PROGRESSIVE ARCHITECTURE *June 1967* *A Chapman-Reinhold Publication*


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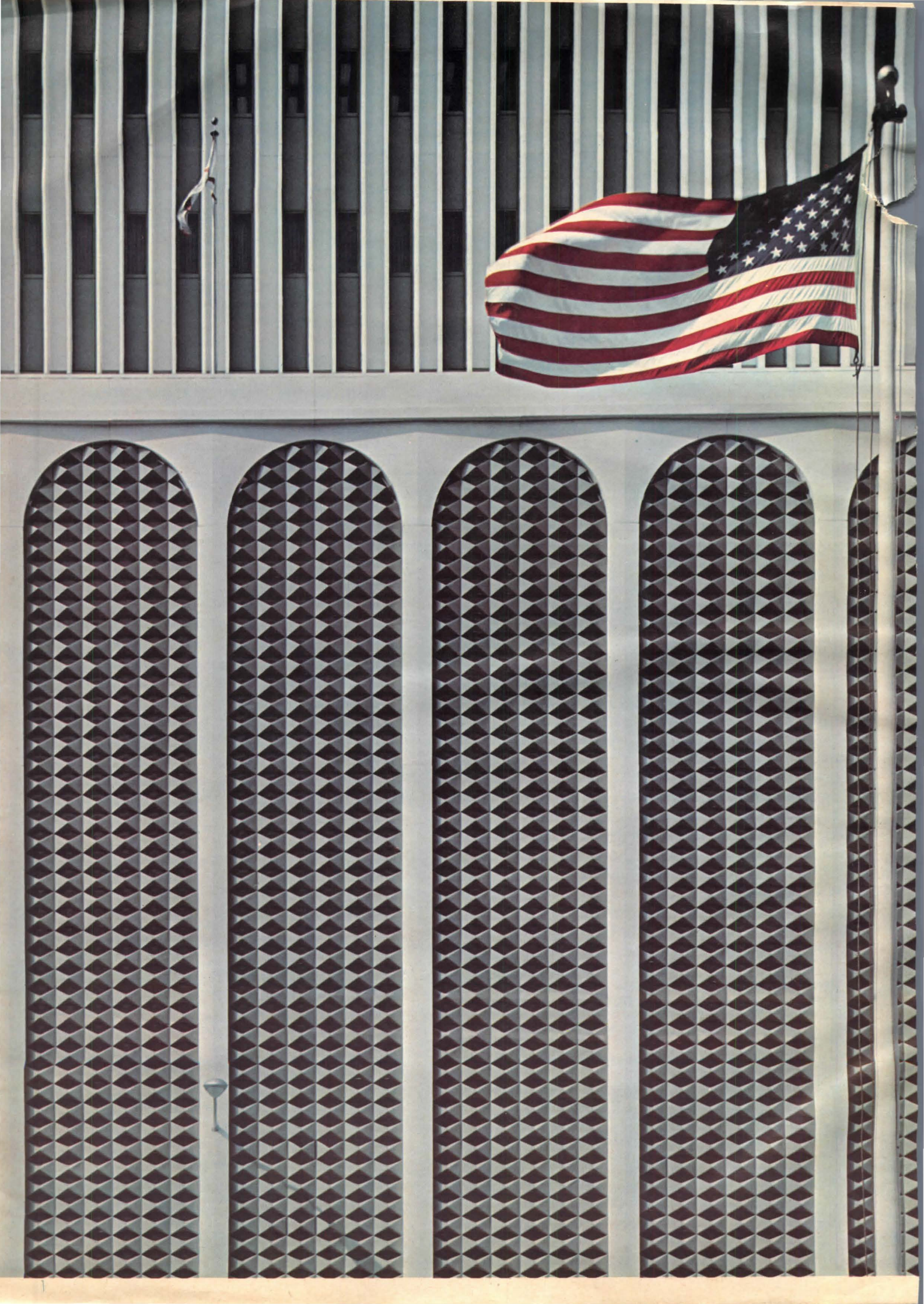

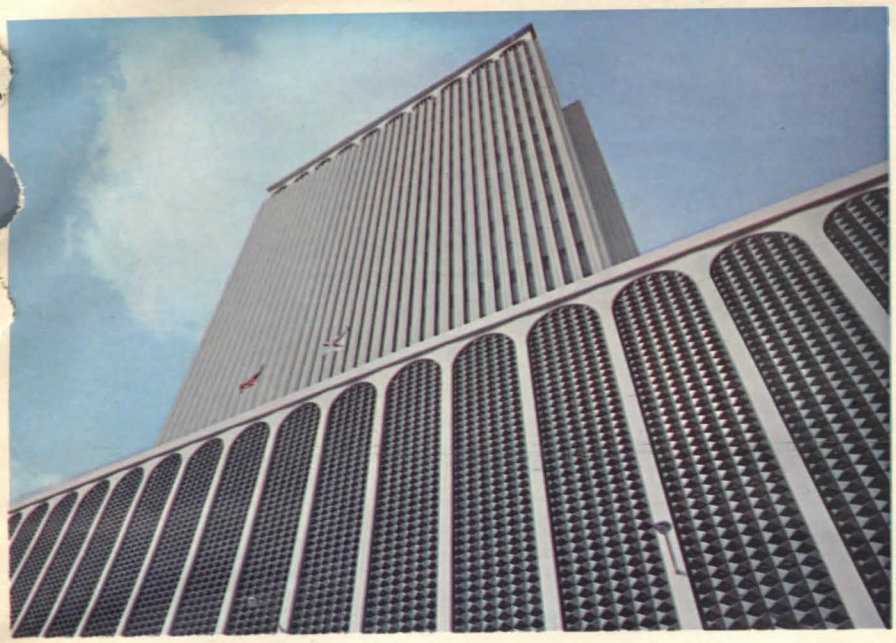

Architect: Harry A. MacEwen
Tampa, Fla.
Fabricator: Architectural Products Division
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VIEWS

Earth Happening

Dear Editor: Your most impressive article in the APRIL 1967 P/A touched off an underground happening here, as pictured below. Please note that the Paul Rudolph placard is in response to his conclusion, "The hell with the underground business — for me," and is no reflection on his talents, especially after seeing them displayed so magnificently in his land-saving plan for a new Washington suburb.

MALCOLM B. WELLS
Cherry Hill, N.J.

The Eclecticism of the Smial

Dear Editor: My God! Who would have thought that Phillip Johnson was a purveyor of Hobbit-lore? Yet his "elegant cave" must surely be patterned after the Hobbit *smials* described in J.R.R. Tolkien's writings. According to Tolkien, "As a rule, only the richest and the poorest Hobbits maintained the old custom [of living in caves]. The poorest went on living in burrows of the most primitive kind, mere holes indeed; while the well-to-do still constructed more luxurious versions of the simple diggings of old."

Perhaps troglodytic eclecticism is another new "direction" for architecture.

TOM RAMSEY
Atlanta, Ga.

Organic Berms?

Dear Editor: The reference in your April Editorial to Wright's "sacrosanct earth" is perhaps on overstatement, since the first use of the berm in contemporary architecture with which I am familiar occurred in his Cooperative Homesteads, Detroit, in *1942*, and the Keyes House, Rochester, Minn., in 1951.

Furthermore, he wrote in *The Natural House:* "The bulldozer comes along, pushes the dirt up against the outside of the building as high as you want it to go. . . . An actual economy and preservation of the landscape."

Wright often shaped the earth with large terraces. It appears to me that the results are in complete harmony with his "organic" objectives.

HARVIE P. JONES
Huntsville, Ala.

New Title for P/A?

Dear Editor: P/A did a fine job with its April issue of "Progressive Landscape Architecture."

Since July 1960, we landscape architects have been waiting for another issue of your magazine devoted to that all-important influence on every work of architecture: the landscape.

WILLIAM H. TISHL
Assistant Professor
Department of Landscape Architecture
The University of Wisconsin
Madison, Wisc.

Cheers for "The Earth"

Dear Editor: Congratulations on your excellent April issue.

RICHARD REYNOLDS
San Francisco, Calif.

Dear Editor: My compliments to you for a particularly stimulating issue. It is most encouraging to see P/A asserting its influence in a way which de-emphasizes individual buildings. The Earth issue is pertinent reading for everyone (public included) and it holds out the hope that architects may yet become aware of their environment instead of themselves.

HUGH HARDY
New York, N.Y.

Correcting Some Credits

Dear Editor: I think it was unfortunate that in your article "Development in Deepest Brooklyn" (p. 194, APRIL 1967 P/A), you neglected to mention the other people involved with us in the schematic development of this project.

We were given many facts and great assistance by Mr. Donald Elliott, Chairman, New York City Planning Commission and his staff. We also were aided considerably by Dr. Cyril Sargent of Corde Corporation on the educational facilities planning as well as on other matters.

ROBERT S. McMILLAN
Rome, Italy

House and Hill

Dear Editor: I read with interest your April Editorial on "The Art of Shaping the Earth," but not without questioning its accuracy on Frank Lloyd Wright's philosophy of "Earth Architecture." As a student of Wright for five years, I was not under the impression, as your Editorial suggests, that "to cut a tree was taboo." As a matter of fact, I was assigned to cut hundreds of trees down around his studio-house one summer.

It is true that Wright had profound respect for the shape of earth, yet he did not hesitate to improve the shape whenever he saw fit. His Taliesin involved certain reshaping of the hill. His project in Marin County, California, is another example of earth shaping. His school owned two bulldozers at the time. I do not think the bulldozers were "the symbols of architectural impotence."

It might have been misunderstood by many who arrived at a wrong conclusion about Wright when he said that if you build a house on top of a hill you lose the hill, but if you build your house around the hillside you might gain a hill because without the house the hill's existence might go on existing but unnoticed.

S.P. SHENG, P.E.
Williamstown, W. Va.

Another Wrightian Vignette

Dear Editor: One is reluctant to destroy the belief in the sacredness of myths, but with regard to the second paragraph of your Editorial in the April issue:

Continued on page 10

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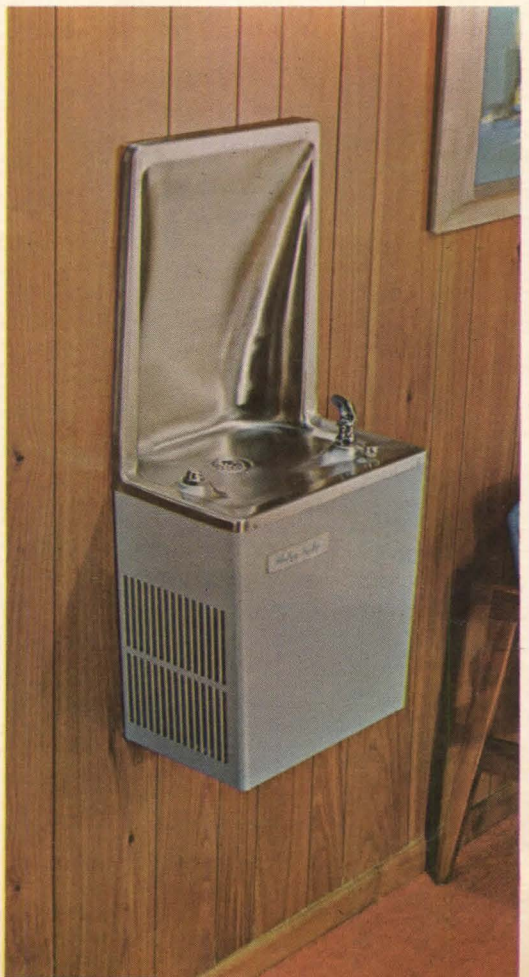

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On Readers' Service Card, Circle No. 409

Continued from page 6

One remembers a time at Taliesin when, as was his custom, Wright was directing with his cane a bulldozer operator in an earth-moving project. He turned to someone standing nearby and commented: "Sometimes I think that I have gotten as much pleasure out of this bulldozer as I have out of my Japanese prints."

Come now, have you ever really looked at Wright's work?

CURTIS BESINGER
Lawrence, Kan.

"Envirial Sciences"

Dear Editor: Please accept my congratulations on your April Editorial.

As a British subject, I am appealing to this nation for an entirely revised standard of behavior toward our environmental circumstances and am calling for the development of an Envirethic whereby to raise popular attention and habit toward a greater respect of our dwindling resources.

I am advocating the immediate creation of an International Institute of Envirial Sciences and have been invited to develop a two-year Graduate Program of this nature at the School of Architecture at the University of Notre Dame.

PATRICK HORSBRUGH
School of Architecture, University of Notre Dame
Notre Dame, Ind.

April Enlightenment

Dear Editor: Your April issue was a very interesting and enlightening piece of literature.

GENE MILHOAN
Columbus, O

Soleri Comments on Earth Issu

Dear Editor: I never, that is to say *never*, designed an underground city, and I never, that is to say *never*, suggested that any single man should live or build his home underground.

I find many of the grand voices exceedingly petty and very, very peripheral. I would recommend for them some open-eye flying and mountain climbing.

Nothing more depressing than blindness in high places. High places?

PAOLO SOLERI
Scottsdale, Ariz.

The Legacy of Wright and Corbu

Dear Editor: I find the implications of your declaration about "the art of shaping the earth" and much of the contents of the April issue a disturbing contrast to your usually sensible and often eloquent Editorials.

I think you have missed the real point of the legacy of Wright and Corbusier. Wright certainly did not consider the earth sacrosanct. His buildings hug and caress the ground like a lover, and like any passionate lover he did not hesitate to bend the earth to his will. Many of his houses, like his own Taliesin East out here, are earth-shaping man-creations of the highest order, more deserving of emulation than perhaps any other aspect of his work. Even the berm-type construction in which Philip Johnson takes such pride was advocated by Wright.

Corbusier, as you suggest more accurately, accorded the earth the respect of an ascetic individualist. He let it go its way and he went his. Neither of these powerful and willful men considered anything sacrosanct except their own creative vision. Both made an art of arrogance itself. But underlying it was the inner humility and reverence for life and its cosmic processes that belongs to all great men and all genuinely creative artists.

This respect for life provides the sensitivity to perceive that the angle of repose of a soil or the shape of a rock is the outworking of gravitational, molecular, and other mysterious forces of which we humans are also and only a part. It was well expressed in P/A's earth issue by the "preservationist" side of the discussions, especially by Mr. Soleri. Religion has always been the chief wellspring of architecture and art, even when commissioned

Continued on page 16

GRAND OPENING

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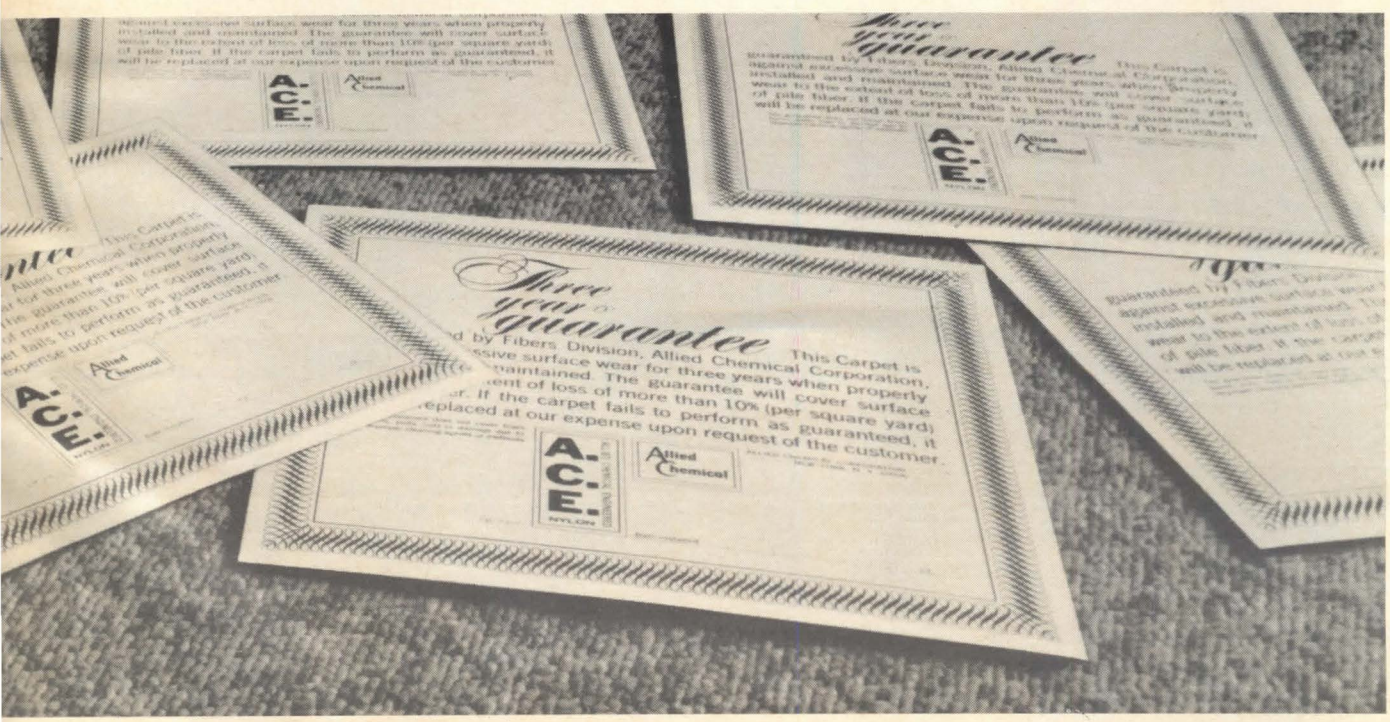

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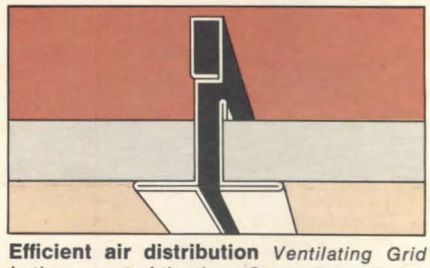

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Continued from page 10

by Philistines, and this cosmic reverence is all that most thinking modern men have left of religion.

It is opposite in spirit to your metaphor of "fists smashing into the powdery earth." Powdery or rocky or molten lava, the earth can hit back, and it is bigger than we are.

No one who wishes to be taken seriously can argue that modern man should, or could if he would, avoid changing the shape of the earth when he builds. We will inevitably keep moving earth on a great and greater scale ahead of our exploding urban agglomerations. It will tax all the creative genius, all the ingenuity and self-restraint of designers now living and yet unborn to do the *necessary* earth moving well.

To suggest, as you seem to do in your April Editorial, that narcissistic architects who are unwilling to blend their buildings with the environment should adjust the environment to their buildings and start bashing earth around just for the formalistic fun of it appears the height of madness, given the pathological state of the environment we already have. Particularly as there is so much evidence that they will take you up on it.

The really pernicious legacy left by Wright and Corbusier is the ideal of architectural "self-expression" passed on to lesser spirits whose perception of form is based on the shape of their own navels.

BARRIE GREENBIE
Madison, Wis.

[*Wright often did not practice what he preached. Hidden steel beams in otherwise all-wood buildings is one example of not quite organic architecture. The idea of the Editorial was merely to convey the basic attitude and especially the effect of this attitude on others.* — ED.]

Some Final Hurrahs for P/A Design Awards Issue

Dear Editor: As someone must have once said, "Show me a sentimentalist and I'll show you a second-rate mind."

Zip, Zap, Zoop! *** and, as Major Hoople sez, "fap!"

So.

Structurally continuous turf, eh, big megastructure and all sorts of contrived dirty things to *someone.*

Egad Martha!

DON KINGMAN
Chicago, Ill.

CORRECTIONS

We gave an incomplete list of credits in the article "Great Big Fill," concerning the landfill development for Jefferson Parish, La., (pp. 198–200, APRIL 1967 P/A). The complete list is as follows: CLIENT: Jefferson Parish (County), La. ENGINEERS AND PRINCIPAL CONTRACTORS: Burk & Assoc., Inc., New Orleans. William R. Burk, Jr., Principal-in-charge and general project administrator. William H. Butts, Project Manager. URBAN PLANNERS: Thompson B. Burk, Principal-in-charge and coordinator of planning and architectural studies. Jack A. Cosner, Associate-in-charge of architectural studies and assistance in planning and urban design. URBAN DESIGN CONSULTANT: Dr. Harry A. Anthony, Prof. of Urban Planning, Columbia University. MARKET ANALYSTS: Gult South Research Institute. SOILS AND FOUNDATIONS: Eustis Engineering Co., New Orleans. OCEANOGRAPHIC ENGINEERING: A.H. Glenn & Assoc. SANITATION: Dr. Donald R. Rowe.

The photos of the Guild House (MAY 1967 P/A) were mistakenly credited to Rollin La France. They were taken by William Watkins. (Exception: p. 136 photo, by Frank Kowasaki.)

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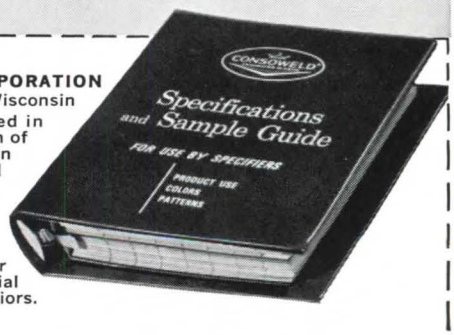

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10-A

L·O·F revisits a senior high designed to keep kids in school.

La Porte (Indiana) Senior High School, completed in 1962, is the end result of the ideas, work and planning of almost every segment of the community. The building was designed by Perkins and Will Partnership, Chicago, Illinois, to give students a cheerful environment, one that is conducive to the highest levels of academic pursuit.

We decided to revisit the school to find out how well its design is fulfilling these needs. Our first interview was with Mr. Harold Hargrave, Superintendent of La Porte Community School Corporation.

Question: How has the over-all design worked out?

Mr. Hargrave: Wonderful. It is not only fulfilling curriculum needs, the building has an openness with plenty of daylight that improves the attitude of the entire student body.

Question: Is the building a help in teacher recruitment?

Mr. Hargrave: Many prospective teachers say, "I'd love to teach here." Also we have a low faculty turnover.

Question: What was the cost of construction?

Mr. Hargrave: $17 per square foot. And the school accommodates 1800 students.

We next visited the high school and talked to Assistant Principal Jack M. Hyde.

Question: How do you like your school building?

Mr. Hyde: Very much. Student morale has gone up. The dropout rate has decreased since we've been here.

Question: How have the large glass areas worked out?

Mr. Hyde: Very well. They're properly shaded with roof overhangs and drapes. No problem with sun heat or glare.

Question: How about vandalism?

Mr. Hyde: In 5 years just two panes have been broken and those were the result of, not the target of, youthful exuberance.

How about teachers' reaction? We talked to Mr. Johnson, physics instructor.

Question: How do you like the school building?

Mr. Johnson: It's delightful. I particularly like my classroom with its clerestory windows. I don't have to draw drapes except when using visual aid equipment.

How do the students like it here? We talked to Valerie Scott and Mike Luther, members of the Student Council.

Question: How do you like your school building?

Valerie Scott: It's better looking than most schools you see around here. This is so much more cheerful and clean.

Mike Luther: All that glass lets in more daylight. And you don't feel closed in.

L·O·F makes a particular kind of glass for every purpose in school design. Consult your architect. Or call your L·O·F Glass Distributor or Dealer listed under "Glass" in the Yellow Pages.

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Toledo, Ohio

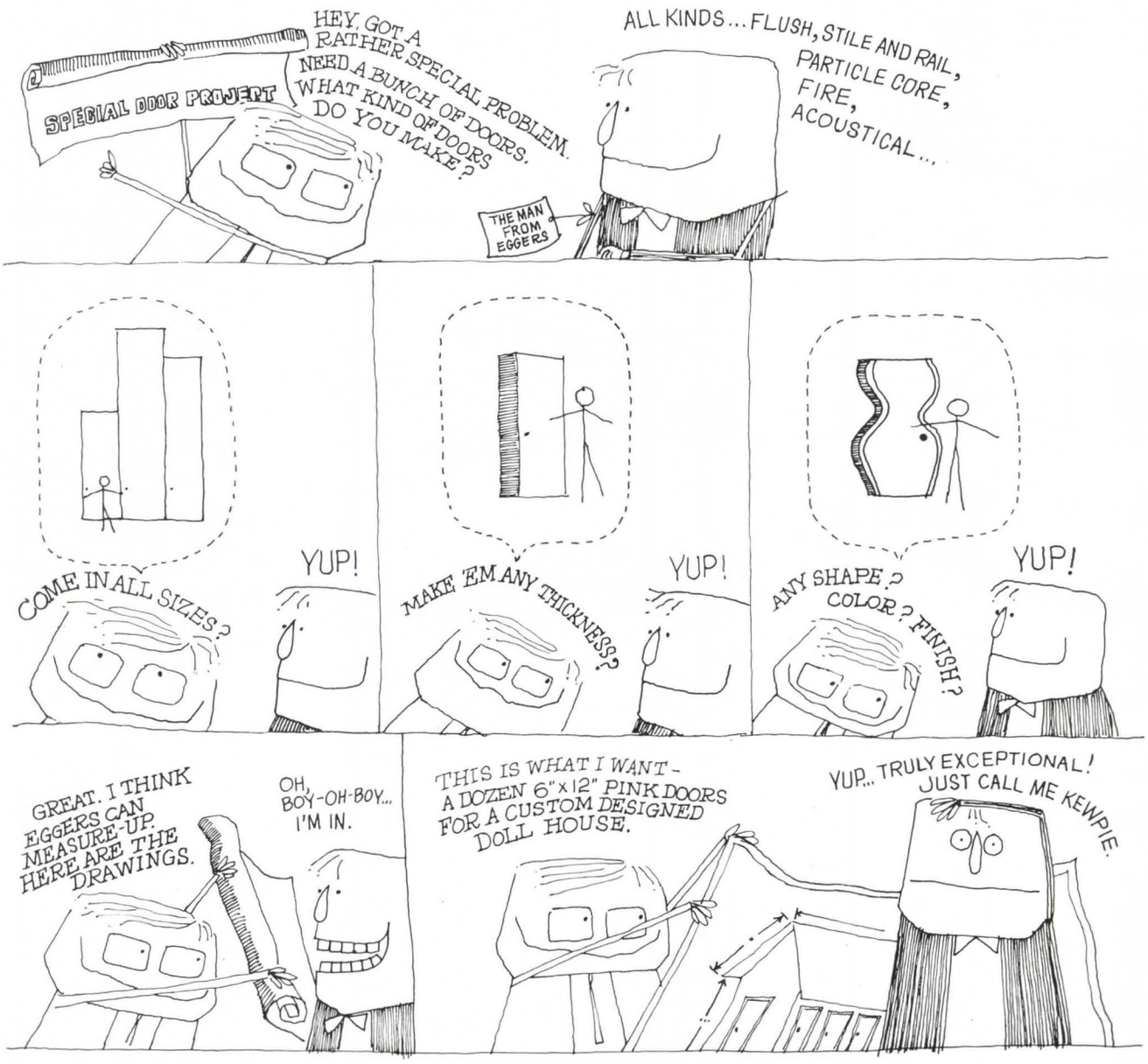
Courtyard seen through L·O·F Plate Glass walls is planted with colorful flowers every spring — a botany class project.

Typical classroom with generous window area. Wall opposite has clerestory windows permitting daylight to spill into the corridor beyond.

Crossweld® Polished Wired Glass in corridor offers a view of cafeteria, a multipurpose room often used for dances.

Botany planter room viewed from corridor through Crossweld Polished Wired Glass window walls.

ACCENTING THE EXCEPTIONAL FROM EGGERS



Doll house doors may be a "tongue-in-cheek" exception to the exceptional things you can specify — and get — from Eggers Hardwood. Regardless of the kind of architectural door you want — from flush to specialty doors — Eggers will make it to your exact needs. For the exceptional in custom-crafted plywood paneling, specify Eggers Plywood. Write for your free catalog.

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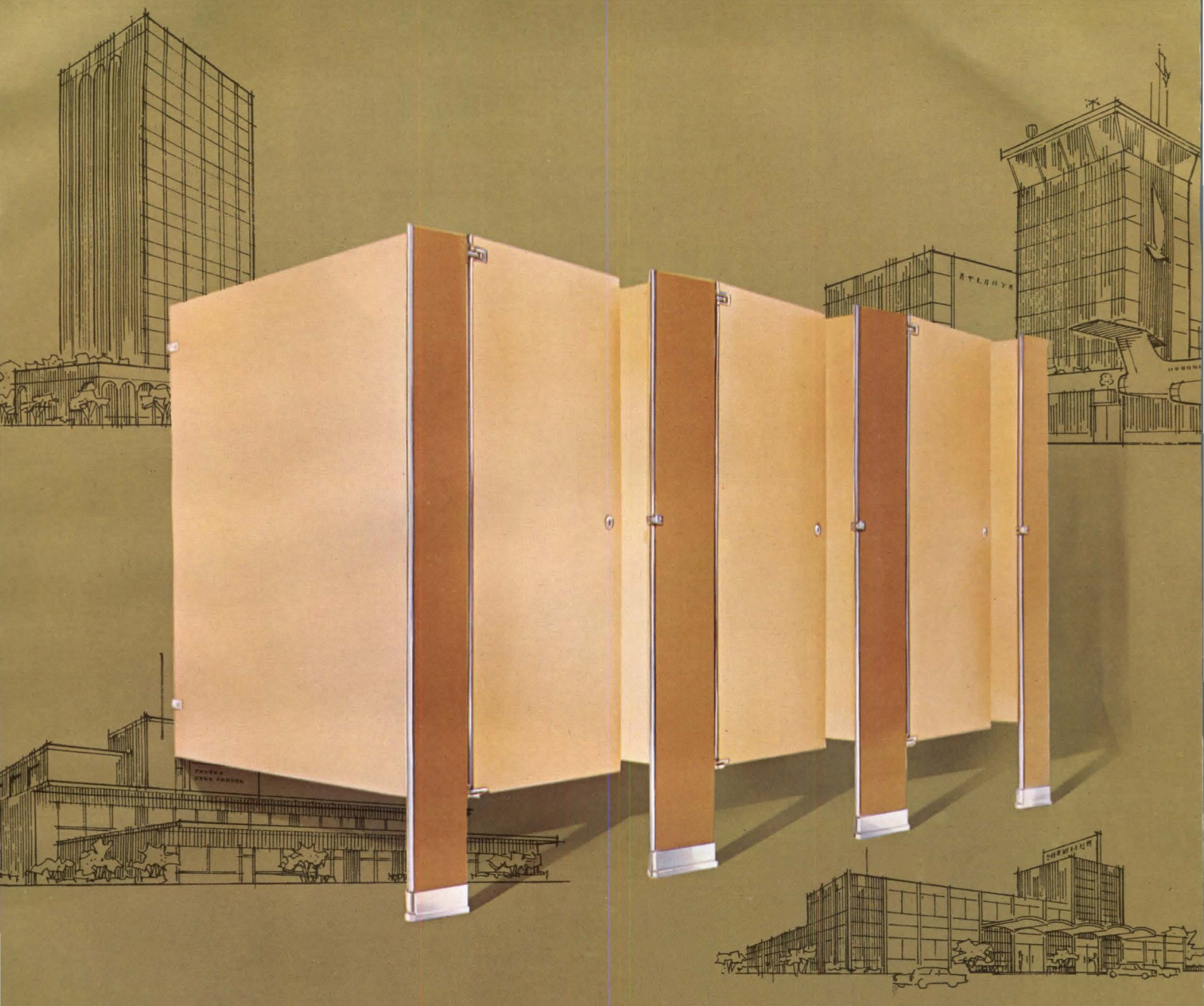

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GO IN ALL KINDS OF BUILDINGS AND STAY THERE LONGER BECAUSE...

. . . Sanymetals are *engineered* to last longer, even under severe public conditions found in schools, institutions, travel terminals, commercial buildings and hospitals. Sanymetal engineering builds in: extra-duty hardware; recessed tamper-proof hinges and latches, smooth corners and shoes and the toughest finishes possible . . . cigarette-proof baked acrylic, glass-hard porcena, life-time stainless steel. If there are more questions, your Sanymetal representative has all the "becauses". Or write direct: The Sanymetal Products Company, 1705 Urbana Road, Cleveland, Ohio 44112.

Sanymetal®

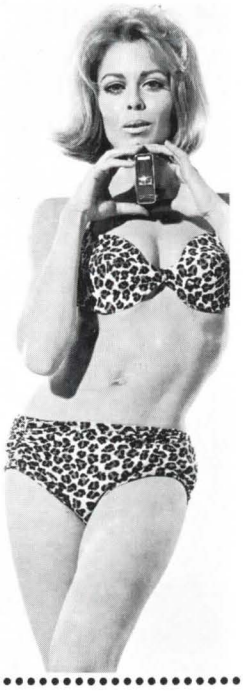
WE'VE GOT SO MUCH TO SHOW YOU,

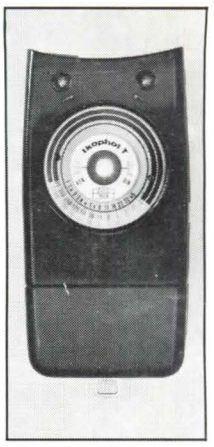
1. Great pictures with the super-simple to use Bessy S featuring instant film loading and built in flash cube adapter. ($29.95)

2. Smallest electronic flash that gives a velvet blast of light indoors or out. Metz Mecablitz 160. ($57.95)

3. The world's first electronic exposure meter, Ikophot T. No moving parts, dial illuminates when exposure readings are correct. Exceptional accuracy and speed. Impact resistant. ($64.95)

4. Icarex 35, a genuine break in the price barrier for precision 35mm Single Lens Reflex camera "systems". With interchangeable lenses and viewfinders, 2-way flash synchronization, depth of field preview and many other pro features. ($139.00)





THAT WE'LL HAVE TO MAIL THE REST!

This is a most happy dilemma brought about by our having just too many exceptional products to tell you about in one page.

Instead, we've prepared a special booklet that will simplify your picture taking by showing you all of the very latest happenings in precision, automatic and electronic photography. It's called, "Photography, from Beginner to Pro" and is designed to make it very easy for you to judge exactly what type and price camera or accessory is ideal for you.

The booklet is FREE. Just fill in your name and address, cut the self-mailer along dotted lines, fold and mail.

It won't make it any easier to pronounce our name, but it will show you every reason why it's worth the attempt.

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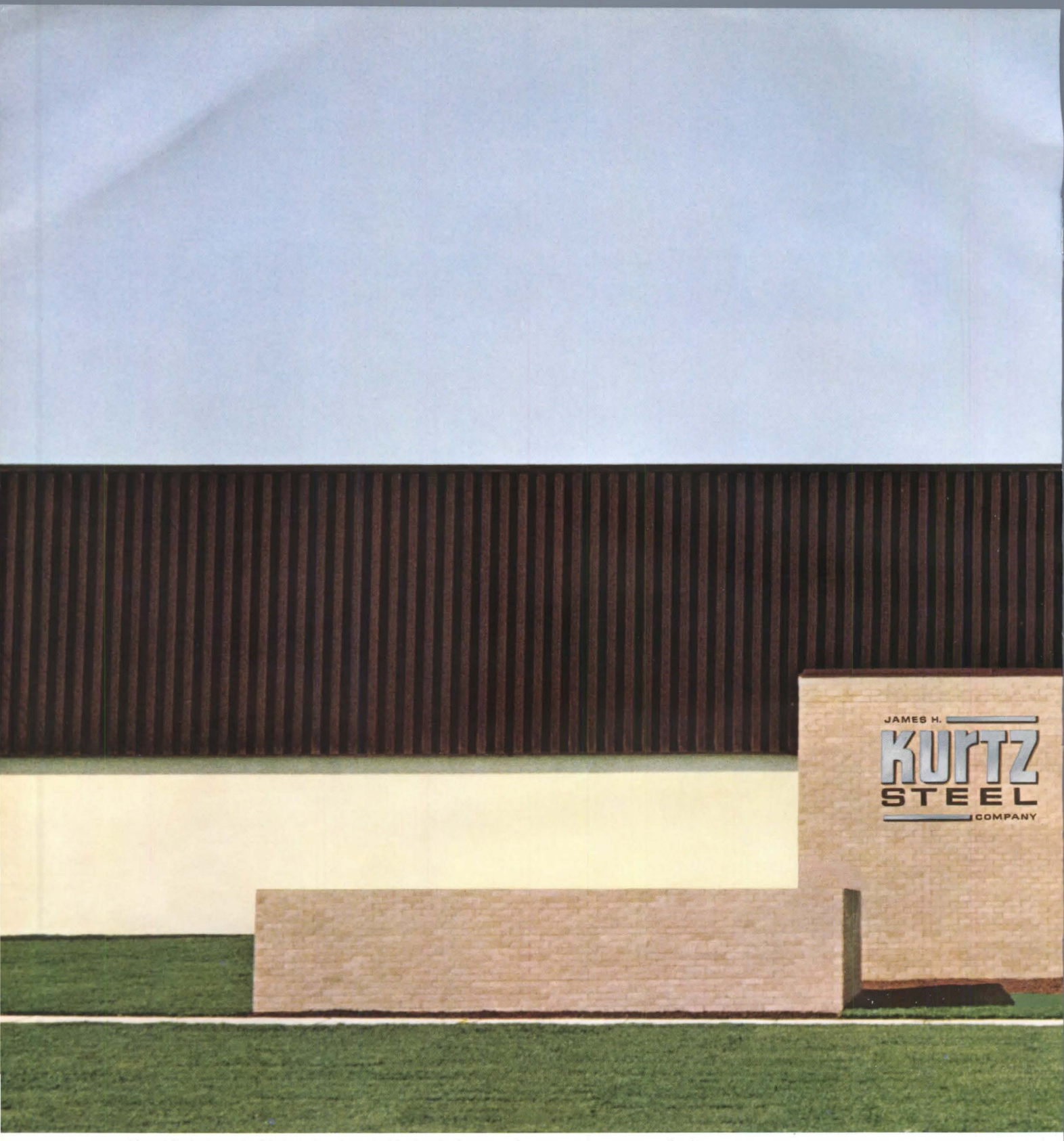
cut along dotted line, fold through center and mail for your booklet without cost or obligation.

Mayari R window frames were fabricated by The Ceco Corporation from special bar sections rolled by Bethlehem. CHICAGO CIVIC CENTER.
Owner: Public Building Commission of Chicago. Architects: C. F. Murphy Associates; Skidmore, Owings & Merrill; Loebl, Schlossman, Bennett & Dart.

Weathering Steel

BETHLEHEM STEEL

Nature wraps this steel in an attractive, protective coating



Mayari R steel sheets, fabricated and erected by The R. C. Mahon Co., are used as siding on the James H. Kurtz Steel Company, Steel Service Center, Detroit. Design—Engineering—Construction: A. W. Miller, Inc.

MAYARI R

Provides rich, earthy beauty in its color and texture

Nature wraps Weathering Steel in a protective coating . . . and provides beauty in color and texture that lends itself to distinctive architecture.

The longer it weathers the richer this steel's deep-brown oxide coating becomes. And what a remarkable coating it is. Closely grained and tightly adherent, it builds up to about the same thickness as a coat of paint. It acts as a barrier to oxygen and moisture and inhibits further corrosion. If damaged, it heals itself. *It need not be painted.*

Another advantage—strength

Bethlehem Mayari R Weathering Steel is a high-strength, low-alloy steel. The yield point is substantially higher than that of regular structural carbon steels. Thus a Weathering Steel structure can often be designed with lighter, slimmer structural sections.

BETHLEHEM STEEL

So you see, rust can be beautiful (and practical)

Office Building, Pepsi-Cola Metropolitan Bottling Co., Inc., Flint, Mich.
Exterior steel framework is exposed Mayari R, fabricated and erected by Chapper Iron Works, Inc. Architects: Baxter, Hodell, Donnelly & Preston.

Entire structures can be designed with Weathering Steel. Or it can be used in pleasing harmony with other materials, as shown above.

As with any material having unique properties, Weathering Steel must be thoroughly understood, and its characteristics fully appreciated, if you are to realize its full potential. We will be happy to review these characteristics with you. Just call or write our nearest sales office.

BETHLEHEM STEEL CORPORATION, BETHLEHEM, PA.

BETHLEHEM STEEL

BETHLEHEM STEEL

. . . and the first tenant hasn't even moved in.

Modern design, engineering and construction—with outdated communications planning—add up to obsolescence.

Chances are your tenants will need more than just telephones. They'll probably use Data-Phone* service, teletypewriter, Tele-Lecture, even closed-circuit TV. Make your building truly modern by allowing for these services in the blueprints. Avoid expensive alterations and unsightly wiring later.

*Service mark of the Bell System

Just call 212-393-4537, collect, and we'll send you a complete list of our Architect and Builder Service representatives.

BELL SYSTEM AT&T and Associated Companies

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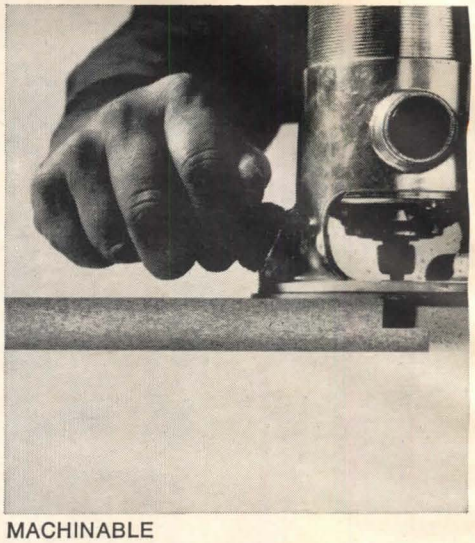


MACHINABLE

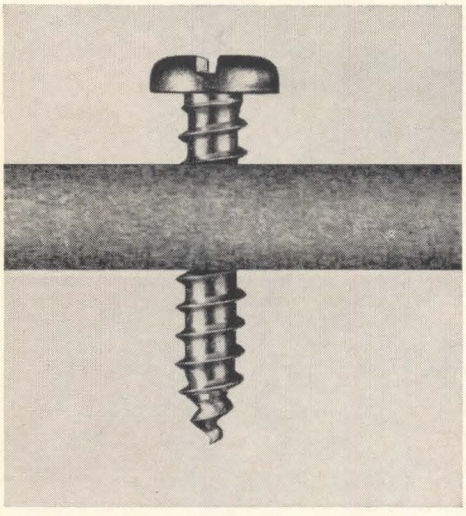
Duraflake

One good product

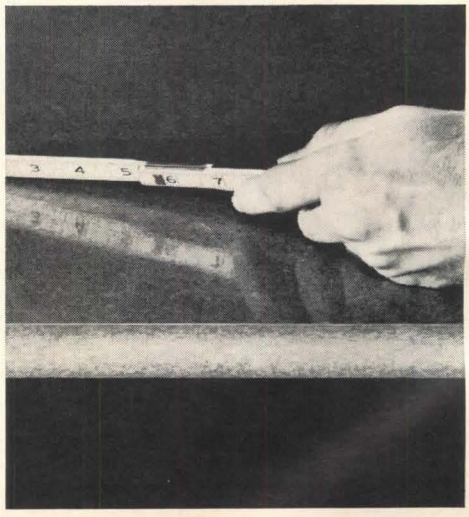
Duraflake is a precision-engineered, wood-formed board that meets rigid tests for *smoothness, strength, machinability.* It is a stable board of balanced construction.

Douglas fir and Western Hemlock flakes form Duraflake's tight inner core while finer particles provide a smooth, even-textured, durable surface.

Duraflake has no patches, no core voids, no grain to raise. Screws used on the surface, or edge, bite into real wood and hold fast. Duraflake has an extremely low moisture absorption rate. Used as a horizontal or vertical surface, Duraflake lies flat, stays straight, won't warp, won't telegraph. Duraflake is the ideal core stock under veneers or laminates, for cabinets and counter tops, furniture construction, shelving, doors, siding, floor underlayment, and other applications.

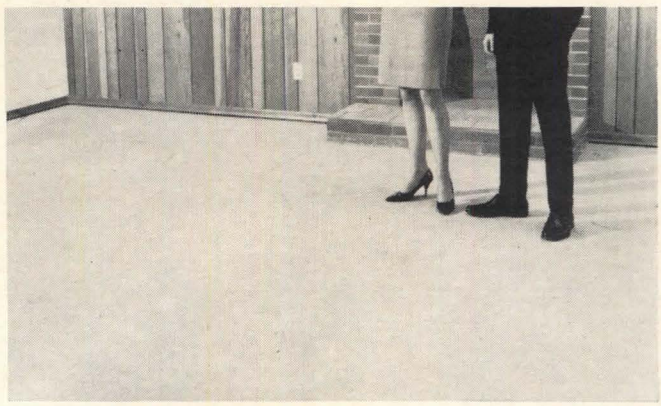


STRONG



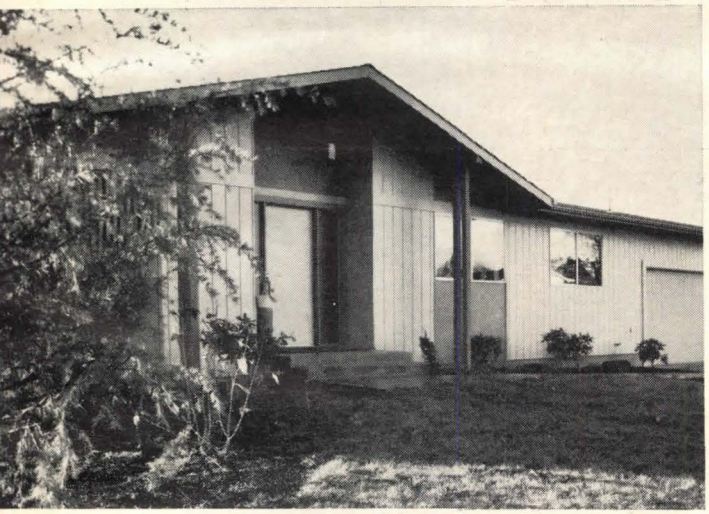
SMOOTH

Duraflake provides solid core for finest finished doors.



Guaranteed Duraflake Underlayment forms a smooth, solid base for floor coverings. No telegraphing.

has led to others



Attractive Duraflake Exterior Primed Siding satisfies modern architectural demands.

Filled and Base-coated Duraflake meets requirements for superior paint surface or for grain printing.

DURAFLAKE is available in many forms for many uses:

Filled. Developed for application where a superior paint surface or where grain printing is required.

Base-coated. Available in any specified color.

Exterior Primed Siding. Bonded with exterior resin and factory primed, face and back. Resists warping; won't check or delaminate. Saves up to 30% on finished painting costs.

Door Core. Lightweight, low-density; ideal for solid core doors. Precision-cut for all standard door sizes and thicknesses.

Edge-Banded. Provides a more finished appearance where exposed edges are a factor.

Penta-Treated. Ideal for application where insect repellent is specified.

Fire-Retardant. Treated to meet requirements of Underwriters' Laboratories Class I or II rating.

Floor Underlayment. Smooth base for resilient floor coverings and wall-to-wall carpeting. No telegraphing. Guaranteed.

Request samples and additional information.

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All Duraflake products are TECO certified.

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in wood office furniture.
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traditional and
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When beauty is just as important as the lighting

. . . *specify Hadco*

The harmonious blending of functional lighting and beautiful design is the keynote of this dignified fixture from Hadco's Independence series. The graceful beauty of this post and lantern combination adds distinction to any home, and like all Hadco fixtures, it is cast of aluminum to assure that its charm will endure.

This post lantern model is just one of many in the Independence series, which also includes wall, pier and ceiling mounted versions, as well as single and multiple hanging lantern models. All are offered in a choice of 12 lovely finishes and with either clear or decorative glass.

In addition to the Independence, Hadco offers a wide variety of indoor and outdoor lighting fixtures for commercial or residential applications, including a full line of revolutionary low voltage fixtures. For complete information on the Independence and other Hadco fixtures, write Hadco Products, Inc., (a subsidiary of Esquire, Inc.), Dept. 22A-43, P. O. Box 128, Littlestown, Pa.

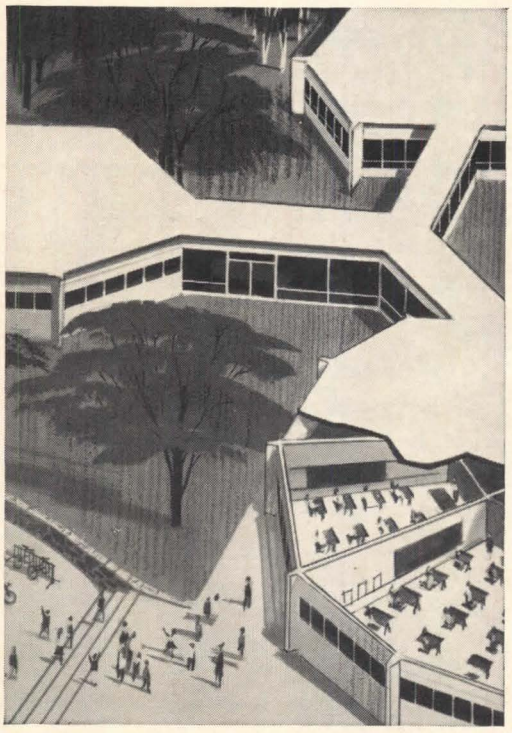
Lighting by **HADCO**

A subsidiary of Esquire, Inc.

On Readers' Service Card, Circle No. 358

Only all-electric you all these

FLEXIBILITY OF DESIGN



The design simplicity of electric heating and cooling components permits you to design with far greater freedom and flexibility. And since no bulky furnaces or complex distribution systems are required, you can solve problems of office and room design with far greater latitude.

Witness the oval layout of the Pine Hill Elementary School, Pine Hill, N.J. Surrounding a central library and multi-purpose room are classrooms varying in shape and size. And rooms will be added as needed—in satellite clusters.

LOWER CONSTRUCTION COSTS

The most modern, efficient heating/cooling system you can specify can actually be the least expensive for your client to install. With an electric system, you can eliminate costly boilers, stacks, trenching and steam piping. Not to mention fuel storage and boiler *rooms*. (The boiler is replaced by a compact control cabinet, like the one seen above.) You would also eliminate attendant high installation costs.

How substantially can construction costs be reduced? By going All-Electric, the designers of the 60,700 sq. ft. Hampshire High School, Romney, W. Va., for example, lowered construction costs by $62,900. A saving much appreciated by the local school board.

HEAT RECOVERY

The principle of recovering heat from high-intensity lighting permits such impressive economies, that it seems sure to dominate the future of space conditioning. By deploying the recovered heat to the cooler parts of a building, or storing it for later use, the architect can effect extraordinary operating efficiency.

Example? The new All-Electric 94,500 sq. ft. engineering and administration building of Electronic Associates, Inc., Long Branch, N.J. So efficient is this building's heat-by-light system that during milder parts of the heating season it provides enough extra heat to carry other EAI buildings.

design can offer major benefits

EASIER EXPANSION

Why is it much easier to expand an All-Electric building? Because you can forget about boilers and boiler capacity problems. And there's no need for concern about boiler rooms, fuel storage or stacks. Instead, expansion is accomplished with wiring and a compact control cabinet.

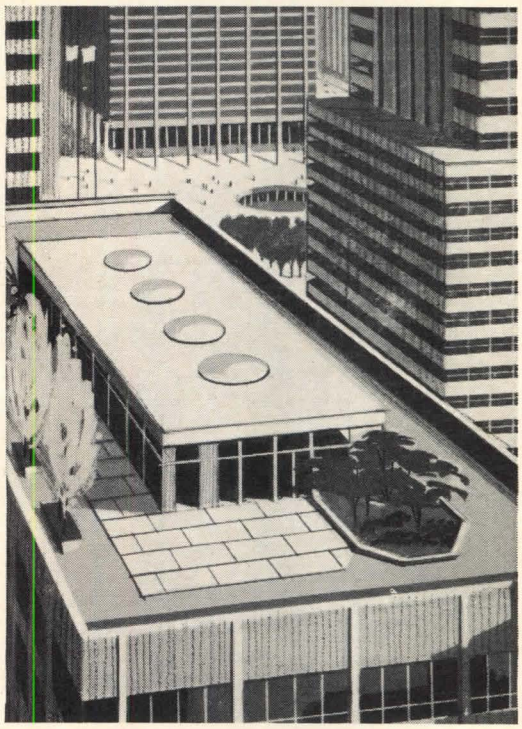
Example? Central High School, Olympia Fields, Ill., expanded from 103,500 sq. ft. to 159,685 sq. ft. at an estimated saving of $38,610.

ROOM-BY-ROOM TEMPERATURE CONTROL

In many buildings, individual room temperature control is a must. Nursing homes require it for critical health reasons. Motels want it for economy. And it is also fast becoming standard in other buildings in which occupancy and activities vary daily from room to room; e.g. schools, churches and hospitals.

Only All-Electric design permits room temperatures to be controlled directly, either by occupants inside their rooms or by management from a remote central location... or both.

EXTRA RENTABLE SPACE



A penthouse serves best as a source of revenue—not as a storeroom for boilers, cooling equipment and fuel. That's one reason why the builders of the $3 million People's Savings Bank Building in Bridgeport, Conn., chose All-Electric design.

By specifying through-the-wall electric heating/cooling units, they freed 4,800 sq. ft. of penthouse space for extra owner income. The added return on capital? $15,000 per year.

Shouldn't you incorporate these All-Electric benefits into your next project? For more facts, call your electric utility company.

LIVE BETTER ELECTRICALLY

Edison Electric Institute, 750 Third Avenue, New York, N.Y. 10017

ALL-ELECTRIC BUILDING AWARD

On Readers' Service Card, Circle No. 349

Robbins has come out with a new kind of continuous surface flooring that makes all other kinds of poured floors impractical.

It's called ULTRAFLOR

Every once in a while you get a chance to get in on something really new . . . design-versatile . . . and practical. Like Robbins completely new continuous surface vinyl flooring: **ULTRAFLOR.**

Unlike conventional poured floors . . . Robbins **ULTRAFLOR** can be installed anywhere permanent sheet vinyl can be installed . . . on or below grade. It exhibits its versatility in flash-coved, wainscoting . . . and floor-to-ceiling installations. And there are no installation problems with **ULTRAFLOR.** It can be installed easily, quickly, and professionally by the average floor mechanic. You see . . . Robbins continuous surface **ULTRAFLOR** doesn't have to be "manufactured" on the job. It's ready-made . . . ready-to-be-laid in continuous 6-ft. wide rolls. Another advantage of Robbins **ULTRAFLOR** is its backing . . . called **MOISTGUARD** . . . which *eliminates* discoloration by preventing any show-through of the subfloor.

And the finish coat . . . which Robbins calls **N.S.U. 238** . . . does even more than expected. It dries thoroughly within 24 hours . . . with a tough, non-slip, high-gloss finish that never requires waxing and is unsurpassed for its wearability. It can even be recoated after years of hard use for a new-again floor.

The result of all this is a beautiful continuous surface floor that can be installed in a minimum of time . . . with a cost factor proven acceptable to both commercial and residential customers. **ULTRAFLOR** adapts itself to any installation not only because of its durability and construction . . . but also because of its range of designer colors and patterns.

We think **ULTRAFLOR** is the kind of continuous surface floor you've always wanted to specify . . . but have never been able to buy before. Why don't you get in on it right now?

ULTRAFLOR

THE CONTINUOUS SURFACE FLOORING BY

Robbins
PRODUCTS, INC.
Tuscumbia, Alabama

Patents Pending

On Readers' Service Card, Circle No. 464

Cantilevered prestressed concrete planks provide balcony and fire escape elements in student apartments

Floors and roof of the new Married Students Housing project at Rensselaer Polytechnic Institute, Troy, New York, are of 8″ thick prestressed concrete sections. In all, there are 106,000 square feet of hollow core planks, with spans of 30 feet. One interesting feature is the use of 36-foot planks to provide cantilevered balconies and fire escape landings.

Time was saved during the interior finishing of the prestressed concrete sections. Exposed ceilings were finished with a coat of paint. Floors required no structural topping.

Prestressed concrete is proving to be an efficient answer to a variety of structural, functional and appearance requirements. And the nations' leading prestressed concrete fabricators are relying on service proved TUFWIRE® and TUFWIRE Strand to help them build in the dependability they want. Write for our free booklet highlighting interesting prestressed concrete projects, in which TUFWIRE products are used. TUFWIRE, TUFWIRE Strand and other Union Wire Rope Products are made by Armco Steel Corporation, Department W-1187, 7000 Roberts Street, Kansas City, Missouri 64125.

Owner: **Rensselaer Polytechnic Institute,** Troy, New York
Architect: **The Architects Collaborative, Inc.,** Cambridge, Mass.
Engineer: **LeMessurier Associates, Inc.,** Boston, Mass.
Contractors: **McManus, Longe, Brockwehl, Inc.,** Latham, New York
Prestressed Concrete Fabricator: Spancrete Northeast, Inc., South Bethlehem, N.Y.

ARMCO STEEL ARMCO

Pyro-Kure® Vapor Barriers Protect Insulation And Are Permanently Non-Combustible

Pyro-Kure facing and jacketing are the safest possible vapor barrier materials to use with insulation for walls, ceilings and floors, on low temperature pipe and service lines, and on air conditioning ducts.

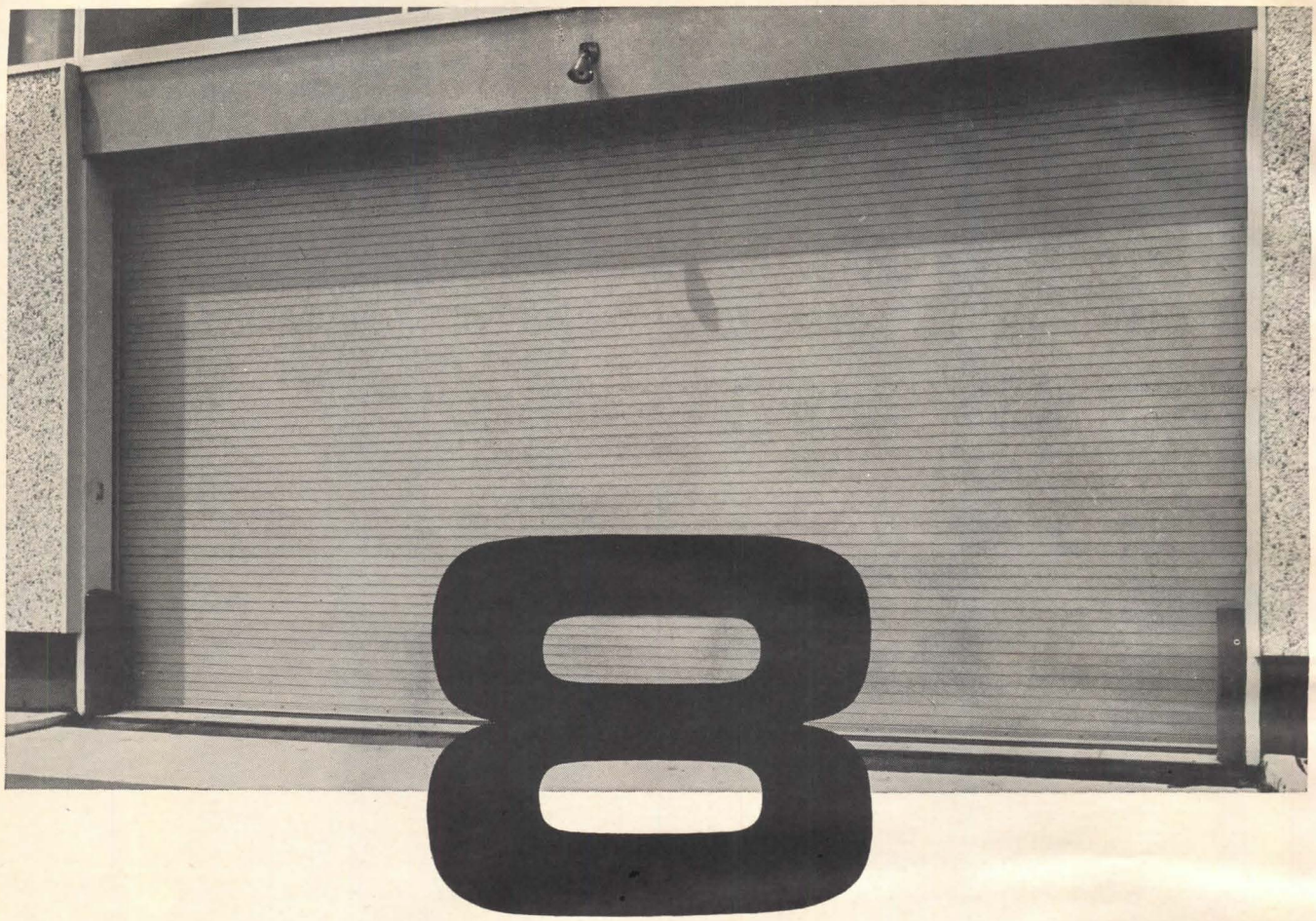
They differ in three important ways from any other vapor barrier:

1. A patented flame-extinguishing adhesive between the plies of paper, foil or vinyl makes Pyro-Kure *permanently* non-combustible. This means its U/L Flame Spread Rating of "25 or less" will never be reduced by age, moisture or humidity, as can happen with chemically treated barriers. **2.** Pyro-Kure meets the standards for non-combustibility of the National Building Code and has been approved by the Board of Standards and Appeals of New York City. **3.** Pyro-Kure has a minimum MVT rate for maximum protection against condensation damage to insulation.

All leading insulation manufacturers offer Pyro-Kure-faced insulation under their own brand names. Also available in roll form for local facing. Write for samples and data on various grades. Contact Sisalkraft, 56 Starkey Avenue, Attleboro, Massachusetts.

ST REGIS
SISALKRAFT DIVISION

On Readers' Service Card, Circle No. 404



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provide unmatched **protection-combination** for service doorways.

- **OVERALL ECONOMY** — Prevents waste of time, labor and money from the day they're installed — and for the many following years of efficient operation.
- **WITHSTANDS HARDEST DAILY SERVICE** — Upward coiling operation combined with the steel interlocking slat curtain and exceptionally rugged overall design insures more years of carefree usage — evidenced by 70-year service records.
- **DEPENDABLE BARRIER AGAINST WEATHER** — They are designed to withstand minimum wind velocity of 88 m.p.h. . . . and also available for higher wind velocities and with various Extra-TITE features.
- **EXTRA RESISTANT TO ELEMENTS** — The triple-protection of the steel curtain . . . 1¼ oz. per sq. ft. of zinc, plus Kinnear Paint Bond and primer . . . is extra armor against the ravages of time and elements.
- **SPACE-SAVING** — Coiling compactly above the opening, no usable floor, wall or ceiling space inside or outside of the building is lost.
- **FIREPROOF AND FIRE REPELLENT** — Built of steel, they will not burn and when closed will help prevent spread of fire. (If fire is a primary consideration, ask for details on Kinnear U/L Labeled Automatic Fire Doors.)
- **SAFE-GUARD AGAINST "BREAKING AND ENTERING"** — Time-proven — and today more important than ever — to be one of the toughest barricades offered for industrial and commercial use.
- **NEVER ORPHANED AT SERVICE TIME** — With a nation-wide service organization backed up by Kinnear "Registered" Life-Extension Plan, a damaged Kinnear door — regardless of age — can always be readily put back into reliable service.

Also manufacturers of Rolling Fire Doors, Rolling Grilles, Counter Shutters, Power Operators and Kinnear Overhead Doors.

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KINNEAR® ROLLING DOORS

Saving Ways in Doorways Since 1895

Offices & Representatives in All Principal Cities — listed in Yellow Pages under "Doors." Also see Sweet's!

If you have a vertical surface illumination problem on the *boards*, our Lytespan Wall Washing System is worth your consideration.

The units in the system were engineered to provide flexible high-intensity vertical surface illumination from concealed sources, without the expense of custom detail and manufacturing.

And the Lytespan Wall Washing System provides a flood of evenly distributed illumination: up to 100 footcandles on a wall as high as 24 feet within a 4:1 ratio from ceiling to floor.

The units are compact, and clip on anywhere along the Lytespan track so you can space them for desired intensities.

The track itself can be installed in troughs, behind baffles, facias, and cut to length or curved as required. Baffles are optional which can be clipped on the track between units.

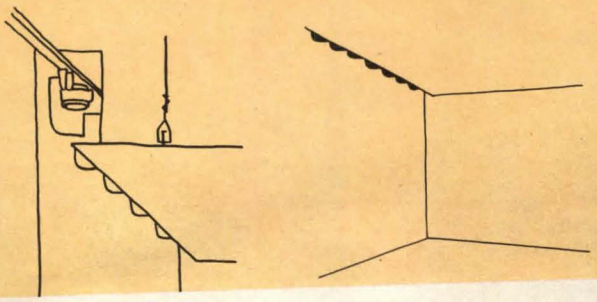
Designed to accommodate "sealed beam" projector lamps of maximum compactness, the wall washers produce long-throw, narrow beams that are fanned out across the wall by a built-in spread lens.

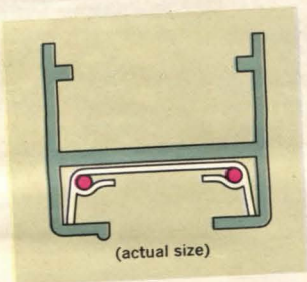
Angle Indicators provide a fast and simple means for setting aiming angles. And a quick-release latch permits each unit to be swiveled quickly for relamping from the back, and to be returned to position without upsetting the aiming angle.

For complete information visit our showrooms, or write for brochure No. 40A.

We think it's a major step forward in vertical surface illumination.

The Lytespan Wall Washing System is one of the many efforts by Lightolier to further coordinate lighting with architecture.





INNOVATORS IN THE DESIGN AND ENGINEERING OF LIGHTING

LIGHTOLIER®

Showrooms: 11 East 36th Street, New York; 1267 Merchandise Mart, Chicago; 1718 Hi-Line Dr., Dallas; 2515 South Broadway, Los Angeles; 657 Mission Street, San Francisco; 4935 Bourg Street, St. Laurent, Montreal, Canada.

Lytespan track comes in 4′ and 8′ modules, straight or curved, can be easily cut to length on the job. Lytespots can be clipped on at any point, spaced as desired.

On Readers' Service Card, Circle No. 375

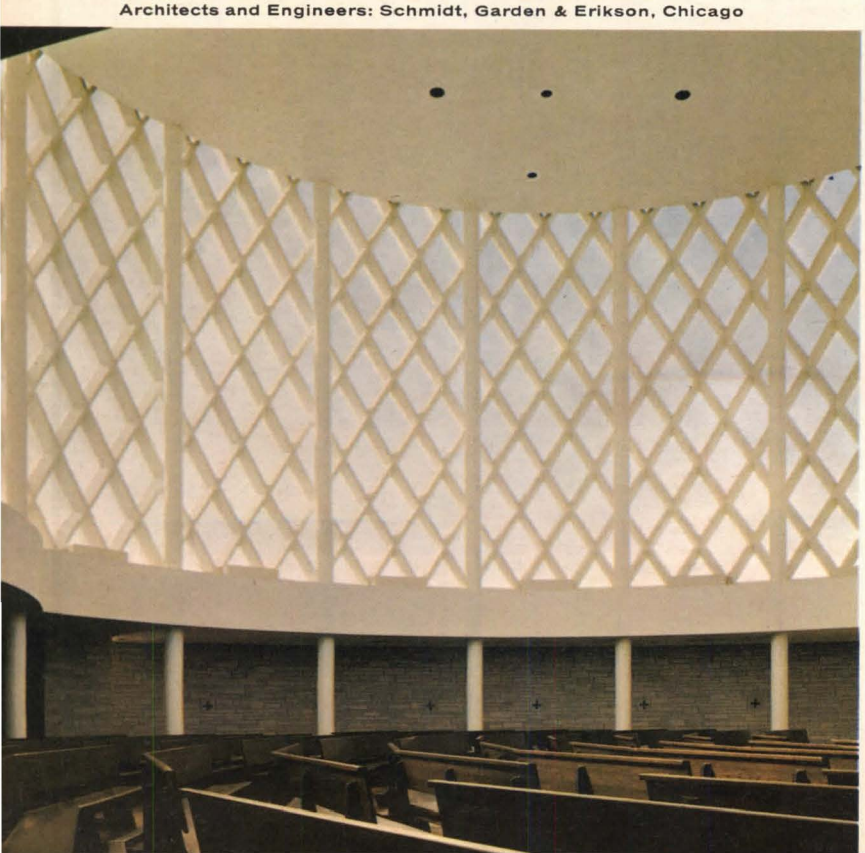
Washington and Lee High School, Montross, Va.
Associated Architects: Stevenson Flemer, Eason Cross and Harry Adreon

Pleasant exterior visibility is provided for this gymnasium through transparent walls of solar glare and heat reducing gray Plexiglas. Grandstands on each side of the playing floor are flanked by the transparent walls, giving spectators a unique out-of-doors feeling.

Tinted PLEXIGLAS® puts the sun in its place

Subdued light enters this chapel through patterned-surface gray transparent Plexiglas. The tint used transmits only 44% of total solar energy. Light transmittance is 27%, and this assures the reduction of solar glare with the effectiveness of sunglasses.

Dorcas Chapel, Marian College, Fond-du-Lac, Wisconsin
Architects and Engineers: Schmidt, Garden & Erikson, Chicago



Tinted Plexiglas offers a variety of transparent colors and densities for effective control of solar energy and glare.

Additional advantages of glazing with Plexiglas acrylic sheet include:

- Impact resistance nearly twice that of tempered glass.
- Distortion-free transparency.
- Light weight for easy installation.
- A wide range of sheet sizes and thicknesses for design flexibility.
- Easy formability for domed enclosure glazing.

Does tinted Plexiglas suggest itself for a solar control problem you have in mind, window glazing, sun screens, skylights, transparent enclosures? Write to us for technical data and our folder PL-712 "Specification and Installation Instructions for Window Glazing with Plexiglas".

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Plexiglas is the only glazing material that combines the properties necessary to meet the unique requirements of the U.S. Pavilion. These requirements are: transparency, light weight, breakage resistance, weatherability, formability and solar heat and light control.

Architects: R. Buckminster Fuller, Fuller and Sadao, Inc.; and Geometrics, Inc., Cambridge, Mass.

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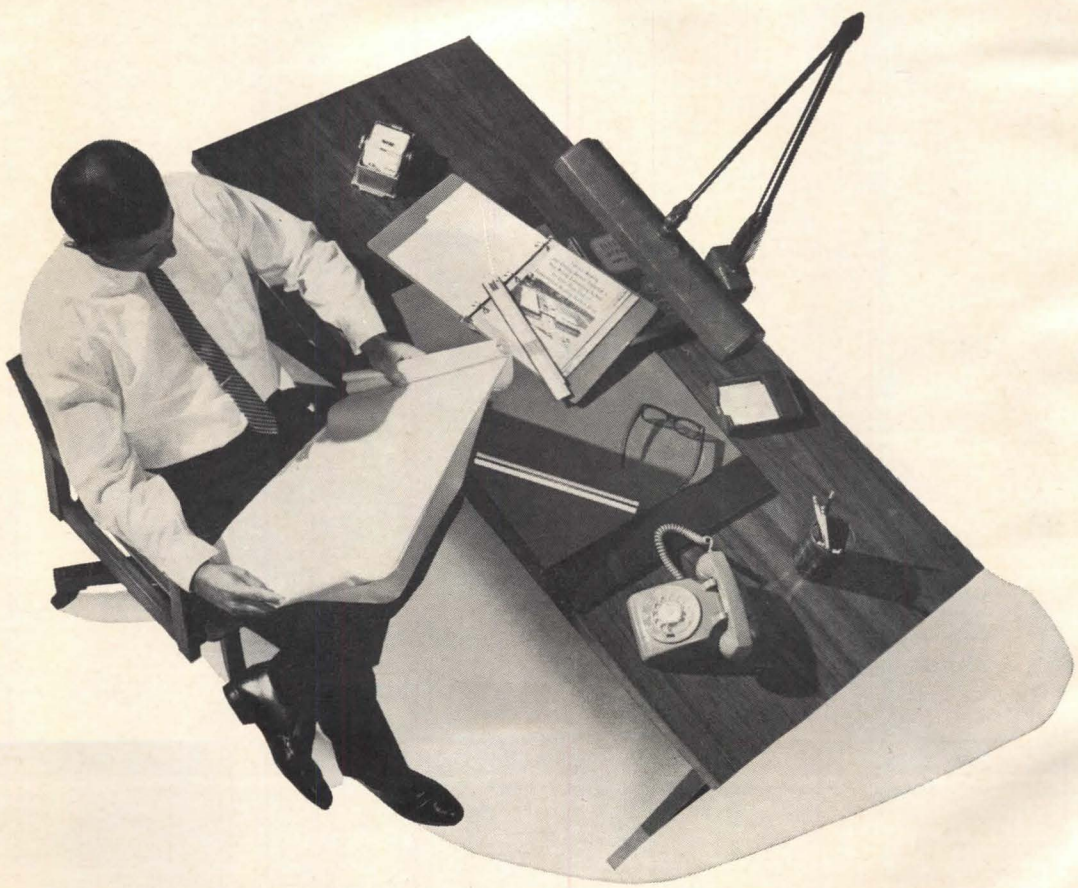

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Lower total annual cost in All-Electric buildings?

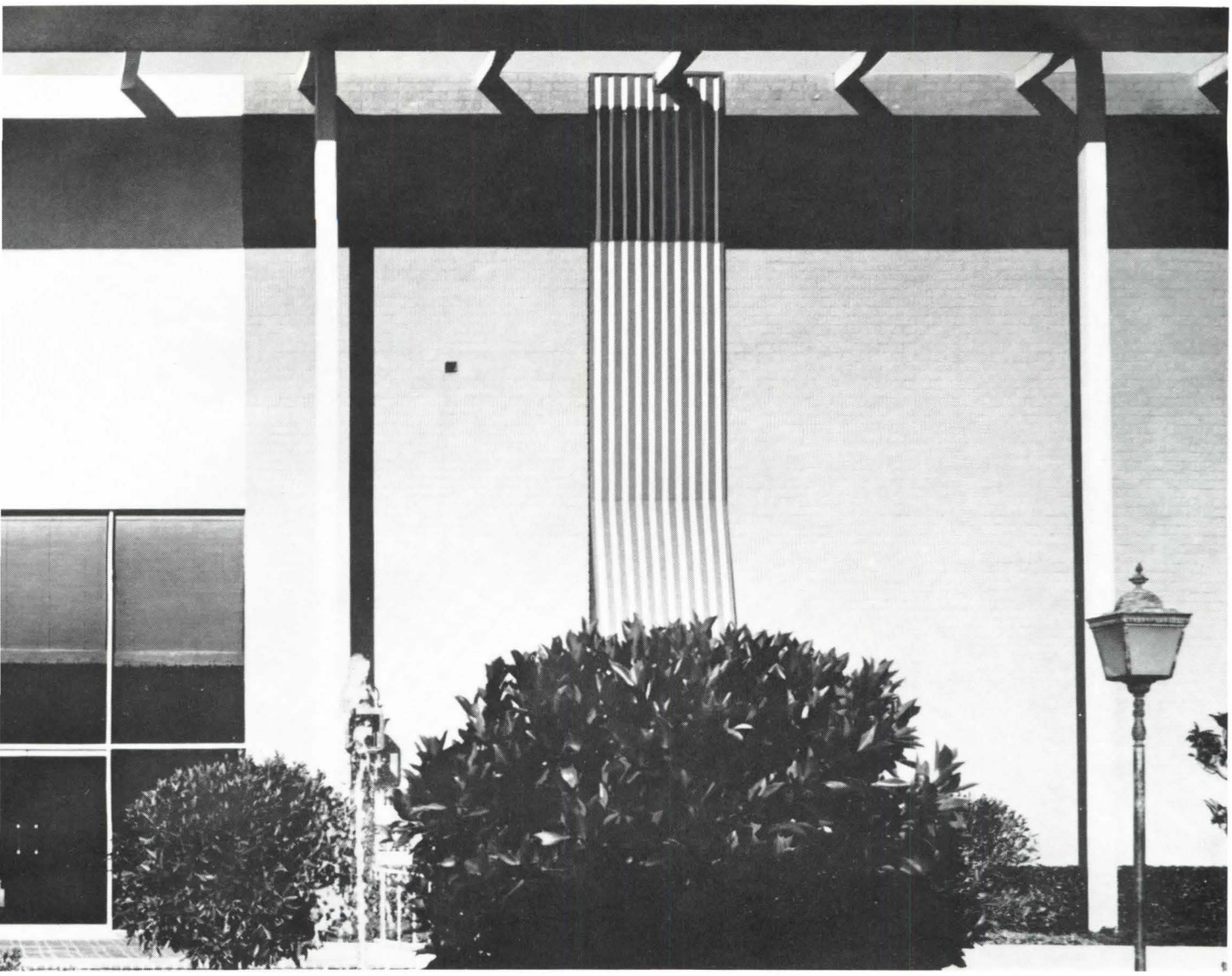
Ask Buffums'...

