BUILDING TYPES STUDY: COLLEGE BUILDINGS

THE NEW METROPOLITAN OPERA HOUSE

A NEW OFFICE BUILDING FOR CHARLES CENTER

CHRISTOPHER ALEXANDER: RELATIONAL COMPLEXES IN ARCHITECTURE

FULL CONTENTS ON PAGES 4 AND 5

ARCHITECTURAL RECORD

SEPTEMBER 1966 9 A McGRAW-HILL PUBLICATION TWO DOLLARS PER COPY

Meet the floor that's tough on the top, soft on the bottom, great on the feet.

New Armstrong Cambrian Vinyl Corlon

Comfortable. Here's a dramatically different type of resilient floor for commercial and institutional buildings. Underneath its handsome heavy-duty vinyl surface is a thick layer of foamed vinyl called Cushioncord that makes Cambrian Corlon delightfully comfortable to walk on. It gives beneath your feet—cushions every step.

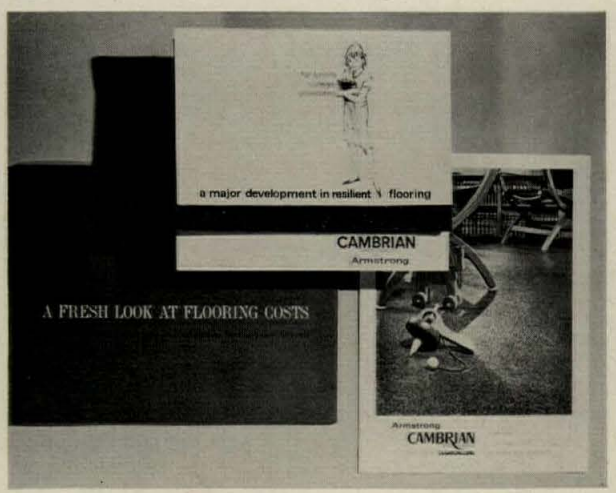
Durable. For all its light-footed comfort, Cambrian Vinyl Corlon is so tough, even spike heels won't permanently dent it. It's engineered to provide years of hard-wearing service. For example, floors of Cambrian Corlon were installed in heavy-traffic areas of a model home constructed by the Springs Mills Inc. in Wagram, North Carolina. Springs Mills officials report that after more than 100,000 people toured the home over a four-week period, Cambrian showed no evidence of wear whatsoever.

Quiets foot traffic. Cambrian's foamed vinyl cushion absorbs impact noise, too, so a Cambrian Corlon floor is as quiet as it is comfortable. It also substantially reduces the amount of impact noise transmitted between floors of multistory buildings.

Sealed seams, quality guarantee. Cambrian Corlon comes in long rolls, six feet wide, for a minimum of seams. And what few seams there are can be sealed by a special installation technique developed exclusively for Cambrian, making them waterproof. Installed by craftsmen carefully trained in this technique, a floor of Cambrian Corlon carries an Armstrong guarantee that covers both material *and* installation.

Easy maintenance. Cambrian's sealed seams and nonporous vinyl composition keep dust and dirt at the surface where they can be easily removed with routine resilient floor maintenance.

Distinctive design. Cambrian has thousands of stone-like vinyl chips set in a bed of translucent vinyl. It has a richly textured surface and comes in eight different decorator colorings.



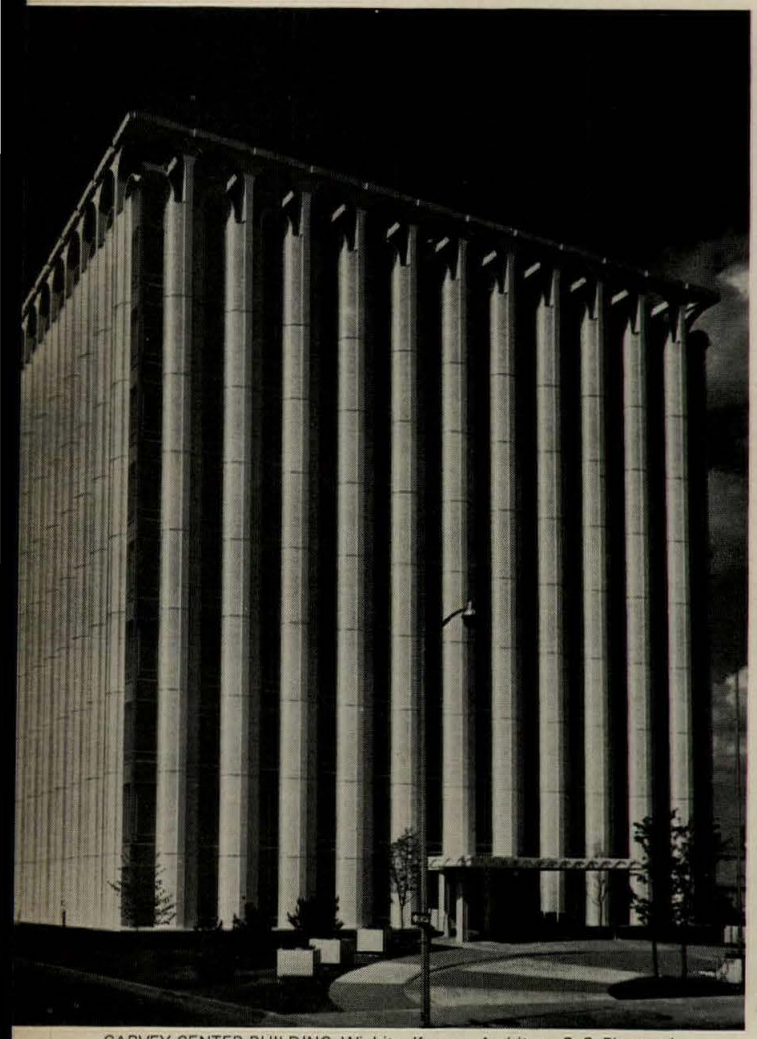
For samples and technical data on Cambrian Vinyl Corlon, write Armstrong Cork Company, 309 Rock Street, Lancaster, Pa. We'll also send you copies of new studies of comparative use costs of resilient flooring versus carpet. One presents data compiled through independent research by the Wharton School of Finance and Commerce, University of Pennsylvania. Another, "A Fresh Look at Flooring Costs," is based on 113,000,000 square feet of floors installed in commercial and institutional buildings. For personal assistance on any flooring need, contact the Armstrong Architect-Builder-Contractor Representative at your Armstrong District Office.

Specification data on Cambrian Corlon: *composition:* vinyl chips embedded in translucent vinyl surface, on foamed vinyl, Cushioncord backing. *Gauge:* nominal .175". *Surface properties:* excellent impact and indentation resistance (200 psi); good resistance to grease, chemicals, alkalis. *Available in:* 8 colorings, in 6'-wide rolls up to 75' long. *Installation:* above, on, and below grade. *Cost:* $1.35 to $1.50 sq. ft. installed.

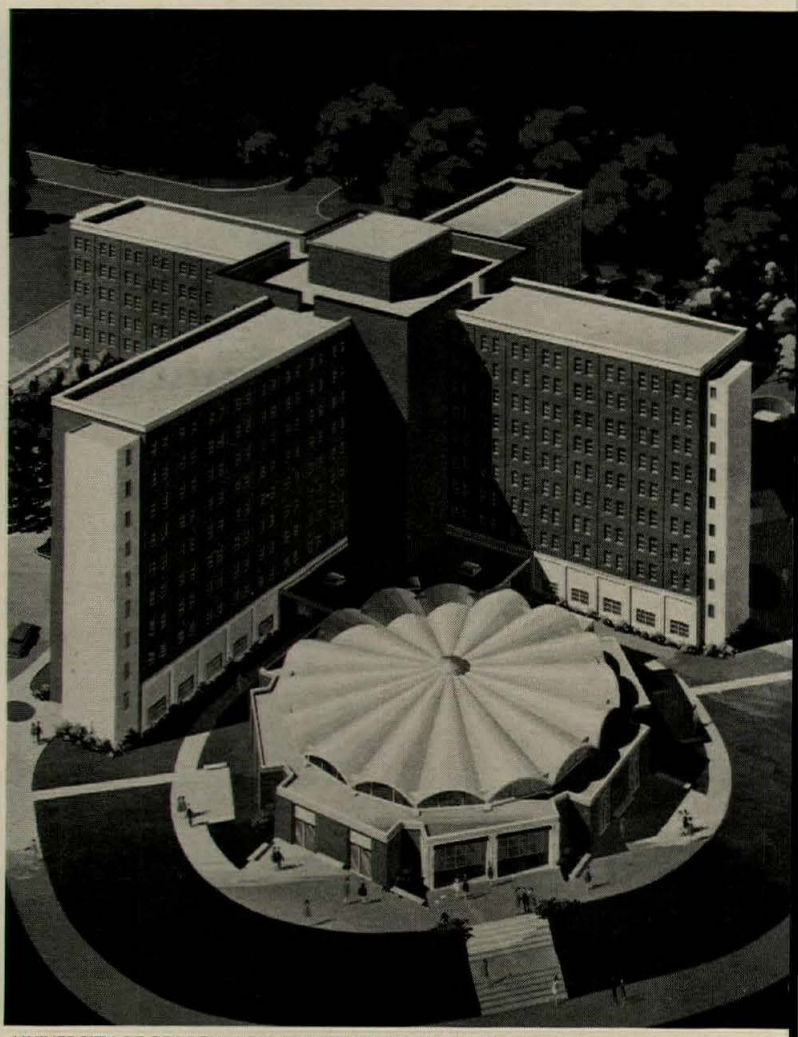
Armstrong

Cambrian, Cushioncord, and Corlon® are trademarks of Armstrong Cork Company.

For more data, circle 1 on inquiry card

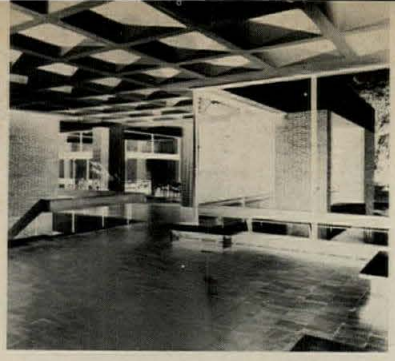


GARVEY CENTER BUILDING, Wichita, Kansas. Architect: S. S. Platt and Associates. General Contractor: Coonrod, Walz and Vollmer Construction Co., Inc. Three Dover Geared Elevators installed by Dover Elevator Co. Group Computamatic® control; speed 350 FPM; capacity 3000 lbs.



UNIVERSITY OF GEORGIA, BRUMBY WOMENS RESIDENCE HALL, Athens, Ga. Architect: Williams and Dean. General Contractor: Atlantic States Construction Co. Four Dover Geared Elevators installed by Dover Elevator Co. Group Computamatic® control; speed 250 FPM; capacity 3000 lbs.

Dover Elevators ...engineered for busy buildings



Cover: Greylock Residential Houses
Williams College, Williamstown, Massachusetts
Architects: The Architects Collaborative,
Benjamin Thompson, partner-in-charge
Photographer: ©Ezra Stoller

FEATURES

BUILDING TYPES STUDY 362

Joseph W. Molitor

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ARCHITECTURAL RECORD

CONTENTS: SEPTEMBER 1966

COMING IN THE RECORD

NEW DEVELOPMENTS IN HOSPITAL ARCHITECTURE

Some new approaches to the design of hospital facilities are developing under the dual pressures of the rising cost of hospital care of all kinds and the new spectrum of requirements established by Medicare, and next month's Building Types Study on Hospitals will be concerned with some of them—"light care" spaces, for example, and the high degree of automation being designed into accounting and supply functions.

RETHINKING THE DESIGN PROCESS

When a large architect-engineer firm long organized for successful practice tries a new approach to integrating its design process, both the methods and the results are of particular interest. The approach of Smith, Hinchman and Grylls, together with some of the architectural results, will be presented in a special feature.

McGraw-Hill Audit Bureau of Circulation American Business Press, Inc.

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"THE PACKAGED SOCIETY" AND ITS ARCHITECTURE

In this piece I should like to develop, in architectural matters, a view of the American scene which I owe to Russell Lynes, managing editor of Harper's Magazine. Mr. Lynes, who has in the past contributed observations on architecture to these pages, wrote in Harper's about "The Packaged Society." While he applied quite broadly the American habit of buying the package without understanding the content, he made only the merest mention of architecture. And I should like (without his knowledge) to show something of how devastating this superficial acceptance of surface values has been in the area of architecture.

Mr. Lynes did include architecture in a list of arts which have contributed to "personal packaging," and he did offer one little warning about superficial thinking in trying to build city housing. But architecture slips easily into his list of things that come in packages—"ideas as well as objects, services as well as places, vices, hallucinations." Also college graduates, Beatniks and business leaders.

First, his warning about housing: "We have . . . learned at least one important lesson about the packaged society in the last 20 years or so. If you package people in mass housing developments that are boxes you create as many problems as you solve. Even so there are a great many responsible men and women who believe that if you can replace physical ugliness with beautiful surroundings, the pretty package will somehow do away with the social ugliness that underlies the troubles of the packaged society. It is not so."

Certainly urban renewal and/or city housing is a great battleground between packaged thinking and social or environmental truth. Or maybe it won't be a battleground; maybe the packaged notions will just take over and proliferate. One would have to be pretty optimistic to think that what Secretary Weaver insists on calling "creative Federalism" will bring us an instant millennium. And it is very difficult, under all of the pressures of time, money, politics or racial strife, to dig for and face the truth.

One can concede that it takes slogans, power, drive and packaging to get any mass action under way. And action is clearly called for. But one may be sure that the packaging will win out, in any contest between packaging and content. It may indeed be that truth will be swept under the rug as in the case of Patrick Moynihan's report on ghettos.

Let's face it: architecture is packaged, just like cookies or cars, is labeled and sold. The models are changed, and the styles and the labels. I haven't seen any architectural packages that say "2¢ off" in the upper corner, or "push here," but the reliance on the packaging technique is just about as plain.

You know the packages. There is the slick metal and glass office tower, hard and shiny and efficient-looking and "modern." Maybe there is some good architecture in these hundreds of new skyscrapers, or was in their predecessors. Maybe they are efficient and practical. But it is still true that about 90 per cent of them are proclamations in the packaging concept. Symbols of the world of commerce and materialism.

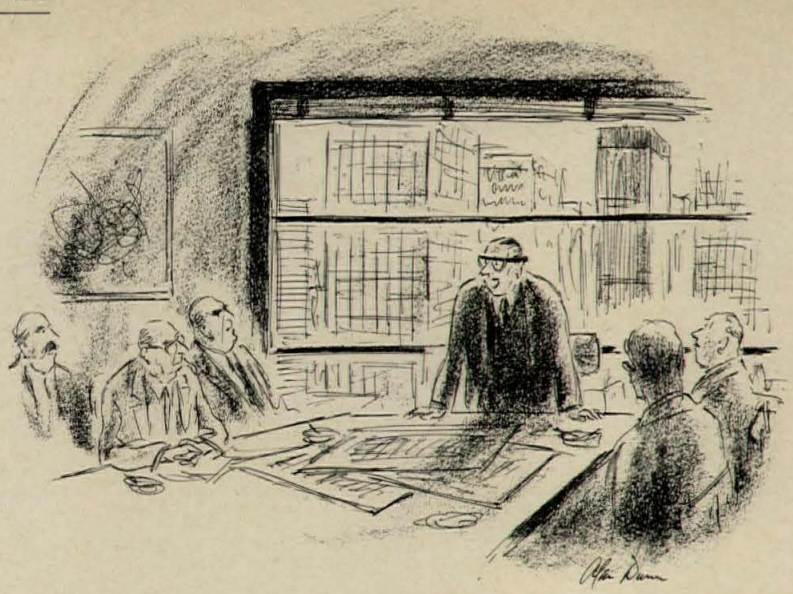
There are other familiar packages. The agglomerations of bad taste known as beach hotels, where decorative nightmares speak of noisy and expensive vacations. There is also the split-level ranch house, the symbol of financial aspiration, fecundity and swimming pool cosmetics. There is the little round drive-in bank, with the pleated roof. More forbidding perhaps is the great public housing project, with sterile towers in Corbusian open spaces, barren of stores, amusements, or human pride or interest.

Now Mr. L included architecture among the packaging arts. Obviously architecture is an art, and arts relate to images, or "packaging." And nobody wants to deny that good packaging is terribly important—to a building, to a woman, to society. His protest, of course, was against mistaking the package for the article, which might be said to be a national habit of thought.

Please do not protest that good architecture shuns all those dreadful things I mentioned above. Separate good architecture from bad as you will, what the public understands as architecture is definitely the packaged variety.

—Emerson Goble

Drawn for the RECORD *by Alan Dunn*



"You have to face the fact that New York, Chicago and all that, are obsolete. Now the proposed 25 New Cities will be mass produced, smartly styled with lots of chromium trim, warranted for 90 days against defective parts . . ."

My own marvelous idea: a subway for bicycles

Having read recently about the comeback of the bicycle in Europe (New York Times), I have been trying to fit it into New York's traffic patterns. The Times tells us that the bicycle, even more than its motorized relatives—the mopeds, scooters, and so on—is gaining new popularity, due to the congestion of automobiles. You always can seem to find a way through the mess of cars with your little bicycle. You can even fold it up and if necessary tuck it under your desk. You can put Junior on the rumble seat, and put the loaves of bread behind him.

The story was quite serious, complete with statistics on increasing sales. There is a theory about commuters who have cars driving to some parking lot, leaving the car there and going on into the city on the bike.

In my own rambles around the city (New York) I have often wondered when to forsake the bus, or the taxi, and walk the rest of the way, to be sure of making the train. How much less effort to unfold the bicycle, and push on—against the traffic, as the kids do, or on the sidewalk. Carry a bike in your dispatch case, and you could get across town in a hurry. I am told bicycles are now made quite light, and collapsible.

No, it wouldn't work. It would take just about a dozen bicycles on 42nd Street to work frightful confusion among the pedestrians. So while we're building a new city, let's remember a subway level, or an elevated roadway, reserved for bicycles. No scooters or motorcycles —too much noise, too much air pollution, too many young kids with tight pants and loose hair.

Develop the parks and develop the kids

This newspaper reader was interested in a recent item about a Negro riot which started because the street hydrants were shut off. The boys had been cooling themselves in the heat of the street, and having a barrel of fun. When authorities talked it over they decided they could spare the water, for that much recreation in the ghetto.

It doesn't seem too far from that thought to reports of the thousands who sat in Central Park or Prospect Park to listen to summer park concerts by Leonard Bernstein and the Philharmonic orchestra—75,000 in Central Park, 50,000 over in Brooklyn.

New York's Mayor Lindsay has led a campaign to lead kids and parents to clean up empty lots for playground use. And a healthier use of youthful energy can scarcely be imagined.

Empty lots, pocket parks, huge city parks, and great response. Mix in a little participation, and there you go.

Secretary Udall's idea: urban recreation trails

Secretary of the Interior Stewart L. Udall was not kidding (as I was elsewhere on this page) about bicycling in urban areas, and trails for it. He has announced a program of trails in 12 urban areas with Federal and state funds. The trails would differ according to location, from several hundred feet to many miles. Purposes would include bicycling, hiking, horseback riding. And generally they would be put in scenic areas.

"I detect an awakening on the part of many urban areas, as they seek to counterbalance buildings with open spaces, to provide cleanliness instead of clutter, and to develop walkways, and trails, as well as highways," Secretary Udall stated. "The trail plans announced today are indications of this growing desire for recreation and natural beauty within our cities."

Speaking of new levels, let's cover the airport

Architect Paul Rudolph has an idea about building some new levels for better transportation, with a side effect of doing something about architecture. He points out that we have overdone the abuse of the automobile, and should see if we can't find some constructive purpose for it, in addition to using the thing.

Talking recently to a student design competition he said: "I have come to the following conclusions, that only the automobile and its configurations give one element large enough to really break up and define certain areas in cities, and that it might well be used to correct some slight little faults which we find on all sides:

"To give an example, the Kennedy Airport has been described, not by me, but others, as an architectural zoo and I'm inclined to agree with them about that. I would like to propose that since one quite often misses planes at the Kennedy Airport because you park right in the middle and have to walk for twenty or thirty minutes to your plane, you know, that one solution would be to build four or five layers of parking over the architectural zoo. You not only would get to your plane much faster, but you would then have a gateway to a city worthy of the name." —*E.G.*

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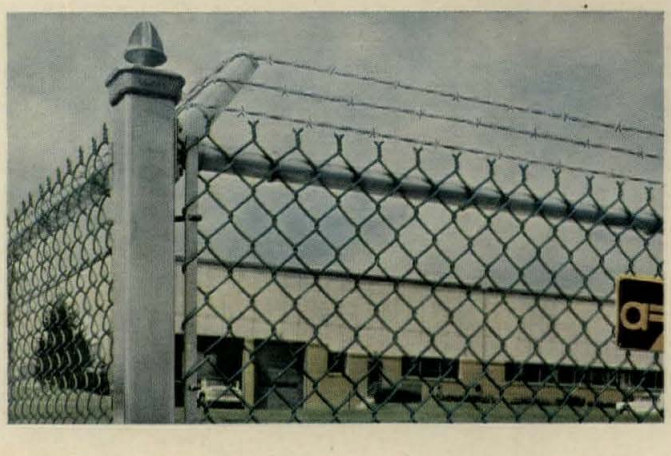

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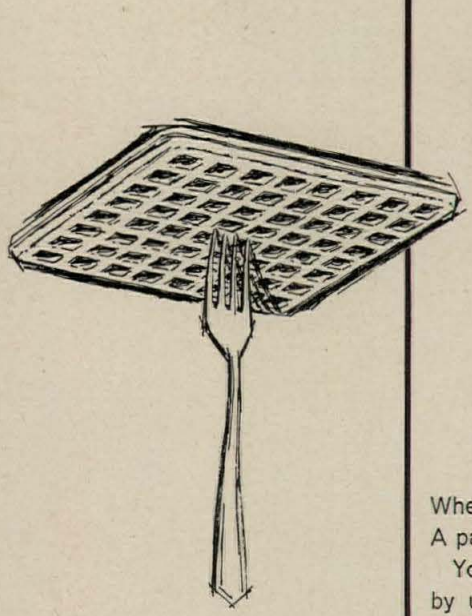

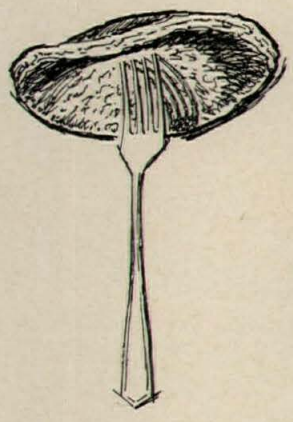

When you hold up a waffle, it stays flat. A pancake droops.

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Hetron® creates a dramatic ceiling at No. One Wall Street

New banking area of the Irving Trust Company, One Wall Street. Architects: Smith, Smith, Hayne, Londberg & Waehler. Hetron-based reflectors designed by Edison Price, Inc., and manufactured by Lunn Laminates, Inc.

Scores of spherical-shaped plastic panels reflect the light from the dramatically hung ceiling of the Irving Trust Company's new banking area.

The five foot by five foot panels are molded of glass-reinforced Hetron polyester resin—a construction material that combines strength, light weight, and fire retardance.

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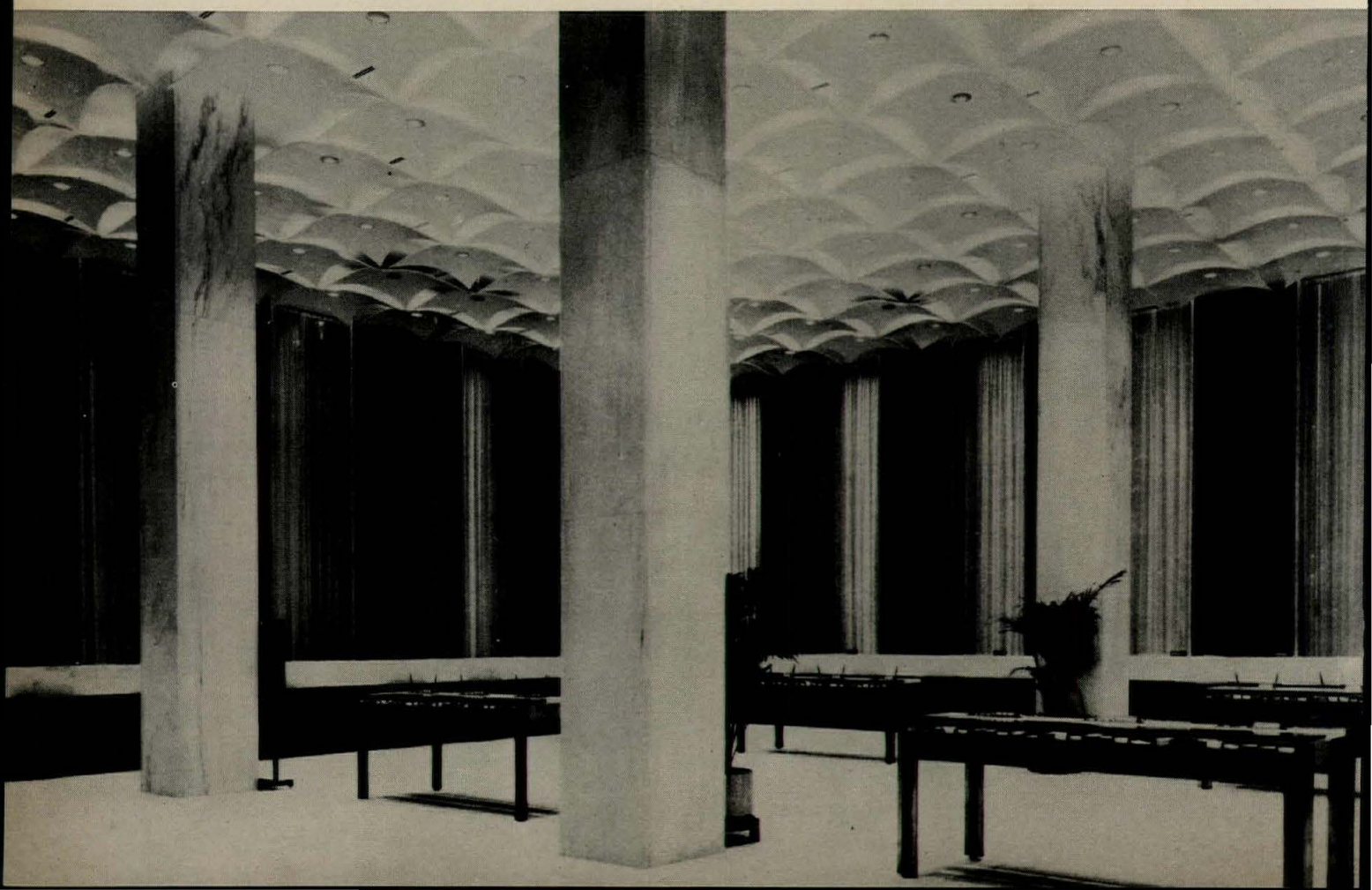

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Subsidiary: Calstrip Steel Corporation, Los Angeles, California

For more data, circle 9 on inquiry card

ENGINEERING
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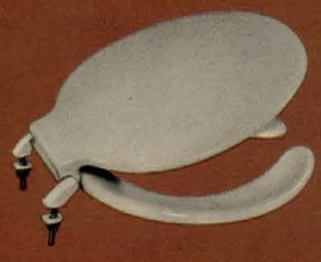
ENGINEERING...using weight, strength and style as decisive factors, writes stringent specifications for aircraft equipment. Airline management looks for luxurious appointments for its passengers. Because BENEKE meets both these air carrier requirements with a solid plastic seat that provides maximum comfort and lifetime good looks, it is No. 1 choice of most airlines.



MODEL 881 favored by leading airlines because of lightweight, yet rugged performance. Injection molded of self-extinguishing solid plastic and furnished with vibration-proof attachments.

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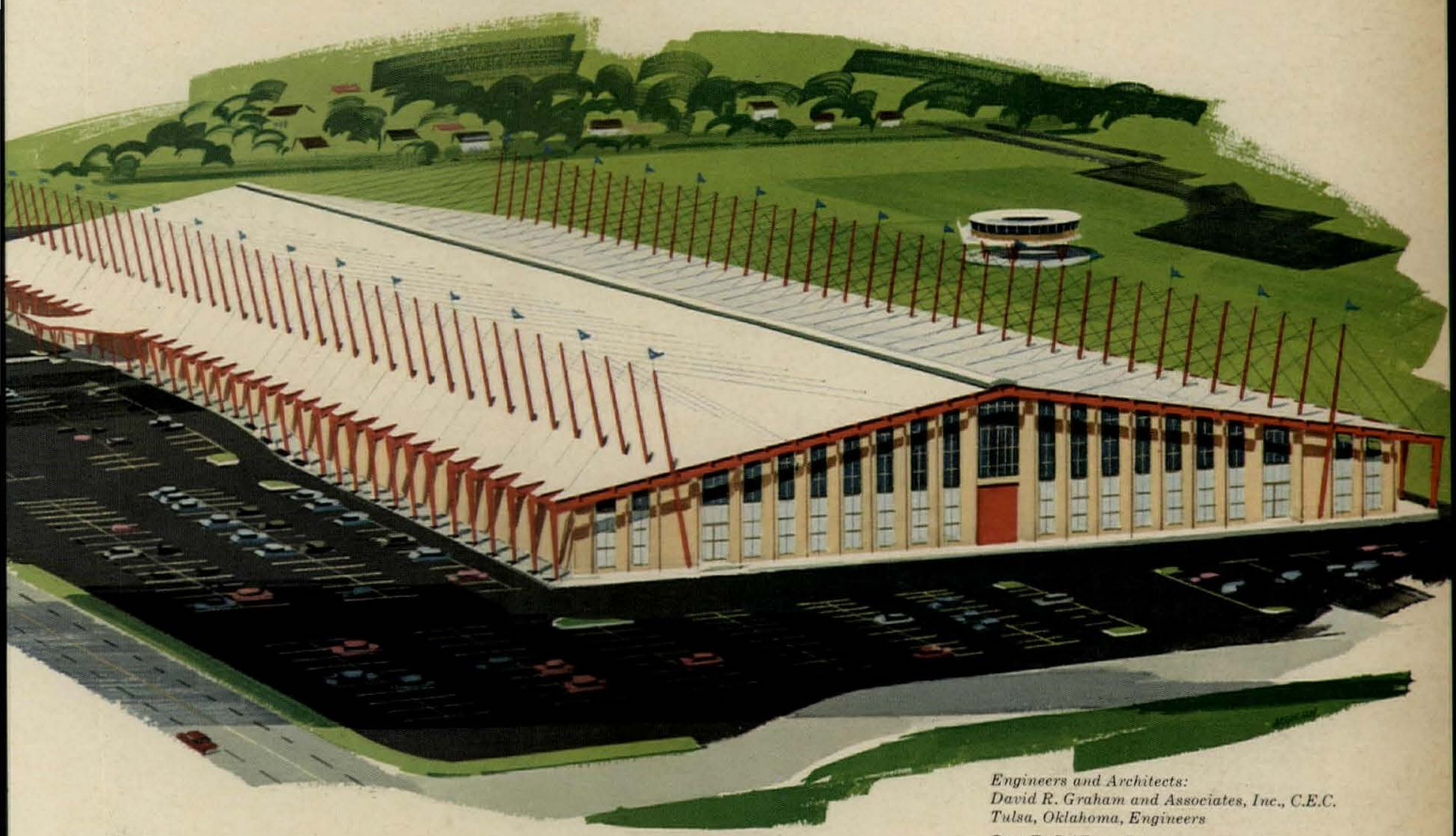
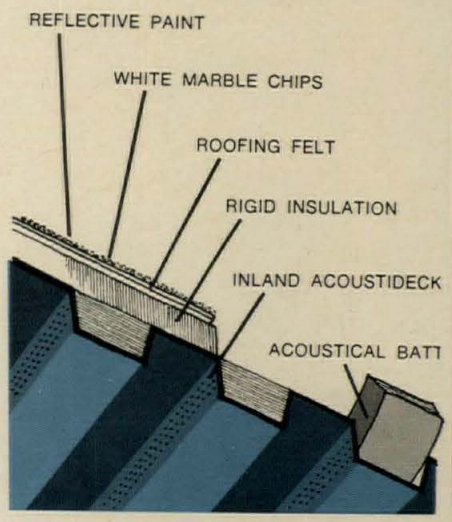
They go to great lengths in Tulsa to house expositions



Engineers and Architects:
David R. Graham and Associates, Inc., C.E.C.
Tulsa, Oklahoma, Engineers
Bert E. Griffin, A.I.A.
Architect

World's largest cable-supported roof— 404′ x 1200′ — is Inland Acoustideck®



Excessive noise in the Tulsa Exposition Center is entrapped in fiber batts through perforations in the vertical webs of the Acoustideck panels. Insulation over the deck is topped with asphalt-impregnated felt and then a layer of white marble chips. This is coated with a highly reflective white paint.

Talk about thinking big—there are 10½ acres of clear-span space under the Inland Acoustideck roof of the new Exposition Center Building on the Tulsa State Fairgrounds!

Structural framing of the building consists of two symmetrical cantilevered halves supported by steel cables. Principal structural members are shop-welded steel box columns and girders. Lightweight beams span between the girders.

Inland type N Acoustideck spans the 13′-10″ between these beams. The inherent diaphragm action of the deck provides lateral bracing for wind loads, thus eliminating the need for extraneous X-bracing.

Acoustideck was a logical choice for this suspended roof system, because it weighs less than half of equivalent poured-in-place or precast construction—and carries normal loads over greater spans. The roof on the Tulsa Exposition Center is designed for a snow load of 20 psf. Because Acoustideck absorbs sound, it dampens the high noise level rampant in exhibit areas.

Acoustideck—with a protective two-coat baked enamel primer—is part of a complete line of Inland roof systems. See Sweet's, section 2i/Inl. Or write for catalog 248 to Inland Steel Products Company, 4033 W. Burnham St., Milwaukee, Wis. 53201.

Inland Steel Products INLAND EP-59

For more data, circle 17 on inquiry card

New Safety for bathtubs

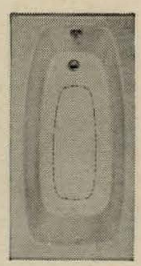
Kohler offers you bath tubs with SAFEGUARD—the textured bath tub that gives stand-up safety!

SAFEGUARD is slip-resistant to help protect everyone from falls. Especially children and older people.

SAFEGUARD is built into the bottom of Kohler bath tubs. Texture is slip-resistant but smooth . . . comfortable to sit on. Cleans as quickly as lustrous enamel on sides and top.

Available on any Kohler bath tub in many sizes and colors.

Specify SAFEGUARD when ordering. Add "S" to the bathtub plate number. For more details, write: SAFEGUARD, Kohler Co., Kohler, Wis.



Dotted lines illustrate area of SAFEGUARD safety bottom.

KOHLER OF KOHLER

Kohler Co., Established 1873, Kohler, Wisconsin

ENAMEL IRON AND VITREOUS CHINA PLUMBING FIXTURES AND FITTINGS • ELECTRIC PLANTS • AIR COOLED ENGINES • PRECISION CONTROLS

For more data, circle 18 on inquiry card

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MONO® will leak-proof it *(20 years or more)* and color-match it

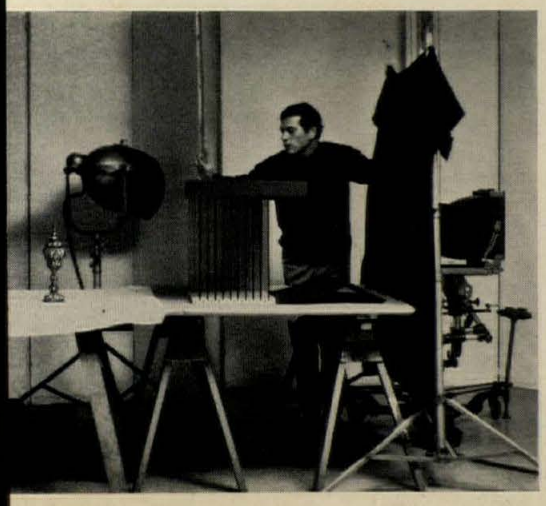
Now with this exceptionally adhesive sealant, you get all the colors of the rainbow plus 8 years of proved performance on jobs of every type. Reason: the acrylic base of MONO is practically water-white, can be color-matched without excessive pigment loading. Most other sealants require excessive pigment loading to achieve color which often leads to loss of adhesion, sealant failure, leaking joints. Because "92% of sealant failures result from loss of adhesion", doesn't it make sense to specify powerfully-adhesive MONO — in any color you desire. Send for color card.

TREMCO
PRODUCTS AND TECHNICAL SERVICES FOR BUILDING MAINTENANCE & CONSTRUCTION

THE TREMCO MANUFACTURING COMPANY • Cleveland • Toronto

To reflect upon the familiar and breathe into it fresh ideas of color, of texture, even of form — this is the idea of KALCOLOR® aluminum. At Kaiser Aluminum, the idea is ideas.

You're looking at the art of Fabergé through 10 pieces of PPG Float Glass



You can see every cherub and curlicue, every glint and nuance of color in this cloisonné covered cup by the master craftsman to the Russian Imperial Court. Float—the new glass from Pittsburgh Plate Glass Company—transmits every detail and color exactly.

Float is produced by a new method of glassmaking. Liquid glass is floated on a bath of molten metal. Hence the name.

The amazing clarity is the reason why architects are excited by the possibilities in this new product. It's available now. For specification data contact your PPG Architectural Representative or write: Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh, Pennsylvania 15222.

Left: This is how the photograph of the covered cup by Fabergé was taken through 10 pieces of PPG Float Glass. Courtesy of A la Vieille Russie.

PPG®

PPG makes the glass that makes the difference

For more data, circle 22 on inquiry card

Compare Construction; Styling; Economics and you'll convince yourself that

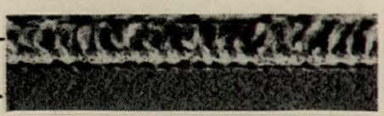
"Rubber-backed carpeting" is inferior to conventional carpets installed with *Allen* rug cushions

Let's look at the facts about the "new breed" of "rubber-backed carpeting" compared to conventional carpet and **Allen Cushion** installation. Much of this "rubber-backed carpeting" is not of carpet loom origin. It's a modified upholstery-type fabric bonded to rubber.

What do you receive for your money . . . in terms of economics?

	Conventional carpet plus **Allen Cushion**	With "rubber-backed carpeting"
Carpet Pile Height	**1/4" or more**	**1/8"**
Face Yarn Content	**22 oz. or more**	**14 oz.**
Cushion Gauge	**1/4" minimum—usually more**	**3/16"**

Conventional Carpet plus Allen Carpet Cushion



"Rubber-backed Carpeting"

What do you receive for your money in style and design?

With "rubber-backed carpeting" you are restricted in selection to a handful of designs and colors. Most of them have a tight, hard finish. You have little choice. Compare this with the vast assortment of styles, colors and designs available from over 2,000 separate carpet looms . . . with the choice of 41 **Job-Engineered Cushion models made by Allen.**

From the all-important acoustical standpoint, conventional carpet plus **Allen cushions** provide substantially higher benefits.

You just can't shortcut quality. So weigh all the facts . . . Ask your carpet contractor to show you the **Allen-made rug cushion** and the conventional carpet best suited to your specific requirements.

Photographed: Allen Top-Flite, America's Finest Rug Cushion

Compare these differences

	Conventional carpet plus **Allen Cushion**	"Rubber-backed carpeting"
WIDTHS	Unlimited carpet assortments in 12′ and 15′ seamless mean fewer seams, lower installation costs.	Mostly 54″ means potential installation and maintenance problems due to seam separation, unravelling, etc.
ECONOMIC WASTAGE	No loss of Allen cushion yardage. A good installer pre-cuts and fits the Allen cushion to keep wastage at minimum levels.	When "carpet" is cut to fit you automatically have a cushion loss that cannot be recovered.
FREIGHT COSTS	Handling and shipping of separate carpet and Allen cushion assures minimum in-transit costs.	Traffic studies indicate costs as much as 40% higher.
REPLACEMENT	Conventional carpet and Allen cushion can be moved, shifted, or replaced in sections as needed without waste or floor damage.	Most "rubber-backed carpets" must be cemented to the floor. Movement will usually mean destruction of the cushion and inability to seam match the replacement.

For Information and Samples . . . Write Allen Industries, Inc., Contract Division, Detroit, Michigan 48207

For more data, circle 23 on inquiry card

Going under for the third time

"Bury the wires!" is item one on the beautification agenda of almost any community which sets out to fight the war on ugliness. Yet few have been able to do anything about the overhead wiring which makes a ceiling over streets and weaves a net in front of urban vistas. For the incontrovertible fact is that it costs money—someone's money—to put existing wires anywhere but where they already are.

Nevertheless, three residential districts in Seattle have accomplished the feat of undergrounding the existing overhead power, communication and television lines. The latest and largest district to do this is East Laurelhurst, where 357 homeowners are sharing the cost of a $300,000 wire-burying job. It took the residents four years to find an acceptable way of achieving what they wanted. In the end, a committee of the residents dealt directly with the utility company and, instead of an assessment based on square footage, used a "one-house, one-price" method of financing the job.

While these three Seattle neighborhoods were offering an example of citizen responsibility toward community appearance, the Seattle chapter, A.I.A. was also setting an example. When Seattle City Light, the city-owned utility, proposed a rate cut, the chapter went on record as opposing the cut and urging the use of the monies to implement the program of undergrounding to which the present city government, and the utility, are pledged.

Per person, the rate cut isn't much. But in the aggregate it could go far toward undergrounding yet another of Seattle's residential neighborhoods.

WHAT'S THE LIMIT?

I'm for great ideas. So are you. And for big, inclusive plans that don't let any of the problems get away; that recognize all the factors, not just some of them; that suggest beauty for all, not just for segments.

But—I prefer realities to dreams. I'd rather see something *realized* than eternally *proposed*. Something implemented, not something shelved. Something possible, not something impossible. T. S. Eliot's good phrase "the limits of the plannable" could be paraphrased for this: "the limits of the achievable."

You, the architect, have to be the judge of these limits. Sometimes the boundaries set by a client are too circumscribed and, as architect, you have to extend them. But sometimes the boundaries are restricted by budgeted public (and private, too) monies, and the realization of the projects depends on strict adherence to the budget.

In the design world, the words "limit," "boundary," "finite" strike a certain terror to the heart—a terror that it may be the imagination that is limited, bounded, defined. Is it lack of courage that brings such terror—or lack of discipline in the exercise of talent?

What extends the imagination like a boundary? What compels a solution like a definite problem? What goads the mind like a limit? Where there is no definition there can be no solution. And for architecture, if there is no solution, there is no realization.

THOUGHTS ON THE CITY

"The city was born in Babylonia . . . In its time, Babylon rose against the sky in solitary grandeur. In our time, hundreds of immense cities spread out over all the continents . . . Tomorrow Babylon will be everywhere." Wolf Schneider, in "Babylon is Everywhere: The City as Man's Fate."

"There is a growing uneasiness about the degree to which cars have become the real population of our cities, with a resulting loss of human scale, both in power and in distance. The town planners are planning ways and means to buy back our cities for the pedestrian from the big transportation interests." Marshall McLuhan in *Understanding Media: The Extensions of Man*.

"Cities have tended to develop in concentric rings with their business areas at the center. Residential rings have grown about the center, constricting the heart of the city. If the growing heart of a child were encased in steel, that child would die within a short time. So with cities." Constantinos Doxiadis, in interview at Aspen.

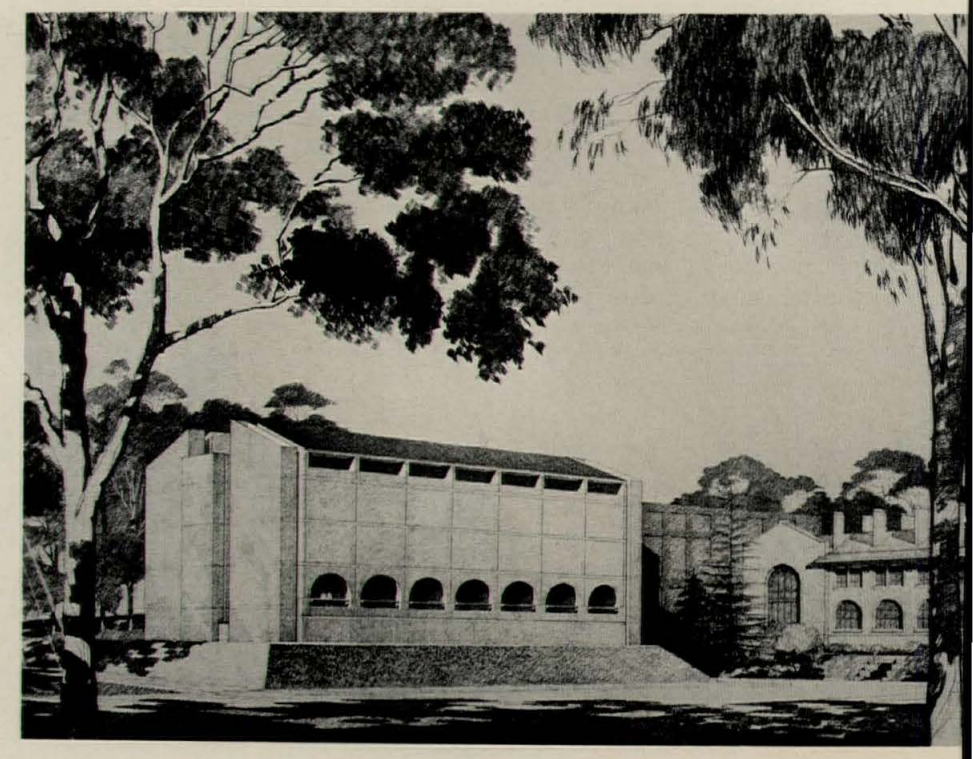
—Elisabeth Kendall Thompson

THIS MONTH'S WESTERN REPORTS

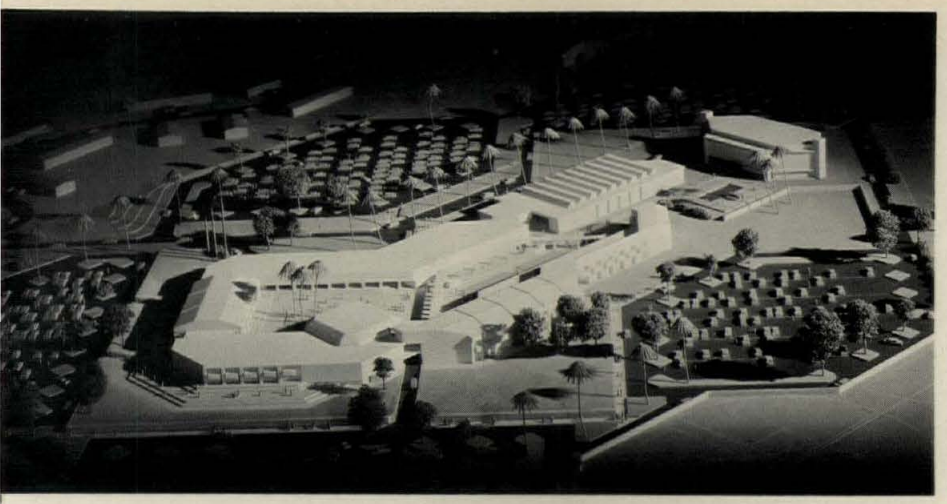
WESTERN BUILDINGS IN THE NEWS

Wilshire Square, a $20-million office building complex on Wilshire Boulevard in Los Angeles, will be built in two phases: the first, a 12-story building, will be completed in late 1967; construction on the second will start after completion of the first. The two-acre site is part of the Chapman tract across Wilshire from the Ambassador Hotel. Architects: Langdon & Wilson; contractor: C. L. Peck.

This design for a $15.5-million multi-purpose Activity Center for Santa Clara, California has been approved by the city's Council. Included in the Center will be a 15,000-seat arena; a 3,000-seat auditorium; an exhibit hall; a children's theater and a little theater; and a water tower with a restaurant on top. Architect: Mario Gaidano.



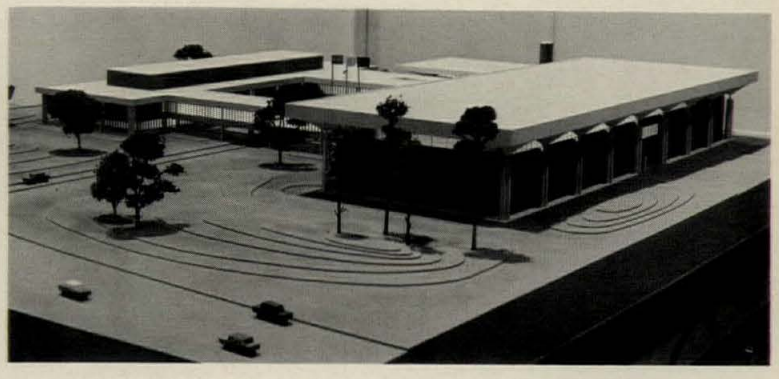
A $4-million addition to the engineering materials laboratory at the University of California, Berkeley, is under construction and due for completion in 1968. The seven-story building will house laboratories for a variety of materials testing equipment on six of its seven floors, with offices on the seventh. A testing slab is located in a two-story room 168 feet long and 50 feet wide located behind and one level below the berm which surrounds the building. Architects: Skidmore, Owings & Merrill; contractor: Continental Construction Company.

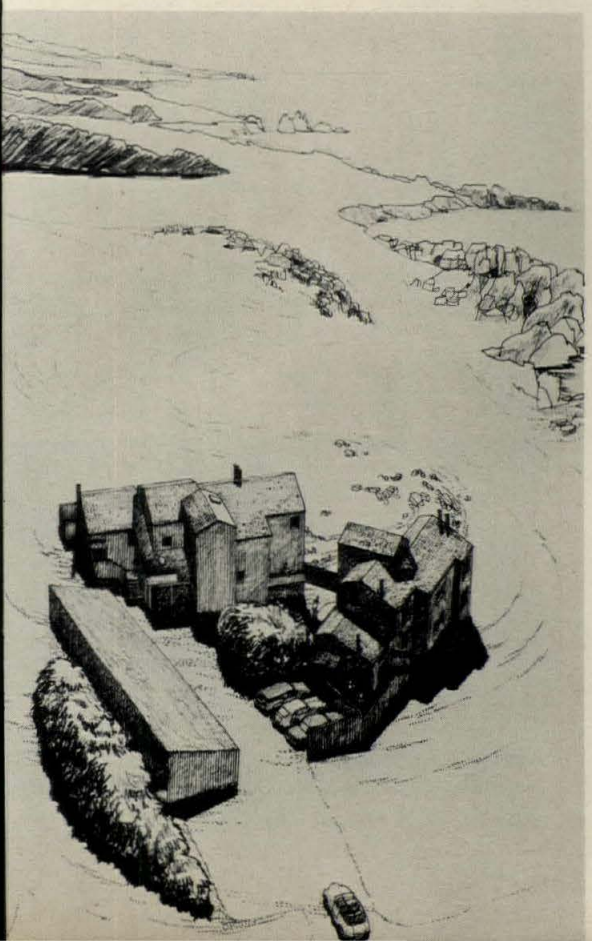


A central mall or "Alameda" will tie together instructional spaces, gym, library and a little theater on the all-new campus of the Peralta Junior College in Alameda, California. The first buildings will house liberal arts and vocational programs; later, library and student center will be built. The new college is to be ready for use in the fall of 1969. Architects: Stone, Marraccini and Patterson, San Francisco, and Perkins and Will, Chicago.

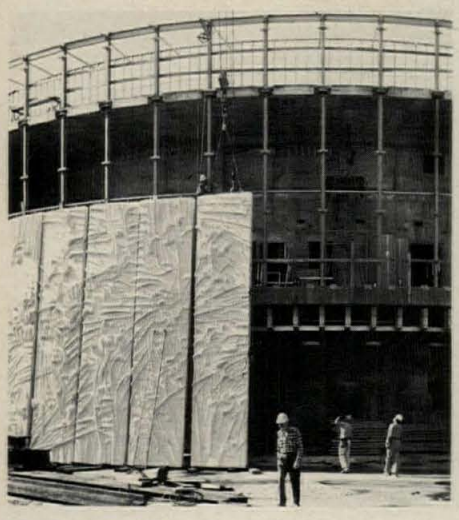
This branch office for First Federal Savings and Loan Association is located in the semi-residential Makiki area of Honolulu. The building stands on a podium two feet above the street, with the principal business rooms on the podium level. A second level contains two large offices. Architects: Lemmon, Freeth, Haines and Jones, Joseph Farrell, associate.

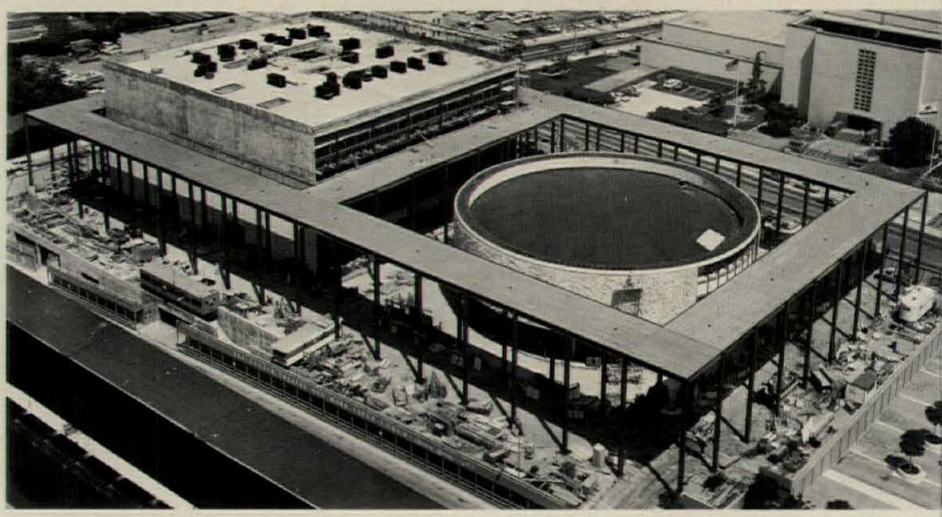
A "university of the air" is under construction by United Air Lines on a 13-acre site at Stapleton International Airport, Denver, Colorado. The $7-million Flight Training Center, scheduled for completion early in 1968, will permit the training of 750 pilots for United and for other airlines and for business firms. Architects: Perkins and Will, Chicago, and Paul Reddy, Denver.





For overnight visitors to Sea Ranch on the Sonoma Coast of Northern California, these 14 guest-house units will provide accommodations. The design of the building allows for conversion of the guest house units to eight condominiums for sale to private owners. Sea Ranch is a second-home community of condominiums and private homes. Architects: (condominiums): Marquis & Stoller.

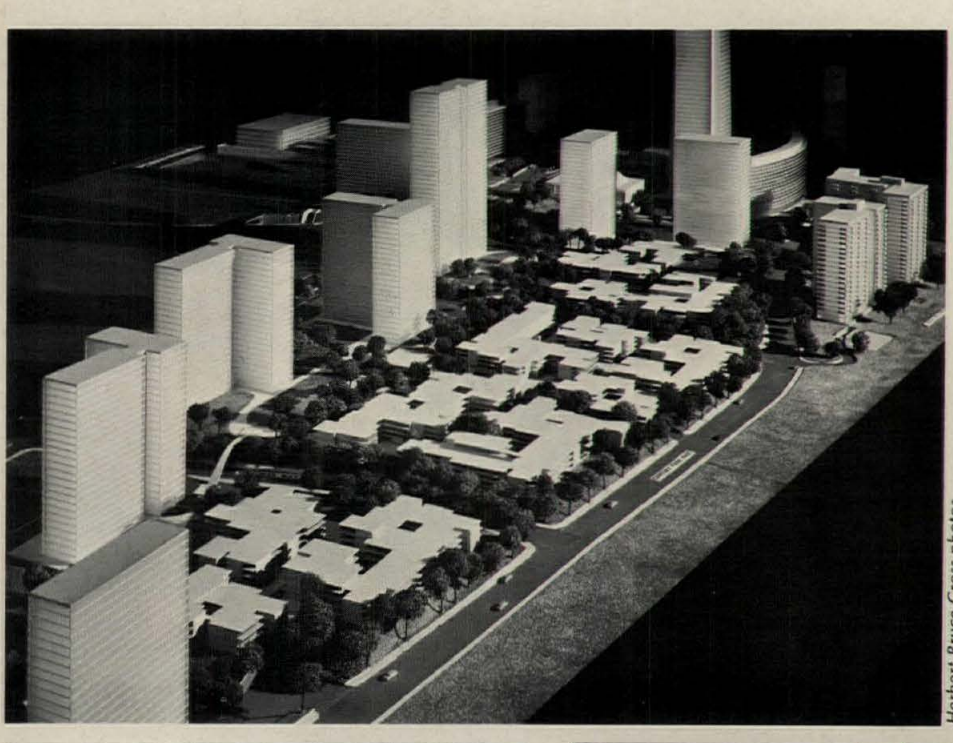




Music Center

Two theater buildings—one for experimental and "intimate" theater, the other for legitimate theater—will be ready for use early next year and will complete the $33.5-million Music Center in Los Angeles' Civic Center Mall. The Mark Taper Forum is a circular building with a thrust stage and seating for 750. The Ahmanson Theater is square, seats 2,100 on three levels, and has a stage without proscenium. The two kinds of dramatic facilities complement the 3250-seat Dorothy Chandler Music Pavilion. A colonnade surrounds the Forum and the Theater. The wall of the circular Forum building is made up of curved panels of concrete precast in foam plastic molds to provide an integral high-relief sculpture on the exterior surface. Its abstract design repeats every seven panels but permits a view of only one section from a vantage point and so achieves visual variety. Architects: Welton Becket & Associates; contractors: Peter Kiewit Sons Co.

Building big in Los Angeles: two projects progress apace



Herbert Bruce Cross photos

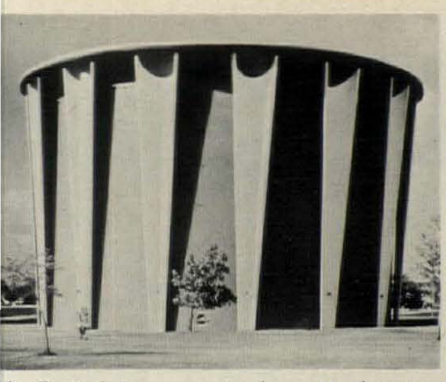
Century City

Residential and commercial development in the $500-million city-in-a-city, Century City in Los Angeles, will be further diversified by inclusion of townhouse apartments and an entertainment center, according to a new land-use study for the development, just completed by Charles Luckman Associates. Additional stores in the Century Square regional shopping center, more underground parking and an airlines terminal will also be added. Already completed are two office buildings (Welton Becket & Associates, architects); two apartment buildings (I. M. Pei, architect); the Century Plaza Hotel (Minoru Yamasaki & Associates, architects); and a number of smaller office buildings. Nearly finished are two more high-rise apartment buildings (Charles Luckman Associates, architects). A medical office building will be built in the next year.

Included in Century City are Century Towers, first high-rise apartment buildings. Architect:

I. M. Pei. 1901 Building, third major office building. Architects: Hellmuth, Obata &

Kassabaum. Century Park Apartments. Architects: Charles Luckman Associates.



Shadle Park Reservoir, Spokane, Washington. Engineers: The City of Spokane Public Works Department.

Valley View Reservoir, Lafayette, California. East Bay Municipal Utility District. Designers: Cornelius Sampson and Associates.

Golden Plant Reservoir, Pacentia, California. Engineers: Southern California Water Company Engineering Department.

Stanton Reservoir, San Leandro, California. East Bay Municipal Utility District. Architects: Anderson, Hyde, Anderson.

New structural forms for improved public relations

These four reservoirs show the new concern of utility districts and water companies for the effect of their structures on "community esthetics." As one company says, "Our engineers now ask not only, does it work? and, is it economical?, but, is it attractive?" Three of these reservoirs are in residential neighborhoods; the fourth is on a hilltop in an undeveloped area. The City of Spokane built a 73-foot-high welded-steel tank in a city park, and improved its appearance with a ring of tapered steel pilasters, an overhanging roof, a two-color paint job, and spotlights. Southern California Water Company put most of its Golden Plant reservoir underground, with a flat-roofed rectangular prestressed concrete structure. East Bay Municipal Utility District used traditional tank forms and camouflaged them with non-structural forms.

WESTERN TOPICS

Nathaniel Owings will head the seven-man Governor's Jury on Good Design and Beauty for the State of California which will nominate significant buildings and projects in eight categories, recommend "the greatest over-all contribution to conservation and enhancement of natural beauty," and propose the names of two "environmental leaders" in a new program of awards just established by Governor Edmund G. Brown. The program is intended as a "powerful catalyst for better design and for meaningful consideration for beauty throughout the state." Other jury members will be structural engineer T. Y. Lin; Mrs. Helen Reynolds, president, California Roadside Council; Dean Sam Hurst of USC's School of Architecture; Allan Temko, writer; Harry Ashmore, Center for Study of Democratic Institutions; and Cesar Pelli, director of design for Daniel, Mann, Johnson & Mendenhall.

The Platte River Valley beautification and redevelopment plan, to which members of the Colorado chapter, A.I.A., gave many hours of volunteer time and effort and which was exhibited in Denver at the recent national convention of the Institute, has received the backing of 21 civic groups. The proposed plan resulted from the destructive floods of June 1965, and is based on the construction of dams along the river valley. The redevelopment plan recommends a 20-year construction program to include a historical-cultural park, a hotel-motel complex, a stadium, and a college complex in the area surrounding downtown Denver; a technical-vocational high school, two new industrial parks, and new recreational parks. Total estimated cost is $630 million in private and public funds.

The Pacific Northwest's newest industrial developments—Boeing's $300-million central fabrication plant in southwest Auburn, Washington and Northwest Aluminum's $100-million aluminum plant on Guemes Island near Anacortes, Washington—are changing the face of these communities as well as the way of life of their residents. Auburn, especially, has been hard-hit because of the suddenness of its population growth. By the end of 1966, some 5,000 persons will be employed at the Boeing plant. Tight money has slowed construction of residential projects both in Auburn and in surrounding Green River Valley communities which are also feeling the impact of the new plant. Guemes Island's population of 250 will be quadrupled when the aluminum plant opens, and planning for increased public utilities and facilities is already under way.

A mass transit study for the island of Oahu, Hawaii, prepared by Daniel, Mann, Johnson & Mendenhall, recommends a 21-mile fixed-rail line on the Honolulu side of the island, with express feeder buses at either end. The transit line would run underground for 2.3 miles through the downtown section of Honolulu; the remainder of the line would be on an overhead structure. The recommended plan is designed to serve the island's needs up to 1985.

WESTERN EVENTS

SEPTEMBER

10-15 35th annual national conference, Northern California Chapter, American Institute of Interior Designers. Fairmont Hotel, San Francisco.

25-30 National convention, Prestressed Concrete Institute. Rice Hotel, Houston.

27-30 Third Institute for International Engineering. University of Colorado, Boulder, Colorado.

OCTOBER

6-9 21st annual convention, California Council, American Institute of Architects. Monterey County Fairgrounds, Monterey, California.

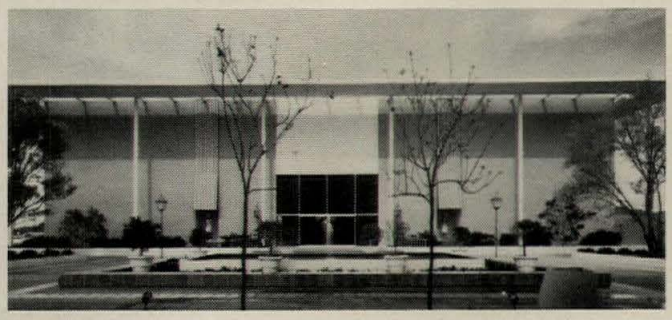
12-15 "Design for People," 15th conference, Western Mountain Region, American Institute of Architects. La Fonda, Santa Fe, New Mexico.

13-15 Annual convention, Structural Engineers Association of California. Ahwahnee Hotel, Yosemite, California.

18-20 Western Motel Exposition, sponsored by California Motel Association. Sahara Hotel, Stateline, Nevada.

23-27 "The Search for Total Architecture," 15th annual conference, Northwest Region, American Institute of Architects. Benjamin Franklin Hotel, Seattle, Washington.

25-28 43rd anniversary congress, Building Contractors Association of California. Hilton Hawaiian Village, Honolulu.



ALL-ELECTRIC BUILDING AWARD

Buffums' Department Store
Peninsula Center
Palos Verdes Peninsula,
California

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

Buffums' completes fourth (plans fifth) All-Electric building

In retailing and in building, Buffums' knows value; and they stay with it!

Buffums' new Palos Verdes store has won the All-Electric Building Award for their fourth all-electric department store. The fifth is on the drawing boards.

By going all-electric, Buffums' achieved a greater flexibility of design, permitting wide aisles and high ceilings that give a smart, modern appearance. Savings in space alone provided enough square feet for a complete shoe department.

Lighting, designed as a subtle tool for merchandising, also helps heat the store. High capacity heaters are not needed.

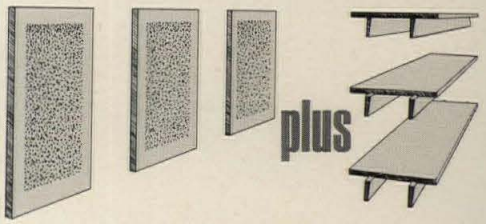
Like to hear more about all-electric building? Write Marketing Engineering, P.O. Box 62, Terminal Annex, Los Angeles 90051.

SCE

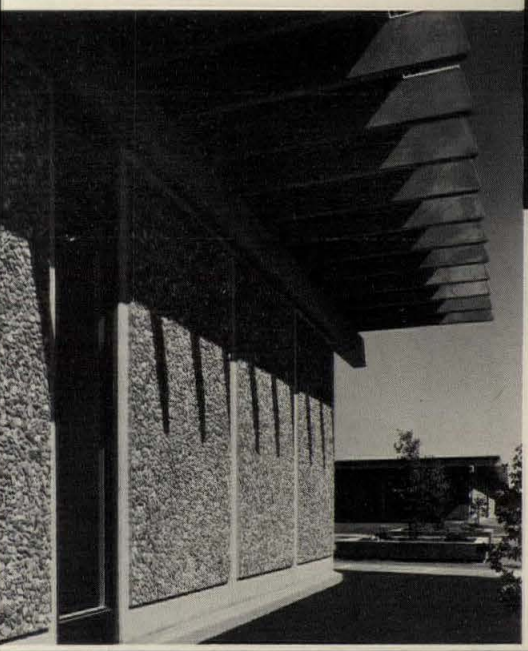
Southern California Edison

For more data, circle 24 on inquiry card

Successful formula for a junior college



Basalt plantcast, prestressed exposed aggregate wall panels and lightweight concrete double tees were chosen over other material systems for this junior college. Economy and architectural effect through repetitive use of components (748 identical double tees; 463 identical exposed aggregate wall panels) and low maintenance were the contributing factors in the selection of this system. Prompt delivery scheduling and placement realized additional savings. Put Basalt "know-how" and prestressed components to work on your next project. Write or call . . . **BASALT ROCK COMPANY, INC., Concrete Products Division, Napa, California 94558. Telephone: 707/226-7411.**



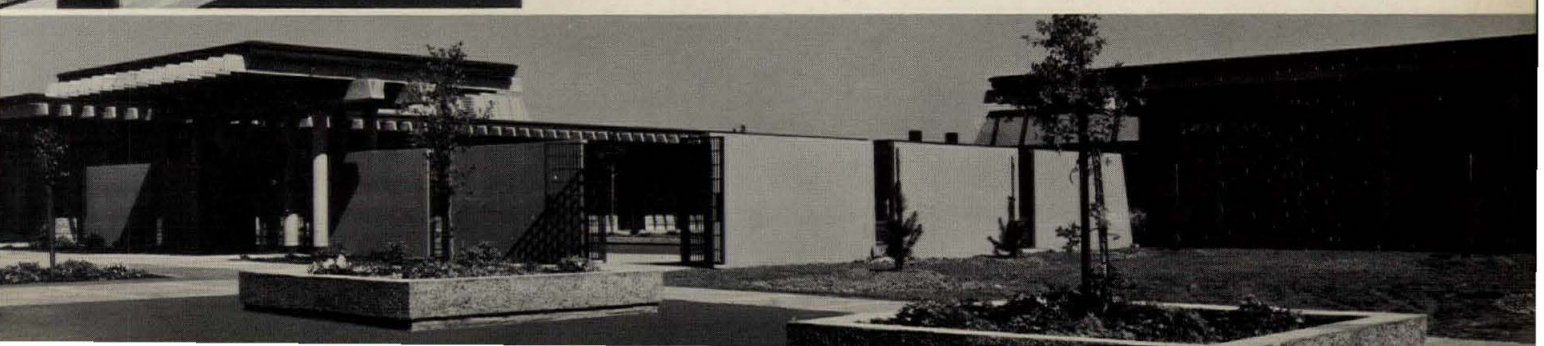
For an additional design effect, 748 plantcast, prestressed double tees project over wall components.

463 plantcast exposed aggregate wall panels achieve a continuous, natural wall pattern.

Basalt
QUALITY through Research and Control

Marketed only in
Northern and Central California

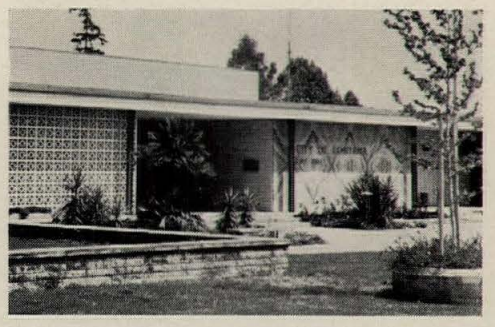
NAPA JUNIOR COLLEGE, Napa, California
Architect: Donald S. Macky, A.I.A., Oakland and Napa
Structural Engineers: Frank E. McClure and David L. Messinger, Oakland



11¢/SQ. FT.

The annual operating cost of heating and cooling the Fontana City Hall electrically

Fontana City Hall
8353 Sierra Avenue
Fontana, California
Architect
Grover W. Taylor
Engineers
Tharaldson, Matthewson, Argebright and Doby, Consulting Mechanical Engineers;
Ted Stuhl, Consulting Electrical Engineer



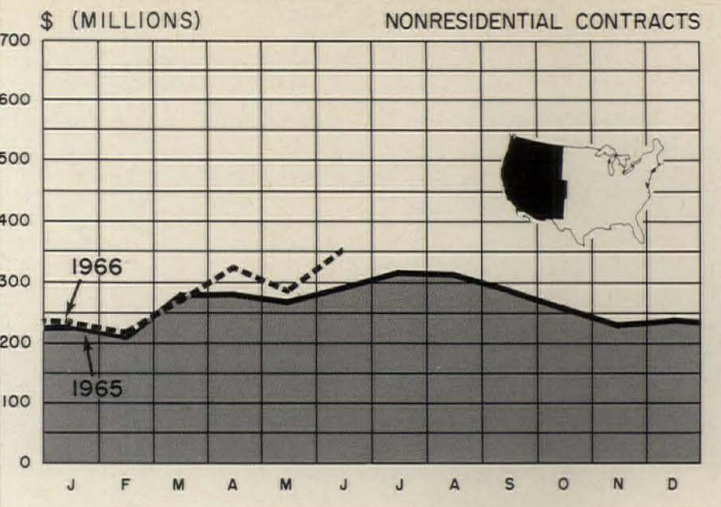
Only 11¢. And that's for both heating and cooling.

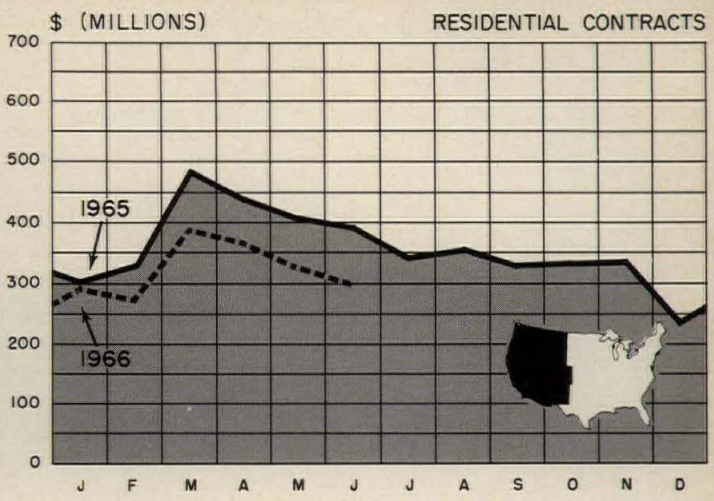
Electric space conditioning *is* economical. And it's practical. Only one source of power is needed.

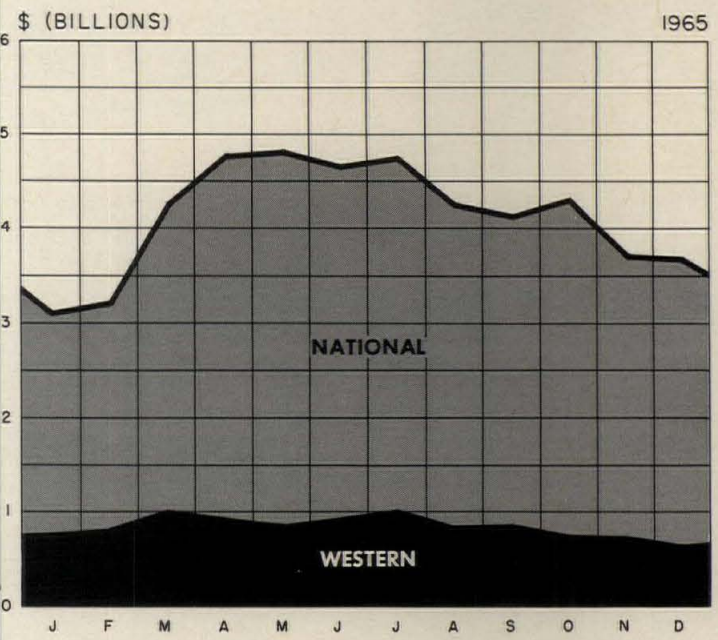
Drop by an Edison office and see for yourself. We have records like this for hundreds of Southern California buildings.

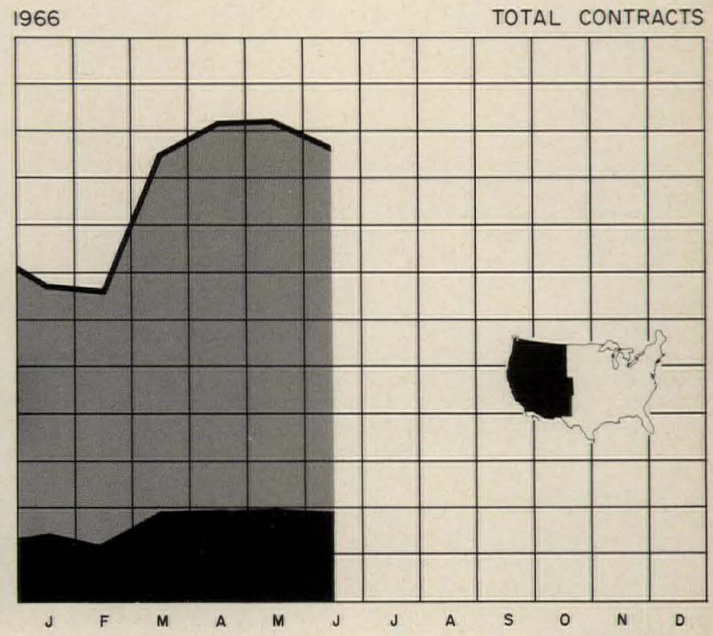
Southern California Edison SCE

For more data, circle 25 on inquiry card









Total contracts include residential, nonresidential and non-building contracts

F. W. DODGE CORPORATION

Western construction trends

FOR ANALYSIS OF CONSTRUCTION TRENDS NATIONWIDE SEE PAGE 44

June construction contract value in the Western states totaled $972,574,000—almost exactly the amount tabulated in the same month last year. But while the two Junes produced comparable *totals*, the similarity pretty well ends there. This year the June contracts tell a story of a vigorously expanding nonresidential building market—up 20 per cent over the year-ago amount—and further deterioration in an already depressed housing market. The current June's residential value fell 23 per cent below last year's.

At mid-year, total Western construction activity was still lagging behind the six-month pace of 1965, although gains recorded during the second quarter went a long way toward closing the gap. The year's cumulative total of $5,084,042,000 for the half year was 6 per cent short of 1965's contracts, and that represented a big improvement over the picture at the end of the first quarter when 1966 was running 15 per cent behind.

In June, nonresidential building turned in its largest monthly gain of 1966 in the Western states. Educational and science building, public building, and social and recreational structures all scored advances of better than 20 per cent. Commercial building contract value was also strong in June with a 10 per cent increase.

Residential building value in the West, on the other hand, has been slipping further behind its 1965 total with each successive month. The year-to-date gap in housing was 14 per cent at the end of the first quarter, and by mid-year had widened to 17 per cent. Multi-family building accounts for by far the largest part of the decline.

Even a wind this ill has to blow some good, and it's to be found in the latest vacancy statistics. Rental vacancies, which on a national basis have been holding very steady for the past five years or so, have at last shown a significant decline. Most interesting, though, is the fact that the West was responsible for just about all of the drop in the national rate. In the West, where higher-than-average vacancies are the norm, the second quarter decline was especially sharp—*and welcome*. In contrast to the same three-month period of 1965, when the rate was up around 12 per cent, the latest reading stands at a much healthier 9.9 per cent. It appears that at least one of the impediments to a recovery in Western residential building—*the backlog of unoccupied housing left over from the last boom*—is finally being absorbed.

James E. Carlson, Associate Economist
F. W. Dodge Company
A Division of McGraw-Hill, Inc.

Estimator's Guide: San Francisco Bay Area

The Estimator's Guide alternates monthly among four Western areas. These prices have been compiled from average quotations received by LeRoy Construction Services for commercial work of approximately $100,000-$250,000 total value. Except as otherwise noted, prices are for work installed including all labor, material, taxes, overhead and subcontractors' profit. Material prices include local delivery except as noted, but no state or local taxes.

EXCAVATION

MACHINE WORK IN COMMON GROUND
Large basement .....CY .80-1.10
Small pits .....CY 1.20-1.90
Trenches .....CY 1.75-2.50

HAND WORK IN COMMON GROUND
Large pits & trenches .....CY 9.00-14.50
Small pits & trimming .....CY 14.50-17.50
Hard clay or shale, 2 times above rates. Shoring, bracing & disposal of water not included.

SEWER PIPE MATERIALS

VITRIFIED
Standard 4" .....LF .33
Standard 6" .....LF .63
Standard 8" .....LF .92
Standard 12" .....LF 2.03
Standard 24" .....LF 8.12

CLAY DRAIN PIPE
Standard 6" .....LF .32
Standard 8" .....LF .46
Rate for 100 LF FOB Warehouse

CONCRETE & AGGREGATES

GRAVEL, all sizes .....TON 3.75
TOP SAND .....TON 4.00
CONCRETE MIX .....TON 4.10

CRUSHED ROCK
¼" to ¾" .....TON 4.00
¾" to 1½" .....TON 4.00
Lightweight aggregate ....CY 10.75
Expanded Vermiculite .....30# Sack 1.35
ROOFING GRAVEL .....TON 4.10
SAND (#1 & 2) .....TON 5.00

CEMENT
Common, all brands (paper sacks)
Small quantities ...Per Sack 1.40
Large quantities ...Per Bbl. 4.45
Atlas White .....Per Sack 3.80
Concrete Mix
6 stacks in 5-cy loads..Per CY 15.65
Lightweight 105# cy..Per Cy 19.80

CURING COMPOUND
Clear, 5-gal drums ....Per Gal 1.45

STEEL MATERIALS

SHEETS
Hot rolled .....LB .11
Cold rolled .....LB .12
Galvanized .....LB .12
PLATE .....LB .11
STRIPS .....LB .13
STRUCTURAL SHAPES .....LB .115

BARS
Hot rolled .....LB .11
Cold finished .....LB .15
Reinforcing .....LB .105

REINFORCING MESH
6 x 6" #10 x #10 .....SF .04
6 x 6" #6 x #6 .....SF .07
2000# FOB Warehouse

STRUCTURAL STEEL

$400.00 and up per ton erected when out of mill.
$425.00 and up per ton erected when out of stock.

BRICK & BLOCK

BRICKS
Common 2½ x 3¾ x 8¼"..M 59.00
Jumbo 3½ x 3 x 11½" ....M 103.00
Roman Red 3 x 2 x 11½" ..M 84.00
Norman Red 3 x 2½ x 11½" .....M 87.00
Norman Buff .....M 116.00
Antique (used) Brick .....M 69.50
Paving Brick .....M 90.00

MANTEL FIRE BRICK
2½ x 9½ x 4½" .....M 142.00

GLAZED STRUCTURAL UNITS
2 x 6 x 12" Furring .....SF .60
4 x 6 x 12"–1 side .....SF .91
6 x 6 x 12"–1 side .....SF 1.32
4 x 6 x 12"–2 sides .....SF 1.00
Add For Color .....SF .25

CONCRETE BLOCKS
4 x 8 x 16" .....EA .23
6 x 8 x 16" .....EA .29
8 x 8 x 16" .....EA .34
12 x 8 x 16" .....EA .51
Add for color .....EA .02

AGGREGATE
Haydite or Basalite
All sizes in bulk .....CY 6.80

BRICKWORK & MASONRY

BRICK WALLS
Back Up Common 8" .....SF 2.70
Back Up Common 12" .....SF 3.80
Back Up Jumbo 4" .....SF 1.10
Grouted Walls 10" .....SF 3.60

CONCRETE BLOCK, REINFORCED
6" walls .....SF 1.75
8" walls .....SF 1.90
12" Walls .....SF 2.40

GLAZED STRUCTURAL UNITS
Facing 2" .....SF 2.20
Partition 4" .....SF 2.65
Partition 6" .....SF 4.40

BRICK VENEER
4" Select Common .....SF 1.60
4" Roman .....SF 2.10
4" Norman .....SF 2.10
3" Jumbo .....SF 1.30

BUILDING PAPER & FELTS

BUILDING PAPER
1 ply per 1,000-ft roll 4.20
2 ply per 1,000-ft roll 6.40
3 ply per 1,000-ft roll 8.75
Sisalkraft, reinforced, 500-ft roll 9.50

SHEATHING PAPERS
Asphalt sheathing, 15-lb
324 SF roll 2.17
30-lb 216 SF roll 2.93
Dampcourse, 216-ft roll 3.30

FELT PAPERS
Deadening felt,¾-lb, 50 s.y. roll 3.00
1-lb, 50-s.y. roll 3.50

ROOFING PAPERS
Standard grade, smooth surface 432 SF roll,
Light, 45-lb 2.20
Medium, 55-lb 2.63
Heavy, 65-lb 2.85
Mineral surfaced 216 SF roll 3.50

LUMBER

DOUGLAS FIR
Construction
2x4-2x10 MBM 98.00-106.00
Standard
2x4-2x10 MBM 90.00- 98.00
Utility..2x4-2x10 MBM 80.00- 88.00
Economy
2x4-2x10 MBM 60.00- 70.00
Clear, air dried..MBM 200.00-240.00
Clear, kiln dried.MBM 235.00-270.00

REDWOOD
Foundation grade
MBM 140.00-150.00
Construction Heart
MBM120.00-130.00
A Grade .....MBM 230.00-270.00
Clear Heart .....MBM 260.00-290.00

PLYWOOD (DOUGLAS FIR) **MSF**
¼" AB .....MSF 90.00
¼" AD .....MSF 70.00
¼" Ext. waterproof .....MSF 77.00
⅜" AB .....MSF 105.00
⅜" AD .....MSF 95.00
⅜" CD .....MSF 70.00
½" AB .....MSF 140.00
½" AD .....MSF 120.00
½" CD .....MSF 91.00
⅝" AB .....MSF 156.00
⅝" AD .....MSF 136.00
⅝" CD .....MSF 102.00
¾" AB .....MSF 178.00
¾" AD .....MSF 158.00
¾" CD .....MSF 135.00
⅝" Plyform .....MSF 170.00

SHINGLES **Square**
Cedar #1 .....Square 17.00-19.00
Cedar #2 .....Square 14.00-17.00

SHAKES
Cedar
½" to ¾" butt ..Square 19.00-22.00
¾" to 1¼" butt .Square 21.00-24.00
Redwood
¾" to 1¼" butt .Square 21.00-24.00

INSULATION & WALLBOARD

FOB Warehouse

FIBRE GLASS INSULATION
foil backed **Per M SF**
1½" thick 40.75
2½" thick 48.75
3⅝" full thick 58.75

SOFTBOARDS—wood fiber
½" thick 60.00
¾" thick 128.50

ALUMINUM INSULATION
35# Kraft paper with alum. foil
1 side only 24.00
2 sides 30.00

HARDBOARDS—wood fiber
⅛" thick, sheathing 58.00
3/16" thick, sheathing 71.00
¼" thick, sheathing 85.00
⅛" thick, tempered 80.00
3/16" thick, tempered 105.00

CEMENT ASBESTOS BOARD
⅛" flat sheets 145.00
3/16" flat sheets 190.00
¼" flat sheets 255.00

ROUGH CARPENTRY

FRAMING
Floors .....BM .27-.32
Walls .....BM .32-.38
Ceilings .....BM .34-.42
Roofs .....BM .29-.33
Furring & blocking .....BM .45-.70
Bolted framing, add 50%

SHEATHING
1 x 8" straight .....BM .23-.29
1 x 8" diagonal .....BM .26-.31
5/16" plyscord .....SF .19-.24
⅝" plywood CC .....SF .27-.32

SIDING
1 x 8" bevel .....BM .45-.50
1 x 4" V-rustic .....BM .50-.60
Bolted framing, add 50%

DAMPPROOFING & WATERPROOFING

MEMBRANE
1 layer 50-lb. felt .....SQ 12.00
4 layers dampcourse .....SQ 16.00
Hot coat walls .....SQ 10.00
Tricosal added to concrete.CY 1.00
Anti-Hydro added to concrete .....CY 1.50

ROOFING

Asphalt & Gravel **Per Sq**
4 ply 17.00-22.00
5 ply 19.50-25.00
White gravel finish–Add 2.00- 4.00
Asphalt compo. shingles 26.00-32.00
Cedar shingles 26.00-33.00
Cedar shakes 29.00-36.00
Concrete tiles 45.00-65.00
Clay tiles 50.00-80.00

SHEET METAL

ROOF FLASHINGS
18 ga galv steel .....SF .85-1.25
22 ga galv steel .....SF .75-1.15
26 ga galv steel .....SF .65-1.05
18 ga aluminum .....SF 1.30-1.80
22 ga aluminum .....SF 1.10-1.25
26 ga aluminum .....SF 1.00-1.15
24 oz copper .....SF 2.45-2.85
20 oz copper .....SF 2.15-2.55
16 oz copper .....SF 1.85-2.35
26 ga galv. steel
4" OG gutter .....LF 1.20-1.45
Mitres and drops .....EA 2.00-4.00
22 ga galv. louvers
22 oz copper louvers

CHIMNEYS, PATENT

FOB Warehouse

6" .....LF 1.45
8" .....LF 2.05
10" .....LF 2.85
12" .....LF 3.50

Rates for 10-50 LF

MILLWORK

All Prices FOB Mill

D.F., clear,
air dried S4S ..MBM 220.00-250.00
D.F., kiln dried S4S MBM
250.00-300.00

DOOR FRAMES & TRIM
Residential entrance ....17.00 & up
Interior room entrance .. 9.00 & up

DOORS
1⅜" hollow core ..... 8.00 & up
1¾" solid core .....19.00 & up
1⅜" Birch hollow core ..10.00 & up
1¾" Birch solid core ....22.00 & up

WOOD SASH
D/H in pairs (2 lts) .....SF .55
Casement (1 lt) .....SF .65

WOOD CABINETS
¾" D.F. plywood with
¼" plywood backs:
Wall hung .....LF 10.00-15.00
Counter .....LF 12.00-17.00
Birch or maple, add 25%

FINISH CARPENTRY

EXTERIOR TRIM
Fascia and molds .....BM .60-.80

ENTRANCE DOORS & FRAMES
Single ..... 60.00 & up
Double .....100.00 & up

INTERIOR DOORS & FRAMES
Singles .....36.00 & up
Pocket sliding .....46.00 & up
Closet sliding (Pr.) .....52.00 & up

WINDOWS
D/H sash & frames ....SF 2.00 & up
Casement sash &
frames .....SF 2.30 & up

SHELVING
1 x 12 S4S .....BM .30-.50
¾" plywood .....SF .40-.60

STAIRS
Oak steps, D.F. risers
Under 36" wide .....Riser 14.00
Under 60" wide .....Riser 19.00
Newel posts and rail extra

WOOD CASES & CABINETS
D.F. wall hung .....LF 15.50-20.60
D.F. counters .....LF 18.50-25.75

HARDWOOD FLOORING MATERIALS

OAK 5/16" x 2" STRIP
Clear .....M 195.00
Select .....M 190.00
#1 Common .....M 180.00

OAK 5/16" RANDOM PLANK
Select & better .....M 285.00
#1 Common .....M 235.00

OAK 25/32" x 2-¼" T&G
Select .....M 260.00
#1 Common .....M 235.00

MAPLE 25/32" x 2-¼" T&G
#1 Grade .....M 305.00
#2 Grade .....M 280.00
#3 Grade .....M 230.00

NAILS–1" FLOOR BRADS KEG 18.00

HARDWOOD FLOORS

Select Oak
Filled, sanded, stained and varnished
5/16" x 2¼" strip .....SF .50- .55
5/16" random plant .....SF .60- .65
½" x 2" strip .....SF .65- .75
25/32" x 2¼" T&G .....SF .75- .90

MAPLE
2nd grade and better
Filled, sanded, stained & varnished
25/32" x 2½" T&G .....SF .85-1.00
Wax finish, add .....SF .10
Dark stains, add .....SF .05

RESILIENT FLOORING MATERIALS

Linoleum, standard
gage .....SY 2.65-2.85
Linoleum, battleship ...SY 2.95-3.10
⅛" Asphalt tile, dark ...SF .10- .11
⅛" Asphalt tile, light ..SF .14- .16
⅛" Rubber tile .....SF .40- .44
.080 Vinyl tile .....SF .55- .65
.080 Vinyl Asbestos tile .SF .18- .19
⅛" Vinyl tile .....SF .78- .82
4" base, black .....LF .10- .11
4" base, colored .....LF .11- .15
Rubber treads .....LF 1.60-2.30
Linoleum paste .....GAL .75- .90

FLOORS

⅛" Asphalt tile,
dark colors .....SF .23- .28
⅛" Asphalt tile,
light colors .....SF .25- .30
⅛" Rubber tile .....SF .60- .70
.080 Vinyl Asbestos tile .SF .38- .44
.080 Vinyl tile .....SF .75- .85
Linoleum,
standard gage .....SY 3.75-4.25
Linoleum, battleship ...SY 5.25-5.75
4" Rubber base .....LF .25- .35
Rubber stair treads .....LF 2.25-2.75

LATH & PLASTER MATERIALS

METAL LATH
Diamond 3.4# copper-
bearing .....SY .49
Ribbed 3.4#copper
bearing .....SY .53

ROCK LATH
⅜" thick .....SY .36

METAL
¾" Standard channel .....LF .038
1½" Standard channel .....LF .053
3¼" Steel studs .....LF .088
4" Steel studs .....LF .098
Stud shoes .....EA .03

PLASTER
Browning, hardwall .....Sack 1.58
Finish, hardwall .....Sack 1.75
Stucco .....Sack 2.50

LATH & PLASTER WORK

CHANNEL FURRING
Suspended ceilings ....SY 3.10-3.35
Walls .....SY 2.90-3.25

METAL STUD PARTITIONS
3¼" studs .....SY 3.15-3.45
4" studs .....SY 3.30-3.60
Over 10-0 high, add ...SY .25- .35

3.4# METAL LATH & PLASTER
Ceilings .....SY 4.75-5.50
Walls .....SY 4.90-5.65
Keene's cement finish,
add .....SY .45- .65

ROCK LATH & PLASTER
Ceilings .....SY 3.55-4.05
Walls .....SY 3.65-4.15

WIRE MESH & ⅞" STUCCO
Walls .....SY 4.75-6.00

STUCCO ON CONCRETE
Walls .....SY 3.50-4.00
Metal accessories .....LF .25- .55

DRYWALL

METAL STUD PARTITIONS
1⅝" studs .....SF .30
2½" studs .....SF .33
3⅝" studs .....SF .40

DRYWALL
½" Nailed on .....SF .13
½" Screwed on .....SF .15
⅝" Nailed on .....SF .16
⅝" Screwed on .....SF .19
Tape joints .....SF .05

TILE MATERIALS

FOB Warehouse

CERAMIC TILE
4¼ x 4¼" glazed .....SF .72
4¼ x 4¼" hard glazed .....SF .74
Random, unglazed .....SF .72
6 x 2" cap .....EA .31
6" cove base .....EA .31
¼" round bead .....LF .18

QUARRY TILE
6 x 6 x ½" red .....SF .51
6 x 6 x ¾" red .....SF .53
6 x 9 x ¾" red .....SF .65
6 x 6" cove base .....EA .23

TILE & TERRAZZO WORK

CERAMIC TILE, stock colors
Floors .....SF 1.90-2.30
Walls .....SF 2.00-2.50
Cove base .....LF 1.25-1.60

QUARRY TILE
6 x 6 x ½" floors .....SF 1.80-2.20
9 x 9 x ¾" floors .....SF 1.95-2.40

TERRAZZO
Terrazzo floors .....SF 2.15-2.65
Cond. Terrazzo floors ..SF 2.30-2.80
Precast treads & risers ..LF 3.60-4.60
Precast landing slabs ...SF 3.00-4.10

WINDOWS

STEEL SASH
Under 10 SF .....SF 2.50 & up
Under 15 SF .....SF 2.00 & up
Under 20 SF .....SF 1.50 & up
Under 30 SF .....SF 1.00 & up

ALUMINUM SASH
Under 10 SF .....SF 2.75 & up
Under 15 SF .....SF 2.25 & up
Under 20 SF .....SF 1.75 & up
Under 30 SF .....SF 1.25 & up
Above rates are for standard sections and stock sizes, FOB Warehouse

GLASS—CUT TO SIZE

FOB Warehouse

SSB Clear, aver 4 SF .....SF .17
DSB Clear, aver 7 SF .....SF .28
Crystal, aver 16 SF .....SF .35
¼" Polished plate, aver
50 SF .....SF .90
⅛" Obscure, aver 7 SF .....SF .35
⅛" Ribbed, aver 7 SF .....SF .45
⅛" Rough, aver 7 SF .....SF .45
¼" Wire plate, clear,
aver 40 SF .....SF 1.90
¼" Wire plate, rough,
aver 40 SF .....SF .90
⅛" Heat absorbing,
aver 7 SF .....SF .90
¼" Tempered plate,
aver 40 SF .....SF 3.60
½" Tempered plate,
aver 40 SF .....SF 6.40

GLASS BLOCKS
6" .....EA .70
8" .....EA 1.15
12" .....EA 3.10

GLASS & GLAZING

SSB Clear .....SF .55
DSB Clear .....SF .80
Crystal .....SF .95
¼" Plate .....SF 2.00
⅛" Obscure .....SF .80
⅛" Heat Absorbing .....SF 1.35
¼" Tempered plate .....SF 4.75
½" Tempered plate .....SF 9.00
¼" Wire plate, clear .....SF 2.90
¼" Wire plate, rough .....SF 1.50

PAINT MATERIALS

All prices FOB Warehouse

Thinners 5-100 gal .....Gal .63
Turpentine 5-100 gal .....Gal 1.59
Linseed oil, raw .....Gal 2.36
Linseed oil, boiled .....Gal 2.43
Primer-sealer .....Gal 3.12
Enamel undercoaters .....Gal 5.54
Enamel .....Gal 5.58
White lead in oil .....LB .36
Red lead in oil .....LB .36
Litherage .....LB .32

PAINTING

EXTERIOR
Stucco wash,
1 Coat .....SY .50
2 Coats .....SY .90
Lead & Oil,
2 coats .....SY 1.20
3 coats .....SY 1.75

INTERIOR
Primer-sealer .....SY .54
Wall paint,
1 coat .....SY .63
2 coats .....SY 1.05
Enamel,
1 coat .....SY .70
2 coats .....SY 1.30
Doors & trim .....EA 15.00
Sash & trim .....EA 17.50
Base & molds .....LF .20
Old work, add 15-30%

VENETIAN BLINDS

RESIDENTIAL .....SF .45 & up
COMMERCIAL .....SF .55 & up
VERTICAL .....SF 1.25 & up

PLUMBING

Lavatories .....EA 280.00-350.00
Toilets .....EA 350.00-450.00
Bath tubs .....EA 410.00-500.00
Stall shower .....EA 250.00-340.00
Sinks .....EA 280.00-380.00
Laundry trays .....EA 160.00-270.00
Water heaters .....EA 135.00-450.00
Prices based on average residential and commercial work. Special fixtures and excessive piping not included.

