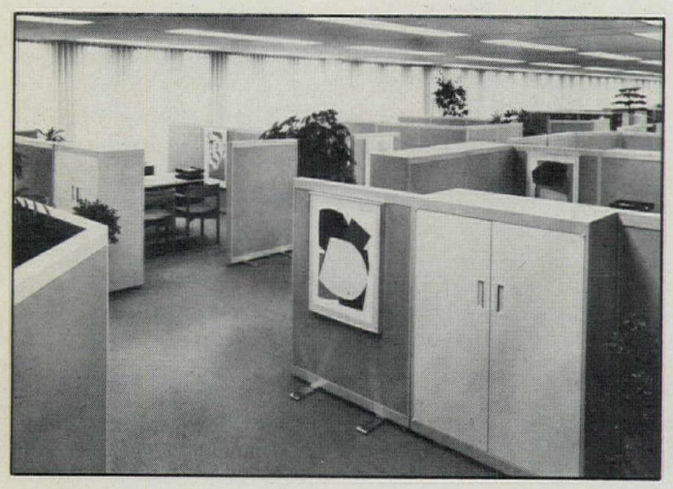

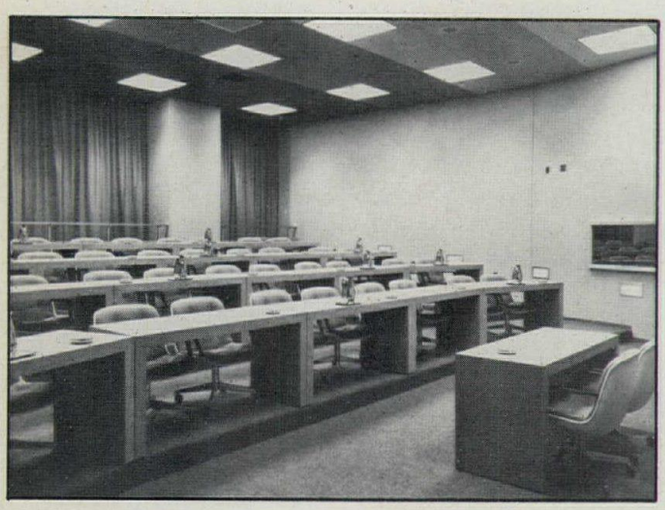

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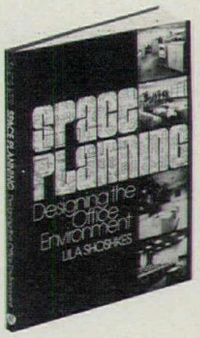

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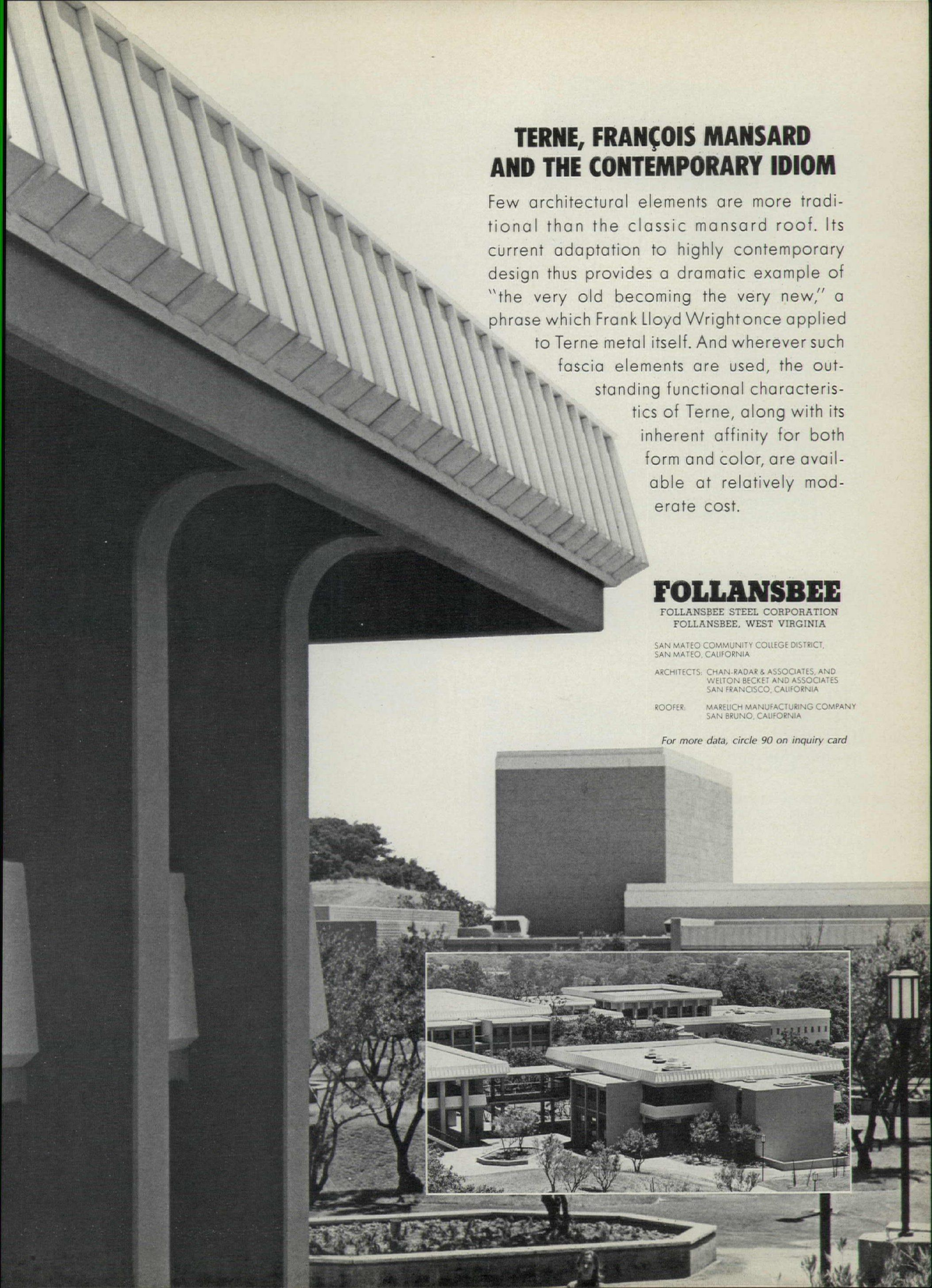