Buffums' Palos Verdes is the fourth All-Electric department store in the Buffums' chain. It's another example of the remarkable economy of the All-Electric building concept.

By going All-Electric, Buffums' was able to make more efficient use of their money in several ways.

The lower first cost of electric heating and air conditioning equipment accounted for big initial savings. Because electric air conditioning is 30% to 50% less, Buffums' greatly reduced costs on that one item alone. Electric heating eliminated the need for boilers, stacks, vents, flues and the space required to house them. Just the savings in piping materials and installation was considerable. Space saving was another factor. In this case, it was the equivalent of a complete shoe department.

Buffums' lighting was designed in accordance with the nationally recognized standards of the Illuminating Engineers Society. It not only lights without glare and highlights Buffums' quality merchandise but, most importantly, is the princi-



pal source of heat for the entire store.

Flameless, quick-recovery, water heating serves Buffums' beauty shop and washroom areas.

Another important benefit of the All-Electric concept is the architectural freedom of design. All-Electric systems are flexible, and can be incorporated in a great variety of building designs, rather than forcing the architect to design the building around traditional systems.

The All-Electric Building Award for Buffums' Palos Verdes testifies that this building has met recognized engineering standards for lighting, heating, and air conditioning.

Buffums', like so many other companies, has found that lower first cost, lower maintenance expense and competitive operating costs add up to lower total annual cost in All-Electric buildings. We can give you all the money-ahead facts and figures on All-Electric building, including hundreds of case histories. Write Marketing Engineering, P.O. Box 62, Terminal Annex, Los Angeles 90051.

BUFFUMS' PALOS VERDES

Architect: Killingsworth, Brady and Associate, A. I. A.

BUILDING PROFILE

GENERAL DESCRIPTION
- Two-story building
- 43,000 square feet department store
- Reinforced brick masonry construction

ELECTRIC LOAD
- Connected Lighting and Miscellaneous Load—600 KW
- Electric Air Conditioning (125 Tons—3 Units)—160 KW
- Electric Supplementary Heating—92 KW
- Electric Water Heating—40 KW

INSTALLED COSTS
- Air Conditioning System—$1.25 sq. ft.
- Electrical System—$1.90 sq. ft.

OPERATING COSTS
- Total Electrical Operating Cost for a Six Day Schedule—$.38 per sq. ft. per year

SPACE CONDITIONING
- Direct expansion, refrigerated, air cooled cooling system. Heat supplied by lights supplemented by electric heating coils as needed.

Southern California Edison SCE

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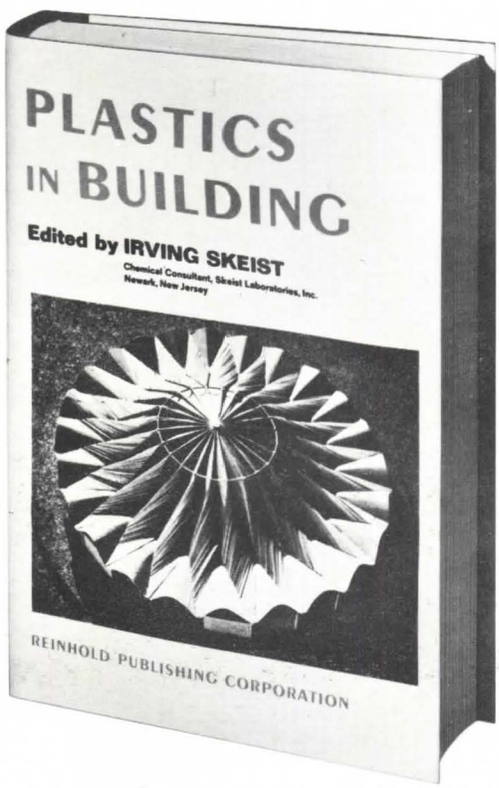

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General Contractor: Carl M. Geupel Construction Co. Inc.
Design: Geupel Architects, Inc., Indianapolis

How to cover eight acres economically and quickly

For the 345,000 square feet of fire-safe roof required for its new plant in Indianapolis, Bryant Manufacturing Company used Laclede Open Web Steel Joists.

Lightweight, high-strength Laclede joists are easy to handle and place. They go up quickly, without wasted time. Roofing crews can move in fast to finish the job. It's easier to meet or beat start-up schedules.

Specify Laclede joists in any length you need. They fit into all design plans, commercial or industrial, high-rise, low-rise or anywhere in between. And, of course, they're made to the standards and specifications of the Steel Joist Institute. 6649

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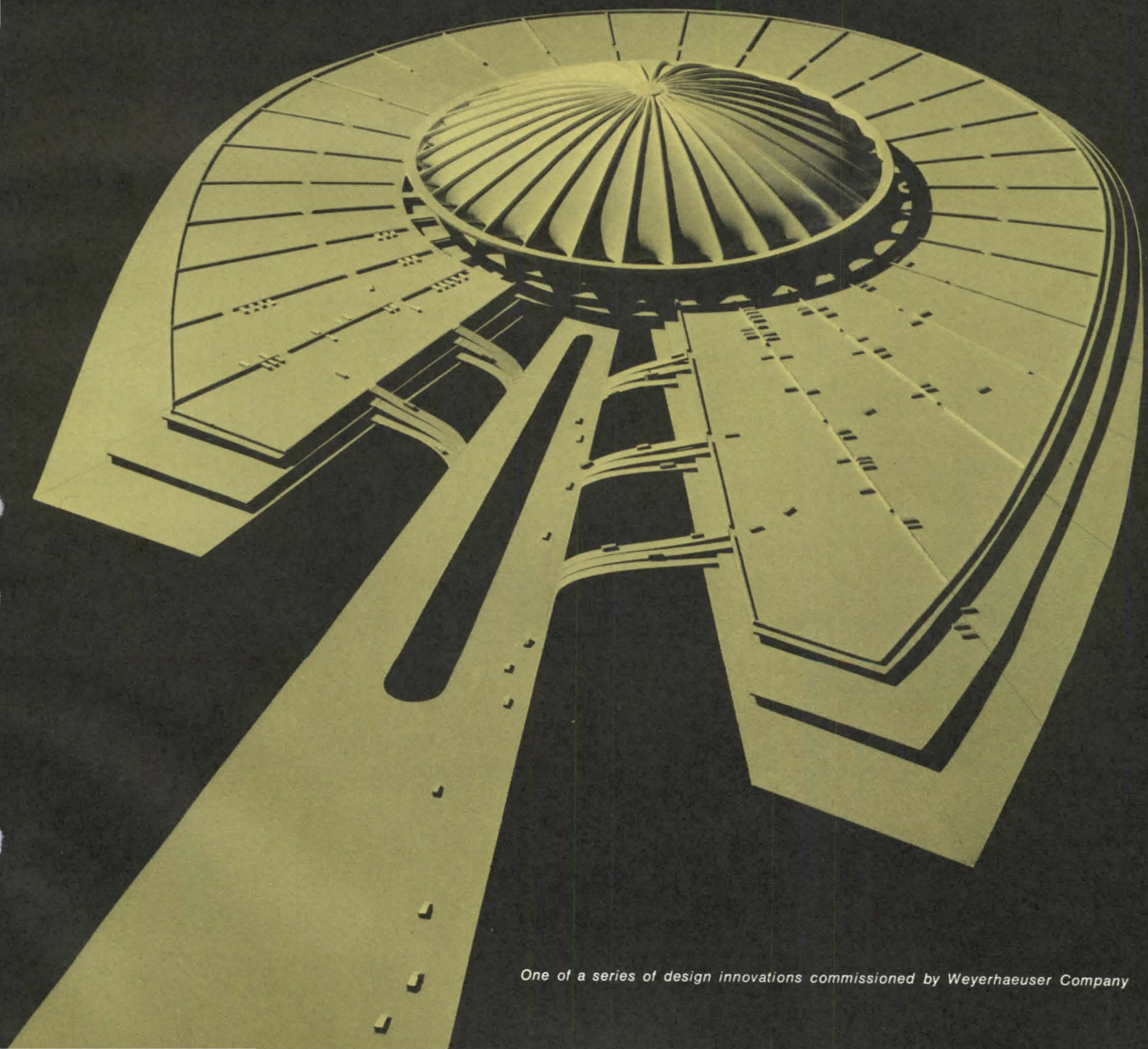
A vast wood domed stadium spanning 840 feet.

ARCHITECTS: HARRIS & REED, A.I.A. / ENGINEERS: WORTHINGTON, SKILLING, HELLE & JACKSON



One of a series of design innovations commissioned by Weyerhaeuser Company

Weyerhaeuser has commissioned a number of leading architectural firms to explore new uses of wood products in commercial buildings. This original design is the tenth in the series. It was executed by Harris & Reed, Tacoma architects, with engineering by Worthington, Skilling, Helle & Jackson, Seattle, Washington.

"A circular plan was chosen because of its ideal structural characteristics..."

In the design of a wood domed stadium, careful consideration was given to the geometric shapes offering the most integral strength.

A circular plan was chosen because of its ideal structural characteristics as well as the greater flexibility for a multiple use stadium.

The dome itself involves a structural system offering the greatest possible strength and stiffness. This is achieved by employing a highly efficient structural shape, the parabolic dome.

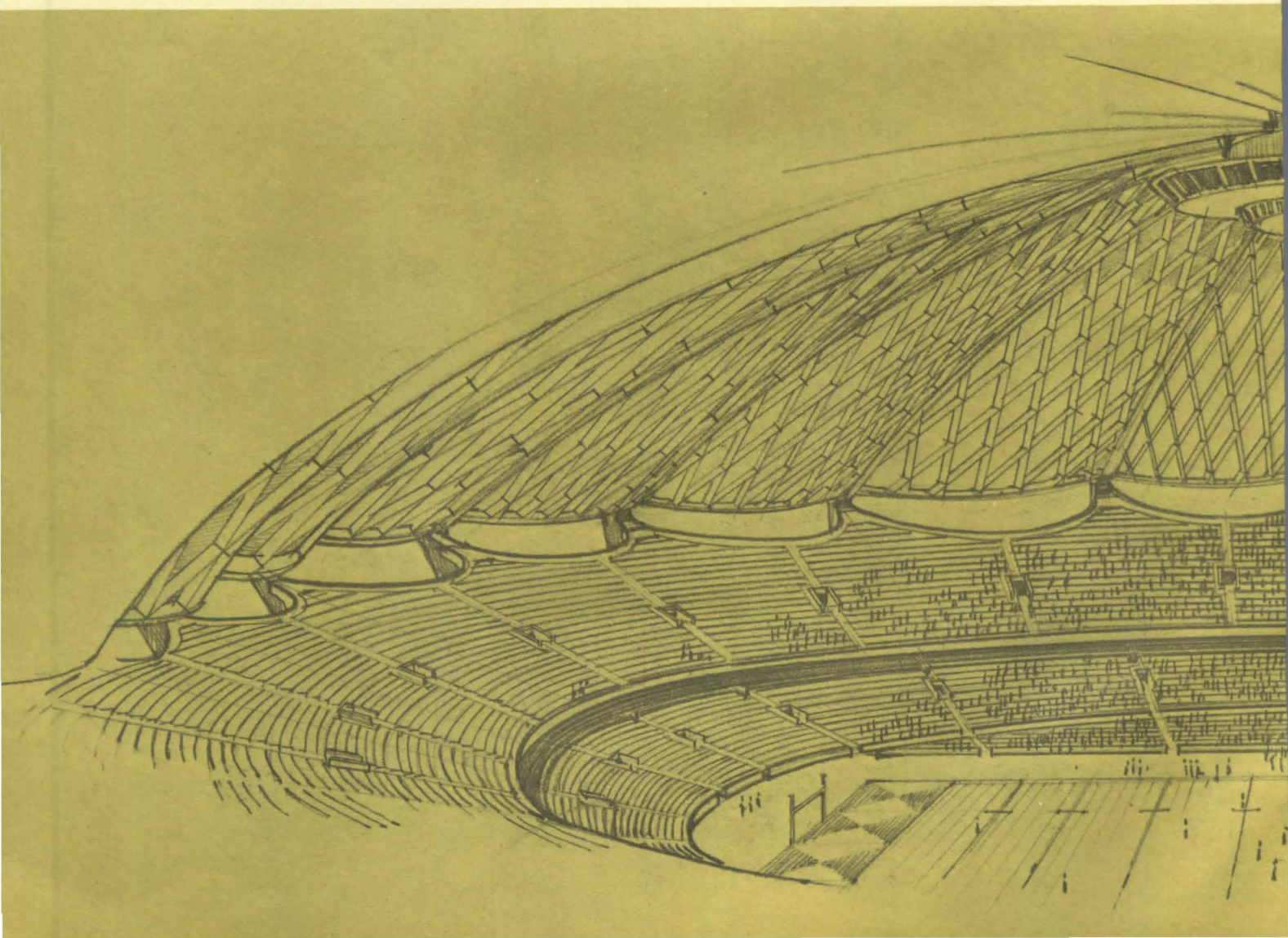
The assignment given us by Weyerhaeuser was to show how a domed sports arena might be done "economically with wood."

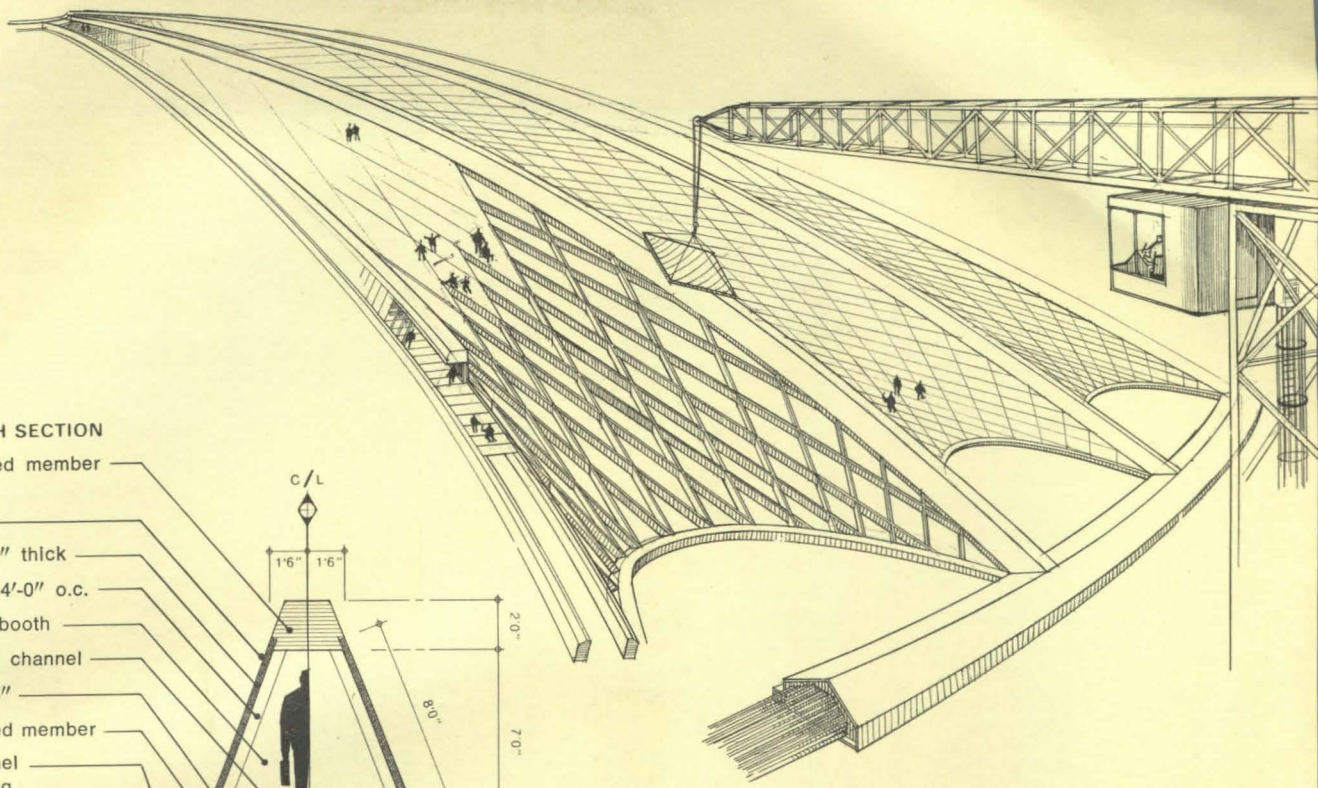
We think we've pretty well accomplished this objective. The engineering studies indicate this building, 840 feet in diameter and 250 feet in height, could probably be built for considerably less than a comparable structure in any other material.

By using an intricate system of straight laminated wood beams and plywood panels in available sizes, we feel we can cut the costs of the stadium considerably.

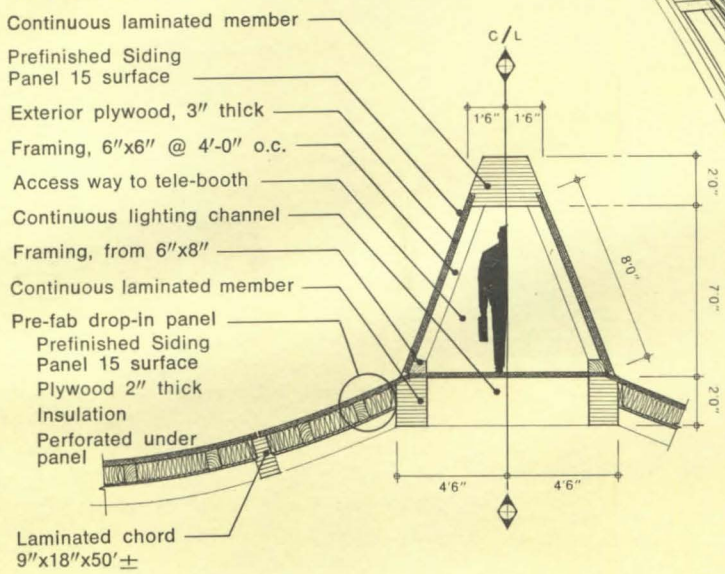
The seating capacity contemplated allows from 49,000 to 52,000 for baseball and 53,000 to 56,500 for football. There is an optional four-level parking facility with three levels under cover provided for in the plan.

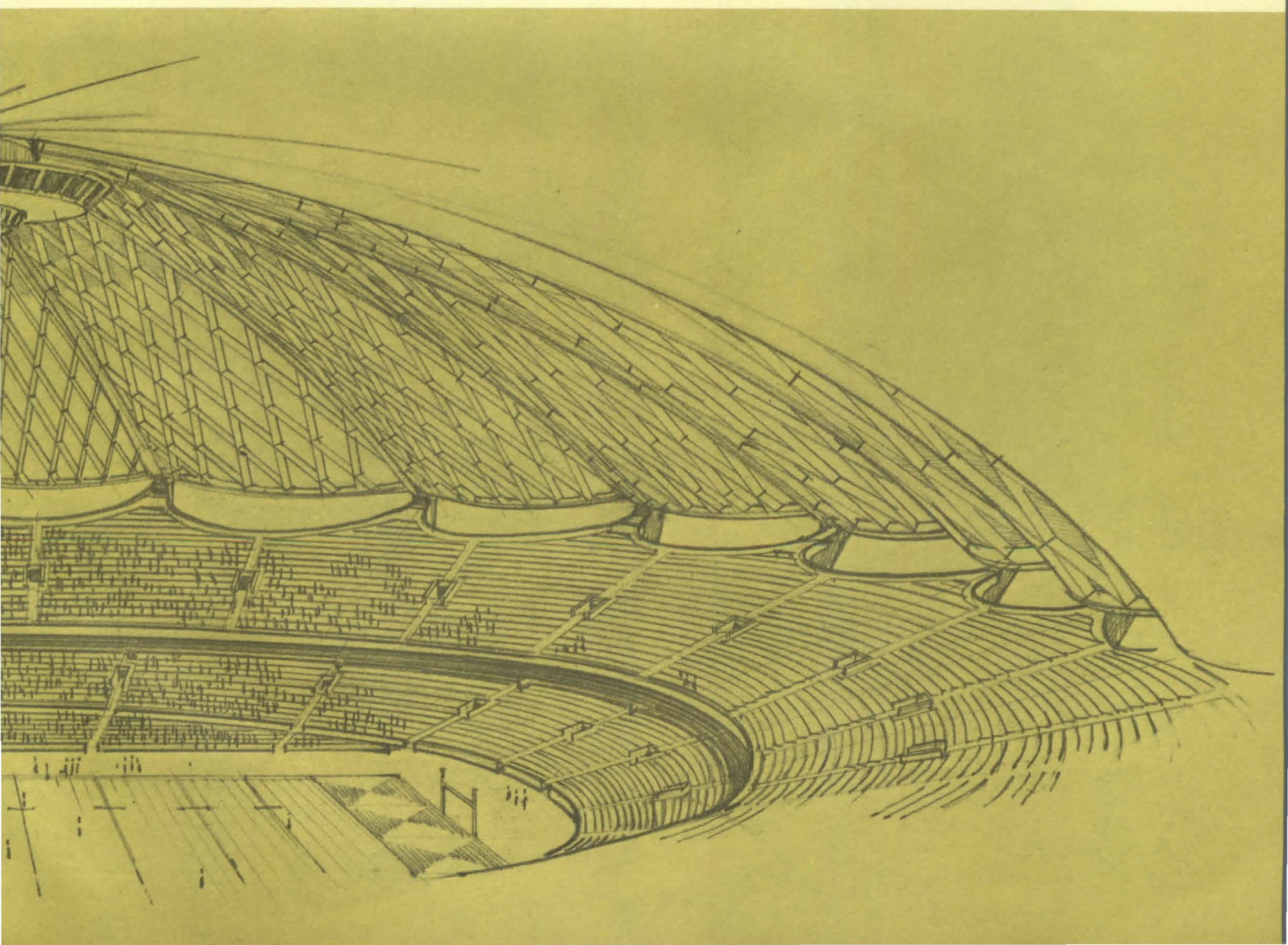
William D. Reed

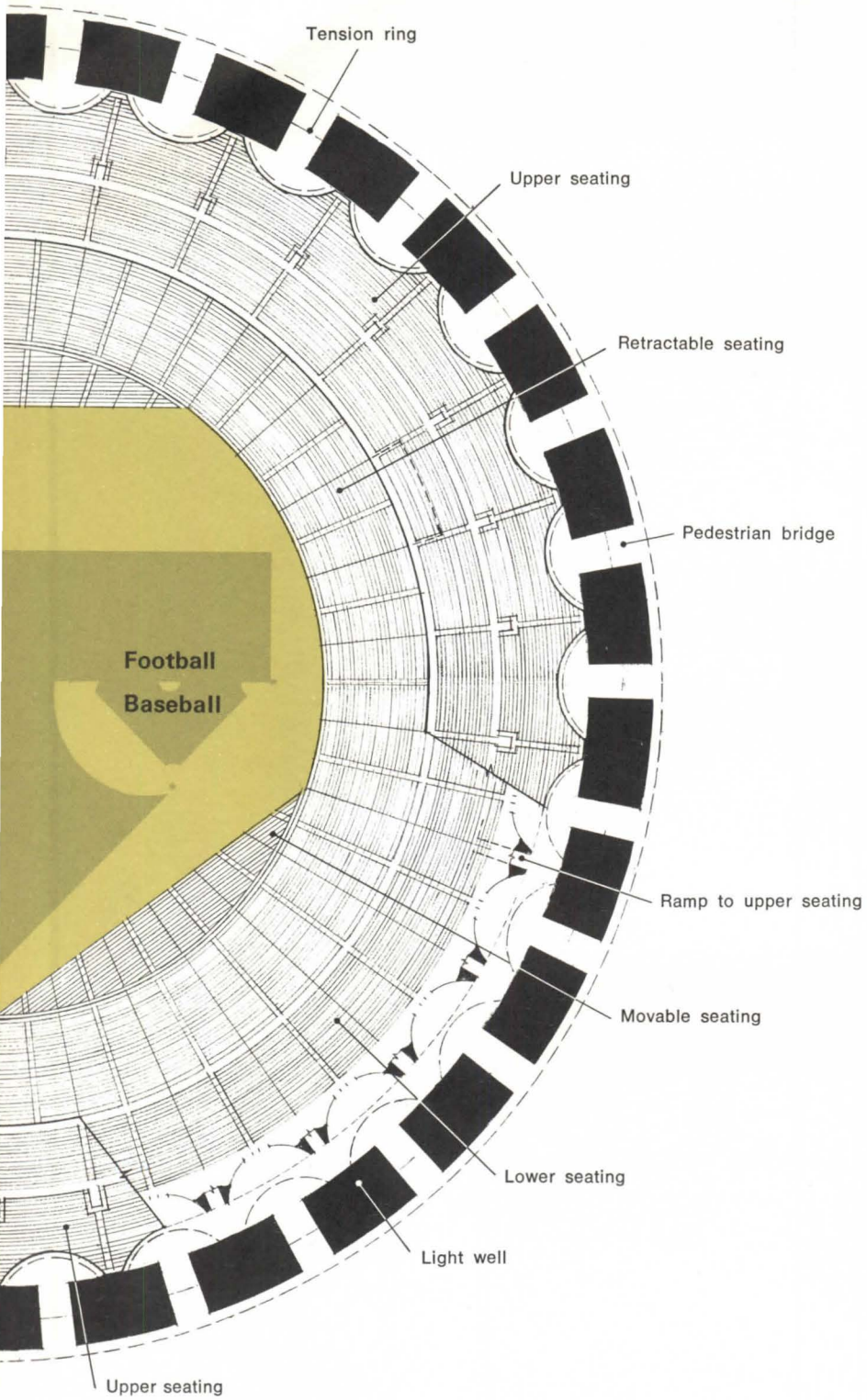




TYPICAL BOX ARCH SECTION







"The structure can be assembled using standard wood products and mechanical fasteners."

Construction of the parabolic dome would involve integration of three efficient elements into a continuous structure. These elements include: 1. a doubly curved plywood shell, 2. a grid of intersecting, stiffening ribs and, 3. a triangular box parabolic arch.

The resulting structure can be assembled of standard, available wood products and can be connected with standard, available mechanical fasteners.

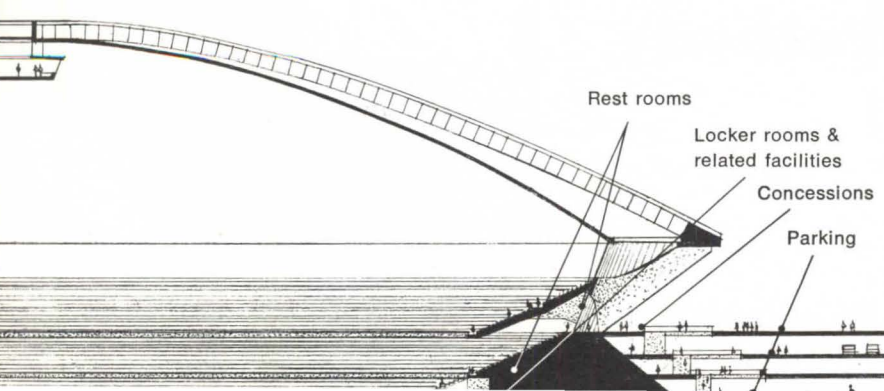
The configuration of the structure is such that its geometry can be readily calculated and presented to construction personnel. Many identical panels and members are used and the maximum benefits of prefabrication may be realized. The design presented is based on a snow-load of 25 psf, and a wind velocity of 110 mph, but can be designed for any given loadings.

Lighting and ventilation requirements would all be concealed in the arch structure of the dome. This would make it possible to perform all relamping and maintenance work without the need for scaffolding.

This structural system presents a clean, uncluttered, clear-span interior space. The box arches also provide enclosed access to the hanging scoreboard at the top of the dome.

All of the materials Mr. Reed refers to as "standard and available" are both standard and available from Weyerhaeuser. They are elements of the largest line of wood products available from any single source in the country. In addition, Weyerhaeuser offers a new Architectural Services program which includes highly trained field representatives, comprehensive literature, and a services staff to provide technical and specification data.

Your Weyerhaeuser Architectural Representative is your source for all of this information. Call him or write us at Box B-2546, Tacoma, Washington 98401.



Weyerhaeuser

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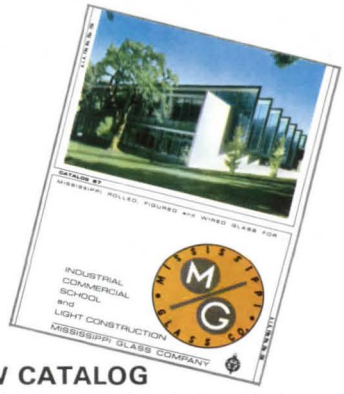
MORE *Daylight* AND *Safety* WITH WIRE GLASS

Architects and Engineers: Engineering Div., Port of Los Angeles.
Gen. Contractors: C & I Construction Co., Inc.; Argo Construction Co.
Glass and metal: Olson Glass Company; Fentron, Inc.

Over 60,000 sq. ft. of SMOOTH ROUGH MISCO installed in Transit Sheds, Port of Los Angeles

Performing triple duty functions, ¼" SMOOTH ROUGH MISCO glazed in clerestories and gable skylights of the three new Port of Los Angeles transit sheds provides favorably diffused daylighting and protection against damaging impact while serving capably as a recognized fire retardant.

Wherever superb daylighting qualities and the innate strength of Mississippi wire glass are desirable characteristics, as in the case of this immense cargo handling facility, there is a Mississippi pattern that combines the utmost in protection with modern beauty. Specify Mississippi glass and insist on safety. Use only glass listed by Underwriters' Laboratories, Inc.



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¼" LUXLITE COOLITE MISCO in clerestories, gymnasium, and cafeteria intercepts solar heat, provides glare reduction and light diffusion with safety.

POLISHED MISCO in library windows facing corridor. Mississippi wire glass is used extensively in this structure.

COOLITE MISCO in window wall (right) and clerestory (rear). Immediately beneath clerestory, fire retardant partitions of ¼" POLISHED MISCO separate service and dining areas.

Edward W. Clark High School, Las Vegas, Nev.
Architects: Zick & Sharp , Las Vegas
Gen. Contractor: Del E. Webb Corp.
Glass and glazing: Olson Glass Co., Inc., Las Vegas and Los Angeles.

School achieves high levels of Comfort and Safety with Mississippi Patterns

Extensive use of obscure LUXLITE COOLITE MISCO (wire) heat absorbing glass in the new Edward W. Clark High School to harness daylight and control temperatures truly fits the aims of the architects and school administrators to provide an environment conducive to the best interests of pupil and teacher alike. Closely allied with this objective, clear Polished MISCO offers proven shatter protection to ward off accidents and defend against fires. There is a school-tested Mississippi pattern for every glazing requirement. See your nearby quality glass distributor.

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H #1-67

P/A NEWS REPORT

Progressive Architecture's Monthly Digest of Buildings, Projects, People and Products *June 1967*

NEW HEAD FOR MOMA

NEW YORK, N.Y. Starting July 1, 1968, Bates Lowry will become Director of the Museum of Modern Art. Lowry, 43, will move to his new post from Brown University, where he is currently chairman of the art department.

Rene d'Harnoncourt, present director of the museum, reached mandatory retirement age, 65, last year, but stayed on at the request of the museum's trustees until a successor could be found; he will now remain until July 1968.

Lowry, who went to Brown as a professor in 1963, has been editor of *The Art Bulletin* and the College Art Association Monograph Series since December 1965. He was the founder of the Committee to Rescue Italian Art.

Also retiring from the Museum of Modern Art is Alfred H. Barr, Jr., who, since 1947, has been Director of Museum Collections, and who was the museum's first director, from 1929 to 1943. No one will succeed Barr. Instead, the individual curators will assume his former responsibilities in their particular fields.

IF YOU CAN'T BEAT IT, JOIN IT

DETROIT, MICH. From the motor capital comes word that Ford and Mobil Oil are pooling resources to develop a fume-free internal combustion engine. The two corporations, which are leaving the door open for other participants, plan to sink $7 million into the project over a three-year period. According to a Ford spokesman, "It is expected the study will lead to development of a fuel engine system that will virtually eliminate automobile emissions, with minimum cost to the consumer and minimal effect on car performance."

The announcement came only months after Ford announced it was starting research on an electric car. (This research will continue.) It also comes at a time when many experts are expressing dissatisfaction with anti-pollutant devices attached to automobile exhausts.

Optimism over the project runs high. It is this kind of research that may make it possible for city dwellers to take occasional deep breaths once again. Now how about someone pooling resources with the Bureau of Public Roads to see what can be done about traffic congestion and freeway blight.

MORE HABITATS PLANNED

MONTREAL, CANADA. According to most architectural critics, Habitat is the outstanding architectural feature of Expo 67 (see p. 152). Shortly after the opening of the fair, P/A learned unofficially that negotiations were under way for at least four Habitat-like structures in three countries — two in New York State, one in England, and one in India. Moshe Safdie, architect of Habitat, will be involved in the projects. If these are built, the architectural promise of the fair will have begun to spread almost immediately.

KAHN PLANNING FOR NEW HAVEN

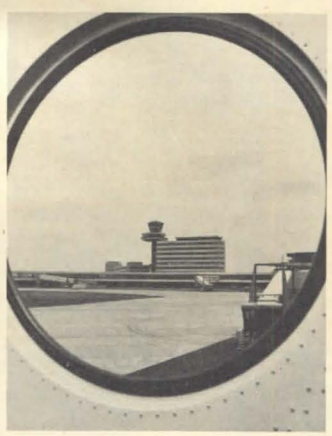
NEW HAVEN, CONN. Louis I. Kahn is the planning and architectural consultant for New Haven's largest urban renewal project, Hill Central, which covers 714 acres. According to Mayor Richard C. Lee of New Haven, Kahn will design a community school and housing for public, elderly, low-income, moderate-income, and middle-income residents. He will also prepare the Hill Central Plan.

A temporary loan from the Department of Housing and Urban Development will make possible preliminary work, which includes clearing the area of substandard housing and junkyards.

AIR GATEWAY TO EUROPE

Photo: Netherlands National Tourist Office

AMSTERDAM, THE NETHERLANDS. The first thing the Dutch tell a visitor to their glistening, spotless new Schipol airport, 6 miles out of Amsterdam, is that it lies 13′ below sea level. So does about half of Holland, on land reclaimed by dikes and pumps from the North Sea, making the news hardly startling. But Schipol's connection with the sea is a close one. The name Schipol means a ship's hole and refers to an area of what was once the Lake of Haarlem, where strident winds

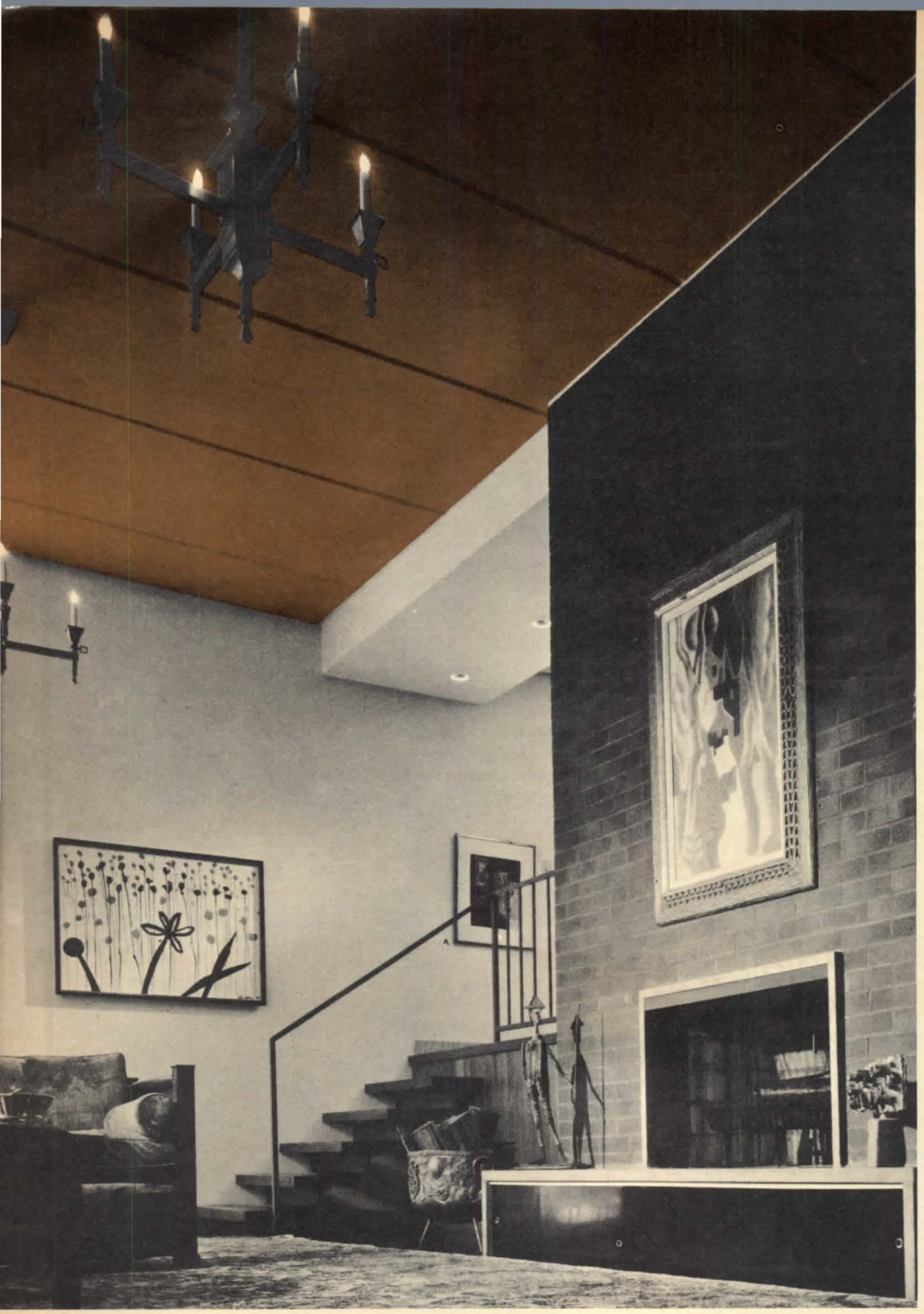


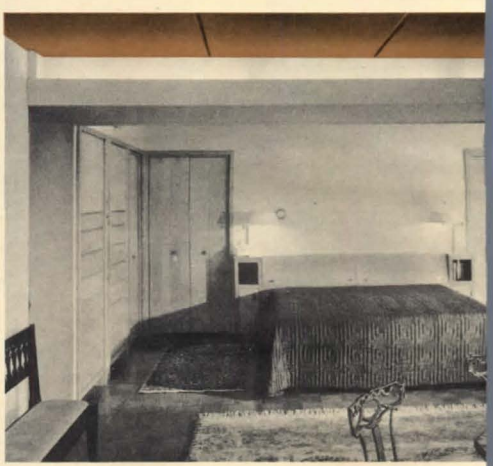
wrecked and sank dozens of ships. Holland's ships, of course, once were masters of the seas, and with the opening of the new airport at Schipol, capable of handling 4 million passengers a year, Holland is taking steps toward participating just as extensively in the age of air transport.

The second thing the Dutch will tell you about Schipol is that it is the most modern air facility in Europe. And it probably is. Opened officially last month by Queen Juliana, who, the day before, had become a grandmother for the first time, the airport is certainly the newest.

Architecturally, it has no innovations. The passenger terminal, with its two sets of long, angular wings connected by a central concourse and with its movable loading ramps sticking out from the wings at regular intervals, looks from the air like a giant crustacean. In the U.S., of course, the trend in air terminals is away from this linear arrangement to a more compact oval or circular configuration. But Schipol, with a set of moving walkways to carry passengers briskly from the check-in gate to the loading area, loses nothing to inefficiency. Its loading ramps, which extend from the terminal to a fixed pivot, then extend from that to a movable support that can move the extension vertically and horizontally, allow two lanes of vehicular traffic to run beneath the ramp between the terminal and the first support. In that way, the entire ground-level perimeter of the terminal is accessible by vehicle. Moreover, the length of the ramps keeps the loading and unloading planes far enough from the terminal so that they can be serviced at their loading positions. At present, 22 aircraft can be serviced at the same time.

Included in the passenger terminal are a nine-story Airport Authority building and a 160′-high traffic control tower. There will also be what authorities claim is the largest tax-free shopping area of any air terminal on the Continent. And the National Aeronautical Museum, now in the old Schipol air terminal, will





Town House at 5800 Blackstone Avenue, Chicago, Illinois. Architects: Keck and Keck.

. . . and all through the house . . . SPANCRETE!

And that means that nothing stirs . . . not a sound. Because Spancrete floor and roof systems muffle noise . . . cut sound transmission from floor to floor (from 49 to 55 decibels) . . . and also eliminate those creaking and squeeking noises so common with wood floor systems. This is important in a town house, such as the one shown . . . and it's even more advantageous in an apartment project.

Paint only was required for ceilings . . . and floor coverings were applied directly over the Spancrete, providing economy along with attractive appearance of the exposed Spancrete ceiling.

Architects were particularly impressed with these Spancrete advantages:

(1) Cuts down finish cost. **(2)** Gives rustic yet elegant look; ties into open stairway plan. **(3)** Light fixtures attached directly to Spancrete ceilings — using duct work in plank to carry wiring.

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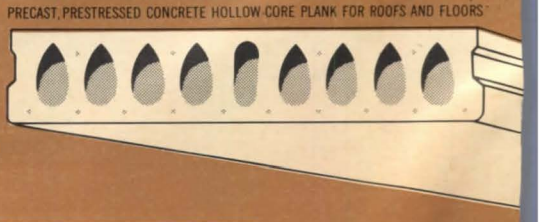

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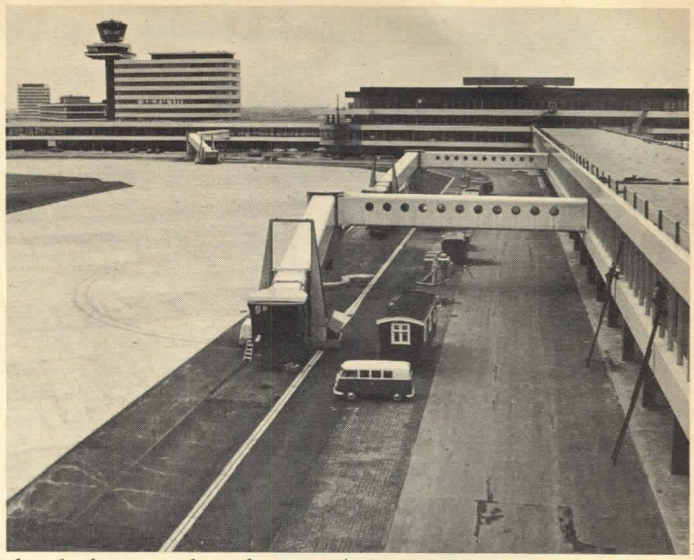


Photos, except as noted: KLM

shortly be moved to the new one.

Perhaps the most striking thing about Schipol, as is true of most new structures in Holland, is the obvious care that has gone into its detailing. Second-rate materials are never used; ceiling fixtures fit neatly into the ceiling; doors and windows fit exactly; and all interior appurtenances from lounge chairs to counters, from shops to works of art, have been carefully designed and handsomely arranged. Interior signs on a bright orange background are easily readable from almost anywhere and give information on the location of loading gates, restaurants, restrooms, etc. Designer Kho Liang Ie, who prepared the signs and most of the interior furnishings, said he visited 27 major airports in the U.S., Canada, and Europe before preparing designs.

Already Schipol is thought capable of handling 5 million passengers a year, and, in a freight terminal adjacent to the passenger terminal, more than 250,000 tons of freight. But work is not stopping there. Construction is underway on two more 11,000′ runways (in addition to the two in operation) capable of handling the yet-to-come super-jets. According to expansion plans, Schipol will eventually have a capability of receiving 30 million passengers a year and processing 400,000 tons of freight.

In all, the new Schipol facility combined with the old one adjacent to it has 4000 acres of land — a vast expanse in a country the size of Holland. Yet there will be little waste. The government is arranging for farmers to work the unused land and to keep cows in walled courtyards now being constructed. Farmers will live in specially soundproofed houses not far away.

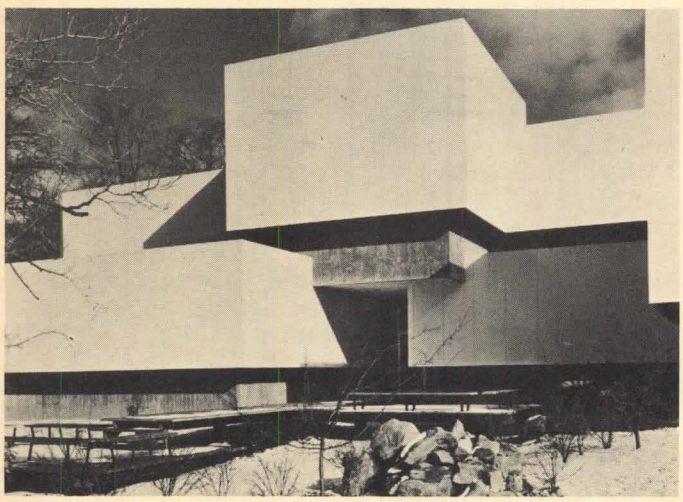
As might be expected, even Hilton Hotels is in on the act. Ground will soon be broken for the Hilton Schipol.

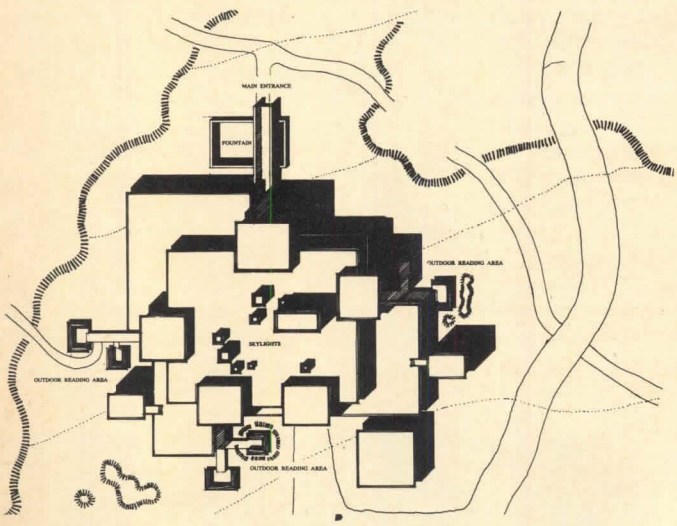
Architects for the airport were the Nederlands Ontwerpbureau voor Luchtavens, working with F. C. de Weger, M. Duintjer, L. Jonkers, and G. Oostveen.

HOPE FOR A VERMONT LANDMARK

MONTPELIER, VT. The Vermont legislature took a typically cautious step last month toward preserving Montpelier's venerable Pavilion Hotel. In authorizing $20,000 for a study of what to do with the building, the legislature at least partially acknowledged the severe protests over the building's suggested destruction put forth by a group of concerned Montpelier residents (see p. 60, APRIL 1967 P/A). Hurt by competition from motels, the Pavilion closed its doors last September, and, although it was purchased by the state for possible use as an office building, funds for either its destruction or conversion have not been forthcoming. Vermont legislators do not spend money lightly and one can only hope they will decide to maintain an important reminder of the state's heritage.

REYNOLDS AWARDS 1967



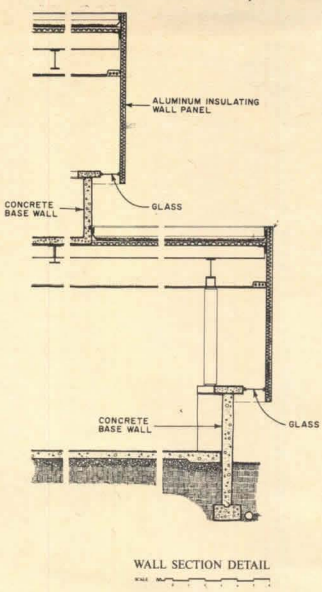


NEW YORK, N.Y. When Victor F. Christ-Janer of New Canaan, Conn., won this year's $25,000 R.S. Reynolds Memorial Award, he was only the third American to receive it in the Award's 11-year history. Presented yearly for "distinguished architecture using aluminum," the Reynolds Award for 1967 singled out Christ-Janer's design of the James F. Lincoln Library at Lake Erie College, Painesville, Ohio.

The building is a study in rectangles and squares, whose surfaces are color-enameled (off-white) aluminum. Hanging from steel framing, the 3"-thick aluminum panels (with a formed polyurethane core) extend beyond the wainscot-high concrete perimeter walls.

Between the walls and the wainscotting at the bottom of the overhang are strips of glass that, at night, let through a certain amount of light, making the walls seem suspended in a soft glow. During the day, of course, they serve to admit light.

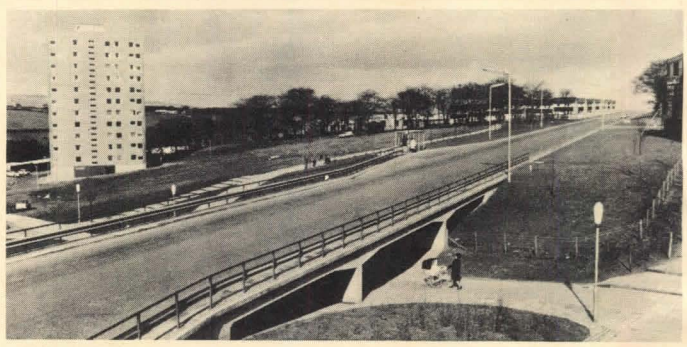
"The effect achieved," said



WALL SECTION DETAIL

the jury report, "is to make this building composed of different cubic forms look rather light and lively, and we believe this to be a new and intelligent use of aluminum." The jury, composed of Dean Jose Luis Sert, chairman, Dean John E. Burchard, Hans Hollein, William Morgan, and William Kessler, went on to note that "the volumes are appropriate and correspond to the different elements of the plan which make those volumes meaningful." At the same time, they cautioned against "the more or less fashionable multiple cube arrangement, when unrelated to plan or contrived at the expense of proper proportions and relationships of interior space."

The AIA is a joint sponsor of the program.



WASHINGTON, D.C. The first R.S. Reynolds Memorial Award for Community Architecture earned $25,000 and an original sculpture for Cumbernauld New Town in Scotland. The $25,000 will be used to create a scholarship in community architecture. Since 1962, Dudley R. Leaker has been chief architect and planning officer for Cumbernauld, and, before that, the post was held by L. Hugh Wilson, who started with the program at its conception in 1956. Cumbernauld, which will eventually house 70,000 persons, is a satellite town for Glasgow, 14 miles away. Already the population is 23,000; 5500 homes are occupied and 50 industrial firms and 31 shops employ 4800 persons. The AIA jury called it "the most comprehensive project of community architecture to date." Jury members Morris Ketchum, Jr., Archibald C. Rogers, and John Fisher-Smith singled out five key features of the town: (1) its separation of pedestrian and

vehicular traffic; (2) its multilevel town center, which will be half-a-mile in length when completed; (3) its design as a single community, without subdivision into neighborhoods; (4) its architectural design and land planning, which provide a high level of amenities for daily living; and (5) the exceptional economy attained in its development. "As a work of urban design," the jury stated, "Cumbernauld holds great significance for the architectural profession and for the future development of community architecture in the Western world." Formal presentation of the award will be made in Cumbernauld New Town on June 19.

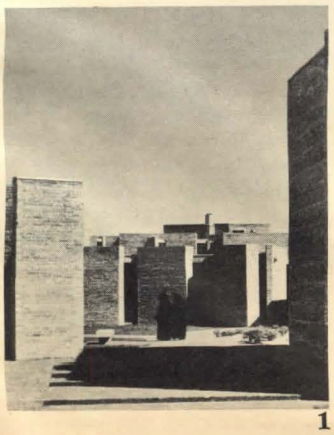
SPACE TO WORSHIP

Photo: "The Times," London

LIVERPOOL, ENGLAND. The space capsule design of Liverpool's Roman Catholic Cathedral has excited comment and imitation ever since it was announced more than five years ago. Although the linking of outer space and God — if that is what architect Frederick Gibbard intended — is an old concept, he couched the thought in terms that have left many irrate, others fairly well pleased.

Completed after a century of false starts, the cathedral cost $11,200,000 to build. Most of the money came from the people of Liverpool, though donations came from as far away as Australia and Trinidad. Monsigner Turner, 78, has been the chief fund raiser since 1936. One of his recent drives produced 1600 rings, each 22 carats; he refused 9-carat rings because he believes only the best is good enough for God. Despite these inhibitions, he raised more than $5,600,000 for the cathedral that will be his memorial.

AIA HONOR AWARDS TO 14 FIRMS, 20 PROJECTS



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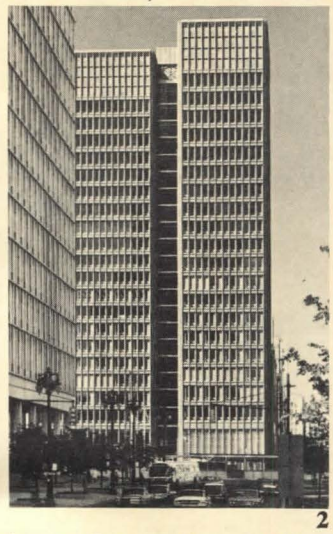
NEW YORK, N.Y. AIA president Charles M. Nes, Jr., last month conferred the nation's highest recognition for excellence in architectural design on 20 out of a total 317 submissions in the AIA's annual Honor Awards program. The awards were presented at a luncheon May 15 during the AIA's 99th Annual Convention here. Heading the list of winners was The Architects Collaborative, with two winning designs, and Skidmore, Owings & Merrill, five of whose entries were premiated.

Members of the jury who made the selections were: James M. Hunter of Boulder, Colo., Chairman; R. Max Brooks of Austin, Tex.; Vladimir Ossipoff of Honolulu, Hawaii; Joseph N. Smith of Atlanta, Ga.; and Philip Will, Jr., of Chicago, Ill. One of this year's most difficult problems, according to their report, was the recurrent one of balancing small, low-budget buildings against efforts backed by less limited resources — the large, prestige structures. Recognizing the variety of motivating architectural philosophies among the entrants, the judges attempted to evaluate each building on the criterion of appropriateness to its objective, both functionally and aesthetically. Following is a list of the winning designs and firms:

Ridgeway Men's Dormitories/Phase III, Western Wash-



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ington State College, Bellingham, Wash., by Fred Bassetti & Co.; Jesse Jones Hall for the Performing Arts, Houston, Tex., by Caudill Rowlett Scott; St. Bede's Priory **(1),** Eau Claire, Wis., by Hammel Green & Abrahamson, Inc.; Municipal Services Building, Philadelphia, Pa., by Vincent G. Kling & Associates; Boreal Ridge (Recreational Development), Truckee, Calif., by Ian MacKinlay & Associates; Sea Ranch Condominium I, The Sea Ranch, Calif., by Moore, Lyndon, Turnbull, Whitaker; University Plaza, New York University, New York, N.Y., by I.M. Pei & Partners; Amphitheater and Plaza, Jacob Riis Houses, New York, N.Y., by Pomerance & Breines; National Headquarters Building, American Republic Building, Des Moines, Iowa, by Skidmore, Owings & Merrill; Banque Lambert, office building and residence, Brussels, Belgium, also by SOM; Beinecke Rare Book and Manuscript Library, Yale University, New Haven, Conn., by SOM; Mauna Kea Beach Hotel, Kamuele, Hawaii, by SOM; Vannevar Bush Center for Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, Mass., again by SOM.

Also, First Federal Office Building **(2),** Detroit, Mich.. by Smith, Hinchman & Grylls Associates, Inc.; Redwood National Bank, Napa, Calif., by Neill Smith & Associates; Los Gatos Civic Center, Los Gatos, Calif., by Stickney & Hull; Museo de Arte de Ponce, Ponce, Puerto Rico, by Edward Durell Stone; Dormitory and Commons Building Quadrangle, Clark University, Worcester, Mass., by The Architects Collaborative; C. Thurston Chase Learning Center, Eaglebrook School, Deerfield, Mass., also by TAC; and the John Knox Presbyterian Church, Marietta, Ga., by Toombs, Amisano & Wells.

IT HAPPENED IN CENTRAL PARK

NEW YORK, N.Y. On May 11, 12, and 13 a group of politicians and designers assembled in an air-inflated structure in Central Park to discuss the problems of urban living and how to solve them. As might be expected, most of the talk centered on the fact that there *are* problems and very little on what to do about them. Although it may not be true that the hot air generated by the speakers was used to keep the shelter inflated, it is true that most of the talk was very general. And anyway, the structure's acoustics operated in such a way that most of what was said failed to reach the second row of listeners. It may have been just as well.

Opening-day festivities set the note. It was raining. The small bevy of participants

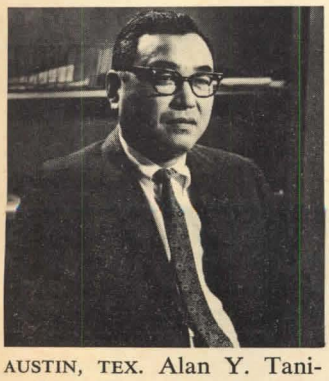
who had gathered at the entrance of the park to march in to the conference site, seemed even smaller as they huddled inside their raincoats and under umbrellas. The procession was led by several electric, nonpolluting cars, followed by a nonpolluting city bus, which had been pulled off its experimental city run for the day. Bringing up the rear were two newly designed Sanitation Department trucks. Also representing the Sanitation Department and the city, the band, drowned out by the rain, played unidentifiable music. It was like most conferences: No one could hear anyone else.

Perhaps one of the most striking things to come out of the conference was a 20¢ chair. Designed from a cardboard beer case by Ronald Beckman and Howard Yarme of the Research and Design Institute in Providence, R.I., it provided seating for the conferees. According to its designers, it does have a certain basic utility: "Like, you can always use one to carry two cases of beer."

One evening, participants were to play a social game called "Sympolis." It was to involve a re-enactment of city politics during an election year. We don't know how it went; we didn't wait around to find out.

The Design-In, as the conference was called, was sponsored by New York University's School of the Arts, the New York Chapter of the Industial Designers Society of America and by the city's Parks Department.

UNIVERSITY OF TEXAS NAMES NEW DIRECTOR



AUSTIN, TEX. Alan Y. Taniguchi will become Director of the School of Architecture at the University of Texas on September 1, succeeding Philip D. Creer. Creer will return to full-time teaching.

A member of the Texas faculty since 1961, Taniguchi received his B.A. degree in architecture from the University of California at Berkeley in 1949 and was associated with architectural firms in San Francisco until 1951, when he established a practice in Harlingen, Tex. At the university in Austin, he was appointed chairman of design in 1962 and became a full professor three years later.

He has for several years combined a teaching career with private practice. Last year, on leave of absence from the university, he represented the firm of Brooks, Barr, Graeber & White on a feasibility study for the U.S. Department of Labor Building and worked on master plans for the university's campuses.

CORRECTION

Artist-Architect J. Gordon Carr's name was incorrectly given on p. 64 of the APRIL 1967 P/A as J. Walter Carr.

NEW YORK ART SOCIETY PRESENTS AWARDS

NEW YORK, N.Y. The Municipal Art Society, an organization devoted to the recognition and furthering of the visual and performing arts in New York City, last month presented its highest award, the Bronze Plaque, to Riis Houses Plaza, by architects Pomerance & Breines and landscape architect M. Paul Friedberg. At the society's 75th annual meeting, president Ruth McAneny Loud conferred the Plaque and five additional awards on the creators of projects in architecture and the visual arts.

An awards committee headed by P/A Senior Editor James T. Burns, Jr., nominated the following projects and groups to receive scrolls: The Downtown Lower Manhattan Plan, executed for the City Planning Commission by Wallace, McHarg, Roberts & Todd and Whittelsey, Conklin & Rossant with Alan M. Voorhees & Associates, Inc.; Thomas P.F. Hoving and the design and planning staff of the New York Department of Parks; and Meeting House Foundation, formed by Benjamin Sonnenberg, Jerome Straka, and Armand Erpf for the preservation of Friends Meeting House, a notable city landmark. Architects Kelly & Gruzen and landscape architect M. Paul Friedberg accepted Certificates of Merit for their design of Chatham Towers, a middle-income housing project. The Anonymous Art Recovery Society and the Brooklyn Museum also received a Certificate of Merit, the one for its efforts in collecting and restoring decorative artifacts of architectural interest, and the other for providing a home for these objects.

Members of the selection committee for the Society were Congressman James H. Scheuer, Emory Lewis, editor of *Cue* magazine, Wilder Green of the Museum of Modern Art, Samuel Brody, partner in the architectural firm of Davis, Brody & Associates, and Brendan Gill of *The New Yorker* magazine.

REYNOLDS' ALUMINUM FAÇADE

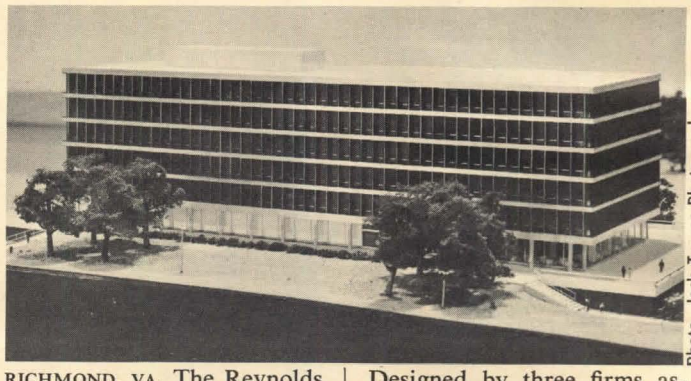


Photo: Jack Turner Photography

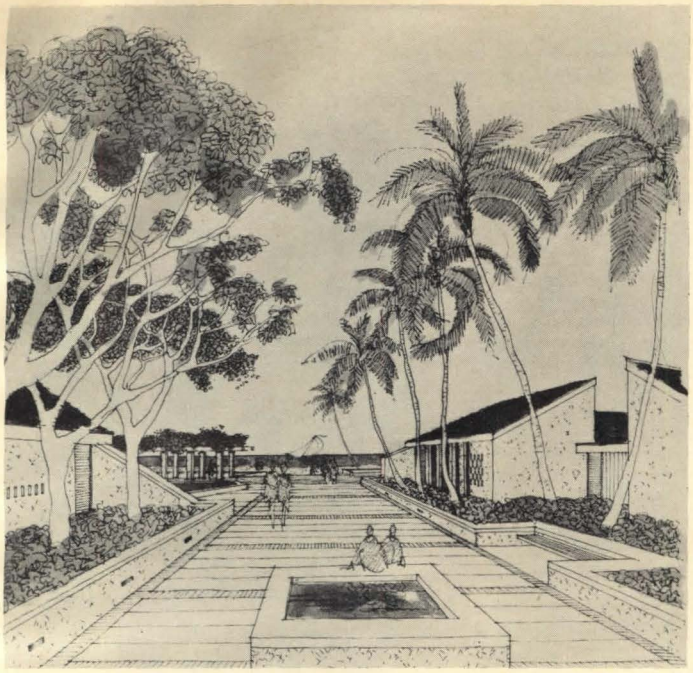
RICHMOND, VA. The Reynolds Metals Company is not only aware of good architectural design, but is also trying to spread that awareness. Through the yearly Reynolds Award for design in aluminum, the company has succeeded in calling widespread attention to the use of aluminum in architecture. And now that it is constructing a new office building for its own use, we can assume that it wishes to use the offices as an example. To paraphrase Marshall McLuhan: The building is the message. Shown above is the design solution. Although it is not likely to win a Reynolds Award, it seems a sound, workmanlike building.

Designed by three firms associated for this project — Marcellus Wright & Partners and Baskerville & Son, both of Richmond, and Skidmore, Owings & Merrill of New York — it will have a reinforced concrete frame sheathed in aluminum and glass. In its six stories, it will provide 247,000 sq ft of space for 1000 employees now located in several offices throughout Richmond. An adjacent parking lot will handle 700 cars. Its 16-acre site is located just to the north of Reynolds' general office building; the two structures will be connected by a 600' tunnel. Completion is expected in the fall of 1968.

COMPETITIONS

The 1967 Cintas Fellowships are available to architects who will be selected from applicants of Cuban citizenship or lineage. Program is sponsored by the Institute of International Education and offers a total of six grants. Applications will be accepted until July 1. Forms are available from IIE, 809 United Nations Plaza, New York, N.Y. 10017 . . . Also under the aegis of the IIE is a competition for **1968–69 U.S. Government Graduate Grants,** awarded for academic study or research abroad. Applications must be submitted before October 16 to IIE.

HONOLULU ARCHITECT WINS PPG–NIAC AWARD



Rendering of design by Thomas E. Fanning.

PITTSBURGH, PA. Thomas E. Fanning of Honolulu, Hawaii, has won the $1200 first prize in a national cometition sponsored by Pittsburgh Plate Glass Industries and the National Institute for Architectural Education. His design for a circular nursing home, to be situated on a man-made peninsula at the southern edge of the island of Oahu, was on display at the AIA convention.

Subject of the competition, which was open to students and architects under 30 years of age, was "a nursing home, 10 minutes from a general hospital." A panel of jurors, headed by Sidney L. Katz, professor of architecture at Pratt Institute and Caleb Hornbustel, New York architect, evaluated submissions of architectural renderings on the basis of good building design incorporating the use of glass and evidence of and understanding of the needs of patients.

Second- and third-prize winners were, respectively, Gary F. Rogowski, a student at California State Polytechnic College, and Robert H. Morin, a student at the University of Notre Dame.

THE SKYSCRAPER COMES OF AGE IN TOKYO

Photos: Makoto Watanabe

TOKYO, JAPAN. A proposed 30-story office building (for the Tokyo Fire and Marine Insurance Co., Ltd.) in Tokyo's Marunouchi section, overlooking the Imperial Palace, is the focus of a controversy that in a way points up the growing pains common to so many cities — even a city of 10 million persons. Although the city rejected the building proposal in mid-April, an appeal of the ruling is pending, and, despite the delay, unless special legislation is forthcoming, Tokyo will eventually go high-rise.

Traditionally and historically, architectural expansion in Japan has been horizontal, not vertical. Like most Americans, most Japanese have long yearned for a detached single-family house to call home. One result is that average height of Tokyo buildings is a lowly 1.4 stories.

Some High-Rise Since 1964 —

Multistory office buildings are by no means new to Japan, but from 1920 to 1964 the maximum height of a building was set at 102′. Although fear of earthquakes was one reason for imposing that ceiling, another reason, perhaps equally important, was that that was the limit for Victorian London and as such was considered an ideal by early Tokyo planners.

For years during the postwar period, architects and planners expressed dissatisfaction with that limit, no longer practical from the viewpoints of urban economics and enginering techniques. When the restriction was rescinded, Japan's

economy was ready for a Skyscraper Age, even if a small-scale one by Occidental standards. The height limit for buildings in the Marunouchi CBD, near Tokyo Station, is now determined by a volumetric rule similar to the one that helped make possible New York's Seagram Building. There is a limit of 10 above-ground stories (two, three, or more below-ground stories are common in Japan today) if the entire site is used for building; if only one-third is used, however, a 30-story building is permissible.

Earthquakes a Bugaboo —

Even if the Japanese no longer believe earthquakes are caused by fitful gyrations of a giant underground catfish, earthquakes do remain a major factor in the design of high-rise buildings. Thus, for the Mitsui Kasumigaseki Building (a 36-story structure now under construction), Mitsui Real Estate architects consulted with Tokyo University's Earthquake Research Institute to design an aseismatic structure. Computers simplified calculations of strength requirements; the specification of new, high-strength steels for columns and beams, and light materials, such as aluminum for walls, lowered the weight of the proposed building. A "soft" structure will enable the building to sway a bit and ride out an earthquake twice as severe as the El Centro (California) quake of 1940, which was three times as strong as the quake that devastated Tokyo and Yokohama in 1923.

Should We, or Shouldn't We?

But Tokyo is unable to avoid growing pains as the city expands upward. The trouble started last October, when Tokyo Fire and Marine Insurance applied to the city for permission to build their 30-story building (with 5 more stories below ground) on the site of the firm's outdated building in Marunouchi. One hitch is that the proposed building would face the Imperial Palace, and from upper stories or the roof, it would be possible, some say, to peer into the Imperial Palace grounds. The Emperor today is no longer divine, but is still the object of great respect — more, it would seem, than that accorded the Queen of England. Invasion of Imperial privacy is a serious matter to many, especially of prewar generations. The second aspect of what has developed into a major controversy is that Marunouchi had been designated as a "scenic area," and some people feel that construction of a high-rise building there would destroy the area's beauty. This is the viewpoint of the Tokyo metropolitan government, which attempted to take up legislation giving a city-appointed commission control over the design and surface finish of buildings in the "scenic area" in general

and the controversial, proposed Tokyo Fire and Marine building in particular. Architects and planners, plus Ministry of Construction officials, the Japan Architects Society, Building Industry Association, several major industrial firms and others have loudly and consistently fought such attempts at legislation.

The "scenic area" includes the Palace, moat, and 300-year-old stone wall, plus the Japanese-manicured pine trees visible above the wall. Across the street from this, and the Imperial Palace plaza, which is criss-crossed by pedestrian walks and unscreened traffic, all buildings facing the Palace for six or more blocks are of uniform height: 102′. To those who call this beautiful, Kunio Maekawa, designer of the proposed building, Kenzo Tange, and others reply that it is a 19th-Century beauty, and that a dynamic skyline of high-rise buildings is desirable from the viewpoints of urban aesthetics and economics, as well as providing ventilation and sunlight to the offices and open space at street level for pedestrians and traffic.

Don't Step on My Turf —

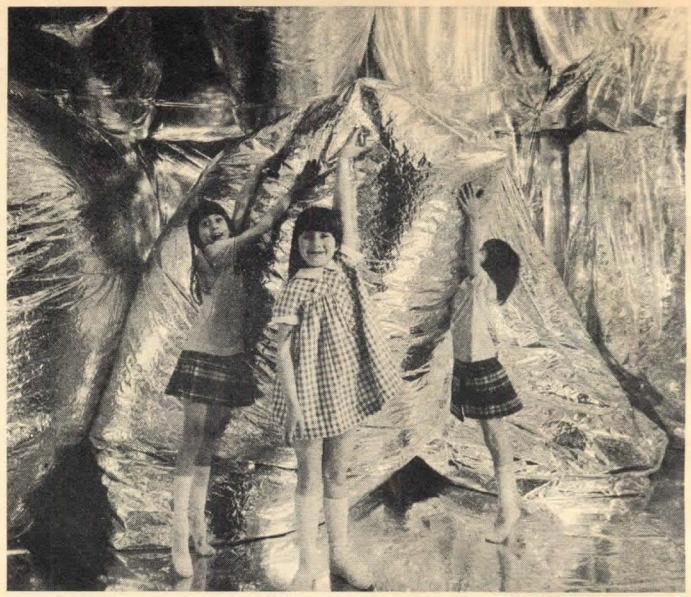
Yet another factor in the dispute is the opposition to construction of the building by Mitsubishi Real Estate, a giant (1965 income, about $40 million) in the Mitsubishi family of concerns. The firm owns most of the land in the Marunouchi area, and many of the buildings, which are all less than the old limit in height. Some observers say that Mitsubishi opposes construction because it would be a relative economic setback to the company.

When the city of Tokyo rejected the building proposal, grounds were that the site consists of two lots that may not be combined to calculate the maximum volume of the building. Adjacent to the now-demolished old Tokyo Fire and Marine building (ironically, a pacesetter in its time), the insurance firm had built another office building, which it is retaining. The area of its site, about 5000 sq m, had been combined with the 5000 occupied by the old building, for purposes of planning the building. In the case of Marunouchi, building codes permit a total floor area of 100% of the total site, providing open space is preserved at street level. Maekawa's proposed building has an area of 91.95% of the "combined" site. Preparation of an appeal of this ruling was started at once, and the controversy continues. — MARTIN COHEN of the "Japan Times"

LEVINE LEAVENS THE LEAGUE

NEW YORK, N.Y. Throwing off more than a decade of ingrown somnambulism, the Architectural League is swinging hard to prove that it it not only in step with the times, but even, perhaps, slightly ahead. Attracting a good bit of attention last month was one in a series of environmental exhibits the League is sponsoring. Called "Slipcover," it consisted of three rooms whose walls, ceilings, and floors were covered with a mirror-finished metalized polyester film. Shimmering off the mirror-like surface were colored lights and images thrown from six slide projectors, showing New York architecture, the lights of Broadway, and portraits of the artist, who is a young man.

Both the images and the dimensions of the room are constantly changing. Each



wall covering is loosely mounted on a wooden frame; fans behind them billow out, like giant air-filled Baggies, hover momentarily, then, when the fan turns off, deflate slowly. The artist, Les Levine, who was born in Dublin and who looks a little like an Irish pixie, means his rooms to achieve the ultimate in changeability. He intends them to be disposable. "When you tire of it," he says, speaking of the polyester lining, "you rip it off and throw it away."

Levine first created Slipcover for the Art Museum in Toronto.

Also on display last month, on the garden terrace of New York's Museum of Modern Art, were four Levine bubble rooms. Seven ft. high, they create a dreamlike environment for viewers who, standing in the room, can look out through the clear plastic to the museum's garden and to the high-rise buildings beyond it.

THE PHOTOS ARE MOBILE

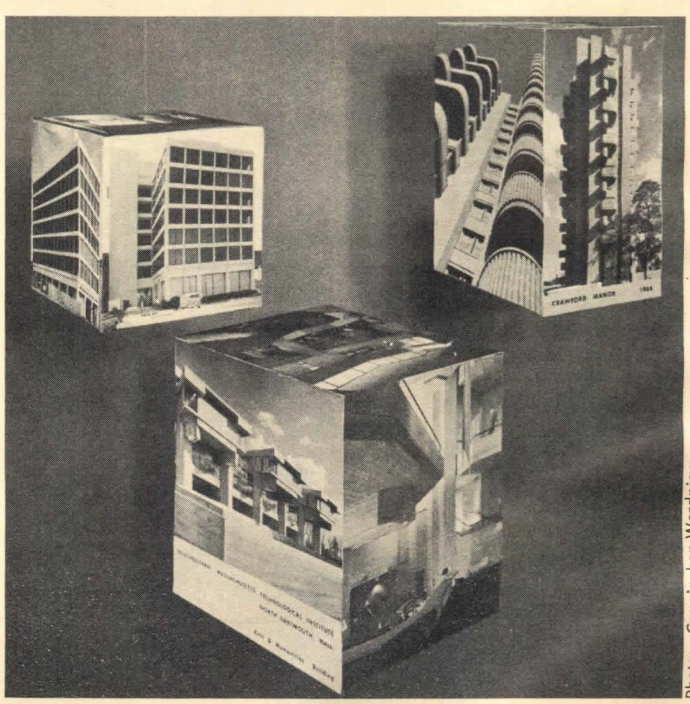


Photo: Cunningham-Werdnigg

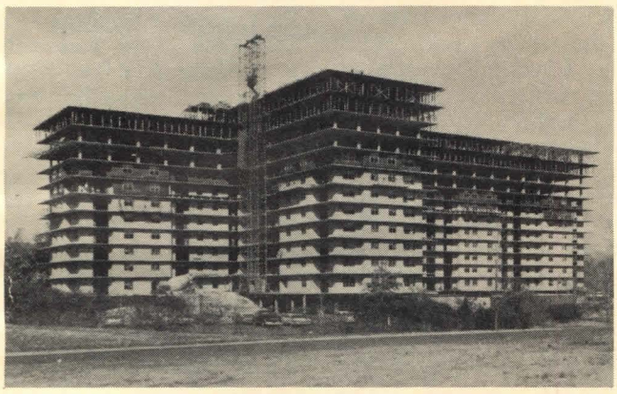
GUILDFORD, CONN. It's such an obvious idea, why hasn't someone done it before? Now that architectural photographer Bruce Cunningham-Werdnigg *has* done it, the answer — and indeed the question — is academic. His Photo-Mobiles are merely six photographs of a building, taken from different angles, glued to expanded polystyrene

THE PRESCON MEMO NEWS

THE PRESCON CORP.: 502 CORPUS CHRISTI STATE NATIONAL BUILDING — CORPUS CHRISTI, TEXAS 78401

APARTMENTS

High-rise apartment designs can have greater floor planning freedom and reduced structural costs when the Prescon System of post-tensioning prestressed concrete becomes part of the engineering. Examples are rising everywhere, as any Prescon representative will proudly show you.