HEATING

Furnaces–Gas-Fired, Average Job

FLOOR FURNACE
25,000 BTU .....EA 145.00-175.00
35,000 BTU 155.00-180.00
45,000 BTU .....EA 180.00-210.00
Automatic control,
add .....EA 42.00- 55.00

DUAL WALL FURNACE
25,000 BTU .....EA 180.00-220.00
35,000 BTU .....EA 190.00-230.00
50,000 BTU .....EA 215.00-245.00
Automatic control,
add .....EA 55.00- 70.00

FORCED WITH DUCTS
60,000 BTU .....EA 420.00-540.00
80,000 BTU .....EA 470.00-560.00
100,000 BTU .....EA 510.00-675.00
120,000 BTU .....EA 590.00-710.00

HEAT REGISTERS
Outlet 20.00-45.00

ELECTRIC WIRING

Per Outlet

Knob & Tube ..... EA 15.00
Armor .....EA 22.00
Conduit .....EA 28.00
110-V Circuit .....EA 35.00
220-V Circuit Range .....EA 124.00

ELEVATORS & ESCALATORS

Prices vary according to capacity, speed and type.
Consult elevator companies.
Slow speed apartment house elevators, including doors and trim about $3,500 per floor.

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REMINDER

Except for genuine hardship cases, volume mailers must pre-sort by Zip Code on or before January 1, 1967

The Zip Code deadline is January 1, 1967.

After that, only mail that is properly Zip-coded will be eligible for Second Class and Third Class Bulk rates. Unzipped mail will be accepted *only at the higher single piece rate.*

If you have not Zipped yet, you had better start right now!

Plenty of help is available. Both the U.S. Post Office and many private companies in the "mail sector" have already helped thousands of companies to Zip their lists quickly and efficiently. To help speed up your Zip conversion:

1. Call your local Postmaster. He will advise you on ways and means of converting to Zip, and show you how the Post Office can supply the Zip numbers you need for a nominal fee of only $1.50 per thousand.
2. Talk to your lettershop, addressing equipment salesmen, computer firms and other mail-oriented suppliers. They have developed many ingenious methods for Zipping lists at minimum cost to you.

Zip Code is here to stay!

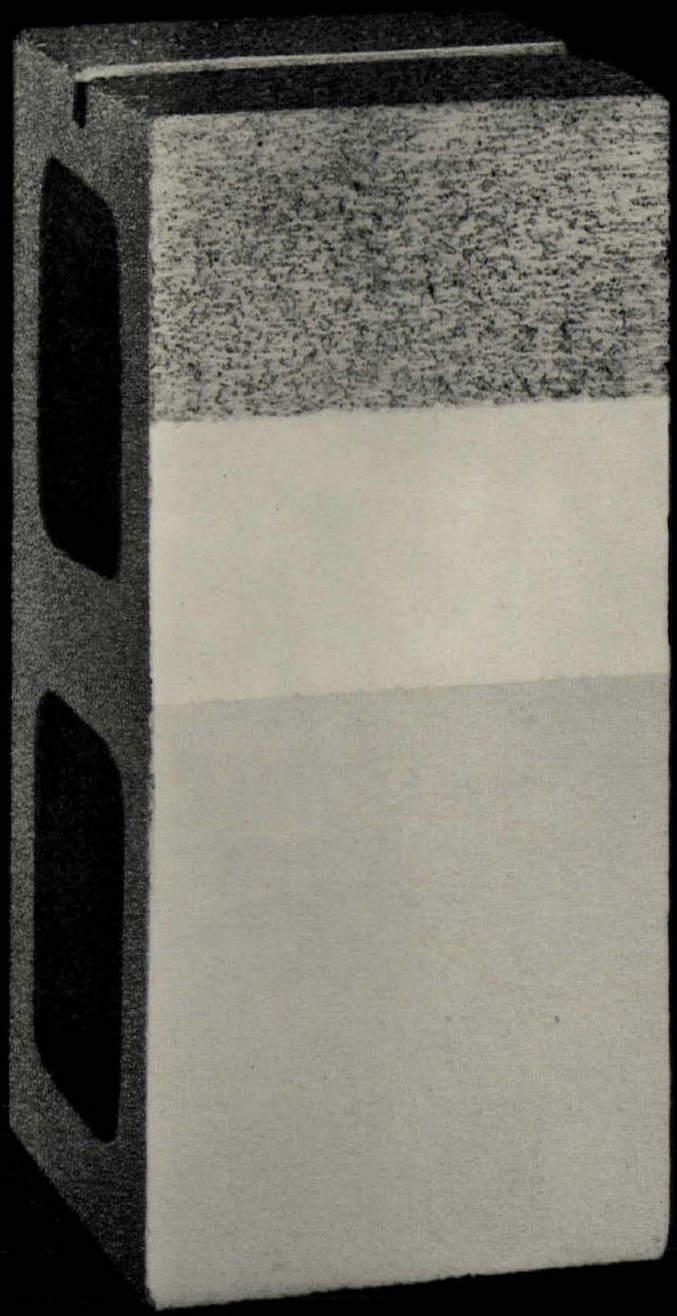
Most businessmen clearly recognize that only through the modern Zip Code system can the Post Office hope to offer low bulk rates. But many are also learning to their surprise that Zip Code offers additional benefits to them.

During Zip conversion it is easy to clean your list of duplicate and dead addresses. Zip filing order makes "look-ups" quicker and easier. Zip Codes are already speeding mail deliveries, and a number of businesses find that Zip territorial divisions are useful tools in marketing, sales and other unexpected areas.

IMPORTANT

Extensions will be given to mailers who can demonstrate that they have made a substantial effort in good faith to comply with the deadline but are unable to do so because of circumstances beyond their control. To apply for a hardship extension, contact your local Postmaster at once. Do not wait until the last minute.

Remember: Zip Code means better postal service at lowest cost to you. There are and will be problems for all of us to solve. But we can be sure of one fact: January 1 starts a whole new era of postal efficiency and economy that will benefit your government, your customers and your business.



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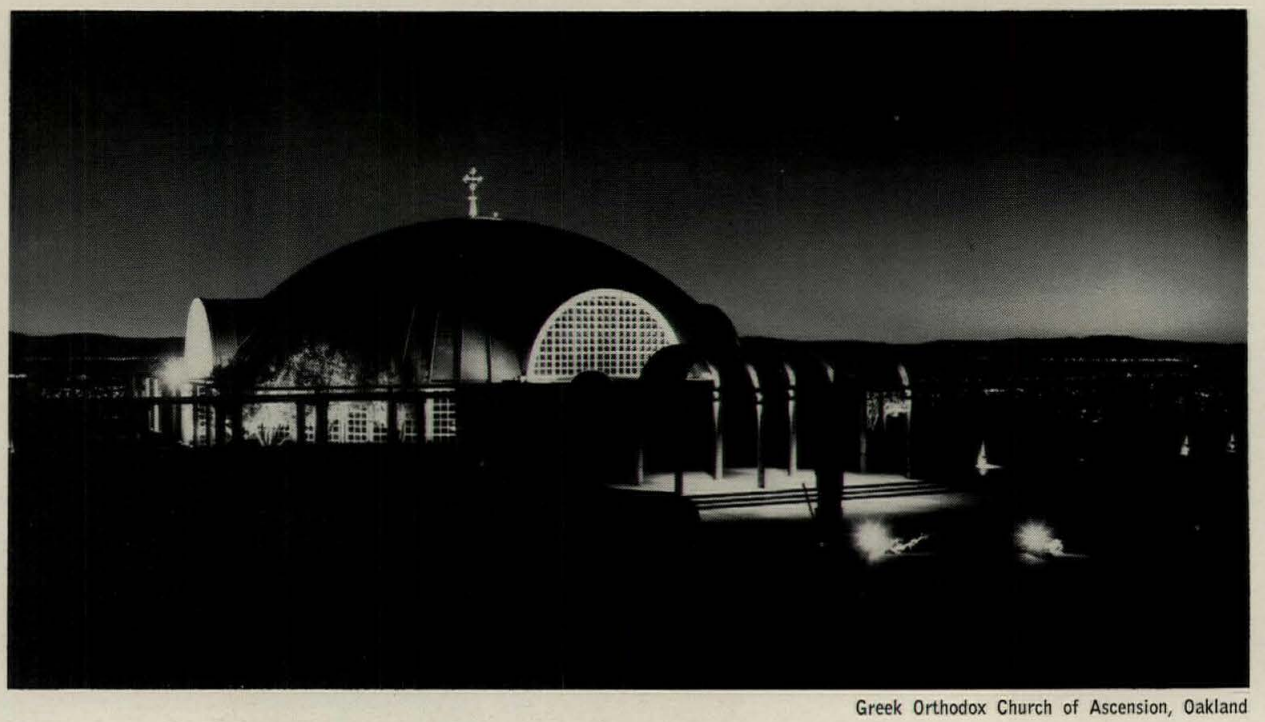
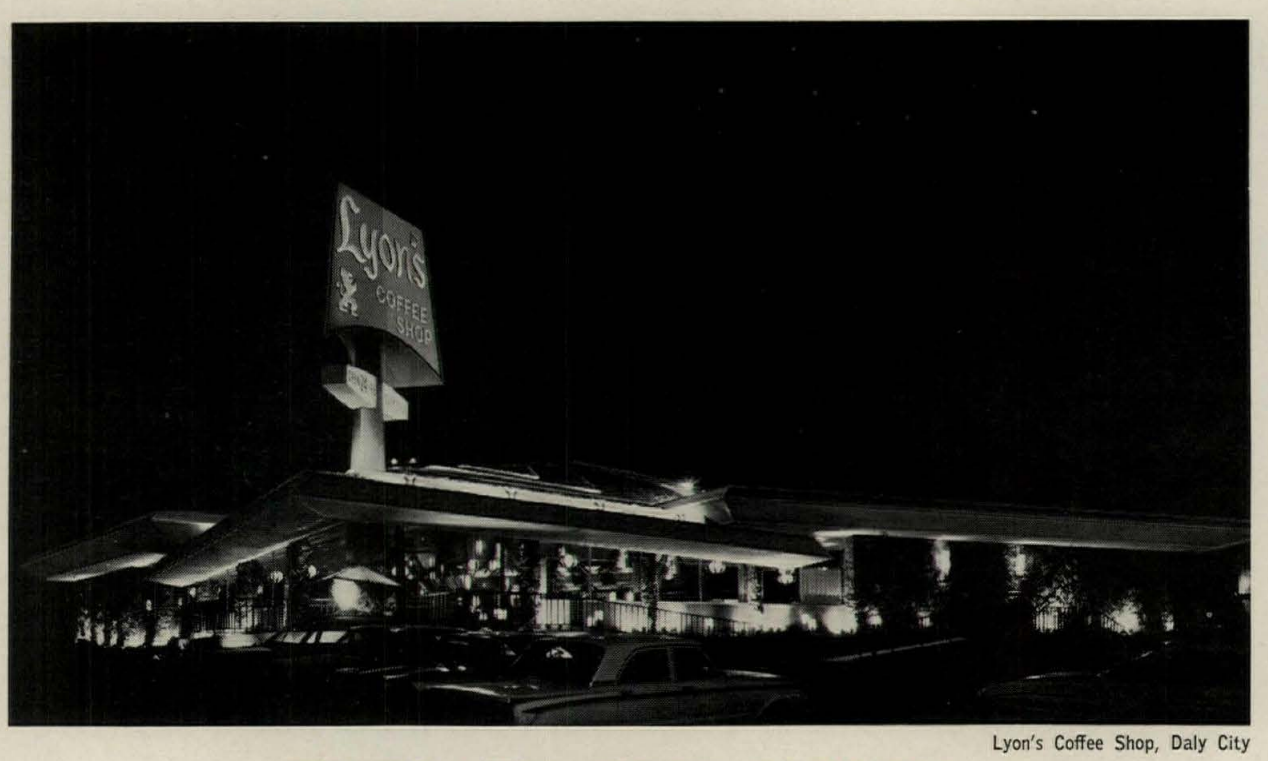


Greek Orthodox Church of Ascension, Oakland

FLOODLIGHTING—AN INSPIRING IDEA



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THAT'S ALSO GOOD BUSINESS.

Floodlighting is a rewarding way to enhance an image or build a business. It dramatizes a building, increases safety and builds good will. Don't keep your clients' buildings in the dark after nightfall. You can get more information on floodlighting—plus names of local suppliers—from your nearest PG&E office. Just give us a call.

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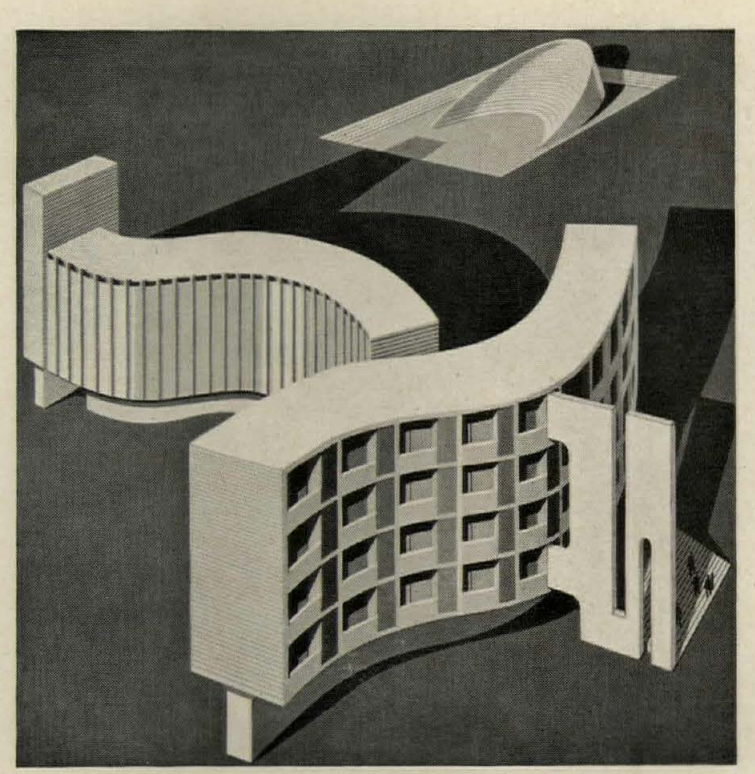

Today's universities and colleges need modern communications: dormitory room phones, Tele-Lecture, Data-Phone* service, closed-circuit TV facilities, teletypewriter.

These complex communication services are essential not only in colleges but in all types of major buildings—plan for them in the blueprint stage and avoid costly alterations and unsightly wiring later.

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For further information on communications planning,
see Sweet's Architectural File 33a/Be
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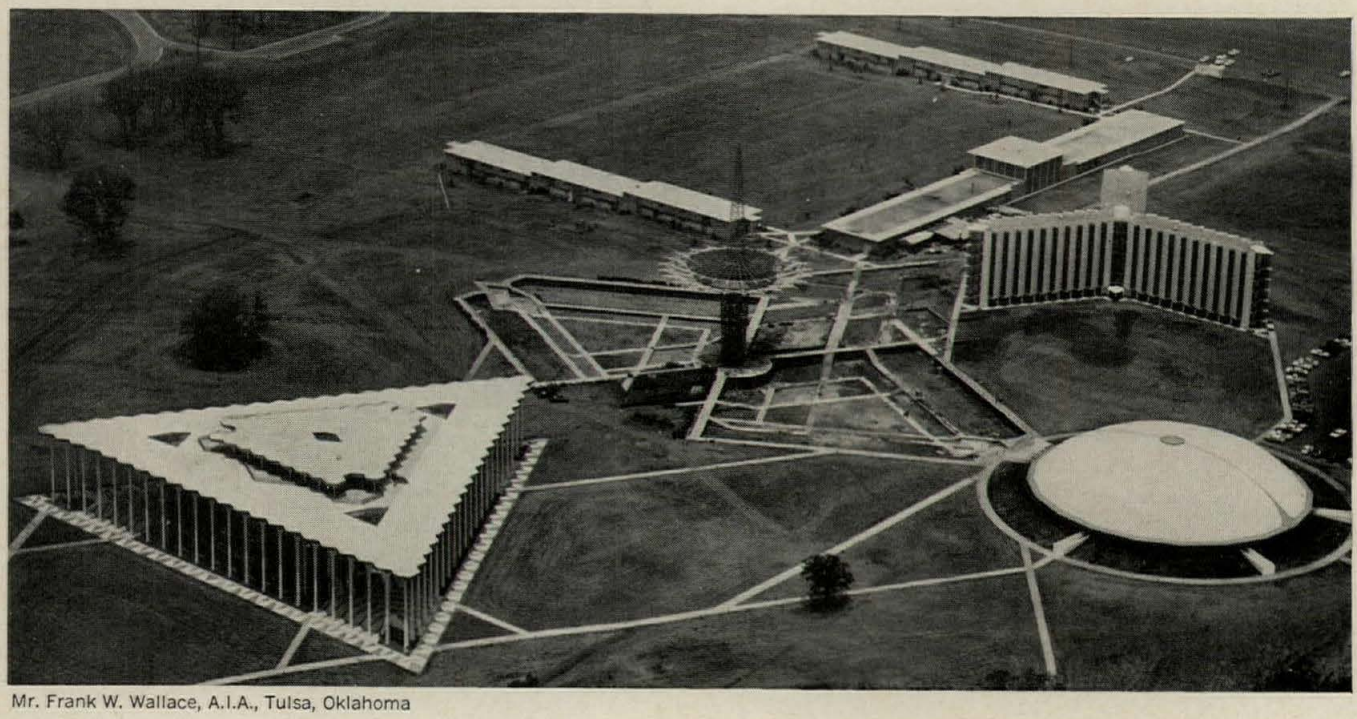
Educational advance:



Mr. Frank W. Wallace, A.I.A., Tulsa, Oklahoma

This new university supplies all its energy needs with Solar Gas turbines.

Closed circuit TV and push-button audio visual aids are just a sample of Tulsa's advanced new Oral Roberts University plant. On the economy side: a Gas Total Energy system.

Two Solar 1100 hp gas turbines drive electric generators for all the lighting and other power needs. They also energize exhaust heat boilers to provide heating and absorption-chiller cooling. Temperatures are regulated from a central control. Electrical controls are unattended. And the big advantage: low operating costs, proven during the past year's service, will offset system expenditures in 5 years.

When the current Oral Roberts University campus of 7 buildings is expanded, the system will grow along with it... using three more Solar gas turbines. Learn more about Solar and Gas Total Energy. Call your local Gas Company Sales Engineer. Or write: Solar, a Division of International Harvester Company, Dept. 0-500, San Diego, California 92112.

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For more data, circle 36 on inquiry card

Birmingham announces competition for civic center

A two-stage national competition for a $25 million Civic Activities Center on a 23-acre site in downtown Birmingham, Alabama has been announced by the Birmingham-Jefferson Civic Center Authority. The program calls for a center consisting of a sports and convention coliseum, a concert hall, a theater, an exhibition hall and a restaurant, meeting rooms, parking and other allied facilities. The A.I.A.-approved competition is open to any architect in the United States who has been licensed to practice anywhere in the U.S. for at least four years. Deadline for registration is September 24, with first-stage proposals due by November 1. First prize will be $25,000 payable towards the commission. Second prize is $15,000 and third prize, $5,000. Each of the eight finalists will receive an honorarium of $5,000. Serving on the jury will be architects Max Abramovitz, Gyo Obata and John Carl Warnecke; Harold Burris-Meyer, director of the University Theater, Florida Atlantic University; and John Fernald, Fellow of the Royal Society of Arts, London. The program can be obtained by writing William A. Briggs, A.I.A. Professional Adviser, Box 18038, Richmond, Virginia 23222.

Belgian architect awarded first "Le Corbusier Prize"

Belgian architect Etienne Dusart has been awarded by the Athens Center of Ekistics the first "Le Corbusier Prize" of $1000 for the study "The Lesson of the Islands." Shown above is a drawing of the Village of Skiros, one of the 400 sketches contained in Mr. Dusart's study. The prize is awarded for a study on "anonymous" Greek architecture or planning. Chairman of the jury which judged 11 entries was C. A. Doxiadis, president of the Ekistics Center.

Casper Hegner leaves GSA post

Casper F. Hegner, the first architect to be named Commissioner of Public Buildings in the General Services Administration, Washington, D.C. has left his post after just over eight months' service. His deputy, William A. Schmidt, was named Acting Commissioner. Mr. Hegner has returned to the Veterans Administration where he had been from 1962 to 1965 Manager of Operations in the construction office, as Technical Assistant to the Assistant Administrator for Construction.

New York City Mayor proposes "vest pocket" housing

Mayor John V. Lindsay of New York City has proposed that over half of the city's 1965-66 public housing allotment from the Department of Housing and Urban Development be devoted to the rehabilitation of structurally sound dwellings or "vest pocket" construction in five core areas throughout the city. The philosophy behind the program is to avoid huge developments of high-rise buildings which upset neighborhood patterns and force large-scale relocation of families. "The sudden influx of large numbers of new families," said Mayor Lindsay to the members of the Board of Estimate, "tended to upset the fabric of the community." The Mayor also deplored the resulting destruction of neighborhood stores.

At the same time Mayor Lindsay defined three objectives for the siting of public housing: (1) public housing will be placed, wherever possible, on vacant land, limiting any one development so that it will not be a massive project; (2) sites will be chosen to achieve both economic and racial integration of neighborhoods; and (3) supporting facilities will be developed to integrate the public housing into the community.

New York State forms Council on Architecture

The State of New York will soon have a five-member Council on Architecture, with at least three of its members being registered architects. Sponsor of the bill, which has now been signed into law with a $50,000 appropriation, is State Senator Whitney North Seymour Jr. of Manhattan. Purpose of the Council, according to Senator Seymour, will be twofold: "To let architects rather than budget directors influence state buildings and to give direct financial assistance to local communities for the renovation of publicly-owned historically and architecturally important buildings." The Council will also seek to include works of fine art in public buildings.

Academic appointments

John E. Burchard has been appointed Acting Dean of the College of Environmental Design at the University of California, Berkeley, succeeding Dean Martin Meyerson who is leaving to become President of the State University of New York at Buffalo. Mr. Burchard went to Berkeley in 1964 as Visiting Professor of Environmental Design and during the past academic year was Acting Chairman of the Department of Design. He had been Dean of the School of Humanities and Social Science at the Massachusetts Institute of Technology for 16 years and was for three years a consulting editor of ARCHITECTURAL RECORD.

Jack H. Swing has been appointed Chairman of the Department of Architecture at the University of Illinois, Urbana, succeeding Professor Granville S. Keith who retired at the end of the academic year. Mr. Swing was with the Perkins & Will Partnership, Chicago, in 1951-52; the Chicago Park District from 1952-55, and was a partner in the firm of McPherson, Swing and Associates from 1955-61. He joined the University faculty in 1959 and has degrees in both architecture and landscape architecture.

A.I.S.C. cites seven buildings in seventh annual competition

The American Institute of Steel Construction has given four awards of excellence and three awards of merit in its seventh annual competition for "beautiful steel-frame buildings." Serving on the awards jury were architects Lawrence B. Anderson, Mario J. Ciampi, Charles M. Nes, Jr., and John C. Portman, Jr., and consulting engineer Dr. Lev Zetlin.

Winning awards of architectural excellence were: The Chicago Civic Center—C. F. Murphy Associates, supervising architect, and Skidmore, Owings & Merrill and Loebl, Schlossman, Bennett & Dart, associate architects; The Equitable Building, Chicago—Skidmore, Owings & Merrill, architect; Inland Steel Products Company, Milwaukee—William P. Wenzler, Architect and Associates, Inc.; and Birmingham Bloomfield Bank, Wixom, Michigan—Ziegelman and Ziegelman, architects. Winning architectural awards of merit were The Atlanta Stadium—Heery and Heery and Finch, Alexander, Barnes, Rothschild and Paschall, associated architects; State Street Bank Building, Boston—Pearl Street Associates, a joint venture of F. A. Stahl & Associates, Hugh Stubbins & Associates, and William J. LeMessurier Associates, architects; and First Federal Building, Detroit—Smith, Hinchman & Grylls Associates, architect.

Hans Namuth

Eero Saarinen's firm changes its name

The architectural firm of Eero Saarinen and Associates, Hamden, Connecticut has changed its name to Kevin Roche John Dinkeloo and Associates, complying with the wish of Mr. Saarinen, expressed specifically in his partnership agreement, that the title be changed within a five-year period following his death, when the new leaders of the firm would have emerged. Mr. Roche, 44 (right in photo), and Mr. Dinkeloo, 48, head a staff of 102 engaged in major projects in 13 states and several foreign countries.

The new firm evolved from the one formed by Mr. Saarinen in 1950 which in turn was preceded by the partnership of Eliel and Eero Saarinen formed in 1937. Since Eero Saarinen's death in 1961, the firm has continued as a partnership of Roche, Dinkeloo and Joseph N. Lacy. Mr. Lacy is now retiring from active practice, but will continue in an advisory capacity as a consulting architect. From its formation in 1950 to Eero Saarinen's death in 1961, the Saarinen firm undertook $177 million in construction. Since 1961, $158 million in work has been added.

P.C.I. honors 15 structures in annual award program

Fifteen structures of diverse types in the United States and Canada have been cited in the 1966 Prestressed Concrete Institute awards program. Serving on the jury were architects Morris Ketchum Jr., chairman, R. Jackson Smith, John C. Parkin and Gene Leedy; J. Neils Thompson, president, National Society of Professional Engineers; and William J. Hedley, president, American Society of Civil Engineers. The jury praised "the high quality demonstrated throughout the entire group of submissions."

Receiving equivalent awards for excellence of design using precast and prestressed concrete were: Greenbriar Shopping Center, Atlanta—Edwards and Portman, architects; the S. I. Newhouse Communications Center, Syracuse University—I. M. Pei and Associates, architects; Estancia High School, Newport Beach, California—William E. Blurock & Associates, architects; The First National Bank Building, San Diego—Tucker, Sadler and Bennett, architects and engineers; Children's Hospital Medical Center Parking Garage, Boston—The Architects Collaborative, architects; Bank of Park Forest, Illinois—Fridstein & Fitch, architects; Central Mall and Transportation Center, Simon Fraser University, Burnaby Mountain, British Columbia—Erickson/Massey Architects; and the Lytton Savings and Loan Association Buildings in Oakland and Canoga Park, California—Kurt Meyer & Associates, architects.

Also, Laboratory of the Research Council of Alberta, Edmonton—Bell, McCulloch, Spotowski Associates, architects; Century Building, Seattle—Bystrom & Greco, Architects; LaGuardia Airport Runway Extensions, New York—The Port of New York Authority Engineering Department; Cascade Orchards Bridge near Leavenworth, Washington—Arvid Grant & Associates, engineers; Los Penasquitos Creek Bridge, San Diego County—California Division of Highways, architects and engineers; and Laurentian Autoroute Bridge, near Ste-Adele, Quebec—Regis Trudeau & Associates, consulting engineers.

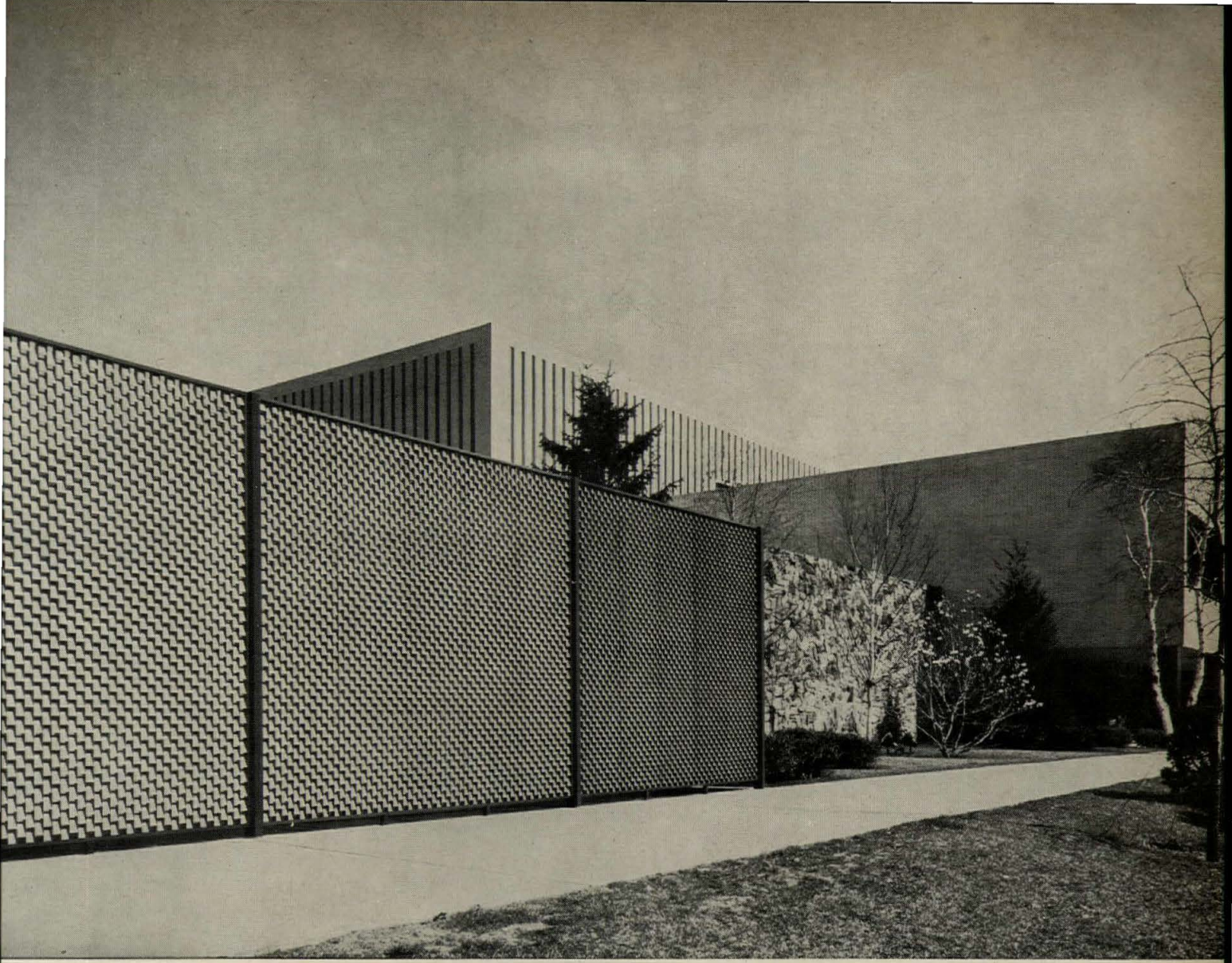
Chase Ltd., photo

Douglas Orr, past president of the A.I.A., dead at 74

Douglas William Orr, F.A.I.A., a practicing architect with offices in New Haven, Connecticut for 47 years, and a past president of the American Institute of Architects, died at his home in Stony Creek, Connecticut at age 74. As A.I.A. president from 1947 to 1949, Mr. Orr supervised the renovation of the Institute's headquarters, the Octagon House, organized committees to foster collaboration between architects and builders; organized a committee on atomic-age architecture; and initiated the annual Honor Awards Program. Mr. Orr was a member of the National Academy of Design and was an honorary corresponding member of the Royal Institute of British Architects. He was vice chairman and the only architect on the six-man Commission on Renovation of the Executive Mansion, Washington, D.C., in 1948. In 1963 his firm became a partnership now known as the Office of Douglas Orr, deCossy, Winder and Associates, Architects. The firm will continue under this name at its present offices, 111 Whitney Avenue.

World Trade Center will start construction

The twin 110-story tower World Trade Center in Lower Manhattan, designed by Minoru Yamasaki for The Port of New York Authority, will start construction soon, following a settlement of its dispute with the City of New York. The dispute centered on the question of how much money the Authority would pay the city in lieu of taxes on the 16-acre site. In addition to the World Trade Center, Mayor Lindsay's office said other Port Authority projects given momentum by the agreement included: the creation of 28 acres of landfill on the Lower Manhattan waterfront (one of the proposals in the Lower Manhattan Report—July, page 35); the determination of the economic feasibility of a consolidated steamship passenger terminal along the Manhattan Hudson waterfront; and a $1,600,000 cargo handling facility along Brooklyn piers. In line with the agreement, bids were open last month for over $100 million of Trade Center construction work.



Architect: Abbott, Merkt & Co., New York City

BORDEN ARCHITECTURAL DECOR PANELS: DECA-GRID

Shown above: Custom-designed Borden Deca-Grid panels with tilted spacers, used to separate and screen the service area at Saks in Garden City, Long Island.

With the Deca-Grid style, specifications for spacings and spacer bar positions may be varied almost indefinitely. Another variation available for Deca-Grid is known as the Slant-Tab variation—here the spacers are mounted at angles of 30°, 45°, 60° or 90° and the spacers (called Slant-Tabs) may be altered in length, depending on angle of mounting selected.

All the Borden Decor Panel styles, including Deca-Grid Deca-Gril, Deca-Ring and Decor-Plank, are highly versatile in design specification and in application such as for facades, dividers, grilles, fencing, refacing of existing buildings, etc. Fabricated in standard or custom designs in sturdy, lightweight aluminum, Borden Architectural Decor Panels provide a handsome, flexible, maintenance-free building component.

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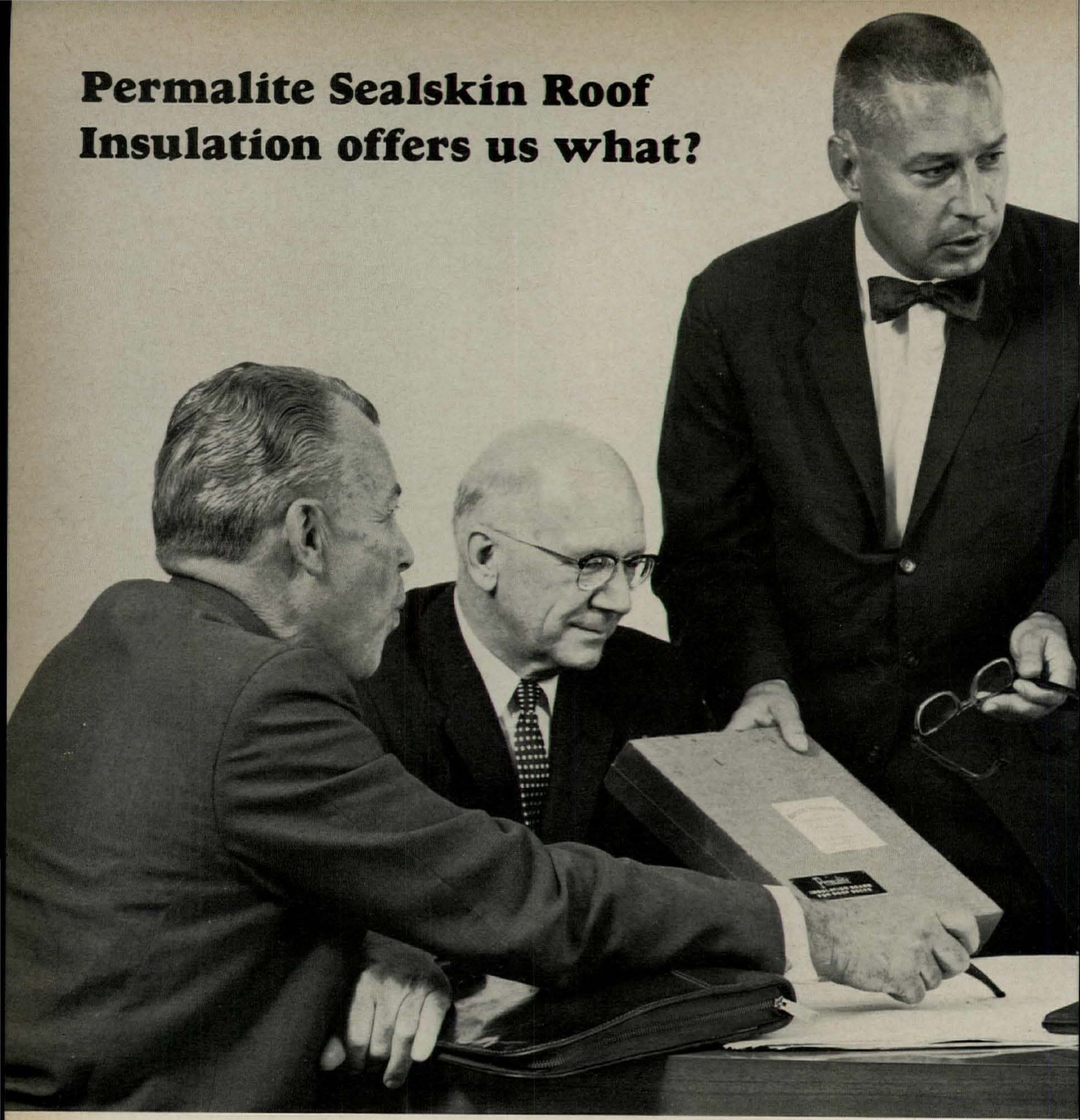

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Vapor Permeability	25 Perms @ 73° F. and 51% Relative Humidity
Concentration Load Indentation	1/16″ @ 77 lbs.
Compression Resistance	185 PSI (50% Consolidation)
Fungus Resistance	Complete
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Smoke Developed	5
Wt./Sq. Ft./1″ Thick	0.8 lbs. Approx.

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For more data, circle 38 on inquiry card

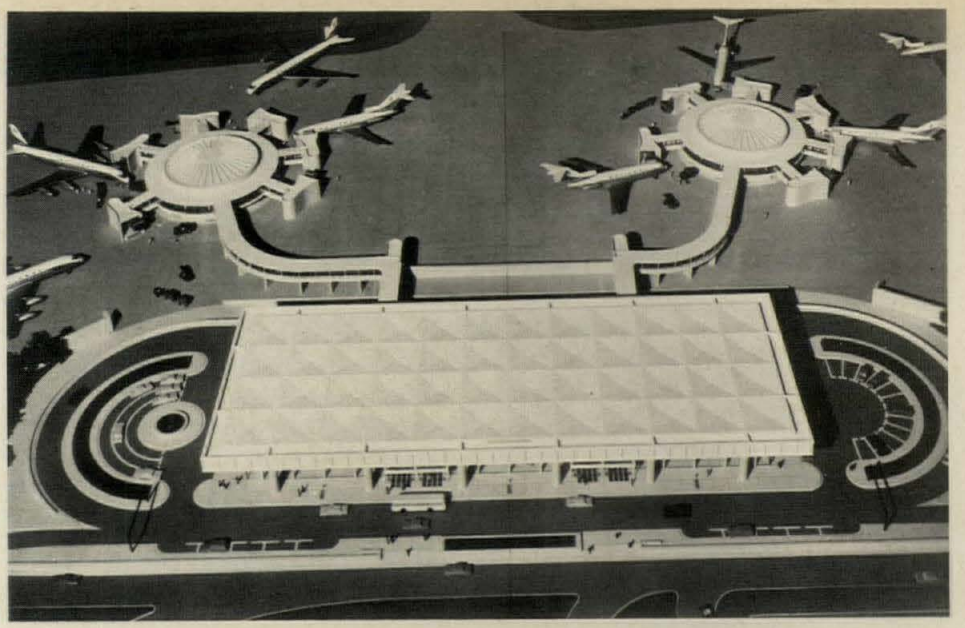
Lens-Art Photos

The South Wing of the Detroit Institute of Arts, designed by Harley, Ellington, Cowin and Stirton, Inc., with Gunnar Birkerts Associates as design consultants, is surfaced with dark gray polished granite to create a backdrop for the Institute's existing ornate, weathered white marble structure. Tinted glass windows, placed at corners, provide subdued daylight throughout the building. The new three-story wing provides 38 galleries. Gallery walls are covered with neutral linen stretched over plywood. Lighting includes a specially designed 500-watt quartz iodine lamp for over-all effects and movable spotlights. General contractor: Barton-Malow Company.

Balthazar

A 300-unit apartment building *(left)* in Ann Arbor, Michigan, designed by King & Lewis Architects, Inc., makes use of reinforced concrete shear walls as the sole supporting structure. The exterior spaces between structure members of the 26-story tower will be enclosed in bronze-toned glass and metal curtain wall. Exterior concrete will be sandblasted to expose textured aggregate surface. General contractor is R. E. Dailey Construction Company.

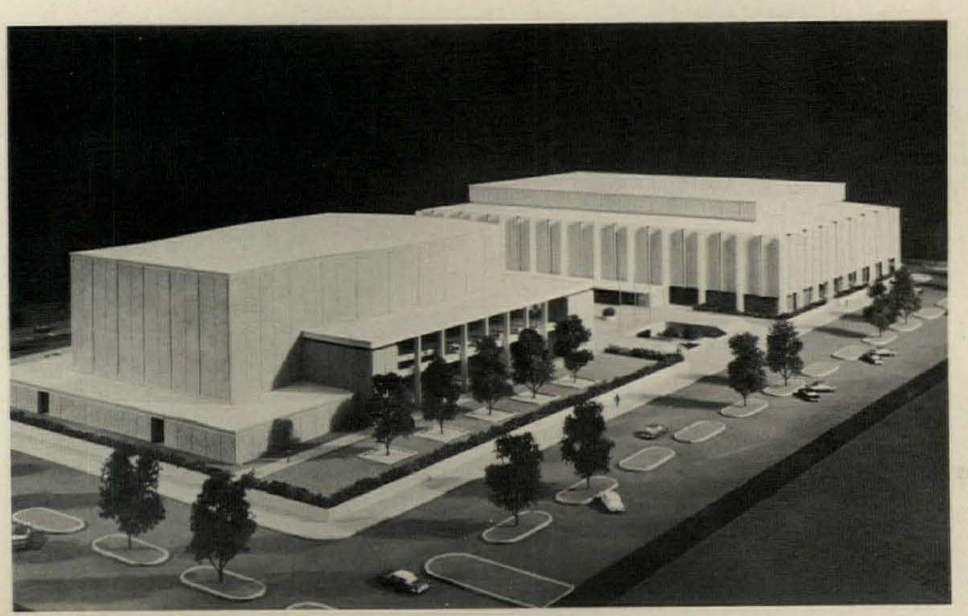
A 28-story office building *(right)* in Portland, Oregon has been designed by the Portland office of Skidmore, Owings & Merrill as headquarters for the Georgia-Pacific Corporation. It will be a 97- by 158-foot tower on a 200- by 200-foot three-level base. The structure, which will cost over $10 million, will provide 500,000 square feet of floor space. It will have two levels of underground parking.



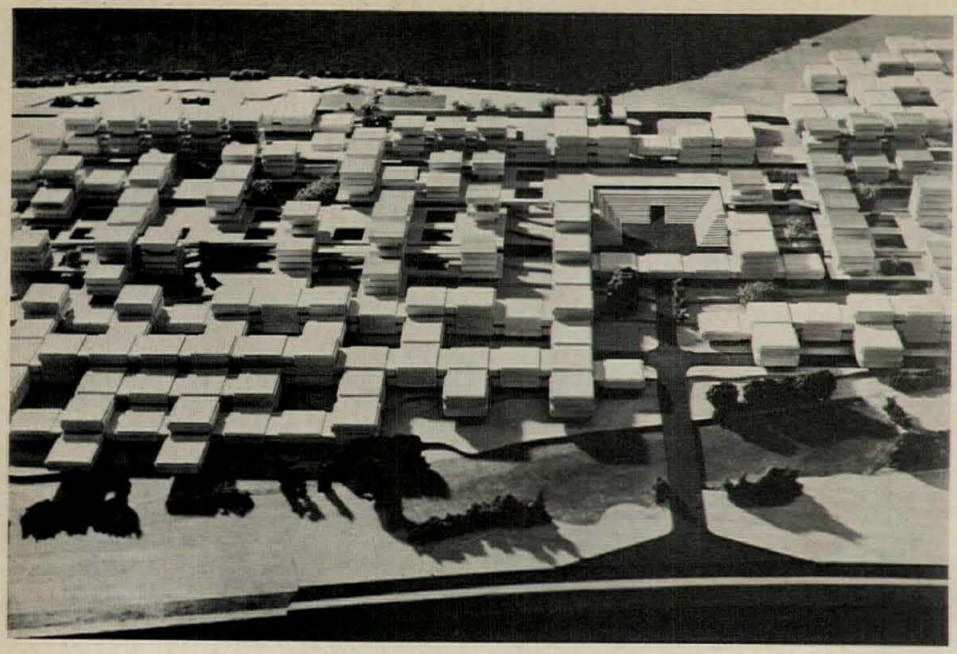
The National Airlines passenger terminal at John F. Kennedy International Airport, New York, designed by I. M. Pei & Associates, will have a main building connected by glass-enclosed bridges to two circular satellite buildings, each having six loading gates. The main building will have a steel truss-framed roof supported by free-standing concrete columns. Glass walls will enclose the two-story structure. Completion is set for late 1968.

Balthazar

A new theater at the University of Michigan, Ann Arbor, designed by Kevin Roche John Dinkeloo and Associates with Jo Mielziner, stage and lighting consultant and co-designer, will seat 1426 with no seat farther than 67 feet from stage. The stage will be adaptable from proscenium to thrust type. Exterior will have an exposed aggregate colonnade with the recessed wall of the lobby being glazed.

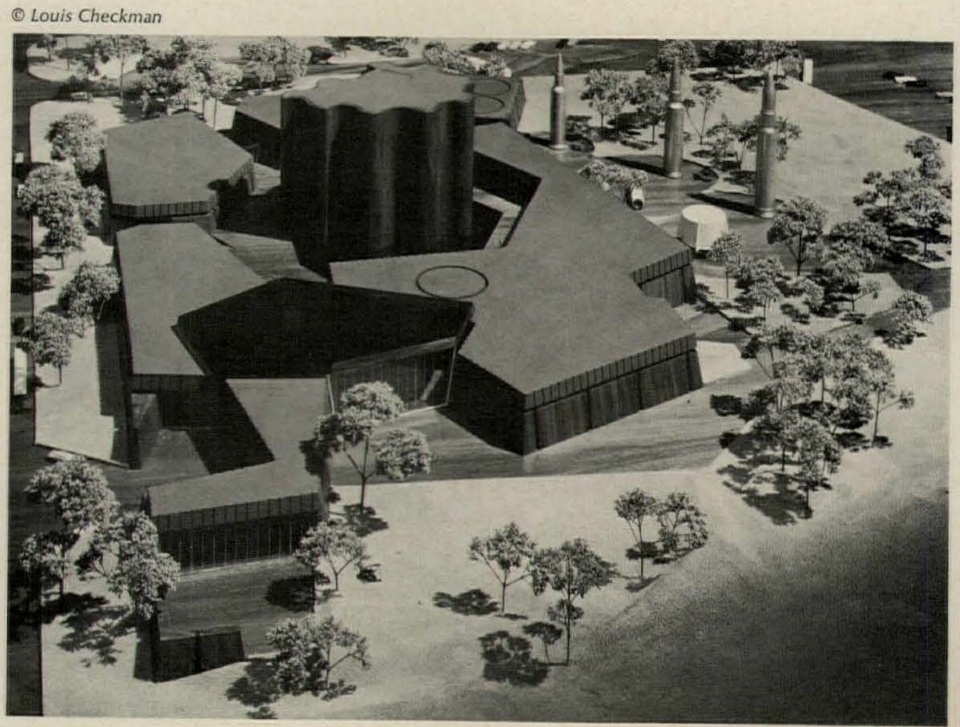


The civic center for Roanoke, Virginia, has been designed by an associated group of Roanoke architects and engineers consisting of Smithey & Boynton, architects, Thompson & Payne, architects, Randolph Frantz & John Chappelear, architects, and Sowers, Rodes & Whitescarver, engineers. It will be a two-building, $7 million complex organized on a plaza. The center will consist of an 11,000-seat coliseum, an auditorium-theater seating 2,460 and an exhibit hall under the plaza.



A new campus for Loughborough University of Technology, England, on a 90-acre site adjacent to the present campus, designed by Arup Associates, architects and engineers, will utilize molecular construction using multiples of 50-foot-squares located on a master grid. The campus centers about a 150-foot square forum. Also at center are areas of student and staff activity. These will be flanked by residence halls which will be surrounded by the academic area. Purpose of the plan is to give "total education" on a round-the-clock basis. The modular plan also simplifies construction and allows total flexibility for expansion. Eleven dormitories will house 3,000 students. Total cost: $42 million.

A revised design for the United States Courthouse and Federal Office Building, Philadelphia, has been approved by a three-man subcommittee of the General Services Administration's architectural advisory panel and by GSA. Design and siting of the project, designed by the architectural firms of Carroll, Grisdale and Van Alen, Stewart, Noble, Class & Partners, and Bellante and Clauss had been the cause of some local controversy last year (September 1965, page 35). The complex consists of a 22-story courthouse tower and a 10-story office building connected by two parallel one-story wings forming an atrium.



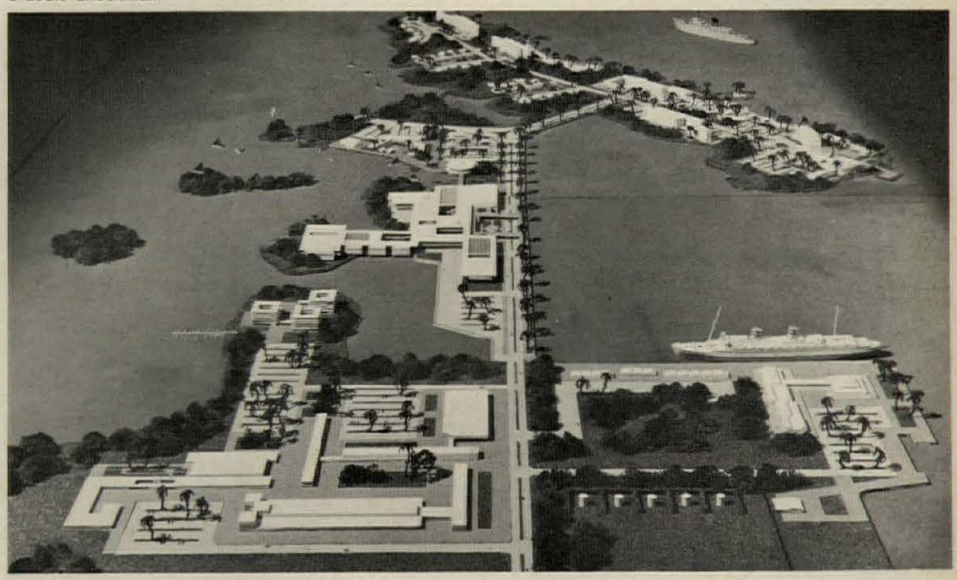
A $7.5-million education complex, designed by the Office of Max O. Urbahn, architects, around the Hall of Science Building at the site of the New York World's Fair will add a nuclear science center (right) and a multi-unit education and exhibit building. The first-phase structures will essentially house exhibit areas, classrooms, laboratories and administrative facilities, adding 125,000 square feet to the project. Construction will probably be of concrete with aluminum roof. The Hall of Science Building was designed by Harrison & Abramovitz.

Lens-Art Photographers

A metropolitan stadium proposed for the Michigan State Fair Grounds, Detroit, and designed by Louis G. Redstone Architects Inc., would have a dome made of a uniform translucent acrylic plastic skylight suspended from a separate structural system above the skylight, thus preventing baseballs from being lost in dark areas. The circular structure will have a six-level parking deck for 10,000 cars around its perimeter as well as parking for 10,000 cars on surface lots. The stadium would seat 63,000 for baseball, 67,000 for football.

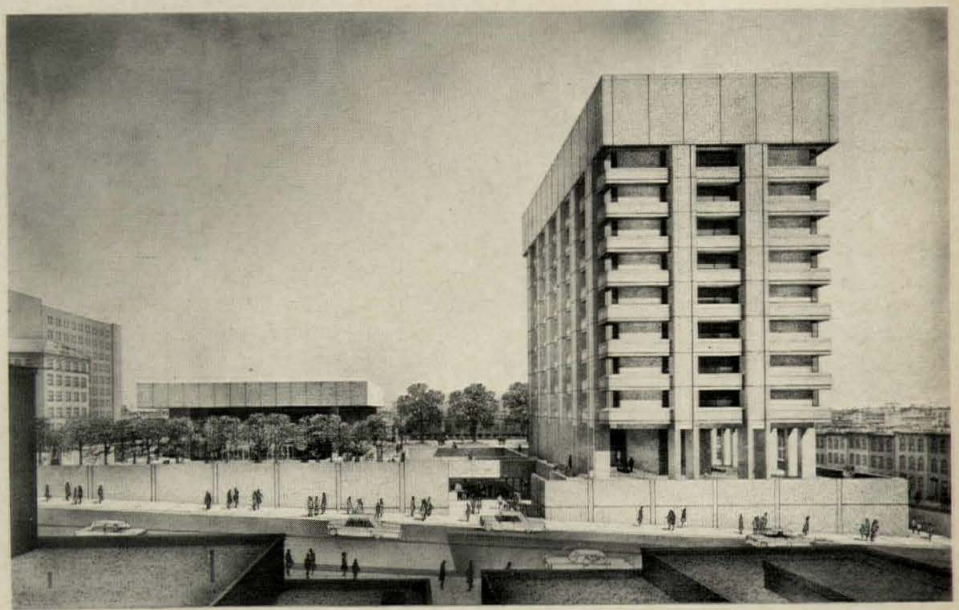
A master plan for a comprehensive development at Montego Bay, Jamaica, developed by Eggers and Higgins, architects, calls for the reclamation of 500 acres of land. The $30-million project will create a deep-water harbor with complete port facilities, an industrial park, office building, and shopping complex, as well as provisions for hotels, beaches, private residences, and rail and road facilities.

© Louis Checkman



The First Savings Building, San Francisco, designed by John Carl Warnecke and Associates, will serve as headquarters for the First Savings and Loan Association and northern headquarters of Great Western Financial Corporation. It has six projecting bay windows running the full height of the building on the exterior elevations. The 26-story steel-frame structure will have a facade of grey glass and opaque spandrels with matching metal trim, and will contain 206,000 square feet. The building will be owned, financed and constructed by the Cahill Construction Company.

A research building and an auditorium at Johns Hopkins University, Baltimore, designed by Fisher, Nes, Campbell & Partners, are both of poured-in-place concrete construction with sandblast finish, and are organized around a two-level plaza. The 10-story research tower has eight floors of laboratories over a two-story lobby, and contains 110,000 square feet. The auditorium, at left, seats 750. General contractor: Cogswell Construction Company.



BIG CITY MARKET: ARCHITECT'S TEN MOST WANTED LIST

For the architect, the big city is where the action is. After all, that's where most of the real building takes place. If there's any doubt about the extent that architectural opportunity is concentrated in a few metropolitan areas, recent data show that roughly one-quarter of the total value of architect-designed building is confined to only six big cities. And by the time you get through the "top ten" metropolitan areas, the proportion accounted for is one-third. One out of every three dollars currently being spent for *architectural* construction—some $8 billion of $24 billion—is being spent in a tight little group of ten cities.

Since these "top ten" met areas are of such tremendous importance to the architectural profession, let's delay no longer in identifying them so we can see how each one is doing so far this year. Our list of the ten best-building cities doesn't always stay the same any more than does the list of the ten best-dressed ladies. But, like the list of fashionable females, there are a few perennial favorites among the cities. New York, Los Angeles, Chicago and Washington usually head the group, but positions eight, nine, and ten often see a newcomer or two. This year those ranks are held by Boston (barely on the list the year before), Seattle-Tacoma (a new arrival in 1966), and Dallas-Fort Worth (which slipped this year from eighth to tenth).

A ranking system such as this one—based on the *size* of a city's building market—is useful as far as it goes, but should be backed up by other data. The amount and the direction of *change* in building activity are also critical; so too is the knowledge of which building types are causing the change. Here, in the table below, is a rundown on the nation's top met areas through the middle of 1966.

A few things stand out quite clearly from these comparisons. One is that of the top ten building centers, *only five are showing gains this year.* Another is that there's no consistent pattern—either by geography or by size—in the split of gainers vs. losers. Both are found in the east and in the west; both appear at the top and bottom of the list.

A closer look at the individual building types sheds more light, though. This year's most consistent gains appear among the nonresidential building projects (institutional buildings like schools and hospitals, especially). And by far the heaviest losses are reported in the apartment category.

The extent to which a city's building pattern is dominated by one or more of these construction types (e.g., Los Angeles with apartments; New York, Chicago, or Washington with office buildings; etc.) has had a lot to do with its recent performance.

George A. Christie, *Chief Economist*
F. W. Dodge Company
A Division of McGraw-Hill, Inc.

CONTRACT VALUE OF ARCHITECT-DESIGNED BUILDINGS

METROPOLITAN AREAS	RANK, BY SIZE		PERCENT CHANGE 6 MO. '66 / 6 MO. '65			
	6 Months 1966	6 Months 1965	Industrial & Commercial	Institutional & Other Non-Residential	Apartments & Other Large Residential	Total Architect-Designed Buildings
New York-No. N.J.	1	1	+33%	+8%	−18%	+7%
Los Angeles	2	2	−6	+35	−50	−10
Chicago	3	3	+47	+43	−24	+18
Washington, D.C.	4	4	+50	+17	+8	+18
Detroit	5	6	−6	+26	−12	−2
San Francisco	6	5	+14	+7	−66	−20
Philadelphia	7	7	−38	−4	+31	−14
Boston	8	10	+96	+32	+50	+57
Seattle-Tacoma	9	—	+75	+58	+57	+65
Dallas-Ft. Worth	10	8	−35	+6	+90	−6
U.S. Total			+14%	+19%	−6%	+10%

Source: F. W. Dodge Co., A Division of McGraw-Hill, Inc.

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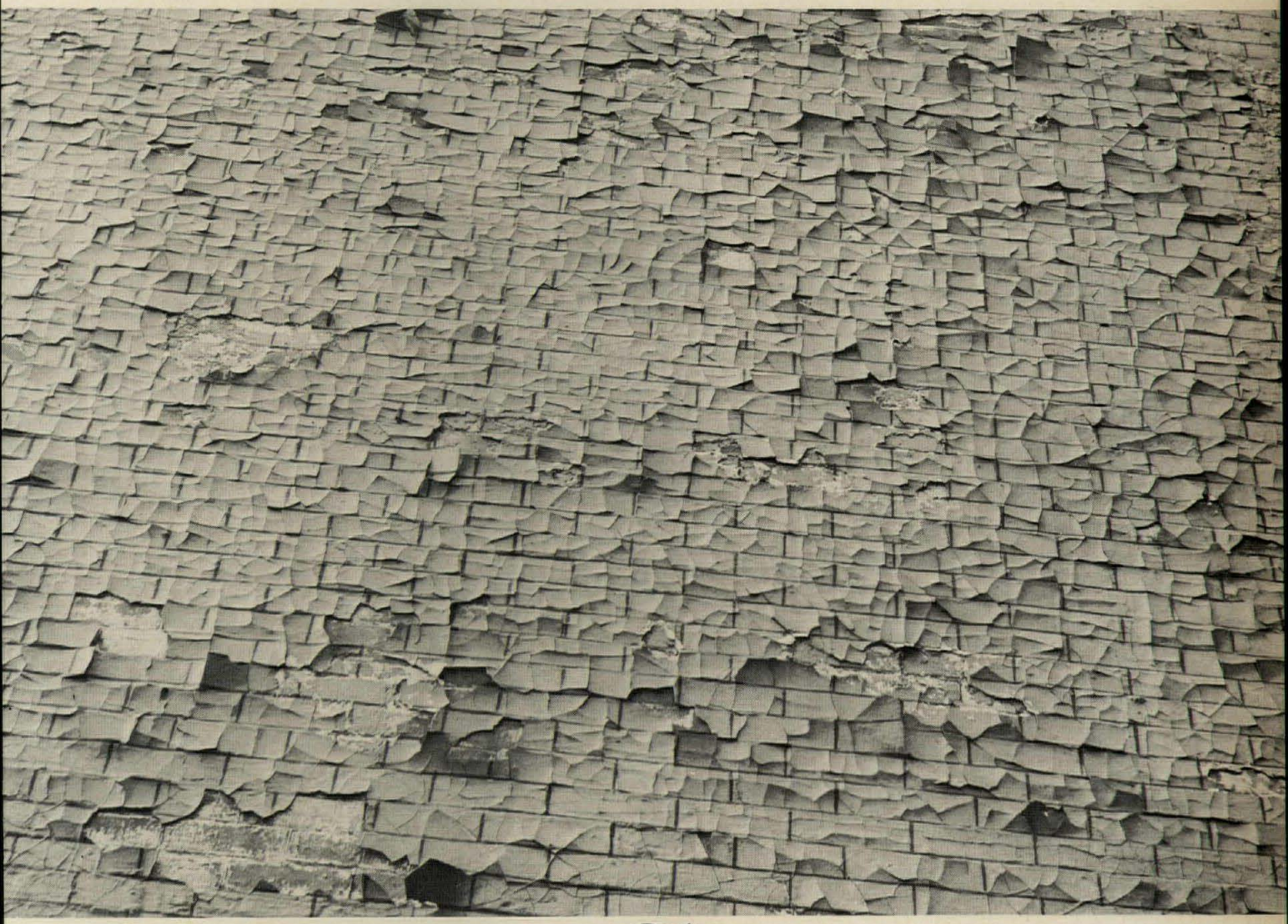
We have a list telling who they are. Ask for it. Goodyear Chemical Data Center, Dept. U-84, P. O. Box 9115, Akron, Ohio 44305.



GOODYEAR
CHEMICALS

BUILDING CONSTRUCTION COSTS

The information presented here indicates trends of building construction costs in 21 leading cities and their suburban areas (within a 25-mile radius). Information is included on past and present costs, and future costs can be projected by analysis of cost trends.

William H. Edgerton
Manager-Editor, Dow Building Cost Calculator, an F. W. Dodge service

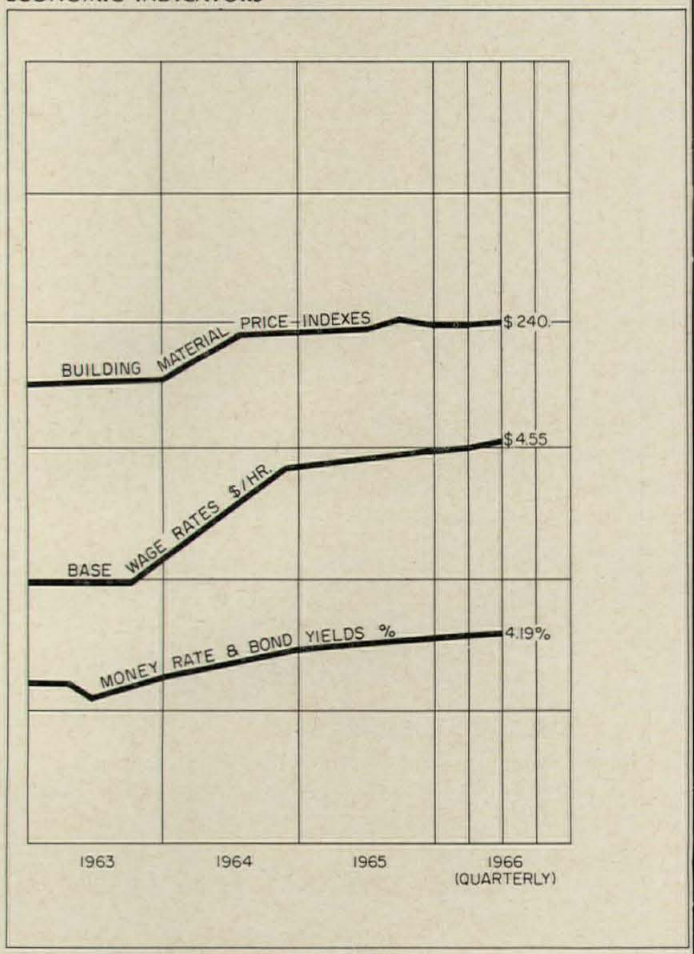
SEPTEMBER 1966 BUILDING COST INDEXES

1941 averages for each city = 100.0

Metropolitan area	Cost differential	Current Dow Index residential	Current Dow Index non-res.	% change year ago res. & non-res.
U.S. Average	8.5	274.8	292.8	+2.43
Atlanta	7.2	309.3	328.1	+1.69
Baltimore	7.7	277.7	295.4	+3.09
Birmingham	7.5	253.4	272.5	+1.51
Boston	8.5	249.4	263.9	+2.80
Chicago	8.9	303.4	319.1	+2.11
Cincinnati	8.8	263.6	280.2	+2.11
Cleveland	9.2	281.4	299.1	+3.77
Dallas	7.7	264.1	272.8	+4.61
Denver	8.3	282.0	299.7	+2.56
Detroit	8.9	277.2	291.0	+2.71
Kansas City	8.3	247.9	262.4	+2.45
Los Angeles	8.3	279.8	306.2	+3.17
Miami	8.4	269.9	283.3	+1.38
Minneapolis	8.8	273.4	290.6	+1.23
New Orleans	7.8	247.5	262.2	+2.01
New York	10.0	284.9	306.5	+1.63
Philadelphia	8.7	273.0	286.6	+2.31
Pittsburgh	9.1	257.8	274.0	+2.00
St. Louis	9.1	271.7	287.9	+2.71
San Francisco	8.5	353.9	387.2	+2.99
Seattle	8.4	250.7	280.2	+2.29

Differences in costs between two cities may be compared by dividing the cost differential figure of one city by that of a second; if the cost differential of one city (10.0) divided by that of a second (8.0) equals 125%, then costs in the first city are 25% higher than costs in the second. Also, costs in the second city are 80% of those in the first (8.0÷10.00=80%) or they are 20% lower in the second city.

ECONOMIC INDICATORS

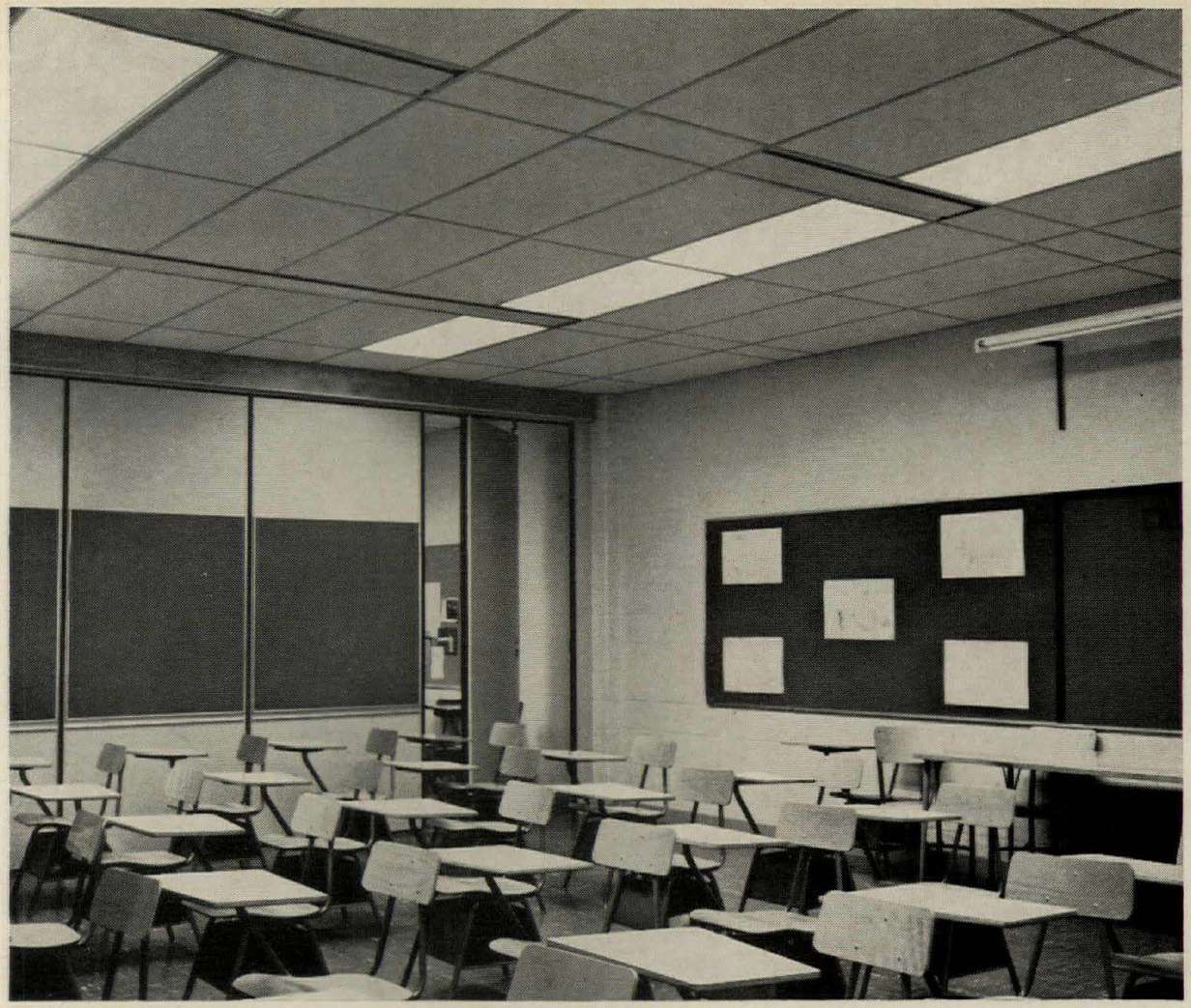


HISTORICAL BUILDING COST INDEXES—AVERAGE OF ALL BUILDING TYPES, 21 CITIES

1941 average for each city = 100.00

Metropolitan area	1952	1959	1960	1961	1962	1963	1964	1965 (Quarterly) 1st	2nd	3rd	4th	1966 (Quarterly) 1st	2nd	3rd	4th
U.S. Average	213.5	255.0	259.2	264.6	266.8	273.4	279.3	279.5	281.0	288.7	284.9	286.3	287.3	—	—
Atlanta	223.5	283.3	289.0	294.7	298.2	305.7	313.7	313.9	317.9	320.6	321.5	322.2	323.3	—	—
Baltimore	213.3	264.5	272.6	269.9	271.8	275.5	280.6	280.5	281.0	284.7	285.7	288.6	289.6	—	—
Birmingham	208.1	233.2	240.2	249.9	250.0	256.3	260.9	261.2	264.1	264.9	265.6	267.1	268.1	—	—
Boston	199.0	230.5	232.8	237.5	239.8	244.1	252.1	251.7	252.6	256.3	257.8	258.5	259.6	—	—
Chicago	231.2	278.6	284.2	289.9	292.0	301.0	306.6	306.5	307.3	310.2	311.7	312.6	313.7	—	—
Cincinnati	207.7	250.0	255.0	257.6	258.8	263.9	269.5	269.4	270.2	272.9	274.0	274.7	275.7	—	—
Cleveland	220.7	260.5	263.1	265.7	268.5	275.8	283.0	282.3	283.4	290.8	292.3	293.0	294.1	—	—
Dallas	221.9	237.5	239.9	244.7	246.9	253.0	256.4	256.9	257.9	259.5	260.8	261.7	262.6	—	—
Denver	211.8	257.9	257.9	270.9	274.9	282.5	287.3	287.3	288.2	292.7	294.0	294.6	295.5	—	—
Detroit	197.8	249.4	259.5	264.7	265.9	272.2	277.7	277.7	279.3	283.5	284.7	285.5	286.5	—	—
Kansas City	213.3	239.6	237.1	237.1	240.1	247.8	250.5	251.2	252.0	255.0	256.4	257.3	258.2	—	—
Los Angeles	210.3	263.5	263.6	274.3	276.3	282.5	288.2	288.9	289.7	295.8	297.1	298.0	298.6	—	—
Miami	199.4	249.0	256.5	259.1	260.3	269.3	274.4	274.4	275.4	276.6	277.5	278.4	279.2	—	—
Minneapolis	213.5	254.9	260.0	267.9	269.0	275.3	282.4	283.4	283.6	283.9	285.0	285.7	286.6	—	—
New Orleans	207.1	237.5	242.3	244.7	245.1	248.3	249.9	250.5	253.1	255.1	256.3	257.1	258.0	—	—
New York	207.4	260.2	265.4	270.8	276.0	282.3	289.4	290.2	294.0	296.0	297.1	297.8	298.7	—	—
Philadelphia	228.3	262.8	262.8	265.4	265.2	271.2	275.2	275.5	276.4	279.5	280.8	281.7	282.6	—	—
Pittsburgh	204.0	241.1	243.5	250.9	251.8	258.2	263.8	264.0	264.9	265.9	267.0	268.9	270.1	—	—
St. Louis	213.1	246.9	251.9	256.9	255.4	263.4	272.1	272.9	276.1	279.9	280.9	282.2	283.2	—	—
San Francisco	266.4	321.1	327.5	337.4	343.3	352.4	365.4	366.6	366.9	367.7	368.6	376.2	377.7	—	—
Seattle	191.8	232.7	237.4	247.0	252.5	260.6	266.6	265.1	266.3	267.8	268.9	271.1	272.1	—	—

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



Classroom of Randolph Junior High School, Montgomery County, Maryland.
Architect: Burket, Tilghman, Nelson Associates. Consulting Engineer: H. Walton Redmile Associates.

Will you step into this classroom for a moment, please?

We'd like to call your attention to two things.

One that you can see: our new Carrier Moduline® Ceiling Air Terminals with automatic self-contained temperature control.

And the other you can't: a new kind of air conditioning system using the Moduline units in a Dual Conduit System®.

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Moduline units also make possible a very simple variable-volume *single duct system*. It is ideal for economical automatic temperature control in office buildings and hospitals. Control zones as small as 100 square feet are highly practical. Partitioning modules may be as small as 25 square feet.

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We've covered both systems in detail in a brochure that illustrates many attractive ceiling arrangements achieved by architects using Moduline units.

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Carrier Air Conditioning Company

More people put their confidence in Carrier air conditioning than in any other make

For more data, circle 40 on inquiry card

Small libraries

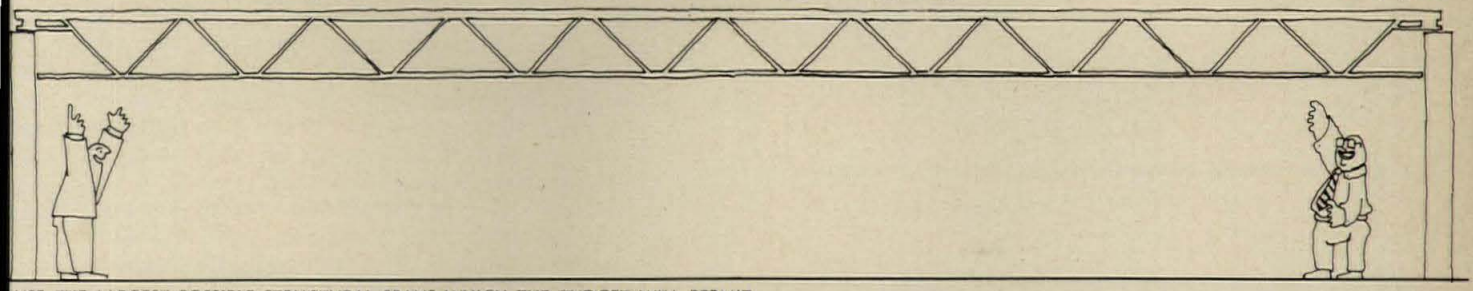
THE DESIGN OF THE SMALL PUBLIC LIBRARY. *By Rolf Myller, A.I.A. R. R. Bowker Co., 1180 Avenue of the Americas, New York, N. Y. 95 pp., illus. $10.00*

Here is a thorough and fresh report which clearly explains every stage in the development of a library building. Written by a practicing architect, the book is mainly intended as a guide to the planning of small public library buildings. The light but well written text is delightfully illustrated with meaningful graphic design.

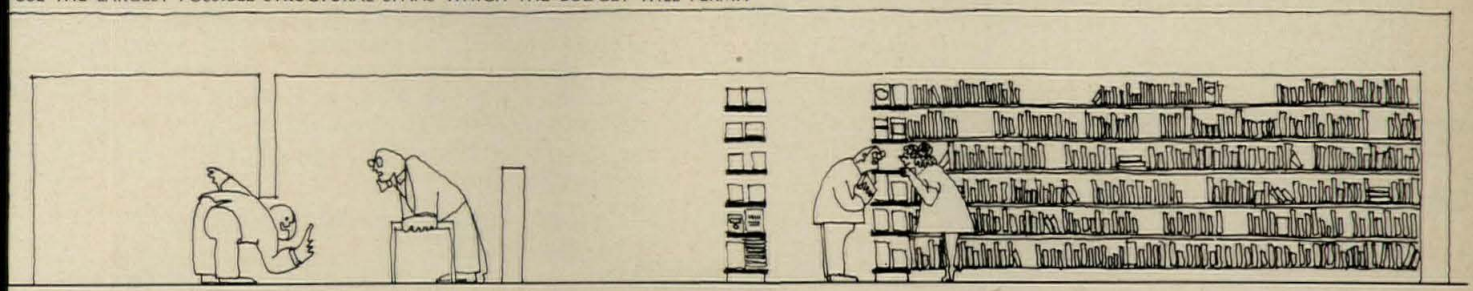
The author addresses himself to the librarian, the library board and to other architects. He condenses the criteria and methodology required for a library that would normally serve populations of less than 10,000. For the architect engaged in such a program the book is thoroughly significant. It discusses siting; relationships of departments within the building; basic circulation patterns; layout of furniture and equipment; special provisions for the children's section; and landscape design. Also covered are the environmental conditions—heating and lighting as well as an analysis of materials for floors, walls and ceilings. Useful rules of thumb for calculations of space requirements (including shelving) exemplify the thoughtfulness of the author's attitude.

A few of the generous illustrations have been included on this page. Mr. Myller has eliminated floor plans from his illustrative materials "Since no two situations are ever the same, a floor plan properly designed to serve one set of conditions will result in a compromise if adapted for reuse elsewhere."

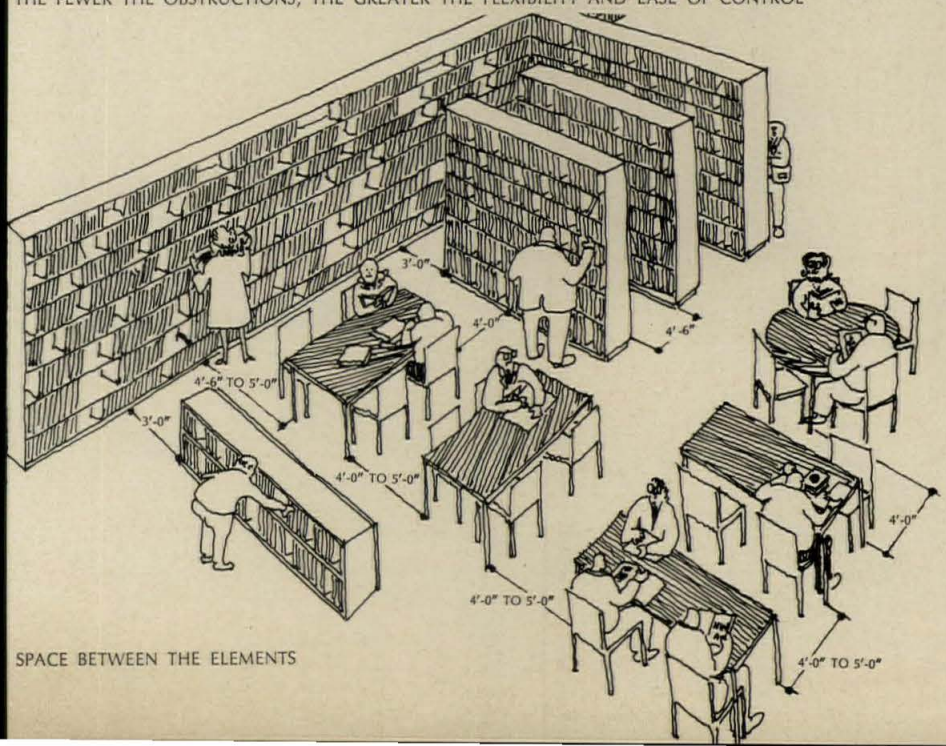
continued on page 70



USE THE LARGEST POSSIBLE STRUCTURAL SPANS WHICH THE BUDGET WILL PERMIT



THE FEWER THE OBSTRUCTIONS, THE GREATER THE FLEXIBILITY AND EASE OF CONTROL

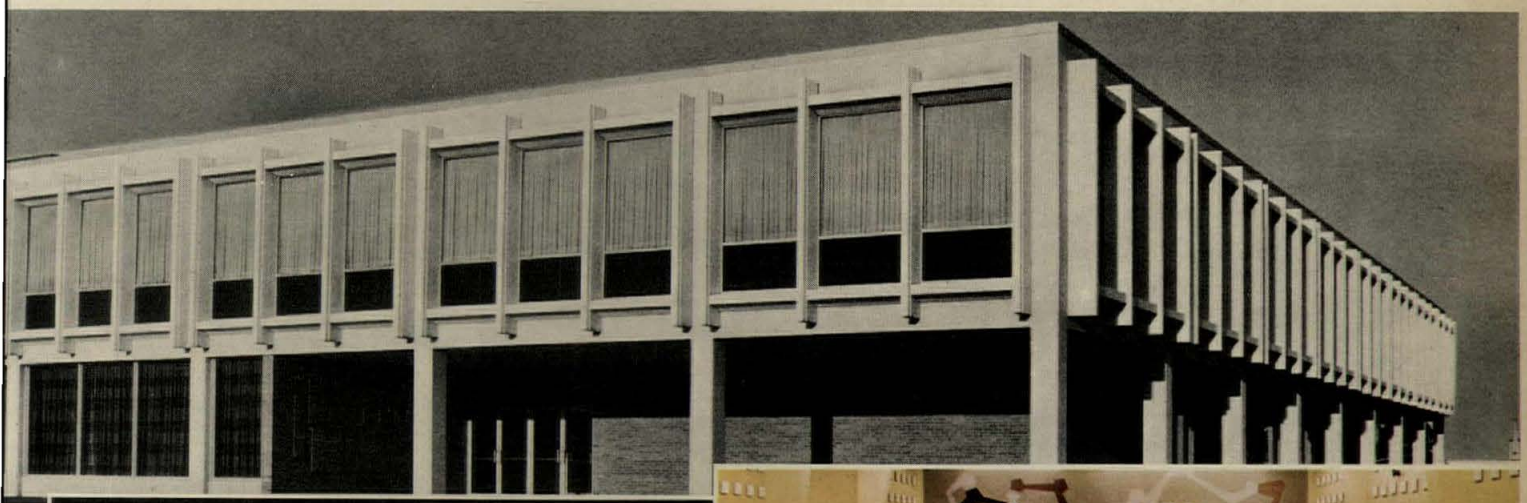


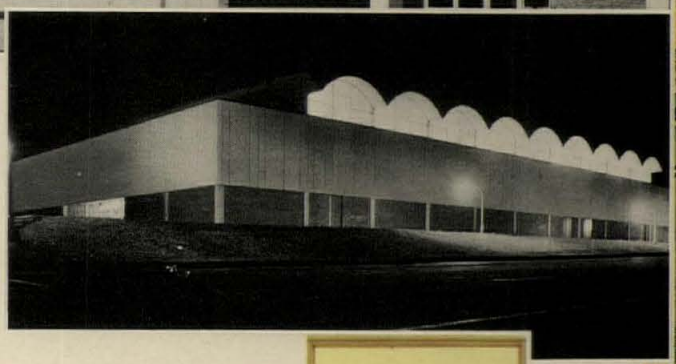
SPACE BETWEEN THE ELEMENTS

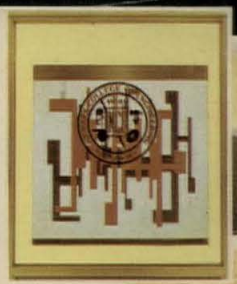
THIS MONTH'S BOOKS

REVIEWS

pple and Seaman utilize ceramic tile
campus rejuvenation at
ewark College of Engineering.







o new buildings on this New Jersey us make extensive use of ceramic tile s functional and decorative character- . Shown here are areas in the new "Stu- Center" and the "Franklin Newlin isle Physical Education Building." The has an interior finished almost entirely amic tile. A focal point is the abstract ic mosaic mural which covers one en- all of the natatorium. A smaller mural ates the opposite, entrance wall.

the student center glazed wall tile is used throughout the kitchen, cafeteria and rest s. It complements the quarry tile and ceramic mosaic tile floors in these areas.

cated on land adjacent to the existing campus, the buildings erected by Walter Kidde tructors are of precast concrete construction. The night photo above presents a dramatic of an unusual post-tensioned barrel vault roof on the physical education building. Mosaic urals in the building were designed by Epple and Seaman and installed by Del Turco of Newark.

you're looking for a material with limitless possibilities in combined decorative and ional use, look for ceramic tile made in the U.S.A. and Quality Certified by the Tile cil of America. The triangular seal at right is your assurance of glazed wall tile, ic mosaic tile and quarry tile that is tested to meet the most rigid government fications. For more information about Certified Quality tile, a material that can ed with confidence indoors and out, write: Tile Council of America, Inc., 800 nd Avenue, New York, N.Y. 10017. Or, see the current Sweets Architectural File.

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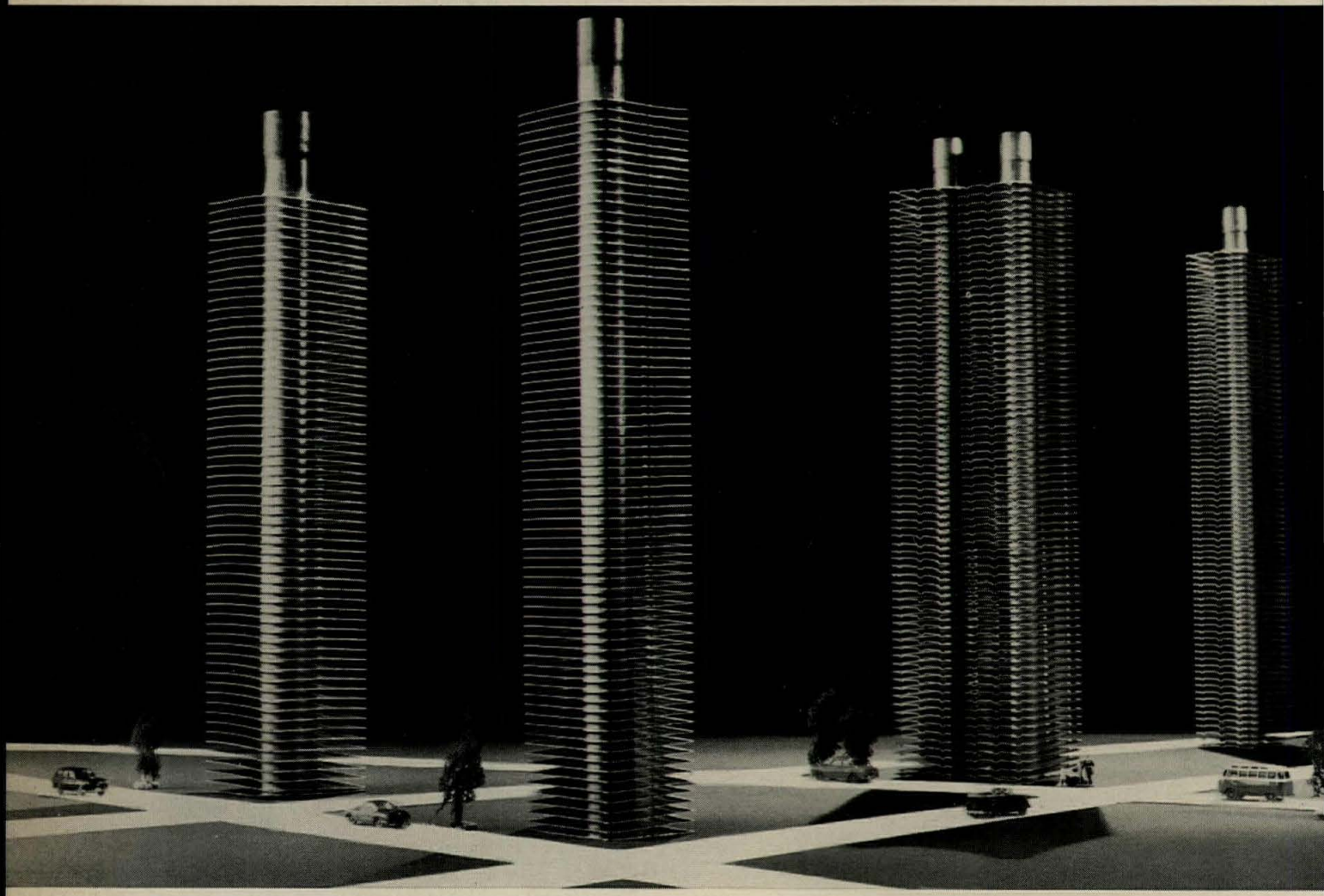
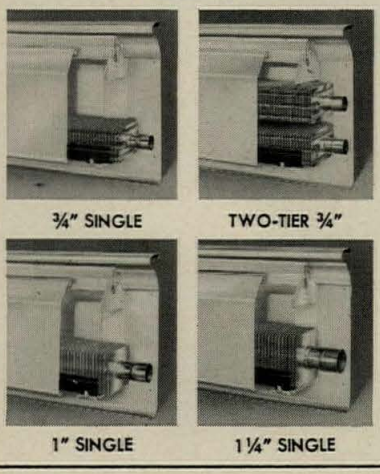
The higher the heating requirements



the more this new National-U.S. high-capacity baseboard line stands above the crowd.