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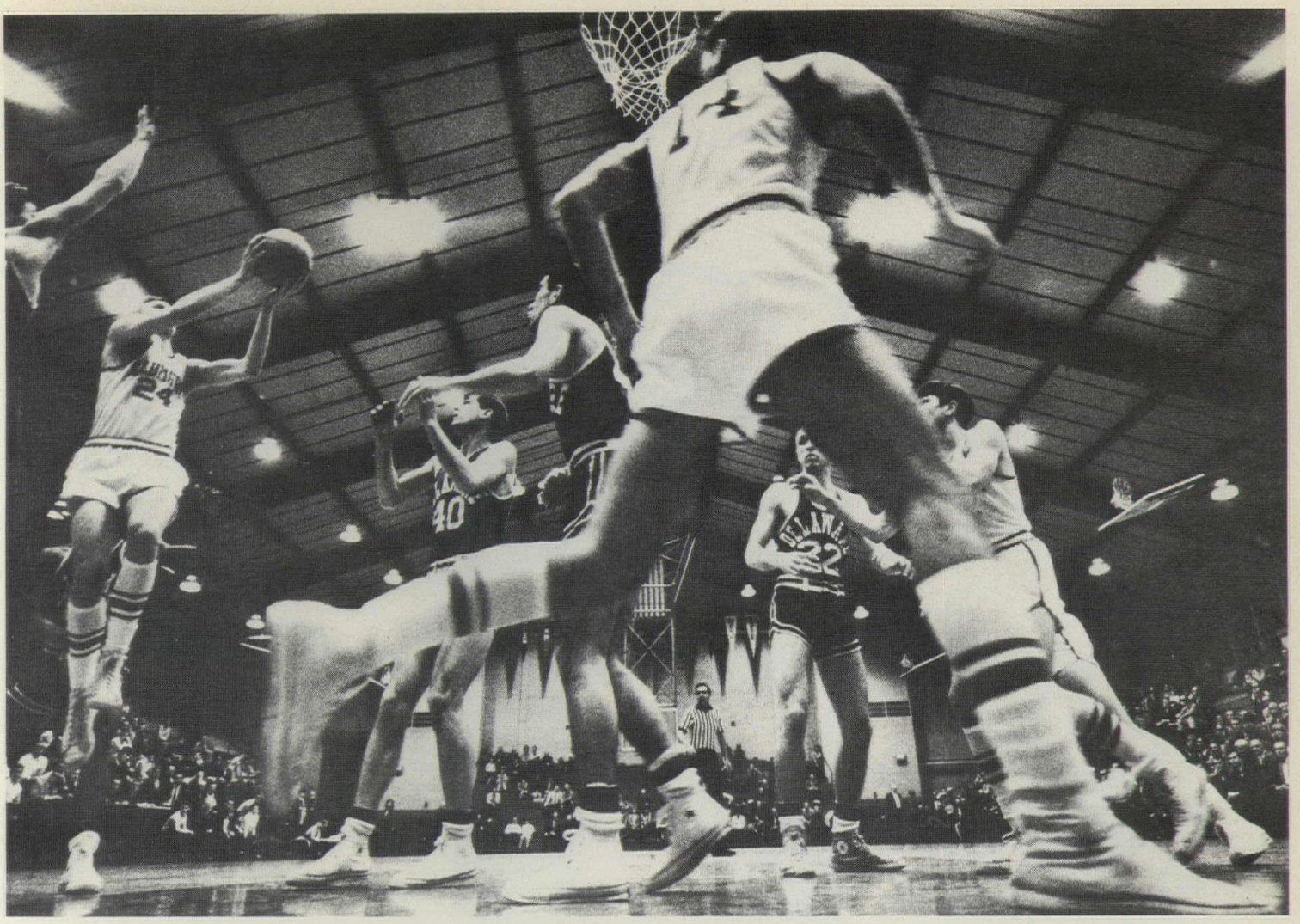

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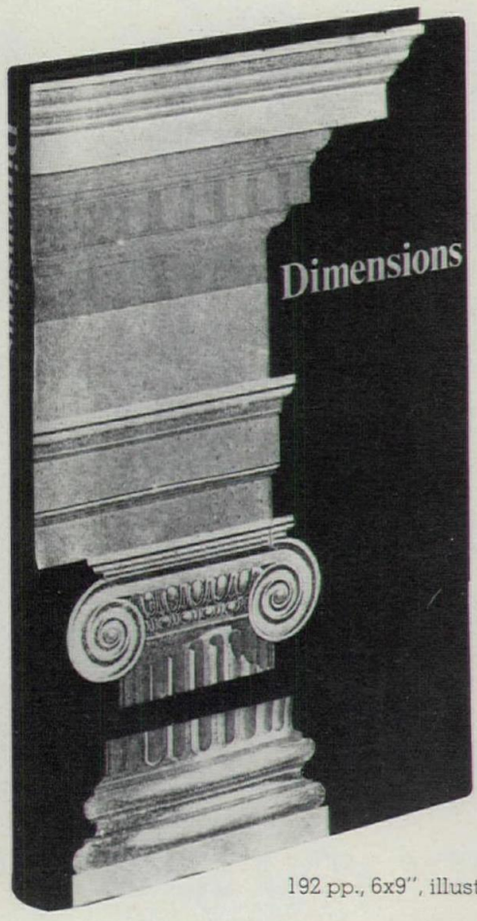

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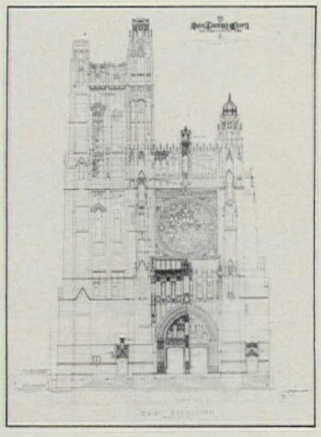

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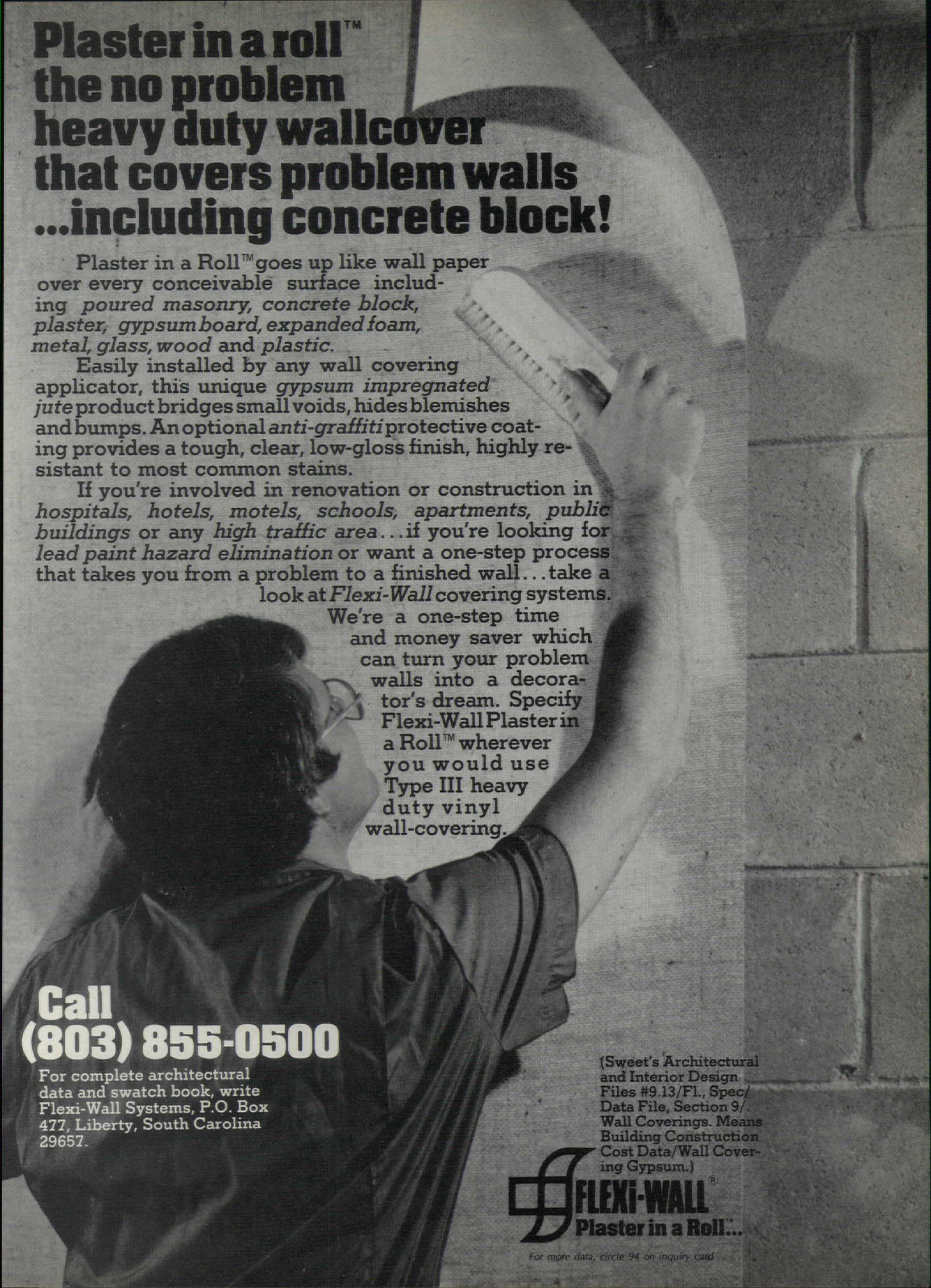