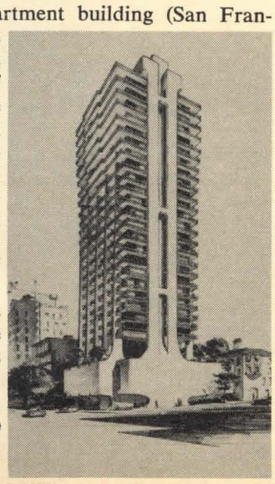
A Total Saving of $177,000.00 – by use of post-tensioned 5″ flat plate construction instead of mild steel reinforced 6″ flat plate, was accomplished in the construction of Arlington, Virginia's 360-unit Dolly Madison Apartments. Preliminary investigations leading to the decision to use post-tensioning indicated a 10-cent per square foot savings over a mild steel flat plate. During design, other savings became apparent, such as in columns and caissons due to reduction of dead load; in elimination of beams at openings; in elimination of 790′ of expansion joint and its double column; reduction of steel and concrete costs; in associated labor; and in the masonry.

One of the most interesting aspects of the project was the ease with which is was built – 13 floors in 13 weeks and one day on a scheduled 37,724 square feet of concrete floor area every 5 working days.

A detailed analysis of the structure and economics of this magnificent apartment has been prepared by Robert L. Meyer of the structural engineering firm Horatio Allison Associates. Write for your copy.

Architect — Sheridan, Behm & Associates **Owner/Builder — Dittmar Company**
Structural Engineer — Horatio Allison Associates

The Eichler Summit 30-story apartment building (San Francisco) has completely column-free living areas. It is thought to be the tallest concrete building west of Chicago. The 10″ floor slabs are post-tensioned in the 35′ direction by Prescon tendons, with reinforcing steel in the other direction. Bays are 35′ x 104′. The first six floors are for parking and the lobby. An unusual design feature includes the tapering-in of the upper part of the nine columns while the cantilevered post-tensioned floor slabs project out farther, so that the structure flares outward and is wider at each succeeding level.

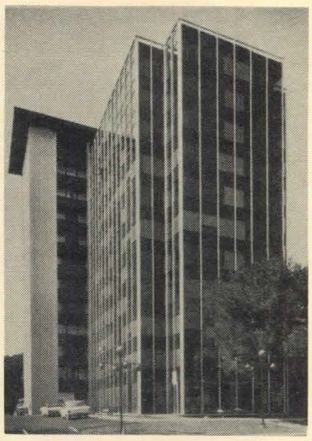


Owner — Eichler Homes. Inc.
Architects — Neill Smith & Assoc.; Claude Oakland, Associate Architect
Structural Engineer — Stefan J. Medwadowski
Contractor — Eichler Homes. Inc.

POST-TENSIONING ALLOWS FLOOR PLAN FLEXIBILITY — *LOWERS STRUCTURAL COSTS*

Post- Tensioned Flat Slab Construction – used in this San Mateo, California senior citizens apartment project, (The Park Towers) substantially reduced the final cost per square foot. Greater column spacing achieved by the post-tensioning technique provided the architect with greater interior design freedom – the resultant lighter weight structure enabled him to achieve an unusually clean-cut exterior. Cost per square foot for structural framing system was $4.038.

Extended economics will be enjoyed by the owners in reduced maintenance costs, made possible by control of damaging slab deflection.



Architect — DeLong, Zahm, Associates **Contractor — Carl W. Olson & Sons, Inc.**
Engineer — Cecil H. Wells, Jr. **Owner — The Leslie Foundation**

Park Towers Apartments – utilized a number of innovations in the construction of their 8-story building overlooking Corpus Christi Bay. This was the first structure in the United States

to combine load bearing masonry walls supporting a one-way post-tensioned slab. The floor system consists of 7″ thick one-way continuous slabs, post-tensioned over 26′ spans, with an overall dimension of 58′ x 180′. Tendons are eight ¼″ wires maintained in flat parallel by special clips. Post-tensioning was applied by a new technique which enabled the tendons to be stressed at approximately the midpoint of their length – eliminating the usual anchorage projections and the need for stressing platforms and scaffolding.

Total savings from the use of flat, centrally stressed post-tensioning were computed to be over $5,000.00 per floor.

Architect — Walter Wisznia **Contractor — Braselton Construction Co.**
Engineer — W. Clark Craig **Owner — Buffalo Apartments, Inc.**

Modern apartment design requires up-to-date engineering to combat risings costs and to provide the free spans and column spacing necessary for efficient space utilization. Post-tensioning provides these and many other advantages.

Some of the more recent apartment structures are shown here to give some indication of the flexibility and economy already enjoyed by some of the country's leading builders. For more complete examples and technical information, write for literature – or contact a Prescon representative.

THE PRESCON CORPORATION

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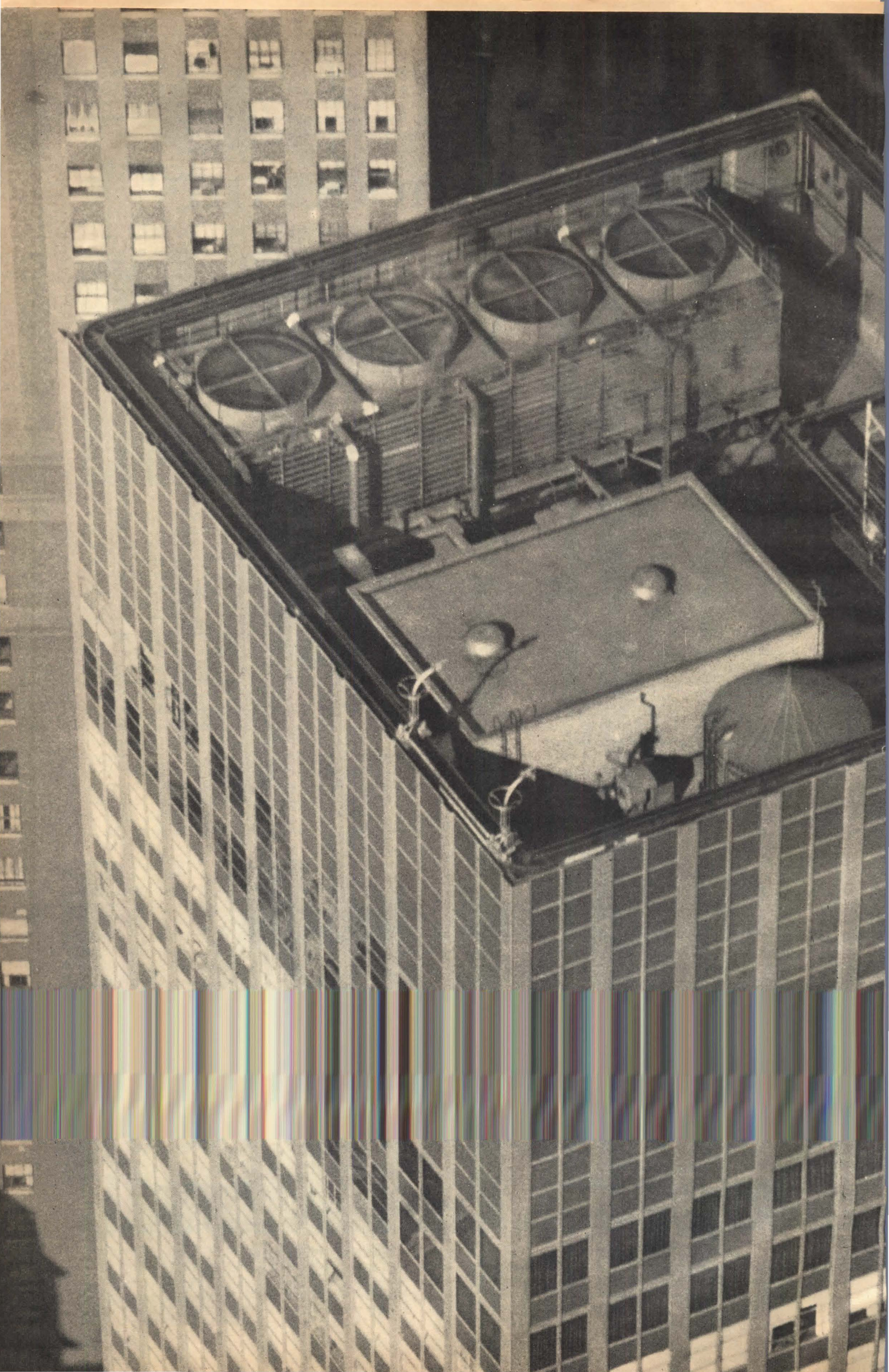
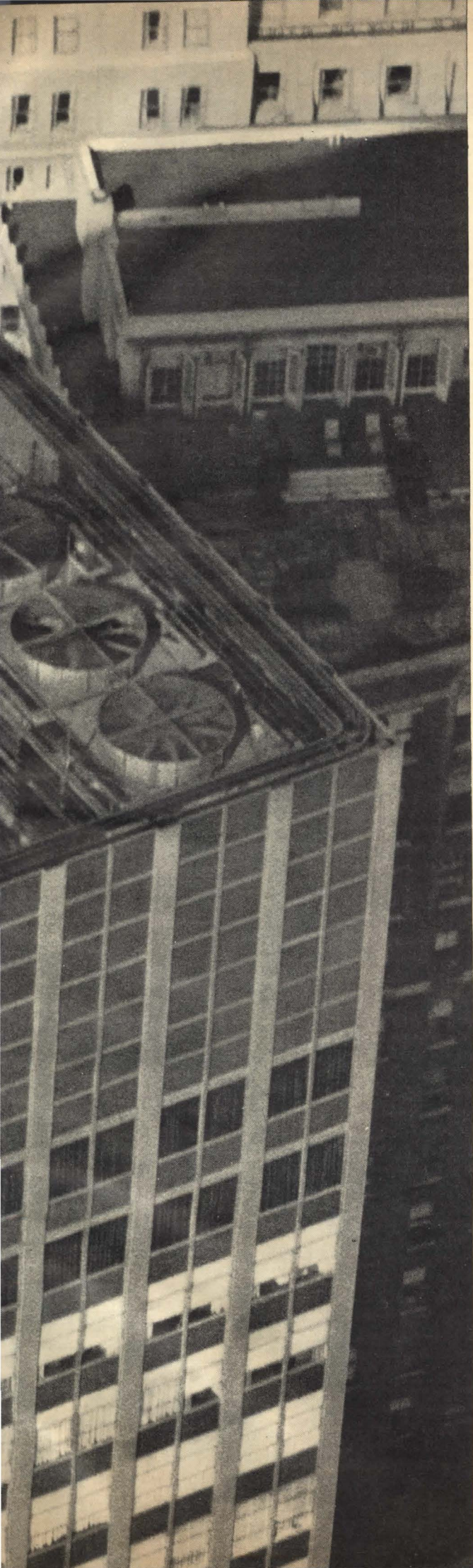




A four-pipe system
isn't always the answer.

There could have been a profitable pool or penthouse on this roof.

And a garage instead of a boiler in the basement.

If only someone had specified a General Electric Zonal System.

GE Zoneline units could heat and cool the outside rooms.

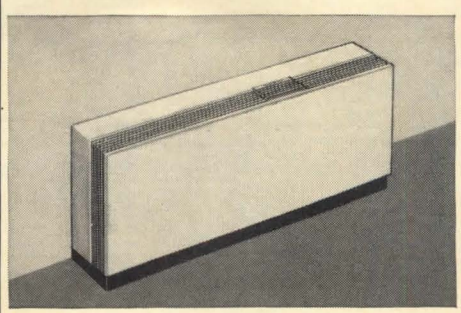
GE unitary units could heat and cool the inside, public rooms.

No rooftop cooling towers. No basement boilers. A significant increase in usable, rentable space.

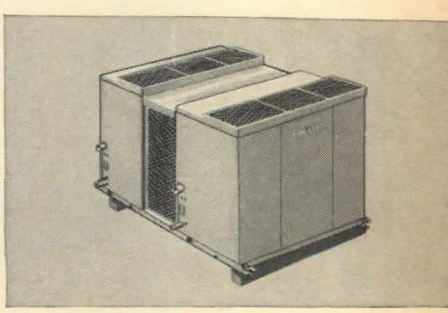
Other advantages over four-pipe systems:

- Big first-cost savings.
- Lower maintenance costs.
- Lower heating/cooling costs in unoccupied rooms.
- A breakdown doesn't affect the entire system.

From motels to high-rise construction, a General Electric Zonal System can save you space and money. For full specs, call your General Electric representative. Or write AP6-208, General Electric Company, Louisville, Kentucky 40225.



GE Zoneline heating/cooling unit. Room-by-room control. Choice of grilles. Fits over doors or under window seats. Through-the-wall or floor-mounted consoles.



GE Unitary systems—A full line from 2-20 tons, split, self-contained, with various heating means including GE famous Hi-Reliability Weathertron® heat pumps.

Air Conditioning Department, Appliance Park, Louisville, Kentucky

GENERAL ELECTRIC

On Readers' Service Card, Circle No. 444

wind up in virtual bidding for A–E services.

In brief, after a lengthy study and much soul-searching, GAO reported to Congress that:

☐ A–E fees, limited to 6% of construction costs since 1939, are too low, should either be raised or the limitation eliminated.

☐ Provisions of at least five existing laws require negotiations with prospective A–E's on a basis of more than competence — price should be included. And if this requirement were enforced, then the fee situation would take care of itself.

☐ But — and this is the big item for architects and engineers — Congress has never made its intent very clear. Thus, until the legislators clarify the matter, Federal agencies should be permitted to continue present practices (which, GAO found, usually result in A–E's fees in excess of 6%, since the agencies have interpreted the limitation to apply only to services concerned with producing plans and specifications, and, in general, have allowed other costs such as travel, supervision and the like as "extras").

GAO's lengthy report was obviously the opening round in the upcoming debate, and the opinions, it should be noted, carry much weight with Congress, since the agency is a Congressional — not an Executive — arm.

For this reason, GAO comments on fees and negotiation are worth reading in detail:

"The requirements [of Public Law 87–653] are that, in all negotiated procurements in excess of $2500, proposals be solicited from the maximum number of qualified sources . . . and that discussions be conducted with all responsible offerors whose proposals are within a competitive range, price and other factors considered. . . . Most of the . . . agencies . . . generally solicit a proposal only from the A–E firm selected on the basis of technical ability. In our opinion, this . . . does not comply with the statutory requirement.

"Agencies have advised us that they are opposed to the concept of soliciting multiple competitive proposals. . . . Representatives of A–E professional societies have advised us of their belief that the legislative history . . . constitutes substantial ground for concluding that the competitive negotiation requirements . . . were not intended to apply to A–E services.

"We find no present statutory basis that would exempt A–E contracts from these requirements . . .

"Recognizing . . . that the problem . . . is a complex one, we have advised the agencies that present procedures may be followed until Congress has had an opportunity to consider the matter."

As to fees, the fiscal watchdog agency stated: "The present statutory fee limitation is impractical and unsound, and we are recommending that the Congress repeal [it]." Elsewhere in the report, GAO cited the argument presented by the AIA and other groups: that basing the fee on ultimate construction costs often has little relation to actual amount of A–E work involved; that the 6% limitation may have been equitable in 1939 but is certainly not so at this time.

"It is the position of this office," concluded GAO, "that consultant . . . fees should be based on the estimated value of the services to be rendered. . . . The requirement for submission of . . . cost and pricing data by A–E firms implicitly calls for negotiation of fees in terms of estimated value. . . . This same concept is the underlying principle of negotiated contracting and should be followed in the negotiation of all contracts for A–E services which are subject to the competitive negotiation requirements."

With the report in hand, professional societies consulted among themselves early in May to decide on a probably concerted course of action to take before Congress.

Sniping at the Capitol Architect — The ever current — and currently hotter — debate over what to do about the U.S. Capitol has now produced a string of bills aimed at clipping the reconstruction wings of Capitol Architect J. George Stewart. It also produced one relatively spirited defense.

On the "clipping" side were a Senate measure (S. 1590) providing that no work involving altering the proportions, changes in the size, or modifications to the Capitol without specific legislative authorization, and establishing a 17-member "Capitol Building Commission" to study present and future needs of the whole Capitol Hill area; another (S. 1582) was the Federal Fine Arts and Architecture Act (a companion House bill is HR 8991), which is to "foster high standards of architectural excellence in the design of Federal buildings and post offices." "Sadly," said Maine's Senator Edmund Muskie, "Federal buildings outside the District of Columbia are unimaginative, mediocre structures which have been built to last — but not to add aesthetic beauty to their surroundings. . . . Many Federal buildings throughout the United States stand as monuments to bad taste."

A 12-member commission composed of "distinguished architects from private life" and others would advise the General Services Administration on art and architecture. Implied also was advice on the Capitol.

Leaping to the defense of the often-criticized Stewart was Rep. Arnold Olsen (D. Montana). He took the House floor to make a point-by-point refutation of criticisms in magazine articles and elsewhere of the architecture on "the hill." His main point: whether the Capitol ought to "be a museum — some kind of a library for people to browse in — or whether it is an active institution, a functioning place, and whether we should do something to make it a better functioning place."

Tidbits — Other Washington developments of concern to architects include these:

☐ Congress was having some serious second-thoughts about the hastily-passed, $350 million (it was thought) highway "beautification" legislation. Sober evaluation now placed costs of removing billboards alone at more than $1 billion; many states were saying they'd rather take the penalty (loss of 10% of Federal-aid money) than get involved in such an expensive program. Chances were good that the legislation would be rewritten.

☐ Internal Revenue Service dealt a severe — but long expected — blow to professional societies that publish advertising-carrying journals. Said IRS: Such journals must pay taxes on advertising revenues, no matter how revenues may be siphoned off into other society activities.

☐ The annual meeting of the National Academy of Sciences got a series of gentle rebukes because it wasn't backing enough urban rehabilitation work, wasn't bringing urban residents into planning.

☐ Federal Aviation Agency issued a new five-year National Airport Plan, calling for 729 new facilities, to cost $1,500,000,000.

☐ The Consulting Engineers Council — in testimony on the Intergovernmental Cooperation Act — called for establishment of "talent banks" of experts from the professions, to be tapped for solutions of the problems of urban areas.

☐ Republican-sponsored National Home Ownership Foundation Act (HR 8820 and S.1592) was getting serious attention in Congress — so serious that the Johnson Administration felt it necessary to open an attack on the proposal. Key idea: self-help, private corporations to help low-income families own their own homes.

Financial — Construction costs have started to inch upward again, after a brief, and apparently not significant, drop in the last quarter of 1966. For the first quarter of 1967, the Bureau of Public Roads cost index rose 0.4%, to reach 113.2 (1957–59 is base period). That was only 2.4% below the all-time high, in the third quarter of 1966.

☐ Construction activity slowed in March, too, according to the Census Bureau. With an estimated $5,700,000,000 of construction put in place in the month, the figure was 8% below a year ago.

☐ Big factor in the slowdown, as usual, was housing, which showed an adjusted annual rate of 1,200,000 units in March — up from February's 1,150,000, but down from last year's 1,570,000.

☐ Nevertheless, taxpayers were still supporting public construction work with enthusiasm. In March, said the Investment Bankers Assn., voters approved a total of $347 million of new bonds, turned down only $171 million worth.

The ceiling for conditions that usually wreck ceilings

Armstrong Ceramaguard™

Meet the tough one. The ceiling that does a bang-up job under conditions that put conventional acoustical materials right out of business.

Much of the story comes from Ceramaguard's ability to shrug off the effects of moisture. Even saturated, this fabricated ceramic acoustical material retains all its rigidity and span strength. Consequently, it can be installed when buildings haven't been closed in and where wet work still continues. Ceramaguard also shrugs off freeze-thaw cycles, so it does a fine job on outside applications.

Even the chlorine-heavy atmosphere of an enclosed swimming pool doesn't present a problem. Neither does repeated scrubbing.

But the tough one offers a good deal more than durability. It provides excellent acoustical control and high light reflectance, plus rated fire retardancy.

Briefly, when the job calls for something special, a Ceramaguard ceiling delivers. For more information, write Armstrong, 4206 Watson Street, Lancaster, Pennsylvania 17604. Or on Readers' Service Card circle No. 300.

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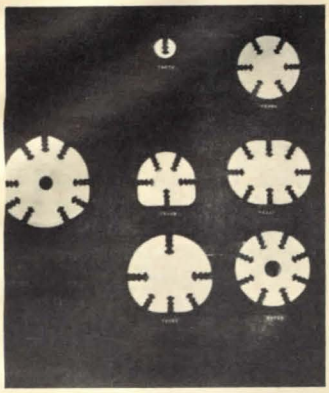
PRODUCTS

FRAMING SPACE



The key to advance in the industrialization of space framing lies in the development of a standard connector. Over the past 10 or 15 years, Canada's Triodetic Structures Ltd. has standardized a number of connectors that adapt their frames to a host of structural geometric shapes (see photo). This hub and tube system is now available to the U.S. designer through Butler Manufacturing Company, recently granted the franchise in this country.

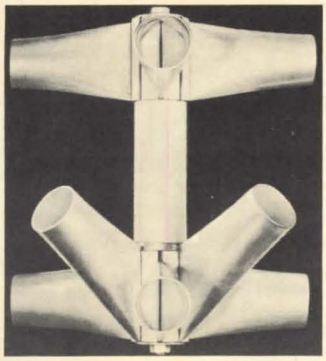
The system, which will be manufactured in both steel and aluminum, comprises the hubs and structural tubes. The serrated ends of the tubular members are matched to grooved keyways running the full length of the hub. Tube diameters may vary but wall thicknesses should remain constant.

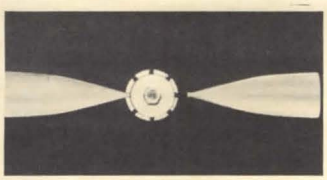
Structural members are quickly tapped into the connector with conventional tools (see photo), and may be inserted at varying angles to create a three-dimensional latticework.

Unused keyways, or those only partially filled by a small-diameter structural tube, are closed by special inserts; hub ends are capped by washers and a single high-strength bolt. Welding is eliminated and bolting kept to a minimum.

Components, shipped to the job site in coded bundles, are marked for their place in the structure. Sections may be assembled on the ground and crane-lifted into place, or workmen may build onto the frame in place. Flexible ducting and wiring is run through and fastened to the structural web.

Space framers are getting a big boost at Expo 67 where three-dimensional



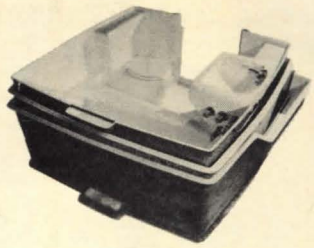


framing is being used for a number of structures — the most impressive being the U.S. Pavilion designed by this country's granddaddy of the space frame, Buckminster Fuller. Triodetic structures at Expo include the main entrance to the fair and the Netherlands Pavilion.

Butler is offering initially several packaged domes and three standard connectors, with plans for possible future expansion. However, the simplicity of the system will make it economically feasible to fabricate special hubs for large projects where necessary. The company's engineers will work with designers in preparing computer programs for structural analyses. Butler Manufacturing Co., 7400 E. 13 St., Kansas City, Mo. 64126.

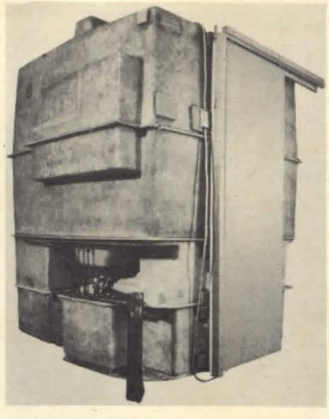
Circle 100, Readers' Service Card

MOLDED BATHROOMS



Long the talk of architects, industrial designers, and the building industry in general, the molded plastic bathroom is now in the realm of mass-produced reality. The fiberglass-reinforced unit, manufactured by the Canadian firm that supplied the molds for Habitat's bathrooms at Expo 67 (see p. 226, OCTOBER 1966 P/A), can be purchased for about $475 f.o.b. the factory in Toronto.

It is a pleasant white room with molded bathtub, lavatory, medicine cabinet, toilet, floor, walls, and ceiling. The floor plan is 5′-6″ square, inside dimensions, with a 7′ ceiling. Surfaces are impact- and mar-resistant, and colors will be available. The manufacturer is now at work developing several variations on the basic unit shown here. They include a toilet/washbasin combination equipped with a floor drain so that it can be used as a shower, and a shower/toilet/washbasin unit.



"Bathunit 300" is preplumbed, pre-wired, and prefabricated in four stackable sections. When stacked, it measures 6′-6″ x 6′ x 3′, and weighs 350 lb. Sections are sealed with a silicone calking compound (or equal), and two men can install the unit in 1½ hrs, reports manufacturer. Reff Plastics Ltd., 91 Milvan Dr., Weston (Toronto), Canada.

Circle 102, Readers' Service Card

AIR/TEMPERATURE

Clean air. Electrostatic air cleaner with activated charcoal odor removal unit is available in three sizes (handling from 400–2400 cfm) for ducted heating and cooling systems. Unit consists of mechanical pre-filter, transformer, electrostatically charged ionizing section, collecting section, and columns of activated charcoal. The 95% efficiency of two throw-away dust filters is said to drop only 5% when they are dirty. Control unit includes an indicator that shows when unit needs servicing: This 5–10 min operation consists of replacing the disposable filters and refilling charcoal columns. The Trane Co., La Crosse, Wis. 54601.

Circle 103, Readers' Service Card

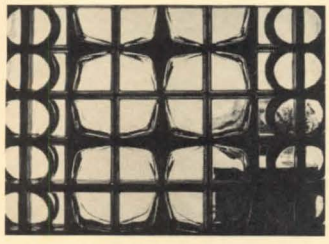
CONSTRUCTION

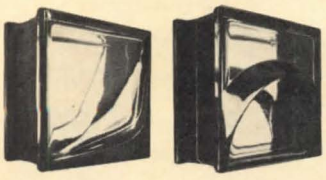
The big roof. "Zip-Rib" roofing panels are 12″ wide and available in "any ridge-to-eave length." Lightweight aluminum panels are installed without end or side laps, and without making holes in the surface. High-standing seams are "zipped" together with an electric hand tool that seals anchor clips (fastening panels to purlins) in the seams and also locks adjacent panels together. There are no through or exposed fasteners, and the resultant one-piece roof is capable of providing long unsupported spans. Installation is fast, durable, watertight. System includes all necessary accessory hardware. Kaiser Aluminum & Chemical Sales, Inc., 300 Lakeside Dr., Oakland, Calif. 94604.

Circle 104, Readers' Service Card

Electro-lamination makes wood stronger than steel. Over specific spans, electro-laminated beams of redwood,

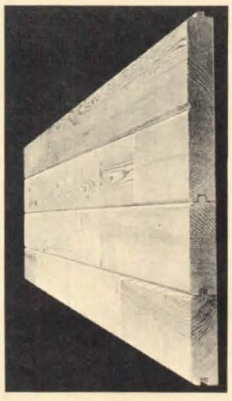
Douglas fir, and Southern pine, are stronger, pound for pound, than similar beams of steel, claims manufacturer, who also states that the beams will neither oxidize nor buckle and twist when heat is applied. "Electro-Lam" beams are available in lengths up to 48′ in various cross sections. Potlatch Forests, Inc., Wood Products Div., 320 Market St., San Francisco, California 94111.
Circle 105, Readers' Service Card



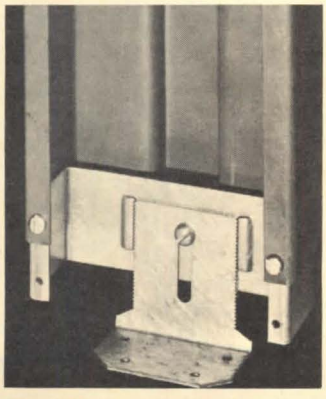


Patterns in glass. Raised surface patterns with a fired-on black ceramic create a new look in clear glass block — breaking up the traditional square grid, especially when laid with black mortar, which blends with black ceramic parts of the block. Designed by Peter Muller-Munk Associates (Donald H. Behnk, chief designer on the project), the two basic blocks — one with a raised semi-circle, the other with a raised, sharply angled crescent — can be combined in many different ways for either interior partitions or exterior walls. The two "Cameo" designs are available in 8″x8″x 4″ hollow blocks that offer good temperature and sound insulation. Top photo shows two possible combinations, and indicates light transmittance and slight distortions caused by the blocks; below are individual blocks. Pittsburgh Corning Corp., One Gateway Center, Pittsburgh, Pa. 15222.
Circle 106, Readers' Service Card

Metal/paper flashing. A thin copper membrane (1, 2, or 3 oz), asphalt-bonded to creped kraft, makes a tough, highly flexible and economical flashing material. "Copper Armored Sisalkraft" is suitable for concealed flashing of spandrel beams, parapet walls, door and window heads. Samples available. Sisalkraft, 75 Starkey Ave., Attleboro, Mass. 02303.
Circle 107, Readers' Service Card



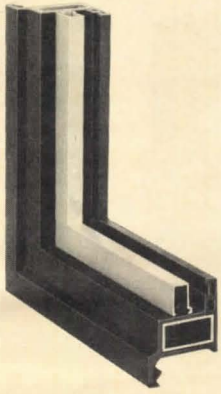
Tongue-and-groove. Decking of 2 x 6 lumber is assembled into 21″-wide panels that can be cut to specifications in increments of 1/16″, up to 24′ long. The joints between individual planks are accented by V-grooves on the exposed face; panels are held together by heavy kraft paper glued to the reverse side. "Bond-Deck" is available in several grades of white fir, including Premium and Industrial; smooth or sawn face; suitable for roofing or subflooring; redwood and cedar also available. Tarter, Webster & Johnson Div., American Forest Products Corp., P.O. Box 3498, San Francisco, Calif. 94119.
Circle 108, Readers' Service Card



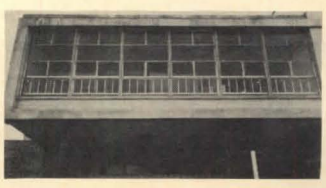
Floor-door problems? Adjustable door-frame anchor compensates for uneven floors with a two-piece channel and angle unit that adjusts in 1/16″ increments within a 2″ range, thus eliminating the need for shims. Designed for the installation of steel door frames, the anchor can be fastened to any type of subfloor or finished floor, says manufacturer. The Ceco Corp., 5601 W. 26 St., Chicago, Ill. 60650.
Circle 109, Readers' Service Card

Cover moves with floor. Expansion joint cover provides adjustment for movement of the joint up to 1″ horizontally and 3/8″ vertically. Roller nut and spring clip secure the cover plate, but allow it to pivot with up and down movement. Gasketing filler strips are keylocked under compression so as not to pop out. Available in aluminum or bronze with several surface finishes. Construction Specialties, Inc., Center Street, Williamsport, Pa. 17701.
Circle 110, Readers' Service Card

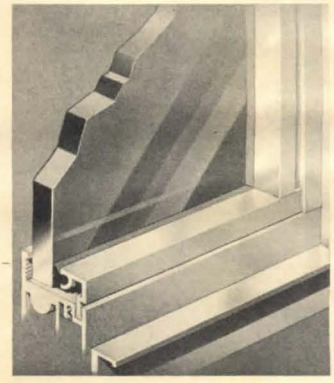
DOORS/WINDOWS



PVC and steel. Windows with a steel core for strength are completely encased by semi-rigid polyvinyl chloride extruded shapes for protection against weather, air pollutants, etc. "Compro PVC Windows" have been tested from –40F to 230F. Fire resistance is rated as "self-extinguishing." Available in 8 standard colors, including blue, red, and a bright yellow. Compro Corp., 10 Dunnell Lane, Pawtucket, R.I.
Circle 111, Readers' Service Card



Tough glazing foils vandals. Clear sheets of "Lexan" plastic are said to be tough enough to resist the rock bombardment that makes glass replacement such a costly problem in schools. The polycarbonate thermoplastic resin resists breakage where acrylics fail, claims manufacturer. Photos show "before and after" results of experiment with "Lexan" glazing. General Electric, Chemical Materials Dept., Pittsfield, Mass.
Circle 112, Readers' Service Card



Plumb true. Sliding windows of tubular metal construction are designed for minimum deflection and plumb installation. Windows are weatherproofed; and metal roller bearings in nylon housing deaden sound. Amarlite Div., Anaconda Aluminum Co., P.O. Box 1719, Atlanta, Ga. 30301.
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FLOORING

Walking Happy. Woven glass fiber, covered by a layer of inlaid vinyl and backed with air-tight vinyl foam, comprises Walk-Ease flooring. The resiliency of the glass fiber causes the floor to spring back even after indentation by stiletto heels and heavy furniture. The thick foam (1/8″) insulates the floor and makes for comfortable walking. Flooring requires no waxing unless higher gloss than its natural satin finish is desired. Two patterns are available: "Encanto," marbleized vinyl chips suspended in clear vinyl, and "Facile," small vinyl stones sealed in clear vinyl.

TRAFALGER EAST, Greenwich, R.I.;
by Louis A. Regnier Associates.

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(NOW AVAILABLE COAST-TO-COAST)

offers more than any other Underlayment!

It's the combination of built-in values that makes Homasote Underlayments the practical specification for so many floor systems. Weatherproof insulation, for constant protection against the penetration of cold and dampness, is one value. Sound-deadening characteristics and cushioned resiliency for walking comfort (even over above-grade concrete) are others. They're also resistant to termites, rot, and fungi. And exceptionally easy to apply—with precision fit—using either adhesive or nails. (Carpeting and pad, or parquet flooring, may be applied directly to the underlayment by conventional methods.)

Homasote Underlayments are available at lumber dealers coast-to-coast in conveniently sized 4′ x 4′ panels of 3/8″, 15/32″, and 5/8″ thicknesses. Complete details in Building Product Selector Sheet 6-048.

Write Dept. F-2

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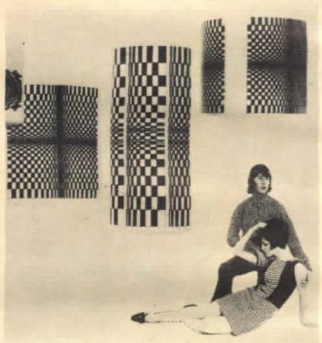
6-394

The Flintkote Co., 201 E. 42 St., New York, N.Y. 10017.
Circle 114, Readers' Service Card

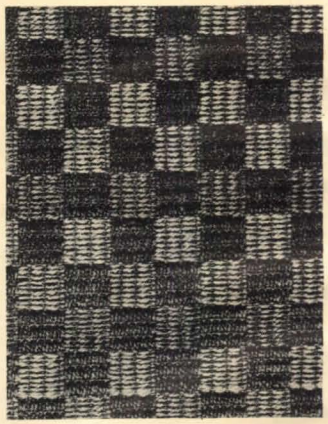
FURNISHINGS

A first for Girard. Furniture custom-designed by Alexander Girard for Braniff International's splashy spruce-up campaign is now being manufactured on a production basis — Girard's first furniture available to the general public. Chairs and sofas are of double-shell construction — two molded plywood shells with a separating vinyl welt. Inner and outer shells, as well as seat cuhsions, can be covered with a variety of matching or contrasting fabrics or naugahydes. The vinyl welt is available in three colors. Furniture is deep-seated and low-backed, supported on cast chrome steel and polished aluminum legs. The group of some 25 chairs, sofas, ottomans, and tables offers a wide choice of fabrics, leg heights, tabletop materials, and sizes. Suitable for residential as well as public areas. Herman Miller Inc., Zeeland, Mich.
Circle 115, Readers' Service Card

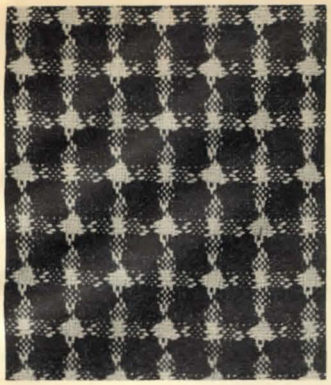
Tables for smokers. "Arbatove" wooden tables resist burns from dropped cigarettes or misplaced hot plates and are said to be impervious to spilled liquor. Secret is a special aluminum layer laminated beneath protective coated wood veneer. Three-leaf folder with black-and-white photos show the six tops available: three squares (24", 26", 30"); two rectangles (30" x 20", 48" x 20"); and one circle (36" dia.). All tables come in heights of 14", 16", 20", or 22". Finishes are either oiled or lacquered hand-rubbed walnut or teak. Springer-Penguin, Inc., 5A Brookdale Place, Mt. Vernon, N.Y. 10550.
Circle 116, Readers' Service Card



Light op the scene. Around the hip pad, you might hang in with one of four white satin glass cylinders embellished by fired-on black, eye-boggling designs. Not shown: black sphere with white polka dots. Koch & Lowy, Inc., 940 Third Ave., New York, N.Y. 10022.
Circle 117, Readers' Service Card

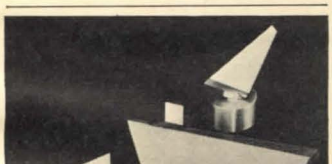


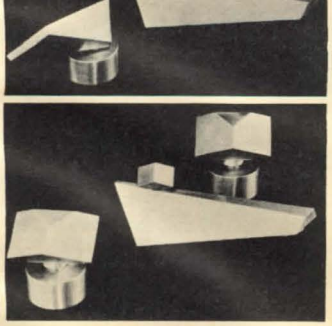
Colorful fabrics from England. Four fabrics from Arthur H. Lee & Sons are the beginning of a new line of contract fabrics woven in England for architectural use. The four include "Rib Cloth," which alternates narrow and wide horizontal ribs and is suitable for upholstery, bedspreads, or draperies. It is 100% mercerized cotton and comes in 15 colors. Also featured is "Basket Weave" of



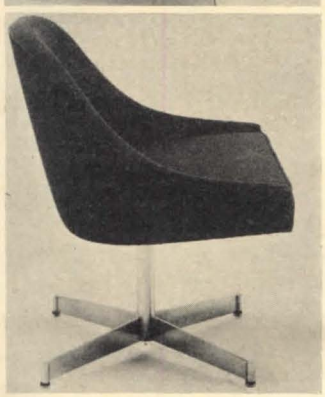
100% wool in 14 shades. Both the former are 54″ wide. Two colorful patterned fabrics, both 51″ west, complete the group. "Diamond Square" (pictured), a small diamond all-cotton check using three colors, comes in 12 imaginative color combinations. "Checkers Cloth" (pictured) is a five-color wool and nylon interwoven check that comes in 9 colorways. Arthur H. Lee & Sons, Inc., 227 E. 56 St., New York, N.Y. 10022.
Circle 118, Readers' Service Card

The natural look. Undyed yarns of virgin wool in seven shades from cream to charcoal can be mixed or matched in attractive, custom-fabricated contract carpeting. The looped cut-pile carpets are seamless and limited in size only by practical considerations of handling and installation. The largest to date is 50′ x 110′. Prices range from $15 to $40 per sq yd. Rugcrofters Inc., 295 Fifth Ave., New York, N.Y. 10016.
Circle 119, Readers' Service Card





Free-form Faucets. Hand-carved, multifaceted bathroom faucets are designed to fill a need in custom-built contemporary houses, where more traditional hardware would be out of place. Sets include one faucet with a choice of two kinds of angular handles: a knob ("Tangents") or a lever ("Dimensions"). In brushed chrome, pewter finish or 24-carat goldplate, sets are intended to resemble Brancusi sculptured forms. Sherle Wagner, Inc., 125 E. 57 St., New York, N.Y. 10022.
Circle 120, Readers' Service Card

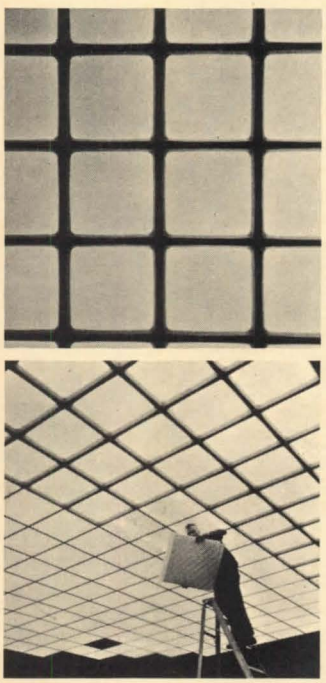


Chair by William Armbruster has a seat designed to fit a variety of bases — swivel or stationary. Foam rubber, with cotton edges for rounded effect, cushions the wood-frame seat. Any specified upholstery available. Legs are wood or of polished chrome-plated steel. Pedestal bases are available, stationary or swivel, with or without spring-back mechanisms and with or without tilting mechanisms. Seats are 18″ high, but can be raised or lowered. Edgewood, 208 E. 52nd St., New York 22, N.Y.

Pick a plastic. Eight patterns recently introduced by the manufacturer to their wood grain series include oaks, walnuts, cherry, and a "Mediterranean Pecan" of blue-gray-green cast. Additions have also been made to the patterned and solid-color laminates. Plastics are suitable for counters, doors, walls and other

nonwalking surfaces. Available in thicknesses of 1/16" or 1/32" in three finishes: low light reflectance, medium gloss, and a grained texture. "Wall 'n Corner" panel system features decorative or concealed spline treatment for joints and preassembled one-piece outside corner units. Consoweld Corp., 700 Hooker St., Wisconsin Rapids, Wis. 54494.
Circle 121, Readers' Service Card

LIGHTING

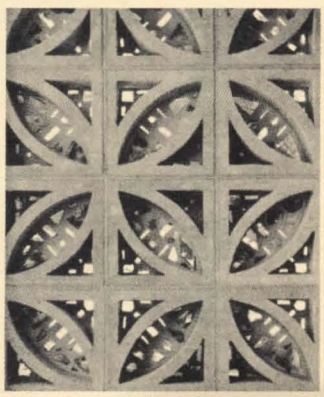


The ceiling grid. Drop-in panels for luminous ceilings eliminate hot spots caused by show-through of fluorescent tubes, and lend a more substantial and less regimented look to the T-bar grid. A plastic frame or collar on each panel creates the three-dimensional appearance. Panels require no clips, since they are raised above the grid and lowered into position. Sonolux Co., 1250 17th St., San Francisco, Calif.
Circle 122, Readers' Service Card

SERVICES

Mosaic craftsmen. Artists and artisans design and construct Byzantine mosaics from special mosaic glasses fired in the company's workshop in Cuernavaca, Mexico. They also work with stone and marble, and report that their "work is guaranteed to meet the standards of any building code in the United States." The company (with offices in

Los Angeles and San Francisco) works with outside artists and designers, or assumes complete responsibility from design to completion. Shown above is mosaic on library in Stockton, Calif. Byzantine Mosaics, 1150 Sansome St., San Francisco, Calif. 94111.
Circle 123, Readers' Service Card



Open spaces closed by colored glass. Conrad Pickel has adapted the faceted-glass-in-epoxy technique (used mainly for church windows) to concrete screen block. Closing the open spaces in the decorative block with epoxy and bits of 1"-thick colored glass (chipped to enhance the sparkle) creates a unit that can be used for exterior walls. Sizes and prices run from 8" x 8" x 4" or 8" @ $6.75 per block to 16" x 16" x 4" @ $13. Studio also designs and executes stained-glass and faceted-glass windows, mosaics, and carvings, specializing in stained-glass windows based on traditional European techniques using hand-blown glass held in place with soft lead strips. Conrad Pickel Studio, 21415 W. Greenfield Ave., New Berlin, Wis.
Circle 124, Readers' Service Card

SPECIAL EQUIPMENT

Moving pedestrians. A spring steel belt bonded to a grooved rubber pad moves people either horizontally or on an incline. The heavy gage, one-piece endless steel belt provides a smooth ride, while the narrow-groove pad is designed with women's heels in mind. "Movator" installations include a 700'-long moving walkway from a shopping to a parking area, and a between-floor ramp allowing shoppers to take carts from floor to floor. Sandvik Steel, Inc., Movator Div., 1702 Nevins Rd., Fair Lawn, N.J. 07410.
Circle 125, Readers' Service Card

One-Piece Bathrooms? "Archon," a mixture of fiber glass, plastic resins, and mineral fillers, permits designers of bathrooms to have all components (including floors and tub wall) of one material, and even two components in one (viz., floor and toilet base). Cast as units, Archon components eliminate joints and crevices; sinks with vanity tops are one-piece with no seams around the basin. Standard Archon colors range from five pastel shades to five marble grains, with three accent tones. Many fixture styles are available, including oval, round, or shell vanity basins, and oval and Roman bath tubs. Associated Design Group, P.O. Box 8106, 1460 Foothill Drive, Salt Lake City, Utah 84108.
Circle 126, Readers' Service Card

SURFACING

Carpet for Sun and Shade. An addition to the indoor-outdoor carpeting family is Orcco's line of 100% Herculon polypropylene olefin carpet. Smooth or embossed "Sun & Shade" can be cleaned either by vacuum or hose, and is said to resist fading, stains, rot, mildew, fungi, and moth damage. Sun &

Shade requires no cementing or attaching, although double-face tape is recommended for outdoor installations. Embossed patterns, in 12 colors, are "CarvTone," a random stone design (pictured), and "La Costa," an ornamental Spanish tile. Carpet comes in 9' and 12' widths in addition to rug sizes. Orcco Industries, Inc., Sun & Shade Div., 4903 Everett Ave., Los Angeles, Calif. 90058.
Circle 127, Readers' Service Card

Single needle carpets. A tufting loom that utilizes a single electronically controlled needle makes random-textured loop carpeting that could previously be made only by hand. Loops are backed with sateen jute sealed with latex. Included in attractive booklet are details on carpeting fibers (Far Eastern wool exclusively), sizes (widths from 12' to 15'-6" in 6" gradations), colors (choice of thousands, all skein-dyed to avoid inconsistencies of piece-dying), and styles (more than 850 different qualities varying in height of pile, compactness, and yarn weights). Delivery and maintenance information and 8" x 5" sample. Sallee Carpet Looms, Inc., 2515 Main St., Santa Monica, Calif.
Circle 128, Readers' Service Card

Stop gambling on the roof

Pittsburgh Corning, the insulation people, make the only insulation guaranteed to keep its insulating value for 20 years—waterproof FOAMGLAS®

Although unseen, insulation is the most important element in a waterproof roof. To provide a solid base for built-up roofing, it must have high compressive strength. To prevent wrinkles and splits, it must be dimensionally stable. Otherwise, your client can face expensive reroofing a few scant years after the original job.

You can protect your client by specifying FOAMGLAS®-BOARD, the cellular glass insulation. It's strong, stable and waterproof because it's formed of millions of completely closed glass cells. In fact, only FOAMGLAS insulation carries a 20-year guarantee that it will not absorb moisture but will retain full insulating value, compressive strength and incombustibility.

Get the details on FOAMGLAS-BOARD. Write Pittsburgh Corning Corporation, Dept. PP-67, One Gateway Center, Pittsburgh, Pennsylvania 15222. In Western Europe, FOAMGLAS® cellular glass insulation is manufactured and sold by Pittsburgh Corning de Belgique, S.A., Brussels.

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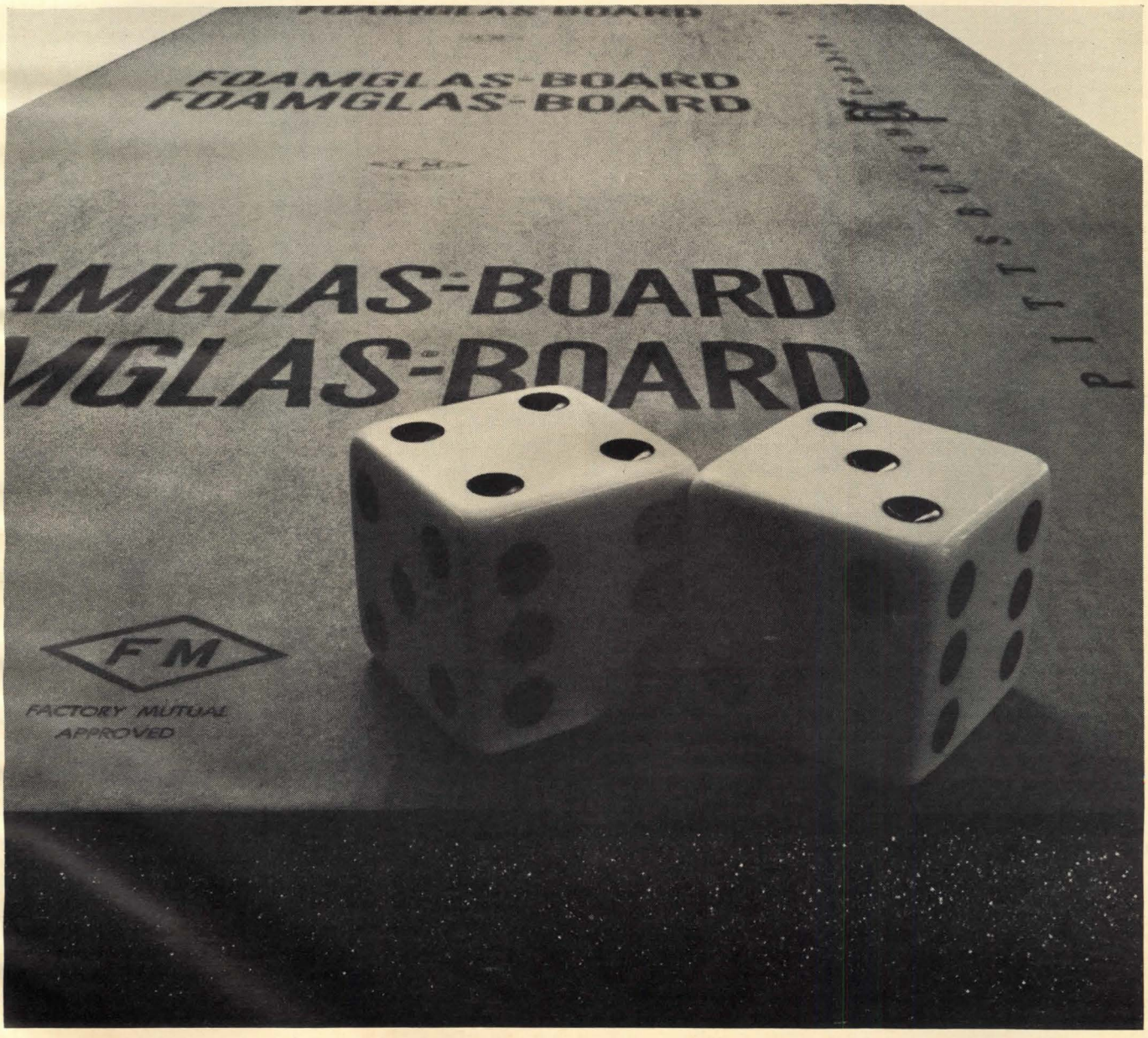


On Readers' Service Card, Circle No. 388

MFRS' DATA

AIR/TEMPERATURE

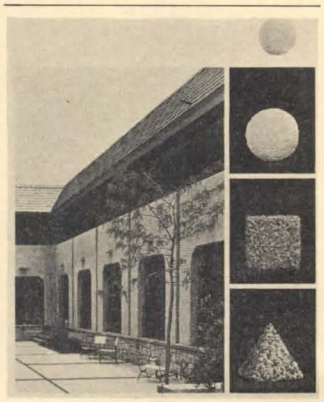
On air. Brief descriptions of manufacturer's rooftop make-up air equipment, central station multizone units, heaters, and air-conditioning units for industrial applications are contained in bulletin with photos. 4 pages. Mammoth Industries, Inc., 13120-B County Rd. 6, Minneapolis, Minn. 55427.
Circle 200, Readers' Service Card

Heat from lights. Systems for extracting heat from lighting fixtures, to be used or exhausted depending on the weather, are covered in a general discussion of what the systems are, what they do, the economic advantages, and the combining of heating, lighting, air conditioning, and ventilating into one integrated system. Diagrams, text, and a description of manufacturer's two air-handling/heat removal troffers are included, plus a two-page bibliography of pertinent literature. 16 pages. Sylvania Electric Products Inc., 60 Boston St., Salem, Mass. 01970.
Circle 201, Readers' Service Card

The fair draft. Products for controlling drafts in fireplaces, heaters, furnaces, rooftop units, flues, and chimneys for residential and industrial application are cataloged and rated in capacity and performance charts in a folder including diagrams and photos. 4 pages. Walker Mfg. and Sales Corp., St. Joseph, Mo. 64502.
Circle 202, Readers' Service Card

CONSTRUCTION

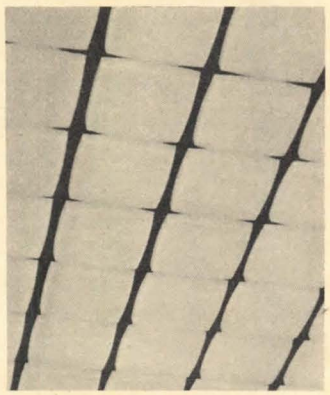
"Circular Steel Framing for Highrise Buildings" provides both general and specific information on circular and polygonal buildings. Framing and bracing schemes are discussed, and design procedure outlined. A detailed wind analysis covers axial forces in columns, girder shears and moments, deflection, transition stories, and buildings with multiple rings of columns, among others. Part II is an 11-page design example setting forth the calculations and formulae used in designing a 25-story octagonal apartment building. Discussion of model tests, tables, bibliography, etc. 34 pages. United States Steel Corp., Rm. 4457, 525 William Penn Place, Pittsburgh, Pa. 15230.



Aggregate "glue." Epoxy-based matrix will bond lightweight exposed aggregate to concrete, concrete block, plywood, and wallboard. "Tuff-Lite" is troweled on and then seeded with aggregate. Description of properties, brief specs, construction details, photos of installations. 4 pages. H.B. Fuller Co., 1150 Eustis St., St. Paul, Minn. 55108.
Circle 203, Readers' Service Card

Glass block mortar. Tips and recommendations for mortar ingredients used in laying glass block are set out in data sheet. 2 pages. Glass Block Institute, One Gateway Center, Pittsburgh, Pa. 15222.
Circle 204, Readers' Service Card

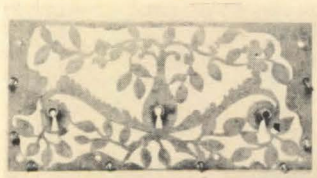
Stone. Limestone quarried in Wisconsin is available in various face textures and colors. Stone is sawed or hand hewn in bed, seam, split, and rock faces. Brochure describes different types of stone, physical properties, sizes. Color photos. 6 pages. Halquist Stone Co., Sussex, Wis. 53089.
Circle 205, Readers' Service Card

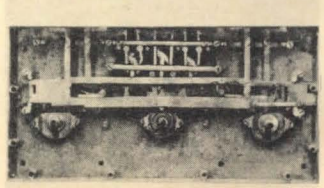


On the ceiling. A wide variety of ceiling tiles, accessories, and lighting fixtures for acoustical, suspension, and ventilating ceilings are extensively cataloged in booklet that gives physical properties, sizes, colors, acoustic and fire ratings, light reflectance, and other technical data, photos, patterns, drawings, louvers, lenses, metal grids, plastic panels, etc. 56 pages. Wood Conversion Co., Conwed Products, 332 Minnesota St., St. Paul, Minn. 55101.
Circle 206, Readers' Service Card

The light aggregate. Expanded perlite for use as an aggregate in insulating concrete and plaster, and as a water-resistant, insulating fill for masonry walls is described in pamphlet with charts and tables giving physical properties, insulation values, and specifications data. 8 pages. Grefco, Inc., 630 Shatto Place, Los Angeles, Calif.
Circle 207, Readers' Service Card

DOORS/WINDOWS





Lock and key history. An interesting and well-designed booklet tells the story of the key as a symbol of power and traces the development of mechanical locks from 2000 B.C. through the Chinese, Egyptians, and Romans to the invention of the pin-tumbler cylinder lock by Linus Yale, Jr. Examples from the past and present include designs by Fernand Léger and Isamu Noguchi. A catalog of the extensive Yale Lock Collection concludes the booklet. Illustration above is an 18th-Century chest lock; face plate at top, and lock mechanism below. 35 pages. Yale Lock and Hardware Div., Eaton Yale & Towne Inc., 401 Theodore Fremd Ave., Rye, N. Y. 10580.
Circle 208, Readers' Service Card

FURNISHINGS

Lifetime kitchens. Designed for efficiency apartments or institutional lounge areas, Dwyer kitchens use a strong porcelain enamel finish that is "burned into steel." The porcelain units range in size and completeness for different uses: One model is the "Hospitality Center" (shown), disguised as a soda fountain or bar on one side and concealing a sink, refrigerator with freezer, and oven or cabinet. Booklet shows sketches and photos of all models and details features and optional modifications. Specifications and dimensions. 19 pages. Dwyer Products Corp., Michigan City, Ind.
Circle 209, Readers' Service Card

Woodworkings. Doors of many kinds (panel, sash, dutch, flush, folding cafe) and other wood products (stairways, entrances, china cabinets, mantels, gable units, shutters) are only part of the Morgan line. In addition, they offer an unlimited variety of stairways based on combinations of component parts. Included are designs for both

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1. **Stainless steel tip** (not brass). Won't bend or wear through.
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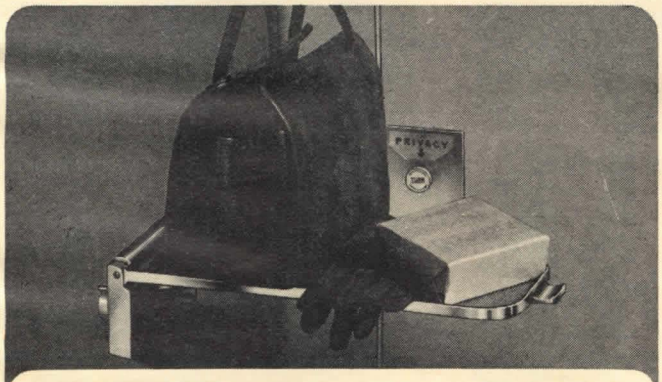
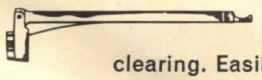


NEW... a handy PULLDOWN SHELF

for restroom booths



A safe place for purses, gloves, packages, hats, coats and briefcases. Sturdily built of Zamac. Attractive chrome and satin stipple finish. Self-clearing. Easily installed with just 2 bolts. A plus-factor in any building you design with public restroom facilities. Send for free specifications, price lists and installation instructions.

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On Readers' Service Card, Circle No. 365

traditional and contemporary settings, specifications and renderings for every model. Items are not exclusively for residential use; 16-page catalogue includes flush units for accordion doors up to any size, and fire and acoustical doors. Morgan Co., P.O. Box 530, Oshkosh, Wis. 54901.
Circle 210, Readers' Service Card

In suspension. A series of upholstered armchairs designed by Danish architect Kay Korbing have "floating" backs that are attached to the backs of the arms by two metal

bands. For use in offices, the chairs come in a number of widths, depths, and seat, arm, and back heights. Satin finished bases are aluminum for the swivel and/or tilt models and steel for stationary, four-legged models. Folder shows variations in style and size. Black and white photos. Specifications. JG Furniture Co., 160 E. 56th St., New York, N.Y. 10022.

Colors on the floor. "Select-O-Scope" device assists designers in arriving at a desired color pattern for the three-step elastomeric liquid resilient flooring — Poraflor. The flooring consists of a solid base coat over which color

flakes are sprinkled. When this flecked base has dried, clear protective topcoats are applied. The kit consists of 17 base-coat colors and 21 clear sheets containing flake designs in addition to 12 standard color combinations. Condensed architectural specifications. Poraflor, Inc., 25–29 50th St., Woodside, N.Y. 11377.
Circle 211, Readers' Service Card

A burning issue. Condon-King's catalogue shows three free-standing fireplaces. Pictured in room settings are both wood-burning and gas-fired models in a choice of bright porcelain, matte, and ceramic colors. The new "Aztec," shaped like a squatting Mexican totem, contrasts its ceramic fire-chamber with black spun-steel base and vertical flue. Both the familiar conical "Firehood" and the rectangular "Manchester-Pierce" can be vented through a roof or attached into a masonry chimney. Full-color. 4 pages. Condon-King Co., Inc., Lynwood, Wash. 98036.
Circle 212, Readers' Service Card

Furnishings directory. A portfolio prepared by the National Stationery and Office Equipment Association contains product information from 45 different office furnishings manufacturers and provides

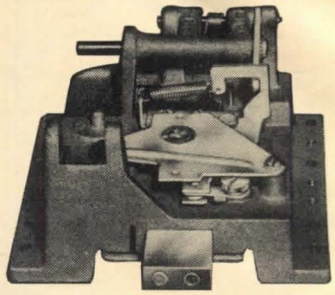
FINK DOME

A unique structure for architectural and industrial uses — designed to exacting tolerances, accommodating large vertical loads. Highly versatile as convention hall, arena, theatre, etc. Proposed dome shown is 900-ft. dia. at base and used as covering for existing ball park. For more information, forward to us the approximate size, required interior loads, together with details of application and surrounding terrain characteristics to:

General Conveyor Inc. of N. Calif., General Domes Div.
1821 Mt. Diablo Blvd., Walnut Creek, Calif. or Phone (415) 934-9121.

On Readers' Service Card, Circle No. 354

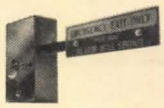
Detex has a lot of brass!



The lock body is the backbone of an exit control lock. And ours is made of solid brass; 4½ pounds of it.

You'd think every manufacturer would be so careful. But they aren't.

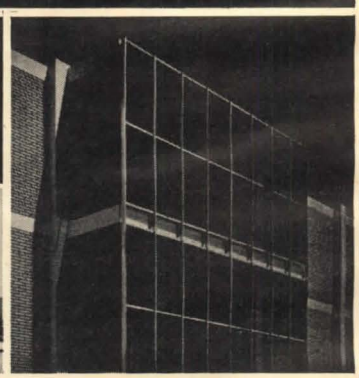
That all-brass lock body is just one of many points of superiority built into Detex Exit Control Locks. Others include high tamper resistance and the only full range of equipment which can be used with your own master key system or furnished with keyed-alike cylinders. For more information, write for a free catalog.



Detex Corporation
Dept. PG-6
53 Park Pl. New York N Y 10007

On Readers' Service Card, Circle No. 345

REINHOLD books



DESIGN WITH GLASS

Materials In Modern Architecture: Volume I

By John Peter

John Peter Associates, New York City

1965 160 pages $12.00

Design with Glass inaugurates Reinhold's "Materials in Modern Architecture" Series. The books in this series are planned specifically to demonstrate the design potentials of wood, steel, concrete, glass, plastics, and clay products in modern architecture. The aim of each volume is to give insight into the materials that lie behind the surface design. The series will provide in photographic reproduction the imaginative and inspirational uses of materials by the great modern masters from all over the world. In Volume One the author surveys the historical background as well as modern developments in the use of glass. An Introduction by Professor Albert G. H. Dietz of M.I.T., one of the nation's most widely-recognized experts in construction materials and their specifications, provides an authoritative technical briefing on the function of glass in architecture. The book contains 141 illustrations, including 72 half-tones, 69 architectural drawings.

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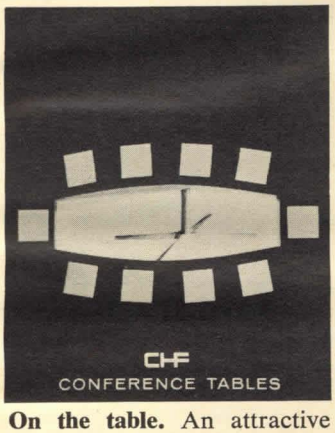
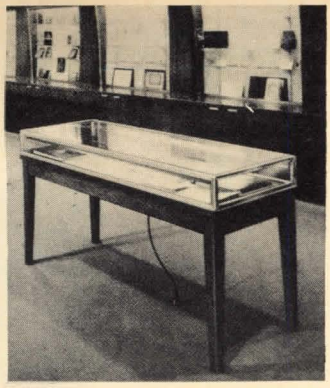
On Readers' Service Card, Circle No. 456

six convenient checklist postcards that may be sent away to obtain more details. "Showcase '67" has three groupings of office interiors: Office Furniture, Office Seating, and Walls and Accessories. Each company includes photos and brief descriptions of a specific line or model. Some of the firms represented are General Fireproofing Co., Knoll Associates, Inc., Myrtle Desk Co., and Royalmetal Corp. Black and white photos. Cost: $2.50. National Stationery and Office Equipment Association, 1143 Merchandise Mart, Chicago, Ill. 60654.



On the table. An attractive catalogue shows nine variations of CHF conference tables. Tops come in many shapes (rectangle, boat, round, oval, taper, hexagonal, octagonal); pedestal styles (single or twin) can be finished in solid cast bronze, cast aluminum, bright or satin aluminum, chrome, or porcelain. Top materials are plastic laminates, wood veneers, and a variety of table edges including a new extra-hard "Rock" edge. Specifications. Black-and-white photos. Chicago Hardware Foundry Co., North Chicago, Ill.
Circle 213, Readers' Service Card

Exhibit cases on exhibit. A substantial if somewhat traditional line of exhibit cases is described by the Michaels Art Bronze Company in "Time-Tight Exhibit Cases." Dust-sealed cases — table, aisle, wall, or recessed — virtually eliminate the need for cleaning the exhibit inside. Illustrated in various installations are both standard models and custom-designed cases. Catalogue includes exhibit lighting, protection features, typical room layouts, construction



details, and specifications. Black and white illustrations. 20 pages. The Michaels Art Bronze Co., P.O. Box 668, Covington, Ky.
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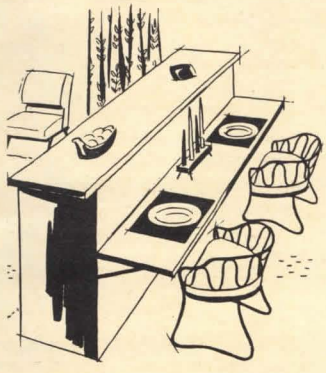

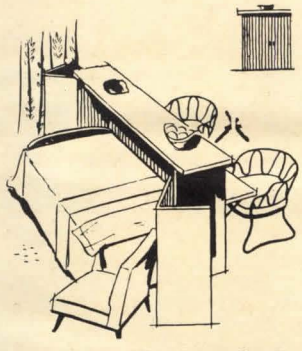

Foldaways. The Murphy Bed Company offers the Murphy Sidebed, which can be folded out of sight by tipping it onto its side against or into the wall. Ideal for space-saving, sidebeds (single or three-quarter size) can be camouflaged as room dividers, wall cabinets, and built-in bookcases. Brochure also illustrates ideas for concealing the standard Murphy Beds (both single and double) that fold heel over head into their compartments. 8 pages. Drawings. Specifications. Murphy Door Bed Co., Inc., 3 E. 44 St., New York, N.Y. 10017.
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Supplementary furniture. Lehigh's supplement to their 1965 office furniture cata-

logue shows sofas, benches, tables, and chairs. A sofa-table unit (above) of two one-armed seats separated by a low table is set on widespread bent aluminum legs (also available: bent laminated wood legs). Also shown is a leather-upholstered bench; sizes from 54″ to 90″ long. Supplement includes data on dimensions, materials, upholstery required. Black-and-white photos. 14 pages. Lehigh Furniture Corp., 16 E. 53rd Street, New York, N.Y.
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SANITATION PLUMBING

The most popular room in the house. A synopsis of Alexander Kira's research study "The Bathroom" (p. 63, JUNE 1966 P/A) is available from the manufacturer of adjustable hand-held shower sprays. Bathtub, shower, wash basin, and toilet are briefly discussed in terms of present inadequate designs and recommendations for improving them. 8 pages. Alsons Products Corp., 15280 E. Chicago Rd., Somerset, Mich. 49281.
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SPECIAL EQUIPMENT

Isolating hospital laundry functions. Protecting patients against infection by staphylococcus bacteria depends to a large extent on the complete separation of clean and soiled laundry rooms. This entails the use of special equipment with carefully designed ventilation. Catalog gives product specifications and sized drawings for manufacturer's special washer-extractors with front-and-rear access, safety-lock doors. A second booklet outlines design procedures for hospital laundries and lays out floor plans for laundries of various capacities. Pellerin Milnor Corp., P.O. Box 19264, New Orleans, La. 70119.
Circle 218, Readers' Service Card

SURFACING

Tile catalog. Full-color booklet gives sizes and color samples for solid or speckled tiles with bright or matte glazes for wall, countertop, floor, special purpose, and trim tiles. Featured are "Master-Set" sheets of tiles prejoined with a special bonding material. Sheets can be applied using adhesives, dry-set mortars, or conventional portland cement and sand setting bed. Tile bathroom accessories also included. 32 pages. American Olean Tile Co., 1000 Cannon Ave., Lansdale, Pa.
Circle 219, Readers' Service Card

Walnut guide. Wood grain patterns depend on how a veneer flitch is cut and where it comes from on the tree. Pamphlet is a series of color-photo close-ups showing different patterns created by flat sliced, half round, quartered, and rotary cut veneers from the trunk, the burl, the stump, and the crotch. 20 pages. American Walnut Manufacturers' Assn., 666 Lake Shore Dr., Chicago 11, Ill.
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PROGRESSIVE ARCHITECTURE
NEWS REPORT

REINHOLD PUBLISHING CORPORATION
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NEXT MONTH IN P/A

EXPERIMENTS IN ENVIRONMENT. *Last summer, landscape architect Lawrence Halprin, his dancer wife Ann, and several others in the fields of ecology, architecture, cinematography, and lighting, took a dozen young designers and a group of dancers through a month-long series of intense experiences designed to explode all their senses and to cause deepened sensory perception for an increasingly aware approach to design and planning. The workshop, which might well be a guide for more traditional-minded schools and professionals, is recreated as closely as possible in text and photographs. One of the participants told P/A of his reaction a year later: "I will never again have any trouble finding approaches to a design, and I am sure that I'll never have a dull moment in my life because I am left so hungry to explore so many things." A significant report on a significant design happening.*

A COLONIAL TOWN ADDS MODERN ARCHITECTURE. *One of the most "New England" of New England towns is Litchfield, Connecticut. To this traditional community have come the contemporary contributions of architects such as Neutra, Breuer, Johansen, Barnes, and Noyes. The manner in which their designs fit sympathetically into the older fabric of the town is examined, and a new library by Noyes is given special attention.*

HOUSES BY A YOUNG ARCHITECT. *Houses are traditionally the first design problem of the beginning architect. Peter Gluck, a 1965 Yale graduate, is no exception to this rule, but the four houses we will present in July show him to be a young designer of unusual perception and maturity.*

ALSO . . . *a warm Bay-Area-Style apartment house by Jonathan Bulkeley; a correspondence with an Indian reader about some shaking minarets in his country that still has the editors wondering; and technical articles on kinetic structures, the tallest slip-formed building yet, and spinning expanded polystyrene into structural shapes.*

AND . . . *commentary in the P/A OBSERVER, all the latest in P/A NEWS REPORT, and a lot of clip-and-file material from P/A's contributing columnists.*

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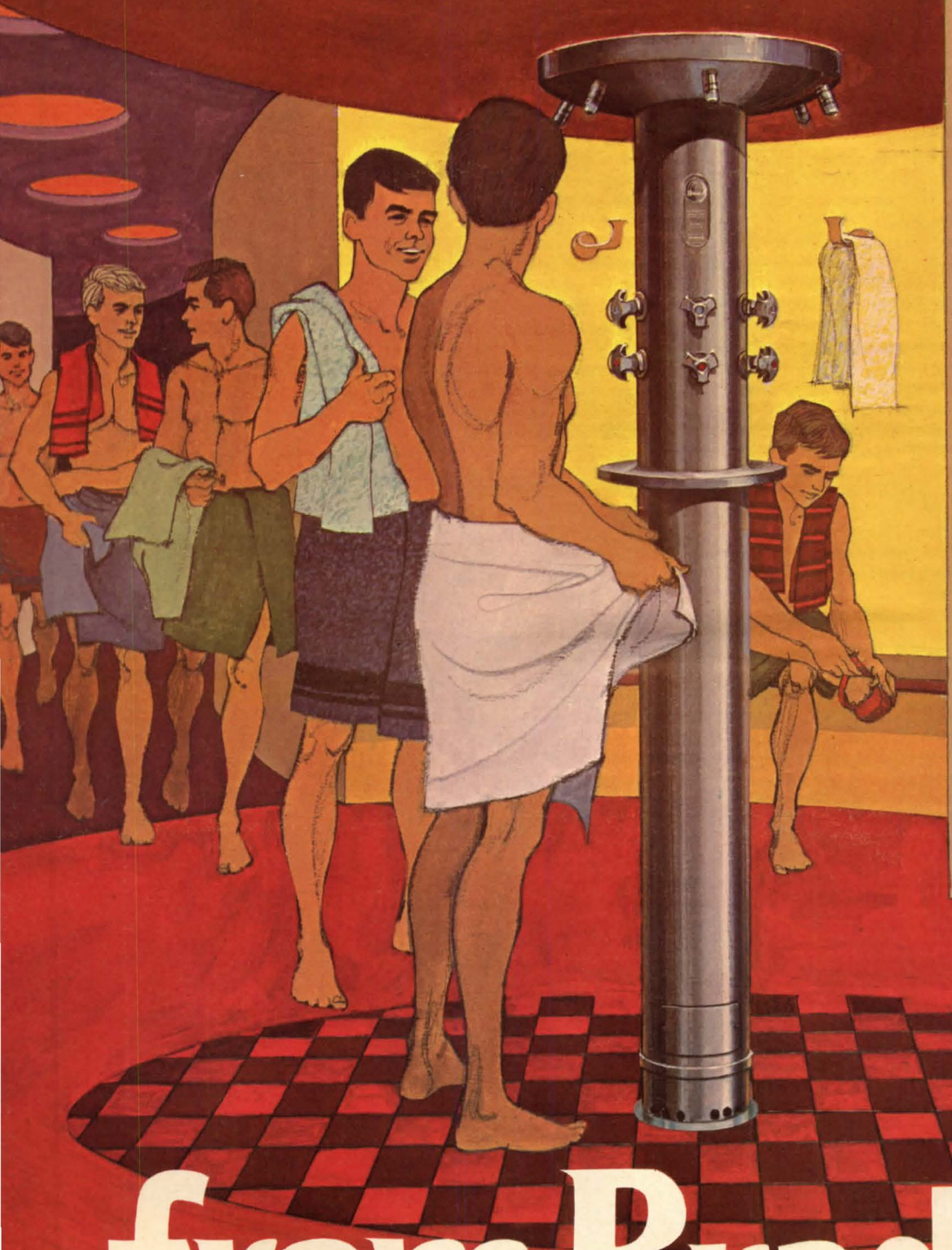

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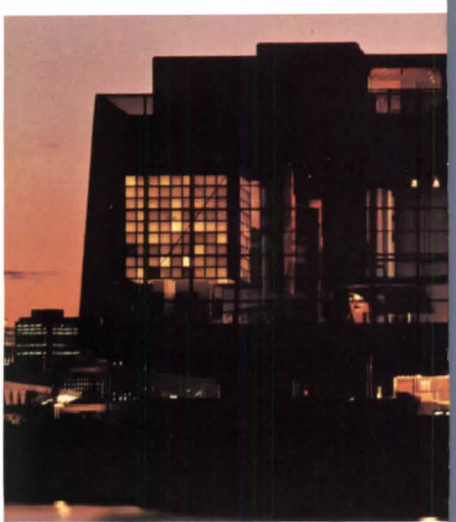
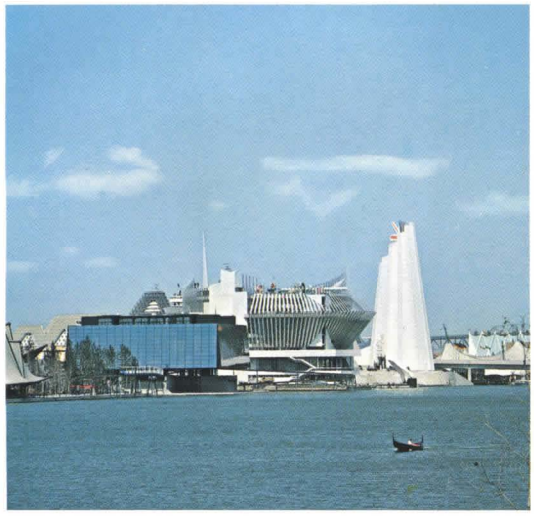
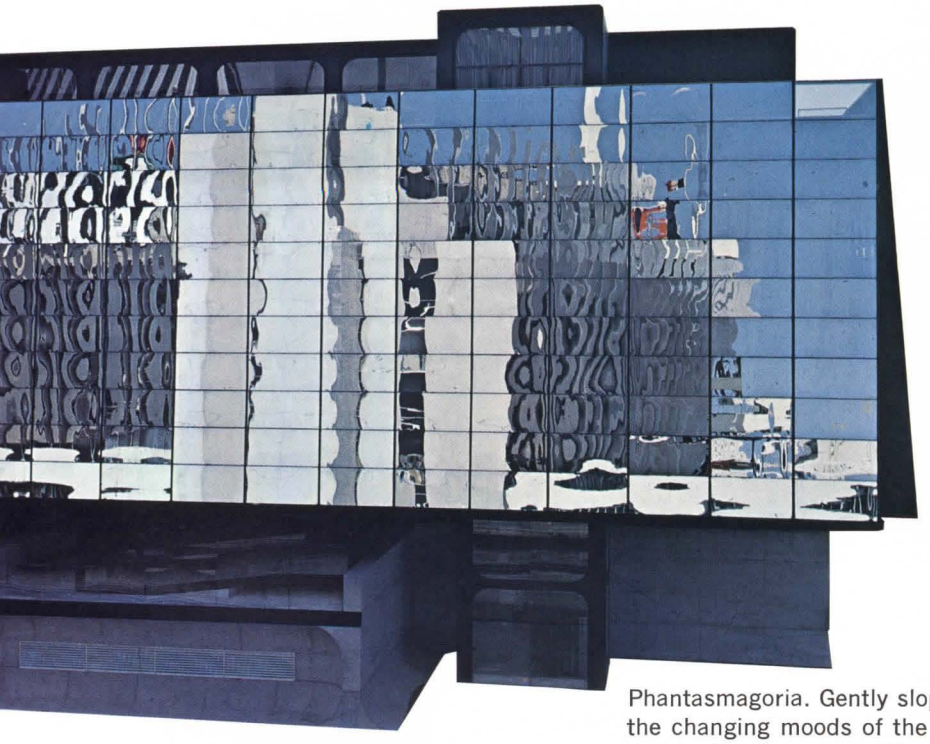
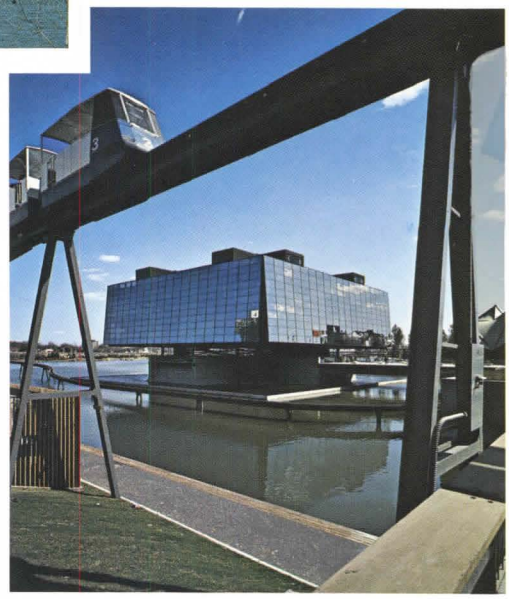
VISUAL DRAMA WITH GLASS