ONE PRE-ENAMELED ENCLOSURE FOR ALL FOUR MODELS



This new line of high-capacity baseboard—¾", two-tier ¾", 1" and 1¼" models—gives you a whole complex of outstanding extras.

Because you get up to 1470 BTU's per lineal foot, you can warm larger areas with shorter lengths of baseboard.

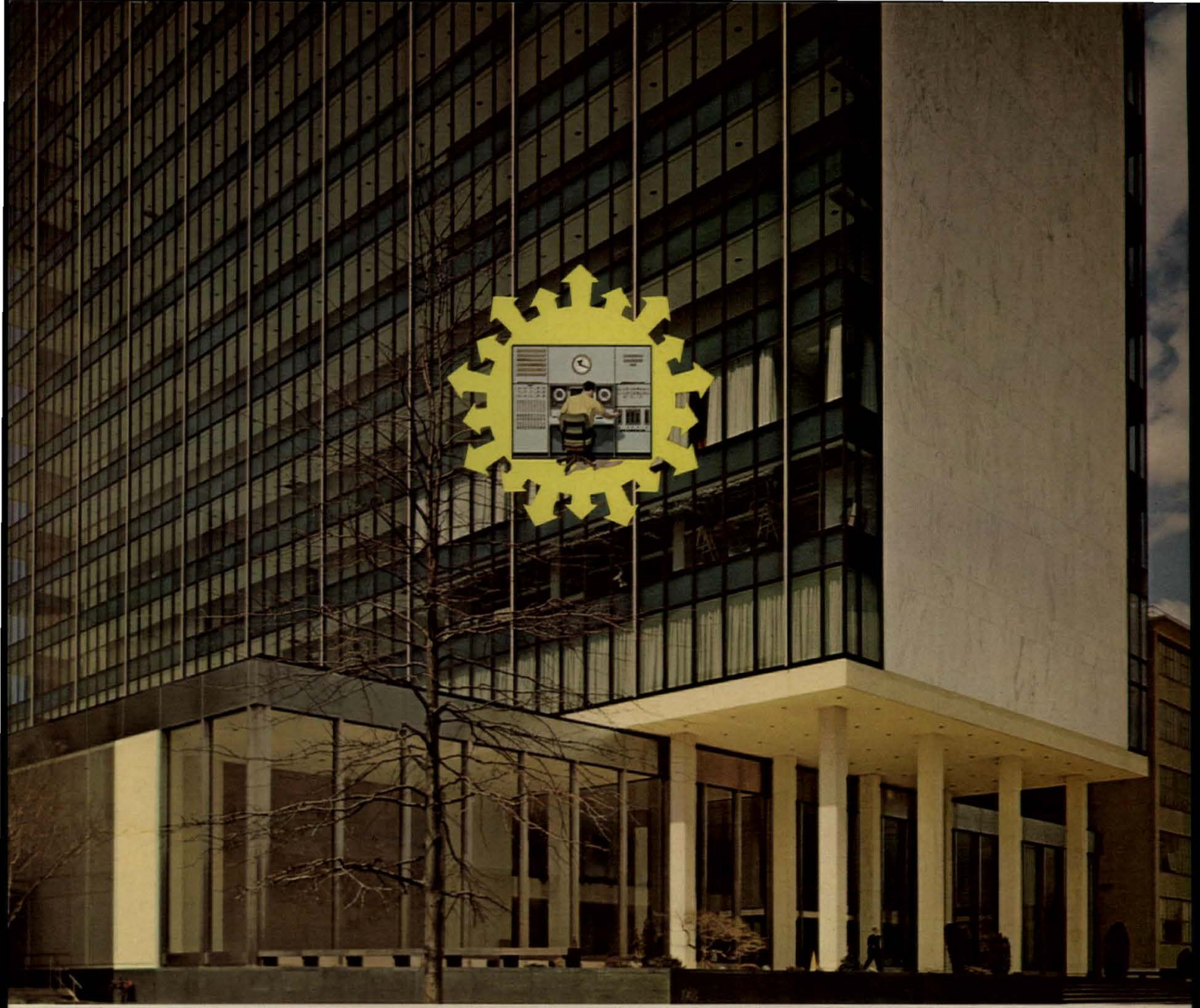
Larger tubing sizes afford greater carrying capacities, providing more heat while maintaining the designed 20 F. temperature drop. This reduces the number of series loops required, saving man-hours and pipe main.

Five standard lengths in four sizes give you greater selectivity. All models fit into the same compact enclosure.

Ask your National-U.S. representative about standing above the crowd in hydronic heating. Or write for bulletin ADJ-1735: Crane Co., Dept. 008, 4100 South Kedzie Avenue, Chicago, Illinois 60632.

National-U.S.

For more data, circle 51 on inquiry card



One man operates the Honeywell Automated Control Center that sees, hears, records, reveals, adjusts, alarms, remembers, analyzes, monitors, starts and stops almost everything at Hoffman-LaRoche Company's Research Tower in Nutley, N.J. Wigton-Abbott, Designers-Constructors.

Why specify Honeywell 1-man Building Control?

Let's start with a 33⅓% annual return...

...because this is almost always where a Honeywell automated building control story begins: **full payback in 3 years or less!** But there's more.

Only Honeywell makes **8 different systems** to automate your clients' buildings . . . ranging from one so simple a secretary can run it to a computer-controlled system. The point is: you can design exactly the system your clients need, no compromises.

We're the **only supplier that makes computers** (including a new model specifically designed for building automation) . . . the only one who can furnish telemetering capability to let your clients control two or more buildings from one spot.

We're the only company with a separate field staff of Building Automation Systems Engineers who work with you to make sure **your clients get the payoff they deserve.** And only the Honeywell man can call on 8 separate divisions for help . . . taking advantage of Honeywell pioneering in diverse fields like process control and space guidance to **keep your system from becoming obsolete** in a few years.

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In short, **only Honeywell can help design, build, install, guarantee, and service the complete system your clients need.**

That's a pretty strong statement. Make us prove it to you. Ask us for examples of operating economies in different types of buildings. Write Mr. W. N. Wray at Honeywell, Dept. AR9-127, Minneapolis, Minn. 55408.

Honeywell

continued from page 65

Cities and people

ARCHITECTURE: CITY SENSE. *By Theo Crosby. Studio Vista, London, and Reinhold Publishing Corporation, 430 Park Avenue, New York, N. Y. 96 pp., illus. Paperbound, $2.25.*

For all that has been thought, spoken and written in the last few years about the future of cities, the problem of how to keep them vitally alive for the continued "delight of man" remains largly unsolved. Theory and practice are still far apart and any constructive changes that are made usually take place too slowly, and are scarcely absorbed within the fabric of urban life before they are overwhelmed by fresh complications. People still flock to the cities, but even as they yield to the lure of the metropolitan environment, they know that—like cigarette smoking—too strong an addiction may shorten their lives.

Theo Crosby, a British architect who was responsible for the Fulham study—a scheme for high-density housing in a low-income area of London—and an inveterate city lover, defines his aim in writing this book as "an attempt to synthesize ideas from many sources into a coherent approach to city planning, with the basic assumption that city life is desirable and exciting. It is an assumption, long unfashionable in planning circles, shared by most of the human race."

Architecture: City Sense is an evocative paperback which packs a great deal of material into its 96 pages. If it is more thought-provoking than problem-solving, it does serve to point up very vividly many of the most important forces which influence city life today, and to blow away some of the dust which has collected around our planning procedures. The presentation is deliberately controversial—one chapter starting off with the statement "traffic is not important"—but the content is less so—the same line continuing—"what is important is how people live." The illustrations are carefully chosen to make use of the techniques of "cityscape" to equip the reader with "city sense." Although brief captions are included, most of the illustrations speak for themselves.

If Theo Crosby does not provide a blueprint for future city planning, his book is unquestionably a valuable contribution to contemporary literature on the subject. Perhaps its greatest merit is its power to suggest to the reader the excitement, vanity and squalor, and above all the eternal magnetism of cities.

continued on page 91

It's time someone butchered the sacred cows of air conditioning

"All heat from light is air conditioning load"

nonsense!

New Barber-Colman Heat-of-Light System puts light-generated heat to work for you, reducing the amount of heating equipment required and lowering operating costs.

"ALL heat from light is air conditioning load". This sacred cow of air conditioning can cost you money on your next building. So why not do something about it?

With the new Barber-Colman Heat-of-Light System, it's now possible to combine the lighting, heating and cooling functions into one efficient system.

Lighting, for example, can be designed so that it also provides a large part of the heating for the building. Heat generated by equipment and people, once wasted, also is now put to work for you. Result: You realize major savings in the cost of air conditioning.

Initial construction cost is often reduced by doing away with such high-expense items as boiler rooms, fuel storage tanks, stacks. Hot air ducts, reheat coils and piping are eliminated. Less pipe and duct insulation is required. And, you get the most possible air conditioning in the least possible space.

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LETTERS

What makes a Record House?

Since I have now done a number of houses with which I am reasonably pleased, my interest in *Record Houses* is even more direct than it has been.

Questions: How do you make your selection? Do you search out all of the houses you publish or do architects send you material on houses they wish to have considered for the issue? If it is appropriate to send material, what do you need and want?

Finally, what, if any, non-architectural factors are involved? For example, if you have five houses that you like all from Illinois, would you publish them or worry about a neat geographical distribution? Or if your five favorite houses were all concrete, would you publish all of them?

T. Merrill Prentice, Jr.
Lewis, Prentice & Chan
New York City

Our selections of award winners for the Record Houses *issue are made from every contemporary architect-designed house we can possibly see. Individual submissions are more than appropriate —they are enthusiastically welcomed!*

We use many other sources of information: photographers, house owners' news and magazine items, Dodge Reports and our own news bureau. In addition, each RECORD editor is responsible for knowing about the architecture in a particular area of the country; he culls this area for outstanding houses.

Because the mid-May issue goes not only to the regular subscribers but to builders and the general public all over the country, we make an effort to keep the field of Record Houses *as wide as possible. To interest such an audience we keep in mind a certain amount of geographical and cost distribution, as well as a balance between well-known and recently established architectural firms. We try to have about one-third of the houses under $40,000, with no price limit for the rest. However, all of this is by no means a rigid formula, and if five houses were all from Illinois and all made of concrete of dissimilar design this would not prevent them from being* Record Houses.

The houses should be rather recently completed and must make some original contribution to home planning reflecting the different directions of current design thinking. Many past winners were selected for their imaginative solution of a client's budget, space or site problems.

To consider a house we need the following materials: The program and architect's description including general cost figures; snapshots of the entire house with color shots if available (professional photographs are not necessary at this stage); and floor and site plans. As decisions are made by December for the following mid-May issue, submissions should be made as soon as possible.

Education: "pendulum in a pool of tar

I was one of a small group of practicing architects nominated by the Board of Directors and the Committee on Education of the A.I.A. and invited by Robert C. Geddes, co-chairman with Bernard P. Spring of the Education Research Project, to "represent the view of the profession in the important task of setting goals that will shape the future of architectural education." Twenty of us, including William J. Conklin, Arthur Q. Davis, John G. Dinkeloo, Norman C. Fletcher, George F. Hellmuth, Charles Luckman and I. M. Pei, met early in June at the new Chicago Circle Campus of the University of Illinois. The conference made it overwhelmingly

continued on page 17

continued from page 104

clear to me that my image of architectural education is quite different than that of my colleagues. As a matter of fact, I am amazed that so many men with widely differing design philosophies can be in almost total agreement about the goals of education toward the attainment of those philosophies. Head nodding and back patting prevailed; whereas, disagreement and argument might have brought forth some principles that could have been useful.

My image of architectural education is that of a pendulum swinging in a pool of tar with the student at one end of the pendulum and the profession at the other end. Communication is direct from student to profession via publications and other visual vehicles of the 20th century; thus a kind of morphology results and not a true educational process. Curriculum makes up the pool of tar, and if it is kept hot the pendulum swings somewhat easier, but if it is allowed to cool then communication is stiff and unimpressive.

We talked about contact between various schools as being important and felt that student views should be presented. Both approaches may be valid. We face, however, the eternal problem of misunderstanding and incompleteness, and this does not assure growth. Students must be interpreted, and therefore, unhappy results are possible. As to the future and possible six-year curriculum proposed, I suggest that if we have little to say in five years we will have even less to say in six. Instead of extended time, I believe we must re-evaluate program and process. One last point concerned the stressing of technology and science and related subjects linking them to architecture. An intensified study of these disciplines will not insure better architecture. The understanding between architecture and the sciences may be improved, but a more creative process may not result.

Everyone agreed that the schools were not training effective draftsmen for offices. I firmly believe that the function of an architectural school is not to prepare draftsmen to write reports, to do drafting and menial tasks. This is the responsibility of the profession. I think the hopes and aspirations of the student must not be curbed or arbitrarily channelled. In fact, part of the reason for his being hired is that the professionals are hoping through the small stipend they pay to get something more than just a draftsman at a minimal cost, and, if in fact, the exploitation of

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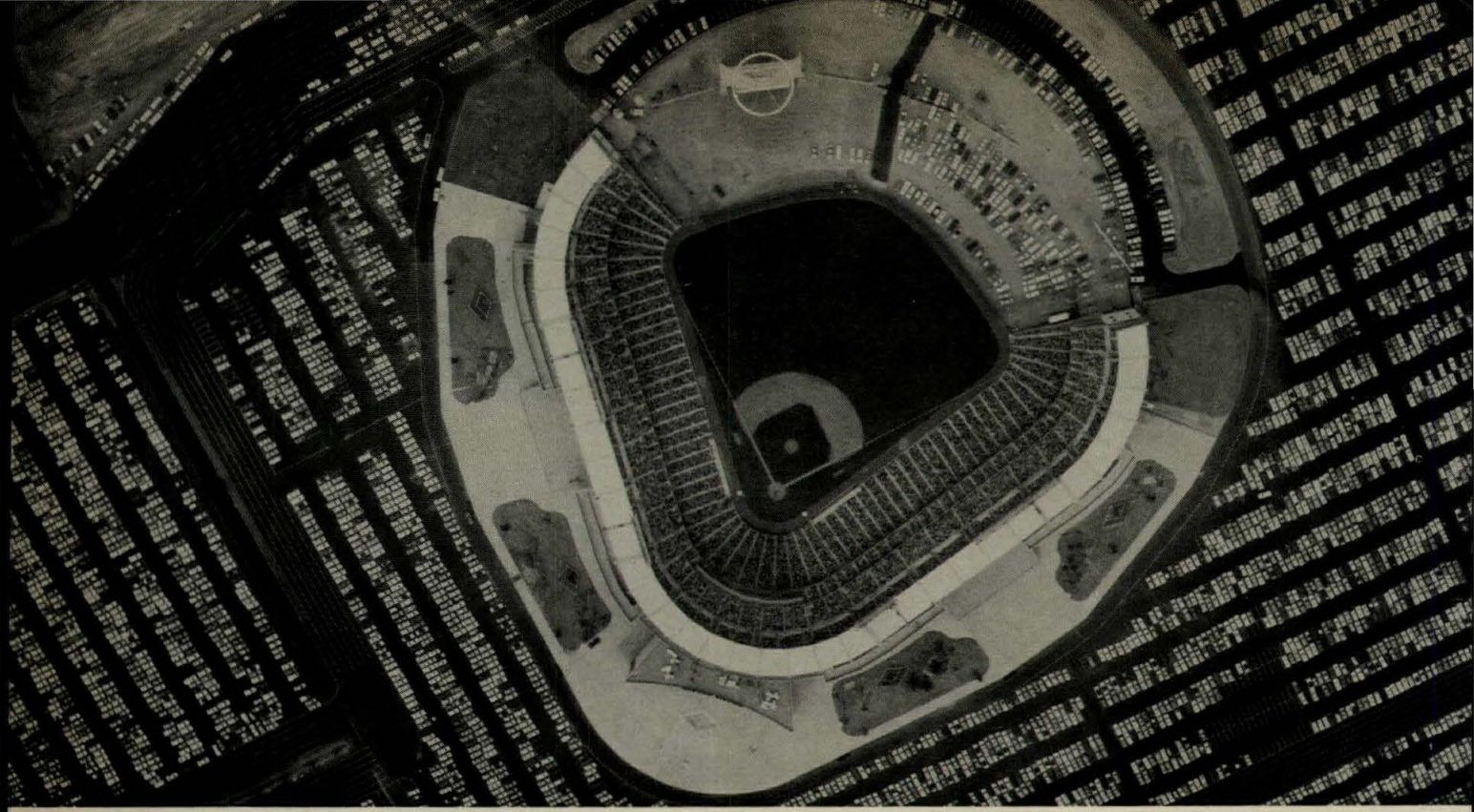
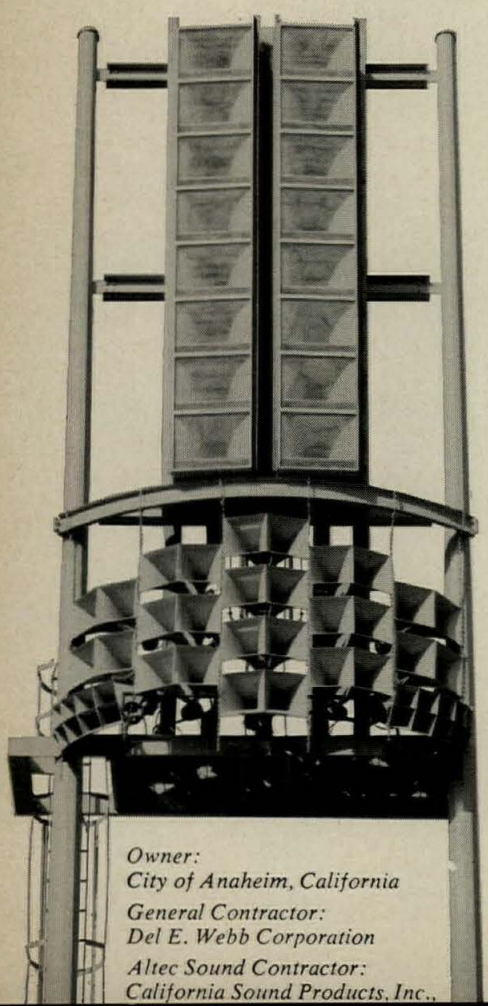


Concert hall with a pitcher's mound.



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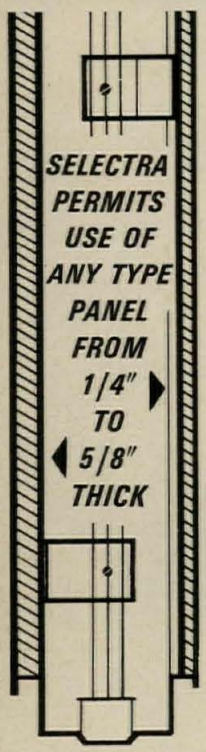

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continued from page 11

the student is not completed by th professional, I say that the problem lie not with the student, but with the pro fessional. Architectural education mus aspire to the highest standards.

The answer to the problems share by the schools and the profession ca be found in a design attitude—a desig attitude toward the formative process i which a student can be prepared to at tack any problem through analysis, syn thesis and execution. I think it is equall important for him to be taught the valu of action, the focusing of power, an yet not be denied the art of dreaming With a proper design attitude he is abl to delve into problems small and large He is equipped with a kind of order o more correctly, a latent order seeking t develop, provoked by change an growth. He will be able to adapt to situ ations as they occur and to find a proc ess of answering them. He would se technology in proper perspective; h would see research alone is not accept able, and he would, instead, develop a attitude that cuts out preconceived no tions of form and which offers a greate range of expression.

I disagree with Pei that we n longer think of our buildings as objects One simply has to look around him t see object after object placed on th landscape, walled in on a manicure lawn, denying contact with anything be yond it, affected by nothing and affect ing nothing in turn. We see buildin after building conceived as processiona units with nothing processional goin on, and these are the naive design solu tions of the profession. The traditiona and still current attitude which empha sizes the single structure hinders recog nition of the real process of developin order that characterizes a system as whole. Our schools are turning out peo ple who are grid-and-pattern-minde rather than use-minded. Our schools ar turning out students whose attitudes ar concerned with the completeness of structure rather than its potential growt through use. I think there is a way to de velop valid judgments parallel with th fantastic transformation that is takin place in all other art forms. I think it i possible to break out of the beaux art *parti* of preconceived form which seem to dominate us. The classic ideal o static perfection must give way to deeper awareness of disharmonies, con trasts and tensions which provok change and growth of LIFE, MIND AND HEART. My hope is that through som enriched concept of form, or more cor rectly, the formative process, an archi

continued on page 14

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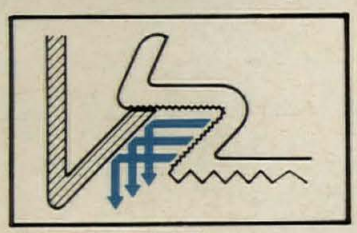

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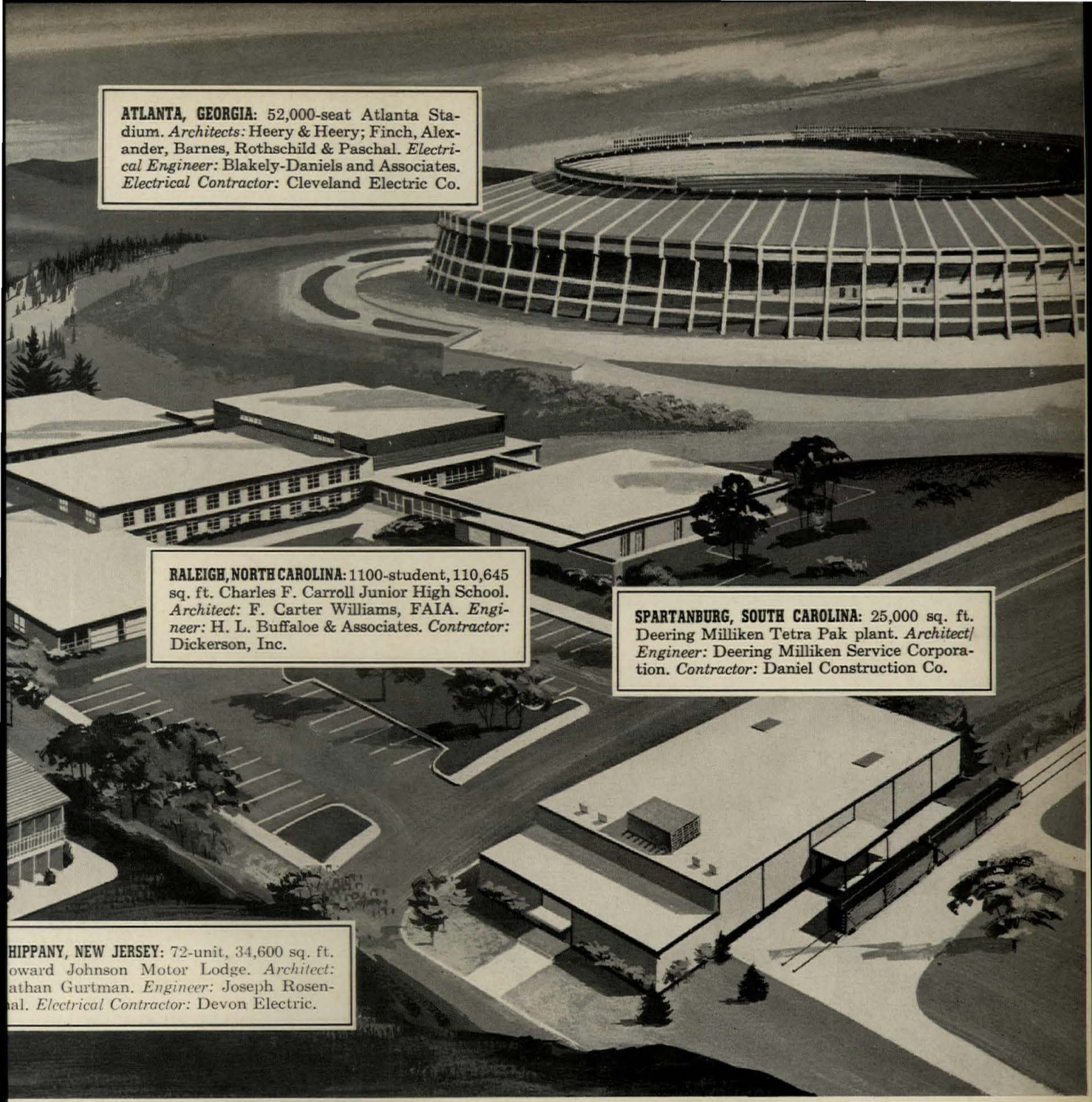

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ARCHITECTURAL STRUCTURAL

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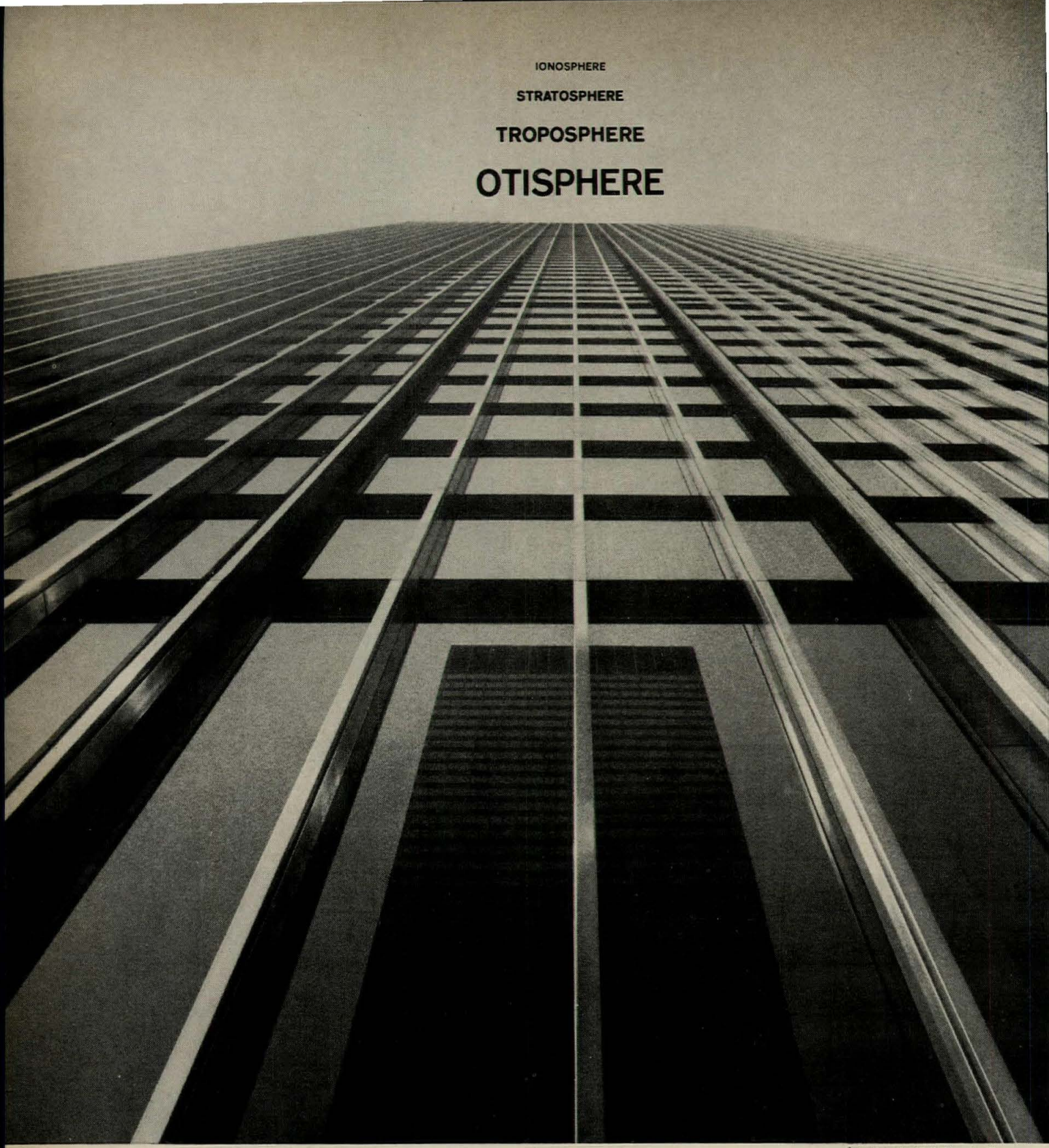

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The directors of the Metropolitan Opera Company, determined that the new Lincoln Center house should surpass the old one built in 1883, told the architect: We do not want just an opera house . . . we want

A HOUSE FOR GRAND OPERA

Joseph W. Molitor photos

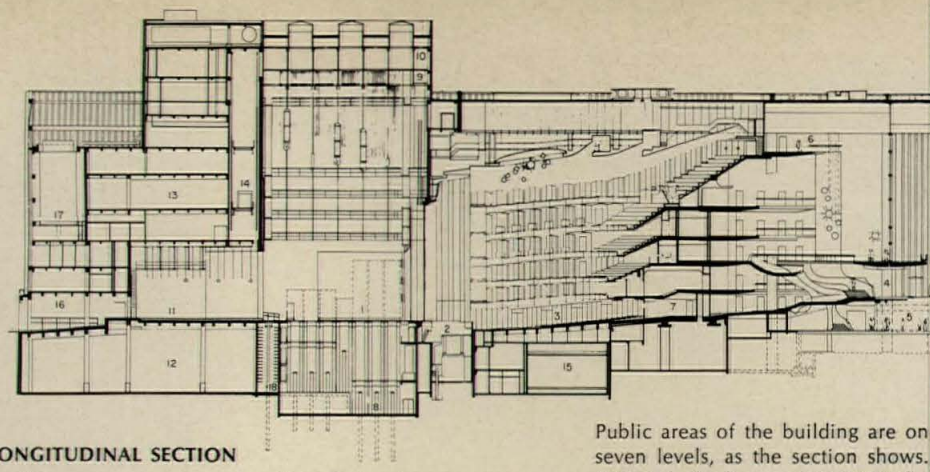
And architect Wallace K. Harrison has given the new Met that quality. Like opera itself, it is more flamboyant and more colorful than life; an elegant setting of gold leaf, red plush, and crystal; latter-day Baroque architecture for the most Baroque of the arts—grand opera


EXIT

"We tried countless shapes for the main house," said architect Wallace K. Harrison, in discussing the design of the new Metropolitan Opera House. "Round, square, wedge-shaped, and many others. But, invariably, as the study of possible alternates developed, we arrived back at the form that was built—that of the classic Renaissance opera house. Why? We arrived there by way of science and the advice of acoustical experts, and because of our determination to provide the greatest possible degree of comfort for the members of the audience, as well as the feeling of luxury and glamour one always associates with grand opera. The directors pointed out that they did not want just an opera house, but a house for grand opera. This thought weighed heavily in all our decisions."

The art of the opera reached some sort of peak late in the Renaissance, and so did the design of opera houses. The architecture of the new Metropolitan mixes old and new; is modern Baroque that sets out to provide the great spaces, the flowing lines, the repeated curves, and the elaborate elegance of the European houses. Thus the abundance of gold leaf and red plush, the crystal chandeliers, the rosewood paneling, the grand stair. What could be more appropriate for grand opera in a great metropolis?

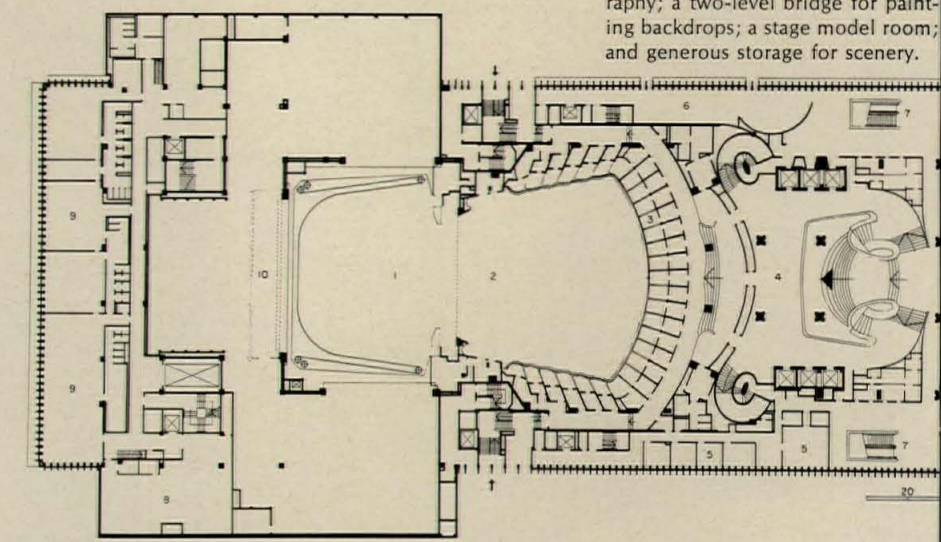
Acoustical considerations conditioned every design decision: the pro-



LONGITUDINAL SECTION

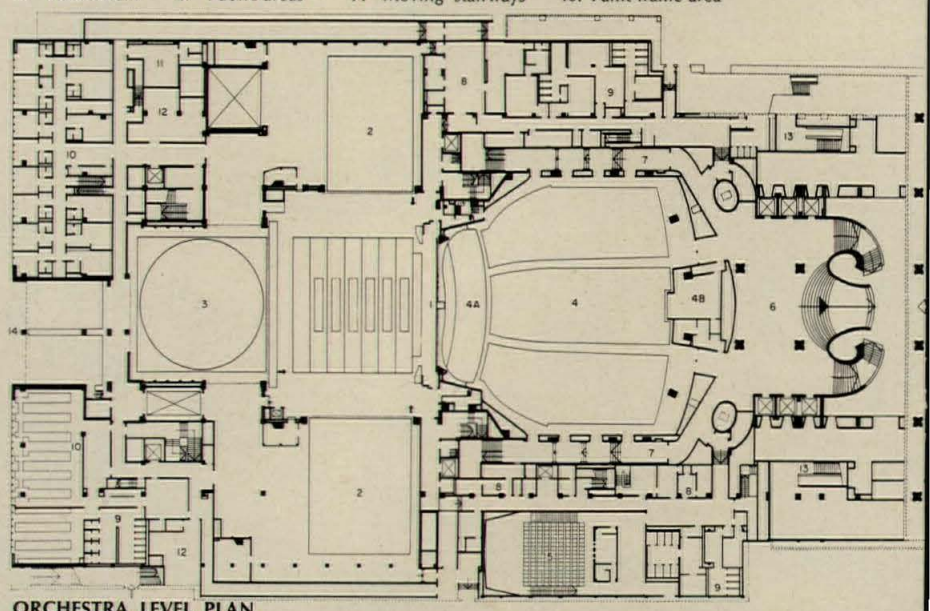
1. Main stage
2. Orchestra pit
3. Auditorium
4. Main lobby, plaza level
5. Lower lobby, auto entrance
6. Restaurant
7. Lighting, sound control
8. Mechanical area
9. First grid
10. Second grid
11. Backstage
12. Scenery storage
13. Shops
14. Paint frame area
15. Rehearsal area
16. Loading platform
17. Cooling towers
18. Drop cut

Public areas of the building are on seven levels, as the section shows. Although the house seats 3,800, the plans and section show the very much larger volume given over to service and ancillary facilities, said to be the most elaborate yet provided for any opera house. Twenty rehearsal rooms include three large enough to mount any main stage action; there are shops for tailor, wigmaker, milliner, carpentry, property and electrical workers; studios for scenery and photography; a two-level bridge for painting backdrops; a stage model room; and generous storage for scenery.



PARTERRE BOX LEVEL PLAN

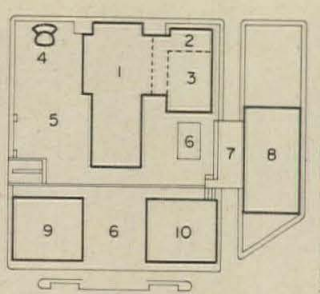
1. Main stage
2. Auditorium
3. Boxes
4. Public areas
5. Executive offices
6. Bar
7. Moving stairways
8. Wardrobe storage
9. Costume shops
10. Paint frame area



ORCHESTRA LEVEL PLAN

1. Main stage
2. Work area with wagons
3. Backstage wagon and turntable
4. Orchestra seating
4a. Orchestra pit
4b. Control booth
5. List Hall
6. Main lobby
7. Access to orchestra seats
8. Office areas
9. Rest rooms
10. Dressing rooms
11. Green Room
12. Wardrobe
13. Escalators
14. Loading platform

Exteriors of the new opera house: above, as axial focus of the principal plaza; below, in side view; opposite, as seen from the promenade terrace of Philharmonic Hall.



With the exception of the Juilliard School of Music—soon to be built—Lincoln Center is now complete. Elements in the diagrammatic plan at left: (1) Metropolitan Opera House; (2) Library and Museum of the Performing Arts; (3) Vivian Beaumont Repertory Theater; (4) Band Shell; (5) Damrosch Park; (6) Plaza; (7) Pedestrian overpass; (8) Juilliard School; (9) New York State Theater; (10) Philharmonic Hall.

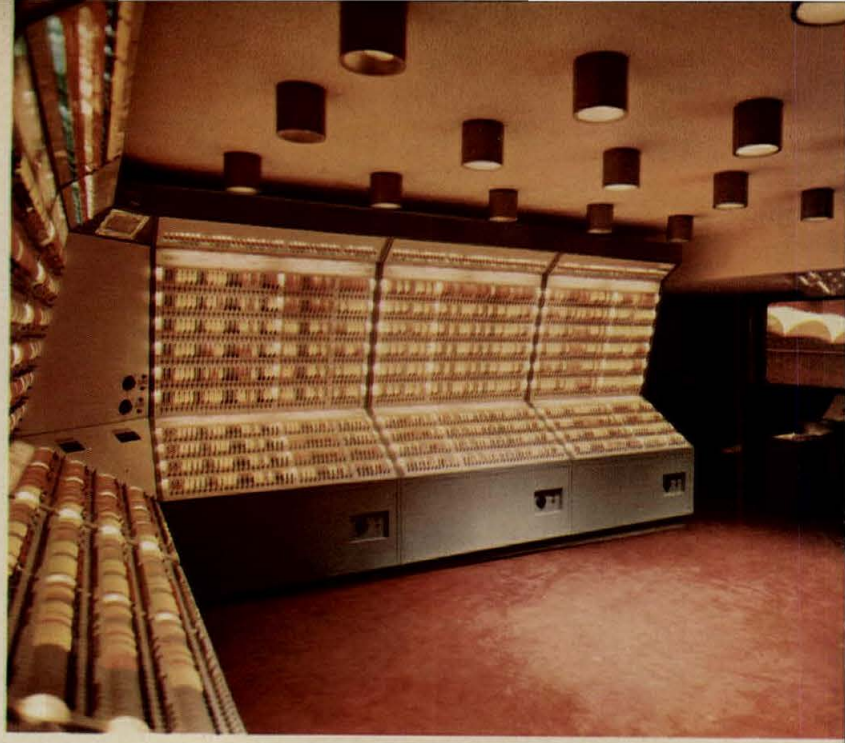
portionately narrow width of the house and the reflecting panels of rosewood on the side walls; the pattern of domes for the ceiling; the sloping proscenium and balcony surfaces to mix orchestra and voices so performers could hear both; the necessary reinforcing and projecting of this mix effectively determined every length, width, height, and shape.

The owners did not require perfection—but asked only that the sound be as good as in the old Met. Preliminary tests have been, according to qualified observers, "very satisfactory." This is the largest opera house yet built, and the first to be air-conditioned. No one can be entirely sure what the forced movement of air will do to the sound, or—in fact—to the singers' voices. Let us hope it favors both.

METROPOLITAN OPERA HOUSE, LINCOLN CENTER FOR THE PERFORMING ARTS, NEW YORK. Architect: *Wallace K. Harrison* of *Harrison & Abramovitz;* planning and architectural liaison: *Herman E. Krawitz*;* acoustical consultants: *Vilhelm L. Jordan and Cyril M. Harris;* seating consultant: *Ben Schlanger;* structural engineers: *Ammann & Whitney;* mechanical and electrical engineers: *Syska & Hennessy;* stage lighting consultants: *Rudolph Kuntner*, Stephen J. Skirpan, Walter Unruh, Syska & Hennessy;* stage equipment consultants: *Walter Unruh, Louis Edson*, Rudolph Kuntner*, Syska & Hennessy;* general contractor: *George A. Fuller Company, Lou R. Crandall, Chairman of the Board.*

* *Staff member, Metropolitan Opera Company.*

...BEHIND THE SCENES



Joseph W. Molitor photos

AT "THE WORLD'S MOST MECHANIZED OPERA HOUSE"

THE MET'S AMAZING STAGE

The stage of the new Met is, say many theater experts, the most highly mechanized of any stage in the world.

While most of the mechanical devices in use at the Met can be found in one or another of the European opera houses, the Met has them all, so the potential for exciting theatrical effects on the grandest scale is there to challenge scenic designers and Met technicians. Scenes can float up from below the stage on seven hydraulic lifts which occupy practically a 60-foot-square area of the main stage. Scenes can glide in from the two side stages on motorized wagons, the largest of which is 60 by 48 feet, and from a back-stage wagon on which is mounted a 57-foot-diameter turntable. Scenes and people can pop up or disappear through traps in the decks of the hydraulic lifts, by means of a movable table elevator. Performers can do the same through traps at the front by means of a hand-operated mechanical lift.

▪ All the rigging is mechanized. The 109 pipes (or battens) from which scenery drops hang are motorized, as are eight spot lines. Variable-speed motors can operate the battens from 0 to 180 feet per minute; the light bridges move 20 feet per minute. Even the footlights, which will be used for ballet, are motorized.

▪ In addition to the seven stage lifts, there are two free-form-shaped orchestra lifts—one small, one large; a 25- by 27-foot scenery lift which brings sets up to stage level from the carpentry shop; and a drop-cut lift which is used for storage and retrieval of drops stored in racks below stage at the back of the main stage.

▪ The lighting is probably the most elaborate and extensive of any theater in the world. The lighting control board, which the electricians like to call "Cape Canaveral," is located in a room at the rear of the orchestra floor and covers three whole walls (see color photo page 156). The manually-operated board—a "10-preset board" (each light can be preset for 10 scenes) is the largest of its type.

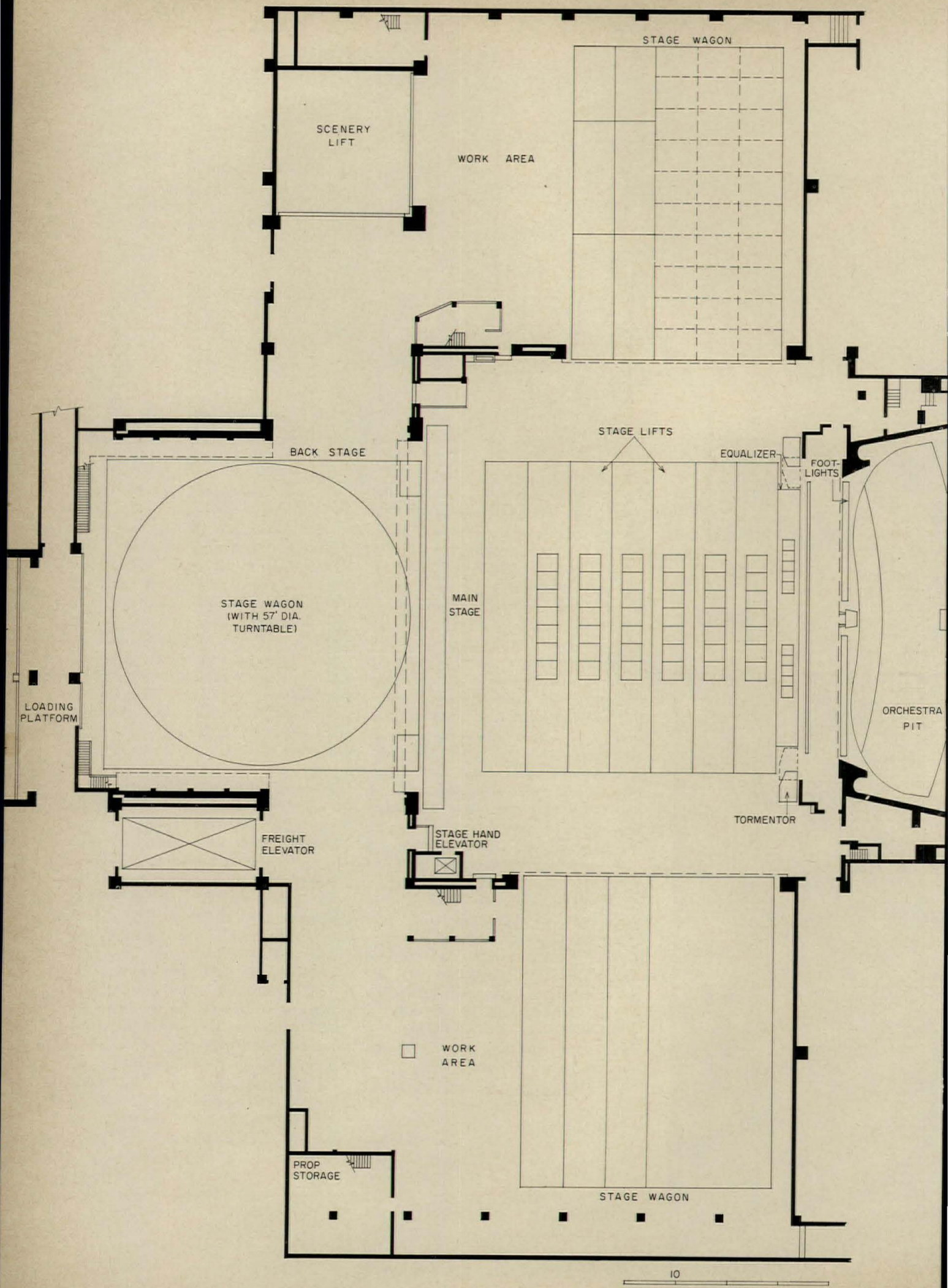
▪ The three front-stage curtains—an asbestos curtain, a Wagnerian-type curtain, and a traveler curtain—are all motorized. The stage manager has oscilloscope monitors for checking opening and closing of the normally used Wagnerian and traveler curtains.

▪ Each of the seven main hydraulically operated stage lifts is 60 feet across and 8 feet deep, with the long dimension parallel to the audience. They move individually or can be locked together in any combination. For part of their rise they can be elevated in increments of 6 inches and for the remaining part, 12 inches. The lifts can move at speeds of 13, 27 or 40 feet per minute. Six of the lifts are double-decked. With three of these the decks are 28 feet apart and the rise is 29 feet, permitting one set of scenery to be used while a second set is in readiness on the top deck. The single deck lift travels 20 feet and the remaining three lifts have 10 feet between decks and travel 24 feet.

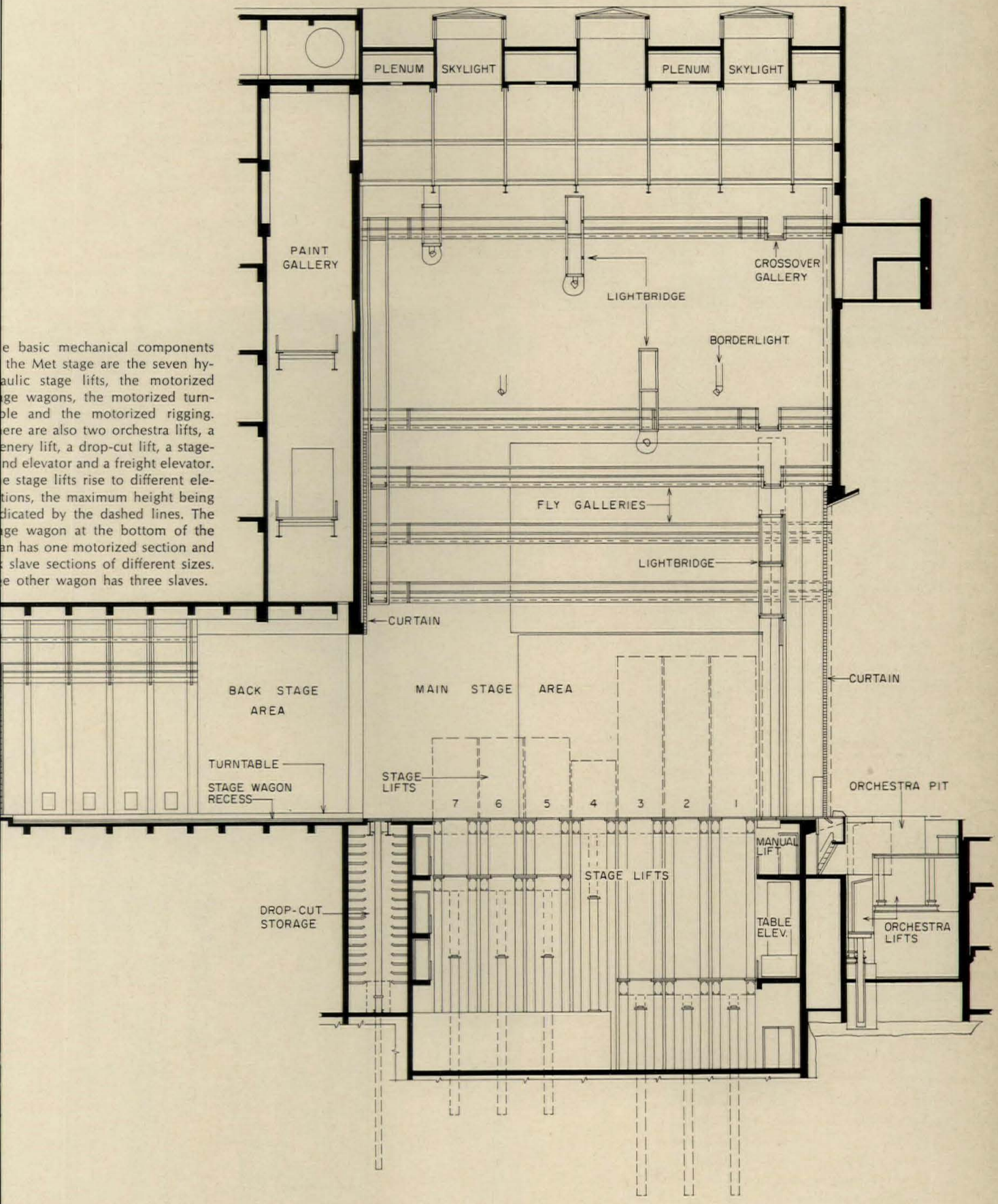
The first three lifts are equipped with two fly pipes for hanging drops and one border light pipe, all manually operated. All lift decks have floor pockets for portable electric equipment.

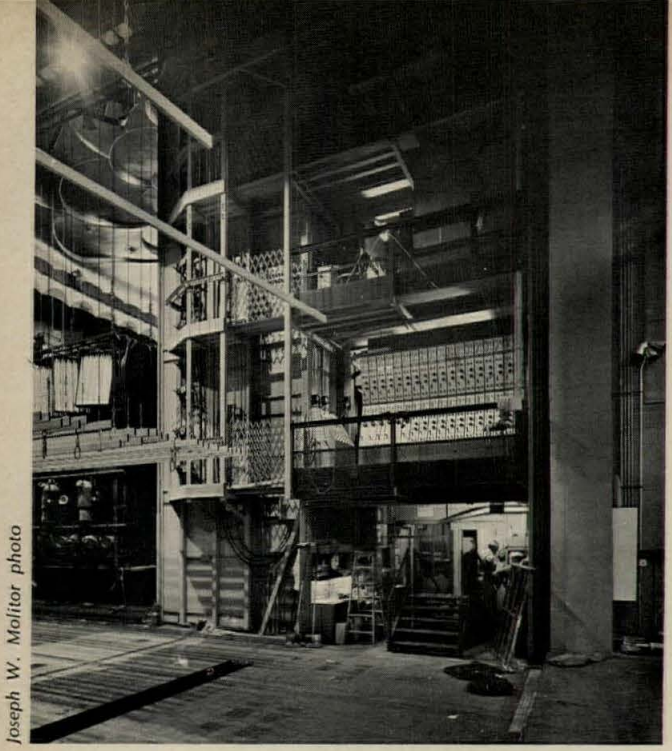
▪ Entire scenes can be mounted on the stage wagons. These wagons are also motorized, moving at a speed of 90 feet per minute. The wagons travel on small wheels (made of very durable plastic to minimize noise) which ride in guide tracks set flush with the floor. Each wagon is moved by friction drive consisting of two drums 11 inches in diameter and 4 feet long turned by two motors.

The rear wagon always moves carrying the turntable. This 57-foot-diameter


STAGE WAGON
SCENERY LIFT
WORK AREA
STAGE LIFTS
BACK STAGE
EQUALIZER
FOOT-LIGHTS
STAGE WAGON (WITH 57' DIA. TURNTABLE)
MAIN STAGE
LOADING PLATFORM
ORCHESTRA PIT
TORMENTOR
FREIGHT ELEVATOR
STAGE HAND ELEVATOR
WORK AREA
PROP STORAGE
STAGE WAGON
10

e basic mechanical components the Met stage are the seven hy-aulic stage lifts, the motorized ge wagons, the motorized turn-ble and the motorized rigging. ere are also two orchestra lifts, a enery lift, a drop-cut lift, a stage-nd elevator and a freight elevator. e stage lifts rise to different ele-tions, the maximum height being dicated by the dashed lines. The ge wagon at the bottom of the an has one motorized section and slave sections of different sizes. e other wagon has three slaves.

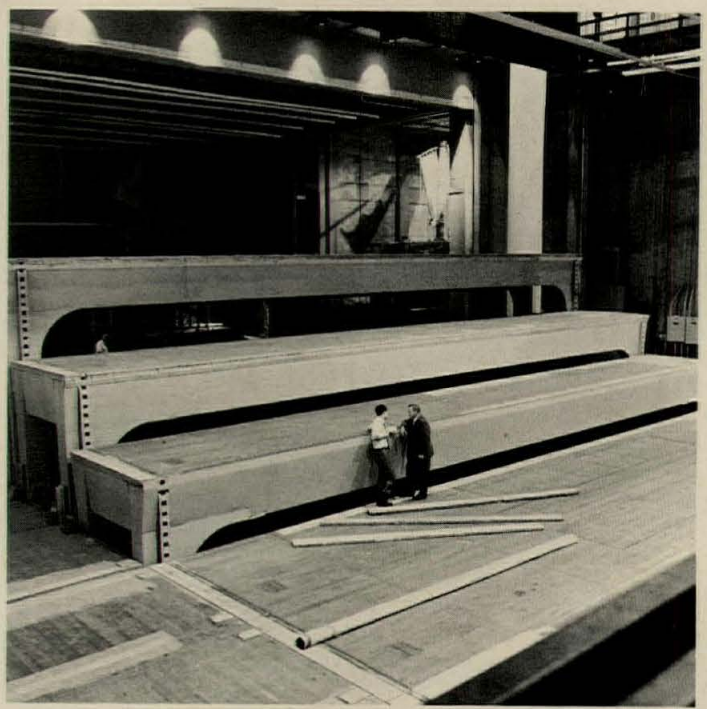


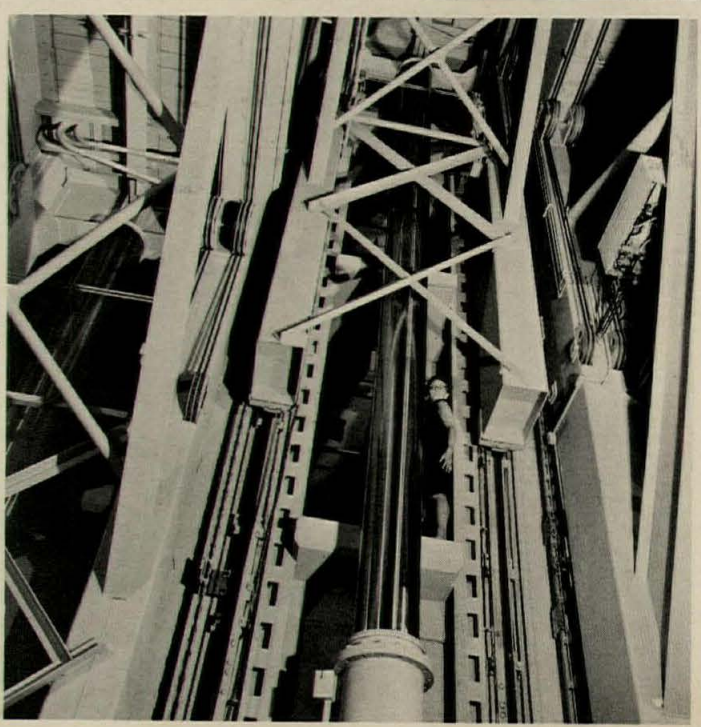


Joseph W. Molitor photo

Left: view of platforms on right-hand side of proscenium. Platform directly above stage contains the master fly console, the stage lift console, the stage wagon console and the spot-line console. Under the platform is the stage manager's intercom unit and curtain monitor.

Below: the top photo shows three of the stage lifts in a tiered arrangement. The lifts can move individually or be interlocked. Six of the seven lifts are double-decked. On the first three of these, the decks are 28 feet apart, making it possible to have one set in use at stage level and another on the top deck out of sight, but in readiness for another scene. The bottom photo shows the hydraulic piston and cylinder for one of the lifts. The hydraulic pumps and their motors are at a remote location so that operation of the lifts will be noiseless.





Jacob Lofman photos, courtesy Dover Corporation

turntable can rotate in either direction, continuously at one of six preset speeds or at variable speeds up to 180 feet per minute at the perimeter.

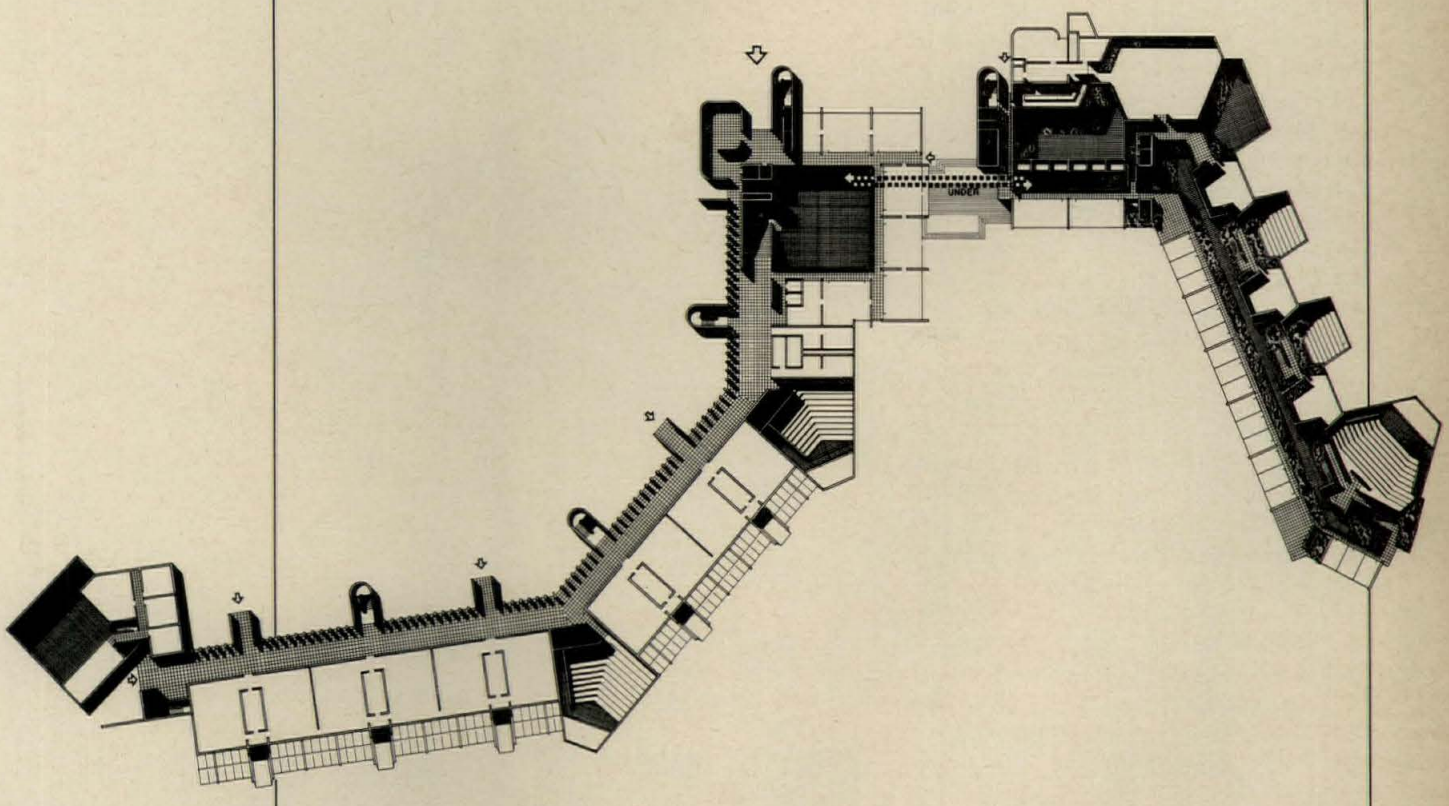
The right-hand-side stage wagon has one motorized section 24 by 60 feet and three slave sections each 8 by 60 feet. The left-hand-side stage wagon has one motorized section 24 by 60 feet and six slave sections, 14, 22, and 24 feet long and 8 feet deep. These slave sections are caster-mounted so that they can be pulled to any part of the stage. The motorized section is divided into 60 segments which can be elevated 4 feet by means of screw jacks. Each segment has two jacks so that these sections of the wagon can be set in tiers and in either horizontal or raked positions.

A table elevator stored below the stage rolls out under the first three lifts and has a platform slightly smaller than the trap section.

▪ How will the mechanics be exploited? Both the Met staff and outside technologists feel that the new-found devices will challenge scenic designers to new heights. Some theater technologists take a more wait-and-see attitude, wondering which devices will be used and how often, and how often scenic designers may want something that is not there. Apparently there is no objective survey of how extensively the mechanical devices are employed in the European opera houses. It is pointed out that the Met stage is a very special design for a year-round opera company and that the stage was specifically tailored for performance in repertory. Thus the stage does not establish a precedent (taken in sum) for the large municipal or college multi-purpose hall. Undoubtedly, however, it will be watched with great interest by theater people to see how the various components are handled.

Fifth in a series about young architects
who build a successful practice with work of notable quality

BEYOND THE INDIVIDUAL BUILDING



Much is being written and said about the architect's responsibility to involve himself in large-scale environmental problems; but it is not so easy for the young architect to find opportunities to perform such a service in practice. The work of John Andrews, an Australian-born architect practicing in Canada, therefore acquires a particular significance, because Andrews built up his successful office through an ability to produce architectural concepts at a scale larger than that of the individual building.

The growth of John Andrews' practice has been based upon an ability to produce strongly original solutions to complex problems, while, at the same time, carrying out these original concepts on a time scale, and at a cost, that is competitive with more conventional projects.

The story can be said to begin when Andrews and three associates became finalists in the Toronto City Hall competition while they were all still students at the Harvard Graduate School of Design. The competition brought Andrews to the attention of the Toronto architect John B. Parkin; and, after Viljo Revell won the second stage, Parkin offered Andrews a job as a senior designer.

During two years in Parkin's office, Andrews was responsible for something like seven major projects, and acquired a great respect for the technical capabilities of the Parkin organization, while at the same time feeling that he would never be satisfied until he could have his own office and final design control.

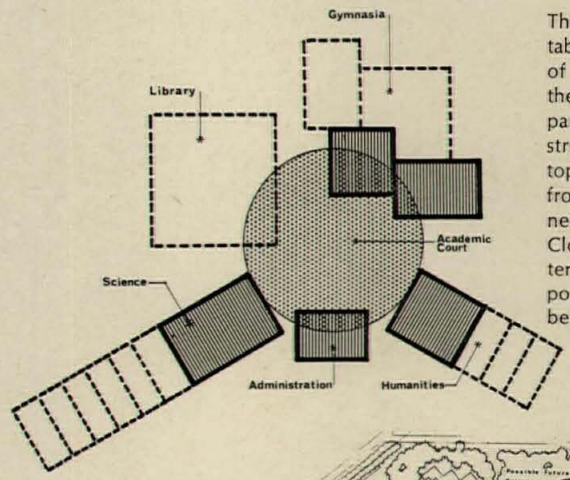
During these two years Andrews also worked on the City Hall, for which the Parkin office was the associated architect. For the last nine months of the working drawing phase, Andrews transferred to Revell's office; and, when the job was finished, Revell offered to lend him enough money to make an extended trip around the world.

To hear Andrews tell it, his return to Canada was almost entirely fortuitous; he claims that he and his wife might well have stayed on in Australia if they could have gotten enough money out of turning in their airline tickets. In any event, on his return to Canada, Andrews found a commission for a shopping center waiting for him. The center was never built, but the fees for the design enabled him to maintain a small office of his own. He also did some remodeling work: ". . . we must have done 15 kitchens," and accepted a teaching position at the University of Toronto.

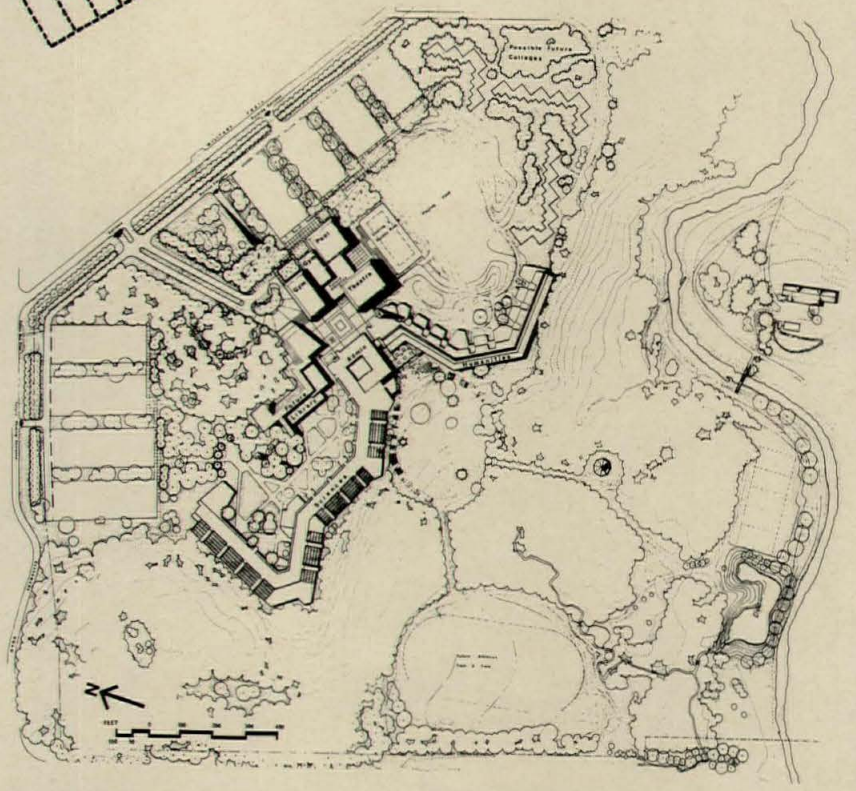
Scarborough College: the concept was established within six weeks

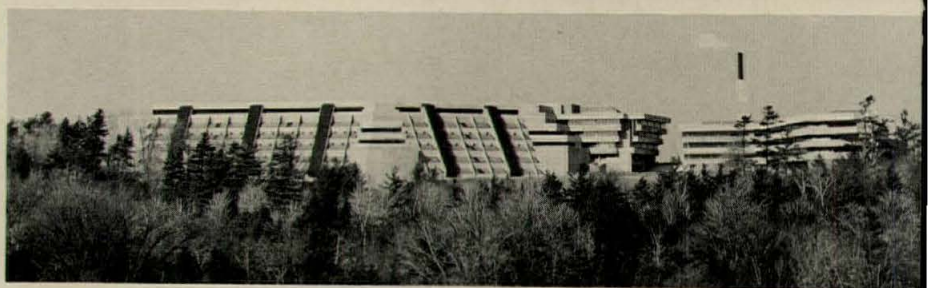
It was through this connection with the University that Andrews received his first major opportunity. Michael Hough, a landscape architect and a member of the faculty, had been asked to prepare a

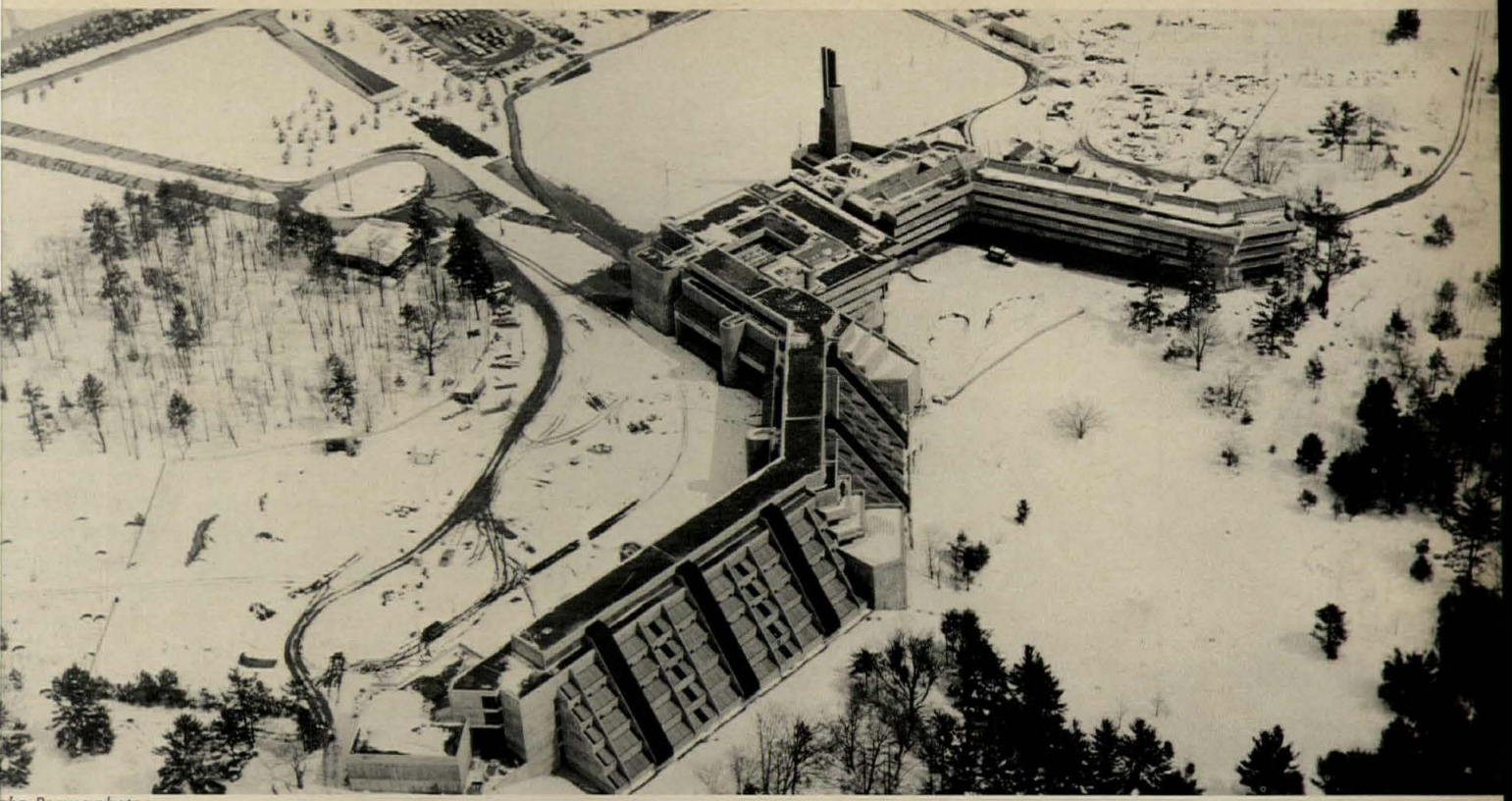
SCARBOROUGH COLLEGE
Scarborough, Ontario



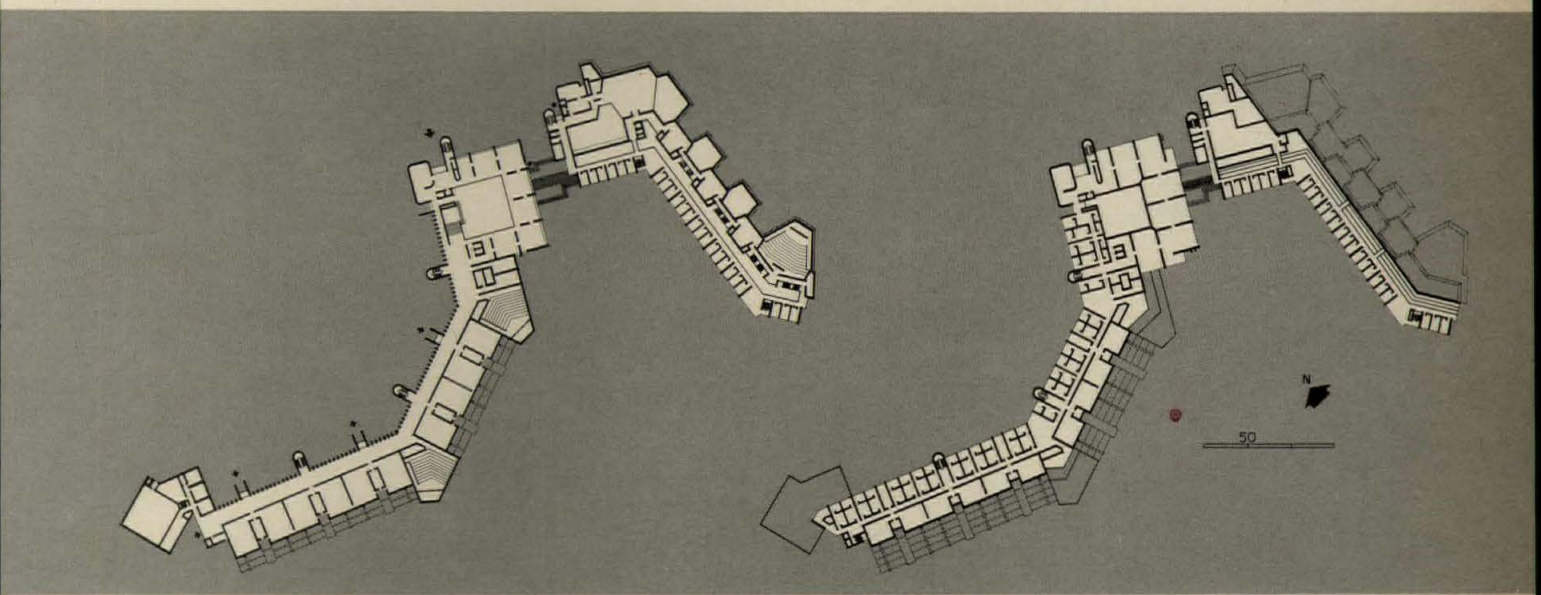
The basic architectural concept, es tablished within the first six week of design, is substantially that o the completed building—see com parison of model photo and actua structure, below, left. Plan follow topography; lines of growth radiat from nucleus containing element needed by all parts of the college Closed-circuit television is used ex tensively for lecture courses, is im portant design element, see photo below right.

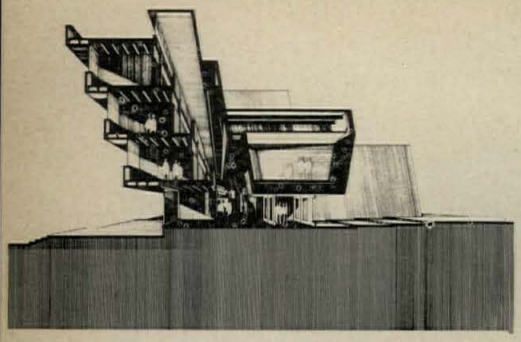


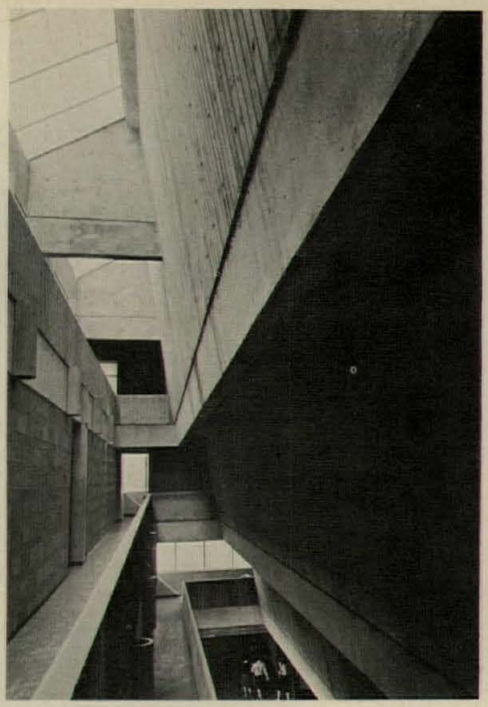




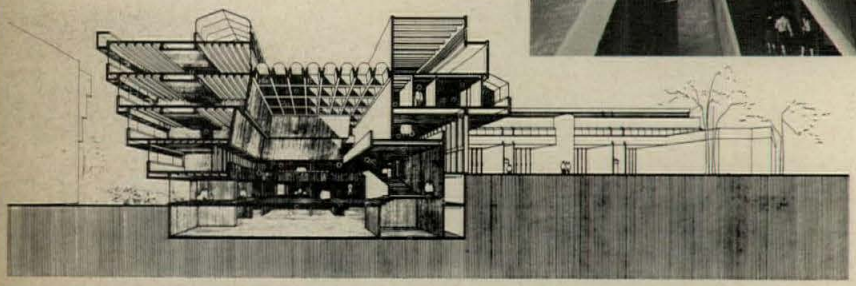
ohn Reeves photos



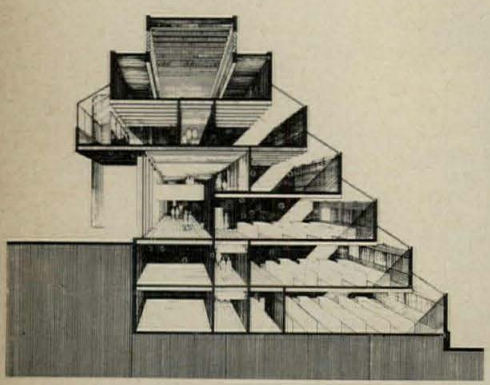


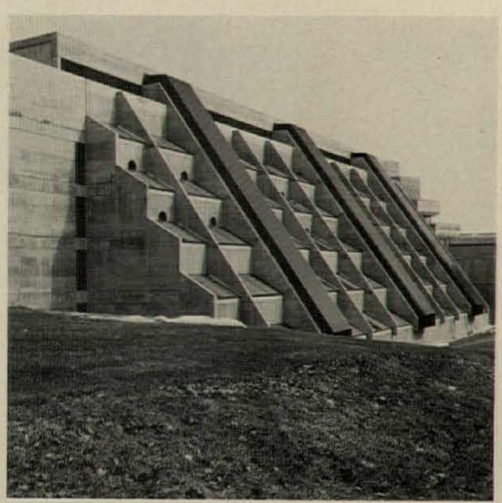


There are three typical section conditions at Scarborough College: one for the area devoted to the humanities, above; one at the great central meeting place which is the hub of the whole college, below . . .



. . . and a third typical section for the science wing. The circulation spaces thus offer a series of varied, but related, experiences.





master plan for a new satellite college on land that the University owned some 20 miles outside of downtown Toronto. Hough suggested that a team which also included an architect and a city planner was necessary to do the job right, and Andrews and Michael Hugo-Brunt, an other faculty member, were selected. The team worked to a tight schedule which required decisions to be both swift and sure-handed; and the basic architectural concept that was established by Andrews within the first six weeks was substantially the same as that of the completed complex. (See pages 162-164.)

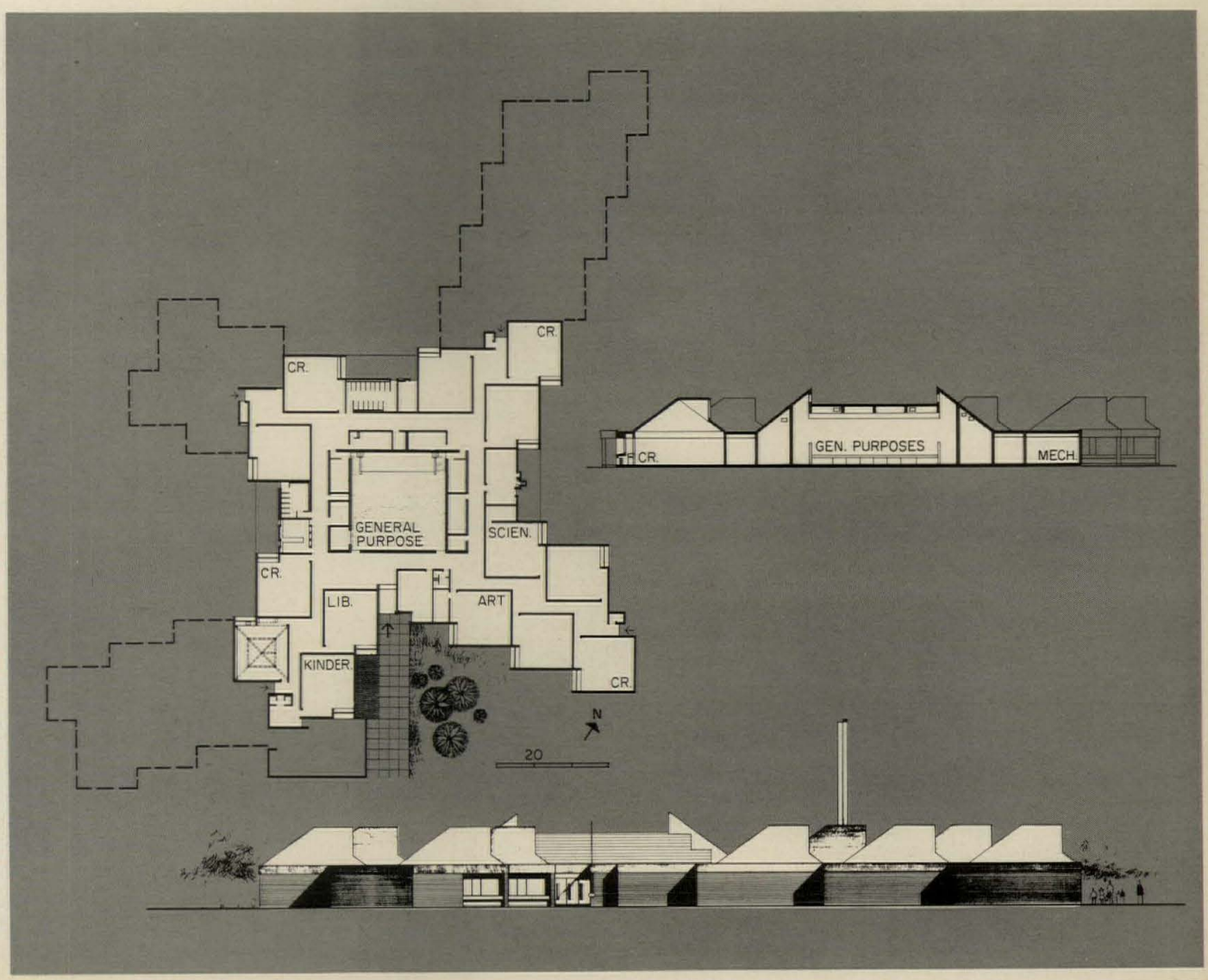
The concept was based on three elements: lines of growth, organization by section, and topography. The ultimate size of the college could not be determined, and the buildings would, in any event, be built in stages. These circumstances led to the establishment of a nucleus of elements needed by the whole college, with lines of growth radiating from it. The concept of incremental growth led logically to a decision to mix different types of space use—classrooms, lecture halls, and offices—in a more or less fixed ratio, rather than segregating them in specialized buildings. The desirability of sheltered circulation during the harsh Canadian winter was also a factor in this decision. Analysis of the site showed that the best location for buildings was the crest and southern slope of a ridge that traversed the area. Placing some of the buildings along the edge of the slope would allow them to be entered at an intermediate level, making more floors accessible without elevators. The shape of the ridge thus became a design determinant.

A critical path "like a cavalry charge"

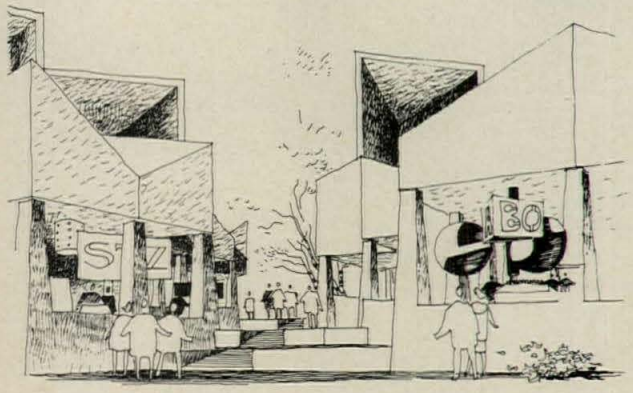
Andrews grasped the relevance of linear organization and a complex section similar to those investigated by Le Corbusier in his projects for Algiers, not only for a situation of continuous growth, but also for a time schedule in which contracts had to be let serially, rather than on the traditional lump-sum basis. Along with Robert Anderson, the partner in charge for the associated architects, Page and Steele, Andrews worked out a means for

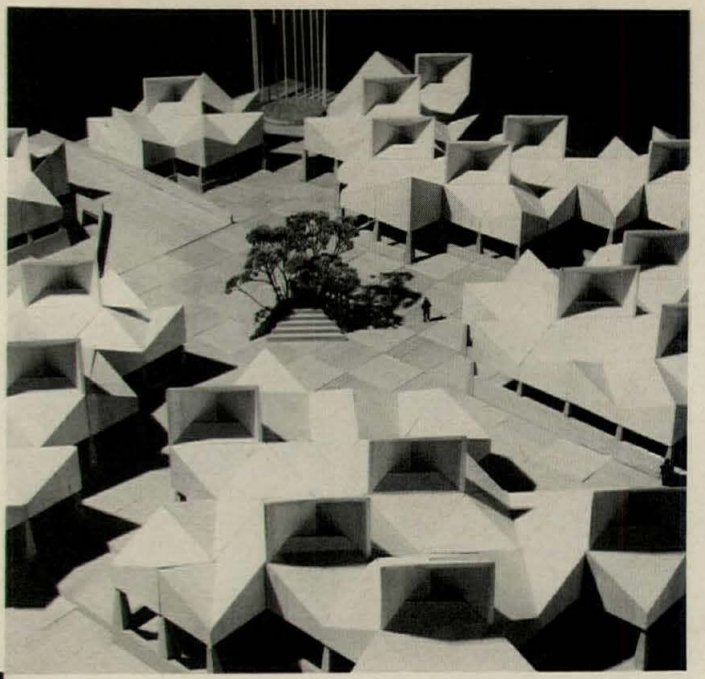
BELLMERE SCHOOL
Scarborough, Ontario

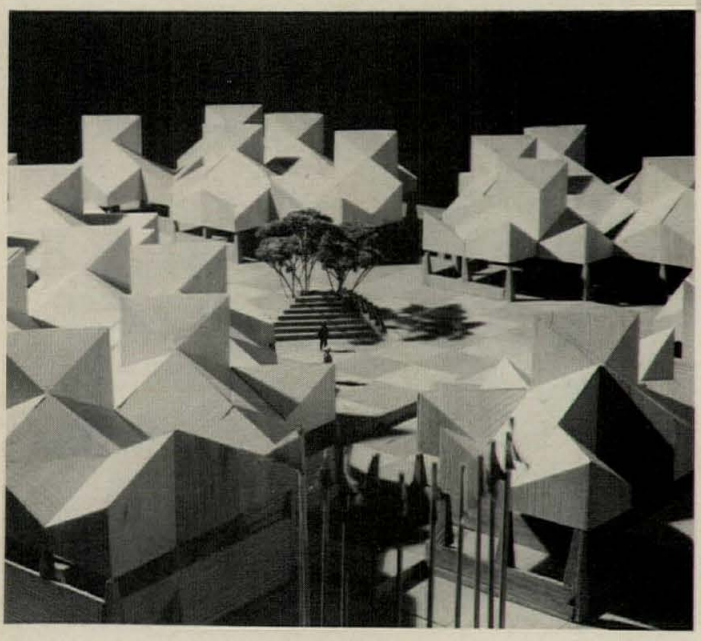
The Bellmere elementary school was designed to expand to the limits of the dotted line shown on the plan; and construction has already begun on the second phase, although the school has only been open a year. Classroom units are grouped around a multi-purpose room in a pinwheel configuration. Each unit has a hipped roof which peaks to form a triangular opening on one side. The roof-scape and the domestic scale of the building complex were designed to blend with the suburban neighborhood in which the school is situated.

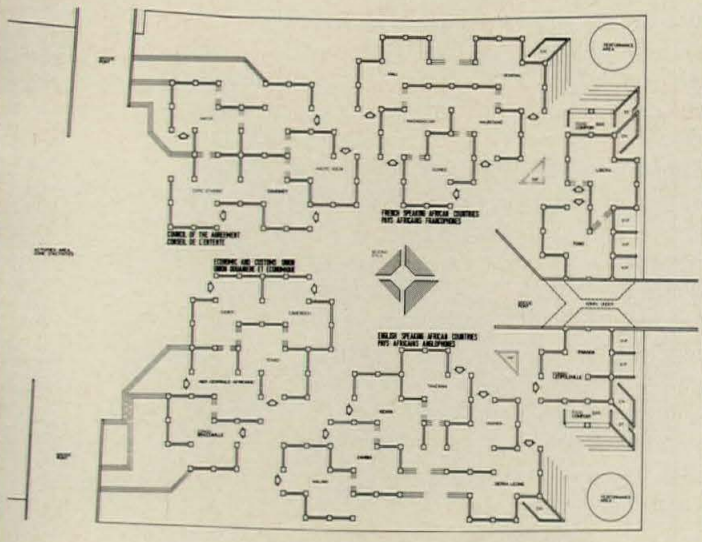


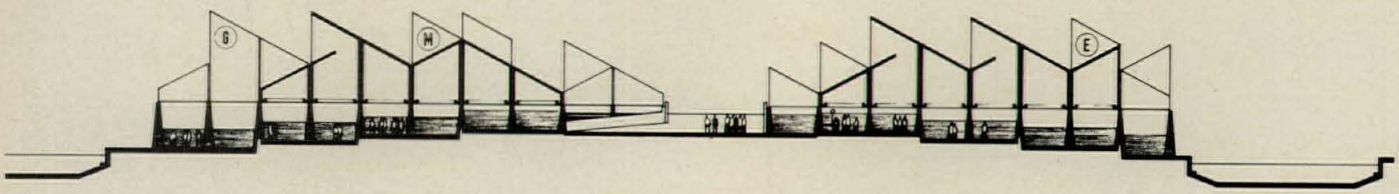
AFRICAN PLACE
pavilion for Expo '67

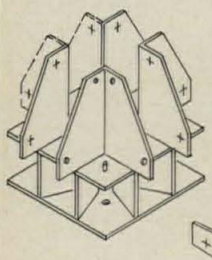




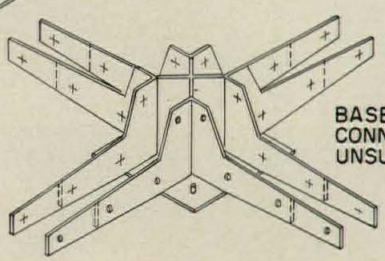






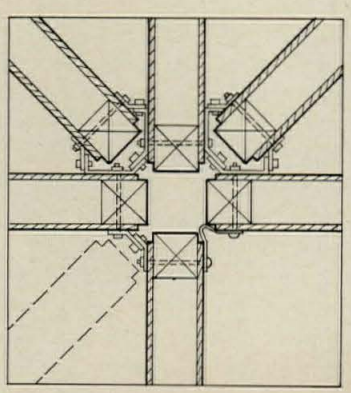


BASE CONNECTOR
AT PIER HEAD



BASE
CONNECTOR
UNSUPPORTED

These pavilions for African nations exhibiting at Expo '67 provide a series of modular spaces, each containing 1,000 square feet. Differentiation between areas has been achieved by changes of level, with circulation planned so that visitors can traverse the complex in many different ways. "Wind scoop" roof was tested extensively in a wind tunnel, will keep pavilions ventilated without air conditioning. Roofs are constructed of demountable plywood sandwich panels, with steel connections as shown.