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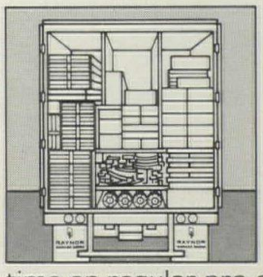
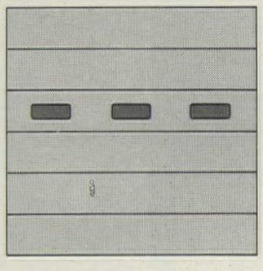


Raynor knows how important timing and coordination are on any construction project. That's why we're as concerned with delivering our product as we are with building it. We have our own fleet on the road all the time on regular pre-scheduled runs. Our distributors and customers know that when we're headed their way they can depend on us being there on time. It's the shortest distance between our shipping dock and customer satisfaction . . . one haul delivery.

And, because a load is carefully packed by our own people, the chances of damage are kept to a minimum.

It's this extra concern for quality that's made Raynor a brand you can depend on for residential, commercial and industrial doors made of wood, aluminum, fiberglass or steel.

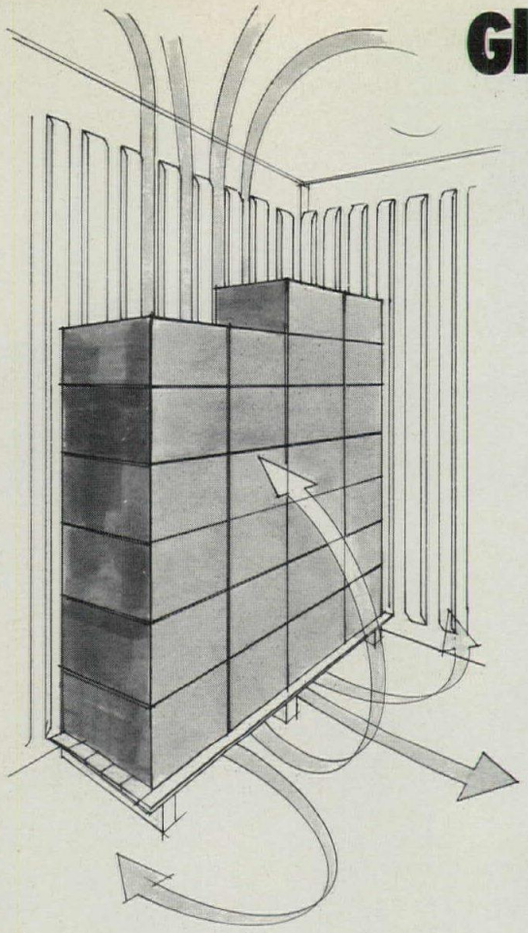


Call us for more specifics. 815/288-1431. Or write Raynor Manufacturing Company, Dept. AR, Dixon, IL 61021, for the name of the Raynor factory-trained distributor/installer near you.

RAYNOR™

Raynor Manufacturing Company, Dixon, Illinois 61021

For more data, circle 99 on inquiry card



Glasbord® ribbed panels help your refrigerators refrigerate.

...foodstuffs stay fresher

Glasbord ribbed panels on your cooler walls allow free flow of cold air around tightly stacked boxes, bins, and cartons. Foodstuffs stay fresher, spoilage is reduced, profits go up.

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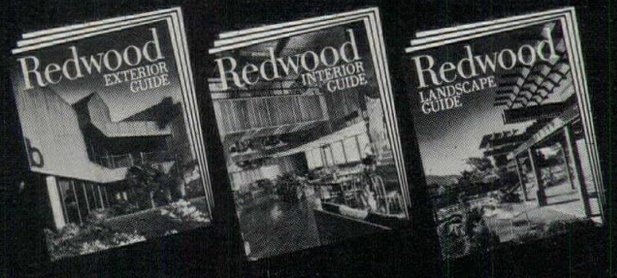
Redwood

DESIGN FACT FILES



New design ideas, practical applications and specification data for California redwood. The files you indicate will be sent at no charge.

CRA California Redwood Association
617 Montgomery Street
San Francisco, CA 94111

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☐ Interior
☐ Landscaping

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Can't say we didn't warn him. When the clearly marked panic bar is pushed, two loud battery-powered horns erupt and a unique dead-locking latchbolt releases to allow exit. Available with 2 or 4 lock/unlock control modes.

ECL-230—for heavy-duty deterrent in isolated areas

DETEX

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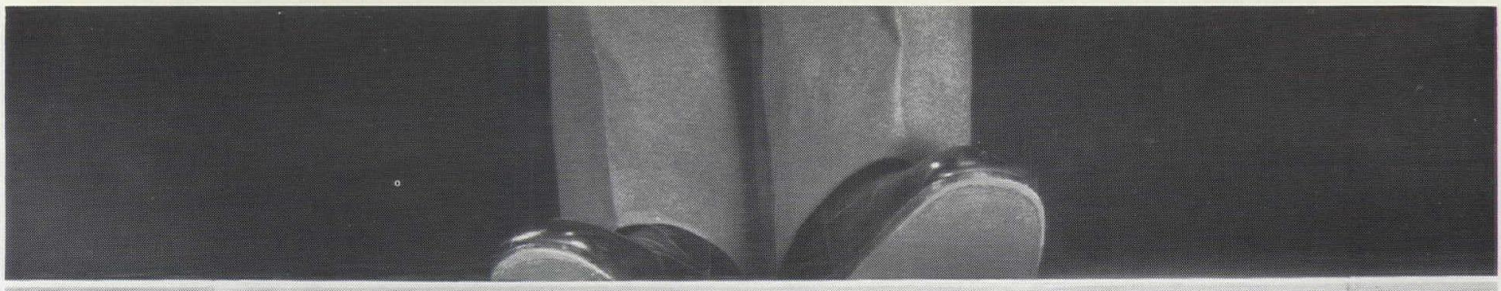

If you specify any computer floor but aluminum, it's a bad compromise!