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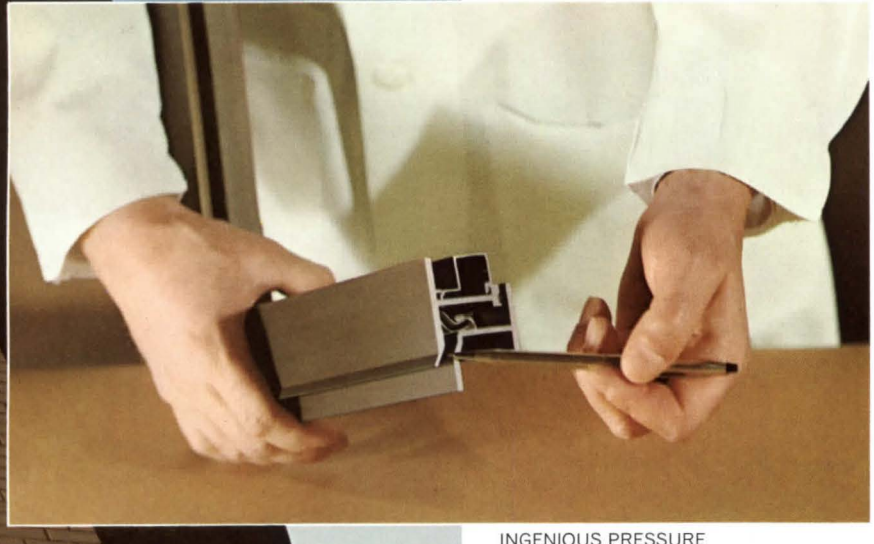

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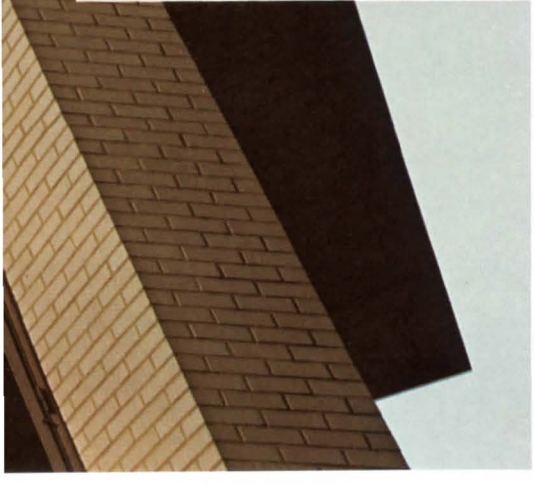

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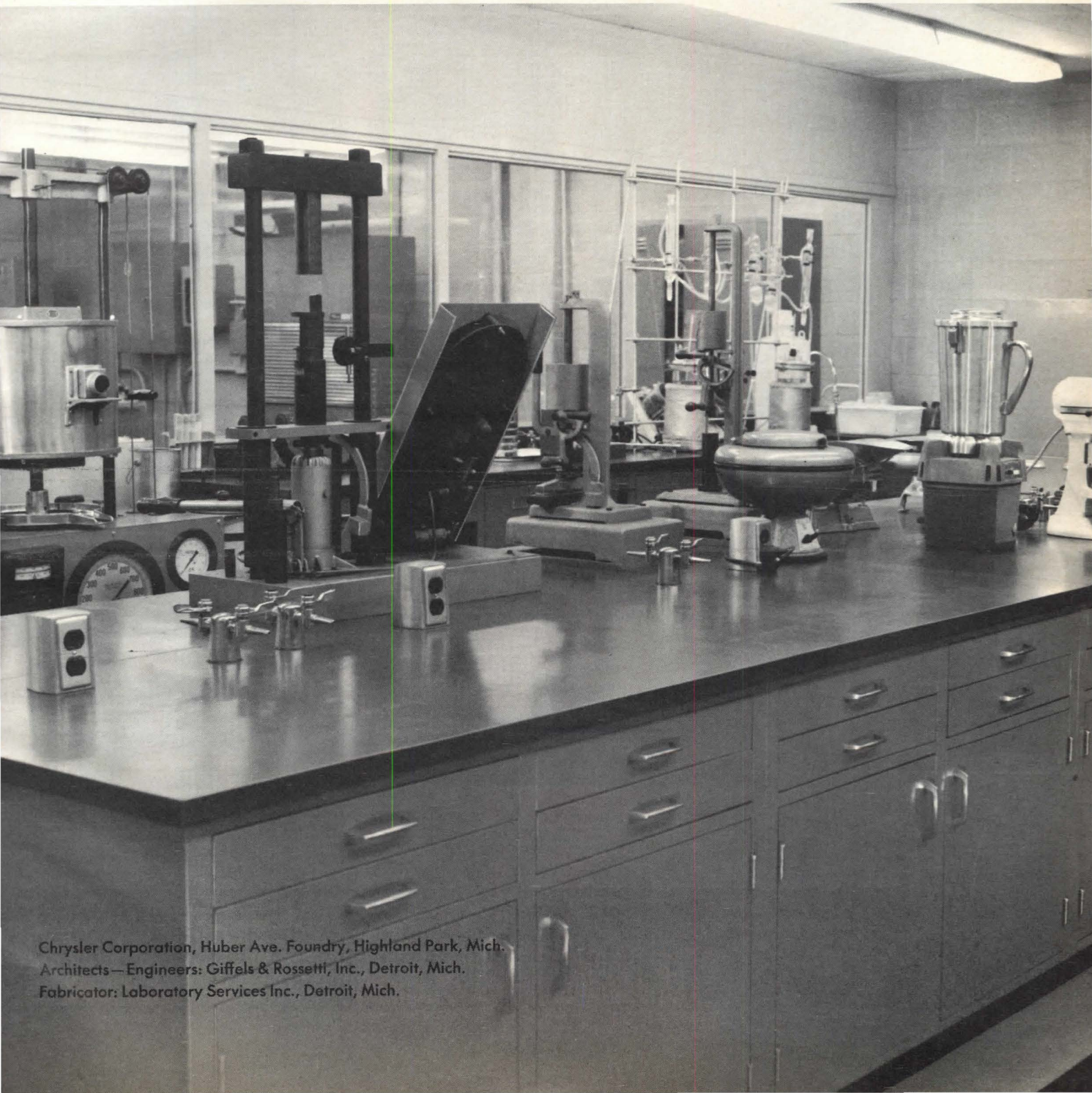

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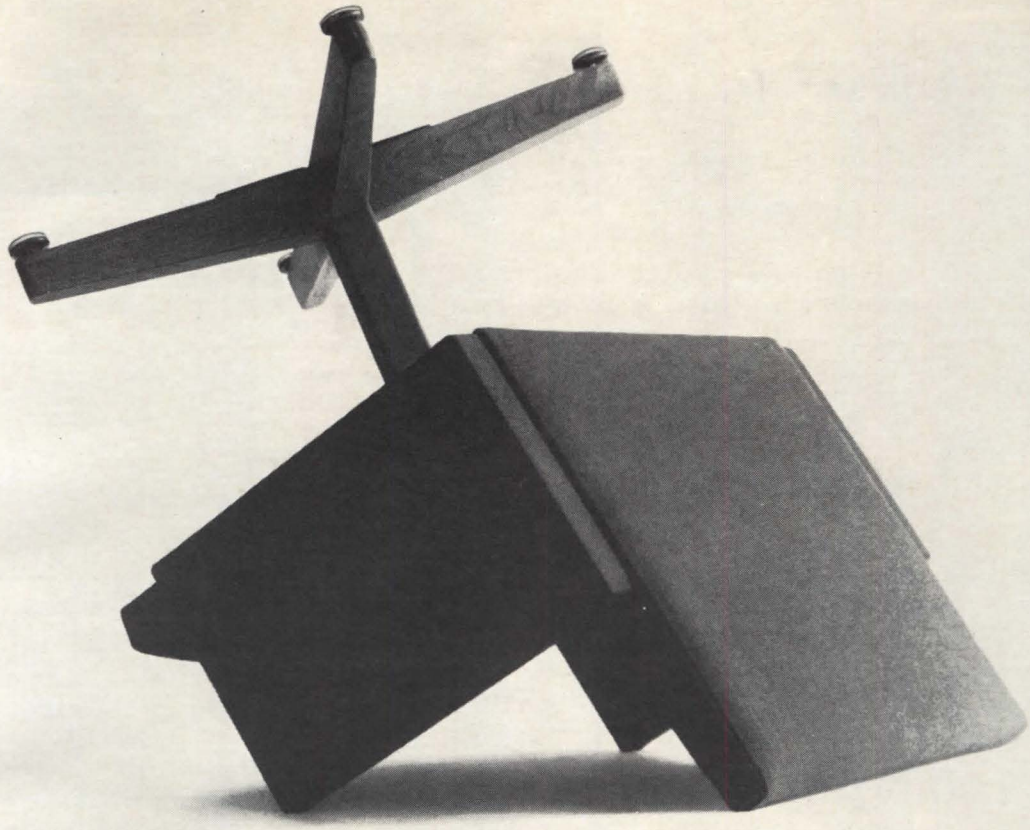

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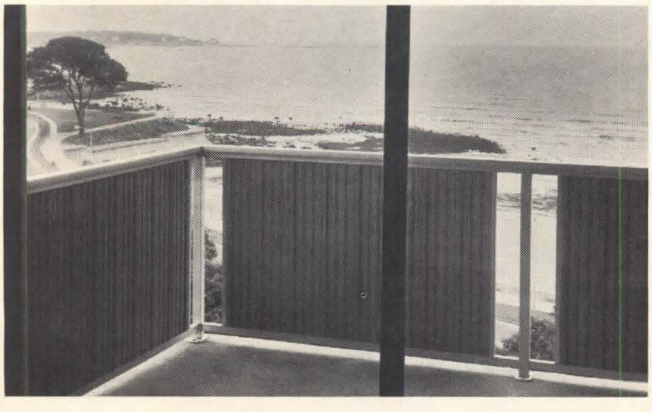

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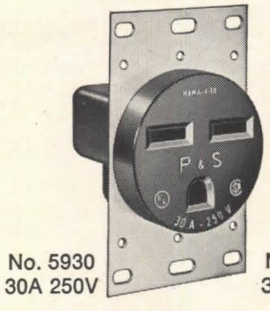

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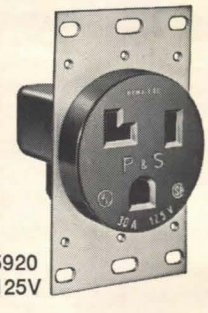

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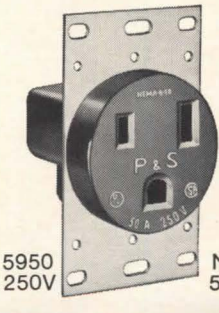

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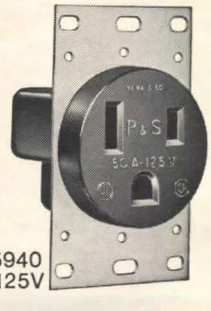

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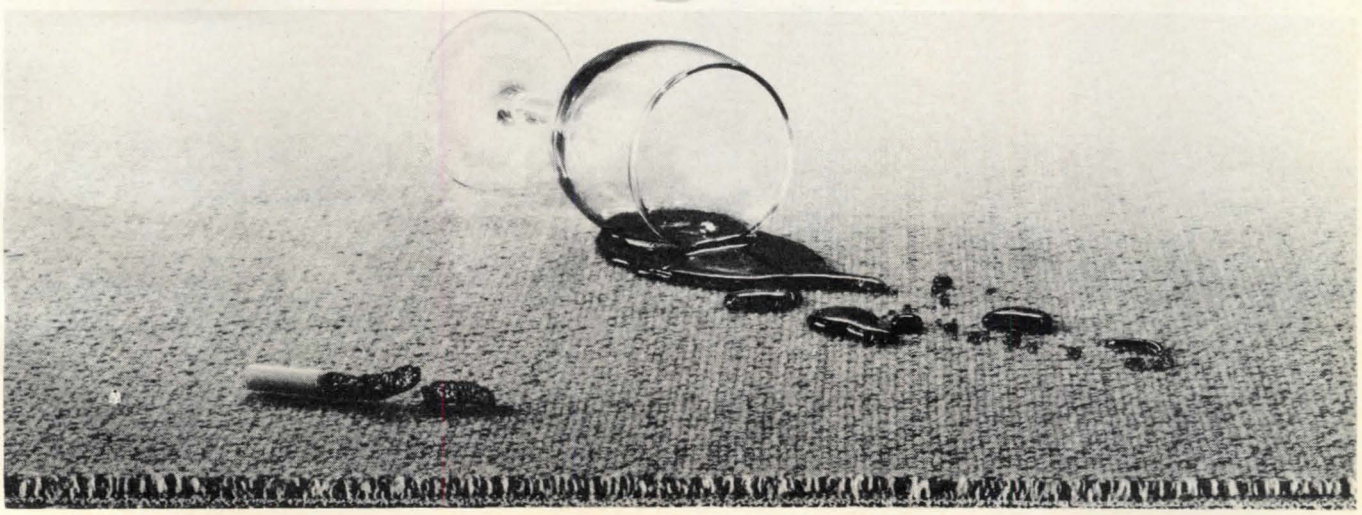


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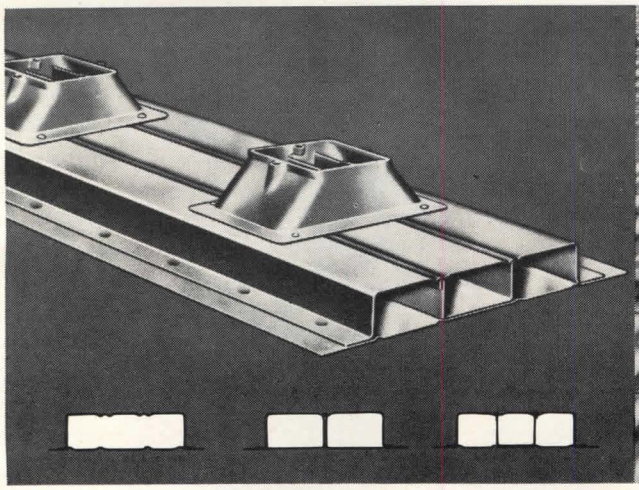

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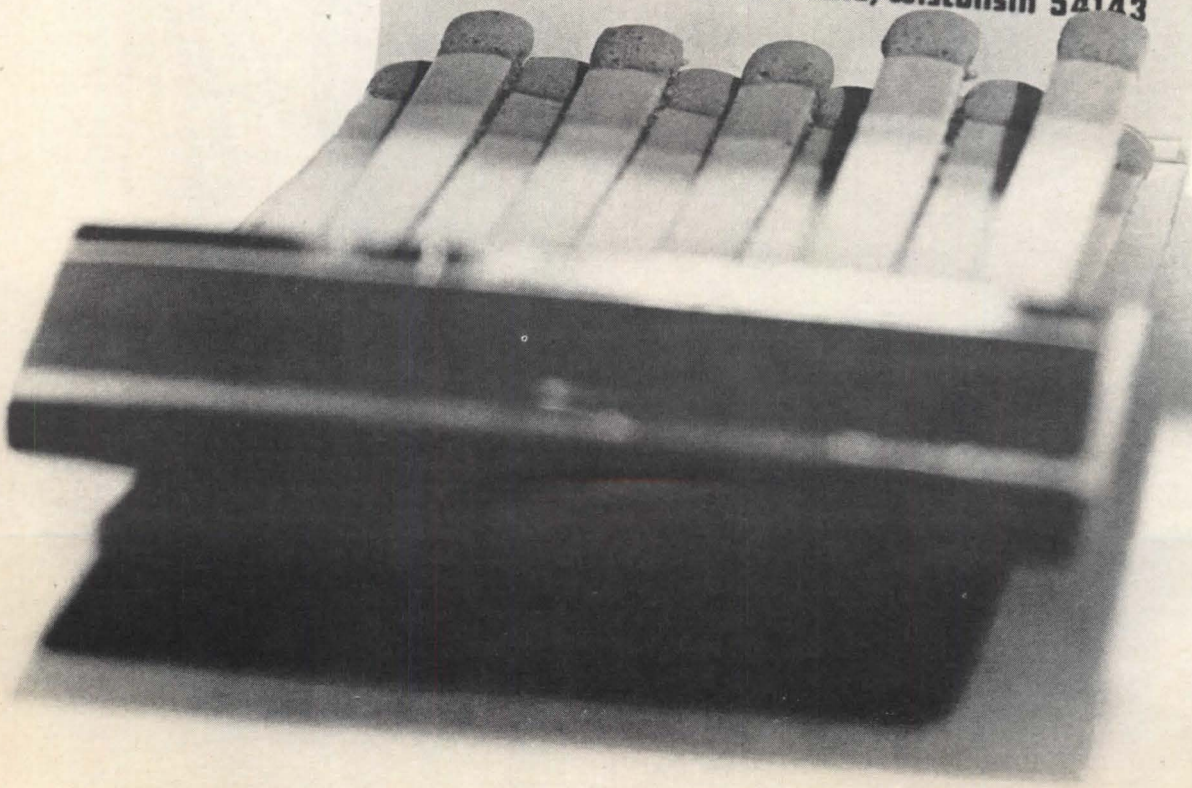

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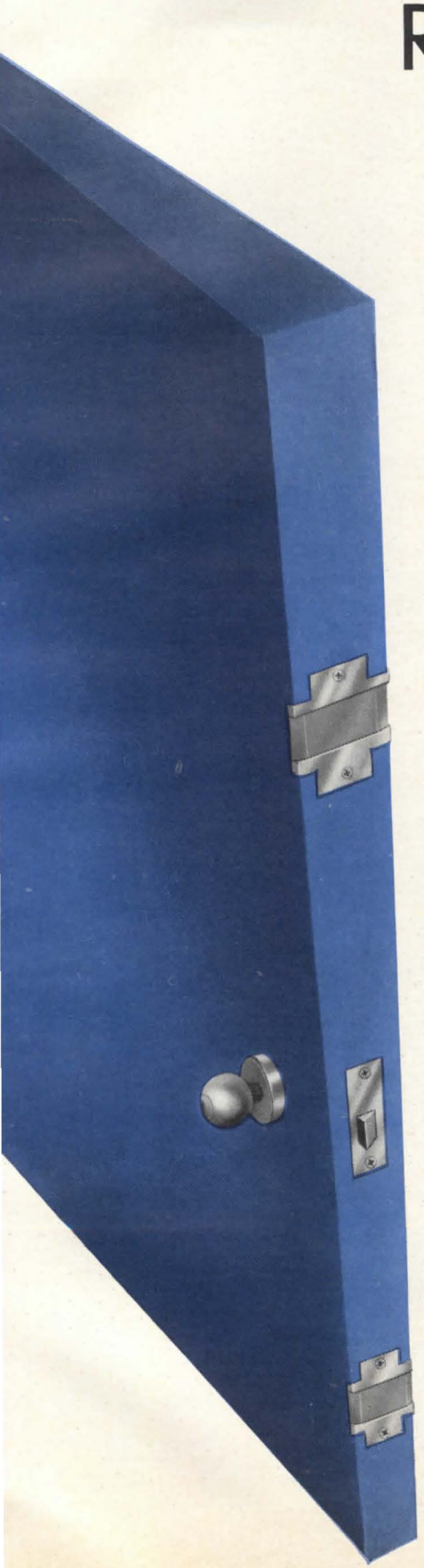

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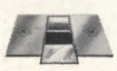

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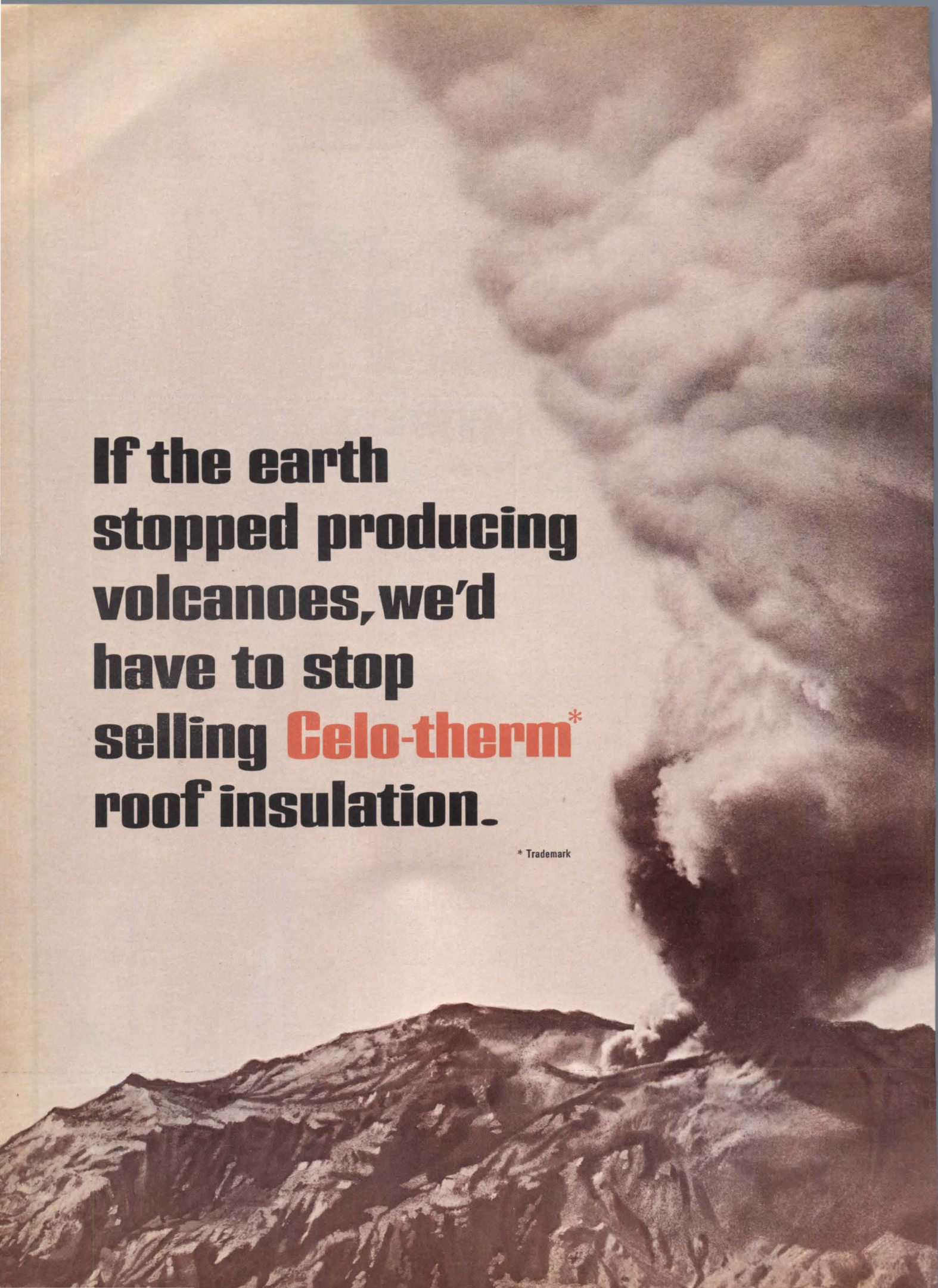
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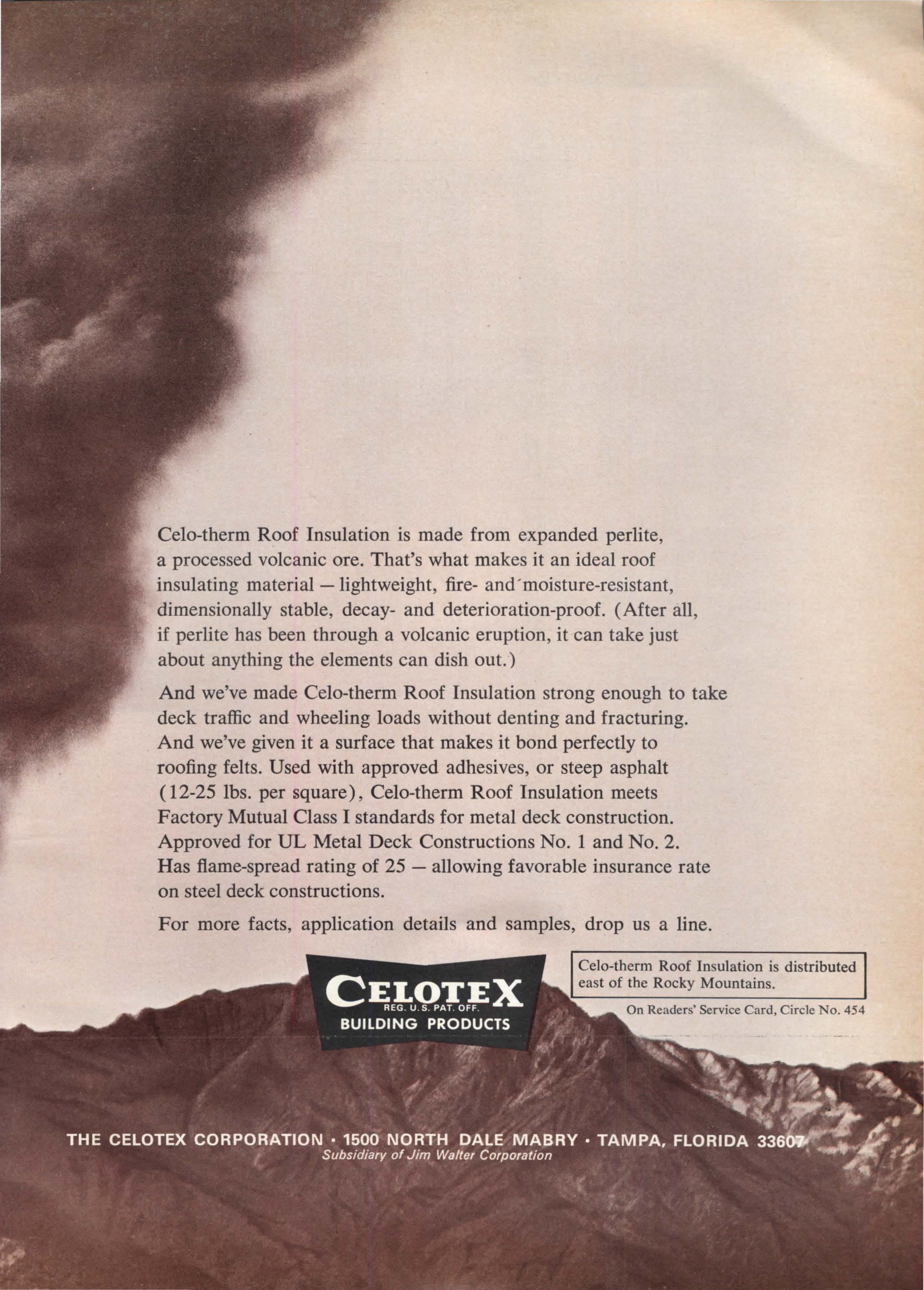

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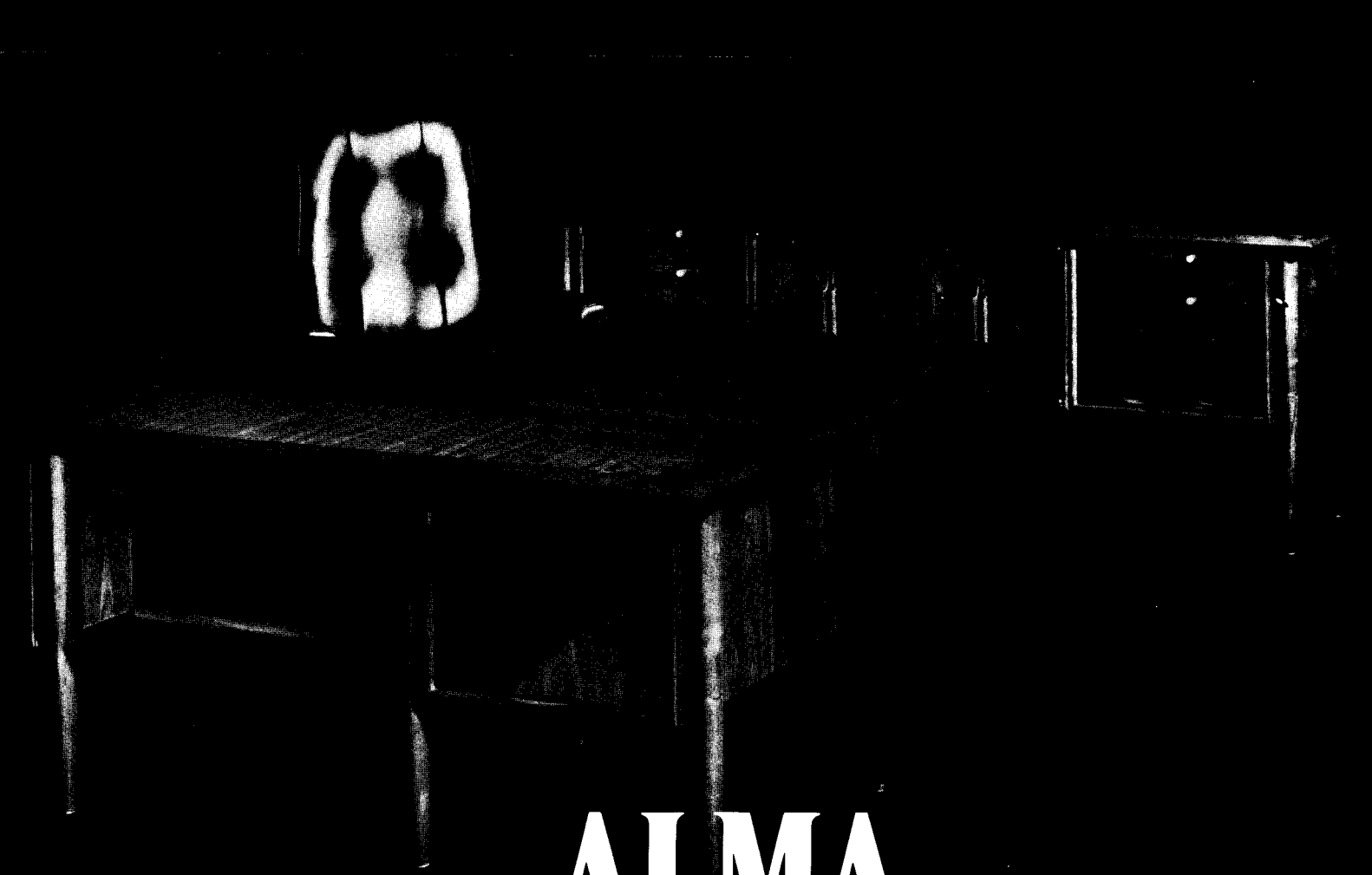

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Food for thought at General Mills—

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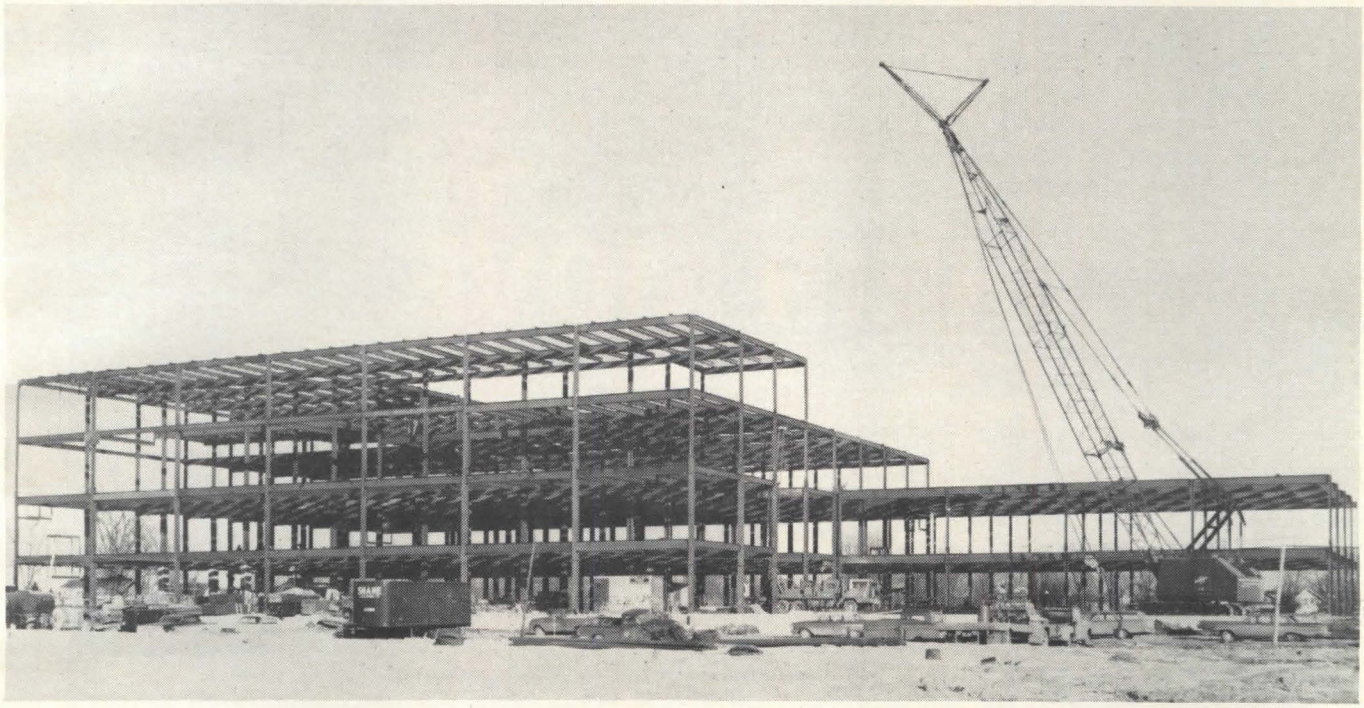

General Mills' new food processing plant in West Chicago. Engineers and Architects: A. Epstein and Sons, Inc. Steel Fabricator and Erector: Chicago Heights Steel Division of General Bronze Corp. General Contractor: George A. Fuller Company.

The criteria governing the design of a group of new food-processing buildings for General Mills, Inc., were: function, sanitation, cost, and construction time . . . *plus adaptability to future changes and expansion.*

It is expected that several floors may be added in the future over certain storage areas. To keep these storage areas free of columns until that time, they are framed with 60′ span girders. However, caissons and column connections on the girders were provided in the original construction for the installation of two interior columns which would reduce these spans to 20′ where the additional floors are required.

The floor system uses 5″ reinforced concrete slab with 2″ floor toppings of various types to meet the requirements of different areas. Composite construction was *not* used in the floor because the owner wished to retain flexibility in relocation of machinery and conveyor systems, which might require removal of all or part of a concrete slab, without reduction in the live load capacity of the structural system.

The building frames utilize 2,200 tons of USS Ex-Ten 50 High-Strength Low-Alloy Steel for beams and girders, plus 300 tons of ASTM A36 Steel for columns and bracing. Studies by the engineers indicated that when deflection was not the controlling factor in the design of the beams, Ex-Ten 50 steel was more economical than A36 steel. In addition, significant cost savings were realized as the result of the lower cost of fireproofing smaller beams.

We'll be glad to send you a copy of our USS STRUCTURAL REPORT (ADUSS 51-1880), which contains further information. If you want a copy, write to United States Steel, Room 4463, 525 William Penn Place, Pittsburgh, Pa. 15230; or call the USS Sales Office nearest you and ask for the Construction Marketing Representative. USS and Ex-Ten are registered trademarks.

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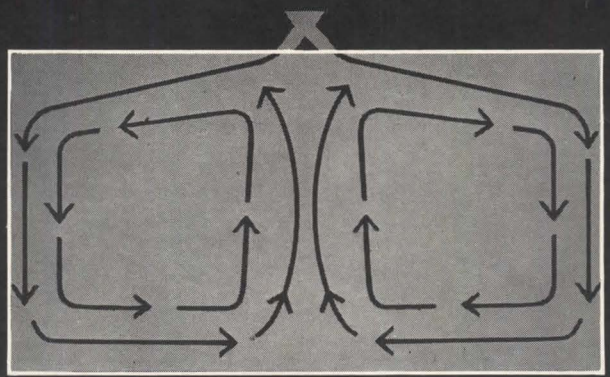
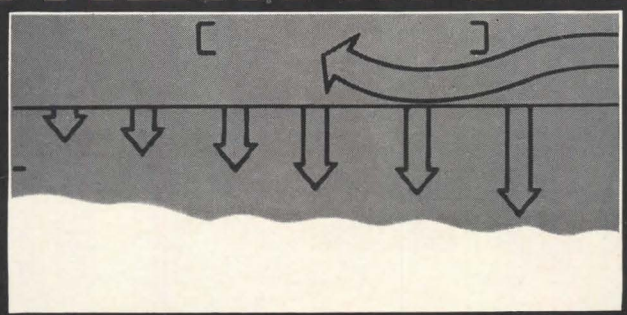
USS United States Steel: where the big idea is innovation

OUR MOVE



We move air evenly. We do it with a brand new kind of linear bar that moves conditioned air to the comfort zone (see our diagram). The bar economically and efficiently and quietly distributes air throughout the space. We call it the OCF Dimensionaire Ceiling System. It's a total ceiling system. Air, light, and sound. There's nothing like it.

THEIR MOVE



The expensive air (either heated or cooled) travels through the plenum, conditioning an unused section of the room. That's a waste of money. As you can see in this diagram, the conditioned air is distributed through the perforations, with greater force on one side of the room than on the other. That's a waste of comfort.

YOUR MOVE

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USE DE Dividend Engineering—to stretch your building dollar while improving building performance.

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☐ Have your sales engineer call for an appointment to show the film.

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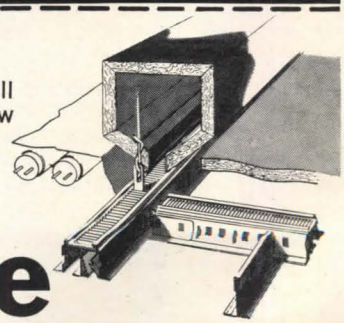

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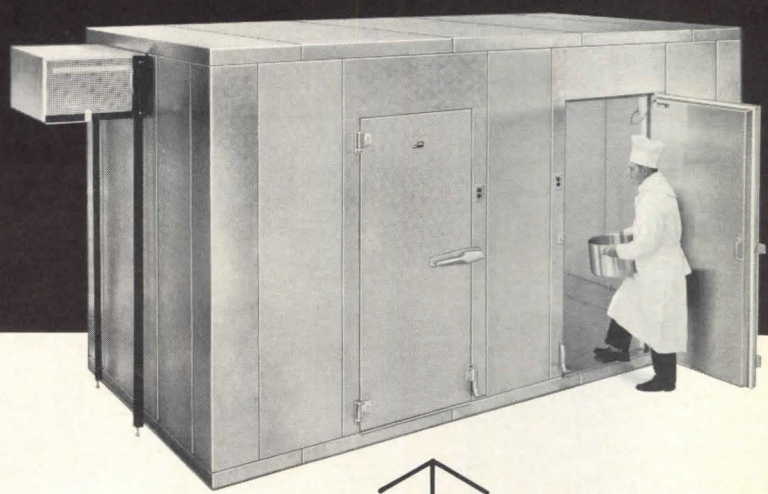

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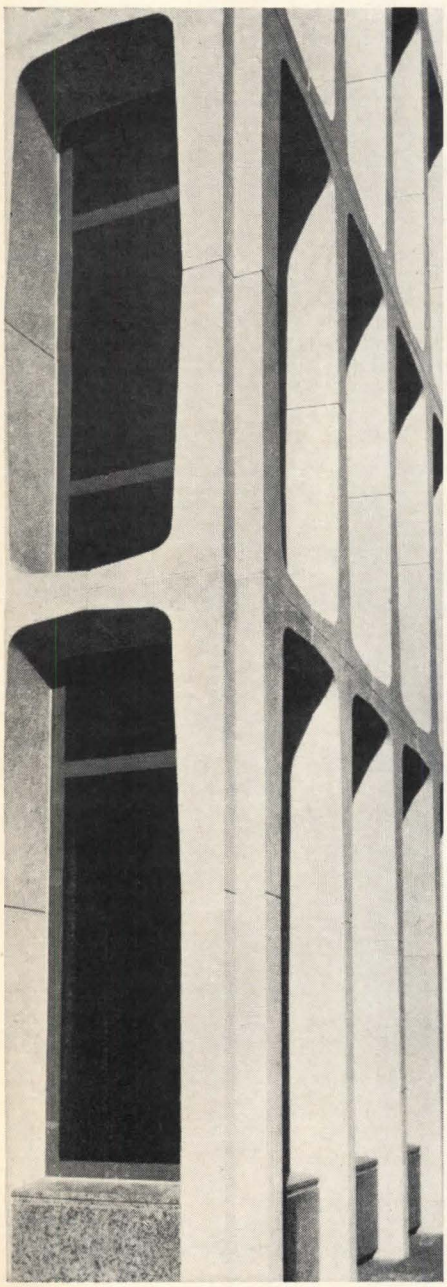

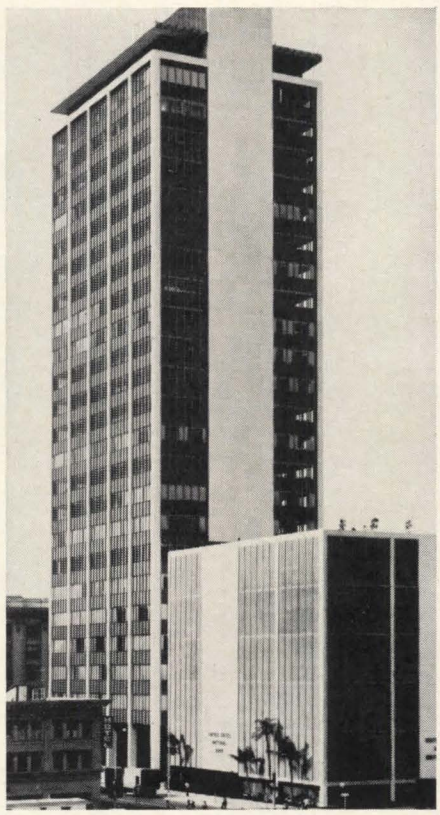

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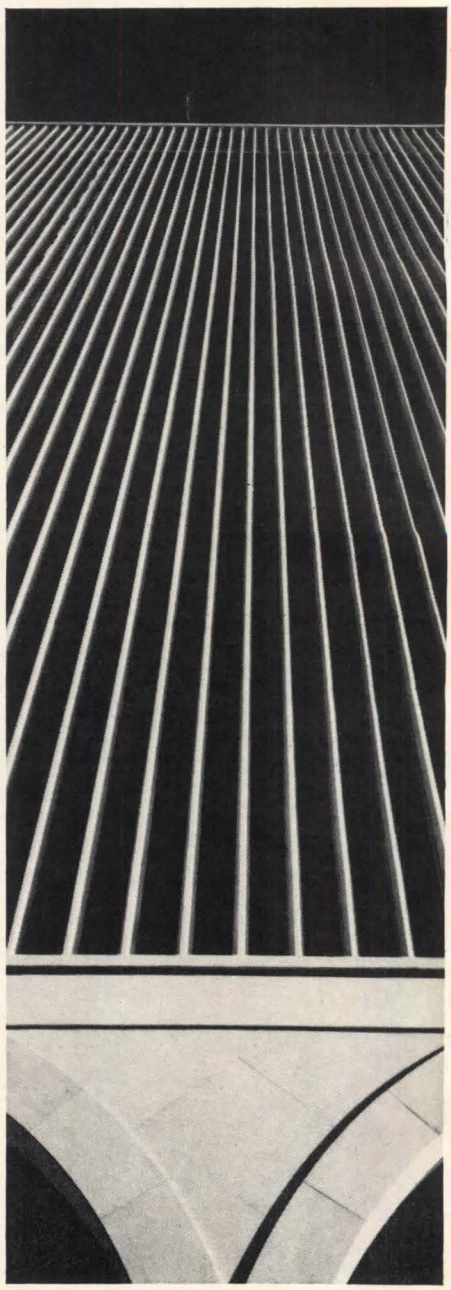

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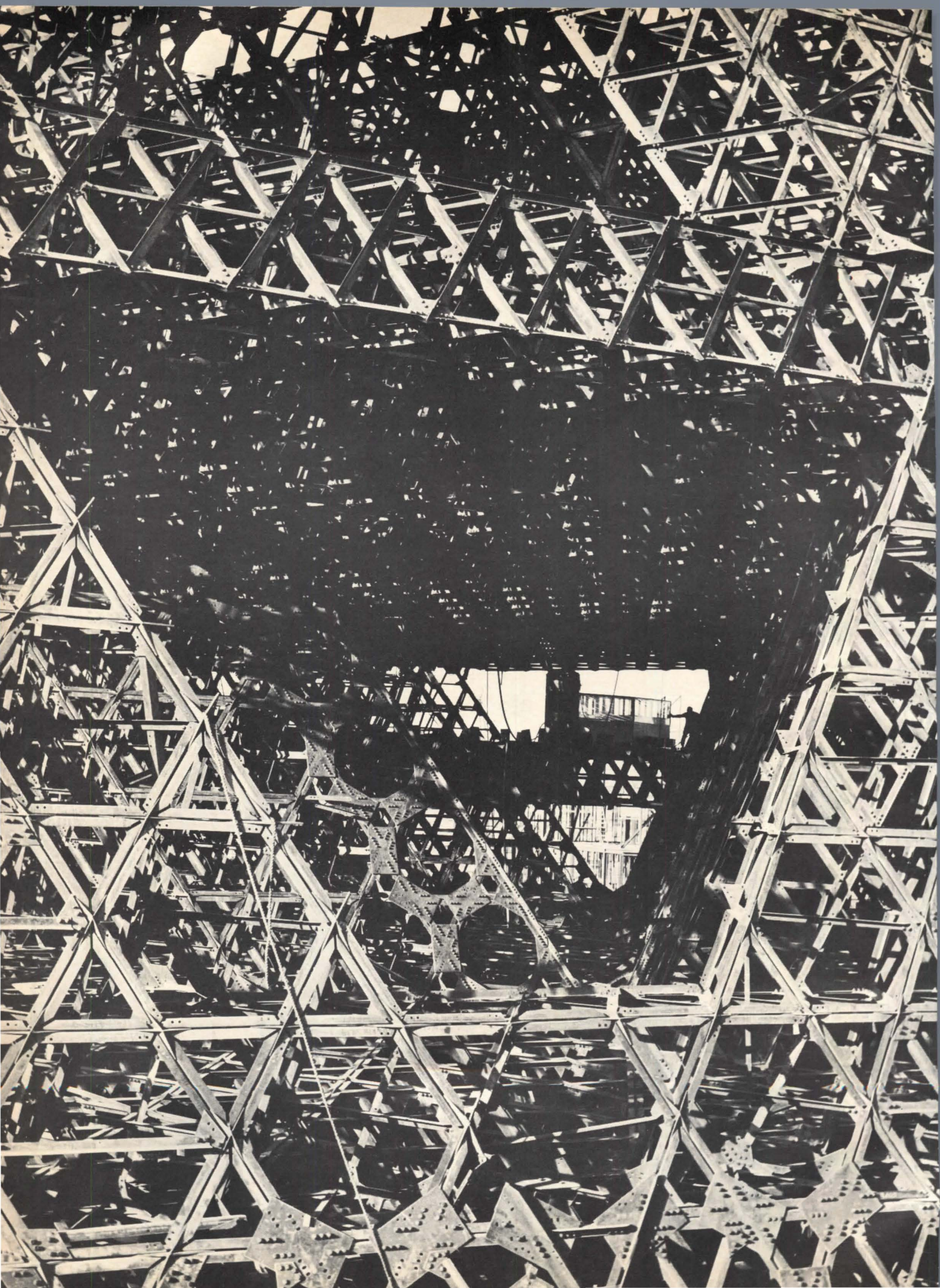
"Architecture is the noblest expression of Man. It is really the basic expression of a civilization. At Expo 67, the nations have participated through their architecture."

EDOUARD FISET



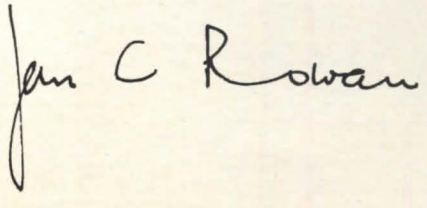
EDITORIAL

Most architects are people and have reactions similar to those of more ordinary mortals. Yet there is also much in an architect's peculiar background, temperament, and interest that makes him often view events differently. The current big parade at Montreal is a good example of this: The People's Expo is not always the same as The Architect's Expo.

Take the more interesting buildings, for instance. To a layman, they represent a whole new world, unknown previously and never thought possible — a fantastic journey to an unfamiliar realm of strange shapes, colors, and textures. The forms, patterns, and spaces generated by suspension structures, space frames, and other devices used at the fair were never part of everyman's visual vocabulary. To live with them, even if only for a few hours, is an unsettling revelation. But to an architect they are as familiar as his favorite architectural publication. Most of what Expo has to offer was on architects' drawing boards for many years. In different versions, by different designers, for different purposes it was all there — on paper. But now, finally, it has all been built and one can touch and walk through all the many pet ideas that were for so long committed to the printed page only. So while the layman ponders what it is that he is looking at, the architect examines it to find out what it *really* looks and feels like.

Another difference is a layman's search for an experience and an architect's search for an architectural experience. Since a powerful architectural space is the greatest architectural experience, it might be worth noting that, at Expo, some of the most notable experiences are achieved by blanking out architectural spaces. In many pavilions, the rooms are painted black and kept in almost total darkness. Electric devices such as slide or film projections, beams of intense light, spotlights, etc., provide the only visual interest. In most cases, the impact on the viewer is tremendous. The impact on an architect-viewer is even greater when he suddenly realizes that electricity is not only an effective creator of drama but also an excellent killer of architectural spaces. When one walks out of a building without having any idea what the spaces in it were, it is time to re-examine the idea that buildings have three dimensions. Those other dimensions (and non-dimensions) are creeping in more and more tenaciously.

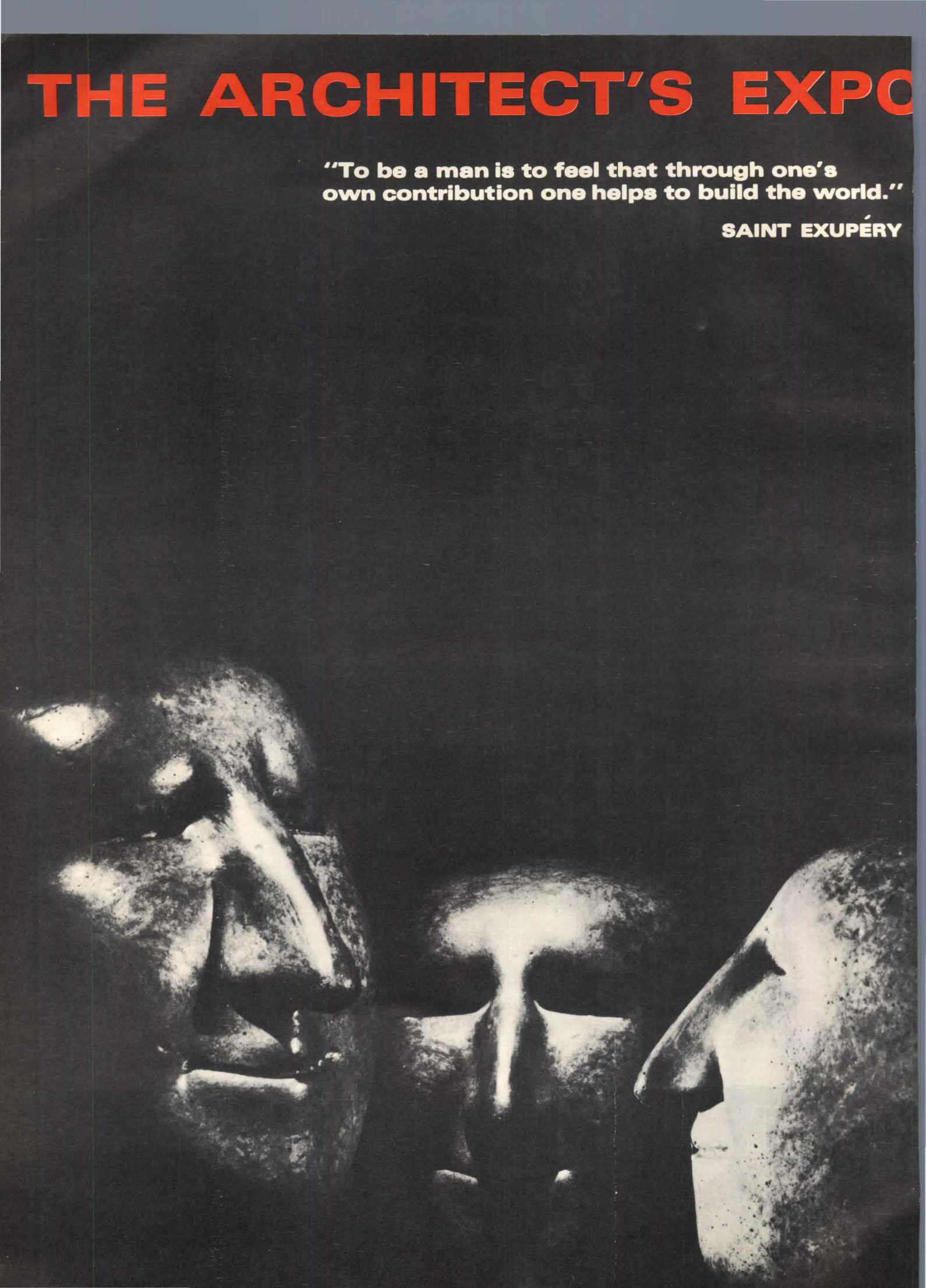
Besides no-space spaces, what an architect will notice at Expo (and a layman might not) is the discontinuity of experience. From monumental to intimate, fast speed to slow speed, giant to miniscule, elaborate to simple, exuberant to subdued, natural to artificial, organized to disorganized, functional to whimsical, all the fragmented, crazy contrasts — like the roaring (the good future) hovercraft rushing by in the swirling main channel of the river, and the put-putting, out-board-powered, plastic-made (the good past) gondola cutting water in the recently created quiet lagoon — they all remind one that we live in a strange world where the future has not yet arrived and the past has not yet departed. It is the middle-world of hesitation — a world worth seeing. ■



THE ARCHITECT'S EXPO

"To be a man is to feel that through one's own contribution one helps to build the world."

SAINT EXUPÉRY



Man's world is no longer the world of the biplane; it is that of the supersonic jet. Today, the pilot whose eyes linger on the sand and the stars invites disaster in a crowded sky.

Expo 67 is dominated by the theme of one man's contribution in helping to build the world and is exemplified in the multitude of pavilions designed by individual architects. However, the most significant buildings are those concerned with solving the problems of many men. Bucky Fuller's dome and Frei Otto's environmental solutions are evidence of their continuing research into social problems. Habitat is one man's contribution to the problem of many men living together. Africa Place is a solution to the coming together of many nations. And the modest Cuban Pavilion contains a solution to prefabricated housing.

Expo 67 represents, in microcosm, the contrasting worlds of the biplane and the jet liner. It is the contrast of one man and his world and many men and one world. The pavilions at Expo that are still in the age of the biplane — Thailand, Great Britain, State of Maine, among others — are not so much straying out of the airlanes as they are left behind in the burst of speed of contemporary architectural and engineering concepts.

The most significant structural system to emerge is that of the space frame. It represents the search for economic means of spanning and enclosing large spaces, much as the Roman dome and vault represented similar attempts; they are social structures. New materials and new architectural forms at the fair show that the individual architects, with the aid of sophisticated calculating machinery, have found uses for the research efforts of many men. The structure of these buildings is *dictated* less by taste and aesthetics than by the manipulation of engineering and material alternatives. In the traditional architectural sense, the only visible sign in these buildings is that they represent one man's contribution to the world in the building details.

The structures at Expo 67 are only part of a much larger complex. The fair's transportation system is tied to that of Montreal, and its impact has changed the host city's planning.

We might add the words of the American philosopher John Dewey to those of Saint Exupéry: "Man's importance is in how he changes the environment for the next generation." How has he changed it at Expo 67?

HOW THE FAIR WAS PLANNED

The general tenor of Expo's attitude was set when the Corporation tapped the Canadian intellectual community to develop its central theme. Meeting at Montebello, Quebec, in May 1963, a brain trust of leading scholars, scientists, and artists chose the theme "Terre des Hommes," inspired by French writer and aviator Antoine de Saint Exupéry's book of the same title. As the kernel of Expo's philosophy, they chose the words of Saint Exupéry quoted on the facing page.

Amidst the praise and glory, Expo 67 deserves a small requiem for the fair that nearly was: A fair planned but shelved, which would have made architectural history.

The plan was begun in 1963 when a small but immensely enthusiastic group of staff planners proposed that, instead of building individual major national pavilions, countries should cooperatively exhibit within theme pavilions, and thus provide an international coverage on a specified topic. The planners conceived of large, somewhat amorphous theme pavilions that could contract and expand to suit the requirements of the participants, which would probably have led to a form of plug-in architecture less esoteric but certainly more tangible than any projects published in **Archigram.**

Many foreign participants enthused about the preliminary concepts of the project, but with the hesitant conservatism of a government-supported group, Expo policymakers rejected the plan and substituted a conventional mélange of national and industrial pavilions built to the greater, or lesser, glory of each individual sponsor.

The great concept died, but it is worth reviewing to see what it could have been like, and also how it influenced the final solution for the fair.

Man and His Integrated Space

The team of planners, three of whom had studied at the Harvard Graduate School of Design, worked for the Canadian Corporation for the 1967 World Exhibition planning staff. They took it for granted that they would not disperse buildings around squares or boulevards, and from this evolved the solution to build linear structures for theme pavilions with clusters of small pavilions adjacent to them.

The theme buildings would be larger and stronger than any other buildings, and would be located close to, or integrated with, transportation systems. Thus, from the outset, the team established a pattern that bears directly on city planning problems: moving people through and into crowded communities.

Each theme building would present exhibits in horizontal and vertical continuity. Story threads would run horizontally through buildings, but where nations or industry could reinforce a particular aspect of a theme, additional display space would be incorporated above or below the story thread (see diagrams). However, because all topics in any one theme pavilion are related to one another, the vertical components of a horizontal story thread could be arranged for continuity at several horizontal levels.

The fair corporation would have owned the building shell, leased exhibit space, and provided the story threads. Because the project died early, there was not time to design theme pavilions, but the planners did offer suggestions for traffic flow and exhibition spaces, and made the framework and mechanical transportation within the pavilion flexible so that there would be no constraining symmetry of enclosure.

Man and His Vanishing Space

The major theme pavilion concept that was squashed in 1963 lingered long enough to influence the final planning stages, and, in a bastardized form, was eventually built for the fair. Theme pavilions are now relatively small, because they shrank with successive budget appraisals and the will of Expo executives outside the planning department.

There is not much left of the international participation envisioned for the theme pavilions, although some countries are exhibiting in them in addition to their own national pavilion. However, these exhibits tend to be isolated blocks, such as Commandant Yves Cousteau's material for Man and the Ocean, and do not meet the original concepts of horizontal and vertical flow.

One sad holdover is the structure of the two groups of large, and similar, theme pavilions: Man the Explorer, and Man the Producer. These heavy, cumbersome, and inefficient structures faintly indicate that someone once had a good idea for an enlightened exhibition space, but between the thought and the execution the heavy hand of design, cost, and expediency mangled the concept. What remains is a space-frame system composed of truncated tetrahedrons that looks like a monu-

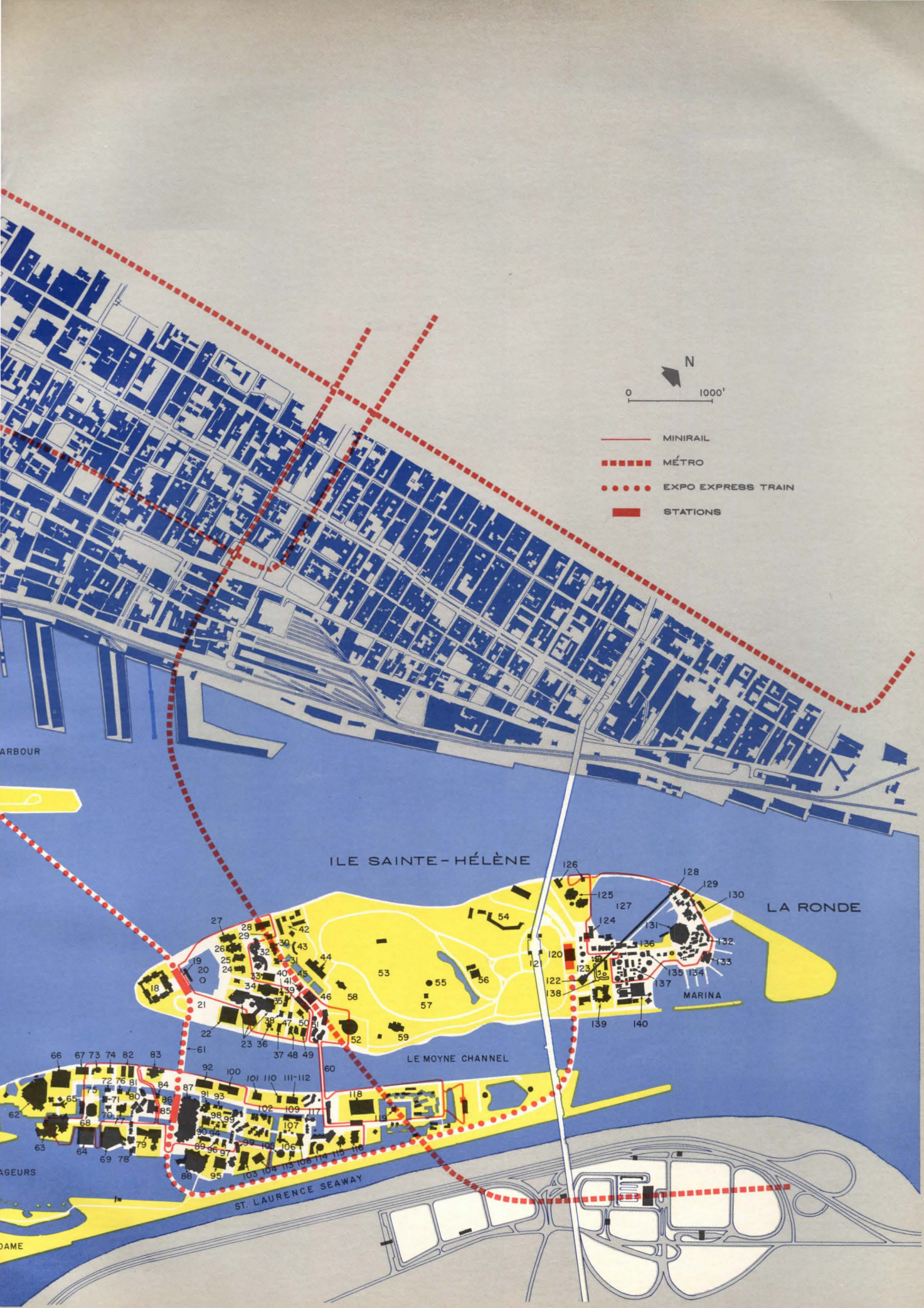
CITÉ DU HAVRE: **(1)** Place d'Accueil (Main Gate); **(2)** Automotive Stadium; **(3)** Administration and Press; **(4)** Broadcasting Center; **(5)** Art Gallery; **(6)** Expo Theater; **(7)** Industrial Design and Photography; **(8)** Les Jeunesses Musicales; **(9)** Hospitality Pavilion; **(10)** International Trade Center; **(11)** Quebec Industries; **(12)** Olympic House; **(13)** Expo Services; **(14)** Labyrinth; **(15)** Man in the Community and Man and His Health; **(16)** Habitat 67; **(17)** Express Stop.

ILE ST. HÉLÈNE: **(18)** Place des Nations; **(19)** Express Stop; **(20)** Swan Lake; **(21)** International Nickel Plaza; **(22)** Scandinavia; **(23)** Man the Explorer; **(24)** Austria; **(25)** Switzerland; **(26)** Belgium; **(27)** Netherlands; **(28)** Japan; **(29)** Vermont; **(30)** Brewers' Pavilion; **(31)** Republic of China; **(32)** Expo Services; **(33)** Iran; **(34)** Telephone Pavilion; **(35)** DuPont of Canada Auditorium; **(36)** Boy Scouts of Canada; **(37)** Master Control Pavilion; **(38)** Maine; **(39)** Air Canada; **(40)** Polymer; **(41)** Post Office; **(42)** Jardin le Petit Prince; **(43)** City of Vienna Kindergarten; **(44)** Bathhouse; **(45)** Swimming Pools; **(46)** Ile Ste.-Hélène Métro Station; **(47)** New York State; **(48)** Visitors' Aid Center; **(49)** Expo Banking Service; **(50)** Korea; **(51)** Expo Services; **(52)** United States; **(53)** Parc Hélène de Champlain; **(54)** Fort St.-Hélène; **(55)** La tour de Lévis; **(56)** La Poudrière; **(57)** Sun Life Centenary Carillon; **(58)** Sculpture Garden; **(59)** Pavilion of Honor; **(60)** Passerelle du Cosmos; **(61)** Pont des Iles.

ILE NOTRE-DAME: **(62)** Canada; **(63)** Ontario; **(64)** Quebec; **(65)** Asbestos Plaza; **(66)** Atlantic Provinces; **(67)** Indians of Canada; **(68)** Western Provinces; **(69)** France; **(70)** Haiti; **(71)** Monaco; **(72)** Jamaica; **(73)** United Nations; **(74)** Christian Pavilion; **(75)** Engineers' Plaza; **(76)** Mauritius; **(77)** Yugoslavia; **(78)** Amphitheater; **(79)** Britain; **(80)** Expo Services; **(81)** O.C.D.E.; **(82)** Greece; **(83)** Israel; **(84)** Trinidad, Grenada, and Tobago; **(85)** Transportation Plaza; **(86)** Express Stop; **(87)** Man the Producer; **(88)** Federal Republic of Germany; **(89)** European Community; **(90)** Cuba; **(91)** Canadian National; **(92)** Italy; **(93)** Canadian Kodak; **(94)** Economic Progress; **(95)** Australia; **(96)** Guyana and Barbados; **(97)** Ceylon; **(98)** Chatelaine Magazine house; **(99)** Expo Services; **(100)** Czechoslovakia; **(101)** Venezuela; **(102)** African Nations; **(103)** India; **(104)** Mexico; **(105)** Kaleidoscope; **(106)** Thailand; **(107)** Burma; **(108)** Sermons from Science; **(109)** Arab Group; **(110)** Ethiopia; **(111)** Morocco; **(112)** Tunisia; **(113)** Pavilion of Judaism; **(114)** Canadian Pacific-Cominco; **(115)** Canadian Pulp and Paper; **(116)** Steel; **(117)** Expo Services; **(118)** Russia; **(119)** Man the Provider.

LA RONDE: **(120)** Express Stop; **(121)** Pont Jacques-Cartier; **(122)** Téléferique; **(123)** Esplanade; **(124)** Fort Edmonton-Pioneer Land; **(125)** Alcan Pavilion, Aquarium, Dolphin Pool; **(126)** Tally-Ho Stables; **(127)** Dolphin Lake; **(128)** Téléferique; **(129)** Le Village; **(130)** Safari; **(131)** Garden of Stars; **(132)** Le Carrefour International; **(133)** Marina; **(134)** Spiral; **(135)** Lanterna Magika; **(136)** La Promenade; **(137)** Ride Center; **(138)** Children's World; **(139)** Youth Pavilion; **(140)** Gyrotron.

(Note: "Expo Services" denotes areas of shops, plazas, snack stands, and restaurants.)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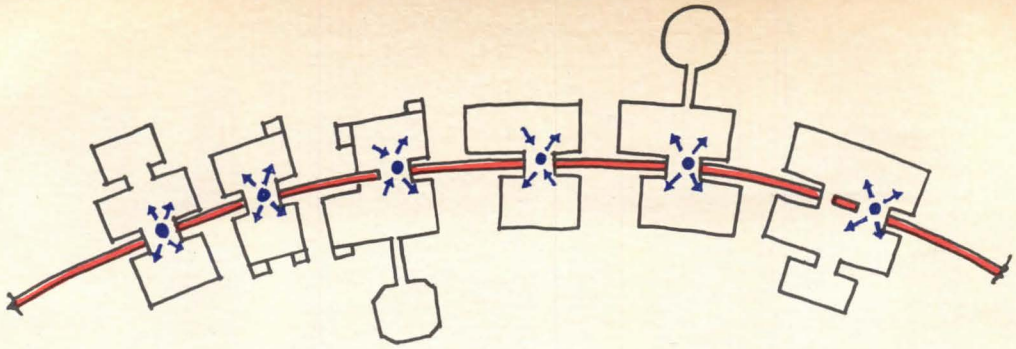

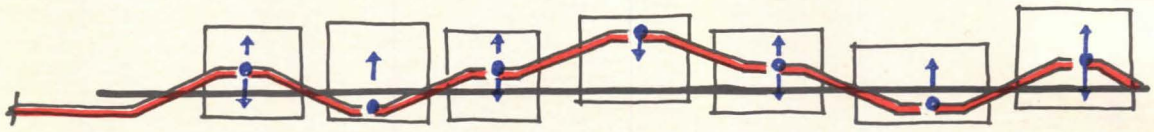

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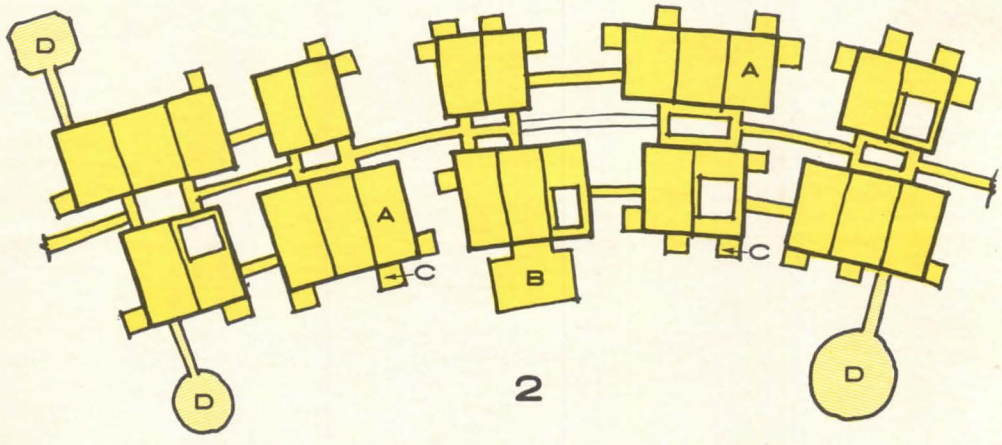

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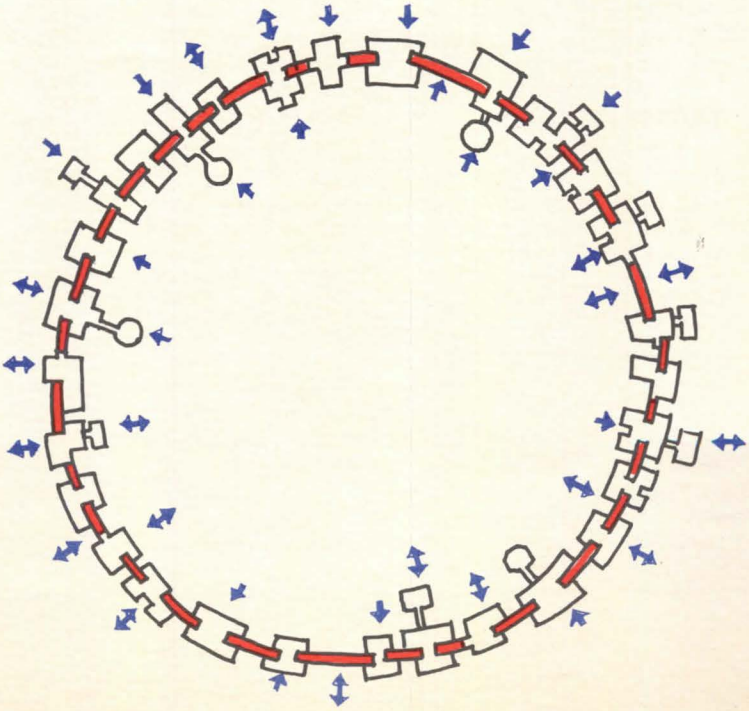


PROPOSED EXHIBITION SPACE FOR "TERRE DES HOMMES": **(1)** Visitors would enter and leave at any point and still be able to pick up the story thread. **(2)** A nation not participating in the whole project could exhibit in space A or add space B to the structure. A nation involved with the whole project could expand its area by adding space C, or if it wanted to show an exhibit tenuously related to the project it would add space D. **(3)** Mechanized circulation system would enable visitors to enter and leave projects at any point or level.

1

ment to the gusset makers centennial. A Montreal engineer describes the structures as a prime example of how not to develop space frames; with sympathy for the designers, however, he adds that the final design was "murdered in the shop drawings."

Man and His City Space

Before the Expo planning group devised the theme pavilion concept, it surveyed Montreal for an ideal location for the fair. Since, individually, the planners were urban oriented, they not surprisingly wanted to put the fair in the city. Also, instead of erecting temporary fair pavilions that would later be torn down, they wanted to build something permanent that would benefit the city.

Again, there is a world of difference between the aspirations of planners and what they eventually have to accept. The Expo group got neither a true city site nor any significant permanent additions to the city. But this acceptance came about surely and gently because the enormity of annexing city streets for the fair overawed all concerned.

Since the urban renewal process in Montreal is as time-consuming as in any other North American city, the ideally suited downtown section between the new core generated by Place Ville Marie (see map) and the harbor had to be excluded from the plans (except for one strip of reclaimed land called Mackay Pier and a slum pocket at the landward end of it).

This 143.20-acre city site was insufficient for a fair, but it could be supplemented with an island, Ile Sainte-Hélène, just off the tip of the pier in the St. Lawrence River. Actually, Ile Sainte-Hélène alone was not large enough, so it was extended, and another island, Ile Notre-Dame, built up alongside it.

Man and His Political Sense

The Exhibition Corporation had made its choice of sites for the fair, but since the city of Montreal was obligated as host to supply the land, the last word came from City Hall. The mayor, Jean Drapeau, unerringly elected to build Expo on islands in the river for several reasons: The site was close to the city center; it could be linked with a then-proposed subway system; it did not displace any people; one island could be re-used as a city park, with the other leased for development; geographically, it was balanced between the French- and English-speaking populations that generate so much of the political maneuvering that spices Quebec politics.