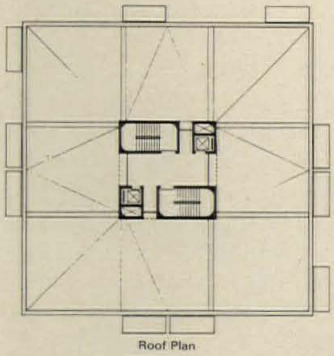
permitting the construction process to move along in parallel with the final development of the design. Anderson, who has since joined Andrews' office, made extensive use of critical-path scheduling and a continuous series of cost estimates to assure that both cost and speed would be competitive with more conventional buildings. According to Andrews, "the critical path was more like a cavalry charge than a sequence of events," but little trace of this is visible in the actual building.

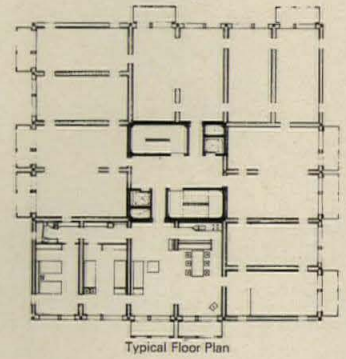
The relation of the completed structure to the site and its execution in detail are both highly accomplished, an achievement which seems more considerable when one remembers that although the continuous building of complex section may have been a familiar theoretical possibility, its execution as a finished building was virtually unprecedented. There are a few places where the "cavalry charge" got ahead of the architects, but not many; and the construction cost of $27 (Canadian) a square foot (inclusive of fees but not landscaping or furnishings) shows the architects' ability to preserve a reasonable budget in an experimental design situation.

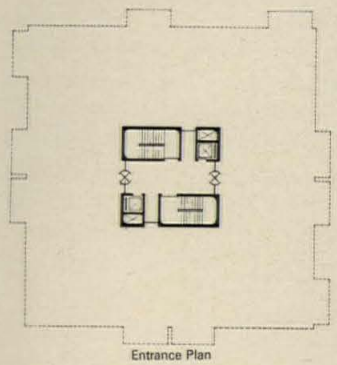
A school and a pavilion: growth patterns for cellular units.

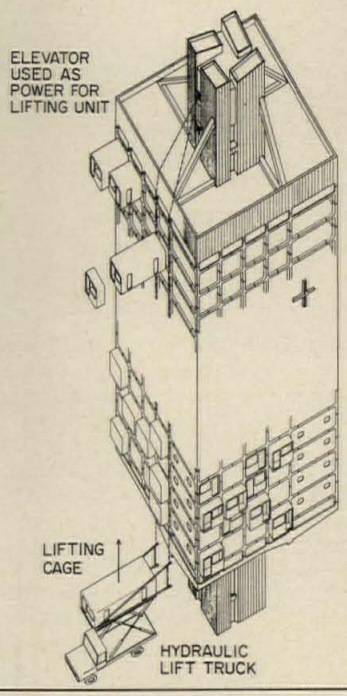
The initial publication of the Scarborough design led to more commissions: an elementary school to be located in the same township as the College (see page 165) and a pavilion for African nations at Expo '67 (shown at left). Like Scarborough, both of these projects needed to grow in increments to a size that could not be finally determined in the initial program. But unlike Scarborough, it could be assumed that growth would occur in similar units: classrooms in the case of the school, modules of exhibition space for the participating nations in the African pavilion. The organizing principle that Andrews used in both cases was that of a grid in which each unit has a hipped roof with a triangular opening on one side. Similar means of giving cellular spaces individual identity had been explored by Louis Kahn in his unbuilt, but extremely influential, design for a Jewish Community

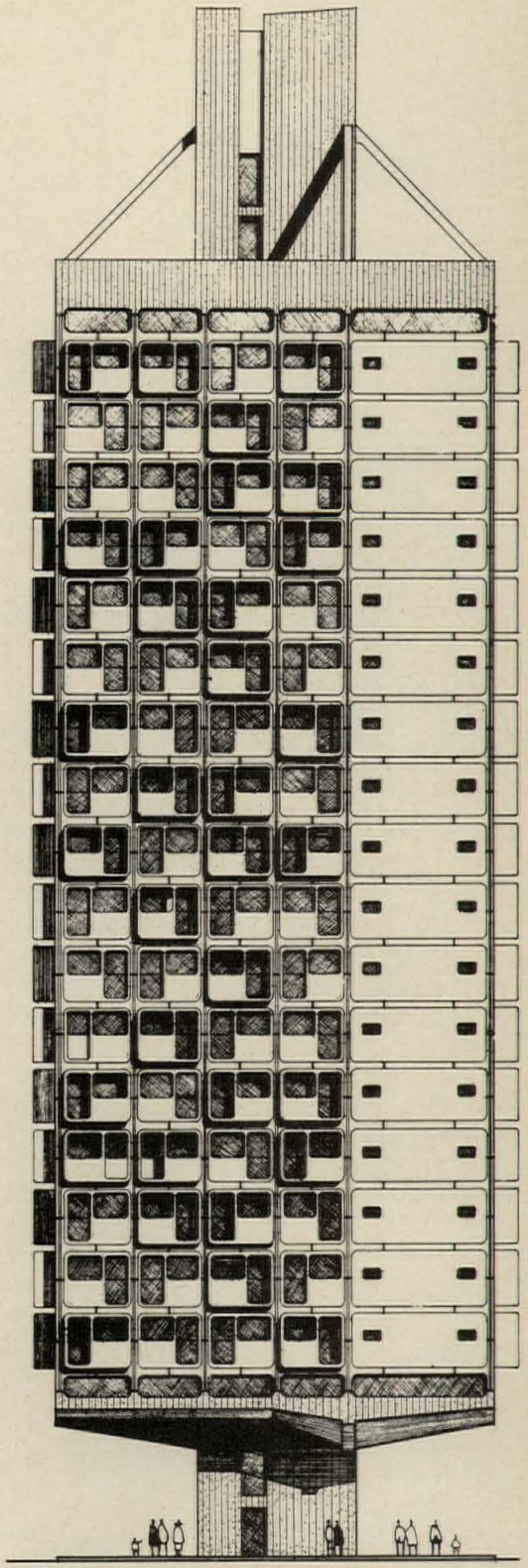
APARTMENT BUILDING
a demonstration project





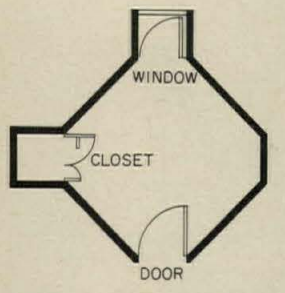




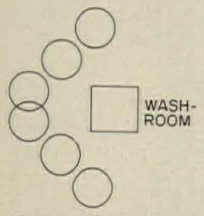


This project demonstrating new uses of steel was commissioned by a manufacturer. The scheme postulates a tower structure that would serve as a "filing cabinet" for prefabricated steel dwelling units, similar in concept to mobile homes. Such an extension of automotive technology to the problems of housing is a very real possibility for future research.

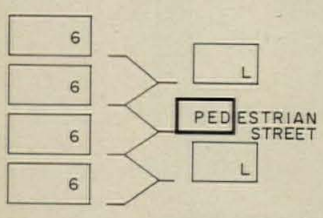
DORMITORY ROOMS
a program study



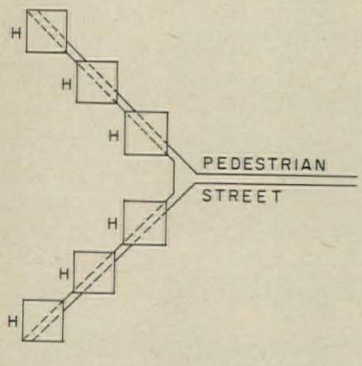
Basic unit is a room for each individual. The student can vary the furniture arrangement.



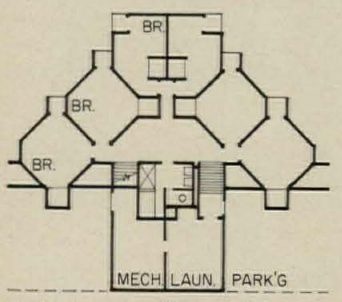
Six student rooms are grouped around a landing and washroom facility, form small social unit.



Each staircase system forms a house, with lounge and kitchenette for each group of 12.



Houses grouped on pedestrian street form a residence, which has its own dining room, resident master.



Preliminary architectural concept shows how actual configuration of rooms grows out of diagram.

Center in Trenton, New Jersey; and, among others, by Aldo van Eyck in his design for an orphanage near Amsterdam. Derived from the academic tradition of stone vaulting, this system presents a structural contradiction when combined with a modern steel or concrete skeleton, as it becomes essentially a series of domes supported on widely-spaced columns. But Andrews' use of demountable plywood sandwich panels for the African pavilion carries this type of design to its logical conclusion, by preserving the form but carrying it out in a type of construction that is consistent with its cellular nature.

A tower of "mobile homes"

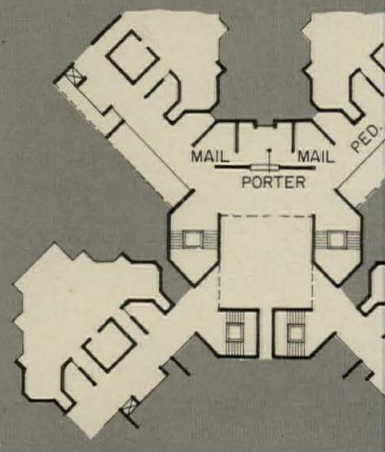
Growth and change of quite a different kind are embodied in Andrews' concept for an apartment tower (illustrated on page 167) composed of removable stamped-steel units. Commissioned as one of a series of projects designed to demonstrate new uses of steel construction, the tower is in some respects, as Andrews puts it, "tongue in cheek". Nevertheless, the idea of something resembling a mobile home that could be plugged into an urban context in the winter and moved to a country location for the summer season (or transferred to another area altogether) has many evident advantages. The technological problems were studied with some care, with the controlling dimensions for the unit being those of the end panel of a railway boxcar, which is the largest steel stamping presently manufactured.

Guelph University: cost control, time control, and unusual design

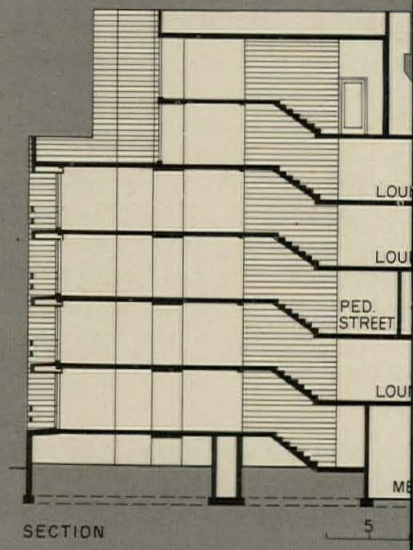
The Andrews office was selected from a large group of architects interviewed for the job of designing the first dormitory complex at the new University of Guelph, in southwestern Ontario. Andrews feels that a major factor in the selection was the organization of his office, with its capabilities for employing cost- and time-control techniques.

This office organization is essentially a vertical one. There is a project architect in charge of each job, and he stays with it from beginning to end. Each project has a fully co-ordinated manage-

UNIVERSITY OF GUELPH
Guelph, Ontario



LEVEL THREE
PEDESTRIAN STREET



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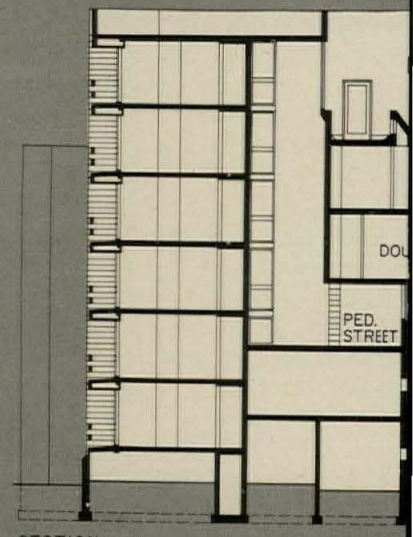

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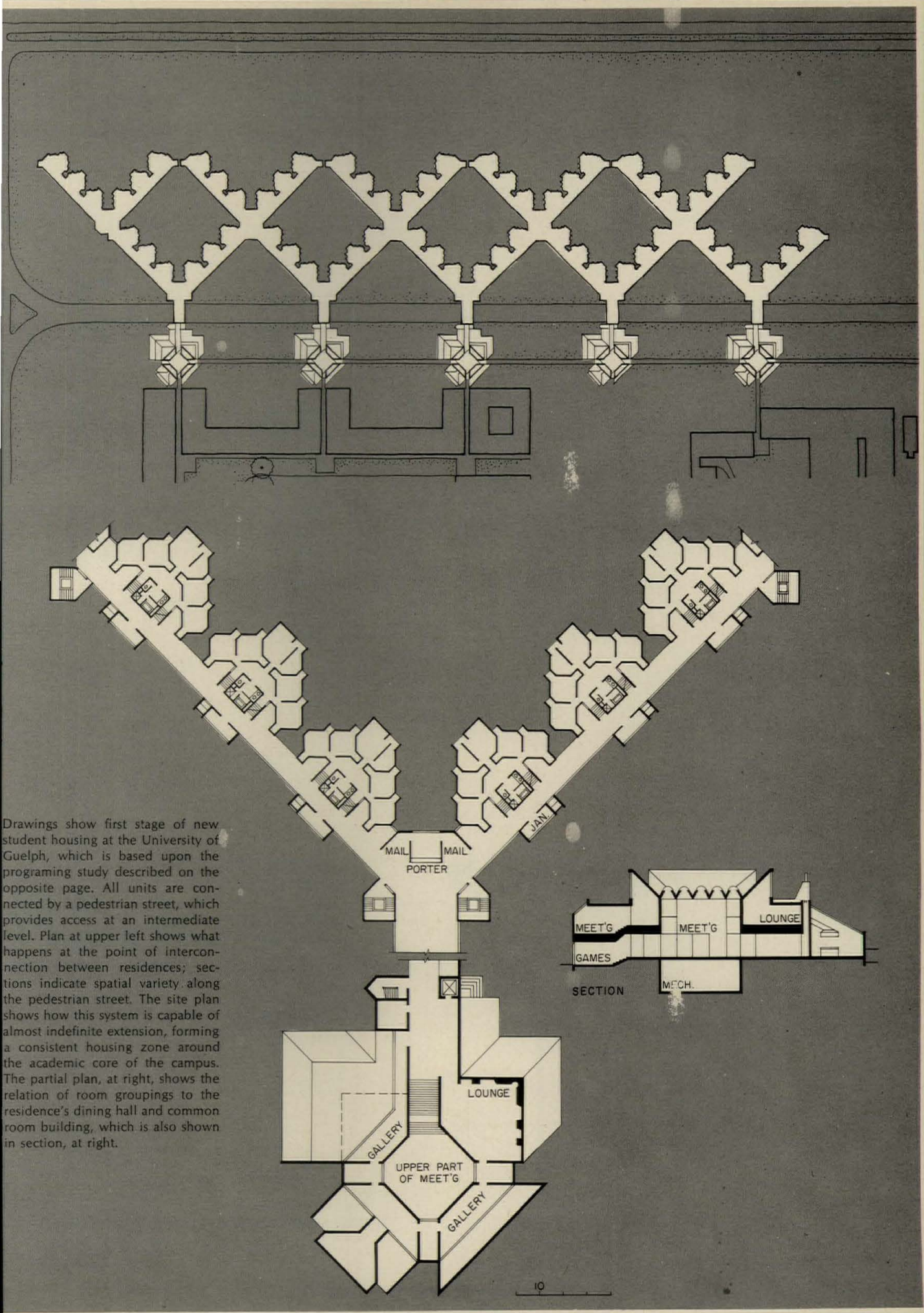
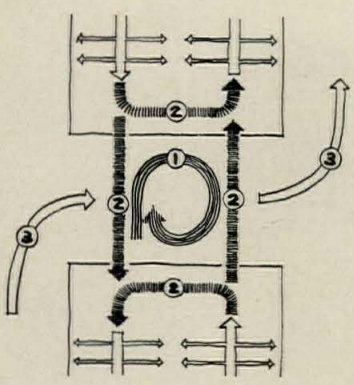
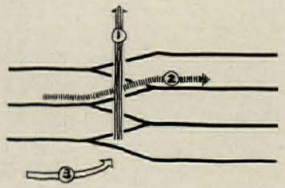
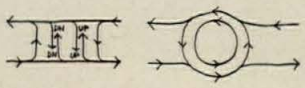


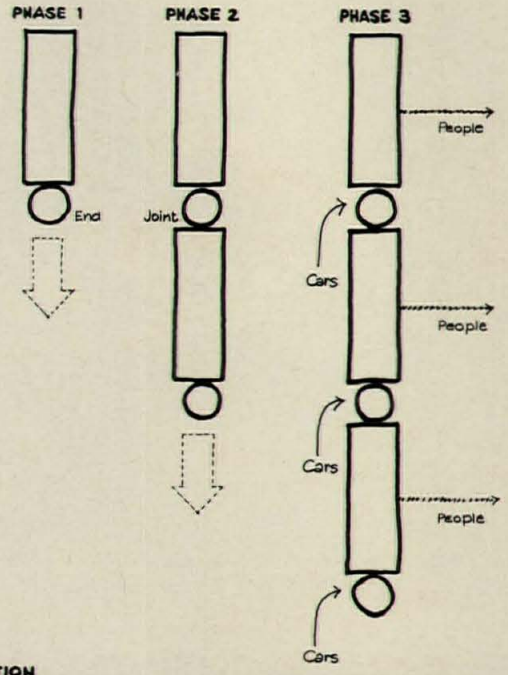
Drawings show first stage of new student housing at the University of Guelph, which is based upon the programing study described on the opposite page. All units are connected by a pedestrian street, which provides access at an intermediate level. Plan at upper left shows what happens at the point of interconnection between residences; sections indicate spatial variety along the pedestrian street. The site plan shows how this system is capable of almost indefinite extension, forming a consistent housing zone around the academic core of the campus. The partial plan, at right, shows the relation of room groupings to the residence's dining hall and common room building, which is also shown in section, at right.

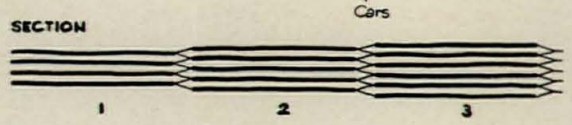
MASTER PLAN STUDY
for the University of Toronto

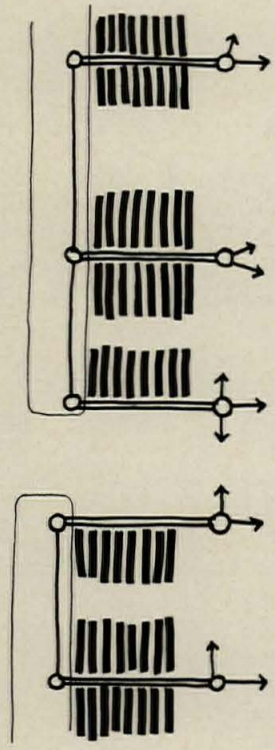




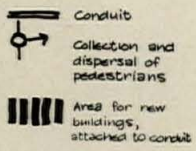


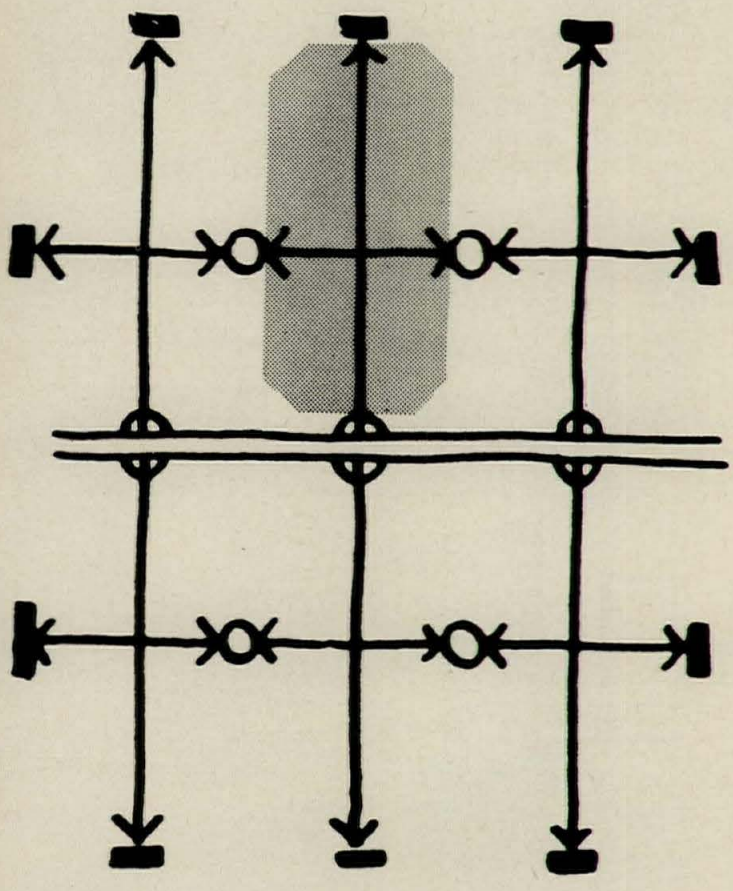


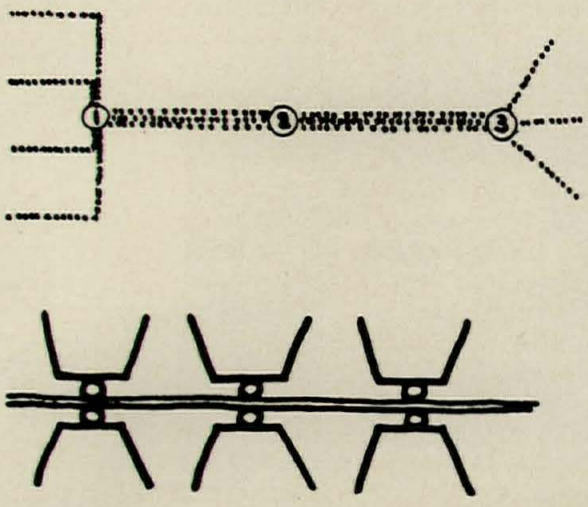




This master planning study for an existing campus seeks to set the basic parameters for future orderly growth. Easy automobile access is considered vital, but parking is to be confined to the edge of the campus. Diagrams, above left, describe parking system and the way it can grow both vertically and horizontally, with vehicular circulation taking place essentially in the "joints" between the parking decks. Pedestrian circulation starts at collection points midway along each parking deck, with buildings branching off each side of the pedestrian conduit. The diagram at left shows ultimate extension of system on land available. Individual buildings are serviced by vertical cores attached to the pedestrian street as shown in the diagram, below, right.







ment program, with the architects and consultants subject to the same critical-path time disciplines as the contractor. Andrews and Robert Anderson are the only people in the office who are involved with every project, with Andrews' major area of responsibility being conceptual design, and Anderson's being primarily technological and organizational. The office has only architectural personnel, with all other aspects handled by outside consultants.

Two of the most important consultants on the Guelph housing were Evan Walker, an architect who did a programing study of university dormitories, and the cost estimators: Helyar, Vermeulen, Rae & Mauchan.

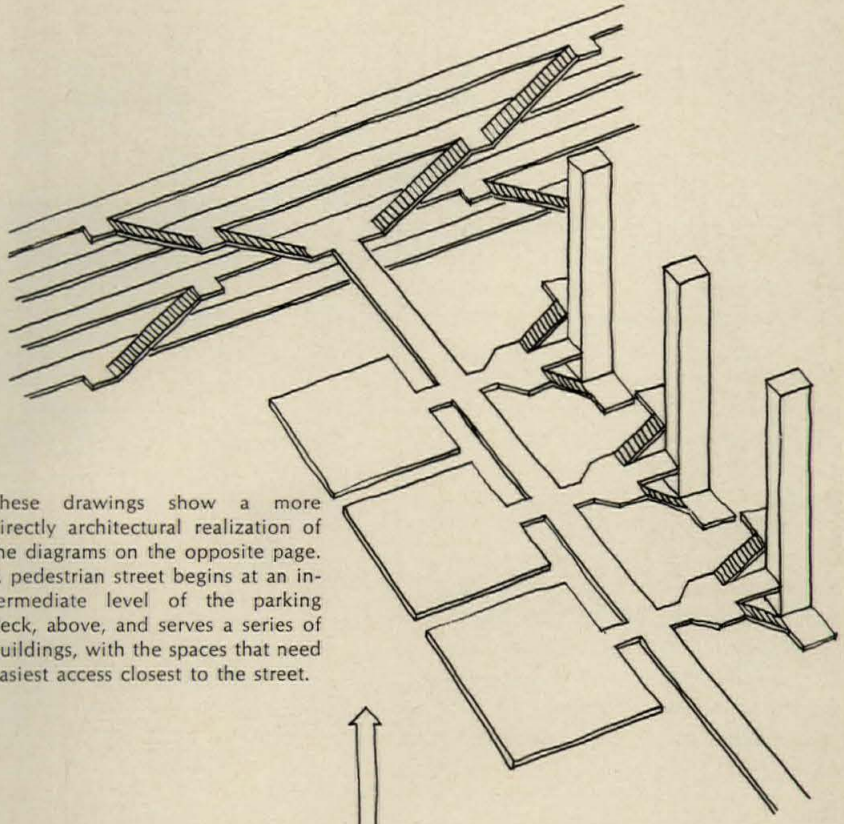
Early estimating allowed the architects to see, even before design began, that the budget ceilings established by the client were unrealistic. A comparative study of university housing on a cost-per-student basis, with the figures adjusted for increasing prices, convinced the client to re-study the budget. The report's discussion of present economic conditions concluded with the terse phrase: "We are advised by our cost consultant that future costs will increase by 1 to 1½ per cent per month up to the date of tender."

At the conclusion of the preliminary design phase, the architects submitted a cost estimate projected for September, 1967 with a cost-per-student figure of $10,042 (Canadian) for a lump-sum contract and a proposal for a negotiated construction management fee and a sequential system of sub-contracts, competitively bid, that it was estimated would reduce the cost per student to $8,854 (Canadian). A table of costs for comparable buildings, also adjusted for September, 1967 showed these figures to be in the lower half of the range covered.

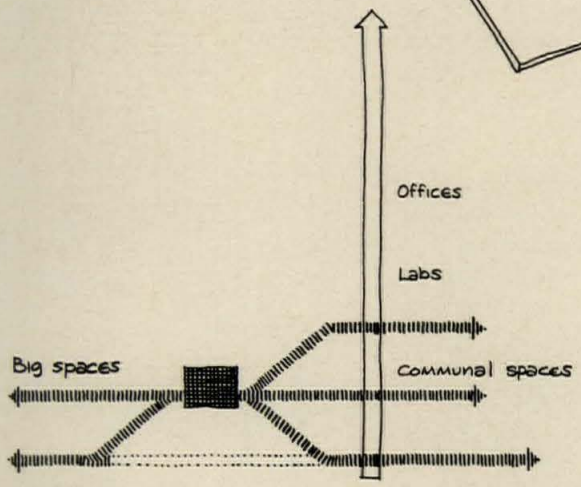
Detailed cost control techniques also gave the architects latitude to use items like high-quality doors and quarry tile floors, because they had an accurate idea what their effect on the total cost would be.

The architects' emphasis on cost control was particularly necessary because the Guelph complex is a highly unusual design. On the basis of Evan Walker's research, each student room is

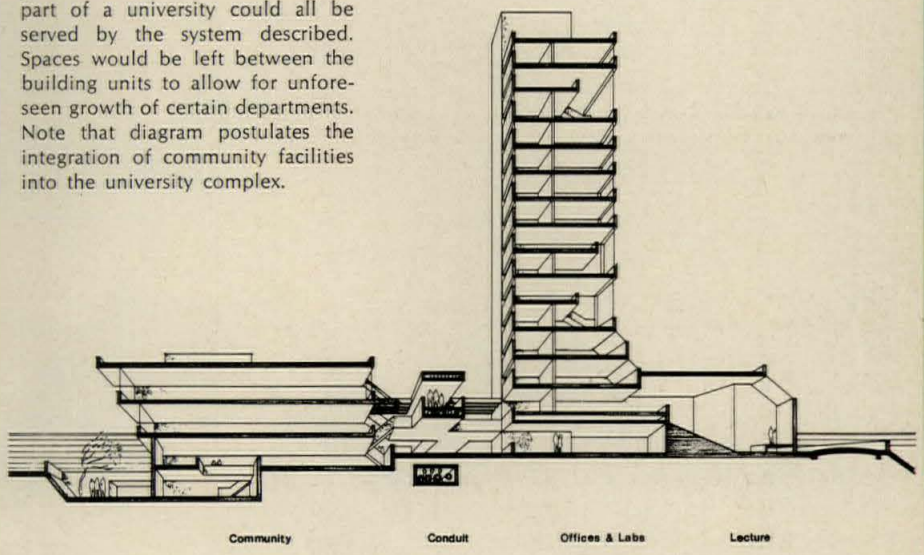
MASTER PLAN STUDY
for the University of Toronto



These drawings show a more directly architectural realization of the diagrams on the opposite page. A pedestrian street begins at an intermediate level of the parking deck, above, and serves a series of buildings, with the spaces that need easiest access closest to the street.



The section, below, shows how the great variety of functions that are part of a university could all be served by the system described. Spaces would be left between the building units to allow for unforeseen growth of certain departments. Note that diagram postulates the integration of community facilities into the university complex.



a square, with the entrance, closet and window opening all occurring at the corners. (See page 168.) The wall spaces are thus uninterrupted and equal in size. Specially designed and selected furniture will allow the students to arrange their rooms in a number of different ways. The rooms are grouped and connected vertically on the entry principle, and are tied to each other horizontally by a "pedestrian street" which is the major means of circulation. Dining areas and common rooms are located at the important connecting points. The result is a building form that preserves the identity of individual units, creates a variety of spaces, but is also capable of almost indefinite extension. (See drawings, pages 168-169.)

Traditional control in unprecedented situations

The Andrews office is also at work on a student union for the University of Toronto, some university master planning studies, one of which is illustrated on pages 170 and 171, and a hotel in Jamaica, which is shown at right.

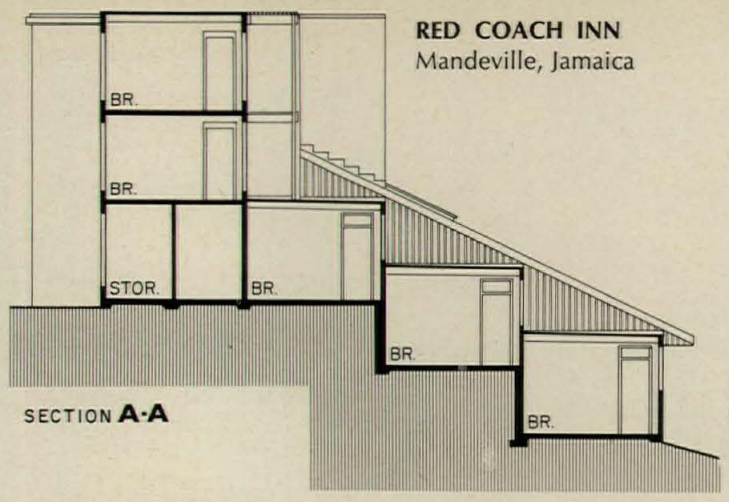
Andrews continues to follow a predilection for reacting to opportunities as they present themselves, but the growth of the office has progressed far enough that certain basic patterns are beginning to emerge.

The rational organization of circulation is an important design influence in all of Andrews work, and is probably the most important single factor that enables him to control problems of large-scale organization. In general, Andrews seeks to create a variety of experiences in the spaces used for circulation and tends to organize the actual functioning areas according to a cellular and repetitive pattern which will be both economical and efficient.

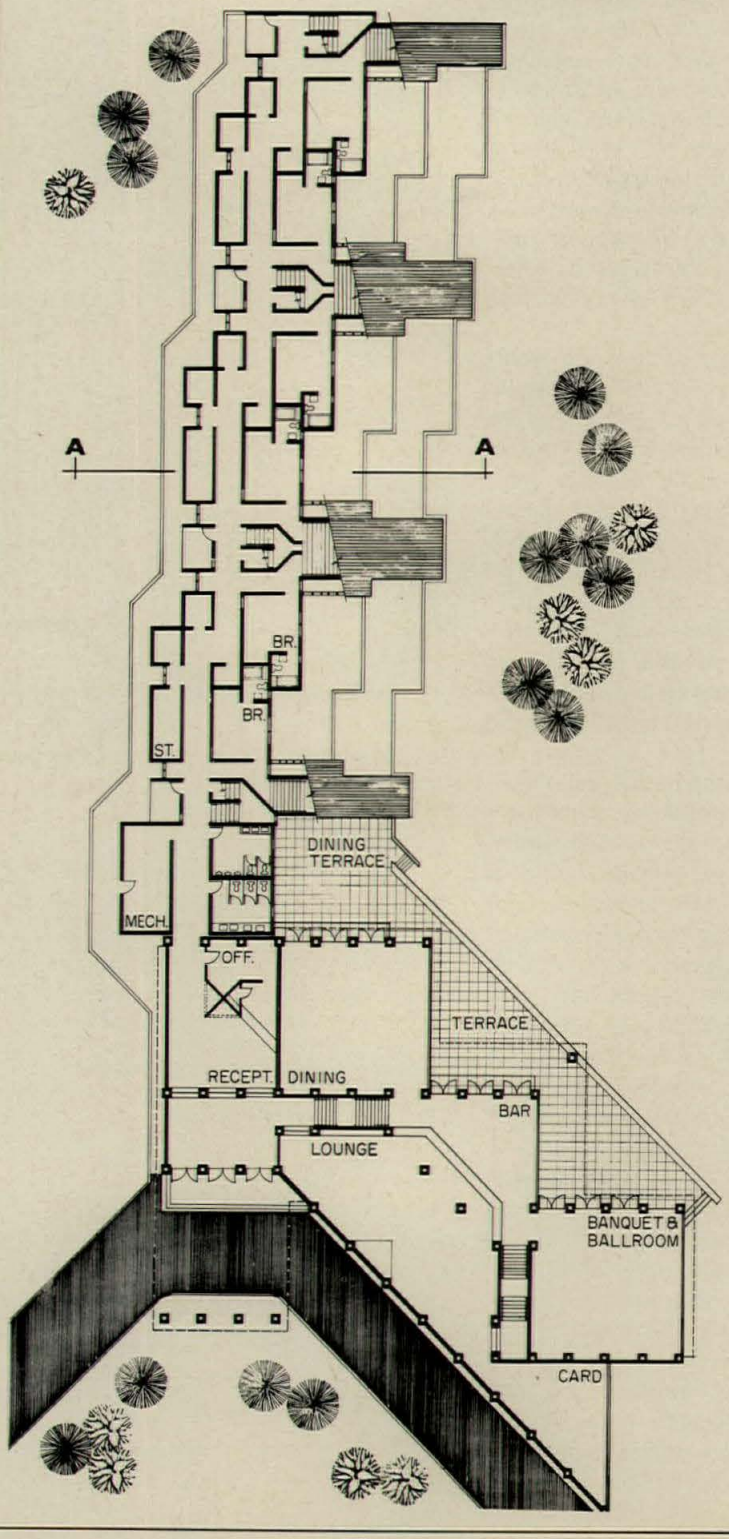
The office purchases its ability to design on an experimental basis by detailed cost control and time analysis, accompanied by frequent and explicit presentations to the client.

In a period where every situation is subject to continual growth and change, John Andrews seems to have evolved a pattern of practice which permits the architect to retain his traditional controlling hand.

RED COACH INN
Mandeville, Jamaica



SECTION **A-A**

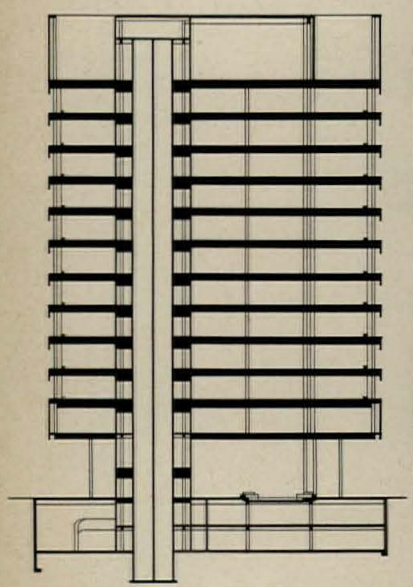


CHARLES CENTER'S LATEST

In this new home office for Sun Life Insurance Company, architects Peterson and Brickbauer, and Emery Roth & Sons, make an elegant addition—at a bargain price—to downtown Baltimore

Joseph W. Molitor photos

SUN LIFE



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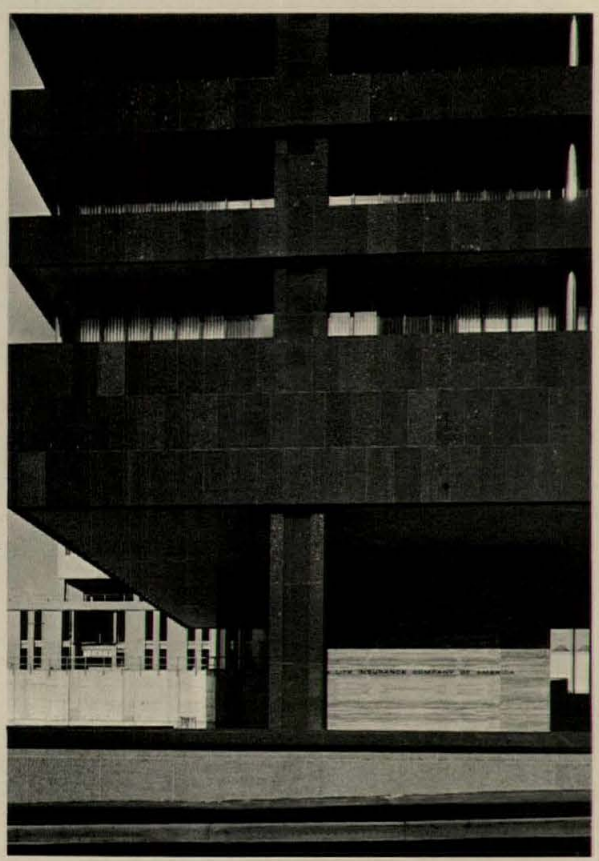


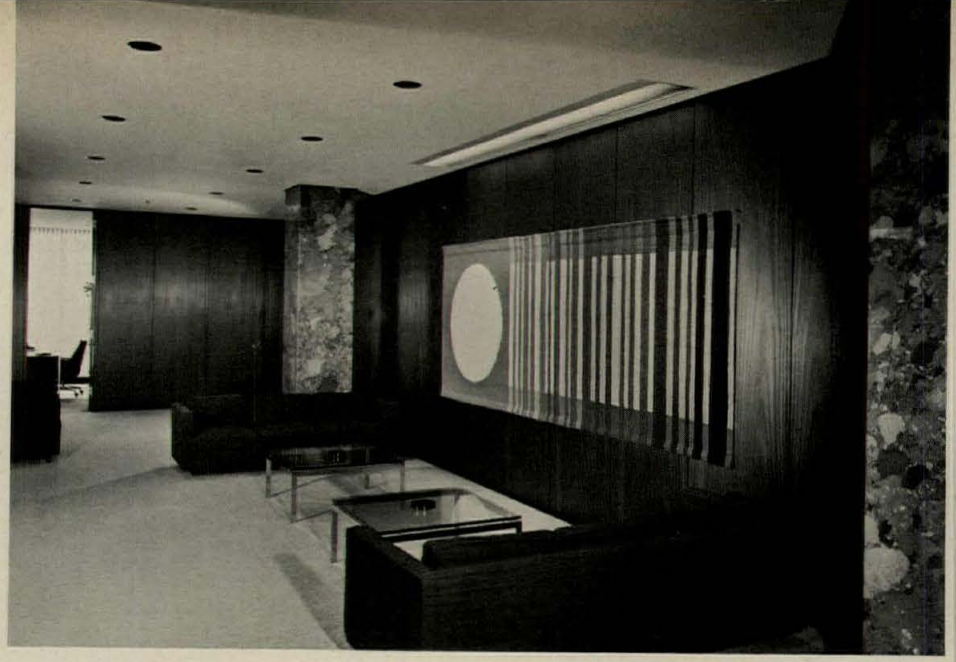
From the total concept to small details, this new office building reveals careful thought and consideration. The architects comment that, "the height and proportions were guided by esthetics, providing the company could be appropriately accommodated within the structure with a reasonable amount of future expansion. The building as a result is a complete entity, with a beginning and an end, and is fortunate in that its size permits the total to be perceived all at one time."

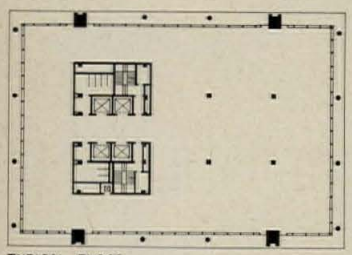
The building does offer a very unified design, and derives a great deal of visual strength from the black granite and the massive penthouse.

In sparkling contrast to the granite and red marble, all secondary columns, and all mullions, entrances and hardware on the plaza level are mirror-finish stainless steel. The lobby sculpture is by Dimitri Hadzi.

In its determined attack on downtown blight, Baltimore moves one building nearer achievement of its remedial and much-publicized Charles Center with completion of the new home office for Sun Life Insurance Company of America. Within the co-ordinated design of the center, this building strikes a note of quietly assertive elegance that is appropriately mid-way in spirit, as well as physical location, between John Johansen's strong, sculptural theater and the milder style of the new Federal building. All elements will be welded into a cohesive downtown neighborhood by the long-planned series of city parks, plazas and pedestrian streets.

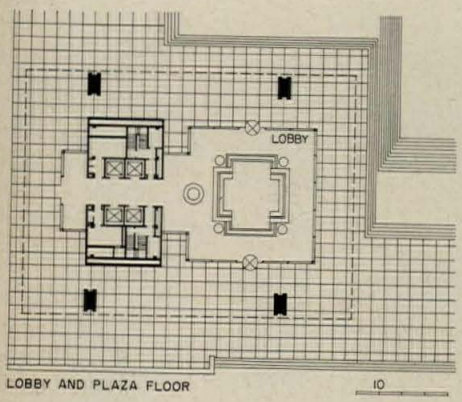
One of the most remarkable achievements in the structures completed to date for the center is the consistently low cost for buildings of higher-than-ordinary quality. Mies' office tower, for example, completed three years ago at the other end of the 22-acre site, was said to have cost $20 a square foot, and





TYPICAL FLOOR

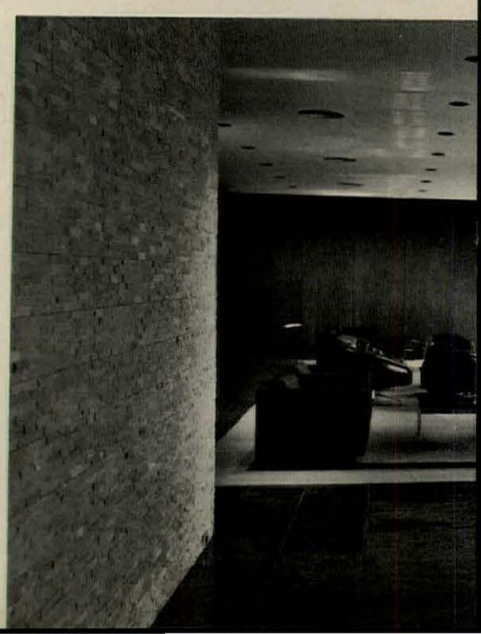
The subdued, clean-cut good looks of the building's exterior are reflected in the design of the interiors, as can be seen in the upper-floor reception area, above, and in the employees' cafeteria and its adjoining lounge, shown below. Materials throughout were "selected with an eye to permanence and quality, reflecting a quiet but elegant harmony that would improve and mellow with age and use."



LOBBY AND PLAZA FLOOR 10

this latest building, designed to provide a company image for Sun Life, and clad in black granite, stainless steel and French marble, also cost about $20.50 per square foot for the basic building, plus $5.50 a square foot for "tenant improvements" which included movable partitions, special equipment and the like.

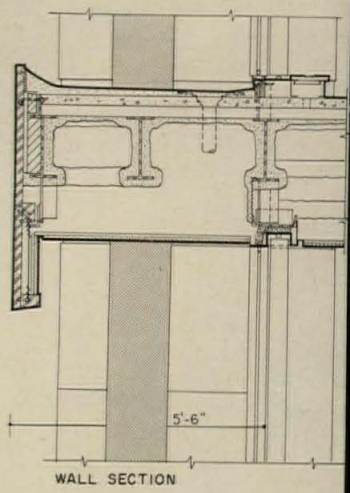
The structure is boldly simple in concept, and unusually well detailed. Its 12 stories and penthouse for mechanical equipment are supported by four big steel columns, tied together by two pairs of deep, welded trusses. Utilities and elevators are banked in an off-center vertical core. This basic structural system permitted the remaining columns around the periphery, and those in the core, to be reduced to minimum dimensions, and gives wide clear floor areas for flexibility of office arrangements. The floors themselves are a new prefabricated system, with integral air ducts, which permits floor-to-



Office working spaces, such as those shown above, received the same care as the more special rooms. Costs were kept in line by using standard manufactured partitions and furniture, but a discerning selection has resulted in a well co-ordinated design throughout.

Background colors are kept fairly neutral, with occasional bright accents in the upholstery, paintings and special rugs. Lighting, heating, acoustic treatment and the like all facilitate easy change of partitions.

The floor-to-ceiling glass walls of the office floors are set back 5½ feet from the facade of the building to provide sunshades for the glass areas, as well as to create "galleries" for maintenance and window washing. Vertical blinds are used on all window areas on the upper floors for added sun control, and to give uniformity from the exterior. Air ducts in the floors discharge through inconspicuous sills around the periphery of the building.



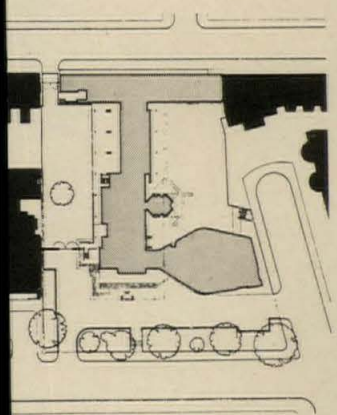
WALL SECTION

ceiling glass without the usual bulky induction units beneath windows. Wide overhangs shield all the glass areas.

The building rests on a red granite podium, which is connected to an adjacent park by monumental flights of granite stairs on two sides. The podium forms a plaza devoted entirely to an open terrace, the entrance lobby, and pedestrians. Beneath the plaza, a two-story concrete sub-structure, resting on spread footings, handles all services via a tunnel below street level. The huge steel columns penetrate through the sub-structure to bedrock.

HOME OFFICE FOR SUN LIFE INSURANCE COMPANY OF AMERICA, Charles Center, Baltimore. Associated architects: *Peterson and Brickbauer, and Emery Roth & Sons;* structural engineer: *James Ruderman;* mechanical and electrical engineers: *Joseph R. Loring Associates;* interiors: *Peterson and Brickbauer,* and *K and J Designs, Inc.;* contractor: *Cogswell Construction Company.*

Behr

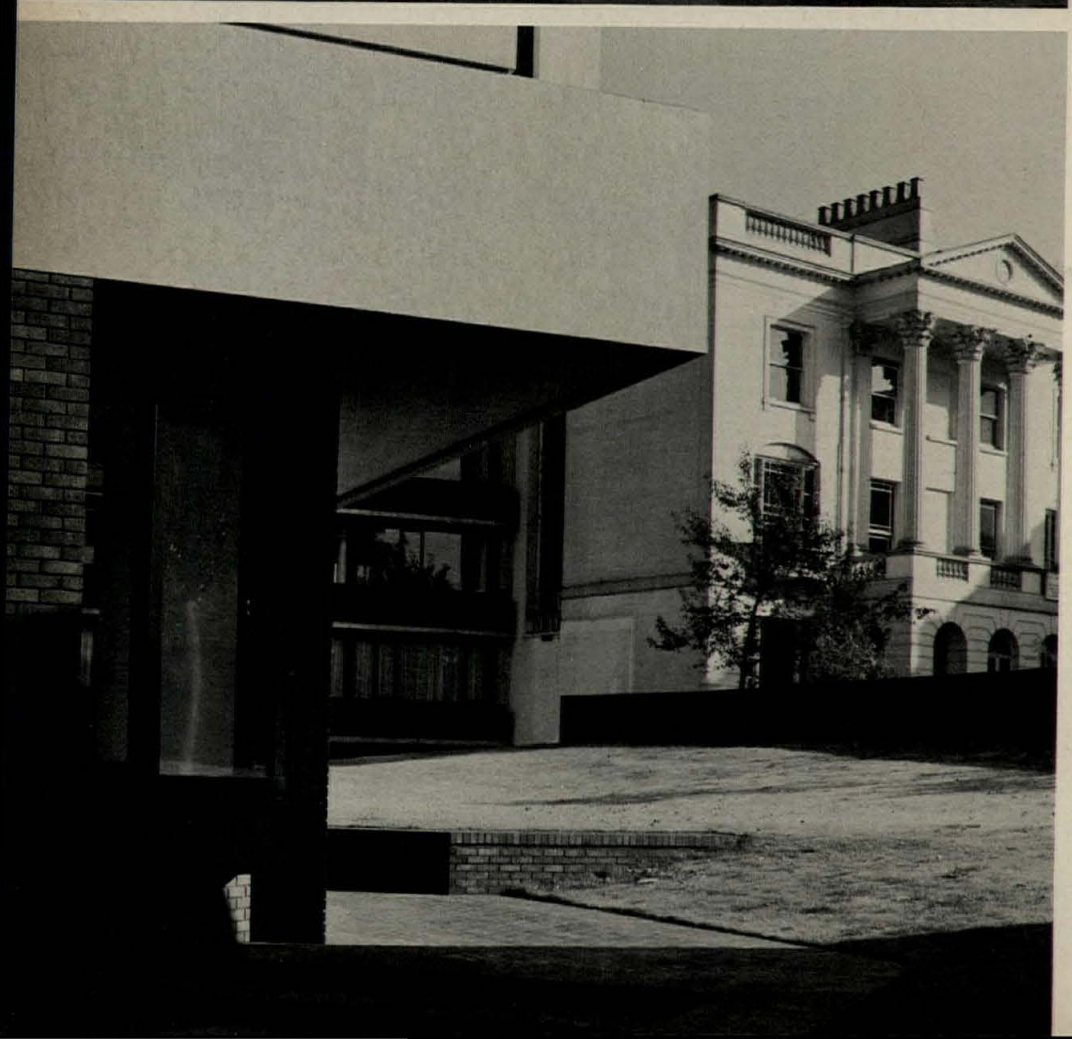


CEREMONIAL MODERN FOR THE ESTABLISHMENT

Denys Lasdun provides London's Royal College of Physicians with beautifully detailed new headquarters which sum up elegance, dignity and authority in contemporary terms

John Donat

John Donat



Probably one of the most talked abo
recent buildings in the British archite
tural press, London's new headquarte
for the Royal College of Physicians w
no doubt predestined to attract th
critics' eyes, if only for architects Den
Lasdun and Partners' injection of hig
modernity into the traditions of the si
and of the client.

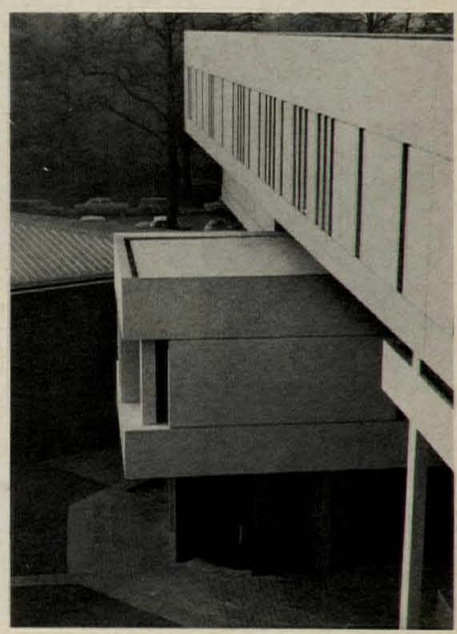
Designed to replace former quarte
in a somewhat dark, formal and impos
ing structure in Trafalgar Square, the ne
building is bounded by Regent's Park, S
Andrew's Place, and ranks of refurbishe
late Eighteenth-Century buildings de
signed by Nash. The site was previousl
occupied by Someries House, also de
signed by Nash, which was not pre
served because of extensive alteratio
and war damage.

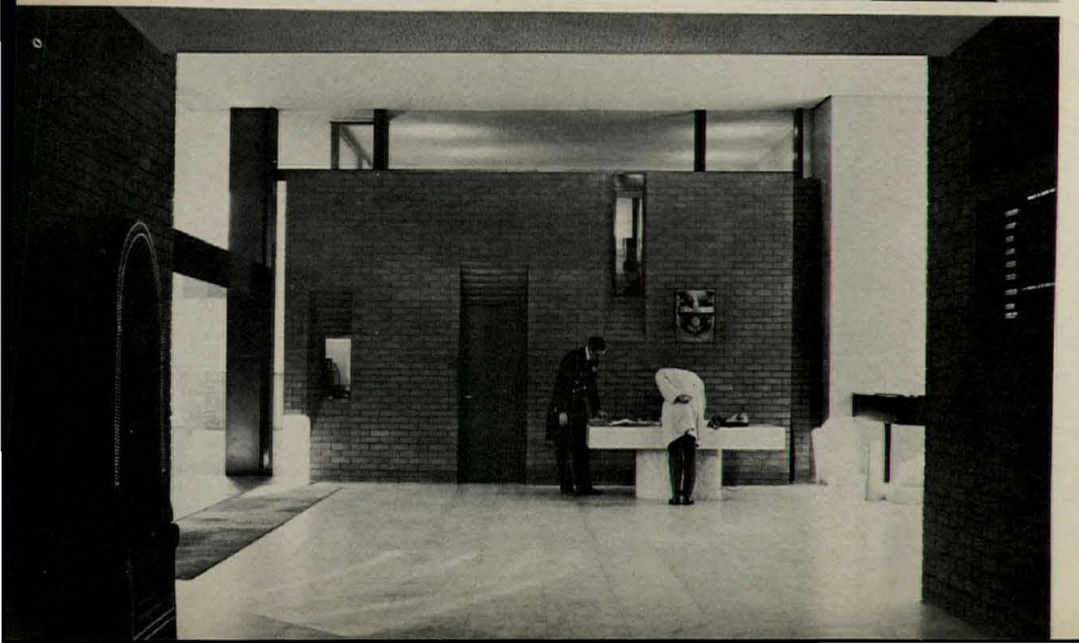
The College itself is devoted to th
advancement of medical science and t
maintaining professional standards. Pro
gram requirements included the obviou
administration and meeting areas, plu
more specialized spaces for traditiona
ceremonials and rituals, a large collec
tion of paintings, some ancient staine
glass, and an historic medical library
An auditorium was also required fo
larger, more public gatherings. Thes
functions were divided into three con
nected but distinct elements: the mai
ceremonial structure which fronts th
park in white, cantilevered layers; a mas
sive, fairly sculptural auditorium in blu
brick; and a more business-like block fo
administration, also of blue brick.

On the whole, British commentar
on the building has been quite favorable
with especial notice given to the sensibl
development of the site. Robert Max
well, in The Architectural Review, note
that, "In particular, the placing of th
main mass end-on to the park has create
a most successful townscape space alon
with the parallel terrace to the south,
domestic backwater without any loss o
power." Many of the other, somewha
rationalized, comments are succinctl
listed by Alvin Boyarsky in Architectura
Design: "Much has been said elsewher
about Mr. Lasdun's use of scale, rhetoric
plastic effect and materials to rhyme wit
Nash—the cream of the Italian mosaic
the blue brick of the auditorium, whic
recalls the Mansard tiled roofs, etc. Su

Behr

John Donat





John Donat photos

face, mass, external volumes and sub-
jective space are in balance. The building
and its context are one."

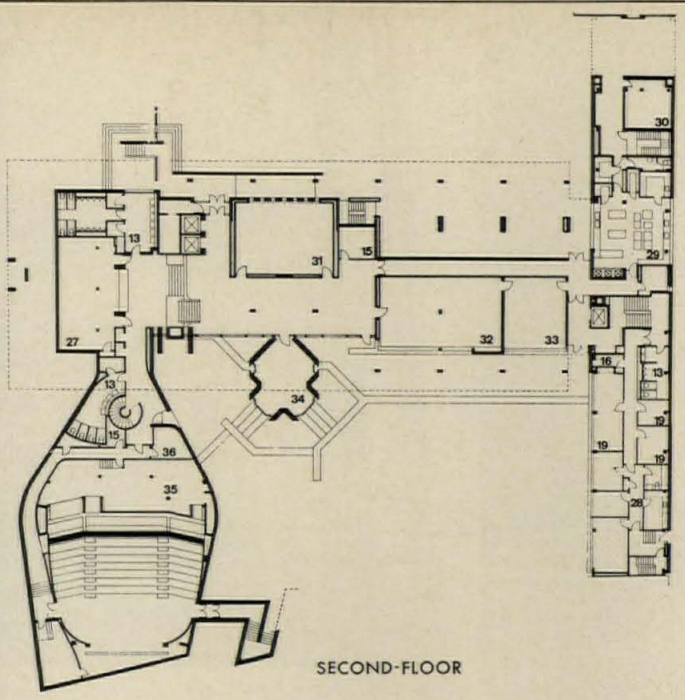
For all of these carefully thought ou
design analogies, the building is in fac
quite different from its neighbors, ye
very compatible with them. N. Keith
Scott, in his review for The Architect &
Building News, notes a possible, if whim-
sical reason: "The [Nash] terraces with
their veneer of painted stucco are like
full-bosomed dowagers; the Royal Col-
lege of Physicians is taut and masculine
clad in dark blue brick and skin-tigh
mosaic—not an ounce of fat, self-assured
and immensely strong."

There is another possible, if improb-
able sounding reason for such an asser-
tive building seeming at home in the
otherwise fairly unified neighborhood
the three units of the building have
enough stylistic difference to have al-
most been built at different times. This
in itself could be a possible criticism, bu
in place, it does give an aura of progres-
sive change that was very probably in-
tentional. In discussing the building a
the R.I.B.A. earlier this year, Lasdun made
a special point that the building was
"susceptible to change" and that it could
"be altered, adapted, extended through
a century of occupation."

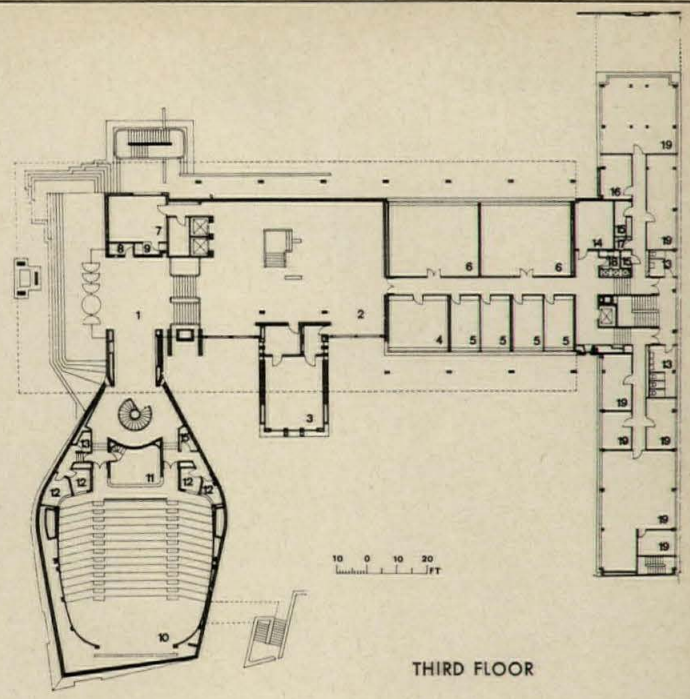
The most splendid space in the
building is the central hall, which rises
the full height of the building and fea-
tures a dramatic, free-standing cere-
monial staircase leading to the principal
rooms on the second level: library, din-
ing hall and "Censor's Room." The latter
is considered the "heart of the plan" and
is clearly expressed as a projecting unit
inside and out the building; its interior
is surprisingly fitted with Seventeenth-
Century paneling preserved by the Col-
lege from the Fire of London. Surfaces
in the main hall are crisp, clean-cut and
rich: Tuscany marble, ivory mosaic, gold
carpets and one wall of brown fabric
hung with paintings.

The auditorium wing is countersunk
to help reduce its bulk on the exterior.
The battered walls and flowing shape
tend to help the same purpose.

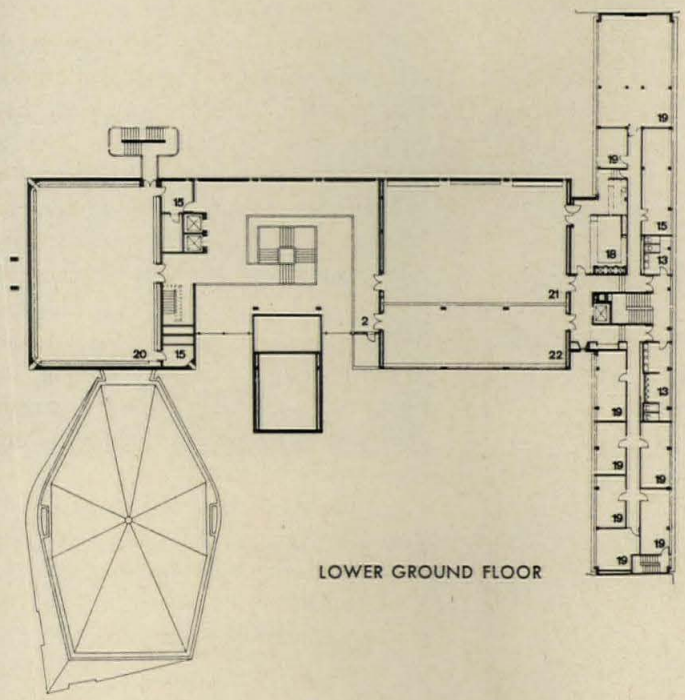
Architects: *Denys Lasdun and Partners—partner in charge: Peter Softley;* assistant architects: *Malcolm Minjoodt, Donald Ball;* structural engineers: *Ove Arup & Partners.*



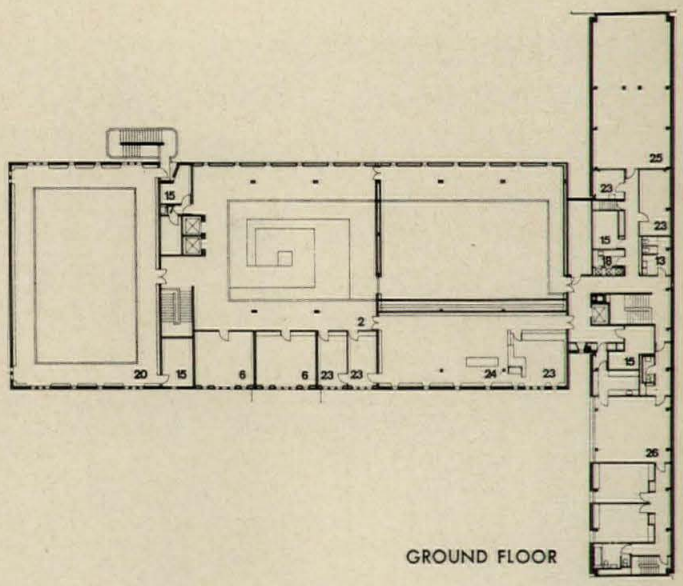
SECOND-FLOOR



THIRD FLOOR



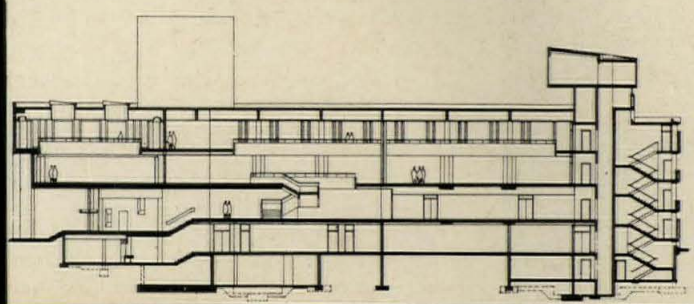
LOWER GROUND FLOOR

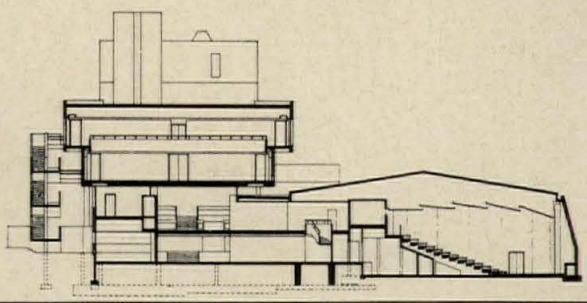


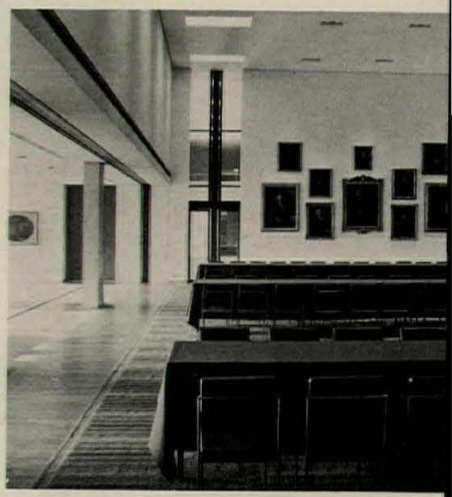
GROUND FLOOR

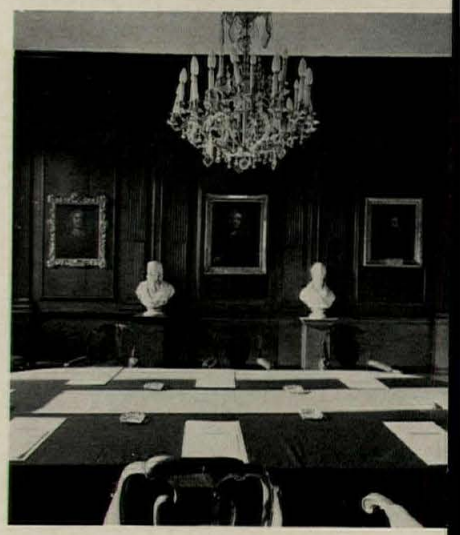
LEGEND

1. Entrance Foyer
2. Staircase Hall
3. Censor's Room
4. President's Room
5. Principal Officers
6. Committee Room
7. Membership Office
8. Porter
9. Telephonist
10. Lecture Theater
11. Projection Room
12. Translation Room
13. Lavatories
14. Strong Room
15. Stores
16. Lockers
17. Cleaners
18. Serving
19. Offices
20. Library
21. Dining Room
22. Long Room
23. Library Offices
24. Reading Room
25. Book Stack
26. Third Floor Flat
27. Cloakroom
28. Porter's Flat
29. Kitchen
30. Fuel Store
31. Lecture Room
32. Common Room
33. Staff Dining Room
34. Fellow's Sitting Room
35. Plant Room
36. PABX
37. Wine Cellar
38. Incinerator

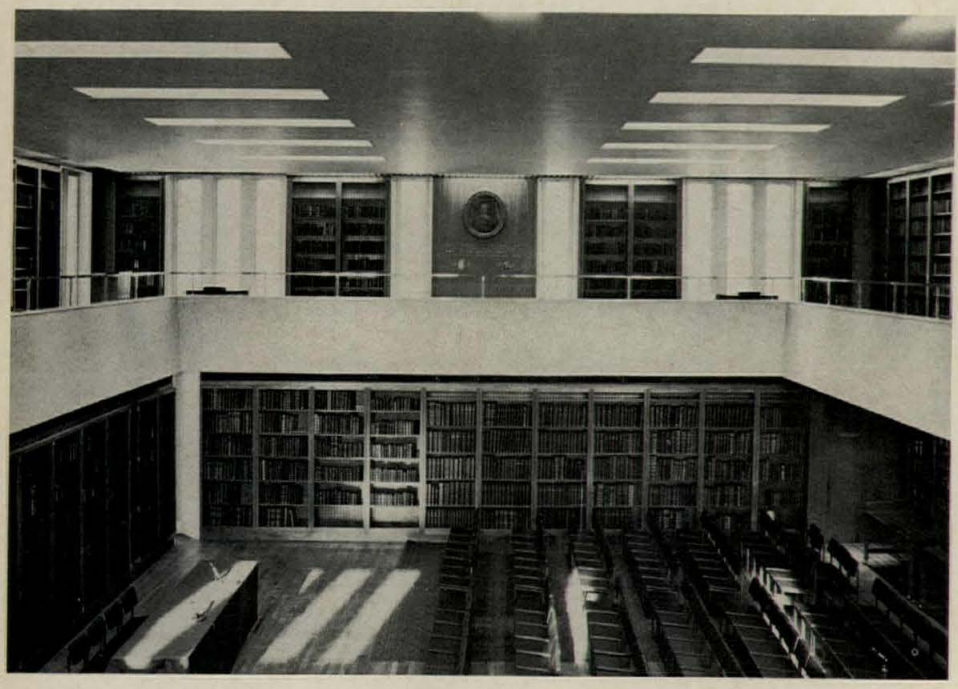








One of the most exciting features of the Roya College of Physicians is movement through its varied sequence of spaces: circulation i carefully plotted to reveal each in turn, and to help one understand their relationships The building is beautifully detailed inside and out, and correlates many precious antiquitie into a contemporary framework.



John Donat

John Donat

Relational Complexes In Architecture

By Christopher Alexander
Van Maren King
Sara Ishakawa
Michael Baker
Patrick Hyslop

This article by Christopher Alexander and his four associates represents a continuation of the investigations that were first published in the RECORD in April, 1965 under the title "The Theory and Invention of Form." This work seeks to make use in architectural design of the new mathematics of relationship and the capabilities of the computer, while at the same time remaining fully cognizant of the complexities and subtleties that are an essential part of all architecture. The six examples of "relational complexes" illustrated were originally part of a study done for the Bay Area Rapid Transit District in San Francisco. Those responsible for making decisions at BART did not, in the end, make use of this material, which is certainly beyond the scope of most programing studies. In Professor Alexander's view, however, this unconventionality is precisely the point; he feels that it is investigations such as these that will permit the architect to cope most effectively with the increasingly complex problems that confront him. Text begins overleaf.

Relations of vehicular circulation in a suburban station

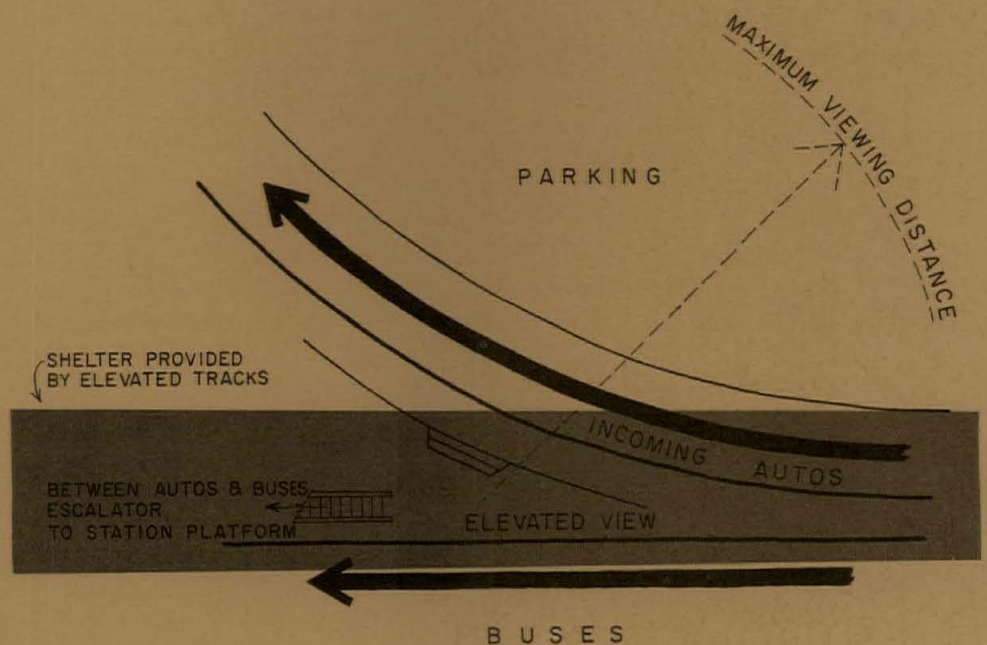
This complex deals with the problem of creating a smooth connection between the train and various feeder services at a suburban station.

A typical suburban station is on an elevated track structure and escalators and special entering facilities will be concentrated at one point along the station's 700-foot length. Complete separation is necessary between bus and auto traffic.

Additional functional requirements

- The bus stop should be as close as possible to the train.
- Commuters should be driven as close to the train as possible.
- People should be able to load and unload from their cars without crossing streams of moving vehicles.
- Buses should be able to load and unload on their right-hand side.
- Incoming vehicles must not spray rainwater on waiting passengers.
- People want to walk in straight lines directly toward their objective.
- Homecoming commuters must be able to find the car waiting for them without difficulty.
- Passage to and from autos and buses must be protected from rain, and waiting must be under shelter.

To satisfy the above requirements, both bus and drop-off lanes must be immediately adjacent to the main entrance escalator. The bus must pass to the left of the pedestrian zone in order to unload on the right. The drop-off lane must be concave so that arriving cars can spot vacant spaces. To ensure that pedestrians do not have to cross traffic streams, the only use that can be made of the area inside the concavity, across the drop-off lane from the escalator, is one that never happens in the morning—pick-up parking. To allow homecoming commuters to spot their wives as fast as possible, they must approach the parking from above; the escalator therefore points towards the parking. Since pedestrians walk in parking stall lanes, these lanes should point towards the escalator to make direct connection. The pedestrian area between the two lanes must be under the elevated track in order to be dry. In wet weather the pedestrian waits and the car drives to pick him up from its parking place under the structure. The bus and drop-off lanes must themselves be under cover so that the road next to the waiting pedestrians is dry. To avoid doubts about where pick-up cars are waiting, parking must be all in one area.



Resulting relations

- The escalator descends onto pedestrian viewing platform.
- The escalator is between the bus lane and the drop-off lane.
- Pedestrian viewing platform, bus- and drop-off lanes are under the elevated track structure.
- All parking is in one area.
- The drop-off lane is concave towards the parking area.
- The pedestrian viewing platform is raised above the parking area.
- The lanes in the parking area are oriented towards the escalator.

Architects are frequently so preoccupied with the details and the appearance of buildings that they take the underlying relationships—the most basic physical relationships—for granted. Worse still, many present-day efforts to make design more systematic tend to obscure these relationships instead of drawing attention to them. Since it is these underlying relationships which have the most profound effect on the way a building functions, it is our intention to try and make them more explicit.

An architectural problem is defined by systems of interacting requirements, which are statements of human need that can only rarely be expressed in terms of numbers or quantities. A typical example of such a requirement would be the phrase:

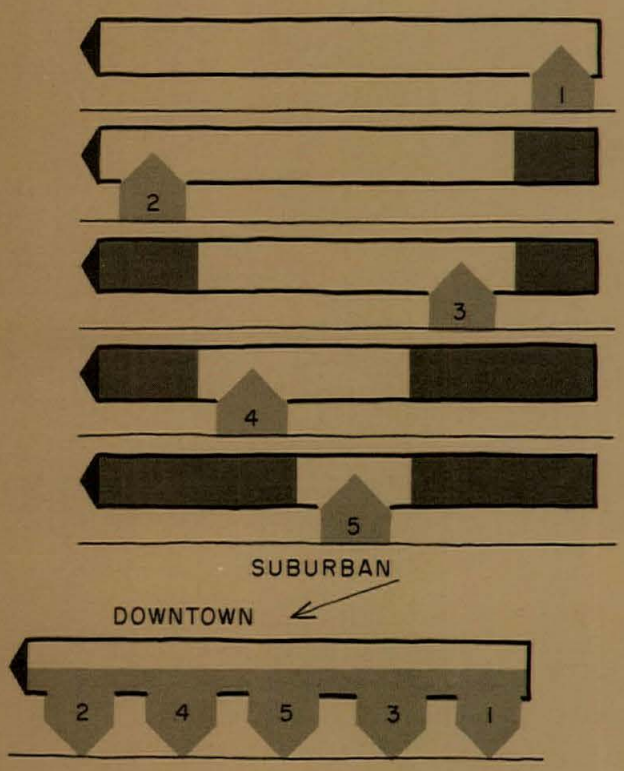
- People should be able to get to and from their cars without crossing streams of moving vehicles.

Clearly there are no meaningful numbers that can be attached to such a statement, but it is none the less definite for that. In any architectural problem there are hundreds of these functional requirements. Some of them may be independent o each other, but most interact closely with several others. W shall try to show that, in order to make serious functional im provements in the design of buildings, it is necessary to inven a new way of describing these functional relations, which w shall call *relational complexes*. We shall use as illustration some examples from our recent work for the Bay Area Rapi Transit District, but we think that the principles apply to an architectural situation.

A relational complex is
a physical solution to a functional problem

It describes the interlock of the various simple physical rela tions which control the way the building works. Let us defin in detail what we mean by the interlock of simple physical re lations. A simple relation describes a particular way in whic two or more elements are arranged with respect to one an

Relations between entrances of different transit stations



The problem dealt with in this complex is that of even distribution of passengers along the train to prevent overcrowding. In suburban stations there is a major entrance which concentrates at one point along the station's 700-foot length all station control, escalators and ticketing equipment. There are also minor entrances, a security gate and an auxiliary stair for rush-hour use only. At rush hours the typical pattern is for 70 per cent of passengers to use the major entrance, while 30 per cent use minor entrances. At all other times only the major entrance is used. The typical rush-hour train is 10 cars long.

Additional functional requirements

- Every passenger should be able to find a seat immediately.
- Boarding passengers must await the train at those points along the platform where incoming cars are emptiest.
- Passengers want to use whichever car will minimize their walking distance at the destination station.
- People do not walk more than about 100 feet along the platform, and therefore tend to congregate around the entrance.

Since existing suburban stations always have their entrances at the center of the train's length, the middle part of the train is crowded while the ends remain empty. To avoid this, each station at which the train stops on its way downtown must have its entrance at a different point along the train's length. If the volumes expected at each station are known, the pattern of entrances can be calculated so that, as the train fills up, passengers are evenly distributed along it. The downtown stations must have a sufficient number of entrances to equalize throughout the incoming train the effect of the passengers' desire for the shortest possible walk at their destination station. The same consideration has an important effect on outbound trains. As long as there are plenty of entrances to downtown stations, people will place themselves at the point on the platform which corresponds to their home station exit, thus creating the same even distribution as on inbound trains. To enhance the effect of this, each zone of the downtown station can be marked with the names of those suburban stations whose exits have the same position as that zone.

Resulting relations

- Different suburban stations have their major entrances at different points along the station length, the position of each entrance corresponding to the emptiest section of an arriving city-bound train.
- Each downtown station must have exits at various points along its length.
- Different positions along downtown station platforms are marked to correspond to positions of different suburban station exits.

other: it is a specification of arrangement. One such relation in a transit station would be that of *adjacency;* for example, the ticket machines must be adjacent to the change machines. Another relation might be *concavity,* the car arrival lane must be concave in the direction of the parking lot. If the platform must be between the tracks, this is a relation of *betweenness.* A building can contain the elements named in a relation without possessing the relation itself. Take the last relation named, that the platform must be between the tracks. A two-track, center platform station does contain it, a station with side platforms does not.

When two relations have an element in common, we say they interlock. Thus, consider the following two relations:

- The escalator must *face towards* the parking lot.
- The escalator must be *between* the car and bus lanes.

These two relations both have the escalator as an element, therefore we say that the relations interlock.

A relational complex is a collection of interlocking relations

Consider the two relations just named, together with a third:

- The car lane must be *concave towards* the parking lot.

These three relations interlock in three ways: in the escalator, in the parking lot, and in the car lane. They form an elementary relational complex.

In this example each relation interlocks with each of the others. In general, however, in a collection of many relations, it is very unlikely that such a high degree of interaction will take place. How many of the relations must interlock before they form a complex? It is naturally very difficult to answer this question precisely, but we shall not call a collection of relations a relational complex unless the interlock between them is considerable. A collection of many relations, with only a few interlocks between them, has no good claim to be considered as a whole. We must therefore enlarge our first definition.

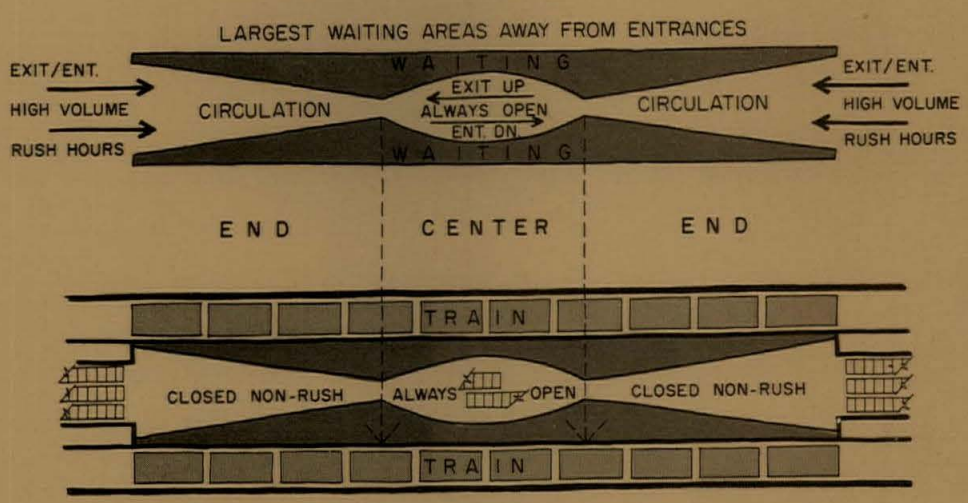
Relations between circulation flow and the station platform

This complex deals with the over-all flow pattern in a downtown station. Rush-hour volume of people coming to and leaving downtown stations is concentrated at the ends of the station. Rush-hour traffic is highly directional—the typical morning pattern of 85 per cent in and 15 per cent out being reversed at night.

Additional functional requirements

- The sizes of various exits and entrances must be proportional to the volume of passengers going and coming in different directions.
- The system must be able to accommodate rush-hour traffic without wasting money on space and machines not used 23 hours of the day.
- No one train door should delay the train because more passengers use it than the others.
- The total effective cross-section of 'flow channels' must be large enough to take the maximum required flow.
- To avoid bottlenecks, the persons-per-minute capacity of flow channels must be the same at all points.
- The complex must be capable of accepting extra escalators and machinery to handle a possible future increase in volume.

There are three reasons why major exits must be at the ends of the station. First, people walk to and from downtown stations; assuming a roughly circular tributary area whose diameter is large in relation to the station's 700-foot length, the vast majority of passengers will find entering and leaving the station more direct via the ends. Second, when a full train unloads, end exits, with only half the capacity of a center exit, can function twice as efficiently because they are not converged on from both sides. Finally, the end of the platform is the only place where extra escalators can be added. The last 280 feet of platform are thus one-directional and carry 85 per cent of the rush-hour flow. These parts are closed at night, but the two-directional center section is open for the whole operating day. The circulation zone is wider near the escalator to accommodate the morning surge; but, to encourage people to move along the platform in the evening, the most comfortable waiting zones will be farthest from the escalator.



Resulting relations

- The main entrances/exits are at the ends of the station.
- The subsidiary entrance/exit is at the center of the station.
- The station is divided into three sections, a 140-foot center and two 280-foot end sections.
- Each end section and escalator is one-directional and reversible.
- The center section, open at all hours, is two-directional.
- Openings between center and end sections are constricted and equipped with a lockable night gate.
- The circulation channel is tapered: widest at escalators and narrowest at dividing points.
- Waiting areas are tapered to complement circulation channel.
- Vending machines are adjacent to constrictions between sections.

A relational complex must have high density of interlock, detailed functional significance

The density of interlock must be very high; there must be many elements in common between the different relations. This is the same as saying that each *element* in the complex must be related simultaneously to many other different elements. Even when the interlock of the relations in the complex is clear, it will usually be necessary to add some further detailed information about the way the individual relations interact with one another, so as to assure their proper integration. In addition, the complex *as a whole* must have inescapable functional significance. The individual relations must be so interdependent functionally that it is impossible to consider them as separate entities.

Each of the six relational complexes described in this article was derived by studying the interaction of functional requirements according to the theory first set down in Christopher Alexander's "Notes on the Synthesis of Form," a condensed version of which appeared in April, 1965 (pages 177, 186). The use of this theory yields systems of requirements whose internal interactions are very dense. Each system, because it is a system, guarantees in advance that the solution of its requirements will be a relational complex, not just a collection of relations. Each system therefore gives a complex.

None of these relational complexes is a complete description of a whole building; it is an abstracted relational property which the building must have in order to work successfully. Unlike a building, which contains both inessential and essential features, a relational complex contains only those elements that are absolutely necessary to solve the problem stated by the requirements.

The six examples give a fairly clear picture of what a relational complex is; and they make it clear that it is relational complexes that really control the way a building works.

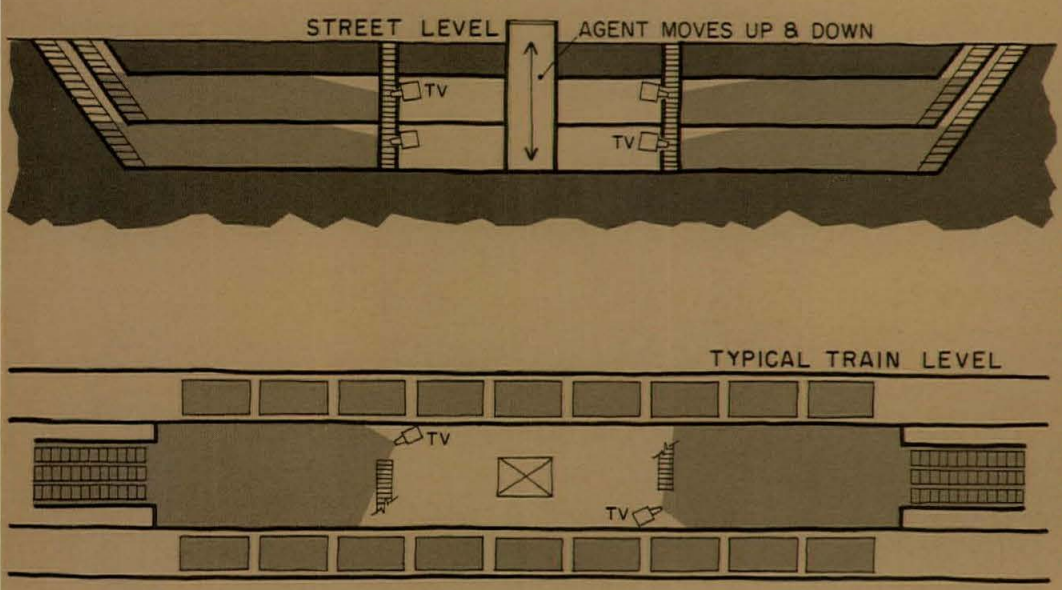
Relations affecting the agent's booth in underground stations

This complex deals with the problem of surveillance. Most existing transit stations fail to solve this problem, and crime and lack of control over crime is perhaps the biggest factor in the decline of big-city subways. In the Bay Area system, underground stations would typically be multi-leveled and the length of trains would vary from ten to two cars. There would only be one station agent. It is feasible to build an underground station with no intermediate column supports. Non-moving escalators are usable as emergency exits from the station.

Additional functional requirements

- Every part of the station that is in use must be very obviously under surveillance, as much to discourage crime as to detect it.
- To reduce crime, no operating part of the station should be deserted.
- To reduce the payroll, the minimum number of police, maintenance and supervisory personnel should be employed on train and station.
- The station agent must be able to oversee the whole station and investigate individual incidents without losing his general overview.
- The station agent must be able to see, and, in case of difficulty, reach the ticket gates.
- Passengers in distress should know that, if they scream for help, the ticket agent will hear them.
- Waiting facilities should be arranged so that women waiting alone at night will not become uneasy.
- In any emergency it must be possible to empty the station in a few minutes with the help of fire escapes.

The solution to this problem makes the agent's booth a two- or three-story tower, extending up to the surface ticketing area and down to the platform level, and placed in the middle of a station with center platforms at each level. Within the tower, the agent must be able to move up and down freely, and he must be able to leave the tower at any level. Waiting areas are concentrated around the tower where women are safe at all times, while minimum use of TV cameras can supplement direct visual control of the remote zone. Stairs and escalators must be at the outer ends of zones providing an unobstructed view.



Resulting relations

- The agent's booth is an elevator enclosed in a vertical tower in the center of the station.
- There is access from the tower to public areas at every level.
- The tower enclosure is one-way transparent, allowing vision out but not in.
- At each level, there is a waiting area adjacent to the tower.
- The station is divided into a center section and two end sections.
- Fire stairs are within the barriers, separating end from center sections.
- Escalators are at the extreme ends of the station with no public access from the sides or back.
- At each level the platform must be between the tracks.
- Each of the three sections must have a clear span, with all the vertical supports beyond the platform.
- Television cameras are mounted on the barriers between the sections, cover rest of platform.

Why have we chosen to define the idea of a relational complex in such a formal way?

Isn't it true that designers already do very much the kind of thing which we have done, but without being so pretentious? Why have we chosen to use the name 'relational complex,' and to keep repeating it? The answer is simple.

Architects are not used to thinking in relational terms. Yet relational complexes control the way that buildings work. Although it is true that relationships of this kind are present in every building, nevertheless the designers of buildings do not, at present, discuss such relational structures openly. As a result, although the details of buildings may be successful, and the buildings may seem good to look at, the fundamental relationships which underlie their form are often wrong.

It is impossible to get the form of buildings right until these structures of abstract relationships, which underlie forms and control the way they work, are explicitly recognized as the most important aspect of the building. That is why we have isolated the abstract structures of relationship and given them the name, relational complexes. Indeed, we believe it will soon be clear that the main task of design is the invention and development of relational complexes *as such;* and that the remaining details of a building are quite unimportant by comparison.

That is the first, and most important, reason for emphasizing and repeating the idea of the relational complex.

There is a second reason.

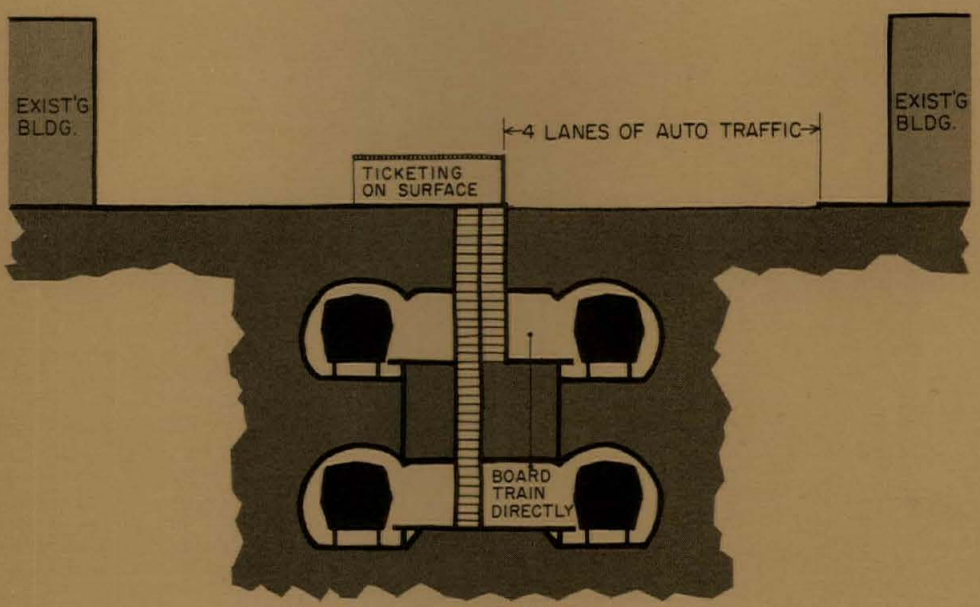
Many architects are getting interested in systematic methods of design. On the face of it, this is encouraging. In order to be systematic in design, one must define the features of a building with which the design is trying to deal. We might hope, therefore, that, as soon as designers start trying to be systematic, they will automatically discover that relational complexes are the most essential features of a building. So far, however, this has not happened.

Relations between street and platforms in underground stations

This complex deals with the problem of making access to the train in a deep underground station as direct as possible and eliminating the mezzanine, which is an undesirable feature of most traditional subway stations. This mezzanine between surface and platform level is hard to police, difficult to clean, breaks the flow from surface to train, adds about 10 feet to excavation costs; and, because of its deserted, dangerous appearance, contributes greatly to the menacing character for which subway stations are notorious.

Additional functional requirements

- The feeling of isolation and enclosure which tempts assaults, particularly at exits, toilets, stair landings and blind corners must be eliminated.
- Transition from the outside of the station to the train must be immediate. Trains should be close to the surface so that no one will think it too much trouble to use the system.
- Waiting facilities must be arranged so women waiting alone at night will not become uneasy.
- The total surface area needing maintenance and cleaning must be reduced to a minimum.
- People prefer a view of other people, movement, or cars to a view of inanimate things such as roofs or parking lots, or empty platforms.
- Waiting areas must accommodate the crowd caused by train delay.
- The closed-in feeling must be eliminated and a connection maintained with the outside world.
- The cost of overcoming soil loads and hydrostatic pressure in deep underground structures must be kept to the minimum.
- There must be a hesitation point for umbrella raising etc., just before people emerge in the open.



