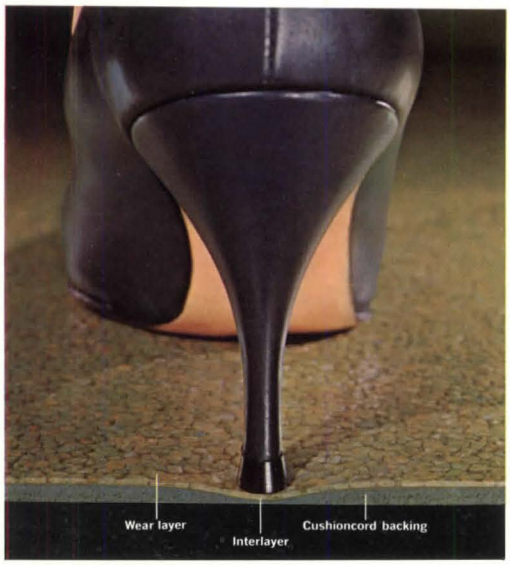
PROGRESSIVE ARCHITECTURE *August 1967*

PERFORMANCE DESIGN

A Chapman-Reinhold Publication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VINYL FLOORS BY Armstrong

THIS MONTH IN P/A

Progressive Architecture ® *August 1967*

103 **EDITORIAL**
P/A's Editor suggests that, if Performance Design represents an emerging direction in the practice of architecture, then the designer will find himself increasingly divided between intuition and reason, between art and technology.

PERFORMANCE DESIGN

104 INTRODUCTION: In this issue, P/A examines in depth the new problem-solving methodology of systems analysis and its implications for the practice of architecture.

106 THE BACKGROUND: What systems analysis is, and why it works for decision-makers in a host of diverse fields. Included are a summary of the growth of the new profession, a glossary of terms, and a list of organizations that employ systems analysis.

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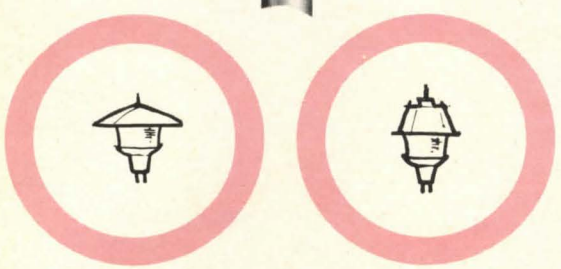

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VIEWS

Young Book Reviewers' Coup d'État

Dear Editor: Except for a disinclination to appear as a chronic letter-to-the-editor writer, I am sure I could find occasion almost every month to express my charmed satisfaction at the meaty and provocative issues of your magazine in recent years.

This month, however (p. 184, MAY 1967 P/A), you have really outdone yourselves, with your brilliantly (intuitively?) timely salvo of book reviews on recently published appreciations of most of our contemporary Giants of Architecture, as registered in the minds of select members of the rising generation. This array of fallen idols, with clay feet first, is indeed a striking spectacle, almost reminiscent of morning-after newsphotos of a contemporary non-bloodless *coup d'état*. The young critics' method of execution is fully worthy of your headline editor's epithet, only reversed to read "perceptive, but nasty." In short, the whole *mise-en-scène* is highly enjoyable.

But in the interest of historic balance, and really not just of gerontophilia, it seems to me three points may be worth raising:

- Mrs. Wright's opus is not really architectural criticism. Although one may trust it will not equal Parson Weems' classic in its obfuscatory effect, it is not in this instance relevant.
- It might have been enlightening, if new and reviewable studies had been on hand, to savor the reactions of coeval reviewers to the life work of Le Corbusier and Louis Kahn. (Presumably, all will agree it would be somewhat premature to include MLTW, Venturi, and Hardy.)
- It will be enlightening, I am sure, if you will arrange to repeat this experiment, *mutatis mutandis*, sometime around 1987.

LANDIS GORES
New Canaan, Conn.

Good Design and Safety

Dear Editor: Re the MAY 1967 P/A: The purpose of building codes and registration for architects and engineers is to safeguard the public and client from practice by unqualified persons. Unfortunately, the privilege granted by registration seems also a license or liberty to pervert the requirements for safeguarding human life with flagrant violations of established standards for aesthetic reasons.

Refer to BICA Basic Building Code section 618.0, Interior Stairways, specifically, subsection 618.5, and the National Building Code, section 604, Interior Stairways, specifically, subsection 604.8; Article XVII, Safety to Life Requirements for existing buildings, section 1706.3 (b), section 606.4, Guards for exterior stairways without enclosures; and section 1706.4 (h), pertaining to guard railings. These are only two national building code examples applicable as safety standards.

Without dispute, your professional staff should recognize the necessity of safeguards to prevent loss of life or injury by not endorsing such practice by publishing examples as good design without an appropriate critique.

Examples as shown on pages 105 and 159 in the May issue are inexcusable and have no justification.

ROBERT J. BERG
Silver Spring, Md.

Housing Issue Praised

Dear Editor: You can imagine how thrilled we were to see housing environments for the elderly so handsomely covered in the MAY 1967 P/A.

Of course, we never agree on all factors. I note Paul Rudolph would have put the community center on the roof if the budget had permitted. Thus, he would have "isolated" older people from activity in behalf of a view. Our experience with rooftop centers has not always been good, and for an obvious reason. Sitting time is more rewarding if activity (even if just traffic) is observable; one soon tires of the sky and would rather see the children going to school, the milkman delivering, and especially the coming of the mailman. A statement in your critique of Crawford Manor — "It is apparent from a visit that one of the most popular spots in the entire building is at the entrance, where groups assemble to chat, joke, or watch others come and go. The spaces on the ground floor, however, are inadequate." — would seem to confirm our findings. I am somewhat glad, therefore, that the budget precluded recreational space on the roof but sorry that the ground-floor community and lobby space could not have been more spacious where opportunities for involvement with individuals and community doings is greater.

I also appreciate your selection of Wilder Residences, another Section "202" elderly loan project in St. Paul. This complex, when completed, will provide a total living environment for the elderly, including dwellings for independent living, congregate dining, a nursing home, and a recreation facility. Europe is ahead of us with this total living idea, and many in this country are hoping for its expanded use here.

Thank you for so adequately covering the Federally assisted housing developments for older Americans.

MARIE C. McGUIRE
Acting Deputy Assistant Secretary
Department of Housing and Urban Development
Washington, D.C.

A Lengthy Exchange: Builder-Developer vs. P/A

Dear Editor: In the six years since Foster City was conceived, there has been a great deal written about it, but the article contained in the APRIL 1967 P/A has to be the most irresponsible report to come from the responsible press. You cite Foster City as an example of filling the waters of San Francisco Bay, where, in fact, the development of Foster City represents fill removed from the bay and placed on dry land behind levees that date from the previous century. Besides enlarging the bay in this manner, the lagoon system, totalling 230 acres, was completely excavated from dry land with the result of further enlarging the bay's surface area.

Your suggestion that Foster City has been less than successful is erroneous, since it has had a tremendous response and more than 6000 people have moved here in three years. I am sure my friends at Redwood Shores will be happy to equal its success in the terms of marketability and proven feasibility.

Your article made not one single comment about any of the land planning, except to criticize the existence of single-family detached homes, which appear in all other new town plans and which the market demands. The other comment depreciated our curvilinear streets as compared to Redwood Shores' grid system, which is a highly debatable judgment on your part.

The final blow is to cite as some sort of evidence the Cooper lawsuit, which is a sham suit, intended only to harass, and which has been thrown out of court for having failed to show it had any kind of merit.

To cite Cooper's claim of "fat contracts for the developer's personal gain," is rumor-mongering of the worst kind. The Midwest Dredging Company referred to in the article made no profit in dealing with the public district, nor was it intended to. It has been thoroughly reviewed by the Attorney General's office and given a clean bill of health. Its only purpose was to provide a means of placing the developer's personal credit behind the enterprise for the benefit of the public district.

T. JACK FOSTER, JR.
San Mateo, Calif.

[*Foster City is not a "filling in the waters project" but is a landfill project in the*

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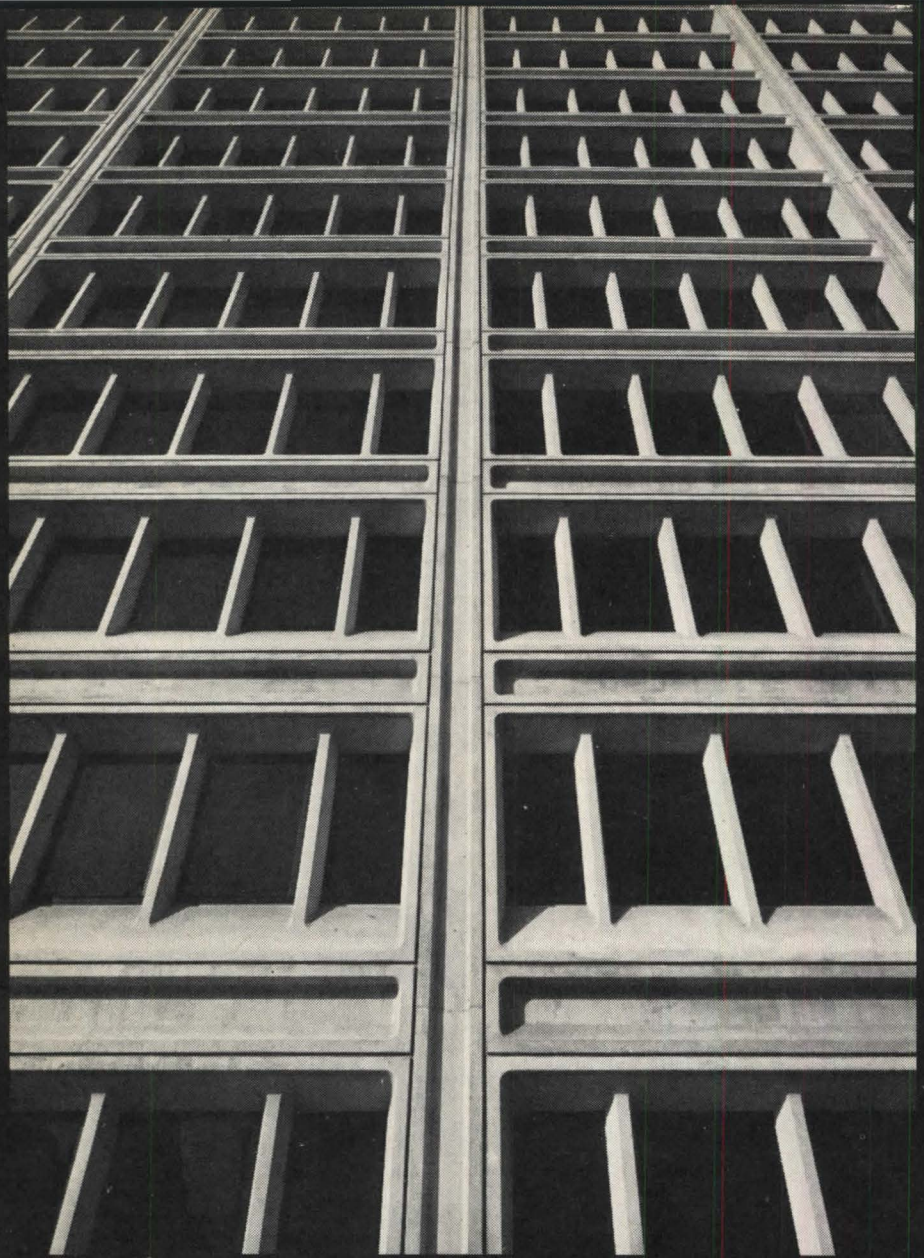

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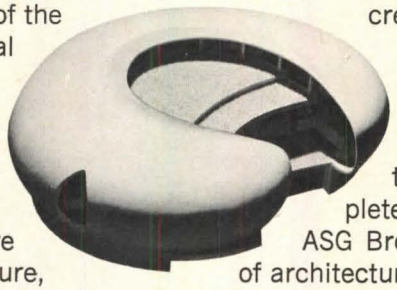

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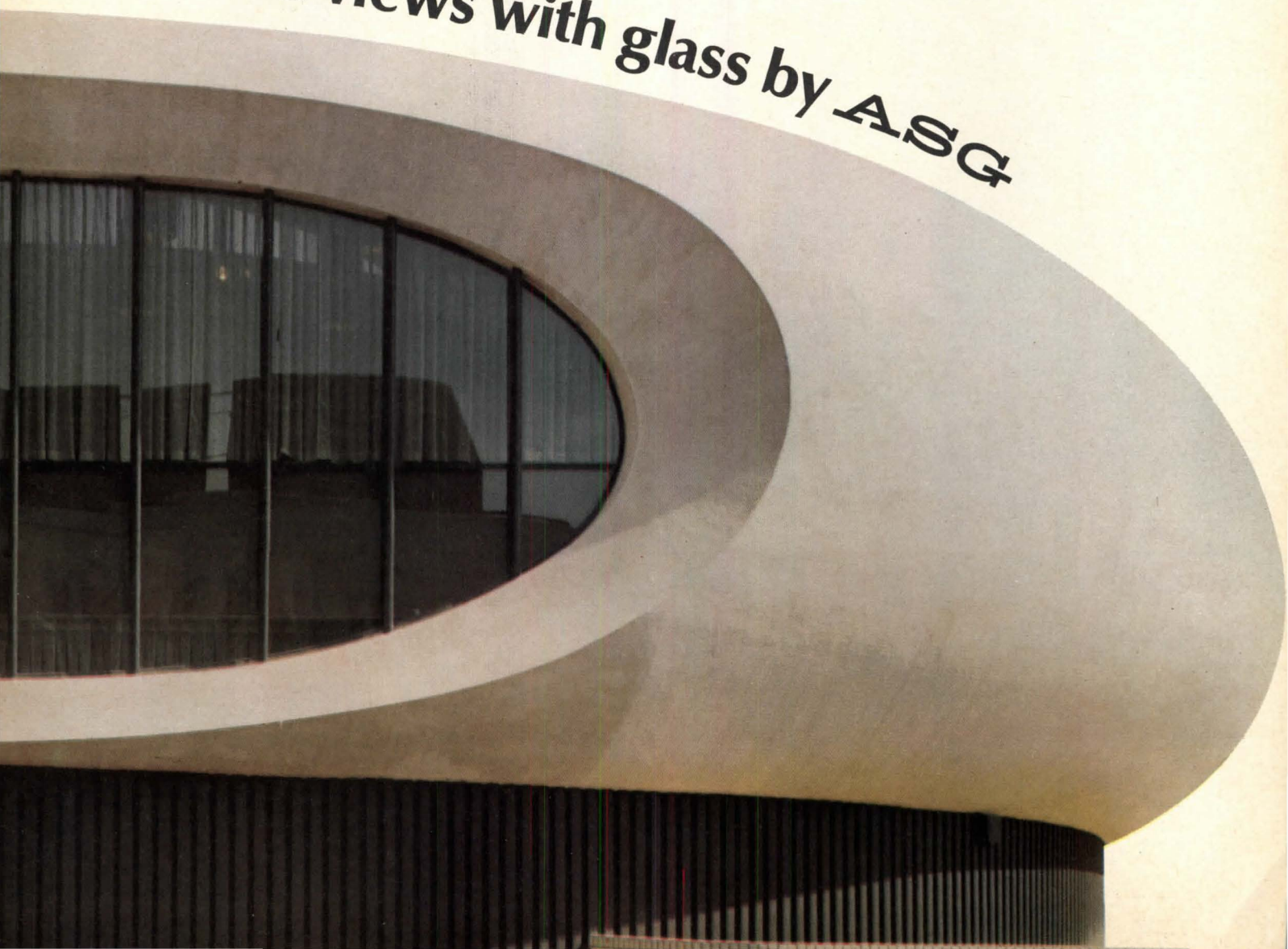

Continued from page 6

broader scape of the article; nowhere does the text imply it is filling in the waters, except, of course, in the title. Furthermore, the discussion in that section of the article is not concerned with "filling in the waters" but with "reclaimed land" and benefits to the developers.

The marketability of Foster City does not imply its ultimate worth. Merely being on the water, in whatever form possible, would be an attraction.

Outside of the lagoons, Foster City shows no indication that someone has given serious thought to waterfront living and architecture, to the different *types of architecture that might border waterways and those further inland. The plan features the standard house-and-lot syndrome that has characterized most developments in the last 10 years. At a time when some developers seem to be taking a risk on providing a little more than people are used to demanding, Foster's project pales indeed. Those sausage roadways occupy fully one-fifth of the land, and they are echoed inland as far as possible. It is a question whether that is the* only *and best solution.*

The Cooper lawsuit was cited from the San Jose Mercury *and was attributed to it. Furthermore, it was put in the context of a discussion on the financing of land reclamation projects and the general suspicion surrounding them. About this, we notice, no comment is made.*

Finally, the San Francisco Museum of Art cata'og, endorsed by Mr. Foster, does nothing to persuade us of the merits of this design. In fact, it is something of an insult to any intelligence. The photographs are poetic, cropped, and totally lacking in comprehensive views of the environment. Many of them could have been anywhere. Street furniture is not related to anything. A corner of Edward Durrell Stone's building does not convince us of its merit. We don't see how Mies' buildings give scale and direction to whole districts or neighborhoods, because the neighborhood is neither shown nor is it indicated how it fits into the district. In short, P/A has not been persuaded of the planning merits of Foster City. — ED.]

Pumps and Cross-Connections

Dear Editor: In response to your article entitled "Pumps Challenge Roof Tanks" in the FEBRUARY 1967 P/A, mention of possible contamination via cross-connection backflow was conspicuous by its absence. The modern high-rise building is becoming a real headache to water purveyors, for such buildings are filled with actual and potential cross-connections.

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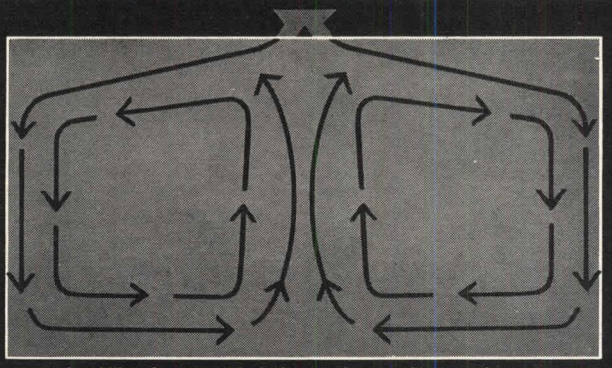
OUR MOVE



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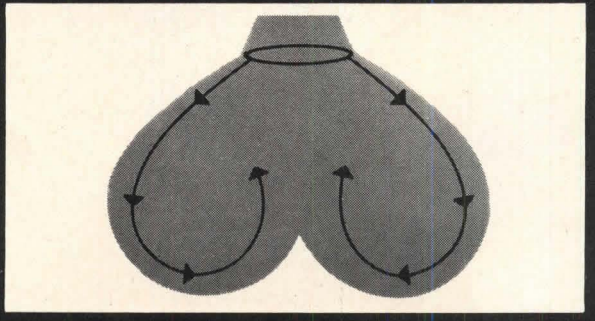

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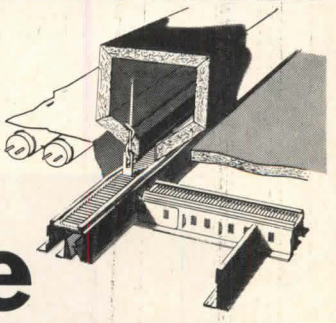

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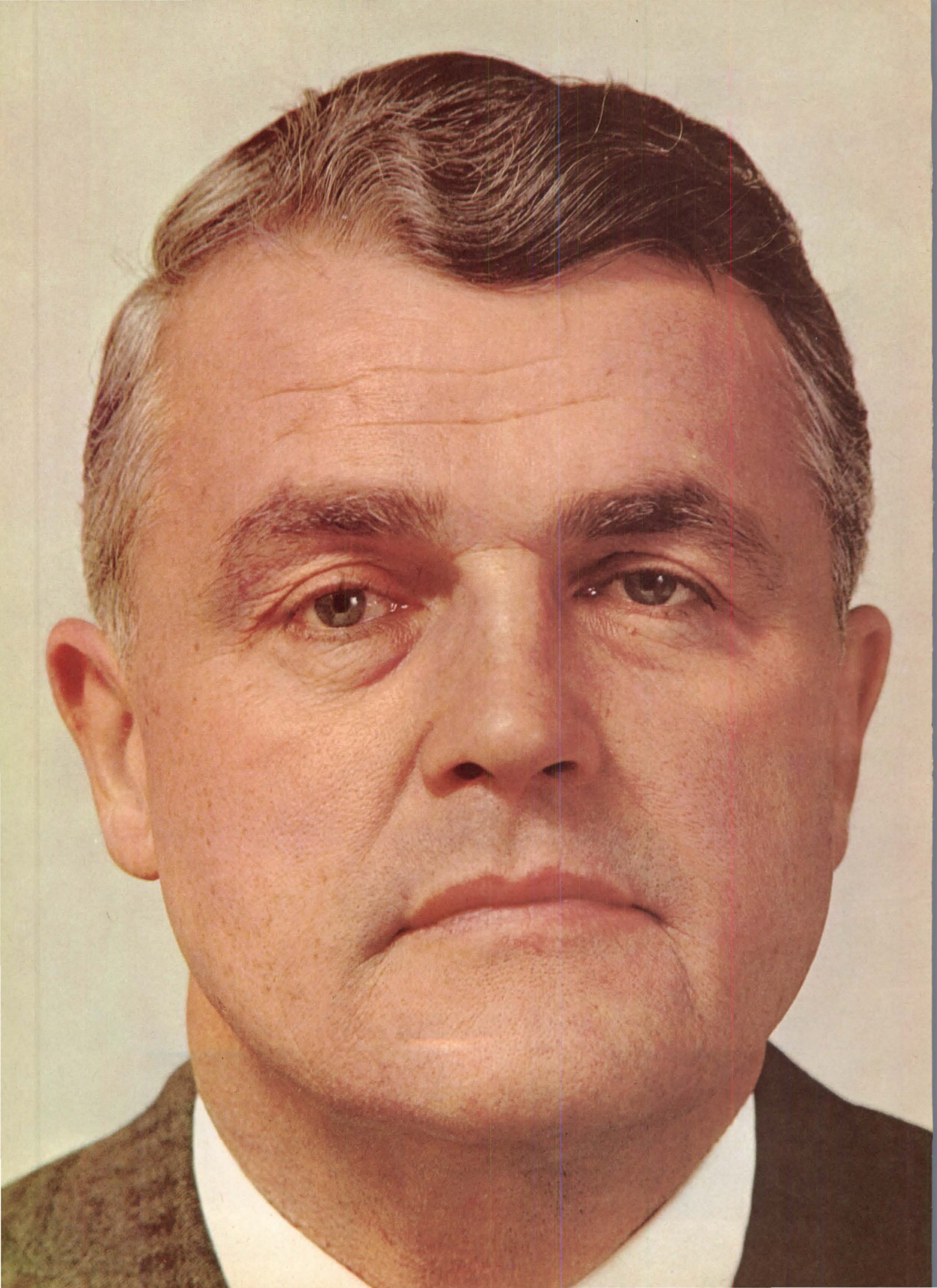

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Continued from page 11

Architects should start including backflow prevention devices at the meter location on all new, high-rise buildings in their original drawings.

R. M. SIMPSON
Sanitary Inspection Supervisor
Castro Valley, Calif.

Fads Are Bad, But . . .

Dear Editor: It was refreshing to read the varied comments on the Design Awards and the Third Millennium issues. I am against fad architecture (the Bauhaus School was one, if we consider it that way), but fads are preferable to a stagnant, safe, unmoving architecture. Keep up the controversy.

HENRIK BULL
San Francisco, Calif.

Digging the March Editorial

Dear Editor: Your Editorial (MARCH 1967 P/A) seems to imply that all the zips and zaps currently zipping and zapping their way into the zipped-zapped minds of some architects (who would rather be "with it" than produce an architecture for human beings) is some kind of reaction against taking the whole scene too seriously.

Well, man, this concept may turn a lot of robots "on" (do they die temporarily when "turned off"?), but there are lots of cool heads who see this self-conscious "Look Ma, no coherence" approach to design as a thin façade for a trend that, rather than being light-hearted, is expressing the violent side of our neurotic society. Just as shiny boots and black leather jackets are the outward signs of sadomasochistic tendencies that can erupt into explosions of swastika proportions, these supposedly whimsical structures — really part-abandoned concentration camps, part bomb shelters, part look-out towers, part inquisitional chambers, part concrete bunkers — are in fact expressing all the guilt, the repressed frustrations, the hate and hostility of a decadent, dehumanized Western society.

It is entirely possible that, in a few years, when all the middle-aged hippies have been turned off for good, this period shall be known as "Late Auschwitz." It is also possible that all those architects who were hung up on "the human being as part of nature" will emerge as the real cool ones, as indeed they always have. Must split for now.

J. CARLOS CALDERON

[*Well, one gleam of brightness in this dismal picture, and perhaps some consolation to the middle-aged, is that not all the hostility and decadence is on one side.* — ED.]

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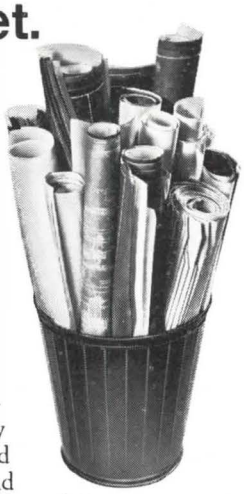

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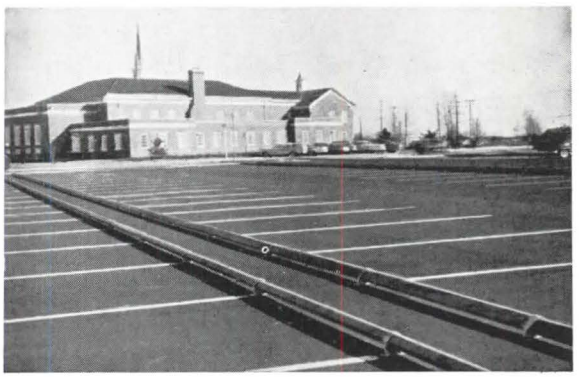

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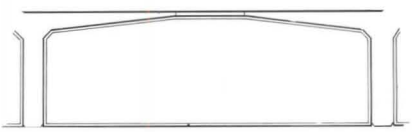

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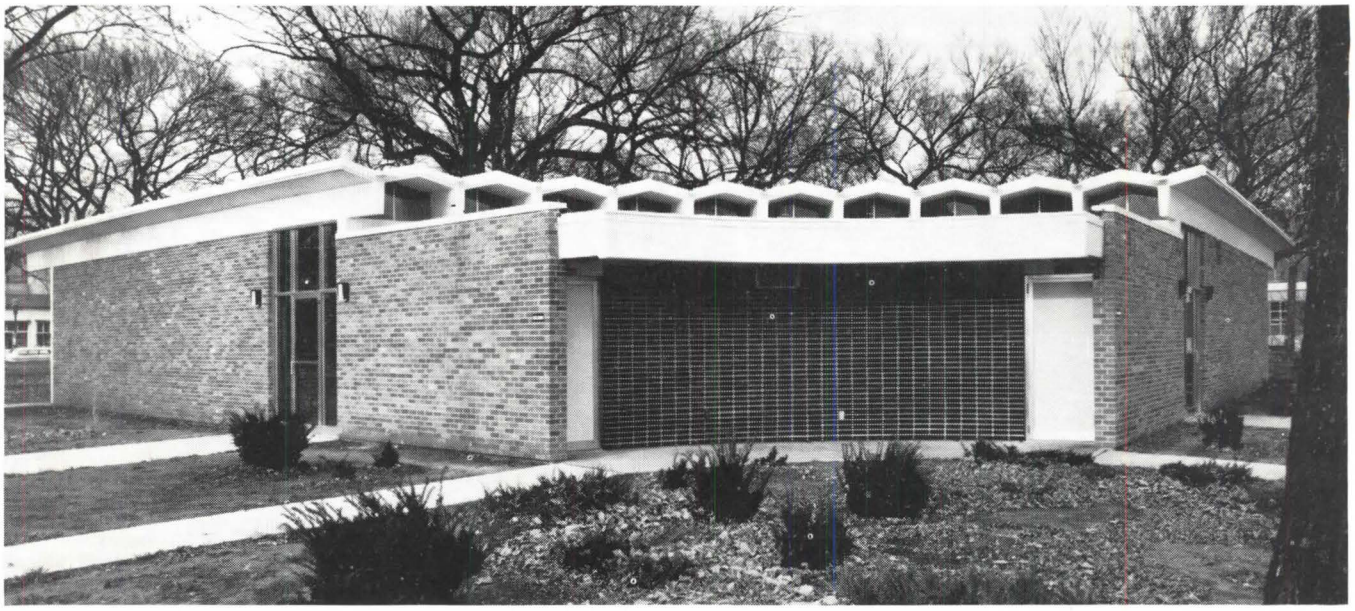

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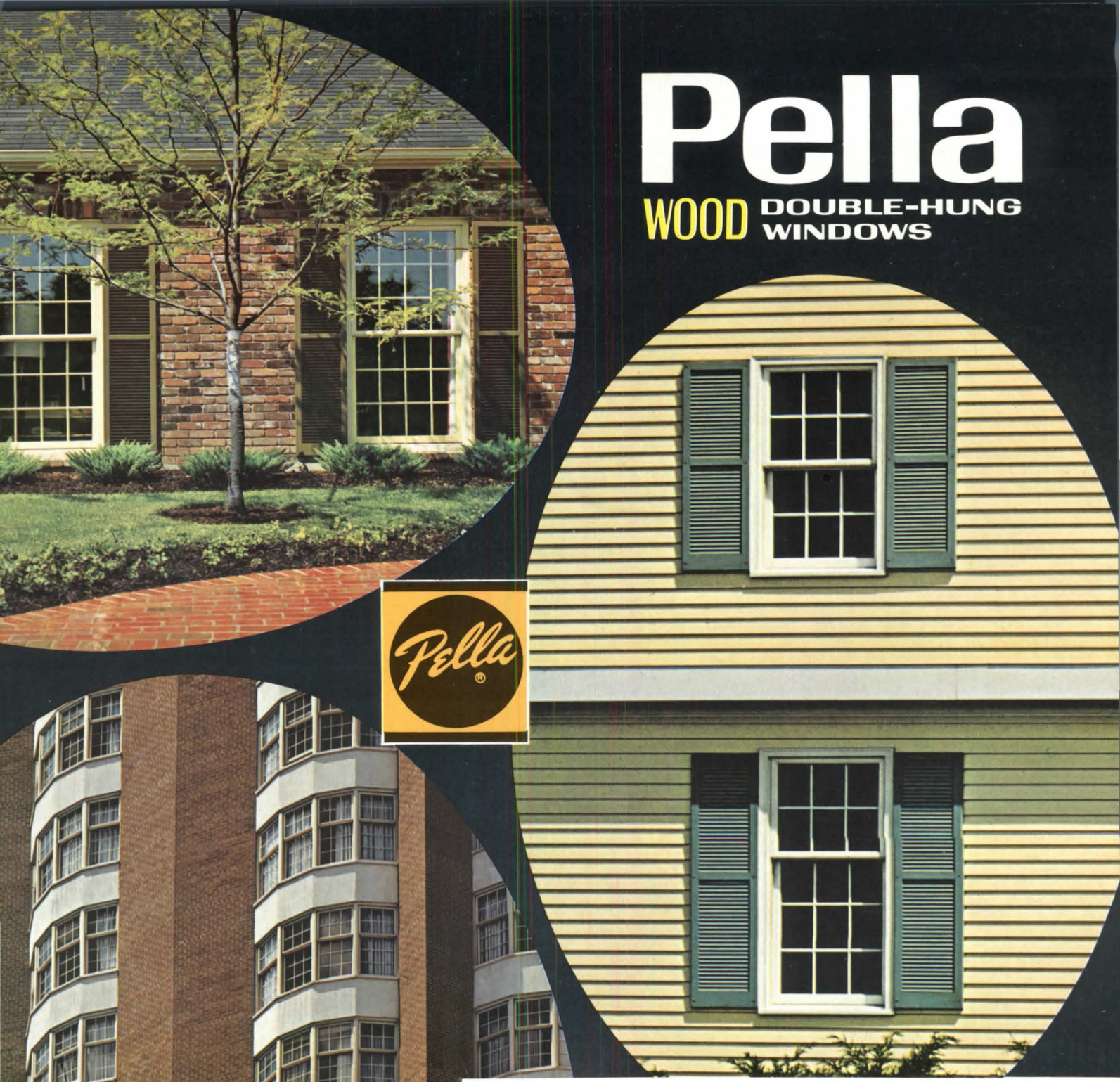

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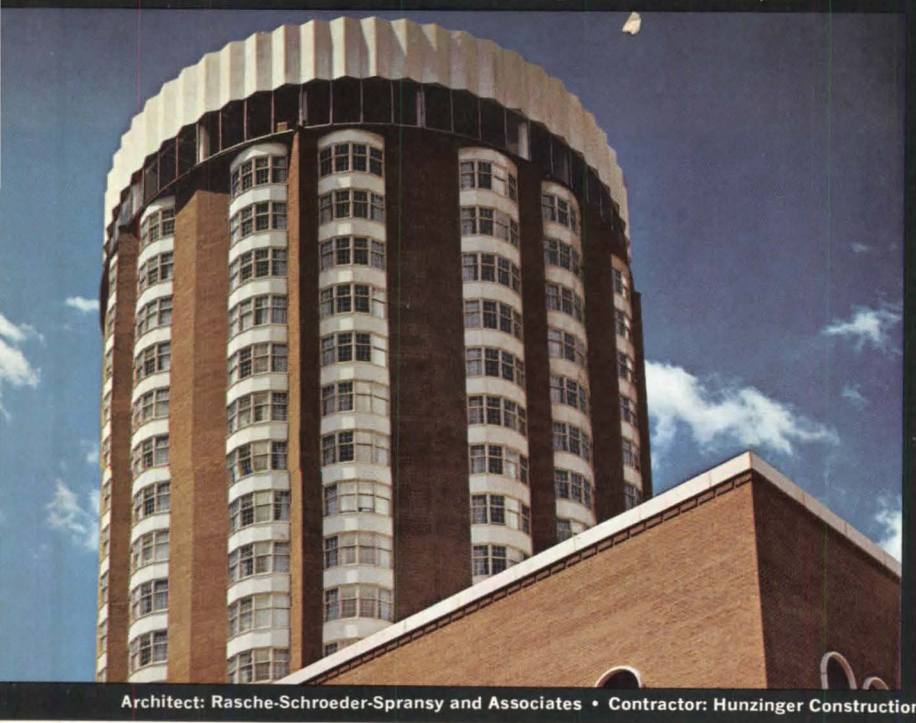

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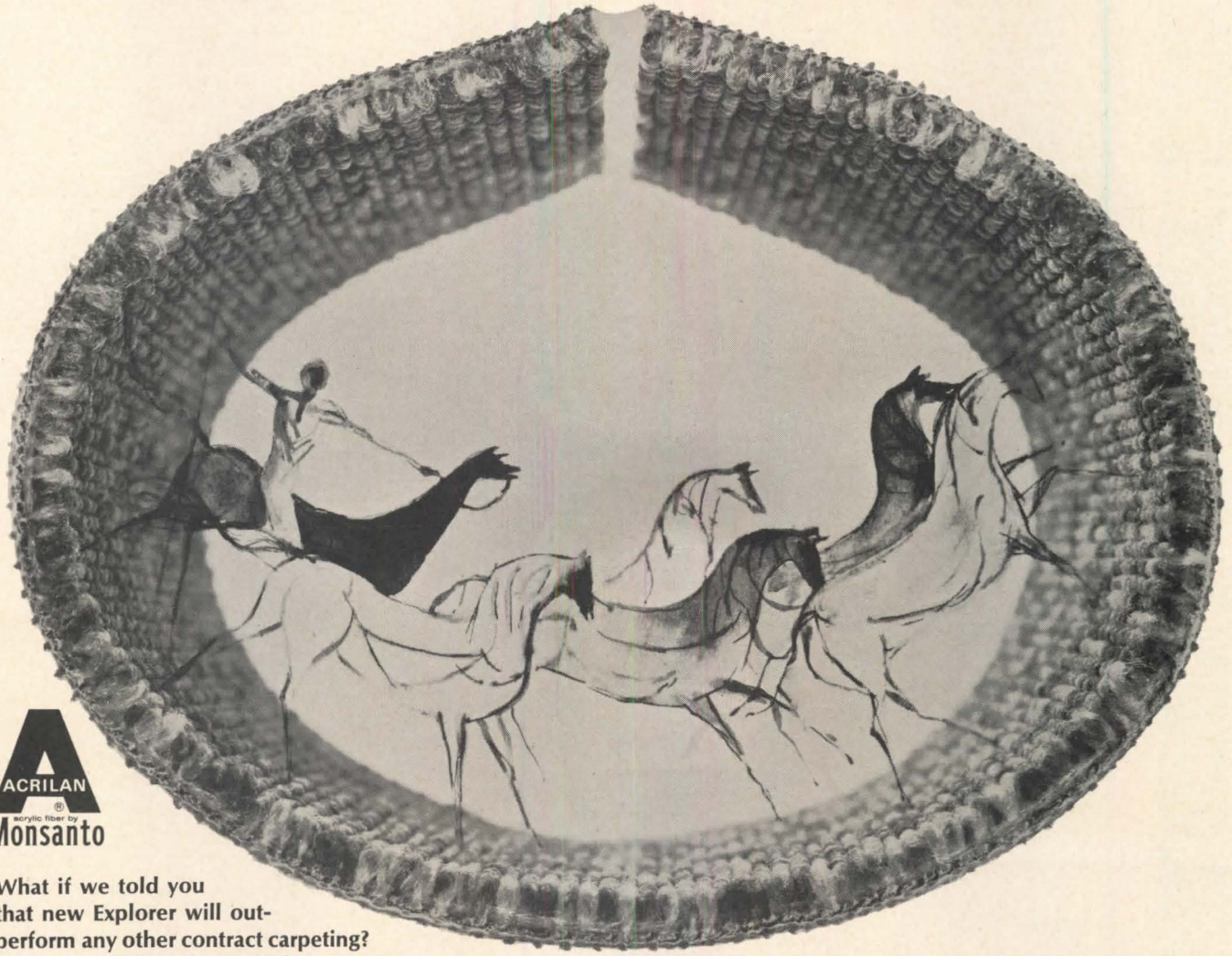

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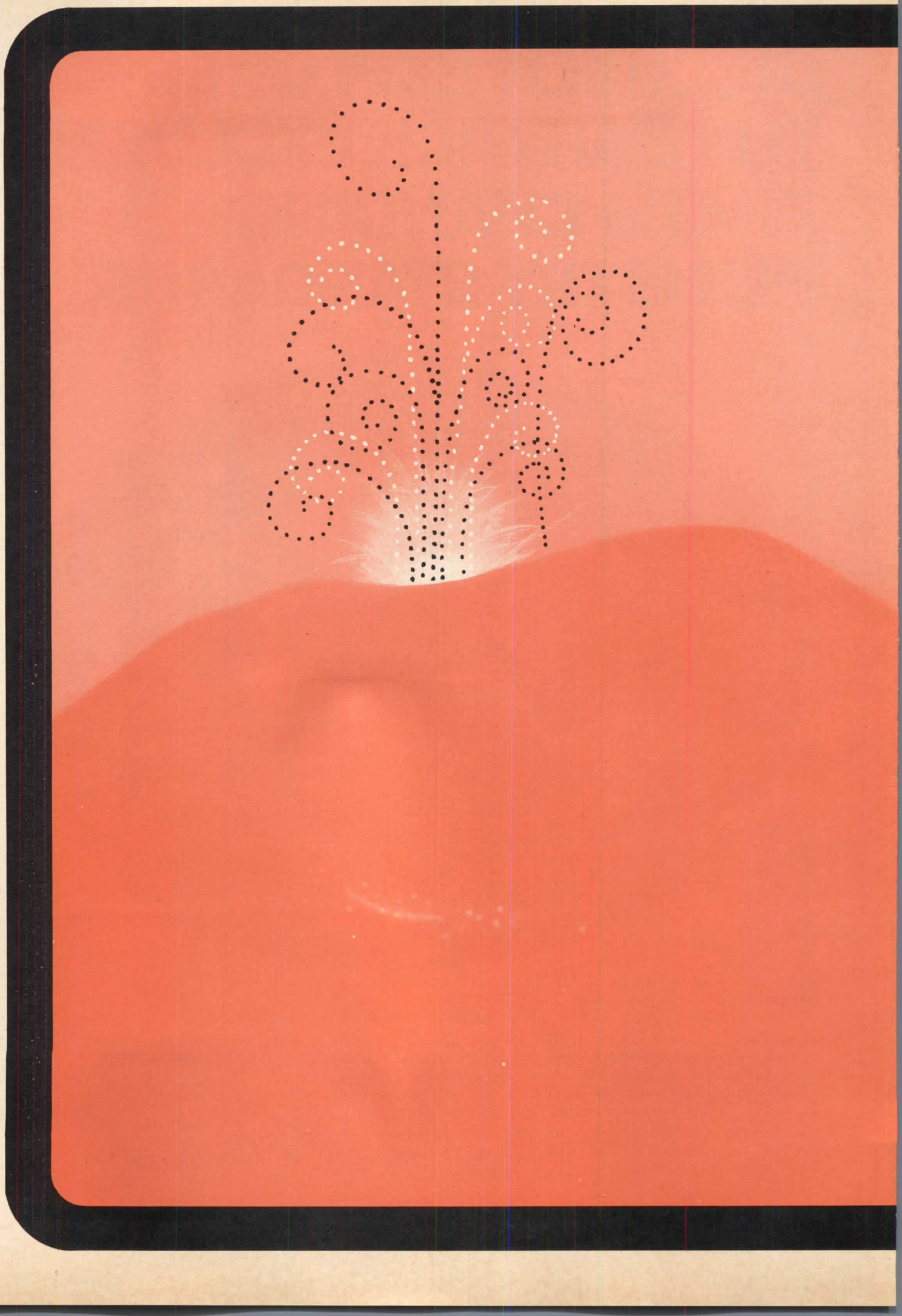

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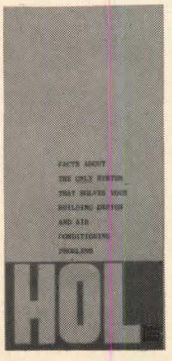

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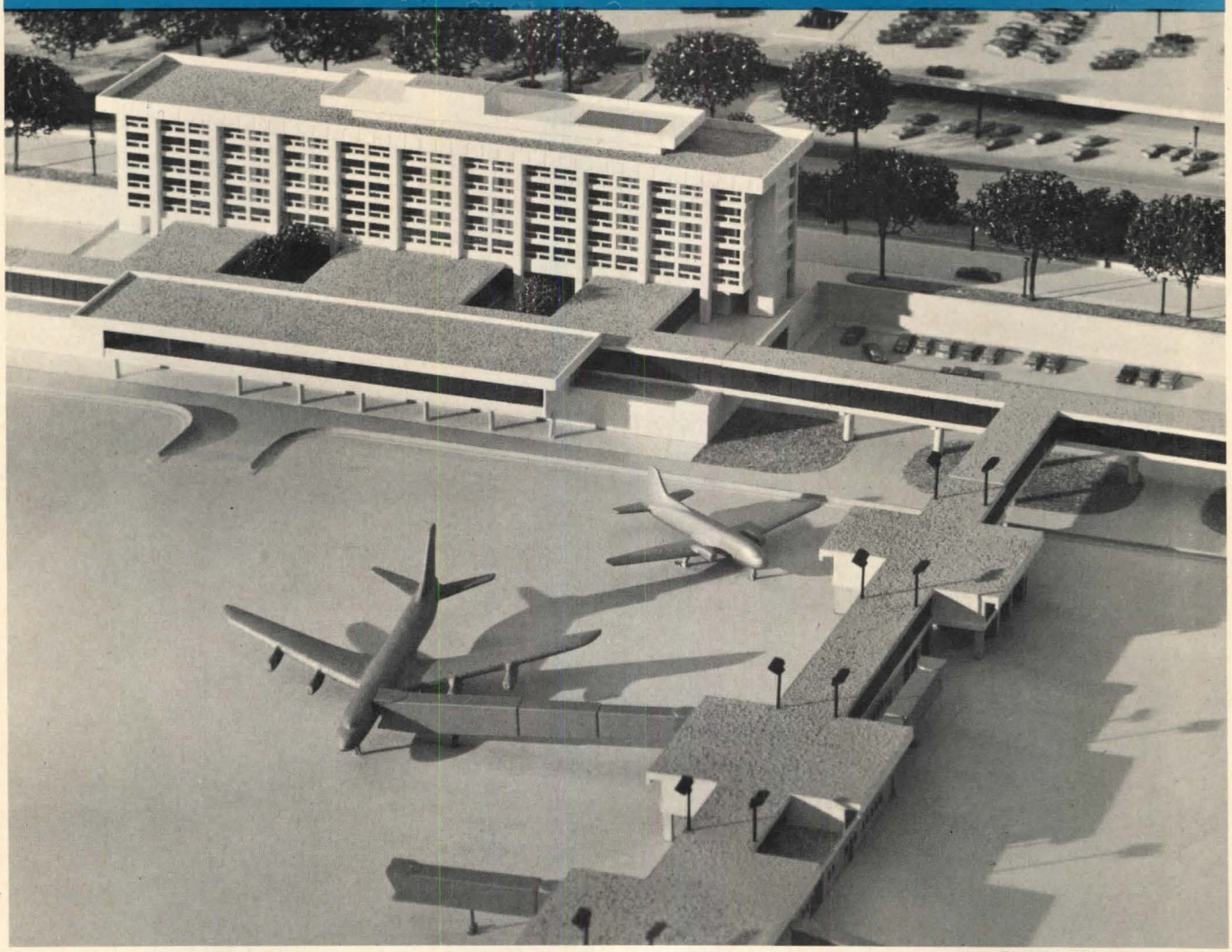

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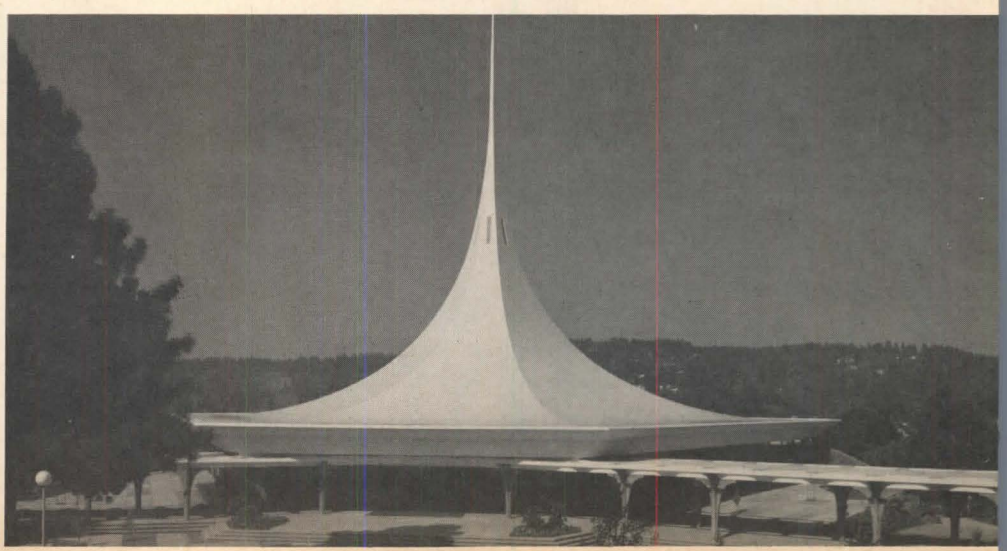

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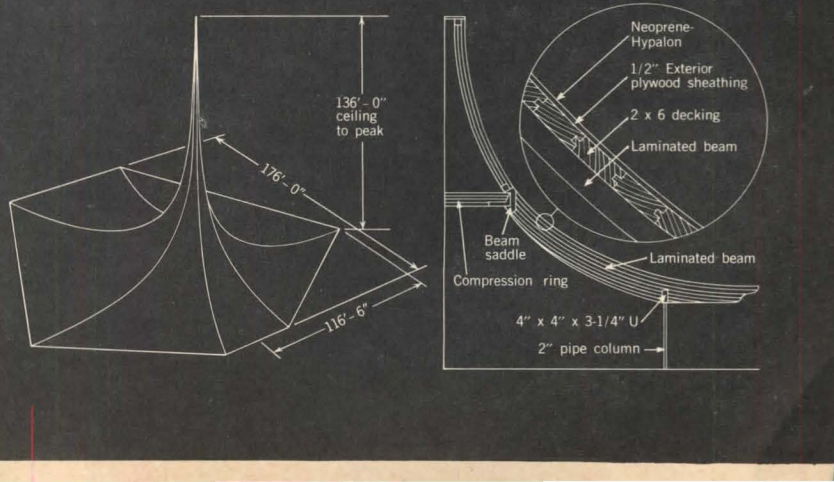

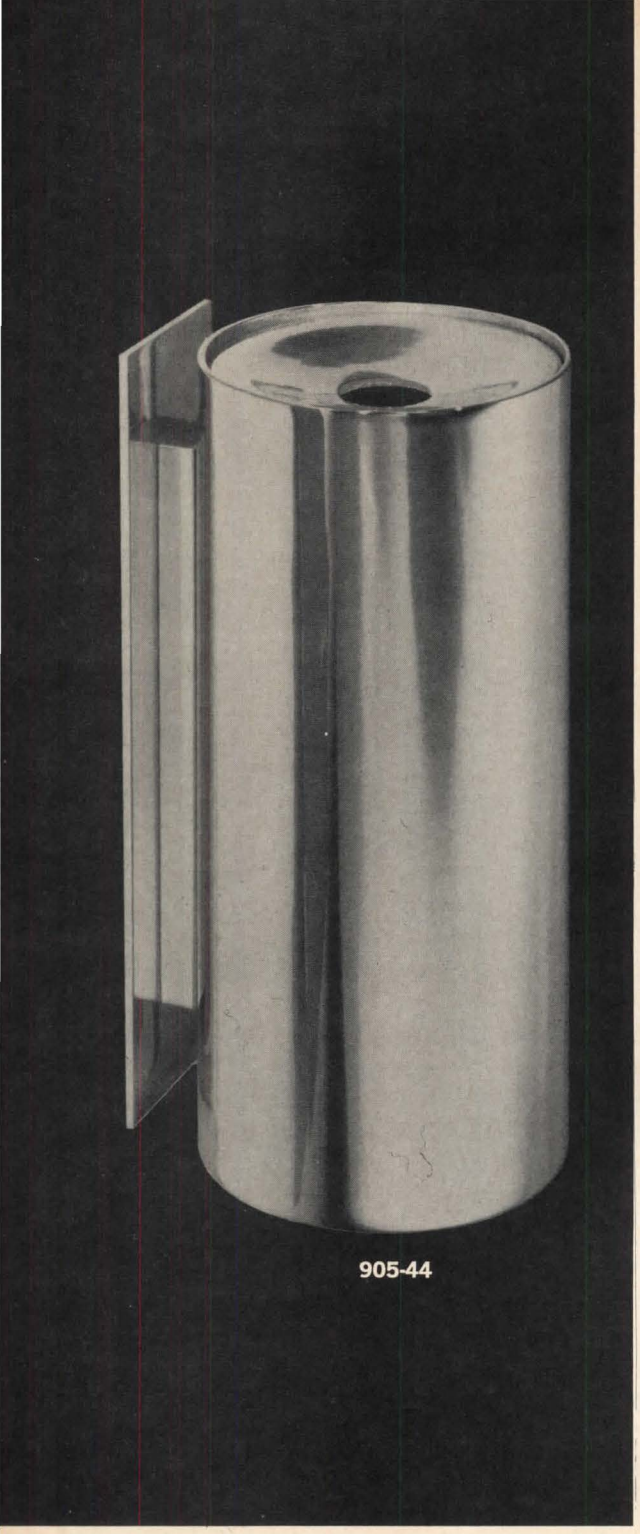

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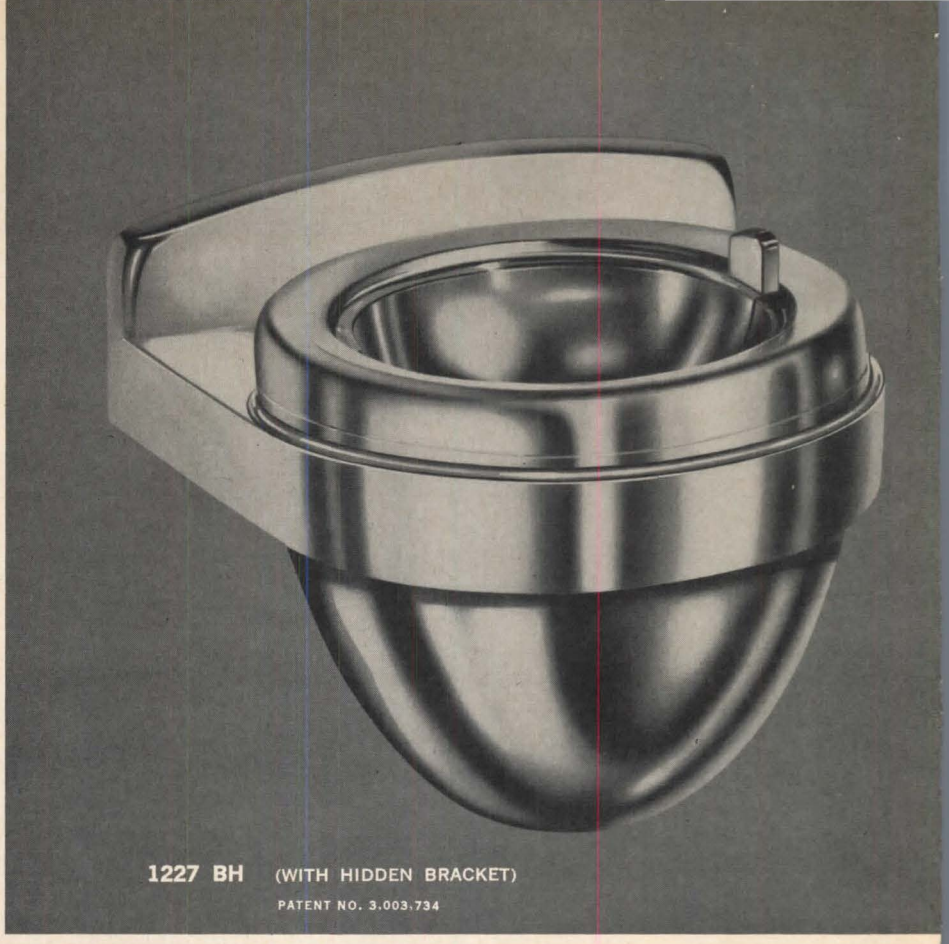