Whatever his motives, the mayor undoubtedly deserves the opportunity to exercise his own judgment, for without him there would have been no fair in Montreal at all. He promoted the idea of a world fair in Montreal, and when the Soviet Union dropped its option, Drapeau swept into Paris to sell the international committee on his city. Perhaps the coincidence of Canada celebrating its centennial during 1967 helped locate the fair in the country, but no other Canadian city actively bid for it. Parenthetically, the attitude of other provinces toward Quebec has mellowed. Traditionally, they treated French Canada as a strange province within the confederation, but they now appear enthusiastic about Montreal representing their country as host to the fair.

Drapeau promised the committee, among other things, to deliver a subway system before the fair opened, and, with the aid of a $140-million loan, kept his word. Then, with Expo signed and sealed for the future delivery, Montreal entered into a concentrated building program probably never exceeded in any North American city. Construction costs for the fair, highways, bridges, hotels, a permanent exhibition and convention center, plus the regular stream of construction, totaled $2 billion.

Much of this construction would have gone up even without the fair, but it would have spread itself out over 10 to 15 years; Expo compressed it into five. Such frenzied activity surprised many observers accustomed to laissez-faire Montreal governments that had not previously shown a great capacity for getting things done.

Man and His Scientific Belief

Once the mayor had decided that Expo would occupy the pier site and two islands, the planners had temporarily to relinquish their influence on the plans while engineers determined what shape the islands should be. Certain conditions were fixed, such as the dike alongside the St. Lawrence Seaway at the south side of the river, and the existing island and shoals.

The plan shapes of the new islands were established not on the basis of aesthetics but with large-scale models in hydraulic tests to insure that neither the river flow nor its ice floes would be impeded by the additional land mass. Hence the upstream shore of the Ile Notre-Dame presents a long sweeping curve that channels water smoothly between the islands.

Since the scientifically determined boundaries provided far more space than Expo required on the islands, the planners incorporated voids in the form of lakes. These occupied about half the island areas and served two purposes: They saved the cost of filling land over an unwanted area, and they provided scenic and recreational adjuncts to the fair. Two of the lakes were formed on the sites of quarries that contractors excavated to about 50 ft for material to build the rock dikes at the perimeter of the landfill.

Unlike the shape of the islands, the island elevations were fixed by the planners. Since the existing park on Ile Sainte-Hélène is high, the additional, reclaimed land was kept low in order to make a contrast and to indicate that it has only recently emerged from the water. To offer some relief from the almost constant view of water, the center section of pavilions on Ile Notre-Dame was deliberately lowered so that visitors will not be able to see the river from street level in this area.

Man and His City Improvements

The pier site of the three Expo elements contains six permanent buildings: the Administration Building, Habitat, International Broadcasting Center, Art Gallery, Olympic House, and a stadium.

The stadium may be permanent, but is ostensibly designed to be relocatable, because the land was procured through urban renewal. It occupies the former site of a slum that was originally built to house Irish laborers building the adjacent Victoria Bridge across the St. Lawrence River. Goose Village, as the slum was once called, was no loss to the city, but in the general neighborhood are some handsome 18th-Century warehouses that add architectural character to the area.

In between these extremes of buildings stand the grain silos. Since they are strong elements, and since meat-packing plants contribute nothing to the cityscape except taxes, the silos enhance the townscape. Interestingly, the meat packers have reportedly spent $1 million to prevent odors from the plants contaminating the fair — a noble public service showing an indifference toward people who lived in the area before the fair was conceived.

A long section of the pier was to have been occupied by Habitat 67, a multistory experiment in town housing (p. 226, OCTOBER 1966 P/A). Looking back to the concept stage of planning Expo, Habitat would have been a 1000-house project stacked 22 stories high, with shops, school, and transportation within it. Habitat, like many of the fair's bold ideas, decreased in scale when policies and budgets shaped up, but it still occupies its intended position, although the name Mackay Pier has been changed to Cité du Havre.

Man and His Heritage

The choice of alignment of a rail link between the city and the fair reflects the inherent difficuity of running a city composed of two national backgrounds: Gallic and Anglo-Saxon. Some planners believe that large-scale transportation to the fair could best have been achieved by extending rail tracks from Central Station, which is in the Place Ville Marie, to the main entrance at Cité du Havre. This would have carried people from the city core, passengers arriving at the station from the city's northern suburbs, and passengers transferring from nearby Windsor Station, which serves the west suburban area.

Unfortunately for the advocates of this plan, its facilities were not weighted in favor of the French-Canadian majority, and it was never a strong candidate. What the fair does have is an extension of the north-south axis of the Métro, which extends through the east end of Montreal, where the population reflects the ethnic com-

position of city hall. Critics say that locating the transfer station for the two Métro lines outside the city core weakens the over-all transportation pattern even if the north-south route does collect passengers from heavily populated areas.

As if to balance this, the new highway approach to the fair starts close to the core. During the run of the fair, however, the approach road will terminate in city streets, but eventually will link with a major east-west highway being built parallel to existing railroad tracks. In turn, this highway will connect with a north-south route under construction at Decarie Boulevard, which leads to the Trans-Canada Highway north of Montreal.

All visitors arriving via the new road by bus or car enter the fair at the main gate, which is called La Place d'Accueil, from which point they may take the Expo Express train to the two islands (see map). This train route shares the two road bridges linking the Cité du Havre and the islands, but for political reasons the city ordered the tracks to be removed at the end of the fair season in order that the route could not be extended to the south shore and thus compete with the Métro.

Man and His Transportation

Although Vitruvius never saw a rapid-transit system, he might have agreed that Expo's transportation system possesses commodity, firmness, and delight. It can move 30,000 persons an hour on an express rail between major locations within the site; its systems create strong links between the three elements of the site; and the buildings, routes, and equipment communicate the fun of a fair. By way of comparison, 55,000 passengers move through the Boston subway during a peak travel hour.

Planning the transportation services for Expo is akin to developing transport for a new town site, but the Expo density is much greater. The fair occupies 1000 acres, and has been populated on a Sunday by as many as 570,000 people (only 20 U.S. cities exceed this population).

Thus, the morning and evening commuter rush of a city is played out all through the day at Expo 67, with buses, cars, subway trains, and ferries disgorging passengers into two distribution systems.

The primary system, an elevated train, moves rapidly between three stations; the secondary system conveys people leisurely in several forms of transportation. However, the bulk of the secondary system comprises three separate loops of elevated cars called Minirails.

Fortunately for Montreal, the city administration insured that the Métro would open just before Expo. The Métro extends under the St. Lawrence River to Longueuil on the south shore, and stops en route at Ile Sainte-Hélène, the middle element of the three exhibition areas. The station is favorably situated for the fair and for a park that will remain after the fair closes.

Man and His Trains

When planning the transportation system for the fair, the Expo staff considered several types of trains. Because the fair lasts only six months, the choice of transportation systems was limited by the budget. Hence the driverless train system, demonstrated in Pittsburgh, Pa. (p. 202, APRIL 1966 P/A), was reluctantly passed up, together with monorails and a system identical with the Montreal Métro.

Métro cars run on pneumatic tires that are guided on concrete tracks by horizontal steel wheels running on a second pair of steel tracks. The trains run smoothly and quietly, but are more expensive than subway cars running on conventional steel rails. So for the express service, Expo bought a cheaper system with standard cars that can later be sold to another city — say, Toronto — for use on its subway. The cars are standard size, but the fair corporation had them air-conditioned and styled to relieve the institutional atmosphere of mass-transit cars.

From the express cars, visitors get a fast perspective view of the fair while en route to a transfer point, or they may prefer to travel the full length of the 20-minute ride just to see what is in store for them.

Fair officials hope that, after riding through the fair by express, visitors will then transfer to one of the three closed loops of the Minirail system. Minirails provide a close-up look at the pavilions, and in some cases pass through pavilions. This gives fairgoers a leisurely chance to determine which places to visit later on foot without tramping around blindly looking for places of interest.

Expo bought the Minirail tracks and cars from the 1964 Swiss national fair held in Lausanne, and installed the equipment in two of its loops. For the third loop, the fair corporation ordered similar but larger equipment from the original manufacturer.

All the Minirails have rubber tires on steel monorails and travel at speeds between 7 and 10 mph. Thus the 5-mile trip on the largest loop takes 40 minutes and costs 50¢. The short loops each carry 2400 persons an hour over 1-mile-long tracks, and cost 25¢ a ride.

In addition to the free express and the paid Minirail rides, the public also has the choice of two trackless trailer trains: a skyride in cable cars across the amusement area, La Ronde; boat rides on canals between pavilions on Ile Notre-Dame; ferries across Voyageurs Lake to picnic areas; ferries across the St. Lawrence River; and a Hovercraft service between Cité du Havre and La Ronde. Except for the sky ride, all these are operated by concessionaires and are considered to be part of the fun of the fair as much as means of transportation.

Man and His Uncertainty

Automation has gingerly stuck its foot into Expo's train systems: Although the trains are automated for "no hands" operation, they carry a man who opens and closes doors and pushes a start button when the train leaves a station. This belt-and-suspenders touch is a decision on the part of the administration to provide an added safety factor.

Minirail trains, on the other hand, run without drivers, but are started by station attendants pushing a button. The trains do not have doors; passengers sit two abreast, facing forward, so an operator is not required. The advantage of open-sided cars is that passengers can enter and exit from opposite sides when a train stops between two platforms.

After leaving a station, train speeds are automatically regulated for grades, curves, and density of traffic. To emphasize the illusion of total automation, the fair displays a control room at Place d'Accueil with a dispatcher controlling switching operations with the aid of an illuminated map showing the position of the express trains.

Man and His Thoughtfulness

Fortunately for visitors, Expo's site layout leaves breathing space for pedestrians: There is plenty of parkland; wheelchairs are provided access to all parts of the site, and pedestrians are separated from vehicles.

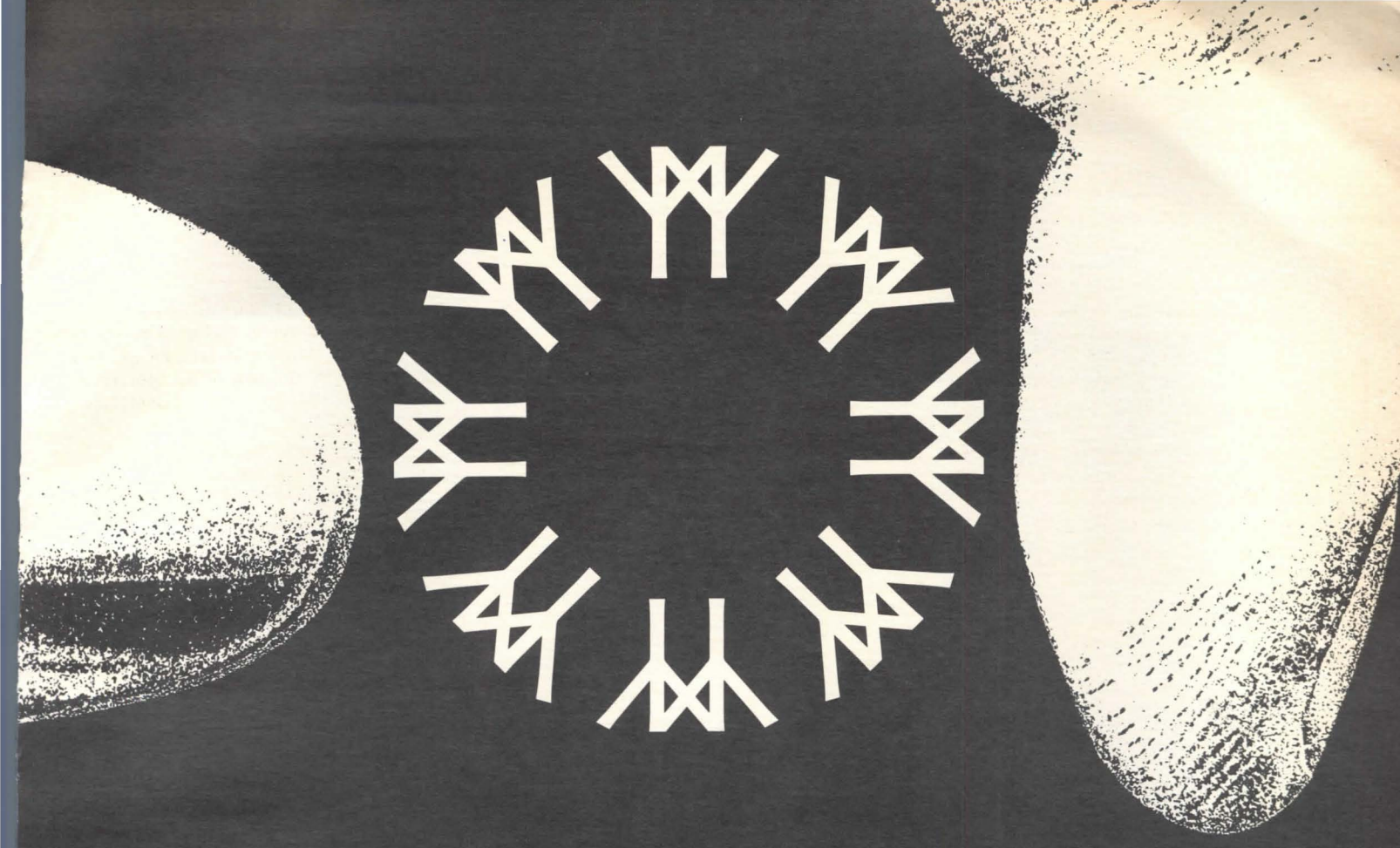
The major park space, the 140-acre Hélène de Champlain Park on Ile Sainte-Hélène, existed long before Expo, and on the average attracted 130,000 Montrealers on a hot day. After the fair closes, the public will get back its park. Meanwhile, however, it serves as a refreshing green, hilly area separating the amusement area from a major pavilion area.

Another large park, built around a lake at the western tip of Ile Notre-Dame, is far enough away from the thoroughfares to become almost a sanctuary for fairgoers, who reach the park by walking around the lake or by riding a canal boat to one of three stops in the park.

Walking through the busy exhibition grounds has been made easier by separating the two trackless trailer train routes from the paths used by pedestrians. This seemingly obvious courtesy was missing from the New York 1964 World's Fair, where the rubber-tired vehicles harassed visitors walking on footpaths.

Fair-going, even with all the aids and comforts of good planning, can be wearisome for most people, but for the handicapped it can involve almost insurmountable problems. Fortunately for these people, the Exhibition Corporation made it possible for wheelchairs to reach all its exhibits, and strongly recommended that all participants make the same provisions in their pavilions.

Thus the exhibition grounds are for everyone's pleasure, and can be taken at the pace of the handicapped, the pedestrian, or the rider in slow or rapid transportation.



IOW THE PAVILIONS WERE DESIGNED

Power of the Individual Detail

Since their inception in 1851, world fairs and expositions have traditionally been memorable for their display of the increasing scientific and technical accomplishments of man.

Occasionally, they have also been remembered for their buildings. Paxton's Crystal Palace, Eiffel's Tower, Mies' Barcelona Pavilion, and U.S. Steel's Unisphere all made architectural history, to greater or lesser degree.

To the designer, the why and wherefore of fair buildings is tangible evidence of the architectural thinking of his time. Techniques of building are often as indicative of the future of architecture as are the finished buildings. Paxton's methods of prefabrication and erection had more effect on the future of architecture than the impression of his finished building standing in Hyde Park.

The following selection of details and comments provide a sampling of the richness of the architectural mine at Expo 67. Every observer, if he digs a bit, will come up with his own treasures.

Man and His Space Frame

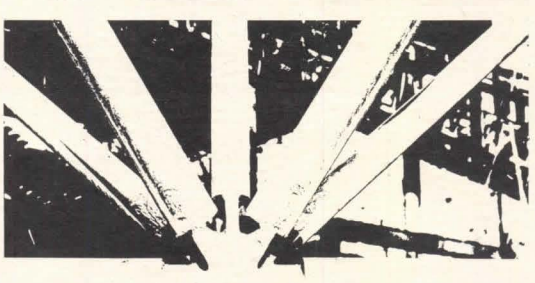
At first glance, Expo 67 seems as if it might herald the Age of the Space Frame, since many pavilions use space-frame construction. However, according to several engineers familiar with the buildings, the applications do not always fully live up to the potential of the system. These men are sharply critical, saying that some structures show "what not to do with a fair building."

One space-frame consultant, Jeffrey Lindsay, told the International Conference on Space Structures in 1966: "The pavilions are primarily architectural, and do not demonstrate the facility inherent in space structures." He added, however, that "the Cité du Havre Theme pavilion, Man and His Community, is an extraordinarily direct expression of the fully integrated architectural space structure premise."

In the same talk, Lindsay made a plea for systems research to aid the industrial development of space structures so that costs can diminish without compromising architectural accomplishment.

Among the systems at Expo, the Triodetic hubs seem a very satisfactory solution and may bear the same relation to space-frame history as did the nail to wood framing. The structural tubes of the U.S. Pavilion were difficult to bolt, so the designers developed an excellent welded detail. The connections for the truncated tetrahedrons of the theme pavilions Man the Explorer and Man the Producer had other difficulties.

Perhaps some of the space frames illustrate "what not to do with a space frame," but they do not, as Montreal engineers have said, represent what "not to do with a fair building." Where else but in the atmosphere of "let's find out" of a fair are these experiments to be made? And where, incidentally, will so many be as accessible for examination by the architectural profession? — FW



Space-Frame Cocoon

Netherlands Pavilion, Ile Sainte-Hélène

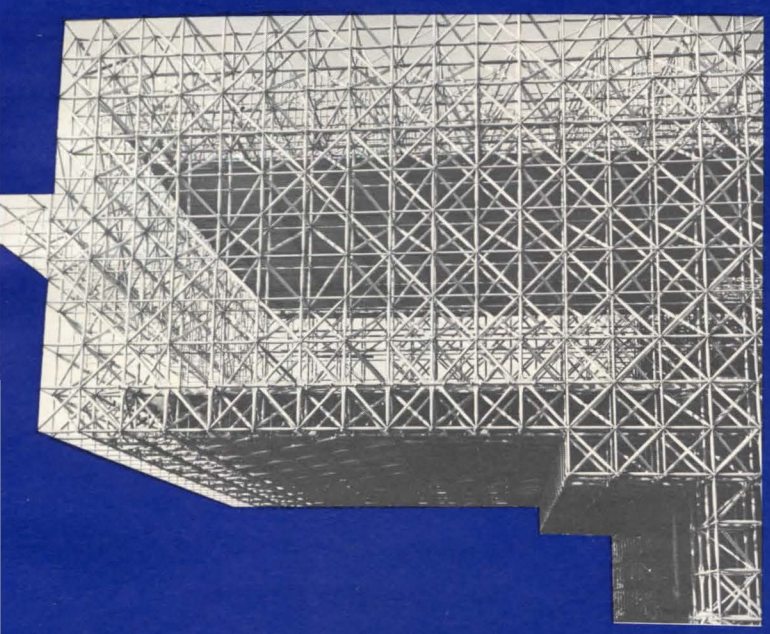
The main feature of the pavilion is the use of the space frame for slab and wall support. Frame connections consist of an extruded aluminum slotted hub. Quoined tube ends are inserted into connector slots. Connections use only secondary bolting.

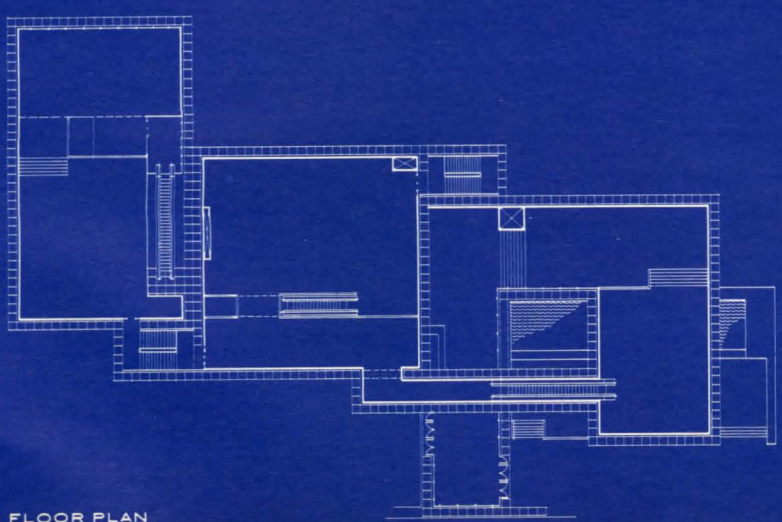
The basic pattern of the space frame is a 3′ x 3′ x 3′ cube with one interior diagonal connecting two primary nodes diametrically opposite each other. This was achieved by subdividing a 6-ft conventional two-way space grid. The floors, walls, and canopies of the space frame are 3-ft thick and the depth of the roof is 6 ft.

Each primary node receives nine bars in the plane of the layer in which it is located, four diagonal bars, and one spacer bar perpendicular to the two layers. Drawn aluminum tubing 1½ in., 2 in., and 3 in. dia with .120-in. wall thicknesses were used in 85 per cent of the structure. The remaining 15 per cent incorporates 3-in.-dia galvanized steel for highly stressed areas.

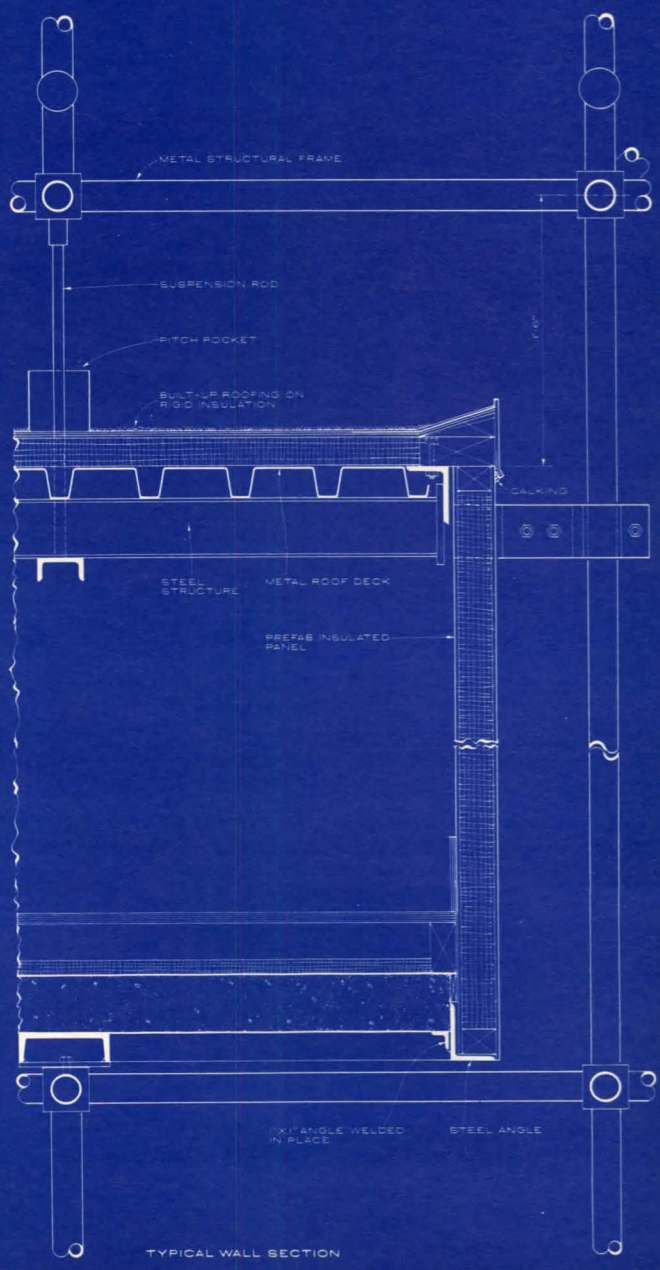
Walls of the building are suspended inside the space frame. They consist of a sandwich of asbestos and gypsumboard with 2-in. batt insulation between. Panels are constructed in 3-ft widths and are separated by means of plastic channel dividers. Floors are precast concrete with wood over. A space between the two materials allows the running of conduit and services. Roofs are steel deck supported by hangers from the structure.

The principal dimensions of the pavilion are 243-ft long, 74-fat wide, and 60-ft tall. There is a total of 78,000 sq ft of space frame structure involving approximately 52,000 aluminum tubes, 5,000 steel tubes, and 17,500 aluminum connectors.





FLOOR PLAN



TYPICAL WALL SECTION

Triangulated Daylight
U. S. Pavilion, Ile Sainte-Hélène

Exterior triangulation and interior hexagonal framing are connected by web members to form the dome surface of Fuller's three-quarter sphere.

An acrylic skin is attached to the inner layer and forms a bubble with hexagonal base. The skin is molded from sheets of acrylic varying in size from 8′ x 10′ to 10′ x 12′, the maximum size available. The hexagonal dimension of the frame was established to accommodate the maximum acrylic sheet size, which in turn determined the dimensions of the outer layer triangulation and web members.

The structure of the outer layer is 3½-in. O.D. pipe, varying from standard wall weight in the upper regions of the dome to double weight near the base.

Pipe is connected with cast steel hubs. Maximum length between joints is about 10 ft for the outer layers, to approximately 7 ft for the inner and web members. Each hub consists of a solid steel cylindrical center, with rectangular tabs for each member joined. Outer layer hubs connect 12 pipes; inner hubs, 6 pipes, with two inner hubs for one outer. Eighty-two different hub patterns were required with the 5900 hubs.

Except for footblock weldments and a few special pieces at doors, no shop drawings were required. Layouts and dimensions were made by computer.

On-Site Fabrication

Subassemblies were prefabricated in one of the two jigs located near the base of the dome. The large assemblies were approximately 50 ft in maximum dimension and were erected by crane. Total time for assembly and site erection was approximately 5 months.

Structural Analysis

The dome was assumed an isotropic shell. Membrane stress analysis was carried out by computer for wind load, dead load, snow load, and live load from hanging exhibitions.

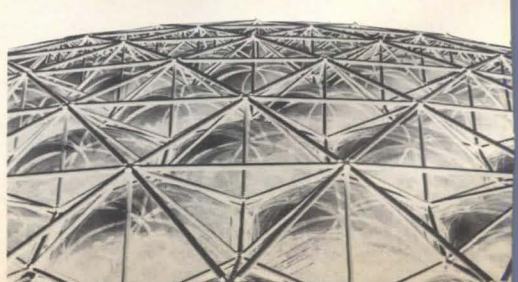
A space-frame analysis was made by computer for a typical portion of the structure to determine the distribution of forces. A special computer analysis was also carried out for portions of the structure at large door and "Minirail" openings and at changes of foundation level at the base of the dome.

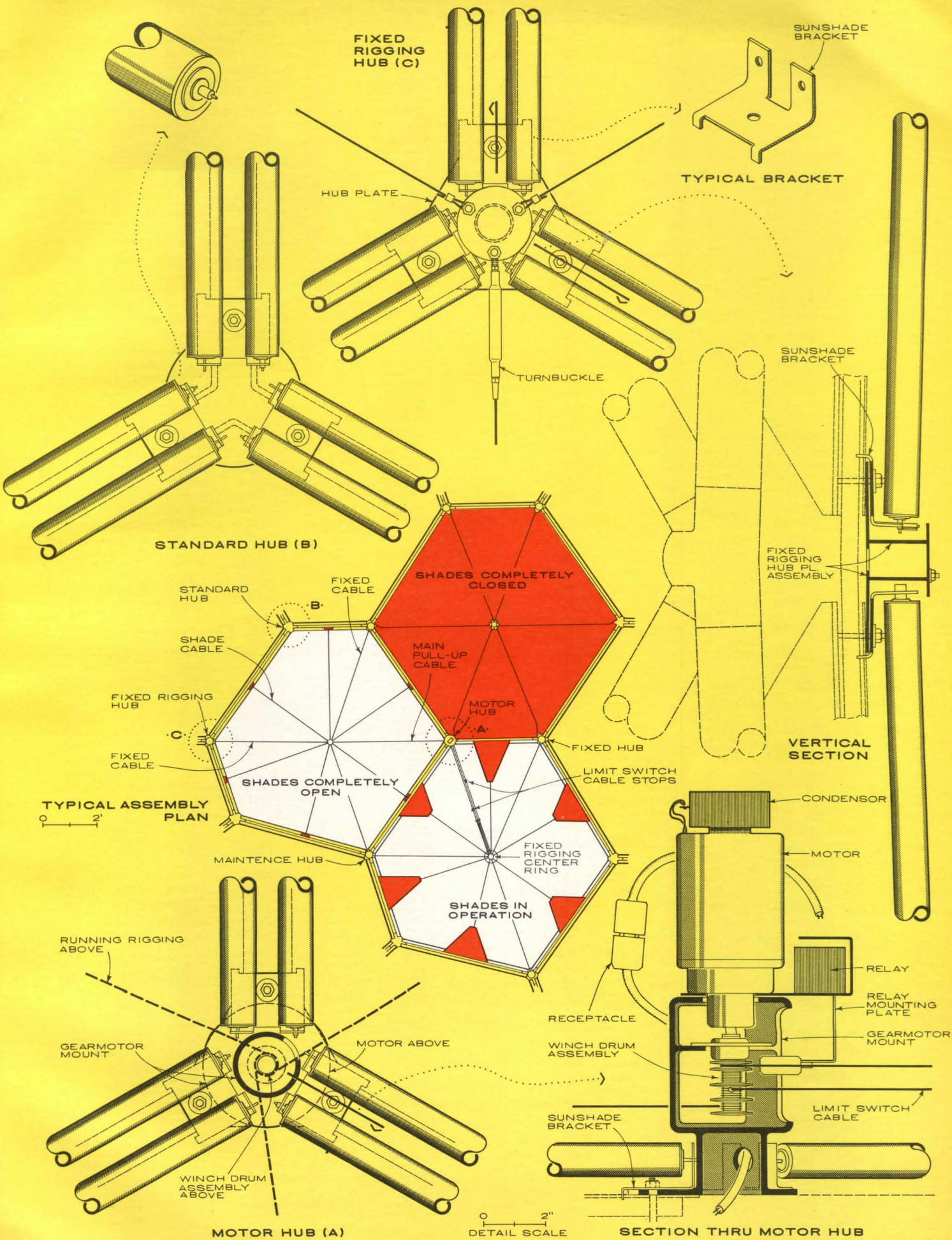
Sunshades are provided on the interior surface of the dome. The shades will open in triangular leafs by motorized operation from a computerized punched tape. Shade pattern is changed every 20 minutes to keep aligned to the movement of the sun. The taped program can be by-passed for special conditions.

Fuller Comments

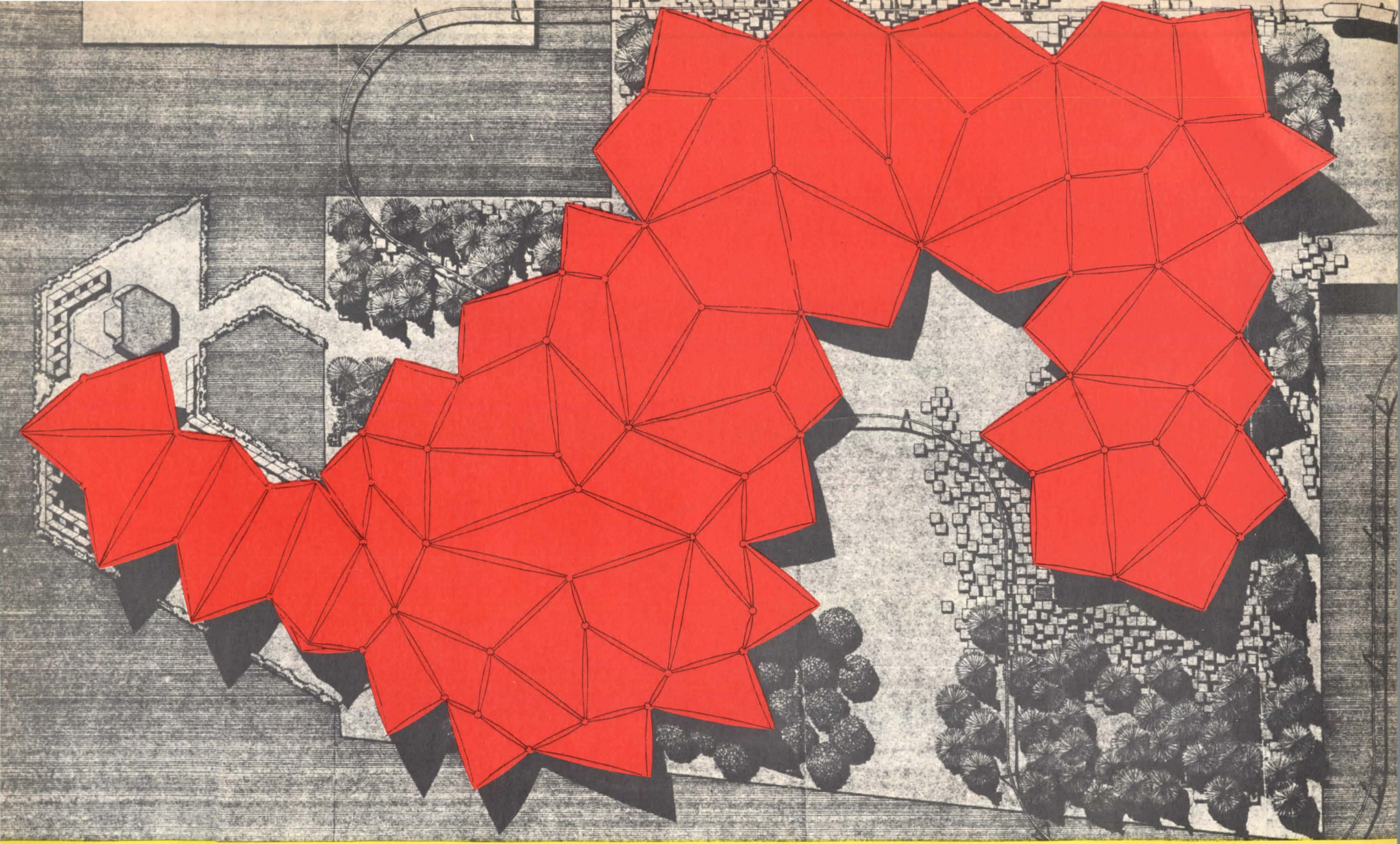
Buckminster Fuller was quoted in **Contract** magazine as follows: "The amount allowed for my building was $1,750,000; yet I was expected to out-do the Eiffel Tower.

"I am certain that no other structure than the geodesic could have made as much of a showing for the amount of money. One thing is certain, my dome is not a plaything or just a fair-time device. It's an advanced environment control, accomplished with much less material and effort than can be accomplished by any alternative engineering strategy."





SHADES AND OPERATIONAL DETAILS



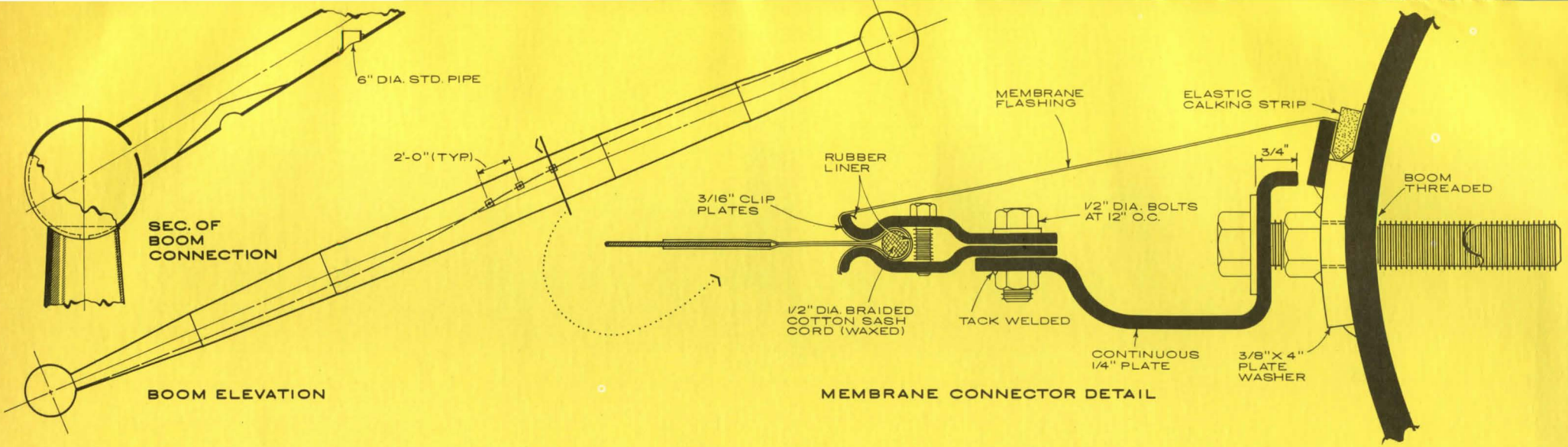
A Boom for Tensioned Membrane

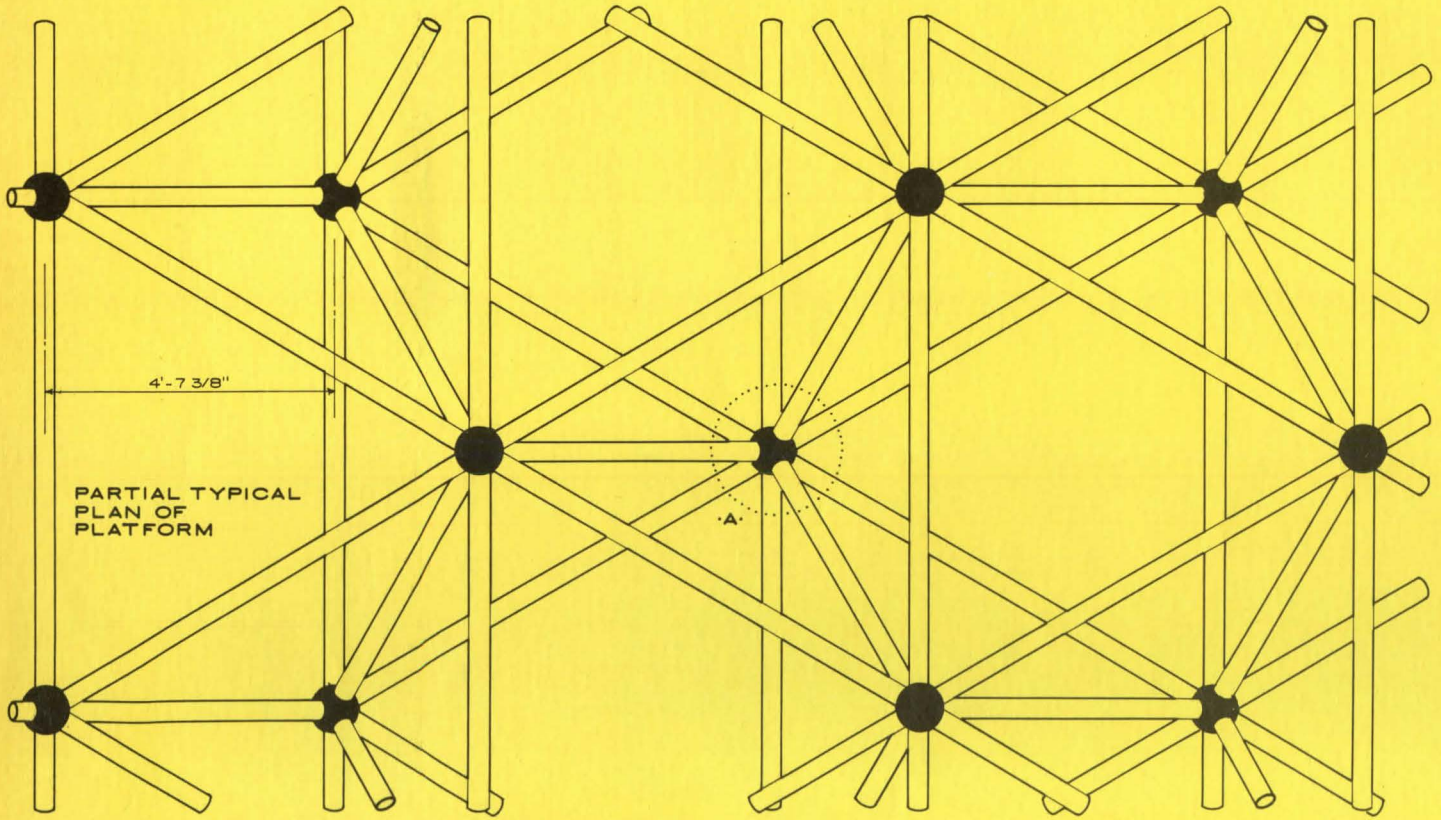
Ontario Pavilion, Ile Notre-Dame

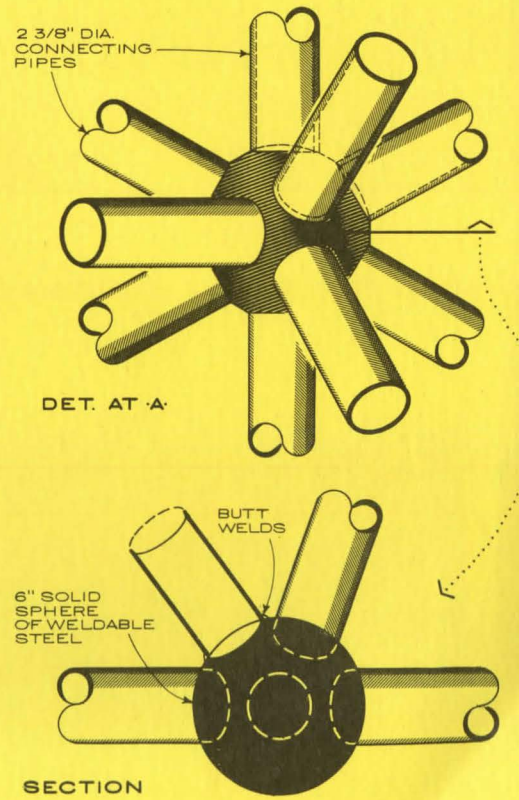
The Ontario Pavilion's roof structure is composed of 73 vinyl-coated glass-fiber panels attached to 180 tapered steel booms that surround and tension the membrane panels at the edges. Edges are joined with a tensioning device and ashed. There are 38 columns in the structure varying in height from 12 to 28 ft; booms are 24 to 81 ft long.

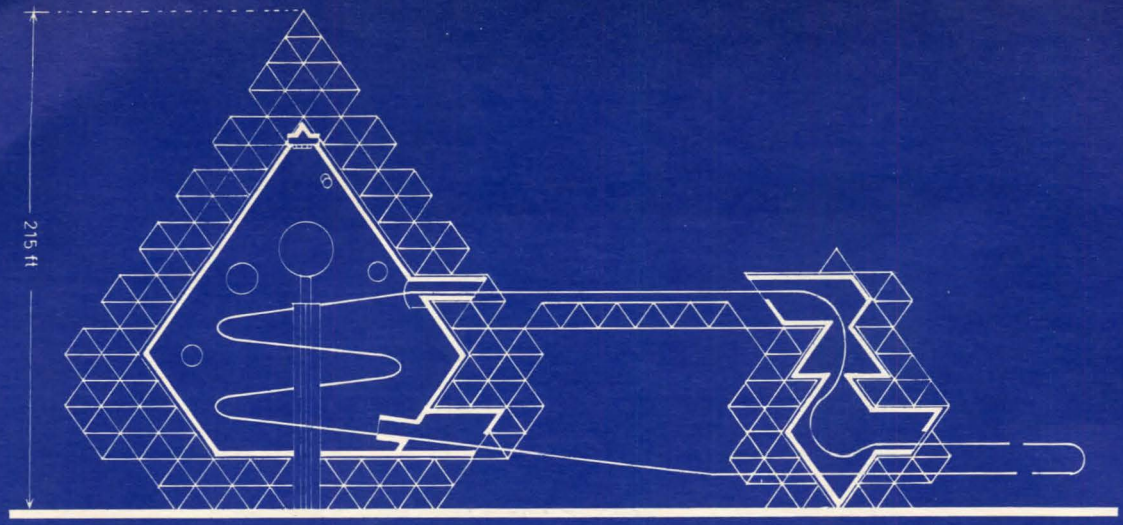
Roof columns and booms are circular in cross-section and are made from welded steel plate. Booms and columns are tapered. Booms are rigidly welded into hollow cast steel spheres.

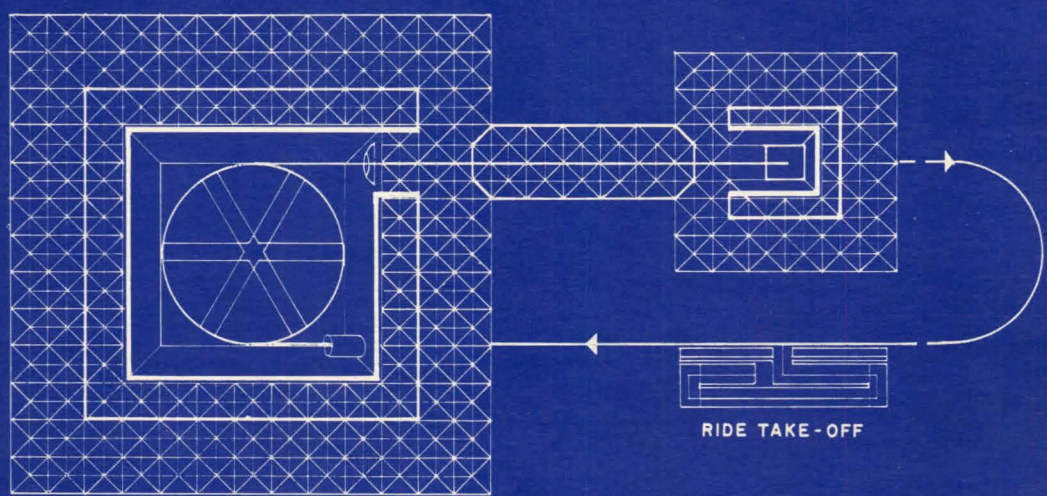
The elevated space frame is irregularly shaped varying in span from 45 to 90 ft.


6" DIA. STD. PIPE
2'-0" (TYP.)
SEC. OF BOOM CONNECTION
BOOM ELEVATION
MEMBRANE FLASHING
ELASTIC CALKING STRIP
RUBBER LINER
3/16" CLIP PLATES
1/2" DIA. BOLTS AT 12" O.C.
3/4"
BOOM THREADED
1/2" DIA. BRAIDED COTTON SASH CORD (WAXED)
TACK WELDED
CONTINUOUS 1/4" PLATE
3/8" X 4" PLATE WASHER
MEMBRANE CONNECTOR DETAIL

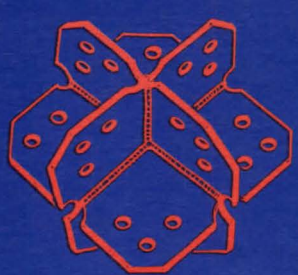

4'-7 3/8"
A
PARTIAL TYPICAL PLAN OF PLATFORM


2 3/8" DIA. CONNECTING PIPES
DET. AT A
BUTT WELDS
6" SOLID SPHERE OF WELDABLE STEEL
SECTION

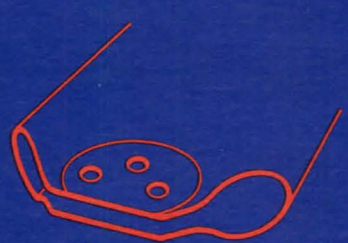




PLAN OF BRIDGE LEVEL



FABRICATED STEEL JOINT



SHAPED END OF ALUMINUM TUBE

30,000 Man-Years of Calculation

Gyrotron, Ile Sainte-Hélène

This is a multilayer space frame in the form of an octahedron. The 8500 members of the structure are aluminum tubes 16 ft in length, 6 in. in diameter, with varying wall thicknesses of 0.086 to 0.280 in. A minimum slenderness ratio of 100 was adopted.

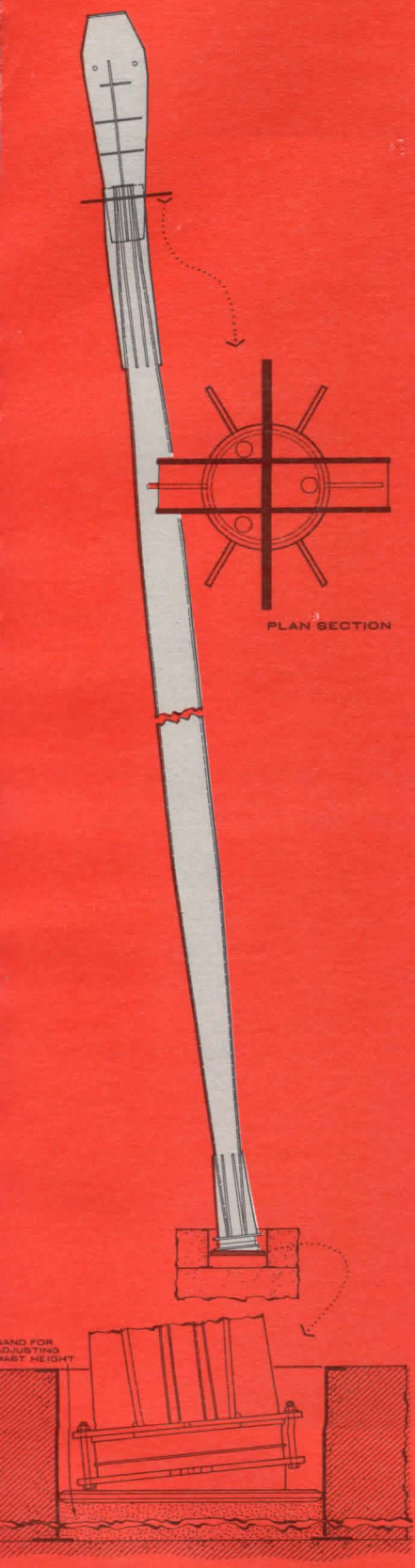
Joints are welded steel and galvanized. Bolted connections are of the friction-grip type that permit assembly tolerances without allowing slack movement on stress reversal.

Designs were completed in both aluminum and steel. The architects believe that Alcan, because of its interest in Expo 67, may have offered a very favorable tender. They say that, as a result, it is difficult to assess the competitive price of steel and aluminum in this structure. However, they believe that, should greater competition develop between the aluminum companies, the result might be that the majority of space-frame structures would be cheaper to construct in aluminum.

The cladding for the structure enclosed by the space frame is composed of laminated aluminum-faced sandwich panels, spanning 13′-10″ between vertical levels in 4-ft widths. The panel skins are 0.051-in. thick, have a baked enamel finish, and are laminated to a phenol-impregnated paper-honeycomb core with perimeter frame of pine.

It is claimed by the architect that this is the largest single space frame ever analyzed. Analysis required two hours of computer time on the world's largest computer — the equivalent of 30,000 man lifetimes of hand computation.

Anchored Cable Nets Mesh
German Pavilion, Ile Notre-Dame



The roof structure of the German Pavilion consists of a stretched, inversely curved, cable net supported on masts in the interior and tied back to anchorages at the periphery. The edges of the net consists of 2-in.-dia cables tensioned between anchorages. Mesh width is 20″ x 20″ and net cables are ½-in.-dia.

Basic criteria for establishing the roof shape is that prestressing forces of the net cables be uniform. Contour lines were measured from a 1:100 scale model.

The roof structure and its supports are designed for a snow load of 20 p.s.f. Wind loading is not a dimensioning factor. Wind tunnel tests showed that most wind directions at the majority of roof locations produced uplift. When snow loading is applied to the structure, the stresses due to initial prestressing diminish: The reserve in strength of the net structure is appreciable, since the sag of the cables increase when loaded and the net is capable of redistributing forces.

The masts are steel pipes with tapered ends. The highest mast is 125 ft long and has an outer diameter of 3′-4″. The mast footings consist of hollow cylinders fitted with sand, which can be varied to adjust the elevation of the top of the masts.

The anchorages are reinforced concrete tied back to bedrock with high tensil steel cables grouted into holes drilled in the bedrock. Cables are tensioned against the head of the anchorages.

Erection

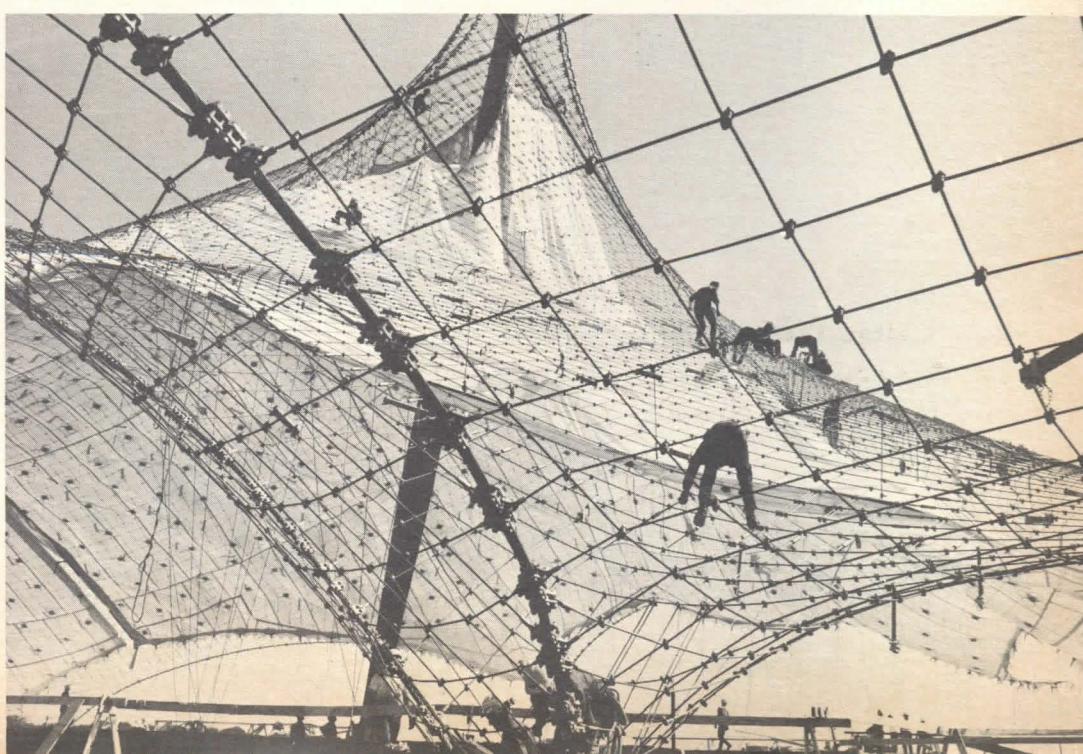
After erection of the masts, the net cable roof segments were connected on the ground, hoisted up the masts, and the desired prestressing and shape achieved by raising and lowering the masts: tensioning the edge cables against the anchorages and by adjusting turnbuckles of the net cables. Fine adjustment was tedious; changes in one area of the structure often influenced the conditions of the net in other locations. Erection of the net was accomplished in approximately one month, fine adjustment took another two-and-one-half. The net covers an area of approximately 100,000 sq ft. The translucent plastic skin is suspended from this net.

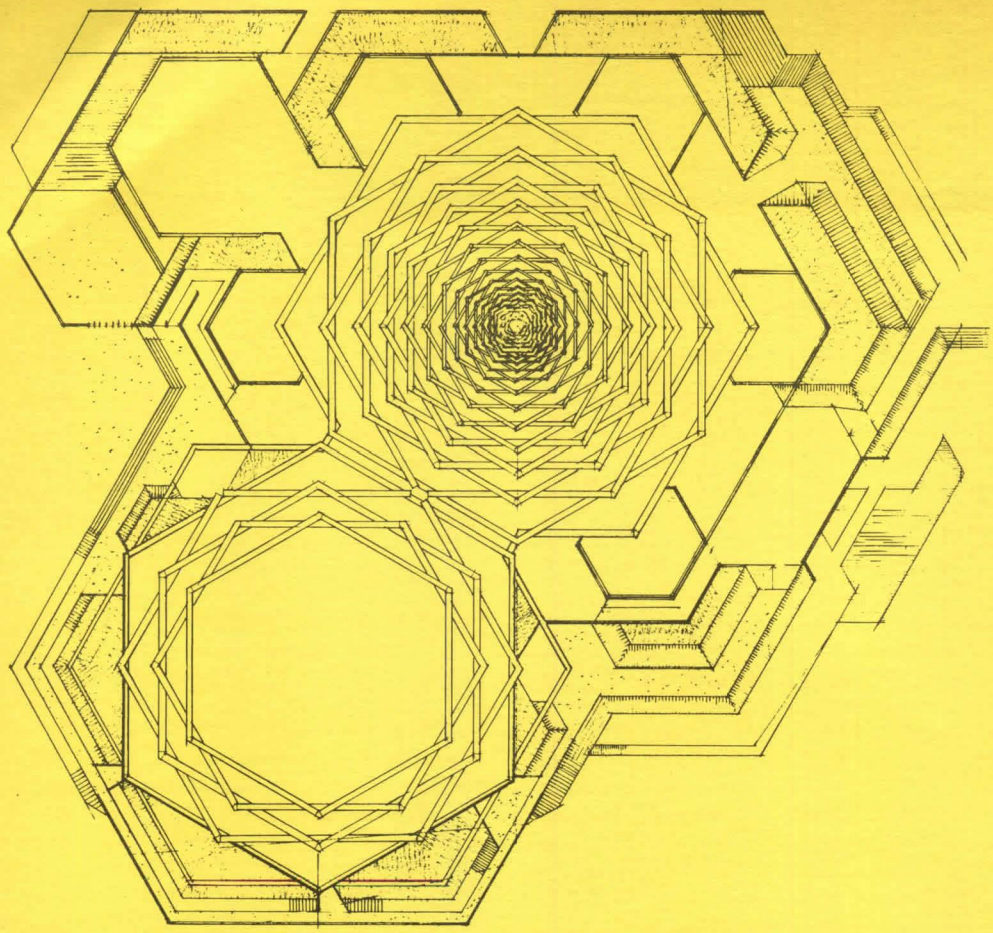
Elevated floors inside the tent structure are of a square grid of steel panels, supported on steel pipe columns. The panel length is about 4 ft. Field connections are made with high-strength bolts. Eber says that this is a system that Otto would like to develop for housing.

The roof over the auditorium consists of two prefabricated timber lattice cupolas. The construction of the domes is 1″ x 2″ Canadian Eastern Spruce @ 1′-8″ o.c. precut and pre-drilled for bolting. Completely assembled outside the pavilion, they were folded scissorwise, lifted, brought over the auditorium, opened, bent down, fitted, and set on the perimeter seat. Three layers of ½-in, rigid insulation was applied and the exterior covered with colored polyester skin. The underside of the domes is sprayed with fire-retardant paint.

The above description of the construction procedures was based on remarks by Mr. O. Tarnowski, Canadian consultant, who also superintended field erection.

Eber said that most of the pavilion's structural innovations would be further developed in the architects' search for new form. The tent itself was for a structure 50 times its size: "Otto would like to use the tent to span between two valleys in Switzerland," comments Eber.





Box Beamed Space

Man in the Community Man and His Health, Cité du Havre

Jeffrey Lindsay said of these pavilions at the International Conference on Space Structures:

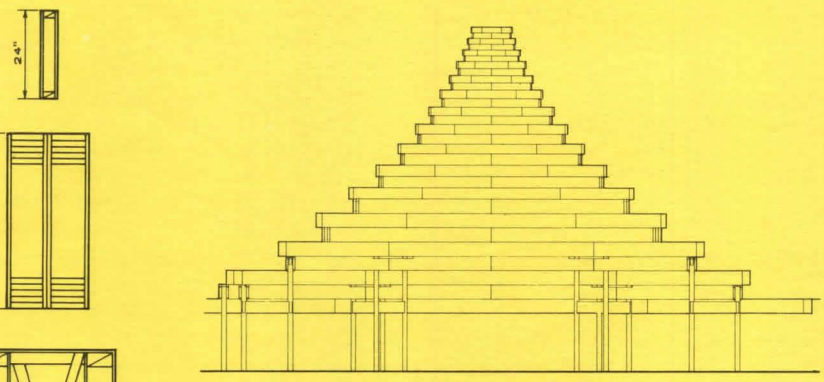
"The architecture is envisioned as a rough-textured concave cone defined by box section hexagons stacked one on top of another with alternate courses slewed 30°. The enclosing membrane was to be translucent and nonstructural.

"As detailed, the beams have glue-laminated fir or sawn fir top and bottom chords spaced by solid fir plywood webs. The larger beams have multiple webs. Sizes progressively diminish from 38 in. x 60 in. x 86 ft to 4 in. x 24 in. x 6 ft for each of the 29 hexagonal courses.

"The enclosing membrane is a laminate of two polyethylene films, sealed together through the open weave of polyester filament reinforcement. This transparent plastic is stapled and glued in strips between pairs of fir purlins.

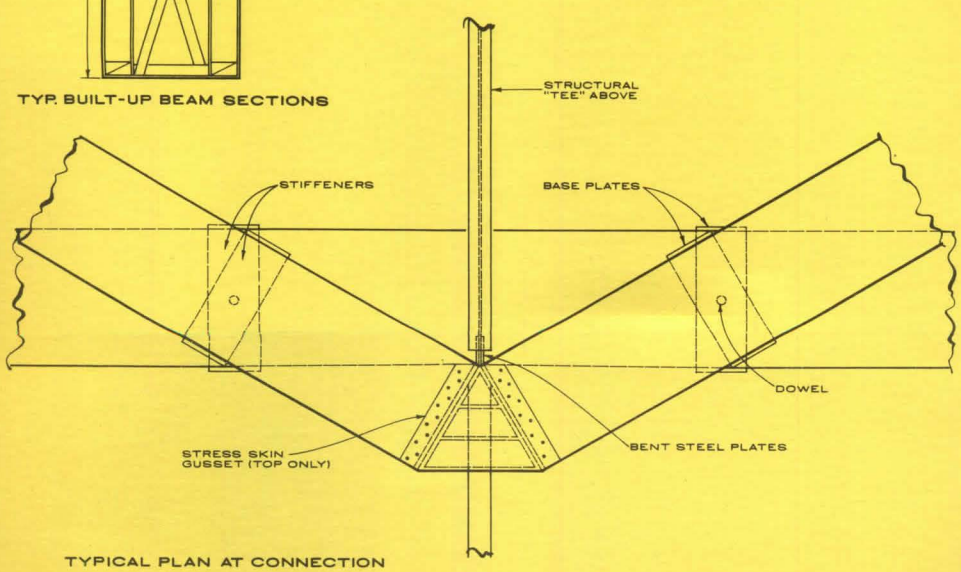
"The timber space structure is the antithesis of the steel system used for the other Theme Pavilions. It happened easily and without contention. It conforms to the modern premise in that the components and fastenings are clearly standardized, and closely regulated industrial processes are used to produce the main structural members. Although these are large, they can be efficiently handled by machine. Tolerances are not an issue because there are relatively few joints and the triangulation is stacked rather than met.

"The justification for this disarmingly simple and structurally circuitous system rests in the merit of the integral architecture. Note that each beam ends on the centre of the beam below. The live and dead loads are therefore routed the longest way down through the configuration, and six concrete columns reduce the moments in the lowest and longest beams. This pavilion demonstrates that proficient space structure standardization can swallow inefficient engineering."



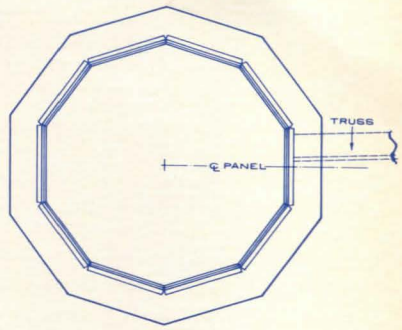
TYP. BUILT-UP BEAM SECTIONS

VERTICAL SECTION

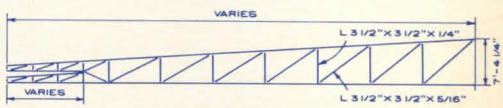


TYPICAL PLAN AT CONNECTION

Air Screw Trussed
Air Canada, Ile Sainte-Hélène



PLAN

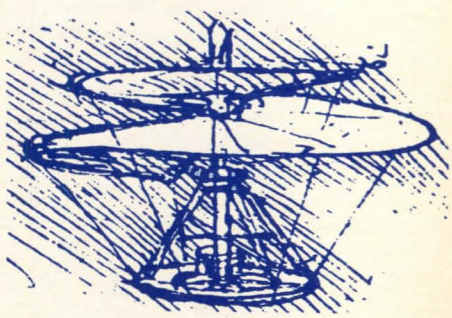


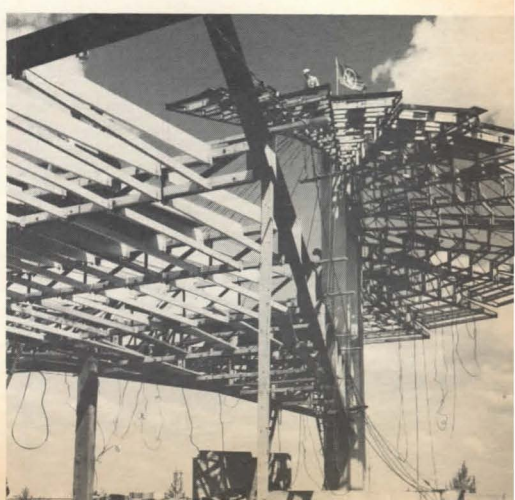
TYP. TRUSS DETAIL

Twenty-three trussed cantilevered blades, welded to a steel column, form the helix, which is 87 ft across at the base and 18 ft at the crown. Plywood skin for weather penetration and diaphragm dampening covers the trussed blades.

The exhibition buildings use loadbearing reinforced glass-fiber plastic panels for walls. Panels are butted and bolted together with ½-in.-dia bolts. The 3/16-in. panels have 7-in.-deep flanges at each end that turn out for joining. After the panels are bolted together, a glass-fiber cap strip is placed over the joined flanges to conceal the bolts.

Bottom flanges are bolted to a steel ring embedded in the cement floor. A steel channel around the top of the building picks up the roof framing. There are 48 wall panels, 45 cap strips and a total of nearly 7000 sq ft of glass-fiber material.





Space-Frame Integration
Man the Explorer, Ile Sainte-Hélène
Man the Producer, Ile Notre-Dame

These two pavilions have been the subject of much controversery. A prominent Montreal consulting engineer has made the comment, "The designers tried to develop space frames but ended up with structurally inefficient tetrahedrons, an example of what not to do."

Thomas E. Blood, project architect for the pavilions, replies: "We designed a system; it had to be flexible enough to accommodate exhibition spaces of undetermined size and the demands of a series of exhibition designers. It had to allow us to position our foundation footings before the building had been designed, and later the buildings had to survive a cut of one-quarter of the original budget without a reduction in interior space.

"We designed an integrated system of structure and energy distribution for both vertical and horizontal flexibility. It was capable of making changes in its configuration during construction while spanning 85 to 100 ft with live loads of 150 psf. There are no known patented systems that are capable of handling such loads.

"A building cell of 3'-3" was set as the basic module. It became the building block that filled all space. Interior volumes were carved from it. We made it crude and rough, like balloon framing. We had to get something fairly bold that would not be affected by bumps and grinds. Any building that became a good outside envelope was sure to get screwed up when exhibitions changed.

"The design was a series of Vierendeel trusses. The engineers said that we had to have the cross-bracing. Because of the great number of redundancies, the structural analysis was very complex. The computer at McGill University did not have a memory bank large enough to accommodate it.

"The geometry is simpler than any other space frame; there are fewer members coming to a point, which makes the nodes easy to design. Our first scheme was for welded connections, but when they calculated that it would involve 90 man-years of welding time, we switched to bolts.

"We covered the frames because the exhibitors demanded closed spaces; we were not selling raw steel.

"Concrete slabs had to bear on truss nodes. Compressed wood fiber plank with cement binder was shimmed ½ in. above the chords, holes cut at the nodes and lined with polyethylene sheet. When the slab was poured, it rested on the nodes.

Control

"The breakdown of construction control was an architectural disaster. Construction got way behind schedule. Panic set in. The contractor got a sympathetic ear and we no longer controlled construction. He was permitted to standardize and was not required to submit shop drawings. I found one gusset plate — 1-ft wide by 2'-6" high that had 32 major holes and 10 minor holes — held by one bolt.

Afterthoughts

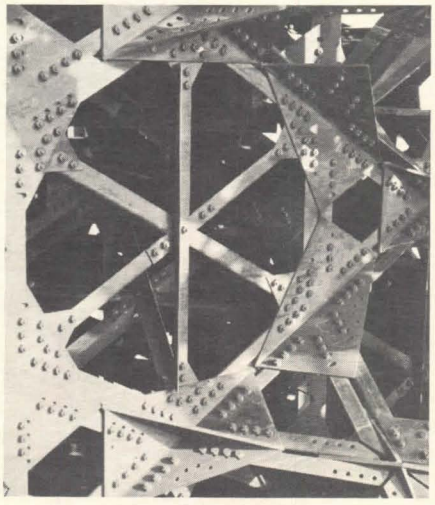
"The most important consideration of price is not related to cost of raw steel. If we had overdesigned the steel and had one-tenth the number of variables, it would have been cheaper.

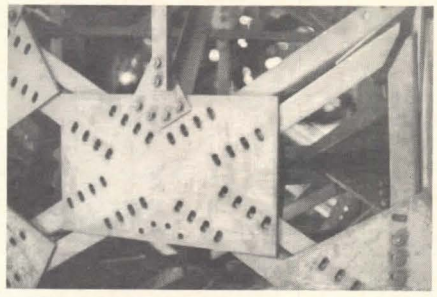
"As we progressed, we started to learn the sleight of hand and developed more sophisticated ways of getting around. We were not that smart in the early stages.

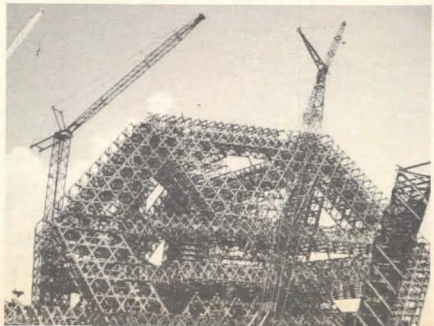
"We know how to do it a hell of a lot better now than when we froze the system and started building. Of course, we would never do it again; we would do it better."

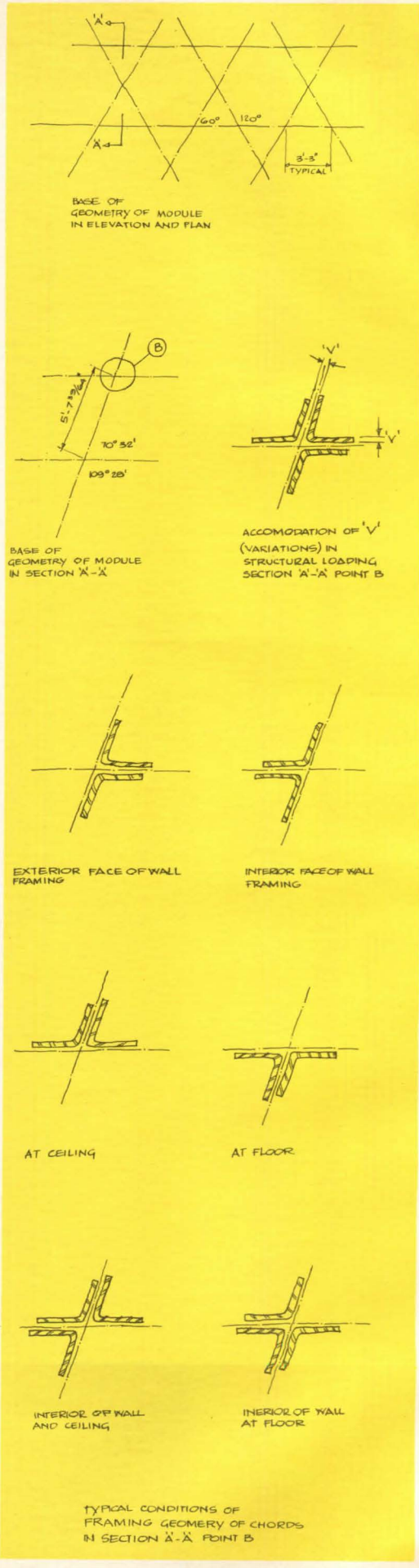
P/A Comments

It seems frivolous to judge the pavilions within the context of traditional architecture. They should be judged in relation to the question they set out to solve, that of a space structure capable of carrying heavy loads, which is additive and reductive with a total integration of mechanical and structural systems. The pavilions set out to solve a complicated architectural problem unique to our time, which is probably more important than their meaning as "architecture," good or bad.



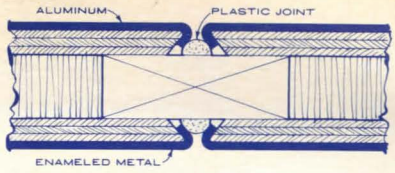




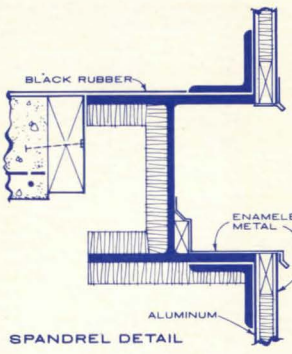


Wide-Flange Jewel

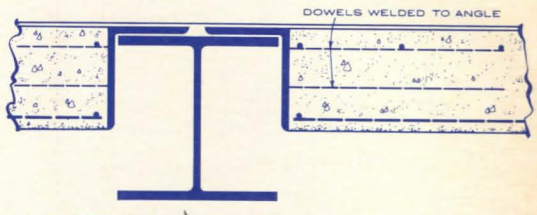
Cuban Pavilion, Ile Notre-Dame



PANEL JOINT DETAIL



SPANDREL DETAIL



FLOOR DETAIL

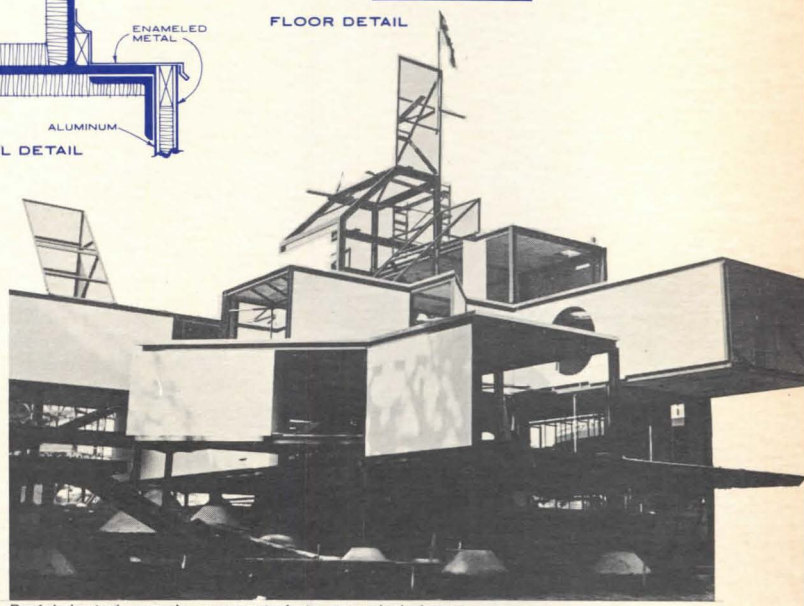
This structure is the result of careful planning and careful detailing. Designed modularly, it utilizes eight wide-flange bolted sections for both columns and beams.

Architect Rousseau says that it presents the possibility of several developments. It is a solution for low-cost housing since its standard prefabricated elements are easily erected in the field without skilled labor or major lifting equipment. The system could also be expanded for prefabricated plug-in housing units.

Details

Instead of edging precast concrete slabs for shipment from Cuba, the architect chose this method of cast-in-place planks as being more economical. Steel angles with welded dowels at each end rest on beam flanges. A wood sleeper between, connected to one slab only, provides separation, protects edges for shipping and affords a conduit raceway.

The pavilion will be dismantled and returned to Cuba after the close of the exhibition.



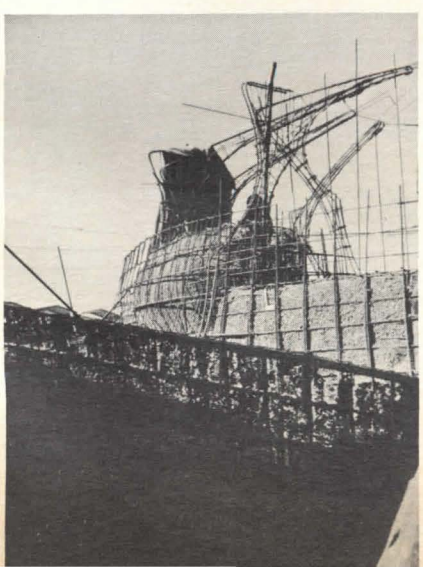
Prefabricated panels connected to spandrel beam.