The problem can be solved if all ticketing takes place in kiosks on the surface, with warning signals to mark the arrival of trains, and if single-flight, unbroken escalators lead from these kiosks to the platform. A single escalator with a break at the intermediate level would not work, as the upper half would have insufficient capacity, and the access flow at the intermediate level would cause impossible congestion. Waiting areas are immediately next to the agent. Trains are as near the surface as possible to allow access by a single escalator trip and to reduce excavation costs. The smaller underground volume and surface area concentrates people together making the station less deserted, and easier to patrol, as well as cutting cleaning and maintenance costs. Surface ticketing areas are safe at night, and, during the day, give increased exposure to daylight. The kiosk provides a hesitation point.

Resulting relations

- Ticketing is in kiosks on the surface.
- Unbroken escalators lead direct from the surface to each track level.
- Track levels are as close to the surface as possible.
- Waiting areas are immediately next to the station agent.

An understanding of relationship should replace the false sophistication of numbers and measurement

Many of the first approaches to systematic methods in architecture have been based on the belief that a problem becomes clear when it is stated in numerical terms. As a result, designers put great emphasis on rates of flow, decibel levels, room sizes expressed in square feet, lighting levels and minimum dimensions. The added precision of these statements is certainly systematic. However, instead of drawing attention to relational complexes and helping architects to think in these terms, such numerical precision actually has a tendency to obscure basic relationships. Worse still, the elaboration of numerical statements, because it falsely conveys an impression of great thoroughness and sophistication, makes it seem unnecessary to probe any further into the underlying nature of the building.

This potentially damaging preoccupation with numbers is a hold-over from the late 19th-century thought that something was not precise unless you could measure it, a belief current i the days when mathematics and physics dealt largely with num bers and quantities. Today mathematics and the older science are more sophisticated. People in these fields have begun t realize that the fundamental nature of things depends far mor on relationship and structure than on number and quantity Unfortunately the younger sciences (like economics, engineer ing, ergonomics, operations research, and systematic design have not yet made this transition from number to structure Within these fields, and in architecture, there is still no way o talking about relational structure, *as such*.

For a science in its infancy this is only natural: things whic can be expressed in terms of numbers are very easy to mak explicit; pure relations are very hard to talk about explicitly But we must leave this 19th-century immaturity behind as fas as possible. Design is the invention of relational complexes. W must learn to define them, and to design them.

Relations between seats and aisles in a transit car

This complex deals with the problem of maximizing the seating capacity of the transit car while at the same time increasing passenger comfort. A minimum of 75 seats is allowable per transit car, in which approximately 80 per cent of all passengers travel alone. Dimensions of the transit car are as follows: outside width 10 feet 6 inches; length to coupler faces, 70 feet. Included in each car will be a "cab" in which the train operator can sit.

Additional functional requirements

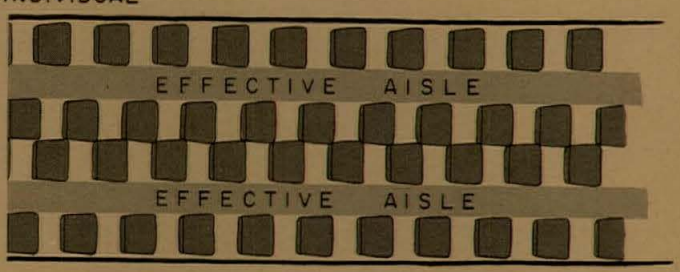
- Nobody wants to sit touching a stranger; each person wants a clearly demarcated seat of his own.
- No person should have to struggle past another person's legs to get in and out of his seat.
- There should be as many seats per transit car as possible.
- There should be no waste space under and between seats.
- Family groups, couples, or card-playing commuters need a seating arrangement which allows them to maintain an inward privacy in appropriate contact with one another.

Existing transit cars, when designed to seat as many passengers as possible, are laid out with a center aisle and double seats on both sides of the aisle. If we accept this pattern, the car cannot hold more than 76 seats, and the only way to provide sufficient individual space and leg room would be to widen the seats and increase the space between them, which would reduce the number of seats in the car.

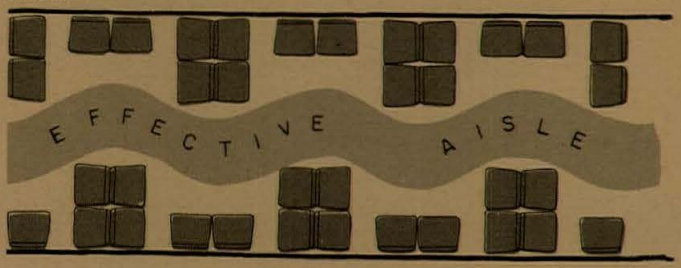
These requirements can, however, be solved simultaneously by using two aisles, each giving direct access to seats on either side of it. Because seats are single, no one need touch any stranger and no one has to pass anyone else to leave his seat. Further, no extra passing space is needed between a person's knees and the seat in front, and because of this, seats can be closer together than usual, yielding 96 seats per car. The staggering of seats, which places each arm rest next to an aisle, comfortably allows the seat width to be two inches less than usual, and keeps the over-all car width to 10 feet.

These provisions are adequate for the 80 per cent of passengers who travel alone, but a different pattern is needed for those who travel in groups. By relaxing the requirement for single, non-touching seats and replacing it with U-shaped groups of seats staggered on either side of a single aisle, we arrive at an arrangement which allows group travel, but in which no one has to pass anyone else to leave his seat. The density is lower than in the pattern for individual travel, but is still higher than conventional cars.

INDIVIDUAL



GROUP

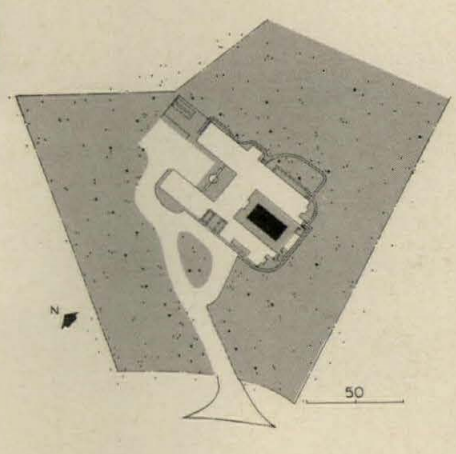


Resulting relations (individual)

- All seats are single seats.
- There are two aisles, each serving a row of single seats on either side.
- Each seat is staggered with respect to seats next to it, or opposite it across an aisle.

Group relations

- There is one aisle.
- Seats are arranged in U-shaped groups of six.
- Groups of seats are staggered, on either side of the aisle.



A cloistered house in Texas

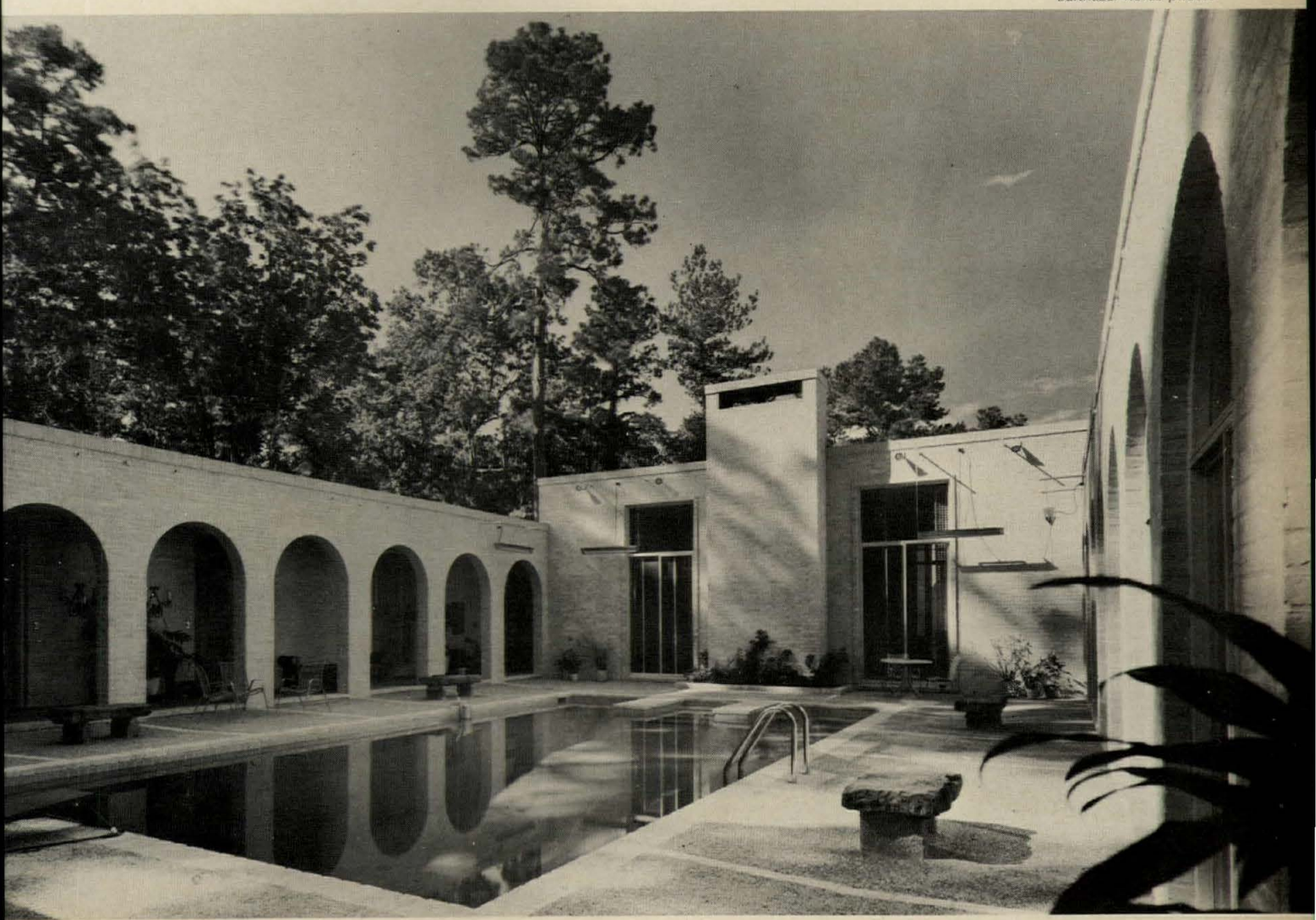
An H-shaped plan has been successfully oriented and carefully handled by architect Preston Bolton to provide shelter from the street and nearby houses, while allowing views over an attractive, wooded bayou; to permit separation of the house into distinct wings which could be closed off when the owners are away; and to enclose a good-sized swimming pool.

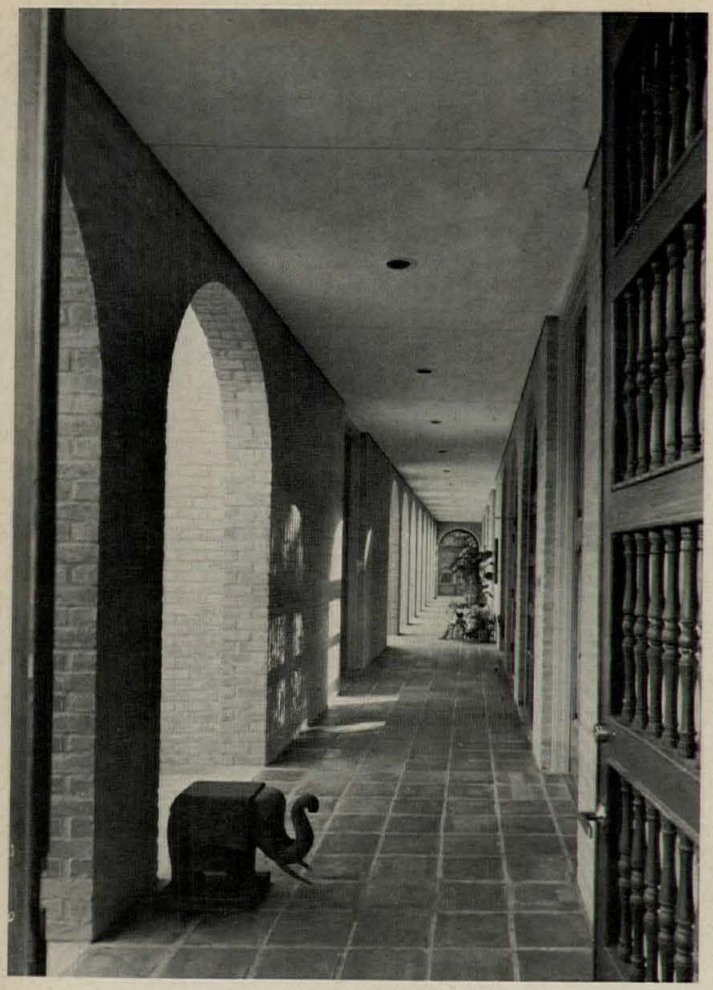
The four arms of the H provide a master bedroom suite; guest bedrooms; kitchen and maid's rooms; garage and studio. A large living room is placed in the center of the H, overlooking an entertaining patio on one side, and the swimming pool on the other. A bank of dressing rooms at the opposite end of the pool assures complete privacy for the whole pool area.

Brick arches around the courtyards give a classic colonnade effect, while the use of champagne-colored Mexican brick and tile and hand-carved Mexican screens at doors and windows are reminiscent of the Spanish legacy to Texas.

Beautiful detailing and a sensitive choice of materials is evident throughout the house. Outside, the brick and pebble concrete courts and walkways

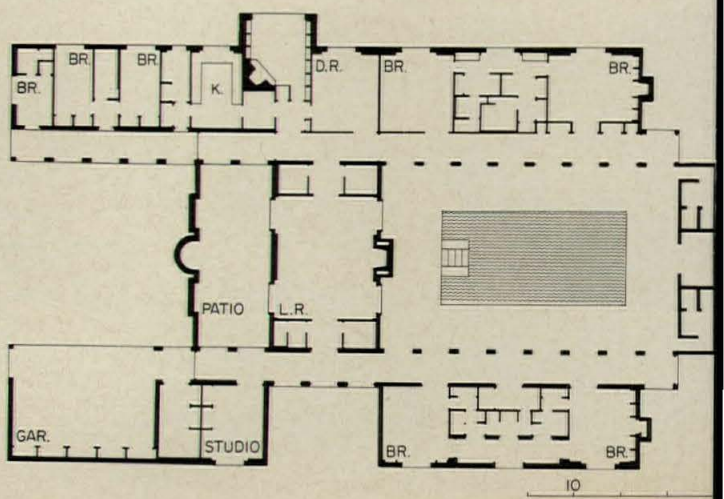
Balthazar Korab photos



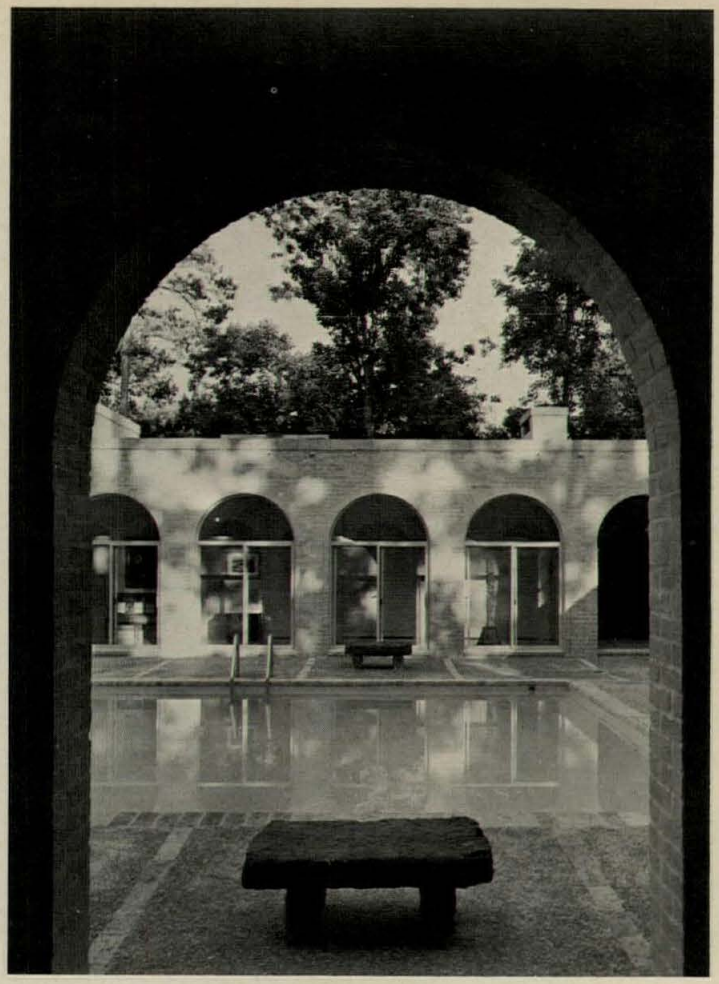


blend well with the walls to give a mellow, serene impression not often found in new buildings. Inside, light-colored plasterboard walls and ceilings are offset by dark-stained oak floors bordered by Mexican tile, and by the hand-carved screens and paneling.

Structure of the house is yellow pine and fir frame on a reinforced concrete slab, with brick walls and a built-up asphalt and gravel roof. The brick is left exposed inside the colonnade walls, and these long, tiled circulation areas are perhaps the most attractive feature of the house. They provide an excellent background for the display of paintings, sculpture and indoor plants, and they are largely responsible for the great feeling of quiet, calm and shelter from the fierce heat of the summer which is characteristic of this region. Although this is a very large, expensive house, there is nothing ostentatious about it, and its great strength is that you feel as if it has always been there.

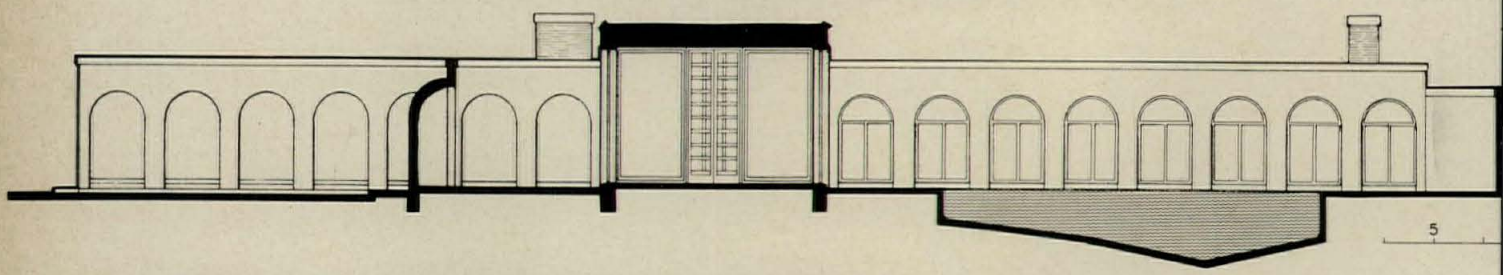


PRIVATE RESIDENCE, Houston, Texas. Architects: P. M. Bolton Associates; engineer: R. George Cunningham; contractor: Koenig Construction Company.



Preston Bolton has taken full advantage of the texture of his materials and has made use of the curved form of the arches to create a constantly changing pattern of light and shade both within and without. Looking through the strong, brick arch at the light reflected on the water and on the brick and glass of the opposite wing of the house, one is made dramatically aware of the interplay of the different elements which go to make up architecture, and how esthetic satisfaction depends on the architect's sensitivity to their relationship to each other.

The stone benches by the pool tend to emphasize the rather classical approach to the swimming pool area, and underline once again the architect's understanding of the value of texture.



DESIGN FOR THE CAMPUS

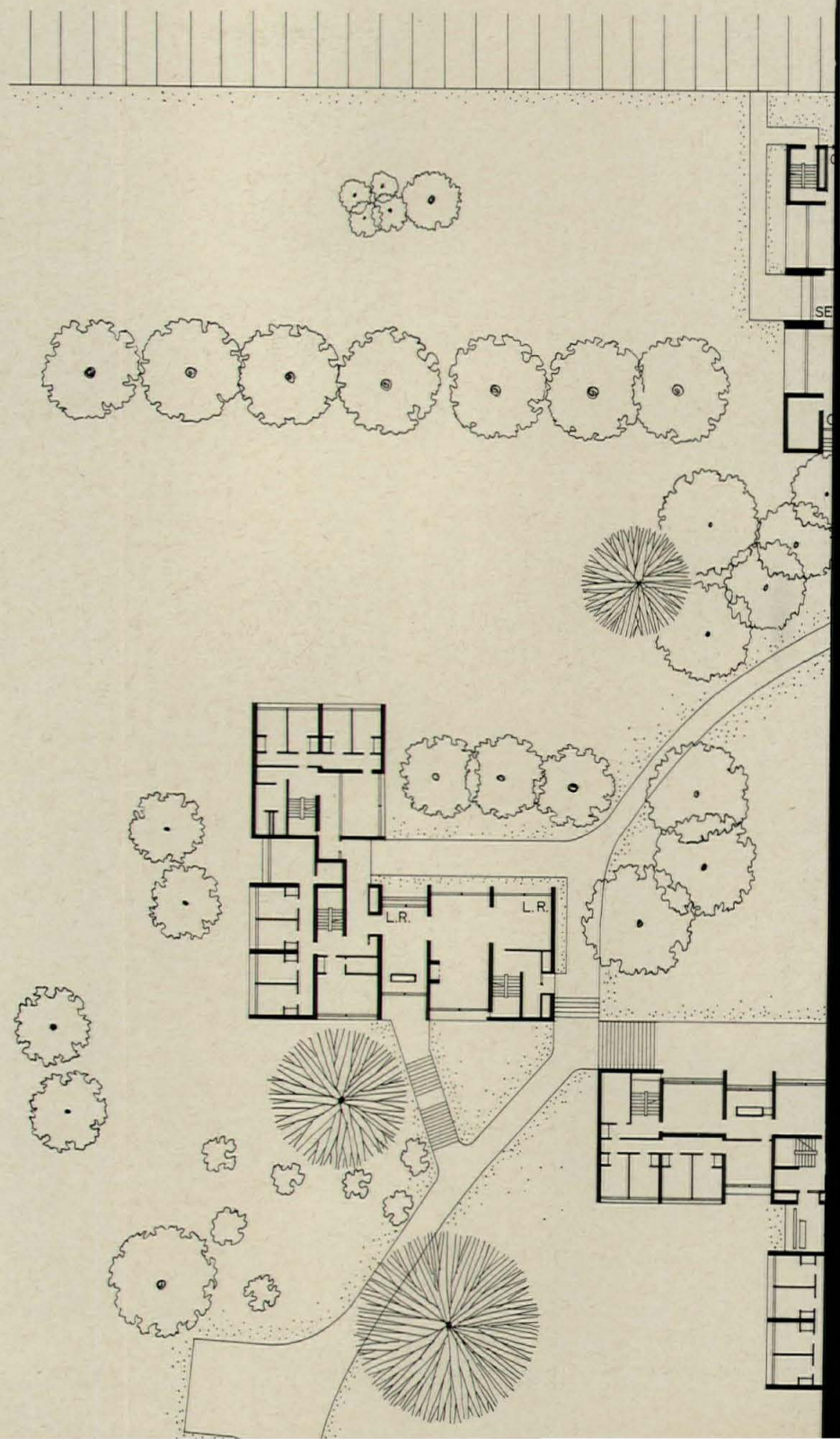
A residential complex, and five large campus libraries, show once more that college buildings offer a fertile field for new space and site planning concepts.

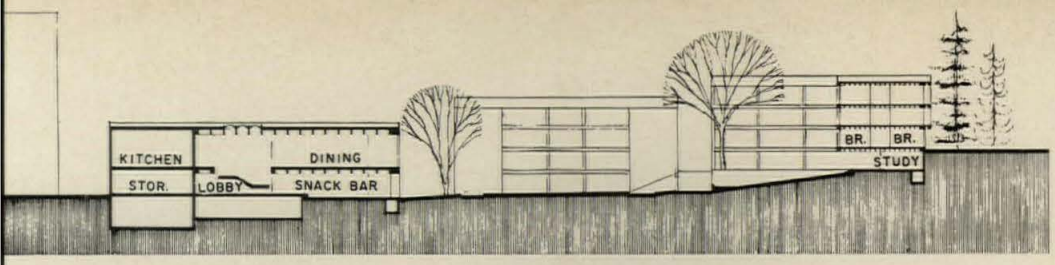
CONSERVATIVE DESIGN FOR A NEW ENGLAND CAMPUS

The Greylock Residential Houses at Williams College, designed by The Architects Collaborative with Benjamin Thompson as partner in charge, were completed just before he left TAC to establish his own firm. These dormitories can be recognized as part of an approach to design which appeared first in TAC at Brandeis and Andover.

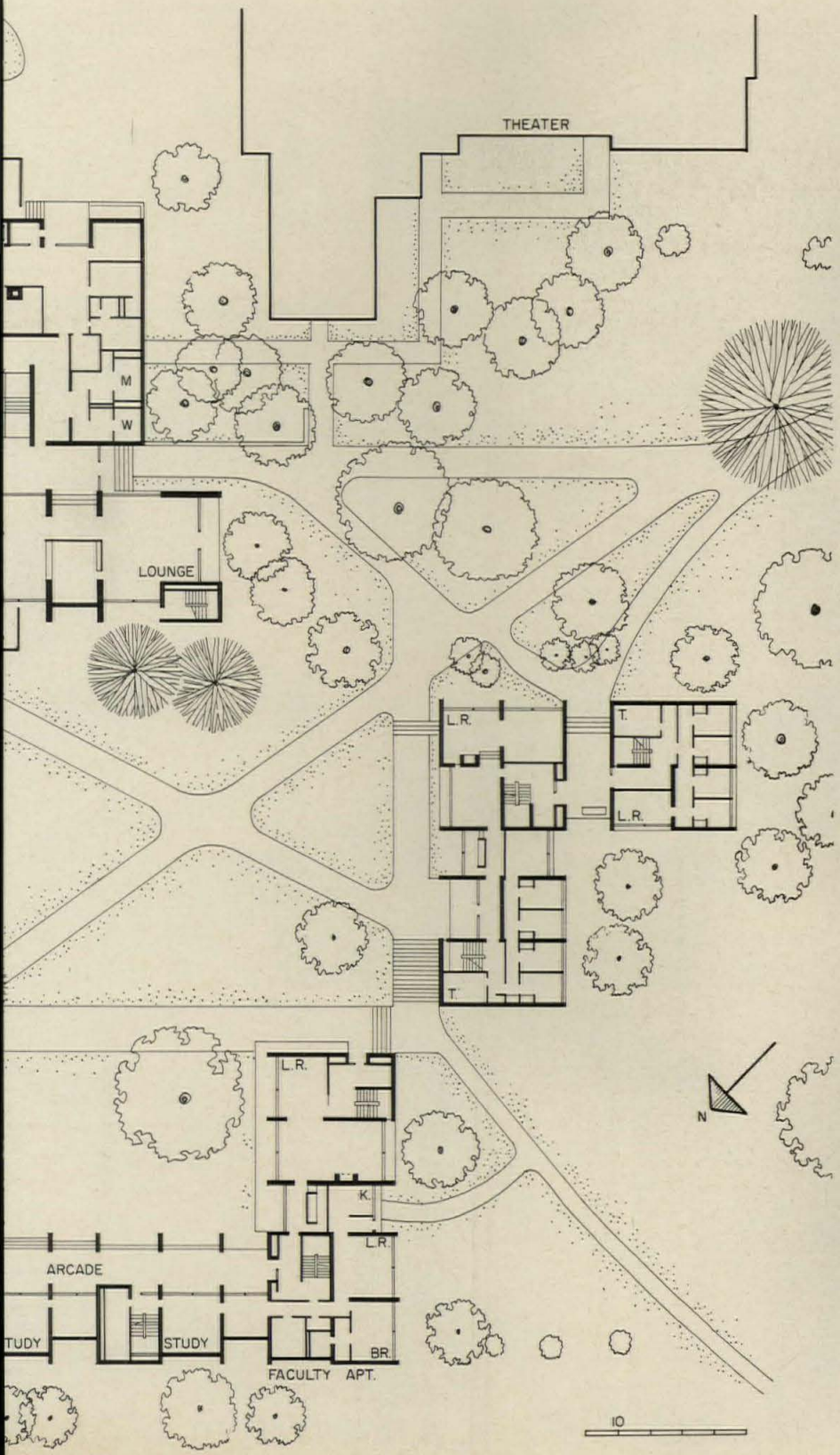
Some architects are always building the same building, more or less, while others may just appear to be repeating themselves. Thompson's work has a consistency in its planning, structure, materials and detailing which marks each newly completed structure as a close relative of the preceding one. Each of his buildings, however, is richly differentiated from the others. What is shared is a common vocabulary which the architect keeps small and uses with distinction.

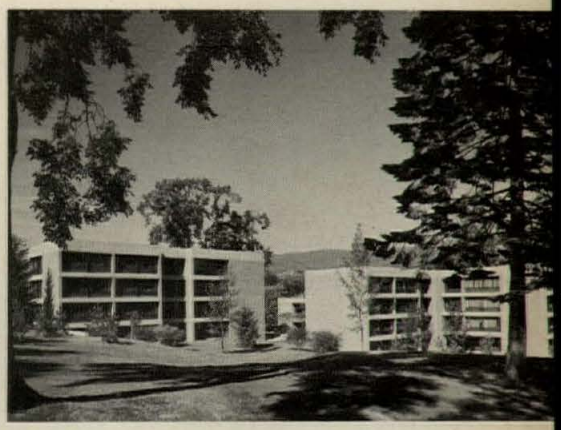
The site plan, photographs, and section, at right, indicate how skillfully the four dormitories and dining hall are located and massed on the sloping site. Thompson's plans generally consist of repeatable rectangular volumes—as at Williams—whose heights vary as program and site require, and which are interconnected by circulation space, stairs and service elements. These volumes can be flexibly arranged on the site to follow an existing contour, to frame an old tree, to form an open passage, to wall in a stair, or to shape a well-scaled court. Thompson has not so far constructed a building in which the elements of the plan are arranged within a simple geometric figure. His solutions are always asymetrical, romantic, not classic. He uses two structural systems: the brick bearing wall supporting an exposed concrete waffle slab, as here at Williams, or the oversize concrete column as the slab-supporting member. Thompson and engineer William Le Messurier enjoy making the waffle slab span astonishing distances, as can be seen in the cover photograph and on page 202. At Greylock, Thompson remains faithful to the materials which have served him well: bush-hammered concrete, water-struck brick and gray slate floors in the public spaces. As in the rest of his work, the roof slabs are cast with a parapet to create a heavy cornice.

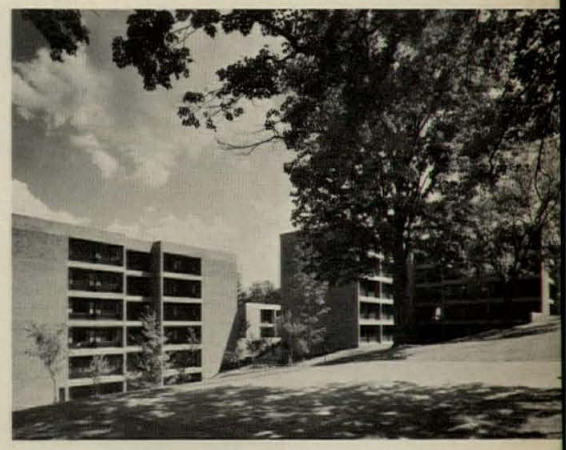


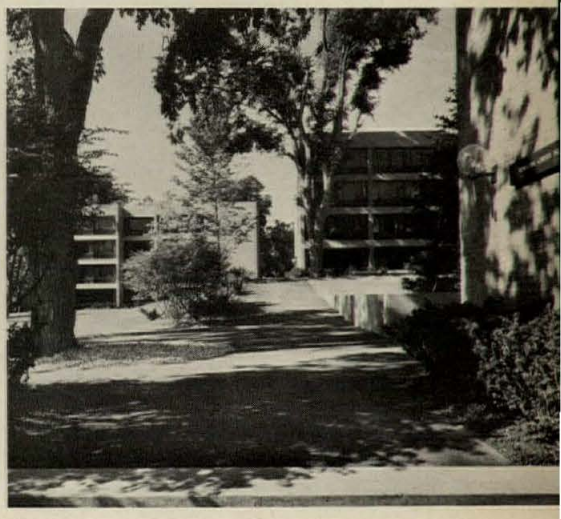


GREYLOCK RESIDENTIAL HOUSES, Williams College, Williamstown, Massachusetts. Architects: *The Architects Collaborative, Inc.—Benjamin Thompson, partner-in-charge; Thomas Green and Joseph Maybank, project architects;* structural engineers: *Le Messurier & Associates;* mechanical engineers: *Shooshanian Engineering Inc.;* electrical engineers: *Norman Associates;* site development: *Carol R. Johnson;* contractor: *George A. Fuller Co.*

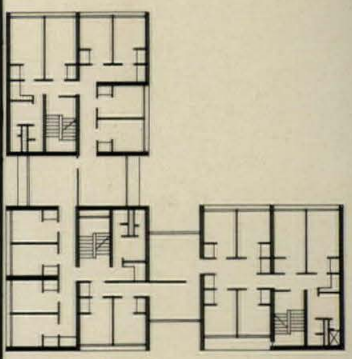








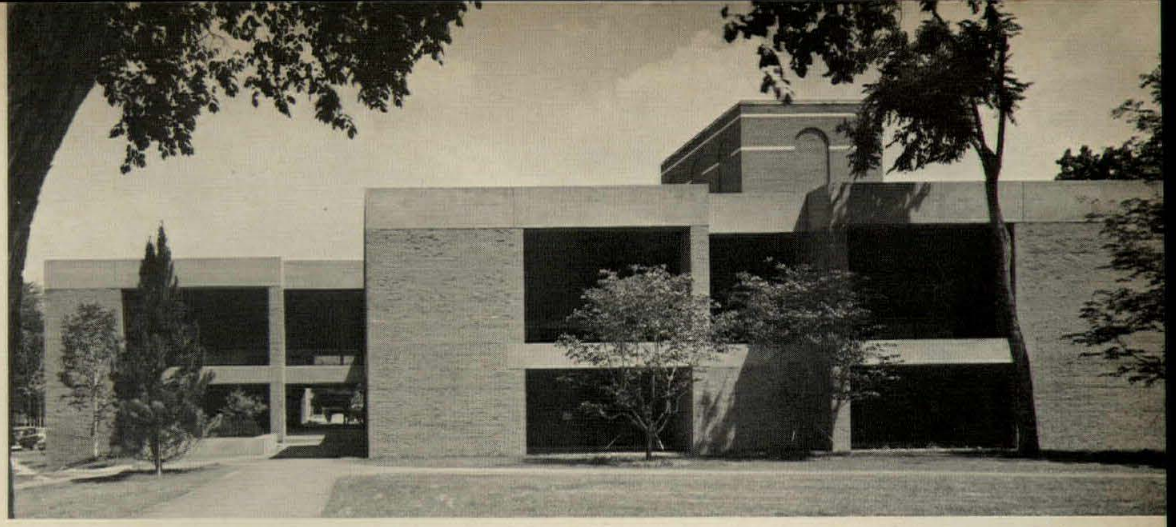
Williams College has abolished its raternities, and the new Greylock Residential Houses have been constructed in line with the administration's recently assumed responsibility for providing housing, dining nd social facilities for all undergraduates. This new $3-million facility serves 288 of them. The Student Committee on Physical Facilies strongly recommended that each tudent have his own private room or sleeping and working, and all ooms have been designed and furished for a single occupant. The ooms vary in depth only as the lan, below, indicates. The photo, eft, shows a deeper room.



TYPICAL FLOOR

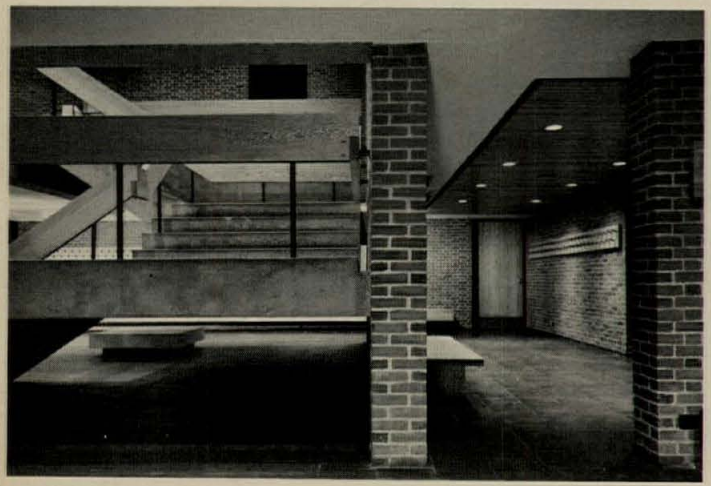
Each cluster of four of the shallower rooms shares a wide common hallway with additional storage closets and is adjacent to a shared living area. This hallway and the living area beyond appear in the photo, far left, opposite. Each of the four dormitories has its own suite of living rooms on the first floor with a fireplace and an adjoining small kitchen. The photo at left shows the juncture of two of these rooms. Great care was taken in the site planning to take advantage of existing patterns of tree growth, and a typically excellent effect is shown at right in the photo.

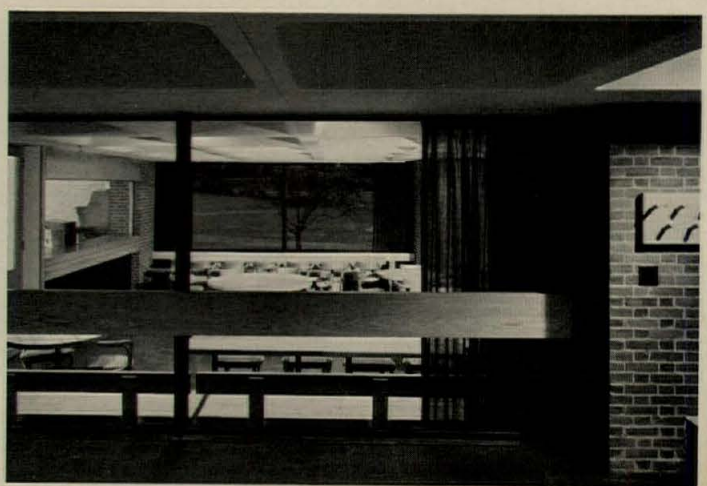
WILLIAMS DINING COMMONS



In effective contrast to the dormitory spaces, which are small-scaled and private, Thompson has made the dining hall spaces large and generous and handsomely public. This is well expressed in the scale of the facade. The two different depths of the concrete spandrel beams, photo, left, are determined by the depth of the waffle slabs, which in turn are dimensioned by the distances they span. At the cornice, the spandrel beam incorporates a shallow parapet. The brick walls are bearing.

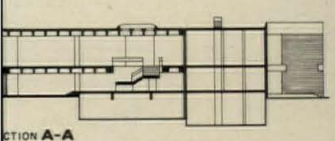
A principal entrance to the residential complex is through the arcade, shown at right, which passes through the dining commons and connects the parking lot to the southeast with the semi-enclosed quadrangle formed by the four dormitory structures. The structural system, materials, and detailing shown in this photograph are typical of the entire complex.



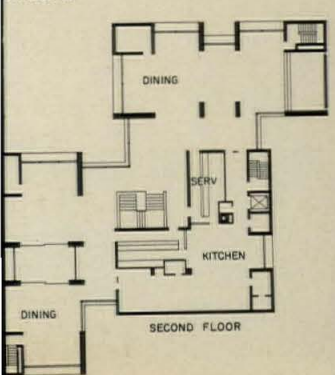


t the entrance level to the dining
ommons, photo, bottom left, the
eiling is quite low. This heightens
ne impact of the high ceilinged
obby and dining halls on the main
oor. The waffle slab spans great
istances, and its large coffers are in
ne scale with the space.

The photograph at the right,
howing a corner of a dining hall,
lustrates the principle of economy
f means which is central to
hompson's approach.



CTION A-A



A LIBRARY SHAPED BY LIBRARIANS' NEEDS

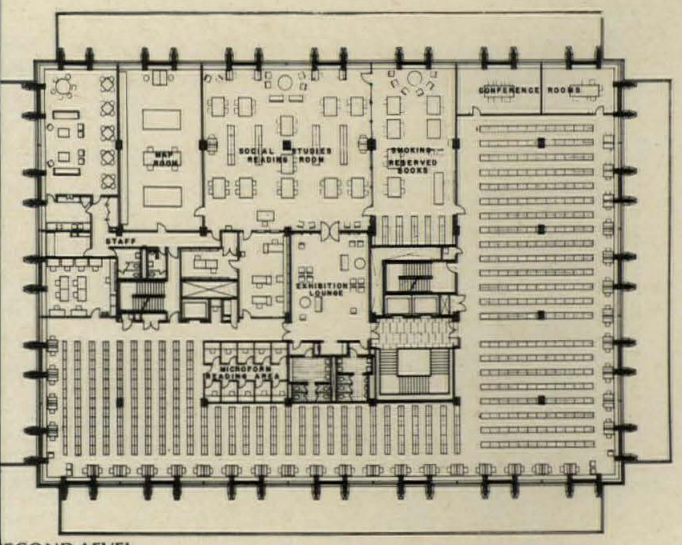
Dr. Ellsworth Mason, Director of Libraries at Hofstra University and well known library consultant, asserts that architects who manage to assemble the complex spatial requirements of a large library into one simple and handsome geometric form have usually done so by ignoring or minimizing sizes and relationships essential to a well functioning library.

The new John D. Rockefeller Jr. Library at Brown University by architects Warner, Burns, Toan and Lunde is an unconventional shape because essential functions are not neglected, nor convenience compromised to force the library elements to fit a pre-conceived shape. Midway between the foundation and roof the building becomes wide, where it might be expected to be narrow, so that from the front one sees three stories resting upon a floating base, and from the sides and rear—where the land slopes downward—the facades appear to be divided by broad enclosed porches or decks. The unusual massing results from functional considerations of prime importance to Brown University's librarians—and which are well solved and expressed in the architects' design.

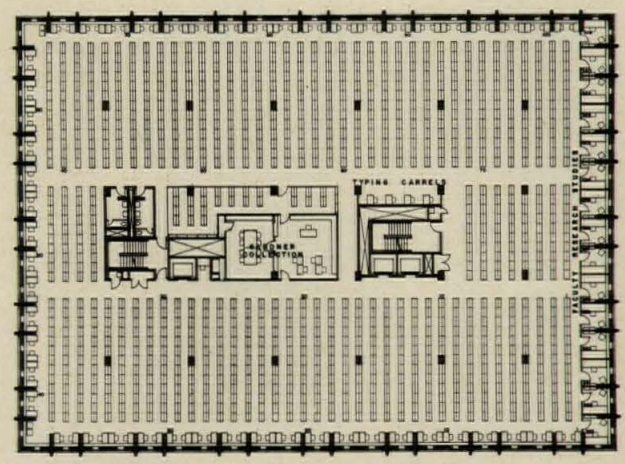
For most efficient functioning, what are called the "fixed departments"—all of which require large amounts of floor area—should be on the main floor, making it appreciably larger than all the other library levels need to be. These departments include the card catalogue, the reference collection, and the order and cataloguing departments. The latter two departments are allocated inadequate space in most libraries. The head librarian's office and administrative headquarters are located on the main floor for maximum ease of access. In the Rockefeller Library generous space is provided adjacent to the circulation desk on the main floor for open shelves which display newly available attractive books.

Campus libraries must be designed to serve effectively graduate research workers, while attracting the undergraduate who, often, is easily intimidated by a large and complicated facility which he is only beginning to learn to use. Some schools separate their graduate and

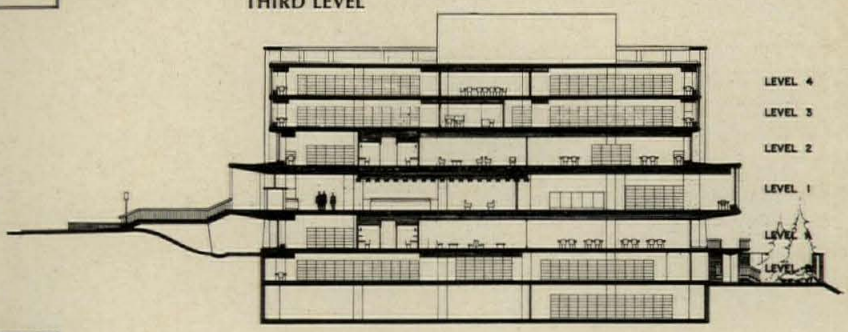
Joseph W. Molitor photos

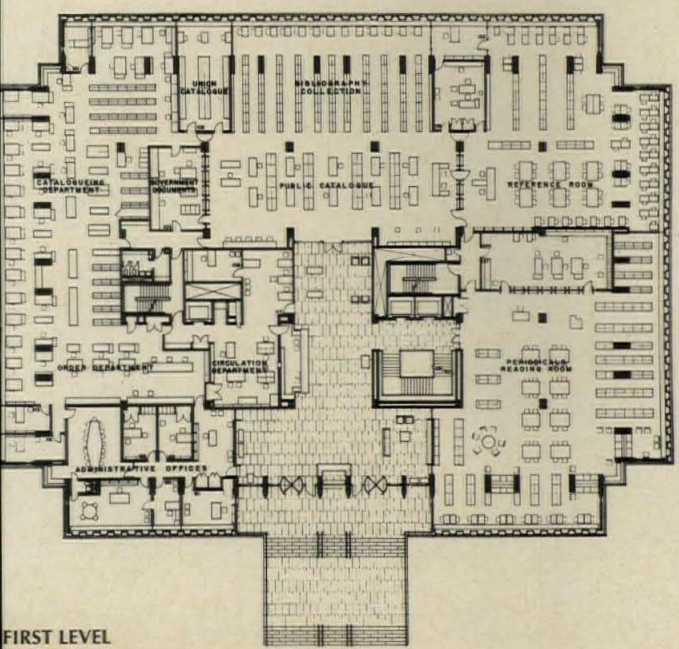


ECOND LEVEL



THIRD LEVEL





FIRST LEVEL

On the main floor are the circulation desk, card catalogue for all the university libraries, administrative offices, a reference room, a periodical section, offices for circulation and cataloguing. The three levels above the main floor contain the social sciences collection, and the two floors below have the humanities section. The stacks are open to members of the university and to all others entitled to use the library.

Lobby at entrance

undergraduate libraries, others make th undergraduate library the main segmer of a central library. The latter arrange ment, because of its size, handicaps th researcher. The Rockefeller Library com bines areas which contain a large mas of books with smaller reading room with special reference collections. Stud carrels for graduate students are pro vided in generous numbers.

Architect Danforth W. Toan, in speech made at the dedication ceremon ies, described the library's esthetic ra tionale: "In developing the exterio architectural design, we sought to matc the modest monumentality of the Joh Hay Library, [as shown on the precedin page] by developing a series of paire piers on the building perimeter whic incorporate air-conditioning risers wit structural columns.

"The projection of these pier along with variations in the wall plan and fenestration, produce varying hor zontal and vertical rhythms intended t reduce the building's scale and reflec the interior functions.

"The cantilevering of the main floo necessitated by the need for greater area provides a strong horizontal band whic hovers above the undulating terrain o College Hill."

Brown University's libraries spen $250 per student per year for new ac quisitions and for library staff members to serve a total student body of less tha 5,000 and a faculty which does not ex ceed 900. This per capita figure place Brown among the leading 10 universitie in the United States in library expendi ture. The new Rockefeller Library, planne as a major research facility in the hu manities and social sciences, now con tains one-million volumes and has bee planned for a maximum of 500,000 more

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JOHN D. ROCKEFELLER, JR. LIBRARY, Brow University, Providence, Rhode Island. Architects *Warner Burns Toan Lunde;* structural engineers *Severud-Elstad-Krueger, Associates;* mechanica engineers: *Cumwalt and Vinther;* mechanica consultants: *Buerkel and Company, Inc.* an *Thompson Engineering Company;* landscape a chitects: *Sasaki, Walker and Associates, Inc.* i *consultation with Mrs. Henry D. Sharpe;* ger eral contractor: *E. Turgeon Construction Com pany.*

Brown-tinted glass contrasts effectively with the white pre-cast concrete facade. The rear garden will be furnished for outdoor reading.

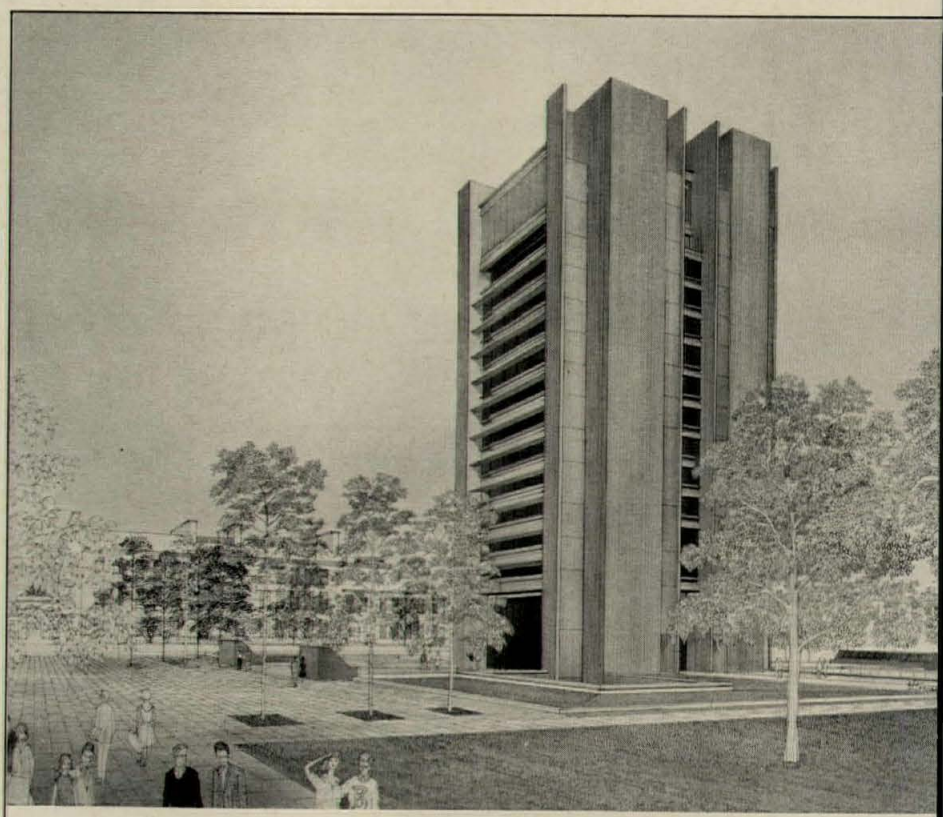
A LIBRARY TOWER FOR THE SCIENCES

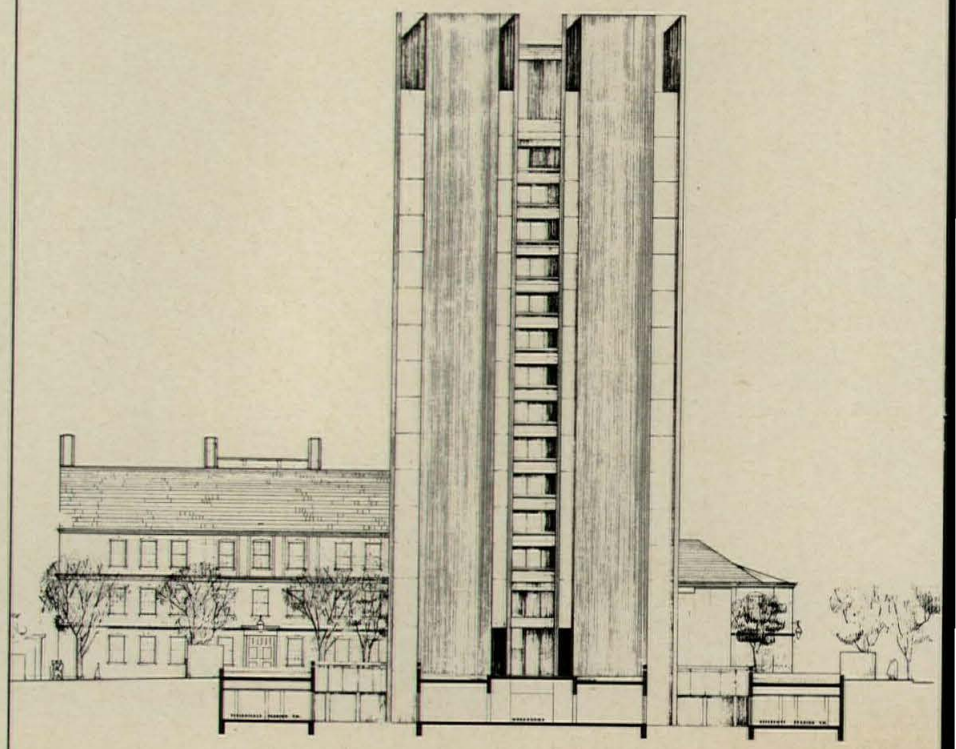
Brown was one of the first universities in the nation to combine its science departmental collections into a single library, in the interest of aiding interdisciplinary research in chemistry, biology, mathematics, physics, engineering, geology, psychology and medicine. Brown's science collection will soon be concentrated in a single tower of 14 stories, located at the pivot of the university's science complex. It is being designed by Warner Burns Toan and Lunde.

The tower form, which until recently has been an anathema to librarians, was accepted in principle by Dr. David A. Jonah, librarian of the University, with the stipulation that the typical floors of the tower would have sufficient area to house the largest separate collections (medicine) on not more than two floors at 45,000 volumes per floor, with room for an appropriate number of carrels, open and locked, faculty study areas, conference rooms and other necessary facilities. Movement of readers and books is accomplished by means of elevator, book conveyor and pneumatic tube, and the entire stack provides an efficient information storage system, with great ease of access for the users.

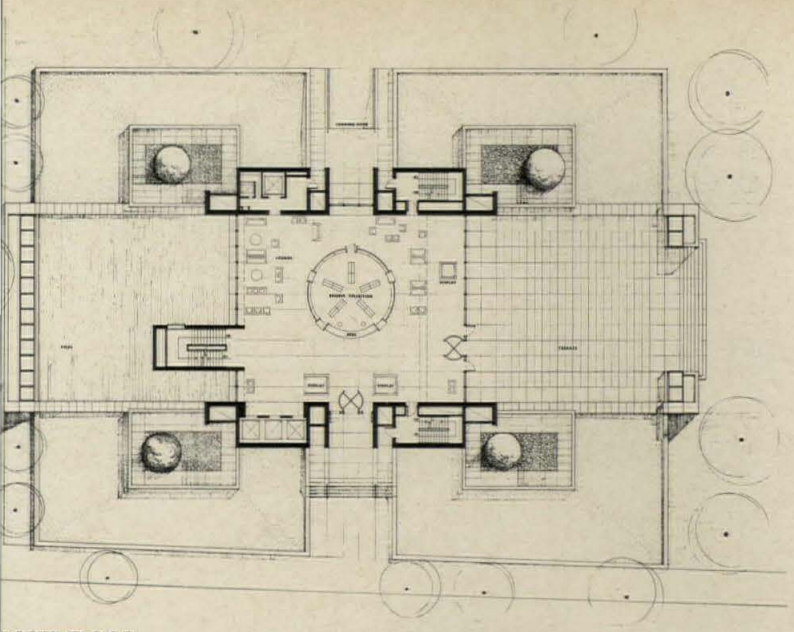
In the tower plan all vertical shaft and service areas for the building are on the perimeter, located in four slip-formed towers which will support a system of prestressed precast tee beams, 4 feet, 6 inches on center and spanning 54 feet.

The free-span spandrel beams of the north and south walls are notched to 2 feet, 6 inches of depth at the tower ends and increase to 5 feet, 3 inches in height at mid-span for greater resistance in bending. They shield the carrels placed just inside them, as can be seen in the section opposite. Their horizontal expression contrasts strongly with the vertical expression of the slip-formed towers. The south wall has a free span bris-soleil of similar pre-stressed members.

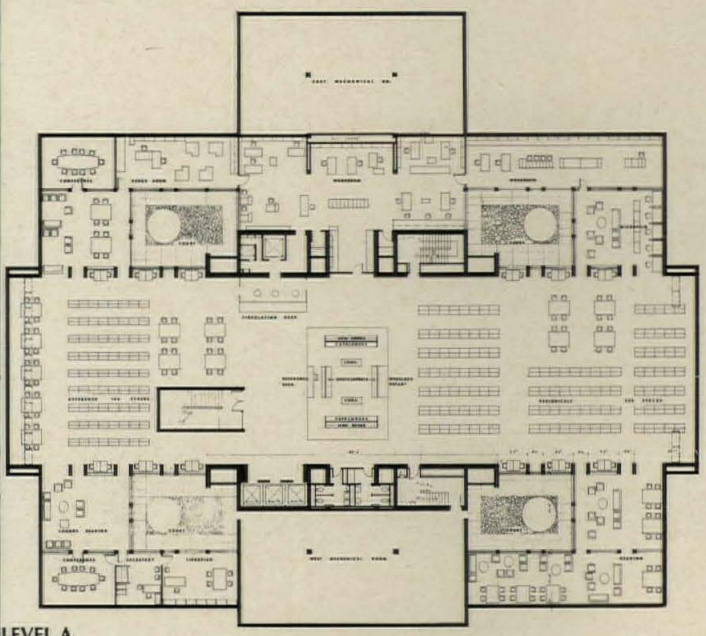




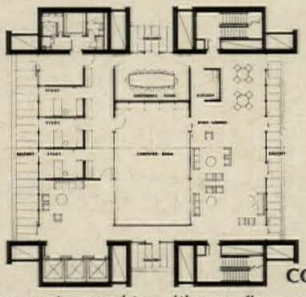
BROWN UNIVERSITY SCIENCE LIBRARY, Providence, Rhode Island. Architects: *Warner Burns Toan* and *Lunde;* structural engineers: *Severud Associates;* mechanical engineers: *Syska and Hennessy.*



LOBBY FLOOR

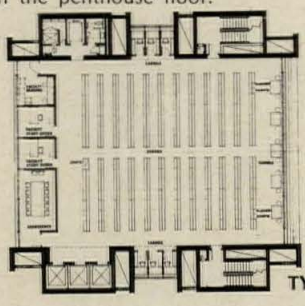


LEVEL A

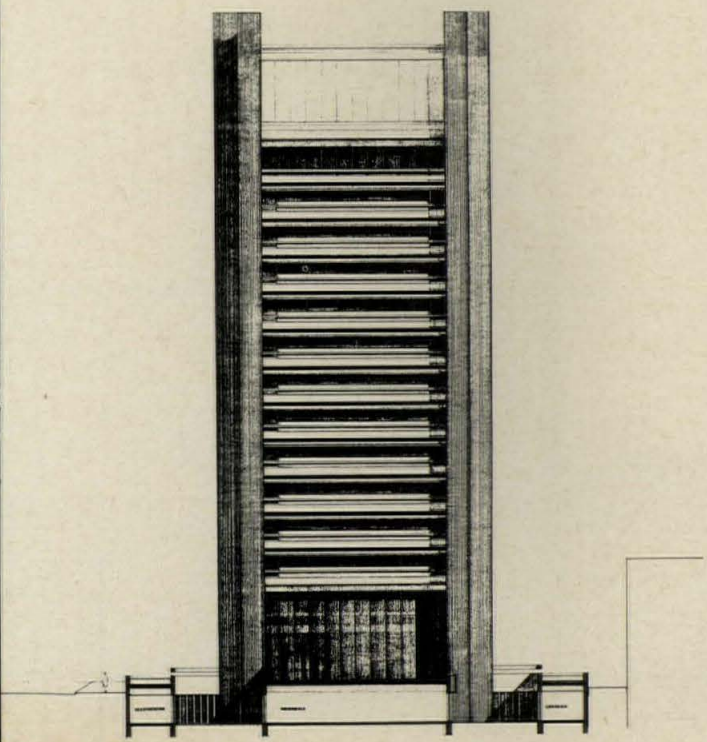


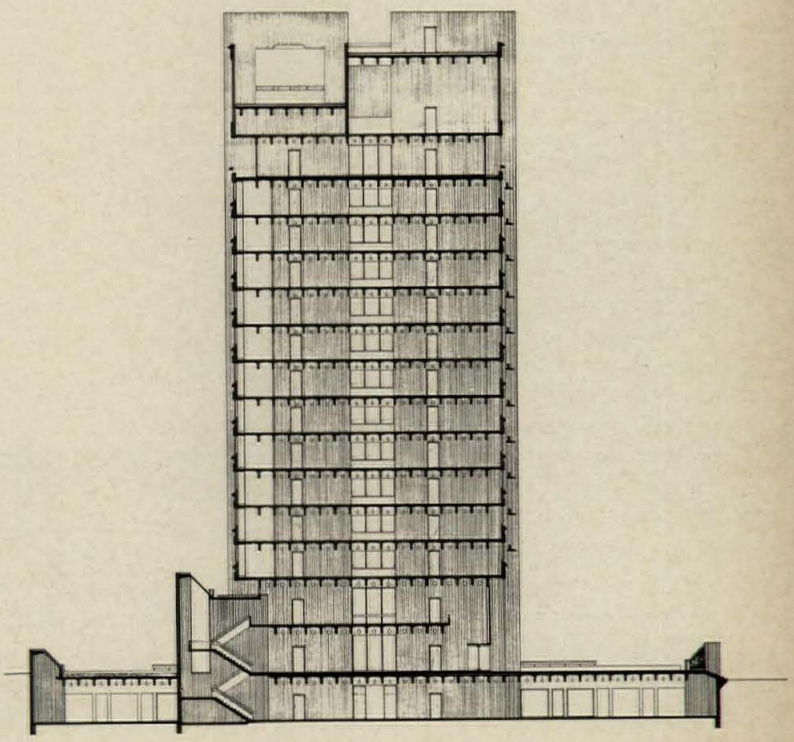
COMPUTER FLOOR

The main working library floor of 25,000 square feet contains the reference and current periodicals collections, and a technical services area. This floor is dropped below a podium which is skylit at both ends, as the section shows. On the ground floor is a spacious room for exhibitions and lounging with a control desk containing the reserve book collection. The undergraduate reading room is on the mezzanine just above, with access by a free-standing stair tower located on the north side of the building. The library's computer will tie into the future library network and will be located on the penthouse floor.



TYPICAL FLOOR

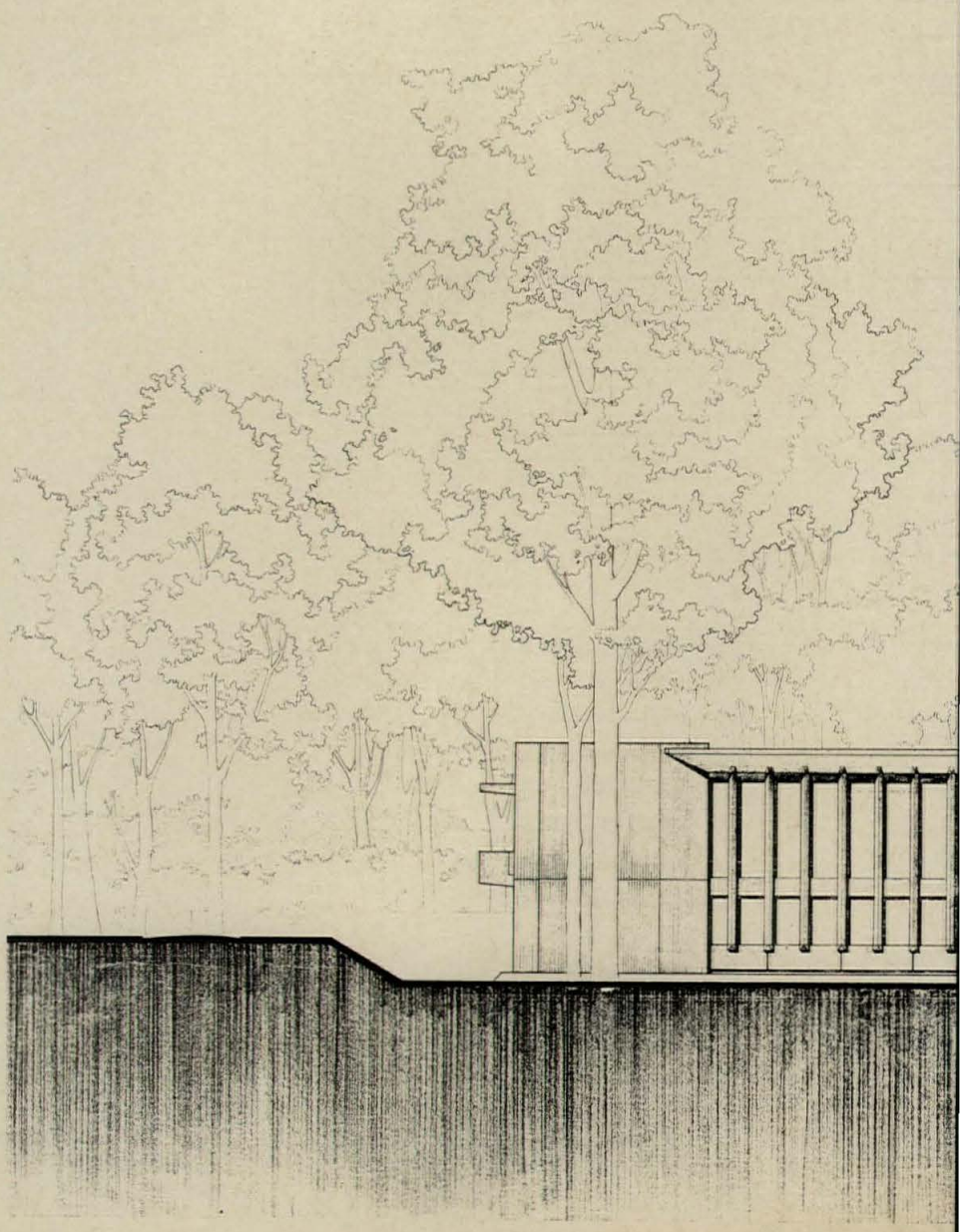


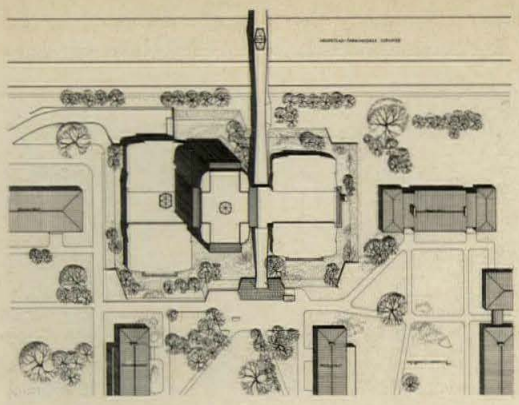


A LIBRARY BECOMES CAMPUS FOCAL POINT

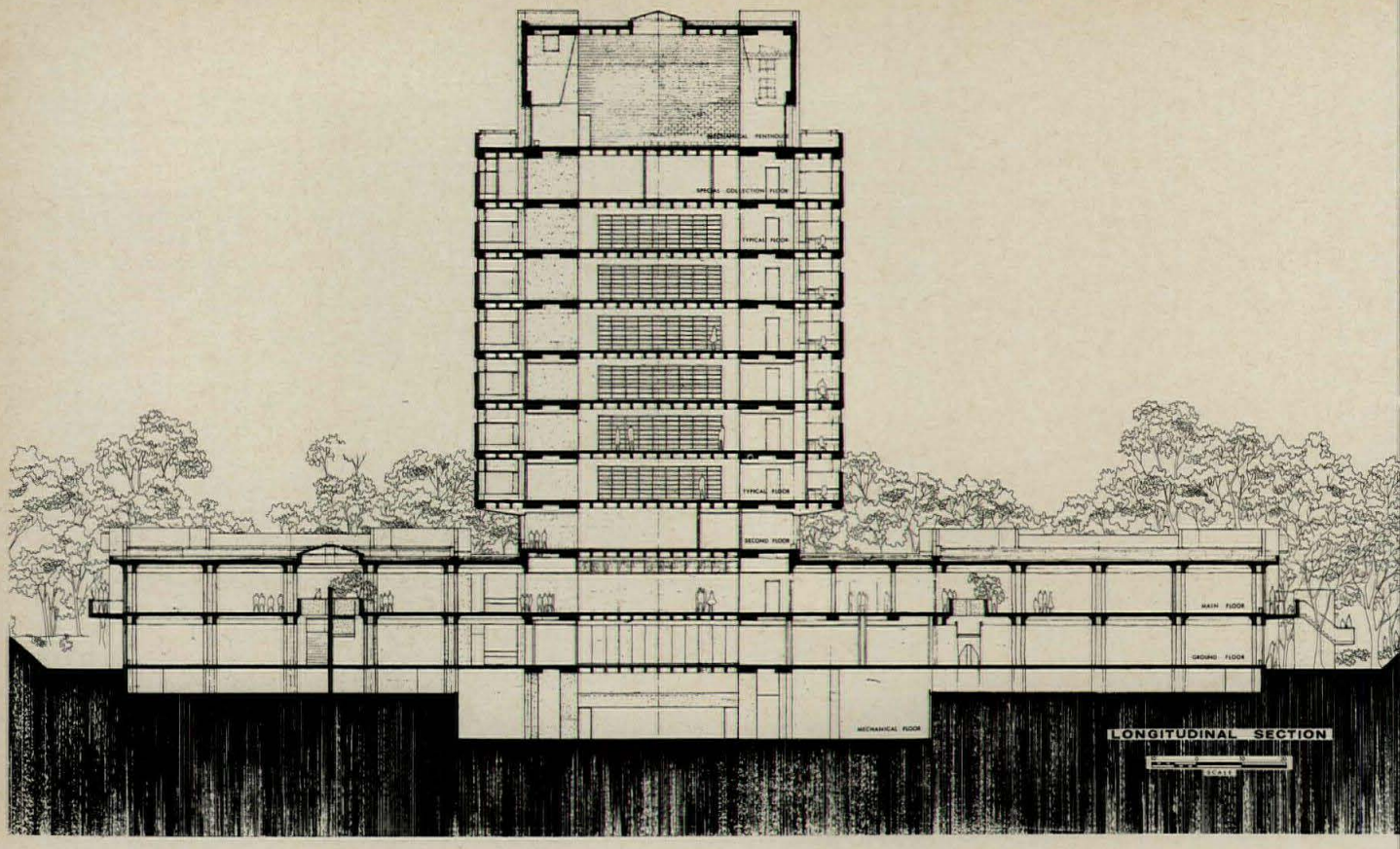
The shape that resembles an oversize rain scupper just to the right of the library tower in the adjoining drawing is actually an entrance ramp shown in combined section and elevation. This ramp is part of a footbridge which thrusts its way through Hofstra University's new library building, now nearing completion at the edge of the school's old campus. The cantilevered bridge stretches 360 feet across Long Island's Hempstead Turnpike and connects the old campus with the new one being developed across the highway to the north, as shown in the plot plan at the top of the opposite page. Thus all students at Hofstra must pass through the campus library on their way north or south. Architects Warner Burns Toan and Lunde are responsible for the campus plan and for the design of all new structures including the library.

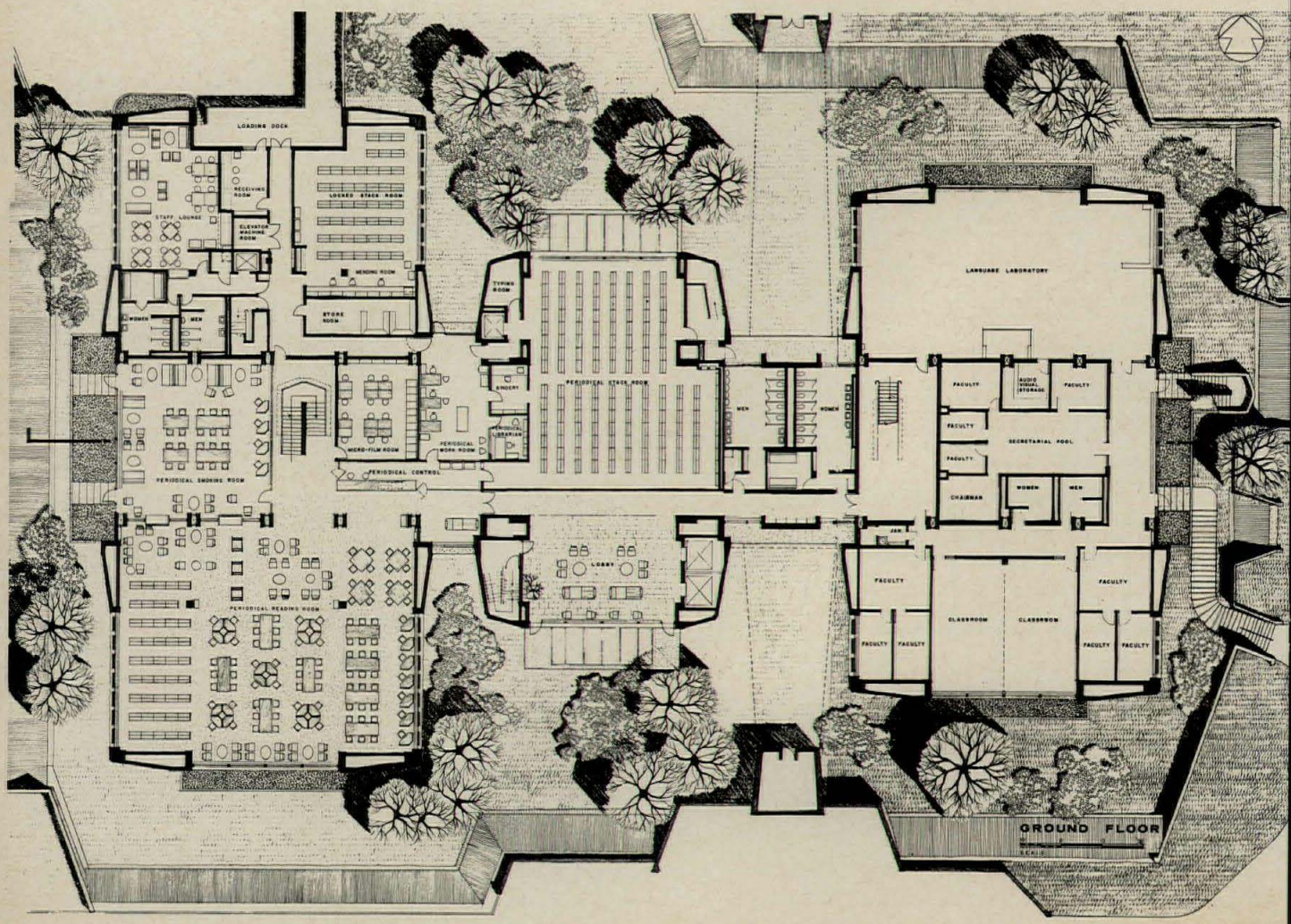
The program, developed by library consultant Dr. Ralph Ellsworth, and Dr. Ellsworth Mason, Director of Libraries for Hofstra University, called for the seating of 1,250 undergraduate, graduate and faculty readers in a wide variety of accommodations, and book storage for over 400,000 volumes. This required a building with an area of about 125,000 square feet, which promised to bulk large in contrast to the two-story neo-Georgian structures which surround it. To reduce the proposed library's apparent size and make a reasonable transition to the adjoining buildings, the architects devised a scheme with two major elements: a central tower and a two-story structure. The two-story element, composed of a gallery with adjoining pavilions, contains the major reading and staff spaces which require the largest square-foot areas. The eight-story tower rising above the gallery is supported on four structural corner shafts which contain elevators, stairs, and all other mechanical and service spaces —leaving an uninterrupted floor in which to place bookstacks, study rooms and carrels. By placing the pavilions in a sunken court, their heights are minimized in deference to the adjoining low buildings, and the slope of the entrance ramp and the footbridge beyond is kept within reason.



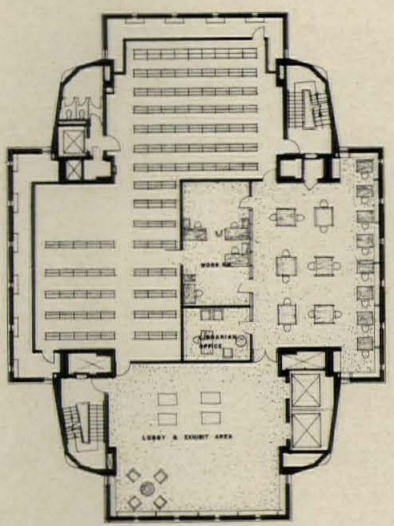


The library tower will dominate the surrounding flat Long Island landscape and provide the visual focus and identification that Hofstra has long sought. It is being constructed of reinforced concrete left exposed, with form-board markings providing the surface pattern on the exterior walls of the vertical shafts and the two-story pavilions. Precast concrete spandrel panels rise 6 feet, 4 inches above the floor to protect the carrels from direct sun. A viewing port appears every 9 feet. The footbridge is formed of two cantilevered frames, each 180 feet long.

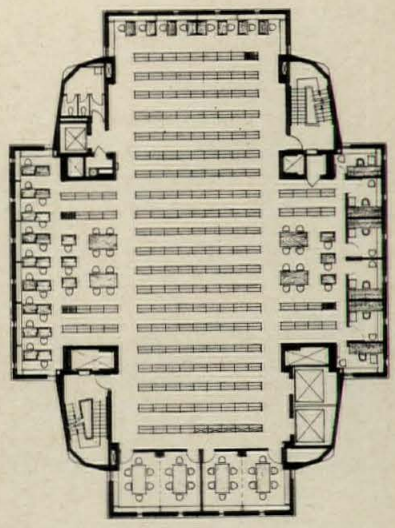

MECHANICAL PENTHOUSE
SPECIAL COLLECTION FLOOR
TYPICAL FLOOR
TYPICAL FLOOR
SECOND FLOOR
MAIN FLOOR
GROUND FLOOR
MECHANICAL FLOOR
LONGITUDINAL SECTION
SCALE


LOADING DOCK
RECEIVING ROOM
STAFF LOUNGE
ELEVATOR MACHINE ROOM
LOCKED STACK ROOM
MENDING ROOM
STORE ROOM
WOMEN
MEN
TYPING ROOM
ENQUIRY
PERIODICAL STACK ROOM
MICRO-FILM ROOM
PERIODICAL WORK ROOM
PERIODICAL CONTROL
PERIODICAL SMOKING ROOM
PERIODICAL READING ROOM
LOBBY
LANGUAGE LABORATORY
FACULTY
AUDIO VISUAL STORAGE
SECRETARIAL POOL
CHAIRMAN
CLASSROOM
GROUND FLOOR
SCALE

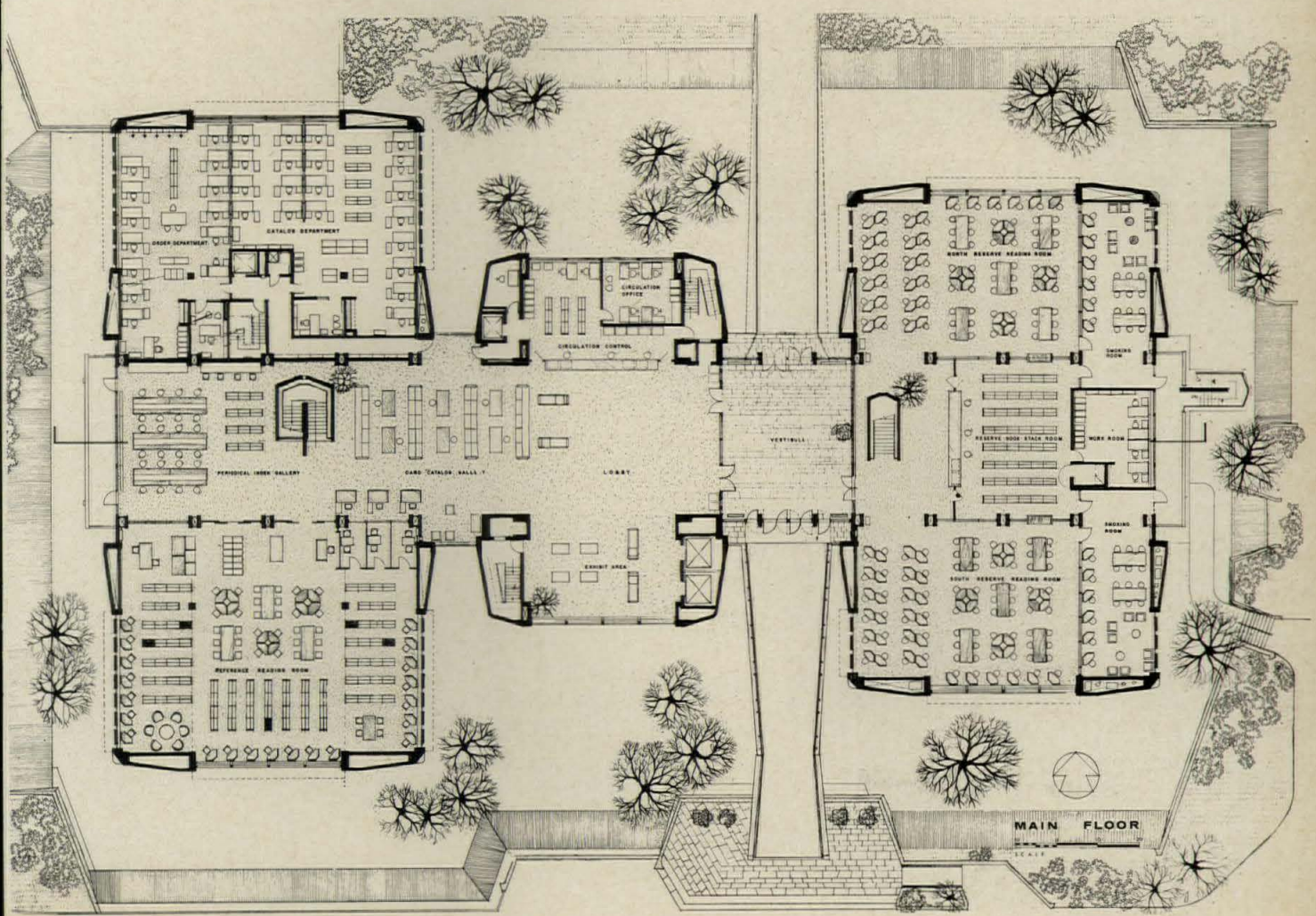
The main floor, bottom, this page, handles circulation, the card catalogue, the order and cataloguing departments, the periodical index, reference reading room and reserve reading room. All these heavily used facilities are easily accessible to the student as he passes through the vestibule on his way across the bridge. The ground floor has the periodical reading rooms, connected to the index on the main floor by means of an open stair. It also contains the periodical stacks and language laboratory facilities. The tower floors are cross-shaped in plan, and provide broad, uninterrupted spaces for bookstacks, study rooms and carrels.



COLLECTION FLOOR



TYPICAL FLOOR



A GRADUATE RESEARCH LIBRARY DESIGNED TO EXPAND

Marvin Rand photos

Unlike the three libraries just shown, the two at Brown and the central library at Hofstra, designed to be built all at once for their maximum capacity, with provision for future computerized catalogue and information retrieval systems, the University Research Library at UCLA has been designed to be built in three stages to meet expansion and technological change as it comes.

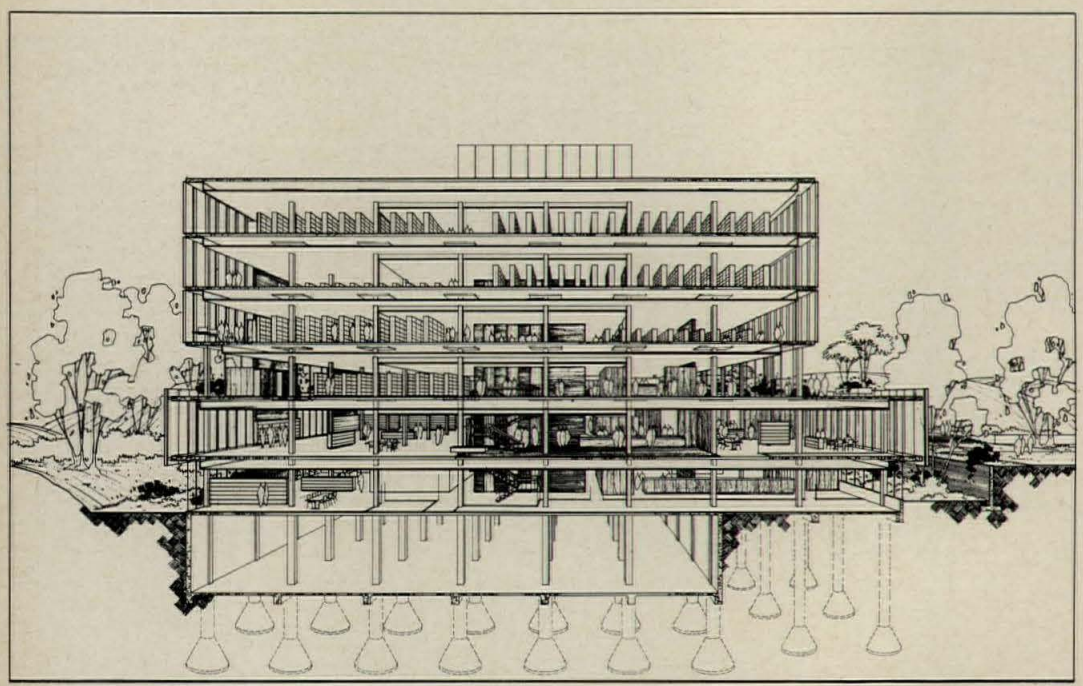
Phase one of construction is now complete. Phase two when built will add four more bays to the facade shown in the photographs, and when phase three is added the facility will be doubled.

The University Research Library—winner of an A.I.A.-American Library Association award—is an open-stack building for faculty and graduate students in the humanities and social sciences. In its present stage of completion it will seat 1,500 readers and provide shelving for 750,000 books.

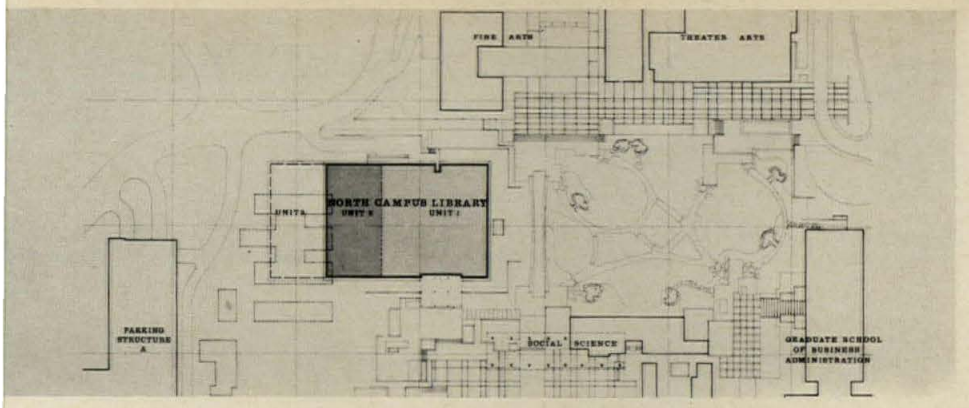
In this library, the administrative offices, card catalogue, reference, circulation and periodicals are all on the first floor under the eye of the head librarian, but other departments which appear on the main floor in the other libraries shown in this issue are here relegated to the floor immediately below. The latter floor includes the cataloguing and acquisitions departments which ideally, according to several library consultants, should be near the administrative offices of the head librarian.

It is interesting to note that the card catalogue of this library—while still a large and bulky collection of file-drawers requiring many square feet of floor space—has also been reproduced photographically and is available in several sets of 129 volumes each which utilize far less space. This is a forerunner of the day, soon to come, when many libraries will have computerized catalogues which will print out on request specific bibliographic information on a given subject.

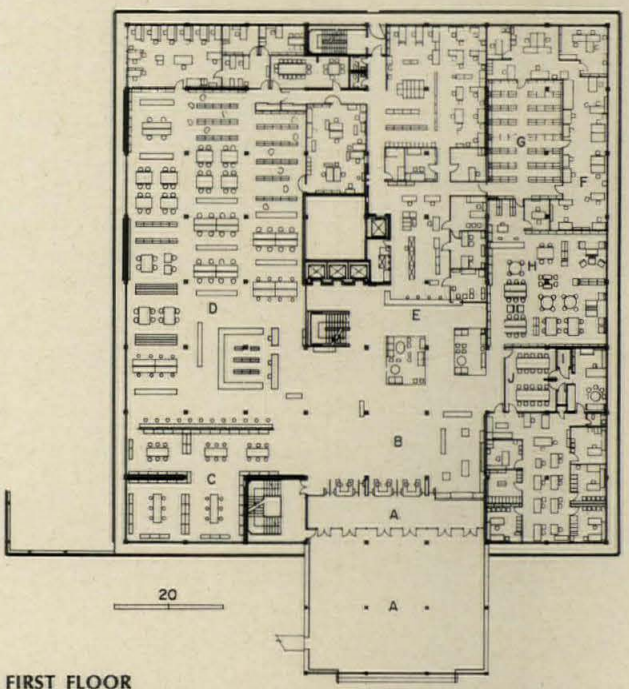
Grouped together on the second floor are books and materials which require special control and servicing. This includes volumes put on graduate reserve, materials in microphotographic form and the machines for reading them.



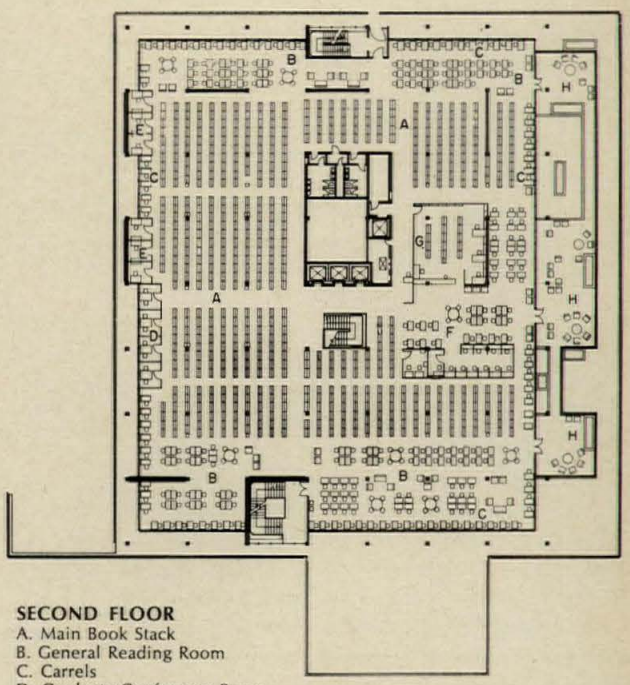
The library was planned on a 22-foot module to allow four stacks per bay with additional shelving on the column line. Although the stacks run in the north-south direction only, the module is maintained in the east-west direction, which results in a uniform facade on all four sides. The third, fourth and fifth floors handle the main bookstack, general reading areas, spaces for faculty and group study, and typing areas. The photo, left, below, shows the modular co-ordination of stacks, carrels, windows and lighting. The photo, below, shows the entire library catalogue in bound-volume form.



