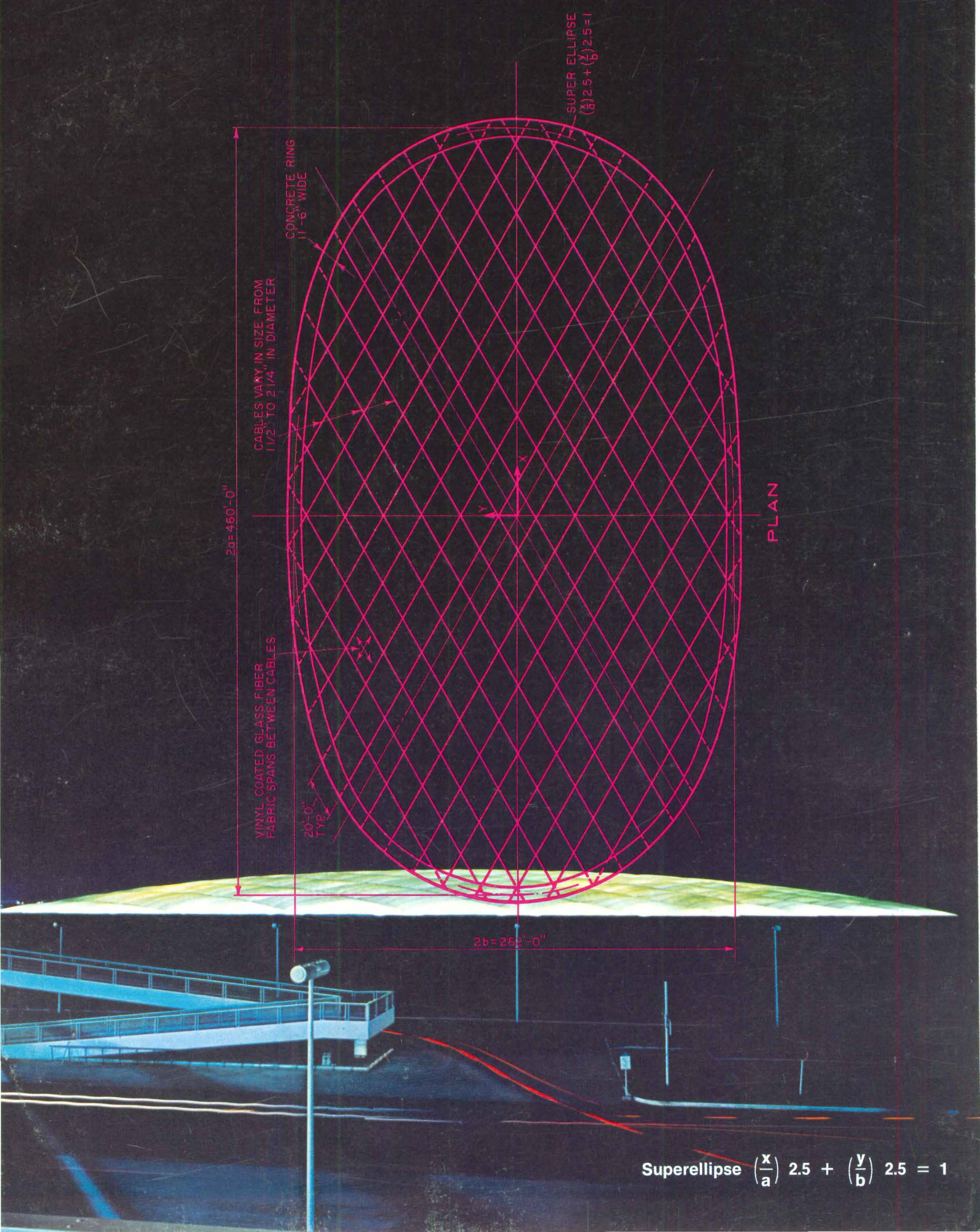
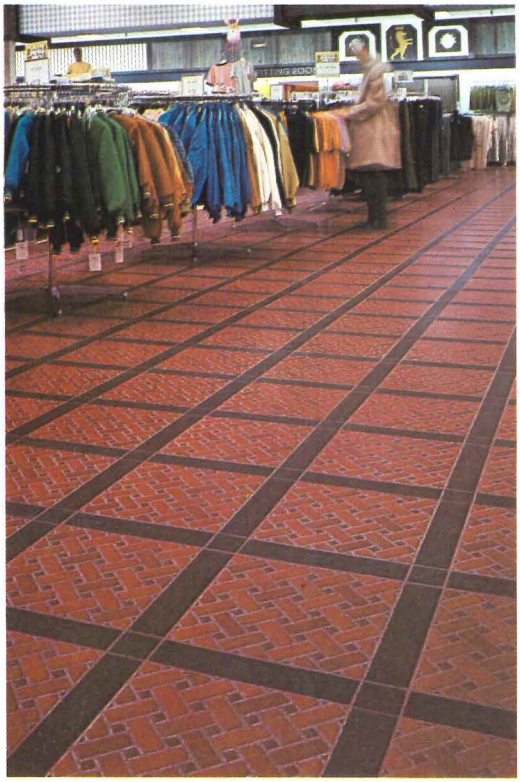
PROGRESSIVE ARCHITECTURE

A Reinhold Publication/August 1970



Superellipse $\left(\frac{x}{a}\right)^{2.5} + \left(\frac{y}{b}\right)^{2.5} = 1$



For the men's shop, floor planners chose the warm look of inlaid brick and wood—the Dungate™ design in Coronelle Vinyl Corlon. A major element in the total decor, Dungate's bold pattern makes the few seams disappear.

This is the Jewel Turn-Style Family Center in Merrillville, Indiana. Under one roof is everything from a supermarket to a gift shop to a haberdashery. Also under one roof is a variety of distinctive Armstrong floors.

ARCHITECT: Teutsch Associates, Inc., 9575 Higgins Road, Rosemont, Ill.
INTERIOR DESIGNER: Bob Cavenaugh, Jewel Turn-Style, 3030 Cullerton Drive, Franklin Park, Ill.
FLOORING CONTRACTOR: Mammas & Zeheralis, 3746 Arthur Street, Gary, Ind.

In the gift area, Coronelle Vinyl Corlon in the Briarcrest™ design provides the understated elegance of ceramic tile with medallion insets. A special feature is Briarcrest's "2-inch match". While the pattern repeats every 54 inches, it can be matched every 2 inches, to save material. (Floor design copyrighted by Armstrong.)

Complementing the Coronelle Vinyl Corlon at the counters, Montrel Excelon Tile provides an economical, long-wearing flooring for the more heavily trafficked aisle areas. The ⅛" gauge marbleized design goes all the way through the thickness of the tile, so the look lasts the life of the floor.

The planned floor.

90,000 square feet planned for design variety.

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Armstrong

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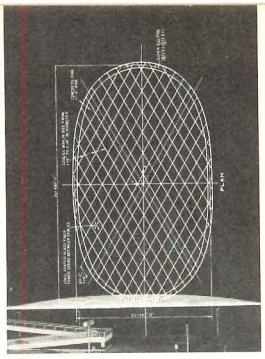
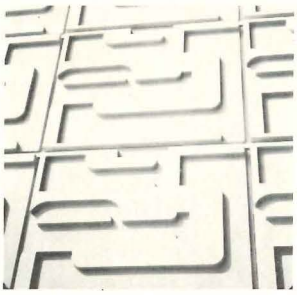


Cover: USA Pavilion at Osaka by night (photo: Masao Arai). Roof plan and building section superimposed.

P/A THIS MONTH

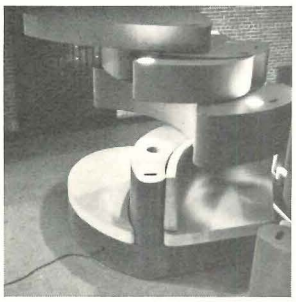
PROGRESSIVE ARCHITECTURE® AUGUST 1970



MATERIALS AND METHODS

Aluminum in Architecture Seminar by Wayne F. Koppes

Early last March a three-day seminar held in Chicago on aluminum in architecture, reviewed case histories, standard product forms, adhesive bonding and finishes, and predictions of the future of aluminum in commercial and industrial buildings. A report on these proceedings and on the ideas of the authoritative speakers concludes with thoughts offered concerning the status of the industry and its obligations to society. 76



INTERIOR DESIGN

Furniture as Process

By providing a process in which users can become involved in the actual manipulation of their environments, furniture designers continue to exercise the "psychology of change." "Total Environmental Design Concept" by tyro-architect John Hanna and "4D Systemic Superstairs" by tyro-architect Denis Holloway are two such systems that can be rearranged to fit a wide variety of physical and psychological requirements of their users. 86

Urban Planning: Memory as Meaning by Ken Ricci

The language and the methodology of the field of "information systems" is applied to anonymous architecture. The South American city of Cartagena, a walled town that was built in Colombia from 1533 to 1811, serves to illustrate the meanings of continuing traditions. 90

Departments

Progressive Architecture, published monthly by Reinhold Publishing Corporation, 600 Summer Street, Stamford, Conn., 06904. A subsidiary of Litton Publications. Philip H. Hubbard, Jr., President; Harry I. Martin, Group Vice-President; Charles O. Bennewitz, Treasurer; Kathleen A. Starke, Secretary; Robert W. Roose, Vice-President. Executive and editorial offices, 600 Summer Street, Stamford, Conn. 06904.

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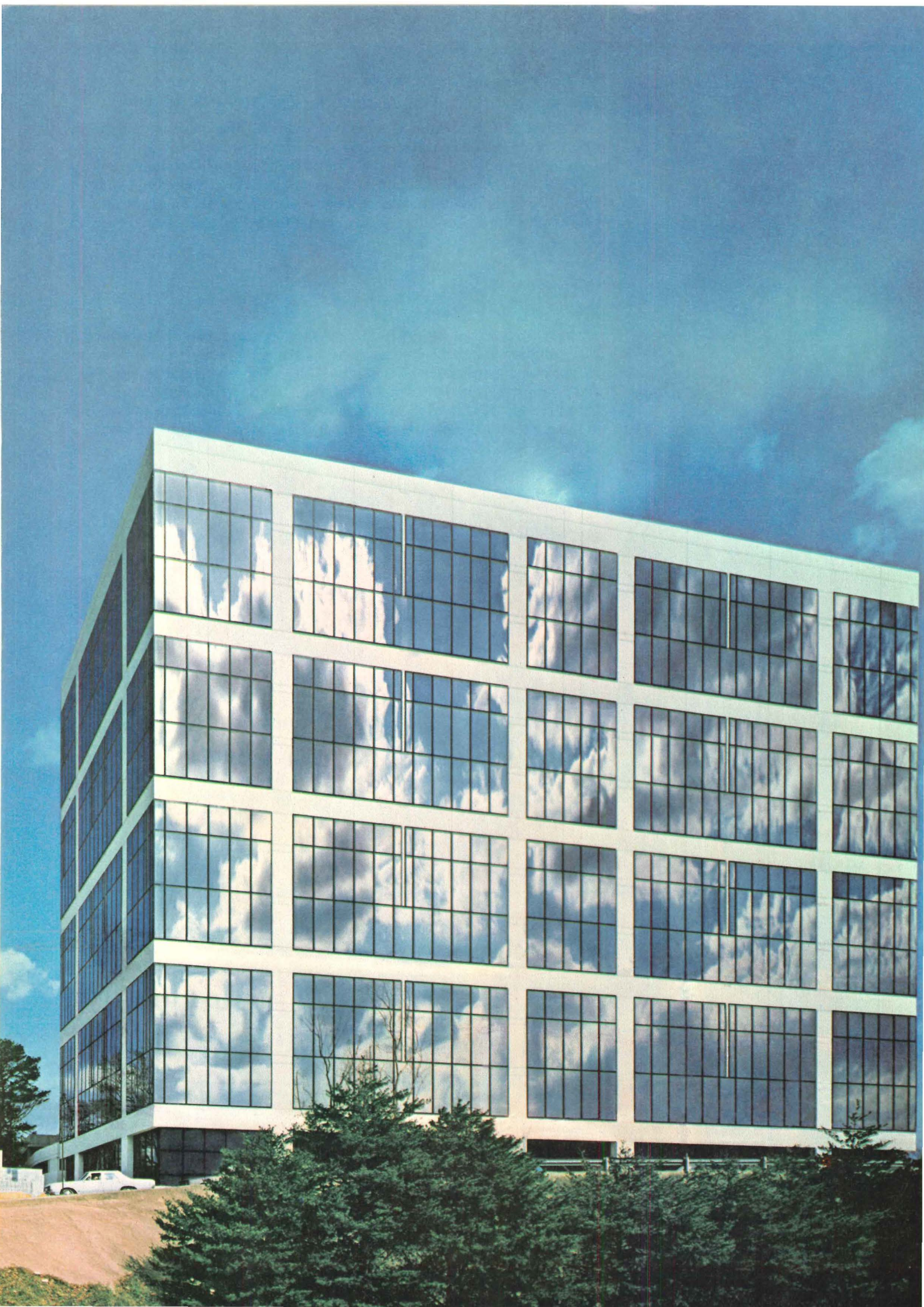

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Architect: Toombs, Amisano & Wells, Atlanta
Developer: Office Planning Associates, a Division of Cousins Properties Incorporated, Atlanta
Mechanical Engineer: Lazenby & Borum, Atlanta

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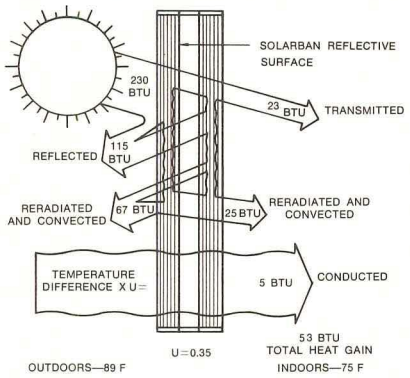

This diagram is illustrative of relationships for a given specific set of conditions.

PPG is Chemicals, Minerals, Fiber Glass, Paints and Glass. So far.

PPG INDUSTRIES

On Readers' Service Card, Circle No. 353

YOUR POINT OF VIEW

Wage Controls

Dear Editor: It has recently been reported that President Nixon hopes to ease the yearly rise in construction wage settlements through opening up the ranks of labor through apprenticeship requirements and expanded training programs. Does the President seriously believe national level policy statements of union acceptance and/or agreement with such ideas? How many times have the readers of this magazine been stifled by local business agents or unspoken field practices . . . regardless of national "policy"? A careful survey of 150 major wage settlements won in 1969 indicates an annual average wage rise close to 19.3 percent per year. Does the President believe that the locals, if allowed to maintain their present autonomy, will vote to cut these annual wage increases through removing their present stranglehold on actual hiring policies? Not nationally stated policies, but actual local policies? The President and the Nation must face up to the fact that as long as we allow this unfettered attitude toward inflationary settlements which are totally unresponsive to either productivity or any national guidelines, the unions will continue to seek them and win. The answer lies in the simple theory of power to combat power. Recent AGC efforts are encouraging; so are the latest proposals of the government; but more is required. Legislation must be proposed to provide aggressive, comprehensive controls and guidelines for union activities . . . particularly in the area of restraining of trade. Similar controls already exist elsewhere in the private sector, administered by law and the activities of the Justice Department. Thus far, only aspirin has been prescribed. The problem is, the patient is suffering from pneumonia. The average citizen, capable of and wanting to work, deserves more!

Stephen Burr
Hartford, Conn.

Thanks for Bank

Dear Editor: The article on the bank (P/A, May 1970, p. 74) is beautiful and the text just right. Many thanks.

Daniel Solomon
Berkeley, Calif.

Skin Deep

Dear Editor: The slick camera shots in your May issue did not convince me that Edward Barnes' New England Merchants National Bank Building (p. 64) displays the "technical logic of the skin." Not many lightweight containers are enveloped in a granite veneer membrane; a bulky material sliced thin does not advertise its lightness unless exposed in section or proved translucent, both highly unmanageable manifestations. A logical expression to Mr. Barnes' "problem" could have been found in plastics or glass rather than heavy stone.

To consider rentable space and zoning requirements as functions which demand architectural expression is so obvious as to be silly. But to single them out for philosophical emphasis creates a dangerous obligation on the part of the urban architect. The "birthday-cake" buildings of New York City were also legitimate expressions of the "function" of meeting the building codes, and at what price?

One need not be reminded that the human body is faithful to the axiom "form follows function," and yet we find it necessary to clothe ourselves, even when not materially necessary. Perhaps there are two processes which utilize that axiom. The first determines the true building, based on physical and sociological criteria. The second finalizes the design in meeting the function of satisfying human concern with the aesthetic. I am not asking Mr. Barnes to resort to "jazzing up" his building, but rather to recycle his design process so that its solution doesn't need any icing in the first place.

Neil Hall
CCNY School of Architecture

Merchant's Bank Saved

Dear Editor: I was distressed that plans had been made to tear down and replace the important Purcell & Elmslie Merchants Bank Building (P/A. Feb. 1970, p. 29). The Merchants Bank is one of the most important buildings in Minnesota — and surely the most important in Winona. Even if it were *not* a building of such stature, it appears that Winona is quickly and terribly doing away with all traces of its beautiful examples of 19th-century building.

However, I was delighted to read that an annex will be built and the main bank building will be saved. Those who chose to save the building should be commended.

Charles F. Woods
San Francisco, Calif.

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Sloping facade and majestic stair columns of Dallas' new Municipal Administration Center give a Texas-size greeting to residents and tourists alike. Dramatic three-block-long structure is planned to house municipal agencies and city officials with maximal convenience and appearance. The building's 10 levels contain 900,000 sq. ft. The effect of a totally planned environment is completed by the spacious seven-acre park-plaza.

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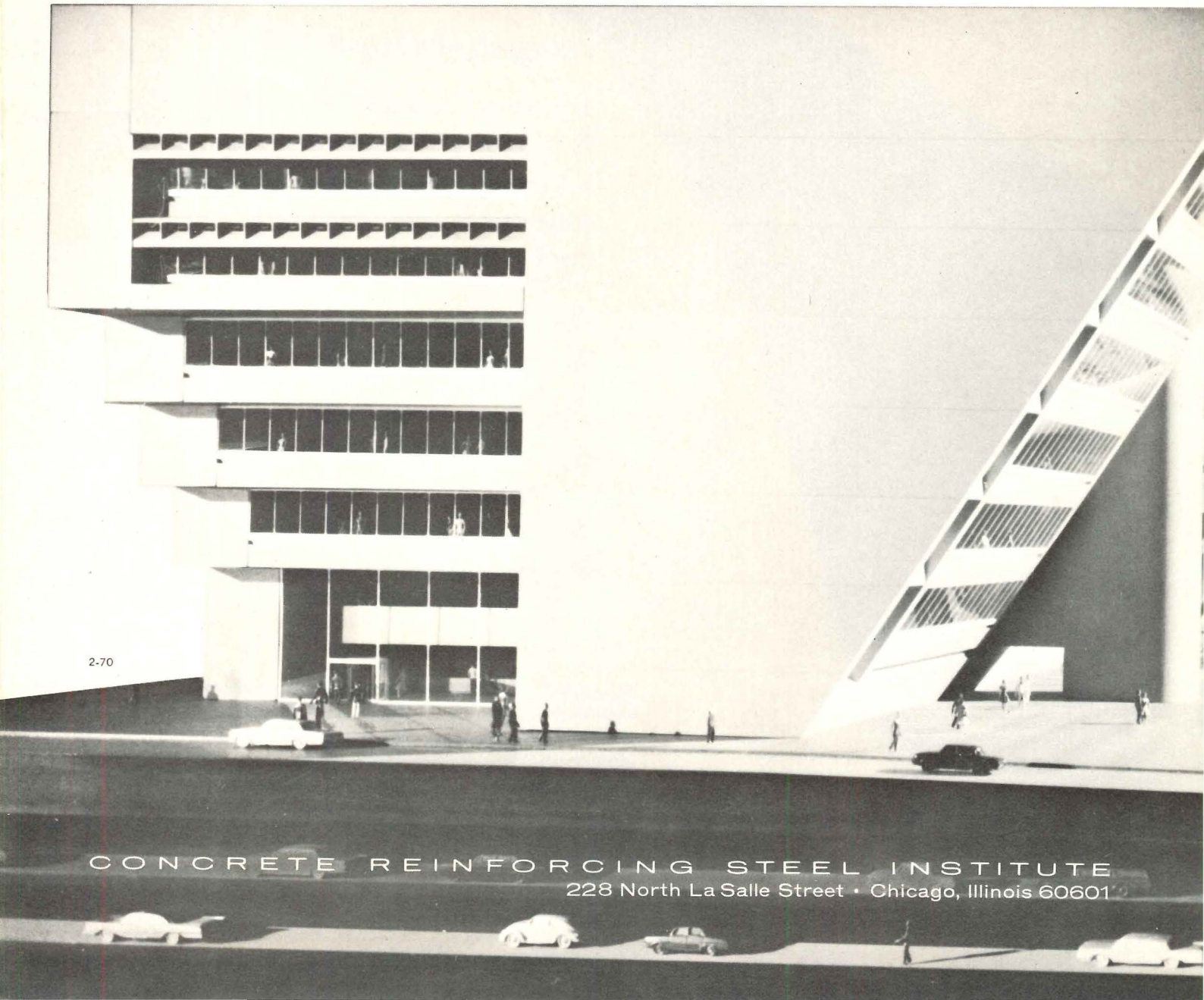

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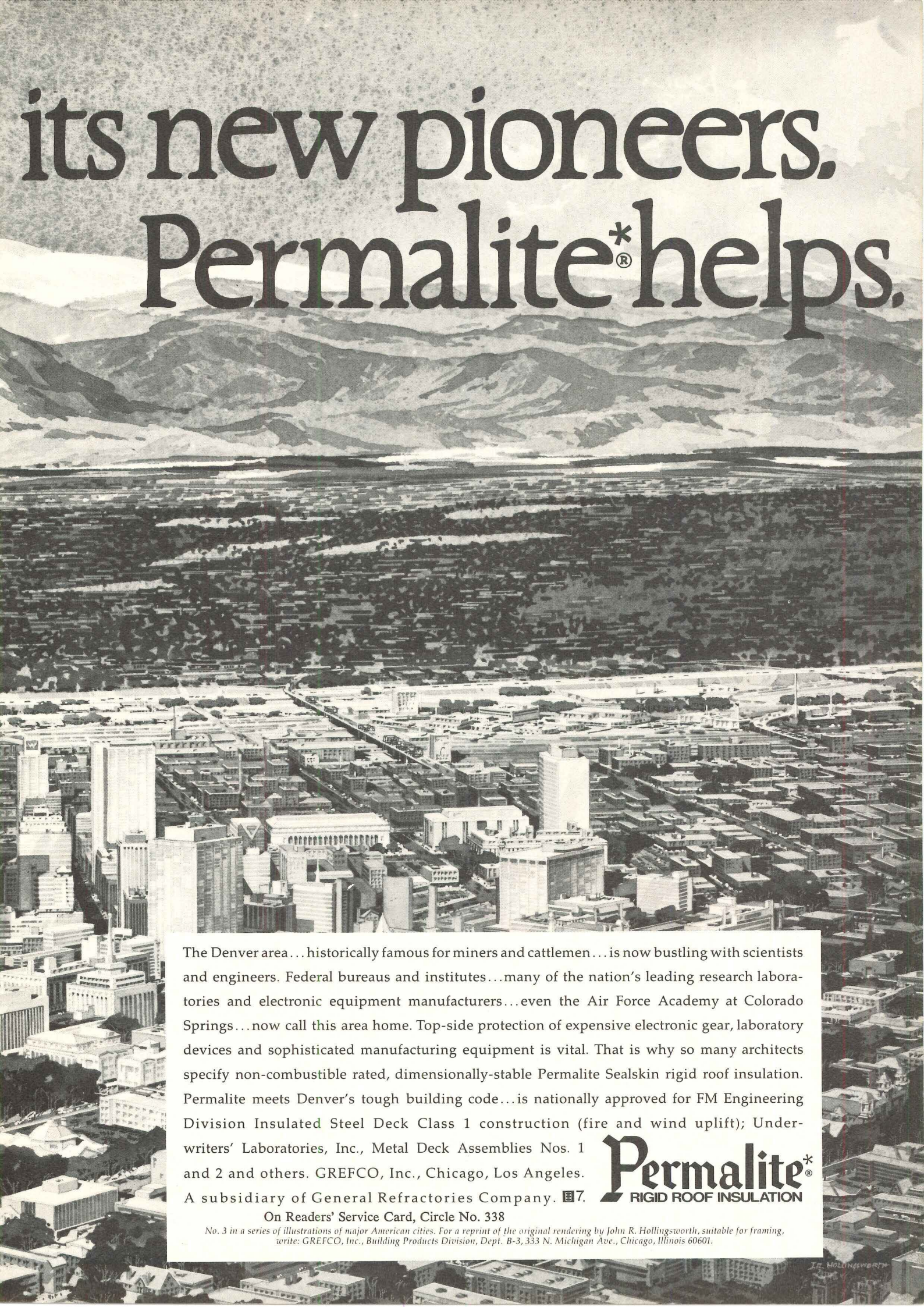

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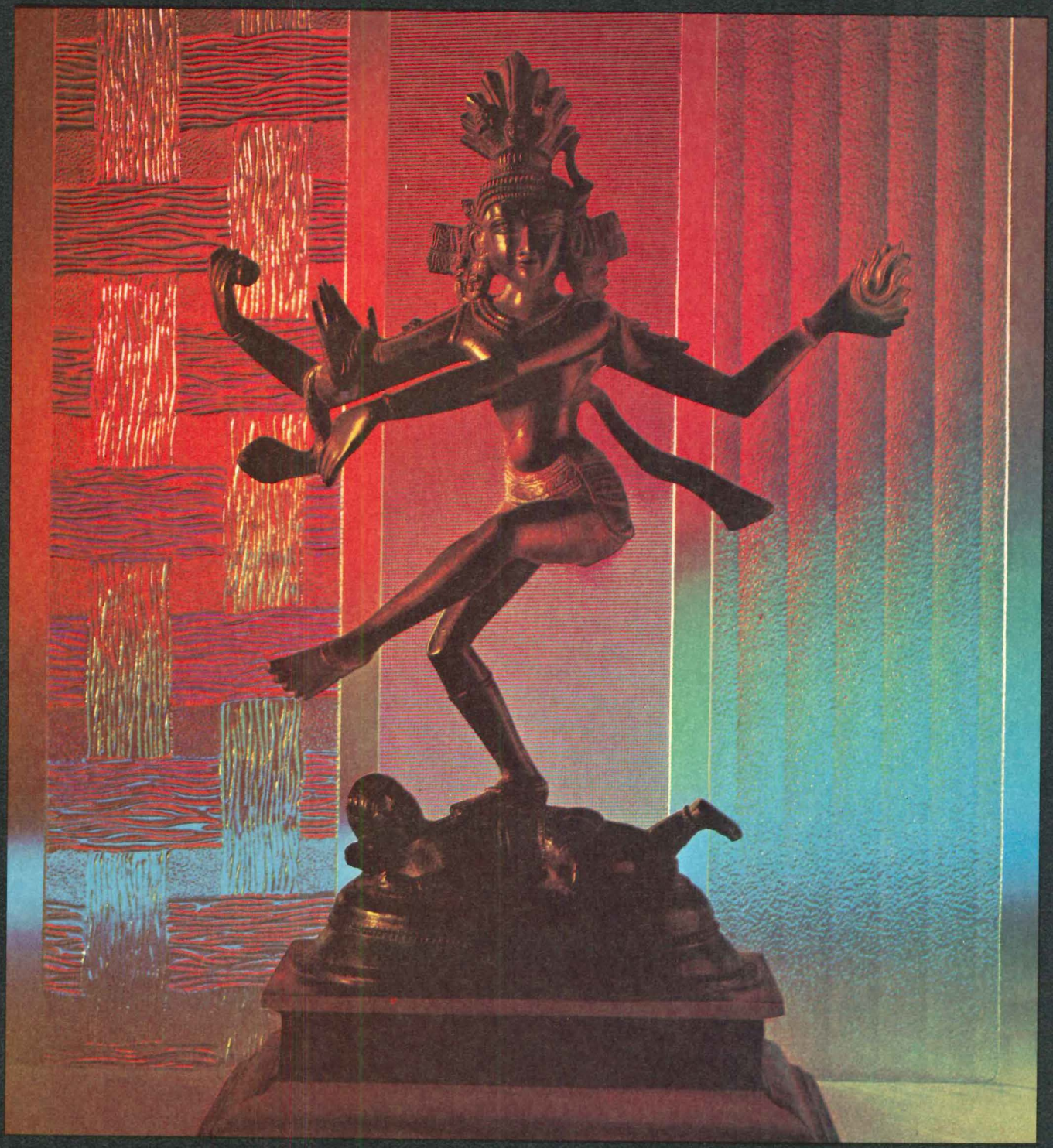

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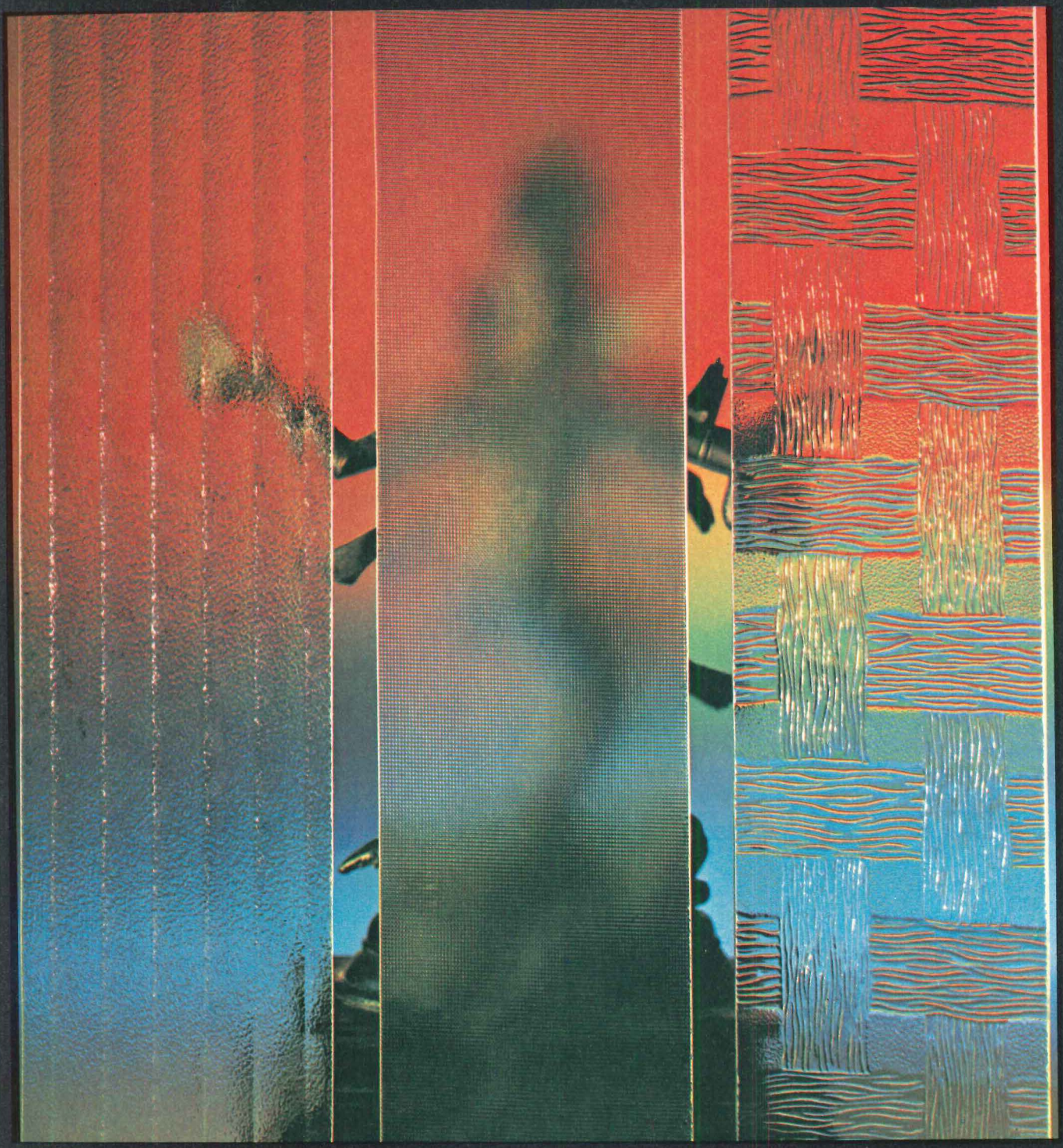

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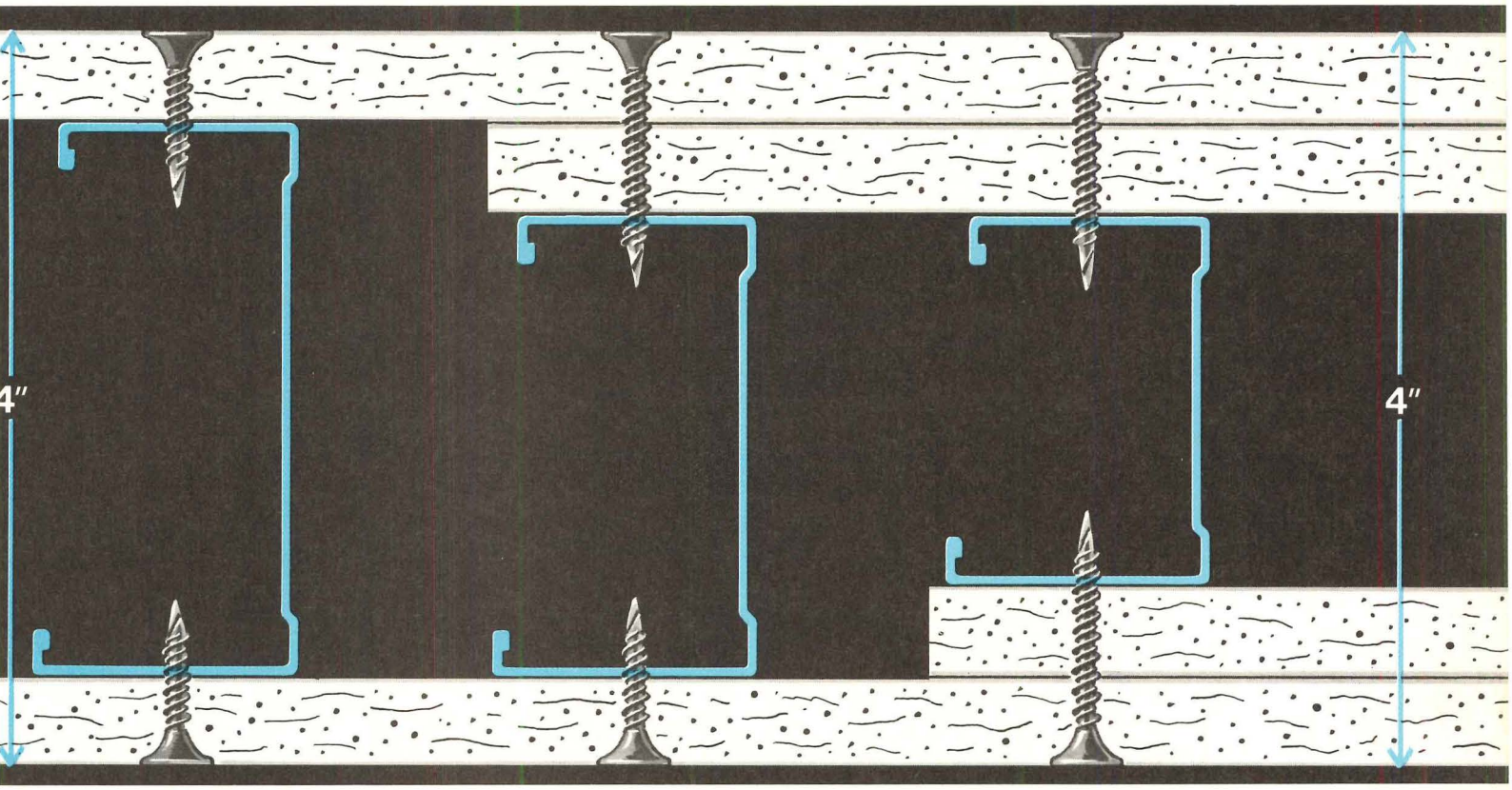

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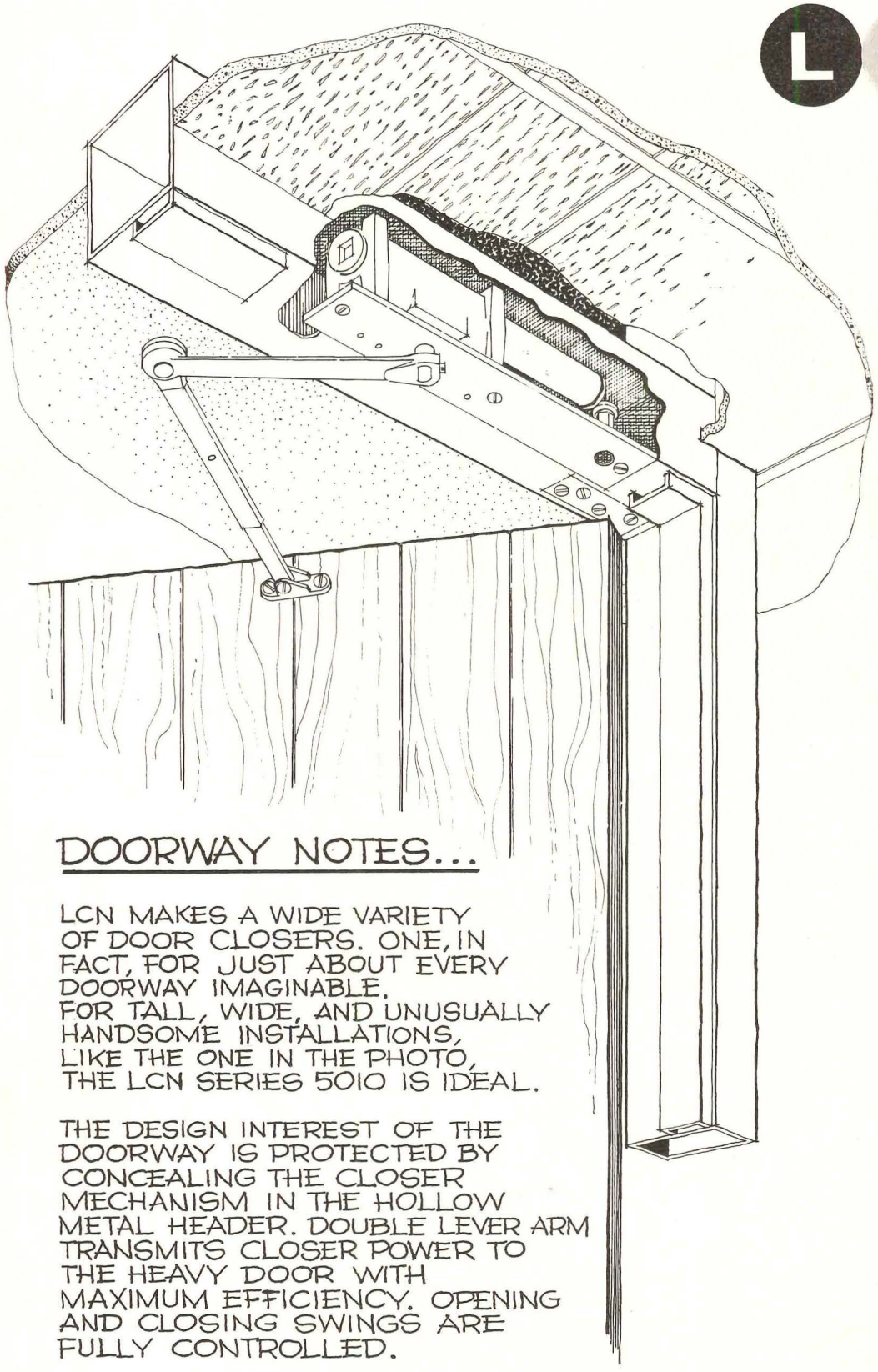

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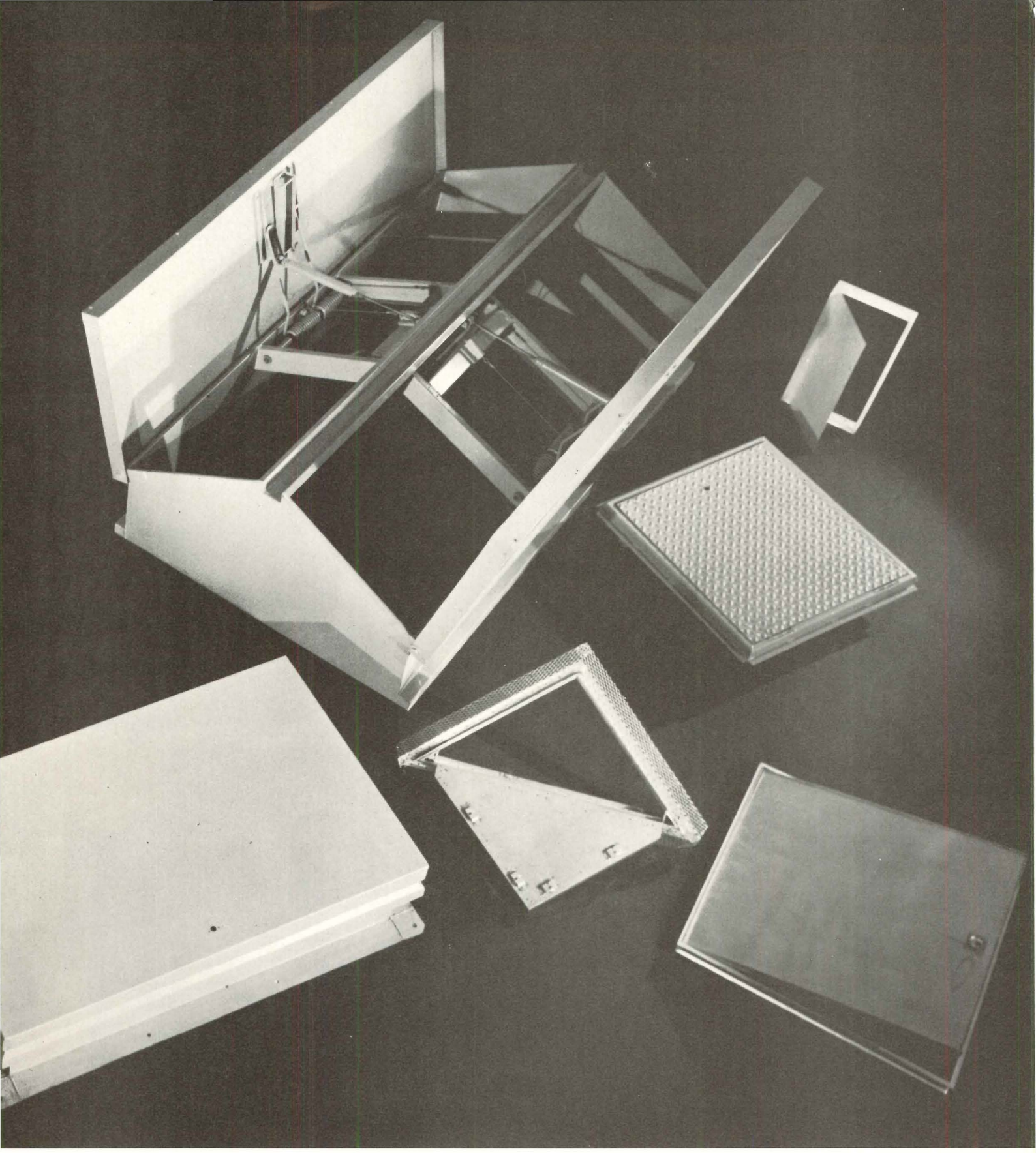

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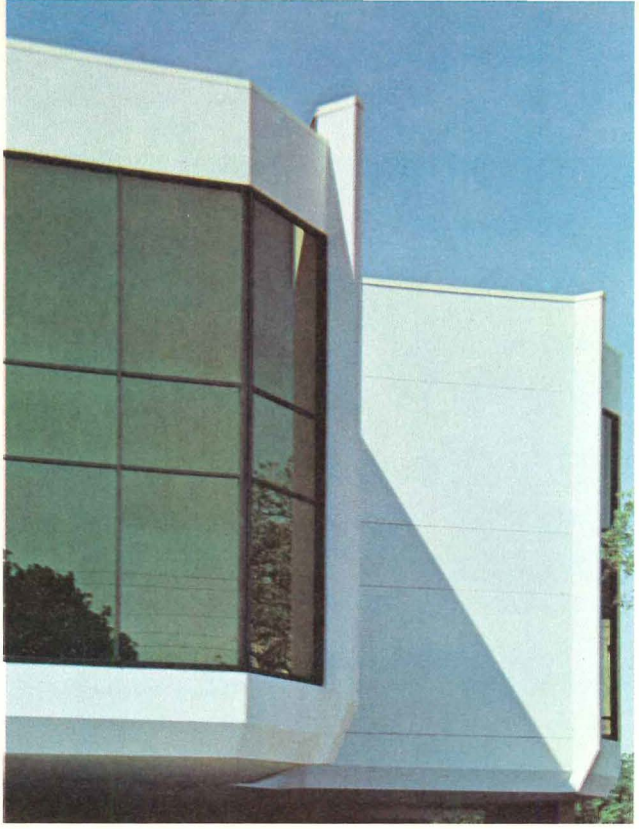

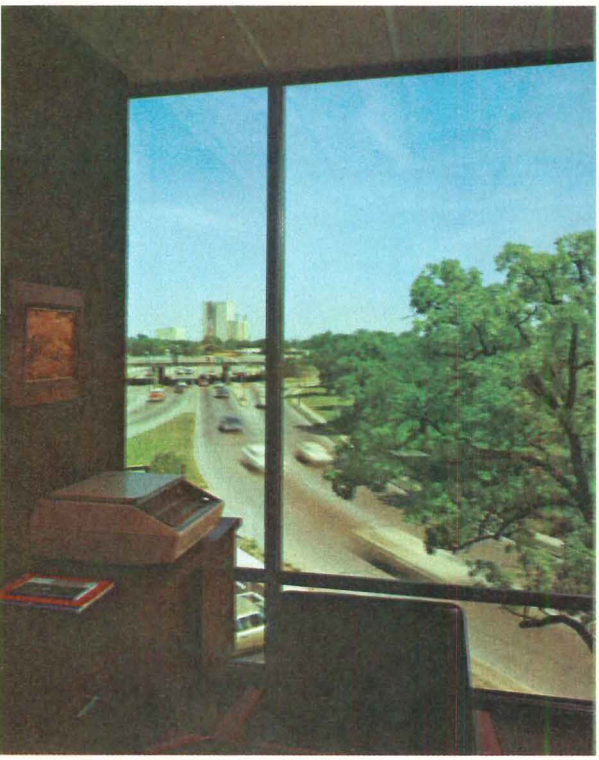

Golden Vari-Tran® reflective glass makes its debut in Dallas.