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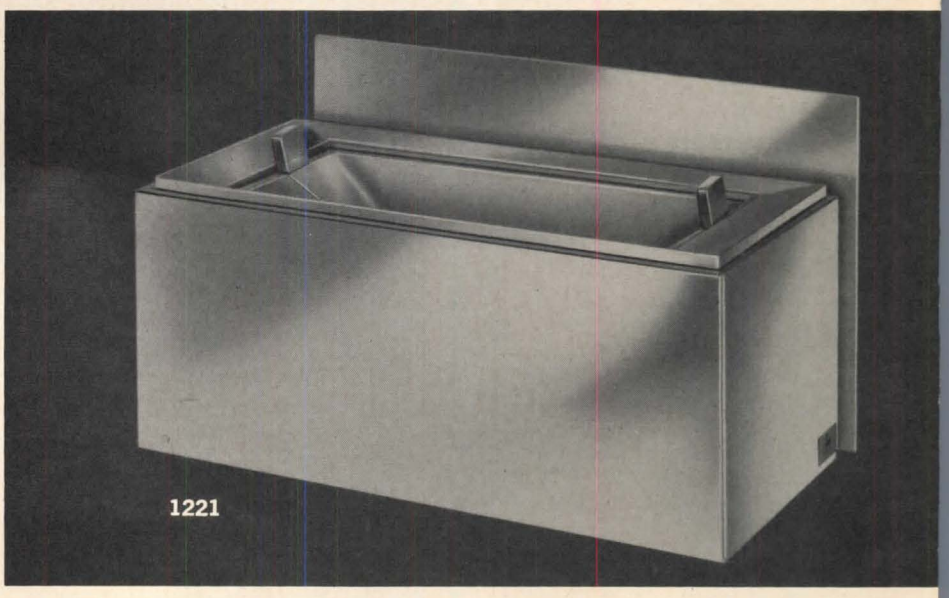

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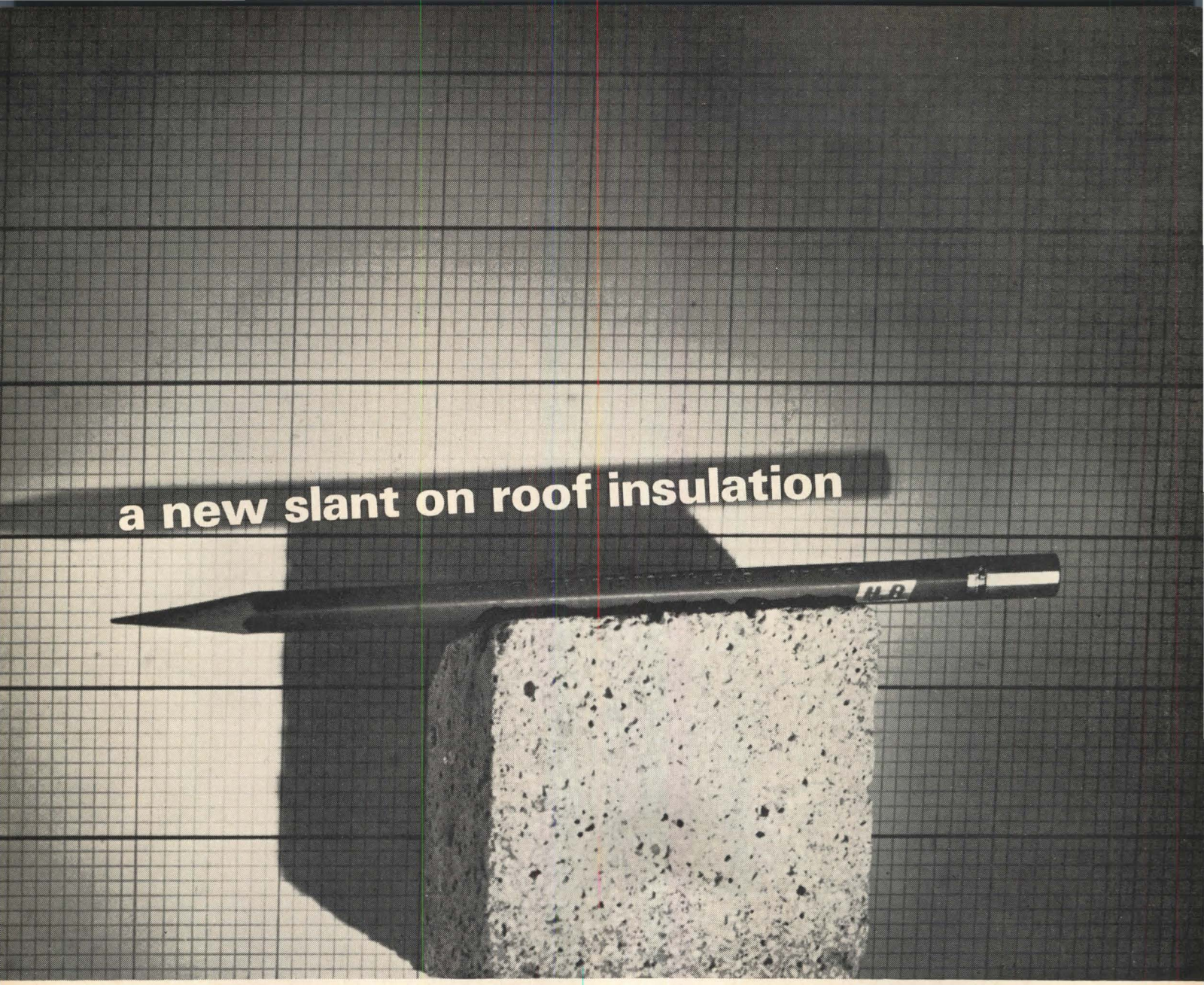

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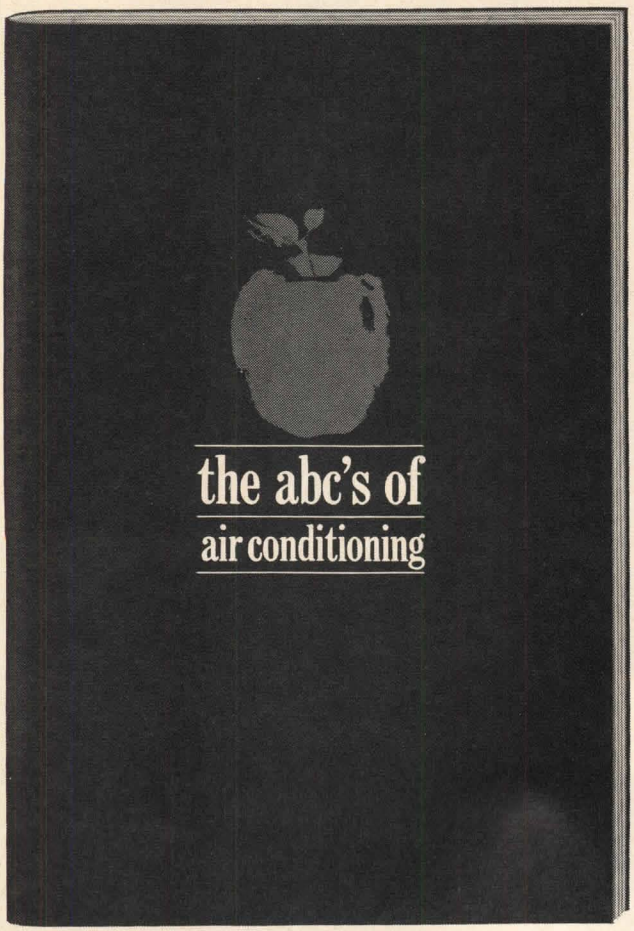

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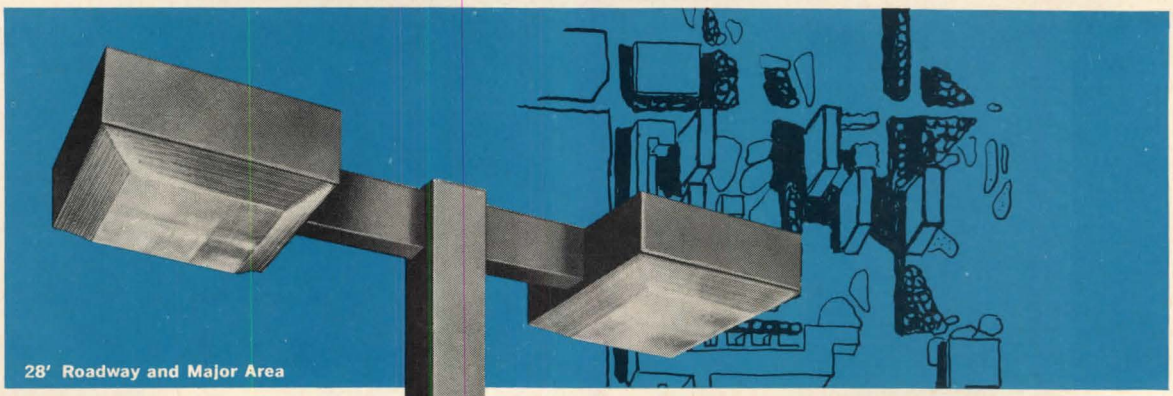

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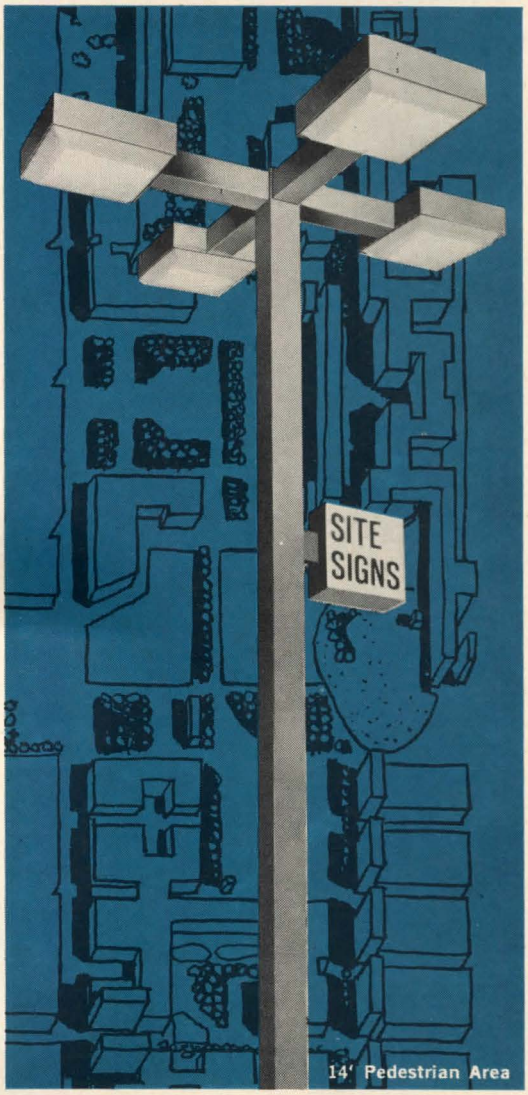

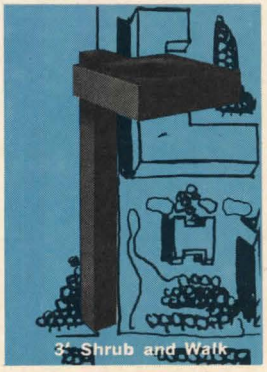

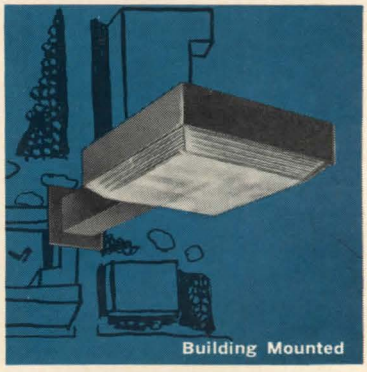

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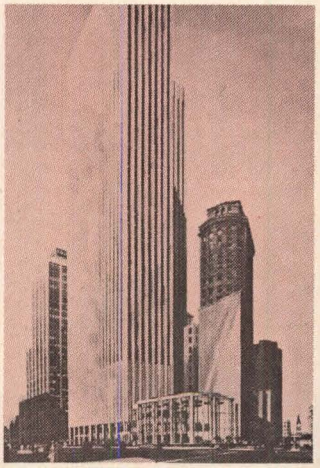

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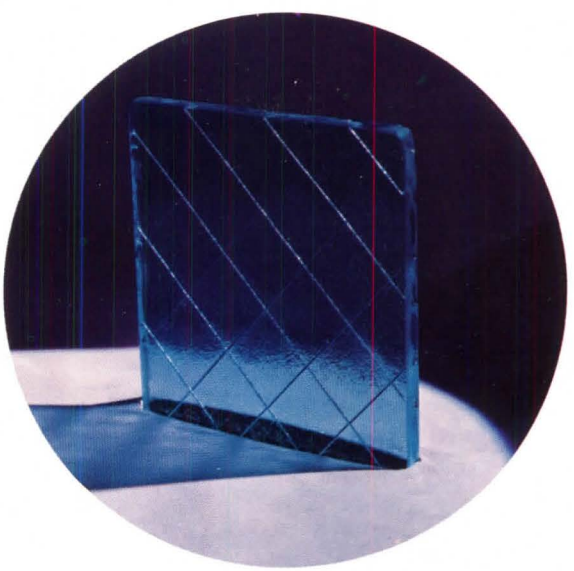

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P/A NEWS REPORT

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

APARTMENT TOWERS TO RISE ON BOSTON'S HISTORIC WHARVES

BOSTON, MASS. Just a few blocks south of the Boston Naval Shipyard, where the frigate "Old Ironsides" is permanently docked, is the site of a projected middle-income residential development designed by I.M. Pei. This site is part of a mile-long waterfront strip, once the heart of the clipper ship district (on Atlantic Avenue, between Constitution Wharf on the north and Foster's Wharf on the south), designated for urban renewal by the Boston Urban Renewal Authority.

The Pei design calls for three 40-story apartment towers, each containing 312 units; a parking garage for 1500 cars; 25,000 sq ft of retail space on ground level; and an office tower.

Looking out over Logan Airport to the east, residents of the towers will enjoy a panoramic view of the harbor and the Atlantic Ocean. Windows on the west will afford a view of the Charles River, near the old North Station.

Major material will be exposed, precast concrete. The first phase — two apartment towers and parking garage — is scheduled for construction in the fall of 1967 and should be completed early in 1969. Estimated cost of the first stage is $26 million. Consultants are: Weiskopf & Pickworth, structural engineers; Caretsky & Associates, mechanical engineers; and Haley & Aldrich, soil consultants.

DOXIADIS TO HEAD A U.S. URBAN STUDIES CENTER

WASHINGTON, D.C. Dr. Constantinos Doxiadis, the Greek city planner, has pooled resources with a U.S. research and development firm, System Development Corporation. At a time when there is growing concern with urban problems and how to solve them, the center will provide a staff of trained experts, who will both study these problems and teach others — city officials and planners mostly — what they have learned. Staffed by members of both firms, the center includes specialists in town planning, transportation, engineering, computer sciences, economics, mathematics, geography, sociology, statistics, and psychology. According to one spokesman, emphasis, at least initially, will be on human and natural resources, safety and security, and satisfactory operation of the city's services.

LATEST FOR CHARLES CENTER

BALTIMORE, MD. Underway in Charles Center is this 21-story office building. Designed in glass and cast-in-place concrete by Peterson & Brickbauer and Emery Roth & Sons, it will provide 405,000 sq ft of net rentable space. Adjoining the building between it and the Federal Office Building seen at the left will be a two-story glass-enclosed pavilion.

THE ASPEN CONFERENCE

ASPEN, COLO. In introducing the seventeenth annual International Design Conference on June 18, chairman Craig Ellwood explained that "architecture needs no words." His pronouncement was followed, of course, by five days of verbiage, as 500 conferees listened to 20 formal speakers (order) discuss "Order and Disorder," each speech followed by a panel discussion (disorder). Few had much to say on the subject, which is, of course, an old one, but the topic was nicely illustrated by an impromptu happening in the conference tent one afternoon. Jeffrey Lindsay, a disciple of Bucky Fuller, had hung a kite, made of metal foil and cardboard, just beneath the roof. Slowly, one by one, the wires holding it gave way, and it settled on the floor like a giant napkin, where it was gathered up by some students. To the accompaniment of a Sousa march from the loudspeaker, they carried it outside, the music making their action a grand one.

Not much else that was grand happened at Aspen this year, although William Arrowsmith, a Greek scholar and critic, did manage to offer a nearly definitive statement on the conference theme. It is probably not too much of an oversimplification of Arrowsmith's remarks to say that he sees order as what man strives after and disorder as an ingredient that man must have to make the order palatable. He sees a possible danger in people mistaking current trends to disorder as a new order. In part, he put it this way: "Our danger, I think, is not so much that of overdesigning the environment as that of creating a new and special modern chaos, in which the ecology as a whole is nobody's business and nobody's design — a conglomerate whose disorder is nakedly exposed in the ruthless design-perfection of some of the parts and their utter unrelatedness."

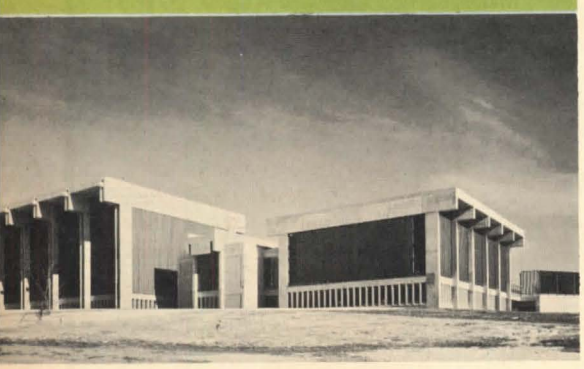
Aspen as usual was good fun. Next year will be the eighteenth.

THE OTHER TWIN

ST. PAUL, MINN. St. Paul and Minneapolis are no more twin cities than Baltimore and Washington or Fort Worth and Dallas. But they share the banks of the Mississippi River in southeastern Minnesota, and a certain fraternal rivalry between the two is as inevitable as the sobriquet Twin Cities. In the past 30 years or so, Minneapolis has grown faster and with more purpose than St. Paul. She has laid out parks, taking advantage of lakes within the city limits, lured industry, showed a remarkable interest in the arts, and generally behaved like an urban leader. "Minneapolis is a *nouveau riche* town," observed a St. Paul resident recently, in a voice that carried no trace of disapproval. And indeed the differences in the two cities stem mainly from divergent attitudes about money. Those attitudes are less divergent now than they were five years ago.

Dollars make sense — In 1962, Minneapolis was attracting enough urban renewal money to make it possible for a developer to purchase land downtown for $7 or $8 a foot, while less desirable land in downtown St. Paul was on the market at $24 a foot. Obviously, St. Paul could not attract venture capital, nor could it benefit from the peripheral business enterprises that follow it. A St. Paul architect who remodeled two floors of an office building around that time found that his client could not lease the space. "And it was not because it wasn't a good remodeling job, or that his rents were not competitive," the architect recalled recently. It was just that no one wanted to locate in downtown St. Paul. Most St. Paul residents put the blame for the decay of their city on the apathy of the old monied families. Great fortunes had been made

Spancrete contributes to "stuctural integrity" of tradition-free church design by Belluschi & Ware



Spancrete ceilings of soft textured concrete, massive poured-in-place concrete beams, and board and batten redwood panels characterize the new Unitarian Church in Rockford, Illinois. The 40-inch-wide exposed Spancrete roof planks with V-groove joints provide the desired scale in relation to other materials and building design.

The choice of materials was influenced by a desire to create a natural warmth conducive to worship. Not too ornate but with simplicity — relying on good proportions, effective lighting and honest materials.

Photos by: Hedrich-Blessing

The Unitarian Church, Rockford, Illinois
Architects: Pietro Belluschi and C. Edward Ware Associates
Structural Engineers: The Engineers Collaborative
General Contractor: Pearce-Butler Company

SPANCRETE

PRECAST, PRESTRESSED CONCRETE HOLLOW CORE PLANK FOR ROOFS AND FLOORS

there during the last part of the 19th Century and the early years of the 20th. The city's location in the northern wilderness on the frontier of the vast Northwest made it a perfect location for railroad and lumber interests, and the fortunes these industries produced are now largely held by six or seven families, who are content to let the money rest in safe investments.

In the 10 years prior to 1962, something like $4,500,000 was spent on new buildings and remodelling old ones in downtown St. Paul. Since 1962, $180 million has been committed in the same area.

The civic spark — What made the difference? Most people give the credit to the Metropolitan Improvement Committee. Formed five years ago by business, civic, and labor leaders, the committee either controls directly or can influence most of the city's financial and labor interests. The 47-man committee has the presidents of six banks on it, for example, and six labor leaders, and, representing as it does such a wide spectrum of city interests, has been spectacularly successful both in putting pressure on

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the Federal Government for renewal funds and in finding private capital for development.

"It's the whole story in St. Paul," comments architect Brooks Cavin. Cavin, and others, tell with some relish how, in St. Paul, the city was in danger of losing Federal funds for its Summit University renewal area, with the tightening of the Federal purse strings this spring. Robert Van Hoef, executive director of the MIC, talked the Minnesota Mining and Manufacturing Company into providing a plane to fly some members of the committee to Washington to state their case. As a result, the city got $31 million, only slightly less than they originally sought, and work is just now getting under way there.

Renewal showcase — Originally, the Summit-University area, whose 1035 acres make it one of the country's largest urban renewal areas, was selected as a renewal showcase. Only 5% of the greater St. Paul's 629,000 residents are Negro, and the Federal Government thought that slum clearance in the Summit area, where most of them live, might actually solve some of the problems traditionally besetting such areas nationally. Whether this can be done remains to be seen. But an outsider visiting the area for the first time is immediately struck by the non-slum quality of the housing there. True, it is sometimes dilapidated; the houses may need paint or repair for a sagging porch. But the area has lots of trees, and the grass and weeds in yards are usually given an occasional cutting. The feeling is much closer to that found in the Watts section of Los Angeles, another non-slum, than in the wrong side of the tracks sections of New York or Chicago or Pittsburgh. Moreover, the Summit-University area has the considerable asset of containing, in addition, one of the city's finest residential areas. It stretches for five miles along Summit Avenue. Only a block or so from it, the area deteriorates rapidly, but along the avenue, anchored at one end by Emmanuel Masqueray's magnificient St. Paul Cathedral, are older homes, dating from around the turn of the century, which mirror the wealth and prestige the city once had and will have again. When Montgomery Schuyler first saw Summit Avenue, he wrote, "There are few streets in the United States that give in as high a degree as Summit Avenue the sense of expenditure, liberal without ostentation, directed by skill, and restrained by taste." His statement is still accurate.

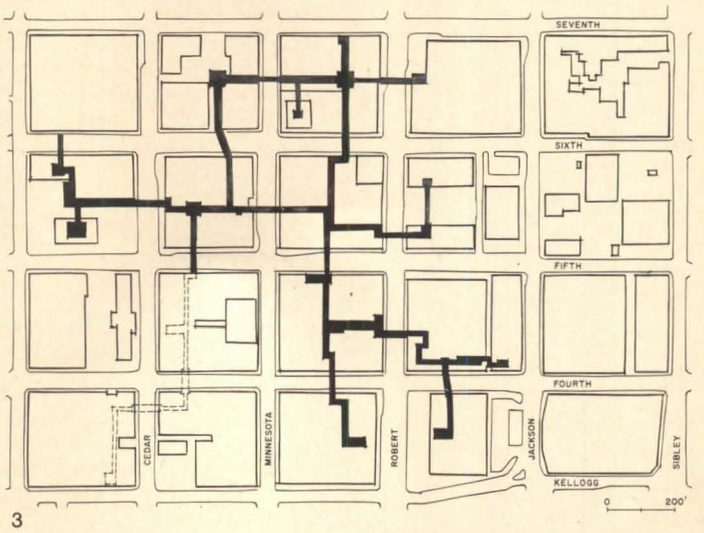
Pockets of potential — Wherever one goes in St. Paul,

one comes unexpectedly upon fine older buildings that can form corner stones for the renewal of the city. This remarkable architectural her-

2

itage, surviving from a more affluent past, is largely responsible for whatever charm St. Paul retains after decades of neglect. Fortunately, the city seems aware of it. And in Mayor Thomas Bryne they have a public official who evidently turns awareness into action. When someone reminded him that the imposingly handsome U.S. Post Office–Court House building (designed in 1894 by James Knox Taylor, a former partner of Cass Gilbert, and to be vacated when the new Federal Courthouse is ready sometime late this year) was worth saving, Bryne promptly appointed a committee to find another use for it. Although the committee's report is not yet available, several uses have been suggested unofficially, among them a museum and office space. H.F. Koeper, who wrote a book on historic architecture in St. Paul, called the Court House "an exuberant collection of gables, turrets, and towers." As one walks past it, it continually reveals new facets, filling one with a sense of expectation, much the way a trip down a winding river does. Inside is a truly magnificient space, reaching from ground level (although the ground floor is now filled with the post office) to roof, surrounded by iron-grille-protected corridors. Facing the Court House across Rice Park is the public library, a handsome Italianate structure. The designers of the legitimate theater (part of what will be a civic center), which will run between the library and the courthouse along the west side of the small park, have a fine opportunity to tie the buildings together visually, making something truly distinctive of the square. St. Paul is rife with such opportunities. In moving about the city, one is continually coming across small plazas of a variety of shapes. Little has been done to make them oases in the fabric of the city, let alone tie them into that fabric. How cohesive the disparate parts of the city can be made depends on how successful the several independent areas of renewal are at sparking the refurbishing of the sections between them.

Plugging the vitality leak — The main point of the renewal, of course, is to bring back to the center of the city the trade and vitality that has been draining away to the suburbs and beyond. Already with the start of active development in the Capital Centre area, 12 blocks in the heart of downtown, an attitude has been kindled that shows St. Paul is reviving. "People used to saunter along the street," says architect Louis Lundgern; "now they walk with a purpose." Lundgern is one of four architects (Grover Dimond, Brooks Cavin, and Cecil Tammen, a partner in Cerny Associates, are the others) who have spearheaded the urban renewal program. They were once the urban renewal committee of the local AIA chapter and they now serve as an architectural advisory committee to the Metropolitan Improvement Committee. "We came to a point about 10 years ago, where we had to make a conscious decision whether to stay in St. Paul and make it a city worth practicing in or to move elsewhere," explains Grover Dimond. And although none of the four has seen much increase in their practice from urban renewal work, it is obvious that the city in general and architecture in particular has benefited from their decision. "The architect has become an important citizen here," a young St. Paul architect said last month. "Those four and their urban renewal suggestions are always being mentioned in papers, and as a result architects can carry their heads a little higher." Grover Dimond's firm won a competition to design a three-block complex in the Capital Centre area comprising a building for the Northwestern State Bank **(1)**, parking, and eventually other office space. Haarstick, Lundgern & Assoc., working with the Walter Butler firm, are completing work on a GSA Federal Court House building **(2).** "We did it just the way the GSA wanted it, and made a profit,"



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gern. In addition, the four architects have pooled their talents, forming a separate firm, to design the civic center, which will consist of an auditorium, an arena, and theater mentioned earlier. And they are working on the preliminary design for a high-rise apartment house to be located downtown close to the river.

Walkways to the sky — One of the most striking features of the Capital Centre renewal plan is a proposed skyway system **(3)**, a walkway that will run through the entire area, connecting buildings at the second-story level by means of enclosed bridges. The minute details of just how the skyway will be maintained, heated, cooled, and policed are still being worked out. But the spans between buildings will be built by the city's Housing and Redevelopment Authority and probably maintained by the owners of the buildings they connect. The first of these bridges — between the new Federal Courts building and Cass Gilbert's handsome Endicott building, built in 1890 — is almost completed. Since the GSA refuses to help cool and heat the bridge, this will be done by the Endicott owners, and it can probably be assumed that the problems facing bridges between other structures and the interior passages through them will be handled with an equal sense of civic responsibility. The walkways, which, as they run through building corridors or along banking floors, will eventually be lined with shops, will separate much pedestrian traffic in the heart of downtown from vehicular traffic. Not incidentally, they will also provide interior shopping and strolling during St. Paul's bone-numbing winters. The design of these skyways and their bridges is being done by Hammal Green & Abrahamson, Inc., of St. Paul.

Overlooking the river — As the city's urban renewal areas are currently arranged, they come down to the Mississippi riverfront in the central business district but stop short of it. Across from the downtown area are two large urban renewal districts set aside for industrial development by the St. Paul Port Authority. Use of the riverfront is a highly complex problem in St. Paul, and one which may prove beyond the scope of urban renewal to solve. As an industrial city, St. Paul has long relied on the river for transportation, and one of the delights of a visit to that city is to watch barge traffic on the river. But if industrial development along the river is not carefully watched, what could be one of the city's greatest natural assets may become its greatest liability. Already there is evidence that industry not relying on the river for transportation is being allowed to cluster along its banks. And although most architects would agree with Louis Lundgern, who, speaking of the view from downtown, says, "I like to look out over steel mills and grain elevators," they probably feel differently about junkyards

and the nondescript jumble of ordinary manufacturing plants. St. Paul acts toward the river the way a blasé lover acts toward his loved one, refusing to acknowledge her considerable charms. This attitude may be explained by the realization that most St. Paul residents have never known the downtown riverfront to be anything but a jumble of railroad tracks and oil tanks. As Robert Van Hoef elaborates, "When most people in St. Paul think of water they think of the lakes to the north, where many of them go on weekends." If the riverfront problem is solved, and it no doubt will be, it will come with the continuing awareness that a renewed, uncluttered downtown has, ultimately, more economic potential than a shoddy, haphazard one. Architects in St. Paul seem well aware of the problem, even if they have yet to convince their fellow citizens. And the urban renewal committee of the local AIA chapter plans to offer the riverfront development to students at the university as a project with the hopes of gaining some civic sympathy for the results.

Photo: Dale Peterson/Warren Reynolds & Associates

4

Traditionally, the river has marked one edge of town and development beyond that barrier has been slow. There is enough open land, for instance, directly across the river from the central business district (in what will become an industrial park) for a small airport to operate there. One can watch the light craft swooping in low over the field at dusk, returning from a day's trip. But from the Capital Centre area, one's gaze is not drawn naturally from street level to the river. Instead, as one comes around a corner, one is more likely to look west toward Cass Gilbert's Minnesota Capitol. Situated on high ground it is truly an imposing building, and there is some talk by the Housing and Redevelopment Authority of landscaping the two main access streets that sweep from downtown up toward it.

The river of concrete — It is somewhat ironic, in view of this visual relationship, that a vast freeway is swinging through downtown St. Paul between the Capitol and the central business district. Because the freeway is sunken, with city streets bridging it, the sightlines are maintained. But the freeway forms an earth-sculptured boundary for the Capitol area and, in the same way, for the Capital Centre, so that the heart of downtown St. Paul is defined by three historic transportation links, the railway-river to the east and south, and the highway to the west. Everyone in St. Paul seems to accept the yet-to-be-completed freeway, realizing that the wound it has opened will heal. Ten years ago, Victor Gruen came to town to provide a plan for growth, only to run afoul of the Bureau of Public Roads, which refused to move their freeway behind the Capitol, as Gruen sensibly suggested. Gruen's plan was never finished.

The giant beacon — From the look of things now, the growth of St. Paul will be a long time finishing. Besides the nearly completed Federal Courthouse, the Capital Centre has a newly opened $3,-

Photo: Michael Myers

5

500,000 Farm Credit Banks Building **(4)** by Bergstedt, Wahlberg & Wold, Inc., and a 22-story, $8-million office building, the Osborn Building **(5),** by the same firm is nearing completion only a few blocks away. And much other work is in the planning stage. Something may be done with Union Station, for instance, where 12 railroad lines converge, and there is talk of more parking ramps and more housing.

Yet even now, despite this hustle, some of those involved are not sure they are doing enough. "Someday," comments Cecil Tammen, "someone is going to sit back and look at what has been done and ask: 'Is that all?' "

Few people seem to be sitting back right now in St. Paul. It is almost as if the giant five-story sign atop the city's tallest building, the First National Bank, were a beacon to show people the ultimate goal. It says simply, "First."

WHICH TOWN? WHAT COUNTRY?

In the May issue of *Town and Country* appeared a list of the new 400 — "the doers of our era, men at the peak of their careers who make our world a vital, vibrant place." The idea was, we suppose, to supply a list of people who do things — to oppose the list of people with family name or money who make up what must now be called by default the old 400.

The list was arranged in four columns with no hint of how the order had been determined. It was not alphabetical. If it was haphazard, there was no clue. The first four names read like this: Lyndon Johnson, Marshall McLuhan, U Thant, Edward Durell Stone. Next came Frank Sinatra. We wonder how they are taking that in Vegas.

In all, there were 11 architects. Besides Stone, sprinkled through the list in this order, were Marcel Breuer, Philip Johnson, Gordon Bunshaft, William Pereira, Buckminster Fuller, Wallace K. Harrison, I.M. Pei, Mies van der Rohe, Edmund Bacon, and Louis Kahn. Breuer was flanked by Eugene Black and Angier Biddle Duke. Philip Johnson came right after Conrad Hilton. Gordon Bunshaft came before William O. Douglas and John Paul Getty (the *Playboy* writer), but after Ralph Bunche and Sammy Davis Jr. Pereira came after Charles DeGaulle and David Merrick but before King Hassan II. Bucky Fuller beat out Bing Crosby and King Constantine of Greece (it's been a hard year for kings) but he was one down from Jasper Johns.

CRANE, PEI TO DESIGN FOR BROOKLYN GHETTO

BROOKLYN, N.Y. Several months ago, announcements were made concerning a large-scale renewal plan for the Bedford-Stuyvesant ghetto area in Brooklyn. Two corporations, The Development and Services Corporation and the Restoration Corporation, formed by businessmen and community leaders, undertook to enlist the support of local and Federal politicians, including Senators Jacob Javits and Robert Kennedy, and to apply for private and Federal funds. Grants from the Astor Foundation and others enabled the Development and Services Corporation to hire Edward J. Logue as planning director, and to commission the firms of David Crane, I.M. Pei, and Raymond & May to begin actual design studies. The three firms are coordinating separate aspects of a physical plan.

Crane's office is developing systems and prototypes for community facilities and directing the over-all planning

process. I.M. Pei, in a parallel effort, is working on specific design problems, one of which is a proposal to create two superblocks, and to turn the intervening streets into open, grass-covered spaces. Surveys, traffic and circulation studies, and other aspects of planning analysis are being carried out by Raymond & May.

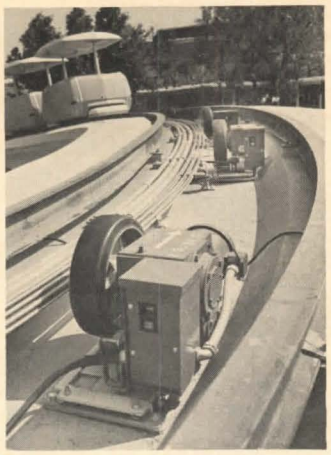
To underscore the Federal Government's intention of accomplishing something solid in this particular slum, news came recently of a $7 million grant from the Department of Labor to be used to create jobs there and train local labor to fill them. Administrators of the grant — the City of New York in conjunction with the two corporations — hope to get a design plan that could be turned over to local talent for execution. Part of the $7 million would be used to renovate an existing structure for use as a community center, or to erect a new one. Here, young people would be trained in the construction trades. This and other socially oriented programs will be sponsored by the Development and Services Corporation, while the Restoration Corporation will work with business and industry to gain their support for the physical renewal.

So far, so good. But the problems of politics and of disputes between the two corporations may stall, or even halt, progress for some time. Residents of the area are anxious to see something happen, and have expressed their doubts about all the big names. A case of overprotestation perhaps. The money and the ideas are available. Now, we can only hope for action.

MINI-TRANSIT

ANAHEIM, CALIF. Our fun world, spreading out from hippie epicenters and financed by the affluent society, is said to be demanding more and more convenience in short-haul travel around such places as airports, shopping centers, and sprawling campuses — academic or industrial. What better place to introduce a fun ride than Disneyland?

The prototype design shown above, called a "PeopleMover," has been installed at Disneyland for the testing-in-action of its engineering



principles and hardware. Continuously moving trains (four cars, each car seating four people) are boarded from a round platform revolving at the same speed as the cars. Wheels run by electric motors set between the concrete tracks propel the trains, which have no motive power of their own. A total of 62 trains, moving around a ¾-mile overhead track, will carry a maximum of 4880 passengers per hour at a top speed of 7 mph. However, engineers feel that larger vehicles will be feasible, and speeds can be upped to 20 mph.

Developed by WED (Walter E. Disney) Enterprises, in cooperation with Goodyear Tire & Rubber Co., the system is still in the testing stage, but WED hopes to interest manufacturers in producing components. At this point, any installation in the "real" world would have to be put together on a custom basis.

TOLEDO TOWER

TOLEDO, OHIO. Midwestern towns, surrounded, as they are, by all that flat land, have grown out rather than up.

Now, though, they are beginning to grow up, too. Before the summer is over, construction will begin on what is to be the tallest building in Toledo — 30 stories. Designed by Harrison & Abramovitz for the Riverview One Corporation developers, who will lease most of the 400,000 sq ft interior space to the Owens-Corning Fiberglas Corp., the building's vertical rise will be emphasized by an open landscaped mall in front and the low horizontal backdrop of a five-story parking garage to one side.

The developer can afford the luxury of a mall and an aboveground parking structure because the land is part of Toledo's Riverview I urban renewal project.

As shown in preliminary design, the Fiberglas Tower, as it will be called, will be sheathed in bronze-tinted glass panels and aluminum framing.

Associate architects are Richard, Bauer & Moorhead of Toledo, and Tully & Hobbs of Columbus.

PERSONALITIES

Edward J. Logue, who is Boston's Urban Renewal Administrator and a part-time consultant to New York's Mayor Lindsay, plans to resign his Boston post early next fall to join 10 other candidates in the race for election as Mayor . . . **Frederick Gibberd,** architect of Liverpool's controversial Roman Catholic Cathedral (see p. 57, JUNE 1967 P/A), was knighted by Queen Elizabeth in June . . . Two architect-planners have been appointed to direct Urban America's new Urban Design Center. They are **James N. Kise,** formerly a member of the Philadelphia City Planning Commission, and **R. James Goodell,** also from Philadelphia . . . To insure maintenance of high quality at The Sea Ranch, its developers have appointed architect **Louis McLane** as Planning Director . . . **Mary Margaret Grant** was recently named assistant director of information services for the AIA

CALENDAR

Workshops at the **46th Annual Meeting of the Producers' Council,** September 19–22, will focus on the "Impact of Building Systems on Construction" and "Cities — New and Renewed." Meeting will take place at the Hotel America in Houston, Tex. . . . The **31st Annual Convention of the National Builders' Hardware Association and the American Society of Architectural Consultants** will be held at the Palmer House in Chicago October 1–4 . . . San Diego's Mission Bay Park, winner of an AIA Citation for Excellence in Community Architecture, will be the scene of the **22nd Annual Convention of the California Council, AIA,** October 5–8 . . . Recreational facilities will be the main topic for discussion at the **Annual New England Regional Conference, AIA.** Dates, October 6–8; place, Sheraton-Eastland Motor Hotel, Portland, Me. . . . In celebration of its 50th anniversary, the Lions International will sponsor a conference on **"The City of the Future."** Featuring talks by Margaret Mead, Constantinos Doxiadis, and James W. Rouse, the event is planned for October 16–18 in San Juan, P.R. . . . **The 15th Annual Convention of the Architectural Woodwork Institute** is scheduled for October 18–19 at the Drake Hotel, Chicago, Ill. . . . **"Transportation Graphics: Where am I Going? How Do I Get There?"** is the theme of a day-long symposium to be held at the Museum of Modern Art, 11 W. 53 St., New York City, October 23 . . . **The Second Conference on Product Literature and Advertising in the Construction Industry** will convene at Chicago's Drake Hotel, October 23–24. The convention is sponsored by the Producers' Council . . . November 9 is the date for the **Fourth Annual Design Conference** of the Society of the Plastics Industry, to be held at the Hotel Americana, New York City . . . The Interprofessional Commission on Environmental Design, an alliance of six professional societies, will hold an **Interprofessional Conference on Environmental Design,** November 16–17, at the Education Center of the University of Maryland.

THE IGNOBLE EXPERIMENT

BROOKLYN, N.Y. Deep in Brooklyn, a $70,000 experiment sits on the grounds of the Cypress Hills housing project, ignored by passers-by and only occasionally recognized by the children for whom it was intended.

Late this spring, two "experimental playgrounds" opened officially at Cypress Hills, while the Rothschild Junior High School band played "Happy Days Are Here Again" and a swarm of children let 2500 colored balloons float skyward. Seldom had the vast housing project ("20th-Century tenements," one critic calls them) seen such color and excitement. As the balloons and the crowd disappeared, so did the focus of warmth and attractiveness that had momentarily brightened the project. Left were two round concrete play areas (one 72′ in diameter, one 32′) remarkable for their forests of vertical concrete slabs, arranged like a grouping of headstones seen through a fisheye lens.

The larger playground also has a tower, with a slide, a wading pool (with occasional water), and a grouping of sliced half culvert sections supported on concrete stems.

Although the completed project has some attractiveness as a piece of sculpture, its appeal as a play area seems to be minimal. It has none of the comfortable attractiveness that the natural materials (wood, sand, water, and trees) lend Central Park's Adventure Playground (see p. 50, JULY 1967 P/A), nor does it enhance the area the way Riis Plaza does (see pp. 170–172, JULY 1966 P/A). Perhaps the comparison with Riis Plaza, which cost $1 million, is unfair, but the parallel with the Adventure Playground, which cost $85,000, is not. The Adventure Playground is inviting, and, as a result, is constantly filled with children, mothers, and strollers.

The experimental playground, barren and forbidding, is almost constantly devoid of activity. "One of the supervisors took a group over there once, but I wasn't here then," recalled a woman at the Cypress Hills Childrens' Center last month, as if she were describing an expedition that has passed into legend, one to a far away swamp, instead of to a playground 30 yd distant. The mothers of smaller children, three to eight years old, for whom the experiment was concocted, don't like their children to play there because of the concrete.

On a recent afternoon there were two or three older boys (about 14 years old) playing a game of tag that could have passed as a Green Bay Packer workout. They darted in and out of the thicket of upright concrete slabs, scrambled over the half conduits on stems, and by their constant violent motion kept any smaller child who might have wanted to venture into the area at bay. When asked if the kids used the playground much, one of the tag players said, "Man, that's all they do use." But he was obviously referring to older children, and there is no evidence that the older ones have abandoned the traditional areas of the project used for stoop ball and other diversions. What the playground does get used for, of course, is as a canvas for crude artwork. Within a few weeks of its opening, the concrete slabs were covered with anatomical drawings and misspelled four letter words.

Photos: Dan Budnick

This sculptural exercise was sponsored jointly by the New York City Housing Authority, the Museum of Modern Art, and the Park Association of New York City, all of which should have known better. The design, as executed, looks no more inviting that it did as a model. It belongs in the Museum of Modern Art's permanent collection of playgrounds — something to be stared at behind glass — rather than in the Cypress Hills project. Charles Forberg was the architect.

THE PERIL OF ST. BARBARA

THE VATICAN, ROME. St. Barbara, patron saint of architects, is in danger of decannonization. If her claim to saintdom is found spurious (she is one of 400 saints whose backgrounds are being examined by Pope Paul VI), architects will be without a spiritual patroness. According to legend, Barbara was slain by her irate pagan father when she ordered three windows, representing the Trinity, put into the family bathhouse. Her father, Diasconus, was killed by lightning for his deed.

SCHOOLS

The Pittsburgh Plate Glass Foundation has granted **Harvard University** $15,000 to study the relevance of systems analysis techniques to the solution of urban problems . . . At **Auburn University,** Auburn, Ala., J. Ingraham Clark has moved from the position of director of the School of Architecture to that of dean of the School of Architecture and the Arts . . . Frederick Morris Wells will take over as chairman of the Department of Architecture at the College of Architecture, Art, and Planning at **Cornell University** next fall. He will also continue to serve as chairman of the college's Department of Design . . . New faculty appointments at the **Rhode Island School of Design** include Guntis Plesums, instructor of architecture . . . Yusing Y. Jung, a Toronto, Canada architect, will be visiting associate professor of architecture at **Massachusetts Institute of Technology** this fall . . . The College of Letters & Science of the **University of Idaho** has named James R. Jarrett as head of its Department of Art and Architecture . . . James D. Gough, Jr. has been appointed Director of the School of Architecture at **Montana State University,** Bozeman, Mont. . . . **Illinois Institute of Techology** is offering graduate courses in air-pollution control. Courses in the Evening Division begin September 18.

AWARDS

Uri Hung of the Art Center School of Design, Los Angeles, Calif., has been awarded the $500 first prize in the Royalmetal Corporation's student competition for the design of a branch bank interior. Judges were Albert Homer Swanke of the office of Alfred Easton Poor; Lawrence Lerner, president of Saphier, Lerner, Schindler, Inc.; and P/A's Editor, Jan C. Rowan . . . Recipient of a $3000 fellowship for foreign travel and study is **Louis R. Saur,** winner of this year's James Harrison Steedman competition. Saur is a designer with the firm of Smith & Enzeroth, St. Louis, Mo. . . . **William Edward Roesner** of Boston, Mass. has won the Rotch Travelling Scholarship for 1967. The $6500 award will enable him to travel in Europe for a year . . . The American Society for Testing and Materials recently presented the Walter C. Voss Award for 1967 to **Frank J. Hanrahan,** who is executive vice-president of the American Institute of Timber Construction. Hanrahan was cited for his efforts in promoting research and education on the structural use of wood and for his participation in the formulation of standards and codes for wood and wood-base materials.

THE LITTLE ROUND SCHOOLHOUSE

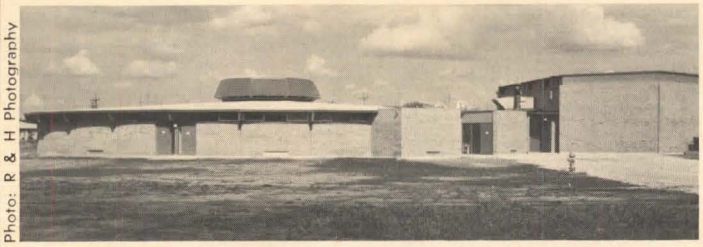
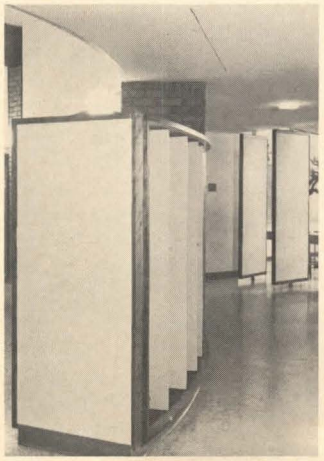


Photo: R & H Photography

WEST SPRINGFIELD, ILL. Standing on 7½ acres of what was once an Illinois cornfield, the Owen Marsh Elementary School brings back much of the intimacy that has been lost to elementary education since the days of the red brick one-room school. It has seven classrooms arranged around a circular central area, which serves as a library, a story-telling space, and even, if need be, as another classroom. All the classrooms open onto a circular hallway that rings this central library, and some of these rooms can be opened to the hallway by merely swinging edgewise pivoting panels, which double as bulletin boards. When open, the panels allow clear views from the classrooms, across the hallway, to the bookcases and lockers that ring the library. These cases, which stop short of the ceiling, about 5′ from the floor, provide only a partial shield for the space within; in all, there is a sense of openness and intimacy, without disallowing a chance for privacy.

Architects Ferry & Henderson designed the school to keep attention concentrated on the interior, and both the library center and the classrooms have windows just beneath the roof line. This inward focus turned out to be doubly fortuitous, for the school board, which spent only $15.30 per sq ft for the building, has not allowed landscaping. The school stands surrounded by 7½ acres of black Illinois dirt. The school might be many times more effective if the schoolyard included grass



and trees, play areas, and even outdoor classroom space. The school board argues that landscaping would be an improper use of taxpayers' money. But to send kids to school in the middle of 7½ acres of raw dirt is an improper use of children.

WREN CHURCH FINDS A MISSOURI HOME

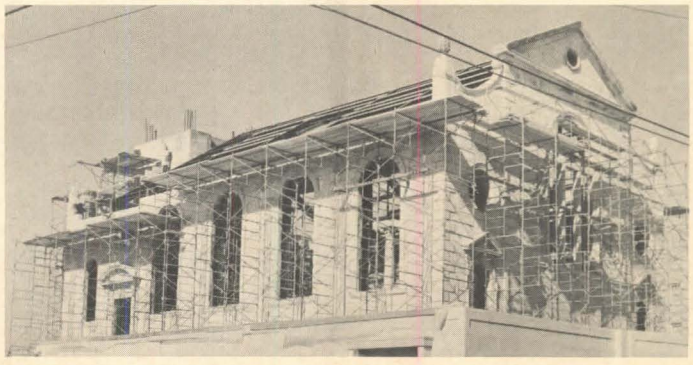
FULTON, MO. Carrying a stone church from London to Missouri is not a waste of effort — but it is an effort. To move Christopher Wren's St. Mary Aldermanbury Church to the campus of Westminster College here, 640 tons of stone had to be dismantled, cleaned, crated, and shipped. Since a World War II bombing raid in 1940, the church has stood roofless and gutted. In 1961, Westminster College president Robert Davidson saw a magazine picture of it and initiated the idea of bringing it to Fulton to serve as the college chapel. Its restoration is expected to be completed this year in time to commemorate the twenty-first anniversary of Winston Churchill's "Iron Curtain" speech, which he gave on the Westminster campus.

The church's history has been long and violent. Originally built in the 12th Century, it was destroyed by the great London fire of 1666. The next year it was reconstructed as part of Christopher Wren's master plan for the city.

In its present reconstruction, a structural steel framing system is replacing the wooden trusses Wren used to support the roof. According to structural engineers Sterling Snyder & Associates, the space frame will eliminate the danger of lateral thrust, which could cause dangerous bulging of the stone walls. Matching Corinthian columns, which originally supported the wooden roof trusses, will be placed in the structure, but, because of damage to them during the war, they will not be structural. Instead, the roof frame will rest on steel columns embedded in

the walls. St. Louis architect Frederick L. Sternberg is handling the reconstruction, following research and sketches prepared by English architect Marshall Sisson.