Truth is that in 1956 when the need for raised flooring in computer rooms became apparent (with function the chief design criteria) a stringerless floor made up of pedestal mounted die-cast aluminum panels was the choice. That's how the Floating Floor System was developed. Since then, Floating Floors® have been providing trouble-free service in thousands of computer rooms.

Stringerless design makes Floating Floors the only true infinite access floor system. Male and female locking devices, at four corners of each floor panel, provide the highest lateral stability. In fact, Floating Floors meet Federal specifications for seismographic zone #3 (San Francisco).

The sad truth is that in order to compete with Floating Floors, other manufacturers have had to promote floor systems of inferior materials and design such as stringer-supported wood and steel. While costing a little less initially, these other floor systems can represent a very bad investment over the long term.

Computer downtime due to electrostatic build-up or magnetic dust may result from one of these wood or steel stringer-supported floors. Costly delays are often caused by the inconvenience of working under stringers, or disassembling and re-assembling them.

Floating Floors on the other hand have proven to be problem-free even after as many as 20 years of service. Monolithic construction with aluminum ensures dissipation of static electricity. And since aluminum is non-magnetic and does not require painting, iron rust and paint flakes are not present to enter the air and interfere with computer operation. Aluminum will not of course, rust, warp or burn.

The Floating Floor system is designed to meet future expansions and changes. Components can be easily changed around since precision die cast and milled alluminum floor panels ensure a uniformity in size (machined to +.005 — .000) not found in hand assembled products. And there is plenty of strength for the installation of new equipment.

In fact, the overall quality of Floating Floors is so good that we are able to give a FIVE YEAR UNCONDITIONAL GUARANTEE AND BUY-BACK PROGRAM with every floor installed.

For more complete information refer to Floating Floors bulletin 10.27 FL as shown in SWEETS under Specialties — Access Flooring. Call us for assistance.

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Tel: (419) 666-8750

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3650 Weston Rd.
Weston, Ontario
Tel: (416) 741-0854

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FLOATING FLOORS, INC.

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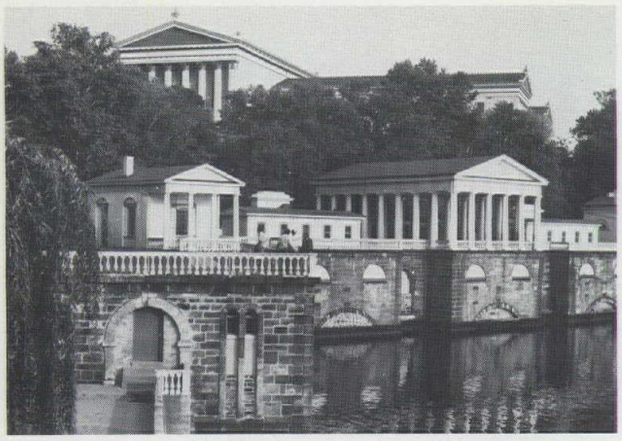

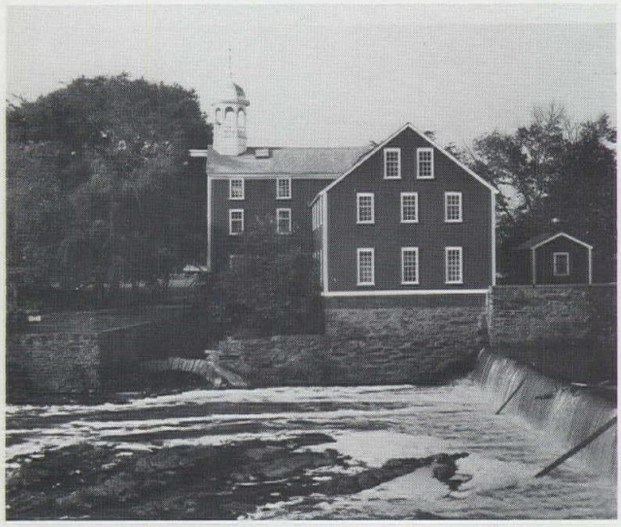

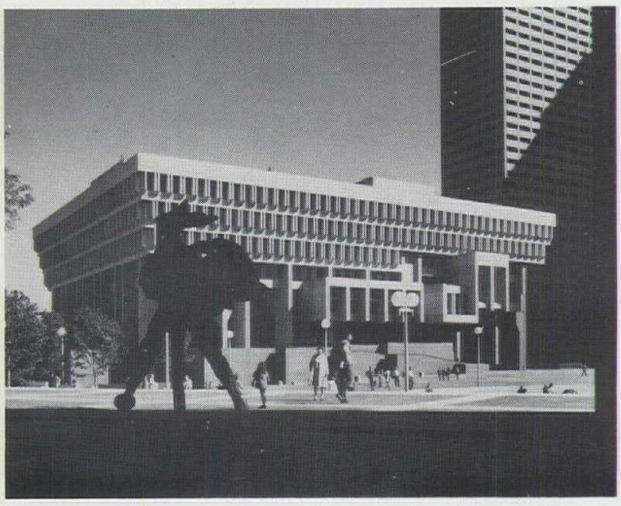

The All-New 1977 Calendar of Historic Architectural Events

The 1977 Architectural Calendar is better than ever! It is all new—365 more historic events in architectural history and 13 more stunning architectural photographs by award-winning architect-photographer G. E. Kidder Smith, FAIA. And, for the first time, this year's calendar is designed to be used as a write-in desk calendar as well as a wall calendar! They said it couldn't be done, but the 1977 Architectural Calendar continues its daily commemoration of memorable architectural events . . . famous firsts in architecture and engineering . . . births and deaths of the world's greatest architects and engineers . . . significant, amusing and little-known facts that inform and surprise even the most knowledgeable . . .

- The day Palladio was fined for absenteeism from the construction site
- The day the Parthenon was "rediscovered" during the Renaissance
- The day that Latrobe complained that architecture wasn't a "fit profession for a gentleman"
- The day Michelangelo began painting the Sistine Chapel
- The day Thomas Jefferson insured Monticello—for $6300
- The day Inigo Jones loaned his client (and King) £500
- The day the Congressional Medal of Honor was awarded to a famous American architect
- The day Disneyland opened

. . . these and hundreds of other bits of history make the 1977 Architectural Calendar a valuable source of architectural knowledge and a true collector's item.

Illustrated with 13 beautiful, full-color photographs illustrating the architectural heritage of the United States, this calendar will make a handsome and decorative addition to your home or office, and would make a much-appreciated (and inexpensive) gift. This strikingly designed calendar is printed on luxurious enamel stock in an oversized, 9x12" format. Only a limited number of calendars are being printed this year, so in order to avoid disappointment, order today! Send your payment for $5.00 to Architectural Record Books, 1221 Avenue of the Americas, 41st Floor, New York, N.Y. 10020, or use the handy order blank below.