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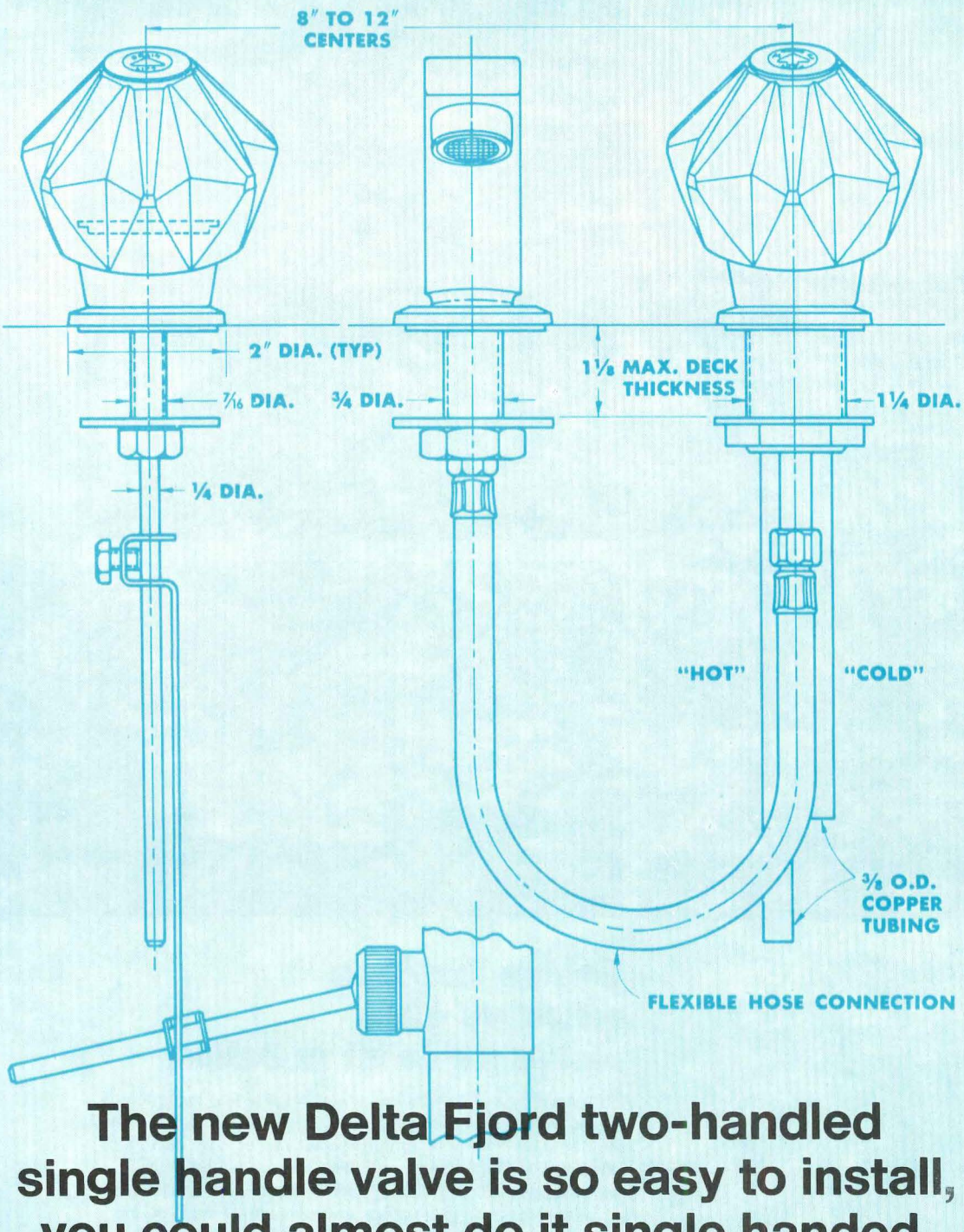

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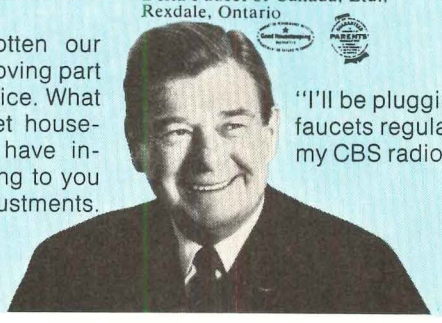
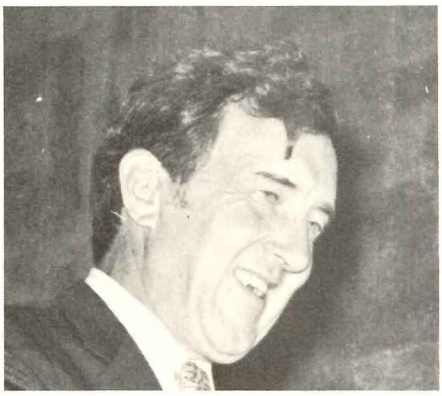
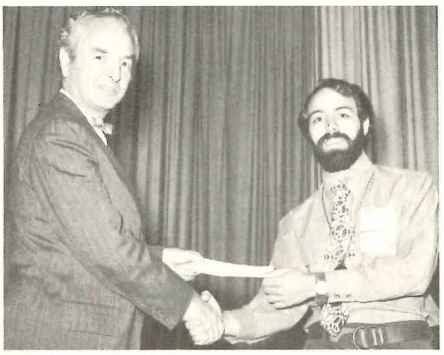
Delta Faucet of Canada, Ltd.,
Rexdale, Ontario



"I'll be plugging Delta faucets regularly on my CBS radio show."



Keynote address was given by Senator Edmund Muskie.



AIA President Rex Allen receives check from ASC President Michael Interbartolo. Check was $500 donation from ASC to AIA Social Responsibility programs.

AIA in Boston: The Year of Status Quo

The title of this year's AIA Convention in Boston "The Architect in a Dynamic Society" proved to be paradoxical. The convention saw the resurgence of the middle-of-the-road American, dedicated to status quo. Last year's spirit of sociopolitical involvement seems to have been a fashionable step on the bandwagon, taken seriously only by a minority. In Chicago, the students, led by black architect Taylor Culver, set the tone for the proceedings (P/A, Aug. 1969, p. 24–48). This year, during the convention, a disillusioned Taylor Culver resigned from the AIA's Task Force on Professional Responsibility to Society.

Despite enthusiastic response to Senator Edmund Muskies' anti-Vietnam, pro-urban action speech, a resolution, submitted by members of the mostly black Task Force (without the endorsement of white Chairman George Rockrise) and the ASC, was soundly trounced. The resolution proposed allocating half of the increase in dues — or an additional $200,000 a year — to the Task Force on Professional Responsibility to Society program. And, despite Muskie's appeal, an amendment introduced by Richard Stein to add to the anti-Vietnam urban priorities resolution of last year the clause that the AIA urge withdrawal from Indochina according to the schedule of the McGovern-Hatfield Amendment (immediate withdrawal) was decidedly defeated. The convention voted to merely reaffirm last year's resolution.

Convention proceedings were often enlivened by liberal speeches of octogenarian Thomas P. Cope.

A second Task Force member/ASC sponsored resolution to halt plans on the new AIA headquarters until last year's commitment to raise $15 million for the Social Responsibility programs be demonstrated as a major priority, died a quick death on the floor. (Not to say that the $7 million headquarters with its 9¾ percent interest rate on the mortgage didn't raise a few eyebrows. When asked why the desperate need for the new nine-story [including rental space] TAC annex, Max Urbahn, first vice president, explained, "It gives us the image in dealing with the Federal Government I think we need." Rex Allen tried to recoup with the explanation that expanded AIA programs mean greater need for space.)

The $15 million commitment has resulted only in $150,000 funding directly to the Task Force for its scholarships to black architectural students, for helping improve black schools, and for aiding Community Design Centers.

Two other controversial resolutions, one seeking a broadened base for the eligibility of corporate members in the AIA, and another suggesting some form of representation on decisions were soundly defeated.

The only two apparently progressive steps taken at the convention were the election of the first black officer, Robert J. Nash as one of three vice presidents and the voting in favor of the controversial ethics resolution. Passed by a 60–40 margin, the cautiously worded revised standards of ethical practice is seen by the AIA as encouraging architects to get involved in the full range of new technologies and complex environmental problems. Regarding specific involvement in *contracting*, the term "contracting" was dropped because it was "too hard to define." The architect may engage in total design-and-build activities as long as it does not represent a "conflict of interest" — or as long as he operates on a fee basis and all other costs are borne by the owner. A Judicial Review Board shall decide when there has been such a conflict, especially regarding disclosure to client cases.

Architects Simulate Future Living Conditions

Thousands of people queued up for hours waiting for transportation . . . then for food and drink. Litter and garbage rose three feet high. There was no place to sit. Coney Island in 2070? Wrong. It was the clambake on George's Island given during the Boston AIA Convention by the host chapter.

That architects should discuss planning for future environmental problems by day, and by night have trouble planning picnics was ironic. Organizers of the party had hired 20 boats to take the estimated 3000 architects, friends, and wives to the island. Due to a number of problems — including the small capacity of boats, and not anticipating that most people would want to go and return at around the same times — revelers found themselves standing in line most of the night.

The situation, however, helped the students make their point: they had been complaining that the $70,000 spent for the party could have gone to better uses. By the end of the night many of the $20-a-ticket guests wished it had.

Young Architects to Form New Professional Organization

Frustration felt at this year's AIA convention has induced young architects such as Troy West of Pittsburgh (P/A Design Award winner 1966), Jan Wampler of Boston's BRA (P/A top Design Award winner 1968), Robert Goodman, professor at MIT, and Paul Belliveau of the BRA, to form a professional organization which would "serve the people." Of primary interest would be involvement with community design centers, which the architects felt was not fully supported by the AIA.

During the next year, the group will be planning its course of action and seeking to unite the new breed of activist architects.

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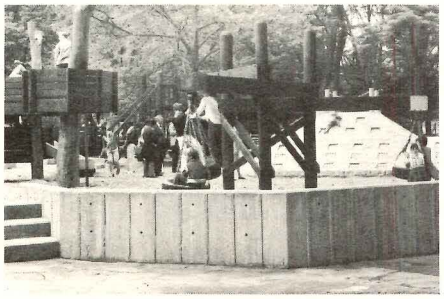
Tenant Study Inspires Housing Project Design

The recently completed Martin Luther King Square, a $2 million urban renewal project in San Francisco, is one of the country's first housing projects designed according to intensive user-need studies. Architects Kaplan and McLaughlin first conducted interviews in many black lower income areas of the Bay Region to establish criteria based on preferences of prospective occupants.

The result is a low-rise townhouse and apartment complex sharing a large backyard space to encourage communal activity, addition of "stoops" or porch steps to the back entries for mingling, and walled-in porches or balconies for private outdoor areas. Since cars have an important place in the community's activities, including socializing while repairing, washing, etc., they have been brought into the open backyard space. The tenant study also suggested variation in pattern and texture in the design, which is expressed in the wood-frame structures with staggered levels and pebble-concrete retaining walls.

Rents in the complex of 60 townhouses and 50 apartments are based on the income of the tenants and start as low as $55 for a one-bedroom apartment.



Park Play Area in Danger

New York City's famous Metropolitan Transportation Authority plans to cut through a portion of Central Park to construct a subway tunnel. Standing in the way of the proposed open cut at 62nd St. is a new playground, designed by architect Richard Dattner. The $106,000 play area includes four tire swings, two climbing pyramids with tunnels and slides, and a tree house. The proposed open cut method for building the subway tunnel would tear up the area for several years. As Parks Administrator, August Heckscher, points out, the playground would be lost to an entire generation of children. Ironically, the new play area is part of the Heckscher Playground built in 1924 by August Heckscher's grandfather, and was funded by the Heckscher Foundation for Children, also begun by his grandfather.

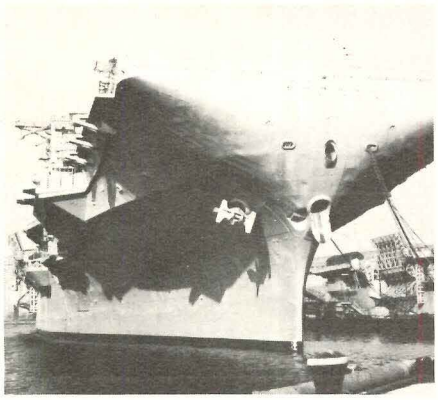
Photo: Scott Hyde

The New Look at Knoll

Following the opening of their Boston showroom (P/A, Feb. 1970, p. 96), Knoll International has reaffirmed the diagonal in a new showroom for their New York City headquarters designed by the same architect, Gae Aulenti.

Light gray pile covers floors and walls in this large open space divided into a number of areas by free-standing slatted partitions and massive angular "columns." The hallway provides a dramatic entry with charcoal pile walls and floors, lit only by the vitrines.

Raoul Bernardo of Museum Planning Associates was the supervising architect and lighting consultant.

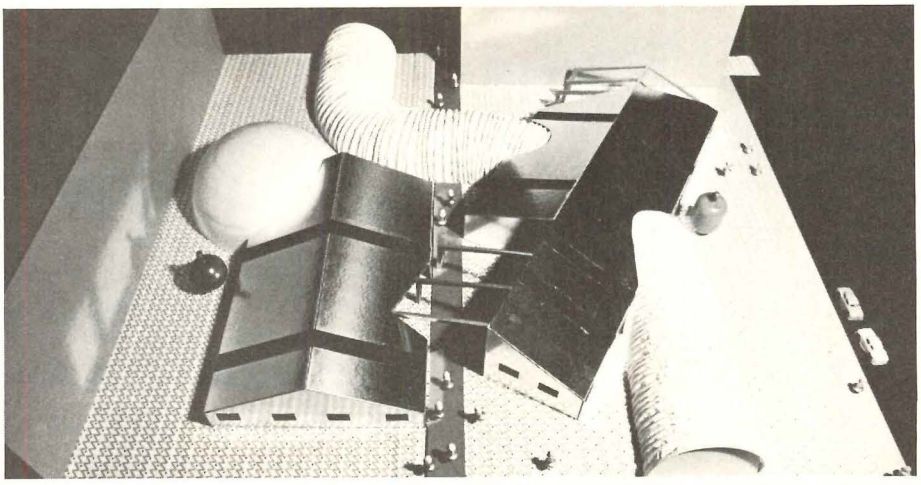


5000 Units Under the Mast

The sea-borne battlewagons of yesteryear will be fighting tomorrow's war on housing, according to a plan by Design Futures, Inc. that would revamp retired wartime vessels for the purpose of manufacturing and delivering industrialized housing. Aircraft carriers otherwise destined for mothballs or the scrapyard (America's fleet of 50 is gradually being phased out of duty) could produce up to 5000 housing units per year, and float them up the river to delivery sites. Design Futures, Inc.'s plans for a prototype vessel-factory divide into fabrication, storage and operations, and assembly areas, with the main assembly line running the length of the ship. Delivery would be by deck gantry crane (for waterfront housing), mobile tower crane (distances up to ¼ mile from the waterfront), skycrane helicopter (up to 20 miles inland), and truck and rail. To avoid the Navy's present concern over possible sale of the ships from secondary buyers to alien countries, local urban authorities would have to assume ownership and lease to private industrialized housing developers who would reconstruct the vessels to factory specifications.

Obstacles for Breakthrough

According to recent reports, local resistance to several Operation Breakthrough prototype sites may cause indefinite delays for this phase (P/A April 1970, p. 120). Sites in three cities, Sacramento, Calif., Wilmington, Del., and Houston, Tex. have met with opposition supposedly because of the fear that low-income minorities will be placed in these neighborhoods. Another city, Seattle, Wash. claims that Breakthrough will weaken the housing market hurting from defense industry exodus. Another problem is budget: the $55 million that HUD requested (of which $35 million would go into Breakthrough), has been cut to $30 million.



Known industrial systems combined and altered in model are by: Wonder Trussless Building, Inc. (tunnel of steel panels), Air-O-Structures (coated vinyl plastic dome), and Butler Mfg. (metal panels).

Satellite Community Arts Spaces

As an answer to the cultural explosion, a solution other than the multimillion dollar arts complexes springing up across the country is being studied. The "satellite community arts space," is a low-cost, quick-construction, flexible center to provide arts and community facilities to neighborhoods, whether inner city, suburban, or rural. Architects Hardy Holzman and Pfeiffer are investigating different industrialized building systems that could be adapted to the varied programs of these neighborhood centers. As yet, they point out, these highly technological building systems have been confined to industrial use.

According to the architects, the programs, evolved with the participation of the community, would most likely suggest that a satellite arts space be composed of several spaces of different sizes and proportions added together to form a System of Structural Grouping (SSG).

Community arts groups and social groups of all kinds could operate and control the facility. Because of the diverse nature of their functions, the SSG idea is to provide an organization of spaces defined by human activity, not institutional program use. Each activity, therefore, would be assigned a structural system best suited to its requirements, whether a gathering-together activity, a random dispersal (such as a happening) or a specific task.

Systems the architects have been investigating include air inflatable structures, aluminum rib-wall construction, and wide-span, stressed-skin steel structures. The Associated Councils of the Arts, a national organization of state and community arts councils and arts centers has become involved in the program by surveying needs of communities across the country and the potential acceptability of such centers. Already the response has been substantial.

Photos: Carol Rankin

Not So Quiet in the Western Front

Supergraphics too often seems a slick private joke for turned-on designers. Boston's Western Front bar, however, has come up with a popularized version for the "folks." The folks are the longtime black habitués of a run-down bar in a seedy section of Cambridge. When Marco Tonci of Stull Associates was asked to refurbish the place, he decided to experiment with the bright bands of color and the curved and cutout forms of his contemporaries. He was a little apprehensive that the regular old-timers wouldn't like the jazzed up atmosphere. They did — but unfortunately now, so does rest of Boston.

NCARB Passes New Exam Proposal

The new exam proposed by the NCARB (P/A June 1970, p. 45) was approved by the NCARB convention in Boston, June 18–20, with a few modifications. It was resolved that the new exam should be available in 1972, not 1974, and the interim "provisional" test dropped. Since the new professional exam proposes to test only areas of knowledge *not* acquired in accredited schools, an additional test has been suggested for persons who have not received training through accredited schools. This "qualifying" exam would be required of this group before they would be admitted to the professional exams. At next year's convention, the examination committee, headed by E.G. Hamilton, will present specific models for both the qualifying and professional exams for approval by NCARB members.

Garden Gate, E.J. Horniman house, England, 1894. Photo is in the first exhibition of Voysey's work assembled, which includes original drawings, and a full array of interior design examples.

First Voysey Exhibition for U.S.

The first exhibition of the work of Charles F.A. Voysey (1857–1941) a forerunner of the modern movement in architecture, has recently been on view at the Art Galleries, University of California at Santa Barbara.

In his catalog for the exhibition, director of the show, David Gebhard, writes: "Voysey's work was rich enough so that it could provide a source for various 20th century architectural movements, many of which have little in common. Certainly he, along with M.H. Baillie Scott, helped to encourage the innovation of the '90s and early 1900s of Frank Lloyd Wright and other members of the U.S. Prairie School. . . . The presentation of his designs in German and Austrian publications was one of the English-Scottish sources which helped the central Europeans to formulate the new architecture of the '20s."

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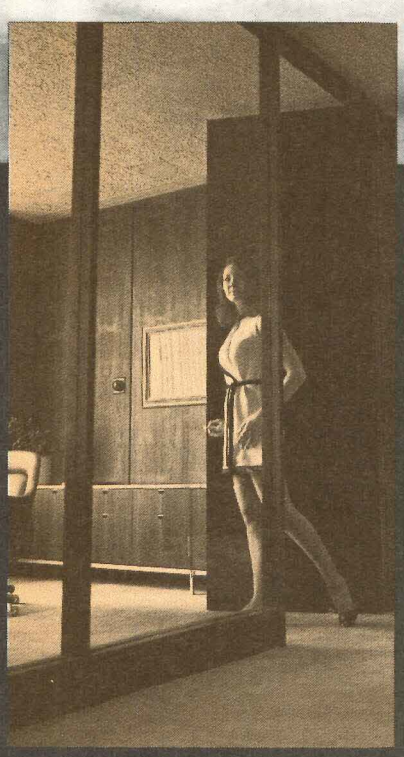

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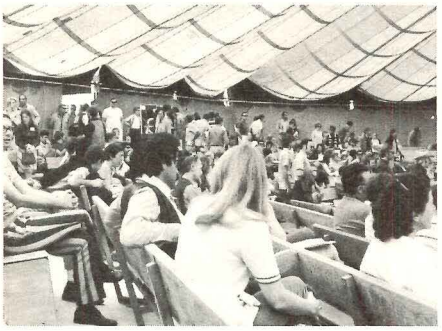


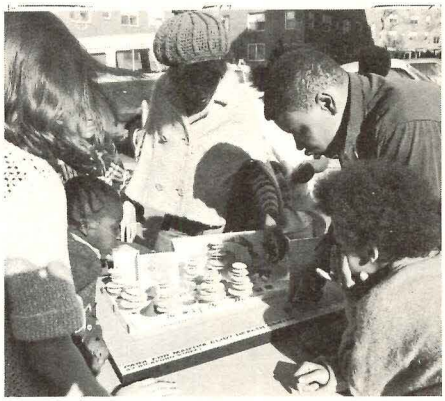
Questions About Approach Plague Aspen

Following the recent International Design Conference at Aspen, P/A asked West Coast writer Tony Cohan to summarize his impressions of the Conference:

One way to analyze a design conference is to consider the conference itself as a piece of design. From this vantage point the theme of the International Design Conference at Aspen, "Environment by Design," was the leading irony. From the moment that Stewart Udall began his keynote speech, the contradictions built into the event began to reveal themselves. To many, already accustomed to interflowing gatherings, simultaneous events, and much more two-way communication, the pronouncements of a single speaker from a podium provided an exceedingly low information yield. And some subsequent afternoon seminars, highly structured, did little toward solving the problem. Complained one dissident, "We're using a 14th-century form of communication in the age of media."

"Design today means flows, processes, functions, not structures. We're designing through time as well as space," said another. The design of inner experiences, individually and together, is now as much a part of the designer's work as considerations of physical design. And it is here that the students, the blacks, the ecologists — action-oriented and impatient — could only castigate the Conference for the implicit message of its own proceedings.

If some of the newer design forces could have had their way, there would have been displays, demonstrations, information and media booths, much more use of the grassy outdoor spaces around the main tent, decentralized small groups and spontaneous workshops and seminars, ongoing design projects. . . . The thrust would have been away from language and toward action encounter, away from fruitless attempts at consensus and toward forms that incorporate conflict.



One of the entries was this park planned by neighborhood residents for the health center in the Bromley Heath Housing Project. Jan Wampler of the BRA conceived and aided in the design.

Project 70 Boosts Community Involvement

The efforts of local artists and architects to become involved in community projects formed a display at Boston City Hall during the AIA convention. Visitors saw models, sketches, and proposals for small scale projects — anything from play equipment, to wall murals to sculpture — for the city's pocket parks, playgrounds, and outdoor spaces. Sponsored by the imaginative Institute of Contemporary Art, the program, "Project 70," has brought 130 projects to the attention of community and business leaders who have already begun to arrange the realization of these ideas in public spaces.

Alice and Donlyn Lyndon designed a "Children's Play Fountain" made of chrome modular tubing.

NYCAIA Goes to HUD

The New York Chapter continually demonstrates its leadership in the AIA in social and political concerns. During the AIA Convention, the chapter organized a group of 40 persons to go to Washington to discuss the war. Earlier, the past year's chapter president, David Todd, took 11 architects to the Capitol to discuss with HUD's undersecretary, Richard van Deusen, the Administration's apparent lack of concern for the urban crisis.

Issues examined by the group included community control in defining eligibility of income groups for subsidized housing, the necessity for Federal programs to pick up real estate taxes in suburban low-income housing projects instead of making token payments, and the possibility of HUD instead of the OEO funding CDC programs.

Although David Todd felt the outcome of the trip was promising, others claimed it yielded no genuine results. HUD, it seems to them, views New York's problems as being unique or too far ahead of the rest of the country. Some pointed out that HUD is ignoring the fact that cities do exist on a rental basis as indicated by Richard van Deusen's statement that HUD was emphasizing homeownership assistance programs (Section 235) over rental (236) to encourage community stabilization. Generally the consensus was that undersecretary van Deusen showed understanding of city problems and the need for strong national policies but he did not offer hope for strong action in the foreseeable future.

ATACing the Problems in the Big City

A volunteer workshop of architects, the Architects Technical Assistance Committee (ATAC), has just been formed in New York City to provide assistance to community groups and other organizations. Organized by architects Stan Eckstut (of the City's Urban Design Group) and Walter Grunwald (Philip Johnson's office), the idea evolved following the May 8 march of 1000 architects down Fifth Avenue protesting Cambodia, also organized by Grunwald and Sam Busselle. The workshop's temporary offices will be the New York Chapter of the AIA while the organizers work on fund raising. Future projects include assisting community groups in creating day care centers, helping tenant groups upgrade their buildings and homeowners their homes, and helping to convert a synagogue into a community center.

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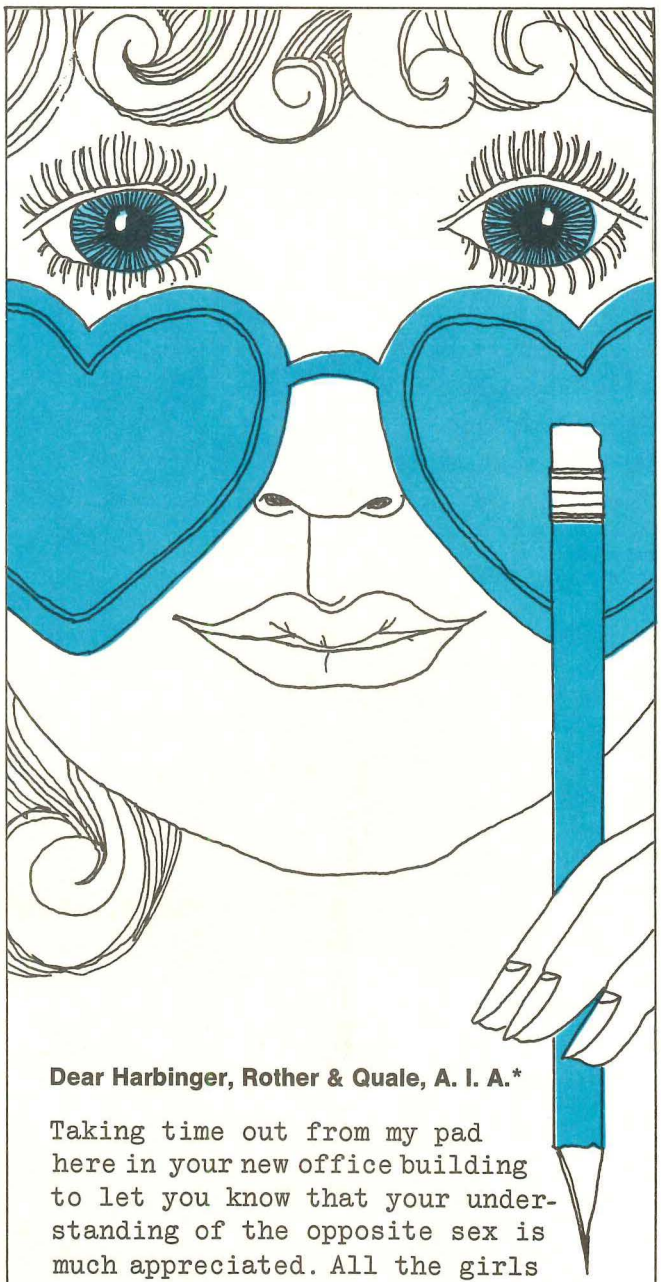

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Signed: The Happy Bunch on the 43rd floor.

H.R.&Q. — you get the Kotex kudos of the month for specifying dual-vend dispensers. All you other architects send for our free catalogue of dispensers made by Bobrick Dispensers, Inc. or see Bobrick, in Sweet's.

*(The names of the architects are fictitious. But the need is real).

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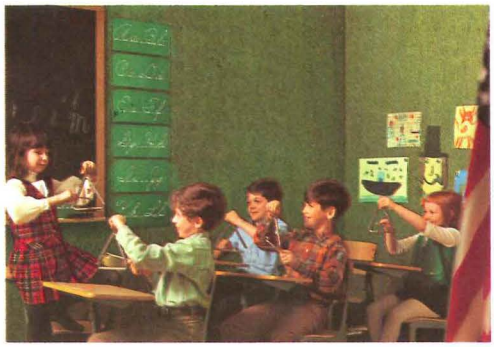
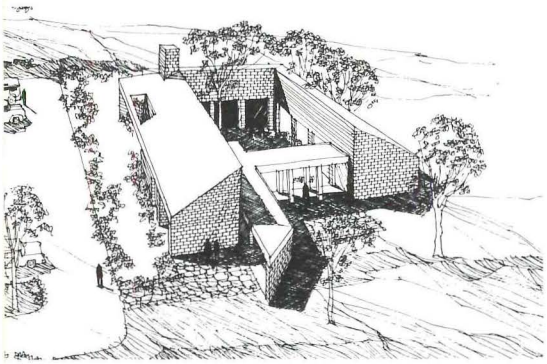


WALLCRAFT



Health Center

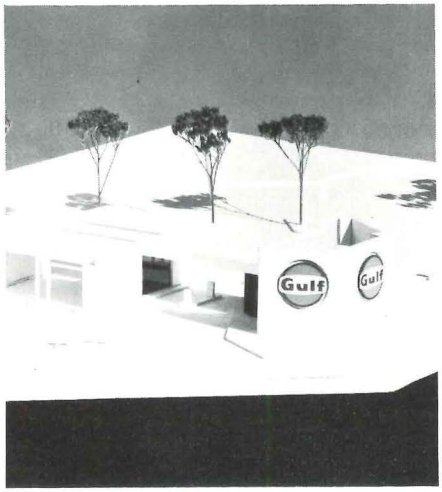
Fayette, Mississippi
James Hadley, Barbara Leslie Cortesi, and Mariano Bartolomei, Architects

The mayor of Fayette, Charles Evers, suggested to the Medgar Evers Fund that they help him build a small clinic the town badly needed for outpatient medical care. The Fund enlisted the services of three young architects to provide a small building for a low budget. The result is a modest (3000 sq ft) but handsome whitewashed concrete block building that contains laboratory, examining, and emergency facilities for three doctors and a nurse.

Buffalo Waterfront Houses

Buffalo, N. Y.
Paul Rudolph, Architect

Construction has just begun on the first Urban Development Corp. project to be realized in upstate New York, a complex of 142 garden apartments. The 2- and 3-story apartments, arranged in 8 to 12 unit clusters, will be part of a 2400 unit complex aimed at revitalizing the Buffalo downtown water front area. Of the 142 brick construction apartments, 80 percent will be for moderate income families, 20 percent for low-income. The limited-profit housing company owning the project is a subsidiary of UDC, with mortgaging provided under the Mitchell-Lama program and interest subsidies under FHA 236.



Gulf Service Station

Buffalo, New York
Frank Schlesinger, Architect

The corner site off a main intersection prompted an unusual design: The main visual element of the building is the three-sided 24-ft high brick wall that acts as a billboard for the 10 ft high Gulf sign, and as a screen for the battery of services enclosed behind it. Sales offices are located immediately behind the wall. The garage is a separate structure with the pump station and overhead canopy bridging the two units.

Symbiotic Chicken Vending Facility

Interstate Highways
Boyd A. Blackner and Associates, Architects

Symbiosis is an efficient biological process that only a few commercial ventures have adopted. Now, a food vending operation proposes to use left-over land on gas station sites for installation of their stands, thereby attracting more clients to that particular station in exchange for shared site, toilets and prime highway exposure. The architects have conceived of the prototype design for the one-man vending facility to be small and transportable — an 8′ x 8′ steel frame with glass fiber reinforced plastic panels. The building would be translucent and brightly colored to act as its own sign.

Calendar

The Second Soviet-American Symposium on Architecture, followed by the **Indian-American Symposium on Architecture and Urban Design** will take place in Russia and India, respectively, Oct. 14–28. Details: Professional Seminar Consultants, 3194 Lawson Blvd., Oceanside, N. Y. 11572. . . . **The National Urban Coalition's 1970 European Study Tours** include "New Towns: Southern and Eastern Europe"; "New Towns, Northern Europe"; and "Industrialized Building Systems" all during September. Details: Institute for Study Forums Abroad, 1707 L St., NW, Washington, D. C. 20036.

Personalities

Caudill Rowlett Scott has appointed **Jonathan King** Hon. AIA as director of the firm's activities in systems building. Mr. King, who is resigning as vice president and treasurer of Education Facilities Laboratories, Inc., has been involved in the development of major buildings systems for educational facilities including the SCSD program in California. . . . **Paul Rudolph,** dismissed and then rehired as architect for the Southeastern Massachusetts University's new campus, was recently awarded an honorary doctorate degree by the school. . . . **Arthur Rosenblatt,** Administrator for Architecture and Planning at the Metropolitan Museum of Art is the newly elected President of the Architectural League of New York.

Competitions

An **Office Design Competition** for interior design is being sponsored by Institute of Business Designers. Entries must be received by Sept. 15. Details: I.B.D., 740 Investment Building, Washington, D. C. 20005. . . . The town of Perugia, Italy has announced a competition for the **Fontivegge Business Center.** Applications for admission to the competition must be received by Sept. 19. Write: Concorso Internazionale Fontivegge-Bellocchio, Commune di Perugia, 06100 Perugia, Italia.

Notice to Competition Sponsors: Please send announcements of competitions to P/A at least three months prior to entry deadline to allow ample time for publication.

We make a lot of different ceilings. To do a lot of different things. This one's thing is versatility.

An Armstrong C-60/60 Luminaire Ceiling is as changeable as the needs of the area below it. The 60″ x 60″ modules can accommodate any of five standard-size recessed lighting troffers (1 x 1, 1 x 4, 2 x 2, 2 x 4, 3 x 3), or they can be fitted with flat panels. In any case, light fixtures, panels, even the modules themselves can be moved or rearranged if and when lighting requirements change. So the right amount of light can be put wherever it's needed without sacrificing the advantages of an integrated ceiling system. Coupled with its lighting versatility, C-60/60 Luminaire offers several air-handling options, superior noise control, and partition and sprinkler head adaptability. C-60/60 Luminaire is one of a wide range of efficient, versatile Armstrong Ceiling Systems. An Armstrong Architectural Representative is in the best position to tell you more about them. For his name and a copy of our ceiling systems folio, please write Armstrong, 4208 Watson St., Lancaster, Pa. 17604.

Armstrong CEILING SYSTEMS THAT WORK

on Readers' Service Card circle No. 300.

PRODUCTS & LITERATURE

Modular Organization of Work Space

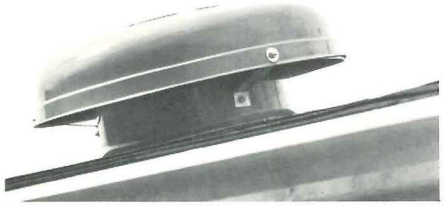
"Modulo 3," an Italian-made office furniture system distinguished for its handsome simplicity and precision of workmanship, provides extreme flexibility as well as rigid and formal coherence. Designed by Bob Noorda and Franco Mirenzi, the system consists of two basic elements: desk/table and cabinet. Desk/tables are made of panels joined at the corners by patented interlocking aluminum extrusion, and can be completely dismounted in minutes. Cabinets are of three types — with drawers, with shelves (with or without doors), and optionally equipped with special filing units and other accessories as needed. Cabinets are mounted on chrome hooded rollers of hard rubber. Three finishes available: white plastic laminate, African walnut veneer, and Indian rosewood veneer. U. S. distribution. Modulo 3 Inc.
Circle 100 on Readers' Service Card

"Floating Floor" System

Duocrete, a fast setting, low shrinkage synthetic anhydrite cement, is a light-weight, crack-resistant, "floating" subfloor system with acoustical and thermal insulating characteristics. Combined with sand, gravel, and water, it provides a concretelike topping that is readily installed over any structural subfloor without bonding or reinforcement. It is installed over membrane separator, such as polyethylene sheeting, and is separated from walls and columns by ½" expansion joints. The Marbleloid Corp.
Circle 101 on Readers' Service Card

Speaker/Clock/Timer

New "Remote Speaker/Clock/Timer" (model 2575), designed for use with NuTone's Music Intercom Systems (series 2560), features a clock/timer ideal for bedrooms or other remote locations. Includes a 5" wide-range speaker, volume and function controls, and talk/listen switches for music intercom. Setting the alarm silences music throughout the system without affecting intercom. A sixty minute timer turns music on again after alarm is set, if music is desired. NUTONE, Div. of Scovill.
Circle 102 on Readers' Service Card



Cut Air Conditioning Cost

Roof-mounted "Vent-A-Matic" automatic power ventilator (model 2414) is claimed to cut air conditioning costs up to ⅓ by removing superheated air trapped in house attics. Unit utilizes a 14-in. fan driven by a ⅒-hp motor to exhaust up to 1700 cfm of air. Thermoplastic construction. Butler Engineering Co.
Circle 103 on Readers' Service Card

Membrane Waterproofing Catalog

Sixteen-page catalog (No. 9) entitled "Membrane Vaporproofing and Waterproofing" contains product data and application instructions for "Sealtight Premolded Membrane" both standard and with vapor seal with "Plasmatic" core. Includes information on hydrologic cycle, moisture movement, and the control of moisture migration into structures. W.R. Meadows, Inc.
Circle 104 on Readers' Service Card

Industrial Straddle Carriers

Line of mobile industrial straddle carriers, the Renner Hydro-Porter, is a hydraulic, winch-type hoisting machine that incorporates in-wheel drives, thus eliminating external gear boxes and chain drives. Gear reduction unit directly driven by hydrostatic motor. Lifting hardware safety factor is 5 to 1. Functions controlled by selector valves, and speed controlled by an accelerator-type foot pedal. Four-cycle gas engine, power steering, service and parking brakes, and operator's cab are standard equipment. Models vary from 25,000 to 60,000 lb. lifting and transporting capacities. Renner Mfg. Co.
Circle 105 on Readers' Service Card

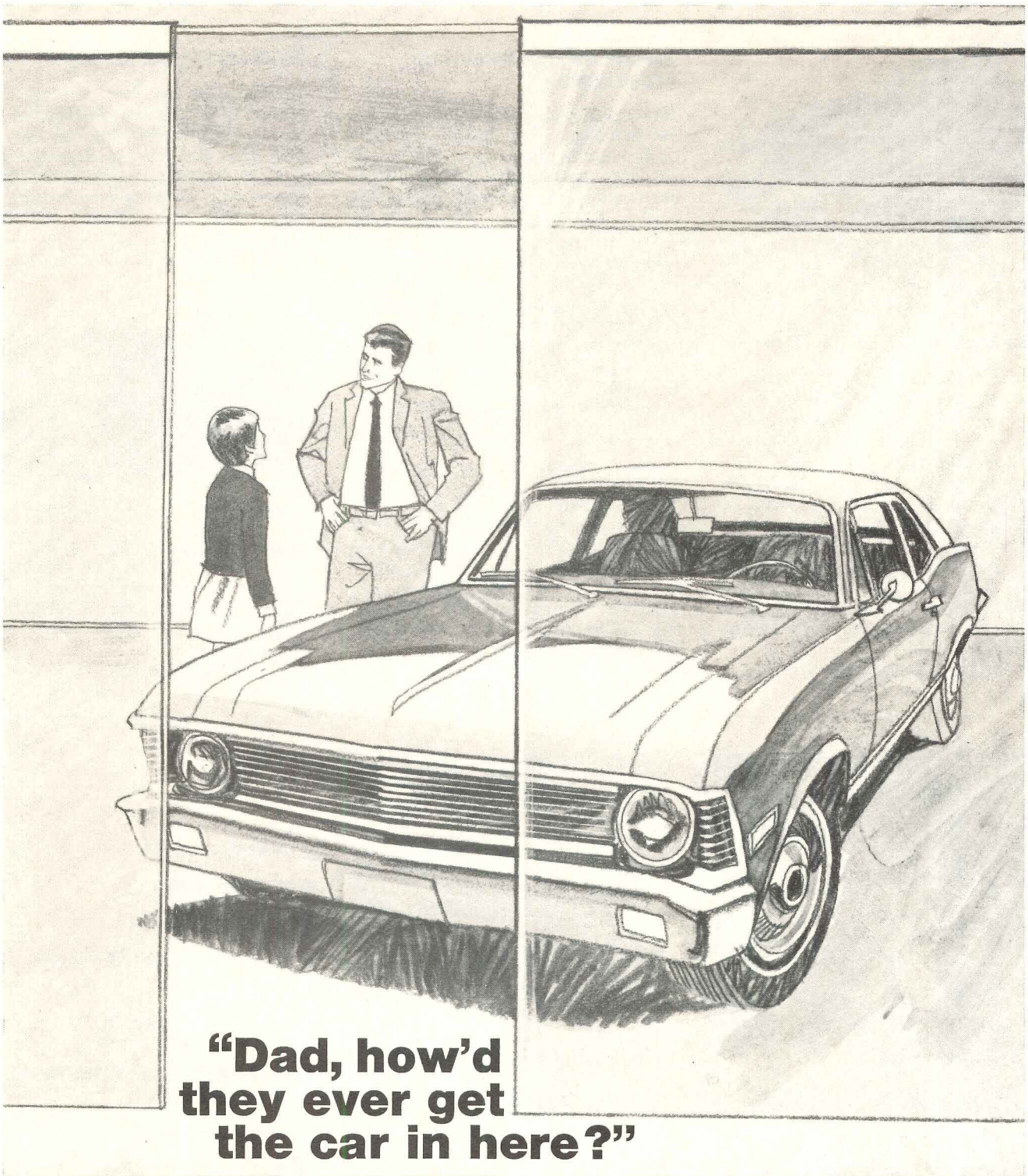
Patterned Carpets

Hardwick & Magee introduces its colorful "Botique" carpet and rug collection featuring tightly woven 100 percent wool broadloom and area carpets for residential and commercial use. Designed by William Sharkey, both soft and bold patterns of contemporary style are available. Ernest Wm. Greenfield, Inc.
Circle 106 on Readers' Service Card

Flotation Billets

Four-page brochure describes the use of "Dyfoam" expanded polystyrene billets in flotation. Includes technical data, systems drawings, bill-of-material check list, and applications in piers, docks, and rafts. Construction Products Div., W.R. Grace & Co.
Circle 107 on Readers' Service Card

(More products on page 52)



"Dad, how'd they ever get the car in here?"