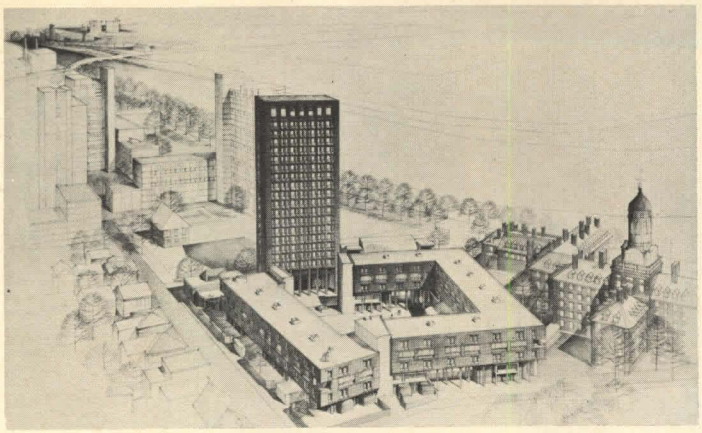
Fortunately for everyone, the Portland Limestone Quarry from which Wren obtained the original stone was able to supply stone to replace broken and missing pieces.



HARVARD HOUSE HAS IRREGULAR SQUARE

CAMBRIDGE, MASS. Increase Mather was probably the most powerful man in New England during the last half of the 17th Century. He was also a renowned scholar and author of 150 books. In 1673, he became the sixth president of Harvard. It would probably please him greatly to know that Harvard has named its tenth educational and social center for undergraduates after him.

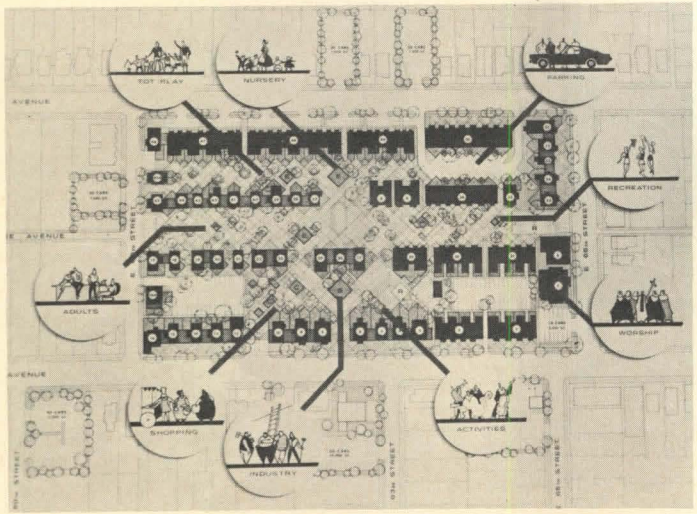
Mather House, designed, as are other Harvard Houses, by Shepley, Bulfinch, Richardson & Abbott of Boston, will be a residence for about 400 Harvard sophomores, juniors, and seniors. Most of these students will live in single and double rooms in the 21-story tower. But some will live in four- and six-man suites in the low-rise structure that shares a courtyard with the tower, each unit with a common living room and an alcove for a refrigerator and hot plate. Because of the irregularity of the site, the architects have made the courtyard an irregularly shaped one rather than a square, and by doing so have given the grouping some distinction. One section of the low-rise building is an open rectangle, with the side that would normally close the rectangle running off toward the high-rise building at an obtuse angle. The high-rise structure sits just back of the opening left where the rectangle would normally be joined and closed. A separate two-story structure will house most of the communal facilities of the



new center: dining room, a grill for after-hour snacks, game rooms, and common rooms for meeting, forums, and informal talks. The main dining room will have a raised stage at one end, for musical or dramatic presentation, with additional space for scenery storage and stage equipment. Also in the low-rise structure will be apartments for the House Master, a senior faculty member, and for resident tutors, offices, and a House library. There will also be a music listening room, a TV room, darkroom, art studio, and music practice rooms.

The contemporary architecture will contrast with the Georgian style of earlier undergraduate houses. Funds for the $8 million structure come from the Harvard College fund-raising program.

ARCHITECT HELPS COOL HOUGH

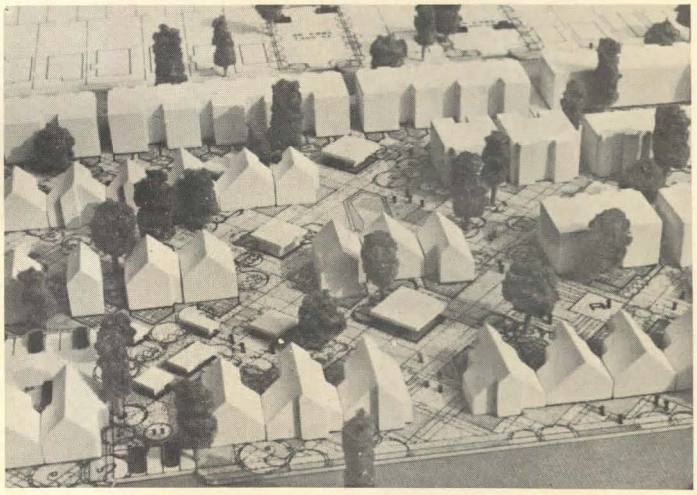


CLEVELAND, OHIO Last summer, one of the hottest areas in the U.S., from the standpoint of racial unrest, was the Hough section of Cleveland. Once a residential area for the white middle classes and later a resort of bagnios and ginmills, Hough, in recent years, became a slum cauldron that finally boiled over in an excess of despair and frustration. The trouble, basically, was poverty, abysmal living conditions, and municipal lethargy.

It fell to a local citizen's organization to furnish the spark that may help Hough become a fit place in which to live, and, tangentially, remove the opprobrium earned by Cleveland as a racial trouble spot. HOPE, Inc., short for Housing Our People Economically, proved that its name means what it says when, within a year and a half of its formation, it took over two apartment houses in Hough, restored them, and began renting the units at modest rates. Now, it has pulled the significant coup of obtaining the promise of $150,000 seed capital from three major building materials organizations — American Plywood Association, National Forest Products Association, and Southern Pine Association — for a two-block rehabilitation project in Hough that will be financed by a $2 million insured mortgage low-interest loan from FHA and HUD. Moreover, the project has been planned and designed by architect A. Quincy Jones of A. Quincy Jones & Frederick E. Emmons of Los Angeles to include not only repaired and renovated structures but also open recreation and assembly areas, parking facilities, and indoor and outdoor provisions for community activities, worship, shopping, light industry, and child care (see site plan). In short, a community of integrated activities.

Unfortunately, when bids went out last month, the results were a staggering $6000 per unit more than HUD and FHA would insure and finance. Under Government regulations for financing on this sort of project, they will go no higher than $11,000 per unit, and bids of $17,000 per unit threw the project temporarily into limbo. HOPE is undaunted by this temporary setback. Working on their own, without the three associations originally involved, they raised $110,000 in seed money from local Cleveland churches, and according to the Reverend Walter Gravatt, a HOPE director, will try to work out architectural designs compatible with the Federal Government limits. One source blames the recently increased labor costs in the Cleveland area for the inaccuracy of the bids, but, whatever the cause, the tantalizing potential of this project is enough to make anyone concerned with the future of cities to want to see results.

Even if the size of the Hough project is disappointingly small — it is not certain how much benign influence a two-block redevelopment can have on an area so rife with problems — it is a formula — local nonprofit organization plus the building industry plus an interested architect plus public money — that should prove successful for other communities trying to pull out of the mire of antiquated slum conditions and the unhappiness they breed.



HIGHWAY BEAUTIFICATION COMPETITION

WASHINGTON, D.C. Highways aren't getting any prettier, but the effort to have designers make them so is moving along smoothly. Latest step is the announcement by Secretary of Transportation Alan Boyd of an annual awards competition of highway beautification. First awards will be made next January — 11 to agencies of state, county, and local governments, and 4 to social, civic, and professional organizations and to private industry. According to Secretary Boyd, the citations to government will go for such efforts as blending the rural highway into its surroundings, the screening off of junkyards, and the architectural design of bridges and other highway structures. Awards for programs of action toward making highways more attractive will go to civic groups and to industry. Full details are available from John A. Hanson, New York Division, Bureau of Public Roads, 12–14 Russell Road, Albany, N.Y. 12206.

IF YOU CAN'T STAND IT, PAINT IT

If you can't beautify the highways, you might try beautifying the cars. One goal seems just as hard to achieve as the other, and in the U.S. today there are legions of junky cars moving over a network of junky roads. Perhaps as a protest of individuality in an arena that demands conformity, several individuals are providing their chariots with personalized exterior colors. Beatle John Lennon had his Rolls-Royce painted with a pattern of flowers and whirling lines on a yellow gold base. Architectural photographer David Hirsch and his friends transformed his Volkswagon into a piece of optical art. The hippies in San Francisco applied the psychedelic touch to an old GM bus, and the idea was picked up by their counterparts in New York's Greenwich Village. If Henry Ford, who had his own ideas about color, could have been warned about all this, we might not have had a highway problem.

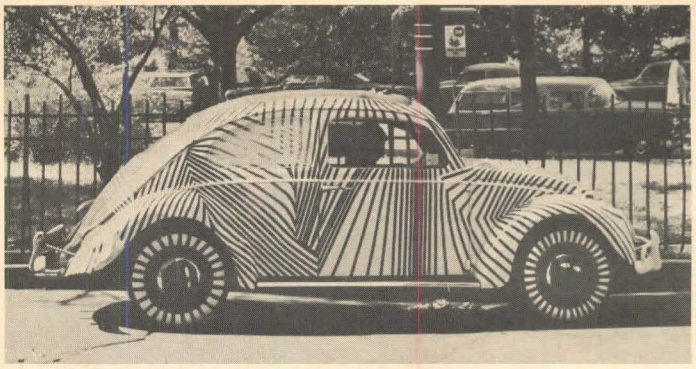


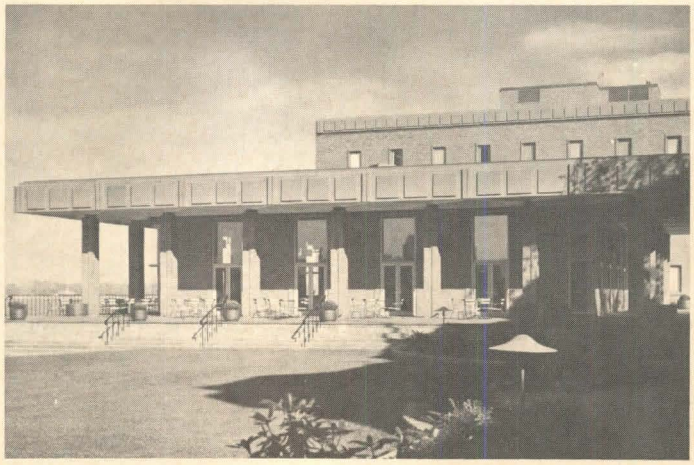
Photo: Maude Dorr

Photo: United Press International

Photo: Wide World

SHOT-GLASS-SCALED-PAVILION

WALKERVILLE, ONTARIO, CANADA While the Bronfmans of Seagram Building fame continue their Mies building program up in Toronto, Hiram Walker, another prominent Ontario concocter of spiritus frumenti, has been making its own quiet architectural stand down in Walkerville, near Detroit. Latest addition to the headquarters of Hiram Walker & Sons, Ltd., is a stately little reception center by Smith, Hinchman & Grylls Associates, Inc., from Detroit. The center is in the form of a pillared pavilion with a deep figured fascia connected to an older "Renaissance-style" office building by an entrance link. The pavilion provides a display area, reception area, service kitchen and a bar. Colorful elements such as a hanging tapestry and a porcelain enamel fireplace hood using abstract themes from the distilling process relieve the quiet austerity of brick walls and exposed concrete roof framing. Obviously the pavilion is a cozy place in which to sample the products.

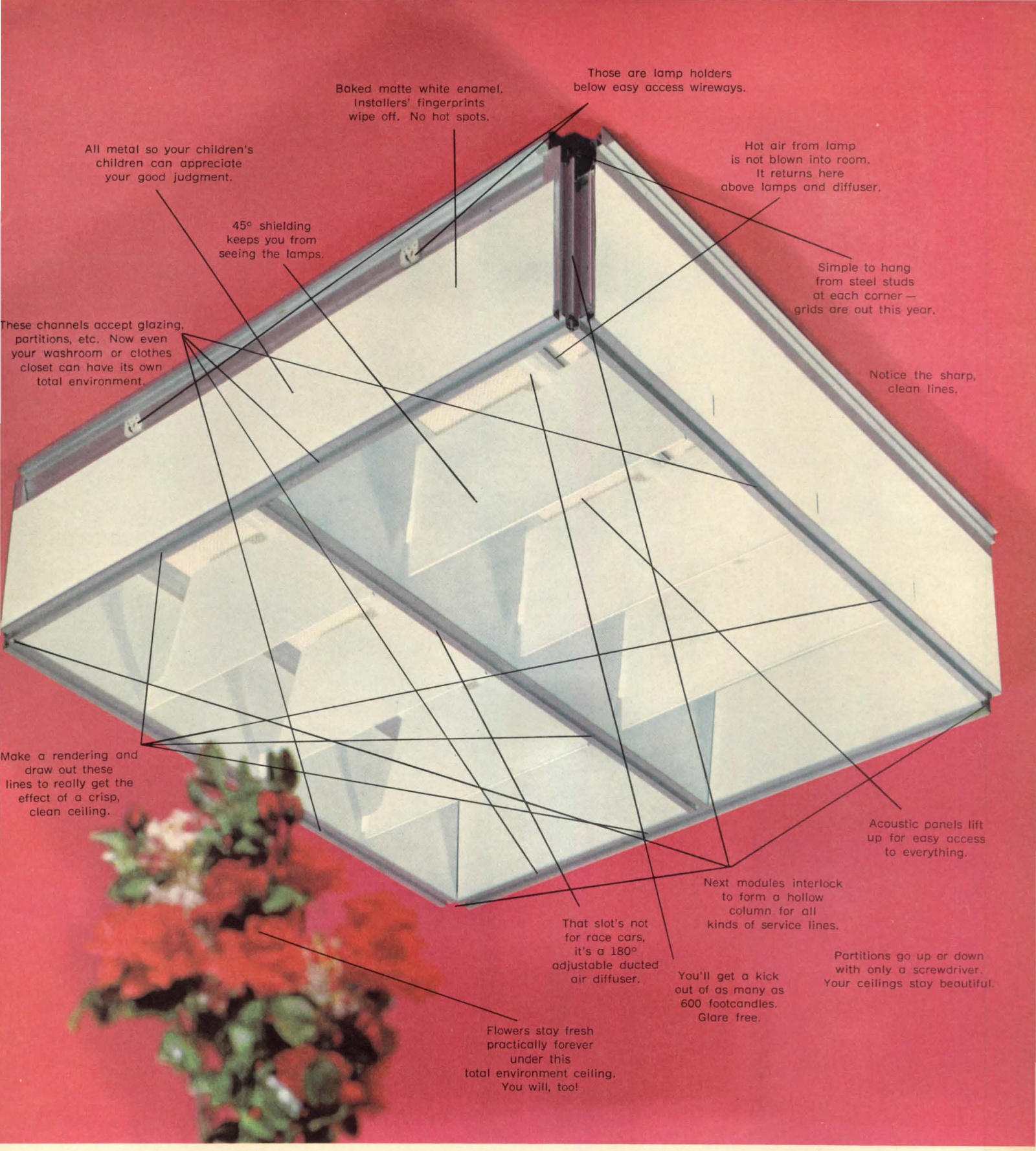


COMPETITIONS

Applications are being accepted for the annual **Rome Prize fellowships** in architecture, landscape architecture, and environmental design. Requests for details should specify particular field of interest and should be directed to: Executive Secretary, American Academy in Rome, 101 Park Ave., New York, N.Y. 10017. Deadline for applications is December 31, 1967.

SCHOOLS

James D. Gough, Jr., has been appointed director of the School of Architecture at **Montana State University,** Bozeman . . . **Pratt Institute** has announced a Graduate Program in Urban Design, to be inaugurated this fall. Applications for the course of study will be accepted at the Office of the Dean, School of Architecture, Pratt Institute, Brooklyn, N.Y. 11205 . . . **The University of Colorado** has received a gift of $1000 from the Producers' Council, Inc., to support student and faculty enrichment projects . . . Architect Amos Chang, who has designed buildings in the Far East, has joined the faculty of **Kansas State University** . . . Jean Labatut, who taught architecture at **Princeton University** for 39 years, retired from the faculty in June . . . The establishment of an Urban Design Fellowship, to be administered by the AIA, has been announced by Eaton Yale & Towne, Inc. The fellowship will provide funds for one year of graduate study and a minimum six-week foreign study tour.



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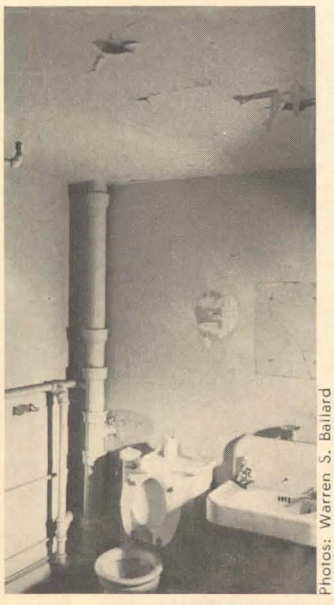
SWEDISH MESSAGE

Photo: Swedish Information Service

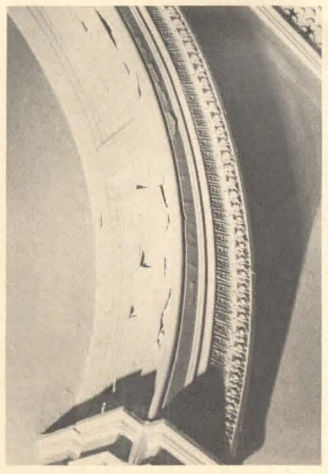
NEW YORK, N.Y. Architects Carson, Lundin & Shaw took the Stockholm City Hall as a reference point for their design of a 22-story office building for Manufacturers Hanover Trust. Retaining the boldness of the City Hall's tower and the medieval aspect of its vertical slit windows, they have failed to emulate any of the light touches that make the City Hall such a memorable building. What they have come up with, though, is a sturdy blockbuster of a building that is probably more suitable for its Manhattan financial district site than something less stolidly substantial.

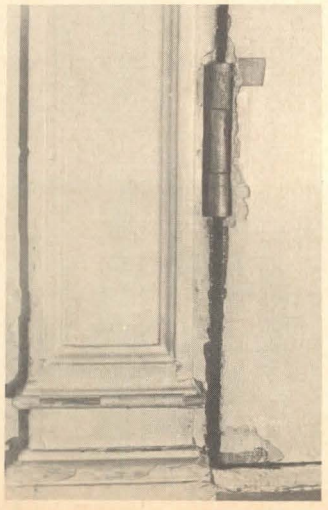
The bank plans to consolidate divisions now housed in three downtown Manhattan buildings in the new structure. The exterior will be all brick, matching as closely as possible the brick color found in some of its landmark neighbors.

KEEPING THE HOUSE IN ORDER



Photos: Warren S. Ballard





WASHINGTON, D.C. The AIA Foundation is nearing completion of its drive for $993,000 with which to purchase and restore the Octagon. Still needed is $88,500. That the money can be put to good use is illustrated here in detail photos by Warren Ballard. Architects who live in decaying houses should not throw epithets.

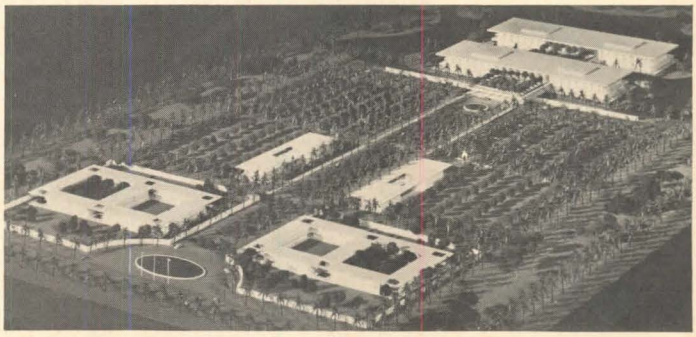
COMPLEX FOR ARCHITECTURE

TEMPE, ARIZ. Sometimes this month, construction will start on the first of three buildings in an Art and Architecture complex at Arizona State University. Designed by Guirey, Srnka & Arnold of Phoenix, the complex will include a three-story architecture building (right in rendering), a four-story building for the art department, (with provision for two additional stories if the graduate program expands), and eventually a 500-seat lecture hall (far left in rendering). Right now $2,034,000 is available for construction of the first two buildings; funds for the lecture hall will be appropriated later. All three will surround a terraced, landscaped plaza, raised 5′ above natural grade.

There may be no such thing as a Southwest style of architecture, but the architects have given the buildings a substantial, thick-walled appearance associated with adobe dwellings. And although the exterior walls will be cast-in-place concrete, plans call for this to be form-textured and sand-blasted to expose local aggregates.

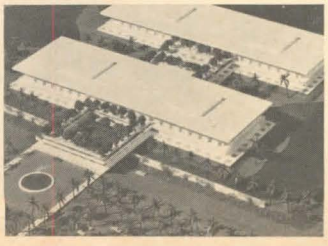
In the architecture buildings, the top two floors will contain 16 design studios grouped around the well of a two-story-high, skylighted jury and exhibition space. At ground level will be the library, dean's offices, jury room, classrooms, and more exhibition space.

PRINCESS IN A LAKE



PALM SPRINGS, CALIF. The Eisenhower Medical Center, designed by Edward Durell Stone, will sit like a medieval princess on an island in a lake. Located on an 80-acre site in Palm Desert, donated by Mr. and Mrs. Bob Hope, the hospital will be on the rear one-third of the site, with housing for residents and nurses situated toward the front, flanking the entry road. The nursing units will face inwards around three-story-high covered atriums. The site will be profusely planted with palm trees and other desert plants to provide pleasant vistas for the patients and, not incidentally, to shield all parking and service areas from view.

First phase of construction of the patterned concrete buildings, to be completed by 1970, will be a general hospital of 128 beds. Cost of the entire center is expected to be $5 million.



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Builder: Louis A. Regner Associates

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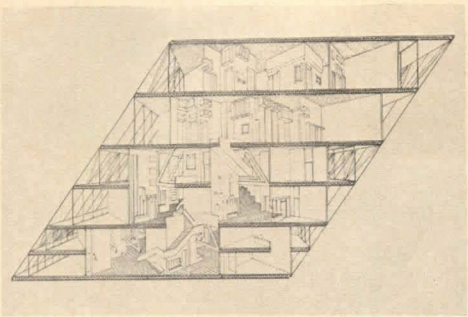
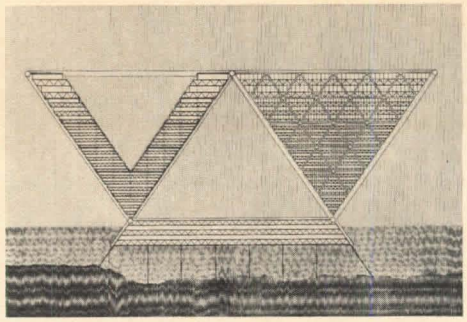
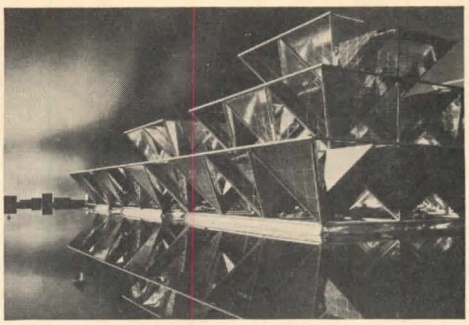






FLOATING CITY FOR 'FRISCO?

NEW YORK, N.Y. Commissioned by the Reynolds Metals Company, architect Stanley Tigerman has developed a scheme for expanding the central core of cities whose natural barrier to growth is a waterfront (river, bay, or lake). Rather than tear down existing buildings in the CBD and replace them with modern civic, cultural, and commercial centers — a process that involves, among other disadvantages, relocating and possibly scaring off both residents and businesses — Tigerman proposes extending the central city out onto the water.

Floating on giant, cable-anchored pontoons would be a matrix of aluminum and glass pentahedrons whose appearance, in combination, resembles more than slightly the same architect's design for an "instant city," made for the Vermiculite Institute last year. Each pentahedral unit would enclose a complete community of residences, community services, and businesses. Units might be subject to a variety of treatments by individual architects designing within the matrix. Segments could either be zoned exclusively for one type of use or for a mixture of activities. Plazas on the pontoons could support light industrial activity. The major structural component of the complex, a hollow truss, would contain the transportation system, linked by tubular extensions to the shore, where a below-grade parking facility would be located. The architect envisions individually controlled, computerized capsules shooting passengers across the waters to their elected destinations. It seems doubtful whether this particular part of the plan fulfills Reynold's request that the design be feasible, using present materials and existing technological methods.

City Shape/21, as shown in the model, would require a surface area of 1½ sq miles, the approximate dimensions of Chicago's Loop, but, because of its basic shape, would accommodate a density slightly greater than that of the Chicago business district, with 22 times as much usable open space. The proposal would leave the waterfront itself undisturbed, and, since its glass walls allow a maximum line-of-sight distance of about 1000′ between facing units, Tigerman feels that there will be no feeling, from the shore, of a wall in the water. One wonders, nevertheless, what the aesthetic effect would be of a structure two-thirds the height of Marina City rising over the waters of, for example, Lake Pontchartrain in New Orleans or Boston's harbor.

Estimated cost of construction would be about $23 per sq ft. Leasing of water rights would avoid the high purchase price of land in the CBD; high density and lack of a substructure should make the plan comparatively inexpensive to execute.

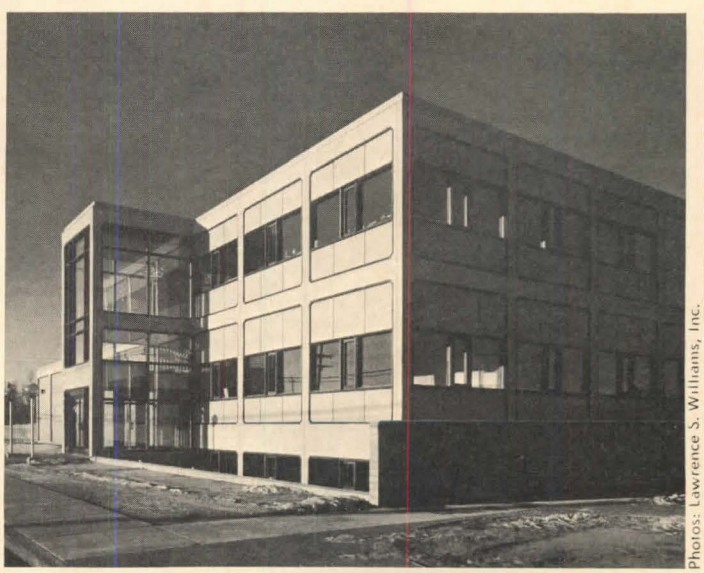
Although the scheme was devised to suit the needs of any expanding city on a large body of water, Reynolds has indicated that if and when City Shape/21 is built (and the company does hope to construct at least one increment in the not-too-distant future), the most likely site will be San Francisco Bay.

OBITUARY

Walter T. Rolfe, partner and co-founder of the firm Golemon & Rolfe, Houston, Tex., died June 10 at the age of 67. Prior to entering private practice in 1946, Rolfe spent 18 years as a professor of architecture at the University of Texas. As chairman of the department there and at North Dakota State University, he actively supported and participated in AIA educational programs and committee work. For his "furtherance of architectural education and practice in Peru," he received the Order of the Sun from that country's president in 1965. Rolfe was educated at the University of Kansas and at the Massachusetts Institute of Technology.

DISASTER: ALASKAN STYLE

ANCHORAGE, ALASKA. Once burned, twice shy, evidently doesn't apply to the people who design Anchorage, Alaska. Before the devastating earthquake of 1964, Anchorage was a grab bag of rough-and-ready, undistinguished structures befitting a city not far removed from frontier status. But when the 'quake leveled or put out of commission most of the city, did the city fathers and planners and architects rush to the colors and cry, "Here is our chance to create from the ashes a city that will be the lodestar, the El Dorado, of the Northwest"? Apparently not, from these views of post-earthquake buildings. With the possible exception of the Alaska Waterworks Building (above), a more mundane selection of catalog-picked dullness we have not seen in some time.



Photos: Lawrence S. Williams, Inc.

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For rules, see p. 63 JULY 1967 P/A.
Address entries to Awards Editor,
PROGRESSIVE ARCHITECTURE,
430 Park Avenue,
New York, N. Y. 10022

FACULTY OFFICES FOR HARVARD LAW

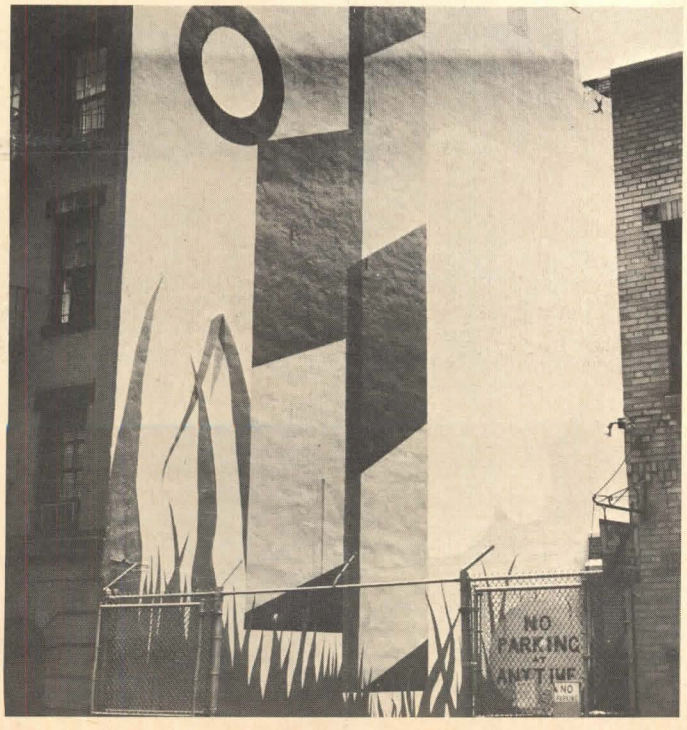
CAMBRIDGE, MASS. Construction was begun last month on the first of two buildings being designed by Benjamin Thompson & Associates for the Harvard Law School. Located in what was formerly a parking lot, the faculty office building shown here will be sited with the yet-to-be-started classroom administrative building, to give the law school an actual campus, in the tradition of Harvard Yard. The faculty offices, of reinforced concrete, will enclose 41,800 sq ft in four stories at an estimated cost of $1,500,000. Carol Johnson is the landscape architect.

BRINGING THE SKY TO THE STREET

NEW YORK, N.Y. The 300-block on Manhattan's East 9th Street is in the heart of hippie land. Because rents are cheaper there, the hippies have moved in, and, slowly, shops that one used to see in Greenwich Village have followed them. There are boutiques with the latest mod fashions, art galleries, leather shops, costume jewelry emporiums, all turned out very artily indeed, with lots of color, and, although the hippies might not like the word, "folksiness." Mostly, the shops occupy the ground floors of tenements, one appearing every now and then, breaking the monotony of the streets, in a way the proponents of beautification never envisioned.

Early this summer, a mural appeared on the open brick wall of one of the tenements there, facing a parking lot. It isn't psychedelic art in the hippie vein, but it has large swatches of primary colors — yellow, red, blue — with a pure grass green thrown in. "It brings a little of the sky to the street," says planning consultant David Brumberg, who talked the tenement owner into commissioning it. Allen D'Arcangelo created it, using an acrylic based paint.

There is, of course, much precedent for this sort of exterior art. Murals were so common on Byzantine and Romanesque churches that the buildings were often little more than frameworks for the art. Today, exterior murals add to the color of Latin American countries; and, in the South, the Mail Pouch tobacco ads, painted on the sides of barns, are the type of art that the hippies, in a perverse way, might yet try to emulate.



EAVESDROPPINGS

"At the moment the center of the city is a shambles because of bulldozers tearing up its streets to make a pedestrian mall, and its edges are made hideous, some of them because freeways are being built. Its problems seem to be every town's problems: the contrast between "progress" and preserving the past, downtown traffic, encroachment by business on parklands, run-down areas ripe for rehabilitation, welfare budgets, school bonds — the normal fare. My impression, however, was of a town with a sense of humor about itself, with tremendous optimism about its future, and a kind of self-confidence which is engaging rather than oppressive." *Russel Lynes, writing of Minneapolis in* Harpers.

"It is of course this hostility to chaos, of this inability to create an order large enough to contain Dionysus without castrating him, that makes modern culture so fundamentally sterile and oppressive. Chaos will out, in one way or another; and the signs are all around us of modern man's obsessive interest in chaos, in the primitive, in a community which blurs and eradicates the anguish of consciousness. We have in fact a Dionysiac society without a Dionysus in sight; the cult exists, the drums, the intoxication, but there is no god. Of prophets there are any number, and the latest of these is Marshall McLuhan, whose mindlessly tribal electronic world is, it seems to me, a transparent attempt to say to those who are waiting for the Kingdom of Chaos to come, the Kingdom is already at hand. One has only to plug in to be turned on, and the old familiar outlines of chaos reappear: a global village, a new tribalism, the extinction of the light-world in the triumph of the tactile senses, the inrush of fresh energy once men are freed from the tyranny of the eye-world and the linear, Apollonian culture. It is a hackneyed pitch of considerable brilliance and perversity, done up in a jaunty technological jargon that makes the Delphic oracle sound lucid by comparison, and on behalf of a god whose existence and power have, it seems to me, been slandered and denied by the modern world. . . . But the soundness of the McLuhanite premise does not justify the conclusion — the idiotic acceptance of chaos as the country where men should be or live.

"Between the lotus-eaters and the electronic tribalism of McLuhan's global village, there is no difference; both have renounced history and the public world, as well as the human quest for a characteristically human fulfillment." *William Arrowsmith speaking at this year's Aspen Design Conference.*

"Increasingly complex networks of roads and facilities are going to turn man into an animal completely dependent on the machine." *C.A. Doxiadis writing in* The New York Times.

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WASHINGTON/FINANCIAL NEWS

by E. E. HALMOS, JR.

Architecture in the capital — The Federal Government seemed to have entered its annual summer doldrums, as far as architects were concerned, even before Congress returned from its traditional Fourth of July hiatus.

Attention of Congress and the Administration was diverted by wars and their consequences, the peccadillos of several elected officials, and a growing drumfire of Presidential politics.

That left most developments of interest to professionals on a local level.

☐ For instance, in an action labeled by one local newsman as akin to Sophia Loren losing out in a Roman beauty contest, Washington's Fine Arts Commission thumbed down the AIA on plans for the AIA's own headquarters to surround the historic old Octagon House (see p. 48, JULY 1967 P/A). The commission hinted that it considered AIA's plans (for a U-shaped, 90′ high, concrete-and-glass secretariat building, to cost about $4 million) close to a disaster. Said commission member Aline Saarinen: "Of all groups, the AIA should be sensitive to preserving the values of Washington architecture." Said Member Gordon Bunshaft (himself an architect): "The design concept is totally out of scale with existing buildings on the site. [It] would make the existing buildings and garden look like a toy. It doesn't belong in this place. [Architect Romaldo Giurgola] was given an impossible task. The existing buildings and garden should be left alone . . . "

AIA showed equal evidence of shock at the turndown, indicated it would try again for a design that it liked and that might get by Fine Arts.

☐ Iowa's burly Rep. Fred Schwengel, one of Congress' most assiduous students of the history of the U.S. Capitol, evoked the ghost of one of AIA's founders, Thomas U. Walter (who was the fourth Architect of the Capitol) to spank AIA for "inconsistency" in calling for restoration, rather than reconstruction, of the Capitol's West Front (see p. 52, MAY 1967 P/A). Walter, said Schwengel, had recommended extension and reconstruction, "in order to complete the architectural composition made necessary by the extensions and changes made under his direction."

Moreover, the Iowa Congressman added, the AIA itself recommended extension of the West Front when (in 1957–58) it was fighting extension of the East Front of the old building. "A paper circulated at the [1958] AIA convention said that the "practical space needs to be gained from the East Front extension could be achieved in better measure by extending the West Front — without the threatened architectural and sentimental damage," Schwengel noted in a floor speech. He couldn't resist the temptation offered by the AIA's planning for the Octagon area: "If they [the architects] are genuinely dedicated to preserving historic buildings such as the Octagon and its dependencies, why do they not go elsewhere to provide additional space — as they recommend that the Congress do?"

☐ The Fine Arts Commission also injected itself into another local controversy, registering strenuous objections to features of a tunnel planned to carry one of the city's freeways under the Lincoln Memorial grounds. Such a tunnel would require ventilating shafts, which city engineers have designed as 50′ high structures (to avoid air pollution, among other things) some distance to the north of the Memorial; and it would also require removal of a number of trees, during cut-and-cover operations.

Fine Arts insisted that the city's highway men consider some other form for the ventilation structure (perhaps a globular building, no more than 35′ high), and construction of the freeway by tunneling, to save the trees.

Highways to the Future — There has never been any real worry that Congress would abandon the current huge Federal interest in highway construction when the 41,000-mile, $50 billion "Interstate" program has been completed (about 1975).

But the influential American Association of State Highway Officials made it nearly official with an enthusiastically received "briefing" calling for a 10-year, $78 billion program for the decade 1975–85.

Of special interest to architects in the AASHO presentation (to House and Senate Public Works Committees), was a shift of emphasis — away from interstate roads and toward urban freeways and primary arteries. "For urban areas," said the highway men, "we are emphasizing the multiple use of highway rights of way in the central city and developing a wide spectrum of design that will make the highway a good neighbor. . . . Our committee is also making a critical analysis of the design and configuration of all highway components . . . so as to retain their primary function, yet contribute to an attractive . . . appearance and enhance safety. We have now reached the point . . . where there is public support for expenditure of funds to enhance aesthetics, and to provide safer highways."

The officials added that all present Federal and state highway user taxes would have to be continued, and state levies raised considerably, to fund the continuing program.

One way to help, it was suggested, would be to get serious about use of air-rights above freeway rights-of-way, so that valuable commercial property is not irrevocably removed from taxrolls because of highway construction.

Disposing of the Beer Can — There was an antipollution particle in the Washington grist that will be of interest to urban planners and maintenance officials:

The Public Health Service awarded a $53,975 contract (to Midwest Research Institute of Kansas City) to find what to do about what it called "the solid waste disposal problems" associated with packaging.

In effect, PHS wants an answer to the growing pile-up of "non return" bottles, cans, and containers that litter the U.S. countryside. Such materials, most of which are not affected by normal deterioration and cannot be incinerated, represent something like 40% of the total weight of all municipal refuse collected in the U.S.

"We expect . . . valuable insights for alleviating packaging disposal problems," said PHS. It didn't stress campaigns to correct public thoughtfulness and general sloppiness.

Financial — There were continuing signs that the predicted leveling-out of construction spending in the current calendar year was occurring, and might even be tipping just a little to the downward side. According to the Census Bureau, in April, the seasonally adjusted annual rate of new construction put in place was $71,900,000,000 — down about 8% from the previous year. Among the reasons, according to the Bureau of Public Roads: a $300 million slump in state highway department contract awards during the first four months of the year, probably attributable to the "freeze" of highway money in an early year attempt to stem inflation.

☐ Housing, continuing its slow, steady decline, was another reason, and it was taking other elements of the economy with it. Census said that housing "starts" for May were at an annual adjusted rate of 1,310,000 units, compared to 1,318,000 a year before. The steady decline in housing starts, according to the Air Conditioning and Refrigeration Institute, is the reason for no gain in sales of air conditioners and heat pumps in the first quarter of 1967.

☐ One of the reasons for caution in the world of finance was inherent in Congressional estimates of the final size of Federal spending for the fiscal year that started July 1. Said House Finance Committee Chairman George Mahon: That total will come out to more than $163 billion, when Congress gets through putting through regular and special appropriation bills.

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PRODUCTS

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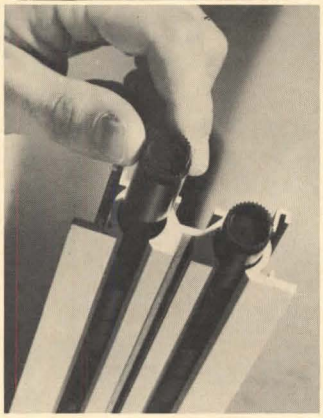

Air diffuser. Black plastic tubes, with a series of 3"-long slots, fit into an extruded aluminum double track. Control of air pattern through 180° is manual, by turning knob at end of tube. As part of a ceiling grid system, the "Tri-Trol Air Trak's" center groove is designed to accommodate partitioning. Krueger Mfg. Co., Inc., P.O. Box 5155, Tucson, Ariz.
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More with less. Axial air-handling unit is as much as 50% smaller than centrifugal fan air handlers, says manufacturer. The straight-through air flow fan, which propels air without change in radial direction, permits the compact design and also eliminates low frequency rumble found in centrifugal fan systems. Capacities up to 75 tons in 50 different models. The Trane Co., La Crosse, Wis. 54601.
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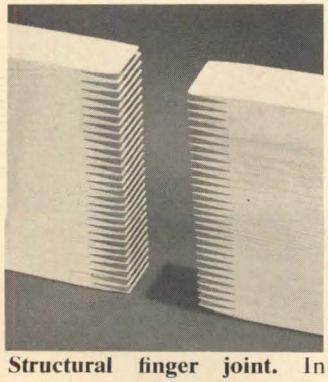
CONSTRUCTION



Structural finger joint. In testing glued finger joints, the wood failed before the joint. Company produces lengths up to 100'; 1 x 4 through 1 x 12; fir and hemlock in all grades. Joint is unobtrusive, and timber can be ordered pre-cut to specified lengths. Rosboro Lumber Co., Springfield, Ore.
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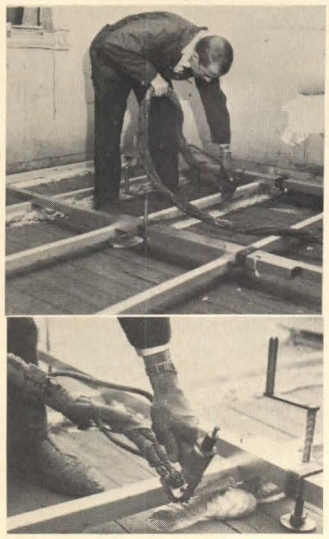
No-joint panels. Vinyl-surfaced wall panels with gypsum cores eliminate taping and make hair-line seam. Each panel has a loose vinyl flap along the edge. After panels are erected, the loose flaps are overlapped and cut through both layers. When excess vinyl is removed, a matched butt point is formed. "Durasan" panels (½" thick, 4' wide, and up to 14' long) are available in eight colors. National Gypsum Co., Dept. MD, Buffalo, N.Y. 14202.
Circle 103, Readers' Service Card



Foamed urethane used in leveling floors. Recent interest in New York City's rehabilitation of turn-of-the-century tenements led to the development of a method for laying new floors over old ones, some of which may sag as much as 8". First step is precutting 2 x 2 wood screeds to fit room. Screeds, spaced from 16" – 24" o.c., are held against adjustable metal bars leveled by jacks. Urethane is then foamed under screeds, setting in a few minutes, and flooring is laid after leveling bars are removed. The foam-supported floors are said to provide 10 times the normal design strength for residential construction. Method was developed by Forest Products Marketing Laboratory (under the Department of Agriculture) in conjunction with Union Carbide Corp., 270 Park Ave., New York, N.Y. 10017.
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Plastic makes an Atlas out of any worker. Lightweight plastic truss beams, said to be "extremely rigid," are available in lengths of 16' –48' for gable roof construction. Fabricated from a plastic laminate of urea formaldehyde and 19 reinforcement laminates, a 48' beam weighs 386 lbs, has a Flame Spread of 25, costs $157.02 f.o.b. factory. Composite Structures Corp., P.O. Box 625, Louisburg, N.C. 27549.
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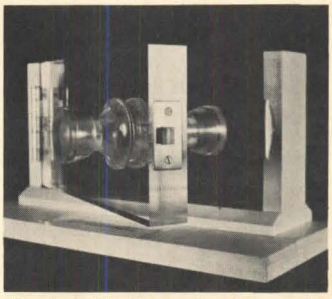
DOORS/WINDOWS



Push-pull. Door latch can be operated either by push/pull of knob, or by conventional turning motion. Assembly is compact and suitable for either interior or exterior doors. Jensen Industries, Inc., P.O. Box 61, Estherville, Iowa 51334.
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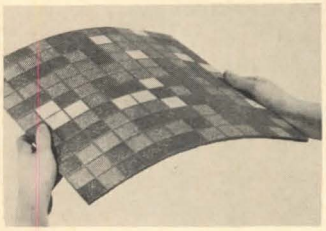
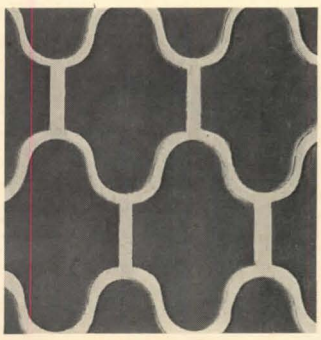
ELECTRICAL EQUIPMENT

Standby generator serves emergency power needs. Diesel-powered generator supplies 2000 w, 60 cps, 115 v for lighting critical areas during blackouts such as those that have hit the East Coast. Hand starting, or equipped with batteries and electric starter; uses about one quart of fuel per hr. Cost: $700. McCulloch Mite-E-Lite, Inc., P.O. Box 14, Wellsville, N.Y. 14895.
Circle 107, Readers' Service Card

FLOORING

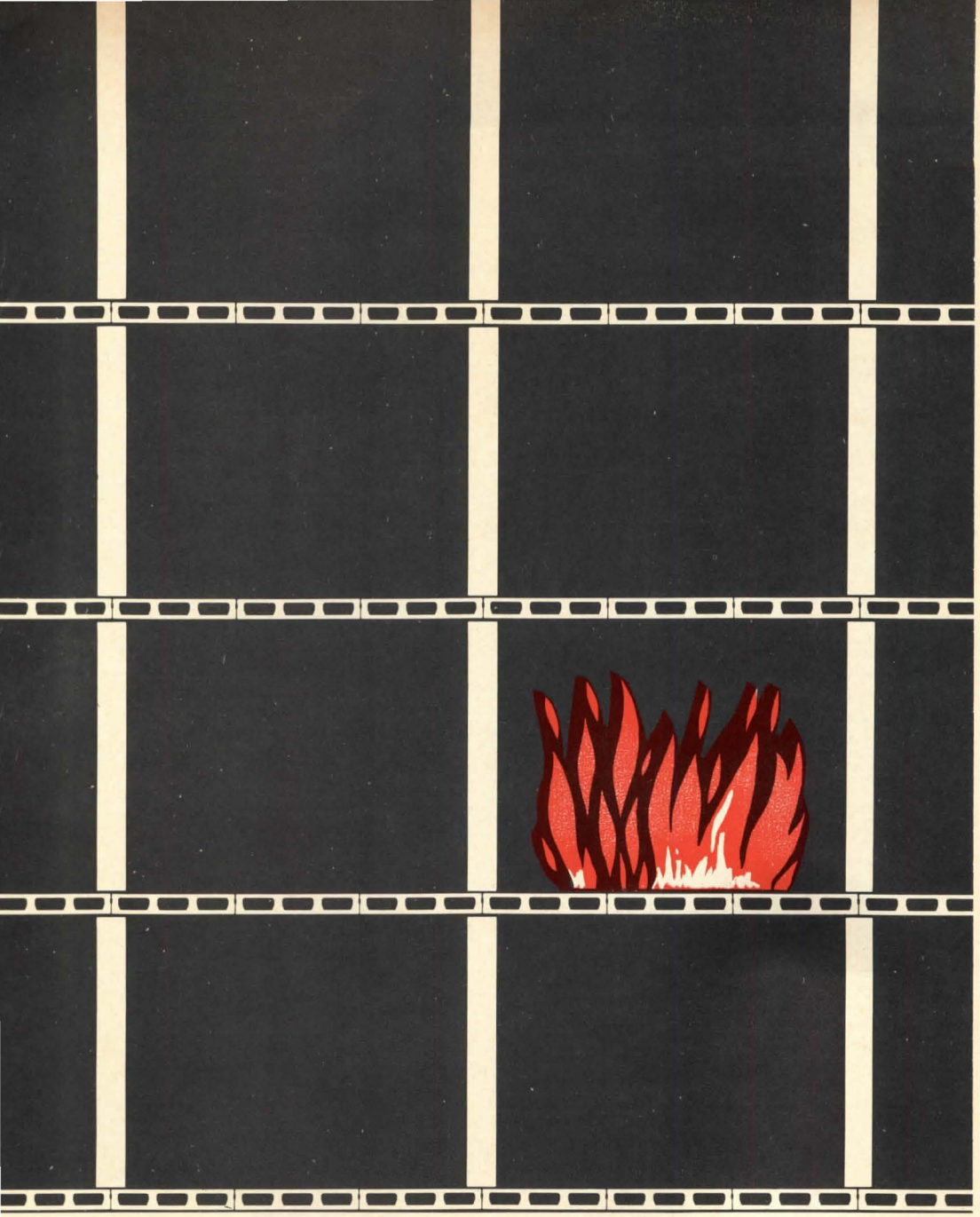


Vinyl-grouted tile. Ceramic floor tiles are now available in sheets of 1" x 1" tiles joined by a gray vinyl grout and installed much the same as resilient tile. "CeramaLux" sheets are 13⅛" square (exact dimensions are said to be maintained from sheet to sheet), and can be laid in portland cement and dry-set mortars, or in one of two special adhesives available from the manufacturer. Choice of glazed and unglazed tile. United States Tile Co., 1375 Raff Rd., SW, Canton, Ohio 44710.
Circle 108, Readers' Service Card



Tiles for roof or floors. "Provence" quarry tile, suitable for Mediterranean villas, is available in brushed or smooth textures. It is baked in red or fire flashed colors, as are two other patterns, "Valencia" and "Renaissance" hexagon. Appropriate for paving inner courtyards, refectory floors, loggias, terraces, and so on. Roofing tile also available. Ludowici-Celadon Co., 75 E. Wacker Dr., Chicago, Ill. 60601.
Circle 109, Readers' Service Card

Resilient Floor Tiles. Designed for light commercial areas, Luran Airtred 100 plus is made of an extra-heavy vinyl top layer, a Quiet-Cor foam interlayer, and an asbestos backing. Foam backing lends comfort and noise-resistance while vinyl layer is resistant to staining. Available in widths up to 6', Airtred comes in three patterns: a



United Metro Materials and Concrete Co., Inc.
P.O. Box 13309
Phoenix, Ariz. 85005

C. W. Blakeslee & Sons, Inc.
P.O. Box 1809
New Haven, Conn. 06507

Concrete Materials of Georgia, Inc.
P.O. Box 864
Forest Park, Ga. 30050

Midwest Prestressed Concrete Co.
P.O. Box 1389
Springfield, Ill. 62705

Cedar Rapids Block Co.
620 12th Ave., S.W.
Cedar Rapids, Ia. 52404

Prestressed Concrete of Iowa, Inc.
P.O. Box 822
Iowa Falls, Ia. 50126

Louisiana Concrete Products, Inc.
P.O. Box 1107
Baton Rouge, La. 70821

Superior Products Co.
10701 Lyndon Ave.
Detroit, Mich. 48238

Jackson Ready Mix Concrete
P.O. Drawer 1292
Jackson, Miss. 39205

Concrete Materials, Inc.
P.O. Box 5247
Charlotte, N.C. 28205

Arnold Stone Co.
P.O. Box 3346
Greensboro, N.C. 27402

Cleveland Builders Supply Co.
5161 Warner Rd.
Cleveland, Ohio 44125

Nitterhouse Concrete Products, Inc.
P.O. Box N
Chambersburg, Pa. 17201

Strescon Industries, Inc.
Pennsylvania Ave. & Post Rd.
Morrisville, Pa. 19067

Dickerson Structural Concrete Corp.
P.O. Box 160
Youngwood, Pa. 15697

Southern Cast Stone Co., Inc.
P.O. Box 1669
Knoxville, Tenn. 37901

Shelby Pre-Casting Corp.
P.O. Box 13202
Memphis, Tenn. 38113

Breeko Industries
P.O. Box 1247
Nashville, Tenn. 37202

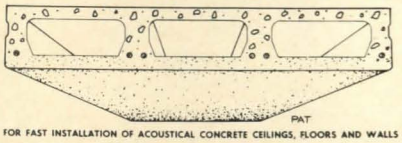
Texas Industries, Inc.
8100 Carpenter Freeway
Dallas, Tex. 75247

Economy Cast Stone Co.
P.O. Box 3-P
Richmond, Va. 23207

A FIRE FIGHTER, TOO

SPAN ✦ DECK® precast and prestressed, hollow-core concrete floor and roof plank will keep the fire bottled up between floors for two to four hours—dependent upon concrete topping thickness—long enough time for firemen to have the blaze under control if not out. This fire fighting quality results in low fire insurance rates for both the building and the contents—a decided advantage to your client. Besides these money-saving factors, the underside is an exposable fine-textured soffit with built-in acoustics rated at 0.55 NRC. For additional information, write your nearest SPAN ✦ DECK® supplier or Box 99, Franklin, Tenn. 37064.