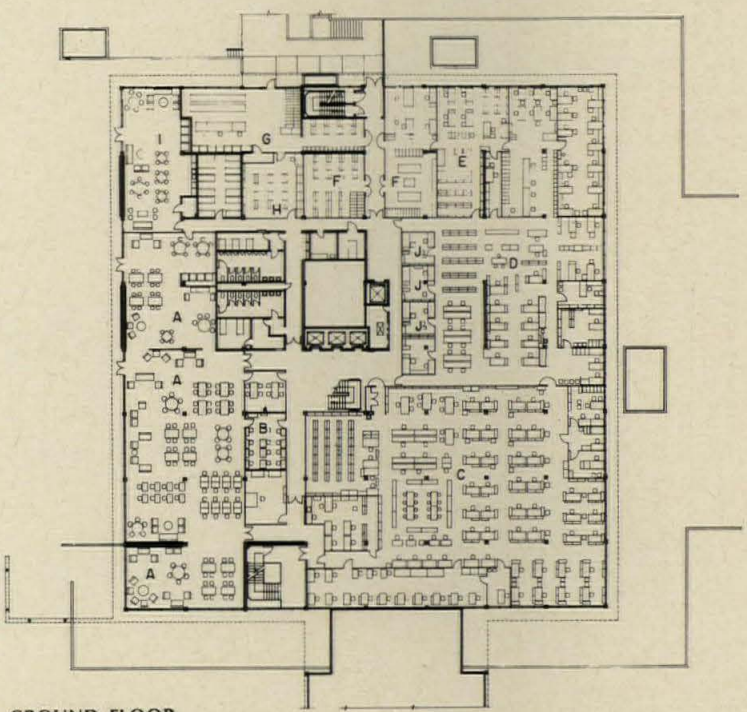
UNIVERSITY RESEARCH LIBRARY, University of California, Los Angeles. Executive architects: *S. Quincy Jones, F.A.I.A. and Frederick E. Emmons, A.I.A., Architects;* consulting architect for the UCLA campus: *Welton Becket;* structural engineer: *Richard Bradshaw;* mechanical engineers: *Ayres and Hayakawa;* electrical engineers: *Frumhoff and Cohen;* contractor: *S. Patti Construction;* landscape architects: *Cornell, Bridgers and Troller.*



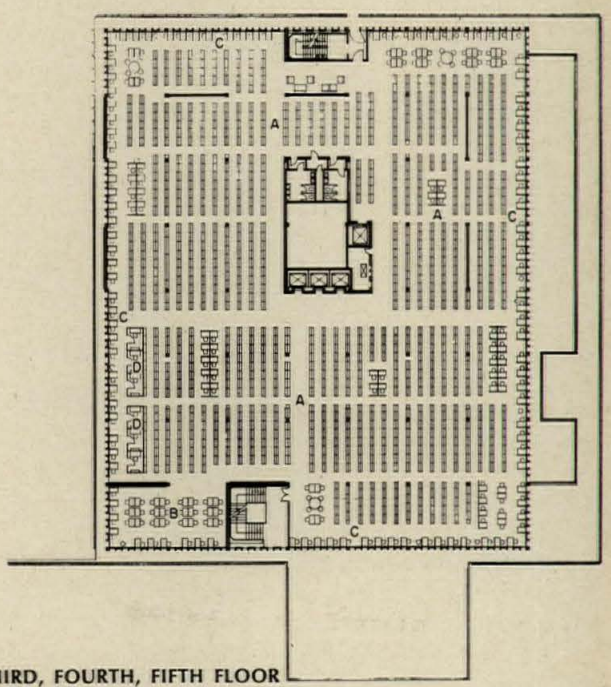
FIRST FLOOR
A. Entrance Portico
B. Lobby
C. Public Card Catalogue
D. Reference Reading Room
E. Circulation Department
F. Periodical Work Area
G. Periodical Stack
H. Periodical Reading Room
I. Vault
J. Conference Room



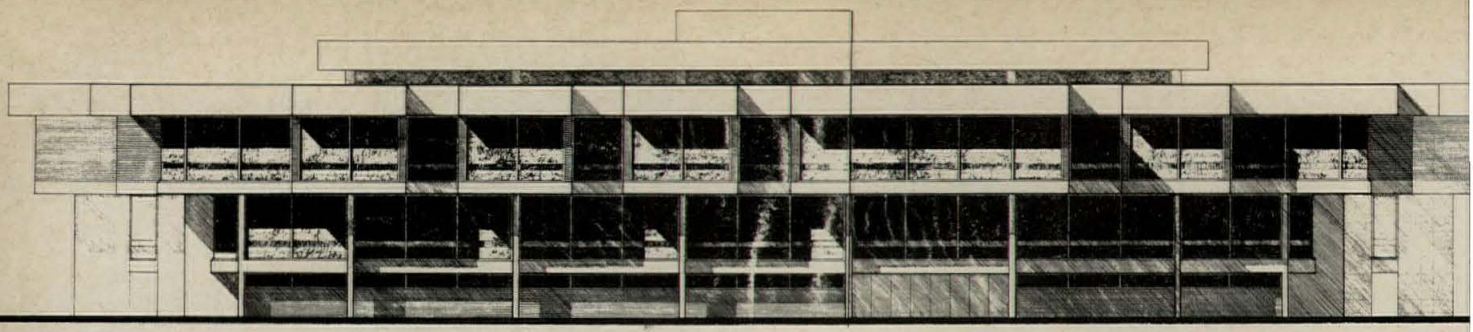
SECOND FLOOR
A. Main Book Stack
B. General Reading Room
C. Carrels
D. Graduate Conference Room
E. Faculty Cubicle
F. Graduate Reserve Reading Room
G. Stack Area
H. Reading Deck



GROUND FLOOR
A. Study Reading Room
B. Typing Room
C. Catalogue Department
D. Acquisitions Department
E. Gift Section
F. Bindery Preparation
G. Receiving Room
H. Supply Store
I. Staff Assembly Room
J. Bibliographers



THIRD, FOURTH, FIFTH FLOOR
A. Main Book Stack
B. General Reading Room
C. Carrels
D. Faculty Cubicles



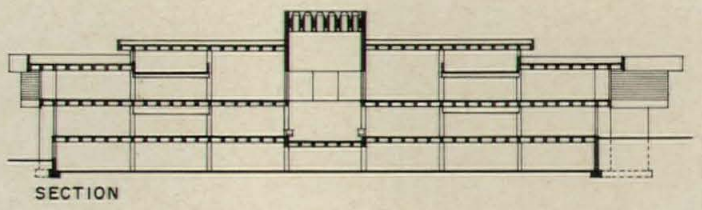
A COMBINED LIBRARY AND STUDY FACILITY

The program devised for the Providence (Rhode Island) College Library called for an unusual ratio of study spaces to book stacks, because of poor acoustics and generally undesirable study conditions in the present dormitories, and because of the need to serve a large number of commuting students. The design solution by architect Kenneth De May of Sasaki, Dawson, De May Associates, Inc. establishes one-third of the total floor area to accommodate between 500,000 and 670,000 volumes, while the remaining two-thirds has been allocated to study.

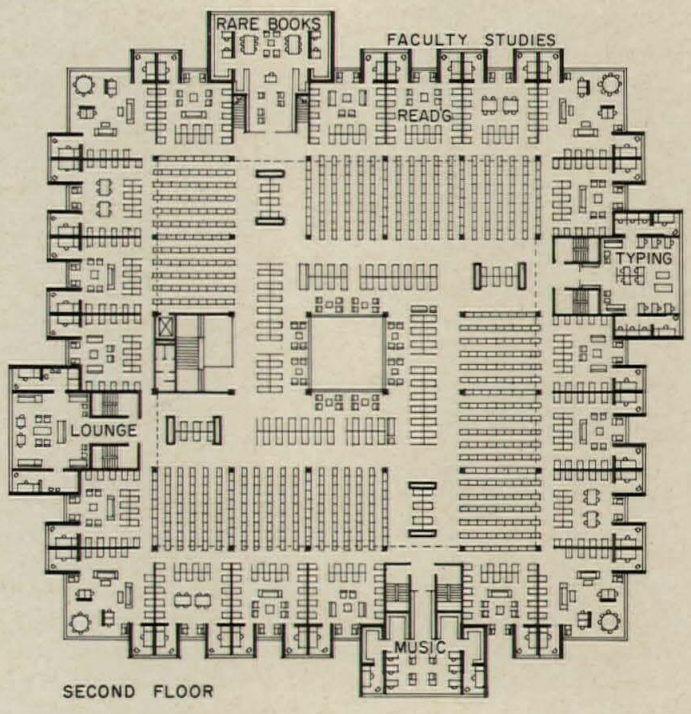
The main entrance is from the north, and service, receiving and general work space for cataloguing and acquisitions is to the west—as the first floor plan shows. The circulation desk, two bays long, is about one bay longer than some librarians consider practicable for best utilization of personnel, especially since most campus libraries try to get along with a reduced staff in the evenings; but this particular library's importance as an evening study facility suggests that the long desk will be well manned during all hours in which the library is open.

As the section shows, the central lightwell provides a vertical orientation within the building and satisfies the esthetic need for a counterpoint to the predominantly horizontal spaces. The central bay directly under the skylight is slightly lower than the main floor, which helps to articulate the special character of the periodical reading lounge.

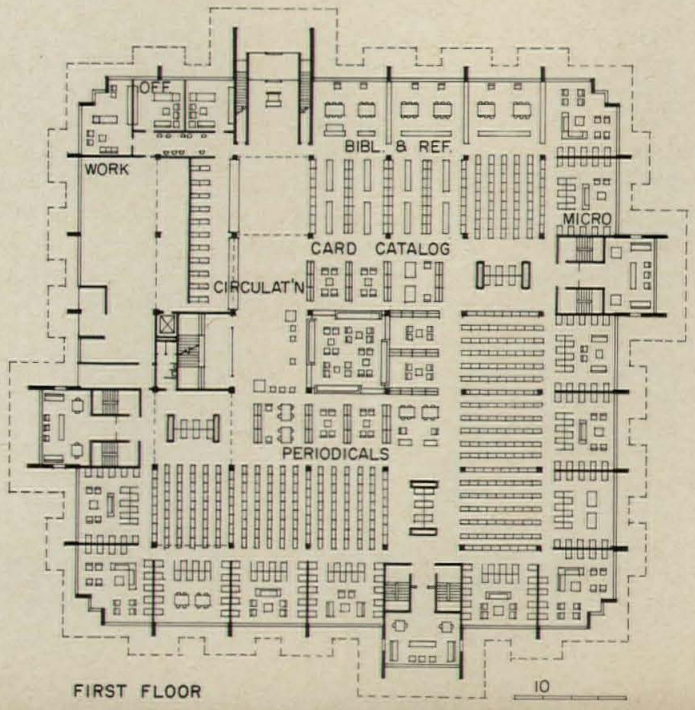
Concrete was chosen for the structural frame because of its low sound transmission, to meet code requirements, and to reduce maintenance costs. The structural frame will be poured in place and formed with special 4-foot, 3-inch domes to match the stack spacing. The structural bays are 25 feet, 6 inches square. The concrete will be sandblasted on the exterior and combined with water-struck brick. The exterior glass areas provided for this library are somewhat greater than is now the normal practice, but this was encouraged by a splendid growth of specimen trees in all directions on the site—and the windows are shaded and screened by broad overhangs.



SECTION



SECOND FLOOR



FIRST FLOOR

ARCHITECTURAL ENGINEERING

Model testing to explore new auditorium concepts

The greatly increased demand for performing arts facilities—and some new economic circumstances—are causing more organizations to think in terms of multi-purpose auditoriums. They find it makes better sense to design for a wide variety of activities than to design for one major one and accept compromises for the rest.

The multi-purpose auditorium, by definition, must be amenable to space changes and acoustical changes. A strong trend in multi-purpose auditoriums is mechanization of the movable elements. If the auditorium is difficult to adjust, time and labor involved will be excessive and the movable elements will remain static most of the time. Obviously the acoustical design gets much more involved—in fact the acoustical consultant is, in effect, designing several auditoriums instead of just one.

To stimulate research in this area, the Ford Foundation has given an $80,000 grant to George Izenour's electromechanical laboratory at Yale's drama school in an effort to perfect methods for predicting acoustical properties of finished auditoriums from scale models. The effect of varying shape and size of multi-purpose auditoriums through movable wall and ceiling panels will be studied. Acoustical studies will be conducted by B. G. Watters of Cambridge, Mass. A basic objective is to improve acoustical design tools so that various techniques for changing room shapes can be assessed for their acoustical properties and to determine what these techniques will require in the form of mechanical devices. Other objectives are to learn how good the correlation is now between models and actual auditoriums, how model techniques can be improved, and to further pin down the aspects of acoustical design which can be aided by model testing.

Building Exits Code gets a new name and a new format

A completely reorganized edition of the Life Safety Code has been issued by the National Fire Protection Association. Formerly known as the Building Exits Code, the new "Code for Safety to Life from Fire in Buildings and Structures" has been rearranged in the format of model building codes, and uses code terminology to increase its application as a basis for laws and regulations.

The chapter dealing with the fundamentals of exit arrangement has been rewritten to clarify definitions. Changes have also been made in the material covering places of public assembly, educational occupancies and penal institutions, and there are new data on folding partitions, exit passageways, and on moving walks. The Life Safety Code outlines arrangements which may be made in certain occupancies to hold doors open by magnetic devices actuated by smoke detectors. There are also new requirements for automatic elevators, making it mandatory for at least one elevator in a building to be quickly convertible to manual operation for fire department use.

THIS MONTH'S AE SECTION

The Life Safety Code has been developed by the NFPA Committee on Safety to Life under the chairmanship of Edward Grey Halstead of the architectural firm of Jensen & Halstead.

Copies of the 1966 edition of the "Code for Safety to Life from Fire in Buildings and Structures" (NFPA No. 101) are available for $1.50 from the National Fire Protection Association, 60 Batterymarch Street, Boston 02110.

Power reliability essential in both building, utility systems

After the widespread blackout occurred in the Northeast last November, great concern developed over the "fail-safe" reliability of utility electric power. But engineers pointed out that any consideration of reliability should include the internal building distribution system just as much as the utility supply and possible building standby power plant (See "Planning for Reliable Electric Power," by F. J. Walsh, February and March RECORD).

▪ That building system reliability deserves more careful attention is plain from the increasing number of internal distribution system failures. Most of these failures go unnoticed, but in June a noontime, electric power disruption in the Pentagon—obviously of more than routine interest—was reported in The New York Times. The Pentagon outage was caused by trouble with a 500-kva transformer in the building. It overheated, burned, and put about 10 per cent of the building out of power for periods of up to two hours in the early afternoon. At first, the failure put 20 per cent of the top two floors out of power. The Pentagon was electrically sectionalized, and service was restored as soon as possible.

Cause of the fire is not known, although four possibilities were offered by an *ad hoc* committee reporting to the General Services Administration (which administers all Federal buildings in Washington). The four possibilities: (1) overloading; (2) insulation failure; (3) dust accumulation; and (4) loose connections.

The *ad hoc* committee feels that a loose connection is the most likely cause —not an overload. The fire started from arcing and sparking (thus the speculation on the connection) and eventually burned both the transformer and related switchgear. Damage was estimated at $2,000.

The Pentagon has an annual checkout of its electrical network protectors carried out by GSA and the Potomac Electric Power Company, which supplies power in Washington.

▪ That utilities themselves are still faced with blackout problems was brought to attention during the recent series of heat waves. As many as 100,000 electrical users in St. Louis were without power early in the week of July 10, The Wall Street Journal reported. It was said that not enough power was available in the Midwest pool to supply the demand created by over-100-degree temperatures. In such cases utilities are forced to employ selective load shedding in order to prevent damage to their equipment as well as preclude the spread of the blackout to the various utilities in the intertied system.

Modular group reactivated to study building components

To assist industry in establishing guidelines and standards for pre-coordination of building components, the American Standards Association Sectional Committee A62 is being reorganized under sponsorship of the National Bureau of Standards Institute for Applied Technology (U.S. Department of Commerce).

The reactivated project will be called "A62, Pre-co-ordination of Building Components and Systems," and have as its scope: "The development of a basis for attaining both functional and dimensional compatibility of building components so that they integrate with a minimum of on-site modification, and the establishment of guidelines for coordinating building systems."

Jack E. Gaston, Armstrong Cork Company is chairman and Russell W. Smith of the Institute staff is vice chairman and secretary of the committee. Working committees will identify the most meaningful systems as guides for smaller committees to develop basic criteria. Various technical study committees will look at pre-co-ordination as a systems problem. Organizations, corporations or individuals who have an interest in participating in the program should contact the committee secretary at the National Bureau of Standards in Washington.

Mechanical system programs being developed by A-E group

A group of 25 architects and consulting engineer firms has formed a non-profit organization—Automated Procedures for Engineering Consultants, Inc.—to establish standard programs for the design of mechanical and electrical systems. Purpose of the new group is to: (1) share the cost and time involved in setting up standard programs in their own practices; and (2) assure use of consistent procedures and languages so that the information can be easily shared.

As a start, each member firm will submit procedures for which they need a computer program. Then operational committees will draw up specifications for the programs which will be worked out finally by computer service companies. As different programs are completed, they will be distributed to member firms along with supporting data. Officers of the organization are: Herman Blum of Herman Blum Consulting Engineers in Dallas, president; S. A. Dittmann of Giffels & Rossetti in Detroit, secretary; Emmett W. Bryan of A. G. Odell, Jr. & Associates in Charlotte, North Carolina, treasurer; and J. Marx Ayres of Ayres & Hayakawa in Los Angeles, operational committee chairman.

Structural engineering guide published by A.S.C.E.

The types of professional services and the interdisciplinary relationships that apply specifically to building projects are defined in the second of three publications developed by the Committee on Professional Practice of the American Society of Civil Engineers. The major subjects covered are: (1) basic services in the preliminary, design and construction phases; (2) special services, both predictable and unpredictable; (3) selection procedure of the consulting structural engineer; types of contract and charges for consulting services; and (4) multiple use of drawings.

The first publication in the series dealt with surveying and mapping and the third will be on professional practice in soils and foundation engineering. The structural engineering guide is available at no charge from the American Society of Civil Engineers at 345 East 45th St., New York, N.Y. 10017.

Congress appropriates funds for building code commission

State and local building codes, zoning regulations and land taxation policies will soon be examined by President Johnson's proposed National Commission on Codes, Zoning and Taxation. Though members of this commission have not yet been appointed, Congress has appropriated $1.5 million to the Department of Housing and Urban Development for the study, and background reports are already being prepared by HUD in anticipation of the major study.

Objective of the Commission's study will be to shed some light on the impact of these local policies. In the past, various critics (including some Federal advisory committees) have called the present system of local codes "a mess."

"The research and development of new materials and methods of residential construction cannot be adapted to mass production so long as there are thousands of different local building codes in the U.S.," claims the National Commission on Technology, Automation, and Economic Progress.

"Code diversity is undoubtedly one of several factors contributing to the lack of progress in the construction industry to exploit mass production techniques," says an advisory commission on intergovernmental relations.

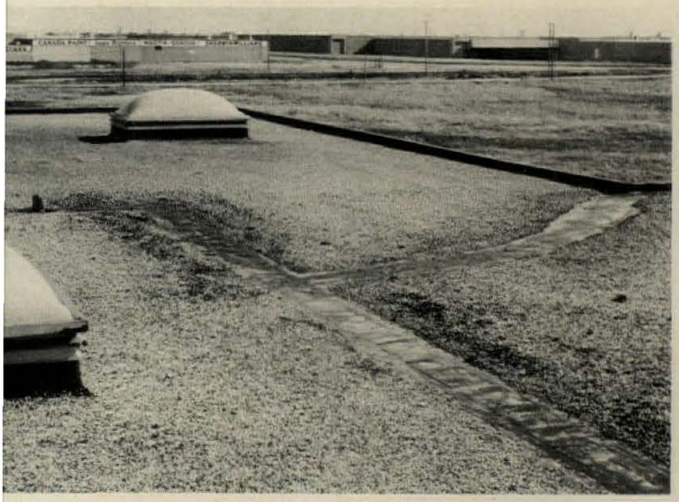
Various manufacturing associations and the model building code groups claim these criticisms fail to grasp the existing organizational mechanisms.

But even the Republican National Committee feels the Federal government ought to inspect the building code situation. While the G.O.P. is against any national or Federal building code, it feels HUD "has the responsibility to act as an information-gathering center concerning use and content of building codes."

HUD Secretary Robert Weaver feels his new commission should "assemble facts and begin a meaningful dialogue among all the organizations having an interest in this complex and economically sensitive subject."

Privately, spokesmen for the various interest groups directly affected by such a study have welcomed HUD's approach, feeling that some official body is needed to clarify the assertions made—without sufficient evidence, they say—that the code situation is fouled up.

The Commission will be looking into matters other than codes, although this subject is causing the most debate. Novel planning and zoning innovations will be studied to determine their impact on environmental design. Tax policies will be examined to see what effects they have on blighted neighborhoods.



Building movement can damage built-up roofing systems

By Werner H. Gumpertz
Simpson, Gumpertz & Heger, Inc., Consulting Engineers

Since all structures move to some extent, potentially harmful changes in dimension of structural elements must be taken into account in the design of roofing systems to avoid maintenance problems.

Until recently—since experience did not dictate otherwise—roofing systems were not designed with reference to building structure. While building design and materials changed steadily over the years, basic roofing design stayed fairly constant—until a variety of built-up roofing failures began.

Back of the trouble is building movement, which was an insignificant problem when buildings were more limited in area and constructed of heavy masonry. But building frames became lighter and more flexible, and roofs grew into gigantic, uninterrupted areas. Today's buildings move due to thermal, wind and moisture influences and these causes cannot be prevented. In many cases such movement transmits more stress to the roofing membrane than it can cope with, unless both roofing and structural designs take this movement into account. If they don't, the result is rupture of the roofing membrane.

Effects of thermal movement

Cyclical temperature swings create stresses in both the deck and the roofing membrane. Unless provisions are made in these two elements for prevention of stress build-up, roofing splits are likely to occur. Splits can be avoided by dividing the roof into small areas with expansion joints and/or providing expansion joints wherever there are sudden changes in roof shape. An expansion joint provides for complete structural separation of two adjacent parts of a building. The relief joint provides only for separation of two adjacent sections of the roofing membrane and is intended to prevent splits at changes in deck direction or materials.

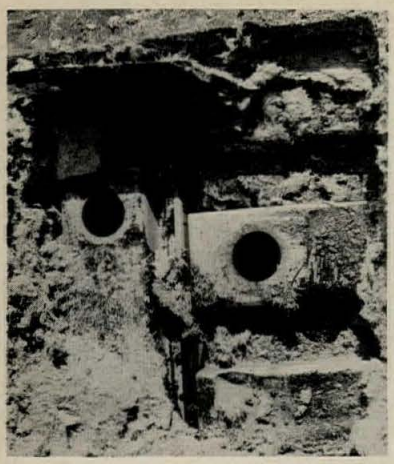
Stress concentrations due to thermal movement can occur at re-entrant corners, as well as at sudden changes in roof direction. The effect of these stress concentrations is usually more severe than those occurring in an excessively long roof with expansion joints. At re-entrant corners, the stresses can be from two-to-10 times normal stresses.

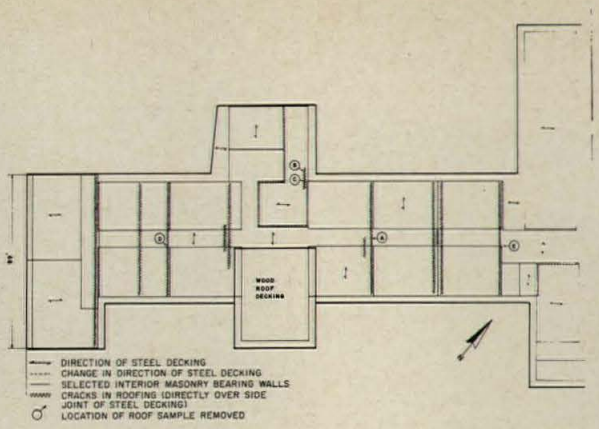
- While there are no hard and fast rules for the most effective placement of expansion joints, an expansion joint should be provided at any discontinuity in the roof plan; small connecting links and legs of Y-shaped roofs should be separated from one another. For large-area roofs, expansion joints should be located from 100 to 150 ft apart. To avoid any possibility of force transfer from one section of a building to an adjacent section, the expansion joint should extend through the roofing membrane, deck, structure, and possibly the foundation. If the expansion joint cuts through merely the roofing membrane and the deck, the continuous elements of the structures act as clamps, voiding all or part of its effectiveness.
- Roofs pierced by skylights, penthouses, mechanical equipment or light courts can develop stress concentrations at re-entrant corners, particularly when the roof-mounted elements are of some length (as with monitors) and are separated by only small sections of roof area. The splits tend to align with the edges of the skylights.

Effect of structural deflections

Even though structures are properly designed to withstand simple gravity loading, they may contain design weaknesses which can affect the proper functioning of the roofing membrane. Among these are: deflections which permit ponding of rainwater, differential deflections of adjacent structural roof elements, opening of joints between prefabricated structural roof elements.

- The dead-level roof has run into difficulty because of accidental or intentional (to reduce air-conditioning load) ponding of water. Dead-level roofs pond water because of deflections of the roof structure under load. Since most roof drains are located near columns, water often ponds everywhere except at the drains. While water itself does not necessarily cause built-up roofing failures, it can result in excessive deflections, followed by roofing splits and then leakage through the splits. These troubles can be avoided, or at least minimized, by designing the roof with a slight slope to provide positive drainage. Drains should be located at the points of maximum deflection of the roof deck. The elastic and plastic (if any) deflections of the deck should be anticipated and compensated for by designing the roof with the proper slope. For example if the roof has an allowable span/deflection ratio of 180 (which would yield a slope of 7/32 in. per foot), the designed slope should not be less than ¼-in. per foot to prevent ponding. If the roof is designed with a span/deflection ratio of 360, the slope can be ⅛-in. per foot.
- While little research has been done on the effects of ice formation and movement on built-up roofing, good drainage can minimize hazards. Apparently the texture of the roofing surface determines the strength of its bond to the ice, and thus the transfer of thermal forces and cracking from ice to membrane.
- Deflections of building frames and roof diaphragms under wind loads frequently lead to damage, some of it major (page 223). Primary victims are high, unbraced masonry walls and roofing membranes. (Many one-story buildings are designed without lateral wind bracing on





Roofing membrane splits can be caused by changes in direction of deck materials, as shown in the photo, left. The roofing plan indicates failures at changes in deck orientation and at transverse partitions.

If expansion joints do not cut completely through the building they will not work as planned. In the photo, right, the joist has pulled away from its supporting wall due to movement of the roof structure.

the assumption that the height/length ratio is small enough to avoid problems.)

Wind uplift also must be considered, especially near roof edges where uplift forces can be considerable.

▪ Competitive pressures and the desire for lightweight elements have produced shallower and thinner deck components, especially where improvement in material strength allows a reduction in material thickness. But elastic deflections aggravate ponding problems, cause membrane cracking over areas of negative bending moments (at supports), and accentuate differences in deflections of adjoining units supported at different spans or loaded differently.

▪ Under long-time loading, concrete (especially some lightweight types) and wood will creep—that is lengthen and deflect beyond that amount resulting from elastic deflection. This can cause trouble if creep is excessive or if the amount of creep varies in adjacent roof deck elements. Differential deflections of structural members cause discontinuity in the deck and thus subject the roofing membrane to shearing and tensile cracking. For example, a typical double-tee plank with a span of 25 ft may deflect .40 in. at installation. If an adjoining plank of the same design were used, but spanned only 15 ft, it would deflect only .05 in. After application of a live load, and allowing for the expected creep, the deflections may increase to 1.70 and .22 in. respectively. This would mean an increase in the differential deflection from .35 to 1.48 inches.

▪ Use of a parapet will in most cases result in eventual roofing problems. Preferably, the roof deck should be extended over the exterior wall and finished with a properly designed gravel stop. If building codes require a protective wall on the roof, this can be provided in form of a steel railing of substantial design. Should the use of a parapet be unavoidable, through-wall flashing should extend from the cap flashing through the wall and should end in a well-defined folded drip on the exterior. The masonry above the flashing should be well anchored to the deck with special attention to the flashing of the anchor bolts to the through-wall flashing; in addition, a well designed metal coping (with expansion joints) should cover the top of the parapet and should be extended down over the through-wall flashing on the inside.

Excessive exposure of parapet masonry to weathering frequently causes deterioration of brickwork, leakage, and damage to flashing. At the same time, thermal and moisture cycling causes cracking and expansion of the parapet. Since there is no corresponding movement in the roof deck, the roof membrane is subjected to shear forces which will form visible diagonal shear folds. In more severe cases, these shear forces will cause tearing of the membrane along lines at right angles to the shear folds. Expansion of long brick walls can split gravel stop flashing.

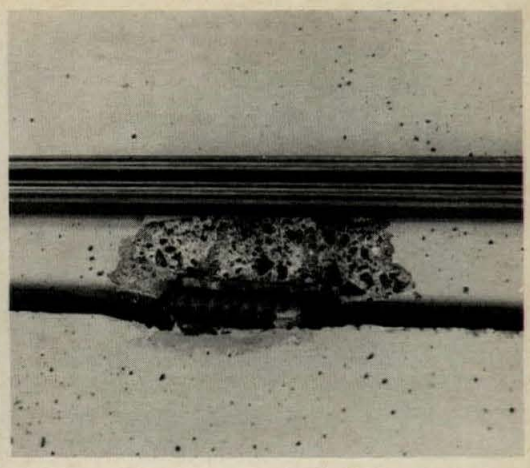
▪ Precast deck elements must be anchored securely not only against wind uplift, but against horizontal displacement as well. Such movement can accumulate significantly wide joints which often cause splitting of the roofing membrane.

▪ Corrugated steel decking is difficult to anchor effectively to steel joists when the deck thickness is inadequate. Gauges as thin as No. 22 or 24 are not easily welded, making permanent attachment of the deck questionable. Experience shows that inadequately fastened steel deck sheets can move horizontally and deflect vertically, causing tensile or shear failure in the roofing membrane. Failure of lateral anchorage has similar effects.

▪ End support of precast planks can be dangerously reduced in area if there are manufacturing or installation defects, eventually leading to complete loss of support as the unit slips off. Most often this is caused by excessive spacing of supporting purlins.

▪ In some buildings, expansion joints in the roof deck are ineffective because they are not continued through the rest of the structure. Also, some details (sliding seat or oblong hole joints) do not always allow the requisite movement. Inspection of such joints sometimes shows that the original paint has not been broken across the joints, indicating that the thermal forces in the building have not been effectively limited at the expansion joints.

▪ Occasionally, roofing membranes split parallel to the edge of the roof just inside the flashed edge. This is caused by differential movement between the flashing (supported by the perimeter masonry walls) and the general roof (supported by the steel framing). This differential movement can also be identified by horizontal cracks in the top of the exterior masonry walls, signs of distress in the frame, and particularly by shear fold lines in the roofing. It can be overcome by supporting the flashing as well as the general roofing on the same framing system. The top of the masonry can then move separately from the rest of the building without transferring shear forces into the roof membrane. In some less severe cases of support by two different systems, taping of the insulation board joints has been proposed to equalize insulation movement directly below the roofing membrane. Frequently, the weight of roof-mounted



Three types of structural movement which can damage roofs are shown in these photos. Left: adjoining concrete planks of different spans have deflected different amounts, causing stress concentration in roofing. Center: improperly anchored masonry wall was moved out of line by wind, damaging both wall and roof. Right: welding anchor at side joints of concrete plank broke due to different creep deflections.

mechanical equipment or roof suspended utility lines, conveyors, etc., has not been sufficiently provided for in the structural design. Even if structural adequacy has been assured, lack of uniformity in deflection can damage the roofing membrane. Adequate strength of the structure should be combined with proper allowance for vibratory movement and proper flashing design between the roof-based equipment and the general roofing surface.

Thermal movement of structure

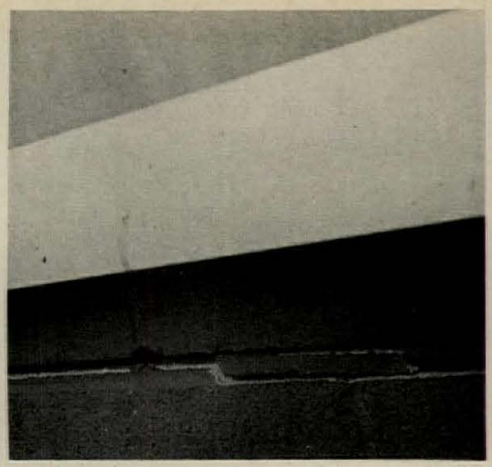
Few designs of any roof structure make specific provisions for thermal movement, except where expansion joints are provided for larger buildings. Lack of relief from build-up of stresses due to thermal movement can produce forces of significant magnitude. Relative movements of interior and exterior steel beams may involve a temperature difference of 120 F, resulting in length differences of about 1 in. in 100 ft. Differential movements between the spandrel beam and the interior steel tend to concentrate in the joints, and frequently roof membrane cracks originate at such joints, extending to the interior of the roof.

- Wet (cast-in-place) construction of structural or insulated decks always carries the risk in the presence of large amounts of excess water. Many roofing failures have been caused by water without adequate avenues of escape. Since water (both in liquid and in vapor form) can damage built-up roofing by penetration and by vapor pressure, the poured deck must be vented before application of the roofing membrane. Any wet deck presents some risk of roofing difficulties unless the drying of the deck is fully controlled. In a recent investigation, insulating concrete sandwiched between roofing insulation boards and a structural concrete roof deck was found to contain in excess of three gallons of water per cubic foot.
- When "wet" decking materials have been applied, the deck surface should be exposed to the summer sun for drying before application of the roofing membrane. Forced ventilation of the building interior is helpful, but omission of exterior walls until after drying of the deck can be used. In case of rain, a protective film should be used to prevent reintroduction of moisture into the deck. Some sources indicate that installation of temporary vents in the roofing membrane can be effective in drying out wet decking. There is no way of sufficiently drying a wet deck during the cold season short of building temporary housing and the use of artificial heat.
- Gypsum decking is quickly and easily installed, is economical, and has some insulation value in addition to its structural function. But if side gaps in the reinforcing mesh coincide with a continuous line of end joints in the supporting sub-purlins, the decking may crack and cause splitting of the roofing membrane. If end joints of the sub-purlins are offset (so that not all occur over the same purlin), and if reinforcing mesh is not consistently jointed over the main purlins, the possibility of damaging thermal movement is reduced. If the mesh is overlapped, no single crack (if any) will become large enough to cause splitting of the roof membrane. Board insulation should be used on top of gypsum roof decks to attenuate movement at the gypsum surface.
- Foamed concrete is light and friable; if it collapses during application, concrete must be added, increasing the density and the water content and reducing the insulation value. The danger to built-up roofing is similar to those of other lightweight concretes, unless the material is adequately vented before the application of the membrane.
- Structural stone concrete is stable, resistant to water-vapor penetration and fairly easy to dry. The concrete should be designed properly for elastic deflection and creep; it should have a minimum amount of mixing water; and it should be dried out before a roof membrane is applied. Crack formation should be avoided by proper field control, adequate reinforcing, and properly located and detailed expansion joints. Concrete surfaces should be reasonably smooth to allow the bonding of rigid insulation boards.
- Lightweight aggregate with bituminous binder—a relatively new system, not strictly a wet construction—is applied as a continuous unit over the whole roof. This decking acts as an insulation and allows shaping of the roof surface for sloping and cants as required. Not much information resulting from experience with material is available at this time.

Roofing problems of prefabricated decks

Prefabricated elements allow better control of manufacturing quality, dimensional accuracy, and moisture content. However, since such decks consist of discrete units, the details of jointing and the risk of cumulative horizontal movement must be considered.

- Fluted metal decking is widely used because of its low cost, and ease of installation. Unfortunately competitive pressures have favored use of very thin steel: sheets made of 22- or 24-gauge materials are quite flexible and difficult to anchor properly to the supporting steel joists. The result of inadequate attachment is usually excessive tempera-



Inadequately fastened steel deck sheets deflected and caused a shear failure of the roofing, left. A sign of conflict between a perimeter masonry wall and the roof structure is a horizontal crack at the top of the wall, center. Such movement will split roofing membranes at the edge of the roof. Dead-level roofs pond water because of deflections of the roof. In photo, right, ponding defines outline of structure.

ture movement in the end joints of the deck, which leads frequently to failure of the roofing membrane over the end joints of the metal deck. Additional membrane failures may occur over lines of main support, due to excessive deflection of the steel sheets. Difficulties have also been encountered where the direction of steel decking changes. A proper steel deck should be designed to allow button punching, screwing, welding, or crimping of the side joints to prevent differential deflection. Failure to provide a secure side connection can cause damage to the roof membrane due to differential deflection. Secure end attachments can best be achieved by use of sufficiently thick steel and proper welding technique; sometimes the use of a welding washer can improve the security of the connection.

- Plywood decking is economical, easily available and installed, and reasonably stable. However, where large areas of plywood are tightly butted and poorly nailed, migration can occur. With certain roofing systems, nail popping can be a problem. Plywood is usually supported by wood joists. If these joists are not kiln dried but are framed into the sides of steel beams, cross-grain shrinkage of the joists can result in differential settlement of the plywood of up to ¾ in. Plywood should always be covered with board insulation, with joints broken both ways. If the membrane is not watertight, rapid deterioration of the plywood can result.
- With precast concrete, the need for proper anchorage to prevent lateral migration is not always recognized. Side connections must also be provided to assure continuity of the deck surface. Concrete planks can also deform through creep, especially with some lightweight aggregates. Since these deflections rarely are uniform, adjoining planks may be vertically separated with resulting damage to the roof membrane. This damage also can occur when adjoining units of identical span have different cambers or if adjoining units are of different length and therefore will deflect differentially. The use of a cast-in-place concrete topping can reduce the surface irregularities. Stress relaxation in the tendons of prestressed, precast concrete, if not uniform, will produce the same type of crack.
- Performed fibrous planks, made of various types of organic fibers and cementitious binders, are somewhat less subject to plastic deformation than the concrete planks discussed above. Otherwise, they can encounter the same difficulties as concrete planks—horizontal migration and formation of gaps.
- If wood decking is properly splined and kiln dried, the results are frequently good; since the many small cracks do not accumulate into large joints, roof cracking is less likely to occur. The use of wet or incorrectly fastened wood may cause damage to the roofing membrane through warping or shrinkage movement. Wood impregnants, if used, must be compatible with the components of the built-up roof.
- Foamed glass plank—formerly used as thermal insulation only—has recently been introduced as a structural material for roofing planks. It is dimensionally stable, not damaged by biological agents, and incombustible. It must be carefully installed to avoid breakage.

Recommendations

Briefly, these are the practices that should be followed to minimize roofing problems due to building movement:

1. Expansion joints should be located not more than 150 ft. apart, and should be detailed to assure truly independent movement (slotted holes often do not work properly; sliding seats should be detailed so that they allow movement without major force transfer).
2. Relief joints should be provided between adjoining parallel planks or other elements which have different span lengths, where there are significant changes in roof loads and at re-entrant corners.
3. Roofing systems should be designed for a minimum of 15 lb per sq ft wind uplift (in areas not subject to hurricanes and tornados) unless codes or engineering judgment dictate more conservative assumptions. Anchor clips for precast deck planks should provide not only for uplift forces but also a positive stop to prevent sliding of planks.
4. No roof slope to drains should be less than ¼-in. per ft unless a lesser pitch through cambering of beams or joists can be shown to provide positive drainage. With concrete or wood beams, the allowable deflection must take into account not only the elastic deflection, but plastic flow as well, which for concrete can be twice the elastic deflection.
5. Parapets should be avoided if at all possible because of the differential movement between roof structure and the parapet. If the roofing membrane is supported by a steel deck, the gravel stop should not be supported by an exterior masonry wall. A simple and inexpensive solution is to support the roof edge nailer on extensions of the top chord of the steel joists.

This article is based on a paper by the author which forms part of a symposium on built-up roofing problems sponsored by Owens-Corning Fiberglas. The symposium is being presented at a number of Construction Specifications Institute chapters across the country. Other symposium papers: roofing, insulation, flashing, weathering, application, specification.

New school has three kinds of flexible space:

- A divisible theater-in-the round
- A four-in-one classroom
- A three-gymnasium assembly hall

Candlewood Junior High School, Long Island, New York—designed by Frederic P. Wiedersum Associates—has a 750-seat theater-in-the-round that can be divided by electrically operated folding partitions into two, three or four sections for small-group instruction. Both adjoining wings (see plan overleaf) also have divisible spaces—one a three-segment gymnasium, the other a four-quadrant classroom.

Major element in the design is a two-story circular wing which forms the hub of the complex. Core of this wing is the divisible instruction area in which seats slope down toward and virtually surround a central circular stage. Around the theater is a corridor accessible through eight exits from the core area. Exterior to this corridor are classrooms, administrative and health areas, conference rooms, a library and storage space (see plan, next page).

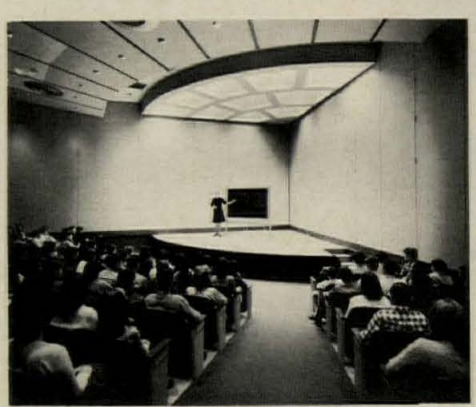
When the round arena is used as one large space, air, light and sound conditions in the 96-ft-diam area are controlled from a master control booth on the second-floor level. When the area is divided by partitions, each section has its own lighting, sound, heating and ventilation, all operated by individual transfer switches within the section.

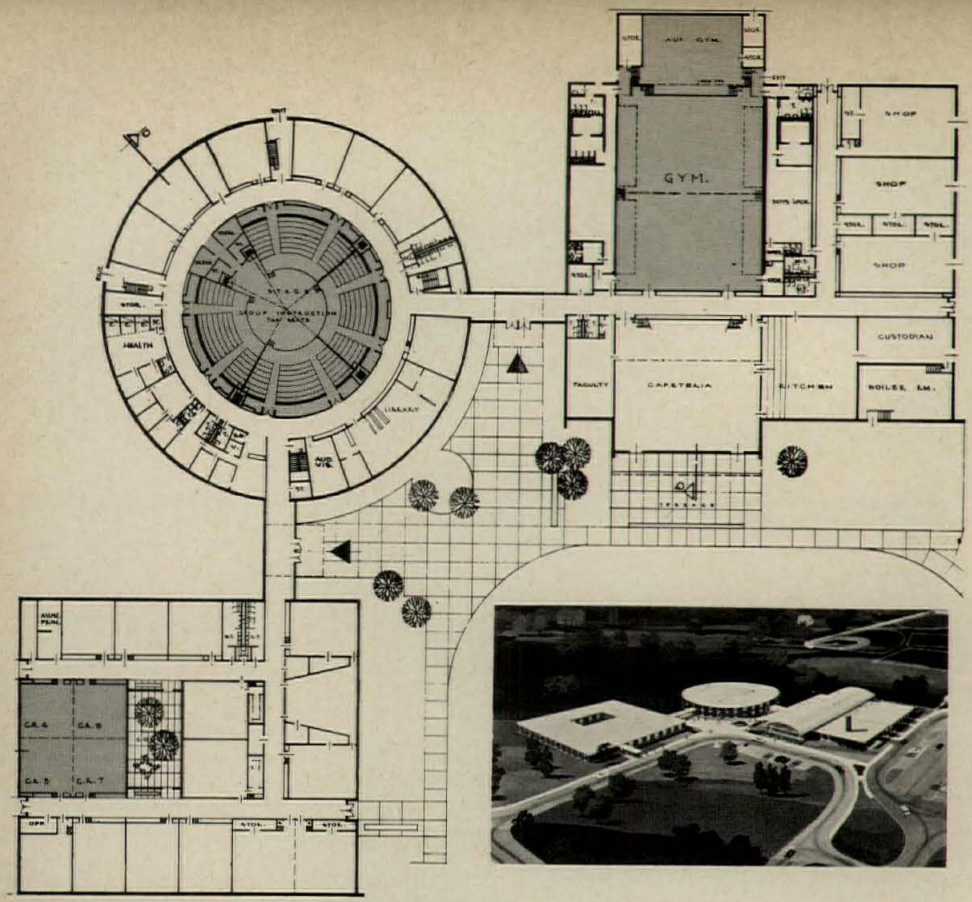
The partitions operate from ceiling tracks and are supported and guided at the bottom by fixed dwarf partitions which gradually increase in depth as they extend from the perimeter wall to the 2½-ft-high central stage, thereby maintaining a constantly horizontal supporting surface at stage height. Thus, two or more folding partitions can be moved directly onto the stage, meeting precisely at stage center to seal off adjacent areas.

When partitions are not in use, the aisle surrounding the 42-ft-diam stage can be cleared of the dwarf partitions—the section of each partition obstructing the aisle swings open on hinges attached to the stage and fits snugly into a recess cut into the stage's perimeter.

Major lighting is provided by a 44-ft-diam coffered ceiling, suspended from a recessed dome in the 17½-ft-high ceiling. This 'wheel of light,' mounted in a wooden frame, actually comprises a

Theatre-in-the-round is divisible by folding partitions converging at stage center creating two, three or four segments. Master controls for heat, light and air are in second-floor booth over stage access and preparation rooms. Segments also can be individually controlled. Major lighting is in a 44-ft-diam coffered ceiling over the stage. Spotlights are at intervals around this wheel of light, and recessed downlights are over the audience section. Access to lights and mechanical systems is by catwalk above ceiling. Colors are: beige walls and ceiling, walnut woodwork, blue seats and carpet.





Four-in-one classroom with partitions withdrawn, above, makes 3,200 sq ft of teaching or multipurpose space. Partitions in place, left, create four 800-sq-ft classrooms.

Three gymnasiums—boys', girls', and a raised-floor auxiliary exercise room—can be separated by folding partitions or opened into a single assembly space with the raised gym acting as a stage.

group of standard 2-ft-square, 500-watt incandescent fixtures integrated into a single multi-unit fixture. In addition, individual spotlights are mounted around the base of the recessed dome. The remaining portions of the ceiling contain recessed down-lights. The round auditorium presented unusual acoustical problems, because its circular shape and central stage eliminated the usual proscenium arch and draperies which normally would be an acoustical aid and because of the wide scope of activities planned for the area. The perimeter walls tilt slightly toward the open stage and meet the ceiling in a peripheral curve with a 3-ft radius.

Further sound control is achieved with strategically placed acoustical panels extending upward from a point 8 ft above the floor and continuing onto the ceiling to within 6 ft of the over-stage recess. Carpeted aisles and upholstered seating add to the acustical treatment.

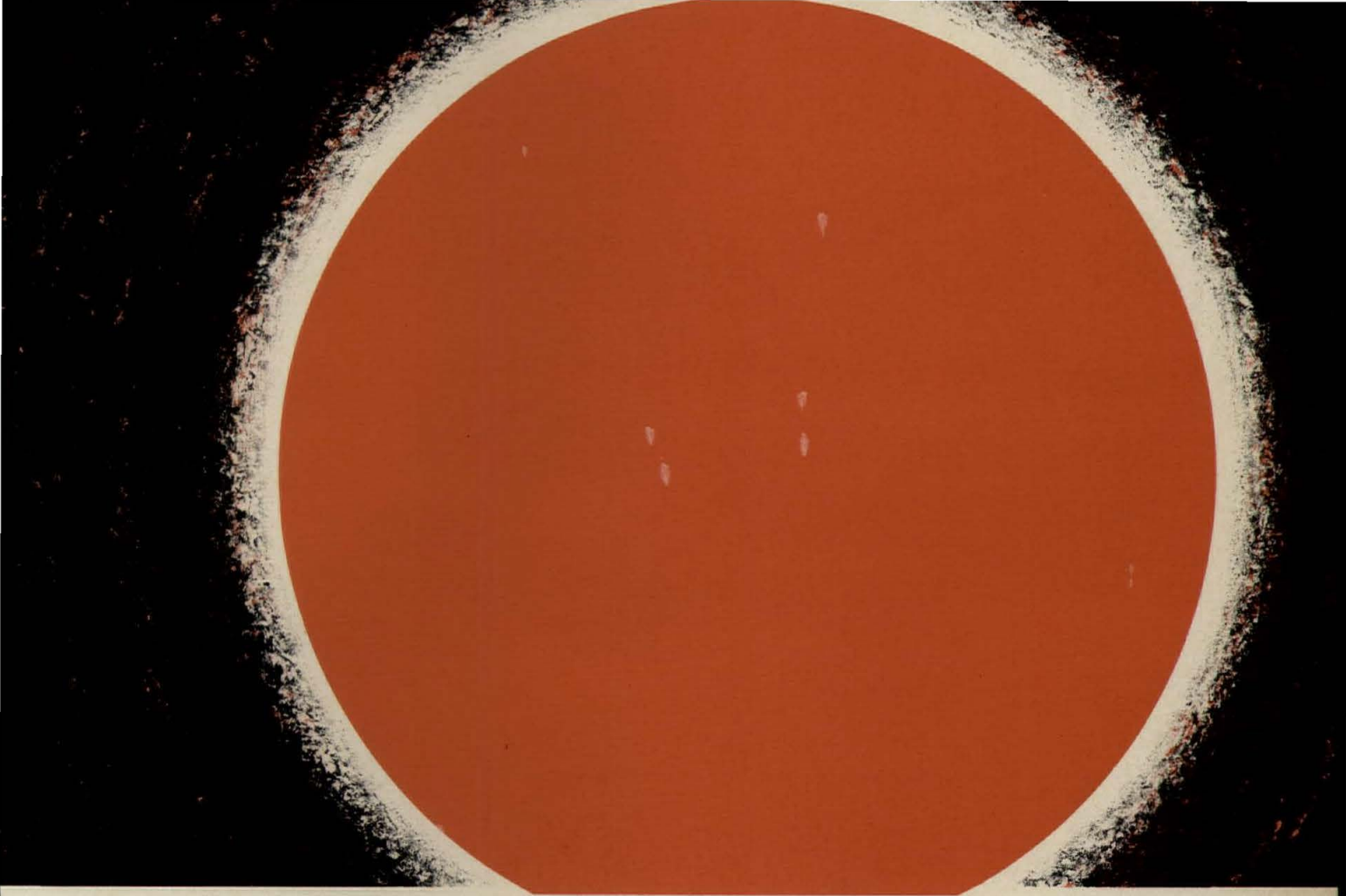
Other divisible areas

The west wing of the school complex is a single-story, rectangular building with physics, biology, home economics and lecture rooms. One block of four adjoining classrooms in this wing is also equipped with electrically operated folding partitions. This area will function much like the circular group instruction area for maximum flexibility. With all partitions extended, the area comprises four 800-sq-ft classrooms. When all partitions are retracted, the area is converted into a full 3,200 sq feet room.

The south wing contains cafeteria, shop and gymnasiums—and the gym is another sub-divisible area. This structure has a thin-shell concrete vaulted roof with a 75-ft clear span which covers the cafeteria and gymnasium areas. A terraced entrance leads directly to the cafeteria and beyond to the boys' and girls' gymnasiums, separated from each other by electrically operated folding partitions.

An auxiliary gymnasium, separated from the main gym by a folding partition, has a raised floor 3½ ft higher than the adjacent gymnasium areas, and thereby may function as a stage, with provisions for chair storage beneath it. Thus, with all gymnasium partitions open and movable seating plus bleachers set in place, the entire area can be used as an auditorium for full school assemblies.

CANDLEWOOD JUNIOR HIGH SCHOOL, Half Hollow Hills, New York. Architects: *Frederic P. Wiedersum Associates;* mechanical engineer: *Clyde M. Alston;* structural engineers: *Atlas and Rosenberg;* acoustics: *John Donahue;* kitchen: *Robert L. Cahn Associates.*



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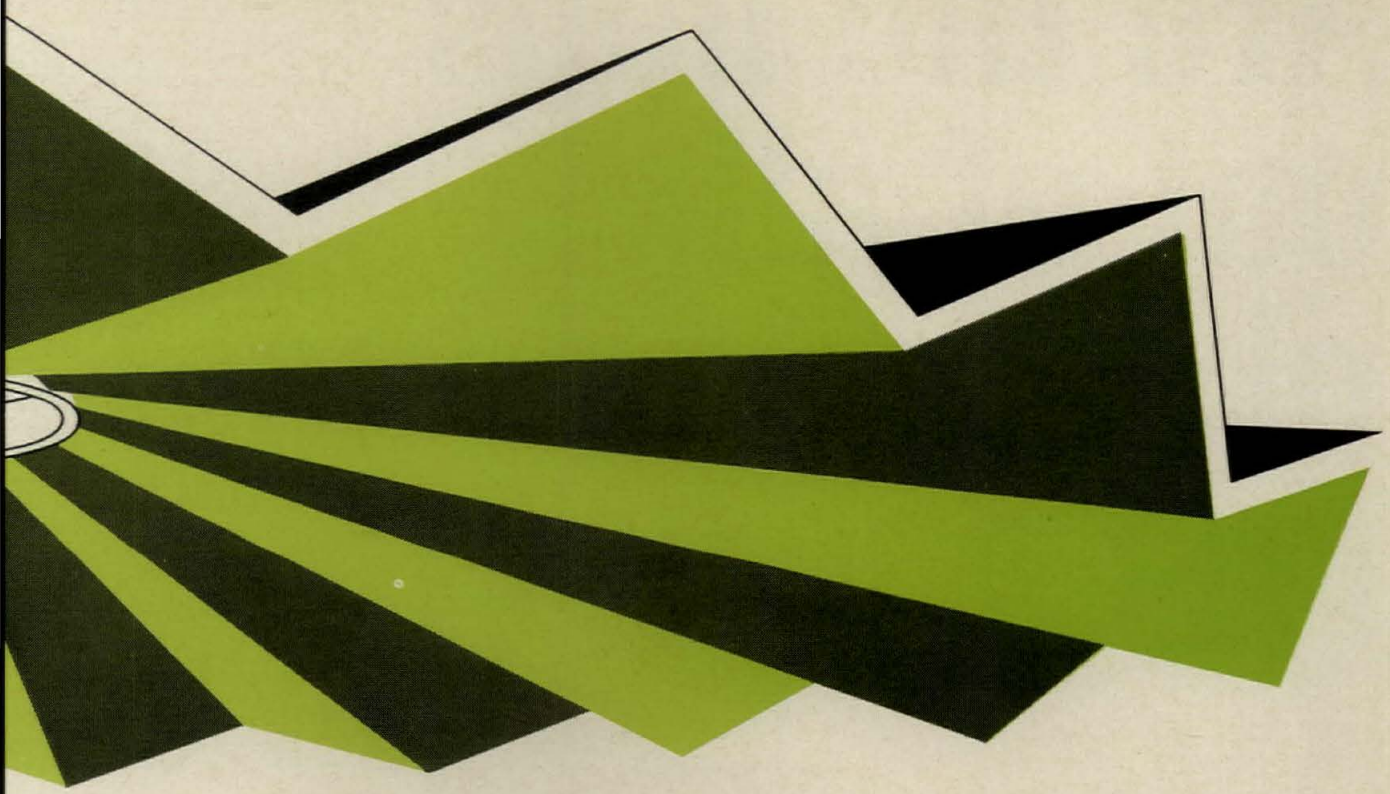
the most exciting ideas take shape in plywood



Whirlpool Employees Credit Union Building, St. Joseph, Mich./Edward R. Duffield, Architect/Holland Construction Co., Contractor/Plywood Components Corp., Fabricator

The jaunty cap on this glass-walled office building is a plywood radial folded plate. Its use here proves the versatility of the design idea, more often seen in the august context of churches and public buildings. This plywood roof cost less than any alternative and went up faster. Besides saving money, radial folded plates give large clear-span interiors because no center supports are needed. For more about this and other time-saving, high-strength plywood building systems, send for the new, free booklet "Plywood Construction Systems." We're at Tacoma, Wash. 98401 (USA only).

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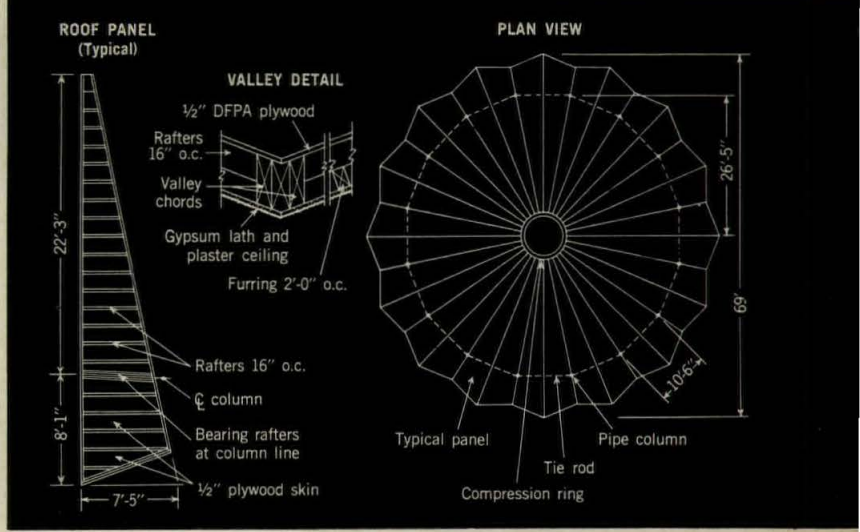

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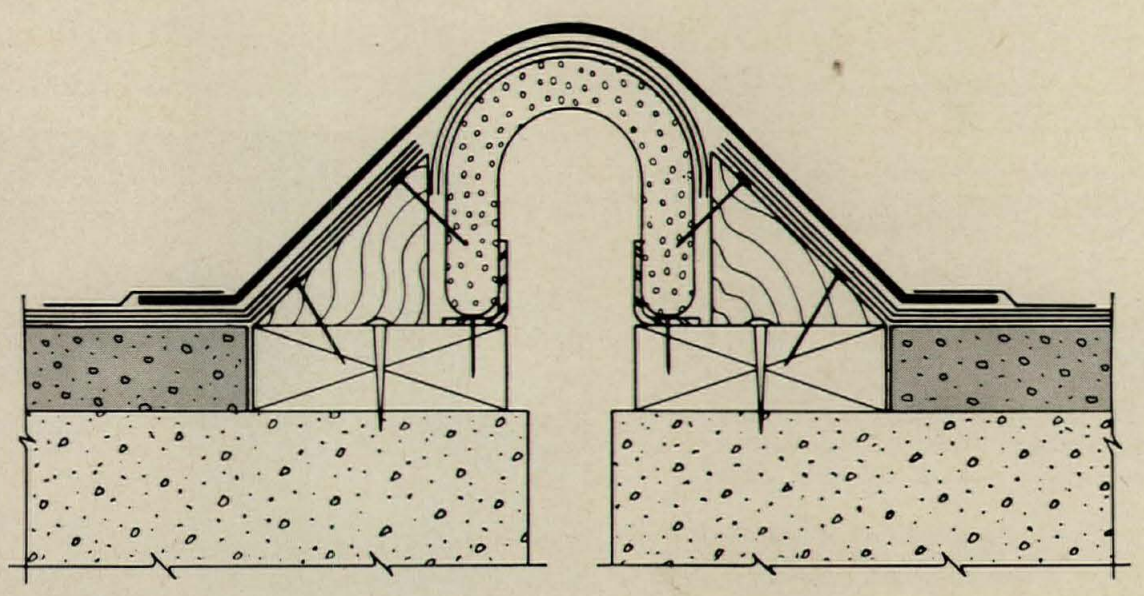

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Expansive cement: a new approach to reducing concrete cracking

Shrinkage cracks have pretty much been accepted as a way of life with poured-in-place concrete construction. Techniques have evolved to minimize these cracks —by keeping water content to a practical minimum, by dividing on-grade floor slabs into small areas or sawing contraction joints so they will crack in predictable fashion, and by the use of prestressing. But until now efforts to chemically change the nature of cement to minimize shrinkage cracks have met with disappointing results.

Such a cement is now available—its first application an exposed, folded-plate roof in Yuba, California poured three years ago (see photo). With this new cement, concrete undergoes a small expansion, about the same as that experienced with a 60- to 70-deg temperature change, which works against the reinforcing steel in the concrete. This action places the steel in slight tension and the concrete in slight compression. Absence of tension in the concrete after drying shrinkage prevents or sharply reduces cracking. The most obvious applications are for industrial floor slabs, parking decks, exposed roof slabs, water tanks and roads.

This article is based on information from the Chemically Prestressed Concrete Corporation and the Medusa Portland Cement Company.

This expansive cement costs more than ordinary cement. For example, the premium for one on-grade floor slab job of 22,000 sq ft was $2 per cubic yard. This was balanced, however, by the elimination of contraction joints. The cement producers say that contraction joints can be placed as far apart as 200 ft when the slab is in a protected area, and 120 ft apart when the slab is exposed to high temperature variations.

▪ The mechanism of avoiding drying shrinkage cracks with expansive-cement concrete is as follows:

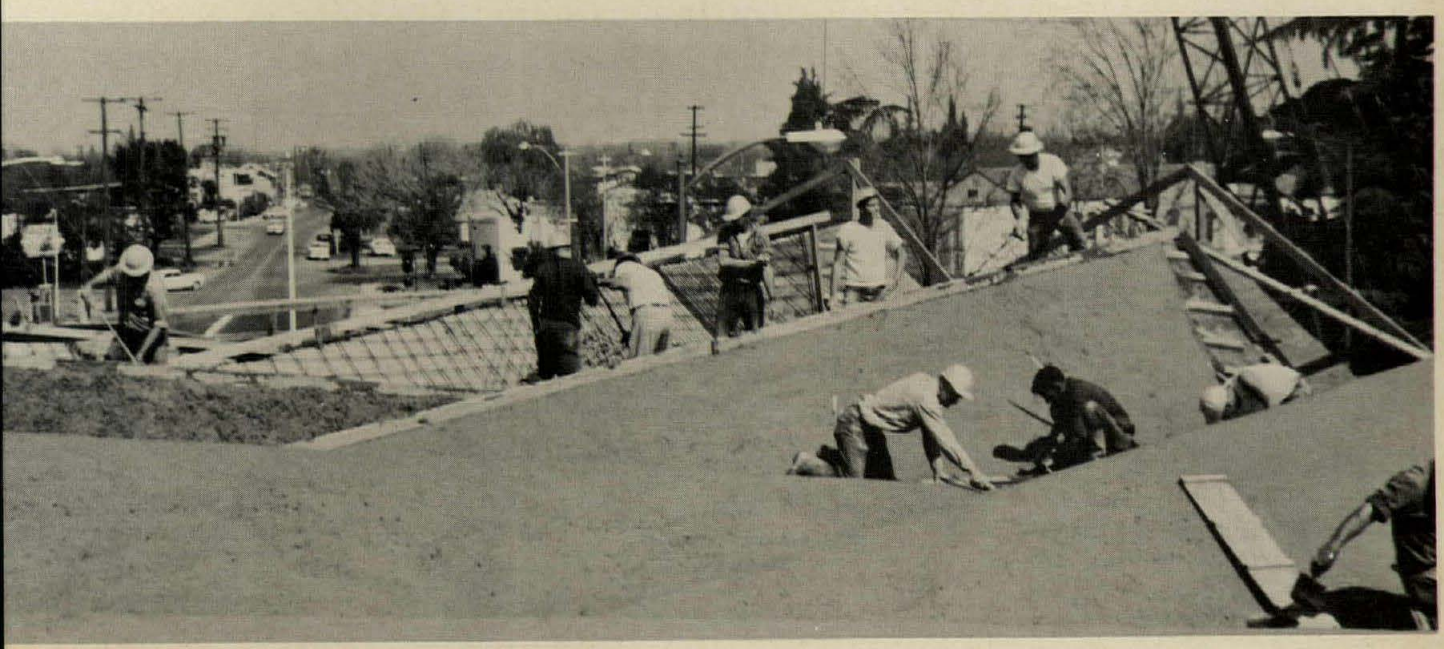
Ordinary concrete, after curing, begins to dry out and to shrink. But the concrete is bonded to the reinforcing steel, and its shrinkage is restrained by the steel. Still, it tries to shrink and in doing so puts the steel into compression. Due to the low tensile strength of concrete, not much restrained shrinkage need occur before the limit is reached, and the concrete cracks to relieve the stress.

With expansive cement concrete, however, while the concrete is curing and gaining strength, the expansive reactions cause a slight elongation of the concrete. Its bond to the steel causes the steel to be stretched slightly and places it in tension, while the concrete is put in slight compression. This expansion is complete in the first two to three days. When the expansive concrete begins to dry out it shrinks just like normal concrete, but, unlike normal concrete, the shrinkage is accompanied by a relief of the slight compression built into it, not by the build-up of tensile stresses—thus drying-shrinkage cracks are avoided.

▪ The new expansive cement is based on the crystal growth of calcium sulfoaluminate. There are other so-called expansive cements available—some based on aluminum powder which depend on hydrogen gas generation for the expansion; others which depend on the rusting of very finely divided iron particles to cause expansion.

Many investigations have been made to determine the factors most responsible for the shrinkage of concrete. Shrinkage is greater for fine-ground than for coarse-ground portland cements, for Type IV (low heat of hydration) than for Type I cement, for high water-cement ratios, and for high cement contents. Shrinkage is also affected by the characteristics of the aggregates used.

Contraction of concrete on drying is also governed by unit water content, relative humidity, cement content and air entrainment. However, tests have



shown that the allowable reduction in total water content which air entrainment allows will partially equalize the actual air entraining effect.

▪ As early experiences with portland cement concrete quickly indicated, some means of control of random cracking patterns had to be initiated. Therefore, joints were introduced, and techniques in using them have been continually refined. This method up until now was the only means of controlling the drying shrinkage of concrete besides quality construction.

There has been much work done in recent years on the introduction of various admixtures to control drying-shrinkage cracking. Some favorable and unfavorable results have been seen. Also, the necessity for adequate curing is still being stressed and is a very important requirement in reducing drying-shrinkage cracking in concrete.

During the past 30 years, investigators in Europe have directed their attention to the possibility of eliminating shrinkage or even causing the concrete to show an appreciable net increase in weight by using sulfoaluminate admixtures in cements to cause controlled expansions. The earliest publications on sulfoaluminate admixtures is the French patent issued in February 1936.

The most aggressive instigator of admixtures covered by the patent was Henry Lossier of France. According to this process, the use of sulfoaluminate admixtures in the amount of 10 to 20 per cent proportion to portland cement, results in considerable expansion to overcome or to exceed the drying shrinkage which occurs during the setting and hardening processes, and their subsequent drying. These sulfoaluminates react with the aluminates already present in the portland cement to produce hydrated sulfoaluminates with a large number of water molecules. This expansive cement developed in France was made by burning a combination of gypsum, bauxite, and chalk, which was used as a stabilizer. It was originally thought to be an anhydrous calcium sulfoaluminate. However, it was shown later to be a simple mixture of calcium sulfate, aluminates, silicates and ferrites.

The U.S.S.R. has been experimenting during the last decade with self-stressing cement which is produced by intergrind-portland cement, alumina, and gypsum, which when combined with water furnish the necessary ingredients for hydrated calcium sulfoaluminates.

▪ In the development of expansive cements, there are a number of items which must be considered from the standpoint of proper reaction and longtime durability of the concrete. Many known expansive components have caused delayed expansions which may be destructive to hardened concrete. The principal distinction between a useful expansive cement and an unsound cement would seem to be the time at which the expansion occurs. If the expansion can be controlled so that it takes place when the concrete has developed some strength but is still extendable, a useful expansive cement has been produced.

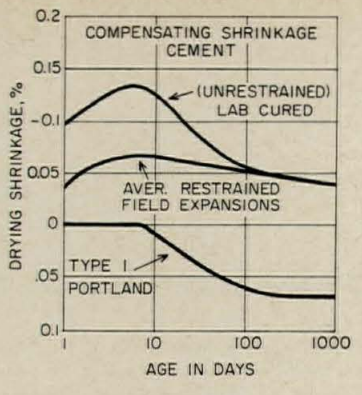
A shrinkage-compensated cement for crack-resistant concrete and self-stressing concrete was developed by Alexander Klein, a research engineer at the University of California. This was done by preparing an expansive agent consisting of limestone, bauxite and gypsum which forms an anhydrous calcium sulfo-aluminate. This expansive clinker, when interground with a specifically designed portland cement, can produce expansions in safe ranges to pre-compensate for drying shrinkage or to the expansion range of actually self-stressing reinforcing steel or cable. The compensating-shrinkage cement is accomplished by intergrinding approximately 13 per cent of the expansive component with portland cement. The self-stressing cement is interground at 30 per cent expansive component and will actually expand enough, by elongating carefully placed cables or high-strength steel, to produce compressive forces in concrete in the range of 300 to 400 psi.

One of the key factors in the use of compensated-shrinkage cement is the matter of restraint. The product performs on the theory of restraining the expansions occurring the first week. The use of reinforcing steel or rigid forms will effectively decrease expansions and apply tensile forces to the steel and therefore compressive forces on the concrete.

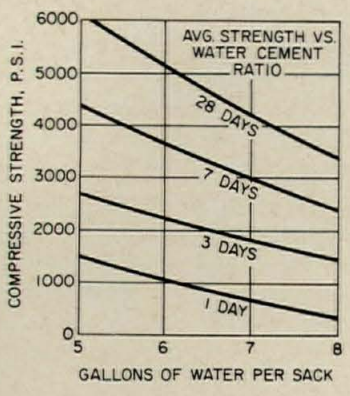
There is essentially no difference in the basic principles of designing durable concrete with expansive cement or portland cement. The normal rules apply such as: use the lowest water-cement ratio possible compatible with the placement problems. The concrete reacts normally to normal admixtures, and requires admixtures for the same purposes.

The maximum value of expansion that can occur in the field with a typical amount of steel reinforcement is 0.04 to 0.05 per cent. This is such a small amount that there is no worry of forms bowing-out or of walls being pushed over.

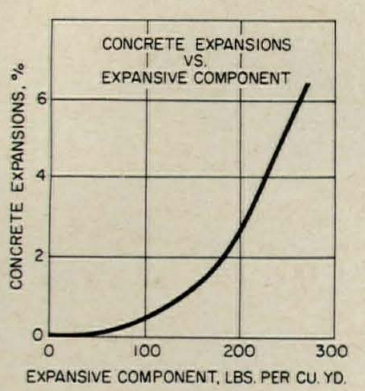
The process to make expansive cement is owned by the Chemically Prestressed Concrete Corporation, Van Nuys, California, a firm owned jointly by Kaiser Cement & Gypsum, of Oakland, California, Medusa Portland Cement, of Cleveland, C. W. Blakeslee & Sons, Inc., of New Haven, and several individuals.



The difference in behavior of concrete with an expansive component and ordinary Type I portland cement is shown by the two sets of curves. The unrestrained sample of expansive concrete expanded about 0.13 per cent and shrank the same degree as ordinary concrete. The expansive concrete restrained by reinforcement expanded to about 0.07 per cent and tapered off with shrinkage to about 0.05 per cent expansion. Ordinary concrete ends up with about 0.07 per cent shrinkage.



Compressive strengths of concrete with expansive component of calcium sulfoaluminate compare favorably with Type I portland cement as water/cement ratio varies.



Percentage expansion of concrete made with compensating-shrinkage cement increases rapidly beyond an expansive component content of 100 lb per cubic yard of concrete.

For more information circle selected item numbers on Reader Service Inquiry Card, pages 293-294

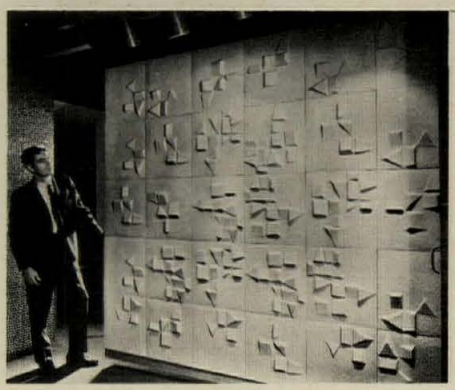
New showroom for architectural ceramics

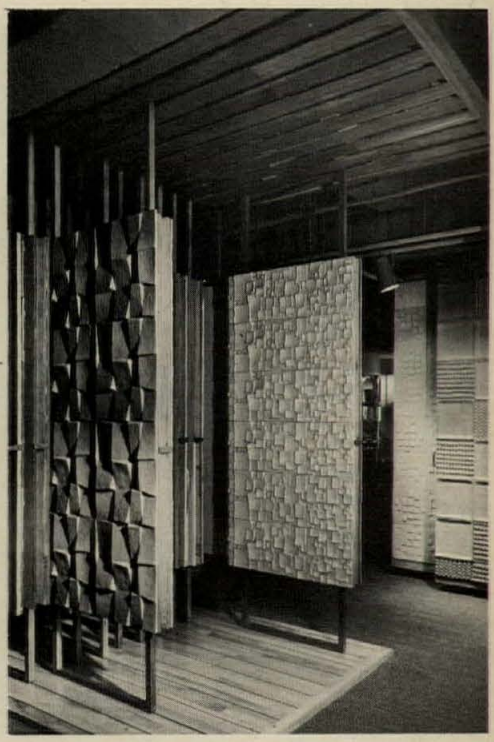
Mrs. Lee Rosen's design for her firm's showroom incorporates a number of ceramic products as an integral part of the scheme and also provides advanced methods of display.

Of particular interest to architects and designers is the display of ceramic wall surfacings, which are arranged as a series of sizable pull-out panels. A special, adjustable lighting system has been installed to enable clients to see the effect of different types and intensities of lighting and choose the most suitable combination for their needs. The showroom is carefully planned and furnished to give an accurate impression of the effect of these clay surfaces in authentic room settings.

Ceramic lamps, table-tops and other accessories are also very well displayed in a wide variety of shapes, sizes and colors for many different applications. ▪ Design-Technics, New York City.

Circle 300 on inquiry card





Contemporary library furniture

A series of seven walnut library tables ranging in size from single to six places and available with matte plastic or heavyweight vinyl tops, forms the basis of a collection of library furniture by Jens Risom. For each size table, separate study carrel units or index dividers provide flexibility of use, giving privacy and storage space as required.

The tables are complemented by a group of chairs in arm or armless models with wood or upholstered backs. Co-ordinated stacking chairs are also available. Some 65 different colors are included in the *Chroma 1* nylon upholstery fabric range.

Describing this new collection, Jens Risom says that his aim was to achieve "straightforward designs, tailored to their specific function and executed in wood to give much needed warmth and texture to library interiors." ▪ Jens Risom Design Inc., New York City.

Circle 301 on inquiry card

more products on page 254

OFFICE LITERATURE

For more information circle selected item numbers on Reader Service Inquiry Card, pages 293-294

TERRAZZO / A complete technical data book based on the outlines and recommendations of the A.I.A. and Construction Specifications Institute includes architectural details drawn to scale for ease in tracing, as well as complete specifications. A special registration card is included for obtaining supplementary materials at no cost. Cost of the data book: $1.35. ▪ The National Terrazzo & Mosaic Association, Inc., 1901 Fort Myer Drive, Arlington, Va. 22209.

CONCRETE FORM BOARD / Wall, column, deck and beam applications are the subject of a four-page brochure that gives procedures for nailing, spacing of form lumber, oiling, pouring and removal of forms. Included are graphs and tables on concrete pressures and maximum support spacing as well as product description giving sizes available, structural properties, and principal advantages. ▪ Masonite Corporation, Chicago.*

Circle 400 on inquiry card

OFFICE PARTITIONS / According to a new catalog, movable steel partitions of 42-, 52-, 66-, and 82-in. heights are available in 22 baked-enamel colors or a choice of vinyl patterns. ▪ Henry Weis Manufacturing Company, Elkhart, Ind.*

Circle 401 on inquiry card

PANEL AND TILE REFERENCE FILE / A new file updates and replaces last fall's edition and includes information on acoustical products, UL time-rated assemblies, incombustible systems and ventilation and air distribution systems. The 28-page booklet is three-hole-punched for binder insertion. ▪ The Celotex Corporation, Tampa, Fla.*

Circle 402 on inquiry card

CANVAS / "31 Wonderful Ways With Canvas" is a colorful booklet giving special attention to the use of canvas for high-rise apartments. Suggestions include ideas for balcony privacy and decoration. ▪ Canvas Awning Institute, Memphis, Tenn.

Circle 403 on inquiry card

HIGH-PRESSURE AIR CONDITIONERS / Catalog No. 580 details the applications and specifications for a 30-model line giving construction features, dimensional data, engineering specifications, physical data and procedures for selecting the right unit to fit particular requirements. ▪ McQuay, Inc., Minneapolis.

Circle 404 on inquiry card

VENTILATORS / Literature describes installation in masonry, precast concrete, structural gaskets, and metal framing. Frames of black vinyl used in conventional masonry installations define the opening and protect the unit and interior finishes. Details, illustrations, sections, recommended sizes, and specifications are included. ▪ E. K. Geyser Company, Pittsburgh.*

Circle 405 on inquiry card

CABINET HEATERS / This 12-page illustrated two-color bulletin contains a comprehensive sketch chart showing 32 different mounting arrangements for the various cabinet styles. Heating-capacity tables provide data for hot water and steam heating. Other tables provide heating capacity factors, air delivery factors, pressure loss factors, duct connection and grill dimensions, and steam and hot water conversion factors. Outline layout-drawings with accompanying tables provide dimensional data. ▪ American-Standard, Industrial Division, Detroit.

Circle 406 on inquiry card

AIR CONDITIONERS / A 16-page catalog gives complete specifications on the full line of air-cooled units, residential and commercial split systems, precharged matched design systems and single package systems. It also shows four new condensing units. ▪ Armstrong Furnace Company, Columbus, Ohio.

Circle 407 on inquiry card

COMMERCIAL CARPETS / A 12-page brochure analyzes the properties of carpets made of *Caprolan* nylon in terms of wear, maintenance, beauty and economy. Color photographs of such installations as the Yankee Stadium locker room, Boston's Hayden Planetarium and the Lansing, Michigan, General Hospital suggest the versatility of the product. ▪ Allied Chemical Corporation, N. Y.*

Circle 408 on inquiry card

COMMUNICATIONS FOR APARTMENT HOUSES / A new brochure, No. AP-2 describes and illustrates a variety of lobby-to-apartment communication systems, vertical and horizontal style mail boxes, non-electric door chimes and peepholes. ▪ The Auth Electric Company, Inc., Long Island City, N. Y.*

Circle 409 on inquiry card

INDUSTRIAL AIR CLEANER / The *Dyna-Vane* self-cleaning inertial separator which can handle large volumes of air at high velocity with a minimum of pressure drop is described in a 4-page bulletin as being suitable for industrial plant installations. The unit, which requires very little maintenance or adjustment, is specially recommended for use where heavy dust concentrations are present, and is useful as a pre-filter to extend final filter life in a two-stage air filtration system. ▪ Farr Company, Los Angeles.*

Circle 410 on inquiry card

STEEL DECKS / A new fire-rating guide for architects, engineers and contractors contains a complete summary of steel roof deck fire ratings and construction details. In addition, a revised edition of the booklet "True Costs of Full Fire Resistive Construction" brings all cost figures up to date. Letter requests. ▪ Steel Deck Institute, 9836 W. Roosevelt Road, Westchester, Ill.*

FANS AND HEATERS / A 16-page brochure contains photos and descriptive data on models for residential and commercial use. Several new products, including a kitchen ventilator with a low-silhouette, roof-mounted blower, are featured. ▪ Emerson Electric, St. Louis, Mo.

Circle 411 on inquiry card

DOORS / A 24-page catalog carries all series of the complete line of full flush swinging and sliding metal doors. In addition to all pertinent specifications, there are illustrations which include steel frames and sidelight and transom sub-assemblies. ▪ Dusing and Hunt, Inc., Le Roy, N. Y.*

Circle 412 on inquiry card

*Additional product information in Sweet's Architectural File

more literature on page 320

Food Laboratory, Bishop Dwenger High School, Fort Wayne, Indiana

Architect—Mox Pohlmeyer & Assoc.

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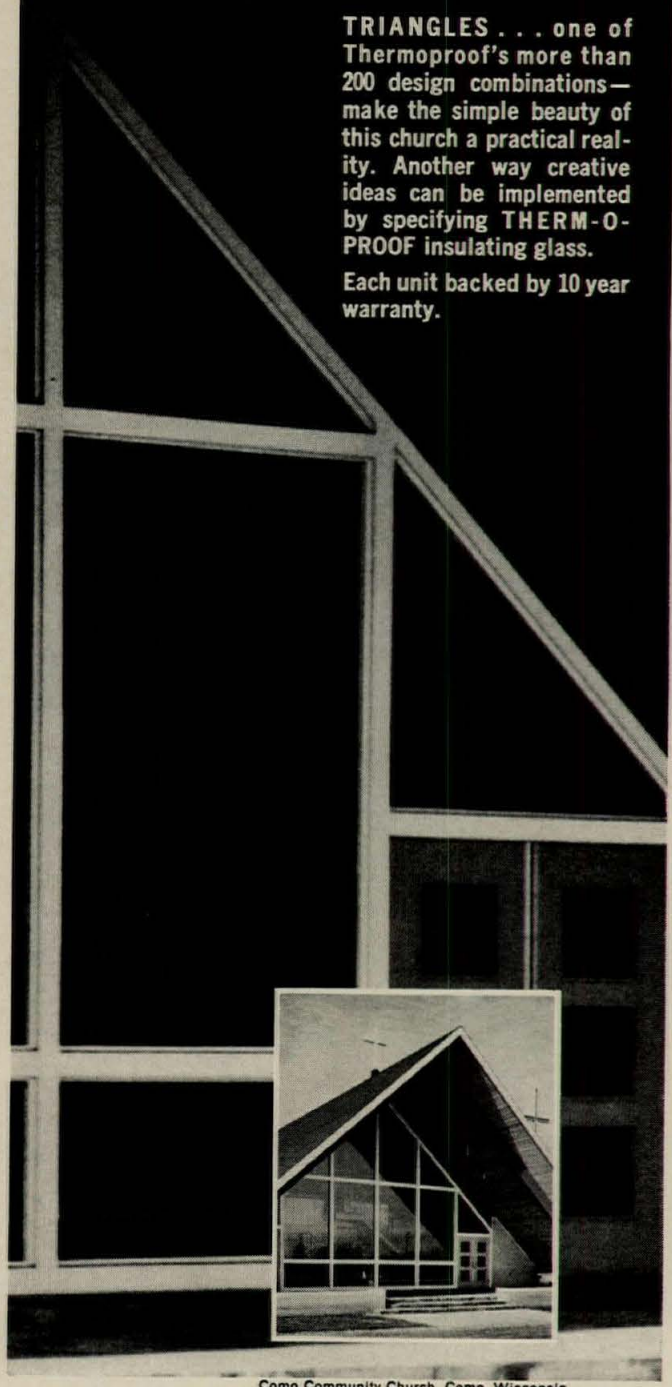

Como Community Church, Como, Wisconsin
Architects: Steffen-Kemp & Associates, Inc.
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- Made of sturdy high-impact plastic, with high gloss finish —UNBREAKABLE in normal use
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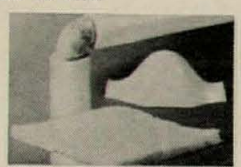

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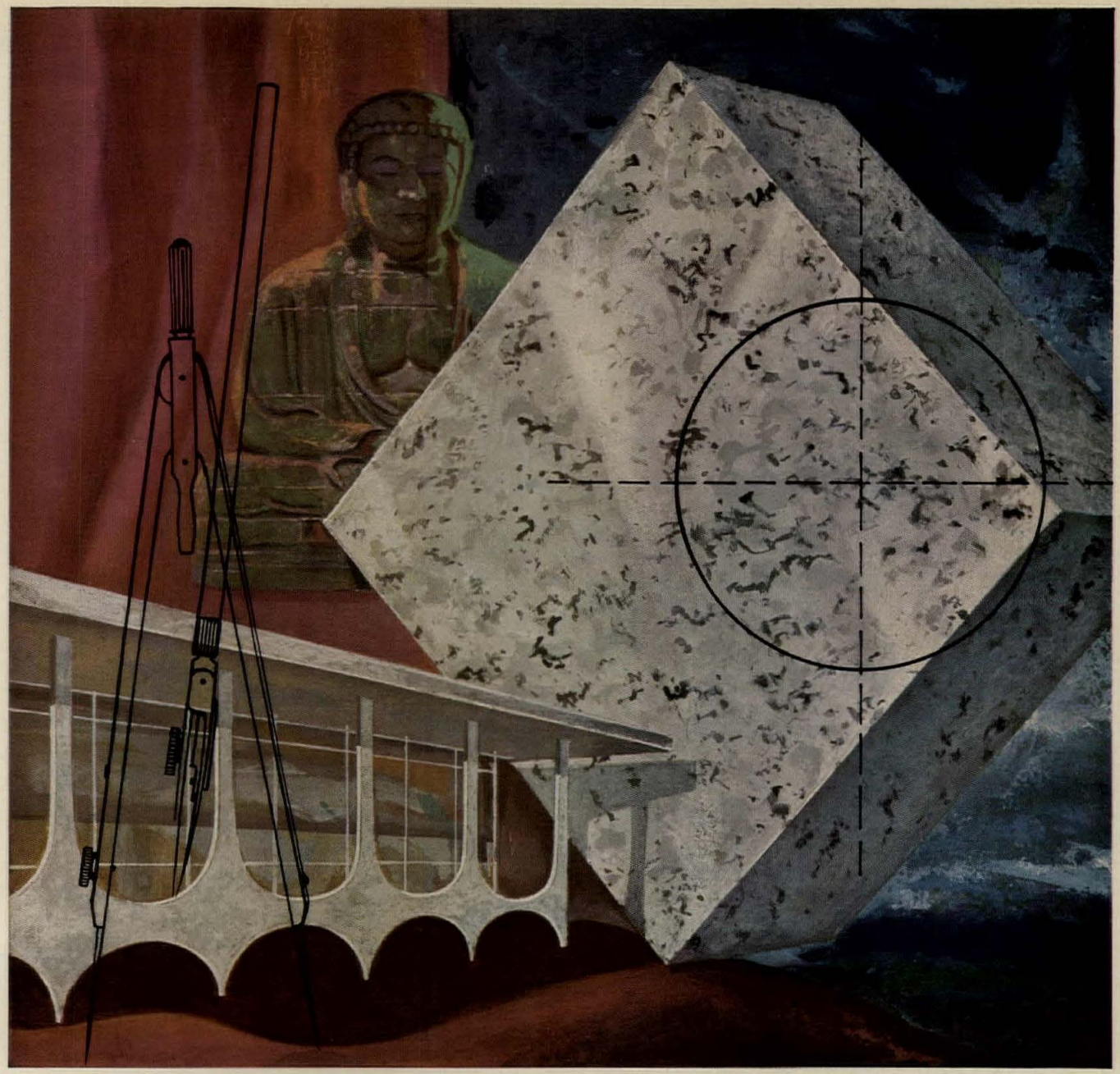

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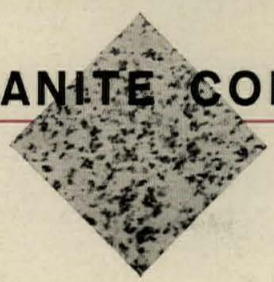

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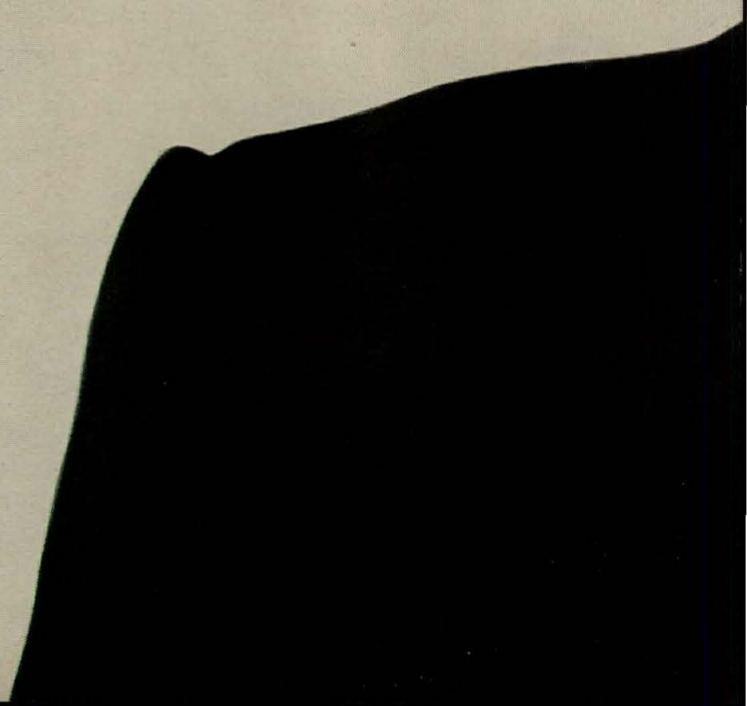

DEVOE

A DIVISION OF CELANESE COATINGS COMPANY

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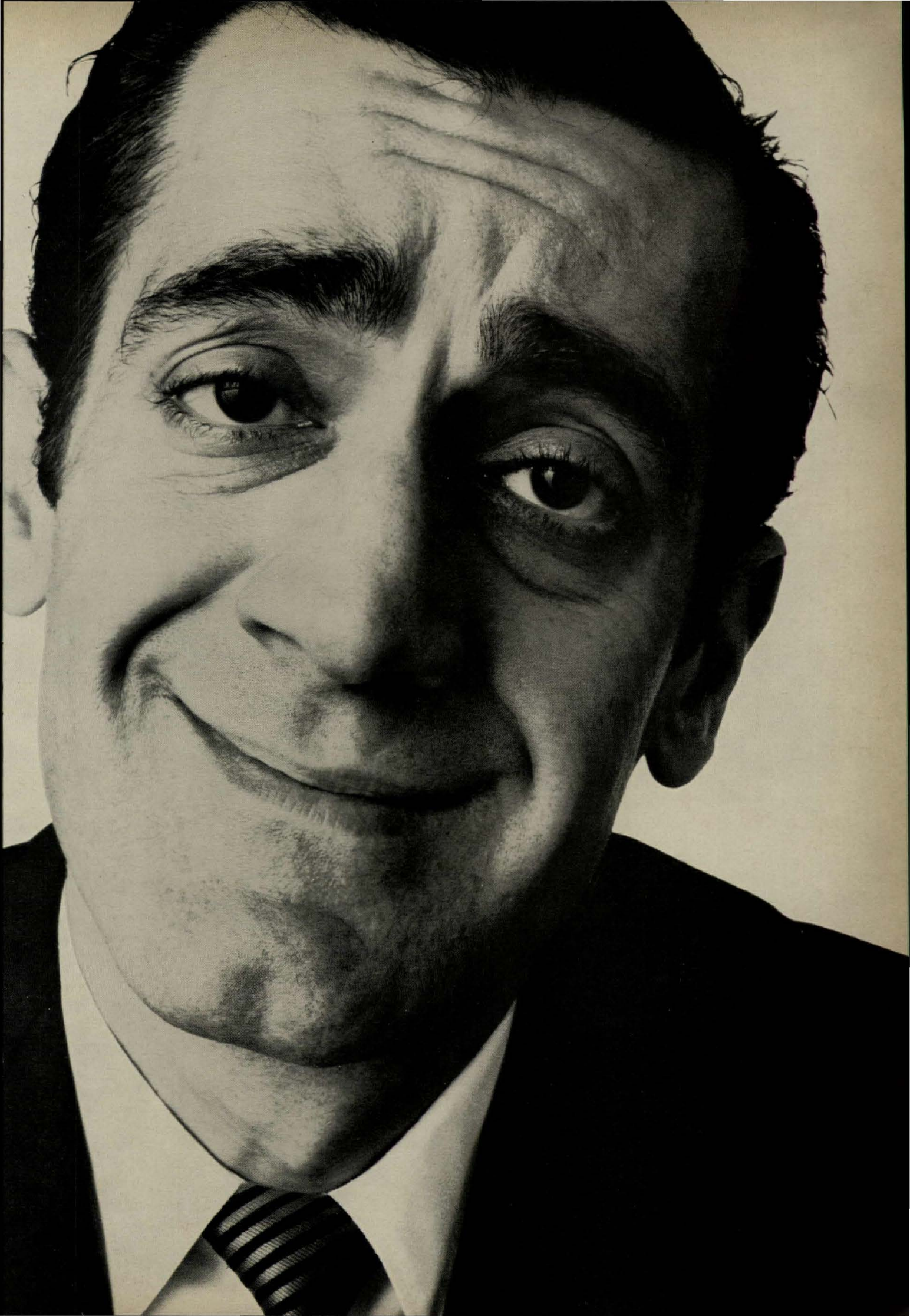

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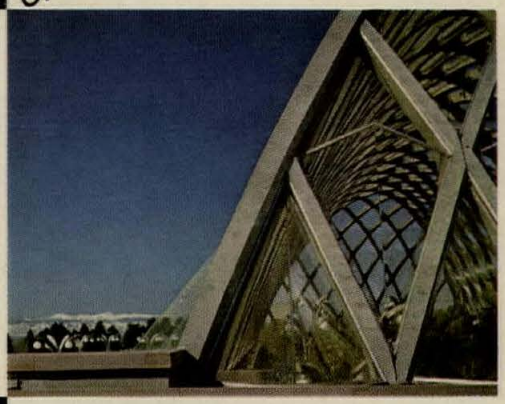

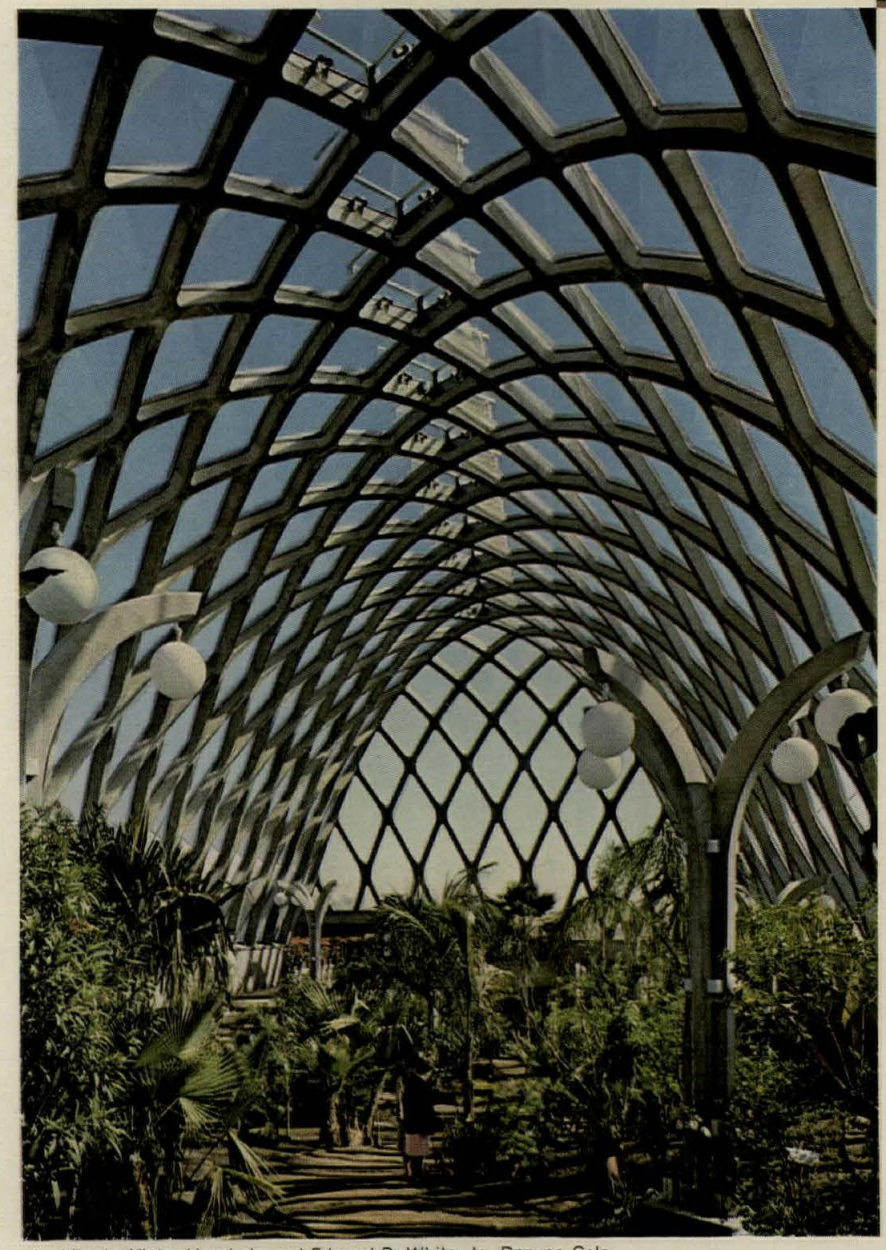

Architects: Victor Hornbein and Edward D. White, Jr., Denver, Colo.