Grant 5000 sliding door hardware. The brute with the gentle touch. Hardware which makes doors, walls, partitions so easy to operate, so smooth in performance that architects have been leaning on it for years. It's master of any weight that must move from here to there (and back again).

In an age when such work is a rarity, Grant craftsmen still hand fit many of the parts of the 5000. And, continuous ball bearing action sends the door on its way with speed and safety built-in.

When Grant 5000 Hardware was specified, that car was given its path in and out of the showroom.

Planning to move heavy loads? Why not get full details on Grant 5000 hardware. Information is available on request.

GRANT®
WE KEEP THINGS MOVING

GRANT PULLEY & HARDWARE CO., div. of Instrument Systems Corp., 49 High Street, West Nyack, N.Y. 10994/Los Angeles, Calif.

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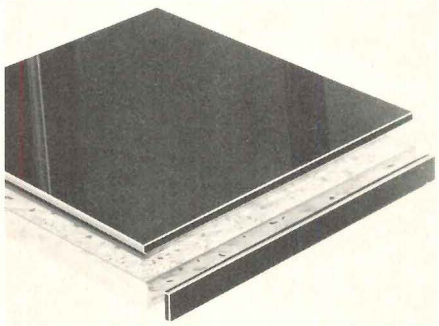
PRODUCTS & LITERATURE

(Continued from page 44)



Laboratory Table Top Laminate

A laboratory table top material called "Durcolam" is a ⅛" thick epoxy sheet designed for lamination to any core of supporting material. It is extremely tough and has a high resistance to stains, heat, and chemicals. Resurfacing old laboratory tops can be accomplished with simple tools, without removing the existing top or sink, and without disconnecting services. Also recommended for lining fume hoods, surfacing reagent shelves, and similar applications. The Duriron Co., Inc.
Circle 108 on Readers' Service Card

Ceramic Ceilings for Severe Requirements

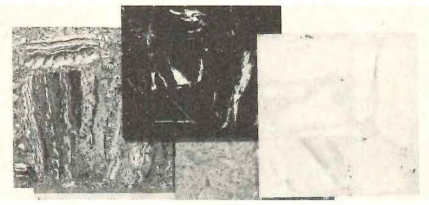
Eight-page folder describes "Ceramaguard Ceiling Systems," including both lay-in-panel and 12" x 12" tile form. Applicable where ceiling requirements are unusually severe, the ceramic ceiling material is unaffected by moisture, is fire resistant, capable of being washed and scrubbed repeatedly, resistive to chlorine atmosphere, and immune to the effects of freezing and thawing. Available in acoustical and nonacoustical panels and tiles. Cat. CS-27. Armstrong Cork Co.
Circle 109 on Readers' Service Card

Drafting Tables and Controls

Automatic drafting tables and controls, and graphic data reduction instruments and systems are described in a 12-page brochure. A chart shows how they may be combined into "customized" systems to fulfill the users' specific requirements. Gerber Scientific Instrument Co.
Circle 110 on Readers' Service Card

Resilient Flooring Catalog

Sixteen-page mid-year catalog illustrates all colors and patterns of Azrock vinyl asbestos floor tile, asphalt floor tile, and feature strip and cove base. Includes information on sizes, gages, uses, recommended installation, light reflectance values, and brief specs. Azrock Floor Products.
Circle 111 on Readers' Service Card



New Concept in Marble Tiles

Seven uniquely colored marble tiles are composed of genuine, extra large pieces of marble set in a rugged resin base. Standard sizes are 12"x12"x⅜" with a subdued satin finish. Quamagra.
Circle 112 on Readers' Service Card

Davis' carpet of Vectra® fiber gets underfoot on the golf course.

Davis "Gator Tuff" tufted carpet really covered the course . . . bonded to the soles of a golfer's shoes! Our carpet didn't do his game any good, but it did help us prove an important point. That whatever stain and scuff-prone area you want to carpet . . . be it theater, restaurant or hotel lobby . . . Gator Tuff is equal to the task. And then some. Witness how beautifully it cleaned up on the 19th hole. Couple this wear and stain resistance with Vectra fiber's extraordinary resistance to fading and you have a carpet that can more than hold its own anywhere. Davis Gator Tuff tufted carpet, made with spun yarns of 100% Vectra fiber. It's well up to par.

Pile of 100% solution dyed Vectra olefin fiber
5/64 gauge
Pile Wt.—22 oz. per yd.
Pile Ht.—⅛"
Primary Backing—
100% polypropylene

Secondary Backings—(wt. per sq. yd.)
8 oz. jute
40 oz. high density rubber
24 oz. all-weather

Davis Carpet Mills, Inc. / P.O. Box 507
Ellijay, Georgia 30540
Please send me samples and information on Davis "Gator Tuff" carpet.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____
STATE_____ ZIP_____

ENJAY

Vectra® olefin fiber is manufactured by Enjay Fibers and Laminates Company, Odenton, Maryland, a division of Enjay Chemical Company. Odenton: (301) WO 9-9000. New York: 60 W. 49th Street (212) 974-3000. Atlanta: 225 Peachtree Street, N.E. (404) 688-4250. Enjay makes fiber not carpets.

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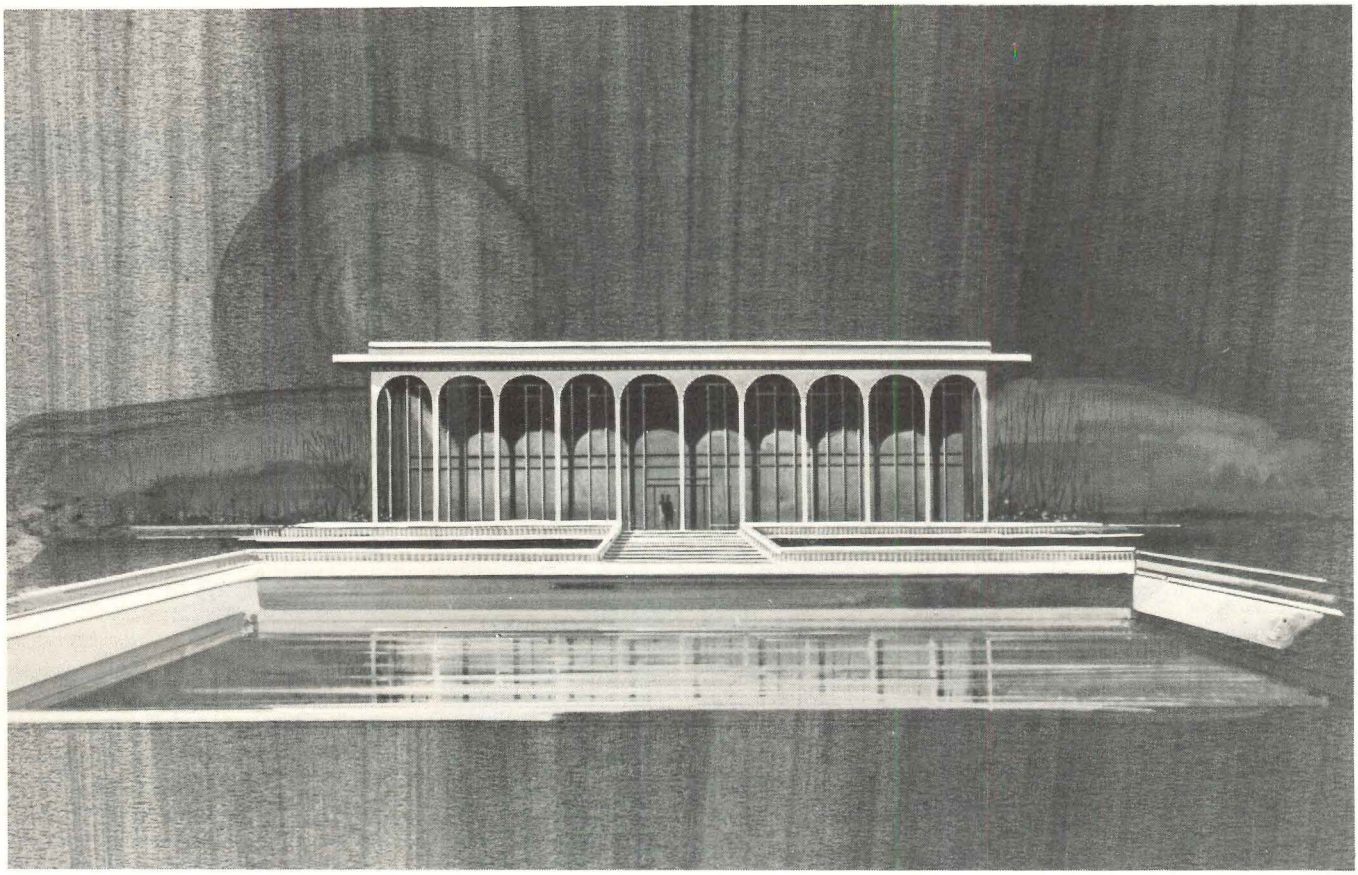
Design Series No. 1



Weath·R·Proof

Insulating Glass

Weath-R-Proof, a new name in insulating glass, is warranted for 20 years.

Weath-R-Proof has a wide range of design flexibility, and can be fabricated to fit your most imaginative specifications.

Weath-R-Proof units are promptly shipped to meet construction deadlines.

Weath·R·Proof
INSULATING GLASS

THERMOPROOF GLASS COMPANY
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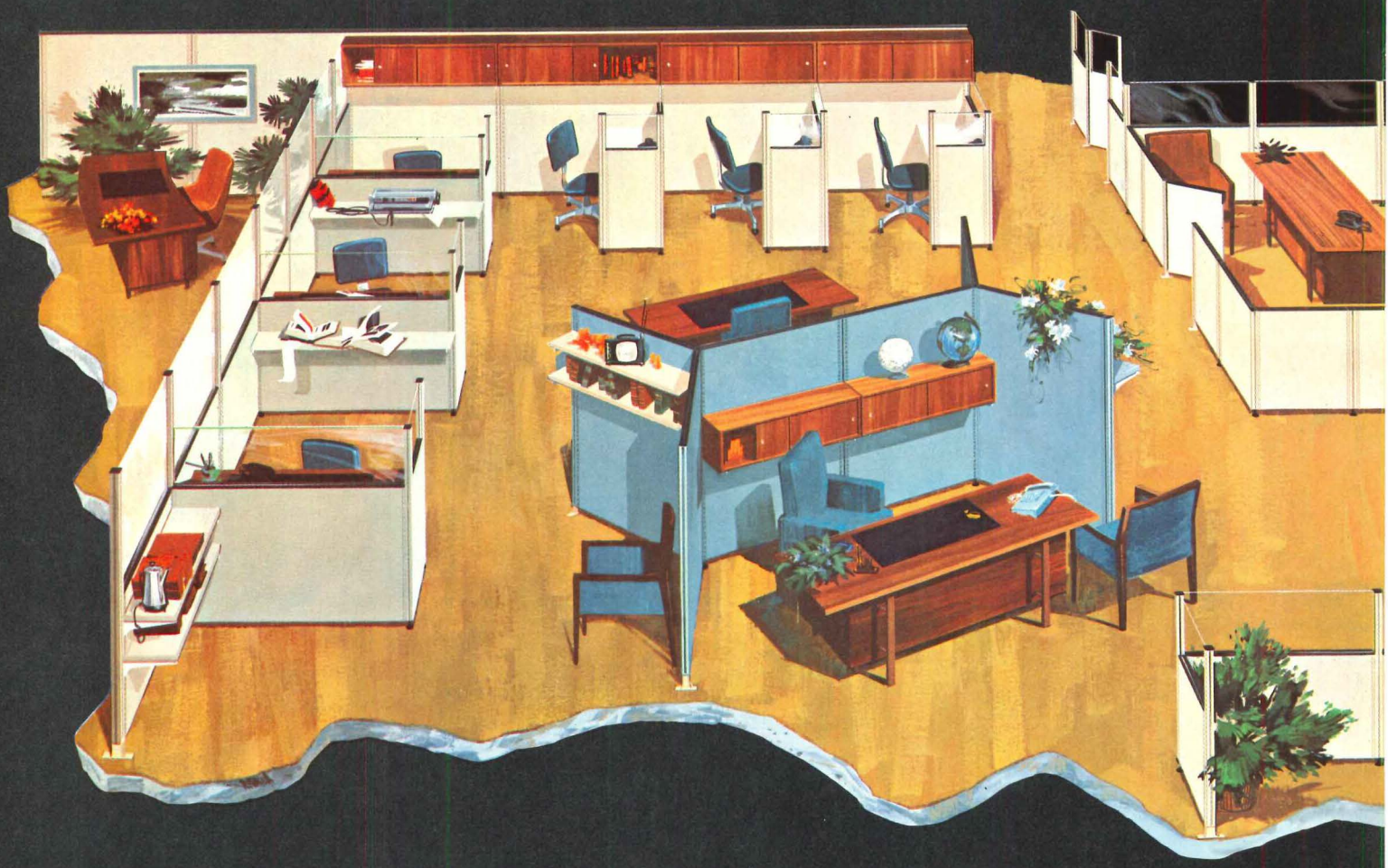
Subsidiary of Shatterproof Glass Corporation

On Readers' Service Card, Circle No. 362

On Readers' Service Card, Circle No. 376 ▸

Your ideas about office walls are in for a lot of changes.



Think what you can do with your imagination and our new Hauserman Divider Wall. Surely more than you ever thought possible with conventional office walls.

Divider Wall provides a setting that stimulates productivity. Increases efficiency. Gives an open feeling. And allows you to keep up with and manage change in everything from technology to personnel arrangement.

It's simple. Convertible. Economical. Attractive. Each panel has grooves to receive slotted standards which support a full range of accessories. So now you can design entire work situations with components that naturally complement one another.

The 120° posts and square posts allow you to create a greater variety of semi-private surroundings to meet the needs of offices today . . . and tomorrow!

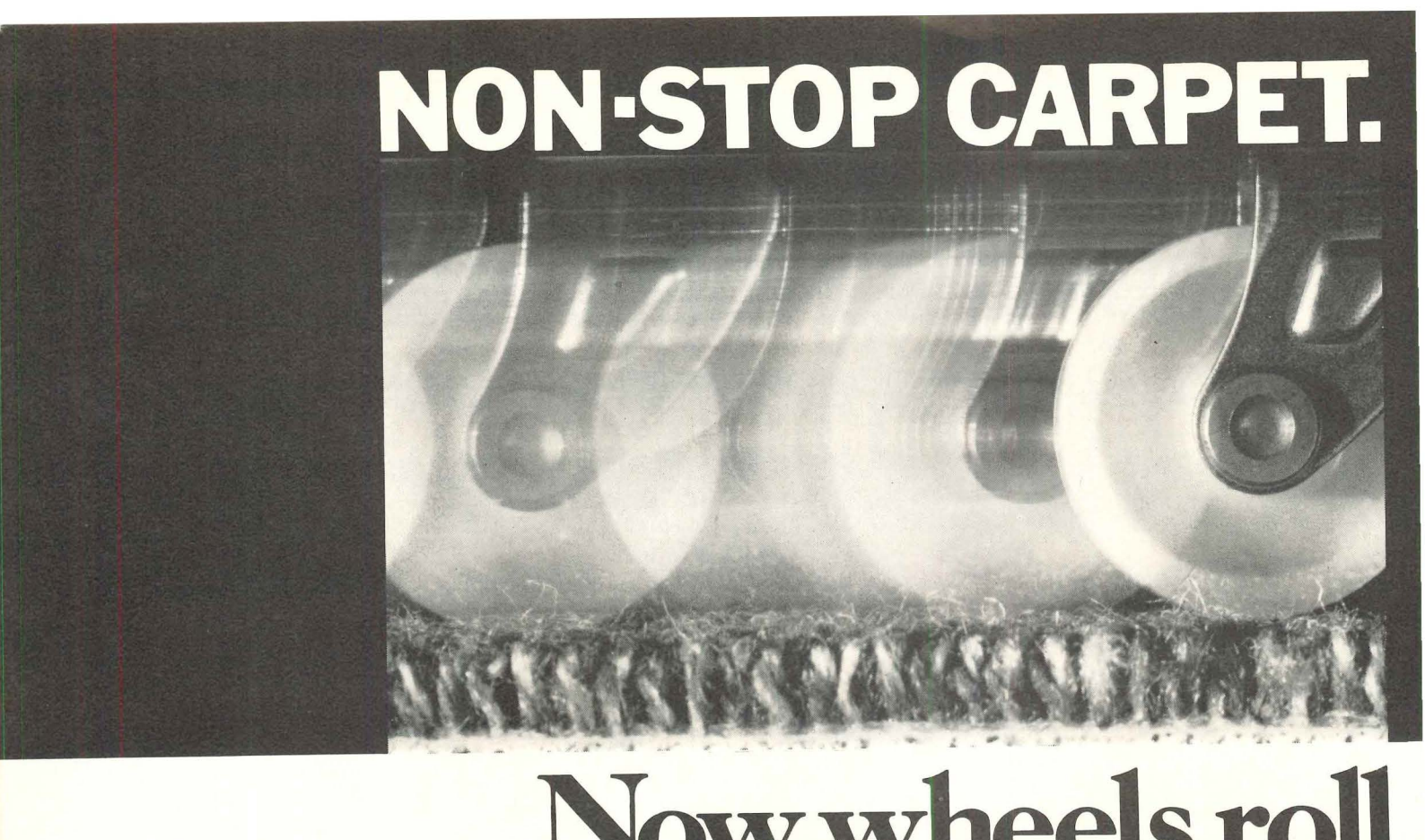
If you'd like to know all about our economical office walls that are built for change, ask for our Divider Wall brochure. It tells in detail how our new wall system can work for you. Write: Wall Systems Division, E. F. Hauserman Company, 5711 Grant Avenue, Cleveland, Ohio 44105.

All it will cost you is your old ideas.

Hauserman Divider Wall:

Wall systems you can change as your needs change.

NON-STOP CARPET.



Now wheels roll easily on carpet... if the carpet is backed by Jute!

Direct glue-down installation does it.

Now—specify carpet where you couldn't specify carpet. Glued directly to the floor, double Jute-backed carpet eliminates mushy cushions or pads that bog down conventional wheels and casters. Bonds securely to any floor, to resist shifting and delamination. But comes up cleanly so the carpet can be reinstalled elsewhere.

And the cost is less. Less than foam-backed carpets with equal pile specifications. Less than equivalent carpets, plus separate underlayment. But still gives all the advantages of carpet. Low maintenance cost. Luxury looks. Good sound absorption. High employee morale. Less heat loss in many cases.

Shouldn't *you* be specifying it? Especially since it works so well in all the general office, computer, cafeteria areas (carpeted in the past 3 years) at Ford Motor Co., Dearborn —and many other demanding installations of a variety of types.

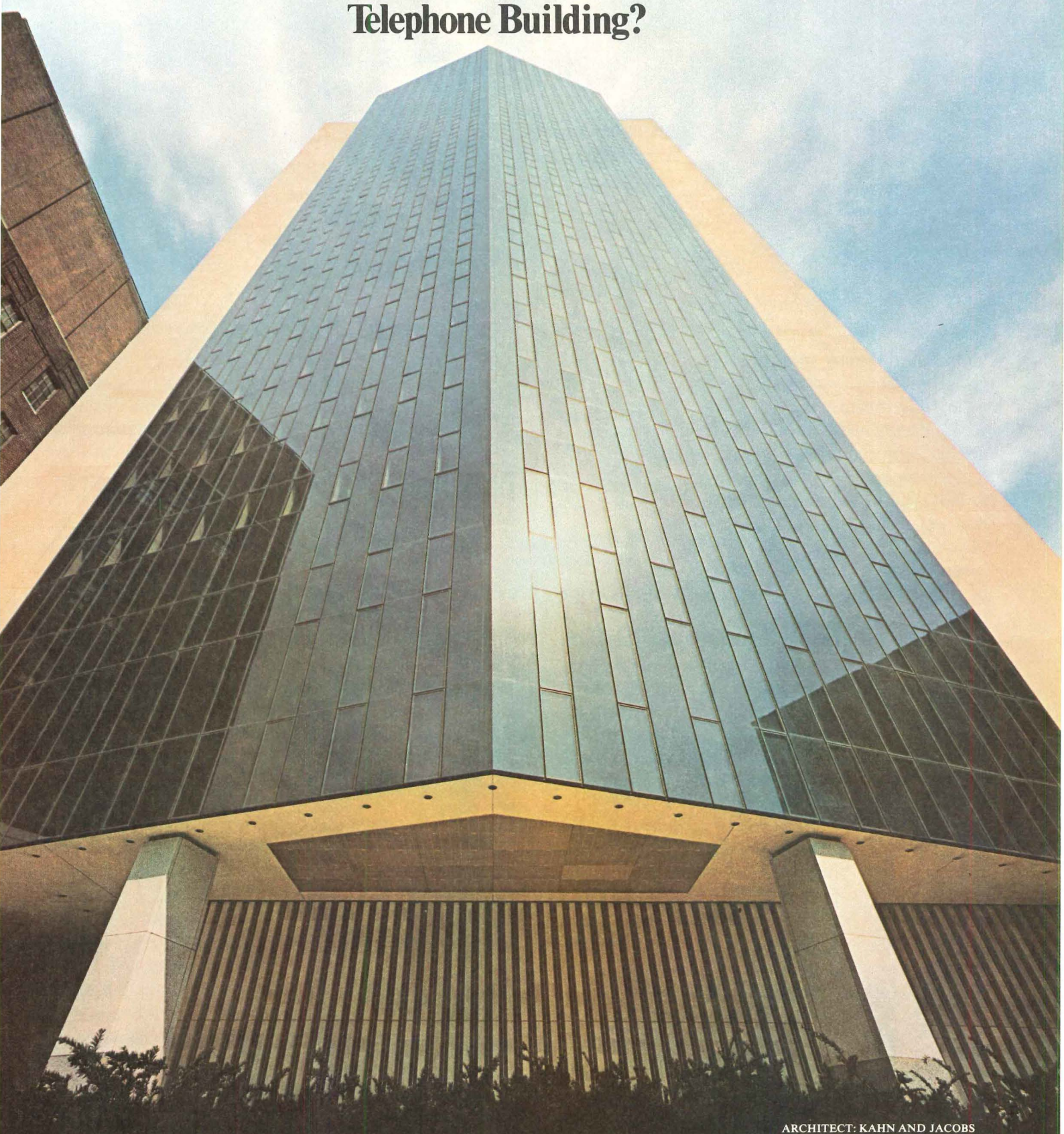
JUTE

Jute Carpet Backing
Council, Inc., 25 Broadway,
New York, N.Y. 10004

WRITE FOR ARCHITECTURAL
GUIDE SPECIFICATION
Prepared by William E. Lunt, Jr., C. S. I.

American Industries, Inc. • BMT Commodity Corp. • Bemis Co., Inc. • C. G. Trading Corp. • D & C Trading Company, Inc. • Delca International Corp. • Dennard & Pritch Co., Ltd. • A. de Swaan, Inc. • Robert F. Fitzpatrick & Co. • Gillespie & Co. of N.Y., Inc. • Hanson & Orth, Inc. • O. G. Innes Corp. • Jute Industries, Ltd. • Lou Me Co. • Pak-Am Inc. • William E. Peck & Co. of N.Y. Inc. • R. L. Pritchard & Co. • Revonah Spinning Mills • Stein, Hall & Co., Inc. • White Lamb Finlay Inc. • Willcox Enterprises,

What's new about the new New York Telephone Building?



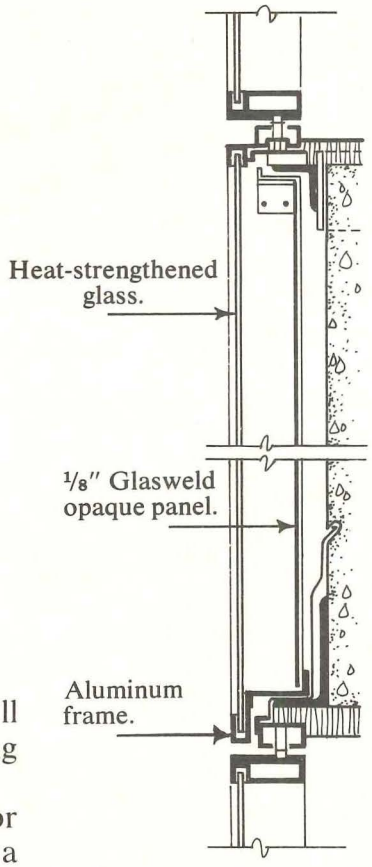
ARCHITECT: KAHN AND JACOBS

Among recent additions to Manhattan's skyline, one of architectural distinction is the 24-story building of the New York Telephone Company.

One of its unique features is the way in which black Glasweld® was incorporated in its window wall design. Glasweld was used as an opaque panel behind glass in the spandrel area. (See installation diagram on the next page.)

Why put Glasweld *behind* glass when it retains its look of newness for years on exteriors with no protective cover at all? Because it enabled the architects to emphasize the verticality of window treatment—an element of design that greatly enhances the building's striking appearance.

This unique use of Glasweld exemplifies the versatility of the material or how—in the hands of innovative architects—it can be used to achieve distinctive effects.



Section through Exterior Wall, New York Telephone Building.

Colorful, durable, versatile Glasweld® for skyscrapers or low-rise buildings.

Look almost anywhere today. You'll see evidence of the ever-widening acceptance of Glasweld.

Why the upsurge in its uses? For one reason, Glasweld comes in a choice of 26 colors that retain their integrity for years on exteriors and in interiors. Regardless of the most rigorous climatic or environmental conditions.

In fact, Glasweld installed on buildings more than ten years ago still retains its original condition – a testimonial to the material's long "life expectancy." Indeed, the surface of Glasweld is comparable in durability to the best grades of exterior porcelain enamel and ceramic tile.

But durability and looks aren't everything. Equally important, Glasweld is easily and quickly installed. It's also simple to cut and drill. Only ordinary power tools are needed.

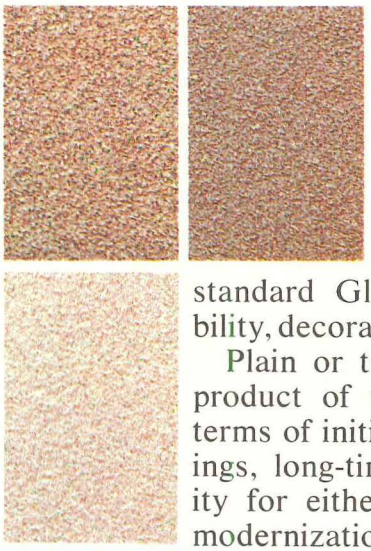
Glasweld is economical, too, when it comes to maintenance. It requires no painting or refinishing for at least 15 years. Cleans easily, too.

It keeps a visually flat appearance when properly installed according to U.S. Plywood instructions. Rustproof, incombustible (U.L. fire hazard classification 0-0-0), waterproof and virtually impervious to stains.

Glasweld is also noted for its immense versatility. It has been widely used for curtain wall panel facings, fascias, soffits, opaque window inserts, balcony panels, and interior linings. Moreover, it is an excellent material for use in rooms – such as laboratories – that must be kept dust-free. Since Glasweld is virtually free from static buildup, dust will not readily cling to its surface.

New textured Glasweld.

In addition to standard Glasweld in a range of 23 colors, U.S. Plywood, recognizing that architects have many uses for textured materials, now offers new sand-surfaced Glasweld with a distinct textured appearance. The new textured designs of Glasweld include Rhine Sand, Moselle Sand and Champagne White Sand. (As shown at left.) And the aggregate is adhered with an inorganic bond.



These new textured designs retain all the qualities for which standard Glasweld is noted: durability, decorative value, and economy.

Plain or textured, Glasweld is a product of unusual practicality in terms of initial cost, installation savings, long-time service and durability for either new construction or modernization.

For further information on Glasweld, call the Architects Service Representative at your nearest U.S. Plywood office or write:

U.S. Plywood

A Division of U.S. Plywood-Champion Papers Inc.
777 Third Avenue, New York, New York 10017

On Readers' Service Card, Circle No. 367

EDITORIAL

Although June began with the CSI Convention in Chicago, which proved to be a straightforward purposeful event, by mid-month the International Design Conference at Aspen was "into it" with the Counter Culture. The month ended with the AIA Convention in Boston which began with a backlash against last year's social, economic, and political commitments and ended with a rearguard action that fought back to positions taken a year ago.

To begin, the CSI most closely resembled the carefree gatherings of times past. It was the least tempestuous and probably accomplished most of what it had set out to do. CSI members with specifications for joy and data for delight had little time for social, economic, or political issues.

Speeches tended to be direct, sometimes dull, informative and uninterrupted. Radicals, long hair, and black dissidents were at a premium. A free and easy mixture of manufacturers, specifiers, and architects had a relaxed, working good time.

Aspen a week later was the scenic scene of confused confrontation. Designers taking blame upon themselves for environmental ills were told by Reynor Banham that "after all they were very small operators in the cosmic scheme of things," and that such small talk as they were making revealed only conceit. The designers allowed that they might not be all that responsible, but that man, since he had a brain, was the only one capable of changing things — as the conference demonstrated, brains have not always been in man's favor. Aspen is always beautiful — with beautiful people to match — and the environment is very far away.

Toward the end of the month, the AIA Boston Convention began by regressing a year. Social, economic, and political programs, proposed only twelve months earlier, fought for their life. All of which must have been a disappointment for the AIA's outgoing president, Rex Allen, who, in a tough year, showed honesty, courage, candor, and outspoken regard for the forward-looking resolutions agreed upon a year ago. Our best wishes for the year ahead to new AIA president Bob Hastings who faces, perhaps, even a tougher year than Rex Allen's if he plans to build on his predecessor's work.

If the Boston Convention is an indication of the mood of the coming year, the architectural profession seems ready to drive youth away, losing one of its strongest allies. The young see the deterioration of the environment as their battleground which, after all, is quite close to "quality of environment," the cornerstone of the architects' professionalism. The AIA should be cautioned against throwing out the youth with the polluted bath water.

To sum up a month of conventions and confrontations: The CSI had no conflict because it was a "how to do it" affair. The International Design Conference was a "what to do" conference and more was accomplished than the final denouncement indicated. Conference participants went to Aspen to exchange ideas and the amount of turmoil was in direct ratio to the amount of exchange.

The real conflict evolved in Boston where the realities of putting buildings together in the real or unreal world — depending on where you stand — came head to head with economic, political, and social realities. It was, in a sense, a convention deferred. The most controversial points, discrimination in relation to ethical standards and social, political, and economic responsibilities will be decided during the coming year by the AIA's judiciary committee and its Task Force on Professional Responsibility to Society.

If there is any lesson to be learned from this month of conventions, it would be — it's not what you do but what and how you do it.

Forrest Wilson

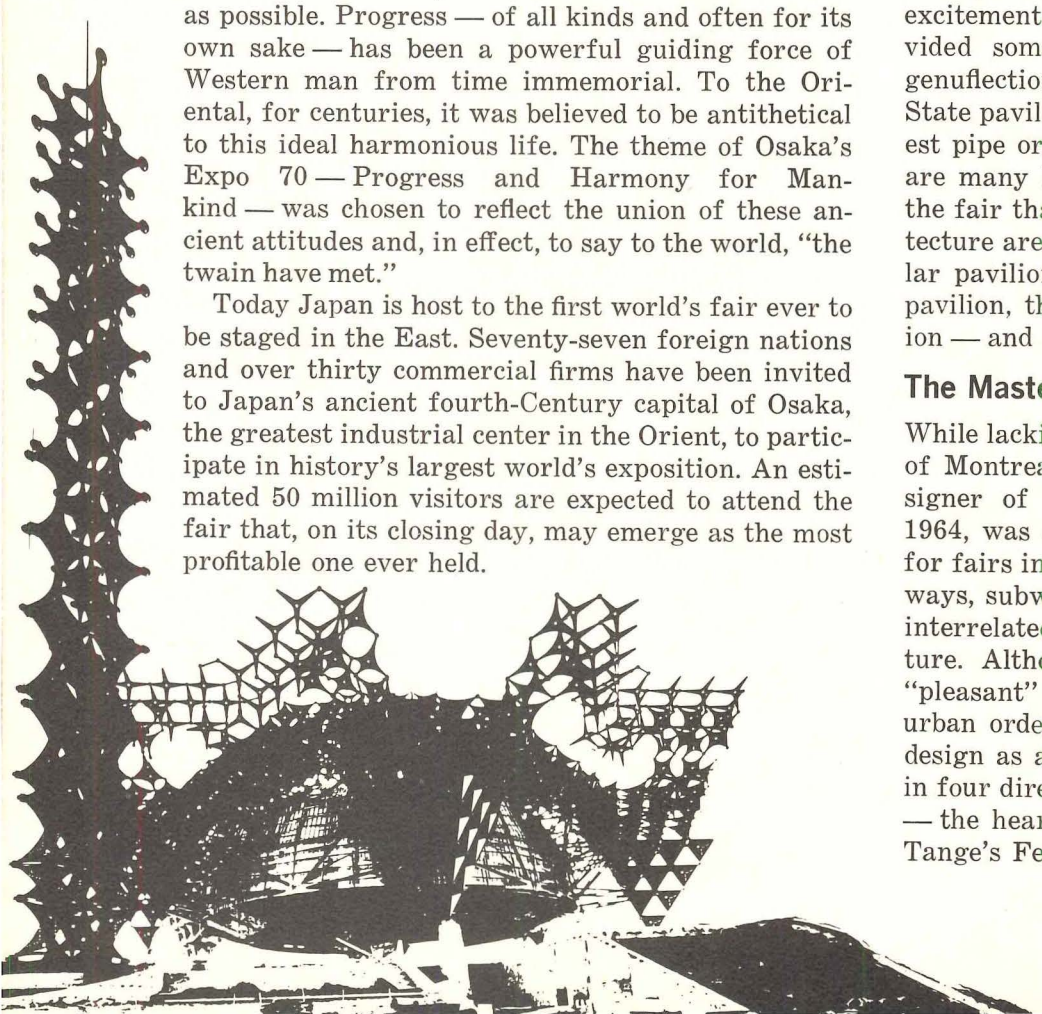
EXPO'70

Where the Twain Have Met

In 1970, with Japan as one of the world's economic superpowers, it is almost impossible to imagine it as the isolationist, feudal island of only 116 years ago when Admiral Perry ran his U.S. Navy gunboats into Tokyo Bay to force the Japanese into trade agreements with the West. Although a few European nations had been trading in the Far East since the 17th Century under extremely limited and tightly controlled conditions — usually the Europeans were not allowed beyond the dock areas — it remained impossible for the Westerner to understand an Oriental attitude that viewed commerce, especially with foreigners, almost as an evil.

Trade, to the Oriental mind, was contrary to the ideal life of harmony and was to be avoided as much as possible. Progress — of all kinds and often for its own sake — has been a powerful guiding force of Western man from time immemorial. To the Oriental, for centuries, it was believed to be antithetical to this ideal harmonious life. The theme of Osaka's Expo 70 — Progress and Harmony for Mankind — was chosen to reflect the union of these ancient attitudes and, in effect, to say to the world, "the twain have met."

Today Japan is host to the first world's fair ever to be staged in the East. Seventy-seven foreign nations and over thirty commercial firms have been invited to Japan's ancient fourth-Century capital of Osaka, the greatest industrial center in the Orient, to participate in history's largest world's exposition. An estimated 50 million visitors are expected to attend the fair that, on its closing day, may emerge as the most profitable one ever held.



(Left) The Japanese Toshiba-IHI Pavilion.
(Right) Canadian Pavilion.

But when we look beyond its historic implications to the fair itself, we can only judge that, with some important exceptions, it has not been a particularly adventurous one. Expo 70 seems to have been organized primarily for the Japanese visitors. For them it signified a cheap world tour, and they lined up massively, everywhere, to run through the fair in militarily disciplined groups behind little flags raised by responsible guides.

A Visitor's Impressions

"My impression of the architecture (some examples excepted) was quite poor," notes internationally known architect Yona Friedman, a recent visitor to the fair. He saw "a cheap baroque façade collection, involuntarily *steinbergian;* a parody of early U.S. movie theaters" where most pavilions exhibited "some variation of exactly the same audiovisual features about the 'life of mankind' in better-than-life Kodacolors."

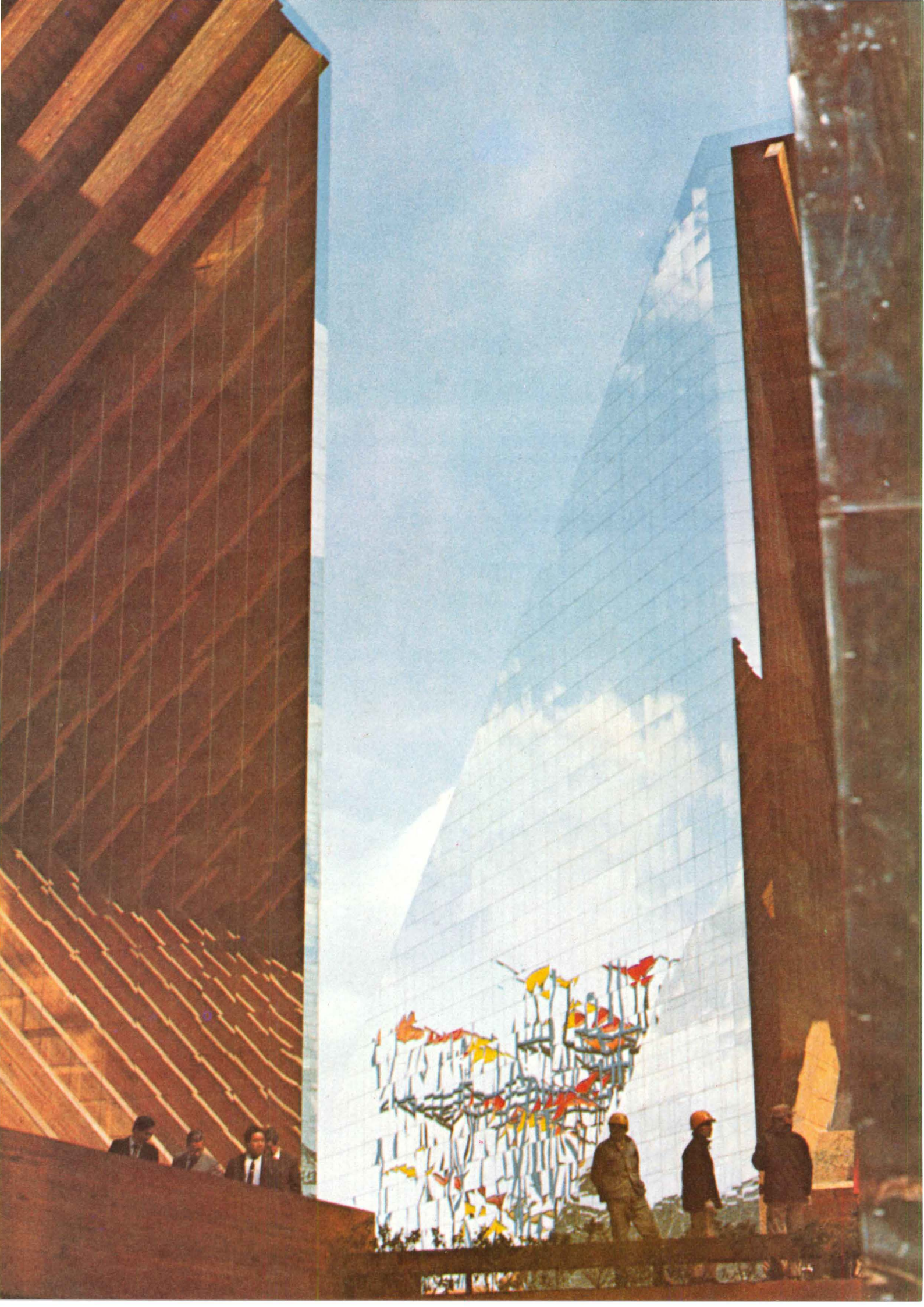
The Exceptions

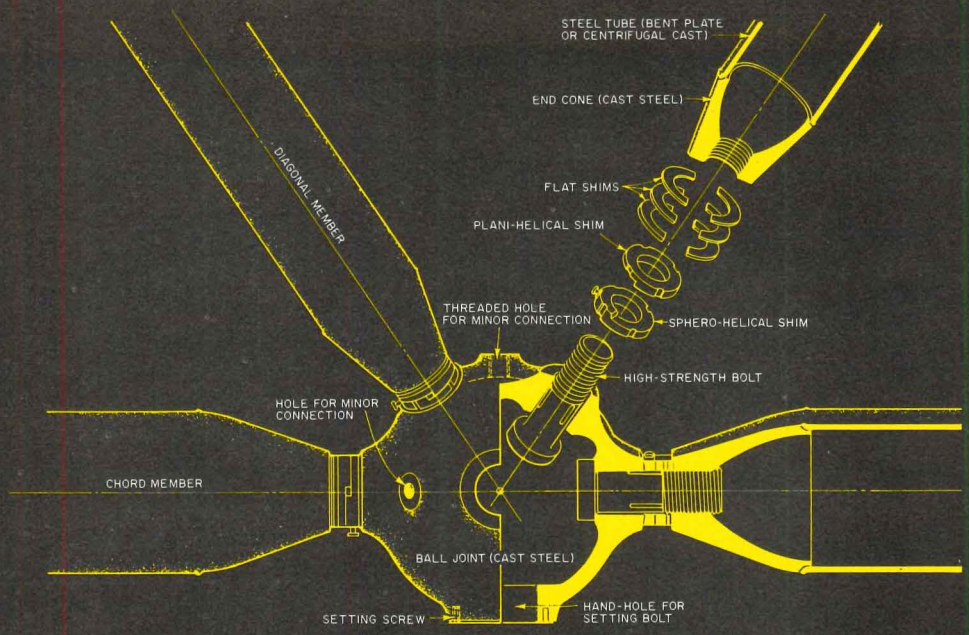
What will remain of lasting importance from this fair? A quick look at fairs of the recent past shows that the design of cable-hung roofs and, indeed, of entire cable-hung structures, was significantly advanced at Brussels in 1958; that Seattle, in 1962, gave the U.S. its first working monorail; that, in keeping with its architectural heritage, the New York fair of 1964 provided some valuable load-test data on the few buildings tested during demolition; and that Montreal's Expo 67 brought the marriage of space-frame construction to computer technology.

Expo 70, although not a hotbed of architectural excitement and innovation has, nevertheless, provided some moments of true inspiration. In its genuflection to the mysterious East, the Vatican State pavilion has bestowed upon the world the largest pipe organ ever built with bamboo pipes. There are many handsome buildings, but the elements of the fair that make important contributions to architecture are to be found in the design of four particular pavilions — the Festival Plaza, the Fuji Group pavilion, the Floating Theater, and the U. S. pavilion — and in the master plan of the fair itself.