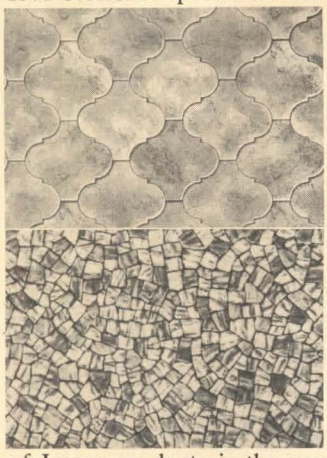
PRESTRESSED
SPAN ✦ DECK ®



PAT
FOR FAST INSTALLATION OF ACOUSTICAL CONCRETE CEILINGS, FLOORS AND WALLS

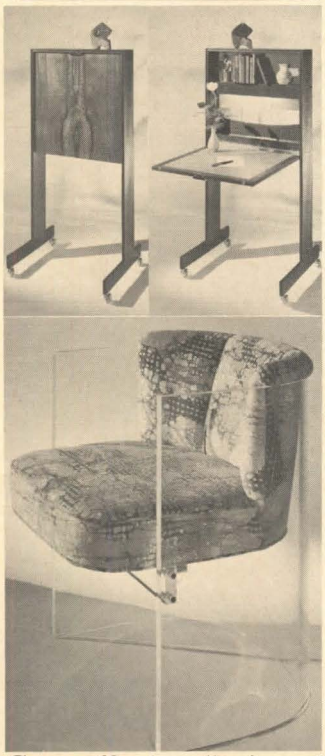
On Readers' Service Card, Circle No. 407

swirling mosaic stone design, an irregular marble chip pattern, and an ornamental clay tile pattern — all in at least four colors. A special feature



of Luran products is the use of Vinylweld seam fusing process, which prevents dirt or water from entering. The Ruberoid Co., 733 Third Ave., New York, N.Y. 10017.
Circle 110, Readers' Service Card

FURNISHINGS



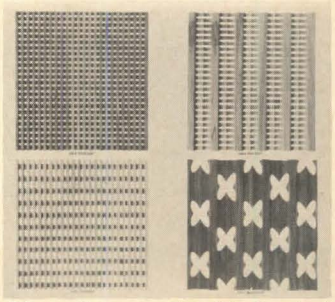
Group 68. A collection of designs by Vladimir Kagan includes the drop-leaf desk shown above. Based on an 18th-Century writing table at Williamsburg, its nicely crafted interior has a leather writing top, indirect light, and is velvet lined. The rosewood or walnut piece folds up into a neat, 5″ slab, which is easily moved about on wheels. An addition to the recent trend toward "invisible" furniture is the barrel chair, suspended in a clear, lucite frame (also available with a bent plywood frame). Among a number of other designs, is a simple, glass-topped dining table (not shown), resting on a single rosewood pedestal; tabletop can be extended to 10′ by adding a rosewood leaf to each end. Vladimir Kagan Design, 40 East End Ave., New York, N.Y. 10028.
Circle 111, Readers' Service Card

Fabrics from here and there. A fine collection of Belgian, Swiss, Danish, Irish, and domestic fabrics are primarily in the white to oatmeal color range. Woven-in textures run from rough, nubby cottons and linens to fine see-through casements, and include an especially attractive group of open weave designs. The Henry Calvin textiles are mostly drapery or casement, but include a few sturdy upholstery textiles. Katzenbach & Warren, 575 Madison Ave., New York, N.Y. 10022.
Circle 112, Readers' Service Card

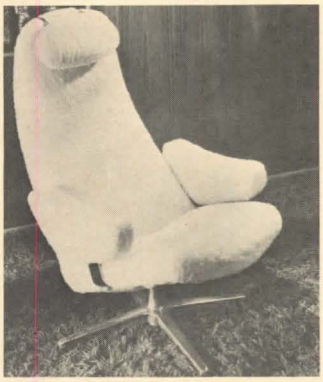
Vinyl-backed carpet. Eleven tweedy color combinations are backed by a vinyl cushion — hard-backed for supermarkets, and thick-backed for other hard-wear commercial applications. Dense, low-loop nylon pile is bonded to polypropylene moisture barrier and vinyl cushion. Carpeting is installed by cementing directly to floor. Manufacturer claims density is three times that of most commercial carpeting, and suggests its suitability for residential kitchens. Collins & Aikman, 210 Madison Ave., New York, N.Y. 10016.
Circle 113, Readers' Service Card

Pin-up furniture. Office units with a sturdy, workmanlike look, are joined to nearly free-standing legs with exposed metal pins. The spacious desk and boxy filing units with metal feet are finished in pecan veneers. They are part of a collection designed by ISD, Inc. (a division of the Perkins & Will Partnership) that includes conference desks, credenza, and a variety of tables, chairs, and free-standing storage units. Jofco, Jasper, Ind.
Circle 114, Readers' Service Card

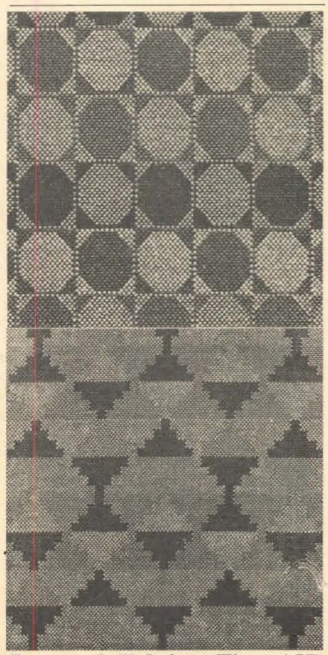
Working wood and steel. Desks, chairs, and conference table shown above are part of Linear/7000 office group. Steel-framed chairs with upholstered body and wood arms swivel on roll-around pedestal. Desk panels are enameled steel. Standard table and desk tops are surfaced with plastic laminates in gray, beige, white, or choice of wood grains (walnut, teak, cherry, elm). Genuine wood tops available on special order. Standard Pressed Steel Co., Columbia-Hallowell Div., Jenkintown, Pa. 19046.
Circle 115, Readers' Service Card



Pierced wood. Perforated walnut, birch and poplar panels have slightly different patterns on each side, and can be used for room dividers, sliding panels, screens, and so on. The four new patterns shown are sanded both sides (ready for painting, staining, or oiling), available framed or unframed. Dimensions: ½″ thick, 2′ wide, and 2′, 3′, or 4′ long. Penberthy Architectural Products, 5800 S. Boyle Ave., Los Angeles, Calif. 90058.
Circle 116, Readers' Service Card



Office luxury. For the feminine executive or sleepy Sybarite who can afford to doze behind his desk, this swivel chair is upholstered in white sheepskin. It is part of a new group that includes glass-topped tables resting on polished steel frames by designer Folke Ohlsson. Dux, Inc., 5000 City Line Rd., Newport News, Va.
Circle 117, Readers' Service Card



Jacquard Fabrics. Five AID award winning fabrics from Boris Kroll's Jacquard Designer's Collection combine complicated pattern effects with durability. All are dyed, woven, and finished for superior resistance to sunlight, dry cleaning, water spotting, and the dye rub-off called crocking. "Prism" (pictured) is a multicolor interplay of octagons on squares, available

End roof "ponding" forever!

Pittsburgh Corning, the insulation people, have developed a new cost-cutting way to do it— with tapered FOAMGLAS®

Roof "ponds" always mean trouble. Many roofing manufacturers won't bond roof areas where water stands for extended periods.

The only way to get rid of this "ponding" is to slope the roof surface. But sloping the roof deck itself is an expensive and often impractical solution. And if you use heavy fill materials to build a slope on top of the deck, they either contain or absorb moisture—so the insulation value is reduced. Buildings are more expensive to heat and cool.

Now, Pittsburgh Corning has come up with a practical solution: tapered FOAMGLAS.

One system—one application insulates and provides positive drainage.

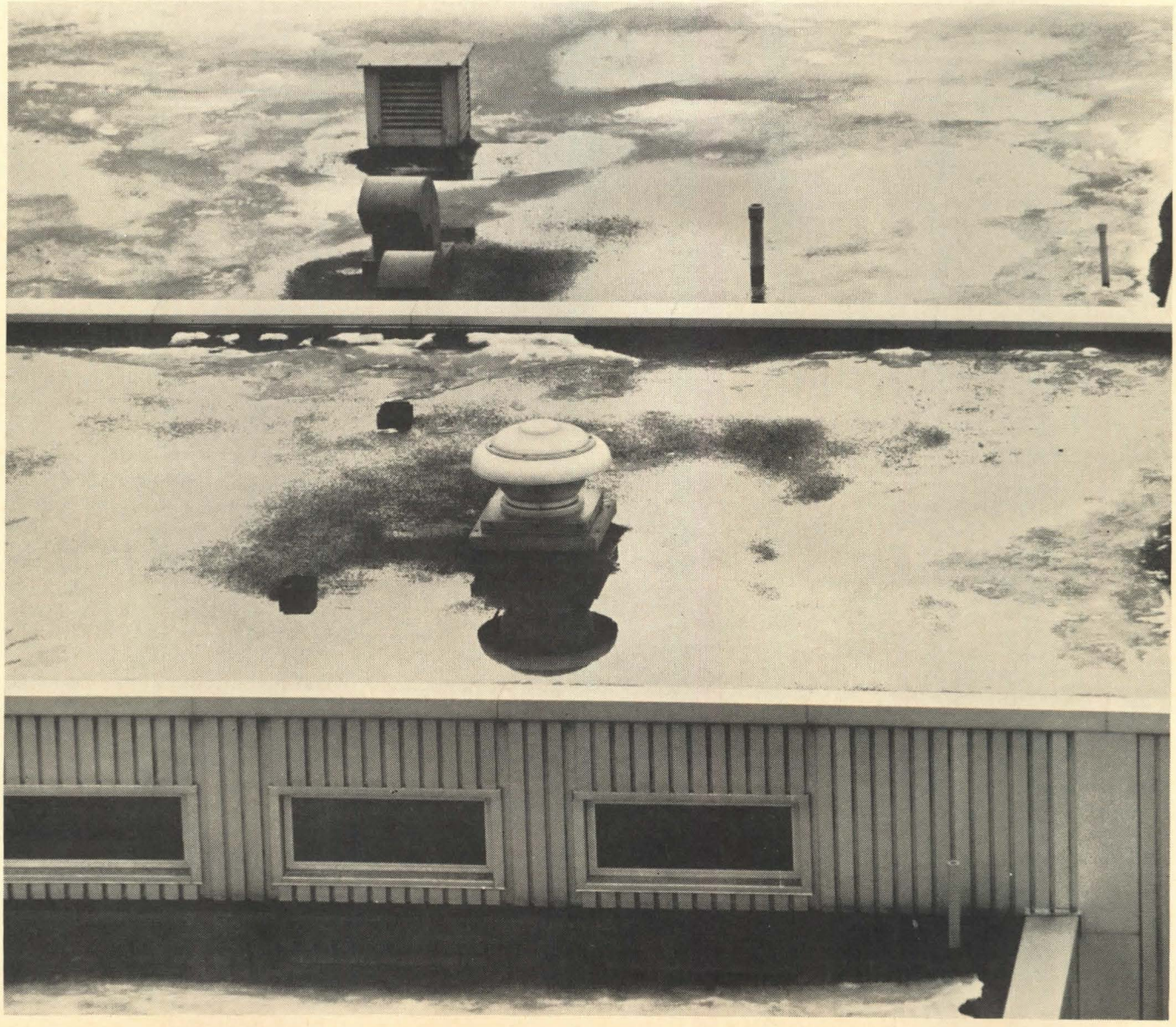
It comes prefabricated with a built-in slope.

It's dimensionally stable—provides the ideal base for built-up roofing and reduces chances of wrinkling and splitting of felts.

It's completely waterproof—vaporproof and noncombustible, too. It's the ideal insulation. Unlike fill materials, there's never any loss of insulation value. You save the maximum on heating and cooling costs.

Use new tapered FOAMGLAS cellular glass insulation to eliminate your ponds. For further information on tapered FOAMGLAS, call or write: Pittsburgh Corning Corporation, Dept. PP-87, One Gateway Center, Pittsburgh, Pennsylvania 15222.

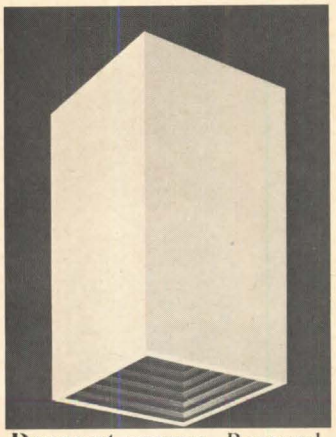
PITTSBURGH PC® CORNING



On Readers' Service Card, Circle No. 371

in 11 colorways. Also pictured is "Maya," inspired by the intricate stonework of Mayan temples and available in seven colorways. "Peru," based on South American Indian weaves, is an angular zigzag pattern that utilizes diamond and triangle shapes. The other winners are "Titan" and "Oberon." Each fabric is rayon mixed with nylon. All are backed with acrylic and "Krollenized" with DuPont's Zepel. Boris Kroll Fabrics Inc., 979 Third Ave., New York, N.Y. 10022.
Circle 118, Readers' Service Card

LIGHTING



Downcast squares. Recessed, semirecessed, and surface downlights have a square section and offer a choice of satin or black anodized finish in cast aluminum. Suitable for outdoors or indoors, they can be adapted to low brightness open baffle, cast louver guard, reflector intensifier, or symmetric prismatic refractor. Cast-in-place concrete and wet plaster installations. mcPhilben Lighting, 270 Long Island Expressway, Melville, N.Y. 11746.
Circle 119, Readers' Service Card

OFFICE EQUIPMENT

A "tesk"? That's how manufacturer describes this table combined with roll-away drawer units — table and/or desk, get it? Seems a fairly neat solution to the demand for convertible office furniture. Aluminum and steel frame combined with plastic laminate surfacing. Uniline Corp., 420 Alabama NW, Grand Rapids, Mich.
Circle 120, Readers' Service Card

SPECIAL EQUIPMENT

Underground carpet. Glass fiber blanket keeps topsoil from "disappearing down the drain" by separating topsoil from subsoil and gravel. As a substitute for straw, the "Soil/Separator" provides effective drainage but retains enough moisture to help keep grass green during dry weather, says manufacturer. Lightweight material is ½" thick, and comes in 3', 4' or 6' wide rolls. The E.J. Davis Co., 10 Dodge Ave., Defco Park, North Haven, Conn.
Circle 121, Readers' Service Card

Going up? Compact elevators for residential installation require 37" x 38" space, and operate on "regular household current." Amenities include a walnut door and carpeting. Dover Corp., Elevator Div., P.O. Box 2177, Memphis, Tenn. 38102.
Circle 122, Readers' Service Card

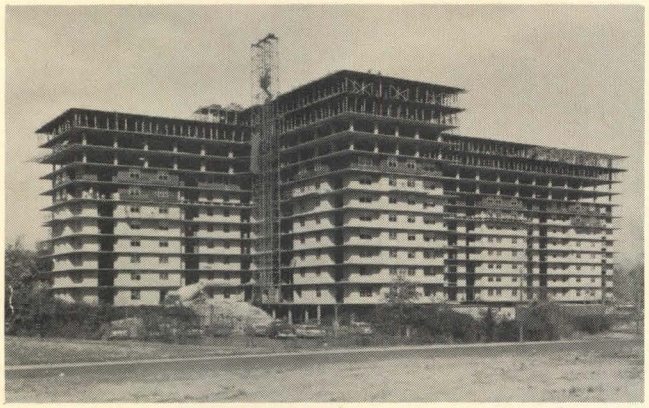
Measuring wheel. When there's no one around to hold the other end of the tape, the one-man "Measure-Meter" can be used to clock off distances. Comprised of a wheel on a long handle, the all-plastic Measure-Meter registers up to 999' (to the nearest inch) as the wheel turns. Measuring Devices, Inc., 18400 Ventura Blvd., Tarzana, Calif. 91356.
Circle 123, Readers' Service Card

THE PRESCON MEMO NEWS

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

APARTMENTS

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

THE PRESCON CORPORATION

General Offices: 502 Corpus Christi State National Building
Telephone: 512-882-6571, Corpus Christi, Texas 78401

 D67

On Readers' Service Card, Circle No. 373

MFRS' DATA

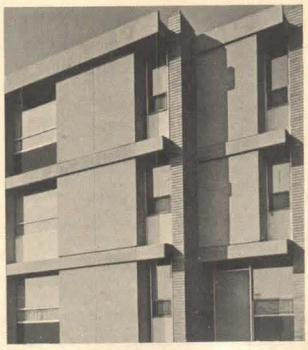
AIR/TEMPERATURE

"Guide for Evaluating Ultimate Cost of Heating Systems" sets forth procedures for determining the energy source best suited for a building. The method (said to be the same as that used by industry for making decisions on capital investments) examines design factors, energy requirements and costs, system capacity, and construction and operating costs to arrive at a single figure for each set of conditions to be compared. Ultimate cost is the total amount of money to be borrowed for construction plus the cost of owning and operating the building over its expected life. Text, charts, and checklists. 22 pages. Cost: $1.50. Engineering Publications, 227 Hammond Bldg., The Pennsylvania State University Park, Pa. 16802.

Sound traps. Silencer for air-handling systems has a bell-mouth entrance leading into a perforated passage, corrugated in the direction of air flow, and an exponential diffuser at the outlet. Booklet gives complete air-flow capacity charts for "Aircoustat Mark II" units of various sizes, a selection guide, and suggested specs. 8 pages. Koppers Co., Inc., Metal Products Div., Sound Control Dept., Baltimore 3, Md.
Circle 200, Readers' Service Card

CONSTRUCTION

Redwood plywood. Clear heart or Select facings of the California wood cover plywoods suitable for either interior paneling or exterior siding. An A-Clear, wire-brushed surface, accenting the grain, is recommended for interiors. Grooves, in a variety of same-width or staggered-width patterns, include inverted batten. Saw-textured grades are fabricated in plain faces with separate battens available. Brochure gives characteristics of "Palco-Ply," full-color photos of different grades and textures, profiles, and size/pattern charts. 4 pages. The Pacific Lumber Co., 1111 Columbus Ave., San Francisco, Calif. 94133.
Circle 201, Readers' Service Card

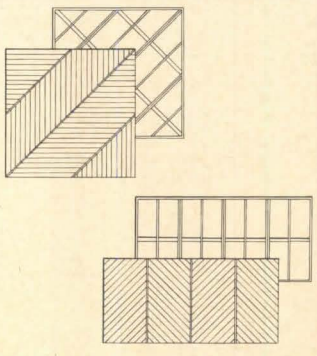


Sand or enamel faces for spandrel panels. Asbestos cement panels with a fine aggregate sand or colored enamel face are suitable for exterior walls, soffits, and interior paneling. "Glasweld" is available in 24 colors, 2 sand colors, several thicknesses and sizes; or it can be cut to size and matched to specified colors. Brochure includes guide specs, Glasweld molding profiles, and installation details, but it is primarily a series of case studies of buildings (in color photos and architectural details) showing how each architect has used the product. Shown above is student building by Tasso Katselas. 32 pages. U.S. Plywood Corp., 777 Third Ave., New York, N.Y. 10017.
Circle 202, Readers' Service Card

Vermont Marble. "Exterior Veneer Standards" contains specifications and information on varieties of marble, thickness, sizes, finishes; waterproofing, joints, anchorage, and setting. Especially applicable to marbles quarried in Vermont. 7 pages plus appendices with additional information on joints and anchors. Vermont Marble Co., Proctor, Vt.
Circle 203, Readers' Service Card

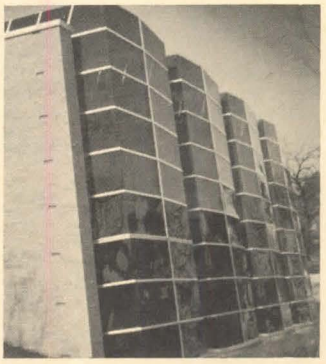
Adhesives for aluminum. A review of the uses and properties of adhesives for bonding aluminum includes a number of applications outside the building industry. But the bulk of information is general and includes surface preparation, adhesive classifications (epoxies, modified phenolic, elastomeric-based, and thermoplastic-resin adhesives), joint design, adhesive selection, and safety precautions. Book is illustrated with photos, charts, and drawings, and contains a glossary, property tables, and a bibliography. 106 pages; available by letterhead request. Aluminum Company of America, 773 Alcoa Bldg., Pittsburgh, Pa. 15219.
Circle 204, Readers' Service Card

Curtain going up. Sandwich panels faced with "Miracoil," a porcelain enamel on sheet steel, are stain-proof, colorfast, and scratch-resistant, says manufacturer. The two basic types, insulated spandrel panels and veneer facing panels, are shown in cutaway views and installation details; physical properties charts, specs. 12 pages. Mirawal Co., P.O. Box 38, Port Carbon, Pa. 17965.
Circle 205, Readers' Service Card



Good weather for decks. From the heart of the redwood comes a lumber especially suited to weathering outdoors. Booklet illustrates deck construction with detail drawings; beam, decking and joist span charts; patterns, (herringbone, parquet, and others); and a discussion of special situations — rooftop decks, decks over concrete, planting. 8 pages. California Redwood Assn., 617 Montgomery St., San Francisco, Calif. 94111.
Circle 206, Readers' Service Card

Planning for the physically handicapped. Specifications, drawn up by the ASA in cooperation with a long list of interested organizations (including the AIA), define physical disabilities that require architectural planning, and set standards for everything from site planning to telephones, restrooms, water fountains, and facility identification. Dimensions are given where pertinent, ramp slopes, turning space required for wheelchairs, minimum platforms, walk widths, and door widths, for example. 12 pages. Easter Seal Society, 2023 W. Ogden Ave., Chicago, Ill. 60612.
Circle 207, Readers' Service Card



Glazed domes, barrel vaults, and odd shapes. Manufacturer's 1967 catalog gives data on standard model "DomeSystems" (in diameters up to 150'), "BarrelVaults" (for covering atria, pools, and so on), and "Skylytes" glazed with glass or acrylic panels. Also included are custom-glazing jobs such as the above photo of a zoo building in Dallas, Tex. Details, drawings, photos, short specs, dimension charts. 12 pages. Ickes-Braun Glasshouses, P.O. Box 147, Deerfield, Ill. 60015.
Circle 208, Readers' Service Card

DOORS/WINDOWS

Sliding doors. Wood-framed sliding glass doors come in right- and left-hand double panels, triple panel with one sliding panel, and a quadruple panel with two sliding panels.

Toward you. Low-cost, water-susceptible insulation might work at first. But, gradually there's a loss of insulation efficiency. Then cooling costs go up. And so do heating bills. Here's what happens. Vapor barriers are not 100% effective. They deteriorate. Movement of a building will split them, allowing moisture-laden air to penetrate the insulation. Moisture forms through condensation, reducing insulation efficiency. What to do?

Specify STYROFOAM® brand extruded foam. It's the finest, most modern insulation you can buy. Never loses its effectiveness. Always stays dry. Requires no vapor barrier. Doesn't rot, mold or deteriorate. Flame retardant. Lightweight and easy to install.

As for application, you can use the Miller System; apply paneling or decorative wallboard directly on it; use as a base for wet plaster, or as a perimeter insulation for foundations and slabs. The next time why not specify STYROFOAM brand insulation, one of a family of rigid foam insulations offered by Dow? For more information, write to The Dow Chemical Company, Construction Materials Sales, Dept. 71301. Midland, Michigan 48640.

DOW

On Readers' Service Card, Circle No. 342

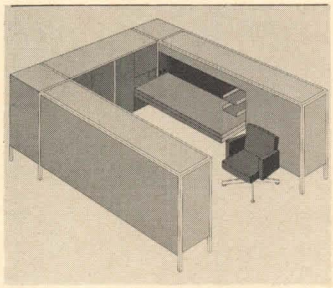
No one will know you installed bargain insulation.

(until the owner cools off)

Photos, and a number of scale details showing head, threshold, and jamb for various types of construction illustrate brochure. Brief specs. 8 pages. Rolscreen Co., Pella, Iowa.
Circle 209, Readers' Service Card

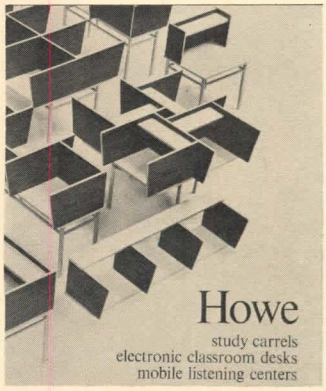
FURNISHINGS

The public carpet. Booklet describes various qualities and advantages of carpeting for public areas. Included is a fairly comprehensive chart listing uses, fabrication, and physical characteristics of manufacturer's polypropylene, nylon, Acrilan, and wool carpeting. 8 pages. Conwed Products, Wood Conversion Co., 332 Minnesota St., St. Paul, Minn. 55101.
Circle 210, Readers' Service Card



Office work centers. Modular components are assembled into custom specified units for free-standing "offices." Optional components for desk-storage units include a large dropleaf suitable for studying blueprints, various trays, and file drawers, phone panels, and so on. Photos and drawings. 6 pages. The General Fireproofing Co., Youngstown, Ohio 44501.
Circle 211, Readers' Service Card

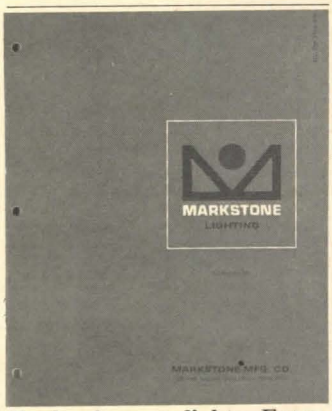
Indian crafts. Sources of American Indian and Eskimo arts and crafts are listed in two pamphlets from the Department of the Interior. One pamphlet lists businesses privately owned and operated by native designer-craftsmen; the second pamphlet lists craftsmen's cooperatives. Names, addresses, and products are listed. Pottery, silverwork, paintings, rugs, and textiles are some of the items available. United States Department of the Interior, Indian Arts and Crafts Board, Room 4004, Washington, D.C. 20240.
Circle 212, Readers' Service Card



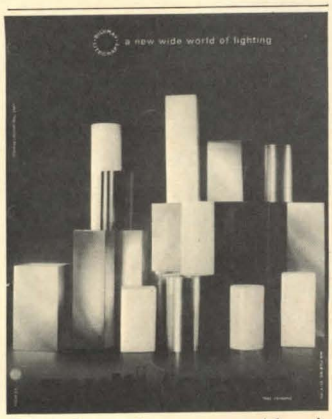
Electronic classrooms. Audio-visual study carrels are equipped with electrical outlets, an 8" x 10" projection screen, and a built-in fluorescent light fixture. Educational furniture group includes a fold-up mobile table, called a listening center, equipped with 10 stations for headsets with individual volume controls. Conventional wall and island carrels are also included. Plywood or composition board units, surfaced in plastic laminates, rest on square steel tube frames. Photos, specs, dimensions, and descriptions. 8 pages. Howe Folding Furniture Inc., 360 Lexington Ave., New York, N.Y. 10017.
Circle 213, Readers' Service Card

Planters and urns. Ceramic vessels for plants and sand ashtrays, in a variety of shapes and sizes, are illustrated in black and white photos. Color samples of the

12 high-chrome, matte glazes include a good strong orange, yellow, and blue, as well as several earth colors. Some designs are available with bases of walnut, teak, rosewood, polished chrome, or stainless steel. Dimensions and photos. 26 pages. Price list for planters and sand urns: 12 pages. Available by letterhead request. Clay Design, 1620 E. 25 St., Los Angeles, Calif. 90011.

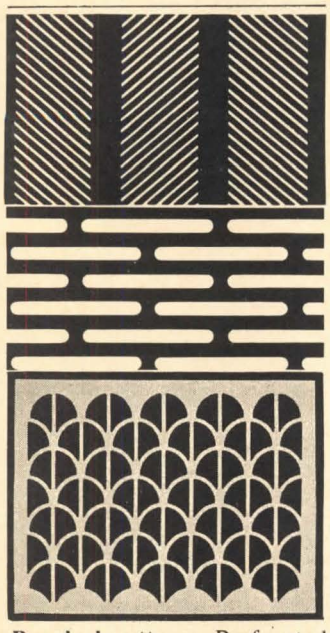


Book of many lights. Extensive catalog covers a great number of recessed and surface-mounted fixtures for incandescent or fluorescent lighting. Spheres, squares, rounds, and other shapes are listed along with mounting accessories, and a variety of frames and finishes. Photos, charts, technical information, and photometric data. 44 pages. Markstone Manufacturing Co., 1531 N. Kingsbury St., Chicago, Ill. 60622. *Circle 214, Readers' Service Card*



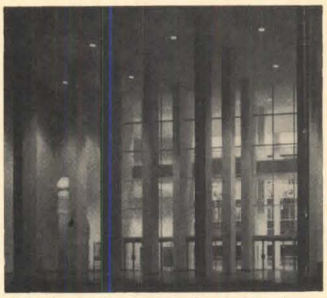
Rounds and squares. Aluminum fixtures, of round or square cross-section, throw light up or down, and white translucent acrylic units give a diffuse general lighting. Suitable for indoor or outdoor applications, "Multi-Forms" are fabricated in various lengths, and in single units or multiple groups,

making a total of 60 different models. Black, white, bronze-tone, and Duranodic colors; ceiling, wall, and pendant mounting. Drawings, photos, wattages. 4 pages. Silvray-Litecraft Corp., 100 Dayton Ave., Passaic, N.J. 07055.
Circle 215, Readers' Service Card



Punched patterns. Perforated metals, from foil-thin to an inch thick, are available in a somewhat staggering variety of patterns from art nouveau grilles to unintentionally Op sheets of round holes, slots, squares, triangles, and combinations of shapes. Although these steel, brass, copper, monel, zinc, and bronze sheets are used primarily in product and industrial design, they seem to offer possibilities for architectural interiors. Besides standard dies, manufacturer will custom-fabricate special designs and will also perforate such materials as plastic, wood, paper, and cloth. Dimensions and gages plus illustrations. 176 pages. The Harrington & King Perforating Co., Inc., 5655 Fillmore St., Chicago, Ill. 60644.
Circle 216, Readers' Service Card

Lighting: Fixtures and design consultation. Rambusch offers standard stock fixtures for churches and commercial installation, and also has a staff of craftsmen and lighting engineers available to work with architects on custom fixtures and special lighting problems. Ring-binder catalog is divided into two major sections: "Decorative" and "Engineering" lighting. Each section contains photos, dimensions, and data on standard fixtures, plus photos and



details of custom installations (see above). Scope of manufacturer's design and shop capabilities also cover stained glass windows, murals, sculpture, altars, and woodwork. Cost of catalog: $1. Rambusch Lighting, 40 W. 13 St., New York, N. Y. 10011.

Miller pages. An addition to Herman Miller's catalog is the recent Library Group comprised of reading tables, and carrels of several designs, including the double and single

shown above. Other up-dated catalog pages replace indices to all sections, several pages on office furnishings, and colored swatch pages for fabrics and Naugahydes. Herman Miller Inc., Zeeland, Mich.
Circle 217, Readers' Service Card

PROGRESSIVE ARCHITECTURE
NEWS REPORT

REINHOLD PUBLISHING CORPORATION
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NEXT MONTH IN P/A

THE IMPACT OF COLOR. *Famed color consultant Faber Birren examines today's concepts of the effects of color on man in three main areas: visual, psychological, and physiological. New discoveries on how man perceives and reacts to color will have far-reaching meanings in its use in architecture and planning, for color no longer can be considered merely as a "decorative" element in the cityscape. Each architect owes it to himself to know the facts contained in this exclusive report.*

ANOTHER LOOK AT ECLECTICISM. *Eclectic architecture, so long downgraded and despised during the establishment of contemporary architecture, receives another look and emerges as a style with more to it than mere fashion-mongering, one with a real aim of improving national taste in a brawling young country. This article postulates that modern architects can now derive positive enjoyment from the contemplation of eclectic architecture.*

SCHOOLS. *"What holiness now resides in hexagons? What sanctity in snails?" asked the superintendent of New Trier, Illinois, schools in describing the straightforward plan of the massive* ***NEW TRIER WEST HIGH SCHOOL*** *by The Perkins and Will Partnership and The Architects Collaborative. The imposing campus plan facility came in at $18 per sq ft, adding economic distinction to its aesthetic superiority.*

RIDGE PROJECT COOPERATIVE DORMITORY *of the University of California at Berkeley is not only cooperative but coeducational, wings for women and men being connected by a lounge, dining room, and office link. The complex by Ratcliff, Slama & Cadwalader is, in effect, a tiny community, with courtyards, massed units, and common facilities.*

. . . And unique coverage on: ***MORE MINIMAL INTERIOR DETAILS,*** *the first time the details of the executive dining areas and the residence of the Baron Lambert in SOM's Banque Lambert in Brussels have been shown;* ***LIGHTING FIXTURE DETAILS,*** *an On the Job feature comparing two methods of fixture detailing for an office building lobby;* ***WEATHERING STEELS,*** *a detailed examination of an increasingly popular material;* ***CALKS AND SEALANTS,*** *discussion of new breakthroughs by two experts in the field;* ***HELIODON,*** *a new device for simulating sun and shadow patterns on models;* ***URETHANE FOAM,*** *an application in an existing apartment building that gave the bonus of sound transmission and odor blockage to an insulation project;* ***P/A NEWS REPORT,*** *the profession's best-read news source;* ***P/A OBSERVER,*** *happenings in and out of architecture presented with opinion and candor.*

THIS RICH BREW *of design studies, opinion, technical information, news, views, and pictorial excellence can be obtained—with 11 other issues equally stimulating—by filling out and mailing in the subscription card you will find at the end of this issue. Do it right now and you will assure yourself of a year or more of architectural reading that will never be bland.*

Bright idea

Corridor-installed Bradley Washfountains make supervision a snap, save money in schools! They get students out of toilet rooms quickly. There's no reason for loitering and possible horseplay. And one teacher can supervise wash-up and monitor the corridor at the same time. What's more, Washfountains serve up to 8 people with one set of plumbing connections. So they reduce installation costs up to 80%. In 36 and 54-inch diameter circular and semi-circular models. Available in widest choice of colors and materials. Corridor-installed Washfountains. A bright idea you can use—from Bradley! For complete details, see your Bradley representative. And write for latest literature. Bradley Washfountain Co., 9109 Fountain Drive, Menomonee Falls, Wisconsin 53055.

from Bradley!

BRADLEY

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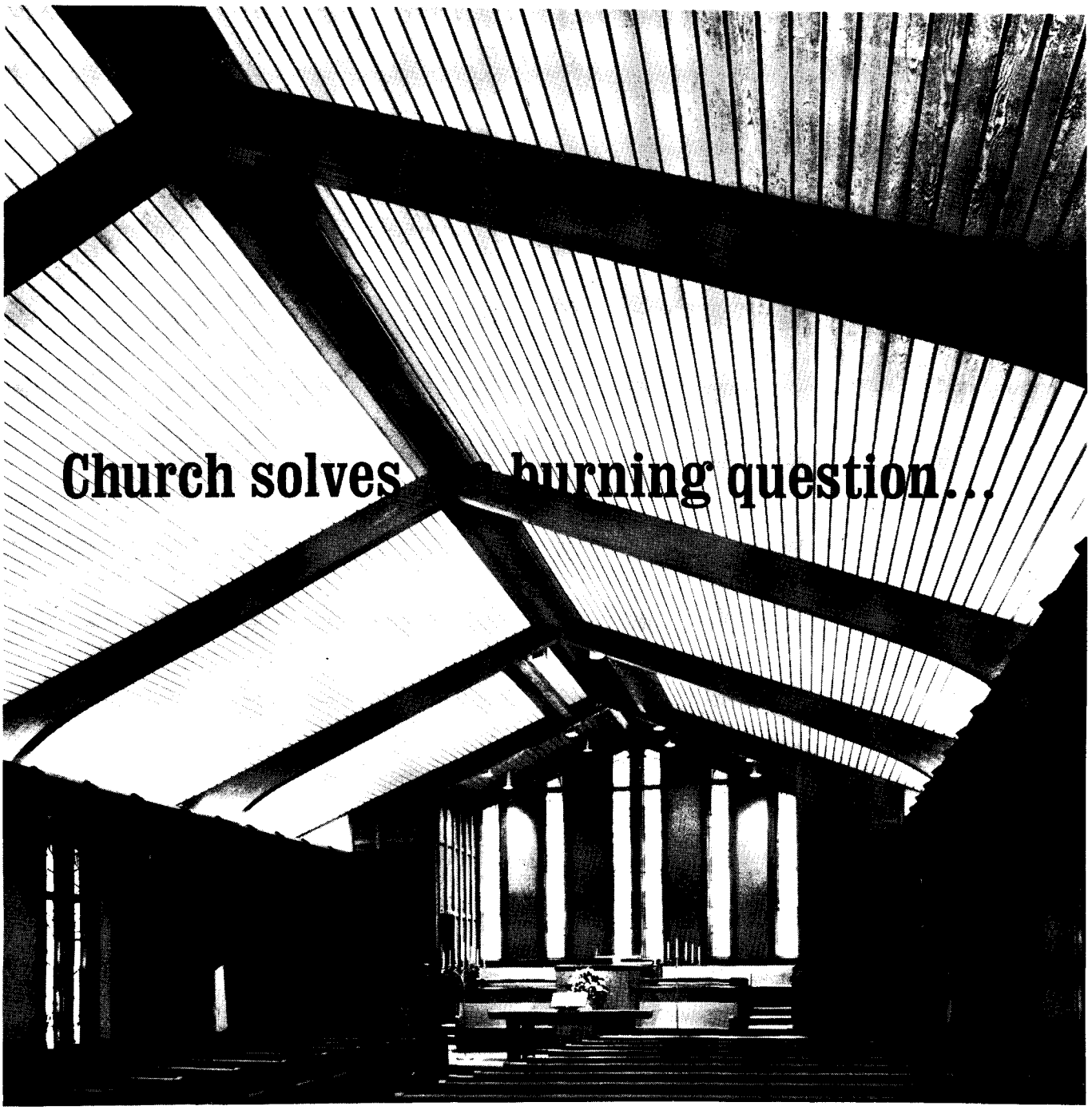


Grace Bible Church, Redwood City, California. Architect: Alfred W. Johnson, A.I.A.

With Pyresote® fire-retardant lumber.

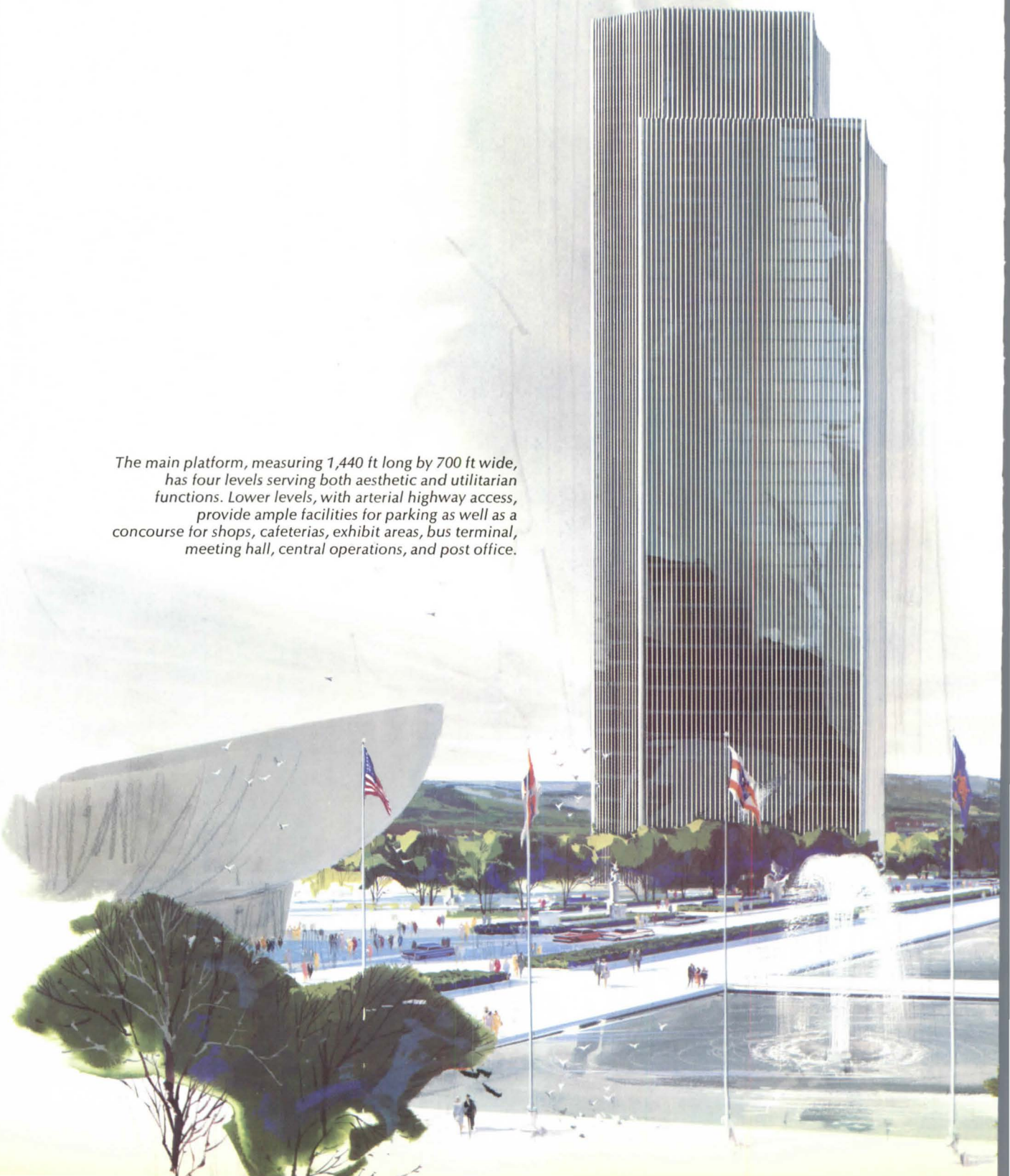
Grace Bible Church in Redwood City, California, won't have to solve the question of burning! Architect Alfred W. Johnson saw to that when he built a silent fireman into the structure by specifying Pyresote® fire-retardant treated 3" laminated wood decking for the ceiling. Although the high fire-retardance of Pyresoted® wood is accepted by Building Codes for several uses where formerly only non-combustible materials were permitted, its use in Grace Bible Church involved special Code modification. Because the Church had an occupant load of 300 or more and was two stories high, a one-hour ceiling was required, which would have impaired the desired aesthetic effect of the natural wood motif. The City Building Department and Board of Appeals agreed that the Pyresote-treated laminated decking provided equal or better fire protection allowing Architect Johnson to preserve the structure's simple dignity. Pyresote® treated lumber is being used in an ever increasing number of buildings because of its high fire-retardant qualities, economy and flexibility. The burning question of Grace Bible Church has been answered...let Pyresote® answer yours! For full information on money-saving Pyresote® (available from licensees and dealers throughout the U.S.) write, wire or phone.

J Baxter

120 Montgomery Street, San Francisco 94104

3450 Wilshire Boulevard, Los Angeles 90005

Albany's South Mall

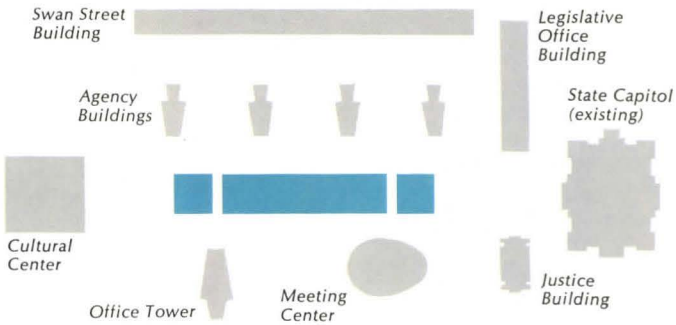


The main platform, measuring 1,440 ft long by 700 ft wide, has four levels serving both aesthetic and utilitarian functions. Lower levels, with arterial highway access, provide ample facilities for parking as well as a concourse for shops, cafeterias, exhibit areas, bus terminal, meeting hall, central operations, and post office.

...a blend of magnificence and efficiency

The $420-million South Mall complex, now under construction at Albany, New York, fulfills the concept that a working state capital can be distinctively beautiful as well as efficient . . . a focus of cultural life as well as a political and economic center. Part of a master redevelopment plan for the city of Albany, the new South Mall integrates existing state buildings, including the historic Capitol, into a complex of new structures providing an appropriate environment for progressive state government.

Stretching across 66 mid-city acres, the Mall opens southward from the Capitol in an expanse of landscaped walks, gardens, reflecting pools, and fountains . . . all lending grace and beauty to ten new stately structures. These include a 43-story Office Tower, four 23-story Agency Buildings, the five-block-long Swan Street building, a Meeting Center, a Cultural Center, a Legislative Building, and a Justice Building. (See plot plan.)



The imaginative use of steel is playing a vital role in the construction of both the mall platform and major buildings. Most of the buildings, including the 43-story Office Tower, are steel-framed. All make extensive use of steel products. In addition to many thousands of tons of structural steel, huge quantities of steel piling, reinforcing bars, and other steel products are essential to the completion of this massive undertaking.

BETHLEHEM STEEL

BETHLEHEM STEEL

BETHLEHEM STEEL CORPORATION, BETHLEHEM, PA.

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Foundation Engineers:
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Structural Engineers: Ammann & Whitney.

Mechanical and Electrical Engineers:
Syska & Hennessy, Inc.

Architect—Swan Street Building:
Carson, Lundin & Shaw.
Structural Engineers: Ammann & Whitney.
Mechanical Engineers: Syska & Hennessy, Inc.

Architect and Structural
and Mechanical Engineers—Justice Building:
Sargent, Webster, Crenshaw & Folley.

Architect—Legislative Building:
James & Meadows & Howard.
Structural Engineers:
Duchscherer & Oberst.
Mechanical Engineers: Jacobus & Babinsky.

Engineers—Arterial Highway: New York State Department of Public Works, with Parsons, Brinckerhoff, Quade & Douglas as consultants.

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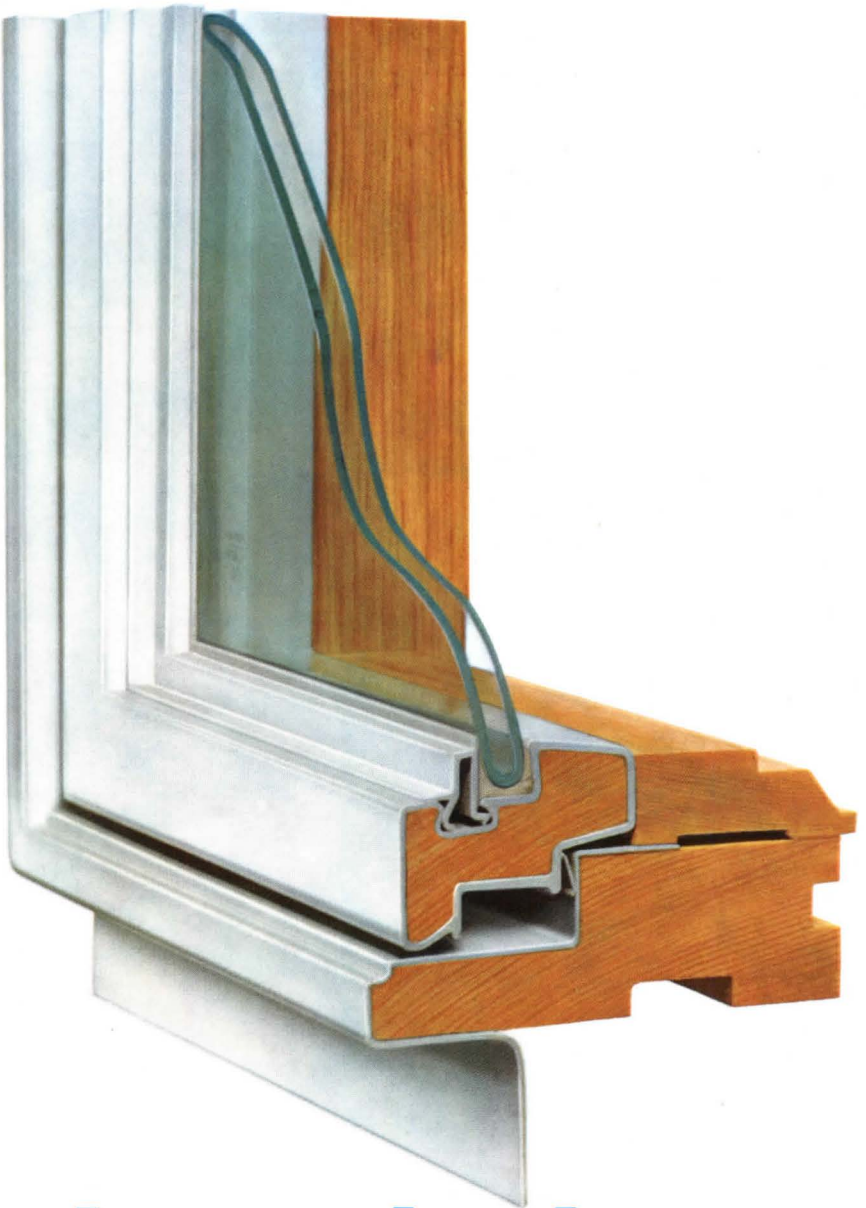
One reason: the qualified electrical contractor has plenty of experience with electrical heating systems. But that's only part of the story. Electric heat is an electric function and should be the responsibility of an electrical contractor. He's the one man who can furnish, install, connect and inspect electric heating equipment—and see the job all the way through from plans to permit to operating guarantee. So talk to a qualified electrical contractor. Then put the heating specs into the electrical section of your building plan. That way your electric heating system will be furnished and installed by the man able to take single responsibility for the single best heating system.

Your Qualified Electrical Contractor

NECA—National Electrical Contractors Association, 610 Ring Building, Washington, D.C. 20036



Introducing Andersen Perma-Shield* Windows and Gliding Doors!

A new <u>third kind</u> of window that combines the best of the other two!

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All the insulating value of wood plus the lifetime maintenance savings of a rigid vinyl shield.

Imagine a line of windows and gliding doors that does not need painting. Nor scraping. Nor rubbing down. With an armor-like lifetime finish that won't pit. Won't corrode. Won't dent. Won't warp. Can't rust. And stubbornly resists scratching.

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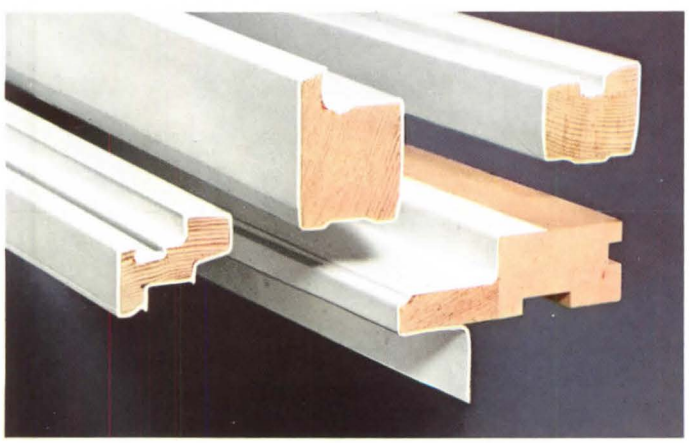
And you're right. New Andersen Perma-Shield doors and windows combine treated wood and a tough, durable sheath of rigid vinyl to create the most maintenance-free, best insulating, most versatile windows ever.

They're ideally suited to light commercial, institutional, and industrial building jobs . . . just great for any residential application.



How Perma-Shield Windows are made

Perma-Shield sash are produced by an exclusive process* where thick, off-white rigid vinyl is extruded directly over a preservative-treated wood core. Mitered corners are welded . . . sealing out all weather forever.

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*Patents pending.

The reason we're introducing The Lobby Carpets.

Every foot that comes into an office has to go through the lobby. That's why we call our new carpets The Lobby Carpets. They can take even the busiest lobby and show less soil, less dirt, less wear than you'd believe possible. So they're not just for lobbies, but for offices, corridors, public rooms—anywhere a carpet has to take real punishment.