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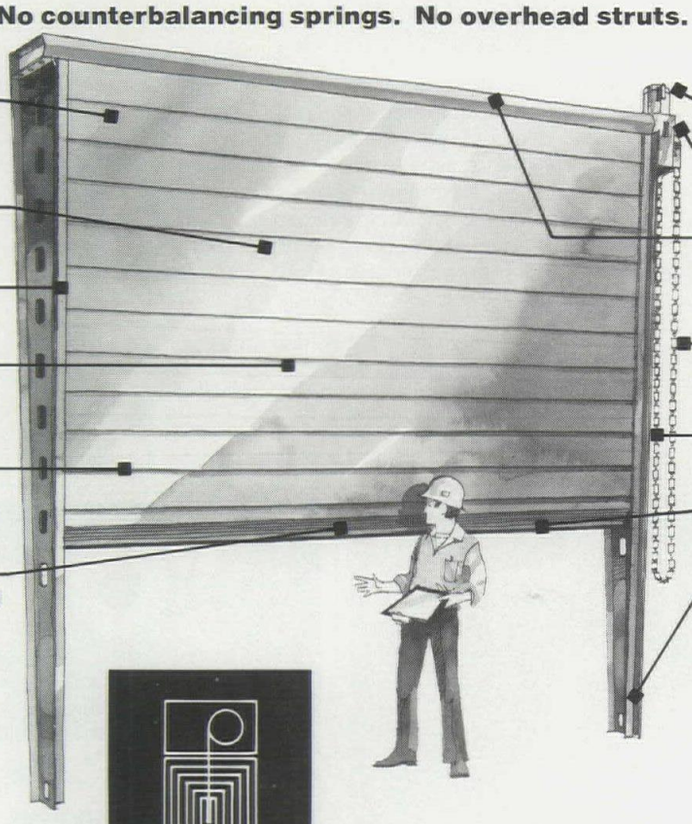
No counterbalancing springs. No overhead struts.



Dead air in hollow sections provides positive insulating values.

Baked enamel finish coat on curtain.

Close fit at side guides minimizes draft penetration.

Cables and control wires out of sight and protected within hollow door sections.

Sections not mechanically connected—easily removed for repair.

Special controls are included in bottom section to reverse door travel immediately on contact with any obstacle.

Motor location optional.

Operator mounted front, top or end; either side.

Two sets of limit controls provide "fail safe" protection against overtravel.

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Side guides and header box carry door's weight.

Heavy flexible weather strip along bottom.

Door locks and unlocks automatically in slot in side guide.

When door is open, hollow sections nest compactly overhead—saving space—minimizing clearance requirements.

THE INRYCO® TELESCOPING DOOR

The Inryco Telescoping Door has no counterbalancing springs or weights and few moving parts subject to wear and tear. Thus it eliminates the major causes of operating failure—provides the reliability so critically needed at high traffic openings. Outstanding resistance to damage—easy repair. Fast, quiet operation. Simple, all-steel construction, with two coat baked enamel finish on door panels. Standard sizes available for doors 100 to 400 sq. ft. in area. Custom doors furnished in smaller sizes and larger sizes thru 30 ft. x 30 ft.

For further information, see Sweet's Arch. or Ind. Constr. Files, section 8.9/In. Or write to Special Products Group—Milcor Division; INRYCO, Inc.; Dept. L, 4033 West Burnham Street; Box 393; Milwaukee, Wisconsin 53201.

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General Offices: Melrose Park, Illinois
Formerly INLAND-RYERSON CONSTRUCTION PRODUCTS CO.

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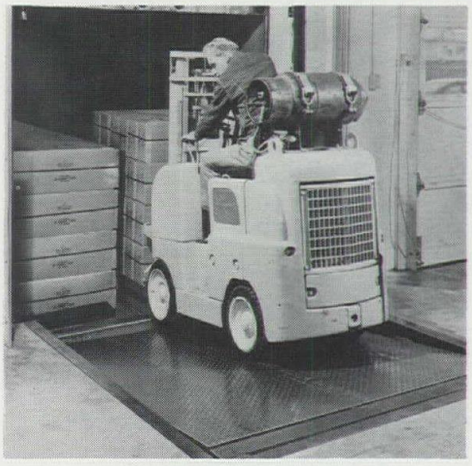
Don't Let Your Clients Accept Substitute Docklevelers



With today's high labor costs and safety emphasis you design loading docks to include permanent docklevelers. Facts prove they can easily pay for themselves in one year.

However, to assure maximum return on investment, specify genuine Kelley Docklevelers of the right type, size and capacity. Docklevelers with patented automatic safety features and a predictable life span to stand-up to high volume use year-after-year. Choose hydraulic or mechanical, standard heavy duty or extra-heavy duty models. Kelley Docklevelers cost about the same, or even less. So there's no reason to accept substitutes. Get the complete facts from your Kelley Representative or contact:

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Haws makes it an EASY REACH!

This electric water cooler ably serves individuals in wheelchairs as well as the general public, and it meets requirements of Public Law 90-480. Haws Model HWCD-8 has dual, self-closing lever valves, offering greatest user convenience. All-stainless steel exterior eases maintenance, assures permanent sparkle. If your upcoming building project involves federal funding, you'll want full facts on this wheelchair model. Contact us. HAWS DRINKING FAUCET CO., 1441 Fourth Street, Berkeley, CA 94710.

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When you specify "Olympic or equal," we sure hope you get what you want.

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1,752,000 gallons each year on 200 units

And, the Emblem is Eljer's regular production model water closet. No premium charges for watersaving. No special orders. Every Emblem uses less water per flush than some of the extra-cost "watersaving" closets.

The Emblem uses much less per flush than the 3.5 gallons stipulated by water conservation codes. And, savings over ordinary closets average a gallon and a half per flush.

So, in a 200 unit apartment building, assuming four residents per apartment and four flushes per day per resident, the Emblem can save 1,752,000 gallons of water every year. That's $1,594 savings** per year on water and sewage bills. And, as costs go up . . . so will the savings.

Gallons Per Flush*			
Emblem Model	**Water Pressure 20 psi**	**40 psi**	**60 psi**
Round	3.16	3.20	3.05
Elongated	3.05	3.12	3.16

You will conserve precious water, ease the demands on sewage systems and save on operating costs at no extra cost with the Emblem. Why would anyone buy any other water closet?

*As tested by Dynamics Testing Laboratory, Toledo, Ohio.

**Based on a 91¢ average cost per thousand gallons in 5 major cities.

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Architects/planners needed for Peace Corps projects in Latin America, Africa, Asia; VISTA projects in U.S. Housing projects, design of schools, hospitals, community centers, rehab., university teaching, regional planning, etc. Expenses paid: travel, medical, vacation and living. U.S. citizens, singles or couples only. Information: Cynthia Poindexter, ACTION, Box A-1, Washington, D.C. 20525.