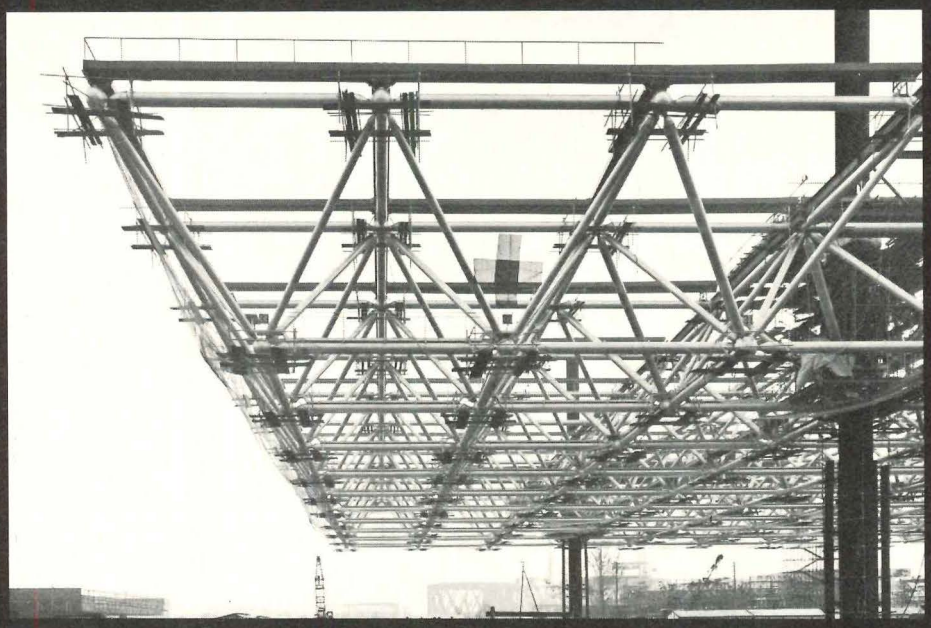
The Master Plan

While lacking the open and graciously planned space of Montreal's Expo 67, architect Kenzo Tange, designer of Tokyo's famed Olympics structures of 1964, was able to realize an unprecedented concept for fairs in his master plan in which buildings, highways, subways, monorail, and moving sidewalks are interrelated into a model of urban design for the future. Although there is what some have called a "pleasant" disorder to the pavilions themselves, an urban order is given to the entire plan through its design as a tree in bloom, with roads branching out in four directions from the trunk — the Symbol Area — the heart of Expo 70 that houses, among others, Tange's Festival Plaza.





DETAIL OF CONNECTION



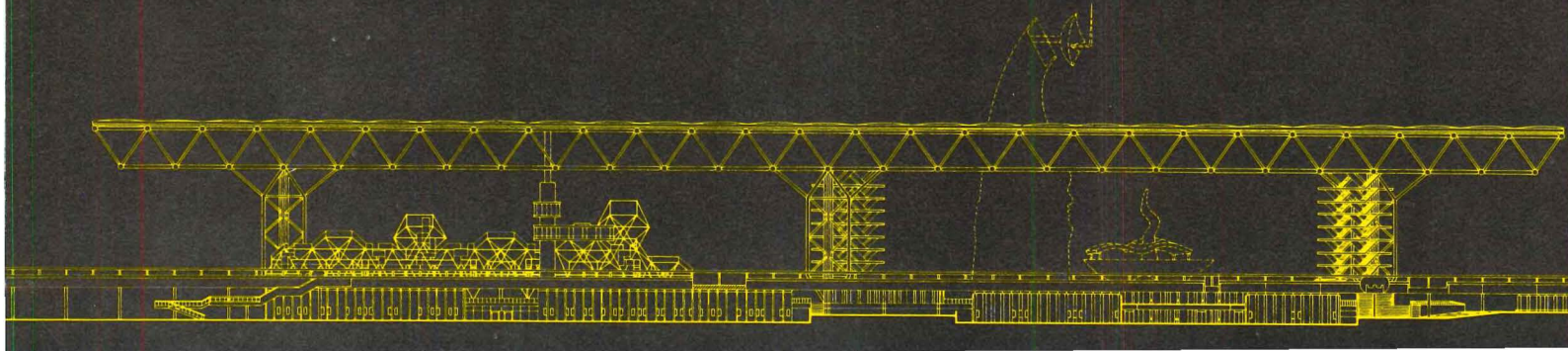
The 425,000 sq ft roof rising to 100 ft position.

Festival Plaza— Joints are Key to World's Largest Space Frame

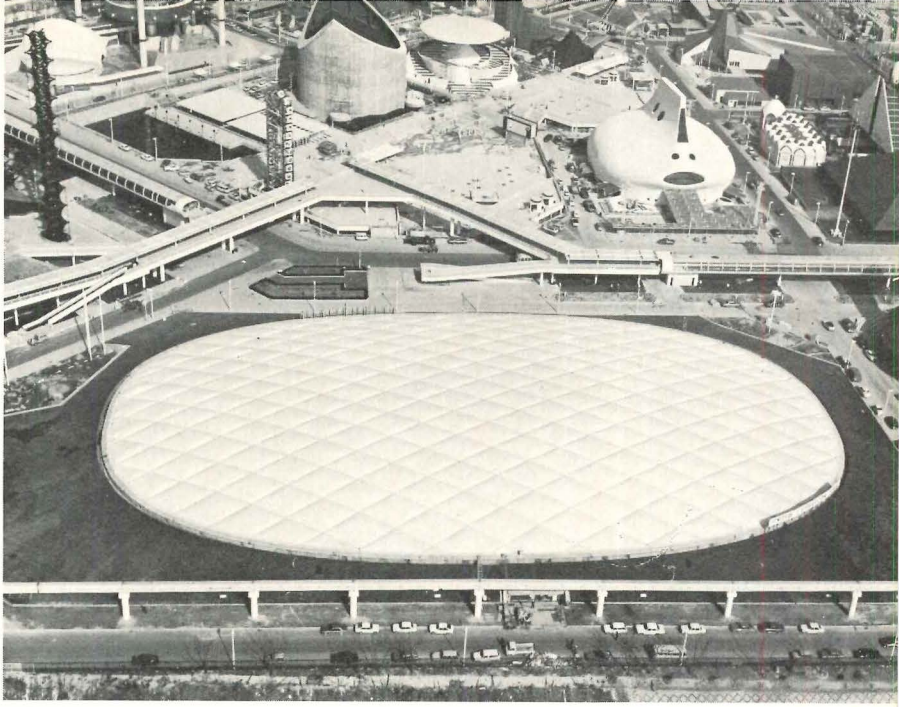
The Festival Plaza is roofed by a 1082′ x 394′ space truss resting on six columns, covered with an air membrane of transparent polyester, whose 4700 tons of steel were raised by six powerful, tandem air-pressure jacks almost 100 ft off the ground into place. This innovative space frame of heroic proportions, with its massive bolted-ball joints and enormous chord members, represents an important breakthrough in the science of space-truss construction. In order to achieve its scale, the architects had to overcome two serious difficulties that had seriously limited the size of space frames in the past: the gaps between demands in measurement and angle accuracy, and the limits imposed by on-site operations.

Since it is nearly impossible to achieve measurement accuracy during construction, the resulting error-accumulation requires later, massive readjustments. To complicate the problem, excessive attention to angle accuracy had always, in the past, resulted in painstakingly slow and poor site assembly. Solving the problem of the space-frame joint became a special challenge to the architects. It was solved by fitting the heads of the bolts into a sphere inside, and concentric to, the main ball joint, with the shank of the bolt projecting through the joint's hand holes. The hand holes were tooled to provide a clearance between the shank and the sides of the hand holes that would allow the bolt axis a plus-minus radian tension of 1/100 of angle of variation around the center of the joint. On the bolt shaft there were two sets of threads for connecting the chord members during on-site assembly; one to compensate for error by absorbing tension, the other to manage compression forces. By this control of discrepancies in both lengths and angles, it was possible to limit element error to the point where large spaces trusses, for the first time, became practicable and, even more important, economical.

Master Design Producer: Kenzo Tange. **Architect:** Koji Kamiya & URTEC Asao Fukuda & Soseisha–Takekoshi Kenchiku Jimusho. **Structural Engineer:** Yoshikatsu Tsuboi Laboratory, Mamoru Kawaguchi Laboratory, Sadao Hirata. **Contractor:** Fujita Construction Co. Ltd., Ohbayashi-Gumi, Ltd., Takenaka Komuten Co., Ltd.



EXPO'70

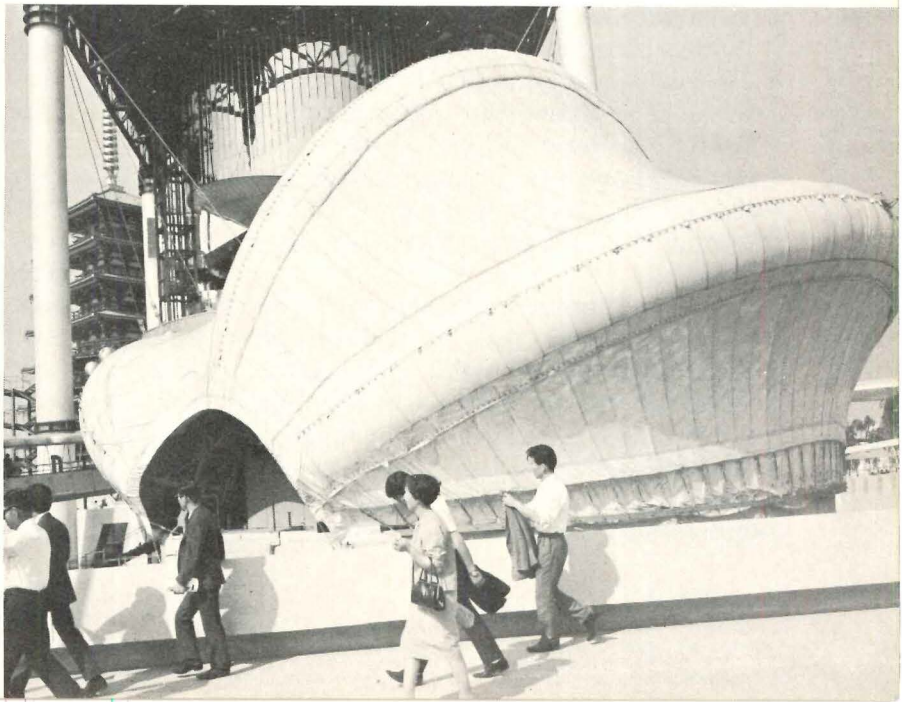


U.S. Pavilion.

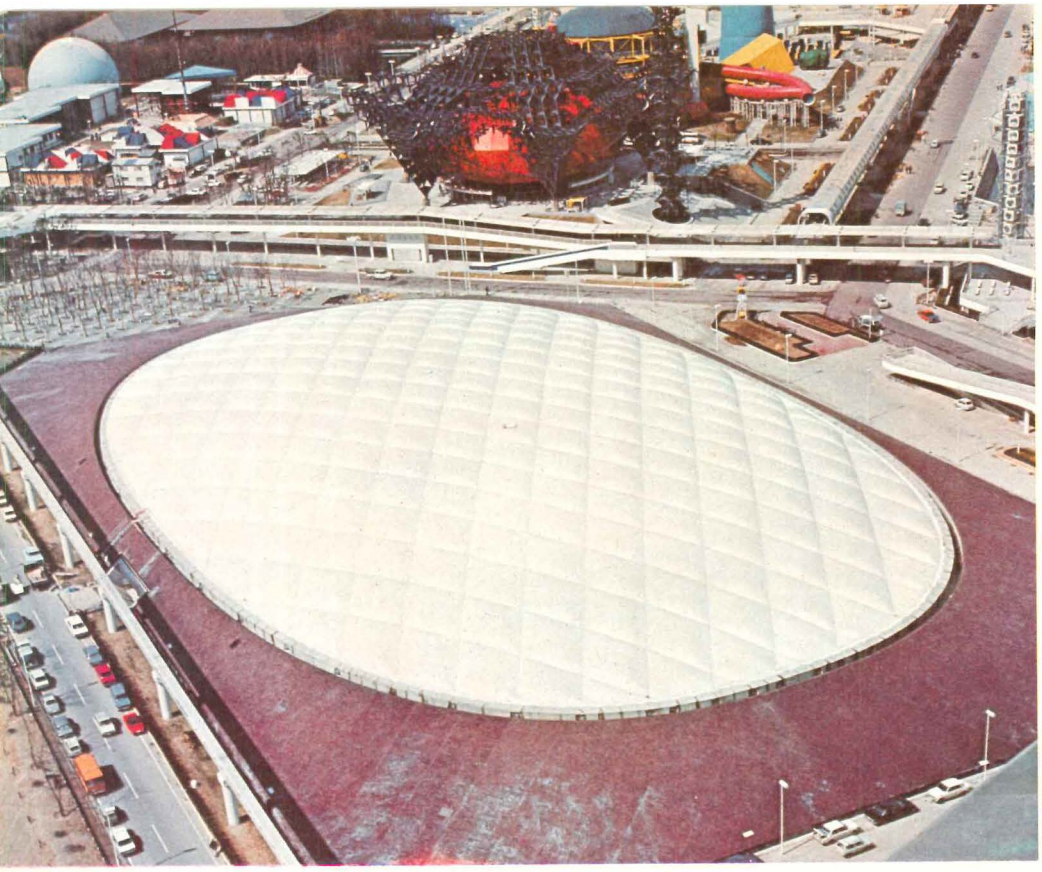
Innovative Inflatables Preview Things to Come

Pneumatic systems have both positive and negative sides, and at Expo 70 they have been utilized in three uniquely different ways: by using low air pressure within a single-membrane system to obtain air pressure only slightly above that outside (U.S. Pavilion); by using high air pressure in double (tubular air beam) membranes that allow a maintenance of air pressure within the structure (but not within the air beams) identical to that outside (Fuji Group Pavilion); and by making use of a combination of these two systems, plus the employment of negative (exhausted) air, while still maintaining equalized air pressure within and without the structure (Floating Theater of the Electric Power Pavilion). These structures are discussed on the following pages.

Fuji Group Pavilion.



Floating Theater of Electric Power Pavilion.



EXPO'70

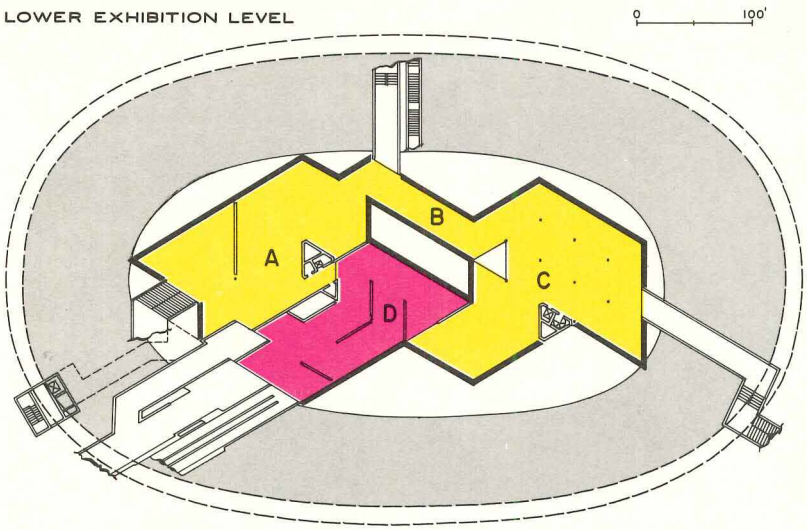
U.S. Pavilion-The Ultimate Understatement

Just as the Crystal Palace awakened Victorians to undreamed of new possibilities of construction in the 1850s, this building, with the largest and lightest clear-span air-supported roof ever built, may prove to be the most important advance in building technology of the 1970s. Spanning an area the size of two football fields, the deceptively simple structure is probably the only building at the fair that could not have been built ten years ago. Perhaps the simplest in appearance, while at the same time the most sophisticated structure at the fair, it is an unassuming, dignified, almost nonbuilding, secreted in the earth, hardly visible until one is upon it. Its purpose was not to shock with architectural pyrotechnics nor to propagandize for America, but rather to provide, simply, an economical, large space as an enclosure for the exhibits.

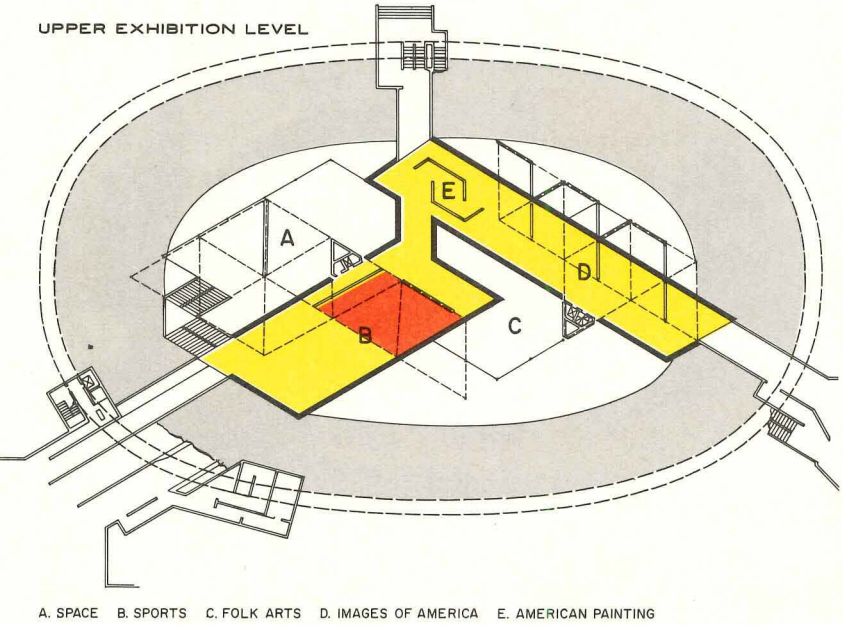
Recognizing the importance of having the exhibit enclosure relate to, and be sympathetic with, what was to be enclosed, the USIA sought to create an "Exhibition Design Team." After a comprehensive review and analysis of eleven submissions, the USIA Advisory Panel recommended the Exhibition Design Team of Davis, Brody, Chermayeff, Geismar and de Harak.

The resulting structure, despite its enormous size of 274' x 465', and poor subsurface conditions, uses neither pillars nor foundation. A huge, 5.2 million cu ft bowl set into the earth, it houses 100,000 sq ft of exhibit space. To create the bowl, soil was hollowed out of the earth, then banked and cemented to form a berm around the cavity left in the ground. A concrete compression ring (there is no tension ring) resting on the berm anchors the diamond-grid restraining cables of the roof. The diamond pattern is carried throughout the pavilion, repeated in the modules of the two two-level exhibition system, again in the mirrored mylar covering the inside of the berm, and in the smooth, brown asphalt paving tiles covering its outside. Under the exhibit spaces is an additional 18,000 sq ft of office space for USIA administrative and service facilities.

With its translucent roof, the interior of the pavilion is bathed in constantly changing, sometimes breathtakingly brilliant light that plays across its mylar walls to create a jewel-like interior. With 10,000 visitors crowding inside each hour, it has become the most popular pavilion at the fair. The highlight of the exhibits — and perhaps of the entire fair — is the moon rock brought back to earth by the Apollo 12 mission in the Space Exploration exhibit. (Causing a major traffic jam during the opening days, it had to be raised so photographers could snap it more quickly as they passed by.) The exhibit of Ten Photographers presents views of American life with an unusual degree of candor, while the American Painting show displays pictures representing the best of our realists from colonial times to the present. The Sports Exhibit, with everything from a Granatelli Turbocar to Babe Ruth's locker and uniform, is the largest exhibit of American sports ever assembled outside the U.S. The dynamics of American architecture are shown in a display that juxtaposes indigenous buildings against the best of today. The exhibit concludes with a large and quite beautiful Folk Arts show that has been especially popular



A. SPACE B. ARCHITECTURE C. FOLK ARTS D. NEW ARTS



A. SPACE B. SPORTS C. FOLK ARTS D. IMAGES OF AMERICA E. AMERICAN PAINTING

with the Japanese, followed by the New Arts exhibit that resulted from 24 young artists working "in residence" with 40 large corporations.

The roof of the pavilion is a single fiberglass membrane of low silhouette supported entirely by air pressure, stretched over and restrained by a network of cables in tension anchored to a funicular (no bending moments under normal loading) concrete compression ring that, in turn, rests on, but is not attached to, the berm of the building. The super-elliptical (an ellipse with squared corners) enclosure, which did not pre-exist as a solution to long-span structures, measures 274′ x 465′, and is the largest clear-span, air-supported roof ever built. Weighing only one pound per square foot, including cables, it is also the lightest roof of this span ever built, and it is designed to withstand all natural forces, including earthquakes and 125 mph typhoon winds.

The enclosure is made of a single, 100,000 sq ft piece of vinyl-coated fiberglass held up by air pres-

Exhibit: Images of America.

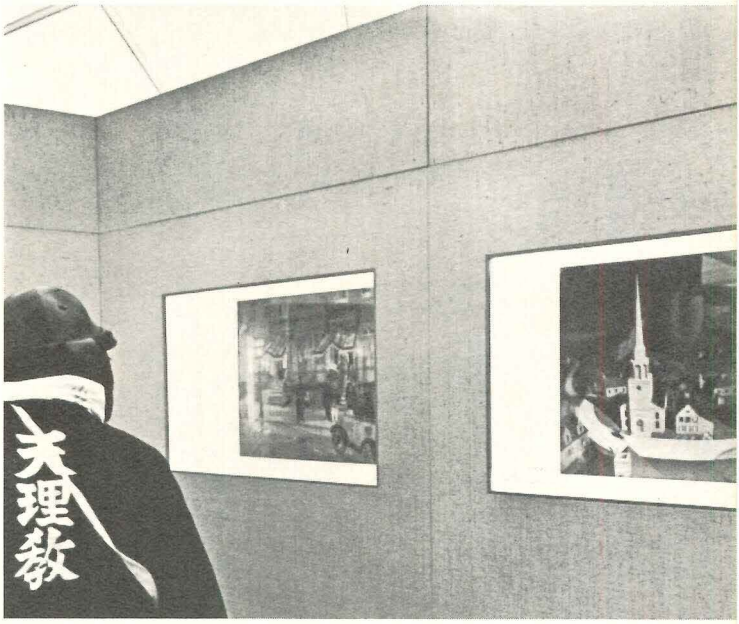
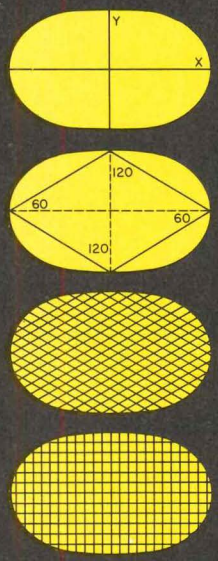
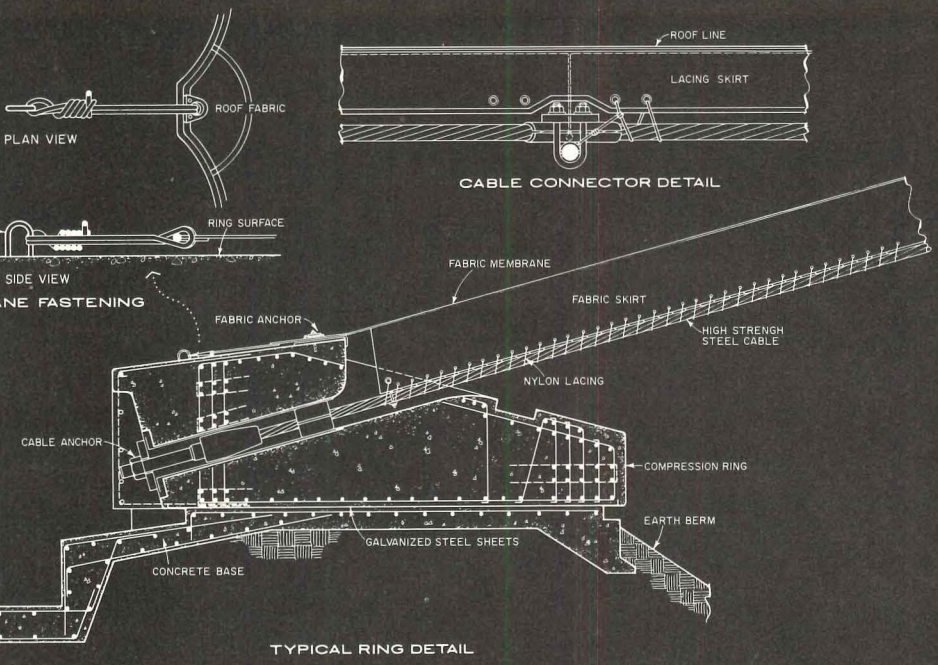


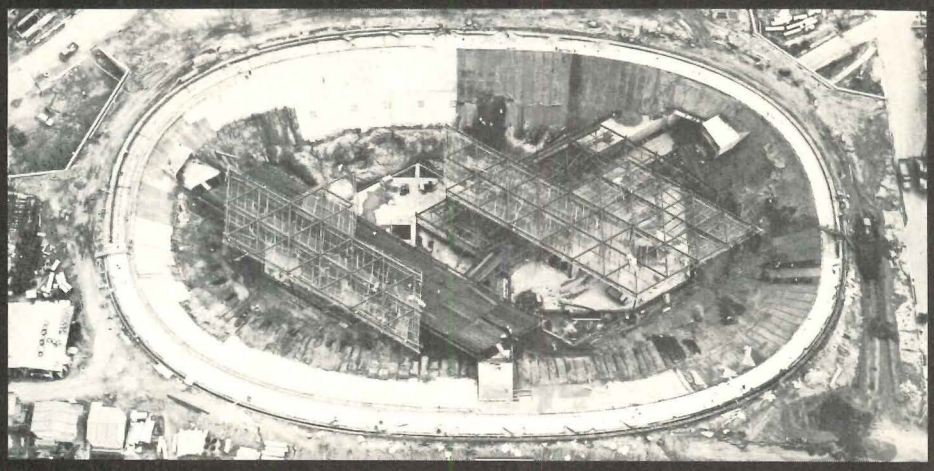
Exhibit: American Painting.

Causing major traffic jams, moon rock in space exhibit was elevated for faster photographing.

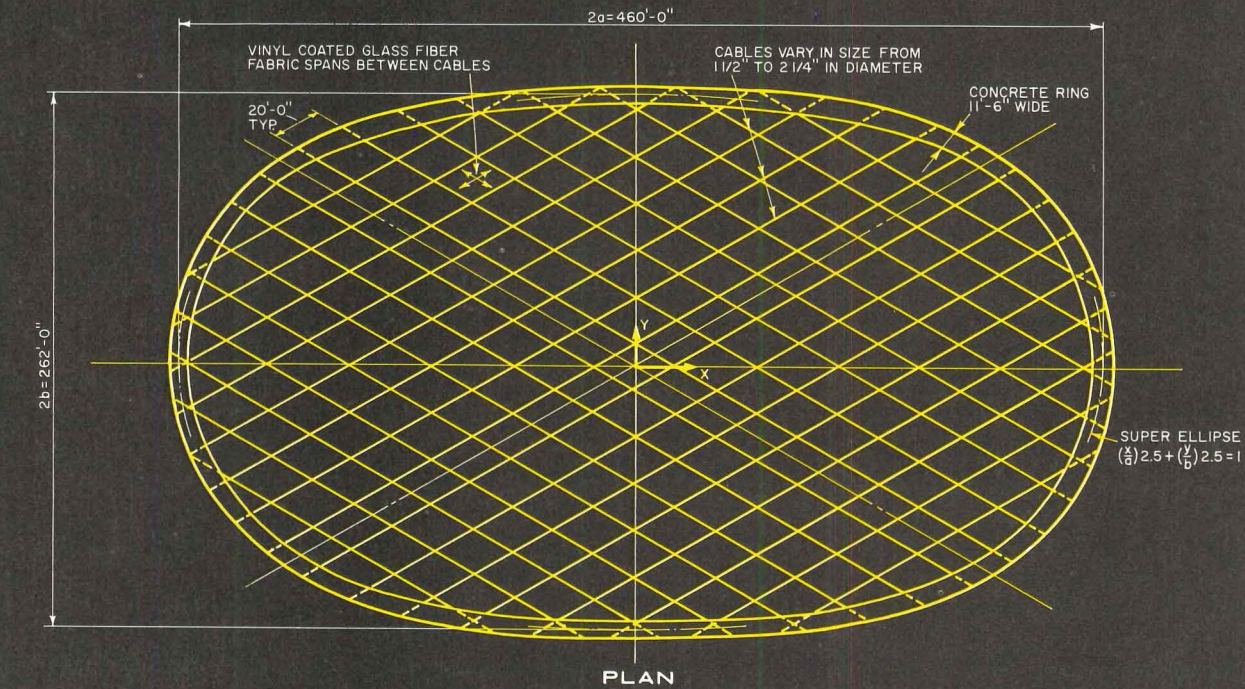


When the terminal points of the x and y axes of the roof (fig. 1) are connected (fig. 2), the diamond-grid pattern of the restraining cables is precisely determined and establishes the exact angle (60, 120, 60, 120) of the cables. By repeating cables at 20 ft intervals parallel to the primary alignment (fig. 3), a highly economical solution was achieved in the resulting diamond grid that uses 33 percent less cable tonnage than a rectilinear grid (fig. 4).





The site excavated and banked, work began on the two-level exhibition system.



sure only .03 psi above outside atmospheric pressure. The interior air pressure is maintained by four blowers, each with an 8000 cfm capacity that also serve as the air-conditioning system for the entire structure. Two additional blowers stand in reserve.

The fabric, developed out of the Apollo program, has a melting point of 1000 F that makes it virtually fireproof: if a fire were to start anywhere on the roof, air rising out of the structure would cool the surface to the point where it could not support combustion and would, in effect, extinguish itself. Furthermore, the roof can tolerate a tear of 40 ft without deflating, but if it were to collapse it would only come to rest on the exhibit frame beneath, leaving the interior essentially open. It can carry a uniform snow-load of 15 psf, as well as large concentrated loads; these forces are not transmitted to the berm, but are carried by air columns to the ground.

With falsework and cables in place, the roof was then laid out and laced to cables while work continued underneath.

Even though an air-supported structure had been the original form decided upon by the architects, they realized it would be difficult to design a large-span roof structure at low cost that would also resist the high typhoon winds of Japan. Since it was impossible to remove the structure from the winds, it was decided to use a low, air-supported and cable-restrained roof that would work aerodynamically with, rather than against, the winds. An advantage of the low structure is that as winds pass over the berm they create a wind-pressure distribution that is positive (downward) on the berm and negative (upward) over the roof; the cables restraining the roof against both the interior-positive pressure as well as the exterior-negative pressure, at the same time providing dynamic stability through their tension.

Arranging the cables in the usual radial fashion, with the added weight of a central tension-ring, could have caused depressions in the roof from the collection of rain or snow that might have caused it to collapse, and also would have required twice as many end fittings, plus the cost of the ring itself, and would have necessitated the uneconomical use of fabric to span small distances at the center and wide distances at the circumference. Arrangement of the cables in a rectilinear grid parallel to the major axes of the superellipse would have required more material than actually used in the final diamond-grid pattern. However, the diamond-grid pattern of the roof was not arbitrary, but precisely determined by the geometry of the superellipse which was, in turn, predicated by the area of the site. Within the rectangular site, the architects wished to enclose as much space as economically possible, so it was decided to use the largest enclosure possible within the area: a superellipse — $\left(\frac{x}{a}\right)^{2.5} + \left(\frac{y}{b}\right)^{2.5} = 1.$ Less pointed than an ellipse, the superellipse did not exist as a mathematically formularized entity until 1959, and it had never been employed in a solution for covering long-span structures.

All engineering problems were solved in the design stage through the use of computers. The intersecting connecting points of each cable were first determined, then marked at the exact point on each cable where connections would occur. During erection of the structure, the cable ends were secured in sockets that were then anchored into the compression ring that rests on the concrete berm. A galvanized steel sheet was placed between the ring and the base to obtain a necessary coefficient of friction, and the ring itself was designed to have sufficient mass to prevent any uplift. Because of these factors, during extreme instabilities such as earthquakes or typhoons the ring will not slide off the berm, but it will slide a small degree to accommodate the roof during high or gusty winds.

Because all foreseeable problems had been solved in the design stage, erection of the roof was a carefully controlled, step-by-step process that only required the contractors to follow the working drawings precisely. After the cables were placed and clamped at the exact, premarked locations, the finished fabric was laid over and laced to the cables, then the roof was inflated in about one and a half hours. Rising with the cable joints in exact position, no adjustment of the cables was required after inflation.

UNITED STATES PAVILION. **Architects:** Design Principals — Lewis Davis, Sam Brody, Alan Schwartzman, Ivan Chermayeff, Tom Geismar, Rudolf deHarak; David Geiger — Structural Consultant; Project Architect — Yasuo Uesaka; Senior Exhibit Designer — David Sutton; Design Staff — Ian Ferguson, Gary Jacquemin, Phyllis Montgomery, Pasquale Del Vecchio, Al Sibley, Fred Witzig, Jack Kupiec, Bill Hofer, Yunoshin Yamasaki. **Site:** Southern boundary of central portion of exposition site plan, with direct access from adjacent monorail station and flanking moving walkways. **Program:** Developed by the U.S. Information Agency with selected consultants. Design concept of air structures as temporary buildings was developed into a low-rising, air-supported roof providing contrast between exterior appearance and interior space. **Structural System:** Highly efficient use of tension structure resulted in simple and economical construction as well as a large span and light, spacious interior volume. **Major Materials:** Roof fabric of vinyl-impregnated fiberglass cloth laced to steel cables, concrete compression ring at boundary of roof supported by earth berm. Surfacing materials of asphalt block (exterior) and mirrored mylar (interior) cover the berm. **Mechanical Systems:** Interior pressurization system combined with air-conditioning. Complete emergency systems include high pressure variable blowers and a power plant. **Consultants:** David Geiger — Horst Berger, Structural; Cosentini Associates, Mechanical; Howard Branston, Lighting; M. Paul Friedberg Associates, Landscape Architects. **General Contractor** (also Associate Architect): Ohbayashi-Gumi, Ltd. **Costs:** Structure, $2,600,000; Exhibits, $1,400,000; Total (including shipping, insurance, demolition, salvaging and repacking), $4 million.

EXPO'70

Fuji Group Pavilion

The pavilion of the Japanese banking and industrial Fuji Group could have come out of a Japanese science-fiction movie; in fact, it looks very much like the famous Mothra in his caterpillar stage. The largest self-supporting, entirely pneumatic structure ever built, it can be deflated and moved anywhere easily, to be reinflated again for further use.

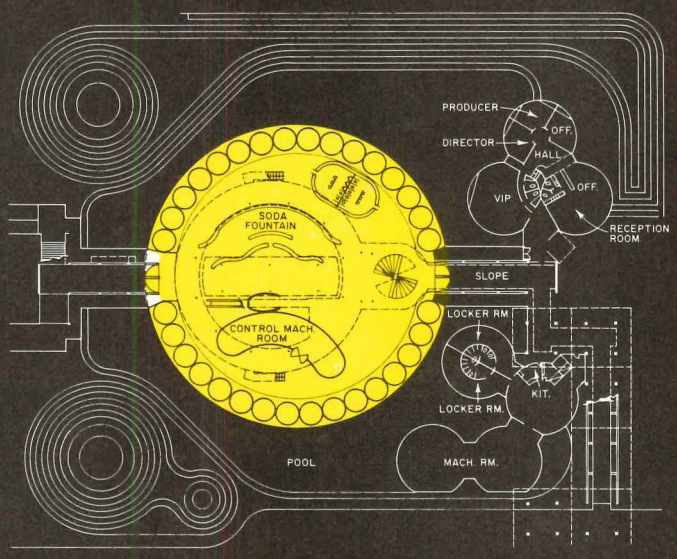
The pavilion is formed of 16 air-beam arches, each beam 13 ft in diameter and 234 ft long, fastened to steel cylinders embedded into a concrete ring foundation 164 ft in diameter. When the air beams are inflated, they assume varying arched forms; the middle one becomes semicircular, and the others become increasingly horseshoe-like the farther they are from the middle beam. The middle arch, of 136½ ft in diameter, rises 82 ft into the air, while the two farthest from it tower 104 ft above the ground, with 35 ft between their piers to allow for entranceways. Because the circular foundation dictates a progressive arching of the beams as the span between their piers is decreased, the tops of the beams lean outward as they approach the extremes, thus causing an overhang of 22 ft at each doorway. This creates a roof that is 208 ft long — 44 ft more than the diameter of the circular foundation. Horizontal belts connecting the air beams stabilize the unusual dome structure.

Each beam is made of double-layered canvas of polyvinyl alcohol fiber, bonded with neoprene, with 2844 psi maximum rupture strength. The outer surface is hypalon; while a black, air-tight liner on the inside controls air leakage and blocks sunlight.

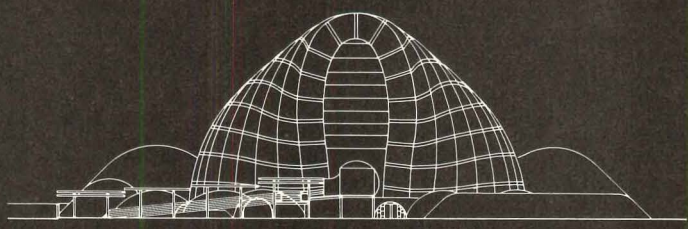
The air pressure inside the dome, unlike that of single-membrane systems, is the same as the outside atmospheric pressure. The pressure in the beams, maintained at 32 in. H_2O manometer, can be increased to 100 in. H_2O manometer to compensate for the high typhoon winds in Japan.

Because the self-load of the structure is negligible, external loads and pressures become chief factors in load conditions — exactly the opposite of that for conventional structures. But in circumstances of minimal external loads — as in artificial climates created under gigantic, primary monomembrane structures — secondary pneumatic buildings could be easily and economically constructed.

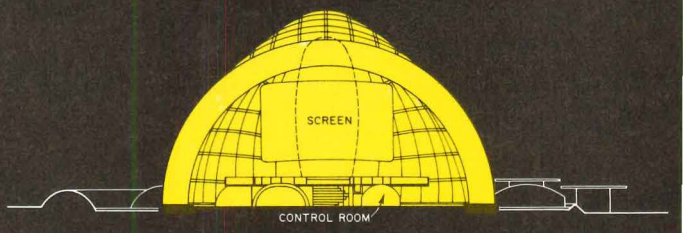
Architect: Yutaka Murata. **Structural Engineer:** Mamoru Kawaguchi. **Contractor:** Taisei Construction Co., Ltd.



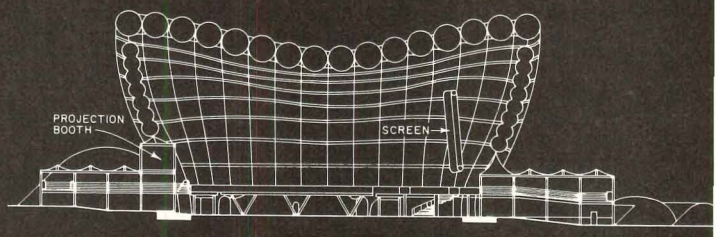
Plan of circular foundation ringed with air beams.



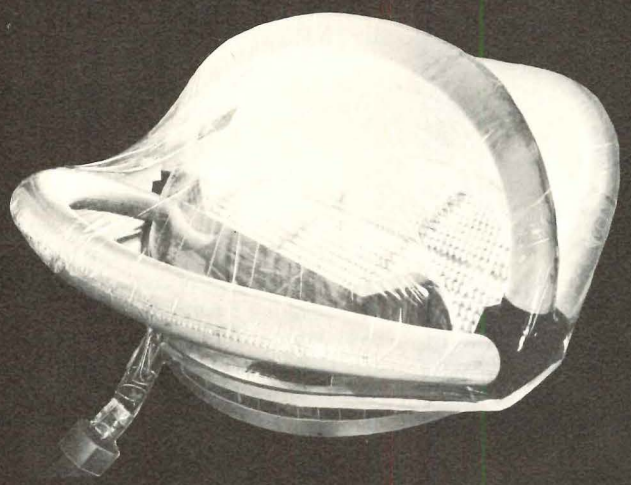
Circular foundation forces piers of end beams closer together, providing greatest height at entranceways.



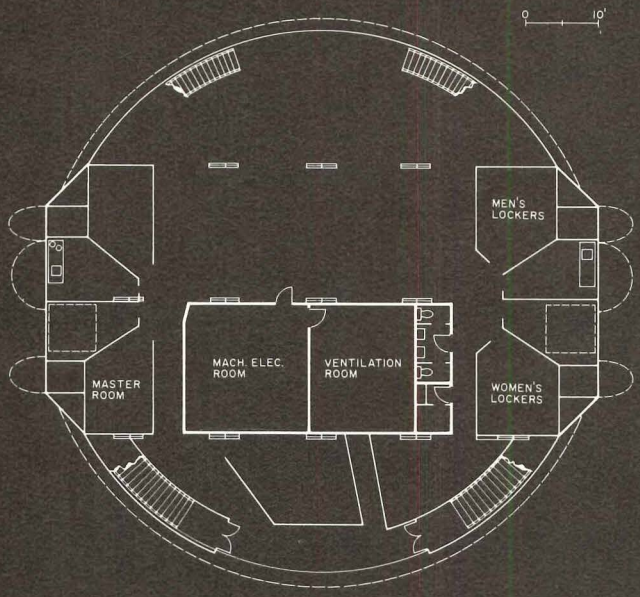
Middle arch is semicircular and has lowest rise.

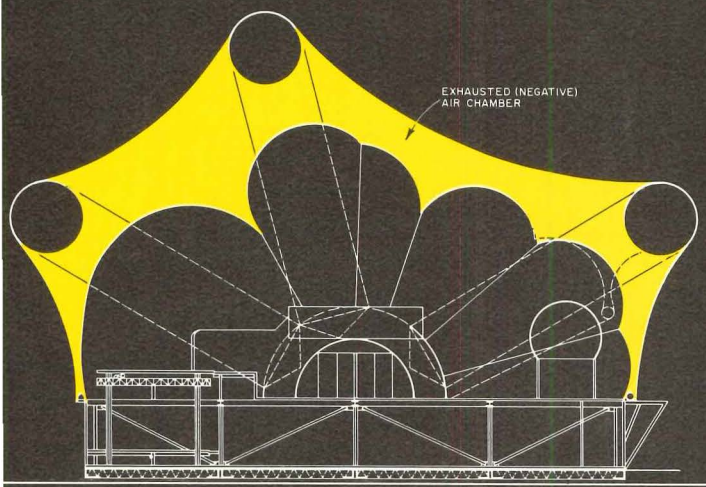


Air beams lean progressively outward as they approach extremes, causing an overhang that creates the oblong effect.



Three air-beam arches on a circular foundation restrain both inner and outer membranes that are given form by exhausting air between the membranes (transparent model shown).





By creating a negative air chamber, the outer membrane is drawn in while the inner membrane rises to form a dome over the steel frame, floating foundation.

Floating Theater

It looks somewhat like the shell of a fat hermit crab, but this pneumatic structure that floats on water is actually made up of a steel-frame boat, 75 ft in diameter, that serves as the foundation for three 10-ft-in-diameter, high-pressure air beams whose arches are 75 ft in diameter and tented with a canvas roof membrane. Under the arches is a membrane-dome of canvas that is supported by negative air pressure through exhausting the air between its outer surface and the inner surface of the air-beam-supported roof membrane. When the air between the two membranes is drawn out, the inner membrane rises to form a domed ceiling. The outer membrane, on the other hand, is drawn inward by the negative pressure and becomes tensely stretched, thus preventing fluttering.

The air beams, which are lined for air-tightness, are made of double-woven polyester canvas of 5200 psi maximum rupture strength. The outer membrane is polyester canvas of 1420 psi maximum rupture strength, surfaced with polyvinyl chloride, and the inner membrane is made of polyester canvas with 830 psi maximum rupture strength.

The air pressure inside the pavilion is the same as that outside, while the pressure in the beams is maintained at 60 in. H_2O manometer above outdoor atmospheric pressure, with the ability of being raised to 120 for extreme winds.