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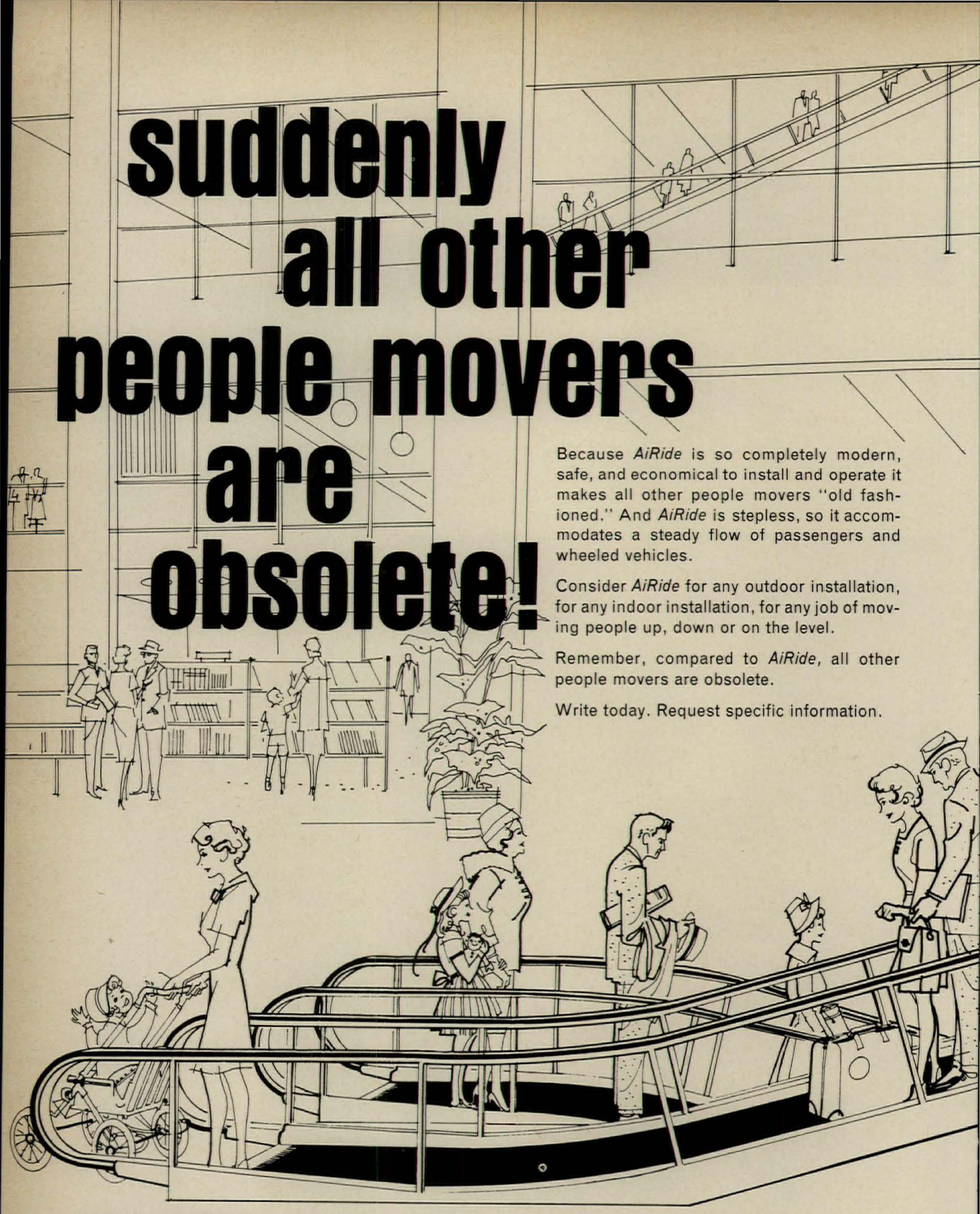

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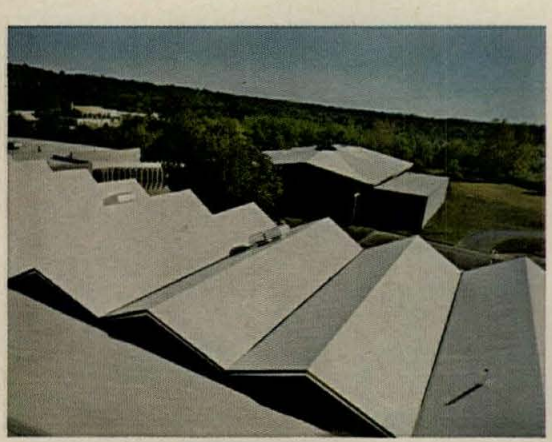
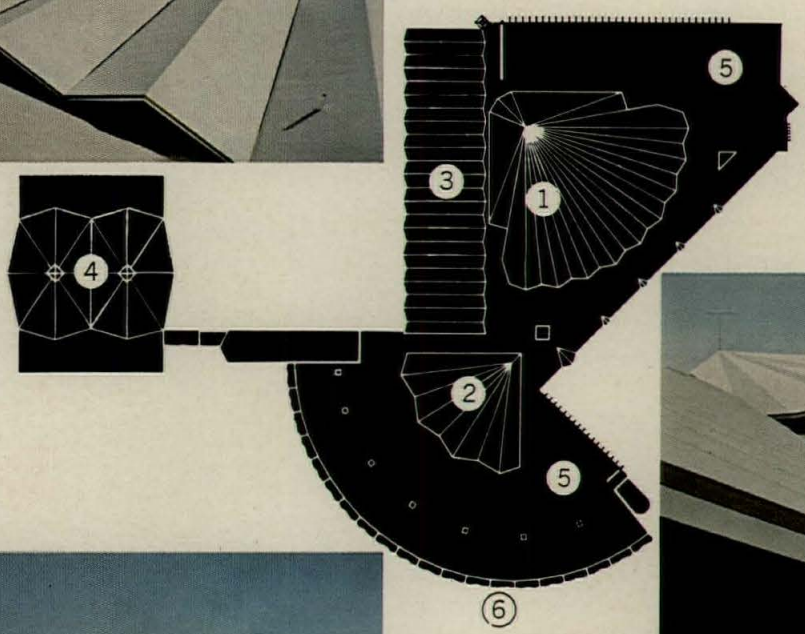




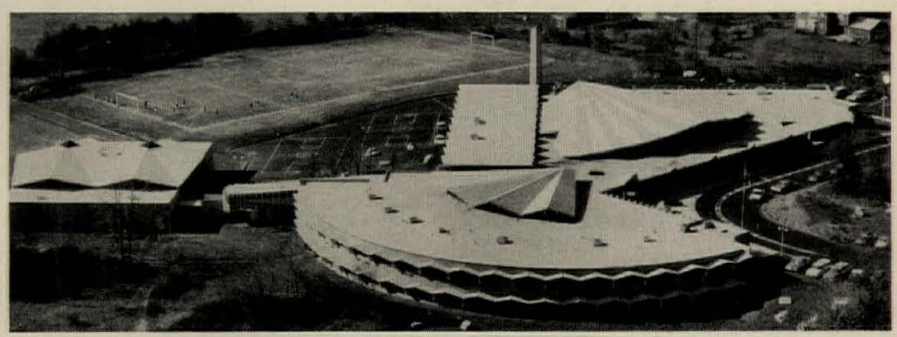
independence Connecticut

Johns-Manville roofing materials meet unique needs of Coleytown Junior High School–Joseph Salerno, Architect.

The Coleytown school in Westport, Connecticut, illustrates the new freedom in roof design—with the new generation of built-up roofing materials from Johns-Manville. Here's how advanced J-M roofing products were used with imagination in this functional modern design:

J-M Last-O-Roof® was the choice for the fan-shaped folded plates over the auditorium (1) and the library (2); for the roofs of the arts and crafts rooms (3); and the octagon roofs (4) of the detached gymnasium. Last-O-Roof is a single-membrane plastic elastomer roof. It adapts to practically any roof configuration and can be used on practically any slope. Application is fast because the membrane and cements arrive ready to use, require no on-site preparation. The roof is finished with a reflective coating of Last-O-Lume®—white here, but also available in colors.

J-M Gravel-Surface Roofing was used on the flat roof area (5). It's built up with Johns-Manville base and finishing felts, plus a flood coating of the J-M bitumen, Aquadam®, and a white gravel topping. Here the gravel surface contrasts attractively with the



gleaming Last-O-Roof surfaces that rise from the flat areas.

J-M No. 80 Flexstone® Roofing covers the "eyebrow" sunshades (6) over classroom windows. The top ply in this asbestos roof specification is No. 80 Flexstone cap sheet. Its felts are 85% asbestos fiber, so they are actually flexible coverings of stone. These asbestos felts are asphalt-saturated, then asphalt-covered, then firmly embedded with a layer of ceramic granules. No. 80 Flexstone can be furnished in white or in a variety of colors.

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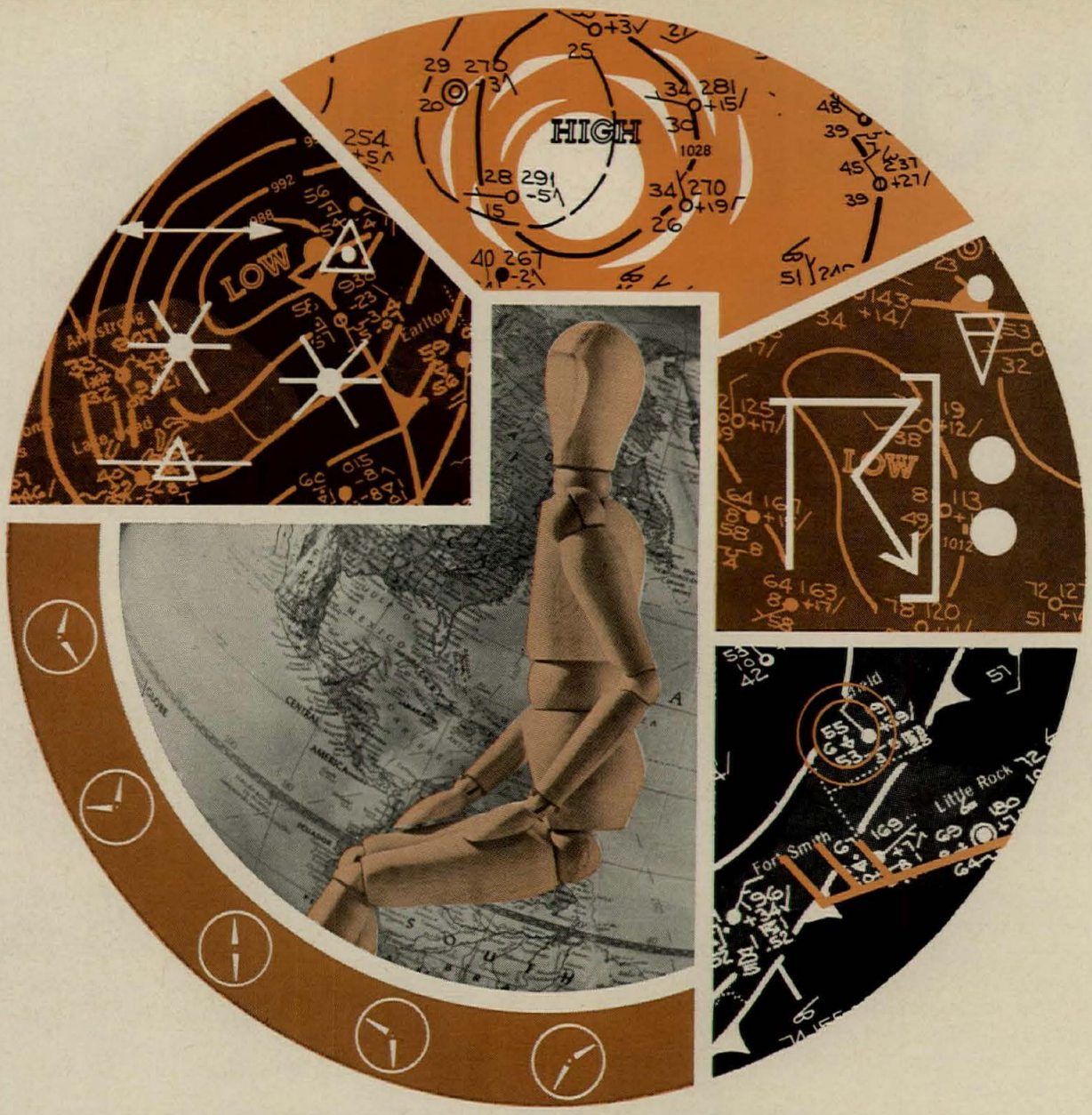
Johns-Manville

For more data, circle 131 on inquiry card



advanced concept in human comfort

The climate control division of the world wide SINGER organization heralds a new era of comfortable living for people all over the world —where they live, where they work, where they play, where they worship.

Electromode, Easy-Heat and Remington—during long years of independent operation in their respective fields, each has earned a high reputation for quality, service and dependability. United under THE SINGER COMPANY, with its vast resources, they offer the world more and better climate control products for more comfortable living today and tomorrow.

Climate Control Division / The **SINGER** Company

Auburn, New York

Electromode®
electric heating products

Remington® AIR CONDITIONING
Incremental* air conditioners

*A trademark of THE SINGER COMPANY

EASY-HEAT®
*A Trademark of THE SINGER COMPANY
electric snow melting and heating cable products

For more data, circle 132 on inquiry card

For more data, circle 133 on inquiry car

continued from page 254

PIPE INSULATION SYSTEM ACHIEVES COMPOSITE FIRE RATING / *Flame-Safe* glass-fiber pipe insulation has obtained a UL rating that includes insulation, adhesive and glass cloth jacket, and is recommended for application to heated lines up to 500 F, in both concealed and exposed locations, particularly in high occupancy buildings. Other advantages of this type of insulation are reported to be low installation cost, factory-applied sizing of the glass cloth jacket, resistance to mechanical abuse, shrinkage or swelling, no required prepainting, easy installation, and a wide range of available sizes. The low thermal conductivity of the product provides good temperature control and low heat losses. ▪ Johns-Manville, Industrial Insulations Division, New York City.

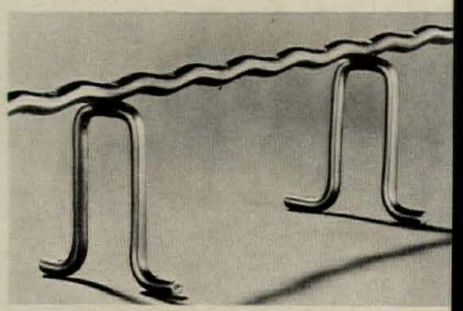
Circle 305 on inquiry card

EASIER FIRE PROTECTION / Seamless steel pressure vessels can be applied to reduce the cost and complexity of self-contained fire protection systems, according to a recent report from U.S. Steel. Traditionally used roof-top water tanks can be eliminated in favor of a pressurized system with key components located anywhere in the building. The central component in the system is a seamless pressure vessel that stores pressurized air or nitrogen to force the water through the system's steel pipes, as soon as the sprinkler system is activated by a fire. The system permits two possible locations for the water tank, either in the basement or on each floor of the building. One pressure vessel, located in the basement, is adequate in either case. ▪ United States Steel, Pittsburgh.

Circle 306 on inquiry card

HOSPITAL FIXTURES / A variety of fixtures, like this free-standing emergency bath of acid-resisting enameled cast iron, feature a thermostatic mixer valve and wall-mounted dial thermometer to ensure safe water temperature. In this unit a rubber hose and spray, together with a diverter spout, facilitate bathing of patients. ▪ Kohler Company, Kohler, Wisc.

Circle 307 on inquiry card



STAINLESS REBAR SUPPORTS / A new line of concrete-reinforcing supports made from stainless steel makes it possible to grind the exposed concrete surfaces without danger of rust stains appearing at a later date. The new supports eliminate plastic coatings and are said not to be affected by temperature changes. ▪ The Dayton Sure-Grip & Shore Company, Miamisburg, Ohio.

Circle 308 on inquiry card

more products on page 280

For more data, circle 135 on inquiry card

CONDITIONING THAN COOL-LOTS MORE

ndividual comfort control for each occupant! The York fan-coil room erminals are easily regulated to meet personal temperature requirements, in very season of the year.

At Lincoln Towers East, in midtown Manhattan, a York central air conditioning system assures each occupant the climate he wants, in every season of the year. Five York absorption type units provide the chilled water for cooling; 4,389 York fan-coil room terminals assure individual comfort control. And York air handling units are employed to air condition the lobby areas of the five apartment buildings.

Plan ahead with York when you plan air conditioning for an apartment, hotel, office building—or any type of building! Recent York technical advances in sound and odor control can help you design air conditioning systems that assure superior performance, greater comfort. Contact your nearby York Sales Office for specification data on York equipment. Or write York Corporation, subsidiary of Borg-Warner Corporation, York, Pennsylvania. In Canada, contact National-Shipley Ltd., Rexdale Boulevard, Rexdale, Ontario.

YOU CAN DEPEND ON YORK

YORK®

air conditioning and refrigeration

BORG-WARNER®

For more data, circle 137 on inquiry card

continued from page 276

AIR DISTRIBUTION, LIGHTING CONTROL / Air handling lighting equipment features continuous regressed air slots surrounding the diffuser frame to create a floating appearance. Fixtures can function as air supply, supply and return, return only, or as a heat exchanger. ▪ Sunbeam Lighting Company, Los Angeles.

Circle 309 on inquiry card

COMMUNICATION SYSTEM / A new low-cost door-answering and room-to-room intercom, which can be surface-mounted or built in, can have as many as 12 remote speakers throughout the house—each with a volume control and a switch to talk or listen to the front door or any other room. ▪ Nutone, Incorporated, Cincinnati.

Circle 310 on inquiry card

MARBLE DOOR KNOBS / Natural marble trim gives an unusual appearance to the *Renaissance* door knob line. The new knobs, which have a grip-tested outer diameter of only 2½ in., are mounted on polished brass tubing. A range of different colors is available to blend with a wide variety of contemporary interior designs. The company's deluxe lock installations can be used with these knobs. ▪ Arrow Lock Corporation, Brooklyn, N. Y.

Circle 311 on inquiry card

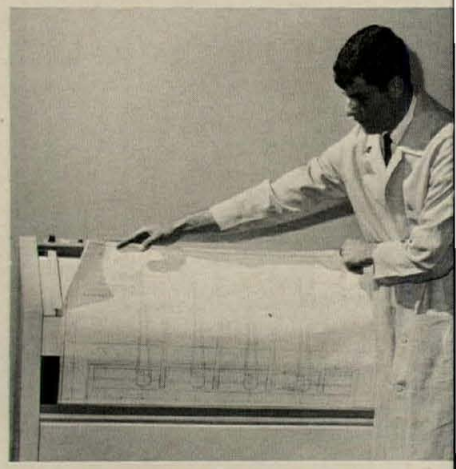
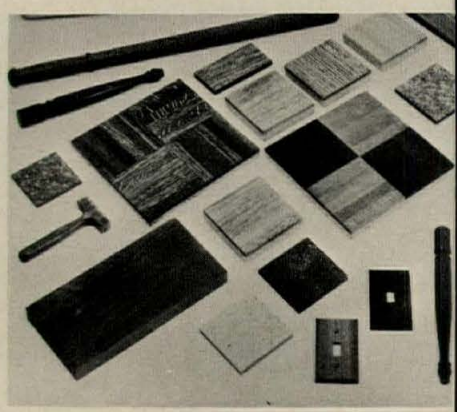


PHOTO REPRODUCTION / A new processor reproduces either negative or positive engineering drawings up to 34 in. by 44 in. in about 30 seconds. The unit has a capacity of up to 1,000 square feet of print material per gallon of activator and stabilizer solution. Automatic replenishment of solution is provided. ▪ Eastman Kodak Company, Rochester, N. Y.

Circle 312 on inquiry card



WOOD PRODUCTS / Novawood, created by impregnating ordinary wood with a liquid plastic hardened by gamma radiation, has the natural beauty of wood plus improved strength, hardness, mar and abrasion resistance, dimensional stability, decay and insect resistance and weatherability. The wood, which is available in a wide choice of colors and tones, may be used in flooring, paneling, siding, door and window sections, and furniture. ▪ The American Novawood Corporation, Lynchburg, Va.

Circle 313 on inquiry card

more products on page 288

Everybody's happy with this Square D UNDERFLOOR DUCT INSTALLATION

OWNER of the 400 Army Navy Office Building, Arlington, Va.
"It provided flexible in-the-floor facilities for telephone and power." —**R. N. Fleming**
400 Army Navy Drive Association

ARCHITECT
"It helped reduce floor-to-floor height and enhanced floor appearance."
—**James F. Hogan**
Edmund W. Dreyfuss & Associates

ELECTRICAL ENGINEER
"100-pair cables were easily pulled through ellipsoid inserts. Another good feature—when a phone is moved, its cable can remain in the raceway and the Amphenol connector can be stored in the insert—ready for immediate reactivation."
—**Sidney W. Barbanel**
Consulting Engineer

OFFICE DESIGNERS
"Gave us complete freedom in initial office layout, provided for easy future rearrangement, minimized problem with boxes and service fittings in carpeted areas." —**Sydney G. Rodgers**
Rodgers Associates

We have a bulletin which illustrates and describes this installation in detail. It also explains the advantages of Pyramidal Feed and Ellipsoid Inserts—major Square D design features. For your free copy write:
Square D Company
Dept. SA, Mercer Road, Lexington, Kentucky

ELECTRICAL CONTRACTOR
"Square D duct was a natural for this tough job of in-the-slab installation—it enabled us to complete decks faster and coordinate with other trades."
—**Malcolm Cox**
Walter Truland Organization

SQUARE D COMPANY

wherever electricity is distributed and controlled

For more data, circle 139 on inquiry card

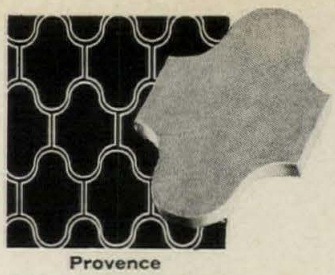
TRIAL BY FIRE

GOLD BOND TESTS GYPSUM WALLBOARD SYSTEMS UP TO 2000°F.

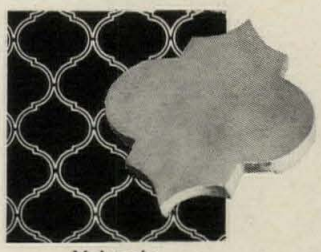
This furnace at National Gypsum's Sound & Fire Testing Center is used to test wallboard floor-ceiling assemblies — some as large as 13 feet by 16 feet and weighing several tons. Purpose: to determine the amount of time (one hour, two hours, or longer) that the system can withstand fire. Tests are witnessed and verified by representatives of recognized independent laboratories. Thus, Gold Bond is speeding up the development of many safe floor-ceiling and partition assemblies. On steel and wood joists. For technical literature and specifications, call your Gold Bond® Representative. Or write to National Gypsum Company, Dept. AR-96G, Buffalo, N. Y. 14225.

Gold Bond®
PARTITION SYSTEMS

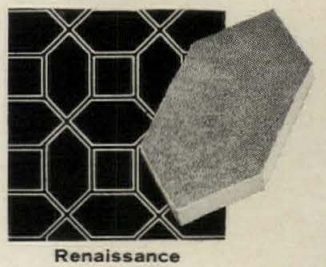
For more data, circle 140 on inquiry card



Provence



Valencia



Renaissance

Enjoy the Elegance of Genuine Quarry Tile Flooring

For the finest flooring, Ludowici is preferred not only for unsurpassed elegance but also for its easy care and everlasting quality

3 Famous Patterns of Special Shapes

Brushed or smooth red or fire-flashed colors that never fade or discolor

Member: Tile Council of America, Inc.

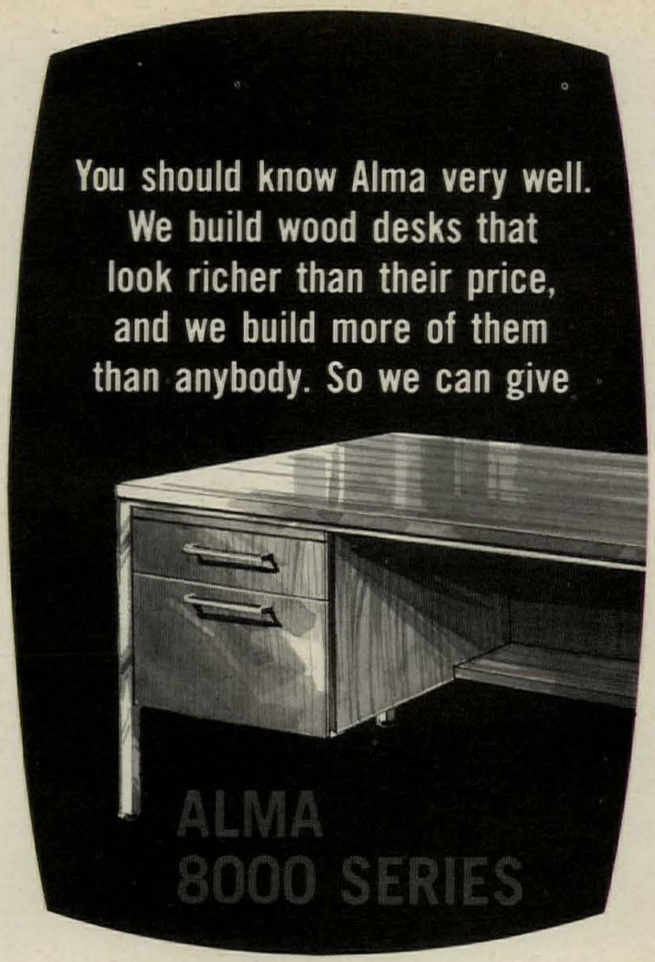
For full particulars write Flooring Tile Division, Dept. AR

LUDOWICI-CELADON CO.

75 East Wacker Drive, Chicago, Ill. 60601

Manufacturers of quarry tile, the nation's largest producer of roofing tile and NAILON Facing Brick

For more data, circle 154 on inquiry card



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THERE ARE IMPORTANT DIFFERENCES IN PERMANENT ADJUSTABLE DOCKBOARDS

Be sure your clients get all the features they need in permanent adjustable dock equipment.

It costs nothing to get the full story from your Kelley Representative . . . or write direct for 6 fact-filled "Difference" Sheets.

Representatives in 87 cities Coast-to-Coast

KELLEY CO., INC. • 6768 N. TEUTONIA AVENUE • MILWAUKEE, WIS. 53209

KELLEY®

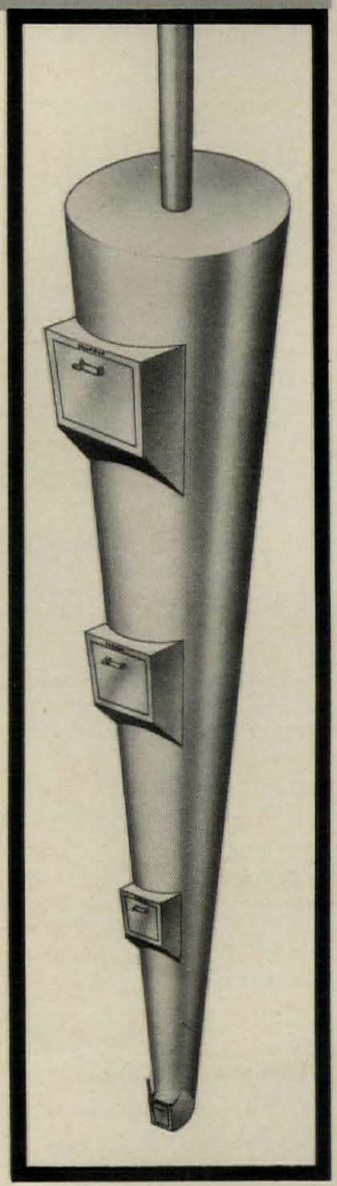
55-181A

For more data, circle 156 on inquiry card

r more data, circle 153 on inquiry card

Rx FOR EFFICIENT DISPOSAL

WILKINSON CHUTES



You are sure of a modern, quality installation when you specify Wilkinson Chutes. Over the years Wilkinson has earned that reputation . . . installed more chutes than anyone else.

Most of today's modern chute features have been initiated by Wilkinson. For instance . . . noiseless self-closing intake doors with unobstructed opening . . . automatic chute sprinklers . . . interlocked doors . . . electrically controlled sprinkling and flushing . . . effective disinfecting and sanitizing.

Yet, with all the advantages, these chutes are usually the least expensive. Large volume and continuous production improvements have enabled Wilkinson to pass savings on to you. Overall installed costs are generally less than for other makes. Operating efficiencies, after installation, extend these savings over a number of years.

Modern installation, quality installation, low cost installation . . . good reasons for specifying Wilkinson Chutes.

RECENT WILKINSON INSTALLATIONS:

- St. Joseph's Hospital
  Milwaukee, Wisconsin
- Watergate Apartments
  Washington, D. C.
- Residence Halls, Southern Illinois Univ.
  Carbondale, Illinois
- Beverly Hillcrest Hotel
  Los Angeles, California
- Phillips 66 Motel
  Ft. Lauderdale, Florida
- Sacred Heart Convent
  Kansas City, Kansas
- Madonna High School
  Milwaukee, Wisconsin

WILKINSON CHUTES, INC.
619 East Tallmadge Ave. Akron, Ohio 44310
WILKINSON CHUTES (Canada) LTD.
9 Dwight Ave. Toronto 14, Ontario, Canada

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you more than just beauty. That's why we're the shrewd choice for any office. We help you make best use of the space you have available. We also

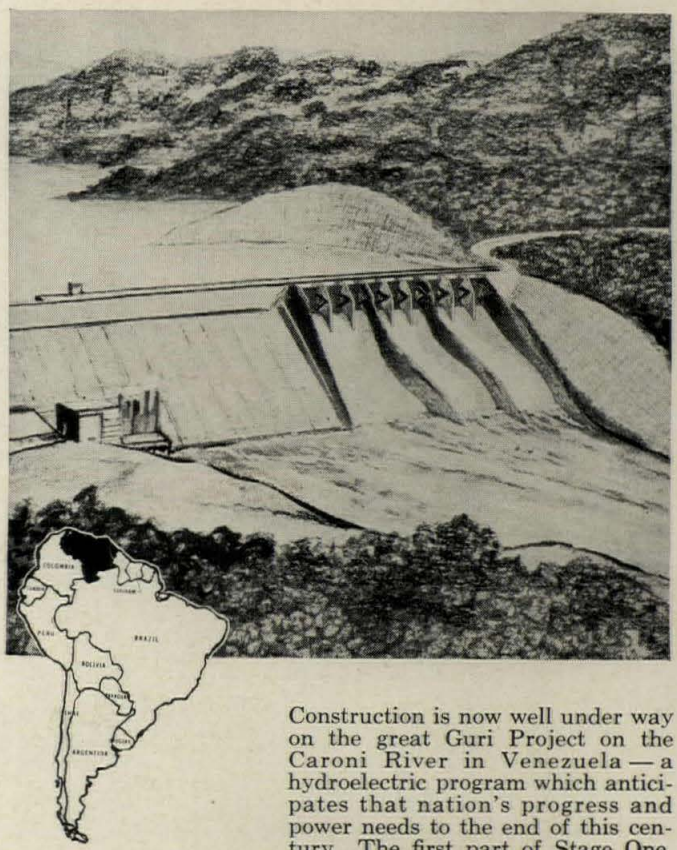
ALMA 400 SERIES

For more data, circle 155 on inquiry card

DELTA FAUCET COMPANY
GREENSBURG, INDIANA
DIVISION OF MASCO CORPORATION
IN CANADA: Delta Faucet of Canada Ltd. Rexdale, Ont.

For more data, circle 159 on inquiry card

MARACON*
CONCRETE ADMIXTURE
Selected
For First Stage of
GURI DAM
IN VENEZUELA



General Contractor — Consorcio de Guri: Kaiser Engineers and Constructors, Inc.; Macco International; Tecon International; Merritt, Chapman and Scott, Inc.; and Christiani and Nielsen Corp.

Construction is now well under way on the great Guri Project on the Caroni River in Venezuela — a hydroelectric program which anticipates that nation's progress and power needs to the end of this century. The first part of Stage One, in which MARACON Concrete Admixture is being used, is scheduled for completion in 1968 and provides for a concrete gravity dam 348′ high and 1040′ long, a spillway capacity of 1,250,000 cu. ft. per second and a powerhouse capable of producing 527,250 kilowatts.

AMERICAN CAN COMPANY
MARATHON PRODUCTS
CHEMICAL
NEENAH • WISCONSIN

*MARACON is the registered trade name for a series of concrete admixtures manufactured by American Can Company, Chemical Products.

AMERICAN CAN COMPANY, MARATHON PRODUCTS, CHEMICAL
NEENAH, WISCONSIN

Send additional information on Maracon to:

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

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Please attach to your company letterhead. A-9

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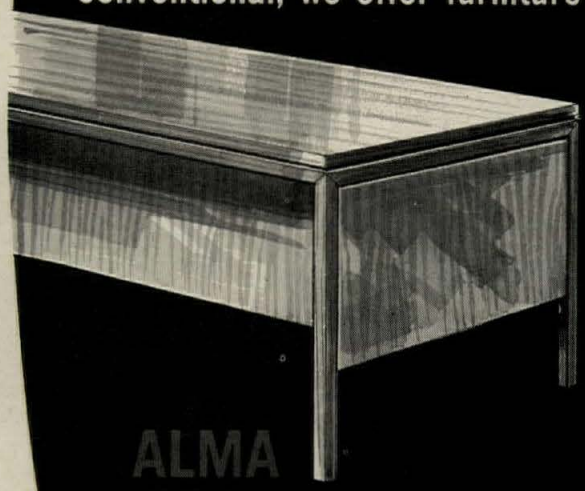
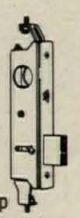
shape a rim . . . magnificently miter a corner. Luxurious when we should be . . . economical when you want us to be. Modular or conventional, we offer furniture



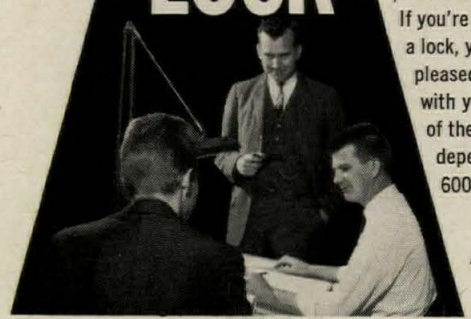
ALMA 4000 SERIES

For more data, circle 155 on inquiry card

HOW TO PICK A LOCK



This group has taken its pick. The choice was the W & F #6000 Series Deadlock, for entrance doors. This versatile mechanism offers Single, Double, or Triple point Entrance Door Security. If you're in a position to pick a lock, your clients will be pleased (and satisfied) with your choice of one of the rugged and dependable W & F 6000 Series Deadlocks.



For detailed information, please contact:

W & F MFG., INC. 811 Air Way, Glendale, Calif. 91201 Phone: (Area Code 213) 245-7441

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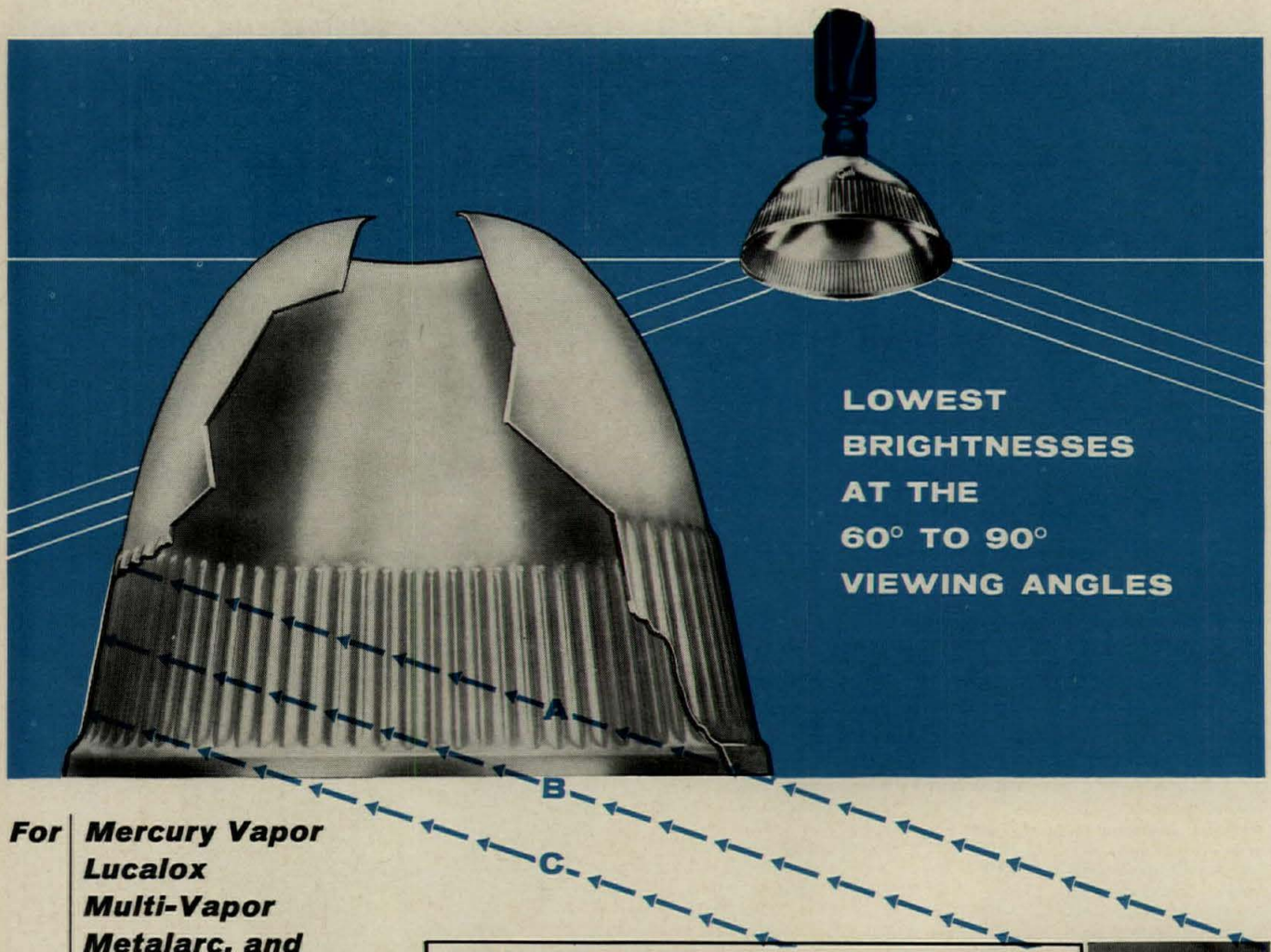
Guth
LIGHTING
since 1902

VUE-TROL® RIBS*

a NEW dimension in brightness control



For** | **Mercury Vapor
Lucalox
Multi-Vapor
Metalarc, and
Incandescent

*VUE-TROL ribs drastically reduce reflector brightnesses in the 60° to 90° viewing zones. Table to right compares 3 standard GUTH VUE-TROL 400-watt reflectors with identically designed (and finished) plain, spun reflectors. Same lamp, ballast and test procedures for all readings.

®VUE-TROL, Trade-Mark & Pats. Pend., E. F. Guth Co.

MAXIMUM FOOTLAMBERTS (RELATIVE) — 400 W. CLEAR MERCURY LAMP

Angle Below Horizontal	Point	B-1576		B-1577		B-1579	
		VUE-TROL	Plain	VUE-TROL	Plain	VUE-TROL	Plain
30°	A	11,000	50,000	1,200	4,700	350	1,250
	B	6,000	25,000	730	1,750	230	510
	C	3,000	14,000	540	1,350	210	230
25°	A	7,800	31,000	720	2,350	210	700
	B	3,100	15,000	420	1,000	150	240
	C	1,350	7,000	340	850	110	145
20°	A	7,500	16,000	430	1,200	130	300
	B	1,500	8,800	280	600	100	130
	C	870	3,300	205	475	91	100
15°	A	2,400	7,300	—	—	98	150
	B	950	4,400	190	340	80	98
	C	400	1,400	130	305	60	68
10°	A	—	—	—	—	—	—
	B	280	800	—	—	61	51
	C	210	690	100	190	51	49

THE EDWIN F. GUTH COMPANY • P. O. BOX 7079 • ST. LOUIS, MO. 63177

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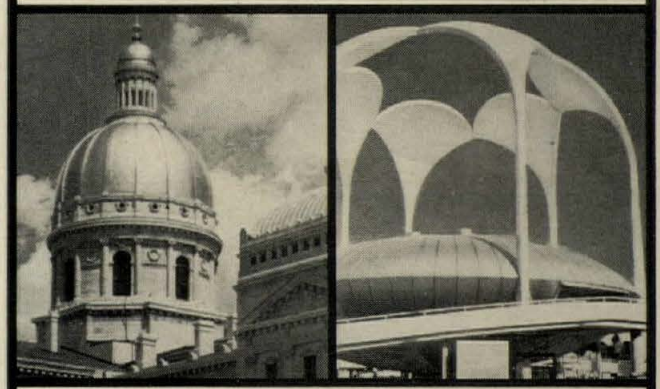
DURAGOLD®
tarnish resistant golds for exterior finishes



Specify Duragold for bright, economical, durable gold exterior and interior coatings. Shown above, the Indiana State Capitol dome and the Johnson's Wax Golden Rondelle at the New York World's Fair, both covered with coatings containing Duragold pigments. For the names of manufacturers using Duragold, plus a free gold spray can, write or call...

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39 Powerhouse Rd., Roslyn Hgts., L.I., N.Y. 11577 • 516 MA 1-8800

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to suit the job, including chairs, but only one kind of quality— the finest. And one kind of service— dependable. Only a few of the reasons Alma belongs in your planning right from

ALMA 610 CHAIR

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REGAL® EPLO

tamper-proof, easy-to-install

MIRROR FRAMES

in stainless steel or extruded aluminum

Here are mirror frames with a clean stylish look to blend with today's modern architecture, and offer tamper-proof protection.

Regal frames are ideal for all types of public buildings: schools, hospitals, restaurants, offices and factories . . . perfect for security-type institutions and ends the nuisance of theft in public facilities. Regal frames are easily mounted. After the hanger frame is installed, the mirror framing slips into place and is locked automatically and securely in place.

STAINLESS STEEL
Consists of a reinforced frame and a special hanger with built-in spring locks . . . Has no screws or exposed fasteners. Stock sizes are 16 x 20, 16 x 22, 18 x 24, 36 x 24 and 48 x 24. Other sizes up to 12 feet are available. Finishes are satin or polished. Tamper-proof steel shelving and accessories are also available.

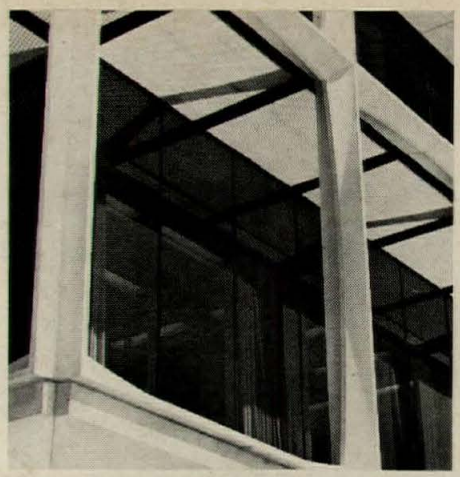
EXTRUDED ALUMINUM
Heavy duty extruded frames are precision mitered and double reinforced with extruded corner keys. Special interlocking brackets and hangers make installation perfect and easy. The magna-lok feature secures the frame to wall without exposed screws or bolts — makes the unit tamper-proof. Available in all sizes. Finishes are buffed, polished and brush satin in anodized natural and anodized gold. Matching extruded aluminum, tamper-proof shelving is available.

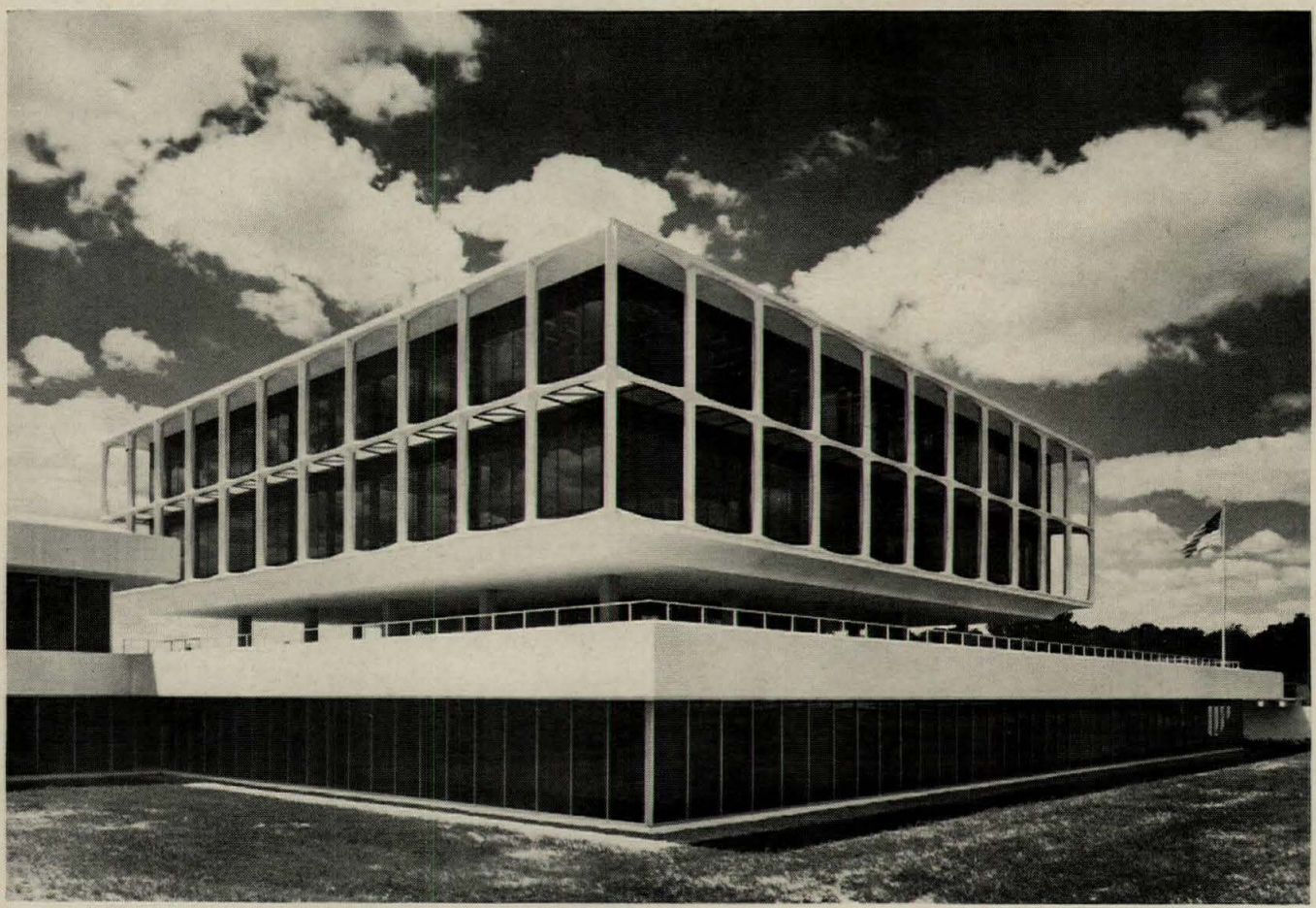
See your jobber, or write direct to:

REGAL P.O. BOX 108 FLINT, MICHIGAN 48501 PHONE 239-8689
SUBSIDIARY OF THE ENGINEERED PRODUCTS COMPANY

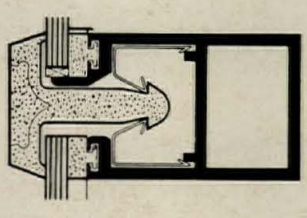
For more data, circle 165 on inquiry card

New PITTCO® T-WALL™ thermal framing system controls condensation, reduces heat loss in new Federal-Mogul Building





Federal-Mogul Corp. Building, Detroit. Architect: Giffels & Rossetti, Inc., Detroit. General Contractor: Barton-Malow Co., Detroit.



The new PITTCO T-WALL has a proven 0.6* U-value. There is absolutely no metal connection from inside to outside. (See section.)

That means no condensation on the metal at room temperatures up to 70° with relative humidity of 35%—even when it's minus 20° outside. Metal framing is not chilly. Sound transmission is reduced.

Appearance is slim, elegant, unobtrusive. Face of the mullion is only 1½ inches wide; gasket projects only ⅜ of an inch from surface of the glass.

PITTCO T-WALL is available in several glazing thickness combinations, including double glazing for maximum insulation. Standard components will meet varying strength requirements.

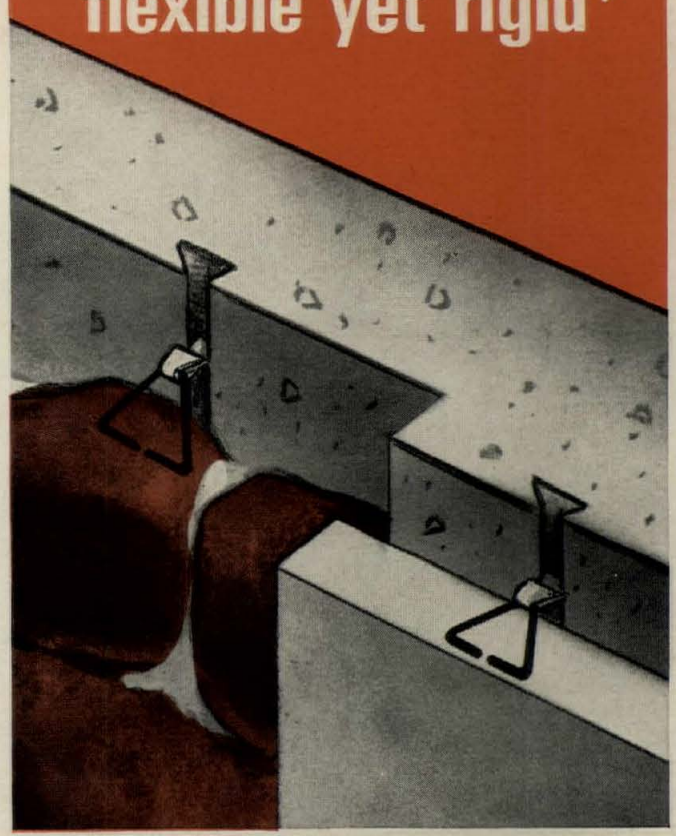
For more information on this new PITTCO framing system, see Sweet's Architectural File, section 3a/Pi, or write for our 4-page descriptive folder. Pittsburgh Plate Glass Company, Pittco Architectural Metals Department, Ohio Street, Kokomo, Indiana 46901.

*Performance test data published March 1, 1965, by Pennsylvania State University.

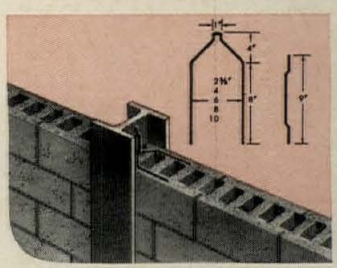
PPG® PITTCO ARCHITECTURAL METALS

For more data, circle 166 on inquiry card

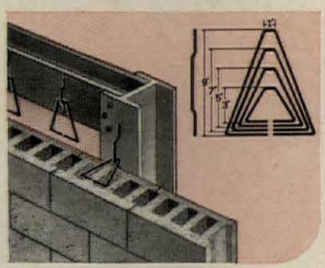
flexible yet rigid*



DOVETAIL FLEX-O-LOK®
For variable vertical anchorage to poured concrete walls and columns.



WEB-TIE FLEX-O-LOK®
For anchorage to steel columns or beams.



FLEX-O-LOK®
For anchorage to steel columns or beams.

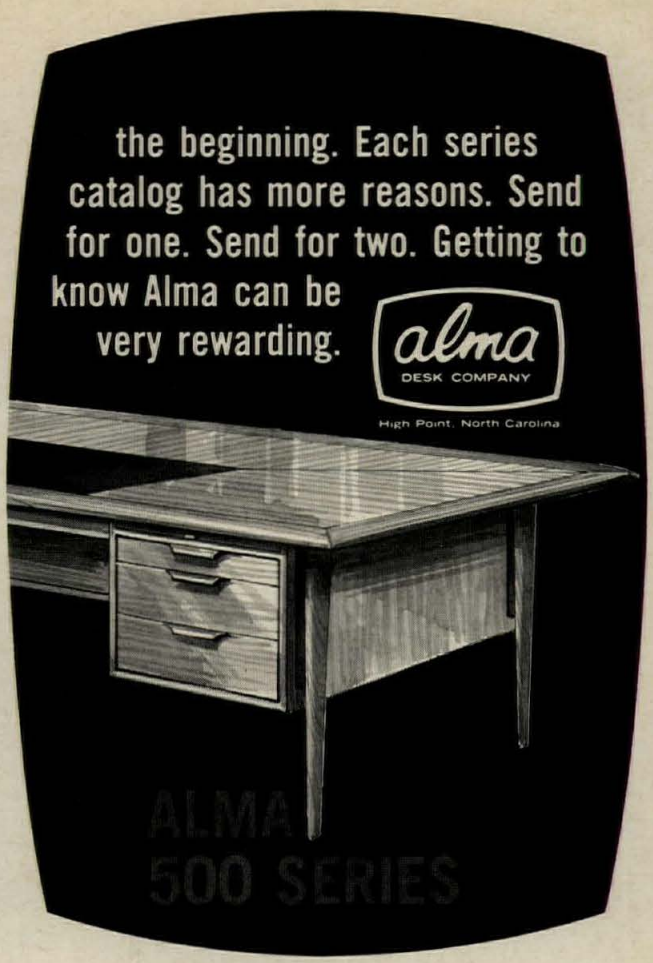
*NEW . . . FLEX-O-LOK!

New AA Flex-O-Lok wall anchorage systems allow architects greater design freedom and contractors greater ease in construction. Complete vertical and horizontal flexibility makes installation easy and reduces wall cracking, yet remains securely tied laterally for maximum wall strength. Flex-O-Lok is just another of the AA quality building products designed, through research, to do your specific job best . . . and at a savings too.

Send for FREE catalog!
Reference:
CSI File Div. 4
A.I.A. File 3M-5F
1966 Sweets' File 4h/Aa
1965 A.I.A. BPR 4.05 A-B
1966 CE Spec. Data file S-a

AA WIRE PRODUCTS COMPANY
6100 South New England Avenue • Chicago, Illinois 60638 • Phone (312) 586-6700
Manufactured in Chicago, Dallas and Ontario, Canada.

For more data, circle 167 on inquiry card



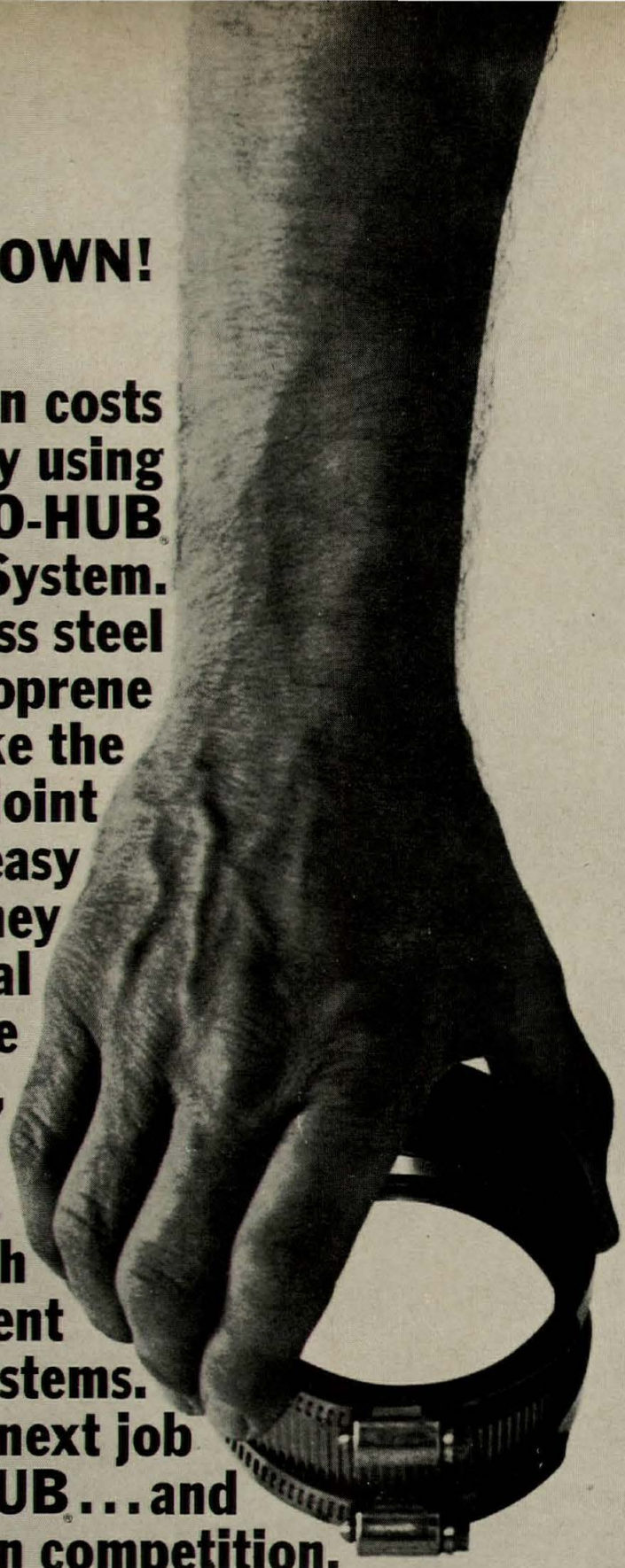
For more data, circle 155 on inquiry card

what can you do with wood panel doors to improve home design?

practically anything.

SEE FOR YOURSELF. It's all in this new and informative "Door Book" crammed with imaginative, functional and decorative uses for wood panel doors. Ideas that will help you make your homes more appealing for today's home buyers! Send name and address on your letterhead to:

PONDEROSA PINE WOODWORK
and The Western Wood Products Assn.
39 S. La Salle St., Dept. AR-8., Chicago, Illinois 60603



CLAMP DOWN!

...on installation costs and time by using the CG NO-HUB® Sanitary System. The stainless steel clamp and Neoprene gasket make the CG NO-HUB® joint quick and easy to install; they create a seal that lasts the life of the pipe, resisting all corrosive elements associated with drain-waste-vent and sewer systems. Figure your next job with CG NO-HUB®... and clamp down on competition.

Specify CG®; there is nothing better... why accept anything less? Made in U.S.A.

CAST IRON SOIL PIPE INSTITUTE

1824-26 Jefferson Place, N.W., Washington, D.C. 20036

Qualified counsel and assistance to code committees available in all areas through resident district manager. Contact the Institute; we'll put him in touch with you.

"Shower's past, let's move in fast..." damp days don't stop sealing with Weatherban 101

Unlike most others, Weatherban® Brand One-Part Sealant 101 can be applied to damp surfaces. It bonds tightly to all materials. Cures to a tough, flexible, permanent seal. "Weatherban" becomes tack-free immediately if sprayed with water; otherwise, requires only two hours

That's not all. "Weatherban" Sealant 101 won't stain or corrode surfaces, won't collect dirt. No sag or flow in seams. Absolutely will not shrink after application. And the cured sealant withstands temperatures from —40 to +160°F.

"Weatherban" gives you the proved dependability of a polysulphide (Thiokol® based) sealant in easy to use form. Comes ready-mixed. No mixing, no mess. Applies smoothly. If you wish, your "Weatherban" man will assist you from joint design stages on. He also will make himself available on the job site to help the calking crew get started and recommend application equipment . . . you name it.

At the very least, ask him for a free demonstration. Just write 3M AC&S, Dept. SBD-96, St. Paul, Minn.

When fully cured, "Weatherban" Sealant 101 exceeds requirements of ASA Spec. A 116.1-1960 and Interim Fed. Spec. TT-S-00230 (Feb. 3, 1964). Black, gray, white and stone colors in 1/10-gal. cartridges and 5-gal. pails.

"IT PAYS TO RELY ON YOUR WEATHERBAN MAN"

Adhesives, Coatings and Sealers Division 3M COMPANY

For more data, circle 170 on inquiry card

For more data, circle 169 on inquiry card

continued from page 296

CURTAIN WALLS / A completely insulated wall for glass and metal curtain-wall construction features a T-shaped gasket that holds the glass against a continuous filler strip, and all metal framing is confined to one side of the wall, to help eliminate thermal short circuits and control condensation. ▪ Pittsburgh Plate Glass Company, Pittsburgh.

Circle 322 on inquiry card

SLIDING DOORS / A new sliding fire door is said to be completely operable at all times regardless of the position of the door, and in event of a fire the door will automatically close. Panels with phenolic resin honeycomb core provide reinforcing and resistance to impact and damage, and the doors are bonderized for rust prevention. ▪ Steelcraft Manufacturing Company, Cincinnati.

Circle 323 on inquiry card

BUS DUCT / A totally enclosed feeder bus duct, for use in confined areas and where ventilated bus is prohibited, is intended for service 600 volts a-c or d-c, with current ratings of 600 to 5,000 amperes. It is available in three-phase, three-wire or in three-phase, four-wire, half or full neutral, and with one, two or three bars of aluminum or copper. Low impedance and voltage drop of less than 3 per cent per 100 ft. are features. ▪ Westinghouse, Standard Control Division, Beaver, Pa.

Circle 324 on inquiry card

ROOFING / This one-ply roofing system can be applied on any deck slope from level to vertical. Application requires—besides the roofing—one gallon of field adhesive, one quart of lap adhesive and 40 in. of flashing tape per 100 square feet of roof. Temperature variations have little effect on application. ▪ Allied Chemical, Barrett Division, New York City.

Circle 325 on inquiry card

SCHOOL INTERCOM / A schoolwide sound-communications system is centered in an automatic console that synchronizes clocks and handles time signals and alarms, and also performs the central switchboard functions for the intercom-sound system. ▪ Executone Inc., Long Island City, N. Y.

Circle 326 on inquiry card

1866 1966
CARADCO®
WOOD
Patio Doors

. . . make a house at home with elegance or informality . . . with cocktails or cookouts. And they're built for trouble-free comfort and efficiency all year 'round.

For a Hundred Years Architects Have Specified CARADCO Creative Building Products


Casement

In sash with insulating glass, a premium vinyl gasket tightly grips both wood and glass, making leaking and around-glass infiltration virtually impossible.

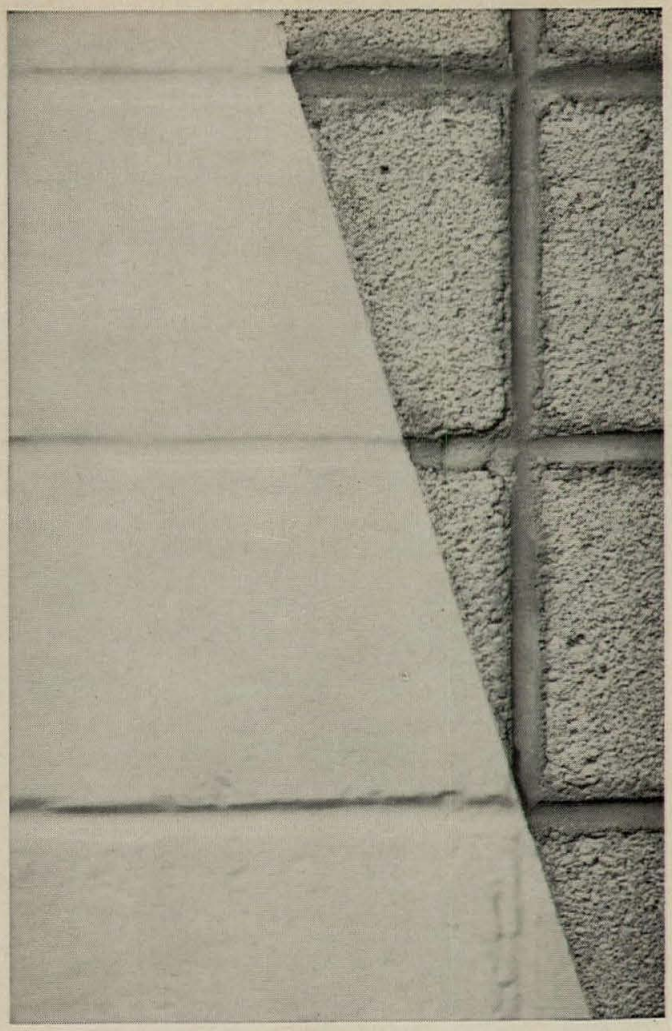

Patio Door

Better 8 ways: Wood Construction • 7/8" Insulating Glass • Dense Woven Pile • Thermal Barrier Sill • Floating Action • Hidden Reinforcers • Nylon Rollers • Jump-proof Screen

Awning, Sliding, C-100' Double Hung Windows; Entrances, Doors **CARADCO INC.** *Dubuque, Iowa*

1866 1966
CARADCO®
WOOD
Casements

. . . designed for America's finest. The consistently "right" window treatment for better homes of any style in any climate.



O'Brien's New *Mira-Plate*

The miracle strength epoxy that goes on like paint, looks and lasts like ceramic tile!

Here's superior protection and tile-like beauty—at a fraction of tile's cost. O'Brien's MIRA-PLATE beautifully coats everything paintable—including new or previously painted plaster, brick, concrete, wood, metal. Ideal for heavy traffic areas. Superior to paint. Defies wear, weather, chemicals, fumes, peeling, and cracking. Unique waterproofing properties defy moisture. Brush it, roll it, or spray it on—and MIRA-PLATE may be recoated or retouched at any time. Many popular colors and attractive fleck patterns. Ask your O'Brien dealer, your painting contractor, or simply send the coupon.

To: The O'Brien Corp., Dept. AR-9
South Bend 21, Indiana
Please send me complete information about MIRA-PLATE, your miracle-strength coating that goes on like paint, looks and lasts like ceramic tile.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

The O'Brien Corporation, South Bend 21, Indiana • Baltimore • Oklahoma City • San Francisco • Los Angeles

"It's good business to help colleges"

"The greatness of America stems importantly from our many fine educational institutions, and industry is critically dependent on their graduates.

"The du Pont Company hires a large number of college graduates each year. As these employees gain business knowledge and experience, they supply tomorrow's need for managers and leaders of our Company.

"In 1966 we will grant $2,200,000 to 213 colleges and universities in all parts of the nation to help them educate leaders of the future. This represents the largest grant in the 48-year history of the du Pont Company's Aid-to-Education program."

Lammot du Pont Copeland, President, E. I. du Pont de Nemours & Co. (Inc.)

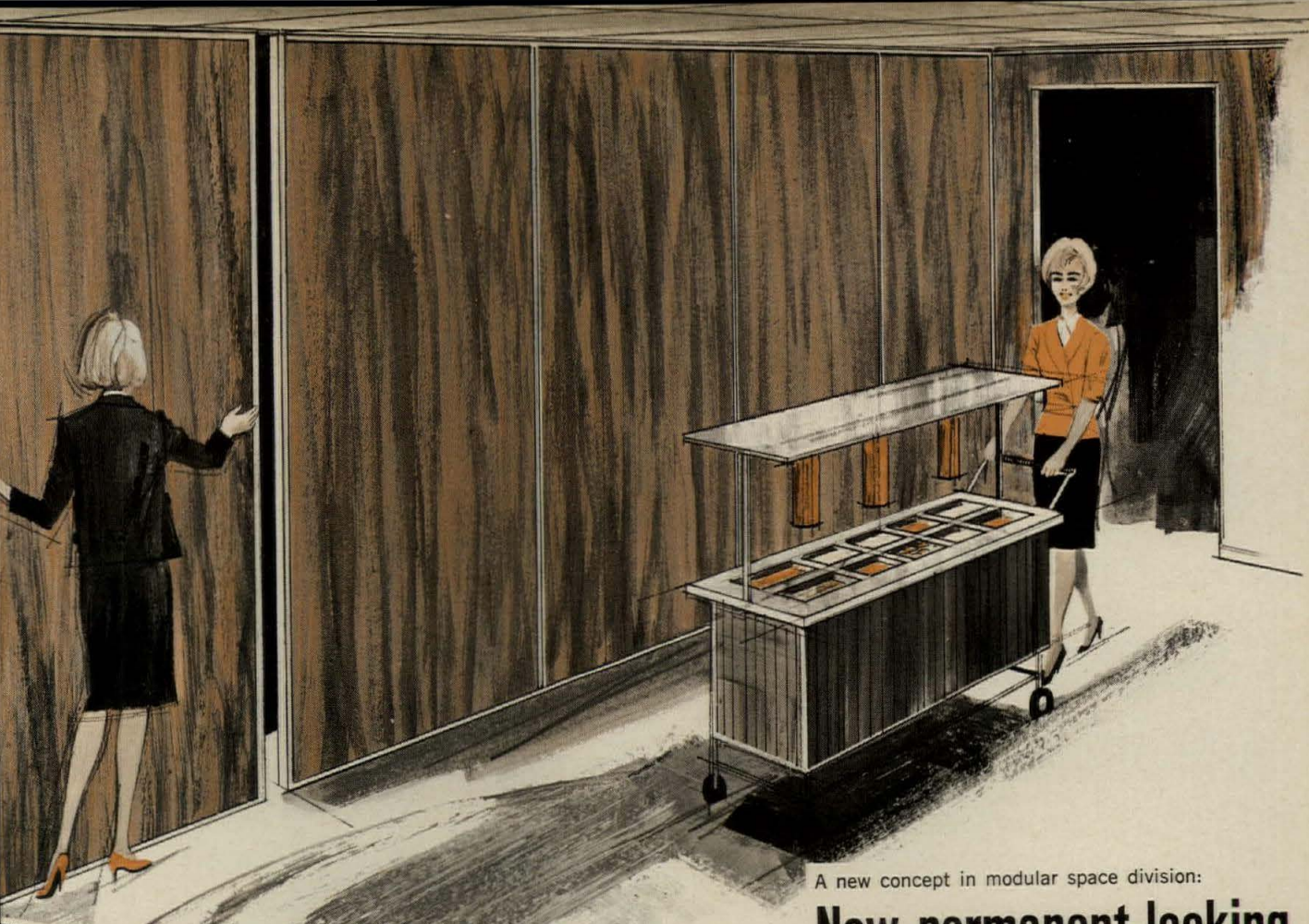
A major problem in the education of students is rising costs. If companies wish to insure the availability of college talent, they must help support colleges with financial aid.

SPECIAL TO CORPORATE OFFICERS—A new booklet of particular interest if your company has not yet established an aid-to-education program. Write for: **"How to Aid Education—and Yourself"**, Box 36, Times Square Station, New York, N.Y. 10036

COLLEGE IS BUSINESS' BEST FRIEND

Published as a public service in cooperation with The Advertising Council and the Council for Financial Aid to Education

For more data, circle 173 on inquiry card



A new concept in modular space division:

New permanent-looking movable walls let you decorate in over 1526 exciting patterns

Beautiful Kwik-Wall movable walls make it fast and easy to divide large areas into smaller profitable rooms. A choice of more than 1526 high-fashion laminates, vinyls, prefinished hardwood, print grains and unfinished ready-to-paint surfaces gives this movable wall a permanent look that will complement your decor. Both the fully portable units and the ceiling track-mounted Kwik-Wall movable walls have sound retardant qualities. Both lock solidly into position with a simple one-hand lever operation. Matching walk-thru doors are available for either style. For more information, send coupon today.

KWIK-WALL

KWIK-WALL CO., Box 319, Dept. A
Springfield, Illinois 62705

Please tell me more about KWIK-WALL movable walls.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ ZIP _____

☐ New construction ☐ Remodeling

Room(s) dimensions: _____

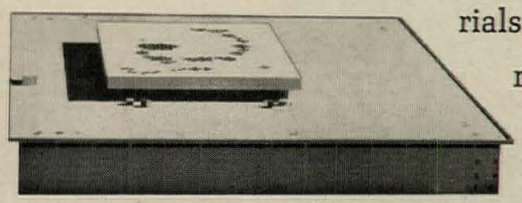
Construction date: _____

☐ Send literature ☐ Have representative call

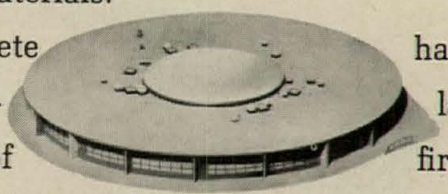
For more data, circle 174 on inquiry card

Perlite roof decks are exciting. Perlite insulating concrete isn't. It just lays there—forever.

Perlite concrete makes exciting roof decks a reality without any loss of functional properties. Unlike rigid insulating materials, its design properties are readily adaptable to your specific project. Thickness can be varied to provide simple drainage slopes or dramatic shapes. Superior thermal efficiency and strength make perlite preferable to other cast-in-place materials.

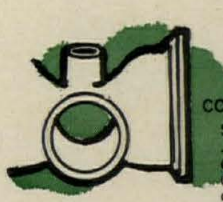


Perlite concrete has a reputation for lasting insulating efficiency plus a choice of fire ratings which often permit substantial insurance savings. It's been insulating all sorts of roof decks for 17 years. When you consider all data, you too will specify perlite insulating concrete roof decks. For information, write to PERLITE INSTITUTE INC., 45 WEST 45TH STREET, NEW YORK, N.Y. 10036.



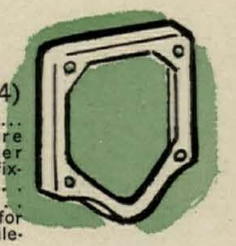
For more data, circle 175 on inquiry card

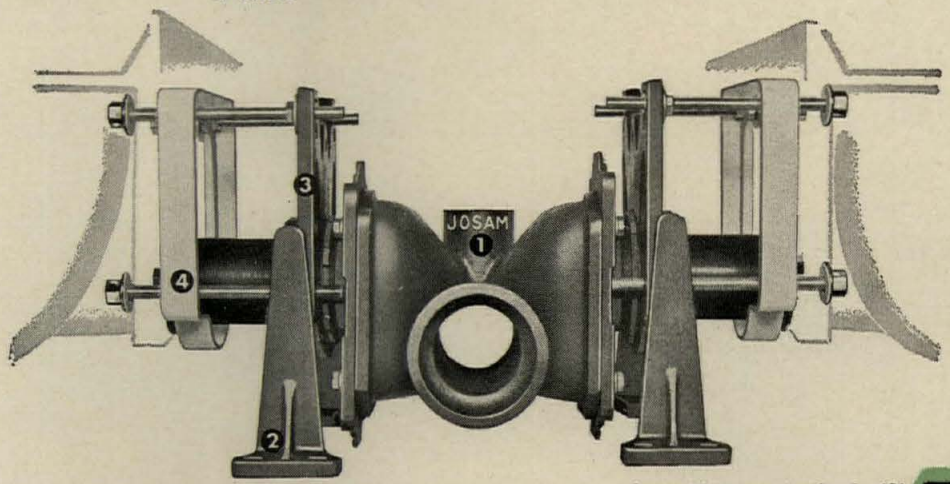
WHAT MAKES AN OFF-THE-FLOOR INSTALLATION COST LESS?



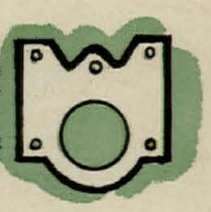
common vent (1)
Saves chase space . . . substantially reduces the number of connections required in a battery of toilets

positioning frame (4)
Simplifies alignment... Saves one or more hours of labor per bowl* . . . saves fixture breakage . . . saves call-backs . . . acts as template for wall finish, saving tile-setting time.

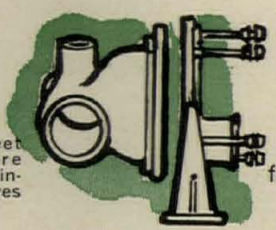




invertible carrier body (3)
Fits all types of toilets, blow-out or syphon jet . . . saves handling time . . . eliminates stocking and ordering of different carriers.



buttress foot (2)
Short Bulldog feet do not interfere with any type of finished floor . . . saves installation time



fitting and carrier are separate
provide more adaptability to meet changing conditions of installation . . . save revision time and labor

. . . put them all together . . . they spell JOSAM UNITRON®

AND THERE'S NOTHING ELSE LIKE IT!

Now . . . with all the other advantages of off-the-floor fixtures . . . there is no reason to allow installation costs to change your mind . . . if you use Josam Unitron Carriers and Fittings on the job. Every feature is designed not only to save time and prevent error, but to provide the adaptability that solves on-the-job problems.

The combined savings in space, materials and installation are substantial enough to make off-the-floor fixtures the logical choice on every job . . . if you use Josam Unitron Carriers! For further information, write for Manual F-4.

Verification on request

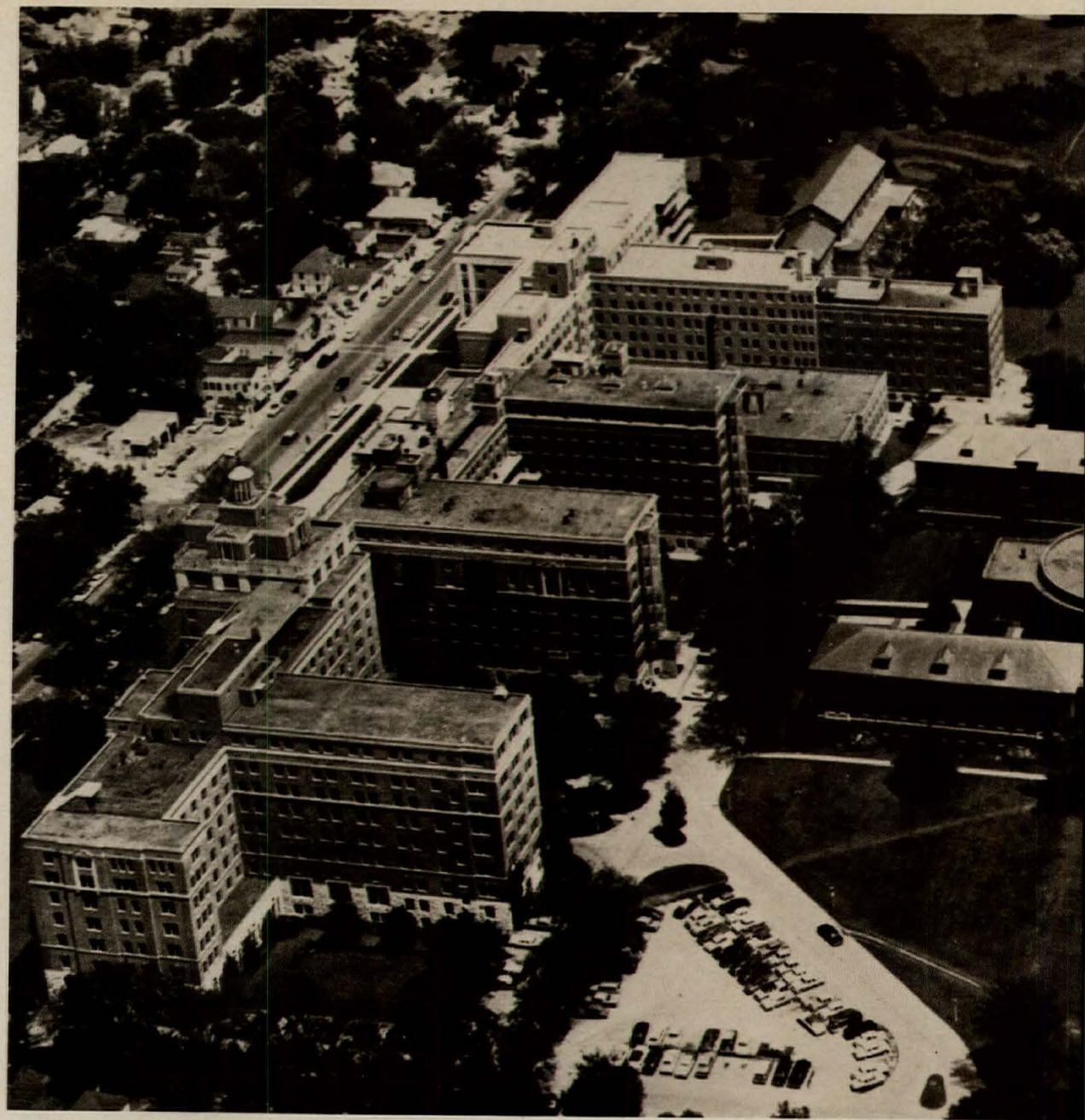
JOSAM

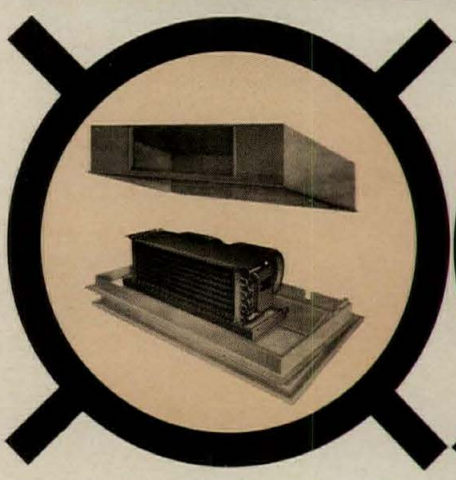
JOSAM MANUFACTURING CO.

Michigan City, Indiana

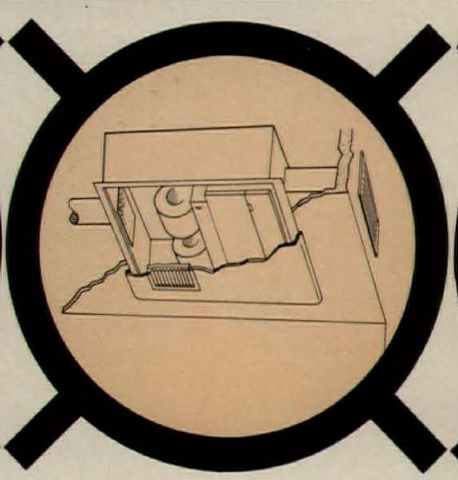
JOSAM PRODUCTS ARE SOLD THROUGH PLUMBING WHOLESALERS

For more data, circle 176 on inquiry card

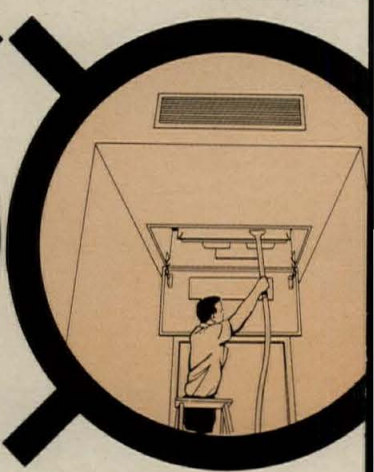




Unique cabinet design, ideal for remodeling or new construction, permits simplified installation in steps compatible with construction progress. Ceiling frame and panel are adjustable for easy field adaptation to any ceiling type.



Model CSH Hideaway Seasonmaker is completely, compactly enclosed in dropped ceiling of a patient room at St. Mary's Hospital. Fresh air is introduced through the fan coil unit in each room maintaining a positive room pressure. Temperature is regulated by individual room control.



Hinged ceiling panel with integral return air grill allows complete access to entire unit. Internal hinged plates of the base unit provide access for thorough cleaning of both coil faces. Now, this custom design offers easy, inexpensive maintenance for hospitals.

ST. MARY'S HOSPITAL, ROCHESTER LOOKED TO THE LEADER ...McQUAY FOR SEASONMAKER® REMOTE INDIVIDUAL ROOM AIR CONDITIONERS ENGINEERED FOR COMPLETE ACCESSIBILITY

St. Mary's, Rochester, Minnesota, is one of the country's largest private hospitals, with more than 900 beds. When the decision was made to air condition all the rooms in the entire hospital, including new and old wings, nursing school, business offices, laboratories, library and other facilities, St. Mary's logically looked to McQuay. McQuay had the best solution to the hospital's sensitive performance requirements. Custom engineered for the job, McQuay Hideaway Type Seasonmakers were selected for maximum accessibility, simplified installation with easy field adaptation to nearly any type ceiling, whisper-quiet operation and the comfort assured by individual room temperature control. You can meet precisely any air conditioning, heating or ventilating requirement when you specify McQuay. McQuay offers the widest range of remote type air conditioners for commercial, residential and industrial applications. Ceiling and Hideaway Seasonmakers are available in 4 models, each in 9 sizes from 200 thru 1,200 cfm. Ask your McQuay representative for catalog #714 or write direct.

Hospital Administrator:
Sister Mary Brigh, St. Mary's

Executive Engineer:
W. O. Cribbs, St. Mary's

Engineer: Evans, Michaud, Cooley, Hallberg & Erickson, Minneapolis

Architects: McCann-Wasmuth Architects, Minneapolis

Mechanical Contractor:
Utility Sales Engineering, Rochester

McQuay Rep.: B. H. L. Mechanical Equipment Sales Co., Minneapolis

nobtrusive, hinged ceiling plate neatly ncloses this Seasonmaker which was pped between the suspended ceiling bars of one of the hospital laboratories. eturn air grill and filter assembly with nged core permits easy filter maintenance by cleaning personnel without moving or dropping ceiling panel.

McQuay INC.

MAKE THE SEASONS COME TO YOU

Box 1551, 13600 Industrial Park Blvd. Minneapolis, Minnesota 55440

AIR CONDITIONING ■ REFRIGERATION
HEATING ■ VENTILATING

MANUFACTURING PLANTS AT FARIBAULT, MINNESOTA • GRENADA, MISSISSIPPI • VISALIA, CALIFORNIA

For more data, circle 177 on inquiry card

continued from page 234

STONE CATALOG / The 1966-1967 edition contains information on bluestone, granite, greenstone, limestone, marble, quartzite, sandstone, slate, specialty building stones and stone anchors. It also contains a list of natural stone producers, an index of trade names and an informative glossary of words and terms. Available to architects on letterhead request All others may purchase the book for $20 per copy. ▪ Building Stone Institute, 420 Lexington Ave., New York, New York.

WALLBOARD / "Water Resistant Tile Backer Board" is a new brochure detailing architectural specifications and application techniques. The board is especially good for high-moisture areas such as bathrooms, showers, kitchens and utility rooms. The gypsum core is fiberglass-reinforced, permanently water resistant, and has a one-hour fire rating. The four-page brochure contains pictures showing applications. ▪ Georgia-Pacific Corporation, Bestwall Gypsum Division, Paoli, Pa.*

Circle 413 on inquiry card

FLUORESCENT LAMP / This booklet explains the features of a lamp said to deliver up to 25 per cent more light and provide a practically constant light output over a broad temperature range. Technical information includes a temperature performance chart, operating data and a sketch of the lamp construction. ▪ Westinghouse, Bloomfield, N. J.*

Circle 414 on inquiry card

ACOUSTICAL DOORS / A new brochure describes sliding and swinging styles, frame and seal systems with sound transmission class ratings of 35 to 62 db. There are specifications for doors 1¾ to 4½ in. thick, door, frame, and sound seal details and typical single and tandem installations in addition to test performance data. ▪ Overly Manufacturing Company, Greensburg, Pa.*

Circle 415 on inquiry card

WALLPLATES / A 15-page catalog shows a wide selection of plastic and metal models, diagrams many variations and provides a table of descriptive information. ▪ Slater Electric Inc., Glen Cove, N. Y.

Circle 416 on inquiry card

MARBLE VENEER ANCHORING / A recently developed system offers a grid arrangement of metal struts and special fastenings, that provide anchoring for marble as thin as ⅞ in. in both exterior and interior applications. An eight-page brochure contains complete mechanical details and progress photographs of applications in both new construction and remodeling work. ▪ The Georgia Marble Company, Atlanta, Ga.*

Circle 417 on inquiry card

HARDBOARD AND SIDING / A four-page color brochure discusses and illustrates the uses of underlayment under all resilient floor coverings. Another four-page brochure describes all-weather, all-purpose sidings. ▪ Masonite Corporation, Chicago.*

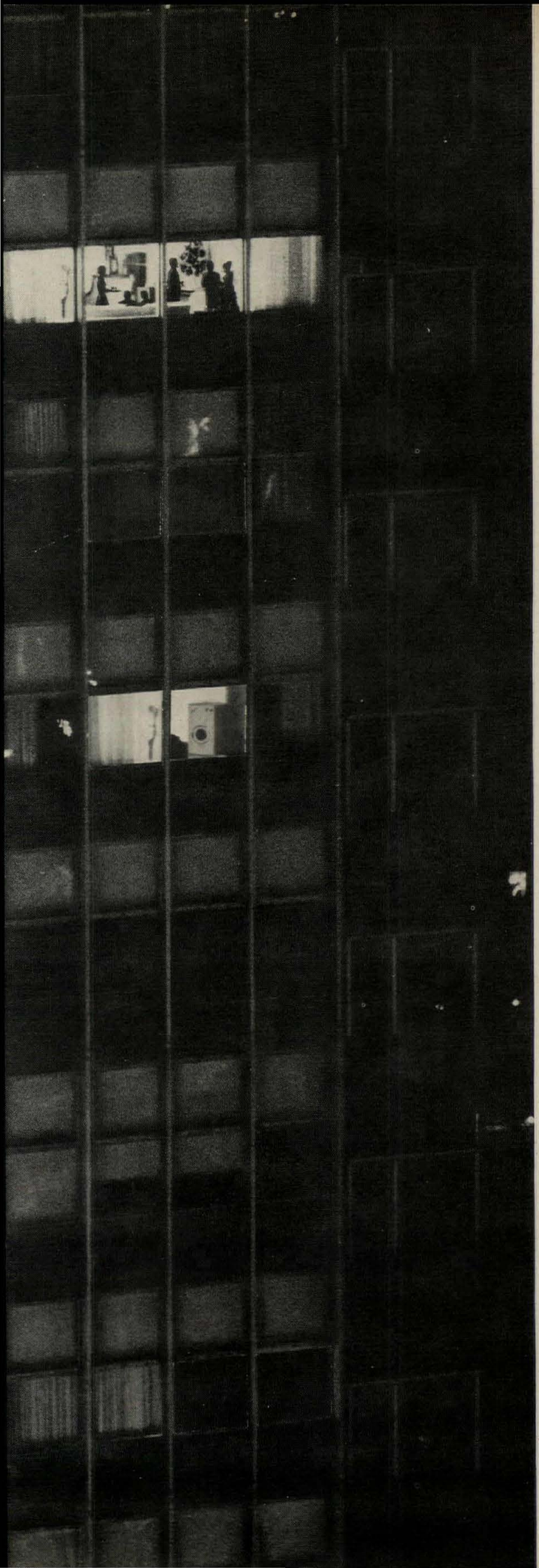
Circle 418 on inquiry card

CEILINGS / Three new booklets, each devoted to the use of multi-functional ceiling systems in school, retail store, or office installations, explain the savings on installation, operating, and maintenance costs. ▪ Armstrong Cork Company, Lancaster, Pa.*

Circle 419 on inquiry card

*Additional product information in Sweet's Architectural File

more literature on page 328



Cissell dryers like to live it up, too!