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We want: Architects—with a Master's degree and 7 years experience or a Bachelor's degree and 10 years experience. Structural Engineers—with a PhD and 5 years experience or a Bachelor's degree and 10 years experience. City Planners—with a Master's degree and 5 years experience or a Bachelor's degree and 10 years experience. $28,000 yearly minimum starting salary! No local taxes at present! PLUS: furnished air conditioned apartment, small car with air conditioning, all moving expenses paid for you and immediate family, one month paid vacation, employee insurance! Contract for one or two years.—Prefer Arabic speaking individual—and able to furnish references from well known consulting firms. Please send resume to:

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University of Petroleum and Minerals—Dhahran, Saudi Arabia—The Department of Architectural Engineering, University of Petroleum and Minerals, Dhahran, Saudi Arabia, will have faculty positions open for the Academic Year 1977-78 starting 1 September 1977. Qualification includes Master's degree plus teaching and/or practical experience. Candidates with Ph.D. degree in Architectural Engineering are desirable. English used for instruction. Minimum regular contract for two years, renewable. Competitive salaries and allowances, free air conditioned and furnished housing, free air transportation to and from Dhahran each two year tour. Attractive educational assistance grants for school-age dependent children. Local transportation allowance in cash each month. All earned income without Saudi taxes. Ten-month duty each year with two-month vacation paid and possibility of participation in University's ongoing Summer Programs with adequate additional compensation. Apply with complete resume on academic and professional background, list of references, publications and research details, and with copies of degrees/testimonials, including personal data, such as, home and office addresses, telephone numbers, family status (names of children, age and sex) to: University of Petroleum and Minerals, c/o Saudi Arabian Educational Mission, 2223 West Loop South, Suite 400, Houston, Texas 77027.

Design assistant for progressive New York firm. Strong graphic ability required. Write Norman Jaffe, A-I-A, 125 E. 80 St., NY, NY 10021.

Faculty Position in Architectural Structures—The Department of Architecture in the School of Architecture and Urban Planning seeks a person to teach in the area of Architectural Structures. Applicants should have a Masters degree in Architecture with a minor or undergraduate degree in Structural Engineering or a Masters degree in Engineering and at least two years of teaching experience in Structures. Teaching responsibilities will include delivering structural analysis and design service courses and teaching with a team of building designers in a studio context. The University of Wisconsin is an equal opportunity/affirmative action employer. Send resumes to Professor Douglas C. Ryhn, Chairman, Department of Architecture, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53211.

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We seek a seasoned professional with the best of credentials in the field of Health Facilities Planning and Design for the staff of our established and respected Architectural, Engineering and Planning firm. Located in a principle Southeastern Coastal city, this new position calls for personal involvement in the functional design and consulting services we offer in ALL areas of Health Care to both public and private clients. We offer professional challenge and growth, a comprehensive benefit package and ideal living and working conditions for a professional with at least 10 years' of Design/Consulting experience on a variety of Health Care Projects. If you qualify, we genuinely invite you to forward your resume—with salary history—to us for confidential consideration.

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Princeton Architecture—Undergraduate, graduate professional and advanced studies doctoral programs in Architecture. Faculty positions available for teaching architectural design, analysis, theory and history. Write to Robert Geddes, Dean, School of Architecture and Urban Planning, Princeton University, Princeton, NJ 08540. An equal opportunity/affirmative action employer.

Head, Dept. of Arch—Masters of Arch. or equivalent, licensed, NCARB Certification. Ten years professional experience, some teaching experience desirable. Final date for receipt of application December 1, 1976. An Equal Opportunity Employer. Contact: Dr. Joseph W. Strother, Director, School of Art and Architecture, Louisiana Tech University, Ruston, LA 71270, (318-257-3909).

The University of Texas at Arlington is inviting applicants and nominations for the position of the Dean of the School of Architecture and Environmental Design (SAED). The SAED is an autonomous school with an enrollment of 900 graduate and undergraduate students and a faculty of 27. The SAED seeks an individual of leadership and vision to direct a school that currently offers a non-professional degree in Architecture, a professional degree in Interior Design, a Master of Architecture (first professional degree) and a Master of City and Regional Planning. The school is accredited by the N.A.A.B. and is a member of the A.C.S.A. and A.C.S.P. Applicants should have demonstrated professional, academic/educational and administrative capabilities. The position normally permits permanent faculty status; rank and salary commensurate with qualifications. The University of Texas at Arlington is an Equal Opportunity/Affirmative Action Employer. Completed applications must be postmarked by December 31, 1976. Nominations and requests for applications should be sent to: Chairman, Search Committee for the Dean School of Architecture and Environmental Design, University of Texas at Arlington, Arlington, Texas 76013.

POSITION WANTED

Financial Executive—Heavyweight—Listed co. V.P., Controller—CPA (Big 8 exp.)—Attorney—Acquisitions, financial controls, taxes, Exp'd. real estate, construction industries. Combines technical skills with imagination. $28-32,000 required. For resume: PW 3258 Architectural Record.

Architect-Designer, Physical Planner Finnish Architect, M.A., 24 years experience 15 years architectural design, 9 years physical planning. 18 years in Finland, own office and govt. employed, 2 years in Jamaica with UNDP, 4 years in Ethiopia as bilat. expert. Physical plans for resorts, towns, regions. Architectural design for housing, schools, clinics, factories, offices, hotels, resorts, shops etc. Project checking, construction supervision. Interior decoration for buildings, vessels. Productive, imaginative, artistic, creative ability, design quality. Seeks permanent position in U.S. For resume, references, write: Knut von Troil, c/o Harold Bolton, 52 W. Fairwood Drive Lakewood, NY 14750.

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LITERATURE

Free Construction Management Publication. Write for your free sample copy of CM World Newsletter and information on the 1976 Owner Construction Guidelines and CM Directory. You will appreciate learning about this helpful service if you are involved with the CM, construction or design industry. Write CMW, P.O. Box 1-A, Westerville, OH 43081, or call 641-882-4388.

BOOKS

Medical Gas Handbook for Hospitals. "The Design Handbook of Medical Gas Systems for Hospital and Medical Facilities" by Richard H. Toder. This handbook contains the latest design criteria for oxygen, nitrous oxide, nitrogen, vacuum and compressed air systems including: pipe sizing charts and tables •illustrations•description of systems•bulk and manifold storage•gas dispenser types and recommended locations•piping design including materials, valves, alarms, and installations•compressor and vacuum pump types, sizing and selection. $10.95 per copy. Send check to Richard H. Toder, 141 E. 89th St., New York, NY 10028.

Europe: Architectural Guide 1860-Today by Jerryll Habegger. 13 countries-500 Bldgs. with address, architect + date. 150 Illus. $4.50 Order from: Architectural Guidebook, 421 West Belden, Chicago, Illinois 60614.

OFFICE NOTES *continued from page 161*

engineers for Leviton Manufacturing Co., Inc., Midwestern and Eastern regions.

Ellerbe, Inc. announces that **Dr. Ellis G. Hanson** has been named president of Ellerbe International, Inc., a subsidiary of Ellerbe. **Robert M. Edwards** has been promoted to director of the Planning and Management Services division.

Marmon & Mok Associates takes pleasure in announcing the election of **Stephen R. Souter, A.I.A.** as partner.

The Wold Association, architects announces the appointment of **Robert C. Armbruster** to the board of directors of the firm.

Frederick Johnson has joined Design Associates as vice president for architecture.

Silvio J. Lorenzi, president of Lorenzi, Dodds & Gunnill, Inc., engineers, architects and planners, was elected vice president of the southwest region of the Pennsylvania Society of Professional Engineers.

Architect **Joseph Esherick** has been elected an associate of the National Academy of Design.