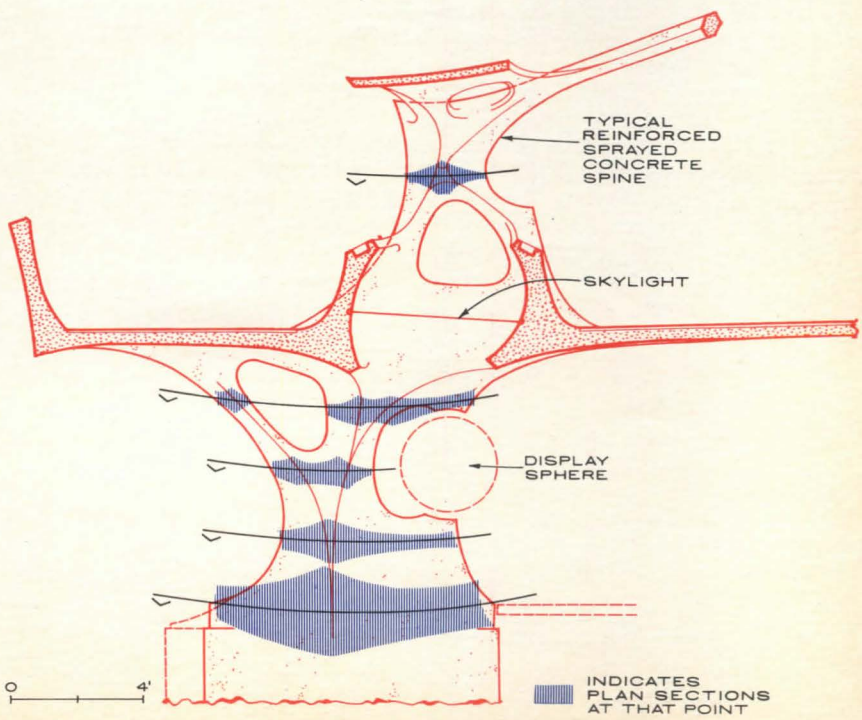
Concrete Plasticity

Polymer Pavilion, Ile Sainte-Hélène

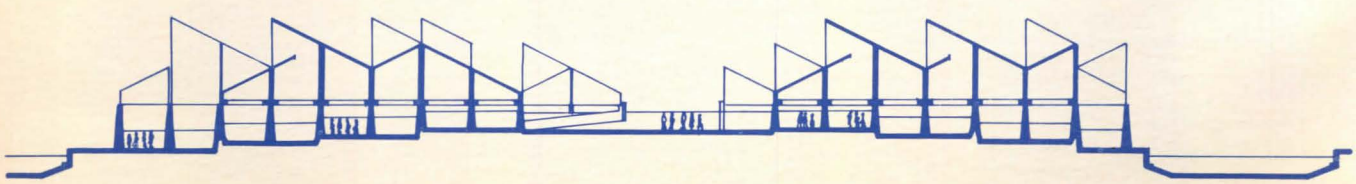
A model of the pavilion was designed in modeling clay, sketched, and then analyzed by structural engineers. It was adapted to their findings to form the skeleton of major reinforcing. Working drawings gave only basic dimensions. Profiles for all situations were prepared and scaled.

Metal lath was wired to one side of each wall as a base for the build-up of sprayed concrete. Light guide rods set at intervals to define final profiles were closely supervised by the architects, who, by means of adjusting the position of the rods, gained field control over the final shapes.





TYPICAL SECTION



Reaping the Wind

Africa Place, Ile Notre-Dame

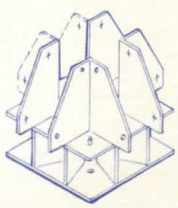
Consistent prevailing winds are harnessed for the ventilating system. Air enters through door and window openings, circulates between exhibition areas, and is drawn out through the roof wind scoops that are faced away from the prevailing summer winds. The system of air evacuation by natural suction was tested in the University of Toronto wind tunnel.

Roofs were prefabricated and assembled on the site. There are 999 panels in 11 basic shapes and sizes, made from ¼-in. and ⅜-in. fir plywood. The plywood skins are nailed or nail-glued to 4″ x 4″ and 2″ x 4″ spruce framing members. Nail-gluing, with casein glue, was used for all stressed skin roof panels and the long-span vertical sides of the roof system. These vertical panels are in effect simple span plywood web beams. The beams range from 4 ft to 12 ft in depth and span 16 ft, 22 ft, and 32 ft.

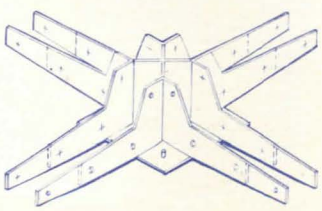
Architect Ian Morton of the Andrews office had this to say about the roof forms: "The roof configuration is the result of an economical structural and ventilating system.

"It is interesting that the layman finds it necessary to identify with the so-called 'unusual.' The roof and cellular plan has been identified symbolically by news media with African villages. One wonders what the lay description would be if the project were to house a cooperative market in a North American City."

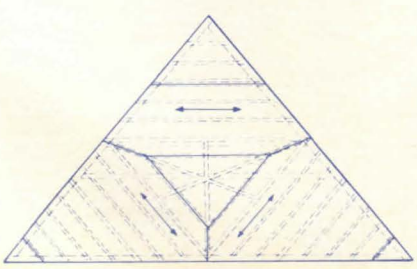
Africa Place is planned as a flexible structure so that participants may select the minimum of 640 sq ft or increase in increments to a maximum of 2560 sq ft.



Base Connector at Pier Head.



Base Connector Unsupported.



Dotted lines show lumber framing system. Arrows indicate direction of plywood face grain.

Geometric Inclination

Israel Pavilion, Ile Notre-Dame

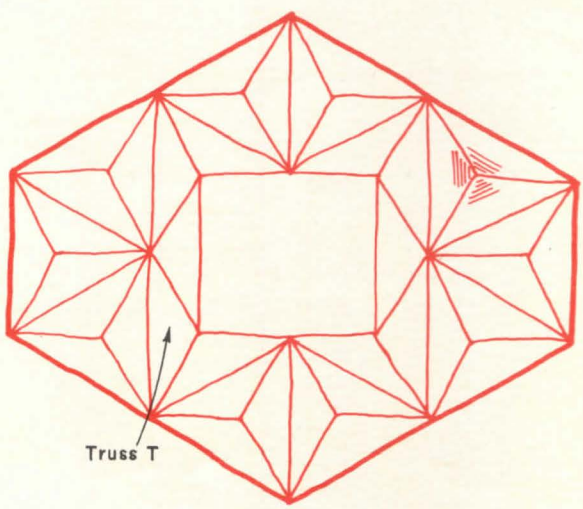
A rich structural geometry is exhibited in the design of the roof of the Israeli Pavilion. Inclined trusses form an efficient and economic space structure somewhat reminiscent of the first space structures known to architectural history — the self-centering, mutually supporting domes of the Middle East, similarly efficient in their use of material and also displaying a pleasing geometry.

Architect Rosen explains the principle of the roof structure: "A pyramidal shape supported at the three corners is a stable and self-sufficient structural unit. One that is supported at the apex is also stable but depends more for its stability on surrounding units."

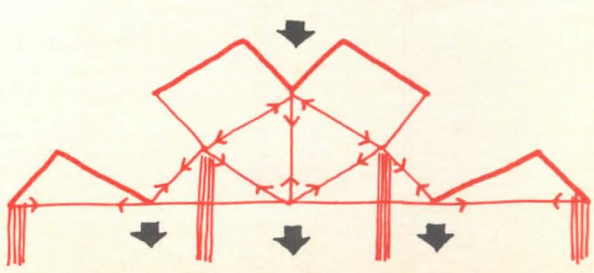
The Israel Pavilion's main roof is a series of pyramids, supported on the exterior by columns at each corner, but in the interior at only four apex points. The various pyramids are therefore interdependent for their structural stability.

"For symmetrical loads, the central vertical truss **(1)** is used to distribute upper and lower roof loads to the apex columns. The redundant horizontal force **(2)** is absorbed by two trusses formed by the valleys of the outer trusses. For non-symmetrical loads, the inclined truss (T) spanning between two outer columns, plus the truss formed by the valleys of the outer pyramids, forms a self-sufficient unit of its own.

"The individual pyramids are identical in their geometry. Three prefabricated trusses were assembled into one pyramid



Roof Framing Plan



Truss Diagram

on site with bolt connections. The sheeting material used was 2½-in. mill stock, which also provided the buckling stiffness of the ridge compression members. The roof was designed for 50 psf snow load and the average weight of steel used was 7 psf.

"The main floor and lower roofs are standard structural steel and mill wood construction, while the substructure and lobby are reinforced concrete carried on piles to rock."

The raised roof over the upper central core emphasizes the importance of the 250-seat theater area and allows natural light penetration. All walls surrounding the central core are independent of the roof structure, allowing the spatial aspects of the roof to be uninterrupted. The architects had first considered the use of plywood for the wall material in their search for a sculptured wall panel system of inexpensive materials. This was discarded because of the problems of weathering, joining, and maintenance. They decided on reinforced glass-fiber for the following reasons: It is easily molded and the shapes made the cost of the forms feasible; it was easier to obtain a weathertight structure with a molded material as well as simplification of joints; repetitive panels could be stacked to reduce shipping costs; the panels created a rigid, translucent and very light exterior skin for joinery details; the material was impervious to climatic change, making it feasible for both Montreal and Israel.

Problems of Construction

Expo 67 could have been the Tower of Babel on an international scale. The total cost of Expo has been variously estimated at between $400 and $500 million. The complexity of the problems that confronted the architects and all concerned with the project can be measured in that it numbered approximately 250 major individual projects, including pavilions of more than 70 nations. Most of the buildings were designed and constructed in one-half the time usually required, in the close confinement of a site of less than 1000 acres.

How this complex undertaking functioned in all its facets would require more space than we have in P/A, even without advertising. However, some idea of the problems are highlighted in the comments of the various architects involved.

Participants at Expo 67 made their own arrangements for construction. However, they were required to retain Canadian associate architects and engineers.

What happened is discussed here by the Canadian architects who were the ones responsible for construction of the buildings, the negotiating of tenders, coordination, and the multitudinous other details that comprise shepherding a building from design to completion.

George Eber and his associates were retained for the largest number of projects of any single architectural firm at Expo. Eber summarizes his experiences as associate architect for various foreign pavilions:

"It could be said that all of the national architects with whom we were associated undoubtedly represent the highest standard in architecture in each country. They all think and work in the same general vernacular as we do. Nevertheless, difficulties existed in communications, aggravated by language problems, even though most of our staff is bilingual, and I myself speak four languages. There were difficulties in conversion from sets of standards to Canadian, and standard sizes. We also had to deal with differences in temperament and approach to problems.

"However, our work was not only interesting, but highly educational for our forces. It is, after all, rare in an architect's practice to be exposed to the thinking of such different, yet similar, men of genius as Buckminister Fuller and Frei Otto."

The Best Laid Plans of C.P.M.

The use of the Critical Path Method was mandatory on all consultants, contractors, and agencies working at Expo under the by-laws of the exposition. The Corporation had the option, if progress lagged on a particular project, of assuming control to assure completion or of scrapping the pavilion. "The problem with this clause was that it had no teeth; it was a delicate issue because of the political complications," said William Somerville, of Smith, Somerville Co., Ltd., Expo's C.P.M. consultants. "We are dealing with sovereign nations," commented Eduard Fiset, Chief Architect for the Corporation. "We negotiate."

Fiset found the system an invaluable aid in keeping track of "the progress of what everyone did." His conclusion: "Its function is to alert management in all areas including contracts, management decisions, and finance. It was a well-oiled tool," he concluded.

Other participants were not as enthusiastic. Although agreeing on the feasibility of C.P.M. methods, they cited individual problems that C.P.M. did not solve. "We agree with the method and found it useful. However, on very small projects we think that this process is too expensive and time-consuming. In fact, we had many delays, mainly because of late delivery of structure. We found that revision of the C.P.M. was not necessary," stated architect Marc Belanger, Canadian associate for the Korean Pavilion.

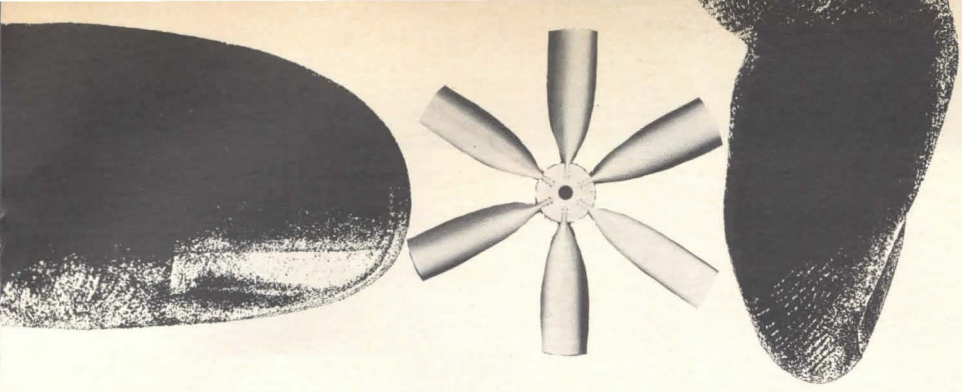
"Our problems basically involved the inability of the contractor and subcontractors to receive the necessary cooperation from the manufacturers in their supply of materials to the job site," stated Robert E. Armitage, designer of the State of Maine Pavilion.

The above statements echoed the reactions of many of the architects of smaller structures at the exposition.

George Eber unequivocally disagreed with C.P.M.: "C.P.M. did not work and you can quote me on that." The Eber office made preliminary evaluations themselves. Both Eber and each project's contractor made schedules. "We then went ahead and did the job. There was lack of accurate information. In the beginning, C.P.M. set a date, but the schedule was not up to date. C.P.M. was not good for Expo."

The Critical Path Method or some similar methodology is obviously an essential for projects of the magnitude of Expo. However, there seems to be a point of diminishing return at which the machinery, due to its complexity, cannot be brought to bear economically on problems that professional architects solve instinctively, such as the scheduling of single buildings. When C.P.M. eliminates the necessity for revision over the title block of an architectural drawing, it will probably be generally accepted.

Both Sommerville and the C.C.W.E. say that many Canadian and foreign firms, despite their initial doubts, have adopted C.P.M. methods on projects unrelated to Expo as a result



of their Expo experience. However, the proof of the piddling is much simpler: Expo 67 opened on time.

The Architecture of Exhibitionism

One of the most difficult problems for most architects was the design of exhibitions their buildings would house. This, for various reasons, was not an uncommon occurrence at Expo.

The architects of the Theme Pavilion's "Man the Explorer" and "Man the Producer" sought to solve the problem in the design of a flexible structure. The most successful collaborations, of course, occurred when the same architect designed both the building and the exhibition — at least, that was the unbiased opinion about such collaborations on the part of the parties concerned.

Ian Morton describes the problems faced by the John Andrew's office in the design of Africa Place:

"Research into behavior patterns of visitors at exhibitions, coupled with the complexity of housing many nations individually and yet collectively, taught us that an exhibition structure is a completely different animal from any other planning or design problem found within the bounds of architecture.

"In order to facilitate the requirements of time, the building operation had to proceed well before all the invited nations had accepted and made know their requirements.

"Through no fault of ours, we were unable to impress upon the invited and participating nations that the project was designed to accommodate dynamic exhibitions of the type that would hold the visitor's attention. Thus the exhibits designed by the participants bore little or no relation to the concept of the project."

Architect R. S. Frew, after describing the design concept of Kaleidoscope, offered the following comments in summation of his experience: "The operational aspects of Kaleidoscope were formulated before the architectural design was begun. As you will realize, you can put any number of people together and obtain little result. Kaleidoscope was reasonably successful; important is the defining and relationship and scope of work of the consultants and the physical location of consultants. Should either be unsatisfactory, then the project can be seriously affected." However, Frew's concluding remarks show that the difficulties were successfully overcome: "The final cost was below the initial estimate."

Eber described his problems: "Most of the national pavilions had exhibitions designed in the country of their origin. Since the exhibitions generally were begun after the construction was well advanced, we had an unusually large burden of changes, mainly of electrical and mechanical systems, which further added to our problems. Looking back, we could say with certainty that wise is the exhibitor who puts into the hand of one team, or coordinated group of teams, the whole problem of pavilion and exhibition."

Construction

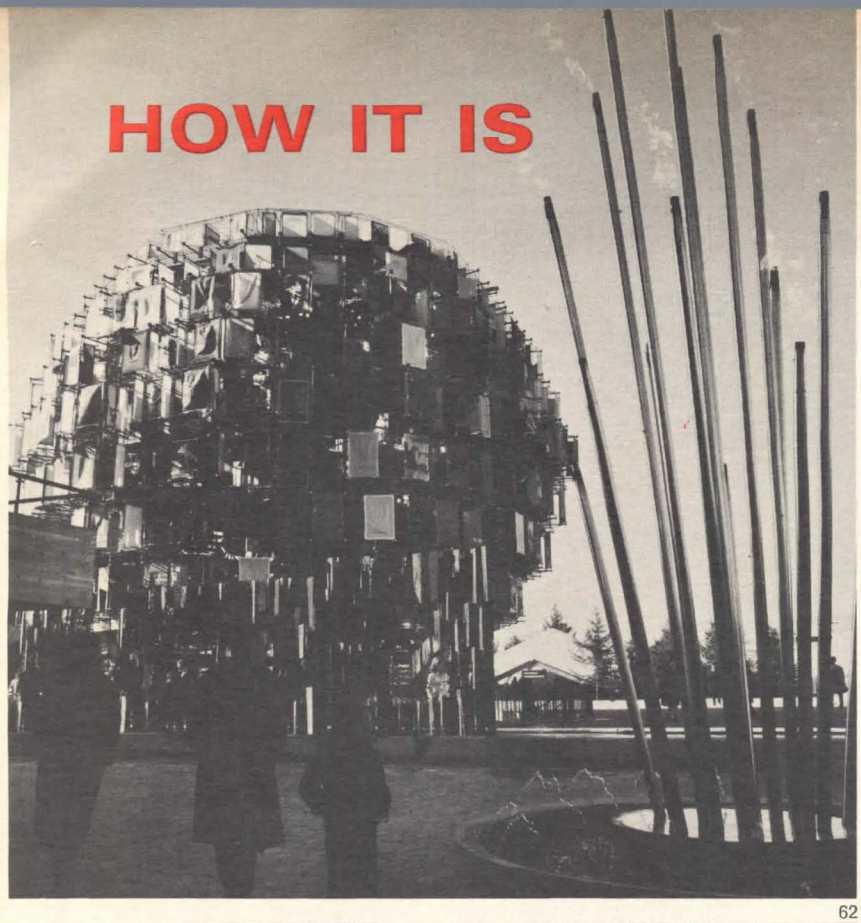
Discussing the problems of construction of Expo, Eber tells of his experience as the consultant to one of the first national pavilions to start construction (The Netherlands Pavilion): "One of our problems, which relates to all construction prepared by the C.C.W.E., were in many instances more severe than the existing municipal building by-laws. These regulations have also added to our budget problems . . . by the fact that a firm building contract had to be awarded when all other costs, which should comprise about two-thirds of the total budget, were known only as approximations and not fixed price items. . . . It must be added also that many of the regulations applicable at first were eased by C.C.W.E. as experience with actual building increased. . . . Expo authorities have collaborated on such problems. In fact, later, a rule of some understanding was established according to which, if a national pavilion had a type of construction that did not fully meet C.C.W.E. regulations and by-laws of the originating country, exceptions were made in favor of the participant."

Architect Rousseau, after discussing the difficulty of delivery and delays of materials that seemed a general problem, voiced another complaint — one frequently echoed by the associate architects. "We wish to be wrong, but we had the general impression that most companies and dealers were deliberately increasing their prices especially for Expo. In fact, this was our major source of difficulties." On the brighter side, however, Rousseau described the "gracious help" of the deputy commissioner general of the British Pavilion, who interceded on his behalf to have material that had been delayed in England due to a dockers' strike specially delivered by passenger vessel.

Eber set up field offices with architect supervisors for each major building. Communications with these field forces were maintained by "bellboy call system and telephone in each key location."

"In order to keep our clients and our architect associates fully informed of every phase of construction," Eber reports, "a much more elaborate supervisory report system was developed than the one normally used by the Eber office. The paper work alone kept three secretaries busy during the entire construction period."

HOW IT IS



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After other P/A editors paid a number of visits to Montreal to gather facts for "How the Fair Was Planned" and "How the Pavilions Were Designed," Senior Editor James T. Burns, Jr., got the assignment to cover the opening of Expo and give his impressions as a visitor to the fair. The numbers next to the photographs in the section refer to placements on the Expo map pp. 128–129.

Take the Place Bonaventure Metro station on your way to Expo 67, and you are in a great fair atmosphere already. Finding your way down the levels of the huge, unfinished concrete, hotel-convention center, you might come across — as we did — the "Fanfare des Pompiers Montreal" (the firemen's band) belting out a pretty professional rendition of "Chattanooga Choo-Choo" while spirited Montrealais dance together on the balconies and stairways leading to the station. Then you catch the swift, smooth, rubber-tired train past some of the handsomest underground stations ever designed out to Ile Sainte-Hélène, to be disgorged with the rest of the crowd right into the heart of the fair, the minirail flashing by overhead, Bucky's bubble for the United States glistening nearby, Russia's hulk looming across Lemoyne Channel, and a sense of general elation announcing that you are where something important is **happening.** You thought that after seeing and hearing about Expo and Habitat and Fuller and the rest of it for two years, it would all be interesting but familiar, a good editorial assignment like the Seattle fair was, but something a little tough to develop a new enthusiasm about or a fresh slant on. But it strikes you all at once that Mayor Jean Drapeau, Commissioner General Pierre Dupuy (who emerges as a fair administrator in comparison to New York's Robert Moses approximately as Michelangelo does to Mickey Mouse), and controlling architect Edouard Fiset really did something: They pulled a city, and maybe a whole country, into international front page life by the feat of creating the most important international exposition thus far this century (and why not throw in a couple of other centuries, too?) in the incredibly short gestation period of just over 24 months. An elephant takes almost that long to be born. If Drapeau, Dupuy, Fiset and all their collaborators married Montreal to Expo in haste, however, it is most doubtful that they will have much to repent at leisure. Expo will do incalculable good for their region, already one of the most progressive architectural areas we know about (be sure to put aside time for having a look around Montreal itself; a lot has happened there since Place Ville Marie). The major issue of the union will be increased respect for Canada as a nation.

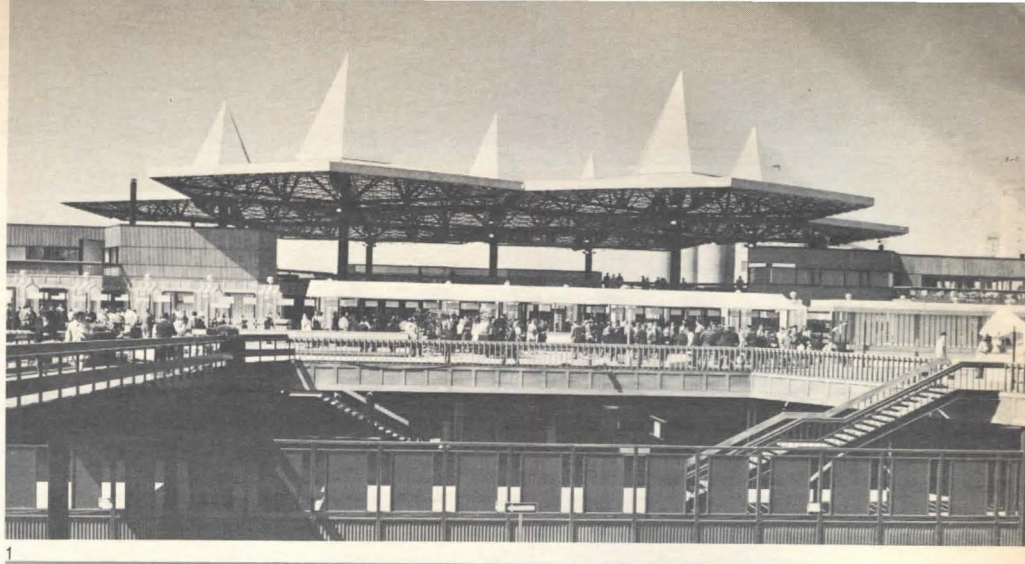
There are bad designs and some junk

at Expo, to be sure; it would not be a very "inclusive" exposition if this were not so. But even a lot of the junk is good junk — designed with a sense of the fun side of fairs and flashiness and phoniness on the tip of the tongue in the cheek. What we consider the real failures, the almost-made-its, and the successes will be dealt with later, after we retrace our steps to the official "main entrance" to Expo, Place d'Accueil.

Cité du Havre

You get out of your taxi or bus at Place d'Accueil and emerge onto a capacious wooden deck sheltered by a festive plastic-skinned tent structure beneath which are some of the well-designed (by the Expo staff, under Fiset) pieces of street furniture, booths, concessions, and signs that you will see throughout the fairgrounds — generally very handsome and appropriate, muted where stridency might take the attention away from a more important pavilion nearby, livelier and more colorful (as in the case of booths and eating places) where they are trying to "sell" themselves. Look left and you will see the International Broadcasting Center (an unimpressive Lincoln-Center-type colonnaded block) and the Administration and News Pavilion, quite a strong and interesting structure that you should visit if you can. Next comes the Art Gallery, a permanent building, simply and convincingly planned on two levels around a central staircase. The concrete pan ceiling system recalls Breuer's Whitney Museum. And what a collection the gallery holds for Expo! Many countries have loaned art and artifacts for the duration of the exposition, some of which — such as works from Leningrad's Hermitage — the usual person would never be likely to see otherwise. It is a slight shock on emerging (or was when we were there) to glance across Place du Théâtre to see the marquee of Expo Theater proclaim "David Merrick présente la plus importante *comédie* musicale d'Amérique: Carol Channing dans 'Hello, Dolly!' " Already, the United States has made a cultural contribution, and we are barely into the fair.

While the feeling for gallery-going is still on you, drop back to the tent-roofed pavilions of photography and industrial design. In the latter, industrial design schools from all over the world have come up with some ideas on the machines and utensils we will be using in the future. Some of them look a bit as though they will be using us. Ottawa's Karsh was appropriately strong at the photography pavilion in May. Pass some rather typical exposition buildings of the New York World's Fair variety, Les Jeunesses Musicales and the Hospitality Pavilion, and, because it is private, the International Trade Center and Expo Club, to have a look at the Olympic House, an austere concrete building



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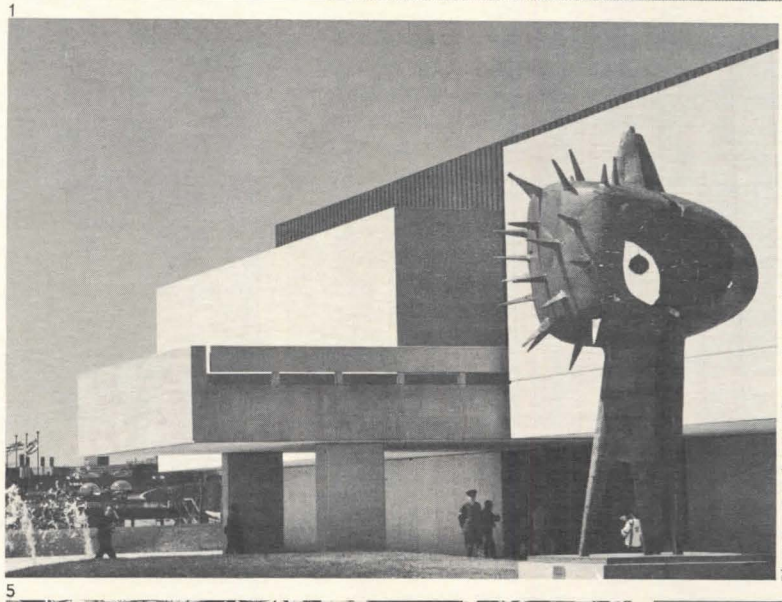

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Photos: (black-and-white) Hugh Robertson, Panda Associates

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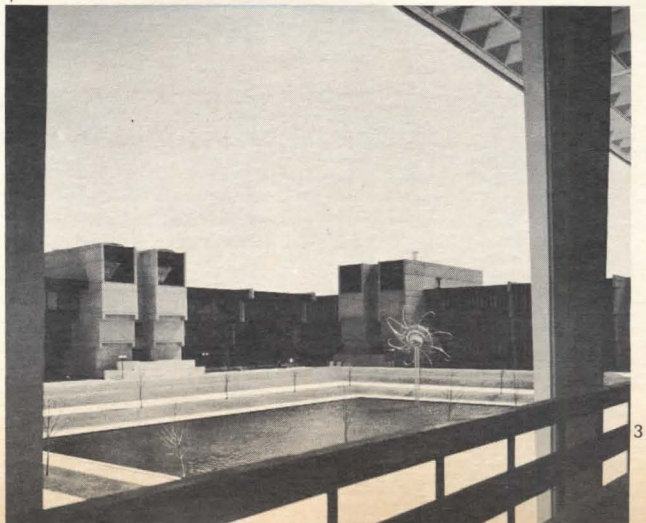

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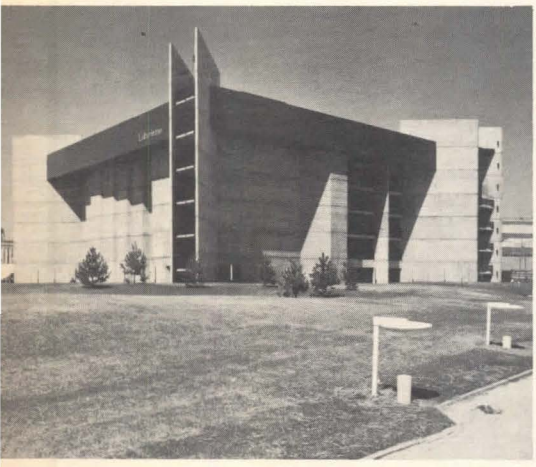
with imaginatively articulated corners. Stop and have coffee in the first of the "Expo Services" areas, groups of stalls, benches, cafés, snack bars, and related activities placed around the grounds for the relaxation of the weary fair-goer. Then line up for the Labyrinth, a 45-minute film experience in a distinguished



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concrete structure (concrete, as you probably know by now, is very big at Expo). This is the first of many multi-screened, stereophonic, many-chambered presentations in store for you, and it is one of the most professional — prepared by the National Film Board of Canada on Expo's theme, "Man and His World," with the emphasis on man.

From the enclosure of this fortress-like theater, you move on to one of the lightest, most exhilarating spaces of Expo, the interior of the giant, latticed-wood cone of the theme building "Man in the Community." Exhibits in tunnels and other enclosures off this area always bring you back into the light and air of the central space. "Man and His Health" occupies a neighboring building also based on the use of wood-framed, skewed hexagonal forms.

So far, so good. You have seen a noble art show, some interesting exhibits, a fine film, and a lofty interior-exterior space. The next stop is Habitat 67.

We asked a lady who happened to be sharing a table with us in the Scandinavian Pavilion what she thought of Habitat: "Well, it reminds me of those Egyptians or Aztec Indians or whatever they were. You know, the ones who lived in caves. Looks like we are going backward instead of forward. No, I just saw it from the train. I might go inside."

Egyptian and Aztec cave dwellers notwithstanding, we can report that for sheer richness and variety of spatial experiences, Habitat has few peers in contemporary architecture. Maybe the lady was unconsciously apt when she drew on two of the most urbane of ancient architectures for her comparison. Architects generally have heard of the high cost of producing and living in Habitat, a factor that will no doubt give aid and comfort to speculators who seek to make killings with

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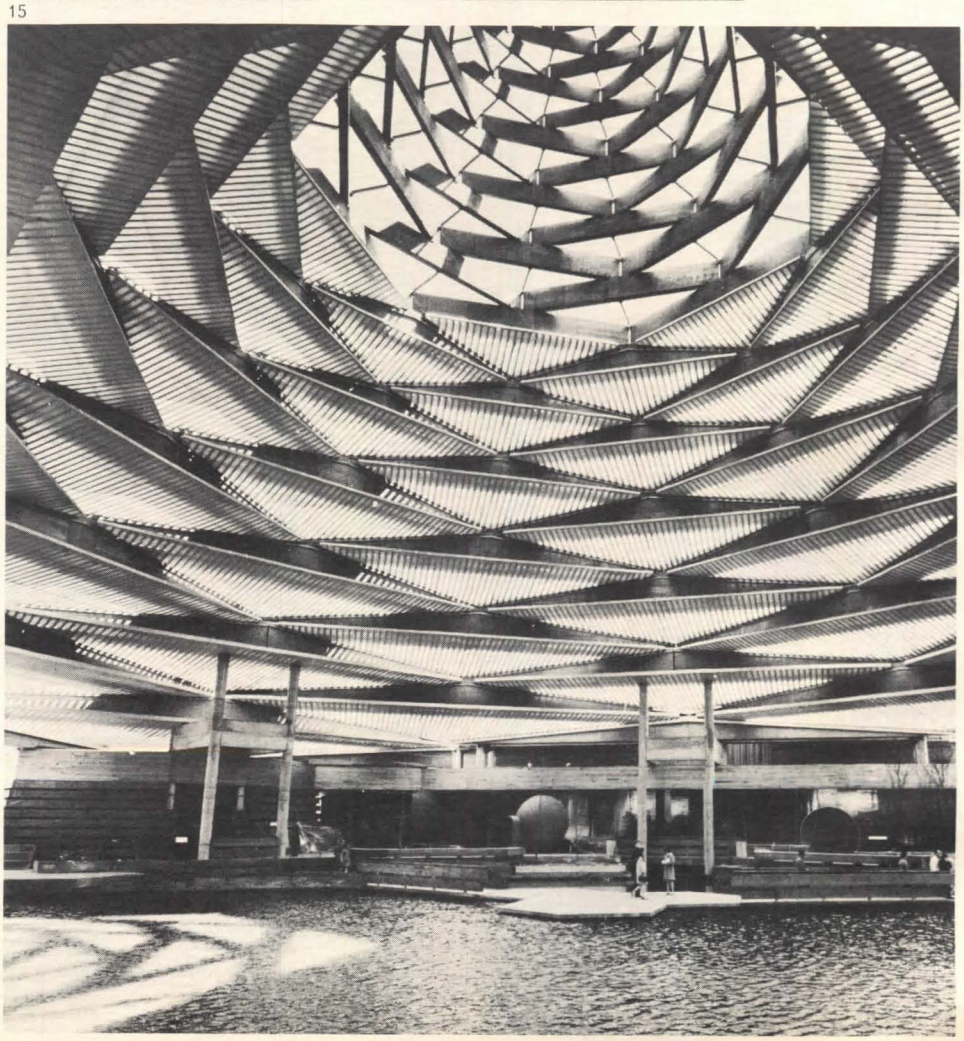

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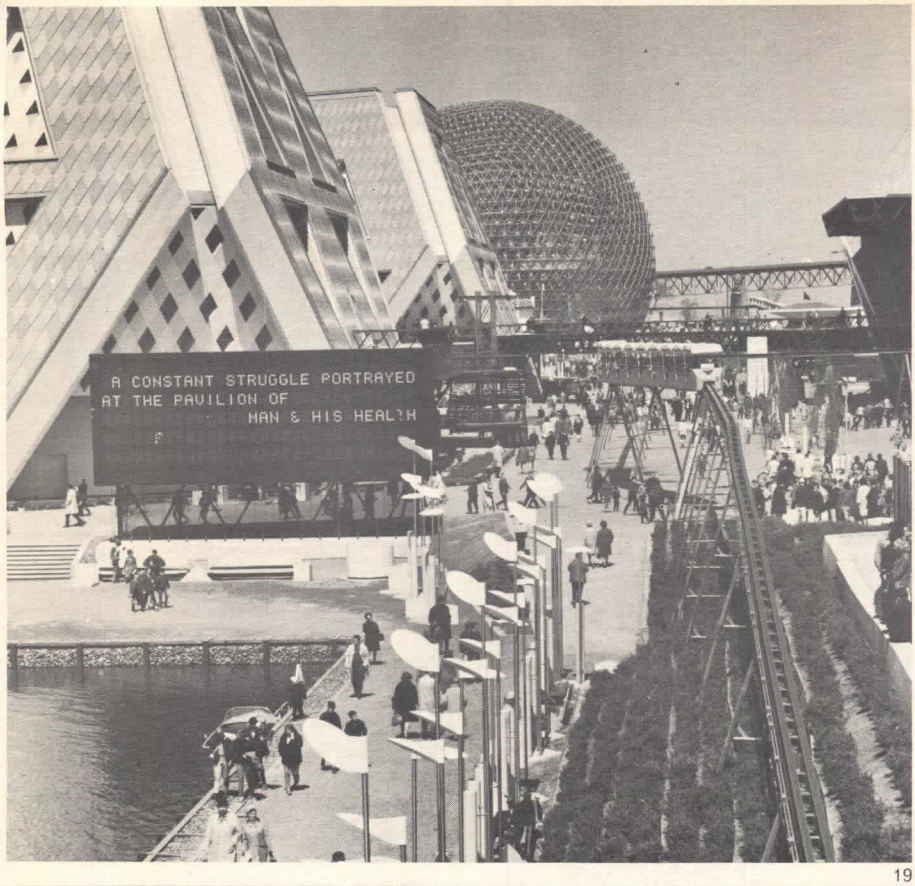
the cardboard-and-spittle constructions that frequently pass for housing these days. But Habitat was labeled from the beginning as an experiment, a live-in experiment. We personally pronounce it a successful one, one to be built on now that some technical and economic mistakes have been made and can be corrected. It obviously represents, for the first time in actual, three-dimensional form, an important direction that housing (and other forms of enclosure for that matter) will take. If we can experiment with billions on space machines and the control of men's minds and bodies and the weaponry of violence, then the high cost of Habitat, measured against the exciting visible forecast it gives us of housing man in a manner suited to what should be his real dignity, is a trifling sum indeed.

You will need to clear your head after Habitat, an act accomplished by a stroll back along Bickerdyke Basin to the Expo Express station where you can board the train for . . .

Ile Sainte-Hélène

Looking down from the station on Ile Ste.-Hélène, you can see the terraced open space of the Place des Nations, site of most ceremonial activities. When there are no troops massed there or parades going on, it is a rather barren and uninviting plaza. In the other direction, you will see Swan Lake, with its great jets of water rising and falling before the background of the island's pavilions. And before you will be Pont des Iles, a handsome span supported on cables strung from twin central towers. Heading toward the Scandinavian Pavilion (for lunch, we suggest), you pass the International Nickel Plaza, with its gigantic Calder stabile, "Man." Not a really first-rank Calder, but an inescapably imposing one (a Japanese artist we know says, "It isn't an expansion of Calder; it's just an enlargement."). The Scandinavian Pavilion is a simple, white, steel-and-wood structure shared by Denmark, Finland, Norway, Sweden, and Iceland. Each has its own exhibition space; we vote Finland the best, with its large, canted, textured plaques testifying to mastery in the fields of glassware, furniture, fishery, tableware, and others. Running outside along a balcony is a display of Scandinavian architecture. One of the most pleasant spaces in this pavilion is the courtyard, with its ramps resembling gangways on luxury liners. A fine place to meet for a drink at the outdoor bar.

Proceeding west from Scandinavia, you see four national pavilions lined up in a row, as though asking for architectural comparison: Austria, Switzerland, Belgium, and The Netherlands. Our vote is: Austria — no, a rather flimsy and uninteresting structure; Switzerland — second worst, with a busy slatted wood façade, but good restaurants and a notable Gia-



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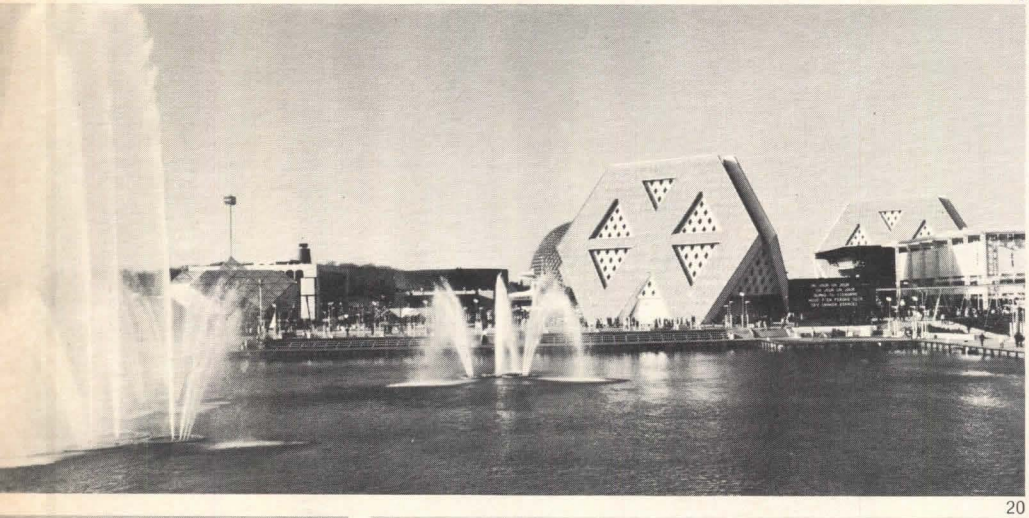

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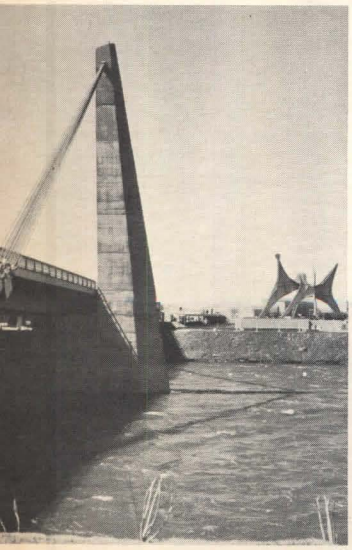

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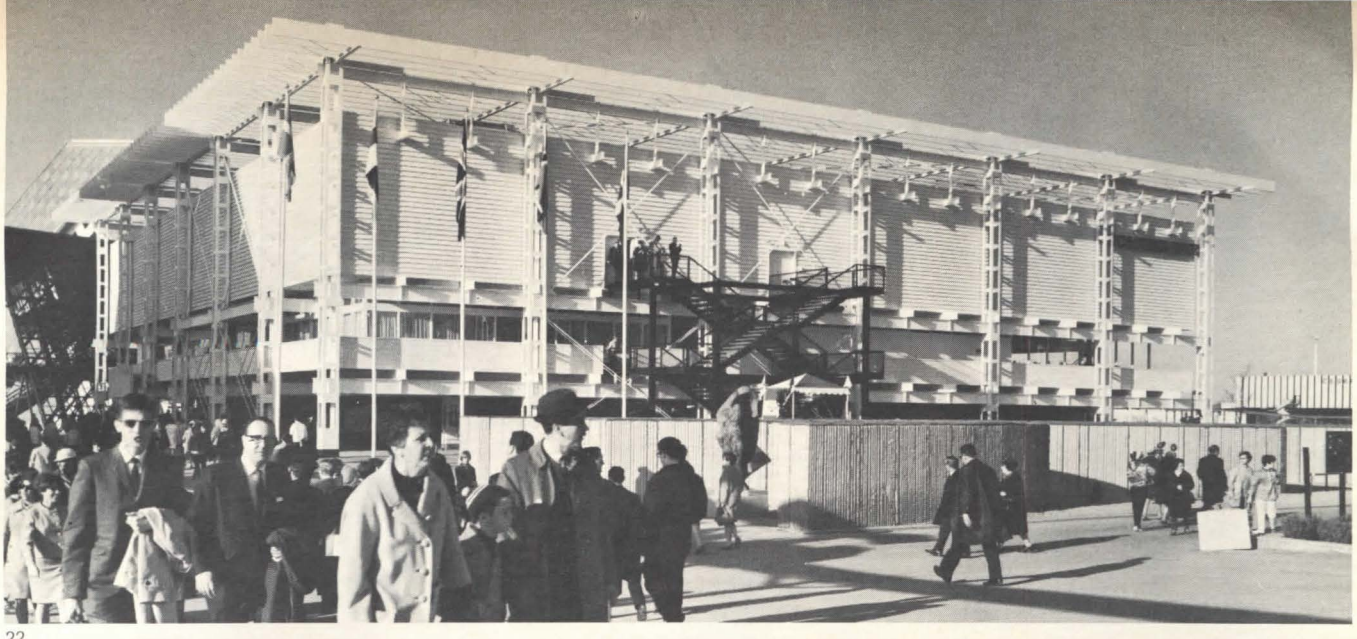
cometti group outside; Belgium — impressively subdued brick and bronze-mirror-glass structure, some rich displays of national possessions inside, and another good bar and restaurant; The Netherlands — yes, outside, for its lacy exposed tubular framework; no, inside, (there is even a room with the windmill and scaled-down old canal houses) except for a splendid room where a hole has been cut into the tubular frame and one can sit and view the Montreal skyline *while listening* to a concert of bells hung on the frame.

Japan is near The Netherlands; another exposed structure pavilion, this time of steel beams at floor and roof levels and concrete beams between. There is a separate restaurant pavilion looking into a water garden. The exhibit is painless and fast, being all on one level raised above a plaza (on which are displayed motorcycles, to the delight of incipient Hell's Angels). A simple, direct pavilion with good landscaping. One cavil is the rather tacky colors of the exterior walls behind the exposed concrete beams: They would better have been left natural or painted white. The reference of the interconnecting beam ends to traditional Japanese architecture is obvious.

There are three pavilions from as many of the United States at Expo, appropriately enough from states bordering Quebec: New York, Maine, and Vermont. New York tries for fun and gaiety and movement and color and fails (does the Moses-Rockefeller architectural taste tarnish all official design in that state?). Maine is a box with colonial pilasters pasted on, pedimented entrances, shutters, the whole cornball works. Inside is a phony lake with stuffed hunters and boaters after stuffed game. A "meeting house" at the rear shows a travelog. The whole thing is a disgrace. Vermont is the best of the three. She tried a pavilion in the currently popular idiom of opposing-diagonal roofed ski lodges. This does not really come off at this large scale, but one thing that is fun to do inside is watch Ferdinand L. Weber, a Barre sculptor, work on a heroic statue of Champlain that will be set up on the border of Vermont and Canada after Expo.

Next to Vermont is the Brewers' Pavilion, a good place for refreshment and aesthetic contemplation if you can get through the crowds of youngsters that seem to have made it headquarters (cheapest beer and ale at Expo). With summer coming on and most of the skirts *we saw getting minier and minier*, you might have the opportunity of aesthetic contemplation indeed.

Spirits revived and perception sharpened, you press on, heeding not the typically cookie-cutter Iran and Republic of China pavilions, to the three theme pavilions, "Man the Explorer." On the way you also pass the Polymer and Air Canada pavilions, which indicate to what



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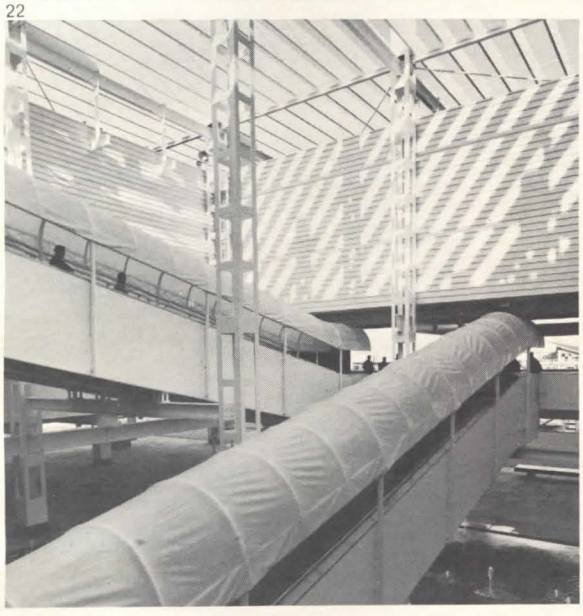

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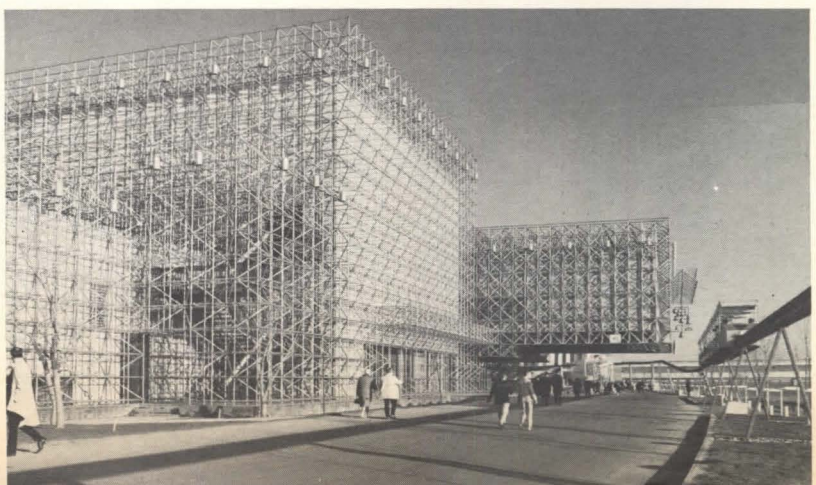
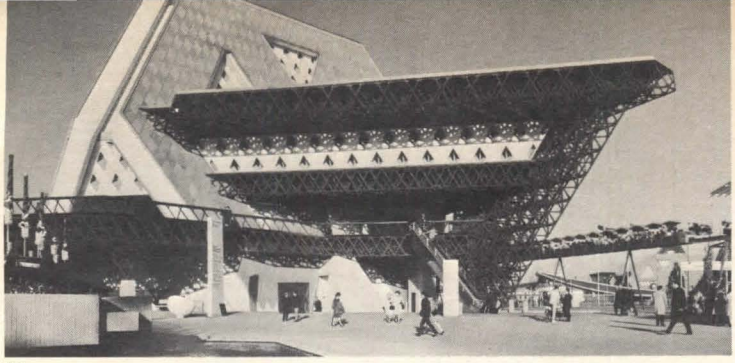


tremendous scale might costume jewelry be inflated, given the will and the money.

"Man the Explorer," the theme buildings on Ile Ste.-Hélène, like "Man the Producer" on Ile Notre-Dame, are gigantic space-framed structures honeycombed with a multitude of generally well-designed exhibits and spatial experiences, and a good three-screen motion picture (this time, the screens are



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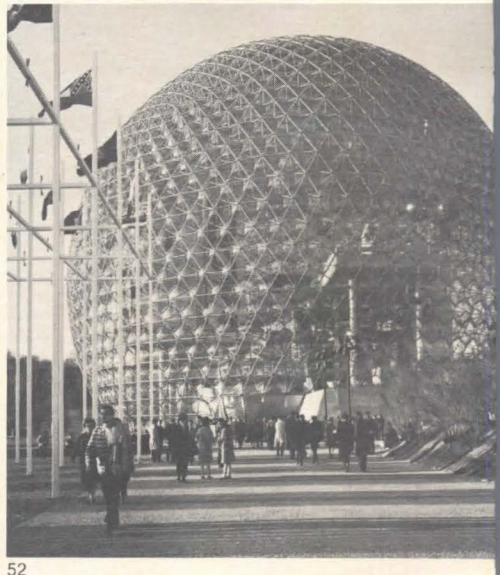
stacked vertically, whether out of courtesy to the commanding form of the building or not is hard to tell). A generous open plaza and moated refreshment platform between these three interconnected structures adds to their impact.

Nearby, the electronic control center of the fair is open to public view in a neat Miesian pavilion. Worth seeing to learn how TV, computers, and information, storage and retrieval devices function to aid man in managing such an immense enterprise.

The first impression of the United States Pavilion depends on the light and the time of day. It might appear as thousands of reflective facets in direct sunlight, as a ghostly bubble on gray days, as a rosy diaphonous bloom at sunset, or as a glowing crystalline container of forms and colors after nightfall. Any way, it is a beautiful object. Getting into such a round form has always posed a problem, and, if it has not been entirely solved here, it has been dealt with with humor, as has most of the U.S. exhibition; one enters through big, orange slab doors skewed onto the frame of Bucky's dome. Inside is one of the most exhilarating spaces at Expo, possibly because it does not include just **inside,** but outside, too (including the minirail that comes flashing through every minute or so). The exhibits by Cambridge Seven (we always expect a design team with a name like that to have a hit record out) are ebullient and indicative of a lot that is true about this country — some of it dealt with in the obligatory national film. Some of our serious accomplishments and all of our serious problems are slighted, but there is an impressively — and literally — hung show of space hardware appropriately up at the top of the dome. Elsewhere are to be found such incunabula as photos of Ned Sparks, Herman Bing, and about a thousand other luminaries of the silver screen, a whole flock of hats of various origins (cops, Shakers, flappers, etc.), and even a stone eagle from the vanished Penn Station (the caption does not say whether this was donated by Charles Luckman, who designed the undistinguished U.S. Pavilion for the New York fair, and also the Madison Square Garden complex, which is rising where the eagle used to have his aerie). Just about everything from "camp" culture is here except Everett McKinley Dirksen reading from "Gallant Men." There is a huge room of towering panels by established Pop and Op artists, though we like best the neon construction to be seen while riding up the main escaltor. The pavilion's interior architects **do** betray themselves occasionally, most of all in the case of the gigantic gold sequined, fluttery eagle that is wrapped around the theater and greets you on entering the pavilion. This is needlessly tawdry and provincial, not a step above the predictable heroic metal hammer-and-sickle in front of the Russian pavilion. According to the Montreal newspapers, the U.S. Pavilion became the most popular building in the early days of the fair. Whether this is because of fortuitous placement near Métro and minirail stops or its superior design may never be known, but it certainly deserves accolades on the latter score. Having paid our national respects, we walk along the Passerelle du Cosmos over Lemoyne Channel, and arrive at . . .

Ile Notre-Dame

The first thing to be seen, of course, is the Russian pavilion, a great 1950ish



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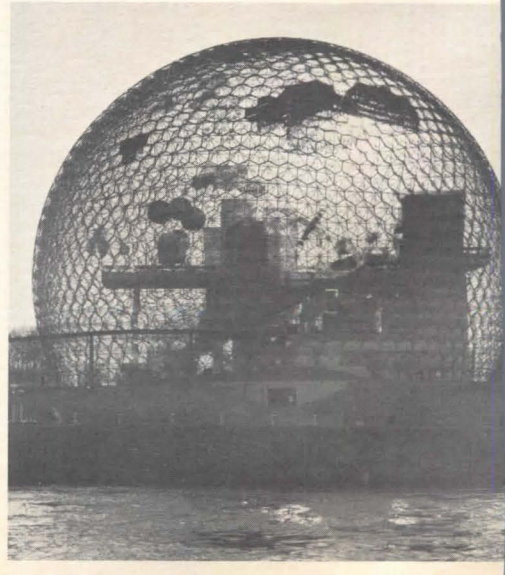

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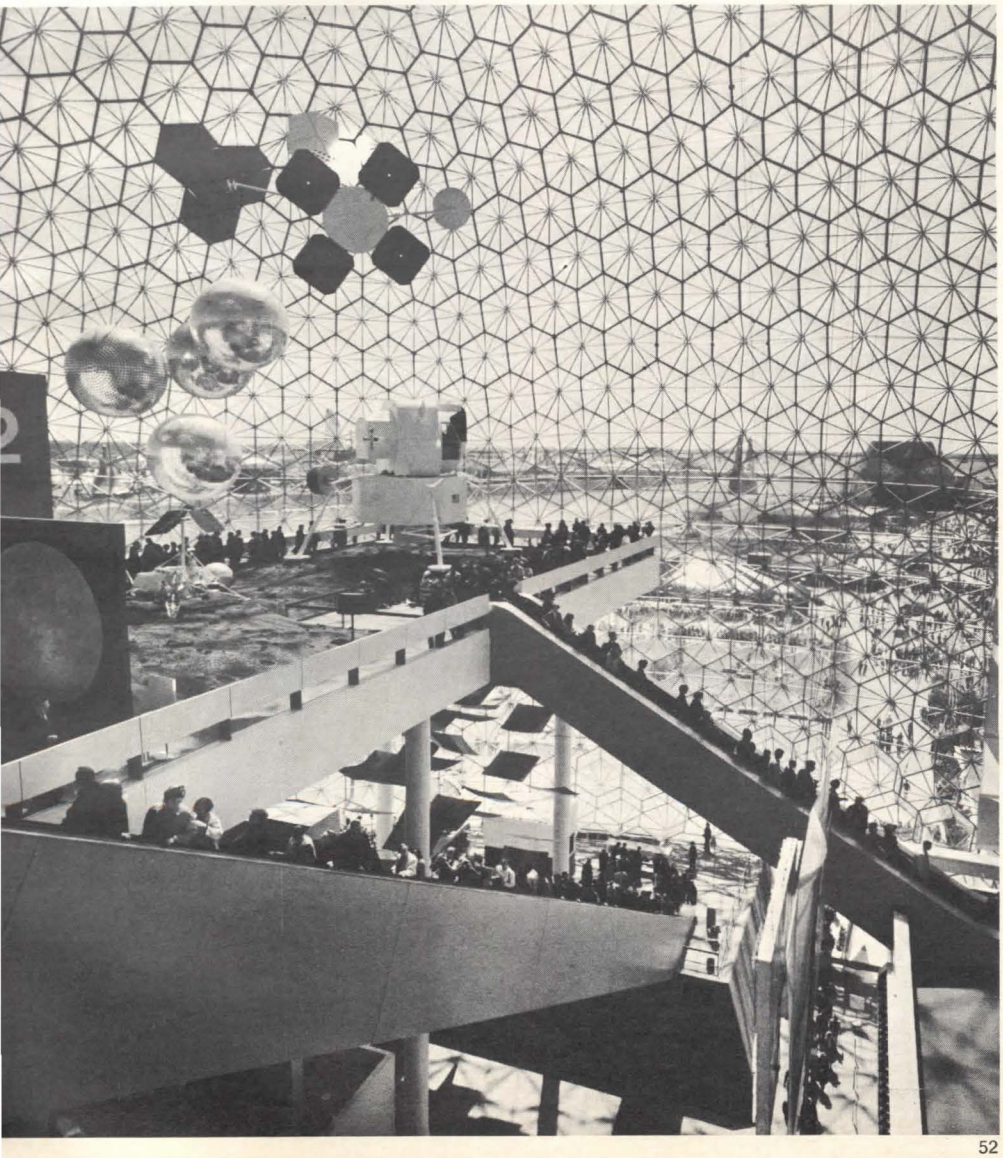

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slung-roof hive of hardware, hardware, and more hardware. Models of hydroelectric projects with blinking lights and the rest of the familiar graphic language take one back to technical fairs of 20 or 30 years ago, though, to be sure, the technology is most advanced. This sort of thing, and the exhibition of goods, motors, space trips, planning, machines, and artisans at work, goes on for level after level and aisle after aisle until the mind reels and a slight mist befogs the eye. This observer was unable to repress the disrespectful thought that the U.S.S.R. interior would be a marvelous locale for a remake of "The Big Store," could the Marx Brothers somehow be miraculously reunited. Once, plodding down an aisle, we were struck still in our tracks by the view and sound (badly screened and recorded, but there) of the Bolshoi doing the Coronation Scene from "Boris Goudonov." These people have some blood and life after all, it seemed. We left the mammoth display a little comforted by that thought. (Incidentally, Russia has a restaurant of proportions to match the rest of its pavilion, dispensing blinis, vodka, and other Soviet goodies. A good view of the theme exhibit, "Man the Provider," can be had from here.)

After a lager in the Expo Services beer garden across from the U.S.S.R., time for a couple of good films in a couple of rather fairish pavilions: "We Are Young," by Francis Thompson and Alexander Hammid of N.Y. World's Fair fame in the Canadian Pacific-Cominco theater, and "Man and Color" in the Kaleidoscope, which uses multiple projections and mirrors to telling effect, except that one tends still to focus on a frontal screen initially, which we do not

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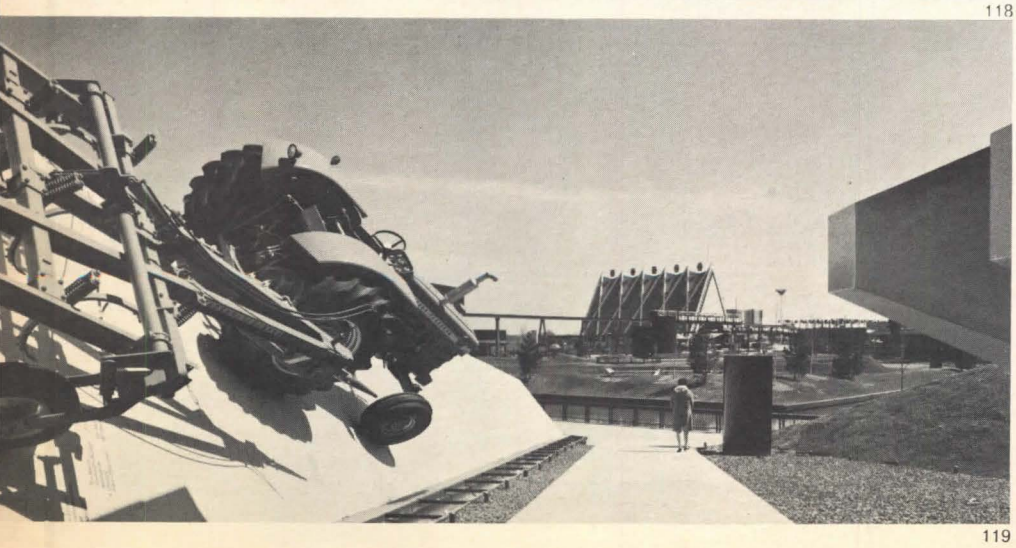

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believe the producers intend. On past Mexico, still unfinished at our visit, with a funny, fin-de-Candela roof and an instant "stone-age-masonry" artifact in the forecourt. India and Australia next, the first faced sideways with a towering triangular entrance shaft á la the astronomical garden of Jai Singh, and Australia concealing a bunch of swoopy Victor Lundy roof-support (we suppose) forms behind a plain-Jane façade.

Then comes Germany. Fuller has had widespread, if not such dramatic, use of his domes in the Union Tank Car projects, the St. Louis botanical garden, and with the military. But Frei Otto, except for the Lausanne fair, has not yet had such a stunning platform for the display of his membrane structures, and he certainly makes the most of it. The alternately shining and glowing tent has been well filled with immaculately designed displays on many levels. Some of them jar each other, but the entire effect is brought into happy cohesion by the enveloping Otto cocoon. If this is the exposition of the space frame and the tent, this is the apotheosis of the latter.

Back to frames in the theme building "Man the Producer." This is the same system used on "Man the Explorer," on Ile Ste.-Hélène, but here it is used more nakedly, more imaginatively. The visitor is left to wander around in the great rusty frame, up and down stairs and escalators picked out with rows of incandescent bulbs, or simply to sit at ground level and watch the boats go by on the canal that passes through the structure. There are displays here, and good ones, including an amazing gleaming white "automatic factory" about three stories tall; but many people will be happy just to let the strength of the building work on them.

After the moving experiences of Germany and "Man the Producer," the expensive, large-scale efforts of Britain and France come as stultifying let-downs. England has turned out a monumental building with a symbolic tower and Union Jack attached that not even the occasional view of a mini-skirted girl guide can redeem from utter pomposity. The same can be said, unfortunately, of the long show that goes on inside.

It has long been a secret idea of ours that, aside from having sheltered the Swiss Le Corbusier, France does not have much to say for herself in terms of progressive architecture. The French pavilion goes a long way toward bearing out our theory. It is a huge bauble of the kind of design we thought died when they tore out the interiors of the old "Normandie" — thoroughly meretricious and "chic" in the most banal sense. The endless interior exhibits seem to rival those of the Soviets in attempting to show every widget and truffle France produces, all in an atmosphere faintly redolent of haute couture copied in sleazy taffeta. De trop, mes amis.

A glance at the Quebec pavilion, neatly dolled up in reflective glass like Saarinen's Bell Labs, only slanted up a bit, which does not do much for the corners, and we get into one of the "sleepers" of Expo, the Ontario Pavilion. From preliminary photos, we had expected this stressed-skin roofed complex to be a pale rendition of the German Pavilion. Not so. We can either take the roof or leave it alone, but what goes on under it has been handled with such taste and vivacity that it is a joy to behold. Granite slabs and pine trees ring the space — they probably look terrible in photographs, but have a wonderful presence when you are there — striding ladies seemingly cut from blocks of stainless steel, a bunch of lively restaurants and terraces, and the minirail flashing through frequently make this one of the best fun spaces of Expo. Upstairs, there is an exhibition appropriately based mainly on youth. It's pretty good, too.

In its national pavilion, a group of structures, Canada evidently attempted to provide a "gathering place" that would be a focal point of the fair. As pleasant as these places are — the big bowl and viewing balcony provided by "Katimavik," the big inverted pyramid; the fun of climbing up into a red and gold "maple tree" with its pennants bearing photographs of Canada's people; and the good show of Canadian art in the

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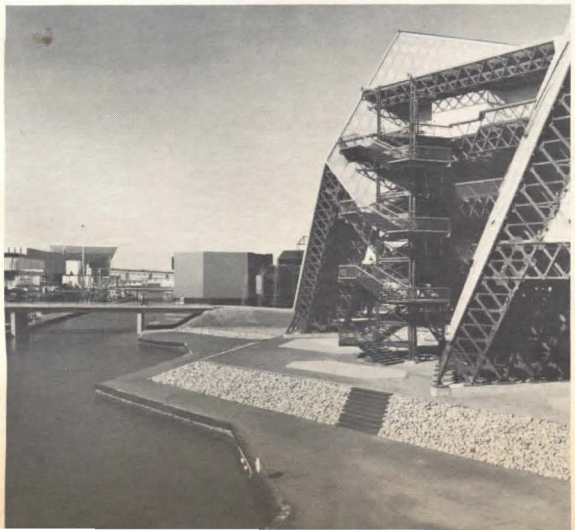

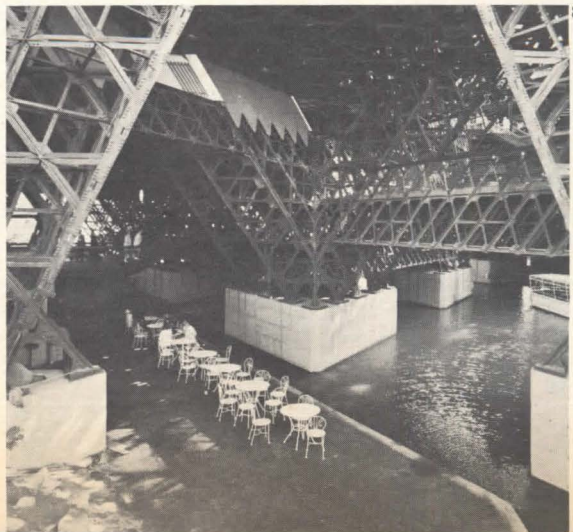

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arts center — they lose in impressiveness to some of the stronger buildings on the grounds, including Expo's own "theme" pavilions.

After wandering in and out of a number of pavilions one is not surprised to find in an international exposition — Haiti, Monaco, Jamaica, Western Provinces, Atlantic Provinces, Indians of Canada, United Nations, Yugoslavia, the Christian Pavilion, Mauritius — we come to the Greek Pavilion. Simple and understated, this whitewashed masonry cluster has a decidedly evocative "Greek village" arrangement of its cubic elements around a placid central courtyard. The interiors are good and simple, too, relying mostly on art and tradition.

Things liven up considerably after that, for we see before us the swooping roof of the Italian Pavilion. This was designed by a team or committee of some of Italy's most prominent practitioners, and, if it occasionally evidences the truth about design and committees and camels, it is nevertheless quite an experience. The roof appears to have suffered a severe outbreak of sculpture, and, inside, things get even more distracting. Crowded spaces, grottoes, catacombs, textures reminiscent of the sepulchre, and lights evocative of the twilight of earth lend a distinctly eerie tinge. A girl we talked to, however, proclaimed the restaurant, where the rugs run up the walls, "extremely sensual."

While the senses are still popping, we step over to the Canadian National Pavilion, a series of dark bronze, faceted shapes on pilotis, and have them really zonked in an exhibition of ops-pops-psychedelics based on time and motion. There is a movie connected with this exhibit, too, but it does not live up to its attendant show.

Across from CN is Cuba, the prodigy of prefabrication described on p. 145. Its perimeter is of inviting wood decks, or decks that would be inviting if there always did not seem to be a gaggle of black-clad men lolling about in a thoroughly sinister manner, keeping an eye on things. Inside, the tone is relentlessly propagandistic, but quite well done as far as visual impact is concerned. Everything except for some screen projections is kept black and white, the only color — which bathes almost all areas — coming from the red or yellow or blue plastic bubbles in the walls and the colored "light grabbers" that poke up overhead. You can enjoy an illicit feeling, as we did, by dining on rum and crabs in the restaurant. Hot colors, hot spaces (no air conditioning when we were there), hot food, and hot crowds. Another experience.

The lady who told us Habitat reminded her of cave dwellers said that she had cried halfway through the Czechoslovakian exhibition. It, too, is pretty strong on propaganda, but much more convincingly handled than in Cuba. This

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one takes the cake for multiscreen films — what must be more than a hundred screens advancing and receding, changing pictures independently. Very thrilling.

Near Czechoslovakia, the grand old man of Venezuelan architecture, Villanueva, has fashioned three lacquered cubes on a concrete hillock: black, blue, green, orange, yellow, red. Through its dashing simplicity, Venezuela manages to dominate most of the scene around it and from across Lemoyne Channel. Inside the cubes are: (1) a film; (2) a roomful of hanging string construction; and (3) a restaurant.

Wander from Venezuela through the passageways of the African Nations, a group of expressively roofed structures over brick walls designed by John Andrews of Scarborough College fame. This complex should take on a lot of life and movement as time goes on. When we were there, some of the nations were still working on their individual spaces, and public performances in two waterside amphitheaters had not begun. The forms are quite good, though not half as patronizing as the "native village" thing at the New York World's Fair. If a better surface than plain asphalt could be found for the outdoor areas, the African Nations could be pronounced a distinct success.

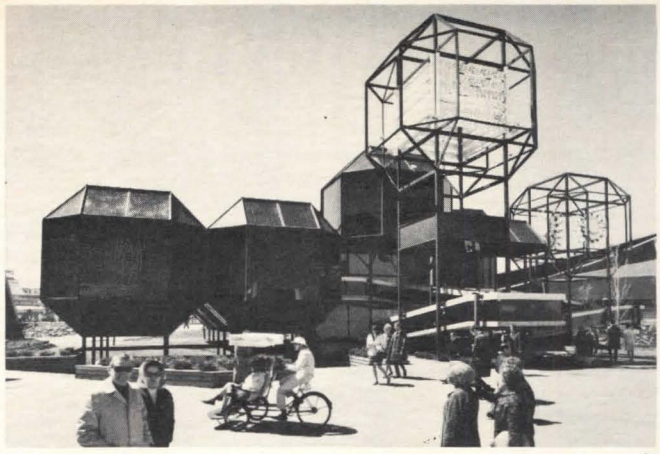
The Arab Nations share a complex next door. The use of giant black-and-white photographs perceived through classical white and pastel arched walls is good. Algeria is best of the lot inside, with an imaginative use of patterned tiles rising up from floor to walls and becoming bases for display podiums.

Across the waterway are Ethiopia, Morocco, and Tunisia. If you want some excellent coffee served to you by very pretty girls, go into Ethiopia's funny looking tent.

Night has fallen. You look across to Ile Ste.-Hélène, where Fuller's globe glows warmly in the setting of brilliants formed by other pavilions and the Expo outdoor lighting. Calder's "Man" hulks massively in front of Swan Lake's luminous, splashing fountains. Good show, America. We'll go celebrate it at . . .