The skirts of both the roof membrane over the arches and the inner dome-membrane are anchored to a steel tube whose ends are joined to the floor with hinges. By means of either pulling the steel pipe down with a cable, or releasing it, a large opening is alternately closed or opened, providing access for large crowds of visitors in a short time.

The bottom of the floating theater incorporates 48 bottom-opened buoys that float the structure. A horizontal control system adjusts air in the buoys to prevent the theater from tilting when people move in or out, or when winds are strong. The air is supplied by an air blower that also inflates the air beams. When operating, the theater moves from one shore to the other, revolving 180 degrees, during the presentation of the show. **DAM**

Architect: Yutaka Murata. **Structural Engineer:** Mamoru Kawaguchi. **Contractor:** Takenaka Komuten Co., Ltd.

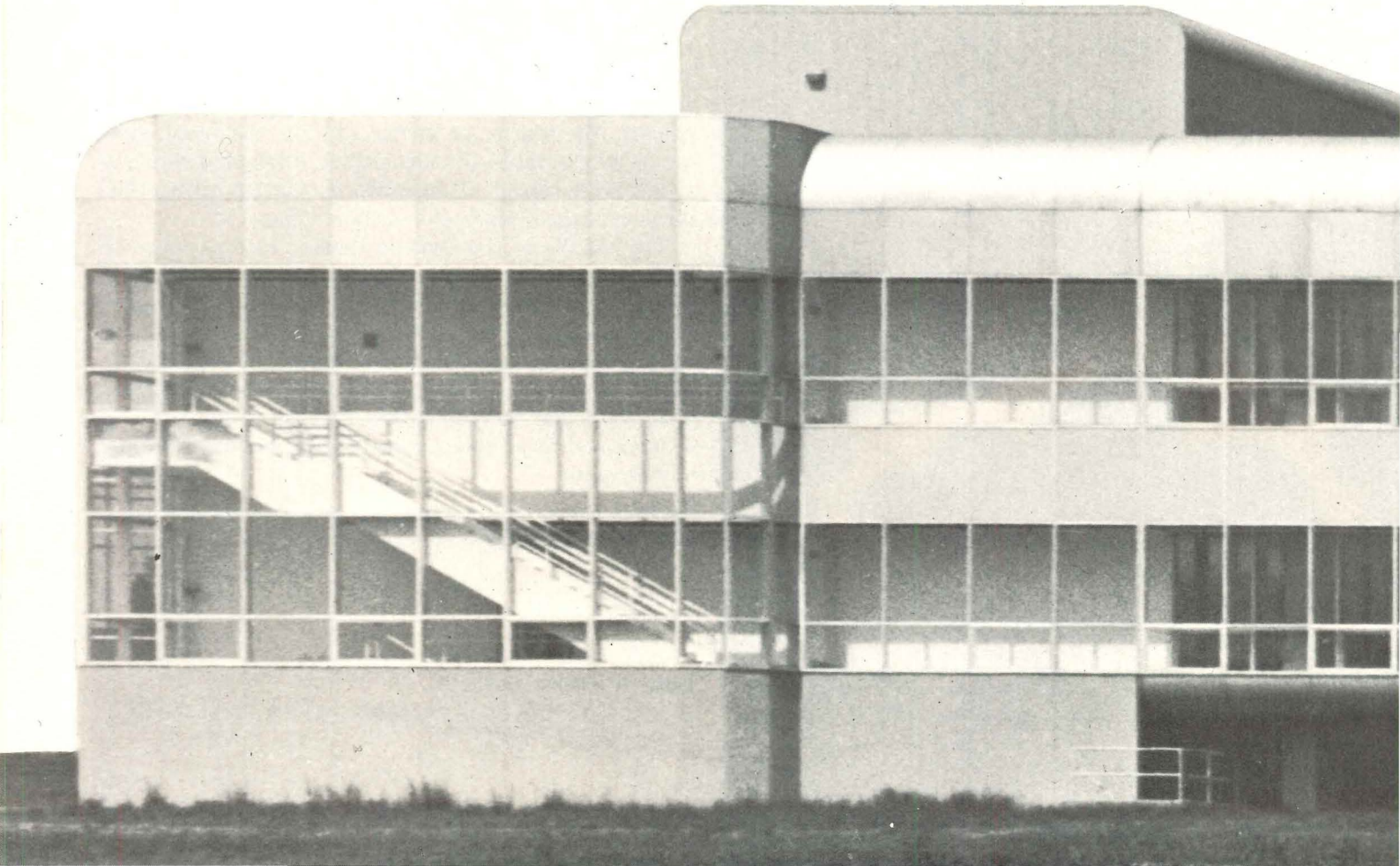
EXPO 70 PHOTO CREDITS

p. 61, Peter Andes; **p. 62,** Taisuke Ogawa; **p. 63,** top, Masao Arai; **p. 64,** Masao Arai; **p. 65,** Shunk-Kender.

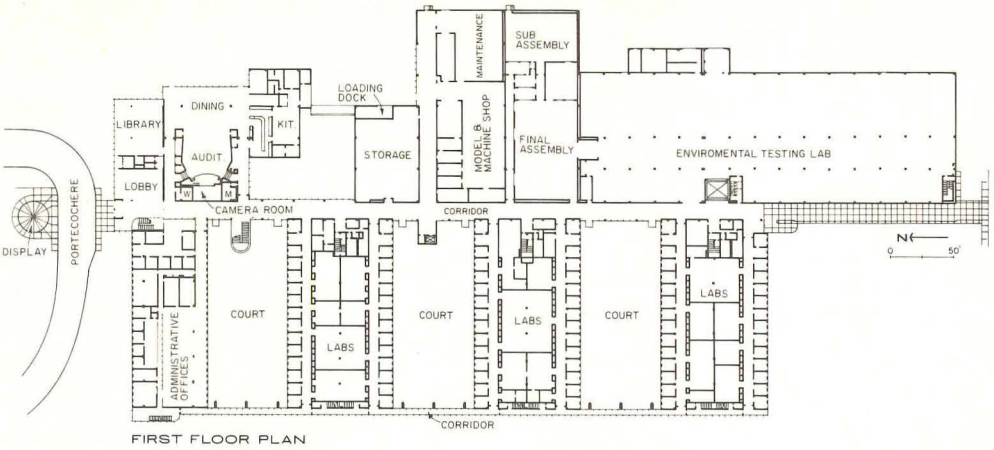
The north end of the building as viewed from Interstate Route 70S. The interior central-spine is emphasized by the projecting canopy.

COMSAT LABORATORIES, Clarksburg, Maryland. **Owner:** The Communications Satellite Corporation. **Architects and Engineers:** Daniel, Mann, Johnson & Mendenhall; designed under the direction of Cesar Pelli; Philo Jacobsen, Design Associate; S. Kenneth Johnson, Partner-in-Charge. **Site:** Rolling, wooded 210 acres located 20 miles northwest of Washington, D.C., adjoining Interstate Route 70S. At 70 mph, Route 70S slashes across one side of the site, severing it from the surrounding dairy farms. The building's spine parallels the road, with 50 visitor parking spaces at the north end of the spine, and 350 employee parking spaces hidden in the woods at the south end. Landscaping retains the look of the local countryside. All plantings are indigenous. **Program:** A building complex to house all the functions needed to research, develop, and produce prototype communication satellites. Basic elements are: laboratories, research offices, satellite assembly area, administration offices,

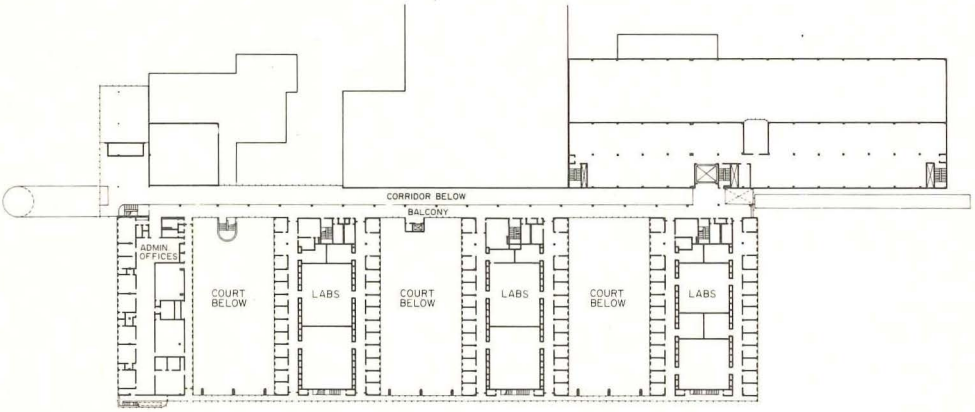
Technological Imagery: Turnpike



auditorium, cafeteria, library, and services, with expansion possible in all areas. **Structural System:** A rigid steel frame rests on concrete spread footings. In the laboratory wing, metal-deck, concrete-infill floors cantilever 10 ft to the exterior walls. **Mechanical System:** Each laboratory wing and service area has its own mechanical penthouse. For climate control all lab areas are served by a double duct system and office areas with an induction system. All offices have temperature controls. **Electrical System:** Electrical demand load is about 3500 kva. Lighting levels are at 120-150 foot-candles by 277v. Fluorescent fixtures. Labs have 120/208v., 3-phase, 4-wire service by plug-in type bus duct. **Major Materials:** Anodized aluminum extruded panels, aluminum mullions, clear glass, and bronze tinted solar glass. **Cost:** $9,257,793, including lab facilities. **Floor Area:** 254,000 sq ft. **Landscape Architect:** Lester Collins. **General Contractor:** J.W. Bateson. **Photography:** Marc Cohen.

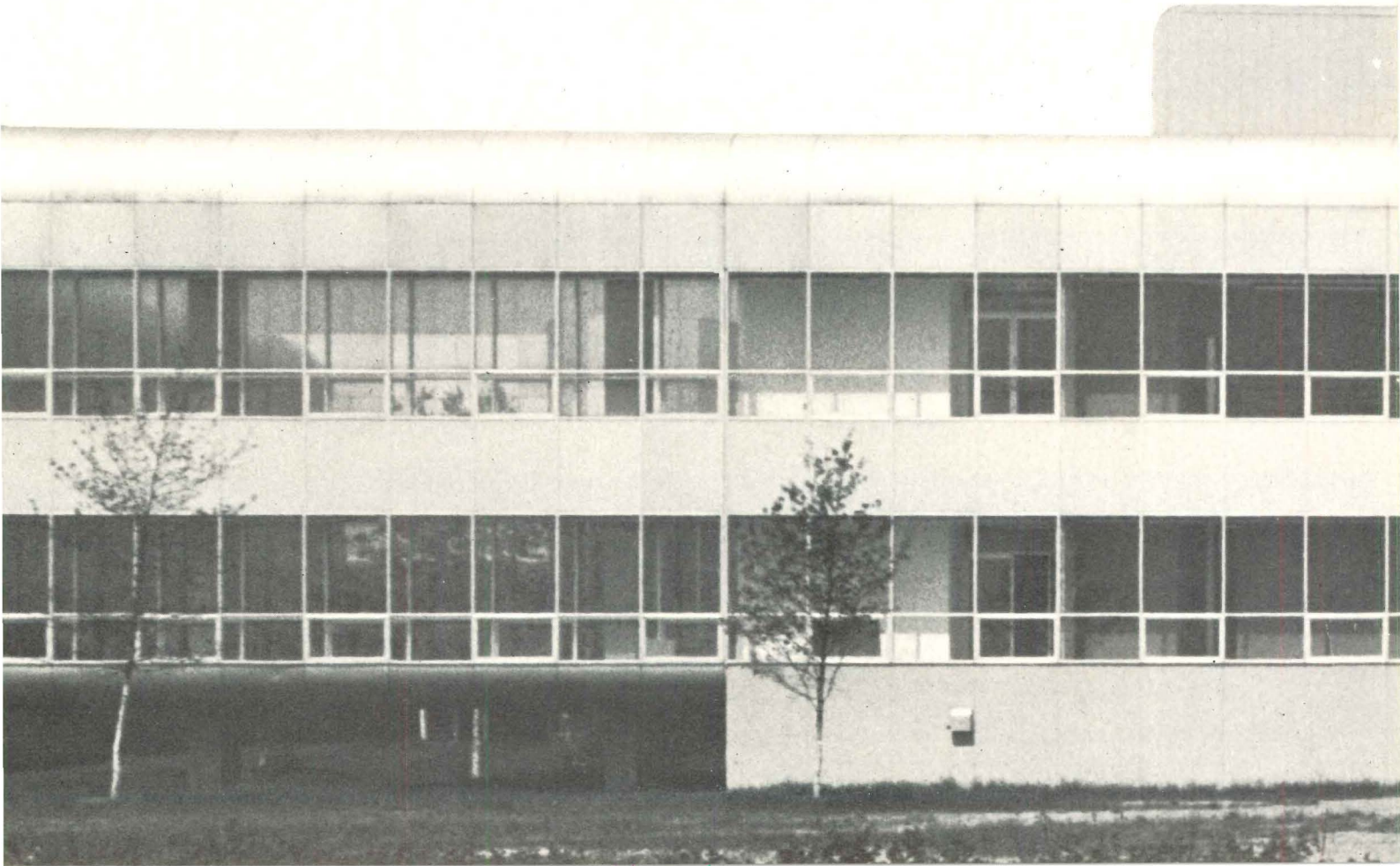


FIRST FLOOR PLAN



SECOND FLOOR PLAN

Version



DMJM's newly completed COMSAT Laboratories Building stands as a highly technological, manmade object in Maryland's pastoral landscape. A low-cost, "open-ended," industrial structure, its taut aluminum skin thrives on imagery from trains, planes, roadside diners, and the "twenties." It is a building best seen in increments; as a whole it seems a collision of images, somewhat incomplete, somewhat clumsy, but always exciting. Lest too much be made of "taste," thereby missing half the designers' point, it is a good building — a fine building in which to work.

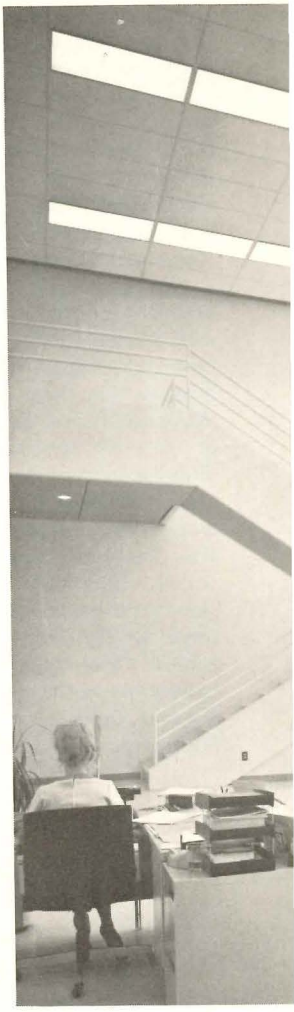
The building — a 1968 P/A Design Award — is a result of studies developed by Cesar Pelli and Anthony J. Lumsden, DMJM's present Director of Design, for earlier buildings like Teledyne Systems Company (completed in 1968) and FAA Western Headquarters (in working drawings). In these earlier buildings, Pelli's design team was already at work on the elements — organization, expansion capabilities, and skin treatment — which elevate COMSAT to an "image" building at a less-than-image-price.

Because the plan is fundamentally quite simple, it was relatively easy to allow things to occur where they wanted to. Stairs are where stairs should be, and they are boldly expressed. The same happens for offices, laboratories, or loading dock — nothing is slighted, little is in excess. There is no hint of a temple about this building, and therein lies one of its greatest strengths. It has broken out of supercontrolled haute architecture, within the visual tradition, without achieving the level of the other 98 percent of buildings. If anything, as an aesthetic statement it transcends taste by becoming a statement in process — the technological process. Aesthetically then it is eclectic — a mixing of the technological orders.

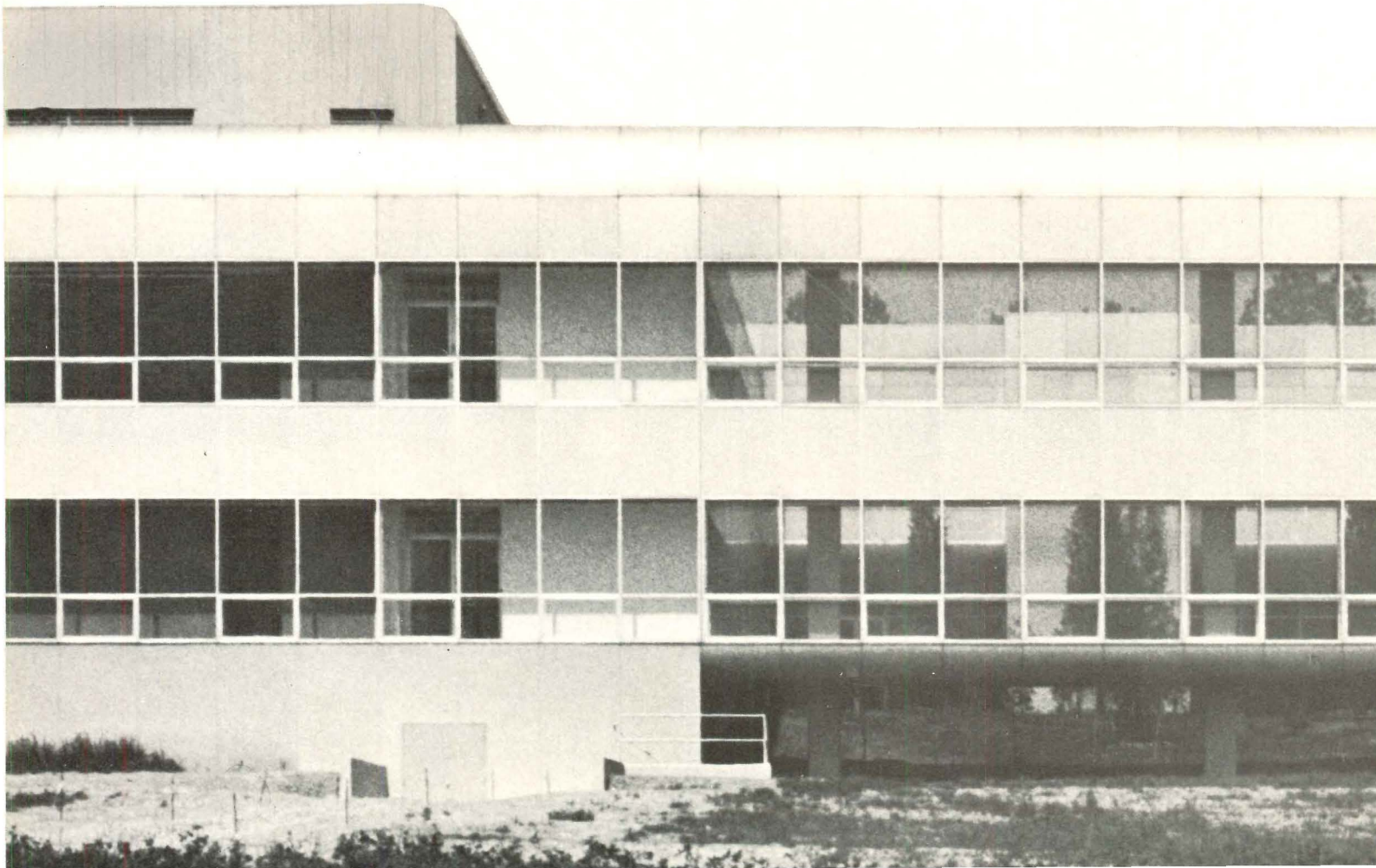
The only inconsistency in plan is the duplication of circulation paths among the laboratory wings, which offers employees a choice in paths and views, and therefore in emotional responses. However, it appears that the primary reason for the secondary path's inclusion was to enclose the form and make it read as one long structure from the road. This reasoning would be easier to forgive in a building not so keen on direct expression of program. Unfortunately, the secondary path is neither enclosed by solar reflecting glass, as other walls are, nor is it air-conditioned. Consequently, few employees walk that way on a sunny day.

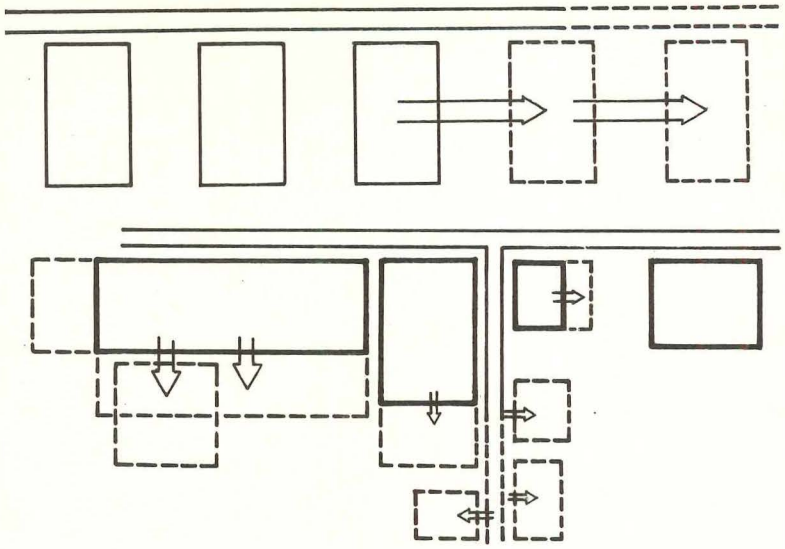
In light of the incredibly short design period of one month, which the designers were given before working drawings began, the building is actually more like a successful experiment than a pure design.

DR



The photo above shows the central spine which serves as a meeting place for employees. Visitors enter the spine from the lobby (photo right).

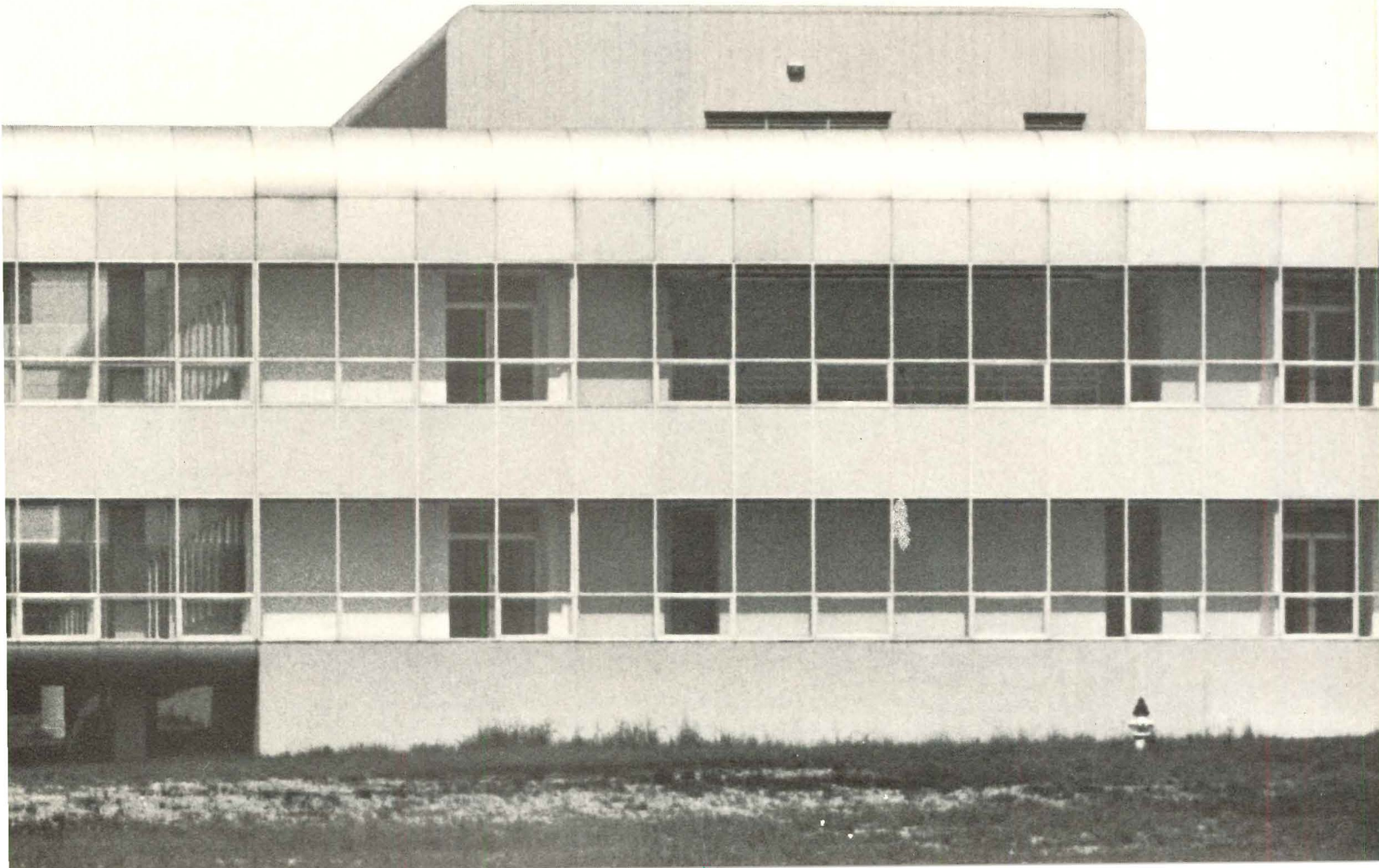


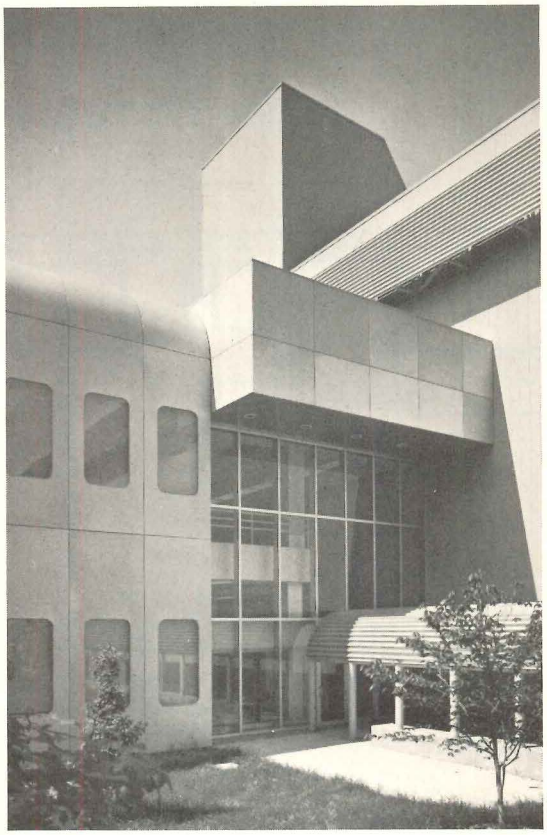


A staircase projects into one of the three enclosed courtyards (photo above). Drawings, above right, show planned expansion patterns of labs and services.

- The plan is generated by the circulation.
- There are spaces and there are circulation lines.
- The complex is planned as an aggregate of spaces off a main circulation line.
- Secondary circulation lines complete the network.
- The circulation is for people and for materials.
- Mechanical services follow the same pattern and are therefore flexible, capable of growth, and accessible.
- Some functions will expand in a predetermined order, since needs for growth can be anticipated.
- Some functions whose future needs cannot be determined will also expand. Their plan is purposely not composed and it is therefore unfinished, open ended.
- A complex is different from a building. In a complex, the corridor is the most important space. This is the common room, the room away from work. It should, therefore, have its own life in the plan. It should not be a leftover. It deserves the best views and the better materials.

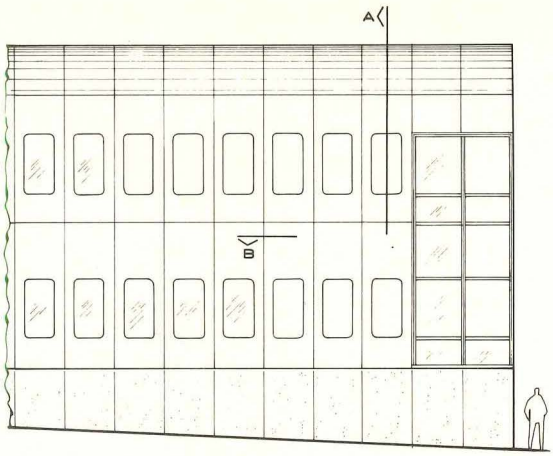
CESAR PELLI



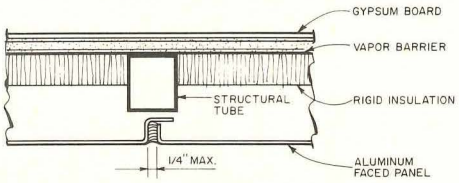


Employees enter the building from the south end, shown in photo. Planned expansion will take place at this end. Glazing is flush with exterior of mullions.

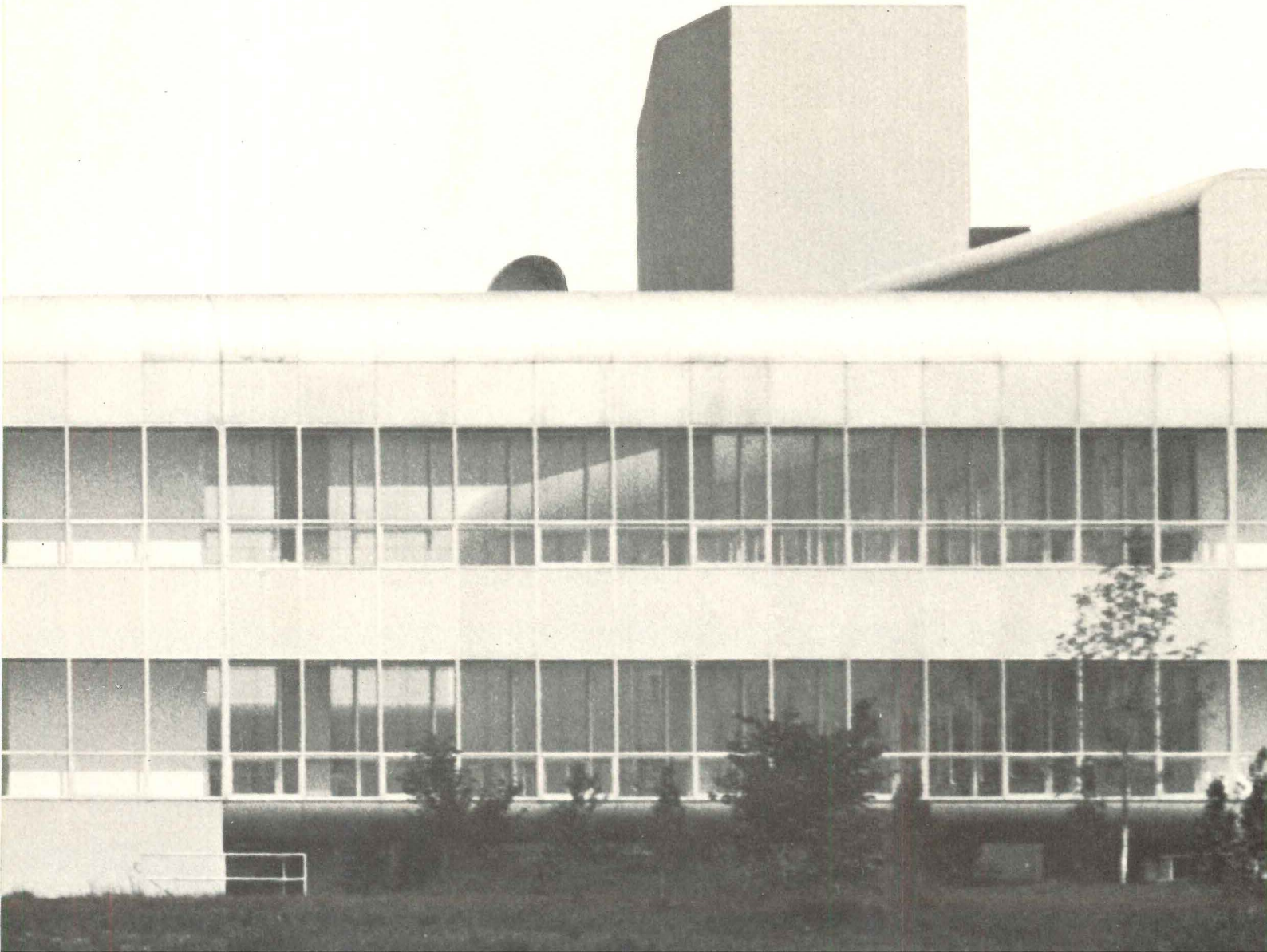
Skin Design: The flat glazed portions of the curtain walls were made from aluminum extrusions adapted to accommodate special reinforcing and anchorage. These aluminum frames are glazed with ⅝ in. insulating glass set into an extruded aluminum sash. A continuous neoprene gasket seals the sash and frame. The frame also supports the edges of the interior gypsum board. Wall panels and the curved parapet tops are made from ⅛ in. aluminum plate stock. Special precautions were taken for thermal expansion since nearly ½ in. vertical movement was expected on the typical laboratory wall. Slotted panel attachment holes in the vertical steel support members provide for this movement. Each 5-ft panel section is attached vertically, but not horizontally, to the next panel. At the typical vertical joint, between steel support and the panels, is a special extruded "T" gasket which extends in one piece from the bottom of the wall to the top of the flat panels. When compressed by panel installation, the gasket seals the joint. Horizontal joints are sealed with a solid compressible sealant. The panels are insulated with glass fiber and an integral vapor barrier. Tops of walls were continuously flashed prior to installation of the curved parapet panels which are set into a continuous aluminum channel.

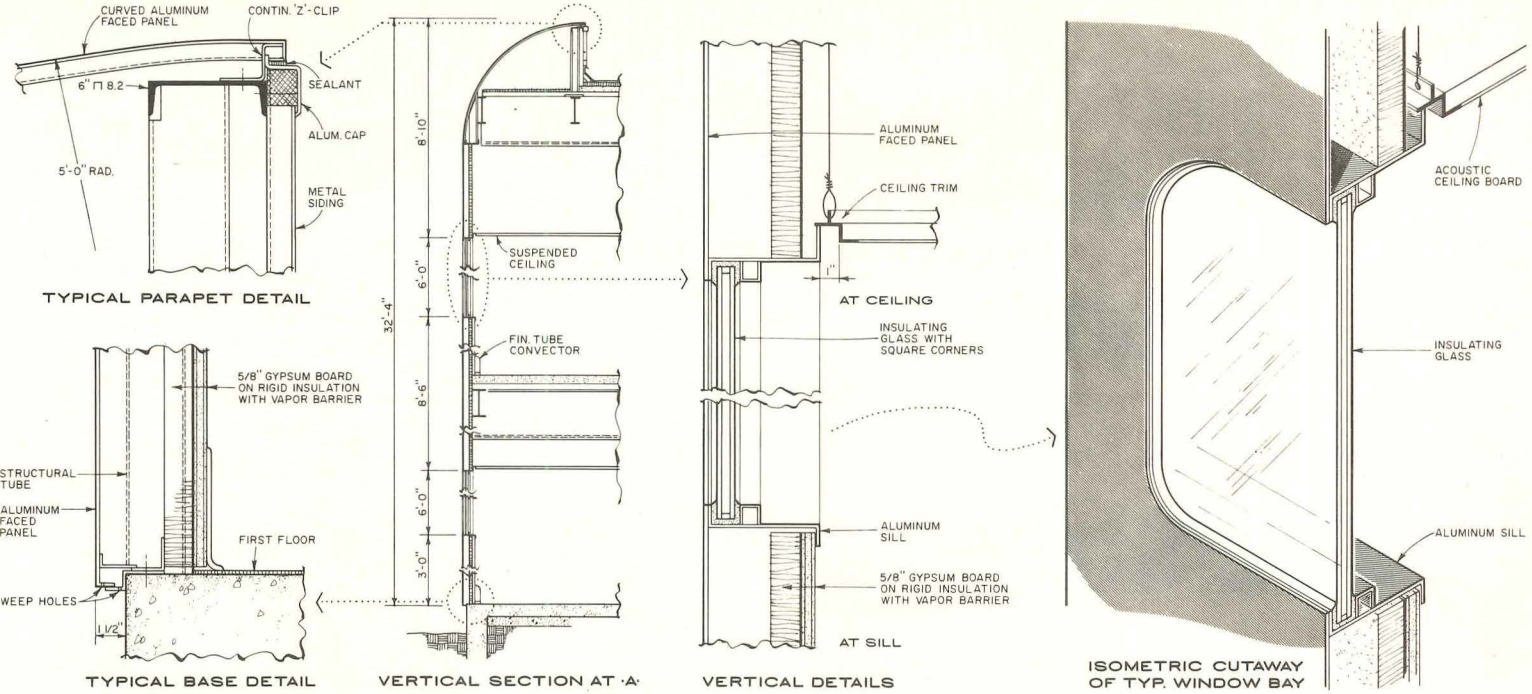


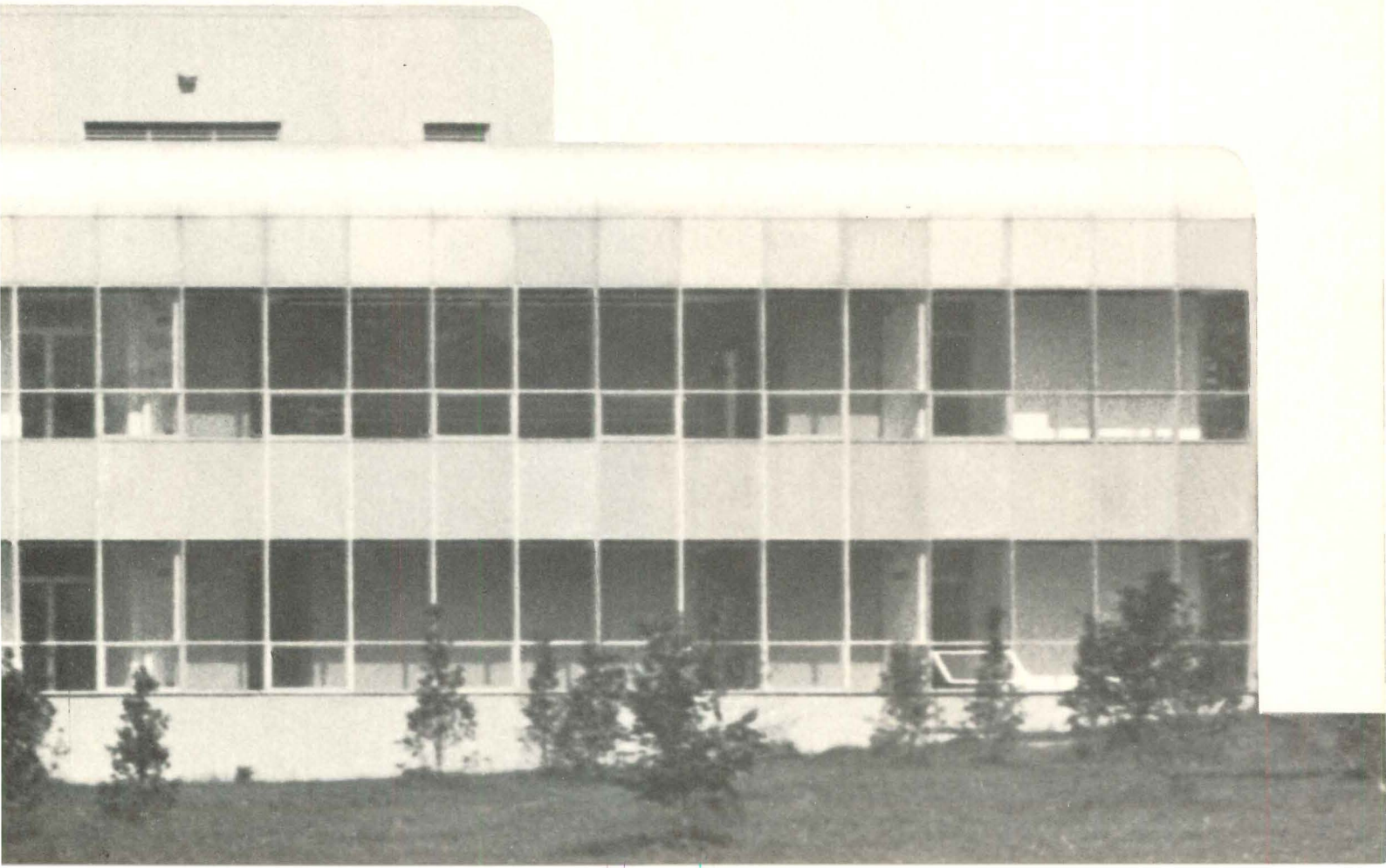
PARTIAL ELEVATION



PLAN SECTION AT ·B·

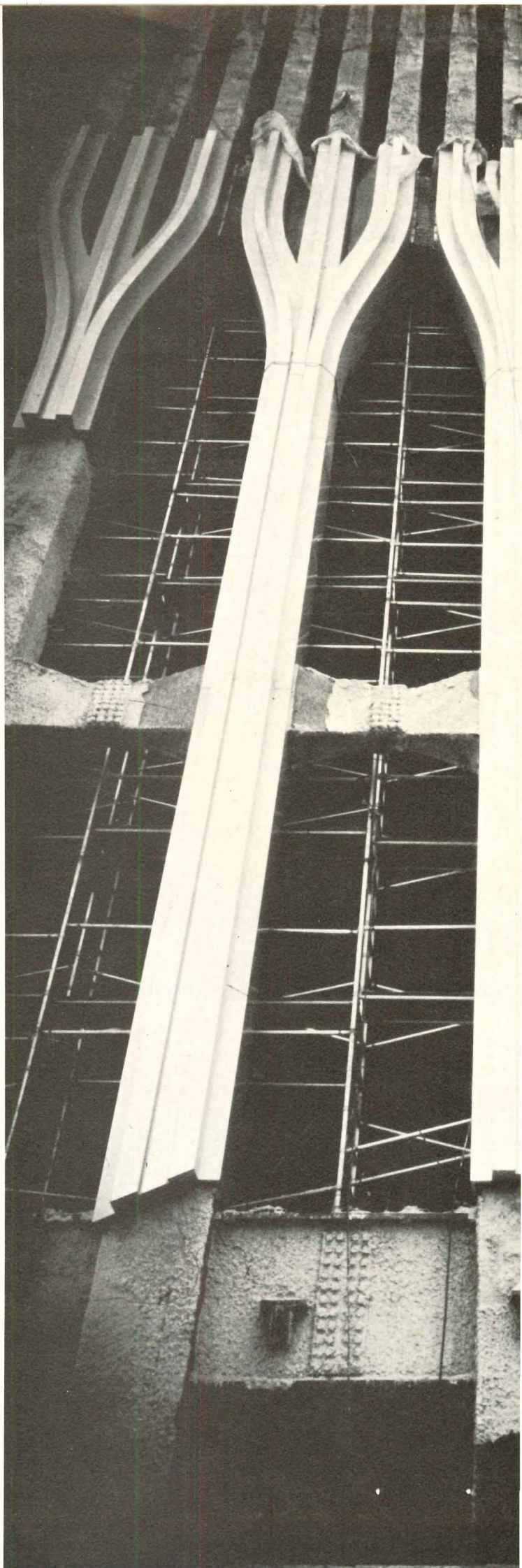



CURVED ALUMINUM FACED PANEL
CONTIN. 'Z'-CLIP
6" ⊓ 8.2
SEALANT
ALUM. CAP
5'-0" RAD.
METAL SIDING
TYPICAL PARAPET DETAIL
5/8" GYPSUM BOARD ON RIGID INSULATION WITH VAPOR BARRIER
STRUCTURAL TUBE
ALUMINUM FACED PANEL
FIRST FLOOR
WEEP HOLES
1 1/2"
TYPICAL BASE DETAIL
32'-4"
6'-10"
6'-0"
6'-6"
6'-0"
3'-0"
SUSPENDED CEILING
FIN TUBE CONVECTOR
VERTICAL SECTION AT A
ALUMINUM FACED PANEL
CEILING TRIM
1"
AT CEILING
INSULATING GLASS WITH SQUARE CORNERS
ALUMINUM SILL
5/8" GYPSUM BOARD ON RIGID INSULATION WITH VAPOR BARRIER
AT SILL
VERTICAL DETAILS
ACOUSTIC CEILING BOARD
INSULATING GLASS
ALUMINUM SILL
ISOMETRIC CUTAWAY OF TYP. WINDOW BAY

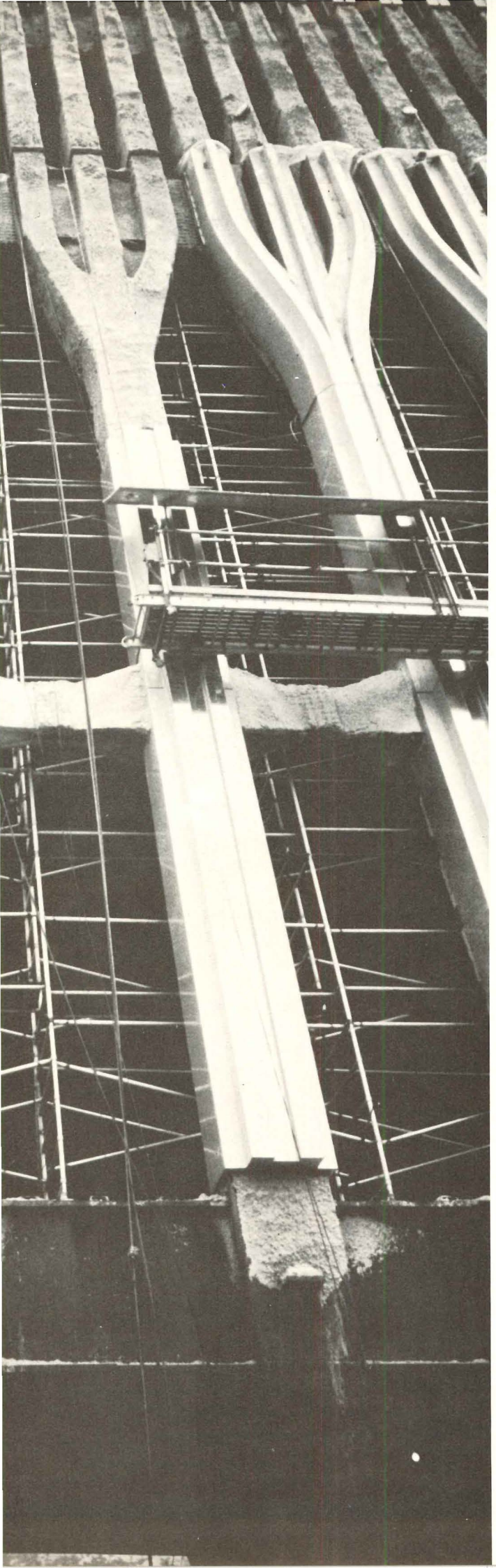


Aluminum in Architecture

A report on the "Aluminum in Architecture" seminar, held in Chicago early last March, provides an interesting and instructive review of the growth of the use of this increasingly-used metal. Special areas of discussion involved notable buildings featuring aluminum, design data for aluminum products, adhesive bonding, finishes, and future developments.