The reason The Lobby Carpets can take it is that they're all made with a pile of 100% Antron® nylon by DuPont. Antron is a kind of super-nylon. It's as tough as regular nylon. But far more soil resistant. Which means it shows far less dirt than any carpet fiber around. And since it doesn't get dirty as fast, it needs cleaning less often. Which makes it more economical.

And because we really believe in The Lobby Carpets, we've introduced a whole line of them. Different pile heights. Different designs. Different colors. But they all have one thing in common. They're all priced right.

The Lobby Carpets by Lees—for places where anything else would be a dirty shame.

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LEES CARPETS

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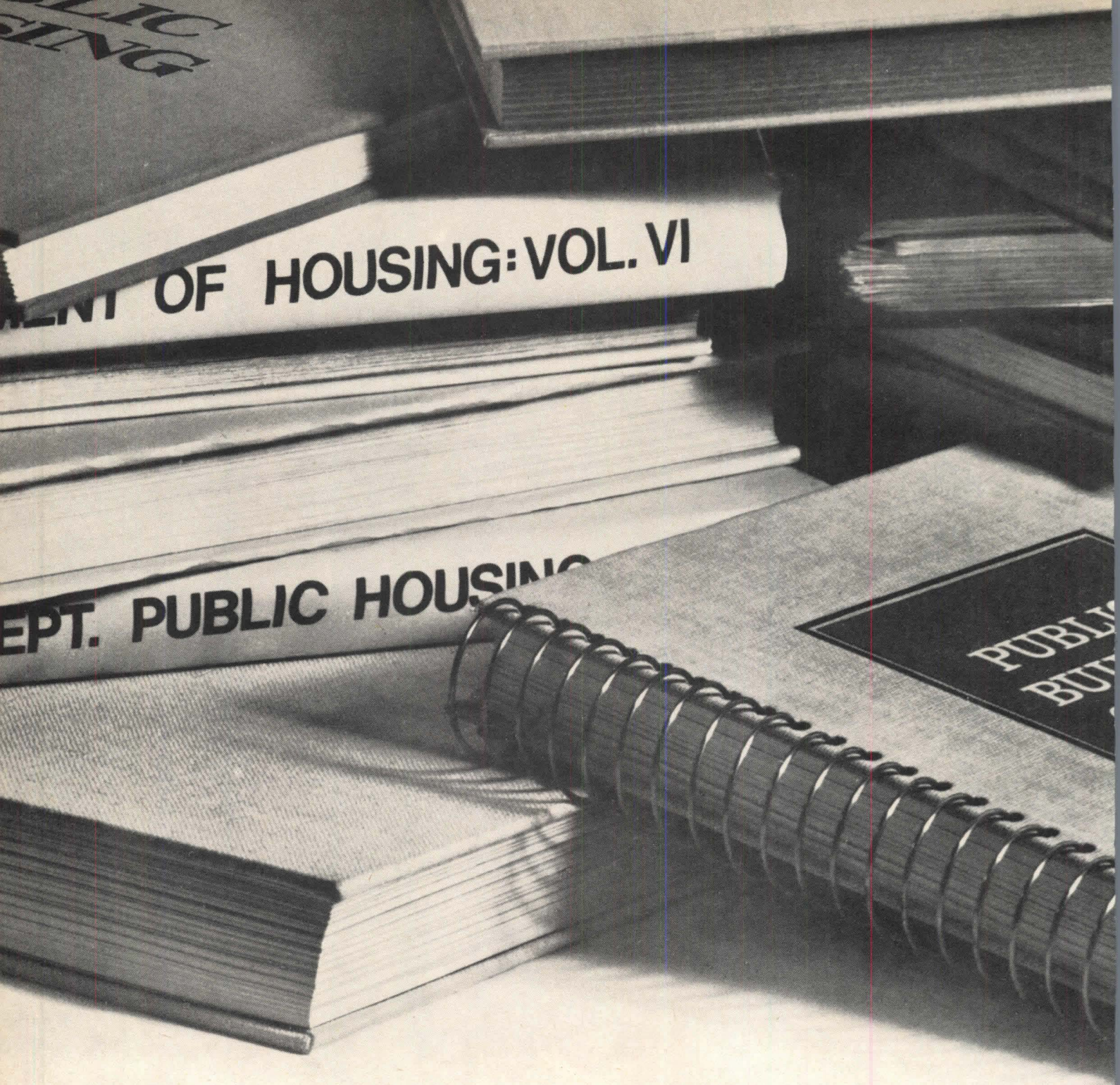

Why do building codes today put acrylic* plastics in a class by themselves for lighting applications?

An increasing number of building and fire codes throughout the country are making a fundamental distinction between acrylic plastics and other plastics used in lenses, diffusers and luminous ceilings. Indeed, some major city and state codes specify acrylics as the only plastics to be used for lighting in buildings for public assembly. Others set technical requirements that can be met only with acrylics.

The reasons? The codes, concerned primarily with safety to life and then with safety to property, recognize advantages of products made from acrylic resins over products made from other plastic materials. In terms of smoke developed, acrylics have the lowest smoke output of any plastic used in fixtures or luminous ceilings. The flash ignition temperature of LUCITE® acrylic resin, obtained by standard tests, is more than 400°F higher than that of most woods. And LUCITE acrylic resins are listed by the Reexamination Service of Underwriters' Laboratories as slow-burning.

The significant distinctions made by building codes are worth keeping in mind. When you choose materials for your next lighting installation, choose acrylic . . . choose LUCITE. For further detailed information, write: Du Pont Company, Room 5303, Wilmington, Del. 19898.

*LUCITE is the Du Pont registered trademark for its acrylic resins.

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Architects: Shannon & Clark Associates; McLoney & Tune; Watkins, Burrows & Associates

General Contractors: Foster Creighton Company; Haggett Construction Company

Aluminum Applicator: Whalen Erecting Company of Kentucky, Inc.

Fabricator: William Bayley Company

It had to be more than aluminum.

It had to be Alcoa.

At Lexington, Ky., the architect of the University of Kentucky's proposed 11-unit dormitory-dining complex had to select a window-wall system that would be immune to mildew problems and also offer maximum insulation values. To meet these needs, he specified Alcoa * Alply Panels. Made of polystyrene foam laminated between aluminum sheets, Alply Panels offer excellent resistance to rot and mildew. In addition, the polystyrene-aluminum combination provides a 3-in.-thick panel that imparts the insulation value of a 15-in.-thick masonry wall.

The handsome and durable bronze finish that lends such dignity to the light metal components is Alcoa Duranodic † 300 finish. Its rich color, like all Duranodic 300 finish colors, is not a dye or a pigment but an integral part of the metal itself.

Other reasons why aluminum was specified: Its versatility and compatibility permitted clean, crisp detailing of the bays. The 11-unit dormitory-dining complex reflects the architect's imaginative use of Alply Panels and aluminum extrusions.

Scheduled for completion in September, 1967, the project includes eight three-story structures, two 23-story, high-rise buildings, and a separate dining facility.

From concept to completion, Alcoa can smooth the way for an architect. Get the benefit of fresh, imaginative Alcoa architectural thinking. Call your local Alcoa sales office and talk to Alcoa early at the talking tissue stage.

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Shows how to guard against commercial kitchen fires with the

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53 PICTURES 53

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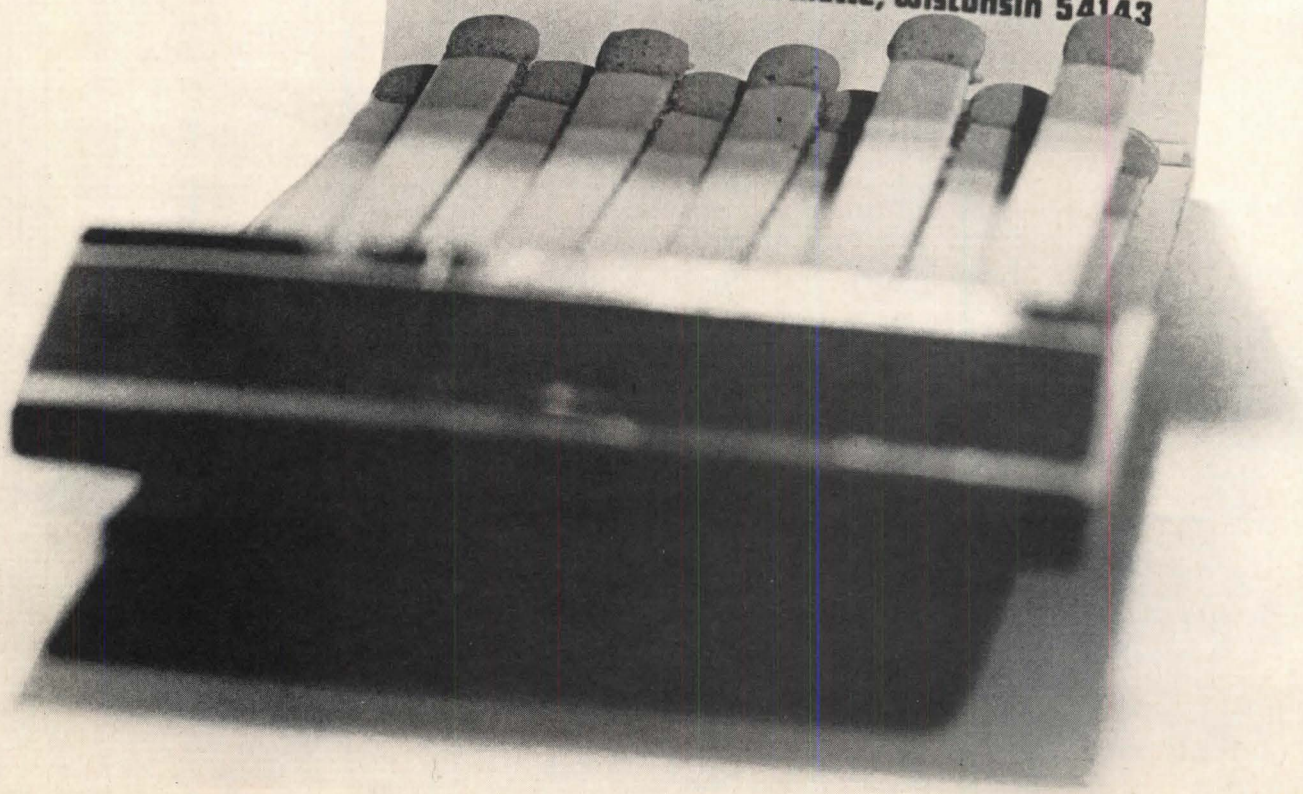

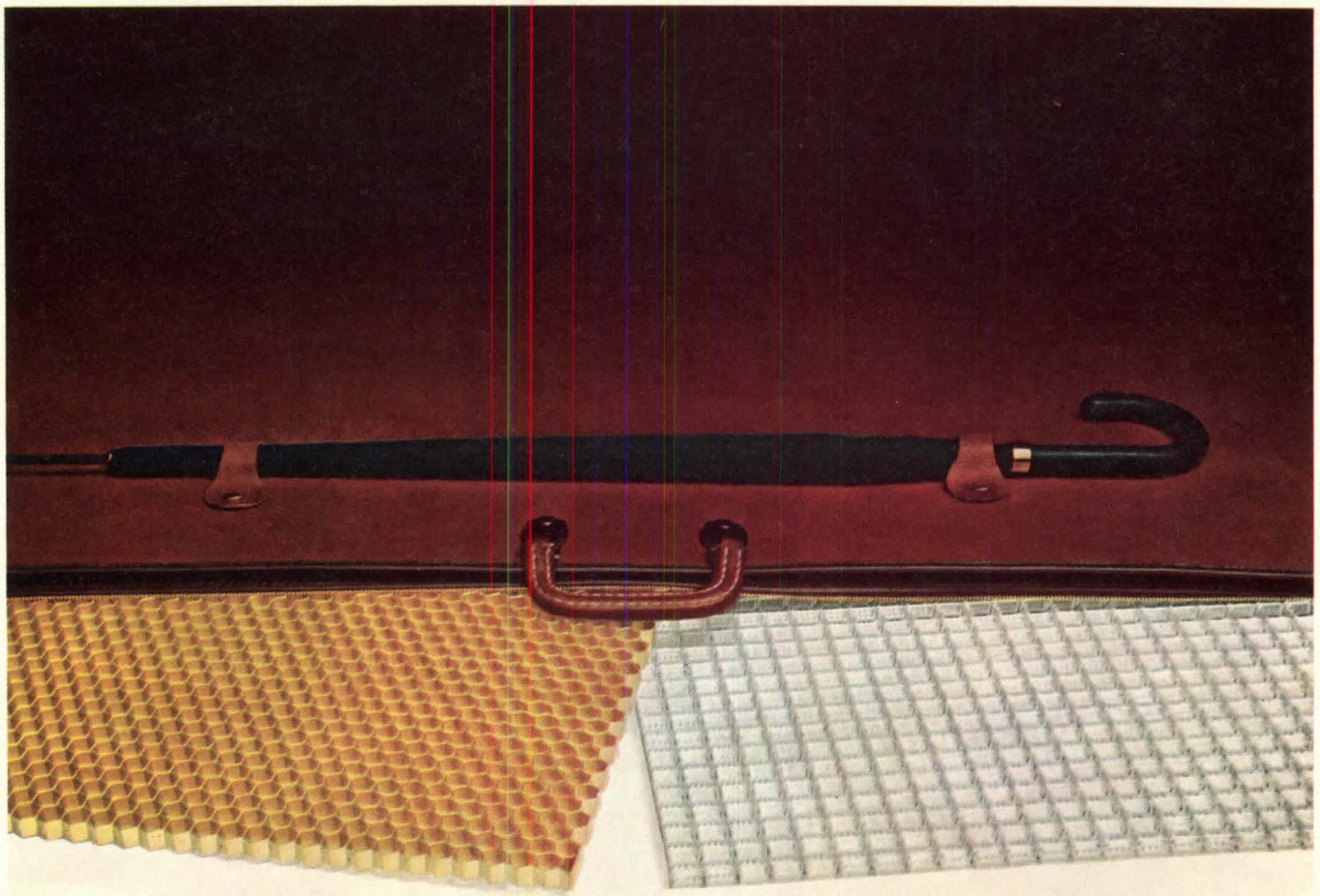

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Our Sinko Parahex Louver (left) can offer brightness control at its finest, by providing unlimited footcandles of illumination without reflected glare.

Our new Louver Lens provides the diffusion of louvers and the beauty of a lens. It is also slotted for clear, unobstructed air flow.

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We're specialists. And we're expensive, like most good things.

(Incidentally, we offer an egg crate diffuser known as Thin Cell. It's our one concession to conformity.)

MSL PLASTICS: the unique lighting people.
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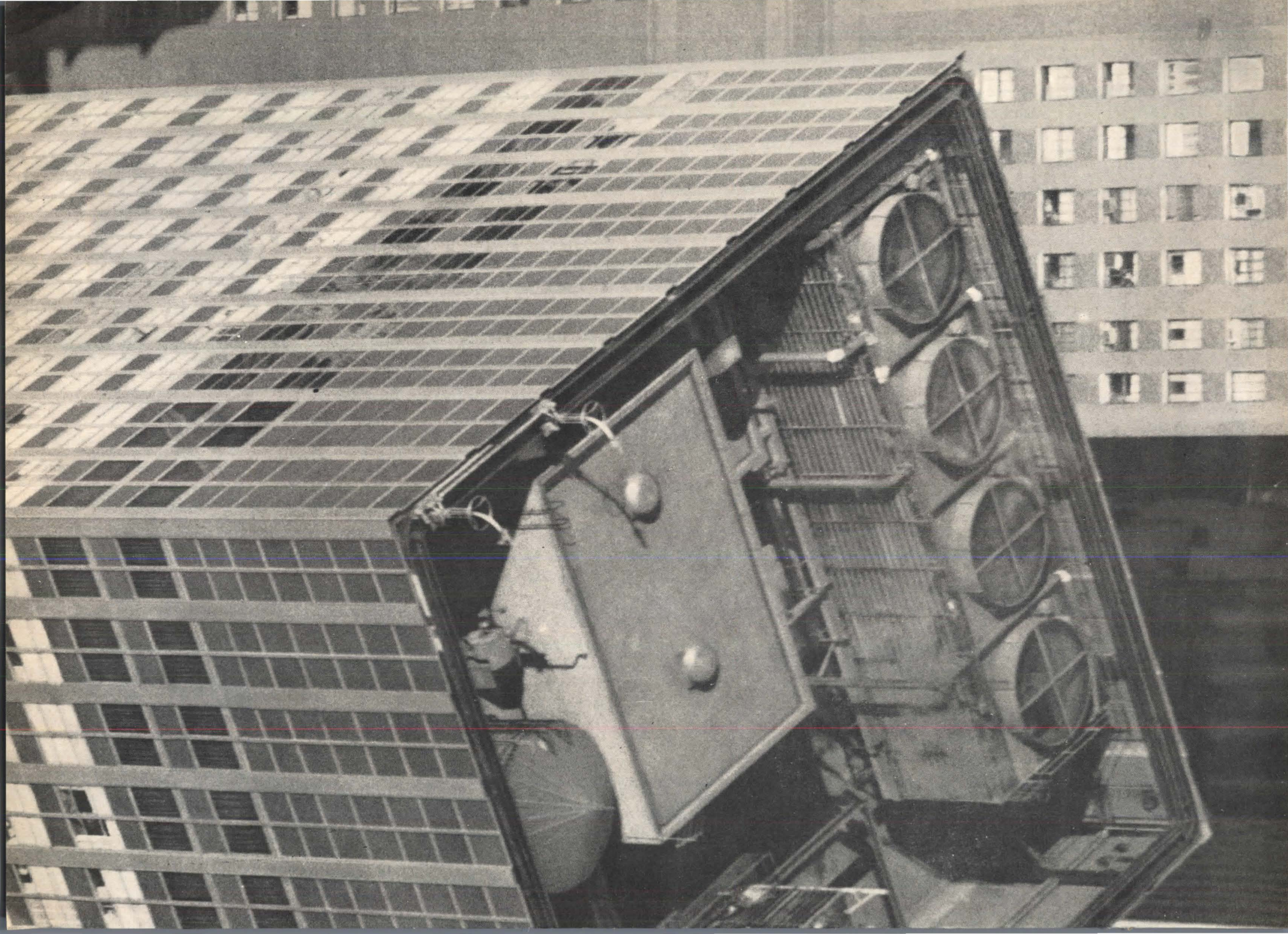

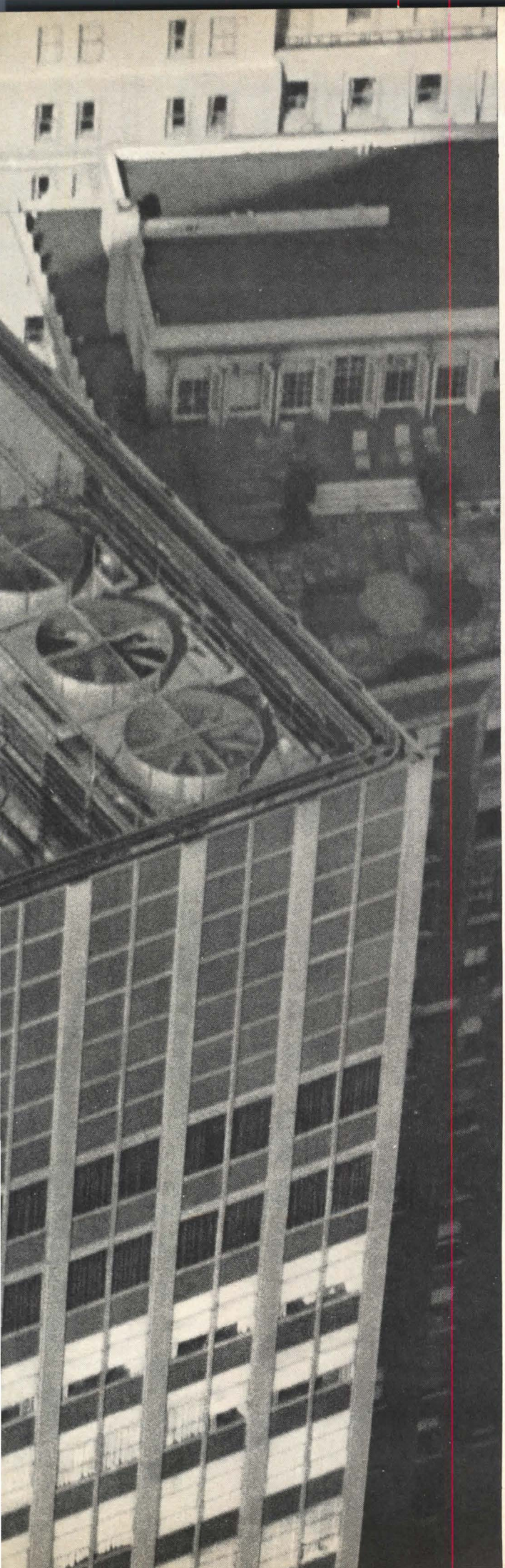

A four-pipe system
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There could have been a profitable pool or penthouse on this roof.

And a garage instead of a boiler in the basement.

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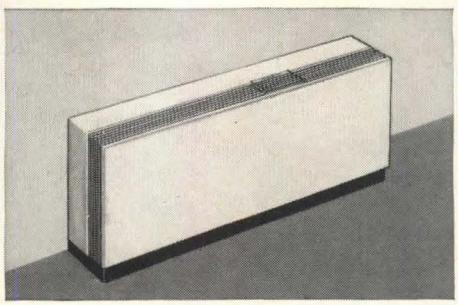

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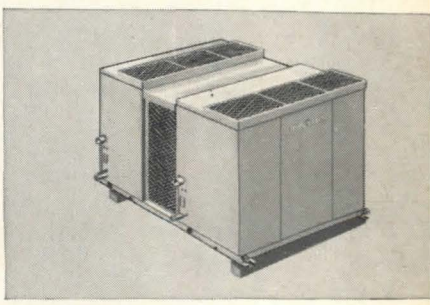

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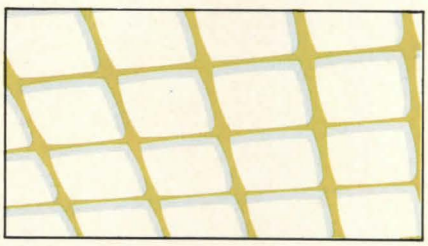

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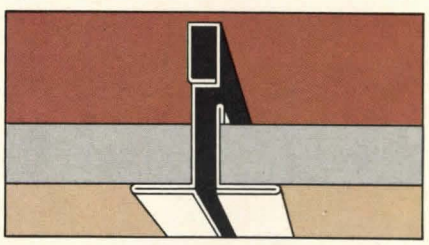

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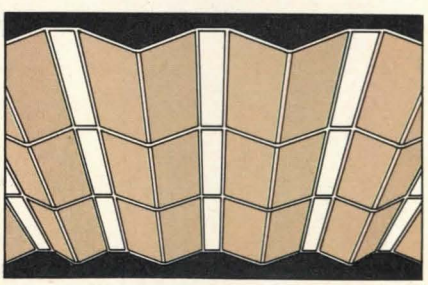

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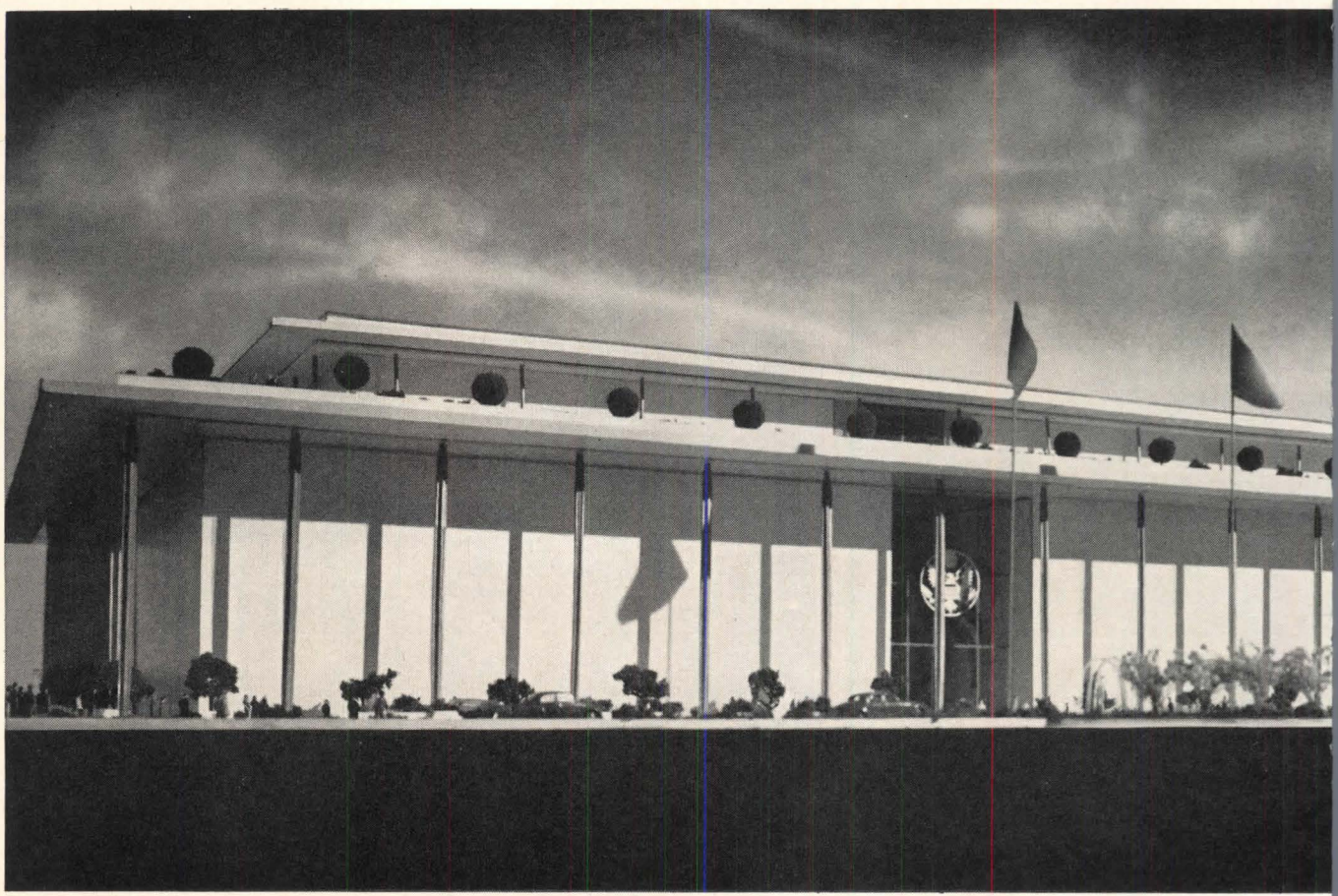

Masterpiece in All-Electric Design

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Structural engineers:	Severud-Perrone-Fischer, Sturm-Conlin-Bandel Associates
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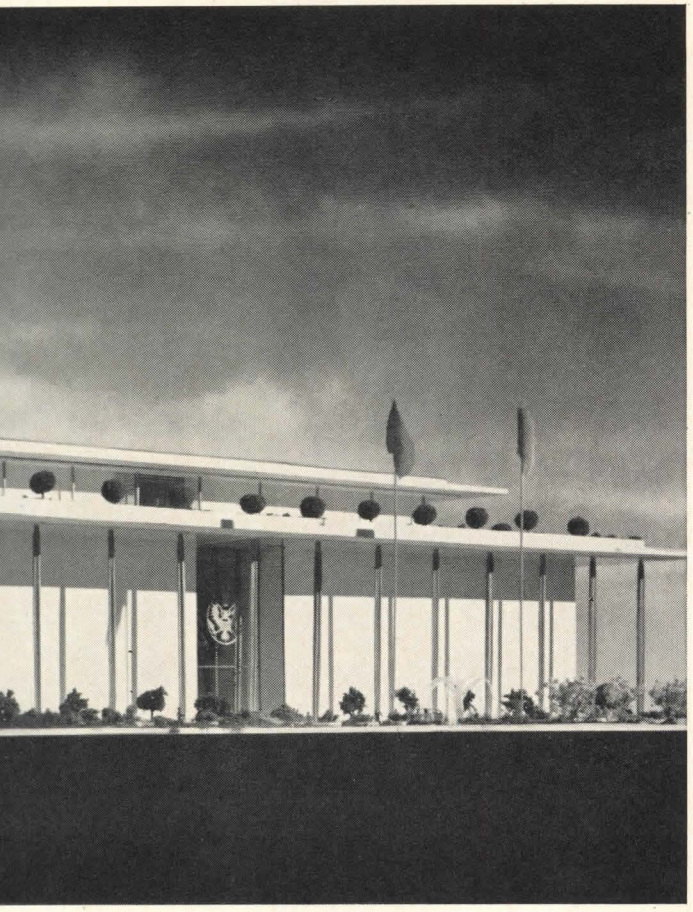
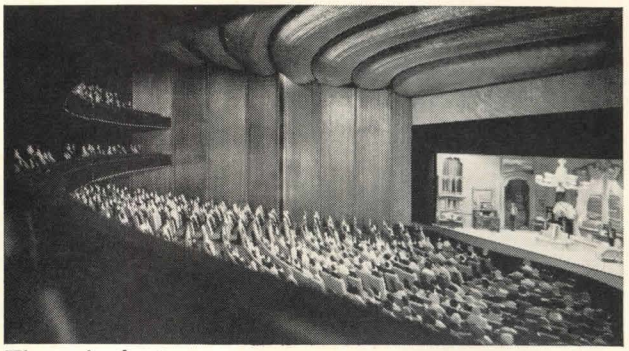
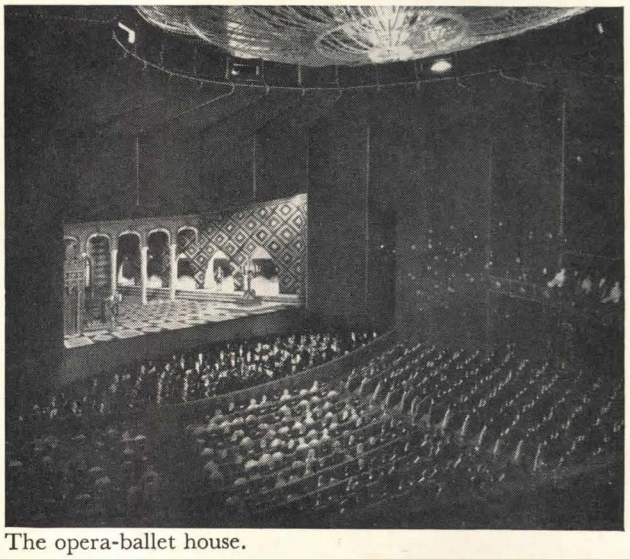




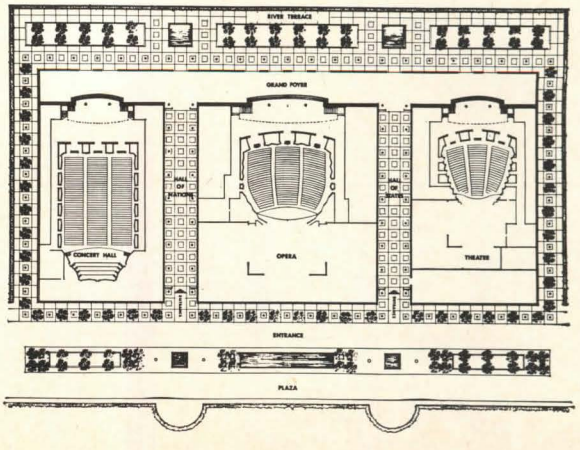
The main theater.



The opera-ballet house.

The concert hall.

The main level.



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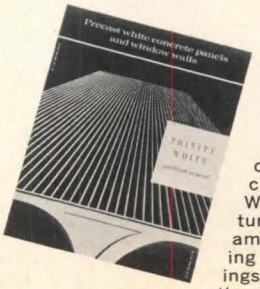

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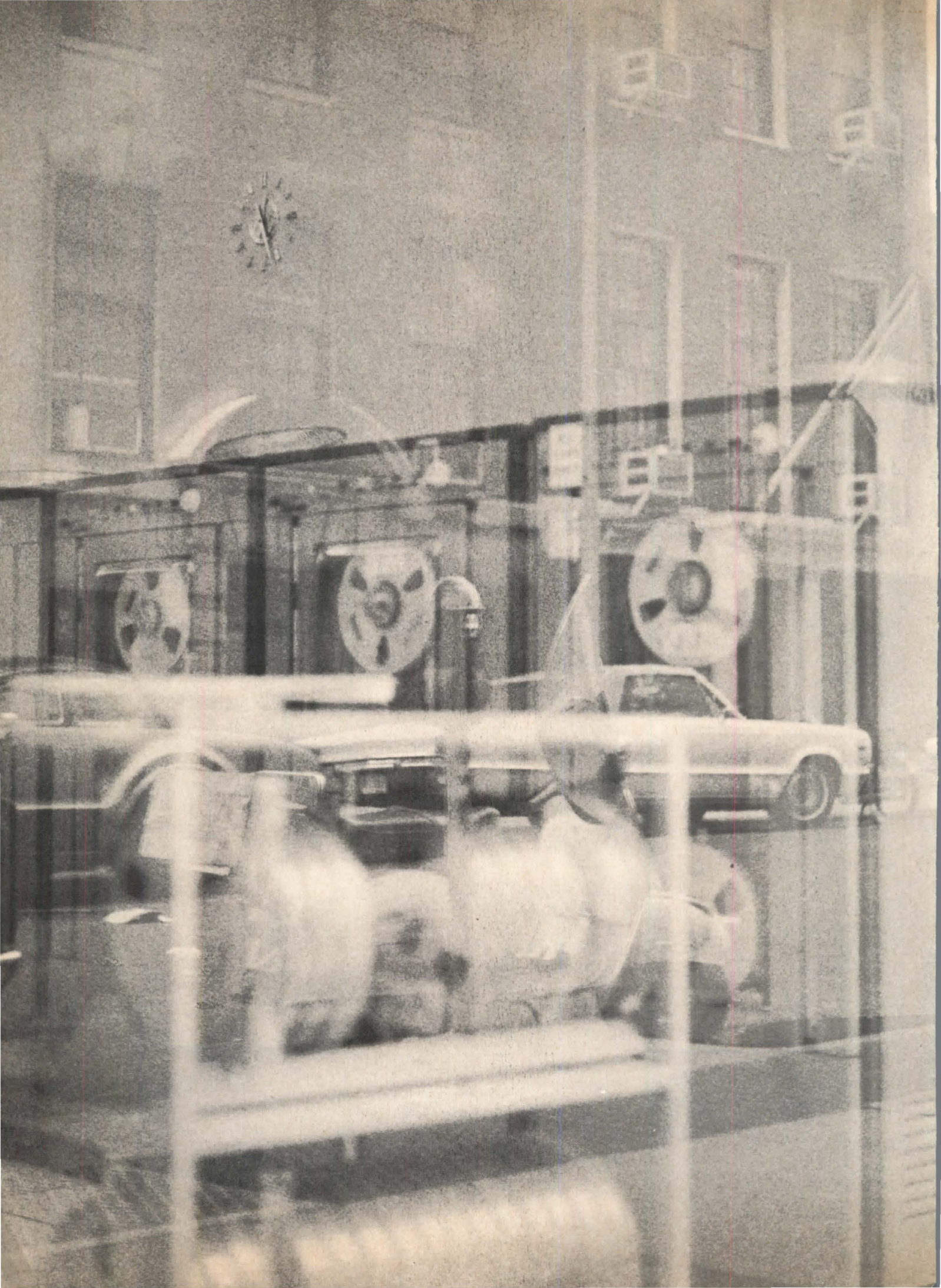
"The individual building does not help tomorrow's people, or the profession, but we got into the profession because we like to build buildings. The present architect tends to be schizophrenic."

MARVIN GOODY



EDITORIAL

Architectural schizophrenia goes deeper than suggested in the quote on the title page of this issue. Most architects become architects not only because they like to build buildings, but also because they like art. The urge to be an artist is rooted deeply in the subconsciousness, if not the consciousness, of the majority of practitioners.

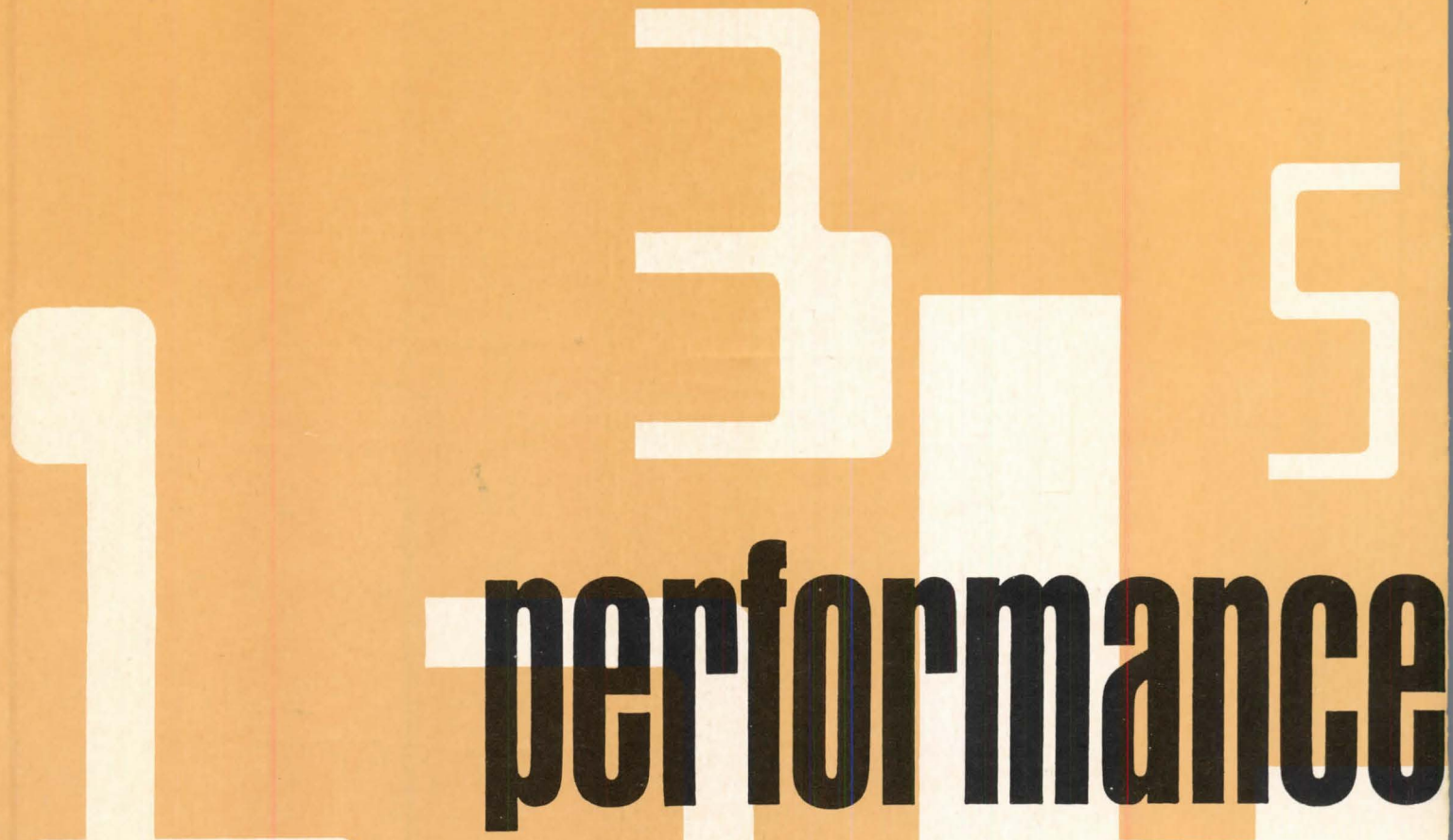
Norman O. Brown, in his book *Life Against Death: The Psychoanalytical Meaning of History*, discusses the Freudian view of art:

"Freud . . . affirms the connection between art and childishness; however, childishness is not a reproach, but the ideal kingdom of pleasure which art knows how to recover. What we are striving to obtain, he says, is a sort of euphoria — a return to the bygone state in which we were accustomed to satisfy our psychic needs with scant effort. This was the state of childhood when we needed neither wit nor humor to make us happy, and indeed we knew nothing about them. The function of art — Freud says 'wit' — is to help us find our way back to sources of pleasure that have been rendered inaccessible by the capitulation to the reality-principle which we call education or maturity — in other words, to regain the lost laughter of infancy. . . . Freud also suggests that art, both as a return to the pleasure-principle and as a return to childhood, must be essentially a play activity. He uses the category of play to establish a connection between the techniques of art and the techniques of the primary process, the infantile and the unconscious. Play on words — the technique of wit — is recovered when thought is allowed to sink into the unconscious. In returning to the unconscious in the quest for the materials of wit, our thoughts are only revisiting the old home where in infancy word play reigned. It takes only the reflection that metaphor, which is the building block of all poetry, is nothing but a playing with words to see how readily Freud's analysis of wit invites extension to the whole domain of art. . . . Thus art, like psychoanalysis itself, appears to be a way of making the unconscious conscious. . . . Art differs from dreaming not only because it makes the unconscious conscious — a purely cognitive relation — but also because it liberates repressed instincts — a libidinal relation. Because of the repression that arises from civilized life, we have lost many of the primary pleasures of which the censorship disapproves. But we find renunciation extremely difficult; hence, we discover that wit enables us to make our renunciation regressive and thus to regain what we have lost. Its object from the beginning is the same: to rid us of our inhibitions, and thereby to make those sources of pleasure that have long been blocked once more accessible for our gratification. As such, art struggles against repressive reason and the reality-principle in an effort to regain lost liberties. . . . Art, if its object is to undo repressions, and if civilization is essentially repressive, is in this sense subversive of civilization."

If Norman Brown's interpretation of Freud is right, and if Freud was right himself, then most architects struggle in their work against reason and reality. This raises an interesting question: If Performance Design (i.e., design based on reason and reality, a subject to which this issue of P/A is devoted) should replace the more intuitive and less rational approach of the past, where will architects-as-artists go? When your life is devoted to a struggle with reason and reality, it is unlikely that you will be happy by marrying them.

It is this conflict between wanting to be part of civilization and a desire to subvert it that will really make schizos of us for some time to come. ■

Jan C Rowan


performance

design

A new profession has grown up in the last 30 years whose members, variously titled "systems analysts," "systems engineers," and "operations researchers," claim to have developed a unique methodology for problem solving far superior to older methods used in other professions. To describe the implications of this methodology and ways of thinking about problems where architecture is concerned, P/A coined the term "Performance Design" — or design based on a scientific method of analyzing functional requirements, including the psychological and aesthetic needs of people. This issue follows the thread of Performance Design in its many guises through government, politics, building, military, the sciences, technology, industry, transportation, planning, and (with a glance to the future from professionals who have already become immersed in this subject) architecture. We hope that the following articles — the result of many months' work by P/A's editorial staff — will act as a launching pad for those architects who wish to accept new responsibilities offered by an increased understanding of the ever more sophisticated means at their disposal in the field of Performance Design.

the background

what it is

Since World War II, and especially in the past decade, the abstruse pursuits of "systems analysis" and "operations research" have extended their methodological tentacles into many fields of government, industry, planning, warfare, commerce, logistics, "pure" science, and a host of other seemingly unrelated areas. What are the characteristics that enable these discovery techniques to serve so many masters? What is their value to so many disparate disciplines? What are they coming to mean, what is their potentiality, to architecture? What the devil are they, anyway?

It is not uncommon for a young science, particularly one that grew almost to full maturity very rapidly, to become overgrown with verbiage, an "in" vocabulary its practitioners invent for what they are doing. Everyone has a name for the kid. In this section (and in the Glossary on p. 108), we attempt to cut through the maze of words for a working definition of what the systems approach is, how it began, how it works, and who is currently using it. Not to be outdone by other writers on the systems approach, we have coined our own term for this issue. It is PERFORMANCE DESIGN, and we mean it, loosely, to indicate the possibilities available to architecture and planning through use of the potentialities offered by systems analysis and operations research.

In his book, **A Methodology for Systems Engineering,** Arthur Hall, himself a systems expert at Bell Labs, describes a **system** as any set of objects with relationships between the objects and between their attributes. Thus, systems can consist of atoms, stars, switches, springs, wires, bones, neurons, genes, mathematical variables, equations, laws, or processes. Attributes are properties of objects: stars have temperature and distances from other stars, for instance. Relationships tie systems together; some of the kinds of relationships are: causal, logical, or random. Hall goes on to the idea of **environment:** "For a given system, the environment is the set of all objects outside the system (1) a change in whose attributes affect the system and (2) whose attributes are changed by the behavior of the system." Defining the boundaries between a system and its environment is quite arbitrary and depends on the interests and aims of the one who defines the system. Ideally, the environment should include all things that affect the system being considered, but, to be practical, the environment often has to be limited to only the things that affect the system **significantly.** (It should be kept in mind that any system functions because of the environment, not just **in** it.) Arthur D. Hall lists five environmental factors that affect man-made systems:

- the state of technology;
- the natural environment (climate, plant life, etc.);
- organization policies;
- the economic conditions for new systems;
- "human factors."

This description of systems and their environments, as used in "systems analysis" and "operations research" (see Glossary for the difference, or lack of difference, between these two terms), merges closely with popular usage, as in "solar system," "philosophical system," "subway system," and so on, but it perhaps clarifies the situation somewhat for those mystified by all the verbal crescendoes of, "But you've got to see it as a system!" This simply means seeing all the isolated segments as tied together by interdependent functions.

Although "seeing something as a system" (i.e., the "systems approach") does not by itself constitute a technical definition of systems analysis, it is one of the key ideas of the methodology, because systems analysis can be understood as nothing more than a set of techniques, coupled with the "systems approach," that **enables** someone to see isolated objects, or a piecemeal series of events, as interconnected and mutually dependent.

Of course, before the advent of systems engineering, people could think about objects and events in this way, but the crucial difference is that there was no means, no technique or "expertise," by which the events could be systematically analyzed as a total process, and conclusions and predictions drawn from the analysis for use in planning and decision-making.

Architects have always been able to imagine entire buildings and analyze their parts; they conceive of groups of buildings, with plazas, parking lots, bordering streets, circulation patterns, and fountains; rearranging the elements while simultaneously keeping in mind all the building codes, client attitudes, budget requirements, functional requirements, and so on — otherwise they could not design. The question then becomes: How does the systems engineer's or operations researcher's idea of seeing something as a "system" differ from the architect's normal, over-all perspective?

The answer seems to be that there is little difference between the "systems approach" and the way most architects normally view architectural problems. But because the types of problems operations researchers and systems analysts work on are so different, and the areas of their professional activities are equally dissimilar, they have developed a set of techniques, a methodology, that enables them to apply the systems approach over a far wider range than that over which architects are presently able to exercise their talents and abilities as "generalists."

We have now seen **system** defined as the new profession defines it, and the meaning of **environment of systems** — two key elements in any discussion of the methods used in conducting either "systems studies" or "operations research studies."

Systems analysis and operations research (OR) are further characterized by the following conditions:

- an interdisciplinary team rather than an individual performs the work;
- the scientific method is always followed;

■ the work is usually done according to a prescribed formula or sequence of jobs.

Though exceptions and variations sometimes do occur, depending on the nature of the problem(s) being studied, it is fair to say that, if the characteristics listed are not present, systems analysis or operations research is not being performed.

how it began

The origins and development of systems analysis occurred at the same time as, and as a closely related part of, the general development of the technologies associated with the second half of the 20th Century: the computer, television, radio, telephone, radar, missiles, atomic energy, and so on. It is a unique methodology that grew up as a sort of second cousin to these to control the acute environmental changes that accompanied these technologies.

Operations research seems to be the older, more established way of referring to this new problem-solving discipline. Since scientists were the first actual practitioners, the use of the scientific method was a fairly natural outgrowth of the origins of the field. It began in the late 1930's, although, before that, other men had begun to analyze working operations of large companies. These were the "efficiency experts" who promulgated the ideas of "scientific management" that were fairly prevalent before World War I. These were largely the result of the time studies made by Frederick W. Taylor, which he published in 1911 in his book, **The Principles of Scientific Management.** Some writers feel that it is this basic concept, first brought home by Taylor, more than the interdisciplinary approach, that is significant about operations research — namely, the formation of organizations for research on operations. They compare it to the idea, held by many, that the main innovation that characterized the Industrial Revolution was not the invention, as such, of the textile machine, but the idea of transferring skill and intelligence to machines.

Military Beginnings

Most of the problems so far in the brief history of systems analysis and operations research have been military, and, more recently, industrial management problems. The first operations research was done for the military in Britain in 1939, when a group of physicists, electronics engineers, and related professionals were called in to devise ways to use newly invented radar. Since scientists working for the military command had made the invention, they were deemed the most likely to come up with the methods to use it. Because a team of scientists had done the research that led to the invention, representatives from each branch of the sciences were asked to work together on utilization methods, since no one could be sure which branch of science was appropriate. Finally, the military commanders (or "management") could not work out the solution, because, to use radar effectively, the radar mechanisms had to be understood.

Another early operations research project, also conceived in England during World War II, involved another team from all branches of the natural sciences and even included a philosopher and a novelist; they were brought in by the RAF to figure out why a newly invented, highly touted bomber was performing no better than the old ones. It turned out that the new plane was being flown no differently from the old one — which explained, of course, why its performance was identical. The operations research team then devised new search patterns and new flying and bombing altitudes to make best use of the new plane's increased bombing accuracy. The plane's "kill" was upped 40 per cent in the first month. The team that did this work was headed by physicist Sir Watson Watts, who thereafter reportedly became a favorite of Churchill's. From then on, operations research teams were called in by the military when there was a problem that entailed highly technical knowledge for its solution. Operations research appears to have been an almost inevitable outgrowth of war's increasingly complex technology and equipment, for whose invention and effective use scientific training was required. But since no one from the traditional sciences had had any previous experience with implementation problems ("operations" problems, teams of them were used.

Word soon got across the Atlantic to the U.S. about the results achieved by these scientific teams of "operations researchers," so that when the U.S. military started having problems of its own with electronic equipment and complex logistical decisions, it, too, created teams of scientists who gradually became known as OR men. Typically, the U.S. plunged completely headlong into the use of these teams — to a greater extent than Britain had ever done. They worked on logistical problems during World War II, designed the proximity fuse, planned the sea mining of Japan, invented the massed ship convoy and new flight patterns, and helped integrate Negroes within the Armed Forces (a fact more fully realized after World War II).

As the defense establishment grew during World War II, and the equipment of war grew more and more scientific, culminating in the big bang of atomic energy, science and scientists became an established part of Government. Mathematicians, physicists, electronics engineers, biologists, and chemists had developed all the sophisticated weaponry, devised ingenious ways to use it, thought up mathematical theories that could be used to simulate decision-making situations, all in the name of World War II, but incidentally creating at the same time the technological and scientific base from which the current "cybernetic" revolution got its impetus. Just two war-developed gadgets should serve to bring home the point: television and the computer. Even today, the most advanced research on computers is conducted by the Federal Government, much of its top-secret defense work.

So the stage was set for the postwar development of systems analysis and operations research in many fields — civilian and space-age as well as military. The basic concept of expert teamwork, scientific method, and sequential treatment of all parameters of a problem was found to be ideally amenable to evolution through more sophisticated concepts of research and investigative methods (computers, information retrieval devices, and so on). Today, there would seem to be few areas of planning or research immune to the potentials of systems analysis and problem solving, imaginatively pursued and constructively used.

how it works

If systems analysis and OR involve, fundamentally, application of the "scientific method" to problem solving in many diverse fields, what is the "scientific method"?

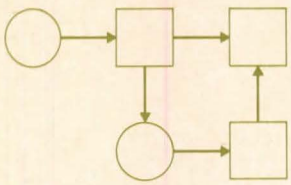
Basically, it involves three steps: (1) the formulation of a theory to account for a set of isolated facts, or observations of the environment; (2) checking to see whether the theory actually explains the known facts, which involves formulating and reformulating (and re-reformulating) the facts in terms of the theory; and (3) testing the theory's validity by seeing whether or not it accurately predicts events (i.e., gives the correct result).

In systems analysis, the theory might be (and is) called the **model** of the problem — the mathematical or, occasionally, physical representation of the facts and behavior of whole systems, be they industrial, electronic, governmental, political, economic, or social. By manipulating the equations comprising the model, tests are performed on the environments of systems and the results reveal what would happen if particular actions were accomplished within the actual environment. Thus, alternative means can be evaluated critically to see how various results, or goals, can be attained by certain actions.