La Ronde

Some expositions and fairs plan the layout of their festival, and say, "That's where the rides and the midway will be," *and let it go at that, leaving the* design results to the concessionaires and the carnies. Not so Expo. Fiset and his staff have turned out a fun fairgrounds that is diverse without falling apart and kitschy and damn well done at the same time. The kiosks and booths are of primary shapes put together to look like children's constructions; they are painted in eye-socking Day-Glo colors. They are very much fun. The ticket booths, ordinarily huts resembling temporary conveniences on a construction site, have been designed to look as though they had just



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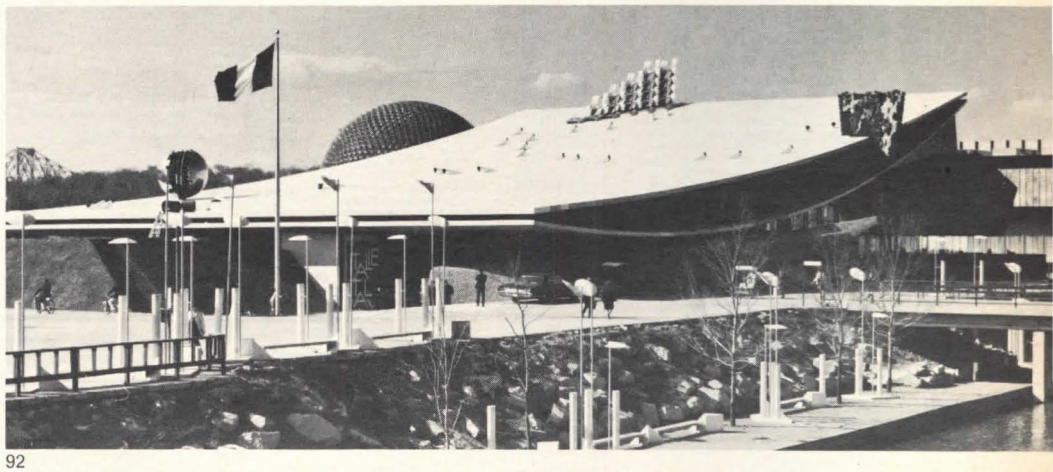

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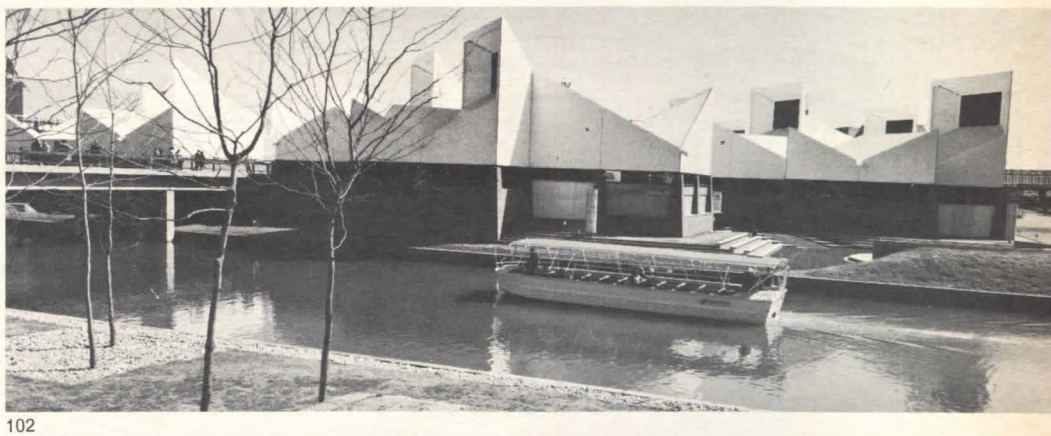

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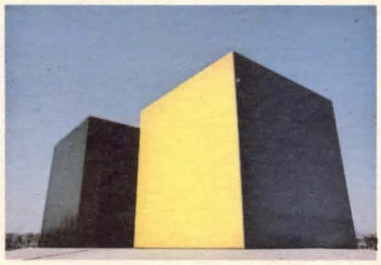

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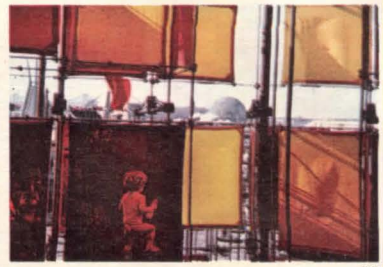

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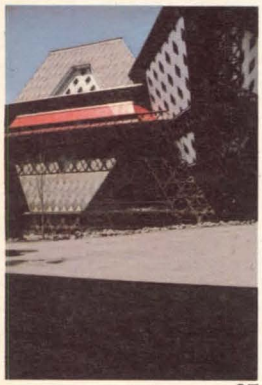

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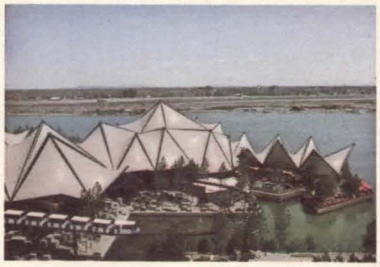

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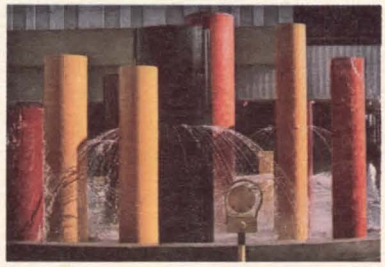

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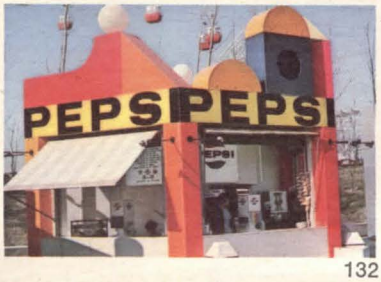

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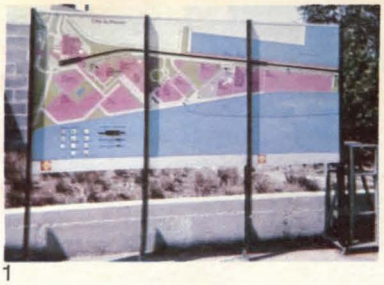
A PHANTASMAGORIA OF

(numbers refer to map on pp. 128-129)

Photos: (color) Jan C. Rowan and James T. Burns, Jr.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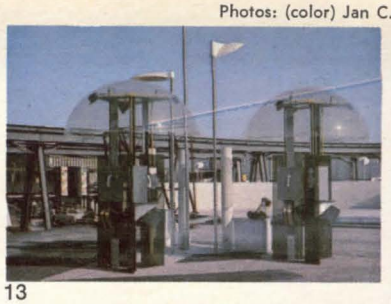
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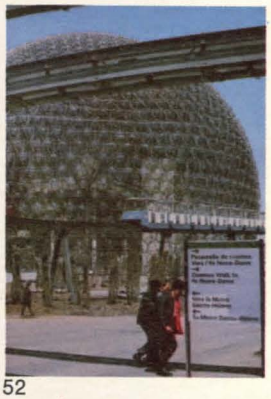
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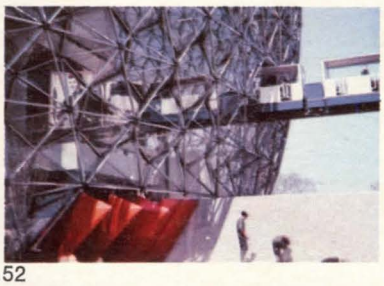
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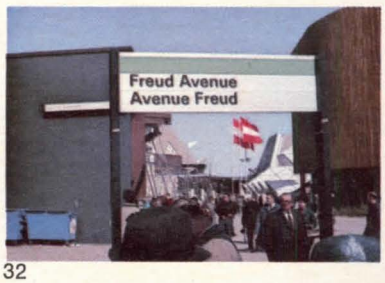

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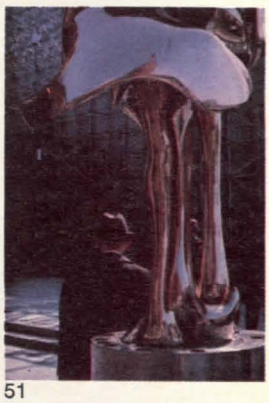
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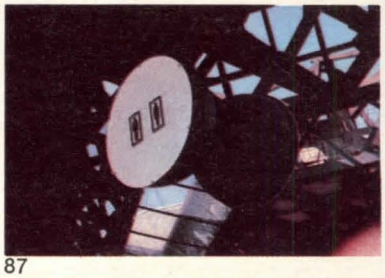
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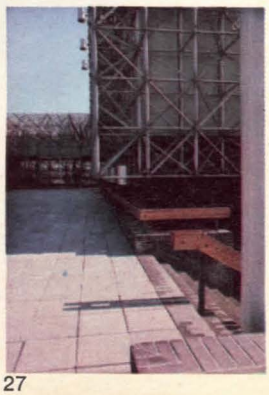
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EXPO 67

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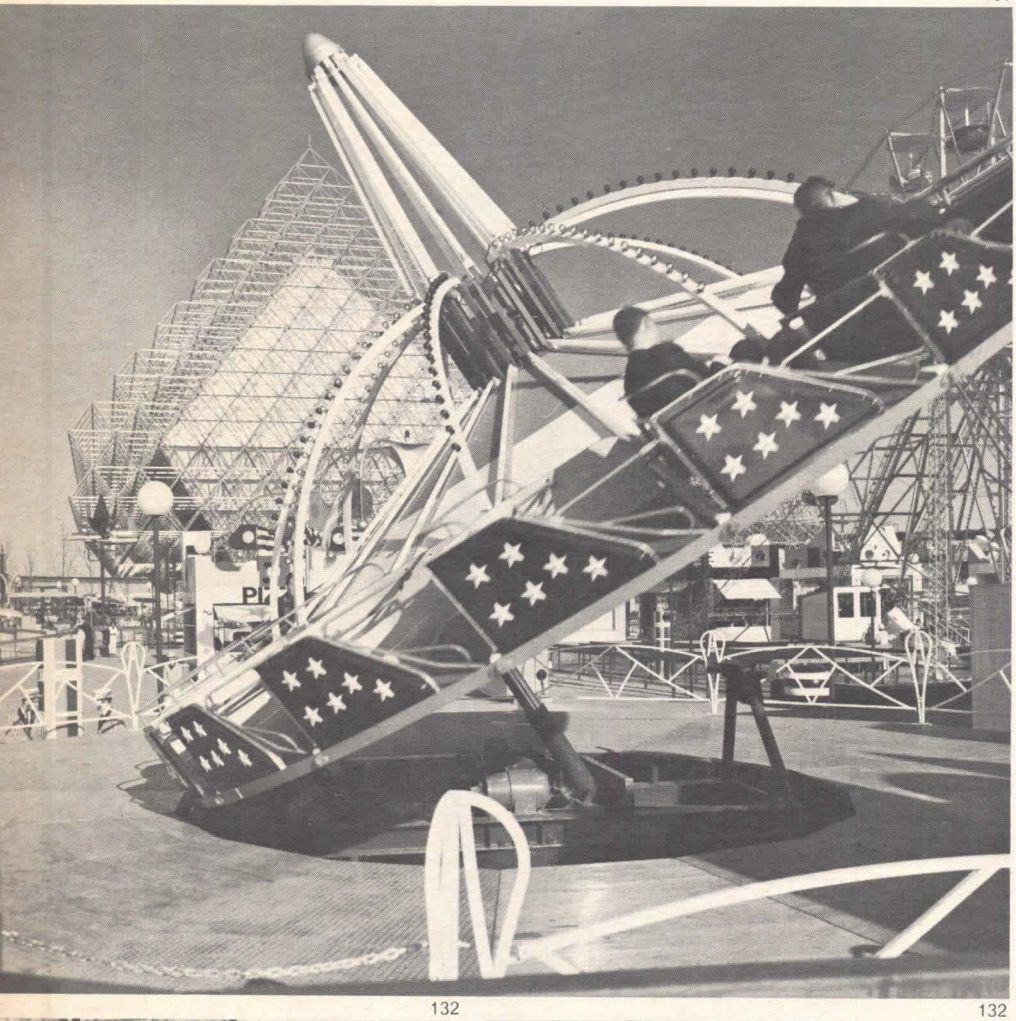

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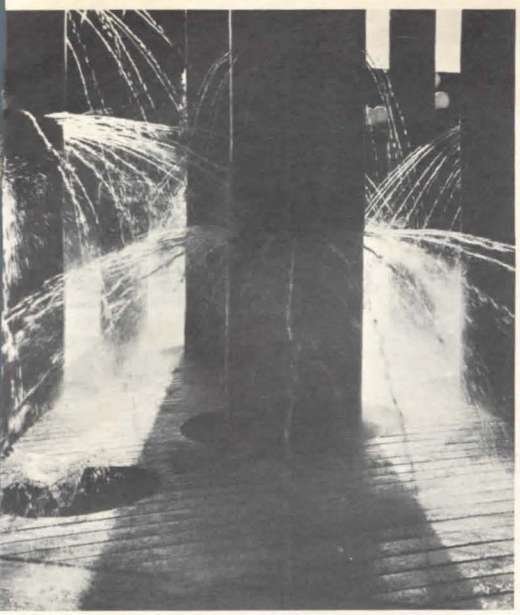
landed, with bright aluminum skins and all sorts of strange antennae lights sticking out. "Le Village," a precinct of beer halls and restaurants, is tongue-in-cheek Old Montreal — stone walls, peaked roofs, little plazas, steps down to the water, outdoor tables — and very charming (the great old carousel that was in the Belgian Village in New York is here; it was good to see it again). Fort Edmonton-Pioneer Land is all Western false fronts; enough to give Robert Venturi ideas for a fortnight. You may see a bit of female flesh here in the "old saloon." Stuff for the kids; rides, a toddlers' garden, a youth center for the slightly older set, completes the circle around Dolphin Lake, where there also is usually something going on.

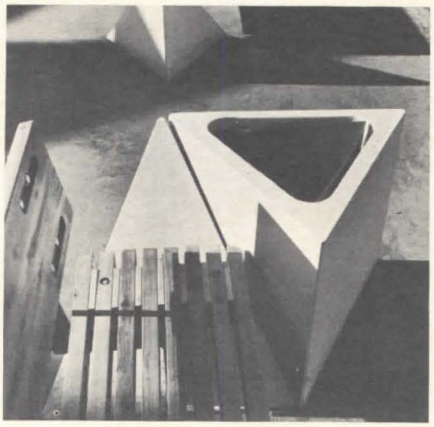
The structural gem of La Ronde is, of course, the Gyrotron. It is pretty exciting when it is all cast in a red glow at night, looking like the armature of some strange gigantic device. The ride through it does not fully live up to the advertisement provided by the building itself, but it is harmless enough. We do not know whether kids used to space movies and frequent actual television coverage of space events will be too sophisticated for it or not. As a veteran of the somewhat less advanced St. Tammany Parish Fairs in the late 1930's, we were a little more impressed, probably.

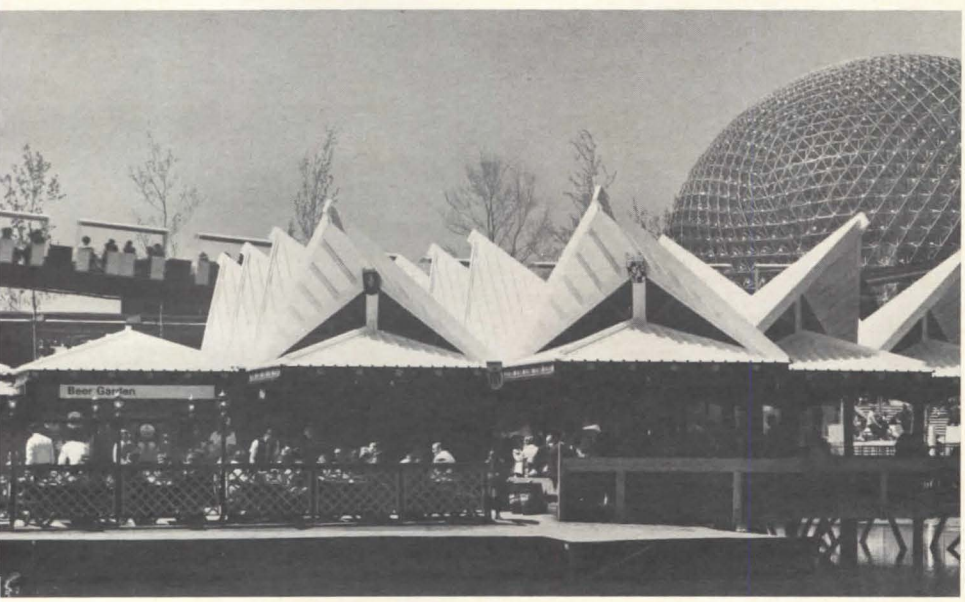
Expo Design

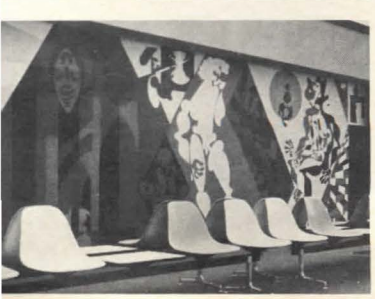
This account should not come to an end without another bow in the direction of the Expo design staff. It had the problem not only of creating all the street furniture, lighting, graphics, and related artifacts of a great exposition but of pulling together the spaces between other designers' buildings, so that Expo should read as smoothly as possible, with always a surprise, or a rest spot, or a beer garden where need be. They succeeded to an amazing extent. Any complaints about individual bits of design (we did not like the triangular bench supports or the material of the tubes on the lighting standards, for instance) are meager, in view of our admiration for the larger accomplishment. The handling of open spaces, such as in front of the Brewers' Pavilion, or the "Expo Services" clusters, such as near the Russian Pavilion, or water practically anywhere, was all top-notch. The art and sculpture scattered around is intelligent and not obtrusive; you can appreciate it or pass it by. To us, the Expo clocks or directional maps were just as enjoyable and appropriate as any fine art on the grounds.

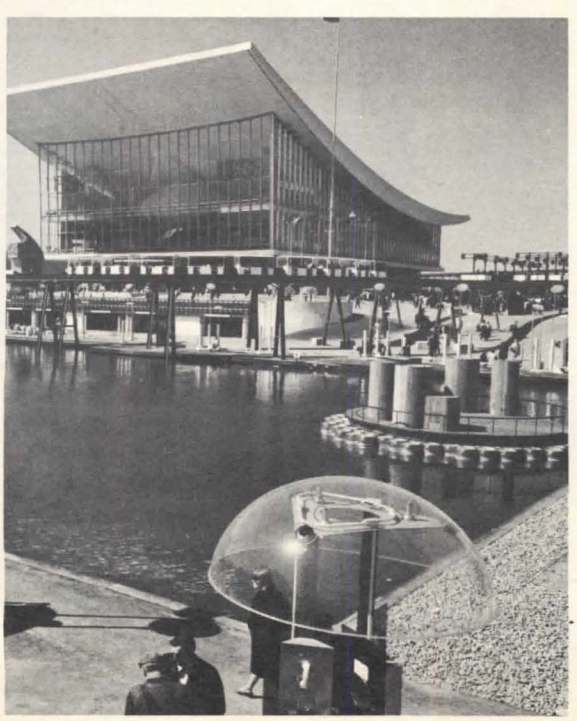
As inveterate walkers, we probably did not make as much use of the transportation facilities as others might. But they are there in great profusion, from pedicabs to bus trains, to the minirail, to the Expo Express, to the hovercraft and other boats plying the waterways. And, above all, the marvelous Métro that gets you there and takes you back.











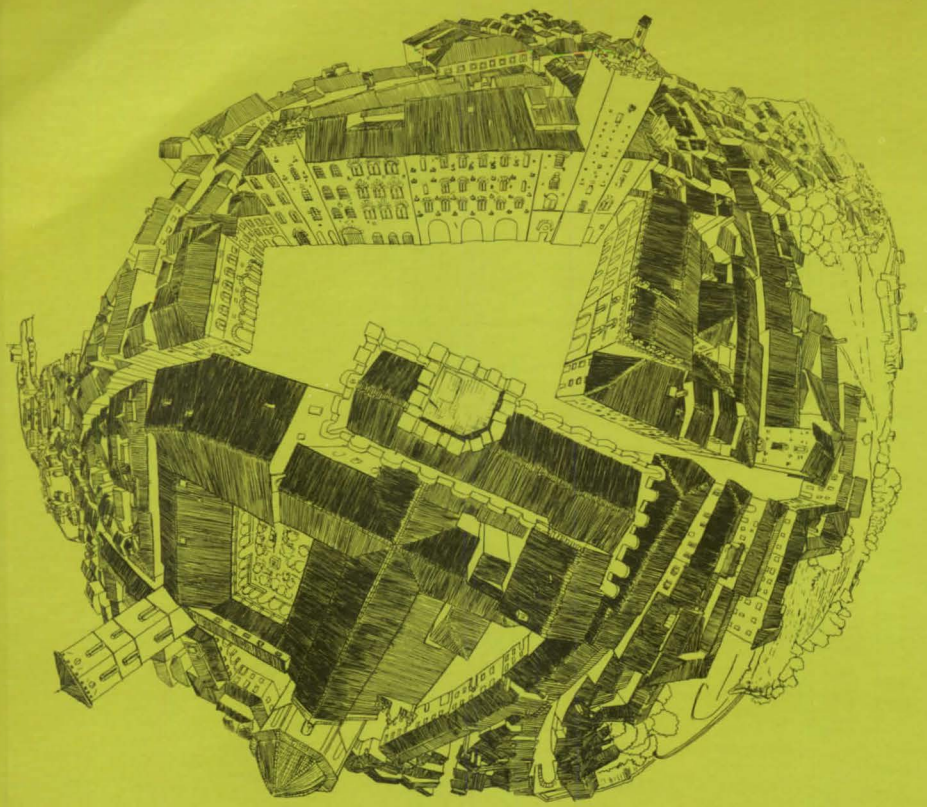
Ex Post Expo

In his new novel, The Man Who Knew Kennedy, Vance Bourjaily writes, "After you're through your twenties, there isn't much left in the way of good experience that's really a new kind for you. Life becomes a matter of repeating, as you can, familiar pleasures, and excitements you have known before."

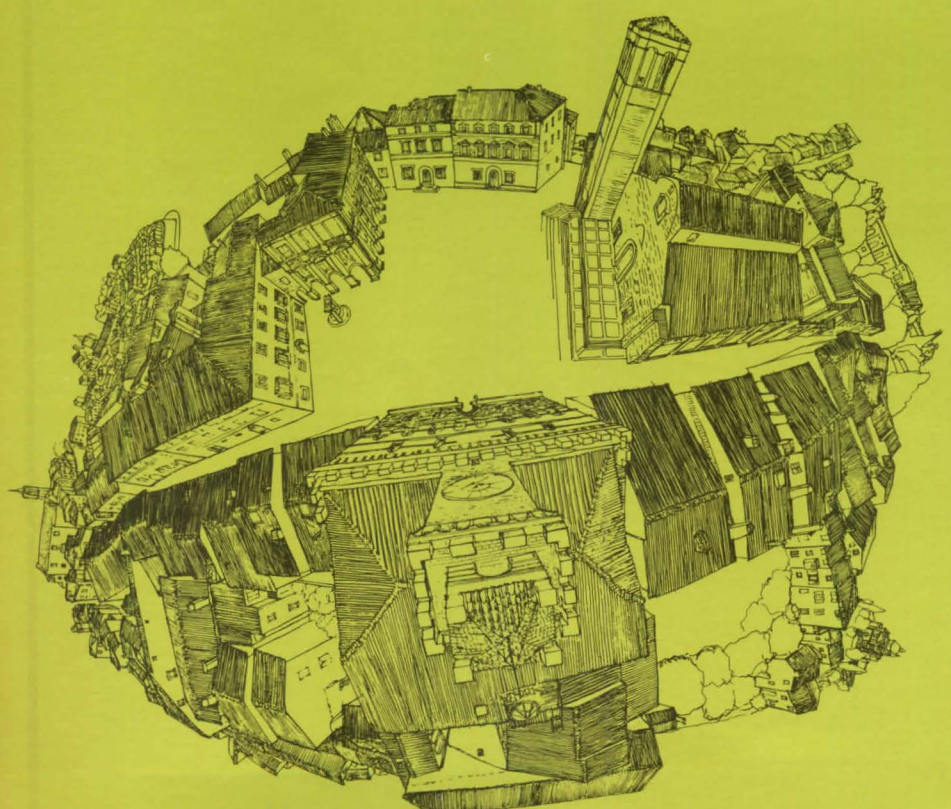
For most of us, that is undoubtedly true. Fortunately, in the design professions, there is always the possibility, the expectation of a new problem or a new idea that will charge us with that peculiar kind of vigor and excitement that is such a sensual part of creation.

We think that you will feel that sensation — second-hand; the creators felt it originally — at Expo. Sure, there's the bad stuff and the crowds and the waiting in line to get to a table. But when you go through Habitat, or feel the space of Bucky's bubble, or the fun of the Ontario Pavilion, or the craziness of Italy, or the peace of Greece, or just go out and let your senses be worked on at La Ronde, you will know that designers have been at work here, and that when this far from insubstantial pageant has faded, Montreal and Canada will sit higher in the courts of world opinion as a real vibrant city and a major vital nation.

VIEW FROM THE CAMPANILE



VOLTERRA's *medieval boundaries stand inside larger, older, Etruscan walls. The town was once the bitter rival of San Gimignano until the Medici tyranny forced all of Tuscany under the hegemony of nearby Florence.*



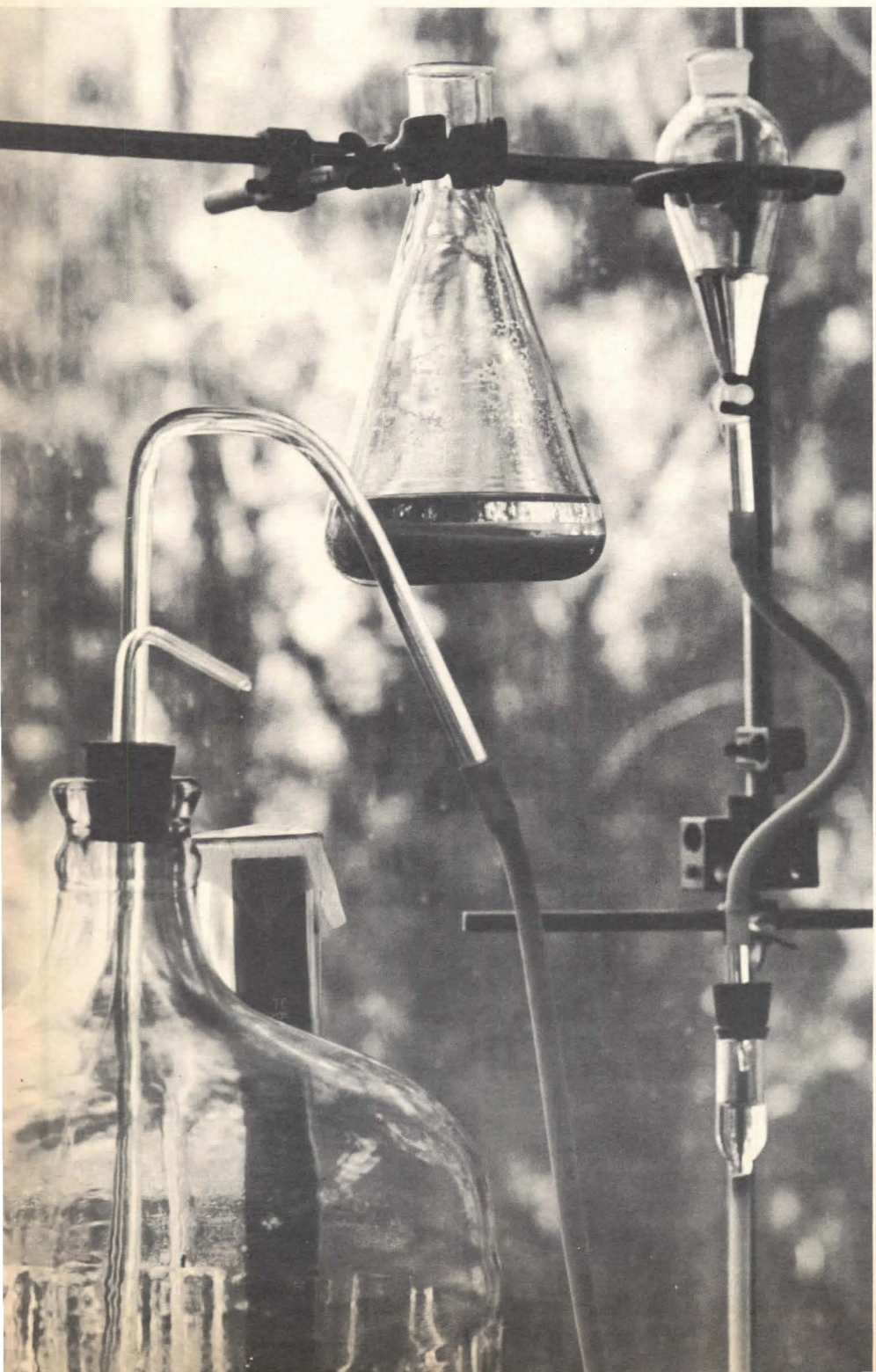
MONTEPULCIANO, *one of the highest towns of Tuscany, was the home of the Renaissance architect family of San Gallo, and the scene of much of the work of the Florentine architect Michelozzo. The Ciesa di San Biagio, just outside the wall, was one of the sources of Michelangelo's plan for St. Peter's.*

Although bird's-eye views have been popular for centuries — and more popular today with the fish-eye lens — the origin of the drawings on these pages was an inspiring view from the top of San Gimignano's highest tower. Graphic artist Joseph Aronson (who also studied architecture) stood one day at the summit and noticed two architectural phenomena: one, from this vantage point, the organic pattern of the medieval town was clearly marked; and two, there was a striking demarcation between town and farmland that made the city an island in the middle of a sea of olive groves, vineyards, and wheatfields. Aronson first tried recording the impression with a series of photographic assemblages (right), but found these unsatisfactory and began to use the camera as documentary tool for drawings. The final drawings, which are quite accurate representations of the towns, were printed on his own press in Florence. "One curious factor about this type of presentation," notes Aronson, "is that it is a complete composition in itself, devoid of top, bottom, or sides. It can and should be viewed from every angle. This graphic device also appears in Japanese maps of the 16th Century and onward, and these helped loosen my preconceived methods of visual presentation — to see what I saw from the top of San Gimignano." Aronson, who has an interesting collection of antique maps, plans to publish a portfolio of his own — a book of bird's-eye views of Italian cities.

Photo-Montage of San Gimignano

SAN GIMIGNANO's *13 towers are all that remain of the 72 built by Tuscany's feudal nobles. With the rise of the free communes in the 12th and 13th Centuries, the towers became a conspicuous symbol of an unpopular nobility and many were destroyed.*

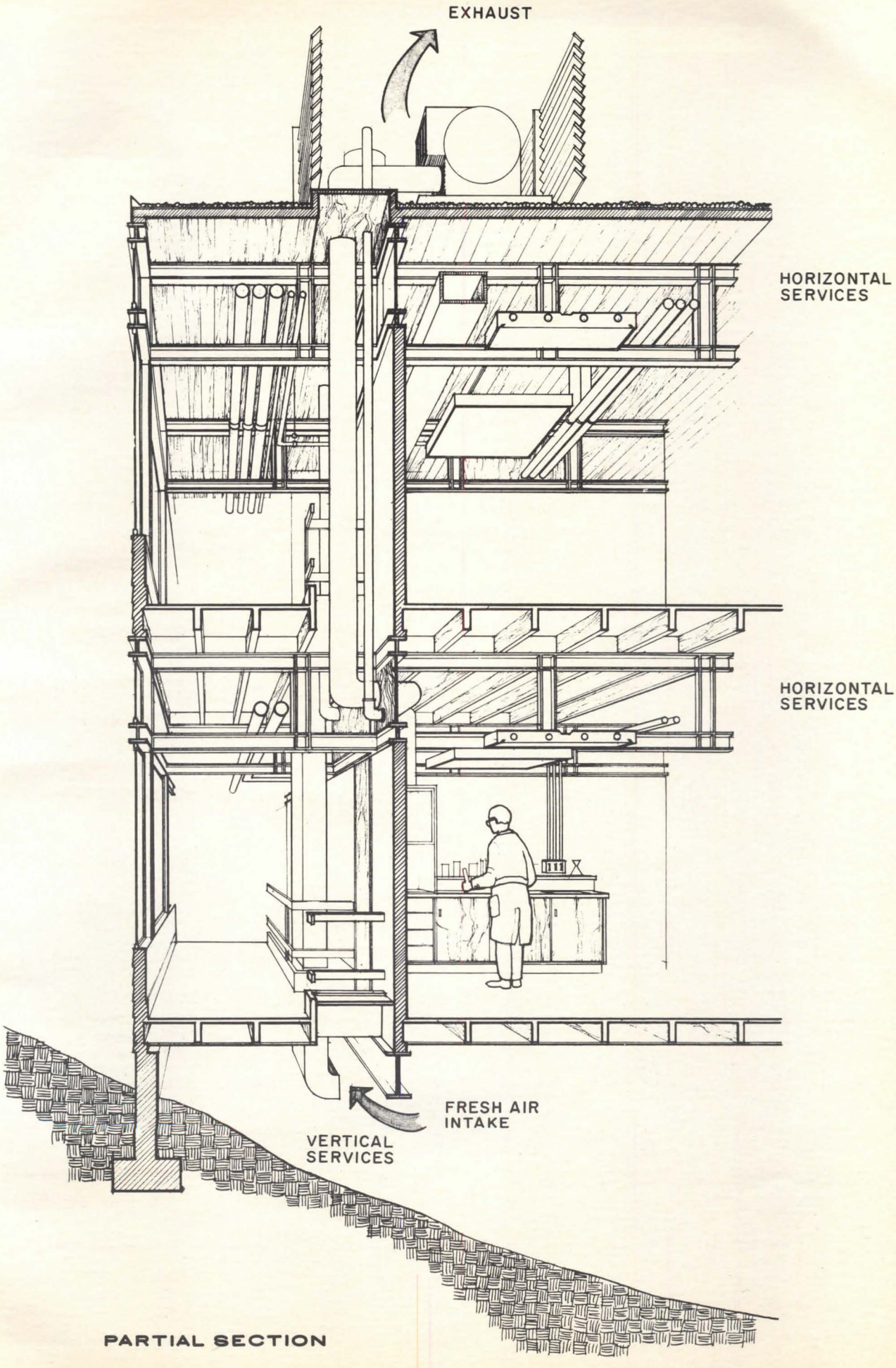
FLEXIBLE LABORATORY



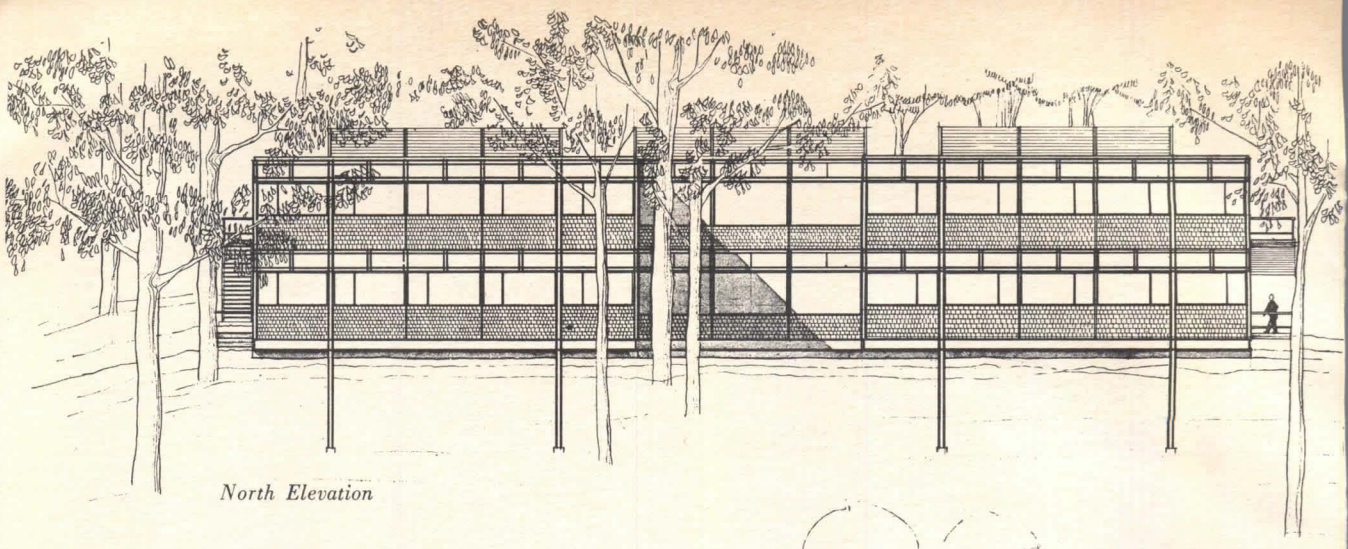
SURGE RESEARCH LABORATORY, *University of California Medical Center, San Francisco, California.* ***Architects:*** *Marquis & Stoller.* ***Site:*** *Steep, heavily wooded hillside with parking lot to the east and roadway above.* ***Program:*** *A research laboratory for as-yet-undetermined research projects.* ***Structural System:*** *Reinforced concrete foundation, exposed steel frame, and Vierendeel truss roof.* ***Mechanical System:*** *Exposed hot water pipes running through truss system with fin tube connectors at the glass, and ceiling-mounted, hot-water heat exchangers for interior spaces.* ***Major Materials:*** *Glass and shingle exterior walls, plywood floors on wood joists. Wood planking spans the spaces between trusses.* ***Costs:*** *$325,000, including laboratory benches but not equipment such as fume hoods; 1500 sq ft of interior space left unfinished.* ***Consultants:*** *Eric Elsesser, Structural; Montgomery & Roberts, Mechanical; Richard F. Darmset, Electrical; Royston, Hanamoto, Mayes & Beck, Landscape; Richard B. Grenfell, Campus Architect.* ***Photography:*** *Ezra Stoller.*

Corridors become catwalks and architecture turns into a system for the new research laboratory at the University of California. "A system" was Marquis & Stoller's answer to a client with an architectural program predicated on uncertainty. The university wanted a research laboratory, but they had no way of knowing exactly what the projects would be, or what spaces they would require. They needed a building that was flexible and could be expanded, but they picked a rather difficult location for growth: The site was a steeply sloping hillside with an outstanding stand of eucalyptus. The building should be flexible enough to wind its way along the irregular terrain, and thereby preserve the best of the trees.

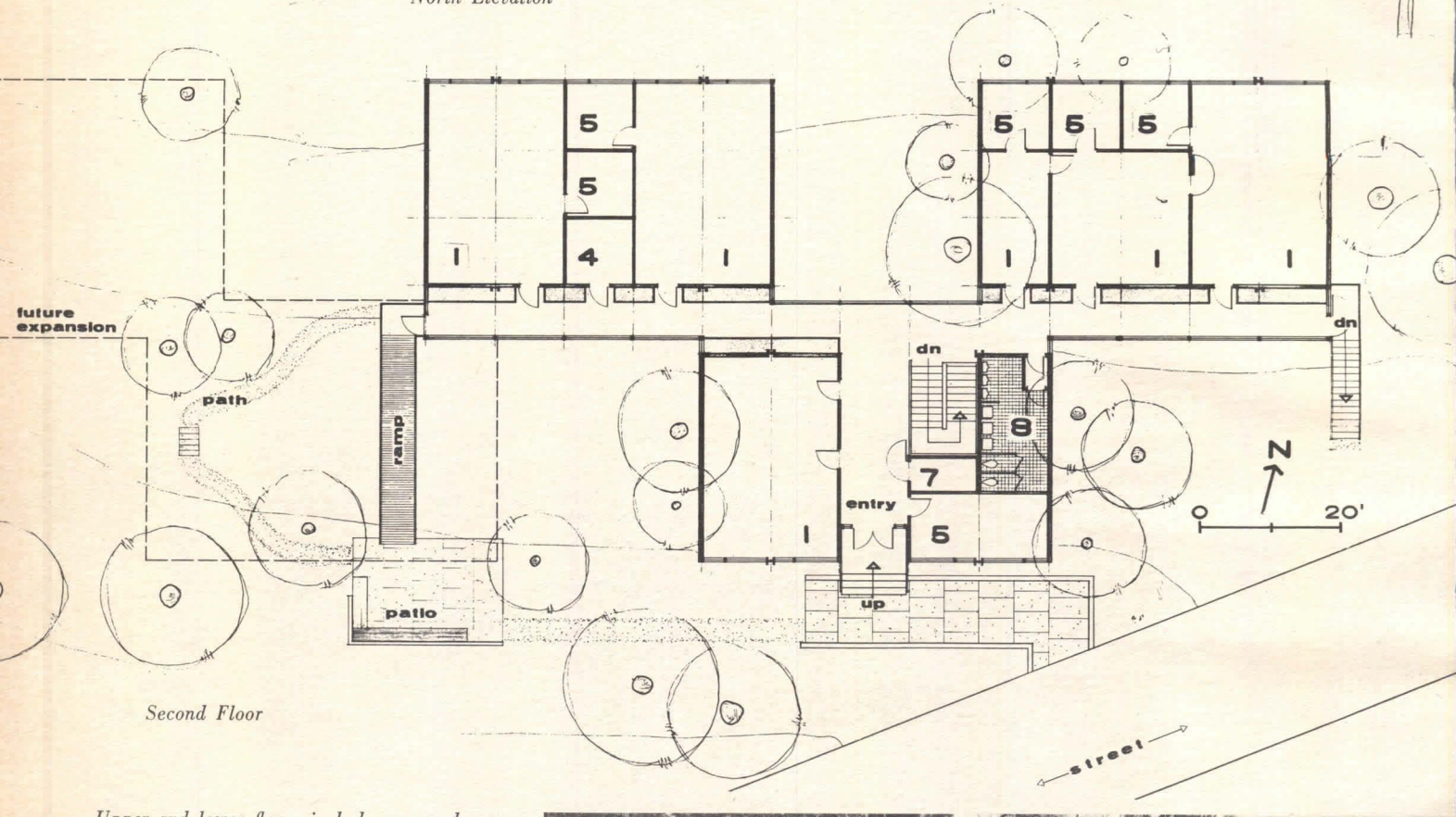
The architect's solution was a structural system based on a corridor or spine that carries the main utilities. The laboratories are modular, 50′ x 30′ lofts located on either side of the spine; when the building is expanded the corridor is extended along the contour of the hill and new lofts are located to the right or left as the trees and site permit. When



PARTIAL SECTION

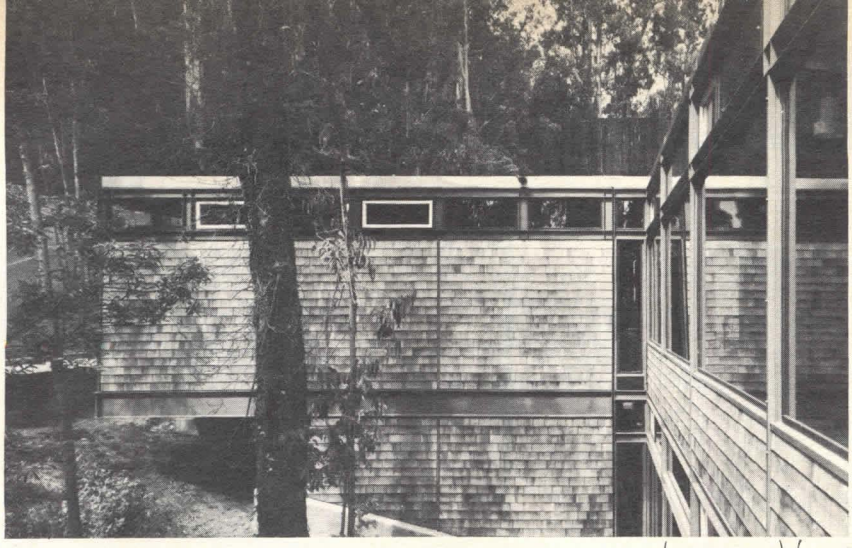


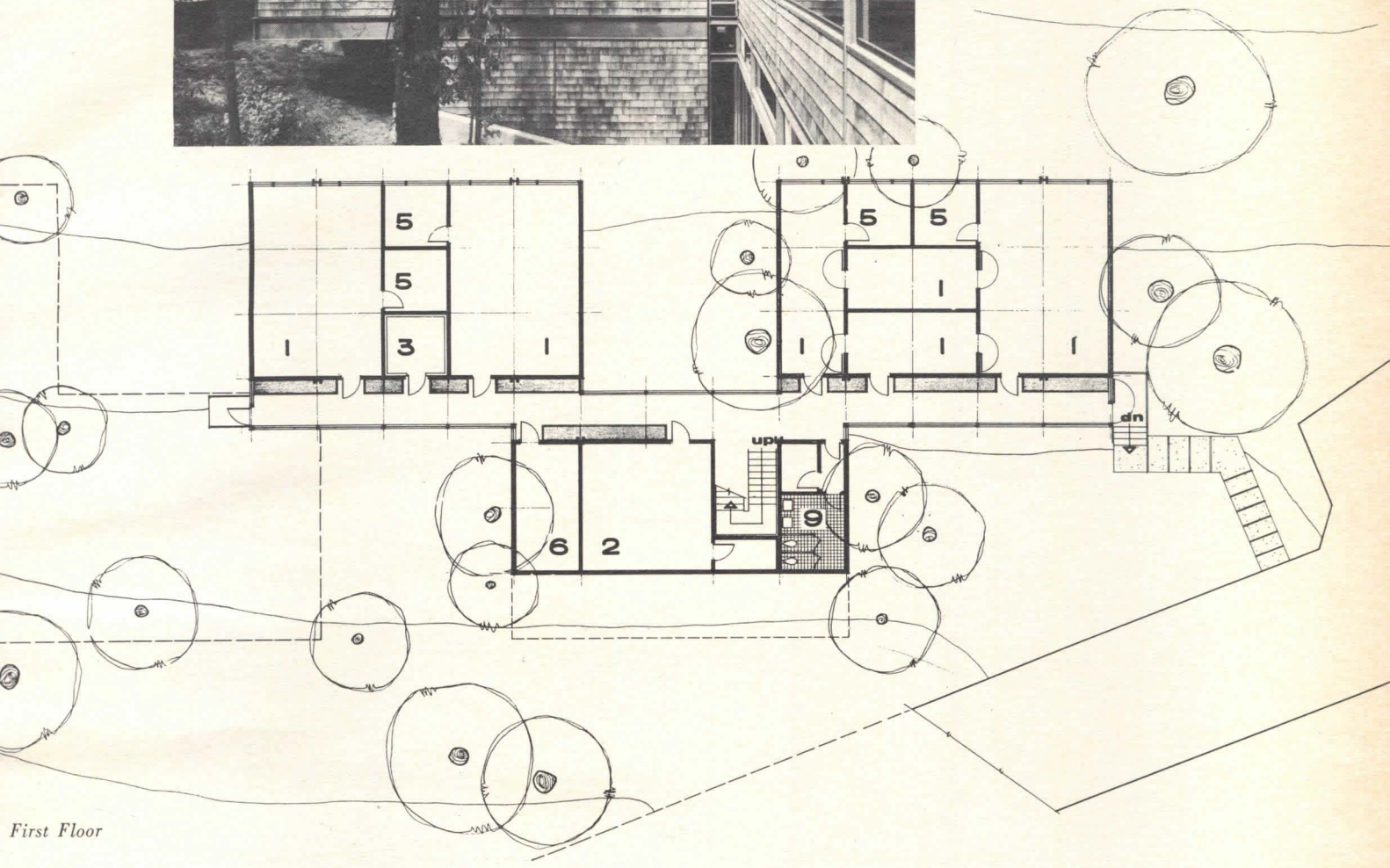
North Elevation



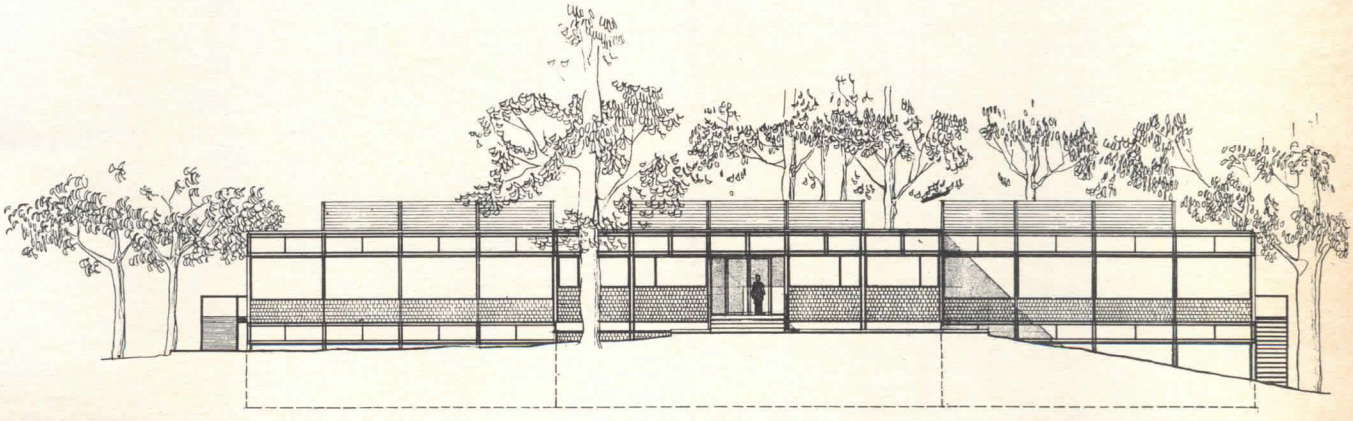
Second Floor

Upper and lower floors include: research laboratories ***(1)****; an animal room* ***(2)****; cold room* ***(3)****; dark room* ***(4)****; offices* ***(5)****; mechanical room* ***(6)****; janitor's room* ***(7)****; men's* ***(8)*** *and women's* ***(9)*** *rest rooms.*

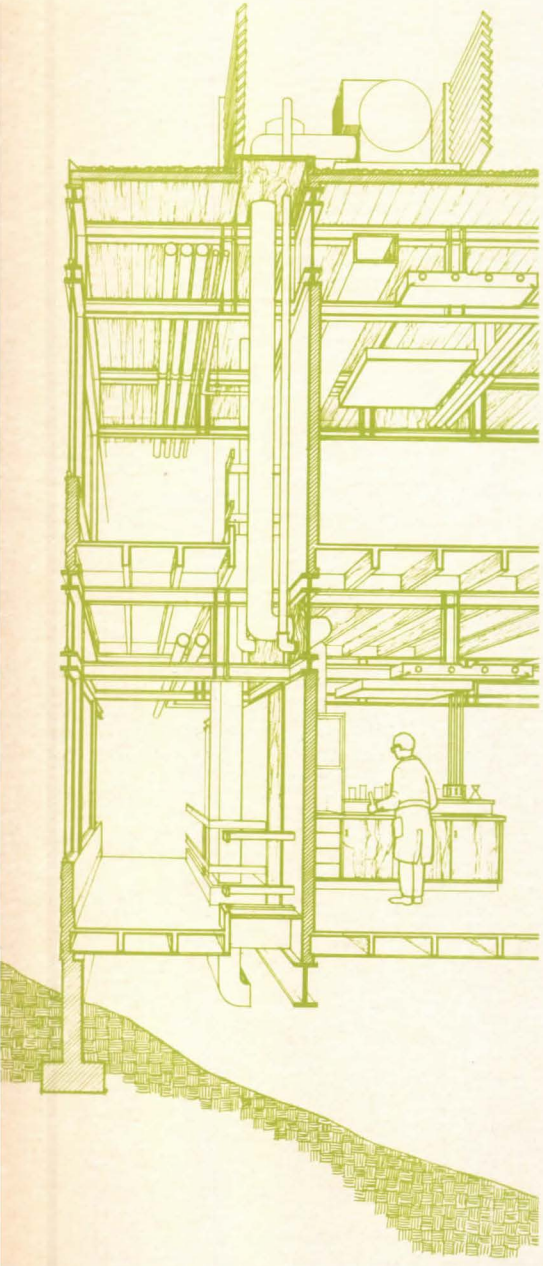


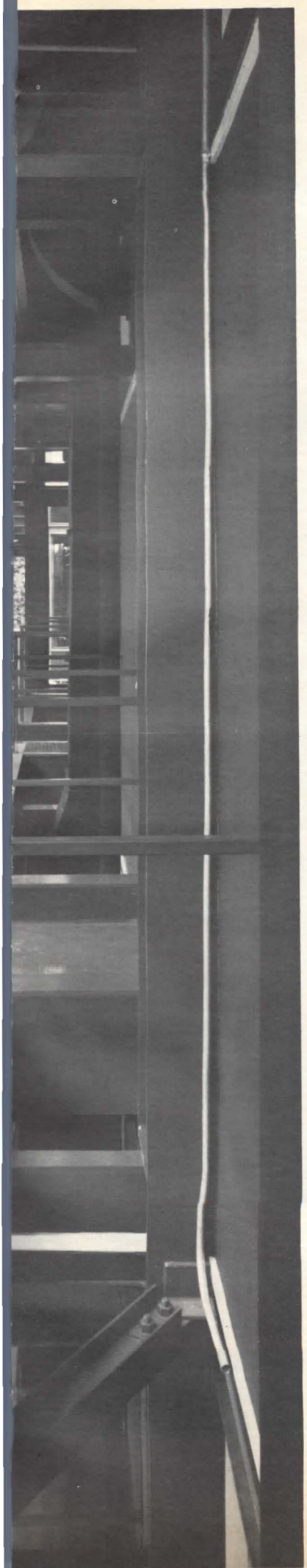


First Floor



South Elevation



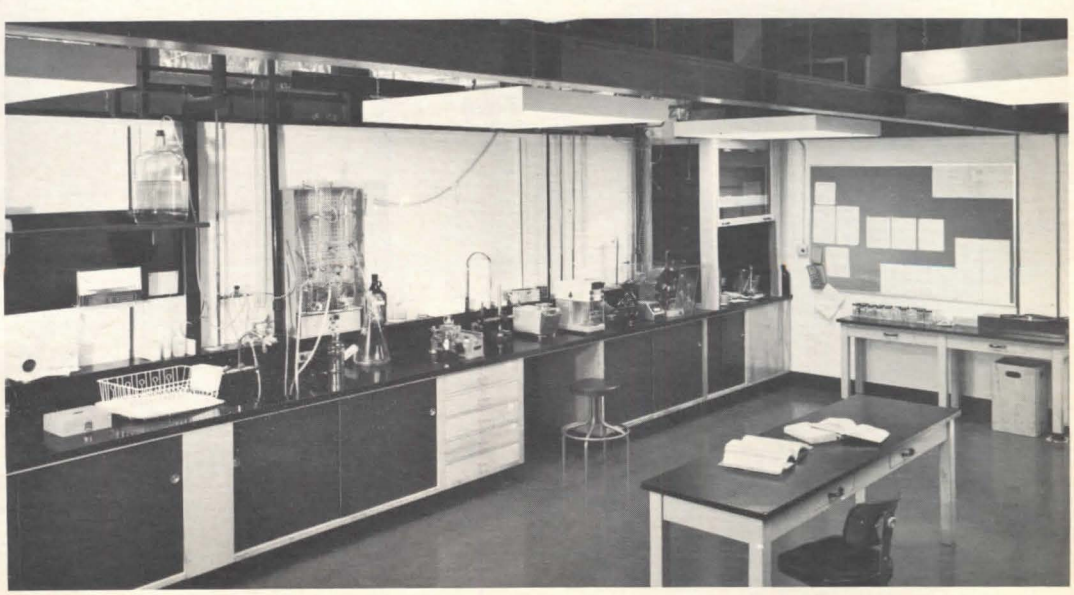


a new laboratory is attached to the spine, the mechanical systems are channeled from the corridor into an exposed vertical shaft on the side of the loft, then carried horizontally over the laboratory. By framing the lofts with steel Vierendeel trusses, ample space is left between the ceiling and the wall partitions to channel the exposed utilities over the laboratory spaces. The Vierendeel trusses also made it possible to perch each loft on only two legs on the downhill side.

The interior of the lofts can be subdivided on a 10-ft module in both directions and arranged to suit the needs of any particular experiment. Metal panels are used in the truss whenever pipes cross over a wall partition; glass panels are used in other locations.

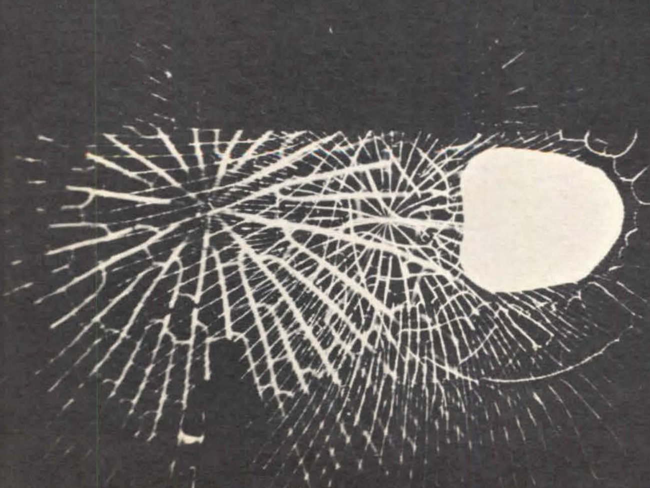
There is no cooling system in the building, since the surrounding trees will offer considerable protection from the sun. For the interior laboratories, fresh air is forced in from below. Hot water pipes, to heat the lofts, run horizontally through the trusses, along with the other utilities. Exposed fin tube convectors are located at the exterior glass walls.

The outside of "the building" is shingled — a bit of appropriate Bay Area styling, to finish off this most sensible system of mechanical boxes.



INSTANT INTERIORS

After instant food, instant...



Projections, this page: Don Snyder. Photos: Moos-Hake/Greenberg
Projection, facing page: conceived by C. Ray Smith; executed by William Warfel. Equipment: Courtesy, Kliegl Bros., Inc. Photo: Louis Reens

...sleep, and instant dreams, now turned-on environments are a product of our instant age. Why not?

For special occasions, we can change a room simply by flicking a button on a new projected transparency. One day the Sistine Chapel, the next a sunset seen beneath fall foliage; when guests come, the lambent light of a lingering meteor. It is instant planetarium—but on home and office ceilings.

Or, projections can be on floors: a priceless and otherwise unavailable Sarouk, an elegant baroque parquet, or a fresh spring carpet of bluebells and daffodils. On the walls, a crowd scene can make an instant party, can make one lonely or jolly.

And transparencies need not be limited to reproductions of

Photo: Louis Reens

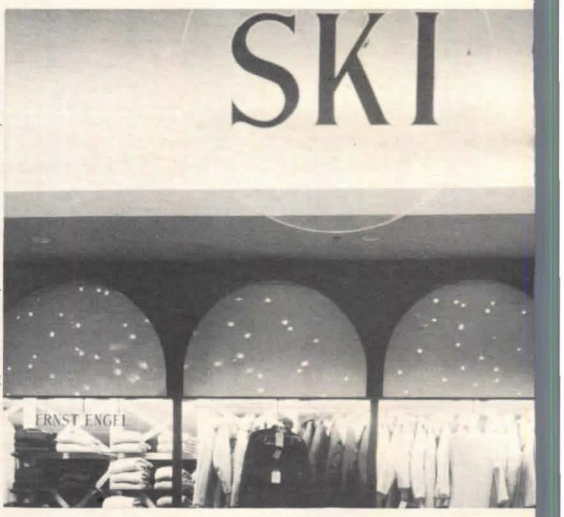


Photo: Courtesy, Gersztoff, Nuckolls & Warfel, Inc.

Earl Reiback's recent exhibition at the Howard Wise Gallery (left) showed not only easel paintings of colored light in motion, which were rear projection devices (rear of photo), but also wall projections using polarized and refracted light to achieve continuously changing forms in irridescent colors. The projection equipment was contained in a box suspended from the ceiling of the gallery. Lighting designers Gersztoff, Nuckolls & Warfel did what they call a "snow job" for Bonwit Teller this past winter (above). Falling snowflakes on panels above the ski-clothing department were created by constantly moving multiple projections that gave consequent three-dimensional depth. The projected snow was confined to the panels and did not fall on either clothing or sales area, but it drew customers' attention immediately as they stepped off the elevators.

known scenes or historical artifacts. New creations — by new artists in the medium — can be designed for each plane of a room.

Instant interiors may also have more than mere decorative or amusement value: Architects' renderings, projected inside all-white rooms, would give clients an immediate idea of what they should expect of a planned building.

It all goes with our electric age, and designers are using it in homes and offices — now. Since the theater has been seriously working with projected scenery for at least 30 years — recently combining live action with it — the technique is not new. Yet now, elaborate visual effects for discothèques and for religio-aesthetic psychedelic experiences have brought it to new heights.

Usually, these exhibitions are constantly moving, changing, flashing, and polarized. They are consciousness-expanding visions that are hardly calm enough for productive or residential environments. Until recently, most of this theatrical work has been frontal or axially oriented, and seldom has the performer, much less the audience, been overlayed with the projection. Nontheater interiors, for similar reasons, have most frequently used rear projections — easel-type artworks — that are recessed in the walls to avoid light shining directly into the eyes.

In today's design approach, however, there is a permissiveness (the word is Vincent Scully's), which accepts things that do not fit exactly, things that spill over from one area to another, from one plane to the next. A correspondent of Marshall McLuhans' "allatonceness," it also allows us to accept a projection falling on the people in a room as they move about it. And that permits enormously simplified installations.

In the future, this newly simplified technique may be the only way to decorate for the exploded population, because traditional materials may be unavailable. Actual costs may be the same, since projection equipment and transparencies, maintenance and electricity, will probably be as dear (and as dear to

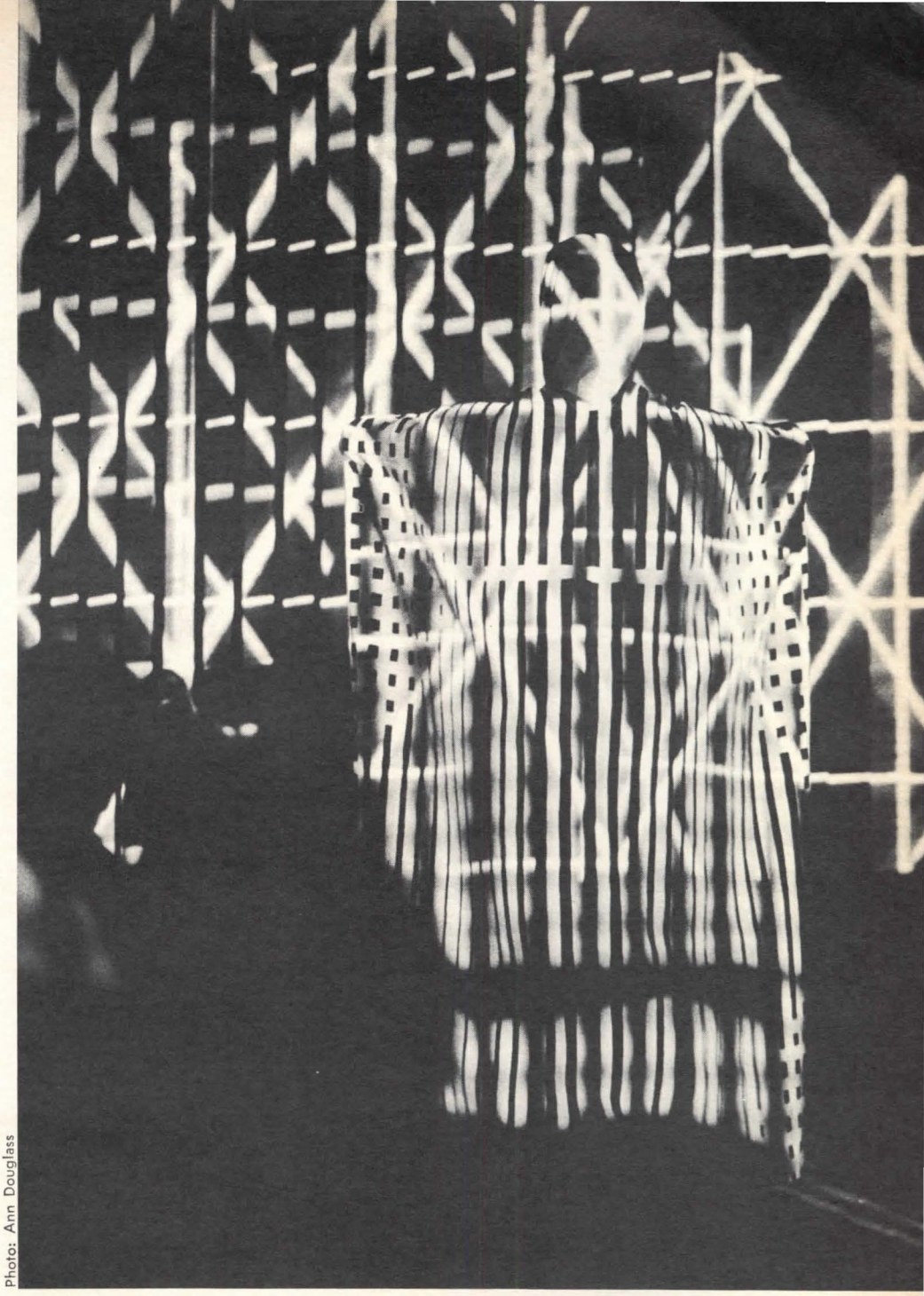


Photo: Ann Douglass

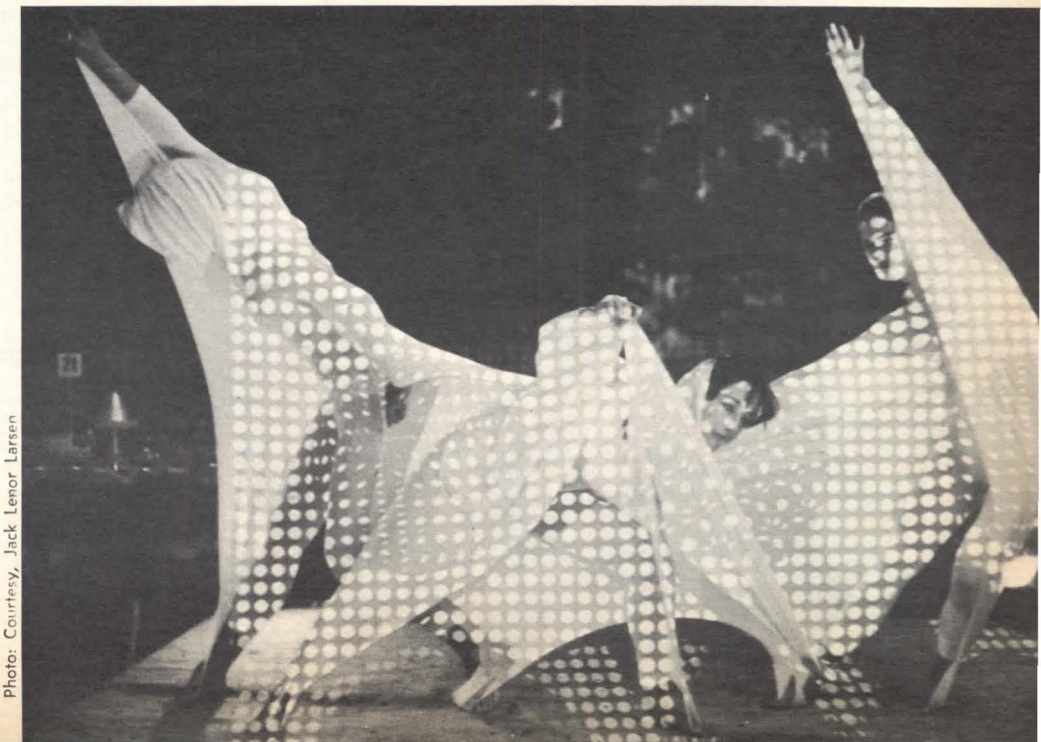
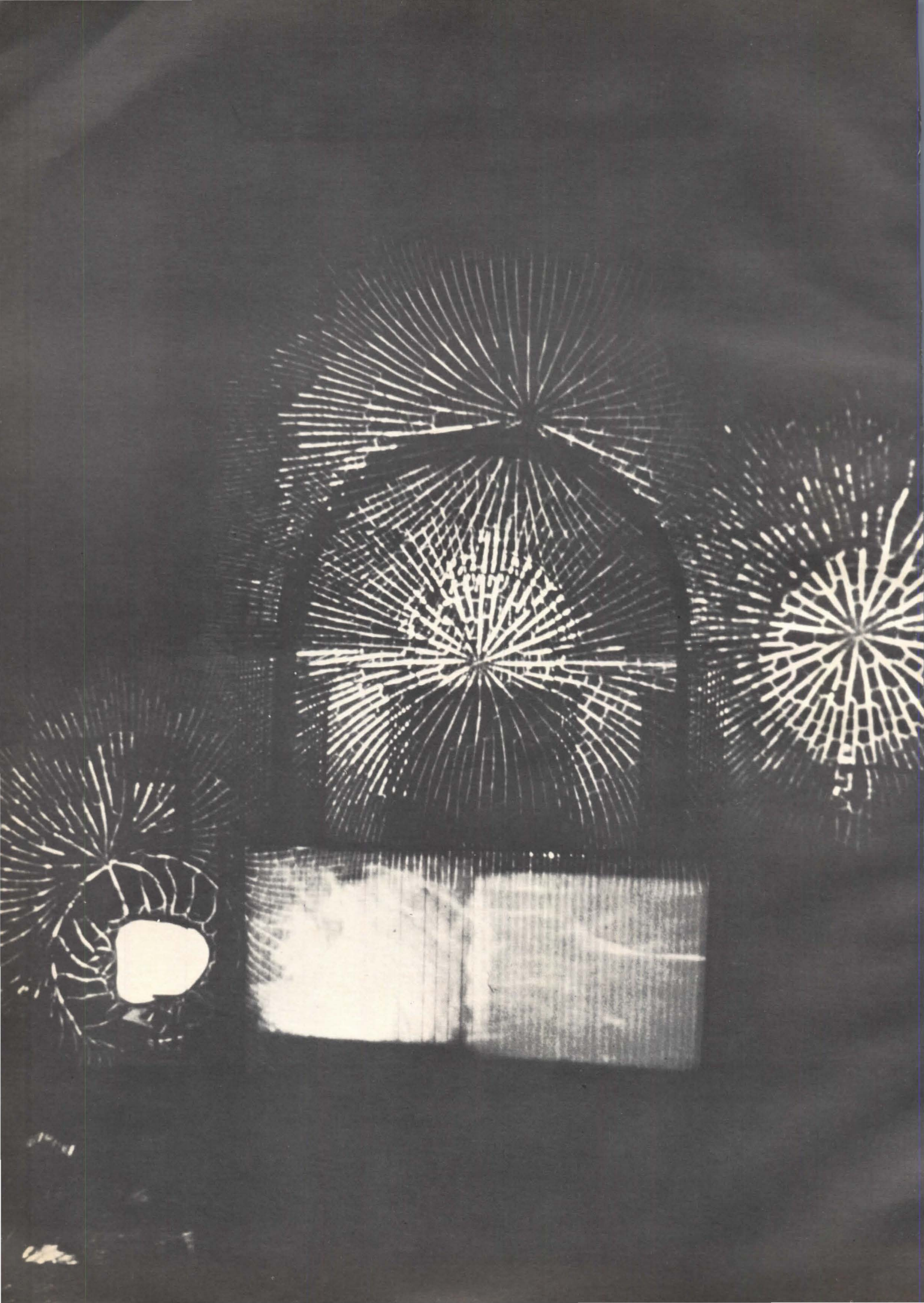


Photo: Courtesy, Jack Lenor Larsen

Don Snyder, who has devised projections for Dr. Timothy Leary's "psychedelic celebrations" (p. 176), pointed the way for residential-scale projections by his overlaying pattern on people in several recent demonstrations in New York City. One of these demonstrations, initiated last fall by Jack Lenor Larsen, Allied Chemical Corporation, and the New York Home Fashions League (photos this page), used multiple abstract projections moving constantly over futuristically clad dancer-models in motion. Snyder calls his kinetic projections "multimedia," aiming at "the architecture of the mind and of the senses."



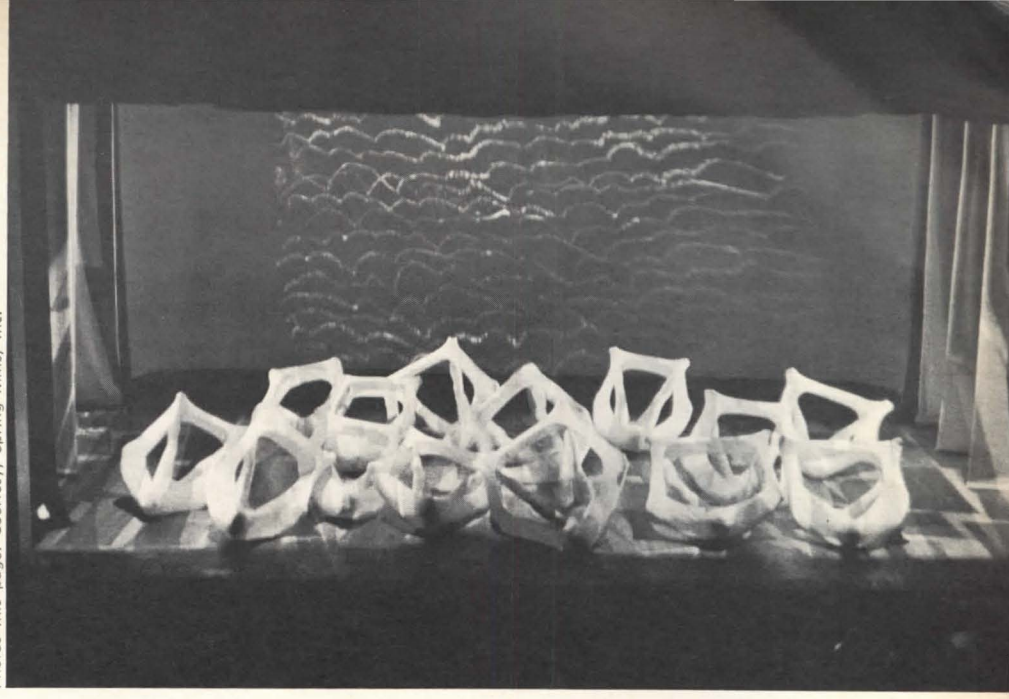
the owner) as our present-day hand labor and individually collected artifacts. But the availability, disposability, and the flexibility of the new method are meaningful messages for our age.

Before equipment can be miniaturized to appliance-ware size, however, problems remain to be solved: The ambient light that dissipates a projected image requires high-wattage lamps to counteract it; and, in turn, high wattage creates considerable heat, which can be dispersed only by noisy fans. Further, even when mounted in heat-resistant glass, transparencies are subject to fading. But acceptance of vaguer images is increasing among lighting designers, who have been used to blacked-out movie houses, and that should speed the process.

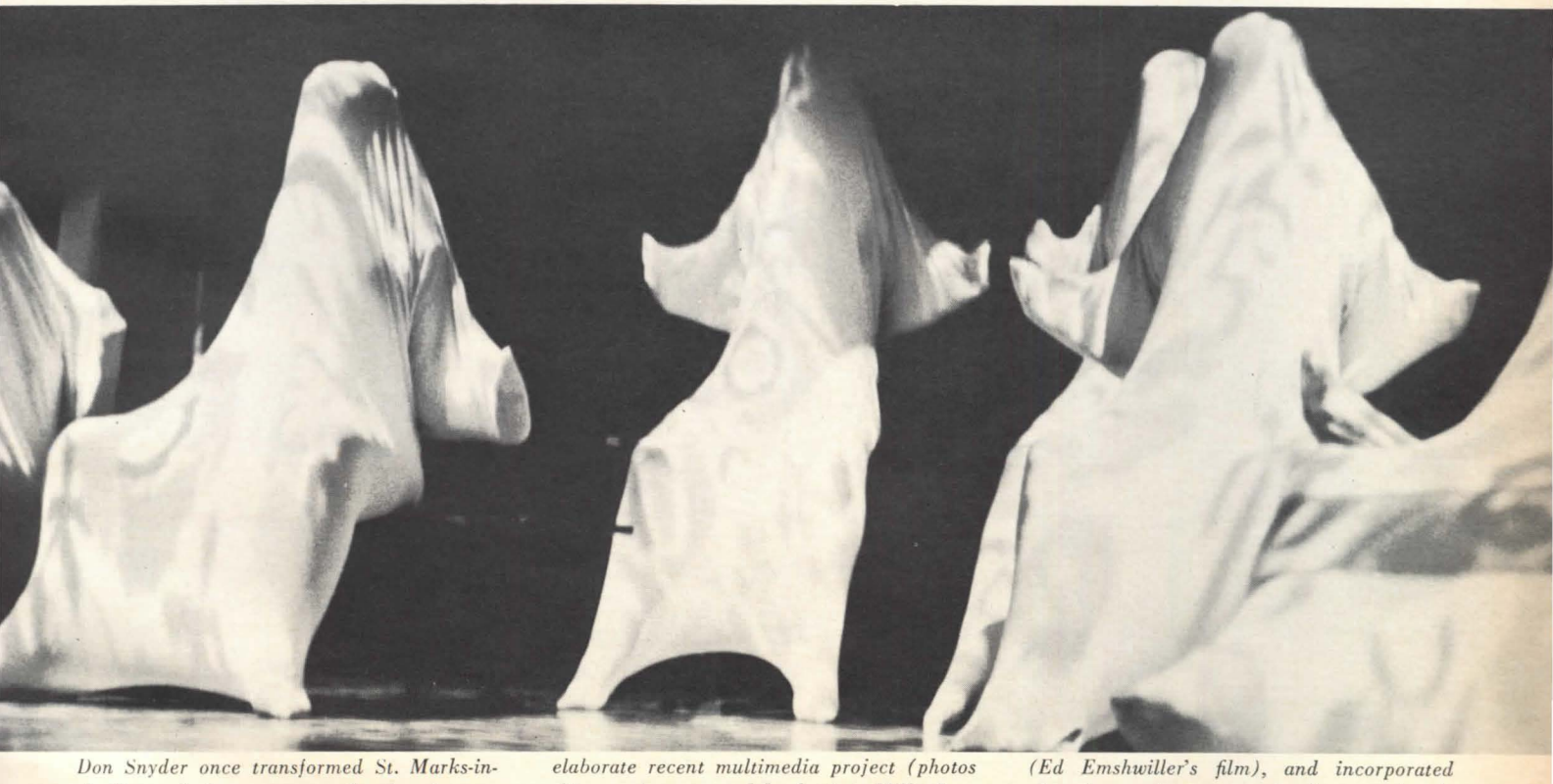
The future will also bring surprises that till recently were unforeseen: The development of holograph photography will permit us to move in a projected environment and see it as a three-dimensional image. We may feel, at first, that we must walk around, instead of through, a projected column, since in holograph photography it will offer different views from various viewpoints.

Then, finally, we must prepare for a social danger: Instant interiors may produce situations like those of seeing someone in the same tie or dress. How will you feel if you go to a party and they have your living room on?

Architects, beware: There is talk of projections on building exteriors. — CRS

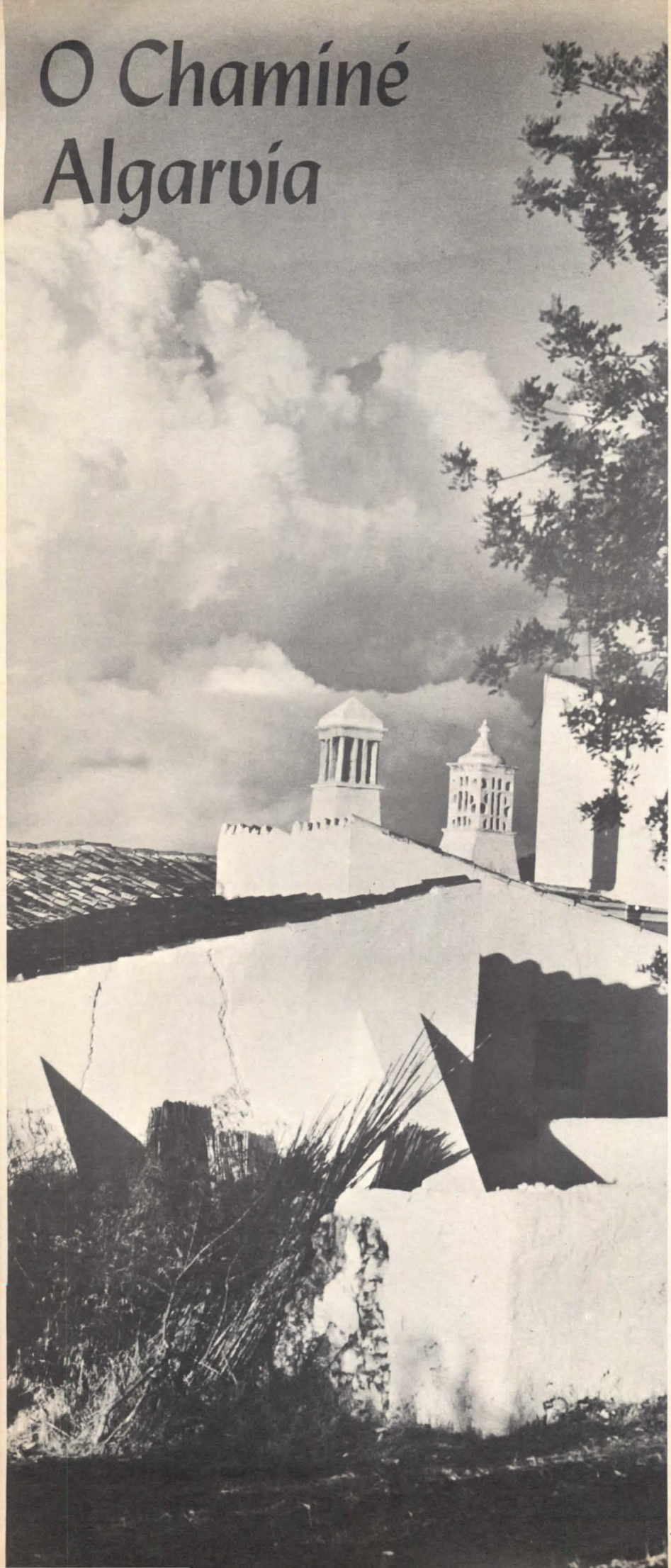


Photos this page: Courtesy, Spring Mills, Inc.