The Cissell Petite Dryer is specially designed for high rise apartments. It's as easy to install on upper floors as it is in a basement or ground floor service room. Convenient size (48″ high, 28¾″ wide, 30″ deep), light weight and easy venting simplify installation. And the Cissell Petite has all the features tenants want. Two temperature settings — 150 degrees and 185 degrees. Non-wrinkling cool-off period. Fast drying — ten pounds in twenty minutes. Big 16-pound dry weight capacity basket with 28″ drop to assure soft, fluffy drying. No-snag perforations to protect the most delicate clothes. Available for gas or electric operation . . . in any color to match your decorative schemes. Want bigger capacity for special applications? Cissell makes a full line of laundry dryers, including the 25-pound dry weight capacity Compact. W. M. Cissell Mfg. Co., Inc., Louisville, Ky.

Petite *Compact*

CISSELL®

Phone our computer...

and find out which lighting system is really most efficient, economical:

For the price of the call and a few minutes' time, you'll get back an answer you can save your clients money with.

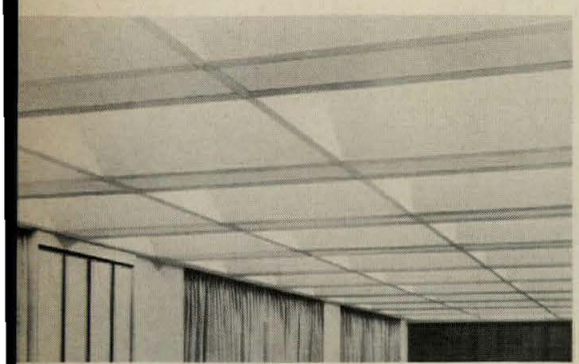
Here's how it works: at the Armstrong Computer Center, in Lancaster, Pa., an IBM 1410 system has been programmed to analyze six lighting systems for efficiency and economy in any given installation. Three systems are conventional ones in common use; the other three are Armstrong Luminaire Ceiling Systems. All six are illustrated and described below. Study them—with a hypothetical, or better yet, an actual installation in mind—and select the one conventional and one Luminaire system which seem most appropriate.

Next, fill out the simple form on the right, under "TELL COMPUTER OPERATOR," so you'll be ready to supply the necessary installation and system data when you call.

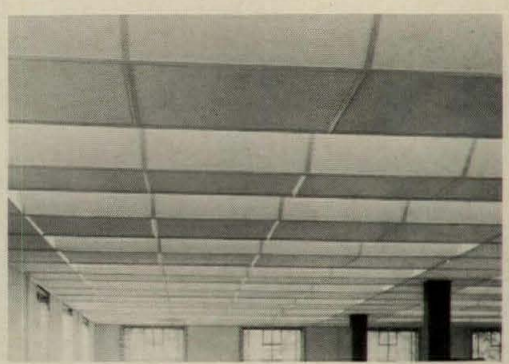
You'll note that we've filled in a column with the data f a sample problem. Use it as a guide in filling out the c umn for your problem.

After that, you're ready to phone our computer. As f what it will say back, take a look at the form on the righ under "OPERATOR READS ANSWER." As you can se you'll be getting back a complete rundown on the ef ciency and economy of each of the two systems you ha selected. The lefthand column gives an exact answer the conventional system half of our sample problem. Th two righthand columns are for recording each half of th computer's response to your own problem.

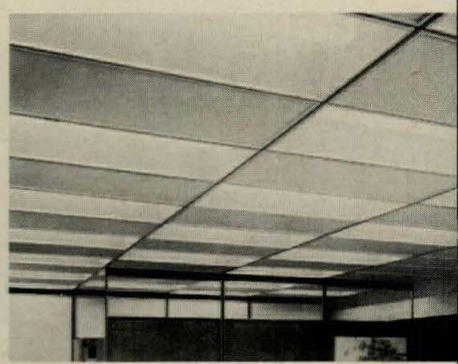
So go to it. The computer is all yours during the tim shown under the phone number on the right. And hope you have a very enlightening chat.



Armstrong A-50 Luminaire Ceiling System (5.0)
All ceiling functions integrated into one unit—lighting, air distribution, acoustical control. 50" square modules, closed both ends. Choice of one-, two-, or three-lamp fixtures, shielded or unshielded. 48" lamps (computer programmed for cool white). Vaulted modules combine with flat panels in any arrangement. (Coefficient of Utilization Range at Room Ratio 5.0, 30% Floor Reflectance, 50% Wall Reflectance: .75-.92)



Armstrong B-48 Luminaire Ceiling System (4.8)
All functions integrated into one unit—lighting, air distribution, acoustical control. 48" square modules, open both ends. One- or two-lamp fixtures, shielded or unshielded. 48" lamps each module, or 96" lamps running across each two modules (computer programmed for cool white). Vaulted modules combine with flat panels in any arrangement. (CU Range at Room Ratio 5.0, 30% Floor Reflectance, 50% Wall Reflectance: .75-.90)



Armstrong C-60 Luminaire Ceiling System (6.
All ceiling functions integrated into one uni lighting, air distribution, acoustical control. 30 60" modules, closed both ends. Choice of one- two-lamp fixtures, shielded or unshielded. lamps (computer programmed for cool whit Vaulted modules can be combined with flat p els in any arrangement desired. (Coefficient Utilization Range at Room Ratio 5.0, 30% Fl Reflectance, 50% Wall Reflectance: .80-88)

1. Call (717) 394-0785

Thursdays, to Nov. 17, at:

If you're on Daylight Time

Eastern	Central	Mountain	Pacific
4 to 5 p.m.	3 to 4 p.m.	2 to 3 p.m.	1 to 2 p.m.

If you're on Standard Time

Eastern	Central	Mountain	Pacific
3 to 4 p.m.	2 to 3 p.m.	1 to 2 p.m.	12 to 1 p.m.

2. Tell computer operator:

Your call goes directly to the Computer Center and a computer operator. Just read him the data you have jotted down in the form below, like so: "number one . . . one A; number two . . . six-zero," etc. Be sure to fill in and read off all 14 items and all digits for each item (using zeros where necessary).

	Sample Problem	Column for Your Problem
1. Conventional system selected (1C, 2C, or 3C—see below)	1A	
2. Luminaire system selected (50, 48, or 60—see below)	60	
3. Number of lamps per Luminaire module (see below)	2	
4. Length of lamps (48" only on five systems, choice of 48" or 96" on B-48 Luminaire—see below)	48	
5. Shields desired with Luminaire system? (1 if yes, 0 if no)	1	
6. Length of room	050.00	
7. Width of room	030.00	
8. Height of room	09.00	
9. Wall reflectance (Use 50%, 30%, or 10%)	50	
10. Floor reflectance (Use 30% or 10%)	30	
11. Maintenance factor (Use .70, .60, or .50)	.70	
12. Maintained footcandles desired*	100	
or		
13. Number of lighted modules desired*	0000	
14. Hours of operation per year	2500	

*In the example on the left, the desired footcandle level has been indicated, so the computer would solve for the number of lighted modules required to deliver it. If you wish, instead, to indicate the number of lighted modules desired and want to know what footcandle level they will maintain, enter 000 on line 12, and the number of modules desired (using a four-digit figure—e.g., 60 modules would read 0060) on line 13.

3. Computer solves problem:

Operator will feed your problem to computer. (Hold on; it will take computer some 30 seconds.) In solving your problem, computer will assume the following:

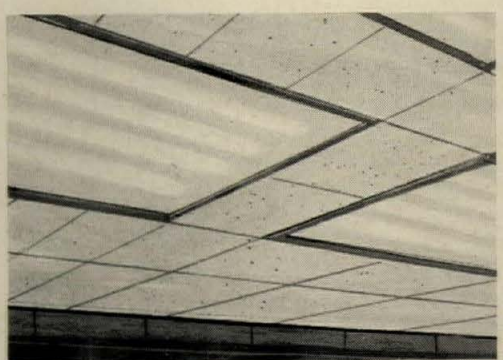
KWH rate—$.02. Cost for 48" T12, cool white, rapid-start lamp—$.70. For 98" lamp—$1.65. Lumen output for 48" lamp —3,150. For 96" lamp—6,100. Watt rating for 48" lamp—40. For 96" lamp—75. Hours of life for 48" lamp—12,000. For 96" lamp—9,000. Ballast wattage allocated for 48" lamp—6 watts. For 96" lamp—12.5 watts.

4. Operator reads answer:

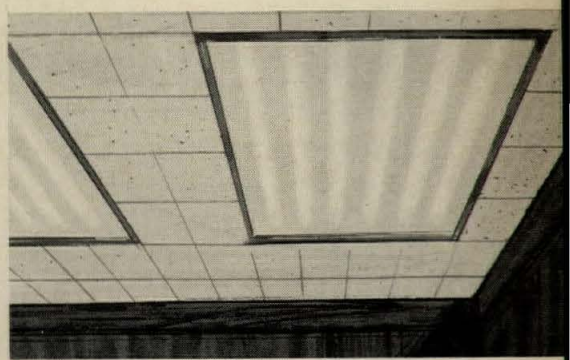
When computer finishes run, operator will read back answer data. Enter it in the columns provided below. When finished, he'll ask if you'd like him to repeat any items. Later, we will send you the print-out sheet for your problem.

	Answer To Sample Problem (Conventional System Only)	Answer To Your Problem: Conventional System	Answer To Your Problem: Luminaire System
1. Total lamp lumens	391252.0		
2. Number of lighted modules	62		
3. Footcandles (Maintained)	100		
4. Footcandles (Initial)	143		
5. Watts per square foot	3.803		
6. Annual operating cost	$ 285.20	$	$
7. Annual lamp replacement cost	$ 18.08	$	$
8. Initial lamp cost	$ 86.80	$	$
9. Do number of lighted modules fit in room?	☑ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO

nventional Lighting System No. 1 (1A) ' x 48" shielded, recessed troffers—each using 48" cool white lamps. (Coefficient of Utiliza- at Room Ratio 5.0, 30% Floor Reflectance, % Wall Reflectance: .60)



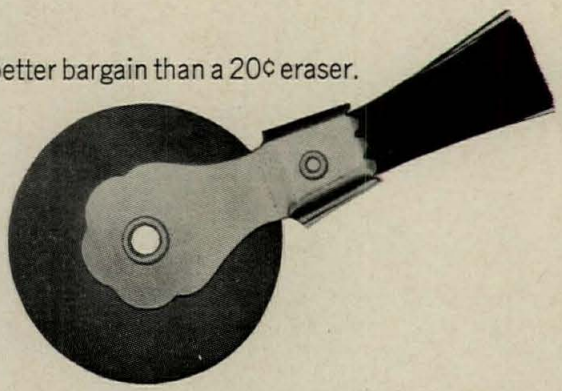
Conventional Lighting System No. 2 (2A) 24" x 48" shielded, recessed troffers—each using four 48" cool white lamps. (Coefficient of Utilization at Room Ratio 5.0, 30% Floor Reflectance, 50% Wall Reflectance: .68)



Conventional Lighting System No. 3 (3A) 48" x 48" shielded, recessed troffers—each using six 48" cool white lamps. (Coefficient of Utilization at Room Ratio 5.0, 30% Floor Reflectance, 50% Wall Reflectance: .68)

The $10,000 typewriter.

It's a better bargain than a 20¢ eraser.

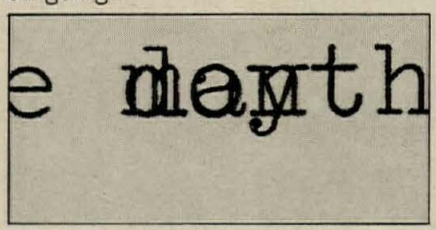


The new IBM Magnetic Tape Selectric® Typewriter, (MT/ST for short), costs ten thousand dollars.

And it's worth every penny.

Before, when a typist made a mistake, she had to stop typing and erase it. Or maybe even start all over again.

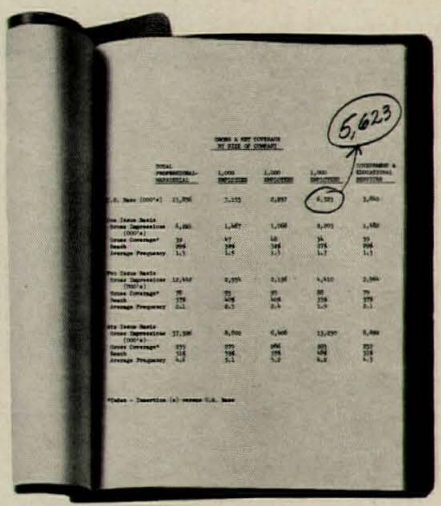
But with the new IBM® MT/ST, she simply backspaces, retypes, and keeps on going.



The mistake is changed on magnetic tape, where all typing is recorded and played back correctly at incredible speed. (Roughly 15 characters per second.)

That's not all.

Suppose you've had second thoughts about some words. And you want to make changes. No problem.



Only your changes are retyped. The rest is automatic.

Now for the $10,000 question: What does the new IBM MT/ST mean to you?

For one thing, a girl who types 80 words per minute won't end up averaging a slow 20 wpm because of constant retyping or restarting.

For another, the IBM MT/ST shortens the time gap between your first draft and the finished document.

In fact, you'll be able to handle correspondence, contracts, proposals, and building estimates more than 50 percent faster. (With less proofreading, too.)

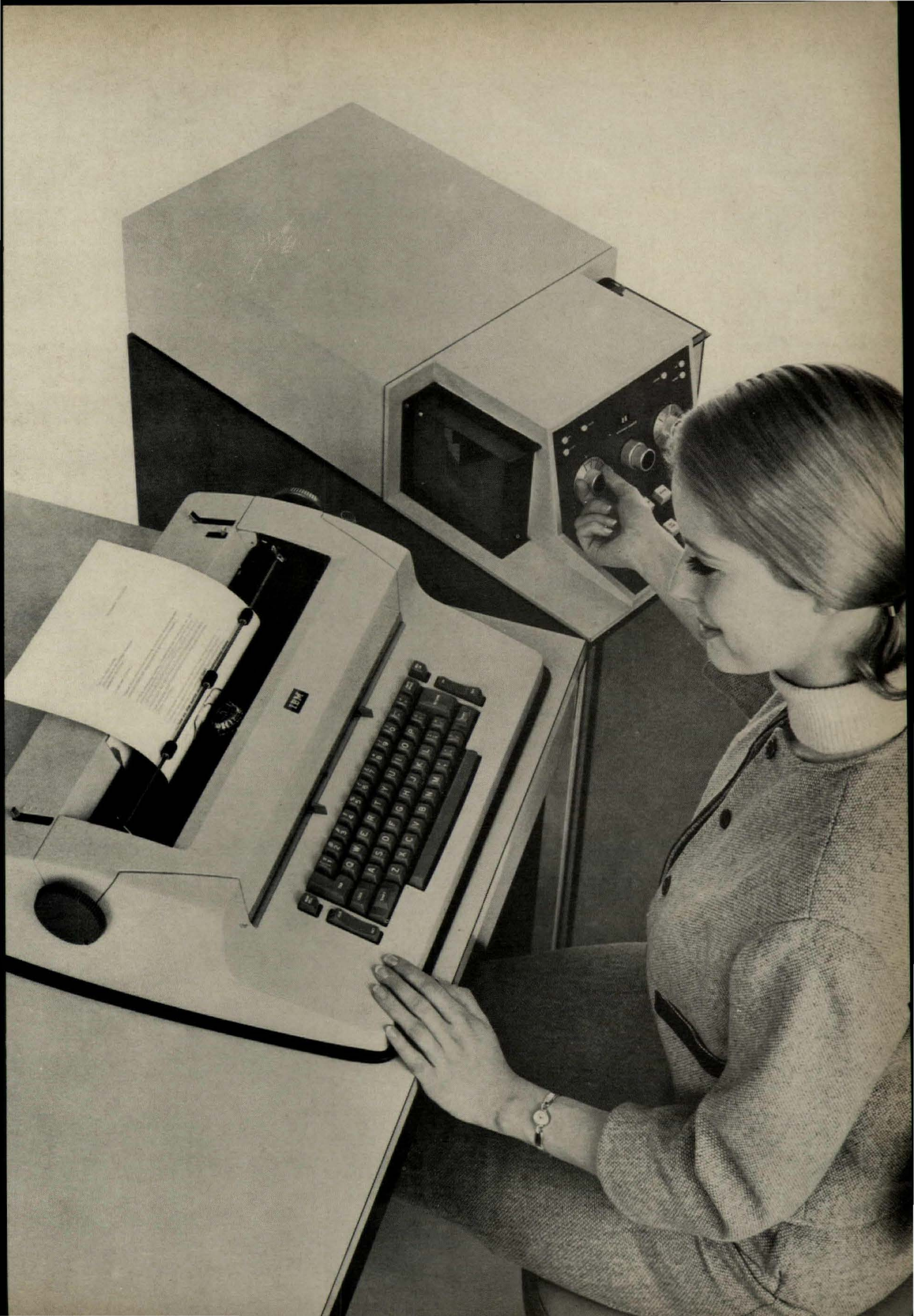
The new IBM MT/ST: more power and more productivity. Ask your IBM Representative for the complete story.

Remember, you have to stop typing to use a twenty-cent eraser.

And that's the rub.

IBM

For more data, circle 182 on inquiry card



continued from page 320

BLANKET INSULATION / Literature describes a glass-fiber blanket that provides both thermal and acoustical insulation for temperatures from zero to 450 deg. The blanket may be used for buildings, ducts, tanks, vessels and ovens. It also serves as insulating and sound-quieting lining for heating, ventilating, and air-conditioning ducts, and provides acoustical correction and noise control of equipment and appliances. ▪ Baldwin-Ehret-Hill, Inc., Trenton, N. J.

Circle 420 on inquiry card

CONTROL VALVES / A 28-page booklet on selecting valves for steam and water systems discusses valve types, ratings and characteristics, and covers design of steam and water distribution systems. The "water" section, for example, includes sections on control methods, distribution systems, supply pressure differentials and valve selection. The booklet includes reference tables and nomographs for figuring steam and water flows and valve sizes. ▪ Honeywell Commercial Division, Minneapolis.

Circle 421 on inquiry card

DEAERATOR / An 8-page bulletin describes a 300,000-lb/hr. deaerator and contains a detailed description of the system, which combines deaerator and surge-tank functions. The system is designed for oxygen removal to .005 cc/liter over a 10-to-1 load swing. ▪ Schaub Engineering Company, Downers Grove, Ill.

Circle 422 on inquiry card

VENTILATORS / Centrifugal roof and wall ventilators are shown in an 8-page bulletin that includes photos, engineering drawings plus unit dimensions and performance ratings covering 114 roof and wall models. The units feature weatherproof construction with fabricated aluminum on all exposed parts. ▪ Aerovent Fan Company, Inc., Piqua, Ohio.

Circle 423 on inquiry card

ALUMINUM IN ARCHITECTURE / Detailed information on alloys, finishes, *Sol Dec* and *Alshade* solar screens, *Alply* exterior and interior panels and extruded shapes are given in a new 14-page bulletin. Samples of Alcoa's architectural colors, including the new *Duranodic 300* colors, are shown as are colored photos of well known buildings in which aluminum is prominently used. ▪ Aluminum Company of America, Pittsburgh, Pa.*

Circle 424 on inquiry card

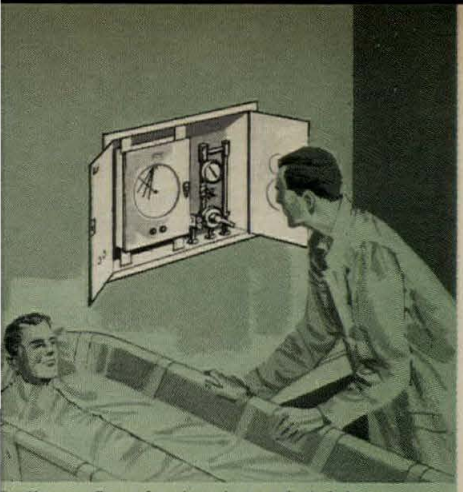
DIMMER INFORMATION / A new 8-page brochure, No. 52F-160, gives detailed information on all UL-listed incandescent dimmers manufactured by the company. Included is operational data and application information on the new 1800-watt modular dimming system, single-pole and three-way 600-watt dimmers, and the 1000-watt single-pole dimmer. ▪ General Electric, Wiring Device Dept., Providence, R. I.*

Circle 425 on inquiry card

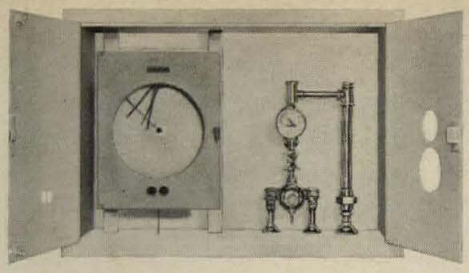
FLOOR BOX CATALOG / A new 16-page catalog of floor boxes and accessories illustrates a complete line of both galvanized steel and cast-iron floor boxes in adjustable and non-adjustable models. Details are given of aluminum and bronze floor plates, which can be ordered separately. A special feature of the new catalog is a range of floor boxes designed to meet the electrical requirements of thin slab concrete floors. ▪ Steel City Division, Midland-Ross Corp., Pittsburgh.*

Circle 426 on inquiry card

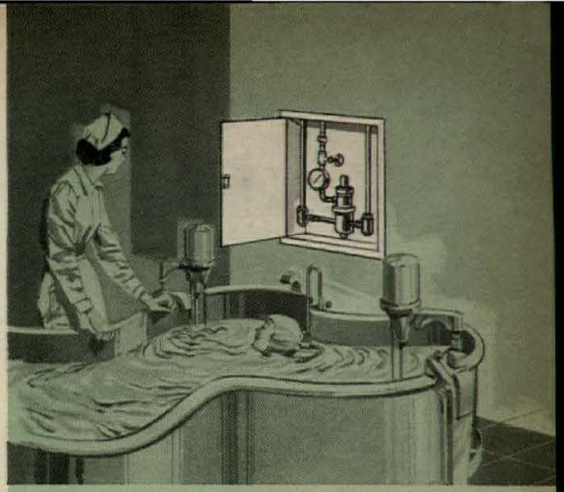
*Additional product information in Sweet's Architectural File



Continuous flow of water at pre-selected temperature. Visual and permanent record of water temperatures, plus audio and visual alarm to protect patient against low or high temperatures.

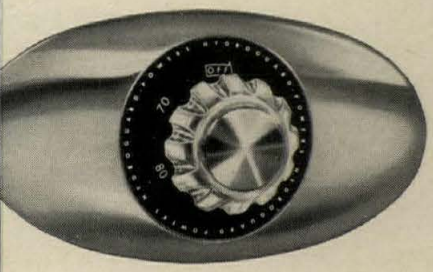


POWERS CABINET SUPPLY FIXTURE
Combines a Series 420 or Series 430 Hydroguard thermostatic water mixer, volume control and shut-off valve, dial thermometer, vacuum breaker and recording thermometer alarm unit.

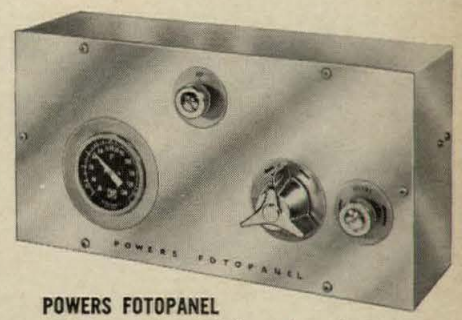


Powers Series 430 Hydroguard for the full body immersion bath thermostatically blends hot and cold water to the desired delivery temperature.

POWERS HYDROGUARDS for SAFETY, COMFORT and CONVENIENCE

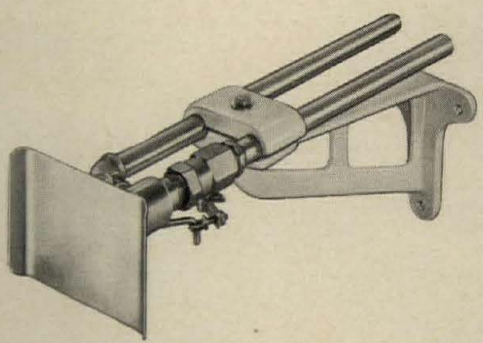


POWERS SERIES 420 HYDROGUARD
A thermostatic water mixer that maintains delivery water temperature at precisely the temperature selected.



POWERS FOTOPANEL
Includes a thermostatic water mixer, separate volume and shut-off valves, dial thermometer and vacuum breaker all enclosed in a stainless steel panel.

A gentle nudge on the knee plate immediately starts or stops the flow of water to the scrub sink. Temperature of the water is pre-selected and maintained by the Hydroguard.



POWERS KNEE-TOUCH VALVE
An on-off valve that operates in conjunction with the Series 420 or Series 430 Hydroguard thermostatic water mixer.

FOTOPANEL maintains constant quality X-ray films because process water is held to precise temperature limits.

Powers *thermostatic* water mixers maintain constant delivery temperature DESPITE fluctuations in pressure or temperature of hot and cold supply water. When Powers control systems are specified for X-ray developing, scrub-up sinks, hypothermia, and hydrotherapy units, you get the benefit of our seventy-five years experience in the research, design and manufacturing of water mixing equipment.

OUR 75th YEAR

Manufacturers of temperature control, water mixing, industrial process, and pneumatic despatch systems.

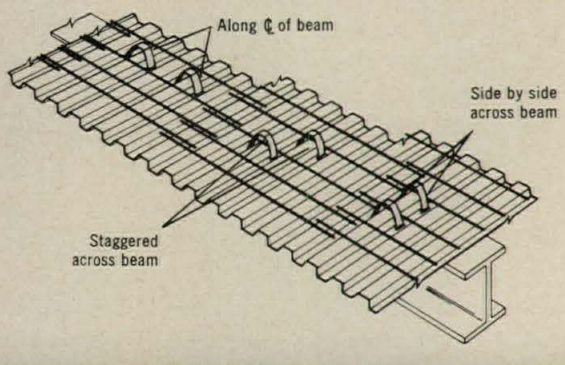
THE POWERS REGULATOR COMPANY

Dept. 966 Skokie 8, Illinois / Offices in Principal Cities in U.S.A. and Canada

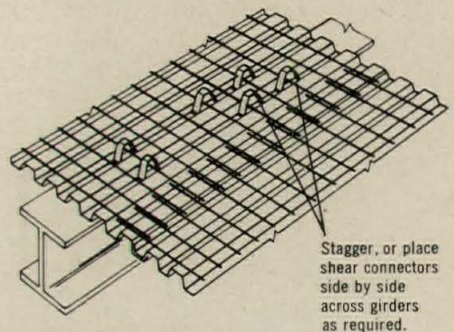
27-100

For more data, circle 184 on inquiry card

Typical Placing Patterns on Beam



Typical Placing Patterns on Girder



REDUCE THE COST OF COMPOSITE CONSTRUCTION

with this new Cofar Shear Connector utilizing new AISC specification

Here's how to put even more economy into an already economical floor system. This new shear connector from Granco was designed specifically for use with Cofar,® Granco's combined form and reinforcement for concrete slabs. It permits designers and builders to use Cofar in composite construction, the structural design which unites the concrete floor slab and supporting members into a single working unit of greater strength and stiffness. Composite design provides reduction in weight of steel beams as much as 30%. The cost of steel frame and beam fireproofing are substantially reduced.

Now look at the even greater cost-saving of Cofar and the new shear connector:

1. Provides the only shear connector with 11.0 Kip capacity which can be welded through steel sheets with 1.25 oz. specification galvanized coating.
2. Requires only one welding operation to fasten connector and Cofar to frame.
3. Shear connector can be placed without cutting holes in deck.
4. Permits welding of connectors in the field with conventional arc welding equipment.
5. Simplifies detailing and erection.

See Sweets file, or write today for literature with complete details about Cofar composite design utilizing the new shear connector. Granco Steel Products Company, 6506 North Broadway, St. Louis, Mo. 63147. A subsidiary of Granite City Steel Co.

GRANCO®

IMAGINATION IN STEEL

Steel

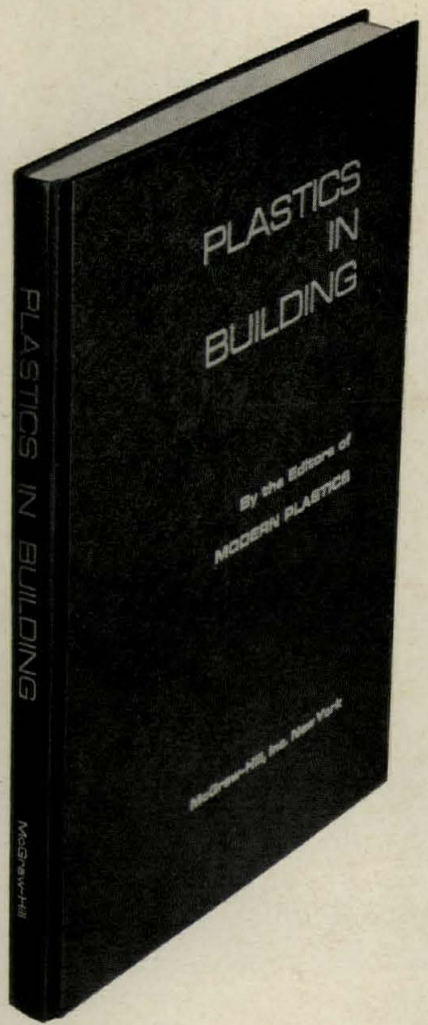
For more data, circle 185 on inquiry card

JUST PUBLISHED!

A special compilation of outstanding features on building from Modern Plastics, this 192-page volume is a most comprehensive reference work on one of plastics fastest growing markets.

Here you'll find hundreds of examples of plastics applications in construction—from interiors to exteriors, from small garden domes to huge ball-park structures. You'll have at your fingertips basic data and charts on materials, properties, and processes; on costs and consumption. You'll discover what other companies are doing in this field, what manufacturing sources are being developed, what end products are available, what gaps in construction have yet to be filled.

Here is an essential text, expertly compiled and edited for all who are engaged in, or who are interested in, the rapidly expanding field of **Plastics in Building**



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NAARCO NEWS

T.M.

1

Naarco Curtainwall passes strenuous water, air-leak tests

The Detroit Testing Laboratory recently created a man-made storm to see how well NAARCO curtainwall would perform under extreme weather conditions.

The test, performed on a full sized curtainwall section, simulated an 8-inch per hour downpour with 50 mph winds, with the help of fifteen spray nozzles. Structural strength was measured at the equivalent of a 100 mile an hour wind.

The tests, made in accordance with curtainwall specifications of the National Association of Architectural Metal Manufacturers, were sponsored by NAARCO to insure performance specified by the architect who designed the building.

Thanks to NAARCO's unique drainage system and precision fabrication, the tests were successful. For additional information on the results circle No. 1 on the return coupon.

2

Naarco has research firm ask architects to rate future of curtainwall

An independent research firm recently completed a study of architects across the country in which respondents were asked to forecast the future of curtainwall.

The project, while sponsored by NAARCO, was done anonymously over 1,000 architects in order to keep results unbiased.

The question was asked: "What, in your opinion, is the future of curtainwall that can incorporate lights, vents, and panels of precast concrete, aggregate, porcelain and many other materials?"

The results indicate most architects know the value and scope of modern curtainwall. The breakdown is as follows:

RESEARCH RESULTS

"Excellent . . . has a good future"	36%
"Good . . . has a few limitations"	38%
"Fair . . . has quite a few limitations	13%
"Poor . . . passe, already overused"	12%
No opinion	1%

For additional information on the findings, circle No. 2 on the coupon.

3

Naarco expands plant to handle zooming building product sales

Because of the soaring dem from architects for more tom effects through the us curtain and window w along with popular stan shapes, NAARCO has creased their manufactu capacity by 33%.

President Bob Barnard says that along with the creased capacity, NAAR has converted their produc concept from a "job-fl method to a modern "ta synchronization" method.

The difference is that the " flow" method, used by n fabricators, finds equipm and labor tied to a single from the time it comes in door until the day it's ship on a first-come, first-s basis.

NAARCO's new conc which has been in effect six months, now has most being completed on a pro tion-run basis, with dep mentalized labor perform multiple operations and all departments synchron to produce the product n quickly and more econ cally. For more data, circle 3 on the coupon.

4

arco teams up with chitect to achieve stom look on hospital

hen the C. F. Murphy sociates designed the ad- ion to the Mercy Hospital Chicago, Ill., they did it ht. After capturing the look y wanted, they designed windows to fit their build- instead of building around ndard windows.

e result is a massive, beautiful, custom window wall. The windows are floor-to-ceiling with a unique combination that uses one large fixed, double glazed window with small, single vents in each section.

NAARCO, who supplied the windows, took the architects' design and completed the total job; including extruding, machining, finishing, assembly, and erection. For information on custom windows, circle No. 4 on the coupon.

5

Naarco gets patent on new etching process... key to better finishes

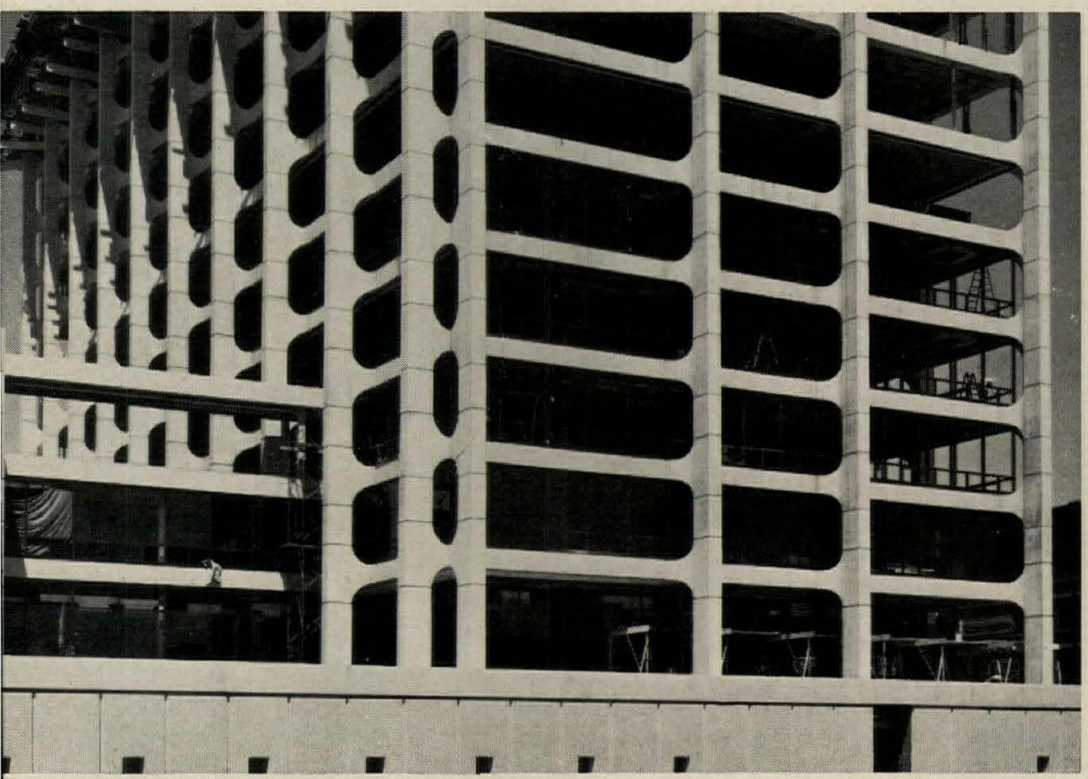
Patents on a new etching process, which results in more uniform color and finish on aluminum windows and curtainwall, have just been granted to NAARCO.

NAARCO Vice President, Ross Griffith, says the new process called NAAR-ETCH gives a "continuity of finish over an entire surface" heretofore difficult to achieve.

The process produces an etching during pre-treatment that permits better control of materials during anodizing. The result is a better quality finish for all standard Naarcolor architectural tones.

The process, developed during research in NAARCO's own laboratories is being made available to qualified licensees both in the U.S. and industrialized parts of Europe.

For more information of "NAAR-ETCH" circle No. 5 on the return coupon.



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Please send me more information on the following articles:
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Name_____ Title_____
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City_____

For more data, circle 189 on inquiry card

ON THE CALENDAR

SEPTEMBER

21-23 International Conference on Space Structures—Battersea College of Technology, London.

27-30 Producers' Council 45th Annual Meeting—Waldorf-Astoria, New York.

OCTOBER

3-6 Institute of Electrical and Electronics Engineers, Industry and General Applications Group Annual Meeting—Conrad Hilton Hotel, Chicago.

17-21 Annual Meeting and Transportation Engineering Conference, American Society of Civil Engineers—Hotel Sheraton, Philadelphia.

24-28 Fall Convention, American Concrete Institute—Jung Hotel, New Orleans.

26-29 American Institute of Architects South Atlantic Regional Conference, "Architecture's Challenge — America's Future"—Queen Charlotte Hotel, Charlotte, N. C.

27-29 Pennsylvania Chapter, American Society of Landscape Architects Regional Symposium, "Toward A More Livable City,"—Hotel Hershey, Hershey, Pa.

OFFICE NOTES

OFFICES OPENED

Richard T. Acott, Architect, has opened an office at 53 West Jackson Boulevard, Chicago.

David A. Crane, formerly Planning Administrator of the Boston Redevelopment Authority, has opened an office as **David A. Crane, Architect** for the practice of urban planning and design, 168 Patton Lane, Radnor, Pa.

Dimitri J. Ververelli, architect, has opened an office at 1500 Chestnut Street, Philadelphia.

NEW FIRMS, FIRM CHANGES

John R. Maslen, A.I.A. has joined **Barnes & Hilgers, Architects** as a partner to form **Barnes, Hilgers & Maslen,** 233 S.W. Front Ave., Portland, Ore.

Hobart D. Betts, Architect is a new architectural firm at 41 East 57th Street, New York City.

Thomas P. Black and **Thomas R. Pagliuso** (formerly of Black, Pagliuso & Associates, Palos Verdos, Calif.) and

continued on page 346

The complete professional library of colors, patterns and woodgrains... *for specifying Consoweld laminated plastic*

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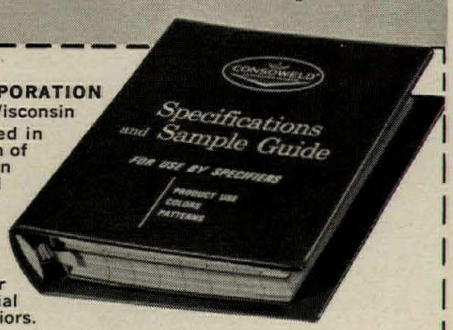
Sirs: I am interested in Consoweld's program of improved accuracy in specifying laminated plastic for walls, fixtures, furniture, wainscoting, kitchen and restaurant counters, vanities, and cabinet faces for residential, commercial and institutional interiors.



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10-A

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Announcing the 1966-67

DESIGN IN STEEL

Award Program

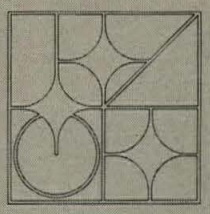
For DESIGNERS, ARCHITECTS and ENGINEERS: American Iron and Steel Institute announces the third Design In Steel Award Program offering wide recognition for imaginative use of steel in the design or engineering of any kind of product or structure.

ELIGIBILITY: Individuals or teams of professionals practicing in the fields of design, architecture or engineering in the Americas are eligible. Entries may include design or engineering of any kind of product, structure or component offered for sale or completed after January 1, 1964.

AWARD CATEGORIES: Two awards are offered in each of eight classes of products and structures listed below—one for the best design in steel, with emphasis on aesthetic appearance; the other for the best engineering use of steel.

- Consumer Products
- Industrial Products
- Commercial Equipment
- Automotive Products
- Residential Construction
- Low Rise Commercial, Industrial or Institutional Construction
- High Rise Commercial, Industrial or Institutional Construction
- Public Works Construction

ENTRIES are being accepted now. They are unlimited in number and may be made directly by designers, engineers or architects, or by any other person in their behalf. It's easy to enter—the only materials required are: a completed entry form, and a photograph and description of the product or structure entered. Entries close January 27, 1967.



FOR COMPLETE INFORMATION, including entry form, write to:
Coordinator, Design In St
Award Program
National Design Center
415 East 53rd St.,
New York, N.Y.
10022

JUDGES

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James H. Harlow
President
American Society of
Mechanical Engineers, 1966-67

Morris Ketchum, Jr.
President
American Institute of
Architects, 1965-66

Donald L. McFarland
Director
Industrial Designers Society
of America, 1966-67

Joseph M. Parriott
President
Industrial Designers Society
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Arthur J. Pulos
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of America, 1966

Robert H. Roy
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Engineering Education, 1966-67

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of Architecture, 1965-67

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Steel

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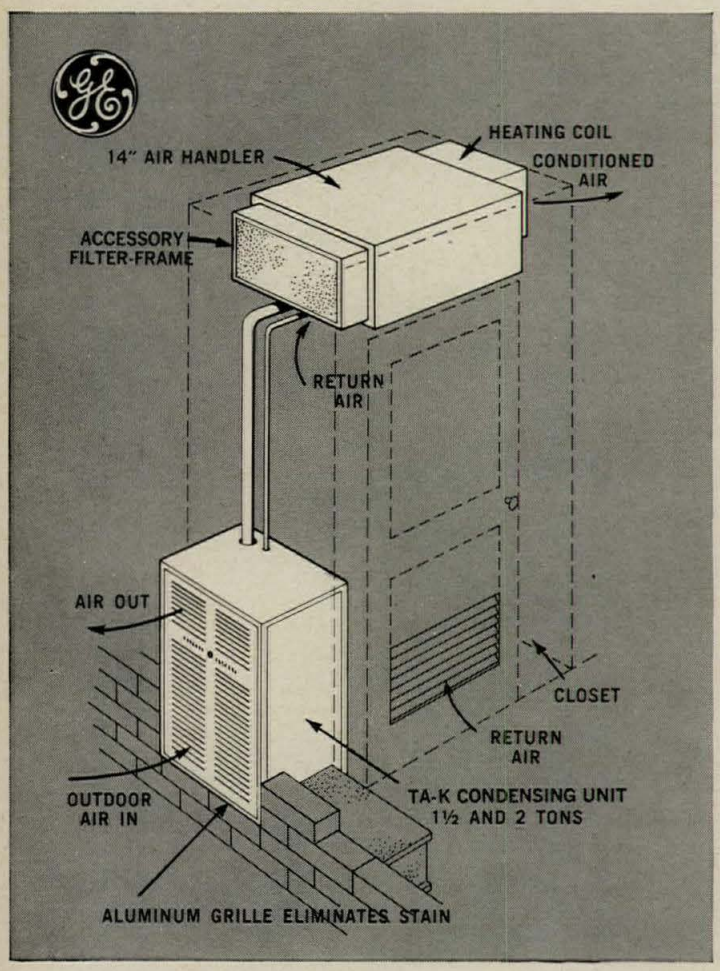
WHATEVER YOUR AIR
GENERAL ELECTRIC

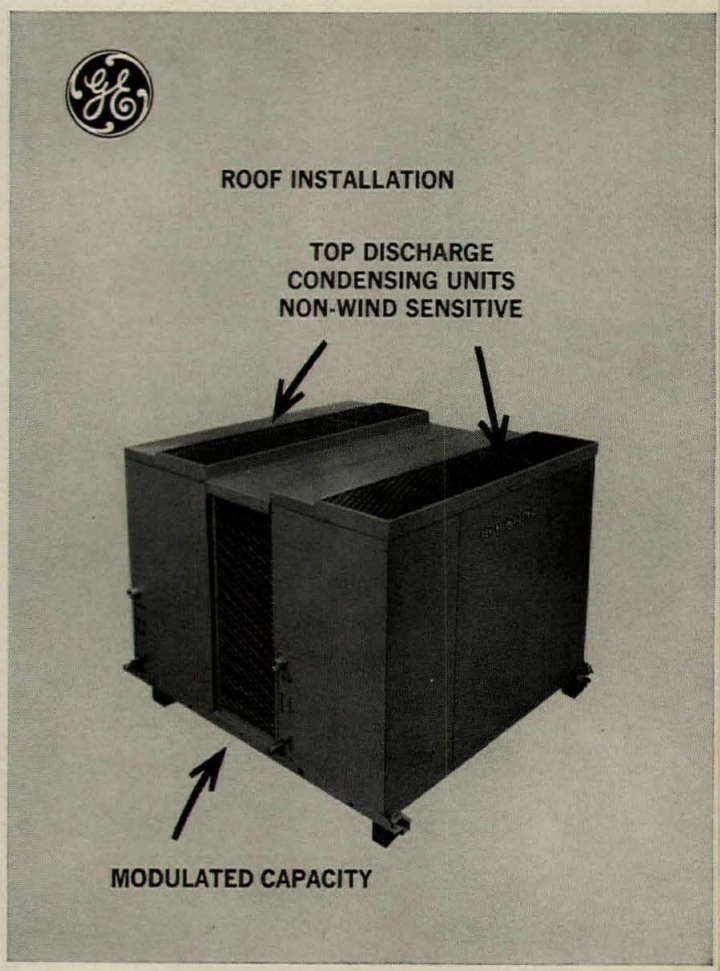
NEED: "...a flush-mounted condensing unit for high-rise apartments . . . compact . . . that won't stain exterior walls."

ANSWER: New through-the-wall, air-cooled unit couples with compact vertical or horizontal air handlers that fit in a closet or furred-down ceiling.



NEED: ". . . top-discharge condensers . . . for split system application . . . small residential to large commercial installations."

ANSWER: The *new* G-E line, ranging from 1½- to *full* 16- and 20-ton units, with choice of vertical or horizontal air handlers.



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ANSWER: The new "closet oriented" General Electric water-cooled single-package air conditioner that provides individual metering, too.

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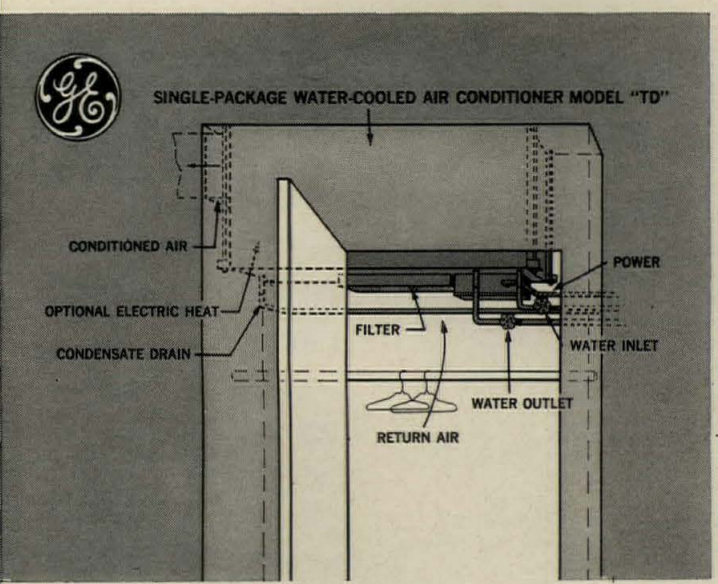
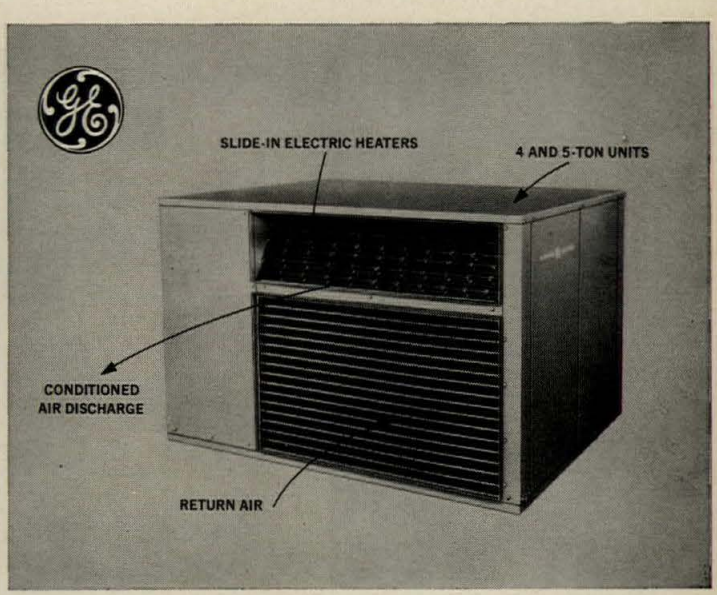
ANSWER: New 4- and 5-ton model single-package air conditioners and new *High Reliability* Weathertron® heat pumps with slide-in electric heaters.





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GENERAL ELECTRIC

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continued from page 338

Frank T. Sata and **William L. O'Dowd** have formed a partnership for the practice of architecture at 27640 Silver Spur Road, Rolling Hills Estates, Calif.

William E. Folsom has joined **Herman Blum Consulting Engineers** of Dallas as head of the lighting design engineering department.

With the admission of **Ernest R. Gilbert** as a partner, the Richmond firm of **Budina and Freeman, Architects** will be **Budina, Freeman and Gilbert.**

Leonard A. Collins and **John T. Collins** have formed the architectural firm of **Collins & Collins,** Hardy Building, Gulfport, Miss.

Vauldine A. Curtis & Associates is a new engineering and architectural firm at 3700 Upton Ave., Toledo, Ohio.

The Los Angeles architectural firm of **Daniel L. Dworsky & Associates** has promoted **Norman N. Rosen** to associate status.

The Freeman-White Associates is the new name for the Charlotte, N. C. architectural firm previously **Walter Hook Associates.**

Jules Gregory, Architect of Lambertville, N. J. has announced that **Allan Blauth,** his associate, will join him in **Gregory-Blauth, Architects.**

The Phoenix architectural firm of **Guirey, Srnka & Arnold, A.I.A.** has promoted **H. Maynard Blumer, C.S.I.** to associate architect.

Gale A. Hill & Associates, A.I.A. is the new St. Louis, Mo. architectural firm at 11722 Studt Avenue.

William Edward McClurg, A.I.A. and **Edward Ritter Wall, R.A.** are the principals of the new partnership of **McClurg and Wall, Architects,** 1369 Laskin Road, Virginia Beach, Va.

Rudolph J. Nedved, A.I.A. and **Mrs. Elizabeth Kimball Nedved, A.I.A.** have formed the new architectural and hospital consulting firm of **Nedved & Kimball,** 360 North Michigan Ave., Chicago.

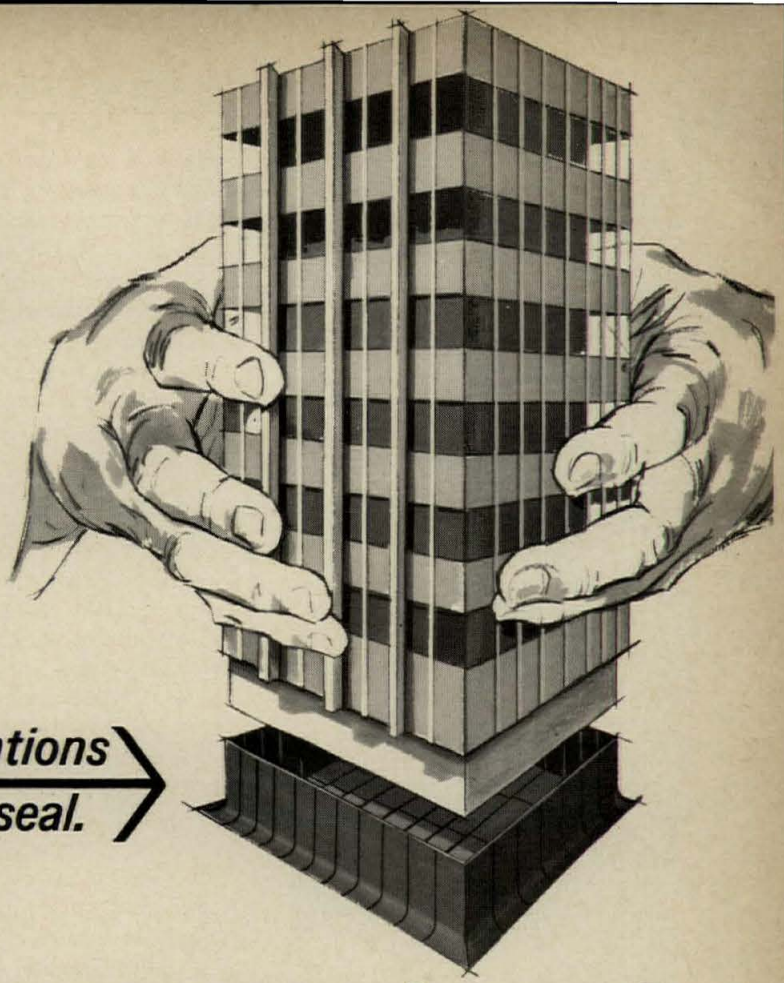
John A. Busby, Jr., A.I.A. has joined **Henri V. Jova, A.I.A.** and **Stanley L. Daniels, A.I.A.** in the Atlanta firm to be known as **Jova/Daniels/Busby, Architects,** 75 Cone St., N. W.

The New York City planning and architectural firm of **Charles Luckman Associates** has appointed **A. James McArthur** vice president and general manager.

Charles M. Sappenfield, Jan M. Wiegman and **Joseph K. Hall** have formed **Sappenfield, Wiegman, Hall Associates, Architects** at 69 Haywood Street, Asheville, N. C.

Frank C. Hartzell, Jr. and **John J.**

continued on page 354



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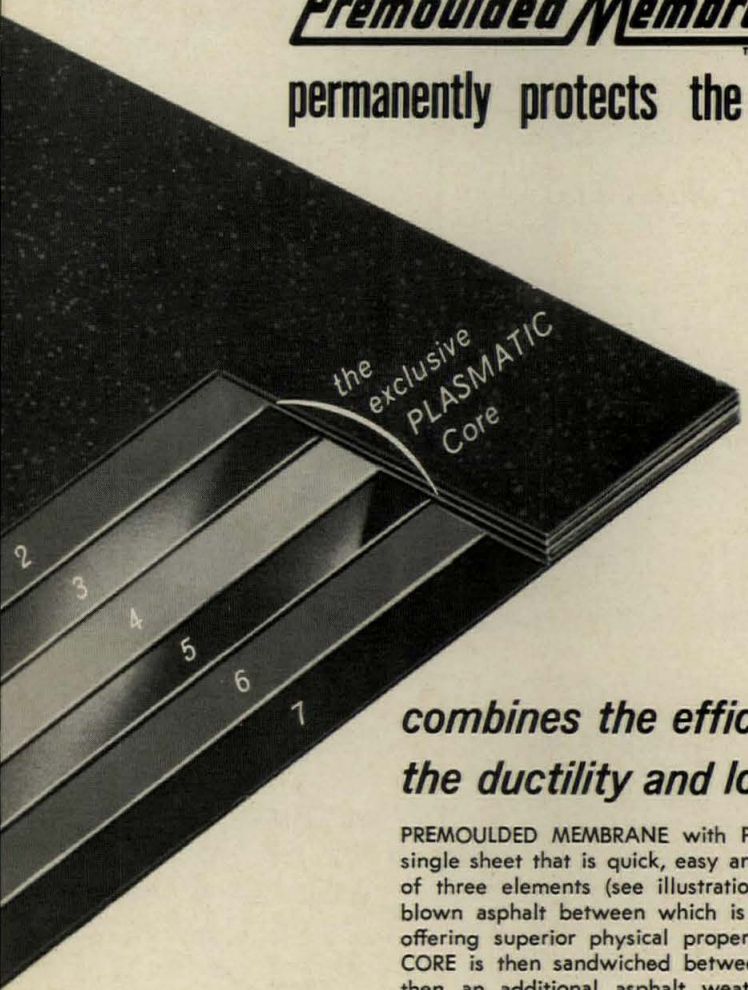

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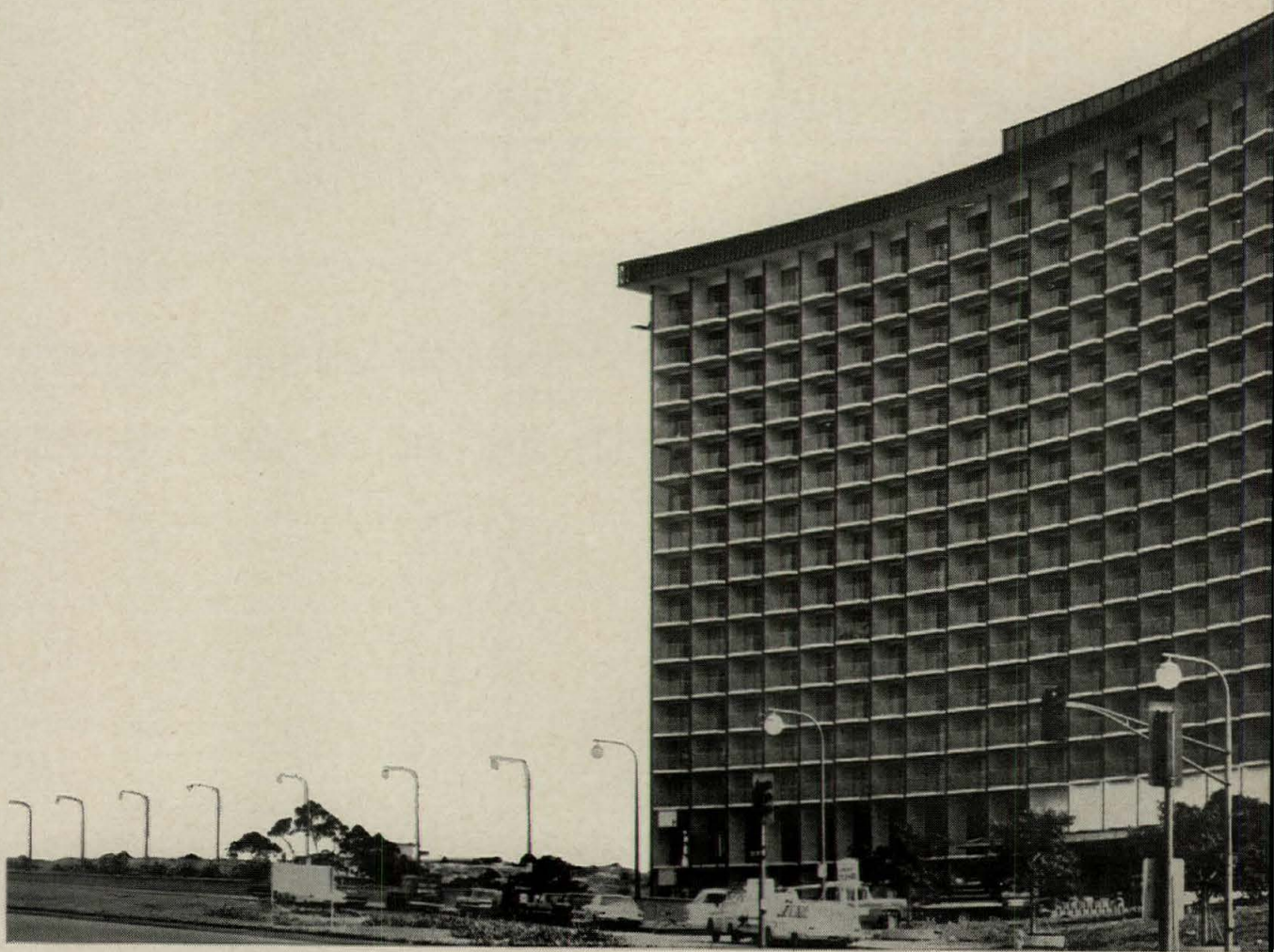

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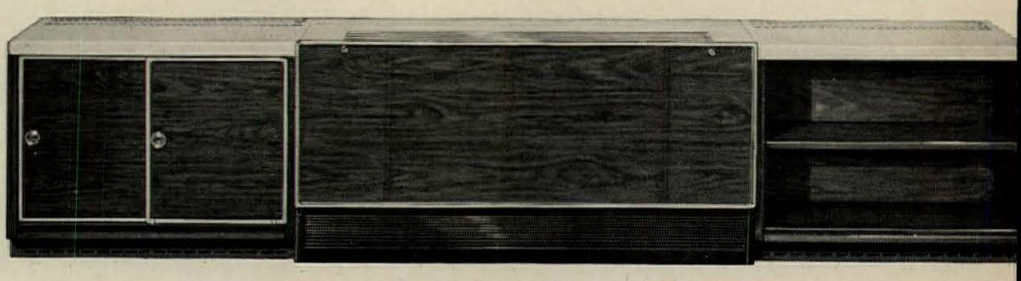

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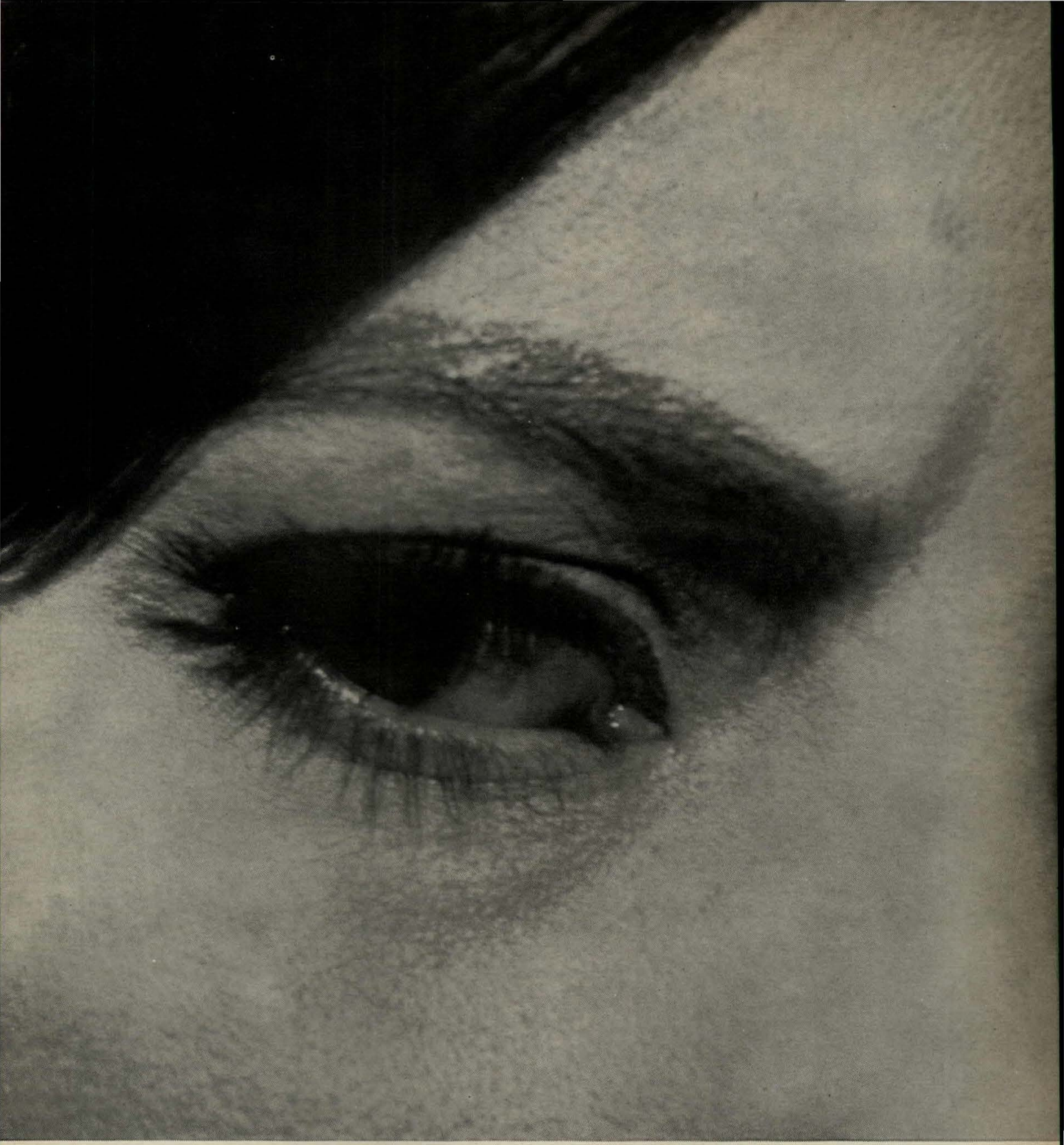

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Immaculate Conception R.C. church, Marrero, Louisiana. Architect: Curtis & Davis, New Orleans. Consulting engineer: Guillot, Sullivan & Vogt, New Orleans.

Photograph by Frank Lotz Miller.

The architect wanted design freedom...

The engineer wanted heating-cooling efficiency...

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OFFICE NOTES

continued from page 346

Corcoran have become members of **Site Engineers, Inc.** Moorestown, N. J.

Smith, Hinchman and Grylls Associates, Inc., Detroit-based architectural, engineering and planning firm, has appointed **John E. Rodger** and **Harutun Vaporciyan** associates.

Linn Smith Associates, Inc., Birmingham, Mich. architectural firm, announces the change in its corporate name to **Linn Smith, Demiene, Kasprzak, Adams, Inc.**

Walker & McGough, A.I.A. Architects of Spokane, Wash. have appointed **Walter W. Foltz, A.I.A.** and **Robert J. Nixon, A.I.A.** partners.

Jack Miller, P. E. has become associate and vice president of **Warren Steel and Associates, Inc.,** consulting mechanical engineers of Los Angeles.

Burton William Berger, A.I.A. has become an associate partner of **Whittlesey Conklin & Rossant,** architects and city planners of New York City.

ADDENDUM

The photographs of the Mary Galloway Home, page 155 of our June issue, should be credited to Alexandre Georges.

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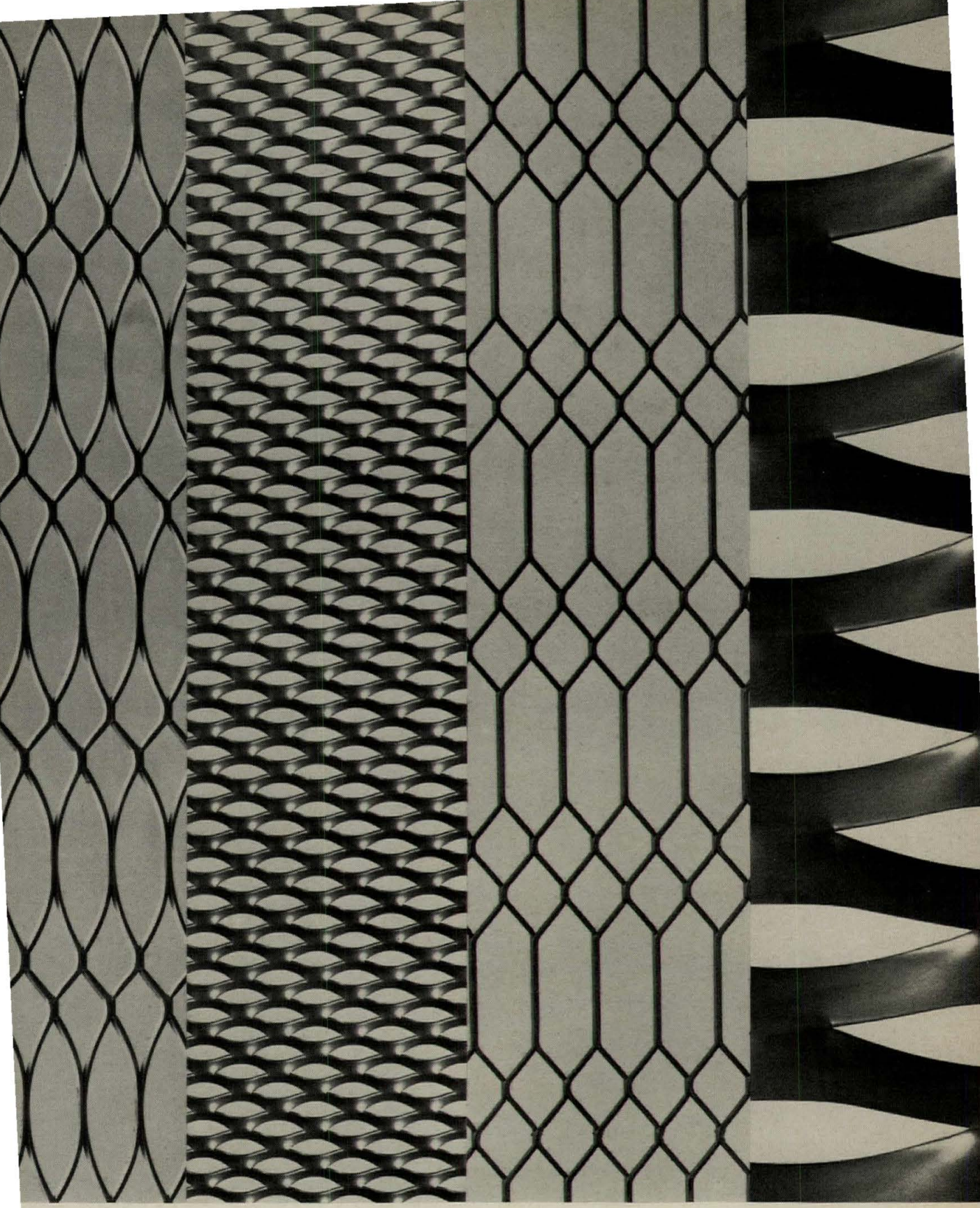

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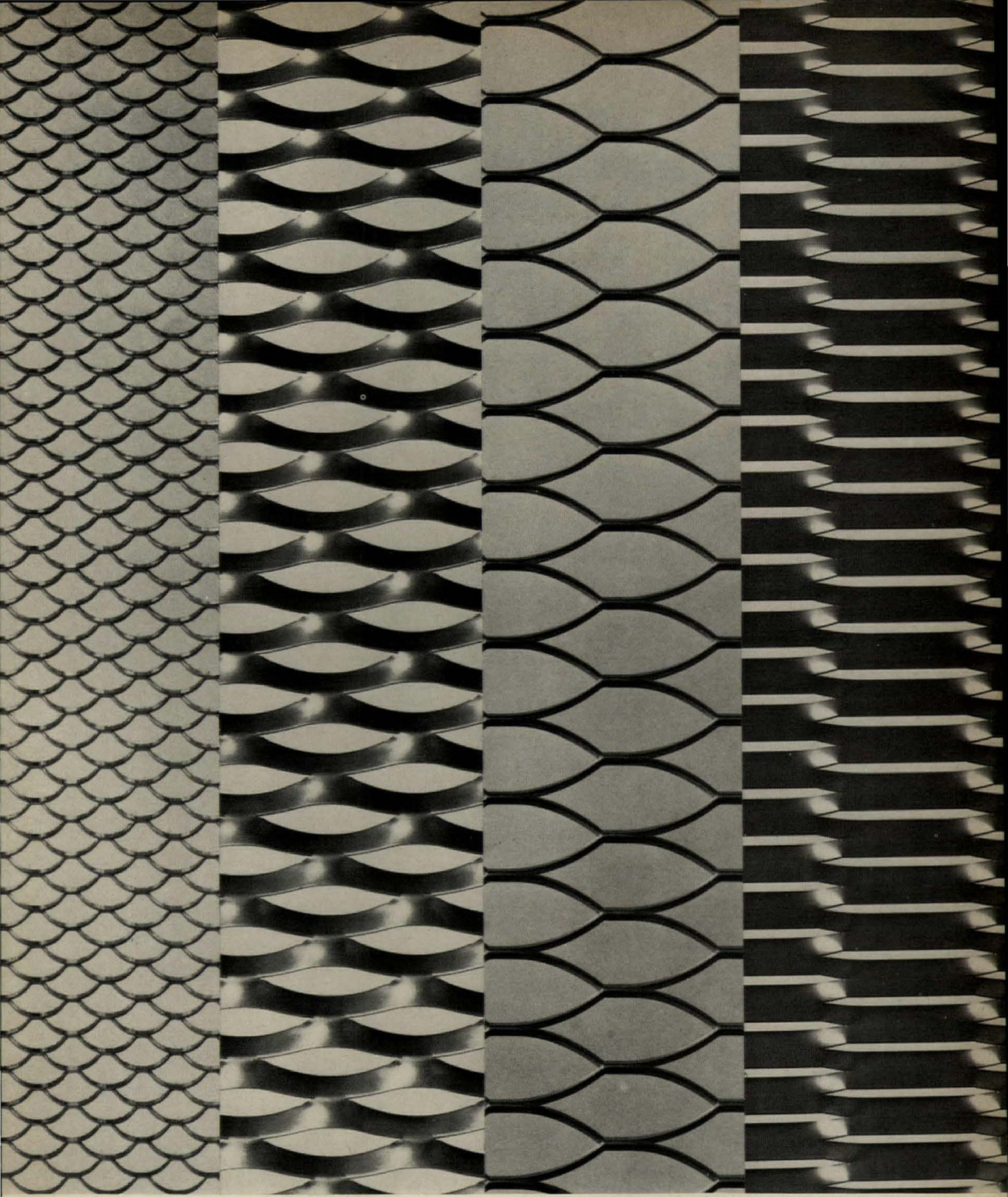

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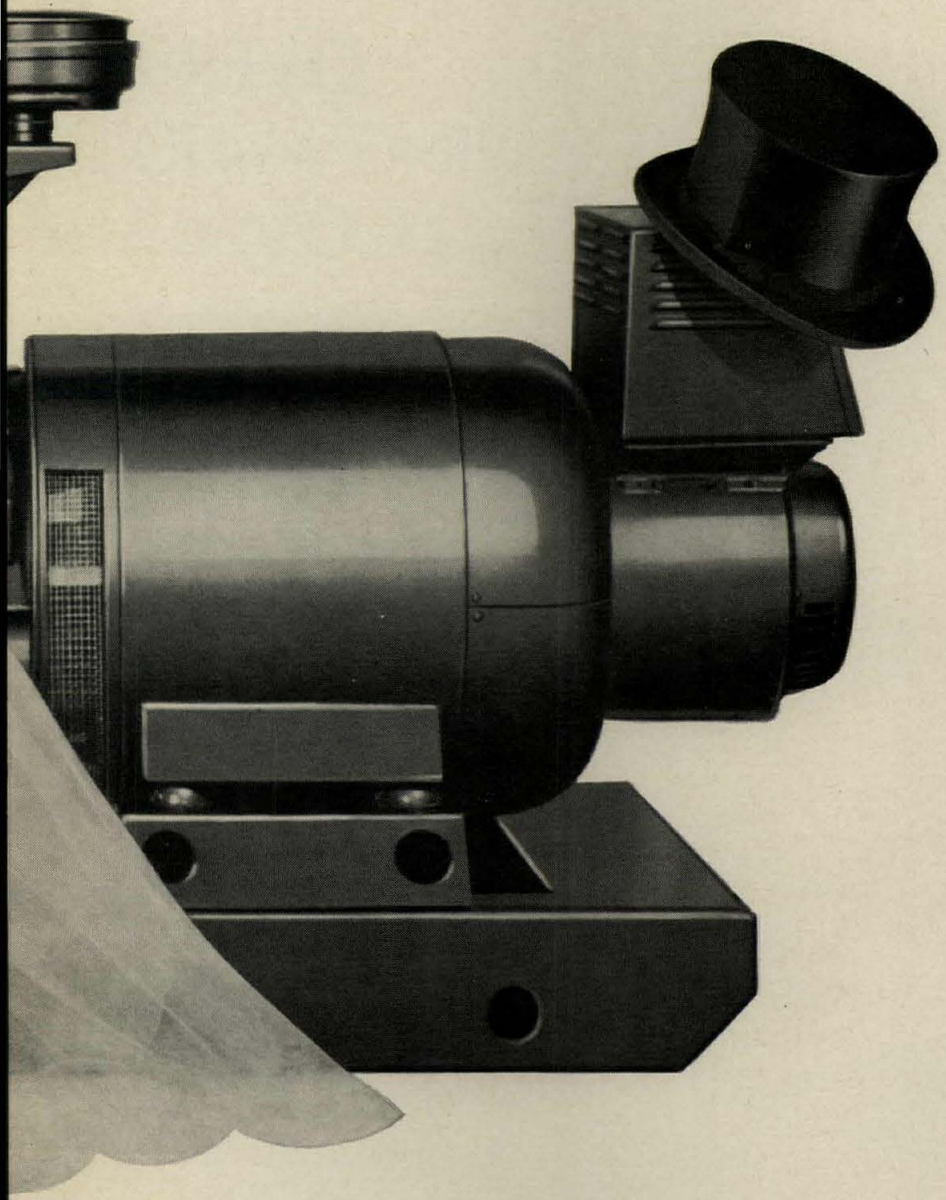

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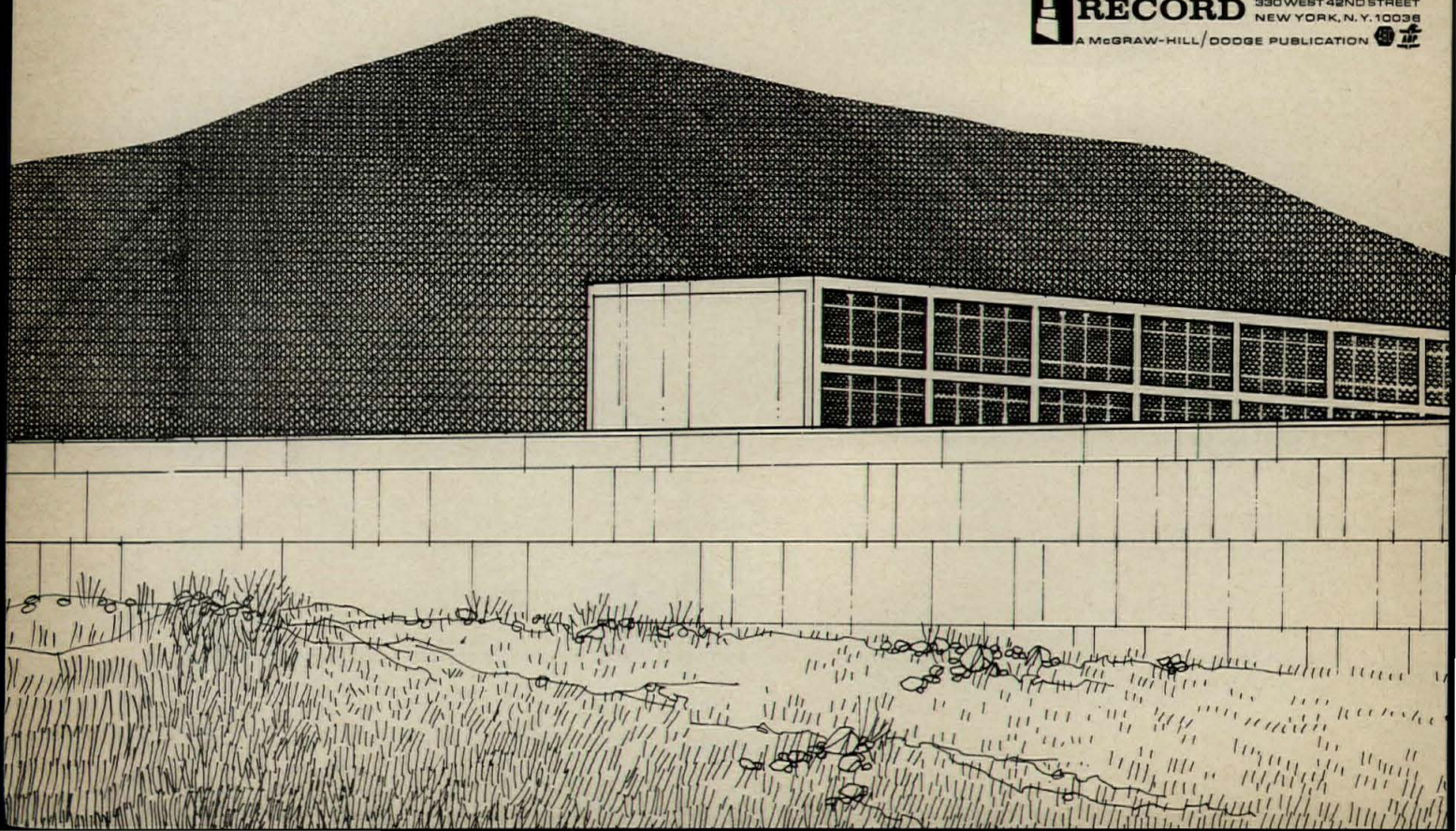

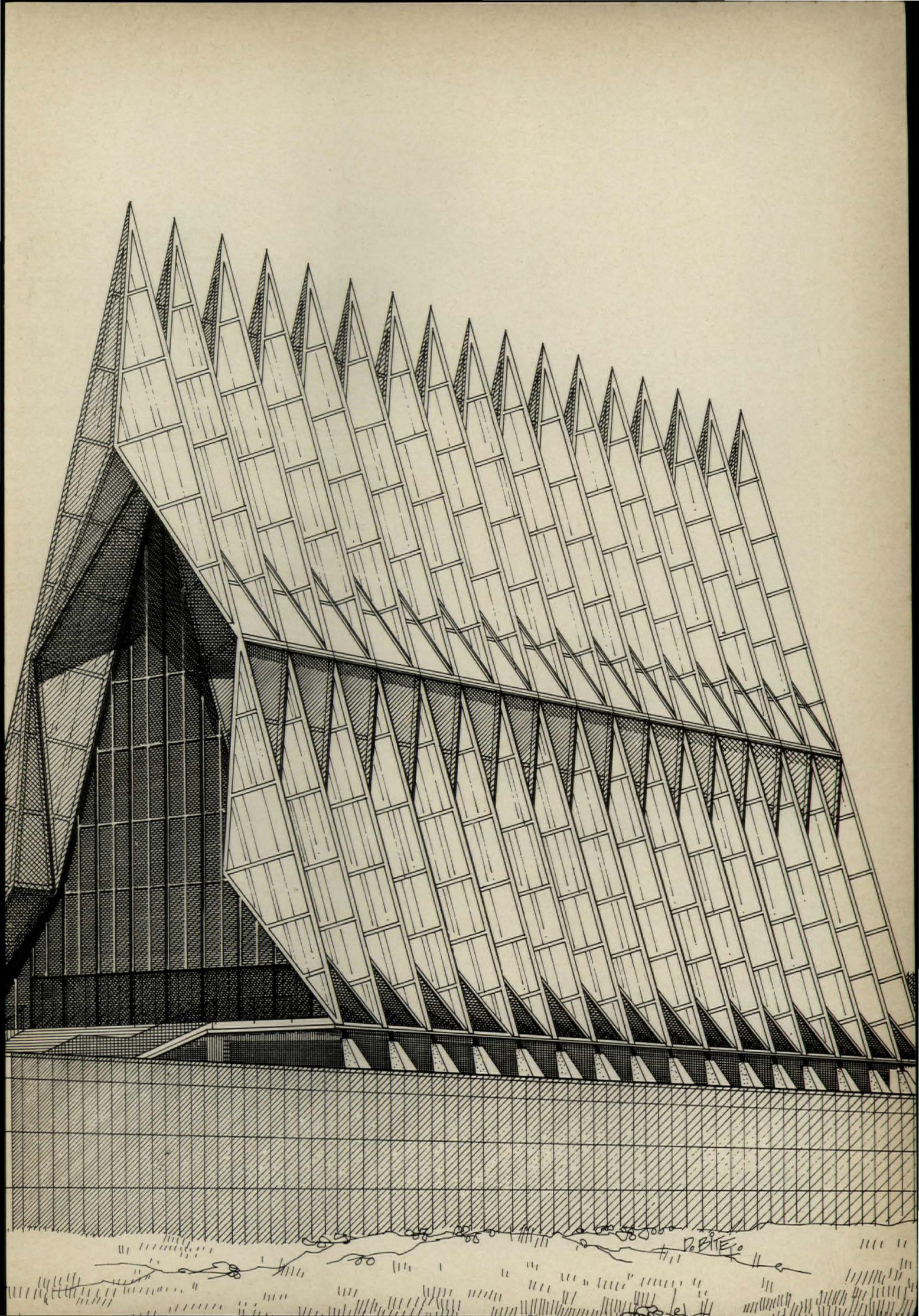

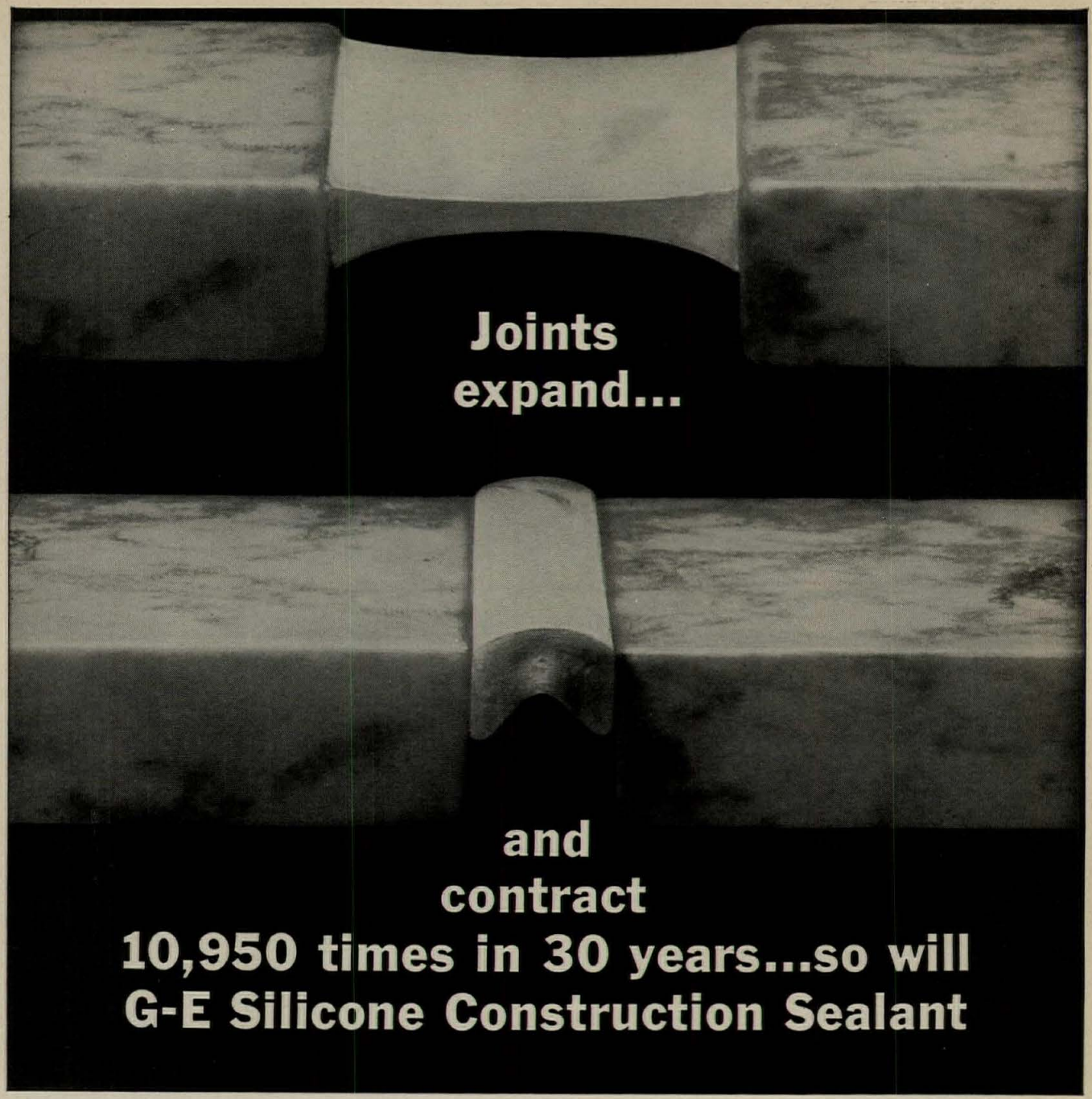

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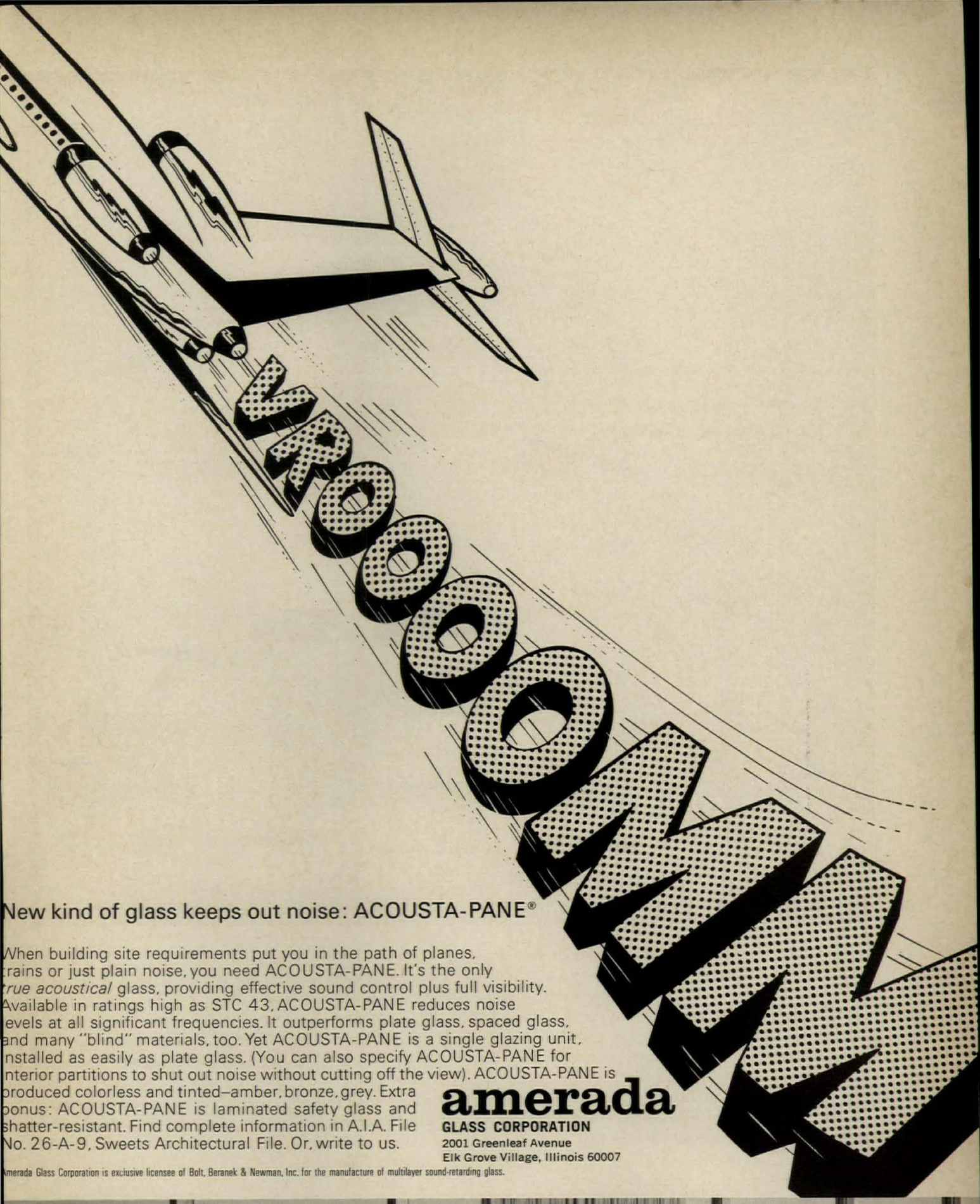

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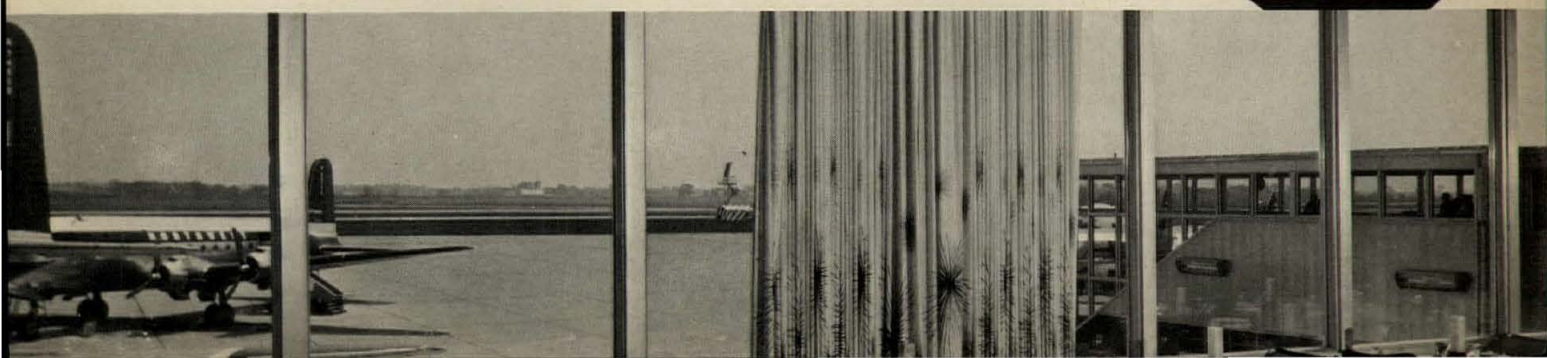

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