The use of the mathematical model to

glossary of technical terms frequently used in systems analysis

ALLOCATION PROBLEMS: A class of problems that arise when: **(a)** there are a number of activities to be performed and there are alternative ways of doing them; and **(b) resources** or facilities are not available for doing each one in the most effective way. The problem then is to combine activities and resources in such a way that over-all effectiveness is **maximized.**



COMMUNICATION MODEL: A diagram representing the pattern of information transfer within organizations.

COMPETITION PROBLEMS: Situations in which: **(a)** two or more parties or groups are in conflict relative to their respective objectives; and **(b)** these groups cooperate relative to either a common objective or an objective of a third party or group served by the competitors. A chess game is a competitive game. (See **Game Theory.**)

CONSTRAINTS: Regulations, restrictions, limitations.

COMPUTER PROGRAMMING: The devising of a series of operations to be performed by a computer. (See **Mathematical Programming.**)

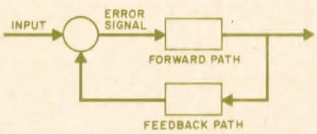
COST BENEFITS (or **COST EFFECTIVENESS**): The comparison of how much something costs with the results achieved, commonly expressed as a ratio of costs over benefits. More simply, a way to determine if one is getting one's "money's worth."

CYBERNETICS: The study of guidance and control problems in either biological or mechanistic systems.

DECISION THEORY: (1) Application of **probability** concepts to management decisions. **(2)** Mathematical method of combining estimated costs and returns with estimated probabilities of the occurrence of various outcomes of alternative courses of actions.

DYNAMIC PROGRAMMING: A type of **mathematical programming** developed at the Rand Corporation in 1952 that involves a multistage process of decision-making, wherein each consecutive decision must take into account its effects on later decisions to arrive at an over-all optimum return.

ENVIRONMENT: As generally referred to in OR, the set of all objects and events containing any given system that change or are changed by the system's behavior.



FEEDBACK: The return to the **input** of a part of the **output** of a machine, **system,** or process that contains information on discrepancies between intended and actual performance and leads to a self-correction of the system.

GAME THEORY: (1) A set of **mathematical models** that deal with **competitive problems.** Widely used in military, industrial, and bidding strategies. **(2)** Method for the study of decision-making in conflict situations, where full control of the factors that influence the outcome is not possible.

HUMAN FACTORS: The physiological and psychological limitations of man.

INPUT: Information fed into a computer.

INTERFACE: (1) A common boundary between two objects or spaces. **(2)** The end of one system or subsystem and the beginning of another.

INVENTORY PROBLEMS: Inventory is defined as "idle **resources.**" Costs arise from both too large and too small inventories and the problem is to determine how large an inventory is appropriate. Production and purchasing divisions are usually the focus for such problems. Other examples are the determination of how much operating capital or how many retail branches a company should have. **Probability** theory is often used in solutions.

LEAD TIME: The amount of time required to attain a stated goal.

LINEAR FUNCTION: A mathematical expression for related variables that increase and decrease proportionately. A straight line is an example of a linear function with one variable. A plane surface represents a linear function with two variables. A more immediate example is in the case of curtain wall materials costs for buildings without setbacks: The cost increases by exactly the same amount (linearly) for each additional floor, whereas the cost of vertical structural elements does not **(nonlinearly).**

MAINTENANCE PROBLEMS: Problems associated with the process of replacing or repair of components: same type of problem as **replacement.**

MANAGEMENT SCIENCES: The generalized name for a set of specialized disciplines that deal with executive decision-making in organizations of men, machines, materials, and money. Includes personnel psychologists, industrial engineers, industrial psychologists, human engineers ("ergonomicists"), **systems engineers, quality control** statisticians, industrial economists, **operations researchers,** management consultants, methods analysts.

MATHEMATICAL MODEL: (1) An abstract representation of an object, event, process, or system. **(2)** A series of quantitative terms that describe the structure of real systems. (See **Model.**)

MATHEMATICAL PROGRAMMING: Formulas and methods for maximizing or minimizing **linear** and **nonlinear functions** subject to linear and nonlinear **constraints.** When both the functions and constraints are linear, the operations on them are termed linear programming. Nonlinear programming is more complex and is concerned with nonlinear functions and constraints. Both types of programming are used extensively in the administrative and economic planning of industrial and military operations, e.g., for **allocation** problems.

MAXIMIZE: To increase to the highest possible degree.

MINIMIZE: To reduce to the smallest possible degree.

MISSION: Goal, objective.

MIXED PROBLEMS: Problems encountered in operations research in which all or several of the other problem types are combined.

MODEL: A representation of an object, event, process, or system that is used for prediction and control. By manipulating the model, the effects of changing one or more aspects of the entity represented can be determined. Several types of models exist: those that describe, or "iconic" (architectural models are iconic), and those that reveal causal relationships and explain. The latter are "symbolic" models and mathematical equations are the most common example. (See **Mathematical Model.**)

NONLINEAR FUNCTION: A function whose variables do not increase linearly. (See **Linear Function.**)

OPERATIONS: An organization of men, machines, and information working toward a stated objective.

OPERATIONS RESEARCH (abbr. **OR**): The application of scientific method to the problems of organizational control by interdisciplinary teams interested in the performance of whole systems.

OPTIMIZATION: Securing the best fit between a system and its environment.

OUTPUT: Information produced by a computer.

PARAMETER: (1) Mathematical term for a symbolic quantity that may be associated with some measurable quantity in the real world (e.g., length). **(2)** Any part of a system that can be deliberately changed.

PERFORMANCE DESIGN: A term coined by P/A to describe the architectural use of systems analysis and operations research.

PROBABILITY: (1) In mathematics, a precisely defined value that indicates the chance of (or odds for) an event occurring. **(2)** The ratio of the number of ways in which an event can happen to the total number of ways in which it can either happen or not happen.

PROGRAMMING: See **Computer Programming** and **Mathematical Programming.**

QUALITY CONTROL: The discovery and control of factors that have a significant effect on system or product performance.

QUEUING PROBLEMS: Class of problems arising from costs associated with bottlenecks and idle capacity. Mathematical techniques (known as Queuing Theory, or Queuing Models) have been developed for determining the optimum size and design for a production or service facility. (See **Waiting Time Problems.**)

REPLACEMENT PROBLEMS: Those that arise when items **(a)** degenerate with use or passage of time, or **(b)** die or fail after use or passage of time. Costs are associated with replacing or maintaining each type of item. **Dynamic Programming** is often used for solutions.

RESOURCES: Anything used to obtain something else of value. Men, machines, money, and materials are principal resources.

SEARCH PROBLEMS: Problems that arise when establishing search procedures; submarine coastal patrols, auditing procedures, and explorations for oil are examples. Mathematical models have been developed for determining optimum search patterns.

SEQUENCING PROBLEMS: Problems concerned with the order or sequence in which service is provided to units by a series of service points. Production scheduling problems are of this type and CPM and PERT are examples of applications.

(Boldface words within definitions are defined elsewhere in this Glossary.)

SERVOMECHANISM: An automatic control device, such as an automatic pilot, which corrects performance to a desired standard by an error-sensing **feedback.**

SIMULATION: See **System simulation.**

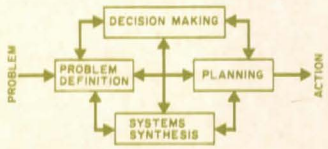
STOCHASTIC PROCESSES: Mathematical processes that include random factors whose values depend on **parameters** such as "time."

SUBOPTIMIZATION: (1) Optimizing a **subsystem** with respect to its objectives; **(2)** optimizing the total system with respect to a subset of objectives.

SUBSYSTEM: Individual units of systems. Assembly lines are subsystems of factories, for example.

SYMBOLIC LOGIC: Means of expressing verbal propositions and statements of relationships between them in a concise and unambiguous form. Boolean algebra is used to manipulate the symbolically represented propositions. Used extensively in the design of computer circuits. Forms logical basis of mathematics.

SYSTEM(S): (1) A complex unity formed of many diverse parts. **(2)** An aggregation of objects joined in regular interaction or interdependence. **(3)** Any set of objects or events with relationships between them or their attributes.



SYSTEMS ANALYSIS: (1) A term often used almost synonymously with **OR** to describe the activities of a new profession of applied scientists, although in practice differences exist in the kinds of problems each works on. **(2)** Sometimes described as a phase of systems studies following **systems synthesis** in which consequences are deduced from alternative systems on costs, performance, etc.

SYSTEMS APPROACH: (1) Loosely, seeing anything as part of a larger process. **(2)** The methods used by system analysts and OR men in solving problems.

SYSTEMS CONCEPTS: A term referring to the whole body of ideas and techniques of systems analysis and OR, especially to the systems approach.

SYSTEMS DESIGN: (1) The engineering design of individual components and devices. **(2)** A term sometimes used interchangeably with the second definition of **systems engineering** (below).

SYSTEMS ENGINEERING: (1) A term often used as a general term synonymous with systems analysis and OR. **(2)** According to some practitioners, it is a distinct profession of engineers whose specialty is the integration of successive pieces of equipment to work together (forming a system). **(3)** A highly developed application of mathematical analysis, primarily for electronic control devices and an extension of industrial plant layout done years ago by industrial engineers.

SYSTEMS METHOD: A term referring rather loosely to the systems approach and sometimes more specifically to the development of **mathematical models** for problem-solving.

SYSTEMS SIMULATION: A way of representing real systems in an abstract form for purposes of experimentation so that there is a close relationship between the experimental situation and the real life situation which remains unaffected. Usually done with **models.**

SYSTEMS SYNTHESIS: A variously described phase of OR and systems analysis: **(a)** in OR, the process of constructing a **mathematical model; (b)** in systems analysis, compiling an exhaustive list of alternative systems, each worked out in enough detail to be evaluated relative to an objective; **(c)** sometimes merely reproportioning parts of old systems to get a new one; **(d)** sometimes the combination of several alternative systems through **trade-offs.**

SYSTEMS TECHNIQUES: (1) All the mathematical tools widely used by systems analysts and OR men, including model building, mathematical programming, queuing theory, etc. **(2)** Used also to designate the several discrete phases of a systems analysis or an OR study.

TECHNOLOGY: (1) Applied science. **(2)** The totality of the means employed by a people to provide itself with the material objects of its culture.

TRADE-OFFS: Changes made in physical and nonphysical subsystems to enable them to function together — a process similar to bargaining and compromising.

VALUE ENGINEERING: Looking for ways to reduce costs and maintain or increase qualilty (as in "bargain hunting").

WAITING-TIME PROBLEMS: Problems in industry that arise when either units requiring service, or the facilities available for providing service, stand idle. First used extensively in telephone systems. **Queuing** and **sequencing** problems are subtypes.

describe a wide variety of processes or problems is an important development in this kind of problem-solving research. Books on the subject even give a formula that describes the general form of all models used in systems analysis. It is E=f(Xi Yj). This means that E — the effects of any system on the environment, or performance — is a result of the interaction of Yj or the independent variables, and Xi, the dependent variables. When this model is used in real problems, all the symbols are replaced by numbers describing the actual system and its environment.

Besides the concepts of systems, environments, mathematical models, scientific method, and the team approach, another key characteristic of systems analysis and operations research is the process used to perform an actual systems analysis or OR study. Although the sequence of phases of study may be described differently by different practitioners (partly because the phases vary as they are applied to different kinds of systems or problems), the following is an acceptable general outline of the usual operation:

The first phase is called "establishment of mission requirements" or "problem definition"; it is a phase that continues on and off throughout the study as the nature of the problem or "mission" becomes clearer through research on it. Simply stated, it means deciding what the problem really is and formulating it so that the various members of the team working on it understand and accept it. It sounds somewhat easier than it often turns out to be, as architects will understand from contact with clients who do not seem to be aware of their real building needs but think they are.

The second phase has been termed "derivation of general systems requirements," which means that all aspects of the system under study have to be quantified, if possible, and experiments and research performed on those aspects of the system for which no data exists. This phase causes most concern among the "humanists," since they feel that some of the "human factors" may not be quantifiable sorts of things. OR men meet this objection by asserting that this is certainly true today, but largely because the behavioral sciences are, in comparison to older sciences such as physics and biology, very young indeed and have not yet had time to develop comprehensive (i.e., quantifiable) data on human beings. Scientists now predict that sometime in the not-too-far-distant future, mathematical models will be devised to "simulate" human reactions to every kind of environment, and that environments thus can be constructed so that humans will enjoy them. Whether humanists will be as-

	Front entry	Rear entry	Office			Fresh	Flowers	Lawn	Mowers	Women			Cash		Men		Aisle					
			Door	Circ	Desk					Door	Powder	WC	Counter	Work space	Door	WC						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1		0	6	0	0	25	0	0	0	0	0	0	30	15	0	0	50	0	0	0	0	0
2			4	0	0	3	0	20	20	10	0	0	0	0	10	0	0	0	0	0	0	0
3				50	10	0	0	0	0	15	0	0	5	15	15	0	4	4	0	10	0	0
4					50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6							50	6	0	0	0	0	0	0	0	0	10	30	15	0	0	0
7								0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
8									50	0	0	0	0	0	0	0	0	10	30	15	0	0
9										0	0	0	0	0	0	0	0	10	10	5	0	0
10											50	0	0	0	0	0	0	0	0	0	0	0
11												50	0	0	0	0	0	0	0	0	0	0
12													0	0	0	50	0	0	0	0	0	0
13														50	0	0	15	3	0	0	15	15
14															0	0	15	3	0	5	0	0
15																50	0	0	0	0	0	0
16																	0	0	0	0	0	0
17																		50	20	10	20	20
18																			50	0	10	10
19																				30	10	10
20																					10	10
21																						50
22																						

1 Tabular set-up showing the numerical "pair importance values" that will determine the spatial relationships between various areas in a retail flower shop.

suaged or alarmed by this prediction we leave to your imagination.

The third phase is the separation of the system under study into its component parts: identifiable components and subsystems. A brick would be a component of a brick wall, for instance, and a particular college within a university would be a subsystem of the university system. This is a critical phase; in it, the mathematical model of the whole system is derived from the models of the parts. Part of the purpose of this phase is to display the component parts so that the influence of the characteristics and their effect on the over-all performance of the system can be quantitatively identified. By varying the characteristics of the subsystems (done by manipulating the mathematical models), it is possible to arrive at an "optimum" — namely, best — over-all system. The same set of models can be used to indicate desired areas of advanced research and development for which no mission is yet defined. This is also the phase in which "trade-offs" between subsystems are performed — meaning a sort of bargaining or compromising among subsystems with a view to enhancing the performance of the over-all agglomeration. Rough cost estimates are derived next for various alternative solutions. This is systems synthesis.

One now knows exactly what each part of the whole must do; the fourth phase involves implementing these conclusions and devising ways to run the entire operation. Design of hardware usually takes place here as indicated by the models. These hardware "outputs" are then tested, on paper, to be sure they will function as intended. Finally, they are manufactured, assembled, and operated. This comprises the "feedback" phase, where actual performance is checked against planned performance, faults corrected and fed back into the original plans to see what was wrong there. Other parts of the system are then adjusted so they work with the whole.

During all these phases, various mathematical techniques and methods are used. These are techniques of all the disciplines of science and are not peculiar to systems analysis or OR, although some of them were developed in the course of OR studies when it was discovered that no technique already existed for solving the particular problem. Obviously, these techniques for information application and problem solving can have a great pertinence in the future of architecture and planning. This is the realm we have chosen to call **performance design.**

Among professions in the U.S., architects are the least acquainted with the tools of systems analysis and operations research, and probably the most reluctant to admit that those tools have a place in their work, according to Russell L. Ackoff, who is himself both an architect and an operations researcher.

Nevertheless, management scientists either have developed or are developing decision-making processes that have implications for every important area of responsibility in the architectural profession. From among the problem-solving techniques available to the operations researcher, it is possible to select two simple but typical examples that illustrate the scientific methodology and foretell the ultimate penetration of science into a profession that until now has relied heavily upon empiricism and intuition.

■ A rational technique for synthesizing floor plans — relating spaces to one an-

other according to function — that draws its inspiration from the mathematical concepts of topology.

■ A corporate strategy plan that ignores the relatively minor architectural question of how to build, addressing itself instead to the deeper questions of what to build, where to build it, and when.

These examples properly fall into the classification of systems analysis or operations research because they embody models — occasionally actual physical models, more often mathematical models — that simulate reality. (See **Model,** in Glossary.)

Planning by the Numbers

The process of arranging the elements of an architectural floor plan so that the spaces relate to one another functionally is traditionally intuitive. No designer would have the perseverance to attempt all the possible arrangements; in any case, he would not know which one was best, since he has no quantitative measure of what is good and what is bad. There is now under development, however, a computer program that can seek out the floor plan arrangement in which the functional interrelationship of the spaces is optimum. The program is not yet fully refined, but it is far enough advanced to suggest the power it may someday possess.

David Parsons, who conceived the technique while he was the IBM Fellow at the Harvard Graduate School of Design, calls it architectural design by natural selection. Indeed, it is similar to the biological process from which it draws its name.

An extremely simple example of the mathematical model used might be that for a five-room house.

A Living room
B Dining room
C Kitchen
D Bathroom
E Bedroom

The desired interrelationship among all the elements is expressed numerically, for example:

	A	B	C	D	E
A	–	8	2	0	5
B	–	–	10	0	0
C	–	–	–	0	0
D	–	–	–	–	10
E	–	–	–	–	–

Parsons calls the numbers in this table above "pair importance values," and the number associated with any pair of elements is a measure of the importance of close proximity of those two elements. Thus the value 10, assigned to the bedroom and bath as a pair, is tantamount to demanding that they be contiguous; the same is true of the kitchen and dining room. Conversely, the relationship between the dining room and the bedroom, which is rated zero, is by implication immaterial.

An abbreviated checkerboard, three squares wide by three squares long, represents the plane on which the five rooms will be manipulated. The symbols representing each room are dropped at random into five of the squares, leaving four vacant.

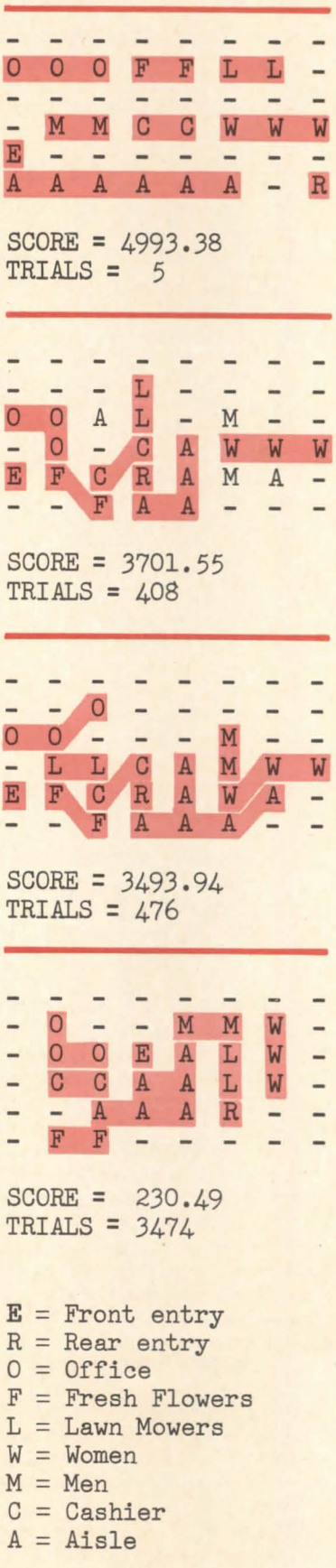
It is possible to attach a score to each pair of elements indicating how well the arbitrary placement of the elements meets the requirements of the previously established table of interrelationships. For example, A and B are three squares apart; the strength of the relationship between the pair is eight; thus the score for that pair is the product of 3 x 8, or 24. Similar scores exist for every pair of elements, and the sum of all these is the score for the entire arrangement. The lower the total score, the better the arrangement.

The computer, which is capable of making mathematically random selections, then transposes any two squares and computes the score for the new arrangement; if the new arrangement is better than the old, it will be held in the computer's memory; if it is worse, the pair of elements will be returned to their original positions. The process continues; random pairs of elements are interchanged, and changes that improve the floor plan survive; those that do not, perish. It is this process of gradual improvement by testing the effect of small changes that gives the method its resemblance to Darwin's doctrine of natural selection, the survival of the fittest.

The accompanying illustrations demonstrate the program at work; the example is a retail flower shop. The designer's first step is to decide what fraction of the total floor area should be devoted to each functional area and allow for each a proportionate number of squares. The areas are tabulated **(1)** and the numerical "pair importance values" that will determine the spatial relationships between the areas are assigned.

In this case, the total floor area is represented by 22 squares, which will be juggled within a 6 x 8, or 48 square matrix. (There exist 10^{39} different ways to arrange 22 elements in 48 spaces. Although many of these combinations are redundant, and still others would be so patently unsuitable as to be unworthy of serious consideration, the figure does give some measure of the magnitude of the task of testing all the reasonable alternatives.)

The computer accepts the 22 elements representing the shop's floor spaces, which are dropped into the 48-square matrix with no attempt to position them logically, and begins the process of exchanging random pairs, totaling the numerical score for the whole arrangement with each trial. Whenever the arrangement



2 Diagrams for flower shop areas produced by computer gives scores for relative desirability of different arrangements.

improves, as indicated by a lower score, the computer prints out the new positions of the elements. Watching the successive diagrams produced by the computer **(2)**, the designer sees the functional areas begin to form and align themselves with one another, shifting slowly, fluidly, like microorganisms observed under a microscope. The numerical ties between the various functional areas, which are often conflicting, pull and tug against each other until the whole floor plan coalesces into a cluster of amorphous blobs resulting from a sort of equilibrium among the mathematical forces linking each of the 22 elements to every other one.

Although the arrangement developed by the computer is irregular, it can be urged into a rectilinear pattern without greatly distorting the mathematically derived relationships.

Dollar Design

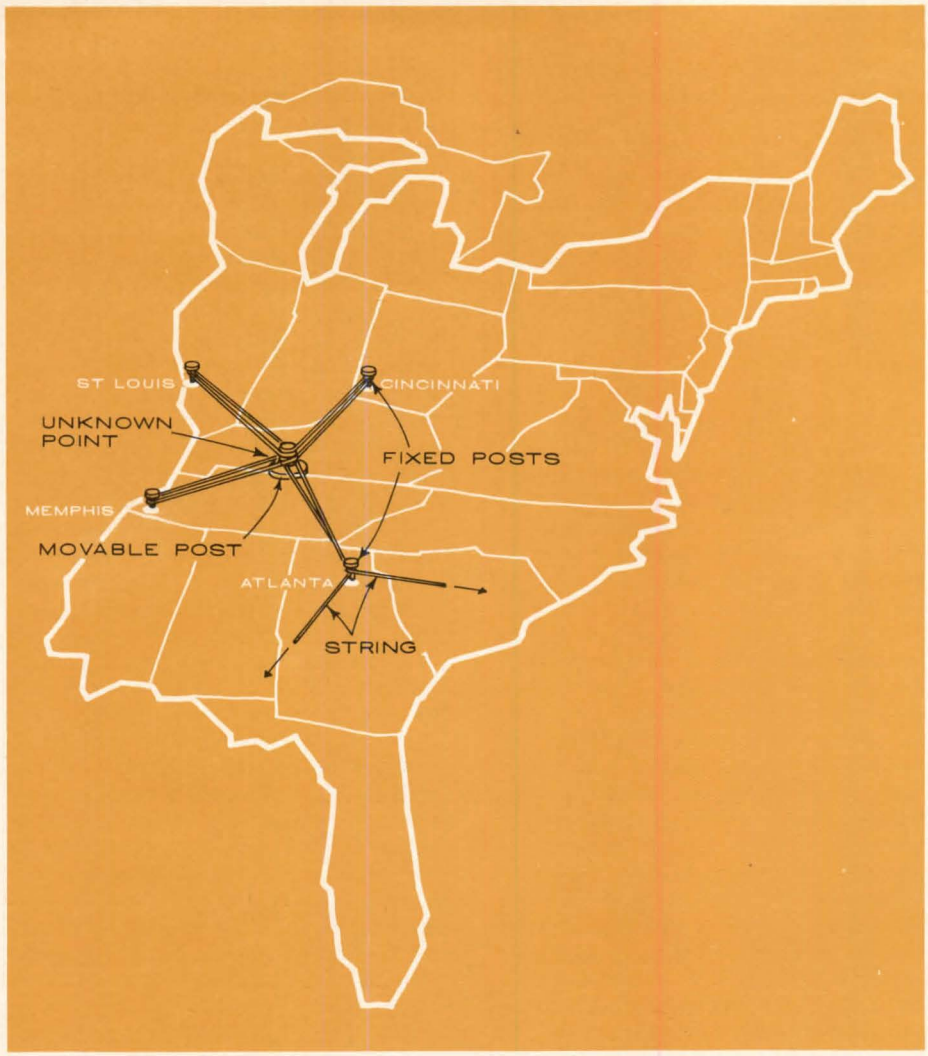
Few problems have received more attention from the systems analysts and operations researchers than those that arise in the transportation and distribution of material; optimizing the logistics support of combat troops was among the original applications of operations research. The subject lends itself readily to mathematical treatment because the cost of moving and storing goods is usually quantifiable.

One early model used to simulate an elementary distribution problem is an elegantly simple physical analogue. A map of the distribution region is reproduced on a thin, rigid sheet — plywood, for example **(3)**. At each of the receiving points in the distribution net, a fixed peg is erected. Another peg, mounted on a movable base, represents an intermediate point from which it will be most advantageous to ship goods to the receiving points.

A string looped around the fixed pegs and the movable one is drawn tight. As the string tightens, the movable peg will shift its position, coming to rest at the point where the total distance to all the distribution points is a minimum. By varying the way in which the string is looped, the model can reflect unequal shipments to different points.

What was simulated by the physical model could equally well have been done with a mathematical model. In fact, much more complicated distribution systems can be simulated mathematically and the techniques for manipulating such models are highly advanced.

Recently, a large multiproduct food manufacturer undertook to analyze its entire distribution and warehouse system by mathematical simulation. Although the study seems concerned primarily with freight rates, handling and storage charges, and inventory costs, the architectural implications emerged at the conclusion of the work.



3 Simple physical model of distribution problem indicates, by use of strings, pegs and pulleys, the most logical point for central supply depot.

The model constructed was extremely detailed. It included customers' geographic location, their typical ordering quantities, preferred method of shipment (truck or rail, carload or less). And it included variations in taxes and labor costs in the different areas in which it maintained warehouses.

These and many other factors combined to produce a model that could simulate the operation of the company's distribution system for a complete year. Then, by altering the number, size, and location of the warehouses in the model, the researchers identified which of the existing warehouses were economical, which should be altered or eliminated, and where new facilities ought to be located. Moreover, by plugging long-range market forecasts into the model, the researchers went on to determine what changes in distribution facilities would be needed to anticipate the changing market.

By the time this company commissions an architect to design a building, its own management scientists have already determined these factors:

- site location
- size
- appropriate economic life
- the degree of flexibility that should be embodied in the structure and the premium it is prepared to pay for that flexibility

The building has already been largely designed, and by men who really know very little about the art of building, men who recognize their buildings for what in most cases they really are — money pumps. For the managers they report to, this is performance design.

who is doing it

We have indicated that the use of systems analysis is every day becoming more and more widespread, crossing disciplinary lines and permeating just about

every aspect of our lives. In the following chapters, specific examples of these problem-solving techniques will be illustrated and discussed in depth. Right here, we give a general overview of the use of systems analysis and OR by public and private bodies — plus a selected list of organizations working in the field — in order to indicate the scope and versatility of the techniques in working toward the solution of many and varied problems.

Government

The development of the PPBS — Planning-Programming-Budgeting-System — technique that Secretary of Defense McNamara brought to Government circles from his experience in the automotive industry (see p. 123 for detailed discussion) has given local and state governments, as well as the Federal, a useful tool for the determination of aims, budgets, and allocations in planning for future development. Variations on this technique and other systems analysis and OR methods are currently being used in a number of areas.

■ Wisconsin has been using these methods since 1959, when Governor Gaylord Nelson initiated a Department of Administration to study how the state's services were being administered. A comprehensive state plan was developed by 1963, and Wisconsin is now in the process of working on long-range plans, such as a state freeway plan, for 1990. The viability of this kind of planning is indicated in that it has been maintained under three different Governors (of both political faiths) and several changes in the political complexion in the legislature.

■ In New York, the Office of Planning Coordination is a policy-making team (along with budget officials) directly under Governor Nelson Rockefeller in the Executive Branch. A staff of between 100 and 200 persons is doing systems work that cuts across all the other state agencies, such as welfare, housing, and transportation. The Office of Planning Coordination is working on the physical development programs of the state as well as the economic, social, and welfare programs (and are consequently having a direct effect on the business of many New York architects). The aim is to consolidate all state programs into a comprehensive, long-range resource plan to be administered by OPC, which will constitute a broad policy statement within which other agencies will carry out their own individual programs. Testifying before a Federal committee recently, Vincent Moore, an OPC official, advocated a National Urban Design Institute, a sort of school city officials could attend off and on for two years to learn modern management techniques and their applications to long-range planning. (The Federal Government is presently sending Budget Department officials to Carnegie Tech to learn systems engineering.)

■ California's former Governor Edmund Brown, observing the advances of problem solving in the aerospace and defense industries, tangentially thinking of a way to use expert talent lying fallow after the termination of a large program in southern California, put systems analysts to work figuring out future aims and directions in four major areas (see p. 127).

■ Mayor John Lindsay of New York set up an Operations Research Council, which, according to member Dr. Tibor Fabian, head of the research corporation called Mathematica, will analyze a number of the city's problems and devise solutions and implementation procedures for those solutions that are not dependent on the political vagaries of the city government. The implementation procedures will thus be built into the structure of the city and will continue to operate no matter who happens to be in office.

Regional Groups

Planning for development often overrides political boundaries, of course, and a number of states have begun to collaborate in the systems analysis of regional problems.

■ The Upper Great Lakes Regional Commission was formed to revitalize the economy of the northern tiers of counties in Wisconsin, Minnesota, and Michigan.

■ The Great Lakes Basin Commission was established under the Water Resources Planning Act of 1965. Like the Upper Great Lakes group, it is a cooperative enterprise between government, industry, and universities that involves groups of states and the Federal Government in drawing on the techniques of systems analysis for coordination of planning.

■ The Tri-State Regional Planning Commission involved New York, New Jersey, and Connecticut in the development and planning of common aims for those states. Systems analysts, architects, planners, economic and government authorities are all working together to develop a smoothly working plan for the future.

■ A somewhat different body is the Council on Economic Growth, Technology, and Public Policy of the Committee on Institutional Cooperation (we wonder whether they submitted that title to systems analysis). This is a committee set up to work on drawing together university systems talent to explore the problems and economic potential of the midcontinental United States. These analyses will provide regional decision-makers with the means and the capacity to devise action programs for regional growth. It is an effort to couple science, in its broadest sense, with the social studies, through the medium of systems analysis.

■ Similarly, several cities, Seattle for one, have "Metro Data Banks" as resources to provide information for municipal decision making. And New York is planning one to cover the entire state, because of the widespread problems of communication across old jurisdictional lines.

Federal Aims

In the Federal Government, quite aside from using the techniques of PPBS in the Defense and other departments, the interest in systems analysis and its application to widespread problems is likely to result in the passage of legislation designed to utilize the talents of systems analysts in the solution of these problems. Senator Gaylord Nelson (D., Wis.), who brought his enthusiasm for systems analysis as Governor of Wisconsin with him to Washington, has conducted three sets of hearings on his bill, which bears the awesome title of "The Scientific Manpower Utilization Act of 1967," calling on systems experts from all sources — Federal Government, state governments, universities, professional schools, business, and industry — for their views on how the U.S. Government should proceed. Basically, the idea is to have some sort of Council in the executive branch that would conduct systems studies, first on national goals, then on national problems, devise alternative ways to approach these and then sponsor more detailed analyses of the goals and problems to be done by private industry and research contracts within universities. The other important bill in the Senate is sponsored by the Republicans and Senator Hugh Scott. His bill is entitled "A Bill to Create a National Commission on Public Management"; although there is partisan rivalry evident in the dispute about which Senator has the better bill, there is widespread bipartisan support for the concept basic to both. It is generally expected that the two groups will in the end get together and produce one bill, thus assuring its support by both parties and ultimate passage.

In Washington, P/A talked with the man who will probably help write this final conglomerate bill, William Spring, who used to be Senator Nelson's legislative aide and is now a sort of roaming systems expert in Washington with the ear of all the right people. One thing he told us should interest architects; this is a provision Spring hopes to include in the bill. It is to provide some sort of way to encourage innovators in the building fields; the names mentioned were Ezra Ehrenkrantz's SCSD and Sanford Hirshen's and Sim Van der Ryn's work on low-income housing in the San Joaquin Valley (SEPTEMBER 1965 P/A). The encouragement would

come in the form of Federal funds for the further development of innovative ideas and uses of systems concepts within building and for the teaching of these to others — probably private industries with the capacity to produce large-scale building systems. SCSD is the prototype of what Nelson's committee has in mind because it was an effective way to involve industry in expensive development projects without assistance from the taxpayers while at the same time furthering public welfare.

Also at the Federal level is the Institute for Applied Technology (part of the Bureau of Standards) headed by architect John Eberhard. Basically, what he is attempting to do with the Institute is to form a "research base" for the building field — similar to the massive research base that underlies modern medicine. Eberhard views operations research as the methodology that will enable a symbiosis to take place between design capability and the technological capability of industry. He thinks architects are not capable today of drawing upon the vast palette of technological capability that has been developed by modern industry — partly, of course, because they are linked to the most antiquated industry in the country, but also partly because, Eberhard feels, they prefer working with already designed components picked out of catalogs or designing individual components to be made to order. Eberhard thinks that there is another design process — designing the products that go into the catalogs — that the architects ought to be keyed into, thus becoming part of the entire process that lies between raw materials and building products or components. The process has to be designed as well; Eberhard feels it is possible for architects to become "designers of the process" in the future if they learn how to translate user requirements into mathematical languages, both for systems work and computers, because computers will direct the actual making of the components. Computers are, incidentally, already doing this in Detroit, where, at the Ford Motor Company, there is a die-cutting computer into which dimensions are fed in the form of mathematical formulae and out the other end comes a shape, already designed and manufactured.

IAT will try to develop this research *base by establishing performance criteria* for building elements — determining what the function should be for interior walls, for instance, instead of what they should be made of as the codes now say. These performance criteria have got to be based on "human factors," since obviously it is human beings who use the wall. Depending on what they are used for, materials can be specified and criteria as to what the various technological means of achieving desired functions are can be developed, thus encouraging innovation, instead of prescribing it as the codes now do.

This program of IAT is being carried forward by a newly formed division called the Building Systems Section, headed by engineer Robert Blake and including two systems analysts and several architects on the staff. The Section has a contract from the GSA's Public Buildings Service to develop performance criteria for Federal office buildings based on a systems analysis of space requirements and means of achieving them. This study will be the basis of design decisions. An overall set of performance specifications, performance requirements, and plans will be developed which will then go out for bids by private industry for actual "hardware" development of components for the $20 million a year Federal office building program. Some of the consultants being used by Blake are: Tishman Research, which has been working up until now on its own new plans for office buildings, doing comparisons, by cost, amount of space, etc., between Federal and commercial office buildings and studying the cost of structure and shell in office buildings; Edward Hall, author of **The Hidden Dimension** and **The Silent Language,** studies of psychological reactions to space; and Peter Floyd, architect with Geometrics Inc.

Robert Blake is hoping that the Building Systems Section will become a sort of "task force" of systems experts under the Public Building Service to coordinate the entire process of defining functional criteria, space needs, and design for all Government building programs, somewhat like the systems analysis groups that support the Department of Defense, developing hardware goals and design.

Also in the Institute for Applied Technology is a division called TAD (Technical Analysis Division) headed by operations researcher Dr. Edward Cushen. He is hoping TAC will become a sort of in-house Rand Corporation for non-defense agencies of Government. He already has about 30 projects; one is his work on the Northeast Corridor Transportation project being run by the Department of Transportation (see p. 132). He told P/A that there are about 800 OR workers in the Federal Government, and 700 of them are at DOD. There are 36 at the Bureau of Standards, of which Cushen has 26 working in TAD.

"Think Tanks"

In the private sector, the appearance of "think tanks" — those research organizations specializing in the cross-breeding of disciplinary thought based on the techniques of systems analysis and operations research — testifies to the great influence those techniques are gaining.

Most famous of these is the Rand Corporation, which started as a research corporation under the aegis of the U.S. Air Force, working on highly classified military projects. Much of the early discoveries in mathematics for systems analysis were made at Rand. In recent years, Rand has become more of a "private" organization and has added more sociologists, psychologists, economists, and other nonmilitary specialists to its staff. It is working on social problems to a greater extent through contracts with Government agencies, and, to a lesser degree, with private industries.

Another research organization is Dr. Tibor Fabian's Mathematica. It employs five or six Nobel Prize-winning scientists and about 50 other experts from all fields. The emphasis at Mathematica is on rigorously developed and analyzed mathematical models. A few of the organization's clients indicates the scope of its research: U.S. Arms Control and Disarmament Agency (a study on how to negotiate disarmament with the Soviets, using "game theory"); Nabisco (a study of production patterns and distribution facilities); New York City Hospital Commission (how best to utilize existing hospital facilities); U.S. Department of Defense (most efficient use of submarines in patrolling our coastal waters); U.S. Department of Transportation (part of the Northeast Corridor project).

Industry

In addition to the Federal, state, and local governments and independent research organizations, private industry naturally forms another important focus of systems analysis and operations research activity. The aerospace and electronics industries are inevitably strong in this field as a result of their involvement with the Department of Defense under Secretary McNamara. However, the most arresting development lately in these two giant industries is their diversification into nondefense work. General Electric has for the past two years had a division entitled Community Systems Development (under their broader corporate segment entitled Components and Construction Materials Group), which reportedly has bought 10 sites around the country on which GE will build 10 new towns. Like Westinghouse, they *seem to reason* that since they already manufacture a great many of the products that go into houses and apartments, or interior furnishings, why shouldn't they tool up to produce the "exterior furnishings"? Besides, the lead times required for the space program are between 5 and 10 years and as yet no projects are currently scheduled for after 1970, which means that, in a few years, their plant and equipment currently work-

partial list of organizations using systems analysts

Many of them were contacted and/or studied in the course of research by P/A.

universities (that teach short and/or graduate courses in systems analysis)

Brooklyn Polytechnic Institute
Carnegie Institute of Technology
Case Institute of Technology
City College of New York
Clarkson College of Technology
Columbia University
Cornell University
Duke University
Harvard University
Johns Hopkins University
Louisiana State University
Massachusetts Institute of Technology
New York University
Northwestern University
Ohio State University
Oklahoma State University
Purdue University
Stanford University
University of Arizona
University of California, Berkeley and Los Angeles
University of Chicago
University of Maryland
University of Michigan
University of North Carolina
University of Pennsylvania
University of Wisconsin
Virginia Polytechnic Institute
George Washington University
Wayne State University
Yale University

societies and publications

American Society for Quality Control
The Institute of Management Sciences
International Abstracts in Operations Research (publication)
Management Science (publication)
Management Science International
Naval Research Logistics Quarterly (publication)
Operations Research (publication)
Operations Research Institute
Operations Research Society of America
Society for General Systems Research
Society for Industrial and Applied Mathematics
Washington Operations Research Council

business and industry

Entire aerospace, electronics, insurance, and petroleum industries (including companies listed below)
Aerojet-General
Alcoa
American Can Company
American Telephone and Telegraph Co.
American Machine and Foundry
Armour
Atlas Chemical Industries
Austin Company
Bank of America
Barber and Coleman
Bechtel Corp.
Bendix
Bethlehem Steel
The Boeing Co., Vertol Div.
The Budd Corp.
The Carborundum Co.
Chase Manhattan Bank
Chrysler
CIBA Pharmaceutical Co.
Cleveland Pneumatic Industries
Commercial Solvents
The Consolidated Natural Gas Service Co., Inc.
Continental Can
Cummins Engine
Curtis Publishing Co.
Thomas J. Deegan Company
Diamond Alkali
Dow Chemical
E. I. DuPont de Nemours & Co.
Eastman Kodak
Ford Motor Co.
General Dynamics
General Electric
General Foods Corp.
General Mills
General Motors
General Precision
General Tire & Rubber
Hercules Incorporated
Hughes Aircraft
Hughes Tool
Hunt Food & Industries
Inland Steel
IBM: (OR Group, IBM Center for Exploratory Studies, Federal Systems Div.)
International Electric
International Harvester
Jones & Laughlin Steel
Johns-Manville Products
Henry J. Kaiser
Kaiser Engineers
Lockheed Aircraft
M & M Candies
Macmillan Publishing Co.
Marketing Research Corp. of America
Minneapolis Honeywell
Monsanto Chemical Co.
Morgan Stanley & Co.
Motorola
Mountain States Telephone and Telegraph
National Biscuit Co.
National Cash Register
North American Aviation
Charles Pfizer
Philco
Pittsburgh Plate Glass
Proctor & Gamble
RCA
Raytheon
Republic Steel
Rheem Manufacturing
James Rouse Company
The Rust Engineering Co.
Scott Paper
S.K.F. Industries
A. O. Smith
Southern Railway System
Sylvania Electric Products
Telecomputing
Texas Instrument
H. I. Thompson Fiberglass
Timkin Roller Bearings
Union Carbide Corp.
U.S. Rubber
U.S. Steel
U.S. Trust Co.
Velsicol Chemical Co.
Volkswagon of America, Inc.
Westinghouse
Whirlpool
World Publishing Co.
Xerox
Youngstown Sheet & Tube

federal government

Army Research Office
Building Systems Div., Institute for Applied Technology
Bureau of Intelligence and Research, Department of State
Bureau of Research and Engineering, U.S. Post Office
Bureau of Supplies and Accounts
Center for International Systems Research, Department of State
Committee on the Economic Impact of Defense and Disarmament
Department of Agriculture
Department of Transportation
Division of Research Development
Environmental Sciences Service Administration
Information Center, Office of Economic Opportunity
National Institutes of Mental Health
National Security Agency
Office of Emergency Planning
Office of Planning and Programming, Office of the Secretary of the Treasury
Operating Analysis Div., Federal Home Loan Bank Board
Operations Analysis, Office of the Vice Chief of Staff, U.S. Air Force
Operations Research Section, National Bureau of Standards
Planning Division, Peace Corps
Policy Analysis and Program Evaluation, Dept. of Housing and Urban Development
Program Evaluation Staff, Bureau of the Budget
Program Systems, Department of Health, Education, and Welfare
Science and Technology Division, Department of Commerce
Special Studies, Office of the Chief of Staff, U.S. Army
Technical Analysis Div., Institute for Applied Technology
U.S. Arms Control and Disarmament Agency
U.S. Atomic Energy Commission
U.S. Patent Office

state and local government

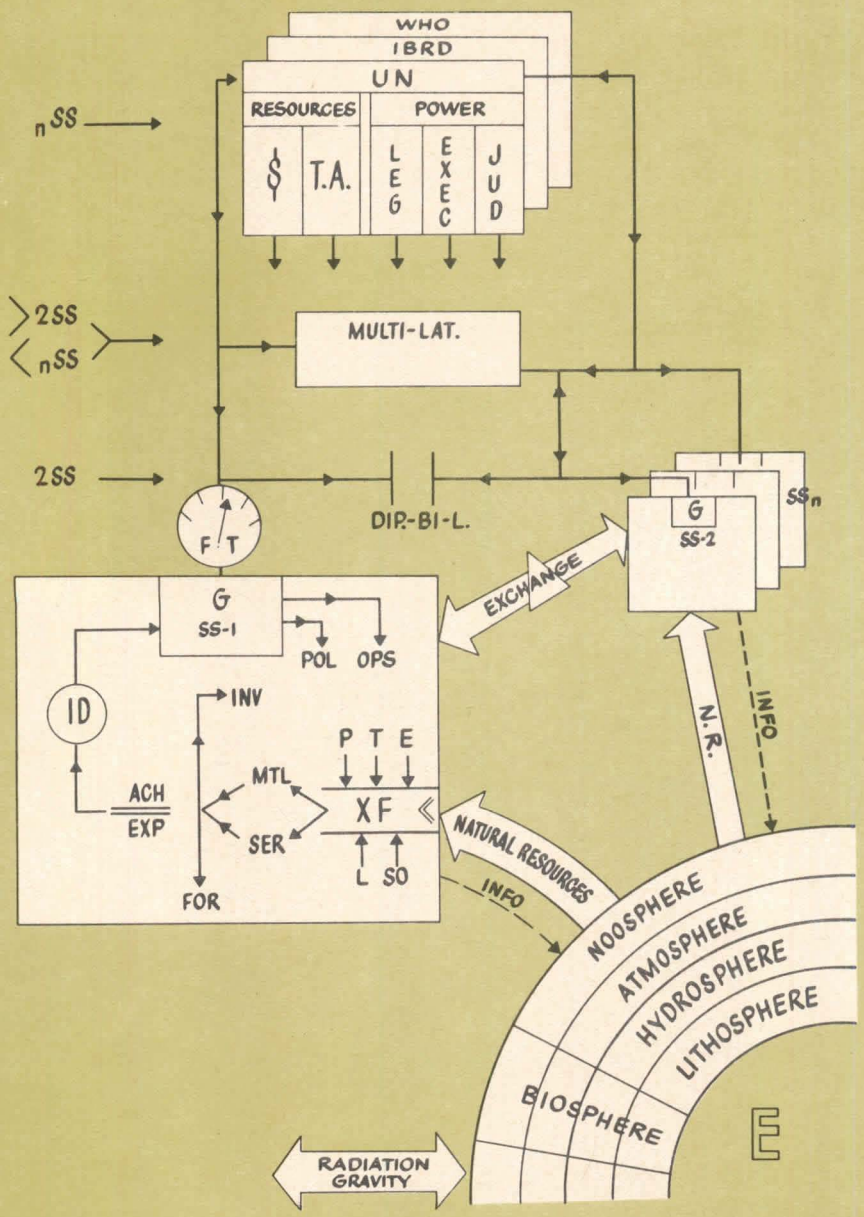
City Planning Department, Los Angeles
Department of Administration, State of Wisconsin
Los Angeles Department of Airports
Operations Research Council, New York City
Office of Planning Coordination, State of New York, Albany
Port of New York Authority
Santa Clara County, San Francisco

"think factories" and other research organizations

Booz, Allen, Applied Research, Inc.
Environmental Research Associates
Arthur D. Little
Management Sciences Corporation
Mathematica
Naval Analyses Center, Franklin Institute
Operations Research, Inc.
The Rand Corporation
Research for Management, Inc.
Resource Management Consultants
Stanford Research Institute
Technical Operations, Inc.
TRW Systems (Div. of TRW Inc.)

nonprofit organizations

American Institute of Planners
American Psychiatric Association
Battelle Memorial Institute
Ford Foundation
League of New York Theatres
National Institute of Public Affairs
New York Racing Association
Parkway School District
Sandia Corporation
Twentieth Century Fund



Model developed by Howard E. Ball at the Center for International Systems Research, Department of State, representing the world as a "multi-layered interlocked set of event sustaining systems." **E:** Earth. **Noosphere:** Term used by de Chardin for informational atmosphere. **XF:** Transformation from natural spheres below, in diagram, with plant **(P)**, technique **(T)**, and energy **(E)**, inputs on one side and labor **(L)**, and social organization **(SO)** as inputs on the other. **SR:** Service, or intangible outputs from XF. **MTL:** Material, or tangible outputs from XF. **FOR:** Force. **INV:** Investment and growth. **ACH:** Achievement. **EXP:** Expectations. **G:** Government reaction to ACH and EXP. **ID:** Ideological conditioning of G. **POL** and **OPS:** Policies and operations of G. **SS-1** through **SSn:** The world's sovereign states. **WHO:** World Health Organization. **IBRD:** International Bank for Reconstruction and Development. **UN:** United Nations. **MULTI-LAT:** Multilateral diplomatic relationships. **DIP-BI-L:** Bilateral diplomatic relationships.

ing on Apollo contracts will be idle. Moreover, because Vietnam is a "miniwar," it has so far not required massive hardware systems; since military contracts are a prime source of income of these firms — and remember that it is even harder on the aerospace firms — they quite naturally, in order to survive, must develop new markets and new products.

The Raytheon Company, a large aerospace and electronics firm, has, according to a spokesman, been involved "for a long time" in looking for ways to transfer systems technology to the public sector "and currently is conducting programs in educational systems, natural resource systems, transportation systems, and as part of a major program for a foreign government, building communities."

The most interesting development in this teaming up of private and public sectors was the hiring by former Governor Edmund Brown of California of four aerospace firms — Lockheed, Aerojet General, Boeing, and North American — to do systems studies of four of California's largest problems: statewide information networks, transportation problems, waste disposal systems, and crime. The amazing thing is that 50 companies competed for these contracts and assigned their best systems talents to the job, which means that 50 bright and shining projects were given time and money by private industry on public problems.

One thing that was apparently discovered by the systems people on these jobs was that the nature of the goals is quite different in defense work and in urban problems. A defense or space program goal might be — put a three-man capsule in orbit around the moon by 1970. A social goal is never so specific.

Performance Design

Just as some people say that the average architect's office should no longer have to handle working drawings or specs, because computers can do it more cheaply and quickly, others say architects should no longer work on individual buildings one at a time, each time designing it from scratch as though it posed an entirely unprecedented problem. Robert Dillon, Head of the Building Research Advisory Board, goes so far as to say that there should be a new kind of architecture — "Scientific Architecture" — where some means is provided so that creative solutions that perform satisfactorily could be reproduced. He draws an analogy between architecture and medicine, asking what we would think if each time we went to a doctor he had to conduct massive tests to find out which drug was the suitable one for our symptoms. It is perhaps not irrelevant that the Federal Government is, according to Dillon, subsidizing the

emergence of clinics and thus the abolition of the private doctor because the latter simply does not have the time or facilities to keep up with the vast amounts of research literature reporting advances in his field. Perhaps the medical profession is further advanced on the same road that the architectural profession will travel on, once research gets moving in the building field. Stimulated by the need to diversify and by aerospace demands for the biological safety of man in space, the aerospace and electronics industry long ago began "invading" medicine; Aerojet is currently conducting an expensive research effort on simulation of biological organisms.

Dillon thinks that industrialized building is inevitable, but he is concerned whether it will go in the direction of "closed" systems or "open" systems. He feels SCSD is a closed system, because each manufacturer coordinated his product with only two or three others. An open building system is one that is completely "componentized" — all the manufactured walls, air conditioning and mechanical systems, roof systems, etc., fit together, somewhat similar to the situation in the electrical industry where for any socket and any lamp fixture one can order attachments to fit. It would seem that Dillon's thinking centers around the industrial mass production of individualized components by automation of the design process.

The question then is: What do buildings have to do with operations research? There are several connections. One is that the most extensive use so far of OR has been for design, control of production and schedules, and coordination of large-scale "hardware" — in the space program, the aerospace industry, DOD, and industry. Since building systems would no doubt have to be (at first) very large-scale enterprises, the applications of systems analysis seem obvious. Another connection is that if already established industrial giants continue to make inroads into building (see pp. 126–133), it seems highly likely that they will utilize their experience with systems techniques to do so. The involvement of the architect with this trend, and with the applications of systems analysis and operations research to farsighted design and planning, becomes what we call **Performance Design.**

the changing city: government

Take the Laocoön group, paint the middle man black, the one to the right white, and the left one a permanent south-of-the-border Mantan; then imagine those malevolent snakes are well-intentioned Federal, state, and city agencies climbing all over one another to attack the same problem in only slightly different ways; contemplate the ensuing snarl, and you have a pretty good picture of the urban plight and the inadequate, hopelessly redundant and unsystematic bureaucracy that is strangling the city.

In the last few years, some politicians have at least become aware that the city itself is a system, requiring a systematic approach to its government and growth. "Our urban woes," conclude HUD's 1966 symposium on "Science and the City" at Woods Hole, "have resulted quite largely from our frequent indifference to the interactions between the many systems in the machinery that makes the city tick. We have tinkered with this, that, and the other thing under the hood without knowing what each one could or should do to make the engine run smoothly."

Photo: The Bettmann Archive

Piecemeal bureaucracy has become a political issue. State Senator Rees of California, testifying before the Senate Special Subcommittee on Scientific Manpower Utilization, recalled New York City's last mayoralty elections: "I think this was one of the major issues in the New York City campaign, because in many ways local government in New York is disintegrating in the handling of this huge problem of the concentration of people, the existence of racial ghettos, the problem of communication, [and in] trying to develop an over-

all concept of education, and . . . job training. . . . There will be more Watts riots in our great urban centers because we have already moved too slow, too timidly. But we can prevent major conflagrations if we move now to develop strong Federal programs, better coordination between all levels of government, and, most of all, a rejuvenated local commitment to solving these problems on a coordinated regional basis."