1. Aluminum sheet encases closely-spaced steel columns of The Port of New York Authority's World Trade Center in Manhattan.



By **WAYNE F. KOPPES,** Architectural Consultant

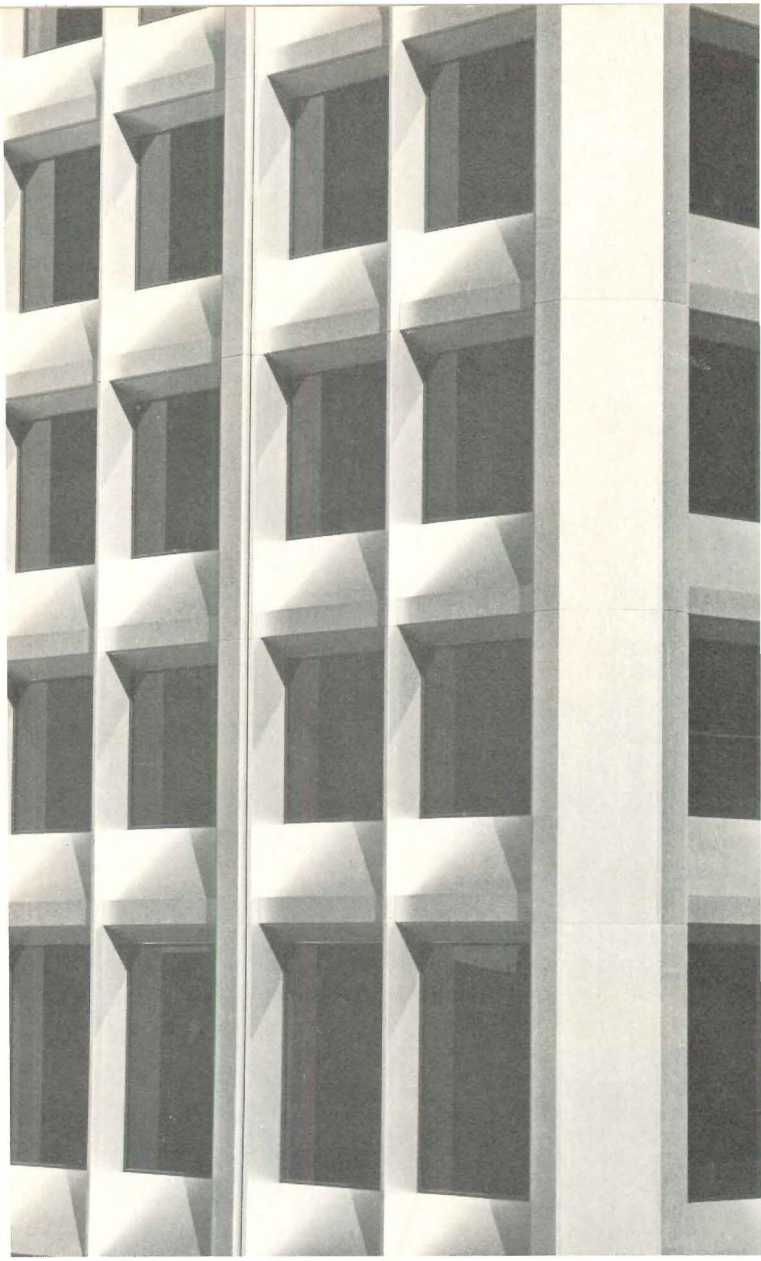
This three-day "cram session," with each day's program presenting 12 or more well-informed speakers, offered a great deal of useful information, largely technical in nature. It is the purpose of this review to highlight only some of the newer information presented, the more significant observations made, and, in particular, some of the more interesting predictions offered; in short, to summarize those items of "news" which, in the opinion of this observer, are probably of most interest and value to the majority of architects.

The impressive list of speakers included such well-known names in the architectural profession as Phil Will, former president of the American Institute of Architects, Minoru Yamasaki, Charles Bassett, Ezra Ehrenkrantz, and Harold Rosen. Among the industry leaders who addressed the meetings were Frederick J. Close, chairman of the board of Alcoa, and Joseph McConnell, president of Reynolds Metals Company and president of the Aluminum Association. Speaking for the manufacturers and fabricators were the chief officials of several smaller companies and many widely respected technical experts in various fields. There were also economists and marketing experts including such authorities as Dr. George Kline Smith and Seymour Kroll.

Case Histories

Quite appropriately, Minoru Yamasaki headed the list of architects who had been asked to review case histories of notable buildings on which aluminum has been featured. As he observed, he has been using this metal (for curtain walls) since 1957, when he designed the award-winning, and still acclaimed, Detroit headquarters building for Reynolds Metals Company. Experience has shown, he said, that while aluminum has many well-known virtues as a building material, it presents certain problems, too. Chief among these, in his opinion, are the problems of thermal movement and color matching. "Aluminum is a good material, but it could be better. It's up to you (the manufacturers and producers) to make it so."

Much of Mr. Yamasaki's presentation, understandably, dealt with the new World Trade Center in New York, undoubtedly the most impressive of his recent designs (1). Not only did he give a current progress report on its construction, but also he provided some interesting statistics about the project and the mass of background research which preceded its design. He stated, for example, that the twin tower structures were designed to resist 140 mph winds, necessitating provision for some very high negative pressures on the wall elements, and that more than 2 million sq ft of aluminum sheet will be used on the walls of these structures. It should be recognized, of course, that these buildings do not really have curtain walls; the aluminum is used to encase the close-



ly-spaced load-bearing exterior steel columns and the steel spandrel beams, which, combined, occupy fully half of the wall surface area.

A disclosure of particular interest was that, although the aluminum skin of the World Trade Center buildings is to have a natural anodized finish, its color, instead of being the usual rather "cold" silver hue, is to be a "warm beige" tone. This has been achieved by using a new proprietary alloy, specially developed by Alcoa and designated as "MJ44."

Other aspects of the World Trade Center project were later discussed by two other speakers. James Davis, of the Cupples Products Corporation, in his talk on fabrication processes, showed a number of slides illustrating how the components of this wall system were being fabricated and packaged for shipment, some of the larger units requiring specially designed carriers. And Norman Collyer, whose firm is installing and glazing the wall, described in his talk some of the new techniques and equipment being used on the job. Because of the extreme accuracy demanded in establishing levels, to accurately locate some 200,000 holes to be drilled through the steel plate spandrel beams, a laser level, specially designed for the purpose by the Ovitron Corporation, is being used, and drilling is being done by pneumatic, rather than electric drills. Another innovation is the use of a specially-designed machine which, operating on the floors of the building frame, picks up, maneuvers into position, and accurately locates the column cover sections, holding them rigidly in place until fasteners are installed.

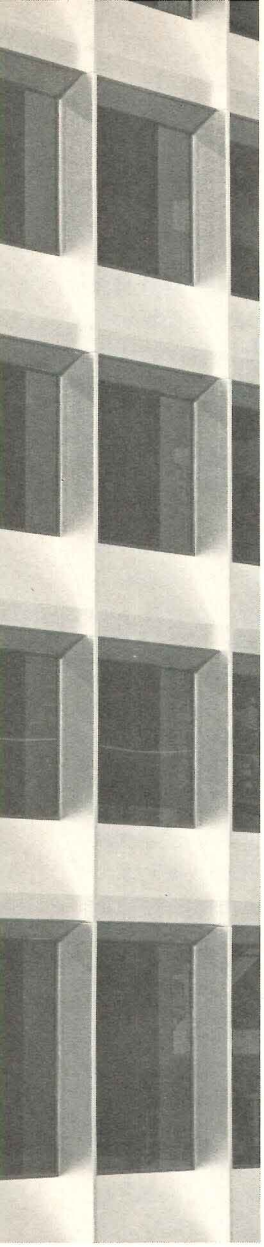
A second case history of special interest was the 28-story Ordway Building, then nearing completion at the Kaiser Center in Oakland, California, as described by Charles Bassett of Skidmore, Owings & Merrill, the designers of the building. This structure represents, in its exterior character, a unique type of metal curtain-wall design. For probably the first time in an aluminum wall of this size, there are no exposed extrusions. The wall is made up entirely of 3/16 in. aluminum sheet, 1.2 million pounds of it. Wall units are, in effect, large 5′ x 9′ shadow-box frames with deep splayed reveals, and present a heavy "sculptured" pattern, typical of precast concrete (2, 3). These units are shipped to the jobsite knocked down, in flat sheet components, and are assembled on the building floor immediately above the story being enclosed, then are lowered into position and installed, all from within the building.

The finish used on the Ordway Building also represents a break with what has become the usual practice, of using hardcoat color. For this job, S.O.M. has selected, instead, a gleaming bright natural-colored finish, employing a new chemical brightening process developed by Kaiser, with a Class I anodic coating. The reason for choosing this unusual finish was to provide, by reflections, a uniquely attractive light-and-shadow pattern, "changing in appearance with every hour of the day."

The focus of the third case history presentation was the Lake Point Tower building on Chicago's lakefront, by comparison with the other two buildings a structure already well publicized, and deservingly so. Although this case history scarcely could be considered newsworthy any longer, the way in which its story was presented was distinctively unique and interesting; undoubtedly one of the high spots of the whole seminar program. It was a documentary movie, made on a minimal budget but with great skill, during the construction of the building, by the young architectural firm of Schipporeit-Heinrich, Inc., the designers of the project.

Design Data: the Standard Product Forms

One of the general topics of the second day's program was "Design Data for Aluminum Products." In general, the papers presented in this session dealt, for the most part, with information of the "common knowledge" variety, but several of the points made deserve attention.



2. Deep-splayed reveals, entirely of aluminum sheet, give "sculptured pattern" to Ordway Building, Oakland, Calif.

3. Assembled wall units are lowered into position from floor above.

Extrusions: The discussion of extruded products emphasized two points in particular: 1) extrusions, if properly designed, often effect substantial savings by combining several component parts in one homogeneous section, *but* 2) generally, the detailed design of an extrusion is a highly specialized skill, involving considerations unrecognized by the layman, and it should be left to the experts. The statement that "What the mind can conceive, some extrusion press somewhere can produce," while generally true, shouldn't be taken too literally. Architects are warned not to be misled by those irresponsible sales representatives who tell them "You design it, we'll make it." Such loose talk often leads to misunderstandings, confusion, and perhaps disappointments. Good communications between the customer and the supplier are essential; the supplier must know exactly what's wanted, and the customer must not only understand the practical limitations of the process but, more importantly, should solicit the producer's advice on questions of design details. "Such things as a change of radius here and there, the balancing of thick and thin parts of a shape, or a slight change of wall thickness, allowing a smoother flow of metal, often results in a better product."

Sheet: Current wall designs reflect a trend toward the increasing use of sheet, as exemplified by the new Ordway Building. Engineering data for sheet, provided in connection with one of the presentations, reveal a wide range of mechanical property values, with ultimate tensile strengths varying from 20 ksi for Alloy 3003–H14 to 37 ksi for Alloy 5052–H36.

Castings: In architectural applications of aluminum, castings are uniquely interesting on two counts: 1) they represent the product form with the longest history of use, and 2) they represent also the form of product whose potentials currently seem to be attracting the greatest interest in the curtain-wall market (4).

Probably the chief obstacle to progress in this field has been the relatively high cost of castings. With the usual sand-casting method, labor costs are high and the amount of metal used is much greater, per sq ft of surface, than that required in other product forms. The permanent mold process reduces labor costs, but equipment is expensive, and this process is presently considered feasible only when 1000 or more identical units are required.

Recently the Japanese have been making considerable progress in producing large thin precision castings of considerable depth, for use as curtain-wall units, and at least two companies are exporting these castings to this country. The units, which are full story height and may be 8 ft or more in width, average only about ¼ in. in thickness, hence are far lighter in weight than their concrete counterparts.

Their average cost, we are told, installed in place but without glass, is in the $9 to $10 per sq ft range. There is also a Swiss company, "Alusuisse," with a new plant in Tennessee, which is producing relatively flat in-fill panels by an open casting process. These panels, which may be as large as 6′ x 13′, with an average thickness of about ⅜ in., have a unique natural, freeform surface pattern and are suitable for use as spandrels, facias, or other surfacing elements.

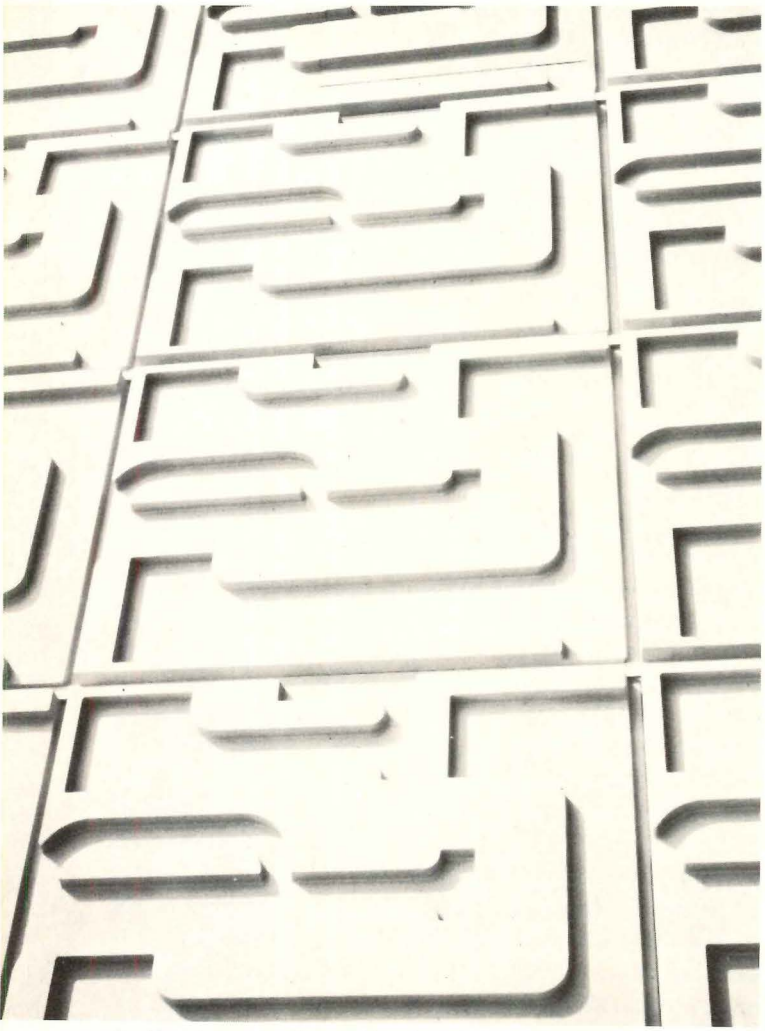
As noted by several speakers during the course of the seminar, there is currently a great deal of interest in the potentials of large castings as complete curtain-wall units, and in the face of growing activity by foreign companies in this field, hopefully we can expect early stepped-up progress in thin castings by our own domestic producers.

Adhesive Bonding

To date, the use of adhesive bonding in the fabrication of metallic architectural products has generally been limited to the lamination of panel facings to core materials and plastic film coatings to sheet stock. It's generally recognized as the most practical method for joining composite structures combining metallic and nonmetallic materials. However, with the constant improvement of both adhesives and bonding techniques, and the growing market for mass-produced items in the architectural market, it's quite likely that adhesive bonding will find more applications.

This method of joining has certain obvious inherent advantages: the joint is almost invisible, it doesn't "print through" like spot welding, and it provides an even distribution of stress in the parts joined. When joining dissimilar metals, adhesive bonding automatically provides a barrier to galvanic action and, furthermore, the resulting composite assembly exhibits the best properties of both metals.

The chief critical factors in successful bonding are: 1) the condition of the contact surfaces (especially their cleanliness), 2) complete knowledge of the service conditions to which the assembly will be subjected, 3) the joint design, and 4) selection of the proper adhesive (Table I). Some contact cements have low resistance to temperatures above 150 F, while others, such as the neoprene-phenolic types, have the ability to develop additional resistance to heat with aging. As a result of some 40 years of research, cyclic testing methods capable of reliably predicting performance under a broad range of temperature and humidity conditions have been developed, and with the aid of such tests the potential uses of adhesive bonding continue to grow.



4. Aluminum castings attract curtain-wall market.

Finishes

The subject of finishes received more attention than any other subject. For reasons that are probably apparent, this is usually the case whenever architectural aluminum is being discussed. The success of most installations is measured, in large degree, by their appearance after some period of use and exposure, and appearance depends chiefly on the finish used. Furthermore, most of the concern in such discussions now centers on color, and the problems so often associated with it. There was little mention of mechanical or chemical finishes, except as pretreatments in other finishing processes. Of chief concern, naturally, are the anodic coatings and the increasingly popular organic coatings. Porcelain enamel continues to be widely used in certain applications, and with the introduction of the coil coating process its uses have been expanded, but there was little new information presented on this subject.

Anodic Coatings: Most architects are by now acquainted with the nature of these finishes and how they are achieved, and if they're not, there are many sources of information at their disposal. But some not-so-well-known facts about the anodic finishes

TABLE I: Adhesive Selection Chart

Material to Bond	Preferred Adhesive Classes for Bonding	General Comments Pertaining to Bonding
Metal	Synthetic rubber	Immediate bond; primarily thermoplastic; one part liquid; room temperature curing; may be heat cured to develop faster heat resistance; solvent present must be removed.
	Reclaim rubber	Immediate bond; thermoplastic; one part paste; cannot be heat cured to give higher properties; solvent present must be removed.
	Natural rubber	Immediate bond; thermoplastic; one part liquid; cannot be heat cured to give higher properties; solvent present must be removed.
	Epoxy	Requires clamping; thermosetting; may be room temperature or heat cured; two part paste; 100% solids as-received; no drying required before assembly; only one surface need be coated.
	Synthetic resins	May or may not require clamping; requires heat curing; available as one- or two-part liquid or powder-liquid combination.
Wood	Synthetic rubber	Heavier application than required for metals due to porosity and roughness of surface.
	Reclaim rubber	Usually not strong enough to produce fiber tearing bond.
	Natural rubber	Not commonly used.
	Epoxy	Bond area stronger than substrate; lower viscosity favors penetration into pores of substrate.
	Synthetic resins	Most commonly used to bond wood to wood, as in plywood.
Glass & Ceramic	Epoxy	Best to remove high gloss or glaze by sanding before bonding.
Plastic Laminates	Synthetic rubbers	Neoprenes best choice; GRS (reclaimed) rubbers can be used; nitrile rubber adhesives used for polypropylenes.
Papers	Synthetic rubber latex	Water solvent permits good fiber binding; neoprene, GRS or nitrile rubbers used but are not economical; sometimes not compatible with aluminum under wet conditions.
	Reclaim rubber	Usually higher strength than paper, yet low cost.
Paper honeycomb	Synthetic rubbers	Neoprene recommended over GRS or nitrile rubber.
	Epoxy	Highest strength bond and good filleting action if highly thixotropic; only facing need be coated.
	Synthetic resin	Makes strong bond combination where heated platen press available; will fillet if thixotropic; if thixotropic only facing need be coated.
Fabrics & leather	Synthetic rubbers	Neoprene and GRS rubbers favored over nitrile rubbers; synthetic latex type can be used but compatibility with aluminum should be checked.
Urethane foam	Synthetic and latex rubbers	Neoprene and GRS rubbers favored over nitriles; synthetic latex adhesives used after compatibility check with aluminum.
Polystyrene foam	Synthetic and latex rubbers	Foam is sensitive to solvents used to disperse neoprene and nitrile rubber adhesive; GRS rubber adhesives generally compatible but have lower heat resistance; latex adhesives compatible with foam but questionable with aluminum under wet conditions.
	Epoxy	Makes maximum strength bond and is compatible; adhesive need only be applied to facing.
Lightweight insulation	Synthetic rubbers	Only GRS rubbers are low cost enough for most applications.
	Reclaim rubbers	Popular because of low cost with adequate strength but low heat resistance.

were brought out in the course of the meetings, and these are worth noting.

For example, it was stated that a Class I anodic coating (the thinner of the two architectural anodic finishes) has a thickness about equal to ⅛ the diameter of a human hair; however, this is about 2000 times as thick as the natural oxide film which forms on aluminum that is not anodized. It was revealed, too, that the accuracy with which the pretreatment (usually an etching process) is controlled has a critical effect on the color uniformity of the anodic coating. And it was emphasized that satisfactory hardcoat finishes require the use of special (proprietary) alloys.

Color matching of the hardcoat finishes appears to still be a prime problem with the industry, and with many architects too, though considerable progress has been made in solving this problem. One is inclined to question whether perhaps *too much* importance isn't being placed on maximum color uniformity, and whether it's the industry or the majority of architects that is demanding such high "perfection." Of course, there are architects who reject any noticeable variation of color, but certainly there are others who feel that a reasonable range of hues in metal color, just as in the color of natural materials, is preferable to the mechanical monotony of exact sameness, *provided,* of course, that proper attention is given to installing the units so that the range of hues is effectively distributed so as to lend interest to the over-all surface, and avoid conspicuous contrasts.

Speaking on the topic "Specifying Aluminum Finishes," Harold Rosen (also of S.O.M.) stressed the importance of obtaining from the supplier, prior to bidding, color samples representing both limits of the acceptable color range, and the necessity of having separate sets of samples for sheet and extrusions. "Reliance solely upon the representations of a salesman, or upon glowing advertisements, can lead to a sorry end," he observed. Further, he recommended that certain controls should be used to insure, by scientific means rather than simply personal judgment, that the color of the components delivered to the job falls within the range specified. His office specifies that a Photovolt reflection meter (5) will be used as the final arbiter of any disputes which may arise regarding compliance with the specifications. If the colors applied, when measured by this instrument (cost, about $600), do not register within the specified permissible range, they are automatically rejected.

Organic Coatings: Judging by the amount of attention given to the subject of organic coatings, this seems to be one of the "hottest" topics in the industry at the present time. Three papers dealt exclusively with this subject, and several others were, to some extent at least, concerned with it. Of course, the chief use of these coatings is now in the residential and industrial fields, but there are indications that they are becoming increasingly important in the commercial field also. The coatings in use today provide a quality of performance undreamed of only 10 years ago.

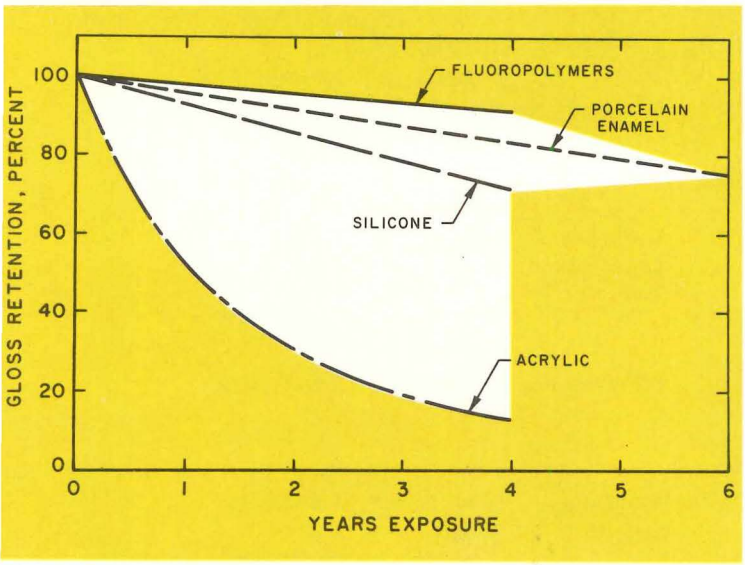
Following a review of developments in aluminum finishes, a look at aluminum's future is taken by Phil Will, Ezra Ehrenkrantz, and others.

The performance of these coatings, on any metal, depends on both the quality and the cleanliness of the substrate; it's the combination that determines durability. For architectural applications the pretreatment is usually a conversion coating of the chromate type. The color coating itself may then be applied in powder form or as a laminated film. The choice of method depends on the type and volume of work, and coil coating is the cheapest method.

Predicted durability, as might be expected, varies broadly, roughly in proportion to the cost of the coating, longevity being classified in three categories: "conventional" types (alkyds, organosols, and acrylics) — 3 to 6 years; "extended life" types (siliconized acrylics and polyesters) — a minimum of 10 years, and "long life" types (fluorocarbons and laminates) — at least 20 years. Both the siliconized polymers and the fluoropolymers show great promise as highly durable coatings.

Experience to date indicates that "gloss retention (6) of an organic coating is a criterion for (predicting) performance, because the loss of gloss is generally the result of surface roughening which signals the start of coating erosion." A number of photomicrographs of specimens exposed for various terms

5. Reflection meter determines spec compliance.



6. Gloss retention of various coatings.

were shown to illustrate the validity of this theory. **General:** The discussion periods brought out several interesting items of information about finishes in general, and how the various types compare. One tangential question raised, for example, was "What are the basic technical differences between paint, enamel, and lacquer?" The answer, of course, can be found in the literature, but probably not in as simple and concise a form as that provided by H.A. Page of Kaiser, one of the speakers: "The chief distinction lies in the drying process; paints dry by oxidizing, enamels by cross-linking of their constituent polymers, and lacquers by the evaporation of their solvents."

Naturally, there were questions as to how the so-called "long life" organic coatings compare with porcelain enamel and the hardcoat finishes, and whether they may eventually be expected to replace these finishes. Of course, no one cares to predict what may eventually happen, but in the foreseeable future it appears that the better organic coatings, as they continue to improve, will surely be a greater threat to porcelain enamel than to the anodic hardcoats. Even the best of these organic coatings, however, have their inherent shortcomings. As compared with porcelain enamel, their range of gloss is limited and their surface hardness is much inferior. Compared with the hardcoat anodics, too, they are much more vulnerable to abrasion and scratching, but they have much greater uniformity of color. One of the papers dealt impartially with both porcelain enamel and laminated coating finishes, pointing out the merits as well as the limitations of each. Comparisons of their characteristics, as the author summarized them, are shown (Table II).

The relative costs of the various finishes were discussed by several speakers, and this data — always of interest to architects — is summarized (Tables III, IV, V).

The Look Ahead

The third day's session, dealing for the most part with probable future developments, was probably the most interesting, not only to the architects present but to all in the audience. Phil Will, the lead-off speaker chose, quite appropriately, to set the stage by "Looking Backward" and reviewing some of the highlights of the progress in the industry to date. He pointed out, with all due modesty, that some of this progress should perhaps be credited to architects like himself who, as "brash outsiders," had offered certain helpful suggestions from time to time.

Ezra Ehrenkrantz spoke in broad terms of the direction which tomorrow's building, and therefore the architectural aluminum industry also, must inevitably take — the systems approach. Although his assigned topic was "Industrialized Building," and although he is generally recognized as one of the prime movers of systems building in this country, he made it clear from the beginning that this topic necessarily represents only one aspect of the much broader "systems approach" concept. It's a vital aspect, to be sure, but the design and production of building components, whatever they may be, must be recognized as only one of the component processes that must be integrated into the over-all building process. "Every man's system is another man's component. To the architect of a school building, for example, the wall manufacturer's system is only a component; to the educator the school building itself is only a component, and to the municipality and the taxpayer the whole educational system is only one component."

Some way must be found to integrate the building industry, he warned. In its present fragmented state it's incapable of meeting, within reasonable limits of time and cost, the demands imposed upon it. Major changes are not only imperative, they're inevitable.

Present measures of building costs may be one of the concepts most in need of critical review. Less importance should be attached to initial costs, more to the long-term costs. On the average, the cost of operating and maintaining a school for a period of only eight years is as great as the initial cost of the building, and it has been shown that by reducing, by only one watt per sq ft, the electric power used for lighting a school, enough can be saved to pay the salary of an additional teacher. In recognition of such facts, some radical departures in bidding requirements have already been instituted in some of

Ehrenkrantz's projects, notably the California Dormitory Construction System work. On this project, the bids for the air-conditioning system were required to cover not only the initial cost of installation, but also the total cost of operation and maintenance of the system for a period of 20 years. This, indeed, represents a new interpretation of the ramifications of the "total systems concept."

As for specific predictions of what the future holds for the architectural aluminum industry and its products, the following, in the views of those who spoke on this topic, are probably the most significant:

Commercial Buildings: The probable future developments in this area include both some heartening and some sobering prospects, though the former undoubtedly outweigh the latter in their effect on the curtain-wall market.

Extrusions will continue their current dominance among the product types, but the major growth will be in the consumption of aluminum sheet, as evidenced by designs already on the architects' boards. Also, because architects want "depth" in building façades, but are not wholly satisfied with concrete walls, the design pendulum is swinging toward a reevaluation of the potentials of aluminum castings. "If the cost of castings can be made competitive with concrete, they will surely be in large demand by architects." There is also the likelihood that the functions of the curtain wall will be expanded. A step in this direction is the current trend toward better thermal and acoustic insulation of wall systems.

On the negative, or sobering side, it was predicted that the volume of curtain-wall work in the smaller low-rise speculative building market is likely to decline during the next few years. Also, as Norman Collyer pointed out, the installation of walls, especially in the taller buildings, still poses many troublesome problems, and this situation isn't likely to improve until the industry "grows up," and establishes "some quality standard for erection other than cheap price." The wall contractor still has to cope with building frames that are out of plumb and level, and with insufficient, if not nonexistent clearances, necessitating expensive and time-consuming corrective measures on the job. The industry is faced, too, with a serious shortage of manpower in all trades and, as Collyer also observed, "the quality of shop workmanship seems to be declining from a low level."

Industrial Buildings: The trend in roof systems is to stronger sheets and configurations capable of greater spans, making use of higher strength alloys with yield strengths up to 50 ksi. Roof systems will be designed not only for easier and quicker installation, but for use on slopes as flat as ¼ in. per ft.

TABLE II. Comparison of Porcelain Enamel and Laminated Finishes on Aluminum

	Porcelain Enamel	Laminated Finishes
Coating type and composition	Inorganic low melting glass	Synthetic Resins — polyvinyl fluoride, acrylic, vinyl, etc.
Film thickness	0.001–0.003 in.	0.002–0.006 in. 0.005–0.012 in.
Application method	Spraying and firing	Continuous roller application
Type of substrate	Sheet, extrusion, casting	Sheet
Color range	Very broad	Broad
Color uniformity	Excellent	Excellent
Color fastness	Good	Good
Gloss range available	Low to high	Low

TABLE III: Cost of Sprayed Coatings on Sheet or Extrusion

Finish	Dollars per sq ft
Alkyds, vinyl, acrylic, and siliconized acrylics	0.15–0.35
Fluorocarbons	0.35–0.80
Porcelain enamel	0.35–1.00

The range in unit costs between the same finishes is attributed to the state of the aluminum when finished, the method of application, or the volume of work processed.

TABLE IV: Costs of Coil-Applied Coatings

Finish	Dollars per sq ft
One coat alkyd	0.04
Acrylic	0.04
Polyester	0.04
Vinyl	0.05
Siliconized acrylic	0.05
Fluorocarbons	0.11
Vinyl laminates	0.12–0.14

TABLE V: Approximate Cost of Finishes for Aluminum

Finish	Dollars per sq ft
Sulphuric acid anodizing	0.08–0.25
Architectural hard coat anodizing	0.25–0.90
Porcelain enameling	0.35–0.75
Conventional organic type	0.04–0.07
Fluoropolymer type	0.10–0.15

Maintenance costs will also be reduced, if not virtually eliminated, by the use of long-life finishes. Another improvement, already featured by some systems and certain to become more common, is the elimination of fasteners penetrating the outer roof surface.

Industrial wall systems will continue to employ the already well-established use of color, probably using more of the "earth tones." Much greater durability of the color coatings is promised, with the increasing use of modified silicone polyesters. There will be greater demand, too, for deeper pattern configurations, as well as for systems using concealed fasteners. And although the field-assembled sandwich-type wall still offers a cost advantage on large jobs, the spiraling costs of field labor will likely change this situation, increasing the use of factory-assembled insulated panels.

Commercial and Monumental Windows: Some of the most interesting forecasts were predicated on the conviction that "the fenestration of the buildings of tomorrow will also change." And these predictions, by comparison with some of the others made — those in which one seemed to detect a few patches of "blue sky" — all seemed to be based on sound logic. They were not blanket predictions, but pertained specifically to various building types. In summary form, these are the expected developments:

High-rise office buildings: Generally will have fixed windows, cleaned by automatic devices. Exceptions will be those buildings with less than 1000 windows (not enough, by present standards, to justify the cost of cleaning machines) and those with windows recessed in deep reveals, inaccessible to automatic cleaners.

Low-rise commercial buildings: Generally will have fixed windows, because operable units are not required if windows are safely accessible from the ground.

Hospitals and similar buildings: Operable windows will continue to be used, to provide ventilation in an emergency and safety in the event of a disaster within the building.

Public schools: Probably will continue to have a wide range of sizes of glazed areas, from zero to maximum, but with more air conditioning the use of operable units will probably decline.

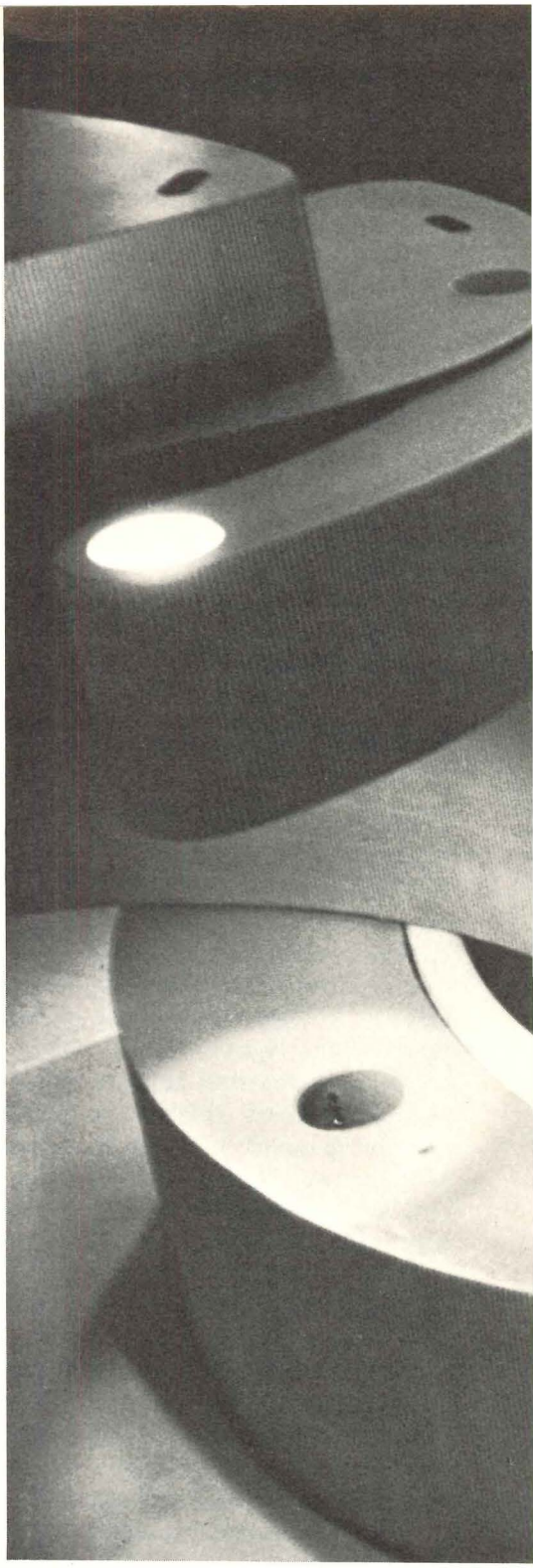
Buildings for higher education: Increasing use of fixed windows, as air conditioning becomes more common.

Apartment buildings and dormitories: Continued use of operating units.

The window unit, which is rapidly becoming a system in itself, will be improved to further reduce heat and sound transmission, and hopefully better solutions will be found for the design of exterior shading devices, thus encouraging their wider use. Also, in line with the general trend, more window assemblies, complete with glazing, will be produced in the factory. We may even see more use being made of the "weathering type" aluminum alloys, now still in their infancy.

In Conclusion, A Challenge

Contrary to the usual procedure at such extended meetings, there were few who left ("to catch a plane") before its official adjournment. Probably the chief reason for this was that the task of summarizing the seminar had been assigned to none other than Frederick J. Close, generally regarded as "the father of the modern architectural aluminum industry," and always an impressive speaker. His brief and informal talk was not the exhortation to a more vigorous sales effort, as one might have expected, but a frank and straightforward appraisal of the status of the industry; its shortcomings, its potentials, and above all, its obligations to society in the face of present day problems. His chief concern, in fact, was that everyone in the industry should recognize the necessity of becoming personally involved in helping to cure our social ills.



"ENVIRONMENTAL DESIGN CONCEPT" John Hanna's "Environmental Design Concept," intended to be the only "furniture" in a room, combines a variety of seating levels, storage space, overhead lighting, stereo, and television into a distinctively original sculptural form.

The structure consists of three separate vertical units, four tiers or levels each, that rotate 360 degrees on pivots. Under each vertical unit is an air-float system powered by two industrial vacuum cleaner motors that can lift the structure (plus about four seated adults) on a thin curtain of air, to enable the unit to be easily moved into different relationships with the other units. The units can be arranged to form an interior cylindrical space 6½ ft in diameter. Over-all dimensions are 14 ft wide by 8 ft high.

The environment, which cost $600 to build, is constructed almost entirely of three types of corrugated paper, similar in fashion to a hollow-core door; the two horizontal planes of each tier are heavy, double laminate corrugated paper, the vertical exterior surface of each tier is covered with a skin of single-face corrugated paper, while the interior structure is of accordion-shaped corrugated paper with the corrugations running vertically to form a honeycomb of cells. Protruding from each tier is an 8 in. diameter spiral-wound paper tube. The tube acts as a pivot when inserted into a slightly larger paper tube in the next section. The only nonpaper materials used are the electrical equipment, air-float system, and a ⅝ in. triangular wood base under each third of the environment for mounting the air-float system. (Corrugated paper: Stone Container Corporation of Chicago.)

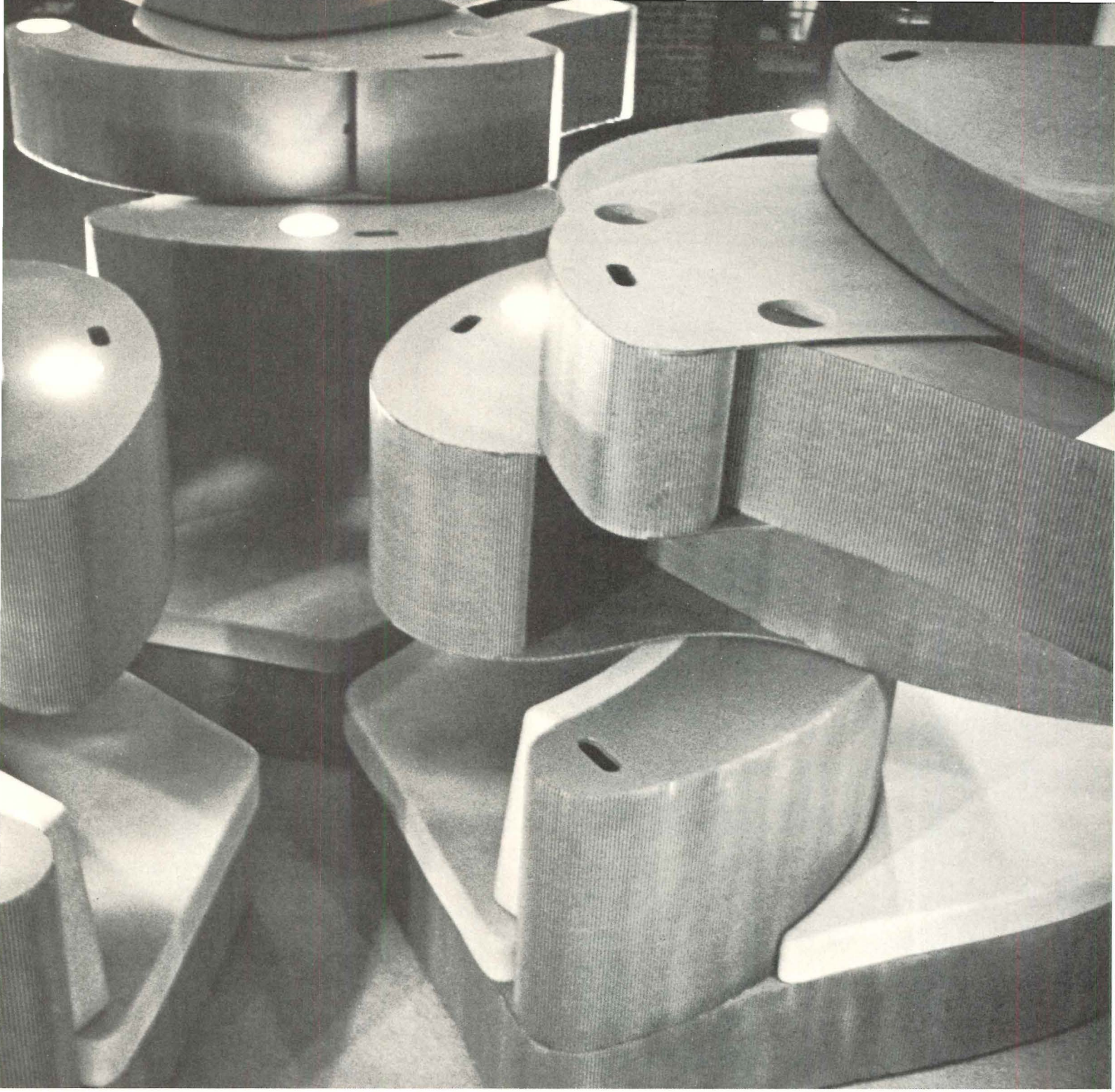
INTERIOR DESIGN DATA

Furniture as Process

Today's new generation of designers is beginning to investigate design in terms of man's operation; in furniture design, they want to provide a process in which the user can become involved. Since laymen have little or no basis for understanding the furniture forms that surround them, they will be more aware of and have more identity with their designed environment if they have a hand in its actual manipulation.