Architect **C. A. Carlson, AIA** has joined Hellmuth, Obata & Kassabaum, Inc., as a vice president.

Carroll N. LeTellier has joined Sverdrup & Parcel and Associates as vice president and regional manager of the firm's northeast region.

Lawrence D. White Associates, Inc. have named **Albert Gregor AIA** executive vice president and design principal, and **James R. Jones, PE,** vice president and engineering design principal.

Ellis/Naeyaert Associates, Inc. have named **Linn Smith** vice president of architecture.

Diversified Design Disciplines announces the following appointments: **Natalie de Blois FAIA** as senior project designer, 3D/Neuhaus + Taylor; **Carden L. Jenkins PE** as chairman of the board and chief executive officer of 3D/Chenault & Brady, consulting engineers, and **Gilbert W. Thweatt AIA** as vice president.

S. I. Morris is pleased to announce the following new associates: **Charles Dunbar, Jayanne Engle, Dennis Hancock, Gerald Koi, Burke E. Koonce** and **Donald R. Laughter.**

Glaser/de Castro/Vitols Partnership announces that **Liviu Brill, AIA** has become an associate of the firm.

Charles D. Smith was elected to the board of directors and **Gil Negendank** was named an associate of McCarty Bullock Holsaple Architects, Inc.

Charles G. Kanner, AIA has been appointed senior vice president-director of planning and design of Charles Luckman Associates.

Roy L. Ash and **Admiral Peter Corradi** have been elected to the board of directors of Daniel, Mann, Johnson, & Mendenhall (DMJM).

Korsunsky Krank Architects, Inc. are pleased to announce that **David Stoval** and **Michael D. Wirtanen** have been named associates in the firm.

Metcalf and Associates announces that **Philip E. Tobey, AIA** has joined the partnership.

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Solid State Elevators: Space-age reliability brought down to earth.

Only Westinghouse offers Mark V, a complete Solid State Elevator Control System. The same advanced space-age technology that took man to the moon and back. Built-in reliability with computerized testing. Programmed precisely for a building's traffic. It can be reprogrammed if patterns change, so the system is never obsolete. Compact size and weight mean more rentable space and reduced construction costs. Reduced power requirements for Solid State Motor Drive save as high as 35 percent on elevator electric bills. All your tenants will enjoy quick, efficient service. And any astronaut would feel right at home riding the most up-to-date elevator system anywhere on earth. For more information, write: Mr. Herc Paxinos, Vice President, Westinghouse Elevator Company, 21 Bleeker Street, Millburn, New Jersey 07041.

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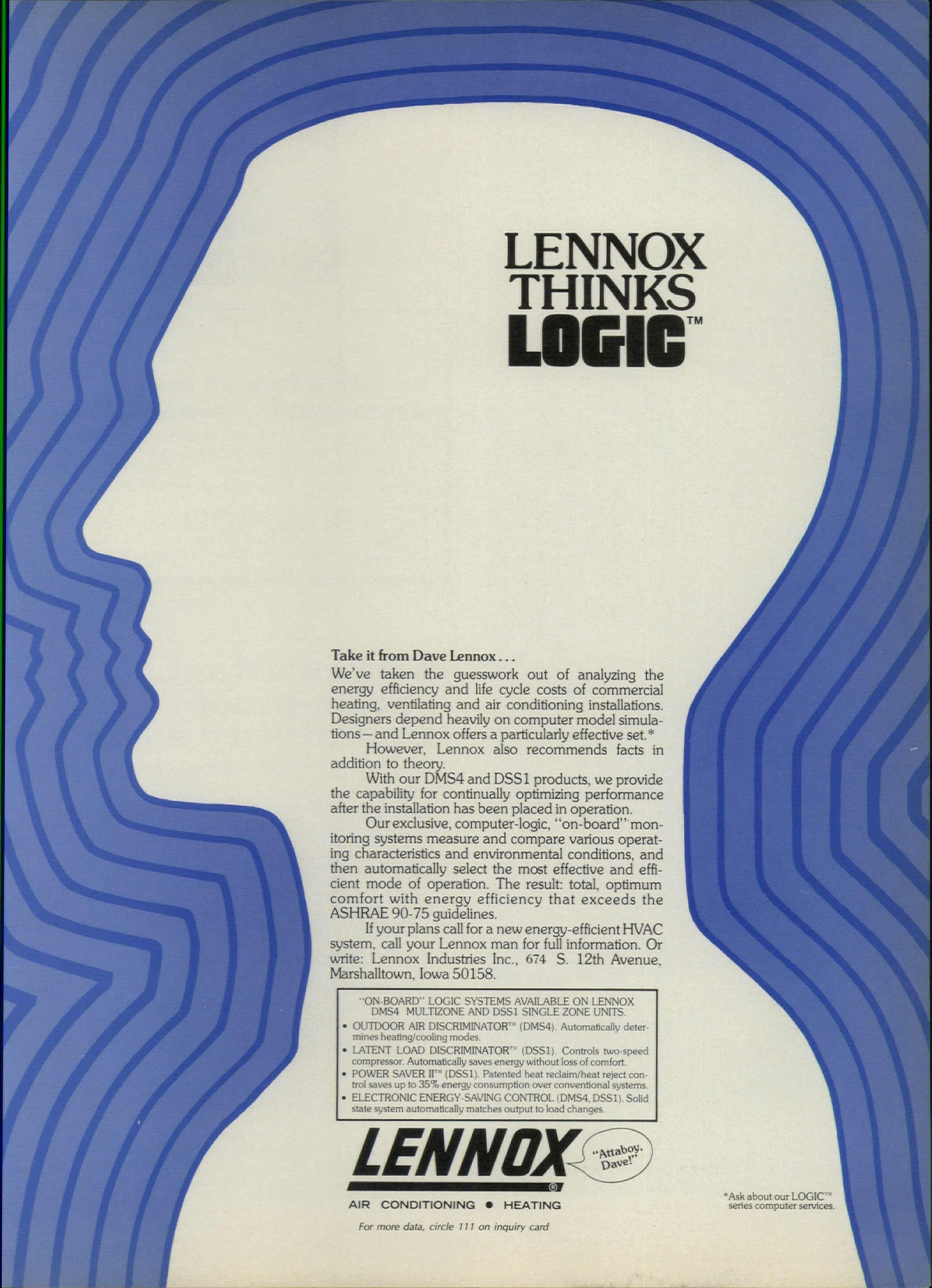

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How it works:

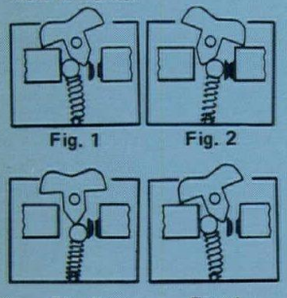

Fig. 1. switch in "off" position (contacts open). As switch lever is rotated, actuating ball compresses the coil spring, but ball must pass pivot point of lever before it can close the contact. As it passes the pivot point it has maximum momentum and closes the contact points positively and rapidly. All independent of hand action (Fig. 2.). As the switch lever is rotated in the opposite direction, Fig. 3, the ball is depressed and slowly releases some spring tension on the contact arm, permitting the contact points to open enough to break the arc slowly. Then as the ball passes the pivot point it completes the cycle (Fig.4.).