Don Snyder once transformed St. Marks-in-the-Bouwerie into a constantly changing environment (facing page) as his patterns, projected onto performers in front of a screen, spilled over onto the entire church. The most elaborate recent multimedia project (photos this page), sponsored by Springs Mills, Inc., and produced by Concepts Unlimited, utilized live dancers (Alwin Nikolais' group) with a movie background of their own performance (Ed Emshwiller's film), and incorporated changing projections on the dancers also. It was a triple layered production that may give intimations of the instant interiors of the future.

O Chaminé Algarvia



By Charles E. Wuerpel, a former Vice-President for Operations and Engineering of the Marquette Cement Company, now retired and living near Loulé, Portugal.

The chimney pots that prominently adorn the white homes that gleam among the almond, olive, and citrus groves on the hillsides of the Algarve province at the southern tip of Portugal **(1)** are a striking legacy of the Moor. Said to derive from the Mohammedan minaret, these highly distinctive creations are seldom found anywhere else. They diminish abruptly at the border of the Baixo Alantejo, the contiguous province to the north, and at the Spanish border on the east. Moorish though they are in remote origin, the extraordinary variety of form and detail of these chimneys, and the absence of any true minarets in the Algarve, makes it exceedingly difficult to trace a direct pattern of evolution. So it would seem appropriate to consider them simply and uniquely as "O Chaminé Algarvia" — the Algarve chimney **(2)**.

The Moors occupied most of Portugal for centuries (711–1249 A.D.), but they found the extreme south, which they called Al Gharb ("in the west"), similar in climate and terrain to their North African homeland, and held on here for one hundred years after being expelled from the rest of the country. This longer and more intensive occupation accounts for the strong Moorish influence still apparent in this province.

The Algarve stretches eastward from Cape St. Vincent, southwestern tip of Europe, some 90 miles to the Spanish border at the Guadiana River. It extends northward from the shores of the Atlantic Ocean only about 30 miles, to a series of low mountain ranges that roughly parallel the southern coastline. These mountains create a sufficient barrier to winds and rains from the north to account for the similarity to Africa's north coast.

The influence of the Moor is evident in the people themselves, in the remarkable battlements of their last stronghold at Silves, and in the architecture of present structures; very notably, of course, in the brilliantly white-washed, cubistic, flat-roofed, single-storied construction that is especially prevalent in the Algarve city of Olhao. However, it is the myriad variety, elegance, and beauty of the chimney

tops that make the Algarve architecturally unique. Present in the cities, but not so apparent to the casual eye, they command attention and admiration when one drives through the countryside. There they grace nearly every place of residence — proud or humble, rich or poor; some of the finest specimens are to be seen atop the simplest cottages.

Through the centuries and up to the recent past, construction in the Algarve has been based on un-reinforced sand-lime mortar with embedded field stones in single-storied structures — some with sloping roofs on which Roman-type clay tiles are laid in overlapping pattern on bamboo canes are supported by light wooden pole rafters. Outer walls are 2- to 3-ft thick, with partition walls likely to be as much as 1′-6″ thick. This type of construction is simple, inexpensive, and feasible for relatively unskilled workmen, and the necessary materials are ready at hand on or near the site. The absence of major climatic variations and freedom from frost are favorable to permanence, but there are rather frequent earthquakes, mostly mild but some sufficiently violent to disturb weakly cemented walls. This and the basically weak roofs account for the absence of residential type structures that are more than 150 years old. This limits our ability to examine the span of centuries from 1240 to today, but the structures that do exist show little evidence of change in design or structure of the Algarve chimney. Each is the unique creation of the mason who builds the house, and the chimney top is built *in situ* **(6)**. There are a number of broad categories of shape and style from which the mason has made his choice, but within each category there is wide scope for exercise of imagination and artistry. Absolute duplicates in Algarve chimneys are extremely rare; one of the few notable exceptions are the three massive chimneys (as unlike minarets as is possible to imagine) that adorn an imposing house in Olhão **(5)**, considered to be the most Moorish of all the Algarvian towns.

As far as this writer knows, there were no detailed drawings or specifications for these chimneys until burgeoning tourism in very recent years brought about mass building and the tendency toward modern construction. Detail drawings **(8)** were used to build chimneys in one of the most attractive recent housing projects.

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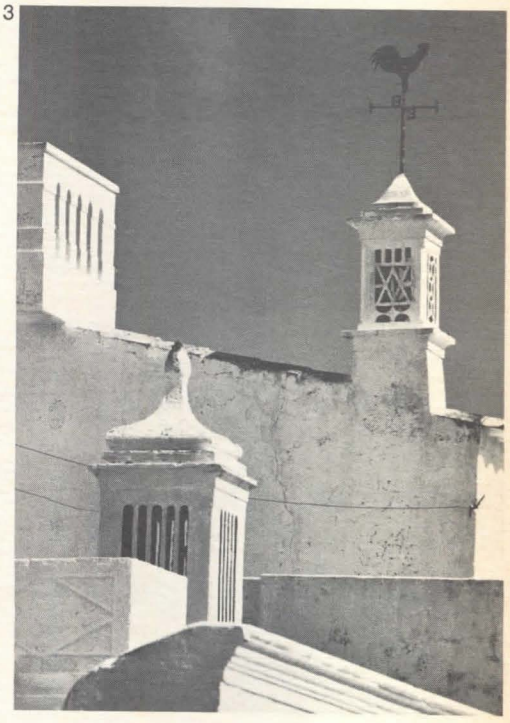

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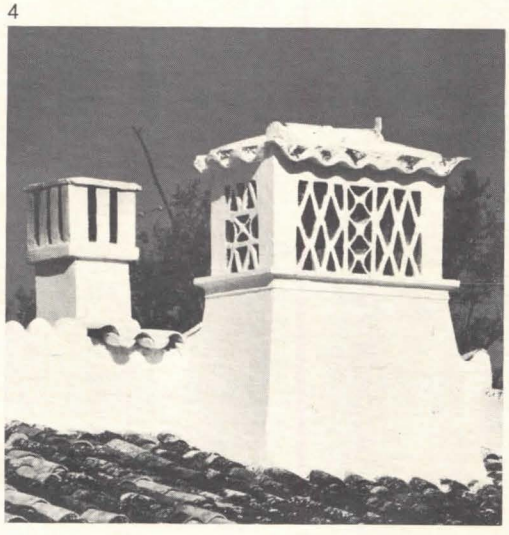

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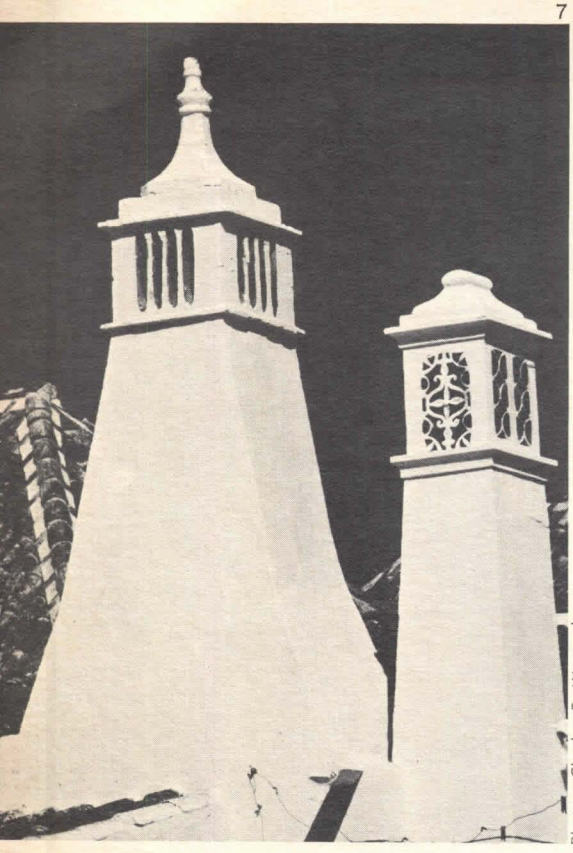


Photos: Charles E. Wuerpel

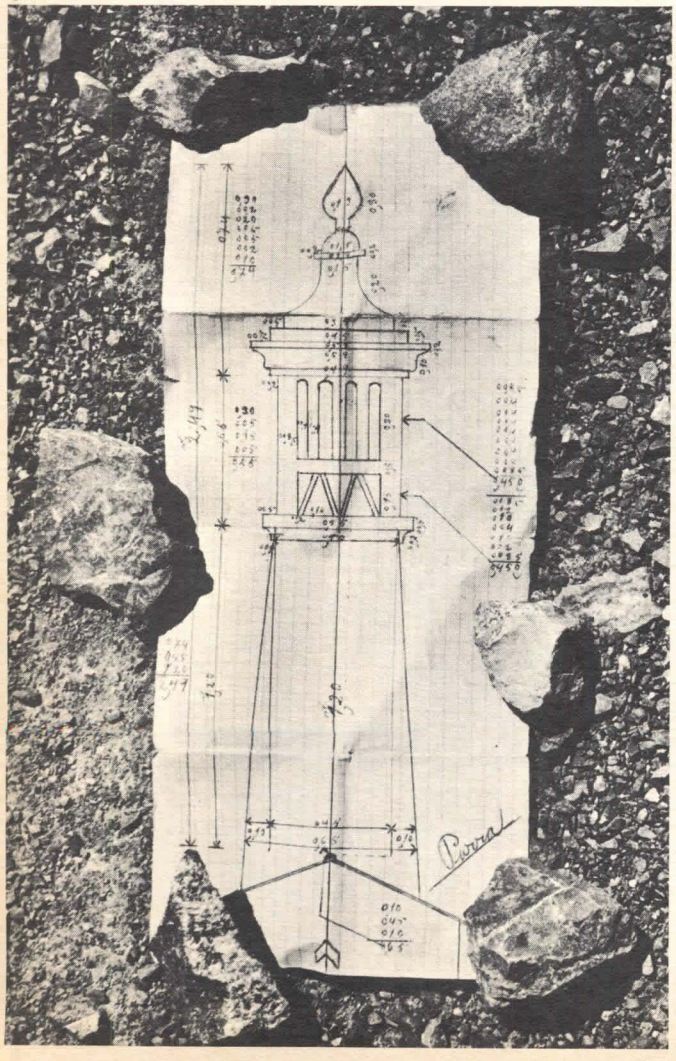
Even in this up-to-date project, the drawing is in free-hand and not photo-printed or otherwise duplicated, with each of the many chimneys in the group differing in design. There are, of course, regrettable instances of mass-produced houses with each identical to its neighbor, but they are as yet very uncommon.

The older chimney pots were strictly utilitarian, surmounting a large chimney area in the kitchen of the house (see section, **9**), much as in country houses of other lands in past centuries. There is provision for hanging meat and sausages and octopi and fish to dry and smoke, and to heat water for washing and bathing, as well as to cook. Now, with bottled gas, rural electricity, and rapid transport, the need for this type of kitchen chimney has been lessened. Many of the oldest as well as newest chimneys thus remain pristinely white throughout the year, serving simply as the decorative objects which they are. From this follows the recent change to lighter and more delicate design.

Rainfall is not abundant in the Algarve. There is none in the summer, and very little in the spring or fall. This may account to some extent for the fact that the use of the Algarve chimney has not spread, since it is vulnerable to wind-driven rain. Rain water trickling down inner walls of old chimneys has proved no great inconvenience here; since plastic sheeting has become plentiful and inexpensive, the chimney openings may be wrapped almost to their tops during the "rainy" season. The writer copes with the wind-blown rain by installing a collecting "gutter" system on the inner surfaces of the beautiful massive chimneys atop his *quinta* (farmhouse).

These photographs merely hint at the myriad diversity of forms of *o chaminé algarvia* in its older and more current manifestations **(3, 4, 7)**. The chimney pots are among the most charming architectural grace notes in this as-yet-"undiscovered" corner of the world.

8



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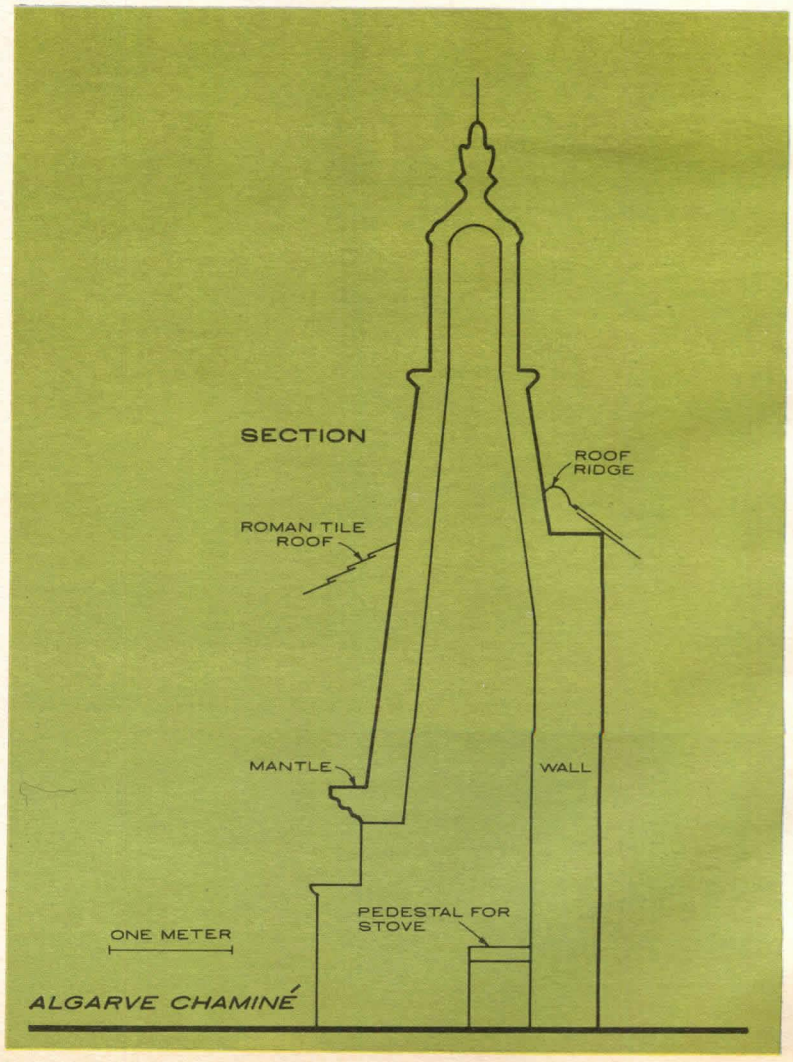



1202

THE FORMS OF TENSION

A philosophical look at nature's affinity for minimum surfaces, and their relationship with architecture.

By James M. Leefe, a partner in the architectural firm Leefe & Ehrenkrantz, San Francisco.

The forms of tension in architecture are the forms of the stretched membrane, of the inherently stable surfaces of negative curvature. Created by structural requirements, they are also the forms of minima; exceedingly beautiful in their simplicity and mathematical purity, evoking the continuity and homogeneity of geometric space.

Tension is the force that binds the particles composing the matter of the universe. It is the force of molecular attraction, inner-directed, ranging in strengths between 1 and 2 million psi.

For the purposes of this article, tension need be considered only as a direct stress acting in the plane of a membrane, and it is only in tension structures that the high strengths of molecular attraction can be realized in architecture. Theoretically, the limitations governing the size of a structure in tension are the strength of the material and our ability to anchor it.

Compression, on the other hand, places very severe limits on size. In compression, a member too thin relative to its length will fail by bending when axial tension and compression both occur in rotation about the neutral axis. Bending is the phenomenon that limits size and sets the scale of things in the range of normal human experience.

From Tents to Shells to Tents

For shell action to occur in a structure, there can be no significant bending. Therefore, shells must be very thin. They must have a degree of flexibility, yet they must be able to carry compression.

These criteria demand that the ratio of shell thickness (t) to radius of curvature (R) is between 1/100 and 1/1000. The ratio t/R for reinforced concrete shells is between 1/100 and 1/250; for steel, between 1/500 and 1/1000. Membrane structures too flexible to support compression have ratios even smaller than 1/1000.

While shell thickness will almost invariably be limited by buckling caused by compression, the flexible membrane will be limited only by the strength of its material in tension. Thus a membrane in tension exploits materials to the fullest.

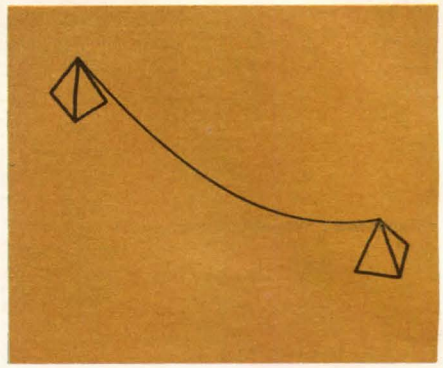
The upward forces will be critical in these structures. In fact, the structural problem becomes one of holding the membrane down, of anchoring it to earth against the lift of wind, of stiffening it against flutter.

Stability in these flexible structures can be achieved by prestressing or similar means. The most effective way, however, appears to be by the development of an inherently stiff membrane form such as a saddle, which is a surface of negative curvature with the centers of radii always on opposite sides of the surface. Because the curvatures are in opposite directions, the surface is always in tension. With one curve to work against the other, it is inherently stable.

The classic membrane in architecture is the tent. Tents can be traced far back into history, and are mentioned in the Old Testament. Talbot Hamlin, in *Architecture Through the Ages*, speculates that Paleolithic man must have made a simple form of tent with skins on a light wood frame. However, it is only in recent times that we have begun to realize that there is a structural potential for woven fabrics tensioned into negatively curved surfaces.

Minimum Surfaces

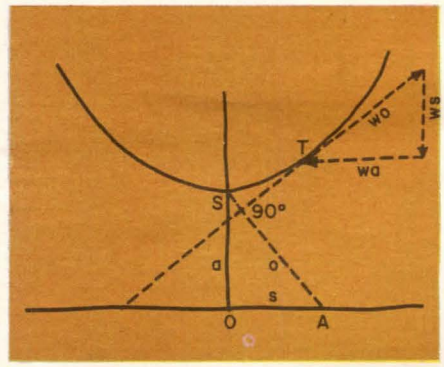
Under its own weight, a flexible cable or chain freely suspended from two points will assume the curve of least effort: a catenary **(1)**. This demonstrates



1

one of the principal characteristics of the physical laws: The tendency at all times to seek the minimum; to create with the least effort; to find a course that runs deliberately from here to there as a stream finds its way downhill, or as a ray of light, traveling through mediums of different density, directs its course to consume the shortest span of time.

The catenary is the curve for which the height of the center of gravity is least, and the potential energy is at a minimum. The symmetry of the curve is established and maintained with the minimum of effort by the uniform weight of the cable itself **(2)**.



2

Some surfaces in nature contain a minimum area for the conditions of their existence. Tension is the prime force giving the essential features common to all these surfaces. We shall find that the catenary is a basic curve in the geometry of these surfaces of minimum area.

There are two kinds of minimum surfaces: those enclosing a volume where the surface is formed as much by outward pressure as it is by tension; and those, entirely free of pressure, which are formed by tension alone.

Surfaces of the second groups can be considered of absolute minimum area, while those of the first are minimum only in relation to specific conditions of pres-

sure and environment. They become stable when the outward pressure is balanced by tension in the surface. As long as the pressure is fluid and can offer equal resistance to contraction in all directions, the surface will be symmetrical and it will be a minimum.

The sphere is the only closed surface that is a surface of minimum area. In all other cases, two kinds of surfaces are required to enclose a volume. These surfaces arrange themselves into regular patterns that are important for the study of liquid cells in the microcosm but that seem to have little bearing on the forms of membranes in architecture.

Tension on the Surface

In the microcosm, surface tension is the force that forms objects in a liquid state. It is the force of molecular attraction occurring on or near the surface of an object, causing the surface to shrink to the minimum area possible for the conditions of its existence. To put it another way, the surface shrinks until its energy is at the minimum.

"Among the forces which determine the forms of cells, whether they be solitary or arranged in contact with one another, this force of surface-tension is certainly of great, and is probably of paramount, importance," wrote Thompson in *On Growth and Form*.

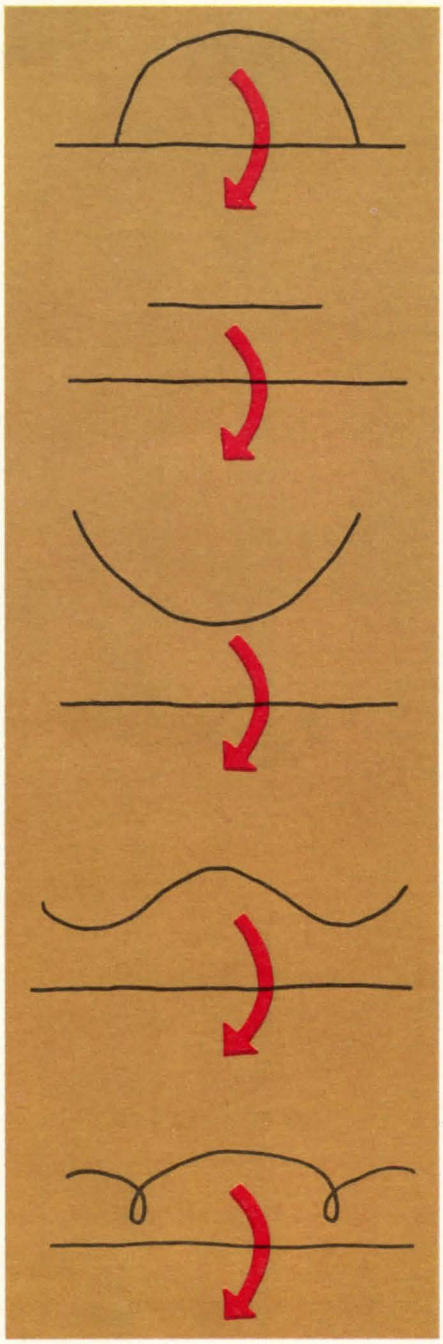
The forces of the microcosm and the macrocosm are essentially the same. Tension forms the flexible membrane in architecture, just as it forms the minimum surface of the liquid soap film. The structure of man and nature are bound by the same laws.

Six *Minimum* Areas

A sphere appears to be the ideal pressure vessel because of its perfect symmetry and its qualities of minima; thus, all fluid bodies tend to be spherical under ideal conditions. Raindrops, for example, or drops of milk or soap bubbles all form as spheres.

The sphere is one of six surfaces of minimum area that are also surfaces of revolution. The group comprises the plane, the cylinder, the catenoid, the unduloid, the nonoid, and the sphere. All of these achieve stability relative to an enclosed volume.

These surfaces are generated from plane curves, which in turn generate roulettes of conic sections. When an ellipse is rolled along an axis, either focus will describe the wavy line that generates an unduloid. The focus of a circle describes the straight line generator of a cylinder; a parabola focus generates a catenoid. The generator of the nonoid can be described by the hyperbola (though not so simply as the others), and that of the sphere by a straight line. All of these plane figures can be considered as special cases of the ellipse determined by expressed relationships between the foci **(3)**.



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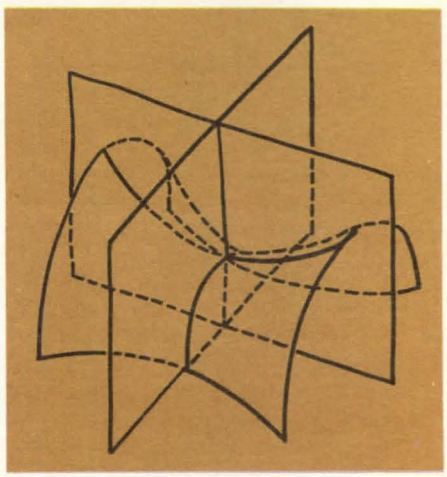
The continuity that exists between these forms of minima can be strikingly demonstrated by manipulating a soap film between a pair of wire rings. Each form will appear as the pressure is varied. As C. V. Boys states in *Soap Bubbles and the Forces Which Mould Them*, "The pressures slowly and continuously change, and so the curves cannot be altogether different in kind. Though they may be different curves, they also must pass slowly and continuously one into the other."

Pressure and Curvature

In the language of mathematicians, minimum surfaces are those in which the mean curvature is a constant. In more detail, curvature is defined as the reciprocal of the radius. At any point on a surface, there are curves of maximum and minimum curvature **(4)** that are generally perpendicular to each other. One-half the sum of these two curvatures is the mean curvature.



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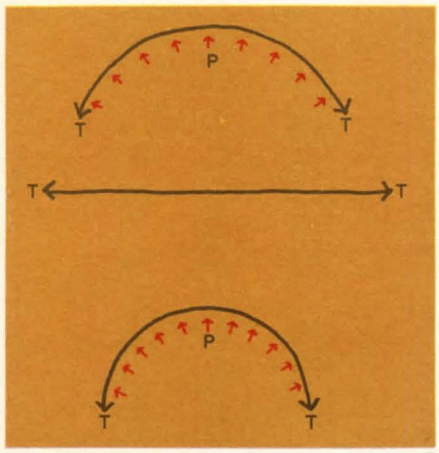
When equilibrium is established in symmetrical surfaces, the pressure is directly proportional to the tension, and inversely proportional to the radius of curvature. This relationship between pressure (P), tension (T), and radius (R) is expressed as the equation of equilibrium, $P = \frac{T}{R}$ for surfaces of single curvature such as the cylinder, and $P = T\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$ for double-curvature surfaces.

Any curved surface in tension will tend to flatten unless held to its curve by an outward-acting pressure. If the pressure is decreased, the radius of curvature will increase until the curve becomes a straight line (or a curve of infinite radius) for zero pressure. Conversely, an increase in pressure will cause a corresponding increase in the curvature.

For a curved surface to be in equi-

librium, P must be a constant, so it follows that $T\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$ must also be a constant. Therefore, for the membrane to form symmetrically, the surface must be homogeneous, with T nondirectional and uniform in value throughout. Thus, equilibrium is reached when the surface has contracted to a minimum for the given volume enclosed and the value $\frac{1}{R_1}+\frac{1}{R_2}$ can only be a constant **(5)**.



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Without Pressure

The second group of surfaces, those with absolute minimum area, could be called mathematicians' surfaces. Their existence was first demonstrated in the 19th Century by Plateau's famous soap film experiments representing physical solutions to variational problems. This group exists without pressure, and Plateau showed that the mean curvature at any point on minimum-area surfaces must be equal to zero.

When the constant $\frac{1}{R_1}+\frac{1}{R_2}$ has a real value in the equation $P = T\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$, the surface will exert an inward pressure to maintain the figure in equilibrium. Where the mean curvature is zero, however, no such pressures can exist. The surface is stable because it is minimum.

Only two of the six minimum surfaces of revolution have a mean curvature of zero: the plane and the catenoid. A soap film bounded by a frame in a plane will be planar and of little interest in lightweight structures. But a film stretched between two circular rings on axis will form a catenoid, which in profile is a catenary. An area marked anywhere on the surface of a catenoid forms a saddle, which, Euler observed, is characteristic of all minimum surfaces within nonplanar boundaries.

Bright Future for Tension Structures

The minimum surface offers a structural advantage because there is only one such surface for any boundary. It cannot change its shape and it cannot be distorted without stretching. In the scale of architecture, however, the flexibility that enables the membrane to be shaped and allows it to be a structure in tension, also makes it unsuited for concentrated loads.

For buildings, minimum surfaces appear to be limited to membrane enclosures of great size. The membrane in tension is not bound by the physical laws that limit the size of beams or of structures in compression. It is not held to dimensions that establish the forms and set the scale to which we are accustomed in building.

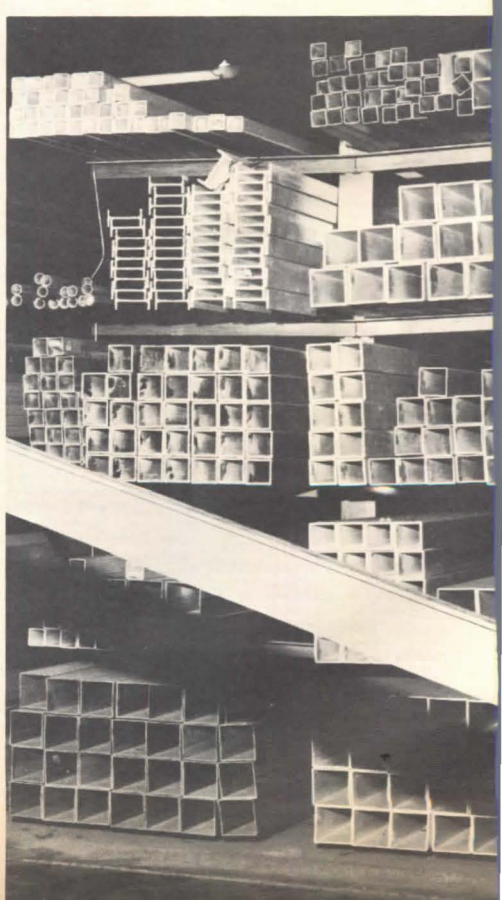
The revolution in architecture, it seems, is not over as some have said, but in one sense is just beginning, because technology has the power to upset all of our notions of size. The standards that normally identify architectural spaces — the weight of columns in rhythmic patterns; the strength of beams, of arches or trusses; the planes of walls, floors, and ceilings intimately connected to the structural system — are not a part of the vast membranes.

Light takes on a new dimension when it diffuses over the continuously curved surfaces, and it lacks the dramatic contrasts of shade and shadow cast upon angular surfaces. Similarly, the quality of sound is changed. The forms of the membranes evolve from structural refinements with little that can be arbitrary.

PUTTING LOADBEARING PLASTICS TO WORK

With a little care, stock and custom-made sections of glass-fiber-reinforced plastic can be nailed, drilled, cut, and bonded with conventional tools.

By Clarence W. Vandegrift, director of engineering, Universal Moulded Fiber Glass Corp., Bristol, Va. The company manufactures eXtren® structural shapes.



Structural shapes traditionally rolled in steel mills can now be continuously formed from polyester reinforced with glass fibers. And a new process enables manufacturers to produce hollow sections without cutting or rejoining; previously these could only be produced by hand lay-up methods. The process could lead to the production of hollow corrugated panels that are flat on one side and corrugated on the other side. This type of hollow-tube construction can only be fabricated conventionally by bonding a corrugated sheet to a flat sheet.

At present, structural shapes can be pultruded (a modified extrusion process) in sizes up to 6-in. angles, 8-in. I-beams, 6-in. wide-flange beams, 8-in. channels. Round or square solid bars and tubing are available up to 1 in., and sheets can be made from ⅛ in. to ½ in. thick, and up to 48 in. wide. Sheets are cut in standard 8-ft lengths, but structural shapes are 10 ft and 20 ft long.

Since it is a continuous process, the length of sections is only restricted by shipping requirements. Nonstandard shapes and sizes may be ordered on a custom basis in mill-run quantities.

Cutting Reinforced Plastics

Glass-fiber-reinforced plastic can easily be sawed, drilled, bonded, sanded, bolted, threaded, tapped, and machined by conventional methods. The material can be nailed to other materials but not to another piece of fiber glass.

Workmen in some fabricating plants are selected from the painting, insulating, and metal working trades to work with structural shapes.

Reinforced plastics can easily be cut with a circular power saw fitted with carbide-tipped cutting tools used for cutting brick or other masonry. For hard work, a hacksaw with 24 to 32 teeth per in. is the most effective, especially if used with a light, rapid stroke.

The dust generated in sawing operation is not a serious hazard and can be collected with a simple dust bag. Water prevents excessive dust and serves as a coolant when cutting large quantities of material. The water increases cutting speeds and produces a smoother cut particularly with thick cross-sections.

Curves can be cut in reinforced polyester shapes with a bandsaw, router, or circular saw, or, for curves of small radius, a sabre saw. With a bandsaw, the

operator should remember to feed the stock with light, evenly applied pressure.

The material can also be punched or sheared in sections up to ½-in. thick. Shearing is not as precise as sawing, but is fast for cutting a straight line.

Reinforced polyester shapes can be machined on most metal-cutting machine tools, and dimensional tolerances will generally run about the same as cold-rolled steel. All machined or cut surfaces that will later be bonded should be coated with polyester or epoxy resin to prevent the entrance of corrosive fumes or liquids.

Drilling and Tapping

The material can be drilled with any standard twist drill operating at the same speed used for hardwood. Holes drilled in reinforced polyester shapes are normally undersized by .002 in. to .004 in., so this must be taken into account where close tolerances are required.

Although reinforced polyester shapes do not provide enough grip to hold a nail when two such pieces are nailed together, one plastic member can be nailed to wood or other material. This can be done with common nails in material up to 1/16-in. thick without pre-drilling, or with tempered nails in material up to 5/16-in. thick. However, for greater thickness, the material should be pre-drilled.

Tapping and threading reinforced polyester shapes is not usually recommended. But for certain applications in chemical plants, threaded joints can be made using standard taps and dies. Water or a wet soap mixture should be used to lubricate the threading operations, improve the surface, and reduce tearing. If a joint is to be bonded after threading, only water should be used for lubrication.

Glass-fiber-reinforced plastics can be

Typical Properties; series 500	Longitudinal direction	
Mechanical	*Standard shapes and flat sheets*	*Round and square bar*
Ultimate tensile strength, psi	20,000	70,000
Tensile modulus, psi	1.5×10^6	6.0×10^6
Ultimate compressive strength, psi	20,000	35,000
Ultimate shear strength, psi	3,000	3,000
Shear modulus, psi	0.21×10^6	0.83×10^6
Density, lb per cu in.	0.055	0.070
Specific gravity	1.52	1.94
Thermal		
Thermal coefficient of expansion, in sq/in./F	5×10^{-6}	3×10^{-6}
Thermal Conductivity, btuh per sq ft/F/in.	4	5
Specific heat, btu/lb/F	0.28	0.24
Electrical		
Dielectric strength (ASTM-D149) vpm, min	200*	150**
Dielectric constant at 60 cps (ASTM-D150)	4.3 to 4.7	5.5 to 5.7
Other		
Water absorption (24-hr exposure) % by wt	0.75	0.75
Barcol Hardness	50	50
Izod Impace, ft-lb per in. of notch	18	18

*⅛-in.-thick specimen tested in oil perpendicular to laminate.
**Specimen tested in oil parallel to laminate.

The reinforcement in eXtren® is anisotropic, so these shapes have different strengths and elastic properties in different directions. An engineering manual and a fabrication manual is available from the manufacturer.

screwed together, but not with lag or wood screws, because they do not take an adequate bite on the material. Fabricators recommend screwing self-tapping screws, lubricated with soap or plain water, into pre-drilled holes. Fasteners should be corrosion-resistant.

A better method of fastening is to use threaded inserts. Some inserts are very effective without bonding, while others should be bonded in place to obtain a good mount. A bolt can be permanently installed into a tapped hole by applying a polyester cement to the bolt before inserting it.

Since the reinforced plastic material is subject to failure under high school stress, such as around a bolt, it is advisable to tighten the bolt as much as possible for maximum effectiveness. If a mechanical joint is required for carrying high stresses, it is best to bond the joint and put a bonding agent around the bolt itself.

Bonding, Riveting, and Painting

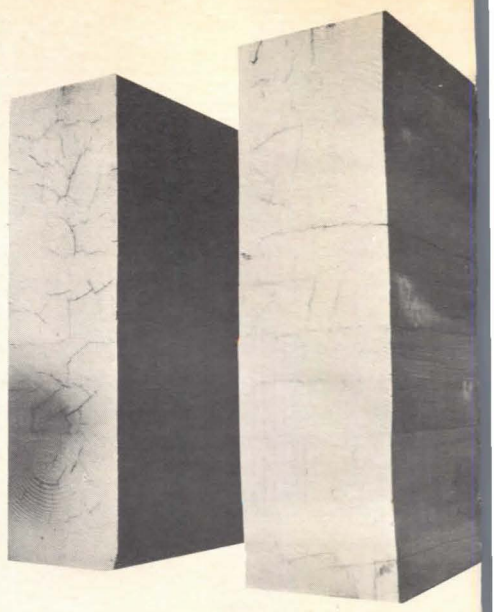
Bonded joints can be made relatively easily and, if done properly on a clean surface, are very effective. The surface film left during manufacture should be removed by sanding both mating surfaces with 60- to 120-grit sandpaper. The clean surfaces are then coated with a pre-accelerated polyester resin and clamped together. When very high reliability is required, bonding and mechanical fastening can both be used, and the bolts bonded in place by coating them with bonding agent before installation.

Plastics can be connected with "pop" rivets without back-up washers unless pressure is required of the rivets. Washers should be used for through-bolting or through-riveting when the joints are not bonded. Washers at both ends of connecting bolts and rivets effectively distribute stresses.

Although the reinforced polyester shape does not require painting for protection, it can be painted for aesthetic reasons. If the existing color is not satisfactory, it can be covered with almost any type of water-based or oil-based paint or acrylic lacquer. For greatest adhesion, however, polyester paints are recommended.

Prior to any painting operation, the surface should be lightly sanded to remove the surface film.

SAW CUTS ELIMINATE END CHECKING



Deep saw cuts in the ends of glued-laminated beams relieve shrinkage stresses that produce unsightly end checking.

By Ben S. Bryant, an associate professor of Wood Science and Technology at the University of Washington, College of Forestry, Seattle, Wash.

Glued-laminated framing for homes and commercial buildings appeals widely to architects who appreciate the appearance, versatility, and economy of this construction material. Unfortunately, the exposed ends of heavy, glued-laminated structural members are subject to checking (splitting), and, until recently, the problem has defied satisfactory solution.

Some designers attempt to overcome the possibility of unsightly glu-lam beam ends by covering them with decorative copper shields, or, more simply, with a piece of plywood or lumber. But such attempts both add to the cost of the structure and detract from the natural appearance of exposed wood grain.

Painting is also unsatisfactory, because the paint film requires frequent maintenance and cannot stretch sufficiently to accommodate the strains caused by the shrinkage or swelling of wood in a heavy cross-section. Although special coatings are available with a high degree of adhesion and stretchability, they still cannot prevent end checking where exposure conditions are severe, or where laminating specifications are inadequate.

Why Ends Check

A completely scientific explanation of end checking in wood members requires an understanding of several areas of wood science. However, it is sufficient to know that end checking results from the interaction of a number of variables that include environment, properties of the species of wood involved, and the history of the lumber used in an assembly.

Putting these variables in perspective, the exposed ends of a heavy laminate will not check:

- ☐ If a laminate consists entirely of boards with the same grain orientation and density (e.g., all edge grain).
- ☐ If boards are glued at exactly the same moisture content, and this moisture content corresponds to the average moisture content of the exposed beam in service.
- ☐ If the exposed end surface of the laminate is vertical, faces north, and is subjected neither to water nor to high winds.

It is impossible to achieve such an ideal set of circumstances; even with the best specifications and laminating conditions, some end checking can be expected on southern and western exposures. In these conditions, the radiant heat from the sun raises the surface temperature of the wood and lowers the relative humidity at the surface boundary layer.

When water evaporates from an exposed end-grain surface (even through a paint film) in the form of vapor, it establishes a drying gradient behind the surface. Since endgrain dries faster than sidegrain, the mass of wood at the end of a laminate may dry enough to create tremendous shrinkage stresses.

These stresses tend to draw together the wide faces of the laminate. But only 1 in. or less back from the exposed end

of the glu-lam member, the wood has not even begun to shrink.

Planes of Weakness

The stiffness of wood along its grain makes the sides of a beam act as thick planes that tend to be bent inward at the exposed ends where shrinkage stresses occur. However, the great stiffness of wood in the grain direction tends to hold the wide edges of the beam in their original unbent conditions. Shrinkage creates internal tensile forces across the end of the beam and across the grain at right angles to these outer planes.

The resistance of the sides of the beam to bending inward at the ends is greater than the tensile strength of wood across its grain. Therefore, failure occurs along wood's greatest plane of weakness; the wood rays at right angles to the annual growth rings.

Sometimes failure also occurs in wood's secondary plane of weakness, between the growth rings. Following the initial checking, the wood continues to dry through the exposed end grain surfaces, and the checks increase in frequency and depth until a new state of equilibrium is reached.

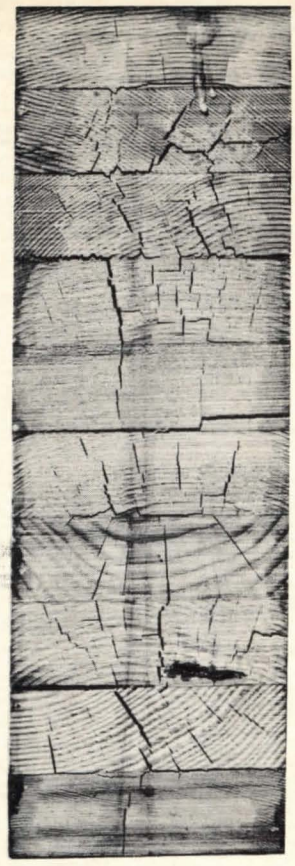
Cuts Control Checking

If glued-laminated members are well manufactured, end checking can be prevented by sawing a pattern of deep cuts on their exposed ends. This stress relieving reduces the width of the cross-section exposed to shrinkage so that the wood will shrink away from the free edge made by the saw cut. In fact, the width of the cut can be observed to increase as the wood dries through the exposed end-grain surface.

The saw cuts in effect build internal checks into the wood surface before it starts to shrink. Under severe conditions, there may be sufficient stress concentration at the bottom of the saw cut to cause a check, but, even if visible, it will be inconspicuous. In any event, it is good practice to specify an end-sealing treatment of water-repellent preservative to be sprayed or brushed well into the saw cut.

Proving the Method

To demonstrate the effectiveness of the stress-relieving technique to eliminate end checking, an experiment was designed for producing an abnormally high degree of shrinkage stresses. The test was conducted on a 7-ft beam laminated by a reputable company using nominal 2-in. Douglas fir with typical mixed grain characteristics (i.e., edge grain, flat grain, heart centers, slow growth, and fast growth).



Test specimen of glued-laminated beam displays splits when dried in the laboratory.

Similar sample, with a pattern of stress-relieving saw cuts, resists splitting.

By request, the lumber was not kiln dried, although kiln drying is the first requirement for quality laminating. The test beam was air dried only to a moisture content between 15 and 20 per cent. Lumber does not begin to shrink until the moisture content is below about 25 per cent. Its moisture content in service may be as low as 8 per cent on average, or as high as 12 per cent. For this reason, lumber for laminating should be preshrunk by kiln drying to at least 12–15 per cent. The drier the climate, the drier should be the lumber.

The beam was glued with casein in order to produce reasonably good bonds with adverse moisture conditions. Then, to protect it from significant moisture loss before cutting it into sections, the sides of the beam were coated with hot paraffin to concentrate drying at the matched sets of end faces. But as soon as the beam was cut into sections, fine checking could be seen and heard due to the low relative humidity in the shop at room temperature in May. For the test, different patterns and depths of cuts were made with a power saw, and one surface was left untreated as a control.

The beam sections were then exposed for 36 hours to high air velocity, high temperature, and low humidity in a humidity chamber. This accelerated exposure produced drastic checking on the control surface.

Quantitative statistical analysis of the results tend to confirm what the photographs indicate: The most effective stress relieving treatment is attained with 1½-in.-deep saw cuts roughly 3½ in. apart vertically and about 2 in. apart horizontally. Cuts can be made for providing stress relief at the glue line, since it is resistant as the wood itself in any well-made laminate.

With these specifications for stress relieving as a guide, architects can incorporate variations of the basic stress relieving pattern in the exposed ends of wood framed structures and be confident that unsightly checking will not detract from the aesthetic advantages of glu-lam construction.

MECHANICAL ENGINEERING CRITIQUE

ELECTRONIC GRIDS CLEAR THE AIR

BY WM. J. McGUINNESS

Electronic grids will de-ionize smoke and dust particles in the new Madison Square Garden. McGuinness is a practicing engineer in New York City.

In New York's new Madison Square Garden, which is nearing completion on the site of the old Pennsylvania Railroad station, the smoky haze that was a trademark of sports events in the old Garden should be just a memory. Gone, too, should be unpleasant odors that can cling to a spectator's clothing long after he has left the arena.

Research has shown that airborne particles of dust and smoke have an affinity for surfaces in the space they occupy. It is also known that odors emanate from such material after it has settled in position — a situation that grows progressively worse.

Electronic devices will be installed in the Garden's air-handling systems to remove the electrical space charge that causes this affinity. The particles will stay away from the surfaces to which they would otherwise have been attracted, and instead will be caught by filters in the central conditioning units. Thus, dust and odors will not collect in the conditioned space. Air will be clearer because particles are broken into smaller size by the electronic process.

Continuous neutralization of the electrical space charge is the function of the new contamination control system. This is accomplished by two electric grids in the primary air stream. One grid is connected to a high-frequency power source, the other to a high-voltage source.

The electronic unit is not an electrostatic filter; it has no filtering action. The removal of particles that have remained airborne in the space because of their neutralized condition is accomplished by wedge-shaped bag filters of special cloth. Air leaving the filters, though much cleaner, is still space-charged. This charge is continually generated by activity in the conditioned space and is also brought in with outdoor air that is added to the recirculated air. As air leaves the cloth filters, it passes through the electronic grids, which remove the space charge. The neutralized air then passes into the space to dilute the charge in the conditioned space.

Besides providing clearer, dust-free, and odor-free air, the system has several additional advantages: Walls, equipment, and furniture remain much cleaner. Cleaning expense is reduced. The rate at which outdoor air is brought in for freshness can be reduced. The function of diluting odors is now borne in large measure by the electronic units, resulting in great savings. In critically cold or warm outdoor conditions, the heating or cooling of large quantities of outdoor air is costly.

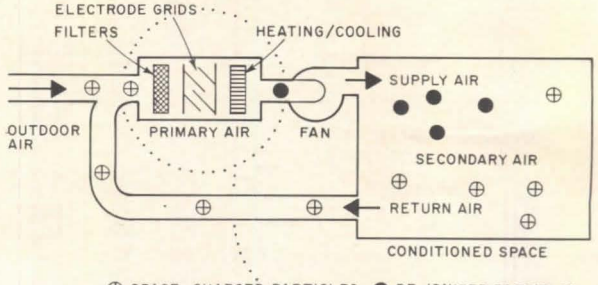
Thirty-five units, each capable of handling up to 24,000 cfm, will be installed in the Garden. The intense and varied activities held in the center, as well as the heavily polluted air in this metropolitan location, upon which the system must depend for its fresh-air supply, would present a big challenge to any conditioning system. It is hoped that the new electronic control method will provide an ideal solution.

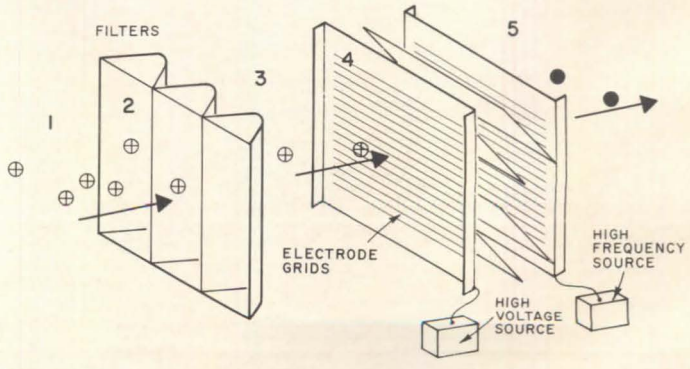
Architects for the Madison Square Garden Center are Charles Luckman & Associates. Engineers for the conditioning installation are Syska & Hennessy Inc. The electronic units comprising what is known as the COSA/TRON system are manufactured by CRS Industries, Inc.

Statistics: Madison Square Garden Center

Space	*Occupancy*	*Volume c.f.*	*cfm*	*Air changes per hr.*	*Outside air %**
Arena	20,000	6,957,000	377,485	3.3	25
Forum	5,000	778,000	128,500	9.9	25
Cinema	500	56,500	15,000	16.0	25
Bowling Center	(48 lanes)	151,000	27,510	10.8	33

** Values are minimum and can be varied.*





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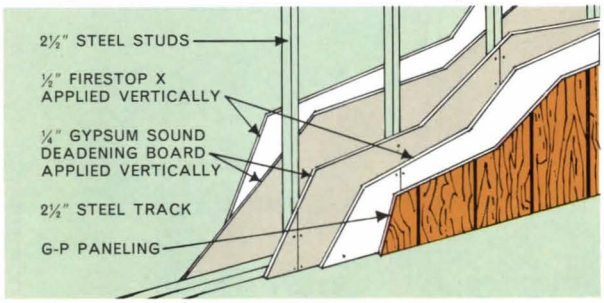

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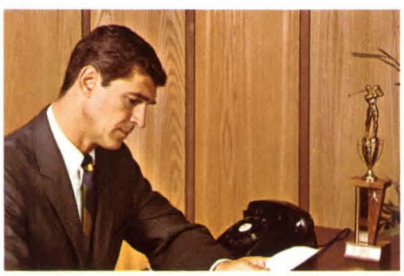
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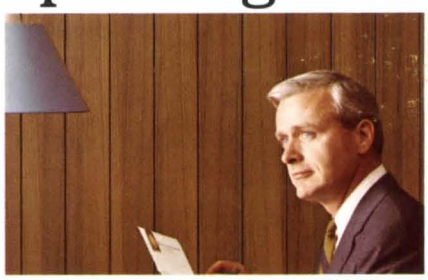
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Continued from page 210

pages, he succinctly discusses the essential nature of "utopia" as a *speculative myth*, and the literary techniques by which such speculation has been expounded. Perhaps the most absorbing part is where he draws attention to the crucial change that occurred a century ago whereby, as a result of technological developments, "utopia" ceased to be an isolated place (in More's original sense) and assumed the connotations of universality (thus incidentally contradicting Lewis Mumford's whole thesis). Fortunately, Mr. Frye's essay cannot be summarized, since its brilliance lies precisely in the extraordinary combination of verbal economy, clarity of expression, concentration of thought, and forcefulness that pervades the whole unified argument. It should be read for its own sake, as a model of expository prose, and for sheer pleasure of enjoying good literature. However, for those parsimonious architects who consider that a literary gem is too expensive at 25 cents a page, it may be added that the book contains a total of 16 essays, many of which will prove engrossing for all those fascinated by man's eternal quest for the intellectual vision of a paradise on earth; or what more erudite architectural taxonomists would doubtless classify as the "Pre-Adamesque Style."

Reference Work on Plastics

BY WILLIAM DEMAREST

PLASTICS IN BUILDING. *Edited by Irving Skeist. Reinhold Publishing Co., 430 Park Ave., New York, N.Y., 1966. 480 pp., illus., $18. The reviewer, an architect, is a plastics-in-buildings consultant with his own New York City firm.*

This big book is about right for the plastics producer who wants to look into the building field, or, perhaps, for the foreign manufacturer who must check out the possibilities for his line of plastic building components in the U.S. For the practicing architect, however, its value is limited. He — or the engineer, or the spec-writer — must search to find information in this reference volume he can use.

The reader may recognize the genre. By page 6, *Plastics In Building* has gotten into a tabulation of projected sales of plastics in the building market for 1970. Page 10 lists 37 kinds of plastics that supposedly might show up in buildings. A list this long inevitably includes some obscure candidates, and the further listing of chemicals that may be incorpo-

Continued on page 230

This shower head has extra spray channels in non-corrosive, non-stick plungers. Beautifully by Speakman.

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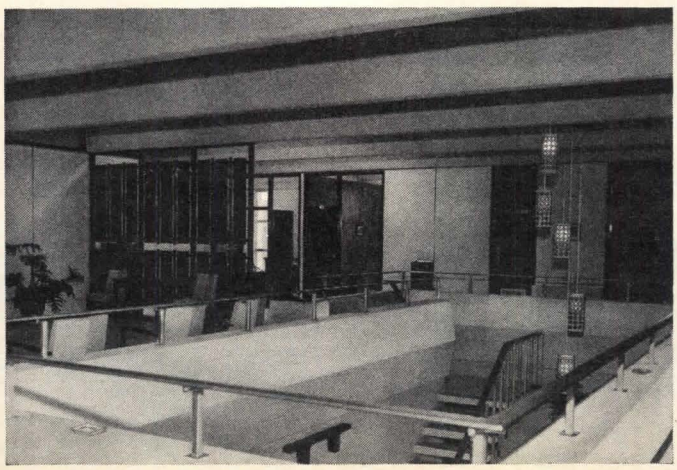
Dura-Stress, Inc., Leesburg, Fla.

Architect:
Robert V. Ford, Leesburg, Fla.

Prestressed and Precast Concrete:
Dura-Stress, Inc., Leesburg, Fla.

LEHIGH CEMENTS



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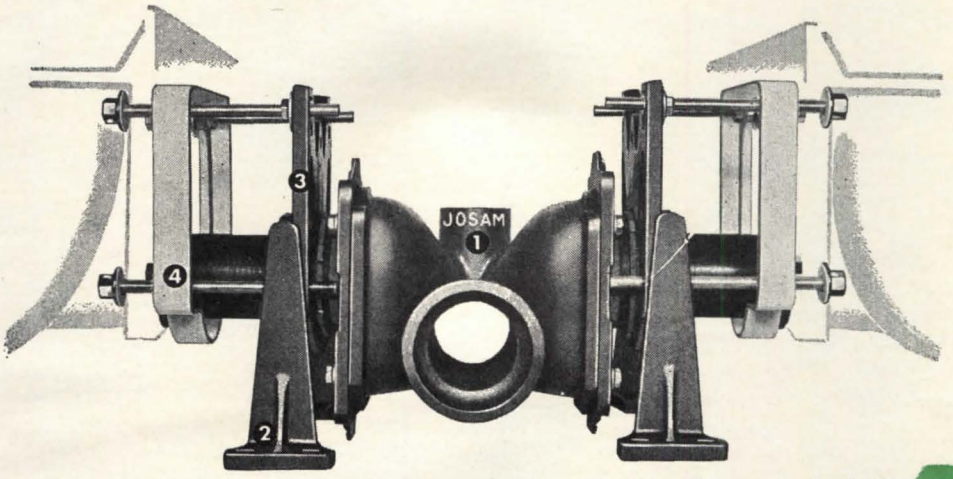

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Architect: Marcel Breuer and Herbert Beckhard

From the outside, this corporate headquarters building gives an impression of substantial mass and dignity, created by its rhythmic facade of precast concrete modules. • From inside, the building is bright, open and very much in touch with its woodland surroundings. All four sides and both levels (a lower level opens on the rear of the sloping site) are glazed with ASG's Starlux® plate glass. • The windows, recessed deep within the outward-opening concrete modules, allow all offices and work areas a clear, distortion-free view of the wooded countryside. The smooth, polished surfaces of Starlux plate glass also offer a subtle contrast to the textured look of the concrete and enhance the building's "quality" image. • Twin-ground, polished Starlux is the premier product in ASG's complete line of architectural glasses. Specify it for the qualities only the finest plate glass can offer—clarity, visual fidelity, lustrous beauty. For full information on Starlux, write: Dept. E-6, American Saint Gobain Corporation, P.O. Box 929, Kingsport, Tennessee 37662.

Starlux twin-ground polished plate glass by ASG

Continued from page 224

rated in the manufacture of these plastics is surely needless, from the architect's viewpoint. (And, if he perversely wanted to call for it, how on earth should he pronounce "diisooctyl phthalate"?)

Plastics In Building, in short, is written from the producing industry's viewpoint. Once its limitations are accepted, there is much that can be said for it. That it was written by 25 authors, quarterbacked by Editor Skeist, has not proven seriously detrimental. It manages to be comprehensive and to avoid much of the repetition and seeming contradictions that often arise under such a *modus operandi*.

Searching in the book for the design aspects of plastics in building, the architect finds that his approach must, reasonably enough, be on an applications basis. There is, for instance, a chapter devoted to plastics in roofing, one on adhesives, one on sealants. Plastic forms for concrete, a matter of real design significance, is buried in a chapter on construction aids. There is a chapter on the uses of plastics in electric lighting and a number of references at various places to daylighting applications of these materials. Discussion of proper detailing of plastic "bubbles," or skylights, would be valuable, but this reviewer could nowhere find the subject covered.

The engineering of glass-fiber-reinforced plastics in building, including shell structures, is amply treated in two chapters contributed by the firm of Simpson, Gumpertz, and Heger, engineers with extensive experience in designing structures of these materials. And the three final, catch-all chapters touch upon any number of intriguing possibilities for plastics in building: decorative and sculptural forms, T-shaped PVC lally columns, experimental, all-plastic bungalows of many kinds. It is worth noting that recent investigations of the structural possibilities of plastics have been given extensive recognition. Although not covered in any great depth, these references could be useful to a designer initially addressing himself to this field.

As might be expected, *Plastics In Building* falls short in its treatment of detailing and in illustrations of architectural details that the architect might hopefully look for. The review of methods of forming plastics is very abbreviated and does not bring out that certain of them — vacuum-forming, for example — are more amenable to the architectural design process than others. Graphic, as well as written, comparisons of plastics' properties would have been welcome.

Continued on page 232

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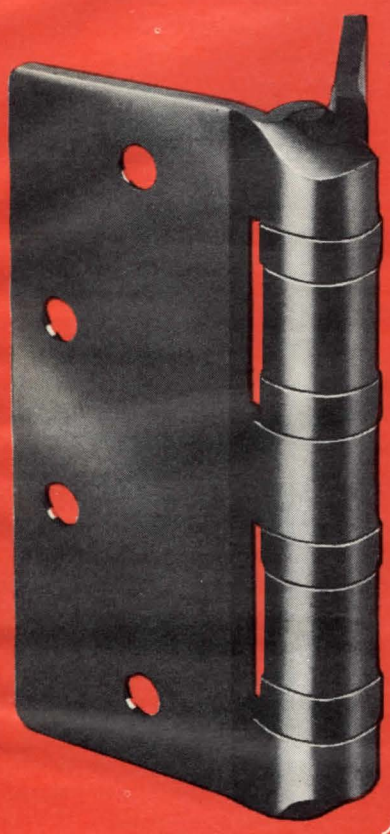

Five dirt-collecting surfaces

Less attractive appearance

Leaves can not be separated... this tight pin hinge requires extra work, time to install doors

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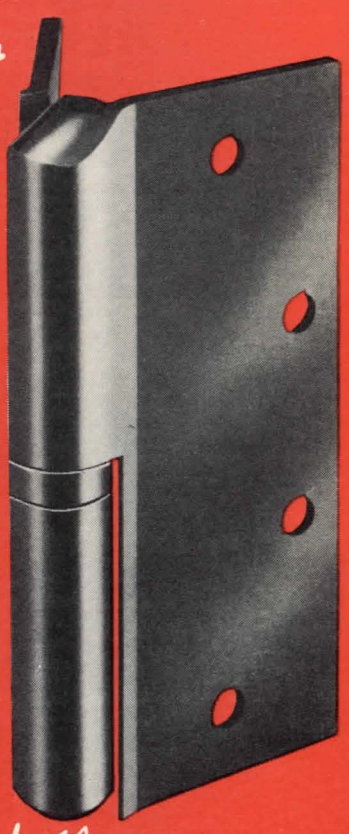

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Continued from page 230

At the same time, the book touches on just about all the plastics building components now being used: foams, honeycomb panels, resilient flooring, pipe, and so on; most are described authoritatively. There is a chapter on building codes. And, finally, there is an index.

All the City's a Stage

BY WILLIAM BRIGGS

THE ITALIAN TOWNSCAPE. *By Ivor de Wolfe. George Braziller, Inc., 215 Park Avenue S., New York, N.Y. 1966. 288 pp., illus., $12.50. The reviewer is an architect practicing in Richmond, Va.*

The eye sees what the eye has means of seeing. But the eye is an inefficient instrument, and, like the camera but unlike the painter's hand, it does not select. It tires easily. "Its defense mechanism ranges from seeing everything (equivalent, that, to seeing nothing) to the most irritating trick of all — selection by habit, which adds up to seeing nothing again."

Elliot O'Hara, teacher of watercolor painting to three generations of American students, housewives, and professional artists, advocated the Japanese way of distinguishing the colors in a sunset: by bending over, touching hands to ground to look between legs at the scene upside-down. In this position, the jaded eye cannot but perceive the spectrum as it exists rather than in a preconceived relationship.

Ivor de Wolfe, as author of *The Italian Townscape*, turns the reader upside-down, and almost inside-out, to make him distinguish the trees from the forest. Here is at once a lecture with slides, a portfolio of expert photography with running commentary, a series of essays beautifully illustrated. Each picture (all 461 of them) is worth a thousand words. But de Wolfe manages with just a few more words to bring new meaning to each picture. As an exercise in reorientation, he uses a photograph for "general impression" and on the next page shows the same shot in "negative" form. In the latter, he demonstrates what the eye should do automatically (the same thing the negative does by surprise): Suddenly the eye records arch, buttress, bollard, floor-pattern, staircase diagonal, sign, carts, wheels.

Throughout the book, de Wolfe thinks of towns as stage-set. He calls the sky the cyclorama, the street the unit of the city, arches and arcades are prosceniums, and cock-eyed blocks of buildings become wings, tormentors, and the like.

Continued on page 236

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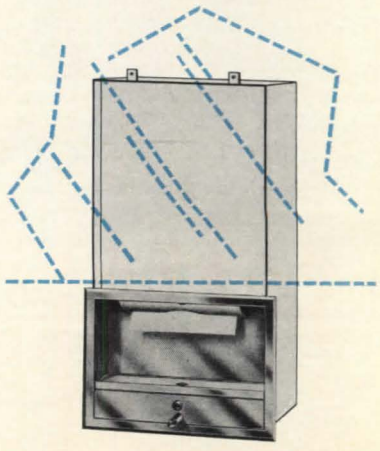

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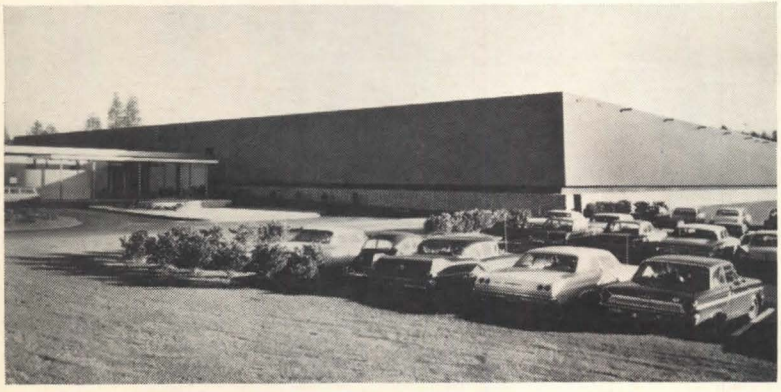

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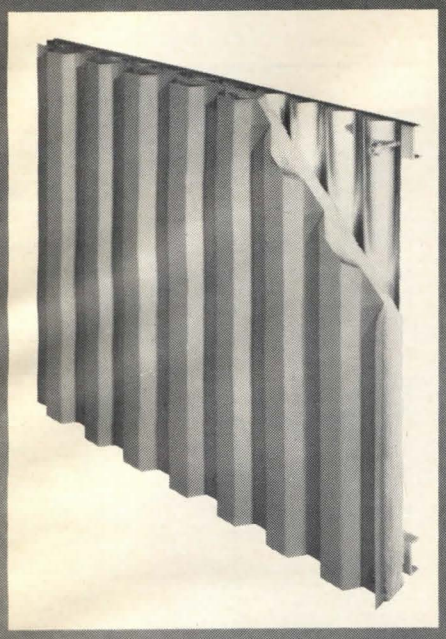

Continued from page 232

He writes, "There would be another notch for the belt if we could convince, first ourselves, then our public servants, that the street, customary and canon, is not, first, a traffic artery but a stage-set, built for drama in many acts; and for a large cast with parts less tedious than Shakespeare's irksome Temperance Seven." He seals this well by pointing out that the "Japanese . . . refuse to name streets because they are nothing but the spaces between buildings."

The authors are obviously sold on the Italian townscape and equally impatient with the Beaux Arts approach to design (of squares, towns, or buildings). They do a fascinating trick, with Sabbioneta as the example. They dissect the city in plan and perspective, labeling each element so it cannot be missed. They take the reader on a tour of the city and point out T-traps, T-crossings, L-traps, P-traps, quads, courts, cul-de-sacs, cozy corners, the whole vocabulary with which the planner should become familiar.

Critically, de Wolfe comments: "Except for the palace, not one of the main buildings is either centered or made a centre. . . . This is no grid. It isn't even formal planning. It is picturesque planning clothed in formal dress. . . . Free planning, far from being a novelty, has a long history stemming from the Middle Ages. . . . Mainly, the trend of four centuries has been to foster a theory of town-planning so outrageously oversimplified as to be disastrous to urban an, secomnd in its capacity for disruption, indeed, only to the industrial revolution."

The excellent photographs and provocative text cannot conceal the poetic and dedicated plea to all designers to look to the past — not for copying, but for inspiration to see through the haze of modern technology, to distinguish the tree from the forest, and to think not in terms of the automobile (which soon may ride on air and need neither concrete nor blacktop), but to view the city as a stage, set for action — people being the actors.

Summerson on Jones

BY SANDRA BLUTMAN

INIGO JONES. *By Sir John Summerson. Penguin Books, 39 W. 55th St., New York, N.Y., 1967. 149 pp., illus. $2.25. The reviewer, a postgraduate student at the Courtauld Institute of Art, London, England, is writing a thesis on English 18th- and 19th-Century country house architecture.*

Sir John Summerson's *Inigo Jones* is one of the first two publications (the other is

Continued on page 238

NEW SCHOOL USES ACRYLIC SHEET OF LUCITE* TO CREATE A MODERN VISUAL ENVIRONMENT

The Marbrook School, an Elementary School pilot project of the State of Delaware, is an example of modern school-building design that reflects modern educational philosophies. It achieves a general openness and relatedness of educational facilities, combined with careful control of thermal, sonic and visual environments.

Since it is estimated that 80% of all learning is by eye, particular care was devoted to the creation of a proper visual environment. Shown above are three examples of the imaginative use of modern designs and materials to achieve balanced lighting. At left above is the skylight of the Physical Education Shelter, an open-air facility. Acrylic sheets allow daylight and sunlight to flood the area while providing resistance to breakage. The center illustration shows the use of clerestory windows to provide uniform light distribution with glare-reducing sheets of gray-tinted acrylic plastic. These are used in the Instructional Materials Center and the Cultural Arts Center. Throughout the classrooms, acrylic lighting shields provide even, well-distributed lighting, with an intensity of approximately 70 foot-candles on all desk surfaces (above right).

The architects – Dollar, Bonner, Blake and Manning, of Wilmington, Delaware – specified acrylic plastic to meet the exacting requirements of these installations, and acrylic sheet and lighting lenses made from Du Pont LUCITE more than filled the bill.

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Continued from page 236

James Ackerman's *Palladio*) in a promising new Penguin series entitled "The Architect and Society," designed to provide authoritative monographs that concentrate on placing important architects in their historical environments.

Summerson's purpose is not to show Jones against the background of Stuart England, but to portray Jones as Jones, putting aside for a moment his significance for later architecture and trying to focus on the man and his work. The task is a difficult one. The most obvious obstacle is that out of 45 recorded works by Inigo, only 7 exist today. Of most of the remaining 38, we have drawings or records of varying completeness. Of a few we know nothing. And of his few extant works, remarkably little of what we see today is actually by Jones. Not a stone of the Banqueting House, perhaps the best known Jones building, is original. It was entirely refaced by Sir John Soane in 1829. The interior, used in the 18th Century as a chapel and in more recent years as a museum was, until its recent restoration, cluttered beyond recognition. Of the important Convent Garden project, St. Paul's church remains, although it was entirely redone by Thomas Hardwick after a fire in 1795. But nothing is left of the arcades, in their time "the first statement of what we naturally think of today as the Georgian house."

Efforts to see Jones as Jones are further confused by misattributions, many of which have become so firmly accepted as to be ineradicable. For a long while, almost any early 17th Century classical building was attributed to Inigo, and one can discover buildings today in remoter parts of England that are still staunchly ascribed by local tradition to Jones. Summerson meticulously clears away the cobwebs of misattribution by careful reference to the scant existing records and by concentration on the documented Jones buildings.

Yet one is hardly aware of the scantiness of the evidence, so successfully has Sir John pieced together the scraps into an incisively argued, cogent whole. The staggering task of working through the Office of Works documents has enabled him to determine much more than had hitherto been known about Jones' work as a designer and administrator. He combines a careful analysis of Jones' architecture with a vigorously delineated portrait of the man himself.

Inigo was a unique figure in his own time. He did not come to architecture in the traditional manner as a surveyor out of the building trades, as did John Thorpe

Continued on page 242

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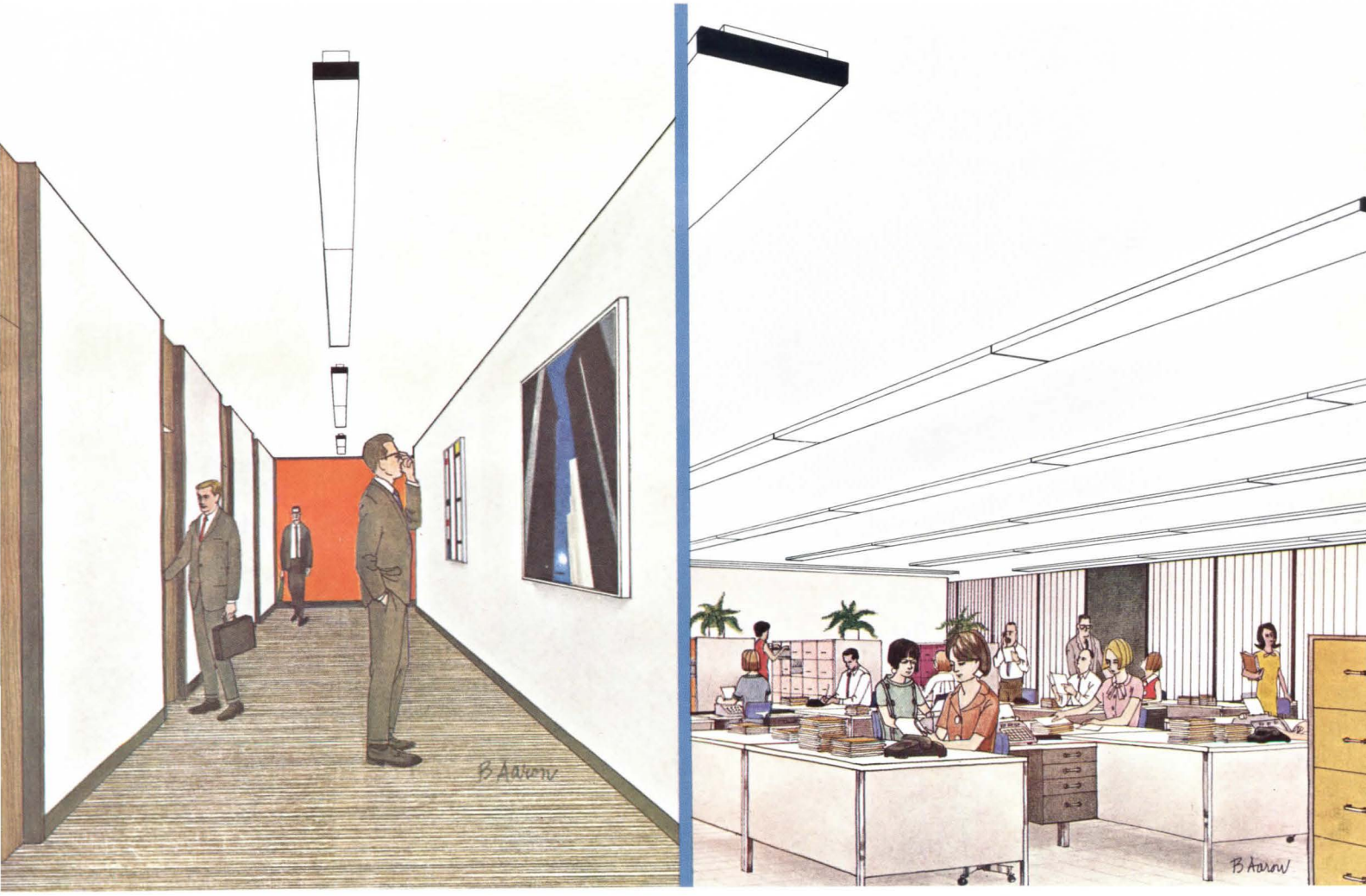

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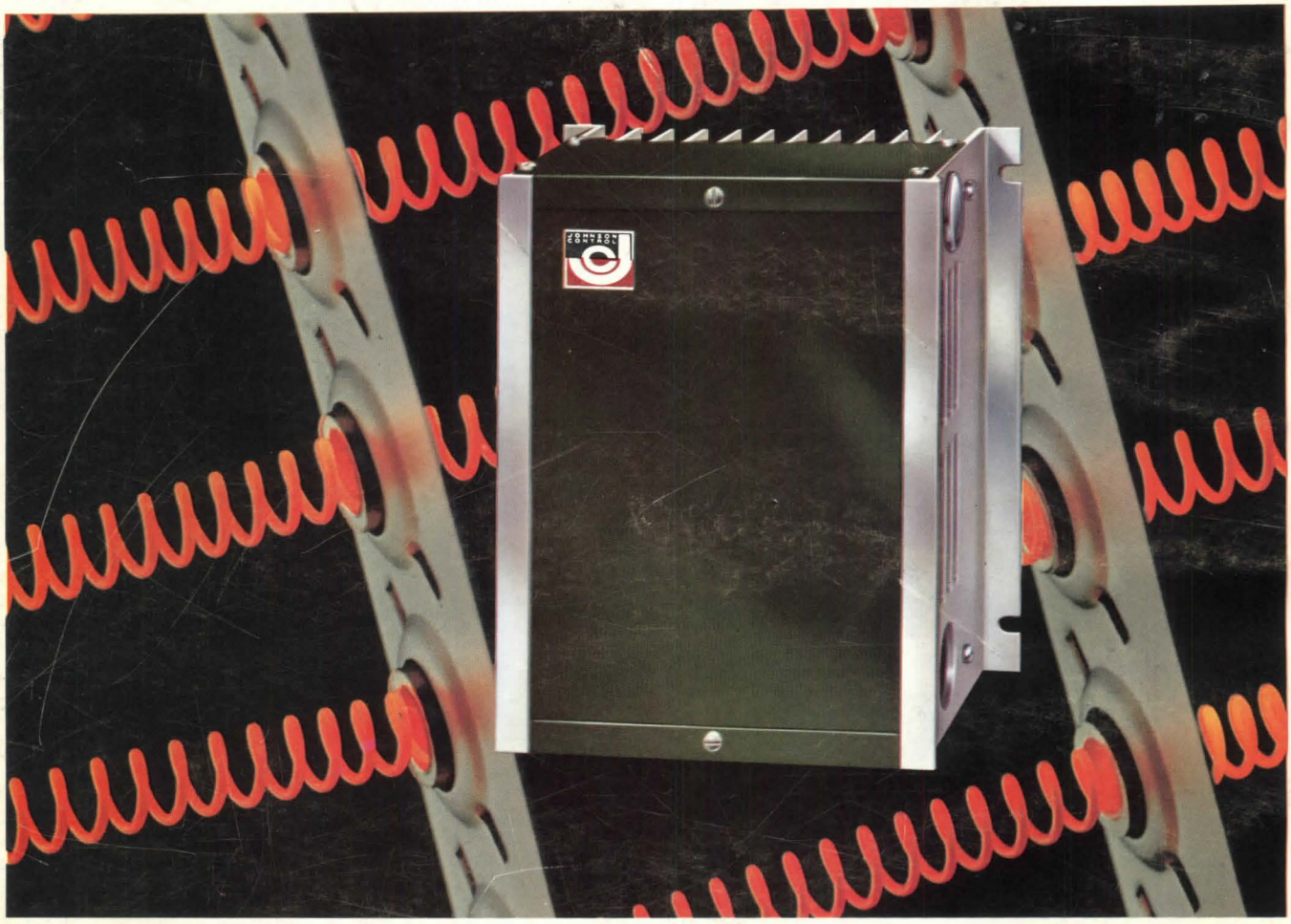

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