One of the main considerations of this direction involves the "psychology of change." In an era when society moved slowly, social forms changed slowly. Today, as technological advances force us to respond faster, mentally as well as physically, new experiences must be assimilated more rapidly. In past furniture design, static forms which already existed were aesthetically refined according to the style of their time — a chair was still a chair. Today's new designers, however, aware that refinement of forms is no longer sufficient to maintain a rapid change of response, suggest the scope of our furniture vocabulary be expanded to include versatility and functional change — a chair is a table is a bed.

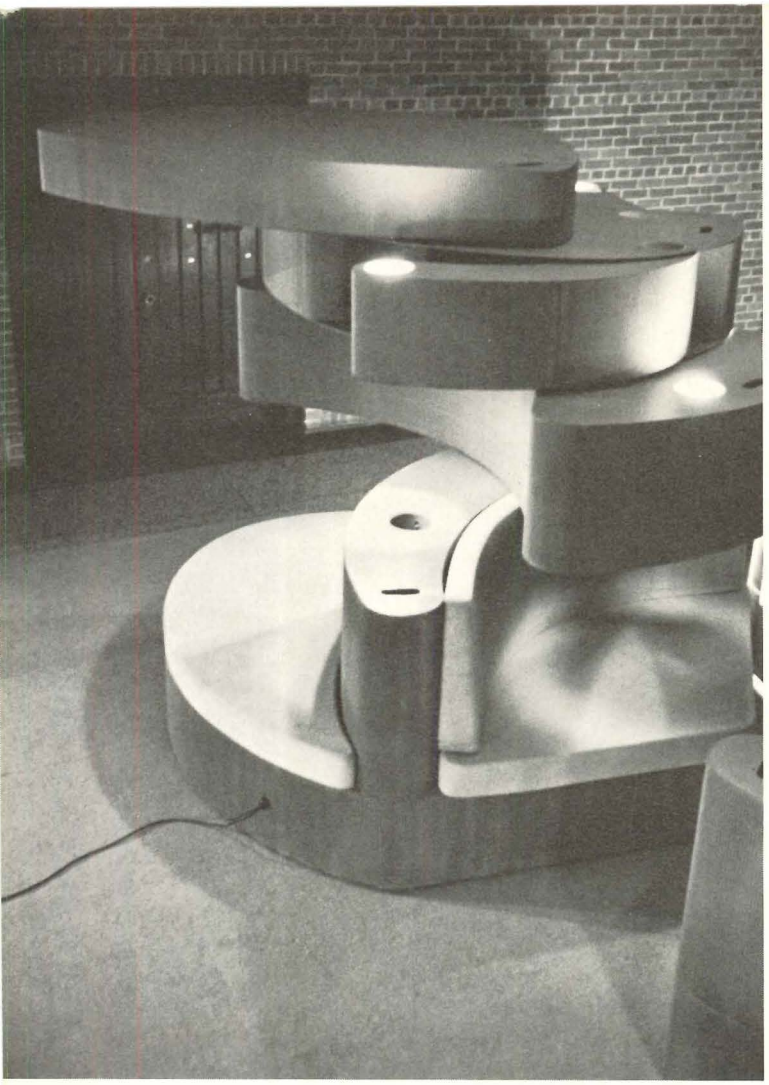
Among the most recent examples of this thinking is "4D Systemic Superstairs" designed by Dennis Holloway for his own New York City apartment,

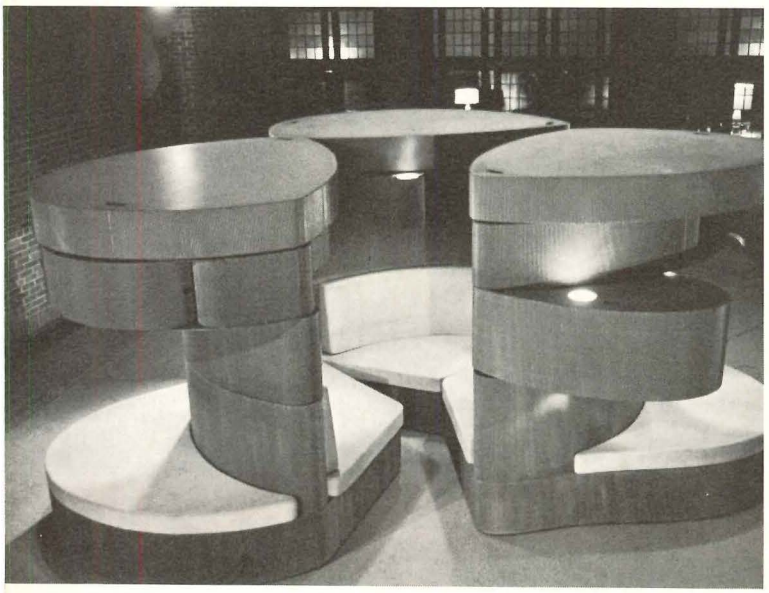


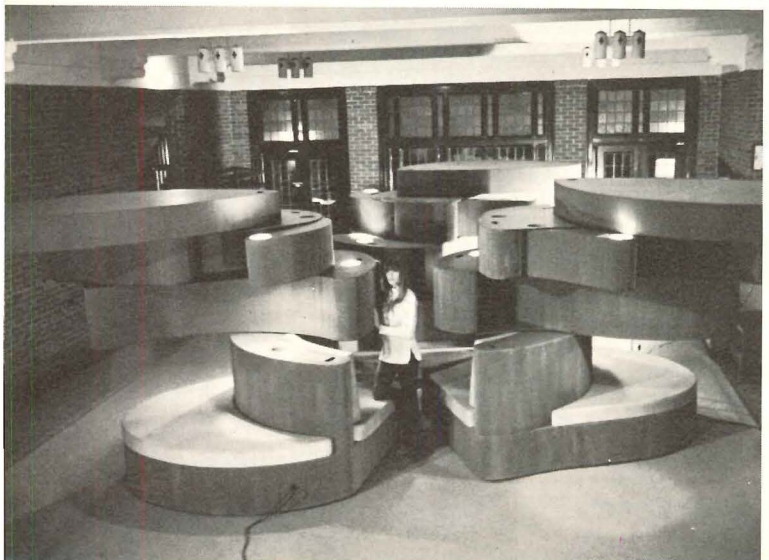
"4D SYSTEMIC SUPERSTAIRS"
Designer Dennis Holloway's "4D Systemic Superstairs" consists of three identical step-shaped units that roll on casters. The units can be arranged in 36 different combinations for sitting, reclining, and sleeping (for guests), while all horizontal surfaces open to accommodate storage.

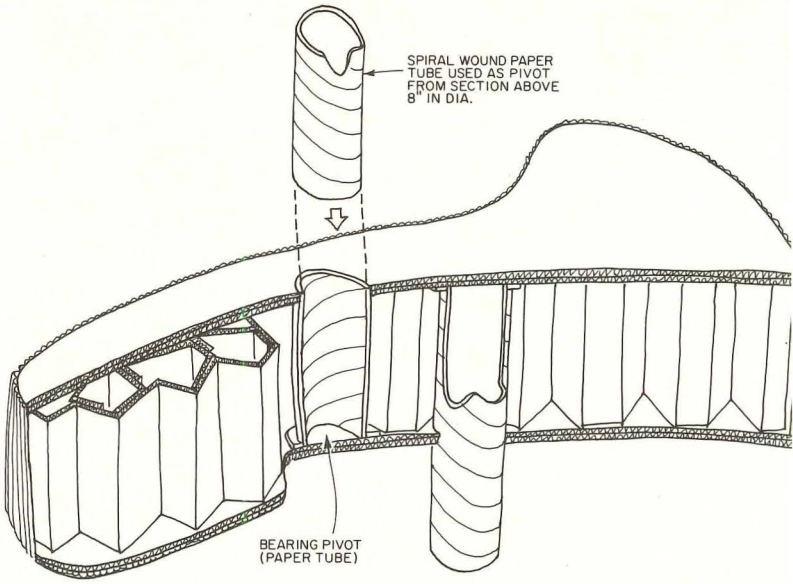
The three units are constructed of ¾ in. plywood, painted bright yellow. They cost $260 to build. Over-all dimensions are 25 in. wide, 90 in. long, and 30 in. high.

Holloway has added a whimsical touch to the space by painting a "blue sky fresco" on the ceiling to provide visual relief. The wall prints are "Cosmological Diagrams" by artist Paul Laffoley.

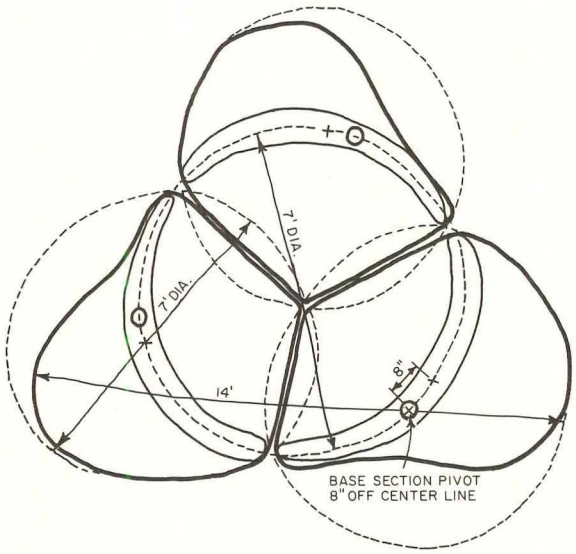




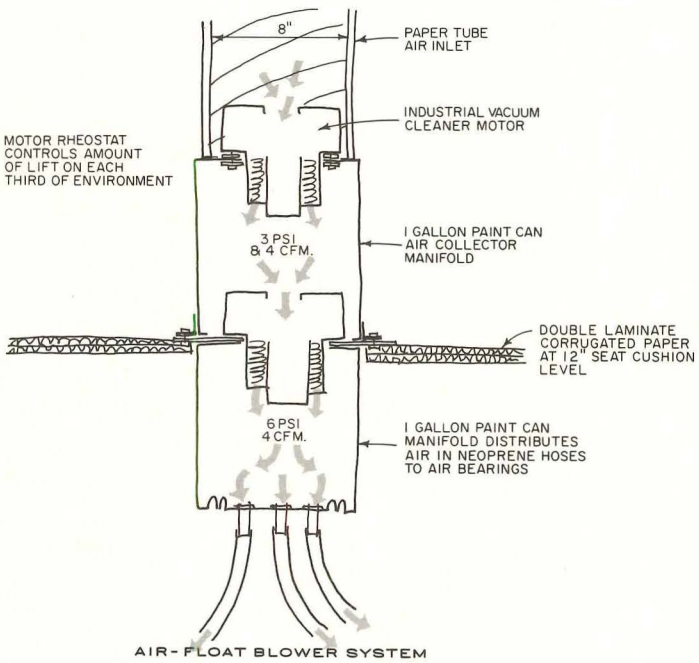




CUTAWAY SHOWING INTERIOR STRUCTURE



PLAN VIEW OF BASE SECTIONS SHOWS RELATIONSHIP OF PARTS FORMING 5'-9" DIA. INTERIOR SPACE.

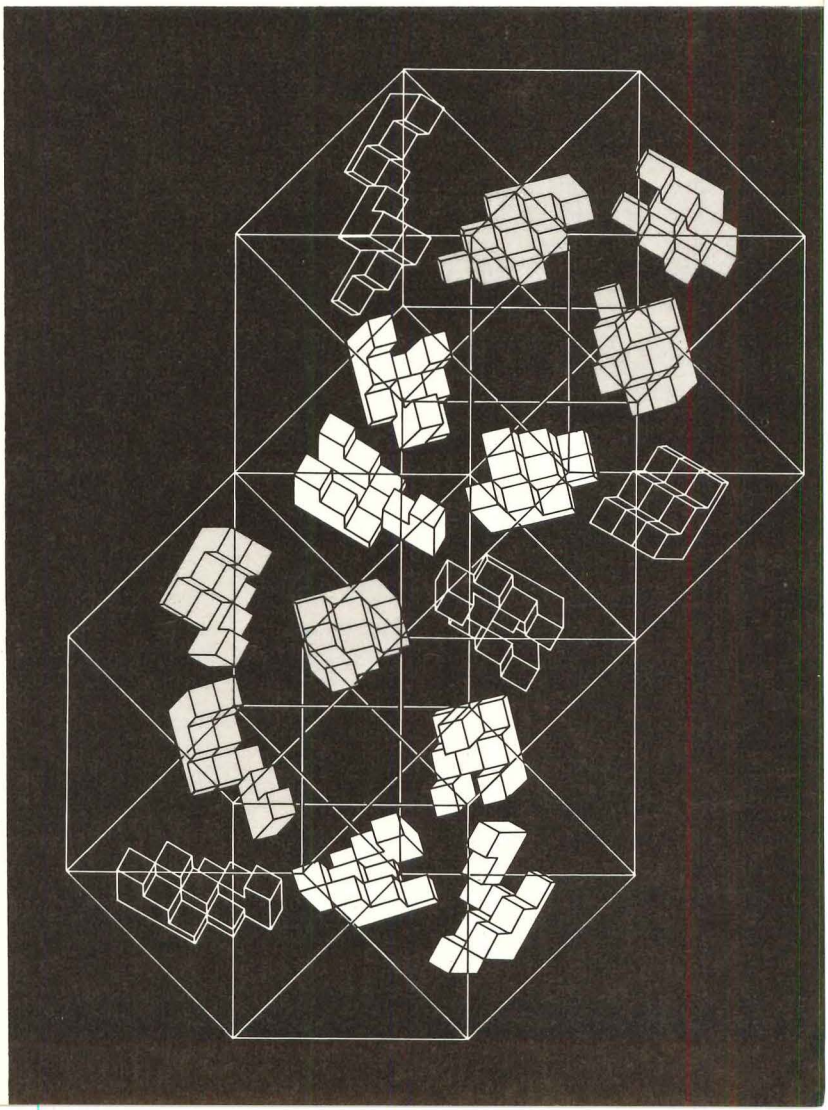


AIR-FLOAT BLOWER SYSTEM

and the "Environmental Design Concept," a prototype developed by John Hanna as a graduate thesis project in industrial design at the University of Illinois. Hanna's design is unique in that it is the first movable furniture to use an air-float system (powered by industrial vacuum cleaner motors). Both projects consolidate a variety of furniture functions within a single system. Both provide efficiency, mobility, and instant flexibility, adapting to the changing requirements of the user. They are also part of the current manipulation of scale and expand the scope of furniture design to include monumentality.

While both examples borrow from today's superscale techniques and break away from the forms we traditionally recognize as furniture, their intent is to approach total environmental systems, not to destroy the established order of furniture. The new designers do not maintain that refinement of style or use of traditional materials is out of tune with today, or that there cannot be innovation in furniture design without radically new forms. But they do maintain that a solution that relies on refinement alone and does not consider versatility and functional change is no longer sufficient to maintain the constant and fresh awareness essential to our time. **CM**

Environmental Design Concept Photos: Norman McGrath
4D Systematic Superstairs Photos: John Hanna



Memory as Meaning

The Cybernetic Role of Tradition in Architecture

By **KENNETH RICCI**

The author received his Bachelor of Architecture degree from Pratt Institute in 1964. He was a Peace Corp architect in Cartagena, Colombia in 1965–66, and is currently writing a book about the history of Cartagena. He is a member of Janus Cybernetics and practices in New York.

The depiction of architectural history through the use of quantitative concepts may well be a dangerous case of borrowed tools in untrained hands. However, this attempt to explore the operational advantages of anonymous architecture translates those advantages into realms where history's prior language could not go: into the adjacent discipline of cybernetics, where models for trying subtle variables already exist. This kind of disciplinary-interweave will be necessary for moving the lessons of the past into the future. As a mechanism for informing and constraining this movement, the role of the memory as meaning in history deserves articulation.

The discipline of architecture is beginning to realize the operational intimacy of all systems, and is coming to recognize the act of building more as a coeval of these systems than as their apex; as mysterious as all the rest, just as glorious, yet quite transparent and incorporated, receiving, using, and sending through itself much from beyond its own borders. Within this nonautonomous view, no building or city can be defined or understood without reference to the many processes that generated it. Yet while the production of a building is dependent on many variables, the completed building soon becomes an independent variable in the city; it soon becomes raw material for inclusion and influence in succeeding cycles.

Through the new emphasis on the procedures by which a city's life is governed, we may disengage the notion of architecture as a product and move toward a definition in which architecture becomes the larger processes that select, control, produce, and monitor man's shelter and its performance. Buildings and cities are then seen as by-products within a cycle. In this era of autonomy, the lessons of anonymous architecture seem not to lie in its by-products, but rather in the process through which a city was able to maintain a coherent and adaptive, and therefore truly continuous, environment.

By anonymous architecture we mean a building not attributable to any specific individual or, at least, not bearing an individual's style; instead, seemingly a casual, extended, communal response to local conditions. Such buildings are not self-conscious in the way that "architecturally designed" buildings are; they are more apt to borrow pragmatically and to be continuous and relatively unchanged over long spans of time. Today, we think highly of anonymous buildings: we enjoy their spaces, their materials, the coherence that binds the towns, and we point to them — San Gimignano, Mount Athos, Mykonos — as possessing qualities that our urban places would do well to emulate. The colonial city of Cartagena, an ancient walled city in Colombia, which was formerly a part of the Spanish Caribbean Empire, is a closer example of anonymous architecture.

Very little of the communal, nonautonomous method has survived in formal architectural education and practice. In an era in which thought and technology are considered to be opening up ever-widening capabilities, it is appropriate to remember that every process is delimited in some way; through these constraints, it defines itself. A new dynamic of interconnection is taking place, which is at the same time a function of opening world systems and a generator of this opening. This renewed union of varied modes of thought and work has an initial, numerical similarity to the anonymous process, insofar as there are many working as one. A profound difference exists, however, between the modern conception of construction options and that of an anonymous milieu.

At the very center of the anonymous methodology, and therefore of primary importance in the growth, for example, of Cartagena from 1533 (foundation) to 1811 (liberation), is the constraint of tradition: a continuous performance prescribed by limited options. If we cannot understand and evaluate the process of a city's life and place and instead hanker after its more pleasing by-products, we become capable only of reproducing profoundly isolated urban effects without any inkling as to the power of their original source.

The City as a Message

The texture of Cartagena has a consistency that can be sensed in the street level exposure and is emphasized by the aerial view. Although each house, church, convent, or public building, considered individually, is almost invariably attractive and indicative of a fine adaptation to the tropical milieu of heat, sun, and humidity, the group of buildings that compose the existing old city, when taken as a whole, reveal a striking

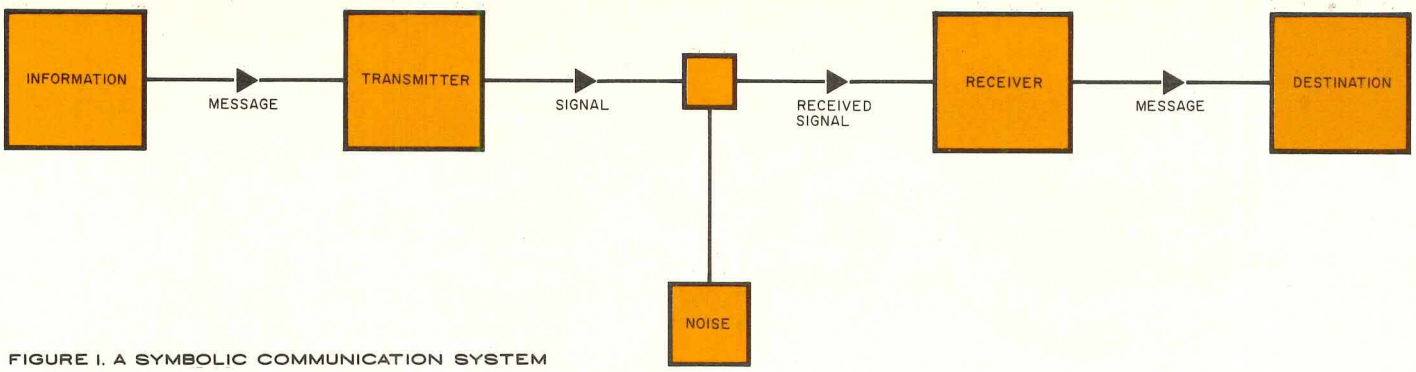


FIGURE 1. A SYMBOLIC COMMUNICATION SYSTEM

A symbolic communication system is shown in Figure 1 (above). The message moves from source to transmitter, is sent, received, and finally arrives. A crude historical interpretation of this system is shown in Figure 2 (below), where the elements of the Spanish colonial world are inserted into the system. Within the closed system of the Spanish Realm, Cartagena is the destination of the constant Iberian message. Invariant input into the city's memory becomes the received message for the variable of time, place, and overseas people (geography, technology, society, and politics). History as transmission footnotes the famous pirate Drake and his rabble as noise; all he did was attack and loot Cartagena. Nelson of the Nile, on the other hand, was a systems sailor. He sent the Spanish Armada (transmitters) to the bottom of the Bay of Cadiz in 1805. This effectively removed Spain as a source of information and changed Bolivar's status from noise to source.

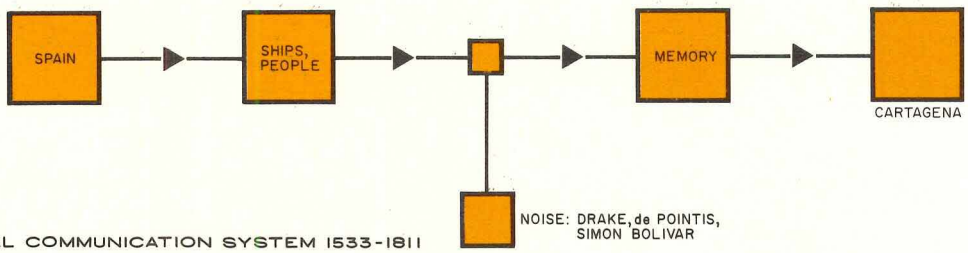


FIGURE 2. COLONIAL COMMUNICATION SYSTEM 1533-1811

uniformity (though their dates of origin span a range of over two hundred years) within which the individuality of each building is submerged. This larger view is representative of the limits of tradition at work. Up close, each house reveals variations and unique expression: proportions vary, materials and color are used to greater or less success.

But from a distance, the individual's role in designing a building is minimal. It is in this communal context that the force of anonymity becomes operative, both in the disciplinary sense (the performance of building is predetermined) as well as in the historical sense (the flow of time has continuous contours and no single moments or eras stand out in the temporal perspective).

Viewed through this lens of anonymity, we begin to see Cartagena less in terms of a visitor and critic and more in terms of the eyes of the Spanish crown. This crown could not, of course, concern itself with all the trivia of each of its colonial enclaves, but focused more on the over-all nature of its realm and on the performance of the more important cities within it. It did not see Cartagena as a collection of individual buildings, or even of individual personalities. What was of concern were over-all conditions and the communal personality. It was these that had to agree in performance with the Iberian family traits. On a management level, the throne's problem was one of communication and control; its tools were ships and society.

Through its own mnemonic mechanisms, society establishes, extends, and defends itself, even in hostile jungles, and perpetuates a pattern of life. The success of these traditional processes represents stages during which the improbable triumphs over the probable.

The performance requirements with which the Spanish crown solved its colonial control problem and the contemporary efforts of mathematician Norbert Wiener in cybernetics share a coincident viewpoint. Wiener's words, in fact, would not seem inappropriate coming from the Spanish crown:

"Organism is opposed to chaos, to disintegration, to death, as message is to noise. To describe an organism, we do not try to specify each molecule in it, and catalog it bit by bit, but rather to answer certain questions about it which reveal its pattern. . . . We are not stuff that abides, but patterns that perpetuate themselves. A pattern is a message and may be transmitted as a message."

The delimitation of a pattern's performance through the mechanism of memory comes out of the anonymous tradition.

Once urban history can be equated to message transmission, where urban equals message and history equals transmission, the terms and operations of communication theory can be engaged. The mathematical theory of communication, interpreted by Warren Weaver, recognizes three levels of communication problems, which are helpful in placing Cartagena within a methodological and temporal context:

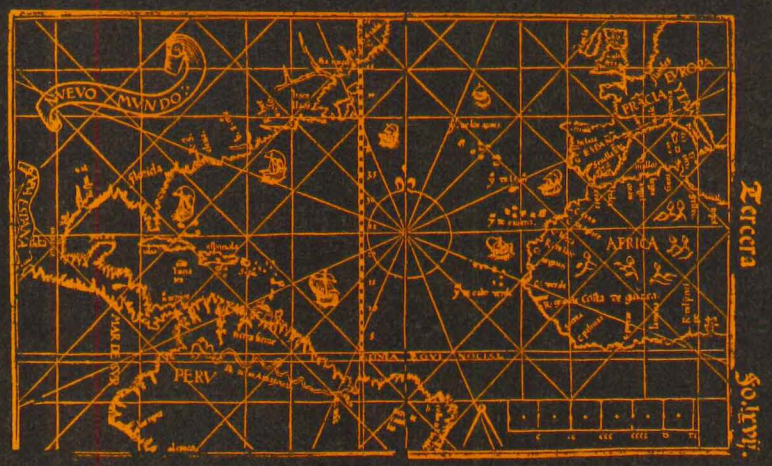
Level A How accurately can the symbols of communication be transmitted?

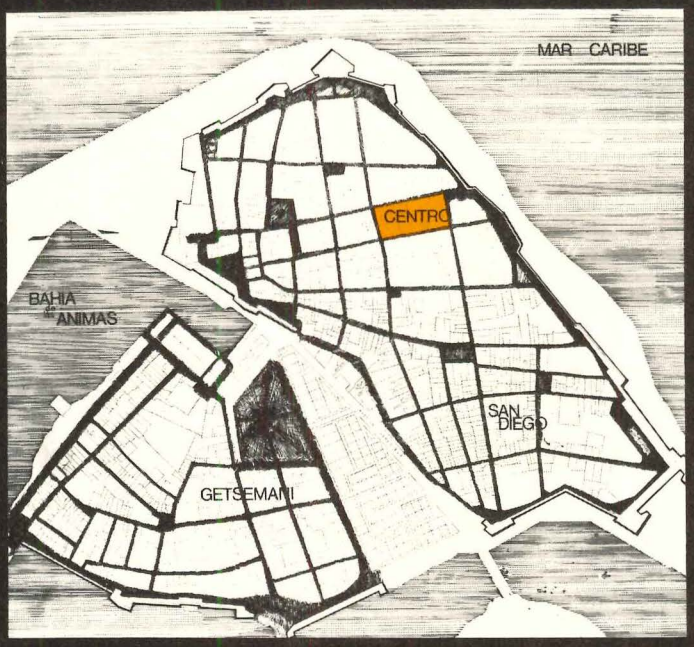
Level B How precisely do the transmitted symbols convey the desired message?

Level C How effectively does the received meaning affect conduct in the desired way?

Traditionally, the focus of architectural history is found at the destination end of the system; it picks up where the diagram leaves off and concerns itself with aesthetic problems (Level C) and occasionally with problems of meaning (Level B). The "technical" problems of communication, however, to which mathematical work is confined, concern themselves only with the transmission depicted in Figure 1 and expressed by the Level A question. Although a complete understanding of urban history is not possible without regarding the second and third levels, no picture of that history is complete without an understanding of the first level and the interrelatedness of all three levels.

Within the context of the communication system, the signal for a city pattern is a function of an information source; in the case of Cartagena,





The old walled town of Cartagena (above and facing page), its plan (below, right), and its location in the Spanish Empire (below, left).

its choices depended solely on Spain. The word "information" as used in communications has a special connotation of its own, having nothing to do with the meaning or content of a message but simply with the probability of occurrence. "To be sure, this word information in communication theory relates not so much to what you *do* say, as to what you *could* say," explains Warren Weaver. "That is, information is a measure of one's freedom of choice when one selects a message." Methodologically, questions asked at the Level A place the city inside its larger context and allow us to consider the probability of various messages, the means whereby the system transmitted these signals, the interference noise created by elements not in the system, and the nature of receiving devices which the subsystem used. It does not involve us in what happens once the message enters the subsystem. Likewise, the traditional milieu is an exclusive — not inclusive — one, and strongly defines itself in terms of options available.

Cartagena as a Subsystem of the Spanish Realm

By limiting options among its subsystems, the colonial network defines itself as a closing system. It appears that the very attractive environs of colonial Cartagena resulted from the ability of the transatlantic network to keep noise to a minimum, thus maintaining itself as a sole source of information, as well as an impeccable process of tradition in which no designer could err, since few building types were allowed and these were controlled by a continuous, self-correcting memory facility. Because its environmental messages were highly predictable, the Spanish imperium had a very low measure of information.

A measure of Cartagena's subsystem options in the period 1533–1811 is indicated by the constraints imposed upon its memory — that is, upon its freedom in choosing what *could* be built. What it *did* build must be measured not on the so-called "technical" level, but on the levels of meaning and effectiveness (aesthetics). It is important to remember that the messages that arrived at Cartagena were not specific in the sense of precise dimensional orders of planning instructions. These were usually left as functions of local conditions. Rather, they dealt more with the performance of the town as a whole than with individual solutions. The exact street dimensions and directions, for example, were solved on the basis of geographic variables: wind, sun, and terrain. But the urban sense and emphasis that these streets were to create were constants that depended not on geography but on tradition.

Chueca Goitia, in his book *Los Invariantes Castizos de la Arquitectura Espanola*, introduces and develops the analogy between the mathematical notion of invariants and the constraints that defined traditional Spanish architecture. Regardless of the temporal coordinates of style or the geographic coordinates of place, certain constant themes repeat themselves in Iberian construction. The most striking two-dimensional in-

variant resulted in what Chueca calls the concept of the "city-convent," where house, plaza, and walled town are reflecting stages in a repetition of inversions.

Chueca says that the patio and the plaza are products of the urban aesthetic of the convent. The passions of the baroque tendency for great spatial outlooks is reflected nowhere in this baroque-age city. Instead, we see everywhere the walled city, the interior plaza, the cloistered house. For political reasons, Cartagena is a walled fort. But gunpowder made stone obsolete long before 1533. Why the walls? Once again we turn to Chueca's invariant, return to Leo Frobenius' "cavern-feeling" of the Magian people: the constant of the cloister, which seems to radiate out from an initial center in the Eastern Mediterranean in the disguises of different religions and different peoples, yet always is essentially the same.

The idea of building the city/convent at a time when all of Europe was under the expansive influence of cabinet diplomacy, Reformation, ferment in physical science and mathematics expressed in the baroque city/palace is further proof to Chueca that the roots of Iberian building reach back into this invariant pool, always expressing their interior memory while decorating in the prevailing mode of the era.

The difference between world and cloister in the Magian sense was one of degree, not one of two different modes of life. The houses of the city are cloistered caverns, each one an ear turned in upon its own voice in the heat — in from the light, in from the noise, in on itself in a climate where sunlight stiffens form and its negative, space — where shadow and its child, coolness, become positives in a world of the brilliant positive: sun. The house as convent, turned out upon itself, becomes the city of plazas; the city of plazas at last becomes the walled world in a new and alien world of jungle. The message is sent and received intact in terra firma, untouched by the new world around it. The dome, the cloister, the plaza, the fort are each an identical stage on differing scales and within each they draw up space around themselves and reiterate their message. The wealth of simultaneous activity within these holes of life instigates the view of anthropologist E.T. Hall, who sees the Mediterranean people living in a "polychronic" world, one which supports, indeed encourages, rapid and multiple exposure to events all around. Any visitor from our "monochronic" northern world, used to orderly succession of events on a linear axis, among these communal living rooms of plazas and patios, soon gets the picture.

Cartagena as a System

The view of information within the Spanish system must always be seasoned by the simultaneous realization that the world of organization, regardless of how limited it is, represents an advance over the higher probability that disorganization and incompleteness would reign in this universe. The creation of town and

Figure 3 diagrams the subsystem posture of Cartagena, focusing momentarily on the role of memory in selecting messages. The absence of any feedback from the city into its own memory concerning the actual, rather than expected, performance of the Iberian message and the absence of any contingent input from the possible future was assured by the exclusive position of Spain as source as well as its desire to perpetuate a certain pattern. The cybernetic analogue of tradition is **memory** (data put in at the moment plus previously stored data). Memory in turn informs and selects the **control** factors: geographic, technologic, politic, and social. Politic here represents the larger system constraints and social represents the subsystem constraints. These controls, in turn, determine input: site, materials, living requirements, etc. and the **operation** of design and construction which yield the city as **output.**

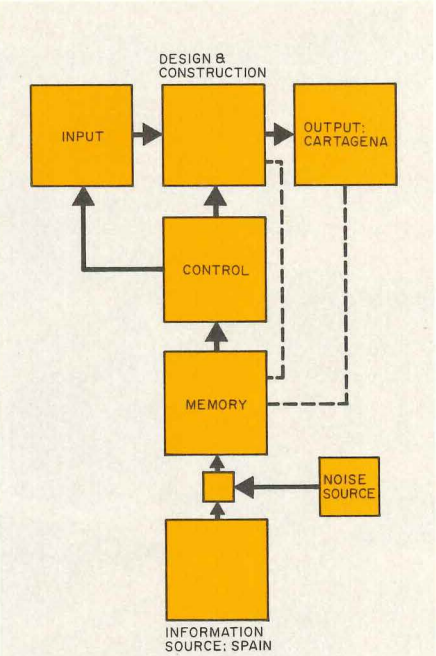


FIGURE 3.
CARTAGENA AS A SUB-SYSTEM

house, however primitive, takes men that much further into the improbable and informative realm of civilization.

It was precisely because the options for urban growth were limited that Cartagena as a system was able to adjust so well to its environs. Once the message reached its destination and entered the system, all possible variations on that basic theme could be tried out. As these solutions were built, lived in, and tested for fitness, the unworkable variations were never repeated. Gradually, fewer and fewer proved themselves capable of adapting to local conditions; it is these tried and tested few that are the superb examples of anonymous architecture.

It must always be puzzling that, while the limited freedom of choice available to Cartagena in its subsystem role is contrary to the current spirit of the independent search in architecture, the results of the experimentation in the city's system role are quite attractive and even used as examples of adaptive urban architecture. This continuous approach in which tradition limits the parameters of action (subsystem function), while allowing for the testing of a few variables at a time (system function), has historically been the key to the local success of traditional architecture.

As the number of workable solutions becomes a smaller and smaller percentage of the spectrum of all possible solutions — that is, as they become less probable — so do they become more empirically informative to the community. In considering the city as a system, our evaluation now begins to move from the first level of communications problems — how accurately can the symbols of communication be transmitted? — to the second level, where the signal has now been received and has entered the system. Now we can ask the question on Level B: How precisely do the transmitted symbols convey the desired message? As we have seen, the desired message of the crown was transferred quite effectively to its offspring in the new world, precisely because the message was invariant in geographic and temporal transformation. This invariance enabled the townspeople to understand and more easily test the message in its new surrounding: within the system, this message had great empirical information; on the level of meaning, it was highly effective. If continuity with the motherland and adaptability in virgin territory were the aims of the crown, they could have chosen no better method of implementation than the city/convent invariant.

The ability to learn and the facility for memory are intimately connected in any physiological system and enable the system to adopt changes in behavior in response to a given environment as more or less permanent adaptations. Three memory models for urban systems are shown in Figures 4, 5, and 6. The invariant model depicts the role of memory in primitive architecture; past stored data is the major factor in the selection of input materials and the control of design and construction, while feedback concerning the actual, rather than expected, performance operates so slowly as to approach zero. Any contingent input into memory is also zero. The primitive model is a response to certain conditions via local materials and fixed techniques developed over long periods of time, which become part of an inherited vocabulary. As conditions around it change, it is unable to adapt. For a while, it lingers as something quaint, then it molders as a relic; soon after, it dies. An example in the Caribbean of this dying type is the indigenous house of palm and bahareque palm-roofed cottages with walls of bamboo and stucco, breezy and easy to build but fast disappearing in the rapidly pressing cities where fire threatens them, materials are scarce, and fashion relegates them to an undesirable status, even among the poor.

Traditional architecture couples decisive memory patterns with a limited ability to monitor and react to past performances, so that learning and variation take place at a slower rate than the input from past memory. Yet, eventually, the pattern is changed as the past recedes and memory receives new inputs and loses its grip on oldest data. This process is called an *ergodic* process. Once the colonial constraints were lifted from Cartagena, change in its patterns seems to have occurred in this way, with the new messages from around the ever-nearing globe gradually eroding the sharper Iberian contours.

The third model, Figure 6, is the contingent model, an exaggeration of a diagram, like the others, depicting the approach prevalent in opening situations where the architecture is predicated primarily on the shape of things to come rather than on the memory of Christmas past. Its only history is the immediate past of feedback whereby it keeps track of its own performance; memory from the past approaches off (zero) while memory of the future approaches on (one). Examples of this type in Cartagena are the large residential and office towers built in the cocoon of modern technology and aimed at the future market and international tastes.

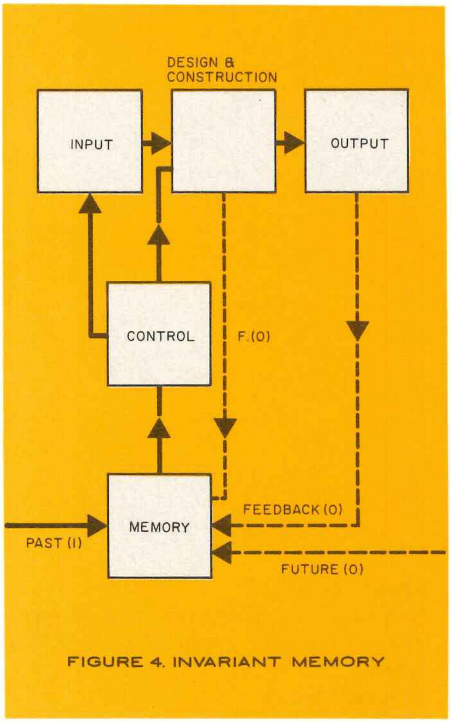


FIGURE 4. INVARIANT MEMORY

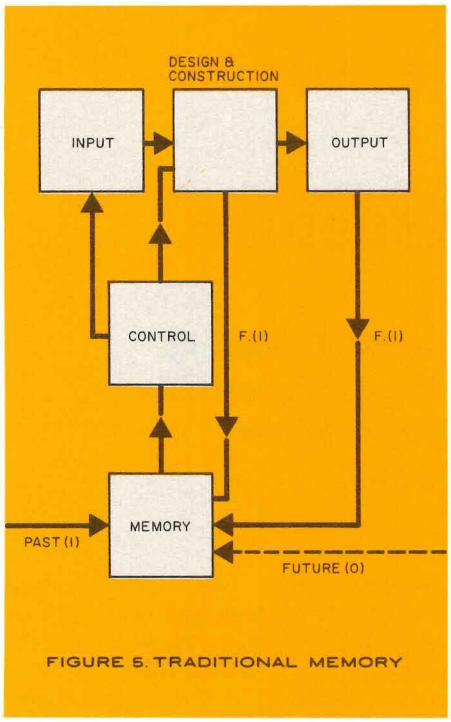


FIGURE 5. TRADITIONAL MEMORY

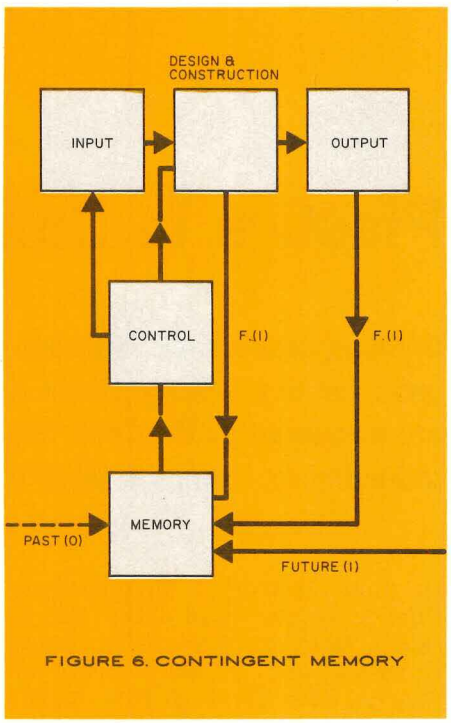


FIGURE 6. CONTINGENT MEMORY

Through the constancy of their message source and the slow pace with which change occurred during the colonial period, and even after, the Cartageneros were able to build up a vocabulary of collective symbols and memories that worked for their immediate needs and placed them squarely in the stream of time. Although the message they received was perhaps an ergodic one, its factor of change was small enough to provide a long sense of constancy even up to the present, 150 years after the liberation. With a strong image in the mind's eye, navigation is made easier, whether in finding your way around winding streets or keeping in touch with community life. It would be hard to overstate the role of the invariant in building both an empirical and spiritual framework for knowledge and action. From within the convent itself, the late Thomas Merton talked about this continuity:

"If society loses its 'memory,' if it forgets its language of traditional symbol, then the individuals who make it up become neurotic . . . then traditions . . . become dead conventions — worse then that, obsessions — collective neuroses. To replace one set of conventions with another, however new, does nothing to revive a truly living sense of meaning and life."

It is this "sense of meaning and life" which is transmitted in the constraints of anonymous architecture.

Beyond Constraints

Although the symbols of anonymous architecture provide us with examples of great urban coherence and continuity, many of the constraints that determined those cities are today widely unacceptable. In their direction lie the potentially closing systems (limited choice) against which much of the self-liberating, individualizing ideal has fought. Opening at the other extreme is the possibility, at times not seeming too remote, of a milieu characterized by the urban situation into which we have put ourselves in the United States. Each system has its price. Where the price of a closing system may be a limited personal dimension, the price of a too-rapidly opening system might be the physical and *communal* disintegration that we are now experiencing.

The lessons of the early life of Cartagena suggest that, as new world systems open, guidance among increasing possibilities is aided by an acceptable set of limits within which the group is willing to work. In the face of ever-opening world systems, of increasing interdependence of world functions, of greater freedoms of choice — that is, in the face of increasing information — our adjustment to this expanding environment could modulate itself through a sense of coherence (control), preventing complete stagnation and closed options on the one hand, while, on the other, recognizing the human limit for absorption and orientation in new worlds. The banal dividend of increasing information is an expanding spectrum of choice; its price, however, is the acute responsibility of defining acceptable choices.

Cybernetics tries to catch the cycle of events that interact and change each other, bringing to these constant changes a language of description that can at least become a guide to events, if never really being able to discover a beginning or an end. But in developing a cycle driven by the flow of time, the water wheel of change and interplay is introduced to disciplined description. Through this discipline it seems possible, indeed necessary, to develop crude simulation of the interaction of men and their cities, using the historical products that flow down to us and injecting hypothetical variables. If time is reversed, is it not possible to trace back via these hypotheses to see if they bring us to approximations of cities already built? Chueca's convent idea or Hall's involvement notion could become performance requirements in building such a test, using constants of geography, technology, and politics. Out of the dimensions of our planet come messages concerning the coherence and continuity of human organization that are potentially instructive. In the difficult attempt to define limits in a time of unlimited aspirations, we can choose to listen to these signals from the memory of the earth.

Plastics in Construction

Building codes, their attitudes on safety of occupants, and a list of plastic materials now found in construction are discussed by the Chief Specifications Writer of Skidmore, Owings & Merrill, New York.