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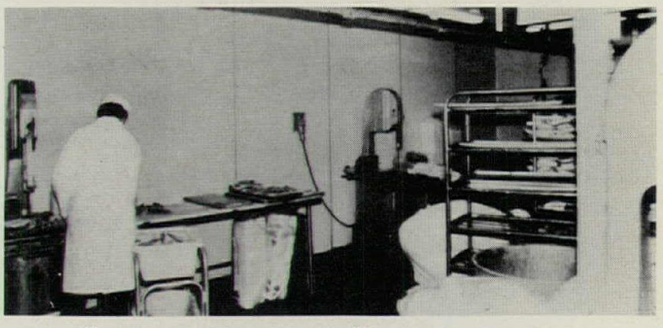

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1. Title of publication—ARCHITECTURAL RECORD (combined with American Architect, Architecture and Western Architect and Engineer).

2. Date of filing—September 29, 1976.

3. Frequency of Issue—Monthly except May, August and October when semi-monthly. Number of issues published annually: 15. Annual subscription price: $15.00.

4. Location of Known Office of Publication—1221 Avenue of the Americas, New York, NY 10020.

5. Location of Headquarters of General Business Offices of the Publishers—1221 Avenue of the Americas, City, County and State of New York 10020.

6. Names and addresses of Publisher, Editor and Managing Editor—Publisher: Blake Hughes; 1221 Avenue of the Americas, New York, NY 10020; Editor: Walter F. Wagner, Jr.; 1221 Avenue of the Americas; New York, NY 10020, Managing Editor: Herbert L. Smith, Jr., 1221 Avenue of the Americas, New York, NY 10020.

7. The owner is McGraw-Hill, Inc., 1221 Avenue of the Americas, New York, NY 10020. Stockholders holding 1 per cent or more of stock are: Donald C. McGraw, Jr.; Harold W. McGraw, Jr.; John L. McGraw; William H. McGraw; June McGraw McBroom: Elizabeth McGraw Webster; all of 1221 Avenue of the Americas, New York, NY 10020; Eye & Co. c/o State Street Bank & Trust Co., P.O. Box 5006, Boston, MA 02101; Sabat & Co. c/o Savings Banks Trust Co., 200 Park Avenue, New York, NY 10017; Batrus & Co. c/o Bankers Trust Co., P.O. Box 706, New York, NY 10015; Ronis & Co. c/o Bankers Trust Co., P.O. Box 704, Church Street Station, New York, NY 10008; Sior & Co. c/o Bankers Trust Co., 16 Wall Street, New York, NY 10015; Myers & Co. c/o State Street Bank & Trust Co., P.O. Box 5006, Boston, MA 02101; American National Insurance Company, P.O. Box 2664, Church Street Station, New York, NY 10008.

8. Known bondholders, mortgages, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities.—None.

9. Not applicable.

10. Extent and nature of circulation:

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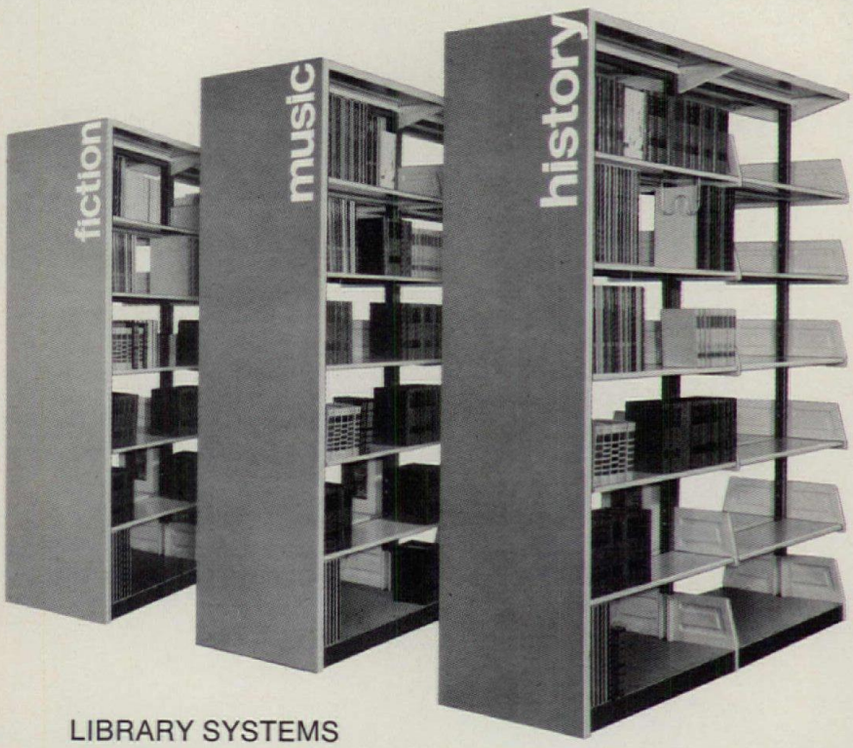

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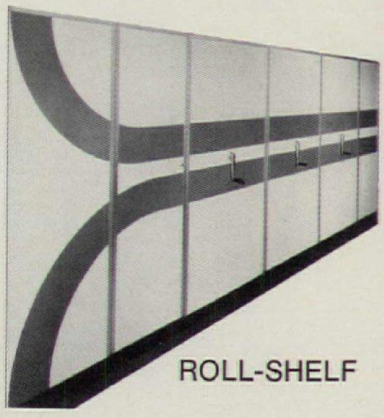

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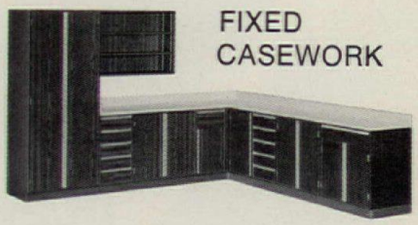

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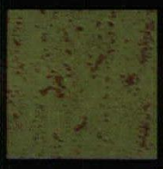
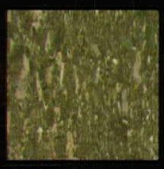
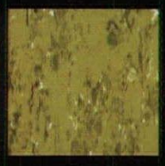
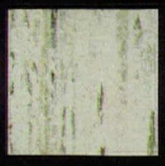
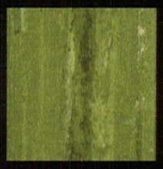
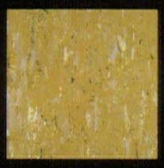
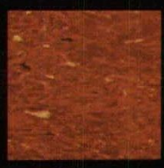
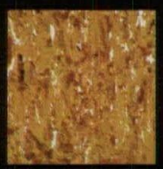
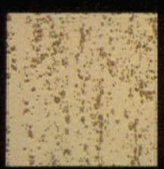
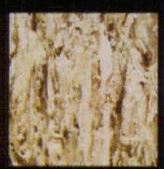
Finally, GAF® introduces the first truly color coordinated Architectural Floor Tiles. So now, when you decide on  or  you can match with   and  or blend with   or highlight with   or  or decide on   or  and match with   or contrast with   or even  . Whatever. You can create it with the first Architectural Floor Tile Line made to go beautifully with itself. In 45 colors, 26 of them new for 1976. Beautiful. GAF® Architectural Floor Tiles

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