Leonard Duhl, a psychiatrist noted for his work in urban affairs and now serving as Special Assistant to the Secretary at HUD, voices the new faith in systems technology: "We are beginning to see connections among complex issues and the possibilities of collective solutions. We are beginning to be aware of the ecology of the environment; that the earth, like a space ship, has limited resources, interdependent systems and functions. Housing, for instance, is only part of a community problem; what are the other functions, needs, and purposes? How does one transport poor people to jobs, install sewer lines in those areas that need it most? How do we plan for the future?" The new technology makes sense out of these complex problems and the systems theory brings out the interrelationship of the parts to one another.

To unscramble the urban mess, governments — local, state, and Federal — have indeed been turning to the systems techniques perfected by private industry. Operations Research teams are focusing on the broad problems; bureaucratic departments are being synthesized and systematized; PPBS (the Programming Planning and Budgeting System evolved by the Department of Defense under Secretary McNamara) seems to offer some tools for comprehensive planning and budgeting; and, finally, systems analysis techniques are being introduced to streamline procedures within Government agencies and Congress itself.

Operations Research

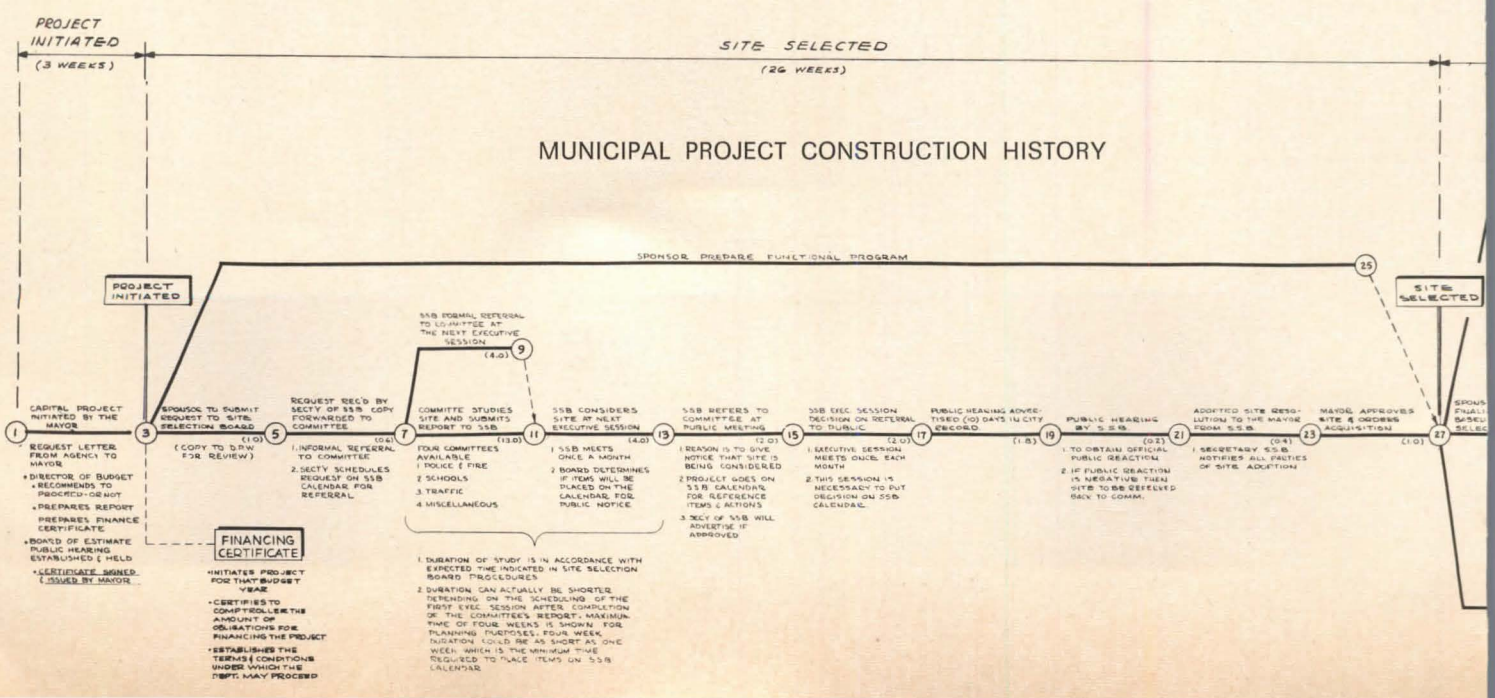
Brainstorming a problem by a wide variety of specialists is a technique generally applied to military and industrial problems. Two notable exceptions focusing on the urban dilemma are the 1966 Wood's Hole conference on "Science and the City" sponsored by HUD to take a look at cities, and Mayor Lindsay's installation of an OR team in February 1967 to study the problems of New York City in particular.

The summer sessions at Woods Hole have been noted for the solutions of knotty military and defense problems. One group, ranging from poets to scientists, was asked to provide the U.S. with indestructible retaliatory capability. They came up with the Polaris System; other Woods Hole conferences have produced DEW (distance early warning system) and the TFX.

Last summer, Government officials met with approximately 50 non-Governmental scientists and urban specialists, including lawyers, architects, economists, mathematicians, psychologists — and a professor of zoology. Their theme was "Science and the City" and their conclusion was that the city, like any other mechanism, is a combination of black boxes or systems. If all the little black boxes function in relation to one another, the machine works smoothly; if not, the result is chaos. As a result of this first conclusion, the group broke down into little black boxes to study various subsystems: transportation, housing, education, health, and so on. Although the broad conclusions were fairly predictable — comprehensive ground transport systems, neighborhood health services, etc. — the value of the conference was that it stressed the obvious point that everyone had missed: The city is a system composed of subsystems that are interdependent. Several concrete results of this type of comprehensive thinking were incorporated in HUD's recent proposals for Federal legislation: the Model Cities Program, the $20 million research program, and the interest in establishing a centralized bank of information on cities, and developing further instant rehabilitation systems.

STATES: California and Wisconsin

Under former Governor Brown, OR techniques have gradually been applied to government problems. The impetus came not only from the urban dilemma but from the cutback in space contracts and resulting unemployment. "About one-third of our manufacturing is space- and defense-oriented," explains the former Governor; the phasing out of the Skybolt two years ago and the dropping of the MI hydrogen engine threw countless persons out of work. I assembled a panel of leading executives from the aerospace and electronic companies to meet regularly with me in various places throughout the state for two reasons: earlier warning of cutbacks and the possibilities of conversion in the event of a continuing drop in space and defense contracts. One-half of all the engineers and scientists trained in space research and development live and work in this state. These men shared a talent that might well be applied to the development of systems to solve nearly any problem of any kind that might be presented to them. And when we began thinking in terms of the public sector — the many un-



met needs of our state — we began to realize that we had a precious and unused resource." As a result, four contracts were awarded to the aerospace industries to work on subsystems: transportation, information, crime, and waste.

New York

At the 1965 hearings on Scientific Manpower, Brown wryly commented: "Mayor-elect John Lindsay hired one of our systems engineering firms to supervise studies leading to a reorganization of New York City government. That is in the nature of a rescue mission. We in California look on the studies as a first step toward preventing the need for such rescue."

The Lindsay administration has been slowly introducing city politics to the systematic ways of private industry. In May of 1966, a Management Science Unit was set up in the Administrator's Office — an arm of the Mayoralty designed to coordinate the work of municipal agencies, improve internal management procedures, create new government units, and streamline municipal operations. The unit was to initiate modern scientific management techniques into city administration. Dr. Nachman Bench, a professor from NYU and an expert in PERT and CPBM, was appointed Acting Deputy Administrator. The Deputy Mayor himself is Dr. Timothy W. Costello, state chairman of the Liberal Party and a former professor of psychology in the School of Business Administration at NYU.

The MS Unit also includes a management analyst from the Port Authority, a systems analyst from Bell Telephone, and two or three members raided from the Bureau of the Budget. So far, they have succeeded in bringing SA techniques to the inventory of the Department of Purchase and establishing an Operations Research Team. Last September, the unit selected 17 key OR men around the country and invited them to serve the city — without pay. Surprisingly, everyone jumped at the chance and the roster includes Russel Ackoff, Director of the Management Sciences Center of the Wharton School at the University of Pennsylvania; John Diebold of the Diebold Group; Tibor Fabian of Mathematica; Sebastian Littauer from Columbia University; John Mauchly, one of the founding fathers of computerism; Albert Madansky, formerly with Rand, and many more of the systems elite. The group, which meets every two or three months, is to decide on how to apply the techniques and methods of management science, including operations research, to the conduct of the city's business.

At one of their first meetings, the team split up into sections and went out to interview various city departments — Health, Sanitation, Police, etc. — to discover what the problems were. Although their objectives were supposedly in the area of long-range planning and policy-making procedures — such as how to collect and assemble data to measure the city's total performance, and design a total city information system — they quickly found themselves bogged down in the application of more specific SA techniques: how to schedule sanitation trucks and pick-up crews, connect fire and police alert systems, computerize the scheduling of hospital beds, and so on.

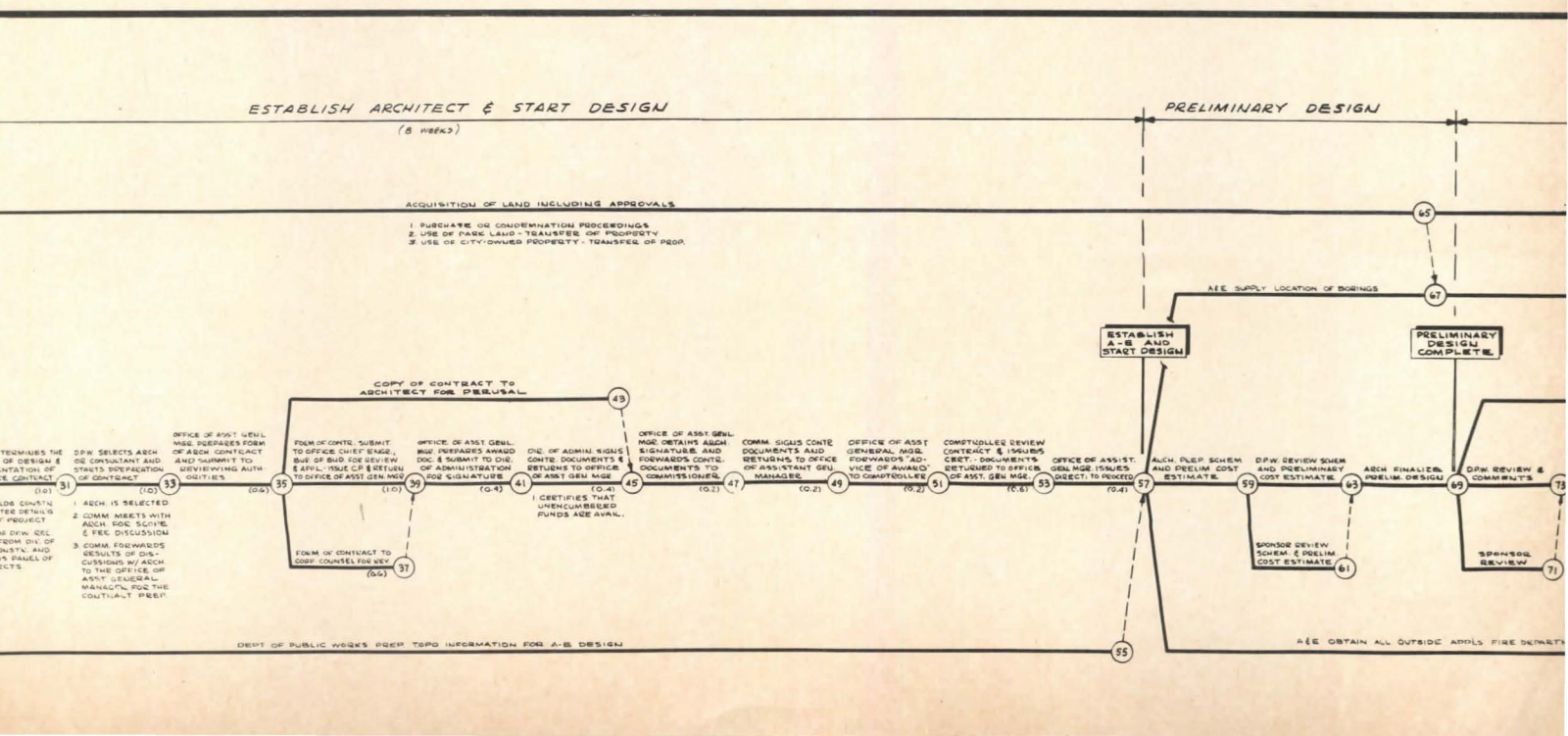
In an address before the American Bankers Association meeting on automation, Lindsay stated that the Operations Research Council was examining problems of law enforcement, environmental protection, human resources, and the information system of the city itself. "I cannot predict the outcome of these pioneering efforts, but, in general, I do predict that the vast intellectual and physical resources of this nation can make life on earth, which is increasingly and overwhelmingly an urban life, more satisfying and rewarding."

What can be predicted, perhaps, is that someone ought to be coordinating the coordinators in this wave of enthusiasm over scientific management techniques. The Administrator's Office, located at 250 Broadway, did not know that one floor below a systems analysis firm, working for the Bureau of the Budget, was coming very close to duplicating the work one floor up. In fact, the coordinator of the OR group did not know the firm existed.

Systematizing the Government Agencies

If the city is a system, it is clear that the agencies that serve it must be set up on a systematic and coordinated manner. Perhaps there are no clearer indications of this trend than the formation of HUD in Washington and HDA in New York City.

Leonard Duhl, while on the National Institute of Health Planning Board, made a statement that aptly sums up the new bureaucratic stratification: "Horizontal, rather than strict vertical, arrangements are emerging at every level of our society — Federal, state, regional, and local. Still, the vital connections between the new horizontal programs are not yet widespread. While some connections are developing through many of the Governmental craft unions such as the Office of Education, the Department of Labor, and the National Institute of Mental Health, this is on a relatively restricted level. Tremendous problems have been created by the fact that organizations are mutually



contradictory in their programs. One may find one's plans in a given community contradictory or duplicated by at least a dozen other agencies with different goals and activities. At all levels, we need horizontal, across-the-board communication among professionals, to bring coherence to the new programs. And we need much more fruitful communication between our services and the people served."

Federal Government and HUD

In the 1965 annual report, HUD made this comment on its own operations: "In establishing this eleventh executive department, Congress recognized that in our urban nation the city needed an equal voice at the cabinet table along with the other major functions of the Federal Government."

The Presidential guidelines for the department stress the coordinating functions of the department, and its duty as an "interface" agency. "The new Department of Housing and Urban Development will be primarily responsible for Federal participation in metropolitan area thinking and planning. The Department will provide a focal point for thought and innovation and imagination about the problems of our cities. It will cooperate with other Federal agencies, including those responsible for programs providing essential education, health, employment, and social services. And it will work to strengthen the constructive relationships between nation, state, and city — the creative Federalism — which is essential to progress."

Finally, the HHFA, FHA, PHA are gathered under one Administrative Secretary, and likewise "the functions, powers, and duties of the head and other officials of those agencies." Included in the bag is the Federal National Mortgage Association. Finally, some of the tools for repairing the urban environment are in the same kit. On the other side of the coin, the local regional offices have been strengthened as well — moving the system toward "creative Federalism" and increased local authority.

Federal to City Mandate: Systematize

With the Model Cities Act of 1966, HUD attempts to follow through with its new philosophy of integrated planning. The program, which was partly inspired by the Woods Hole conference, tries to focus on urban problems in a systematic and consolidated way.

This program is, in effect, a systems approach to planning. There are approximately 150 Government programs and 20 assorted agencies involved in urban renewal problems. Prior to the Model Cities Act, each went on its merry way with no clearly defined objective, and no consideration of the total effect.

The act authorizes HUD to give grants and provide technical assistance "to enable city demonstration agencies to plan, develop, and carry out comprehensive city demonstration programs. According to Secretary Robert C. Weaver, the Model Cities Program authorizes the first coordinated use of all Federal, state, and local urban programs in selected neighborhoods.

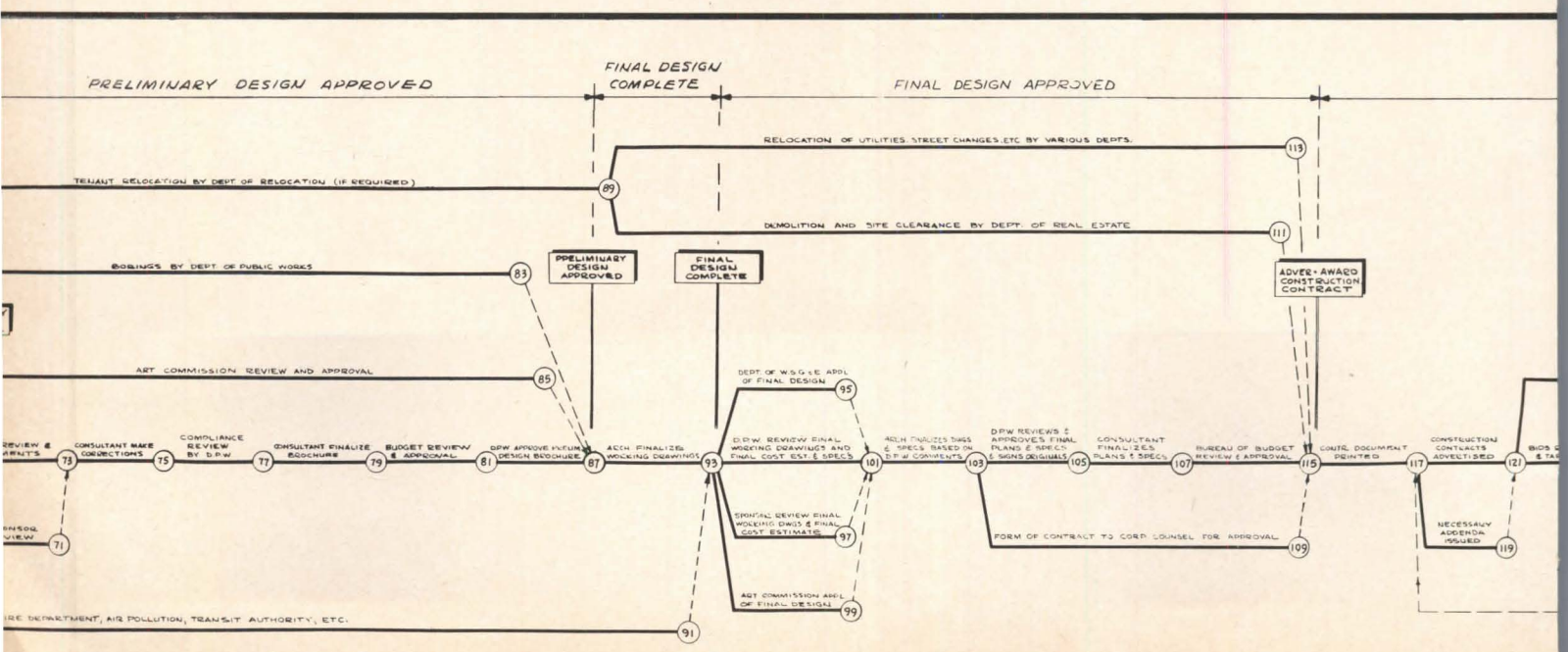
Included in the act is a provision for a metropolitan expeditor, the coordinator, interface man, who shall provide information on Federal programs, and keep the Federal Government informed of the city's activity.

In Section 103 of the act, which outlines the terms of eligibility, it is quite clear that HUD is pushing administrative systematization on a local level and the application of modern management and budgeting techniques to planning problems. Grants are only available to those who have "the administrative machinery at a local level for carrying out the program on a consolidated and coordinated basis." Furthermore: "The preparation of Model City programs should include to the maximum extent feasible: (1) the performance of analyses that provide explicit and systematic comparisons of the costs and benefits, financial and otherwise, of alternative possible actions or courses of action designed to fulfill urban needs; and (2) the establishment of programming systems designed to assure effective use of such analyses by Model City agencies and by other Government bodies."

San Francisco

In the September–October 1966 issue of the **Harvard Business Review**, Cyril C. Herrmann describes the application of systems to city planning in San Francisco. Herrmann, who is Vice-President of Urban and Regional Economics for the city, describes the mathematical model used to simulate the San Francisco housing markets between 1960 and 1967. "It represents," says Herrmann, "a landmark in urban research, for it is the first time that a workable simulation model has been built for the purpose of forward planning in the city."

"The model," he continues, "is designed to provide a skilled planner with a means for considering the ramifications of alternate plans before they are executed. This is a breakaway from the traditional view which assumes that history will repeat itself." The first model, used to simu-



late housing conditions, contained 35,000 computer instructions, 15,000 data items identifying the components of the system — the housing market and population figures — and was programmed to help answer some crucial questions: How will zoning modify housing construction patterns? How will demolition in one area affect the price of buildings in another? Will housing quality improve if building codes are more rigidly enforced, or will prices merely go up? Can we provide housing for expanding populations without impairing the quality?

In constructing the model, the programmers grouped together all the decision-makers (citizens) who behaved similarly: 114 groups emerged, with each group reflecting the same income, family size, race, age, and housing preference; the groups were then classified into 106 neighborhoods and all dwelling units were grouped into 27 categories. It was assumed investors would be willing to buy or rehabilitate whenever it was profitable, and profitability was tied to the variables of yield price and cost of construction or rehabilitation. In order to simplify the inventory of space in the city, the programmers invented the "fract," a unit consisting of 2 acres. There were approximately 4980 fracts of residential land in San Francisco, including vacant land available for residential development. By rigidly controlling the imputs, the programmers used the model to simulate the interactions and effects on residential housing of public policies, programs, and actions; the investment behavior of the private market, and the location decisions of household.

From two runs on the computer, the programmers determined that, with a projected 16 per cent increase in population between 1960 and 1978, there would be a 14 per cent increase in housing units. During the 18-year period, the private market would increase the housing stock by 21 per cent (gross).

The computer also indicated that, if a housing code enforcement were added, the number of substandard units would decrease by 9 per cent; with no housing code, low-quality units would increase by 3 per cent.

Herrmann is careful to qualify the present model: "A more sophisticated model, one tied to a continuing program of data collection, can describe **all** the major subsystems that make up the urban complex, and cover **entire** metropolitan areas. What it does, and does superbly, is provide the ingredients for evaluating the alternative courses of action. By telling us what we do not know, as well as what we do know, it provides a means by which we can focus more effectively on areas of action which require great attention and on areas of policy which require great sensitivity of response."

New York and HDA

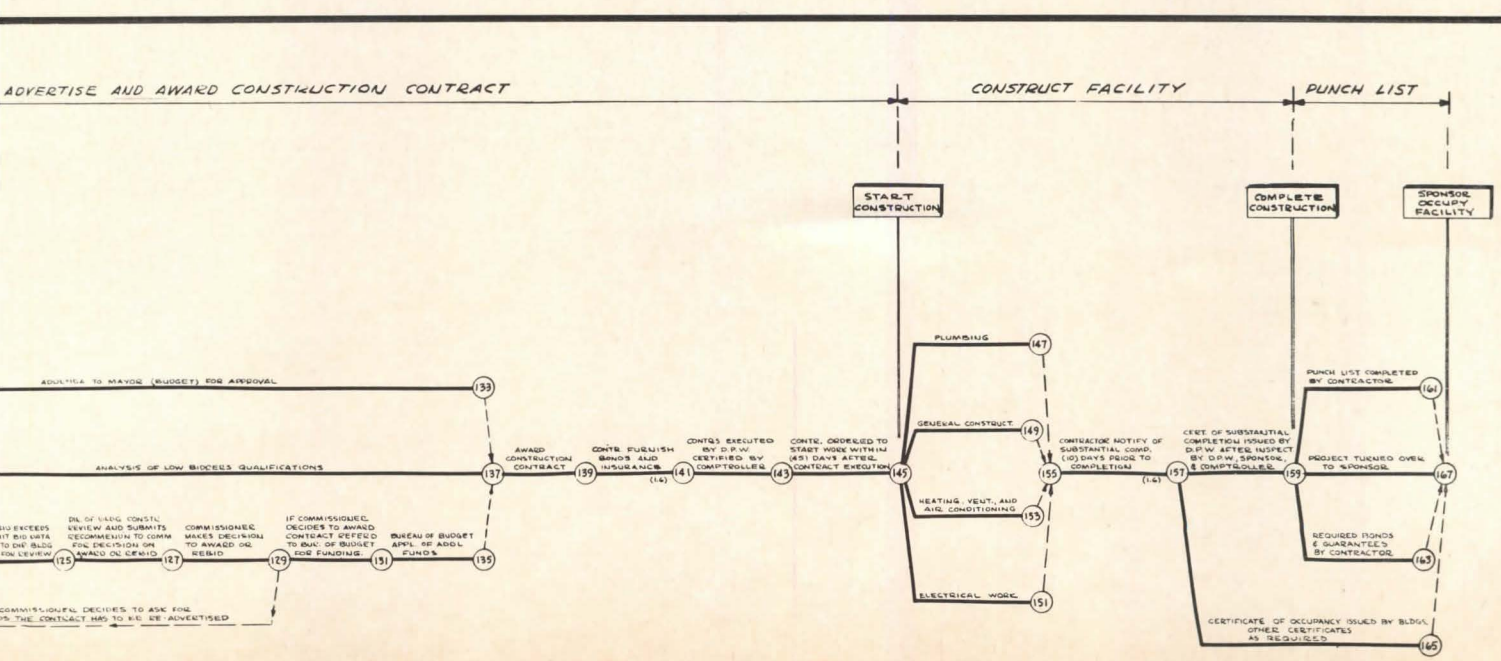
New York is perhaps a classic example of a city that has done itself out of Federal aid because it is woefully lacking in systems planning and because its bureaucracy is so complex, with so many agencies and overlapping authorities, that the Federal Government does not rightly know whom to give the money to, and has no assurance that, once given, the grants will be properly administered. Since 1951, $41.35 per capita in urban renewal funds have been committed to New York, $47.18 for Chicago, $268.44 for Boston, $160.43 for Pittsburgh, and $790.51 per capita in New Haven. As Jason R. Nathan, administrator for HDA in New York, succinctly commented, "Federal aid flows most heavily to those areas organized to seek it and to spend it."

Like HUD, New York is attempting to reorganize its housing and urban development departments into a logical, coordinated, bureaucratic system. In 1965, Mayor Lindsay retained Edward Logue to make some positive recommendations in the area of housing and neighborhood improvement. In September, Logue issued his report, which struck at the system itself, advising that the bureaucracy be consolidated at the top, and decentralized, routed in the neighborhoods, at the bottom.

In addition, some effort is being made to bring about a rapprochement between private industry and the Government; an office in the Buildings Department is to be established to review all disagreement and issue consistent regulations for all five borough superintendents.

Down at the bottom, all effort will be made to keep in touch with the local citizenry. In a program similar to the "Creative Federalism" policy sponsored by Washington, Lindsay is allocating greater and greater powers to localized bodies. Under his new program, 10 area administrators will be appointed, who will have authority over their own HDA personnel and will be able to make decisions in the field on a day-to-day basis. "It is time to recognize," says Nathan, "that not all decisions can be made at City Hall." Planning will be speeded up by using recommendations made by local officials who know the community and the community will participate in the development of plans as they proceed.

The City Planning Commission has also been ordered to prepare a comprehensive plan for the city, a job which it has had on its agenda for years, but never accomplished. Without it, New York cannot



PART II

The problems listed below are considered to be major problems as of this reporting date and are respectfully submitted for Management's attentions and corrective action.

PROJECT NUMBER/ TITLE	DESCRIPTION	DATE PROBLEM NOTED	ACTION AGENCY		ACTION REQUIRED OR RECOMMENDATION	ACTION TAKEN		REMARKS
			MIS LEVEL B Responsible Agcy. (Supervisory Role)	MIS LEVEL C Responsible Agcy. (Action Role)		YES	NO	
F-127 Eng. Co. 9 Ladder Co. 6	4. Total project estimated cost overruns the Budget funds by $22,000 due to costs for land.	3/17/67	BUDGET Bur. of Budget (name)	BUDGET Bur. of Budget (name)	4. That Budget be revised to accommodate land cost difference.			4. $35,000 was included in Budget. Actuals to date are $98,300.
F-172 Firehouse for Engine Company 241 & Ladder Company 109 Brooklyn	Preliminary plans went to the Bureau of the Budget for approval on 12-9-66. Approval has been held up for review of the estimated cost.	3/16/67	BUDGET Bur. of Budget (name)	BUDGET Bur. of Budget (name)	Expedite approval of preliminary plans so that Architect can proceed with final design.			A review of the est'd cost has been made an approval of prelimina plans is expected by Bureau of Budget on approx. 4-15-67.
	Executive Capital Budget for fiscal year 1967-68 does not include funds for construction Present schedule indicates that advertise and award of construction contract could begin as early as Dec. 1967, provided there is no slippage in the schedule.	3/18/67	BUDGET Bur. of Budget (name) SPONSOR Fire Department (name)	BUDGET Bur. of Budget (name) SPONSOR Fire Department (name)	Recommend that Sponsor & Bureau of Budget consider amending the 1967-68 Capital Budget to include funds for construction.			
F-176 Central Communications Building - Central Park	A-E Contr. went to Budget for App'l on 11/28/66. This is being held up due to study concerning the 100 psi overpressure requirement.	3/16/67	BUDGET Bur. of Budget (name)	BUDGET Bur. of Budget (name)	Bureau of Budget take action to expedite approval of contract.			Bureau of Budget expects approval by 4/15/67.

Photo: Richard C. Lewis

have any clear-cut goals or coordinated progress.

Lindsay also hopes to set up an experimental and research unit in the Office of the Administrator that will coordinate demonstrations and pilot projects previously conducted independently of one another. "This team should not only stimulate creative thinking," according to Nathan, "but also stimulate state, Federal, and private aid."

PPBS — A New Planning Tool

In all circles, PPBS has taken on the aura of the magic word that is going to roll away the rock to Ali Baba's cave.

The magic word originated in the Department of Defense, where Secretary McNamara believed that systematic quantitative analysis would be used to solve many defense problems. Charles J. Hitch, formerly with the Rand Corporation, became comptroller for DOD and developed the PPBS system.

In 1965, President Johnson was so pleased with the effects of PPBS in the Department of Defense that he directed the Federal Bureau of the Budget to put the system into effect in all executive agencies and establishments.

HUD's Model Cities Act requiring "performance analysis" takes the directive to the cities.

Mayor Lindsay, who wanted to institute PPBS practice into New York City's budgeting system, appointed Frederick Hayes, formerly with the Federal BOB, HUD, and OEO, to do it.

In the past, Federal and state budgeting systems have been largely designed to monitor expenditures or management. In short, they were a means of checking that there was no hanky-panky in the handling of money, or in the management of a program. The first of these, called the line budget, itemizes, on each line, specific expenditures. "If we were talking about education," explains David Grossman of the N.Y. BOB, "we would list: one teacher, one teacher's aid, one room, etc. In the management budget — sometimes called performance budget — we would list one teacher, fifteen kids, etc. The planning budget, or PPBS, would list gross expenditures, the number of kids, and then evaluate their reading readiness. This does not necessarily mean that you do away with the linear system, but that you try to evaluate the expenditures against the benefits, in a larger perspective."

Basic to the PPBS systems is the establishment of goals, the presentation of **alternative** means of reaching those goals, and an evaluation of their effect.

Although this seems like a fairly logical process, it has not always been so obvious. Dr. Alain C. Enthoven, Deputy Assistant Secretary for Systems Analysis in the Department of Defense Comptroller's office, relates that: "Four years ago, the Department of Defense was organized in such a way that military requirements were determined by the Services, the Joint Staff and JCS quite independently of costs, while, on the other hand, we had a financial management system for determining budgets without any explicit reference to military requirements or military effectiveness. The forces and the budgets, or, in other words, the effectiveness and the costs, were considered on completely separate wavelengths. The system did not recognize the cost effectiveness principle."

In another example, he pictures a man planning a house, dreaming up a $100,000 job while he can afford only $30,000. "If I am operating under the old concept, I take the $100,000 design and I slice off 70 per cent of it, and what's left is my house. Now, clearly, that's not a very sensible way to design a house. I might find that I left off the bathroom, or included the bathroom, but left off the plumbing that is required to make it work. Yet that is a pretty fair description of the way that the Department of Defense did its business. We found in 1961 that we had Army divisions without adequate airlift or other means of mobility and with far from adequate supplies of equipment. We had tactical air wings without supplies of nonnuclear ordinance, and numerous other similar problems. In effect, we had bought a lot of houses without the bathrooms or the plumbing." New York City, whose budget is set up on a linear system, has an additional problem. There are two budgets: expense, dealing with government services, and the capital budget, dealing with the hardware — the physical plant of the city. The two budgets are prepared separately, by different personnel.

Why Is It Necessary?

In the old days, it might have been quite clear from a linear budget that you were getting what you wanted. Expenditures were not so complex or so remote from the effects. If the village needed a fence around the commons to keep the sheep in, it was pretty obvious when the money was spent, the fence installed, and whether or not it was sturdy enough to keep the sheep inside. Today, linear budgets are so lengthy and so complex it is nearly impossible to deduce from the list of expenditures what the total effect will be: Legislators and public alike may rack their brains to see the forest for all the trees but it is well nigh impossible. One of the first chores of New York's new Bureau of the Budget was to redesign the Mayor's capital budget statement to the City Council and Board of Estimate. The change primarily consists of presenting summary tables that show how various agencies allocate their expenditures to various programs, instead of simply listing the allocations by Department only. The volume containing the supporting schedules also included an explanation of changes in the budget. Formerly, this was left up to the imagination or memory.

A frequent criticism of PPBS is that it attempts to evaluate, quantitatively, things that cannot be quantified, and that planning will become the slave to overmanagement.

McNamara's replay is that, "To undermanage reality is not to keep it free. It is simply to let some force **other than reason** shape reality. That force may be unbridled emotion; it may be greed; it may be aggressiveness; it may be hatred; it may be ignorance; it may be inertia; it may be anything other than reason.

"To argue that some phenomena transcend precise measurement — which is true enough — is no excuse for neglecting the arduous task of carefully analyzing what **can** be measured."

Unfortunately, he can also turn around and say, "But all reality **can** be reasoned about. And **not** to quantify what **can** be quantified is only to be content with something less than the full range of reason."

Who Are the PPBS Experts?

The Defense Department has often been accused of "calculator brainiology," of comprehending only those items that can be reduced to numerical and computer language.

Enthoven would like to dispel the notion: "Ironically, my office, which is sometimes alleged to be the center of computerism and to be manned completely by computer experts, includes economists, political scientists, philosophers, engineers, and mathematicians, among whom there are experienced combat veterans, and young and relatively inexperienced scholars, some of whom are civilian, some military, but not a single one of whom could in any remote sense be called a computer expert. This shouldn't be surprising, because the really difficult and important part of doing a good analysis is not the computation; it is formulating and defining the problem, clarifying the objectives, and determining which assumptions ought to be considered."

This is just about the state of the art

A sampling of S.O.P. publication of New York City agencies. Excerpted page is from the Management Report of the City's Capital Building Program, summarizing status of current projects.

in New York City's Bureau of the Budget.

Frederick Hayes, with his Assistant Director, David Grossman, has set up a young team of PPBS enthusiasts — if not experts — to reform the system. Among these are an English major, a former OEO employee, a researcher from Howard Samuel's campaign for the Lieutenant-Governorship of New York in 1966, a couple of veterans of the Federal Bureau of the Budget, and Martin Freidheim, a young city planner. Freidheim, who is the first city planner the New York Bureau of the Budget has ever seen, thinks it's the logical place for a member of his profession. After all, planners are concerned with allocations, cost benefits, and they play with alternatives under severe constraints. It all sounds like a fairly jargon-prone description of what the team is up to, but what it boils down to is a group of outsiders who can make a common sense leap from costs to benefits and not get enmeshed in the multiple lines of a linear program.

One of the basic problems in initiating PPBS into New York agencies is that the departments do not have any clearly defined goals. "Generally, people have only a vague idea of where they are going," says Freidheim, "and expect only **eventually** to get there."

In a recent seminar on PPBS, Grossman pointed out to his staff how difficult it is to measure the cost-benefits of social programs. Taking education as an example, he said, "Money, society, education, kids, and parents all go into the melting pot, and out comes an output; is it what one expected or even what society expected it to be? The factors are constantly changing." At this point, Grossman's team is involved in establishing some long-range goals with various departments: "We are really operating outside formal BOB procedures," comments Freidheim, "talking with various commissioners and trying to determine goals and policies so that short-range programs can be evaluated against long-range objectives. The agencies don't really have the personnel to evaluate their own roles."

One of the great values of program budgeting is that it points out that there are **different ways** of achieving results. "For instance, take the pre-school program," says Grossman. "A two months' summer *program* was initiated, which cost approximately $300 per student. It made use of idle resources: schools, teachers on holiday, and so on. A winter program, of nine months, costs about $1500–$2000 per pupil. When first graders were later screened, it turned out that those who had attended the summer program differed very little from those who had no previous schooling at all, but the students of the nine-month program showed more readiness for reading and greater social responsiveness. As yet, New York City has no long-range goals," points out Grossman, "and it's unlikely that any will ever be firmly established, because the city itself is constantly changing. But at least those commodities that can be measured should be measured and alternative choices given. 'To do or not to do' is not a good choice; 'to do something one way **or** another way' is a great choice."

The value of PPBS lies largely in the fact that it forces policy makers to think in terms of **alternatives** and to **think through** a program. It does not necessarily dictate which choice should be made. As Enthoven is fond of putting it, "Render unto the computer those things that are the computer's and to judgment the things that are judgment's. In the end, there is no question that analysis is but an aid to judgment and that, as in the case of God and Caesar, judgment is supreme."

George Steiner, Director of Research in the Graduate School of Business at UCLA, puts PPBS in somewhat the same perspective in an article for **Business Horizons,** "We visualize cost-utility analysis as playing a somewhat modest, though very significant, role in the **over-all-decision-making process**. It is to sharpen this intuition and judgment, to ask the right questions, and put them in a logical order of importance, and then to design, as scientifically as the question warrants, an objective valuation of the cost of alternative programs in relation to their values. Cost-utility analysis is a powerful tool for measuring the advantage of one expenditure over another toward achieving an objective.

"Different programs require different types of analysis. A cost-utility analysis for an anti-intercontinental ballistic missile differs considerably from one for a new water conservation program."

Systems Analysis and Capital Budget Programs

One offshoot of PPBS and the Hayes regime in New York has been the retention of Meridian Management, Inc., to systematize the capital budget programs in New York City. Capital budget projects in the city are notoriously hung up in bureaucratic red tape, approvals, super-approvals, and the like. It may take as long as 10 years to build a hospital (by which time it is obsolete), six or seven years for a fire station. "The process was originally designed not to get anything built," says Grossman. And from a description prepared by Arthur Klein (superintendent of buildings and construction at the Metropolitan Museum of Art) one can understand why. Klein's masterpiece, later called "The 39 Steps," was drawn up to illustrate the complexities of carrying through a capital budget program.

The proceedings read like a satirical ballad with a constant refrain: An idea goes from the agency to the major, to the BOB (Bureau of the Budget), and back to the agency again. The design contract goes from the agency to the Mayor, to the BOB, to the Mayor, and back to the agency again. The architect's preliminary drawings go from the agency to the Mayor, to the BOB, to the Mayor, and back to the agency again . . . and so on through working drawings and final contract. There are, of course, many more steps, but that is the gist of it.

In order to streamline the capital budget projects system, Lindsay retained Meridian Management, Inc., in January 1967. The Philadelphia management and engineering firm prepared the visibility studies for the electronic scheduling of the Vertical Assembly Building at Cape Kennedy and has its own group of architects. Its first target in the New York system was the Department of Public Works, which oversees all construction for the Departments of Health, Police, Fire, and Parks.

The department has approximately 2000 projects currently underway, and a backlog in the capital budget that would keep the Parks Department occupied for 20 years, and the Police Department for 12. During a four-month period, Meridian applied systems analysis techniques to the chaos and came out with some tangible results.

Procedure Charts

Their first task was to design a schedule that could be applied to the wide range of buildings processed by the DPW. To begin with, they recorded **all** the steps in the process, put them in sequence, and then determined the time required for each. Later, they keyed in special procedures required for individual projects such as hospitals.

Streamlining

First to be eliminated from the schedule were the repetitive approvals of the Bureau of the Budget. Under the new system, the bureau will only have to approve a project *once — in the preliminary stage.* It also turned out that every time a contractor put in a payment voucher, four different people in four different offices checked out his insurance. The chart further pointed out those steps that could be undertaken simultaneously and where time could be saved. One bottleneck, which still has not been eliminated, is the four-contract system that compels the city to parcel out a job without **one** contractor

to control the schedule and be responsible for the whole product. One great advantage of the flow chart, however, is that finally the city can assign definite deadlines to various projects. Formerly, they dragged on and on — until, someday, they were completed.

Project Managers

Another innovation to emerge was the establishment of project managers. At the initial stages of Meridian's contract, its own staff took over about 200 current projects and proceeded to manage and guide them through the new system. Eventually, Meridian will train members of the Department of Public Works to take over six to ten projects each and follow them through the construction and design stages. "Unfortunately, a PM must be tough, willing to get things done, a son of a gun," says Meridian's project director, Dick Shively, "and the city doesn't attract that kind of people in sufficient numbers to cover the jobs they are faced with."

Preprogramming

Much of the delay in getting many buildings underway is due to the fact that client agencies do not give the architect enough information in the beginning as to what kind of a building they need and what it is to be used for.

As it is, an agency may submit a rather vague proposal and vague estimate to the Capital Budget for approval. But by the time it is thoroughly designed and programmed, it has exceeded the original sum and has to be reprocessed for more funds. By the same token, the architect finds himself designing and redesigning because the program changes, or is so outdated by the time it is processed that it needs to be thoroughly revamped. To expedite programs all along the way, Meridian has compiled a book of **technical criteria** and a sample program book on neighborhood centers. The criteria book gathers into one volume all the requirements demanded of the agencies and the architect. It spells out clearly all the submissions procedures and gives detailed checklists for plans. The neighborhood centers volume outlines all the functional requirements of the building and minimum space allocations. If similar preprograms were prepared for other departments, the Bureau of the Budget would only have to approve the project once, since it would not change radically or dally so long as to become obsolete.

If the scheduling of projects could be tightened up, it might also be possible then to close the gap between the capital and expense budgets, and allocate funds for the entire project at one time. As it is, many projects are completed as far as designs are concerned but have to wait until the next budget for funds to be assigned for construction. Tighter schedules would also allow the city to start thinking about expenditures for operation and maintenance, in time to meet the construction deadline.

ADP

Part of the new system for the DPW involves the computerization of all data relating to the progress of the building. Cost and time lapses would be recorded and the project manager could continually update the report so that full information would be available to anyone at any time. In addition, all the approvals required from various agencies are all coded and delays recorded.

Management by Exception

Another system instituted by the management experts is a review of all projects "by exception." Inconceivable as it may sound, progress reports used to include a full run-down on the job, including good and bad aspects. It was long and unreadable. As a substitute, Meridian came up with a chart that highlights only the difficulties ("Who needs to know what is going well?" asks Grossman); it tells exactly who is responsible and what department is at fault ("That is the beauty of it: It names names, and blames are blamed"), and finally it recommends what should be done about it.

In addition to recording present difficulties, it also points out any problems that are likely to develop into major hang-ups in the future. Every three weeks, the reports are submitted to a meeting consisting of the Bureau of the Budget, the Department of Public Works, and the sponsoring agency.

Summing Up

It is debatable whether current changes in agency structures and Government procedures will succeed in closing the gap between Government and the people — and establishing a workable system. Edward Logue, one-time consultant to New York City, is convinced that only violence and revolution will compel New York to make the drastic changes it needs. The machinations of the Department of Public Works may also prove fruitless unless the system is drastically short-circuited. "The only way to get anything done, even now," claims one city official, "is to call the Mayor and say it's urgent. Then you get a signal to 'go ahead and do it.' " Some New York welfare recipients are convinced that the entire system must go (Rockefeller, Lindsay, Ginsberg, all down the line), and they are frustrated by the recent moves to reinstate food stamps — another move to complicate the flow of money from Government to the people. Finally, the consolidations made at HUD and other agencies seem but minute steps in establishing a Government system tailored to meet present needs. As one politician put it, "Pollution doesn't stop at the county or city line." In order to establish a meaningful governmental system, planning and action must take place on a broad regional level. Ideally, the state system would be absorbed into a larger political system, dividing the country according to reasonable economic and geographic entities. It is clear that there must be interstate cooperation on such issues as pollution, transportation, and almost anything you can name.

On the brighter side of the coin, systems thinking has brought some encouraging results. In May, when numerous cities prepared their applications for Model City funds, they commented that the program itself fostered a new outlook on planning. "Even if we should decide not to file such an application," says city manager Fred E. Weisbrod of Pueblo, Colorado, "we will end up with a complete inventory of the difficulties that exist. Each agency recognizes its own problems, but often we do not realize how these affect the goals of other institutions. This way we will all know what the problems are and I will have a way of quickly becoming acquainted with the area's base difficulties. The **Honolulu Advertiser** commented, "Even if we fail in this, the City Demonstration Agency still provides a long needed vehicle for increased State-City cooperation — something that has been lacking in the past and is going to be of increasing importance in the future. A. Donald Bourgeois, Director of the St. Louis, Missouri, Model Cities Program, calls the application itself, "a landmark in joint planning. For the first time," he said, "all governmental units and agencies which affect the city have sat down together and jointly thought out how to solve urban problems. This process will continue in coming months."

The same may be said of the systematization of procedures in the Department of Public Works in New York. "PERT charts and streamlined diagrams are generally most useful in the beginning of a project," says Grossman. "They have forced management to think a problem through, from beginning to end. Whether they are subsequently followed or not is less crucial. As a professor once commented to Alain Enthoven, "There is nothing new about what you are doing, except that you are doing it."

the changing city: corporations

You want to know who the city planners of the future will be? Well, today, some of those who say they can best plan the environments for future man are airplane builders and electrical engineers. And some of them are researchers who are systems analysts for aerospace missions.

How these segments of private industry (both manufacturing corporations and independent "think" factories) are using systems analysis in the development — the creation — of communities and towns is the subject of this chapter.

Spokesmen for industry are firm and convincing in their faith in systems analysis, and they claim wide use and adaptability of its techniques.

W. L. Rogers of Aerojet-General Corporation, in addressing the American Institute of Planners Conference at Portland, Oregon, in August 1966, stated: "Our successful, large, diversified companies daily demonstrate their special problem-solving capabilities. The aerospace industry has solved vast and extremely complicated problems using what is termed 'systems technology,' which is primarily the application of managerial skills in integrating creative effort in the fields of science, engineering, manufacturing, logistics, and operations to accomplish some defined objective or goal. These same capabilities can and must be brought to bear to solve the present and future problems of our environment."

General Electric Company's George T. Bogard, in addressing the Urban America Meeting in Boca Raton, was equally optimistic: "From past experience in production and distribution of power, in attaining far-reaching objectives in aerospace and weaponry, it is convincingly evident that a systems approach to complex problems is time-conserving, economical, and effective. Rapidly advancing computer technology is helping to solve complex problems, do mathematical modeling, and perform simulation programs at a feasible cost in both time and money. Using systems analysis and program phasing as a guide to development and construction will certainly bring about savings in building and developing planned communities just as it has when applied to other complex problems."

Charles E. Diehl of Standford Research Institute, one of the independent "think factories," told P/A: "It does not take much imagination to realize that the opportunity exists to utilize the technique in major urban areas, or in the subsystems within these major system areas. The planning, programming, and operation of many public works, such as water management, urban transportation, waste disposal, and pollution control, are too frequently conducted without taking the benefits of recent scientific developments into account. With modern management techniques, technological innovation, advanced decision-making theory, rapid communication, and improved transportation modes, public works systems can be improved for expanding urban areas with significant and demonstrable savings and benefits to the community, region, state, and nation."

And Robert E. Nelson, Manager of Public Sector Programs for Raytheon, in addressing the Senate Committee on Scientific Manpower Utilization earlier this year, put it this way: "The applicability of the systems analysis and systems engineering tools to public problems has been demonstrated. . . . If Raytheon is any reflection of industry at large, a great deal of planning for additional applications by industry is in process."

By making extensive use, then, of what is termed "aerospace-proven systems analysis and operations research methods, which employ computers to process data," these segments of private industry feel that they are eminently equipped to plan the cities of the future.

Defense and space-oriented experts, such as R. F. Robinson of Bendix's Aerospace Systems Division, explain the adaptability of systems analysis: "The methods used in systems analysis, which have, in many cases, originated in the examination of military problems, have application to many commercial, industrial, and other governmental or public problems" **(1).** Robinson, in his paper presented at the American University's Center for Technology and Administration in April 1966, goes on to say, "The determination of the system requirements for the tactical military problem and urban transportation again differ very significantly but will serve well to illustrate approaches to the definition of the system requirements" **(2).**

(1) Function Definition: Mobility

Military	Urban
Strike	Work
Search and Destroy	School
Defend	Home Supply
Logistics	Logistics
Withdraw	Recreation
Medical and Emergency	Medical and Emergency

(2) Future Projections

Conflicts	Urban Change
EUROPE	DISPERSAL
High Level	Homes
Possible but Improbable	Office Business
	Manufacturing
SOUTH ASIA	ATTITUDES
Medium Level	Families
Highly Probable	Affluence
AFRICA	Minorities
Low Level	EXISTING FACILITIES
Highly Probable	Transportation
MIDDLE EAST	Homes
Medium Level	Business
Probable	Manufacturing

Robinson then proceeds to explain that systems analysis is essentially similar to market analysis, in that it would ask, concerning an urban transportation problem, where people are likely to move, what kinds of transportation people want, and what changes of attitude might affect this situation.

Emile Tessen of Westinghouse's newly formed "Construction Group" told P/A, "Systems analysis is a method of applying a cash-flow analysis in a venture. That comes about because the financial people demand to know where they stand at every moment, and the taste-making efforts today are heavily influenced by the mortgage banker."

City planner R. Wayne Nelson of Westinghouse adds, "Probably there is a break-off point in scale between market analysis and systems analysis. It is not a difference in kind but in emphasis."

Why this involvement in community development by private industry is accepted by wide segments of Government and business, according to planner William R. Ewald, Jr., is because "power and competence are both found together in private enterprise. Also, there is a great worship of the decision-making machinery that has been created by private organizations — because it is quicker and better than Government decision-making machinery."

Raytheon's Nelson, in an interview with P/A, again emphasized that "the aerospace people who have been dealing a lot with the large programs are the logical ones to deal with other big programs."

Ewald adds, "There is more noise from the aerospace people because they do more in inventing the future than merely asking how do we market this air conditioner."

This, then, is what is said about the value of industry's use of systems analysis in city planning. What has been accomplished in that endeavor is another matter.

The California Studies

In 1965, at the invitation of the State of California, four firms — North American Aviation Company, Lockheed Missiles & Space Company, Space General Corporation, and Aerojet-General Corporation — all systems-oriented aerospace firms, were commissioned to study four critical areas of California's environment. These studies included: the design of a statewide waste management system (Aerojet-General); a system to provide for the detection, rehabilitation, and institutionalization of the juvenile delinquent and criminal population (Space General); an information system using advanced planning for public needs (Lockheed); and a complete, integrated, transportation system (North American Aviation). Their goals were to anticipate requirements and developments over the next 30 to 50 years. These studies were an experimental effort to use systems technology to solve socioeconomic problems.

Each of these California programs is an application of the methods of systems analysis to a single segment of the system of an existing city.

Raytheon Abroad

Raytheon indicates that it has used systems analysis to plan new communities. As Robert E. Nelson told the Senate hearings, "For some time now, Raytheon has been involved in the transfer of these skills to the public sector and currently is conducting programs in educational systems, natural resource systems, transportation systems, and, as a part of a major program for a foreign government, building communities including housing, schools, roads, sanitation, and water, plus literacy and vocational training."

These communities grew out of the HAWK Defense Program for Saudi Arabia, when Raytheon found they had to set up schools to teach the use of the very complex, highly sophisticated machinery being installed. They then had to house these training technicians, put in roads, and so on — in fact, make a complete community.

On their activities in Saudi Arabia, the architect is a joint venture formed by The Architects Collaborative; Metcalf & Eddy, Boston, Mass.; and Frank Basil, Athens, Greece.