In June 1960 the "Specifications Clinic" column listed those specification technical sections in which materials and products made of plastics were being used in building construction. In the intervening 10 years, the number of building materials and products utilizing plastics has grown steadily. In some measure, plastics now are replacing metals, glass, wood, and other materials customarily used in the construction industry.

While the advent of these products of chemistry has in many cases provided the architect and engineer with superior materials and products, it is also apparent that some plastics in their present formulation can affect human safety.

There is an increasing awareness of flame spread, fuel contribution, smoke development, and toxicity when plastics are subjected to fire. When they are enclosed in construction materials, such as insulation embedded in masonry and concrete, or waterstops in concrete, then the use of plastics does not contribute materially to any fire hazards. When applied as thin paint films in thicknesses of 2 or 3 mils, the health hazards resulting from fire are minimal. However, when used for interior finishes or exposed in finished construction some plastics, when subjected to fire, are likely to provide smoke and toxic fumes in inordinately high volume so as to constitute an unsafe condition.

Most building codes concern themselves primarily with flame spread characteristics and ignore the problems associated with smoke and toxic fumes. Many manufacturers of materials derived from plastics cite flame spread characteristics that are not used in building codes nor building construction. The ASTM standard flammability tests used by plastics manufacturers are D–635 and D–1692, both of which, as a result of their test procedure, might classify a material as "nonburning by this test." However, if these same materials were subjected to the ASTM E–84 "tunnel test," which is the flame spread test procedure specified in the major building codes, these same materials would be consumed by and contribute to the fire.

Equally disturbing is the fact that little attention is paid to smoke development and toxic fumes derived from the combustion of plastics by most current building codes. While the ASTM E–84 test method provides a procedure for measuring smoke development, there is no recognized standard for measuring toxic fumes. If plastics are to be used in increasing number in building construction, then building code officials should recognize the lack of requirements and standards concerning smoke and toxic fume development.

The following is a listing of some of the plastics and their utilization in construction:

Acetal Homopolymers
Shower heads, valves, and ballcocks for plumbing, replacing brass and zinc. Hardware knobs such as Delrin.

Acetal Copolymers
Transformer cases, inductor cases, and terminal plates for electrical equipment.

Acrylics
Internally illuminated outdoor signs. Spandrel panel sheets. Transparent window glazing. Diffusers and lenses for lighting fixtures. Sealants, paints, water repellents.

Amino Resins
These resins are used in the production of urea-formaldehyde and melamine products such as plastic laminates for kitchen countertops, wiring devices (switch plates, toggles, receptacles), and toilet seats.

Epoxy Resins
Adhesives, coatings, paints, composition flooring, concrete bonding agents.

Fluoroplastics
Insulation for electrical wiring; slip joints and expansion plates for structural members; baked-on coatings for metal; clear sheets over vinyl wall coverings.

Methylpentene Polymer
Lighting diffusers, lenses, and reflectors.

Neoprene
Waterproofing, roofing, flashing, composition flooring, sealants, glazing gaskets.

Nylon
Hardware, drapery guides, pivots.

Phenolics
Electrical insulators, adhesives, kickplates.

Polycarbonates
Glazing materials, bus bar insulation, outdoor lighting globes, signs.

Polyesters
Composition flooring, pressure-sensitive tapes, paints, coatings, gutters and leaders, facing of concrete block.

Polyethylene
Electrical insulations, joint fillers, drapery fittings, carpet backing, vapor barriers.

Styrene Polymers
Insulation, plastic wall tile.

Polyurethane
Coatings, waterproofing, sealants, paints, insulation.

Vinyl Polymers
Vinyl tile, vinyl composition flooring, paints, gaskets, vertical blind slats, plumbing piping, siding, weatherstripping, electrical insulation, flashing, wall coverings, waterstops.

Silicones
Sealants, water repellents, adhesives, paints, coatings.

Styrene-Butadiene
Paints.

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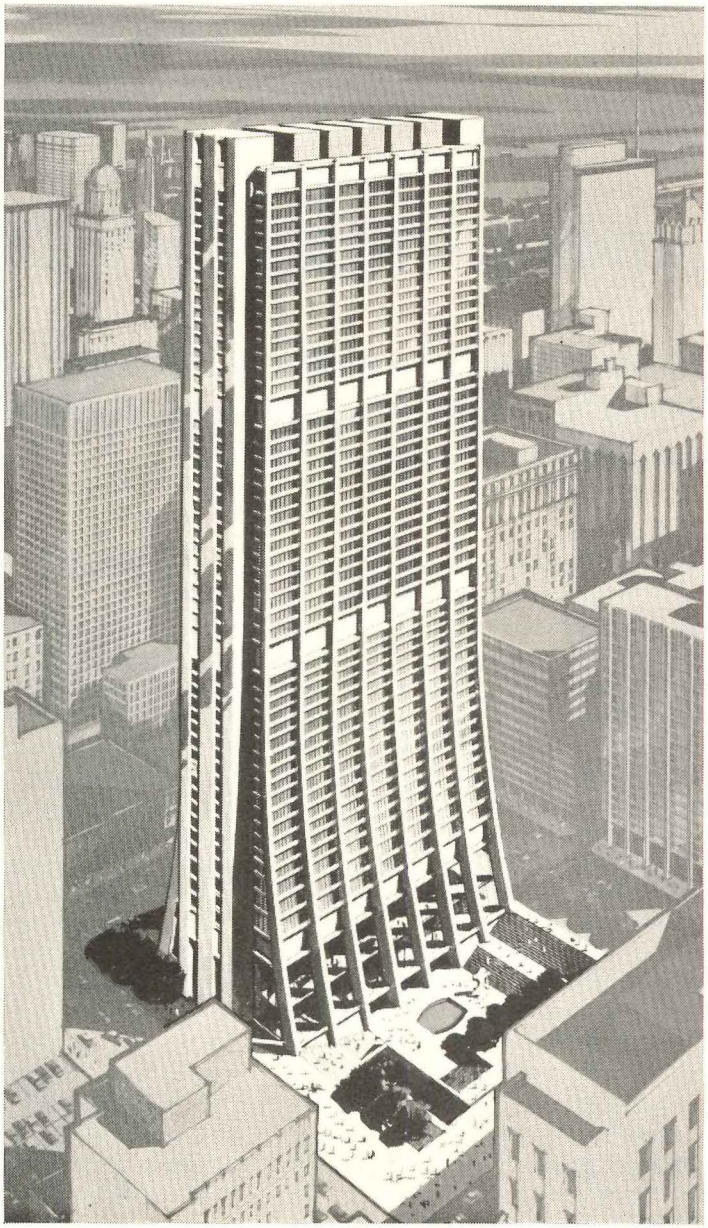

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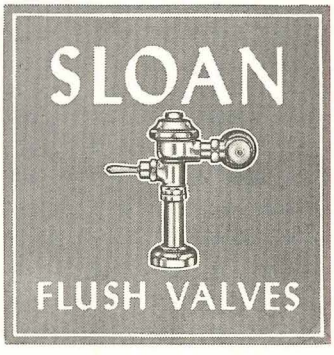

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IT'S THE LAW / By BERNARD TOMSON, District Court Judge, Nassau County, N.Y., Hon. AIA
and NORMAN COPLAN, Attorney, Counsel to New York State Chapter AIA

Limiting Contractor's Claims

The interpretation of provisions in construction contracts intended to limit claims against clients, is often disputed in court because of inadequate phrasing.

Claims by contractors against owners for damages arising from delays and for additional compensation for extra work are a source of a substantial amount of litigation in the courts of the United States. Many sophisticated owners, particularly public agencies, have sought to limit the area of contractors' claims by incorporating provisions in the construction contract which delimit and reduce the circumstances that will support such claims. Disputes concerning the interpretation and application of these provisions also engender litigation, particularly where the language is ambiguous or seemingly inequitable or unfair.

Typical of such litigation is the case of *Herlihy Mid-Continent Co.* v. *Sanitary District of Chicago,* 60 N.E. 2d 882 (Sup. Ct. of Illinois), in which the plaintiff, a contractor for the construction of a sewage works system for the defendant, sought to recover damages from the owner resulting from certain delays. The contract provided that should the contractor be obstructed or delayed in the prosecution of the work by any acts of the owner, or by unavoidable acts or delays on the part of the transportation companies in delivering material for the work, or by acts of public authorities, or by war or other calamity, or through any delays of other prime contractors, or due to abnormal weather conditions, or to any other cause beyond the contractor's control, the engineer was to extend the time for completion for a reasonable period but that "the contractor shall not be entitled to any damages or compensation from the Sanitary District (the owner) on account of any delay or delays resulting from any of the aforesaid causes."

The contractor in this case contended that he had been delayed by certain acts of the owner and argued for the principle that a waiver of damages for delayed performance is ineffective where such delay was brought about by the act of the owner. The Illinois court, however, rejected this argument, stating that the provision in question clearly set forth all inclusive language which constituted a waiver of any claim for damages resulting from the causes stated. The court concluded that "there was no basis for construing this paragraph as limiting plaintiff's waiver of damages" as "the language was explicit that plaintiff shall not receive any damages which may arise from any delay caused by defendant."

In a recent decision, the courts of New York, in an analogous situation, were called upon to interpret the provisions of a constuction contract which related to the question of additional compensation for extra work. In this case (*Camarco Contractors, Inc.* v. *State of New York,* 305 N.Y.S. 2d 207), a contractor asserted a claim for additional compensation for the stockpiling of 52,593 cubic yards of waste material excavated, based upon the fact that the plans estimated waste material at only 3700 cubic yards. The contract provided that no additional payment would be allowed for disposal of surplus material in "spoil banks." The trial court had denied any recovery on the part of the contractor, and on appeal this decision was affirmed, the court stating:

Claimant had inspected the job site before the bidding, and there was no proof of any intentional misrepresentations or concealment by the State with regard to the estimate of the quantity of waste material so that the State's error was quantitative not qualitative, and there was no basis for a claim of damages for the extra work performed.

In the same case, the claimant had contended that it had lost profits of approximately $43,000 by reason of deletions and changes in the construction contract, reducing the amount of certain work. The contract provided that "the engineer reserves the right to increase or diminish any or all of the above mentioned quantities of work or to limit any of them as he may deem necessary, and such increase or decrease of the quantities given for any of the items shall not be considered as sufficient grounds for granting an increase in the unit prices bid." The court, in denying the claim for lost profit, said:

Such general omission clauses have been construed to permit the State to order deletions in contracts whenever they do "not alter the essential identity of the main purpose of the contract." Claimant has failed to establish in the record here that the portions of the contract deleted were more than incidental to the contract's main purpose, and the denial of any recovery for lost profits was correct.

It is possible that other courts would view the facts of the foregoing case in a different light, particularly in respect to the issue of extra compensation for additional work. The discrepancy between the estimate of waste material in the plans and the actual amount that existed is so great that a court might conclude that it indicated negligence which would relieve the contractor from the strict application of the provisions barring his claim.

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Two Chicago Architects and Their Clients: Frank Lloyd Wright and Howard Van Doren Shaw.

By Leonard K. Eaton *MIT Press, Cambridge, Mass., 1969. 259 pp., illus. $10.*

Reviewed by H. Allen Brooks. *The reviewer, a past president of the Society of Architectural Historians, teaches at the University of Toronto.*

The title of Leonard K. Eaton's latest book quite aptly describes the contents, for herein are recorded the biographies of 26 clients, half of whom built Wright houses and half of whom patronized architect Shaw. From this data, assembled from published sources and including interviews whenever possible, conclusions were drawn concerning the typical client of either architect. Shaw's clients were conspicuous by their wealth, not uncommonly being second generation tycoons like meatpacker Swift and steelmaker Ryerson. The character and lives of these people fit the expected establishment mold — they made money, entertained lavishly, patronized The Art Institute, and had subscription tickets to the Chicago Symphony. When it came to building a home, money was of little or no importance. Wright's clients, however, were from a different stratum of society. They were, as Wright often pointed out, middle-class men of business whose homes were built on a budget. They also differed, according to Professor Eaton's findings, in that they often had an active interest in music, were inventors or were mechanically inclined, and rarely had an Ivy League (or any other) university education. Their wives were active as individuals (less socially concerned with "being in the right place at the right time") and often one spouse had some unusual interest — Mrs. Coonley and her kindergarten and Mr. Winslow and his hand-operated basement printing press. The clients of both architects were usually Protestant and Republican.

It seems, therefore, that both had clients who were typical, although not average, Midwest Americans. Howard Shaw, who had studied at Yale and MIT and maintained a home in the exclusive, estate-studded North Shore suburb of Lake Forest, often built mansions for Eastern-educated, North Shore millionaires, while Wright — whose buildings were called "peculiar" by some — built for the less monied residents of Oak Park, the town in which he lived.

But how much of this is really new? And why were Howard Shaw's clients chosen as the "control" against which to measure Wright's clients, when these clients were known to come from a different economic and social stratum of the Midwest? Would it not have been more meaningful to have selected an architect who was competing in the same league — competing for the same clients as Wright? And why were Wright's clients chosen for the period 1893–1912, and Shaw's for the years 1902–1924 — overlapping only 11 out of 32 years? It is fascinating to have all this client-biographical information neatly summarized and presented, and in one instance to have a quoted interview with a Wright client, but this is what one might hope was the beginning — a point of departure — for an incisive sociological study of Wright clients and Midwest architectural patronage in general. I wish that the seven-page concluding chapter, "The Failure of the Siege," were the Introduction both because so many fascinating questions are raised here and because one realizes how many of the answers are conjecturally presented. This is because the biographical format of the book was unable to provide information concerning the most significant questions of all — how Wright's clients differed or failed to differ from people of similar economic and social standing in the community, why these people selected Wright rather than another architect, why residential clients abandoned Wright after 1917 (Eaton's date) etc.? Perhaps this is too much to expect, since these are the unanswered questions that historians have been asking for decades.

The chapter that actually introduces the book is entitled "The Problem of Architectural Innovation in History," and here Professor Eaton speaks of three great architectural revolutions in Western culture, that of the Gothic style as associated with Abbot Suger at St. Denis, the Renaissance with the Medici family as typical patrons, and closer to us, the revolution in Chicago of 1890–1913 with Frank Lloyd Wright as chief protagonist. This makes Wright's clients the modern counterpart of Suger and the Medici, and the worthy subject of the book. The main portion of the subsequent text divides neatly into four sections: one chapter about Wright and his clients, and another with 13 biographies of Wright clients; a similar organization is repeated with regard to Shaw. The Wright *vs.* Shaw theme takes visual form in the layout of the book where a Rothko-like cover and dust jacket design of square-above-square prefigures the printed page. In the two Wright chapters the text is printed only on the upper half of the page, the lower half being left blank or perhaps containing a (not necessarily square) illustration. Shaw, a lower caliber architect, gets his two chapters printed only on the bottom half of the page, all of which is rather gimmicky. The book is profusely illustrated with often new and unusual views of both men's work — this is a real plus — yet several are unnecessarily blurred.

In conclusion, therefore, it should be noted that the author has faithfully accomplished his limited objective, and done so in an interesting and highly readable text. He has organized a vast amount of information that hopefully will stimulate others to carry the work onward, especially at this time when sociological problems increasingly attract the art historian's attention. And not least among the pleasures of this book are the illustrations that the author culled from often inaccessible and little known sources.

(More Book Reviews on Page 108)

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Architect: John D. Bloodgood
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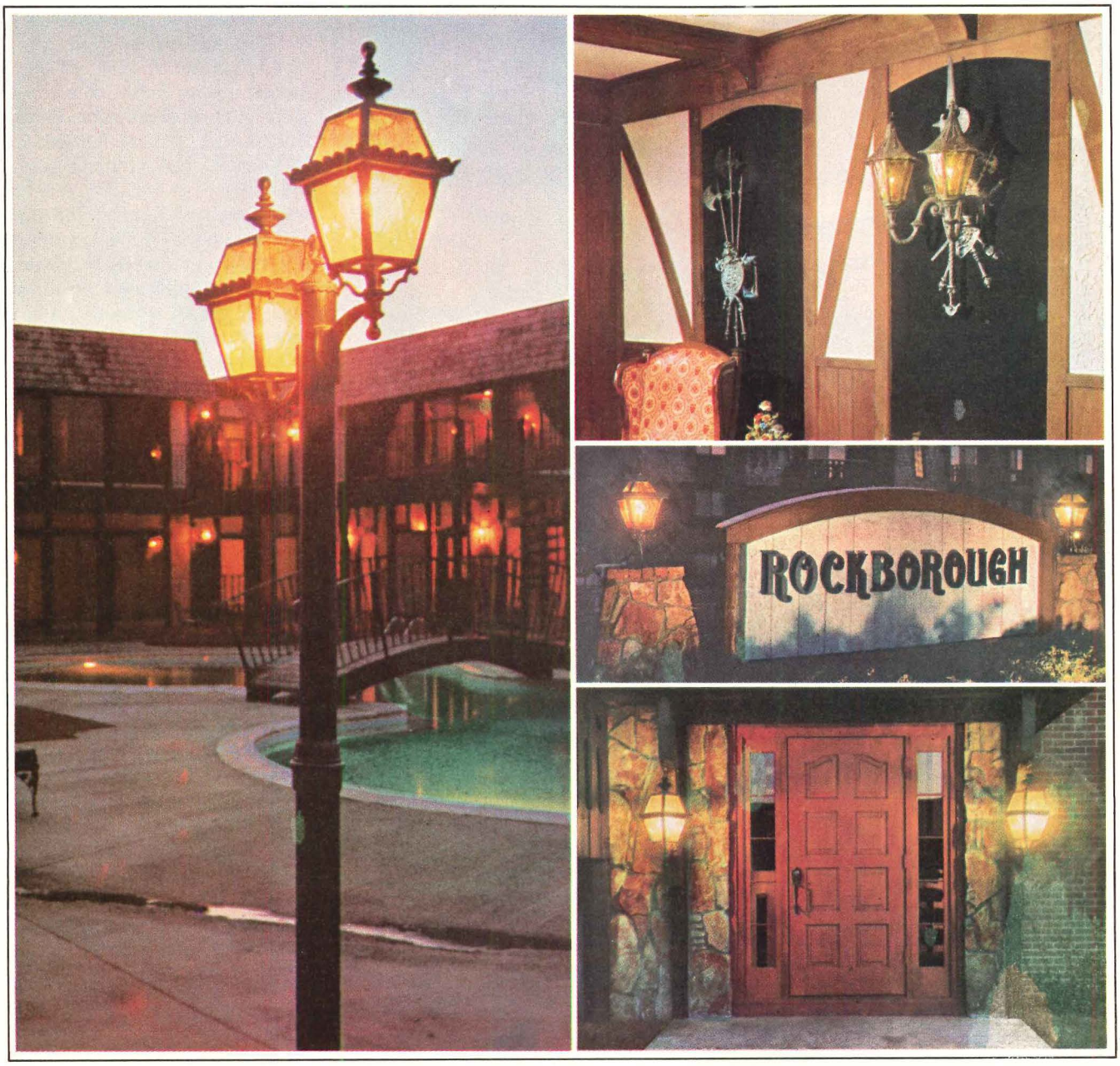

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Systems Building: an International Survey of Methods.

By Thomas Schmid and Carlo Testa.
Frederick A. Praeger, New York, N.Y., 1969. $20.

Reviewed by Helmut C. Schulitz.
The reviewer, who formerly worked in University Building Systems for the German Government, is now an Assistant Professor of Urban Design at the new School of Architecture and Urban Planning at UCLA, where he teaches a course in building systems.

An attempt to survey the state of the art of systems building on an international basis is long overdue and will, therefore, be appreciated by everyone concerned with the urban environment. This is especially true in the United States where, after the establishment of the new housing goal by HUD, the trend toward industrialized building will accelerate enormously. There is no doubt that this fact alone will insure a large number of readers; the glossy cover with the well-selected photo of the GEAI system will also enhance sales. But does the open book meet the expectations raised by the snazzy cover and the price? Or, is it a waste of one inch of book-shelf?

In terms of quantity of information covered, one is as likely to be disappointed as with any book printed in three languages. The actual text of this 240-page book shrinks to only 18 full pages, if one does not count the introduction, captions, and the text to the examples of industrialized buildings.

In terms of quality of the information, one would have liked to see the authors adhere to their promising opening statement that: "There is no danger in not knowing many things. It is only dangerous to know many things that are no longer correct." But again, one is likely to be disappointed; the authors have not been very sensitive in selecting materials and have covered much outdated and previously published information on merely prefabricated buildings that can, in many respects, already be termed obsolete.

The book does represent a concise overview on central aspects of the field, but not so comprehensively as the title of the book misleadingly suggests. (The title "Systems Building" instead of "Building Systems" may be due to an inaccuracy in the translation.) Generally, the book will be more useful for those seeking an introduction to the field than for those already working within it. This is partly due to the condensed presentation from which the book suffers, and which leads invariably to oversimplifications and sometimes to banal and distorted statements. Unfortunately, the book shows, to only a limited extent, the change that is taking place in the architectural profession generally, and that has already been extensively discussed in the press elsewhere. But it fails to describe the conceptual changes that are and should be taking place in the field of industrialized building today.

The book is divided into two parts: the first part, "Planning with Systems," shows a certain strength in

(Continued on page 114)

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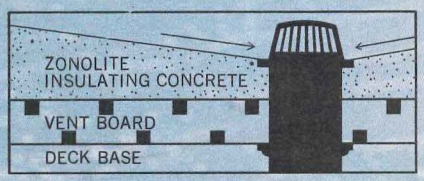

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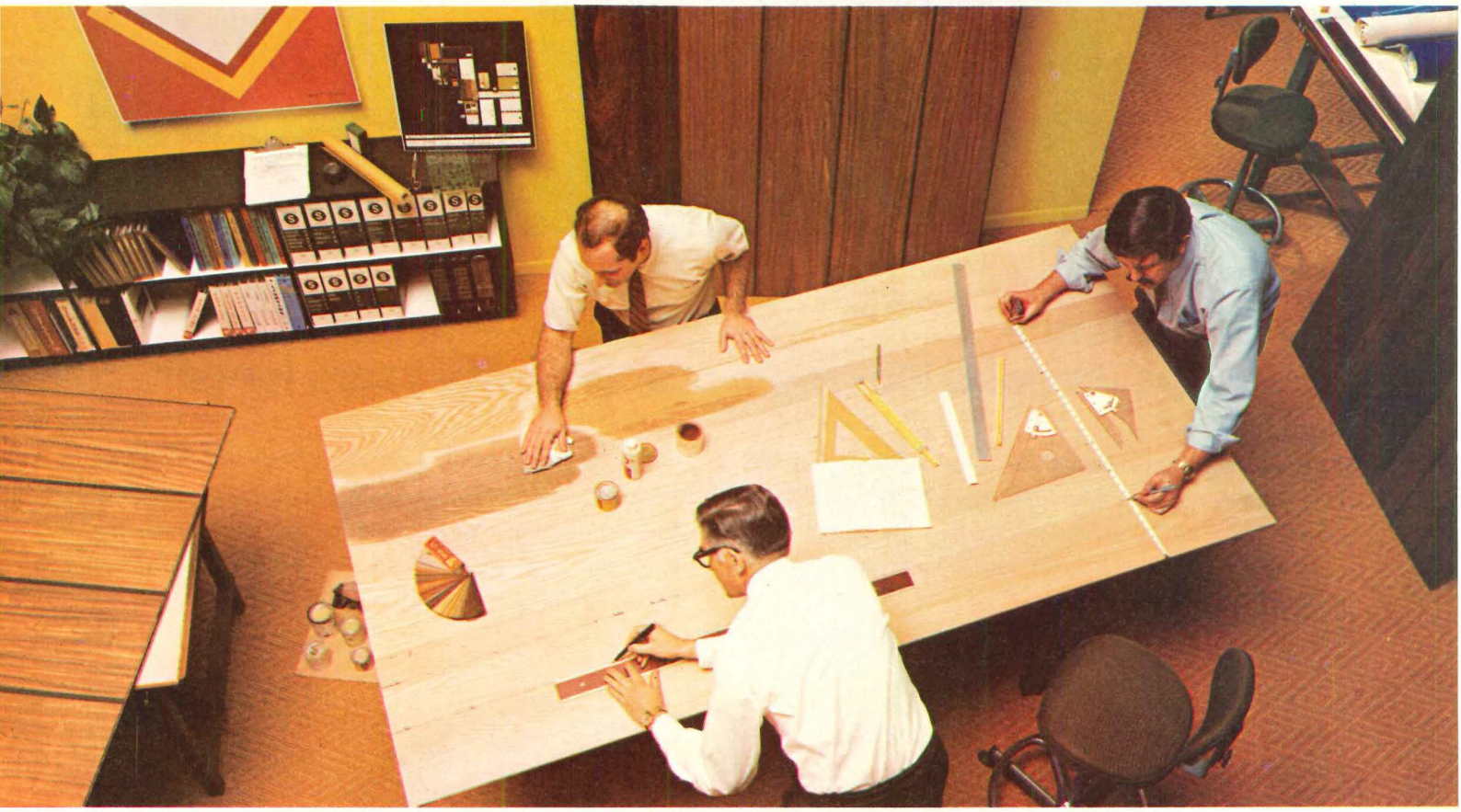

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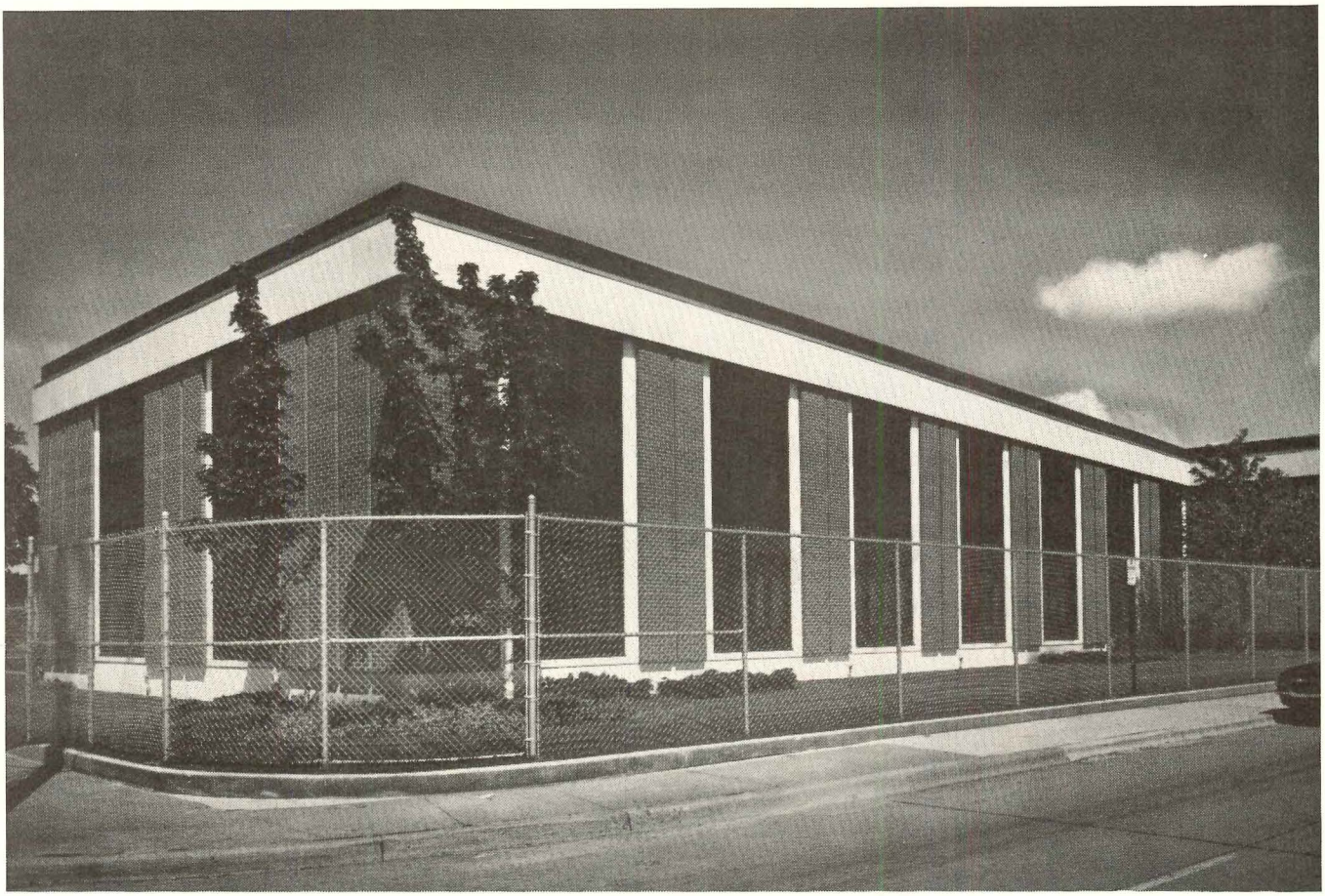

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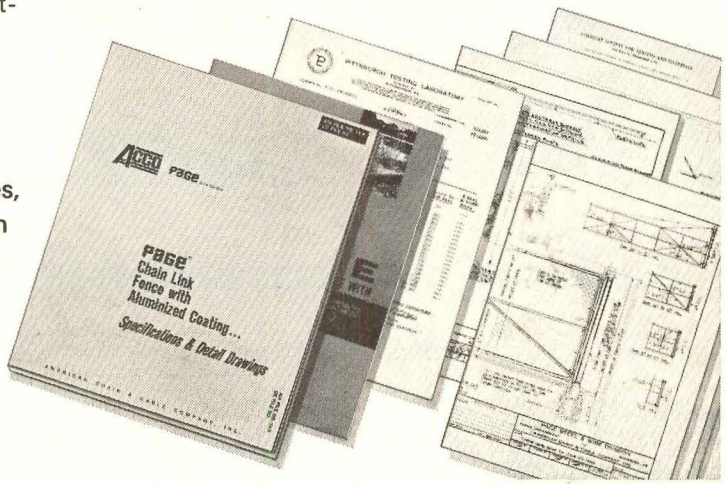

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(Continued from page 108)

emphasizing concepts of modular coordination. In this context the authors discuss such European programs as the Marburg University Building System, which, although often published abroad, is unfortunately little known in the United States. Developed eight years ago, it remains as one of the most sophisticated examples of systematic modular coordination, and, from the viewpoint of adaptability and growth, an important contribution to the generation of new building systems.

The second part, "Building with Systems," reviews various technical details in its first section. It is disappointing that the emphasis is on those solutions that have existed in prefabricated buildings for many years. Co-author Carlo Testa identifies the gap between theory and practice but would have us believe that the examples given, actually rather unadapted leftovers from conventional building design, are representative of the current state of the art. These details are typical of the period of transition from traditional to prefabricated and industrialized building techniques. Our concern today (and the concern of this book should accord with its title) is the transition from industrialized building to "systems building." The terms "systems building" and "industrialized building" have often been used interchangeably. But as our concern has shifted from the fixed, built product to the user, the differentiation of both terms becomes conceptually significant. The concept of systems building not only takes into account processes that lead to the finished product, but also processes involved with the course of occupancy over time, including adaptation to changing requirements, deterioration, obsolescence, maintenance, potential re-use, and eventual demolition. In this way the concept includes the whole life cycle of a building. Construction processes have been emphasized by most people working in the field to such an extent that the word "process" threatens to become as fashionable and abused as the word "systems."

The wrong emphasis becomes even more obvious when one enters the next section of the book, which was supposed to provide a survey of 62 building systems. One would have liked to see more stress put on such systems as SCSD, GEAI, USM, and

(Continued on page 119)

(Continued from page 114)
Marburg, and less emphasis on the European heavy concrete buildings that are basically an application of industrialization techniques to conventional architecture. The larger part of the material covered in this section hardly deserves the term "system," whereas school building systems such as the Canadian (SEF), housing systems such as the Scandinavian Techbuild (STS), the American Mitchell system, and other still unrealized alternatives have been omitted completely. Furthermore, this part suffers from the fact that again, an attempt is made to cover too much in too little space. Twenty concise statements on each system simply cannot provide enough useful information to describe any one sufficiently. It is unfortunate that the little space available was wasted with so many useless photographs. (Out of approximately 250 illustrations in this section, 170 are elevations, whereas more useful sections, floor plans, details, analytic material, or diagrams are in many cases completely missing.) The emphasis on the styling of façades tends to show that the authors seem to be persecuted by the common falacious assumption that building systems lead to uniformity, to be avoided by "elevation cosmetics."

In the last section, failures of industrialized buildings were to be described. However, only one full page has been allowed for this enormous task. There is no suggestion that the failures of industrialized building could be other than economic ones. This one-dimensional thinking seems to be common in the field of industrialized buildings. The only criteria for success or failure seems to be the potential quantity of output and the initial cost of the product. The multidimensional nature of problems associated with building will never be resolved in a singular problem area. The test will be if the building will be considered a success by the user in the year 2000.

But, if building systems have a future at all, we must stop thinking about buildings in conventional patterns. The built products have to be questioned in terms of performance over time in order to meet the requirements of a rapidly changing society. The emphasis has to shift from construction processes to processes of use. Industrialized building will not be the answer; systems building might. Let's try harder!

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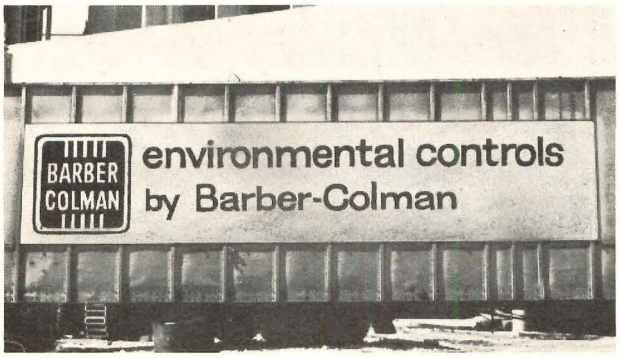

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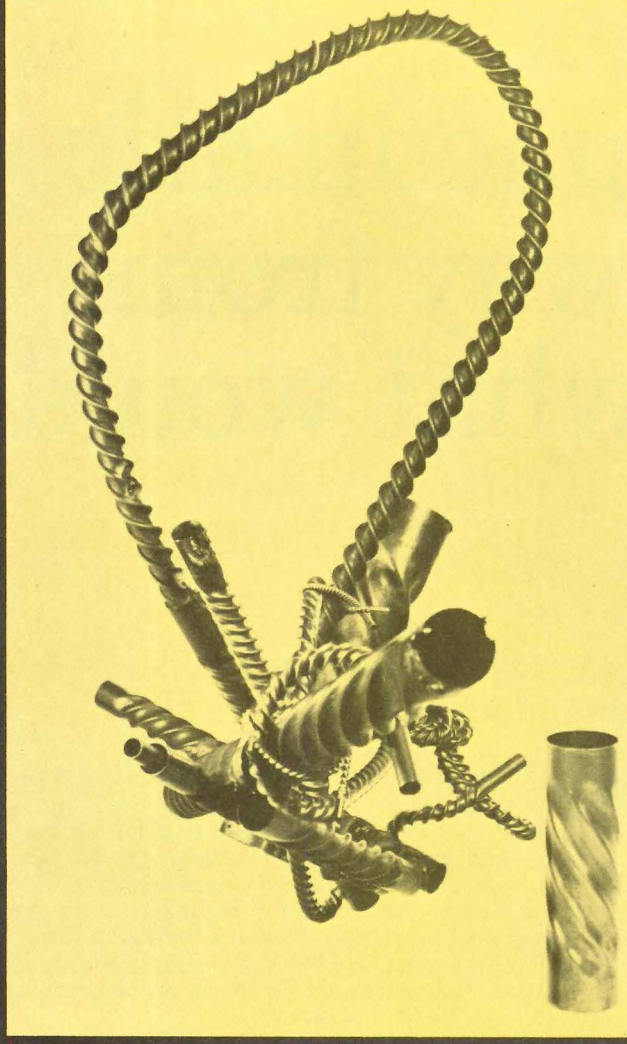

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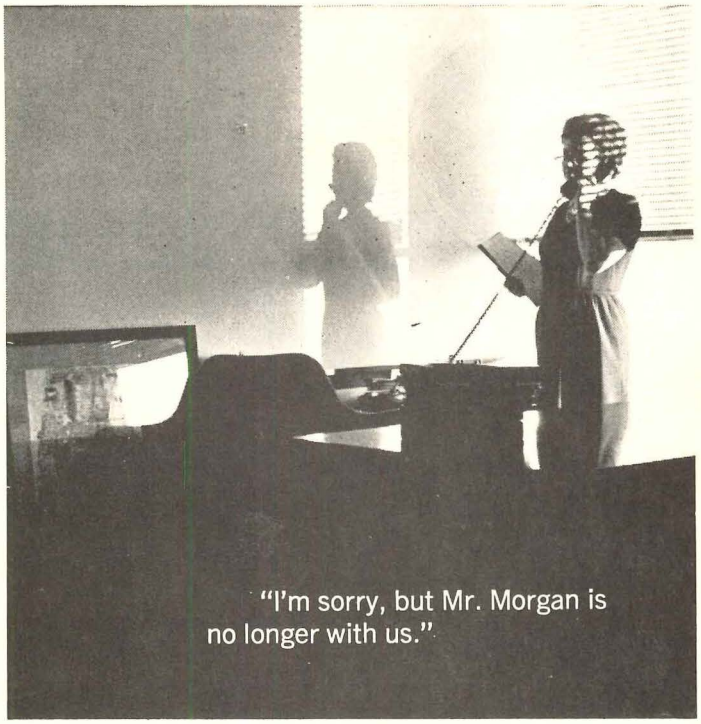

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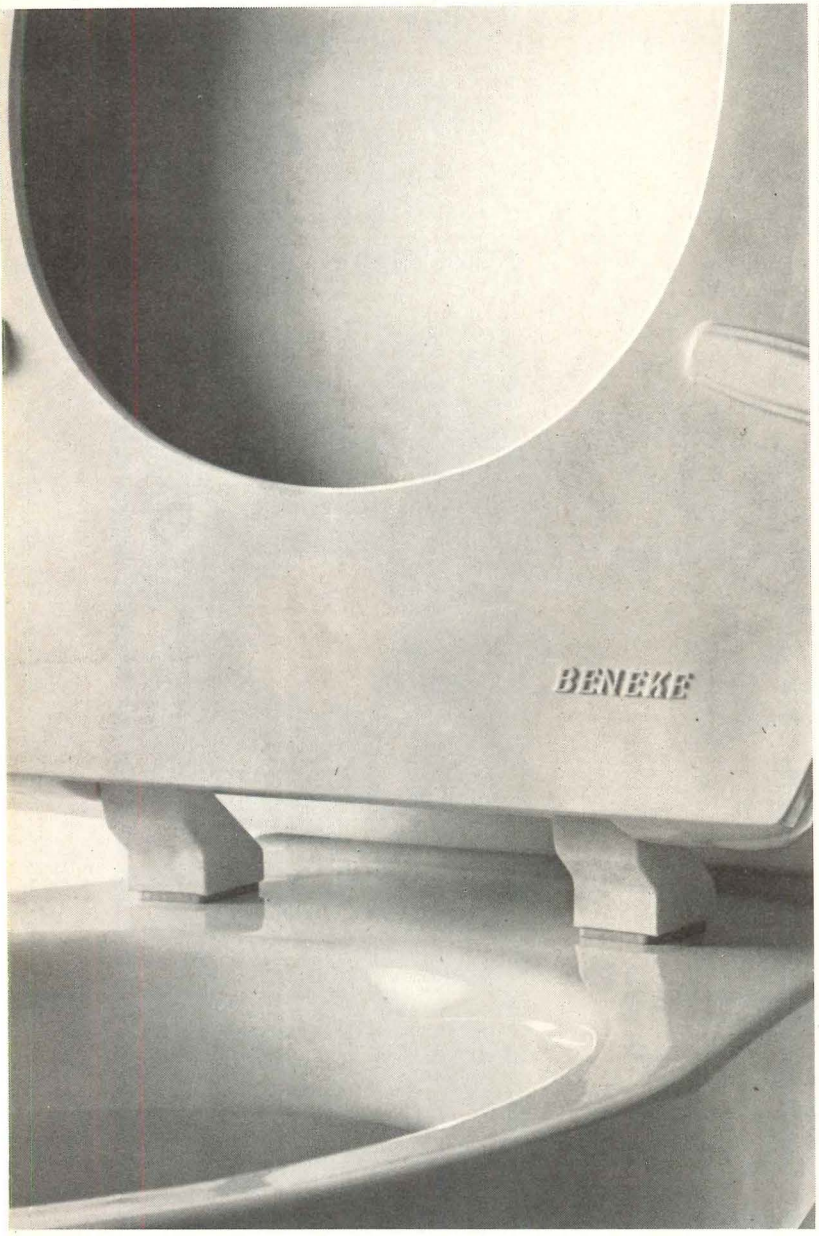
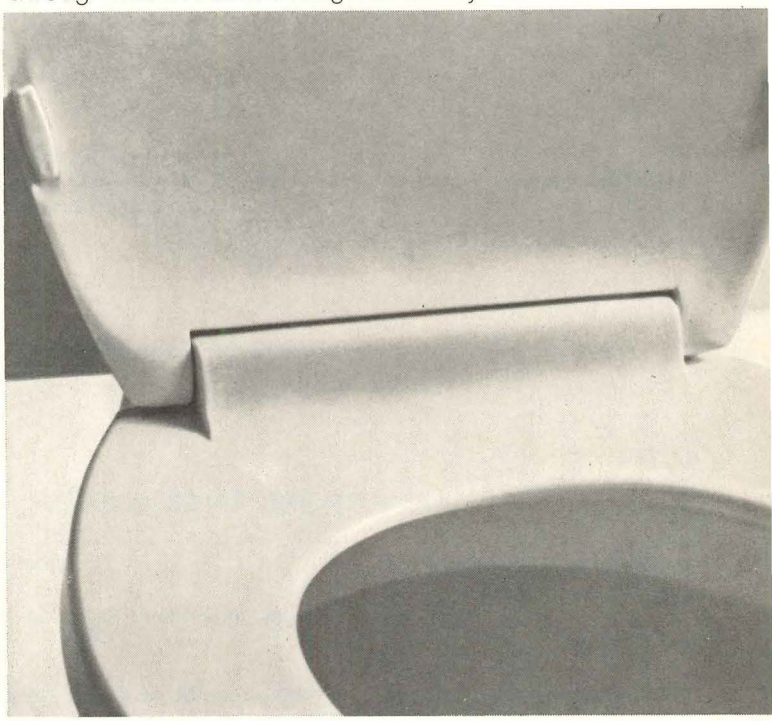
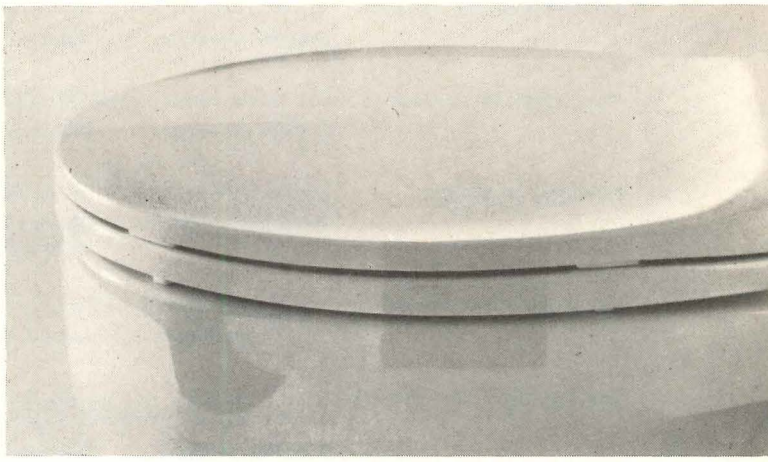


With the seat down and lid up, the streamline design of the hinge shield facilitates comfort and cleanliness. Wetness can't seep through into the actual hinge assembly.



The seat itself is molded from high impact polystyrene plastic with carefully contoured depth for maximum comfort.



The bowl and seat are cleaner because the hinge is higher. The Beneke HI-RISE® heavy duty plastic toilet seat is the first to feature this important sanitary breakthrough: the rotating mechanism is elevated well above the bowl, so thorough cleaning is accomplished quickly and easily without removing the seat. The best seat is the cleanest seat. The HI-RISE is the cleanest because it's the easiest to clean.

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