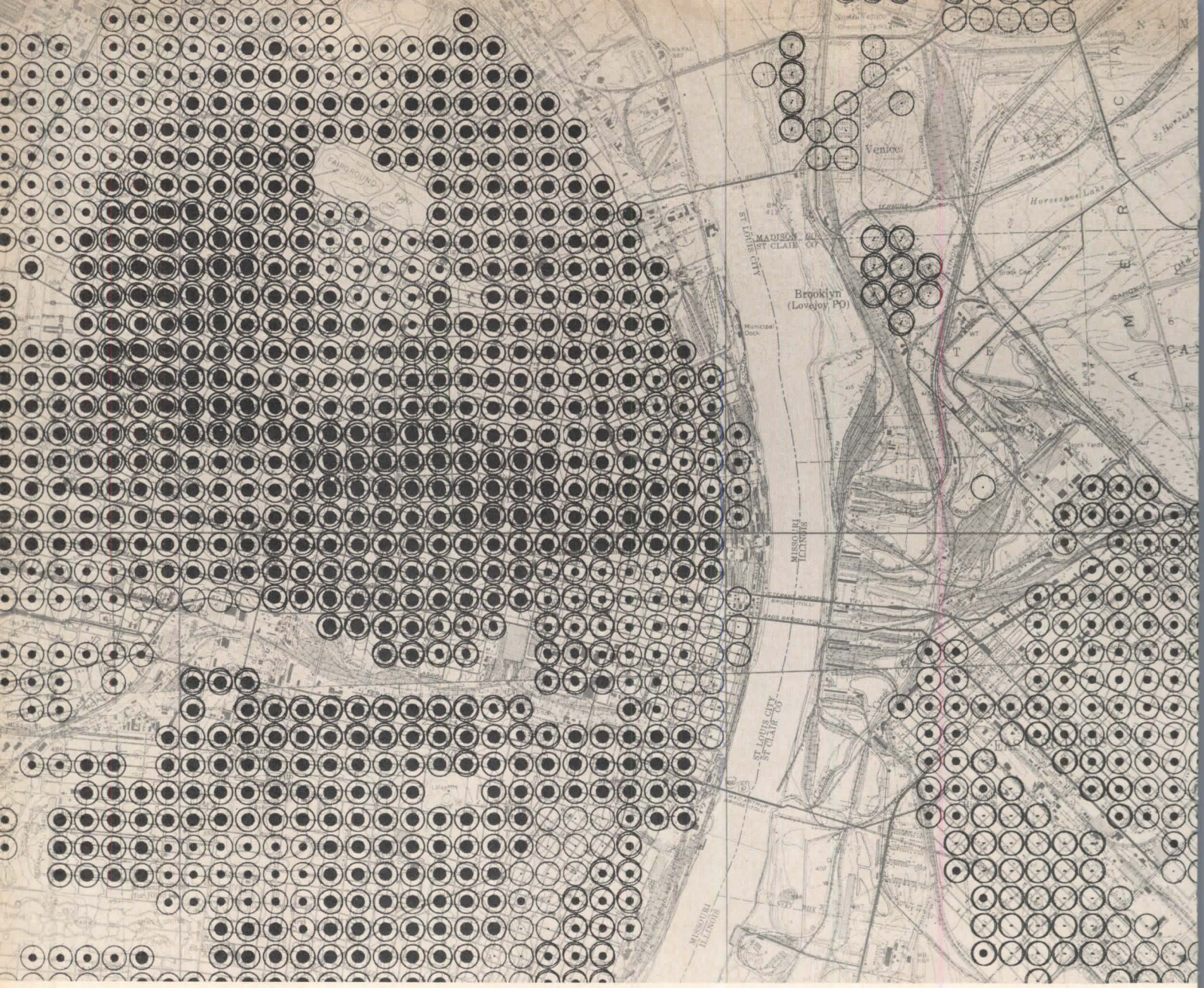
But what methods of systems analysis were applied to which segments of this community planning problem, Raytheon will not spell out in detail.

G.E. Sparks Ideas

To add to the list of firms claiming the use of systems analysis in city planning, the General Electric Company announced its intention, several months ago, of putting its systems analysis capabilities to work toward community development. As articulately outlined by George T. Bogard, head of G.E.'s Community Systems Development Division, to the Urban America meeting in Boca Raton: "Although General Electric has had only limited experience in community development, having operated the town of Hanford, Washington, for the AEC, and it with a population of less than 20,000, we believe that we have the management skills — the scientific, engineering, manufacturing, marketing, and financial resources — to create prototype communities on a large enough scale to provide thousands of homes and apartments in a community characterized by a diversity of incomes, occupations, cultures, age groups, and interests; to create basic employment for the majority of residents and provide commutation to a wide variety of jobs; to provide for the full cycle of life with a wide range of educational, recreational, entertainment, and cultural opportunities; to provide better answers to the problems of air and water pollution, waste and sewage disposal, transportation and circulation within the community; to add a high order of beauty and aesthetic appeal

Photo: Louis Reens

"Photo Factuals" by Kuriloff, exhibited at New York's Fischbach Gallery, show the tools of the systems analyst in an eerie, expressionistic light. Enlarged in scale, intensified by contrast, flattened to the plane of the photograph, the file cabinet and the computer, in Kuriloff's vision, reveal their sometimes dangerously thin reality.



to structures and to public and private lands; to improve municipal services and efficiencies, and at lower per capita operating cost. . . .

"The kind of planned, multifunctional community being envisioned means more than just physical and aesthetic planning; it must incorporate economic and social planning to make it a viable, self-defined, self-sufficient community."

So far, however, G.E. has not announced the acquisition of any sites, and has been reluctant even to discuss whatever systems analysis procedures may have been used to arrive at the decisions made to date.

Some of those announced decisions are fairly specific:

"We will attempt to locate our new planned communities in those areas with the most rapid growth of population and capital formations," George Bogard explained in his speech at Boca Raton. "Ideally, they will be within one hour commuting time of metropolitan centers of at least a million population; within 30 minutes of a jet port; have excellent access by freeway, rail, and water."

"To provide maximum market appeal," Bogard continued, "there will be green space; good circulation planning; excellent schools; medical, church, and recreational facilities; a college or university; a determined effort to provide a cultural climate which enriches community life.

"General Electric will control the land (10,000 acres or more); establish master planning; maintain architectural and design supervision; install necessary utilities, amenities; and retain ownership of key commercial properties. . . . Planned diversity and variety is the objective with pleasant and beautiful surroundings paramount.

"We envision an integrated community with a wide range of housing types appealing to all income levels except the very lowest (no developer can yet afford to provide such without substantial subsidies). Experiments will be initiated in land planning; innovations will be introduced into off-site and on-site improvements which, hopefully, will result in substantial cost savings. New approaches to municipal services will be initiated to reduce cost and improve operations. But we will not attempt to build the town of tomorrow. We expect improvements to come by evolution rather than revolution." Perhaps G.E.'s systems analysis (about which we have no indications from G.E.) will come by evolution also.

Westinghouse Barrels Ahead

Westinghouse Electric Corporation, not to be outdone by its competitor's announced head start, has acquired a 4-mile-square (10,400-acre) tract northwest of Fort Lauderdale that will be developed as a new city called Coral Springs for 60,000 residents. Some 40 miles of roads have been built; part of this road system was there when the property was acquired; part was newly added. City-owned sewerage systems are being installed.

In the words of W.B. Weathers, Mar-

The importance of current and available statistical data to urban planning is indicated by a map of St. Louis, Mo., from **Urban Atlas: 20 American Cities** by Joseph R. Passonneau and Richard Saul Warman (MIT Press), in which the U.S.G.S. map of the city is surprinted with a 250-meter square grid of color-coded symbols that designate population density, land uses, and income density.

keting Manager of Westinghouse's recently organized Construction Group, "Westinghouse has used systems analysis for a long time." We know, for example, that the firm has used the methods in transportation studies — arriving most notably at the much-discussed PA/AC test of automated transit systems. Westinghouse has also used systems analysis to arrive at two digital computer programs for specifier mechanical engineers: The first, "Building Heating and Cooling Load Study" program, and the second, "Energy Study" program, which enables the consultant to take a detailed analysis of a building's total energy requirements on an hour-by-hour basis. These methods of analysis help to determine operational costs and can therefore determine not only decisions about mechanical systems but also can influence the optimal site and location and the construction system of a proposed building.

The logical next question is, "Is Westinghouse applying its Energy and Load systems analysis to Coral Ridge properties?" But Westinghouse fields an answer, "If R&D can adapt systems analysis to rapid transit, they can certainly adapt it to community development."

The fact is, there are no indications that Westinghouse actually is using systems analysis in their Coral Ridge properties or that they used it in making the decision to get involved at Coral Ridge.

The history is that Westinghouse acquired, in June 1966, substantially all the property and assets of a Fort Lauderdale builder-developer, Coral Ridge Properties Inc. That firm had already started the Coral Ridge development, which includes a 3000-acre tract of hotels, 17-floor apartments, shopping centers, and homes; their other property, the inland community called Coral Springs, already had a golf course, a city administration building, police department, mayor and council, and a post office when Westinghouse acquired the organization to develop its "planned city of tomorrow."

Westinghouse Corporation's W. B. Weathers also fields the question, "Coral Ridge Properties has been a really successful development, and we can't really speak for their methods of planning. I just know what they did, they did right for that particular time in history."

That acquisition, for evidently financial goals, is no indication of the use of systems analysis in community development. Furthermore, one look at Coral Ridge shows only that it follows the received standard of planning that can be found in any nondescript, mediocre, uninventive planning scheme across the country. This is not encouraging, since the parent corporation clearly has the resources to do more; it is alarming in view of the fact that the venture has a 2400 bay-front acre holding at Sebring, Fla., and other land at Curacao in the Dutch West Indies.

Enter Goodyear

Goodyear Tire & Rubber Company is also getting into the New Town Business with Litchfield Park, which is a community near Phoenix, Arizona, planned for from 75,000 to 100,000 people by architects Victor Gruen Associates. But a spokesman for Goodyear admits "no systems analysis as such" was applied to the location or development aspects of the venture on the part of Goodyear. They merely owned the land — a 12,000-acre property that had once been a cotton farm — and wanted to make more efficient use of it. Now, whether Victor Gruen employs the methods of systems analysis in his work is a question for a later study.

New Town Developers

Another segment of private industry, the entrepreneur-developer — such men as Simon, Rouse, and Hunt — is also building new towns. Before starting construction of Columbia, Maryland, The Rouse Company sought answers to such questions as, "How many acres of land would 100,000 persons require? How many jobs would it take to support the population? How many schools? Playgrounds?" It drew together a group of 14 thinkers in the science and social science fields — a psychiatrist, psychologist, educators, ministers, city managers — "to discover what aspects of people should influence the shape of the city."

Some planners say that this group performed a two-year operations research before Columbia was designed. Feasibility studies certainly were made and detailed analysis was made of many support systems for the new town: education system, transportation system, and systems for water, central heating and cooling, gas distribution, electrical distribution, central fuel oil and central oil distribution, sewerage, signal, and even the religious system. However, the electrical load study by consulting engineers Albert Gipe & Associates, for example, did not use the computer to establish projected requirements, according to Albert Gipe, and neither the consultants nor the Rouse Company itself use the terms "operations research" or "systems analysis" in description or conversation. Perhaps that is merely because they do not speak the aerospace industry's newspeak. But the situation brings up two questions: First, would the aerospace people say that systems analysis was done at Columbia? And, second, **was** systems analysis done at Columbia? The question remains only vaguely answered — or vaguely unanswered.

The Experts Answer

Planner William Ewald explains the reticence of industry about describing its systems analysis approaches. "The giant firms still try to say, 'When it comes time to having the future invented, then we will invent it.' But the only way that American business will be able to operate as it is used to operating in this regard is going to be when it owns the land. What we are talking about is in a longer-range future than the building industry is used to operating."

As to whether American industry is or is not using systems analysis to determine the over-all city-system, Ewald comments, "I have been quite disappointed with private enterprise and its understanding of this whole effort. They really haven't gotten started yet. We have to invent some new institutions to do systems analysis for our cities."

Architect Joseph Passonneau, whose recently published **Urban Atlas** of maps has quantifiable indications of urban density, income, and other urban statistics surprinted in a computerized grid, says of industry's involvement, "Systems analysis for city planning is mostly a dream right now. And you can only identify uses for it."

Stanford Research Institute's Charles Diehl, in an interview with P/A, commented, "Systems analysis is not generally in practice so far as city planning is concerned. Without much fear of contradiction, you could truthfully say that no one has really done a total systems study."

R. Wayne Nelson of Westinghouse explains, "The subsystems are rather well packaged, but the blend has been done only at the universities."

Despite the claimed use of systems analysis by industry for city planning, therefore, many knowledgeable systems people still feel that not much is being done. Westinghouse and G.E. both prefer not to talk about their activities on the grounds that it is still premature to do so. Yet we know they do use systems analysis, and the chapter in this issue on Gov-

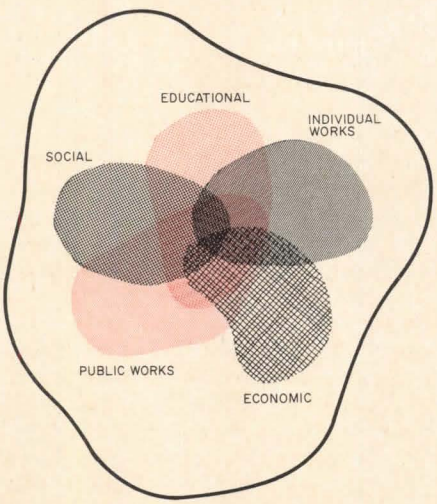
ernmental uses of the new technology toward city improvement ("The Changing City: Government"), indicates a growing use of it.

Where is the confusion? Basically, it is a matter of the changing scale. From the single building to the total city, from the transportation and sewerage system to the total city system, these are the awkward and slow transitions of our day. Similarly, it is a grand leap from the analysis of a transportation system, which is only one of many single systems, to the analysis of the over-all supra-system of a city.

Industry may well be doing the former — both inventing new subsystems and improving existing subsystems of cities. But as of the moment, there are no indications that any segment of American industry is attempting to cope with the analysis of the total city system.

Systems and Subsystems

SRI's Charles Diehl elaborated on the differences and interrelationships between systems and subsystems in a paper for P/A: "If one envisions the urban community as a system of related functional areas, it might be represented diagramatically **(3).** The major functional areas in any urban complex could be defined as the social (devoted to the well-being of the individual); the educational (devoted to training and development of the individual mind and skill); the economic (devoted to providing support for the individual); the individual works (devoted to shelter for people and private economic enterprise); and the public works (devoted to providing urban area-wide support for all the other endeavors and needs of the individual) **(3).** These are the ones that I think have a bearing on the subject."



3 The urban system and its major subsystem areas.

Diehl continues, "Although these functional urban areas support one another, they are often in conflict. Like any other system, they are always seeking optimization in their own terms and resist external pressures that would change their structure. If you could combine all of these five things in just the right way you would optimize the whole system rather than merely one of the subsystems. The forces pushing at the center of each of the areas has a corresponding impact on the entire urban area and the urban area's attempt to optimize its system" **(4).**

Aerojet-General's W.L. Rogers, in his speech at Portland, Oregon, to the American Institute of Planners Conference, made this additional point: "In all areas, one can see that each component added to the political or physical environment increases its complexity factorially and not linearly, and correlation and control of this proliferation of components require greater and greater analytical skills as well as much more rapid evaluation techniques."

"We are not talking about a single kind of subsystem," Charles Diehl pointed out in an interview with P/A. "We are talking about 15 or 20 worlds within a city, and you have to develop a technique of talking about all these interfaces. How do we work with bigger and bigger systems? I don't know that anyone has done the whole thing."

Planner Constantinos A. Doxiadis comments, "You cannot isolate one element of a city's problems, and treat it as an unconnected part of the rest of the city. Only if we understand that every action within the city has an impact on the city as a system will we be able to create a better city."

SRI's Diehl, in his paper for P/A, noted several examples: "Definitive studies of the various subsystems in the public works area have been limited mainly to optimization of such subsystems as water, sewer, waste disposal, pollution control, transportation of all forms (each treated separately), and other community facilities. There is a tendency for each of the systems to optimize within its own vertical capability and resources, often to the detriment of other areas. Until these relationships are documented and understood and methods are arrived at for the necessary horizontal coordination, little improvement can be expected, even with the current trend in urban legislation toward requiring planning.

"A common example," Diehl continues, "involves local road networks, interstate road nets, and mass transportation nets. Money for roads at the local level comes from bond issues, general funds, and state and Federal funds. Money for mass transportation systems — rail, bus, water, and air — similarly comes from separate sources. . . . Airport expansion is considered to be one of the significant problems for many urban areas, but if the majority of air travel is performed for business purposes, it might be better to pursue some other form of communication, such as live vista phone, and reduce travel requirements. A change in business working communications could change the need for airport expansion, which would have a tremendous impact on many facets of urban transportation systems and use of urban land." This would be a systems engineering approach to transportation as a totality.

"Again," Diehl goes on, "water supply is never designed with sewage system. Yet, obviously, they are locked-in systems. How can you optimize these two subsystems? Systems analysis for an urban area must look at each one of these aspects in its own world. The trade-offs are important.

"In complex problems," Diehl maintains, "the only solution is often to break them down into component parts, study the parts in detail, and then recreate the whole through summation of the described parts. We believe that such is the case in urban areas."

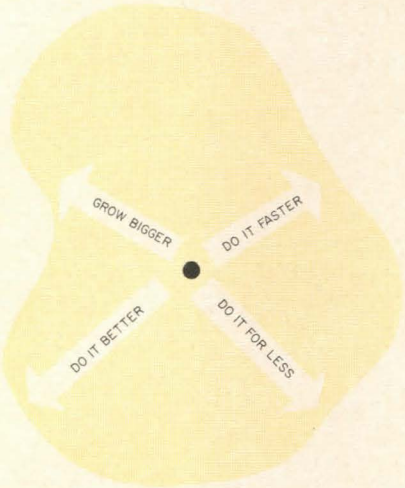
This would suggest that Charles Diehl agrees with the thinking that systems analysis is not yet being used for city planning, but, so far, merely for the planning of subsystems of cities. (Even if private enterprise has not yet begun to apply systems analysis to the over-all supra-system of the city, there is no doubt that it has coped — and coped well — with separate subsystems. Communication and transportation are the most notable examples.) Diehl offers some guidelines for the transition from the analysis of subsystems to supra-systems:

"Until one can describe in adequate terms the content of each of these subsystems, its internal attempts for optimization, and its relationships with other systems, it is unlikely that improvement will result from other than chance circumstances. As one of President Johnson's commission so aptly stated: 'We have the technology to build pieces of the city, but not the whole.'

"Until one metropolitan or urban agency is equipped with the planning and engineering know-how to make such alternative studies on a continuing basis and has the ability to choose the best social alternative on an economic basis," Diehl concludes, "neither the money nor the talent to solve the urban problem will be available."

Why Is Industry Interested?

Presumably, manufacturing corporations will eventually work up to the larger activity of total city planning with systems



4 Forces of optimization in conflict with urban areas and systems.

analysis. But how did the corporations get interested in community and city development in the first place — and why?

For one reason, the Government has given official thought to what the defense industry might be put to do in the event that disarmament should occur when war ceases. Since the defense industry's present-day skill, manpower, and resources ought to be usefully employed even after war is over, a President's Committee on the Economic Impact of Defense and Disarmament investigated the possibilities in 1964–65. Industries need to find, it was felt, ample diversification into an area with a large enough scale to challenge and enlist all their energies. Cities, the problem of our day, seemed logical, since they will be a large-scale activity tomorrow.

State government also encouraged industry to investigate this new area, and the interrelationships between Government and industry have been frequent and sometimes complex. Federal and state governments call both upon the independent "think factories" and the systems engineering units of industrial corporations.

The California studies sponsored by former Governor Edmund Brown arose out of a concern over the uncertain guarantee of employment in California's space and defense manufacturing. "It is subject to policies set nearly 3000 miles from here," Governor Brown told the Senate Committee on Scientific Manpower Utilization, "and these policies can change on very short notice, as we have discovered in recent years with a phase-out of the Skybolt. . . . Therefore, we started out thinking in the conventional terms of conversion to consumer production as an alternative to space contracts."

However, it became clear that California had a large number of engineers and scientists with experience in the development of systems to solve all sorts of problems. "If these men got John Glenn into orbit and back," Governor Brown continued, "could they get a father to work a little bit faster and get him home a little bit sooner? If they can keep one man in space, can they keep another off the welfare rolls?"

The companies themselves, however, have not been as universally interested in the process of employment, as Governor Brown was. Most of the firms seem to have been more concerned with the product. Lockheed Aircraft & Service Company, for example, has indicated that low-cost housing was identified as a large market whose needs were not being met by existing construction methods.

Westinghouse Electric Corporation's W.B. Weathers says, "We don't feel that you can go out in tomorrow's market and just sell products. We have such a broad involvement that we should offer our total capabilities — our products, our systems and subsystems."

However, the three reasons Weathers gives for Westinghouse's involvement in the building of Coral Ridge and Coral Springs, two communities near Fort Lauderdale, Florida, are: "First, we saw the need, after a market study, to know more about new cities — the development of them and the need for them — and Coral Ridge seemed the ideal place. Second, it was a testing ground for products. Third, it was a profitable operation." Much more of Westinghouse's literature expresses the firm's concern with Coral Ridge and Coral Springs as an "urban laboratory" that will "help develop and test new products and improved methods of installation, and the concept of the total electric city."

Their priority of interests is perhaps indicated by the fact that the Construction Group engaged a director of urban planning nine months after the marketing manager, product manager, and other positions were filled.

G.E.'s George T. Bogard, in addressing the Boca Raton meeting, explained his firm's interests in broad, altruistic terms: "A large, diversified, financially strong enterprise with broad interests running throughout the entire fabric of a city might contribute importantly to the development of new prototype communities, which offered more human values, greater living satisfaction . . . at less investment cost and lower per capita operating costs than existing cities."

Bogard also pointed out a potential by-product: "What is badly needed is to accelerate an evolution in the building process comparable to that which has been under way in other major industries. . . . [Building] is the only major industry failing to participate in the greatest economic boom the world has ever known."

Yet, among the nine background capabilities that Bogard credits to G.E., including "systems experience" and "long practice with systems analysis," the most detailed and extensive is "a product manufacturing capability which embraces almost the complete spectrum of community services."

This description of the major industries involved in city development is not intended to indicate that there is anything at all irregular or wrong with a concern about product sales or real-estate profits in relation to city building. However, it seems a fair warning to point out to corporations whose experience with building and city planning is not long-lived that, if they start with an interest in mere products, that start will influence their systems analysis. The problem is one of how to get to the larger vision of people's needs rather than product-sales needs. If a firm is optimizing only for market potential in its city development involvement, it must recognize that that is not necessarily the greatest good for the greatest number.

Aerospace's R.F. Robinson expressed this warning vividly in the paper he presented at American University in April 1966, "The major danger is that the 'most probable' future world will be the one best reflecting the desires of the analyist, i.e., one that 'proves' a trend of population toward a city center or that 'proves' the aggressive intents of the Chinese."

The aerospace and defense corporations are also in this danger when they consider the analysis of the subsystem "industrialized housing" as the broad analysis of urban requirements. Furthermore, it should be recognized that the defense firms and the independent "think factories" who have guided the defense industry are not a panacea.

The assumption has been, it appears, that since war and defense are so highly organized, they ought to be incorporated into daily life — or the organization of them ought to be incorporated. The thinking is that private industry is so efficient and productive that all of American life should be exposed to its working and and cost-efficiency planning. Although the systems analysts are the ones who have the techniques, it does not follow that they are best qualified to determine man's future environment.

Where is the voice that says industry is doing the right things at all? Who pollutes our rivers and lakes with industrial wastes? Who is largely responsible for air pollution? Surely it is industry — both private and public. Did industry analyze where they should dump wastes or whether they should manufacture insecticides that kill birds? And who is to say that efficient Detroit has produced the safest automobiles — the safest mobile environments? The answers are self-evident.

Similarly, since systems analysis of

war and defense does not prevent wars (which, presumably, we do not want to happen), how can systems analysis be expected to prevent disasters in city and community development? Systems analysis may be able to keep a war or a city running at the optimum efficiency, but the more important consideration is: Do we want a city or building there in the first place?

Warnings of the Systems Analysts

Aerojet's W.L. Rogers noted in his Portland A.I.P. speech, "When we speak of utilizing systems technology to create the future environment, we can only use the word 'create' in the sense that the end product is derived by the skillful and systematic use of logic and computational tools, rather than by evolution."

"If we can only establish and define the end results we seek in a city environment," says G.E.'s Bogard, "or, putting it another way, create performance specifications, then a kind of reverse Critical Path can be mapped out which identifies necessary input. . . . Therefore, if we can identify what constitutes a better community and know what values to end up with, it should be possible to create the kind of city people would really like to have, and at costs they can afford to pay."

"Even with the introduction of modern technology, however," as Stanford Research Institute's Diehl points out, "the best systems for public works management might not be able to cope with the numbers of variables involved."

Westinghouse's Wayne Nelson suggests: "Systems analysis may give diminishing returns as you increase in scale, because you introduce a lot of intangibles such as consumer tastes, which are not quantifiable."

The question that must follow is: Can we project to a time when everything will be quantifiable?

Raytheon's Nelson admits, "Although we have been reasonably effective in learning to cope with the hard sciences, we have a lot to learn in coping with the soft sciences. We don't really do it at all yet."

And what architects have been proclaiming, albeit without unchallenged response, is that they provide that missing

> "It's a fairly rough day around Big Town. The Long Island Expressway has normal traffic, bumpering along . . . but alternate routing is not necessary at this time . . ."
> Morning radio report on New York City commuter traffic.

> "In 1900 only 30 percent of us lived in urban areas; by 1975 [that figure will be] 80 per cent."
> Leland Hazard, Board of Port Authority Allegheny County, Pa.

> "The famous Hollywood Freeway carries 8000 cars an hour at some points, and the Santa Ana Freeway bulges at the seams with more than 200,000 vehicles per day."
> Howard Faull, former Chairman of the Southern California Rapid Transit System.

> "The number of registered automobiles in the United States increased from 40 million in 1950 to 61 million in 1965."
> Judge Loran L. Lewis, Chairman, Board of Directors, Port Authority of Allegheny County, Pa.

> "Some people call these [Pullman] cars 'sleepers' — I call them 'wakers.'"
> Senator Claiborne Pell, Rhode Island.

> "Aircraft make 200,000 flights a day in the United States. By 1975, there will be 400,000."
> The New York Times, May 14, 1967.

the changing city: 4

Mobility is the name of the game — or at least the aim of the game. Keeping the American public mobile has become a task of such complexity and potential chaos that some apocalyptic seers feel it will take a near miracle to prevent the total hardening of transportation arteries.

It seems obvious that, given the complexity of our system (the United States) and its proliferating transportation subsystems, a reasonably accurate way of predicting the consequences of action must be found if people are to have a choice among possible alternate futures. And the highly sophisticated technique of systems analysis has proved the best crystal ball available for a number of transportation problems from train scheduling to the space program, called by some the "sexiest" application of the method.

Perhaps the most crucial, and certainly the most intricate, transportation problems are in regions of merging urban growth, the megalopoli, where mistakes can be extremely costly, both in human and monetary terms, and where the consequences of errors in judgment by policy makers can be virtually irreversible.

During the past three or four years, significant beginnings have been made in establishing techniques and computer languages for regional studies that will furnish legislators and regulatory agencies with coherent information and forecasts.

The Northeast Corridor Project is now in the process of constructing a series of mathematical models describing the area that extends roughly from Boston to Washington, D.C. — both its present and future profiles. Cadres of highly competent, often brilliant men in Government,

link between statistical analysis and shape, between variables that cannot be translated into numbers and the planning for those variables. That is what architects say they do.

On the other hand, Aerojet's Rogers, at the Portland A.I.P. conference, urged another way to cope with the intangibles and variables: "Almost without exception, research programs must be instituted in every discipline taught in the colleges and universities of the country, to provide qualitative and quantitative knowledge for understanding the environmental components and eventually establishing and accomplishing environmental goals." For, he continues, "the validity and effectiveness of a systems-engineered environment will be directly proportional to the degree to which we can quantify social parameters such as health, convenience, aesthetics, and happiness."

In conclusion, Bendix-Aerospace's Robinson has a few ironic observations about systems analysis in his paper at The American University. First, "Too frequently, studies are used as an excuse to avoid decision or action." Second, a happy example of systems newspeak, " . . . The first step is the definition of the future trends to a degree of precision sufficient to assure both the decision-maker and the analyst that there is a chance that the proper problem is being worked on." Third, "Simulations also have their dangers: They can be too detailed for first looks, hence time-consuming and expensive, and input data are difficult to obtain. Simulations can simulate the wrong things and can hide assumptions." Finally, "The rules for doing systems analysis, succinctly stated are:

"1. Think big, but not too big.
"2. Define goals, but as qualitatively as possible.
"3. Model and simulate, but not too much.
"4. Think broadly but expertly.
"5. Cost everything."

Finally, H.R. Walt of Aerojet-General told P/A, "Systems analysis in itself is not a cure-all, but it provides an integrated and well-organized methodology essential to resolving complex problems."

So perhaps we should think of it as "Systems People Play" to make them think.

transportation

industry, universities, and the so-called "think factories," are refining the methodology of making paper simulations for transportation networks as they interact with social and economic factors. And old line thinking, frustrated by years of fragmentation, is getting a transfusion of new energies and enthusiasm.

On the West Coast, North American Aviation, with a background of systems analysis in aerospace programs, completed a comprehensive pilot study for the State of California in 1965. The California Study sets detailed guidelines for a thoroughgoing analysis of the state as a total system depending on integrated transportation.

These two studies are pace-setters in the analysis of regions as systems laced together by intricate networks of transportation subsystems. The cause-and-effect relationships between transportation and land use are complicated, and, according to those in the field, not very well understood. The regional study at this point is as much a search for better understanding of those interrelationships as it is a quest for specific solutions.

In the broad-scale project, specific goals are often blurred. Rather than being a sequence of straight paths between problems and solutions, the systems approach becomes a game of arbitrarily changing assumptions and manipulating those variables subject to human control in order to discover feasible alternatives. "Its major value," states Michael Michaelis of Arthur D. Little, Inc., "is the insight it provides into the interrelationship between parts of a whole — often leading to unexpected discoveries about objectives and values, or relationships, or fact. This opportunity for new discoveries is one of the most fascinating and valuable assets of the systems approach."

Modeling the Northeast Corridor

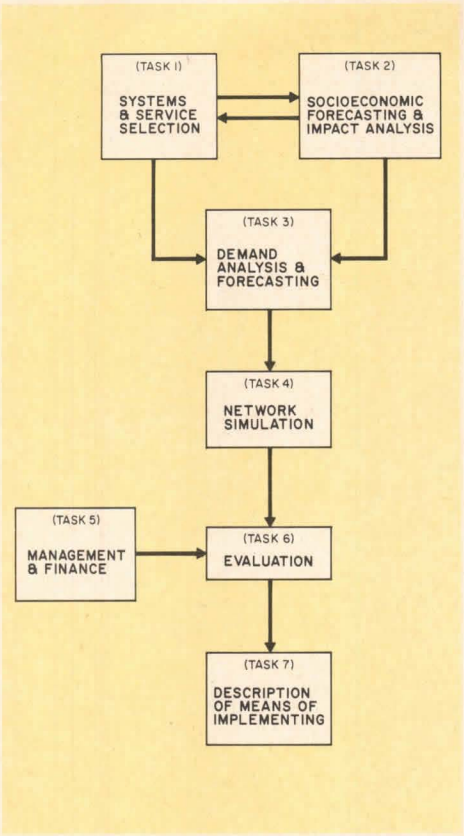
The Northeast Corridor (NEC) Project has had a perambulatory career, beginning in the Department of Commerce in 1964. About a year later, it became a part of the newly established Office of High Speed Ground Transportation (OHSGT, also in the Department of Commerce); and, in April of this year, it moved over to the new Department of Transportation, still as part of the OHSGT.

Its position under the OHSGT's Transport Systems Planning Division is somewhat anomalous. Since the scope of the Corridor Project covers much more than high-speed ground transportation, it would seem that the hierarchy should be reversed. However, such are the fortunes of practical politics and piecework legislation.

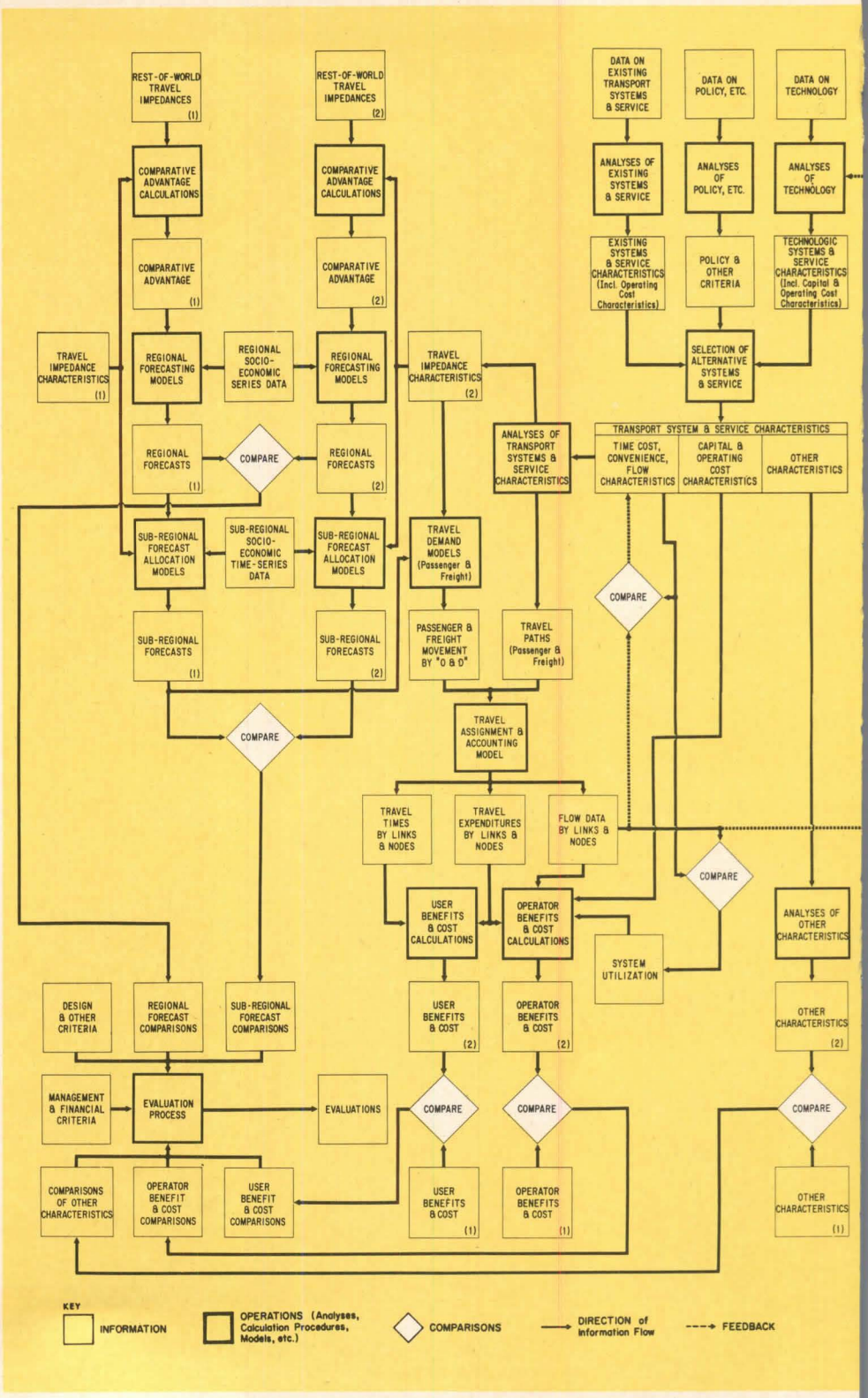
NEC funds originally came from research monies available to the Secretary of Commerce, and the same arrangement is continuing under Secretary of Transportation, Alan S. Boyd. The operating budget has been about $2 million a year for the past couple of years. None of the $90 million allocated by the HSGT Act is directly available to the Corridor Project. However, its staff works closely with the other two divisions of the OHSGT (Engineering Research and Development, and Demonstrations) and incorporates the results of their research into NEC planning.

The inevitable turmoil involved in organizing a new Cabinet-level department makes the future of the Northeast Corridor Project uncertain. It would seem a sad waste of pioneering effort should the Project be shelved or curtailed.

Some critics feel that the OHSGT and the Corridor Project are too rail-oriented. This would seem to be borne out by their new position under the Department of Transportation's Federal Railroad Administration. But the NEC Project is much broader in its stated objectives, which are: (1) to try to develop prototype analytic and planning techniques applicable to other large-scale transport systems problems; and (2) to develop several al-



1 Northeast Corridor Model



2 Sequence of Operations in the Northeast Corridor Model System

ternative comprehensive transportation plans for the Corridor region for 1980–1990. " 'Comprehensive' means that we are equally concerned with all modes, present and future, as well as passenger and freight transportation," says H. W. Bruck, Director of the NEC Project. Bruck, a sociologist, feels that one of the major benefits to be gained by the Government from the study will be its contributions to the art and science of overall regional planning. He will, however, be leaving the Corridor Project to set up a systems program in transportation at MIT this fall.

General and conceptual work is done in-house, with private contractors being treated as extensions of the Project staff. Emphasis is on the importance of maintaining close coordination and continuing interchange between the Government staff and contractors building various computer models.

Work has been broken up into seven tasks, each task comprising several submodels that must be integrated into a general task model — in itself a submodel of the total structure. Task interrelationships and logic flow are shown in the simplified diagram **(1).**

This model structure is built on certain assumptions, as are all systems analyses. Some of the more basic assumptions made for the NEC are that reasonably accurate forecasts of regional activities can indeed be made; that the future demand for transportation can be estimated from these forecasts; that the consequences of this demand can be analyzed; and that the evaluation of alternative investments and phasings of construction can be made in this context.

The second diagram **(2)** will give an idea of the next order of complexity, starting with the "Rest-of-World" and showing feedback flow. It represents the "sequence of operations in a run of the forward-seeking model system." A "run"

consists of introducing into the system the characteristics of a given alternative for a single time interval. The number (1) indicates the beginning of a time period, and (2) the beginning of the subsequent time period; path (2) will show the state of the system resulting from changes introduced during (1). A five-year lag (between a proposed change in transportation systems and its impact on regional development) has been tentatively selected for the analysis.

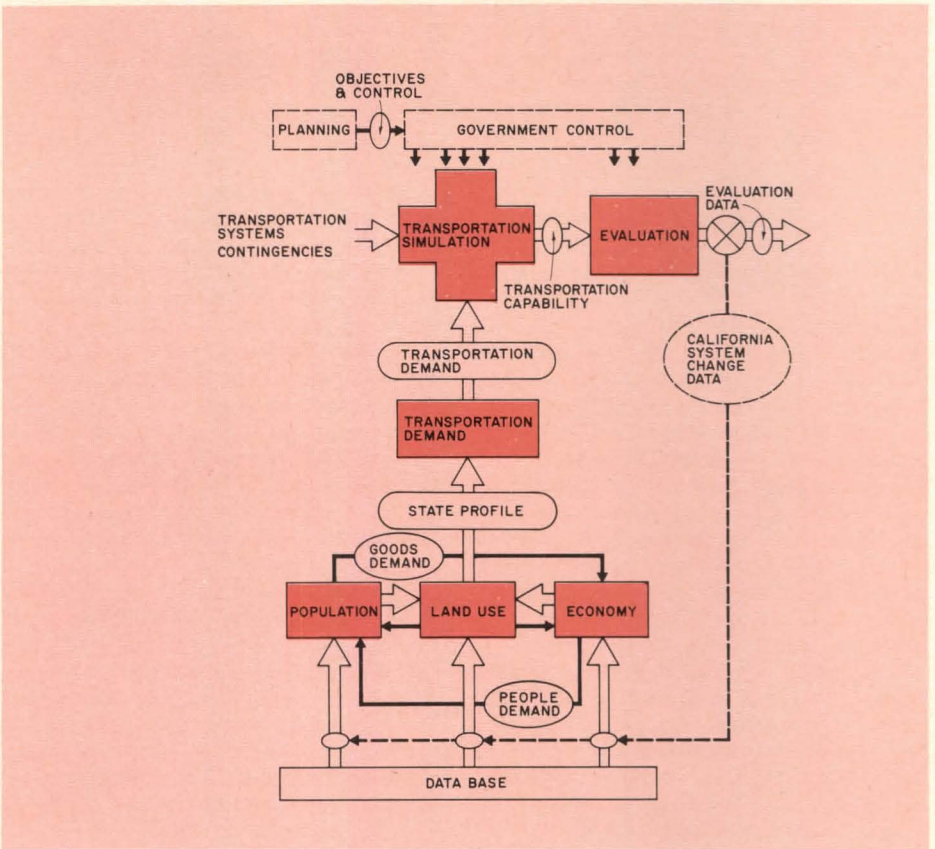
The NEC Project is indeed firmly based on technology, if not on rail transport, as shown by the assignment of Task 1 (see diagram) to Systems and Service Selection. It sets the whole model structure in motion by its interaction with the Socio-Economic Forecasting and Impact Analysis. If implementation is an objective within the 1980–1990 time span, this would seem to make good sense, since any abstraction of performance characteristics must eventually be tied to specific, realizable technologies. But an NEC report dips its toes into the "purer" systems approach by stating that an "underspecified system appears to offer advantages for the broad nature of a regional development structure."

Existing transportation is being explored in addition to new or experimental modes of transport, and it is quite possible that improvements in service, management, and hardware of existing systems will prove the most effective answer in the end. Such improvements are called for, in any case, for short-range plans.

In evaluating new technologies, a number of criteria are being used to determine "system effectiveness": passenger preference, comfort, safety, convenience, noise, pollution, and effects on the surrounding countryside and city environments. Reliability of schedules, low door-to-door travel time, ease of altering routes, and growth capabilities are also major considerations. But final evaluation will rest on performance, cost, and regional impact.

Among the drawing-board or relatively untried technologies being considered are: elevated systems such as monorails; automated highways; tube and tunnel vehicles; vertical or short take-off and landing (V/Stol) vehicles; tracked air-cushion vehicles such as the French Aerotrain; auto transporters, such as train ferries or overhead conveyers, in which passengers stay in their cars; and high-speed rail travel based on conventional steel wheel-steel rail.

An OHSGT demonstration program of high-speed trains is scheduled to start this fall between New York, Washington, and Boston. And a train ferry will be tried out next year running between Jacksonville, Florida, and Alexandria, Virginia, across the Potomac from Washington.



3 California Model

The second set of models, or Task 2, built on population, employment, and income data, will serve up inputs for the Demand Model and predict the impact of transportation alternatives. The Demand Analysis will, in turn, feed into Network Simulation forecasts of the total volume of movements between origins and destinations (designated as "sources and sinks" in transport parlance) and predict the distribution of those movements among various modes. Forecasts will be based on the time, cost, and service characteristics of alternatives related to requirements of shippers and travelers.

The Network Simulation Model assigns movements developed by the Demand Model to segments (links) of the transport network. Travel paths through the network are selected on a least time-least cost basis, considered the optimum path. The measurements obtained from this model then become user/operator cost/benefit inputs for the evaluation process.

Somehow, up to this point, the lay mind can accept the method and magnitude of the analysis. Since we have come to believe that statistics can be gathered in an orderly manner and organized into meaningful data, and that this data can serve as a useful tool in analyzing such things as population growth, transportation demands, and complicated schedules and routes, it is all sufficiently believable — number dependent and therefore manageable, given enough time, brains, or computers. And as for technology — almost no one doubts that magic anymore.

But when it comes to the moment of truth — that grand meshing of models in preparation for judging values — one must stand in awe of the courage and optimism, or perhaps temerity, required to approach such a task. As is, in fact, recognized by those who have to do it. "There are few things more difficult and trying than putting a large system of models together," an NEC Project spokesman declared. "No matter what the systems analysis boys tells you, it is not done by PERT chart; it is done by hours of discussion (not infrequently somewhat acrimonious), by patience, and often by cut-and-try."

Apart from evaluation, the Corridor staff has set for itself what would seem to be the equally difficult task of devising ways and means. Management and Finance studies will include organizational possibilities for setting policies and operating the network, funding sources, and the relationship between organizational alternatives and existing legal institutions with an eye to possible modifications.

The results of the Project will also include a description of the steps necessary to implement each alternative transportation system for the Corridor. "The major

stress," states an NEC report, "will be on the necessary Federal actions, but the steps which other levels of government would need to take as well as those which might be necessary for the private sector will also be described."

The two most critical items in the Northeast Corridor package are considered to be transportation system alternatives and evaluation. Although evaluation is a continuing process running through the program as it progresses, there must be a final selection of alternatives, and a way of showing trade-offs that can be made by decision-makers. Evaluation will be made in three categories: (1) user and operator costs and benefits; (2) indirect costs (e.g., displacement of people) and indirect benefits (e.g., advantages to a region with improved transportation); and (3) qualitative evaluations. This last involves questions on the impact of the transportation system on social and political organization, aspects of culture, and the styles of life and activity in the region. "The relationships between these categories of benefits and costs will for the most part be incommensurable," the report says. "Moreover, when alternatives are put side by side, no single standard of comparison will be applicable."

This admission of the value of human judgment, although reassuring, does not preclude improvement in techniques that will make it easier to analyze slippery sets of costs/benefits. And the NEC Project hopes to advance the state of the art by its research in this area.

In any case, one of the prime user benefits inherent in this systems juggling act is the freedom to fail at minimal cost — the freedom (ideally) to fail on paper instead of in the real world.

California's Contributions

California's Integrated Transportation Study was commissioned by the state as a result of the then-Governor Brown's respect for accomplishments of California's aerospace industry and his concern over its health, which contributes substantially to the economy of the state and is notoriously vulnerable to the capricious drafts of defense and space spending. The study was done for the state with a price tag of $100,000, which seems modest enough in view of today's government spending habits.

The speed with which an experienced team of analysts can whip through a preliminary but comprehensive study is breathtaking. North American Aviation (NAA) completed its task (five volumes, roughly 600 pages) in six months. However, their recommendations call for a rigorous computer-aided analysis that would take 52 months, a total of 309,260 engineering man-hours, and 417 computer-hours on an IBM 7094, or equal. Unfortunately, the proposal is dormant at the moment, and there do not seem to be any plans for funding the follow-up analysis, which would require an estimated $6 to $9 million.

The study program is similar in many ways to its East Coast counterpart, but emphasis is on the region (California) as a socioeconomic system that determines the development of its transportation subsystems. This shift in emphasis — away from technology — is made clear in the different model sequencing illustrated by the diagram **(3)** (major submodels shaded). Where the Corridor starts off with vehicle systems, NAA does not assign a separate model to them, but relegates Transportation Systems to a kind of secondary input for the Transportation Simulation Submodel.

Although admitting the difficulty of finding a "best" starting point (referred to as the "chick-and-the-egg syndrome"), the California Study clearly states that "the Population Submodel activates and drives the entire California Model." Once the model structure is set in motion, however, it tends to become a closed loop through feedback (in increments of from 5–10 years) — indicated by the dotted line running from evaluation output to population/land use/economy inputs.

The next steps in model logic leading to Evaluation are similar to the Corridor model structure. California Population/Land Use/Economy Submodels are comparable to the NEC's Socio-Economic Forecasting and Impact Analysis; Demand, Simulation, and Evaluation Models or Submodels are all roughly comparable. Planning, and Government Control (boxed in dotted lines) seem somewhat analogous to the Corridor's Management and Finance, and Implementation Models, but the California Study does not indicate an intention to set well-defined goals in these areas.

It does consider data important enough to include (in a subsidiary position) in the first model structure. The Data Base contains information necessary to describe California physcially and functionally in quantitative terms, and its contents will be "addressable by a high-speed computer." Data would certainly seem to be a critical element in any study, since reliable results depend on comprehensive and accurate data in a suitable form.

Another interesting aspect of the California Study is Contingencies (see diagram), fed into the Simulation Submodel along with transportation system alternatives. Included are wars, disasters, and technology advances. Technology, in this case, is general and not limited to transport technology.

North American Aviation was perhaps

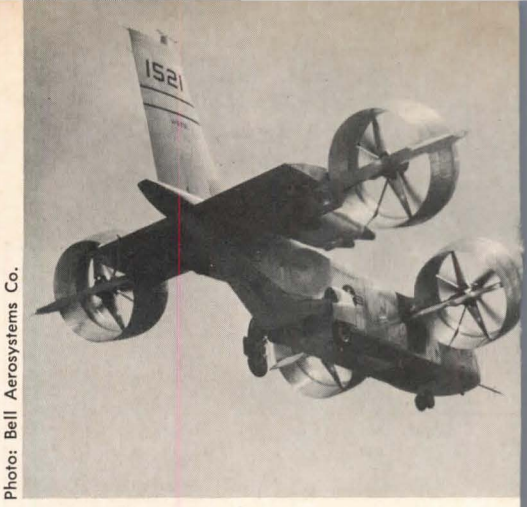
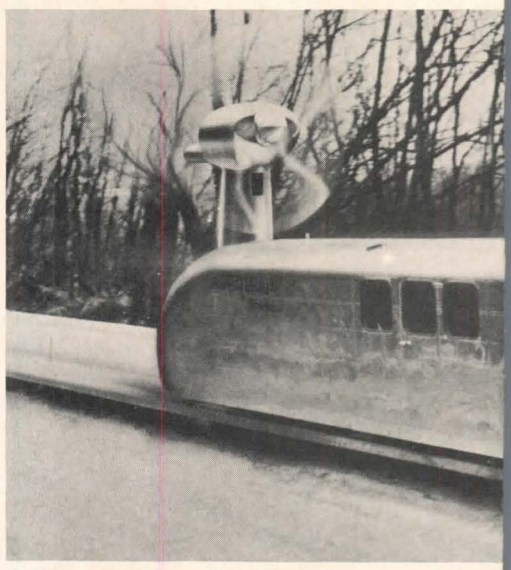
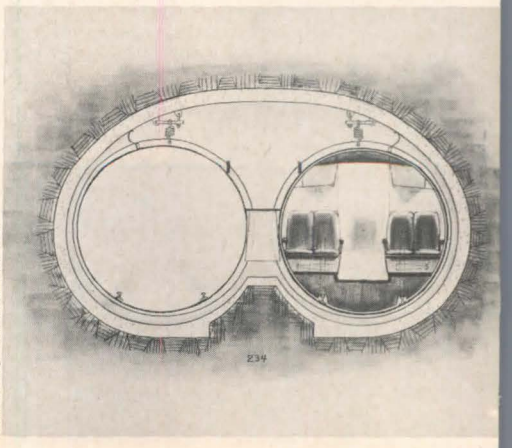


Photo: Bell Aerosystems Co.



commuter's future?

Top left: V/STOL craft rotates propellers for forward flight after vertical takeoff. Top right: Hovercraft skims water on a cushion of air. Above left: Turboprop propels tracked air-cushion Aerotrain. Above right: Electric car commutes along guideways and also on own power. Right: Proposed tube "torpedo" moves air from front to rear of train. Below: Force of gravity plus partial vacuum propel and decelerate pneumatic train.



Rendering: Tube Transit Inc.

Photo: Hoverlloyd Ltd.

Photo: Alden Self-Transit System Corp.

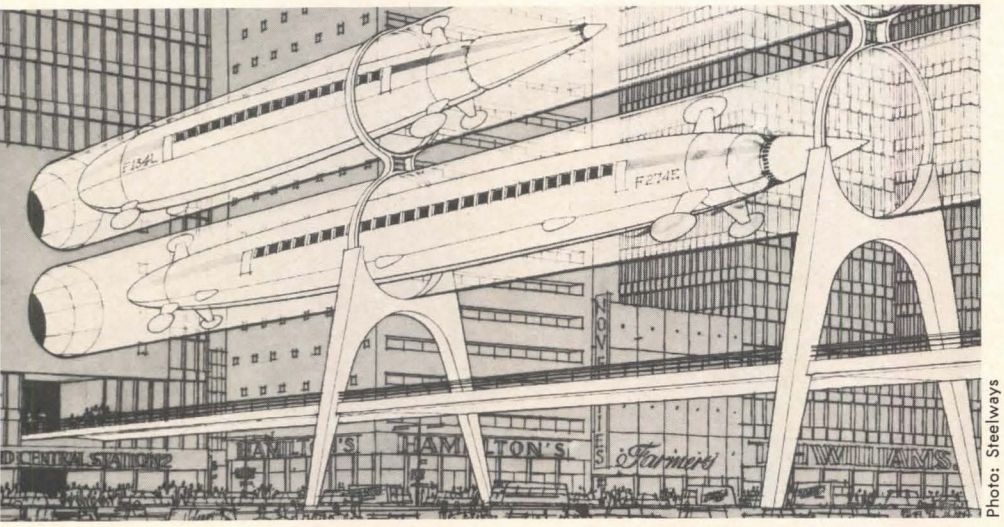
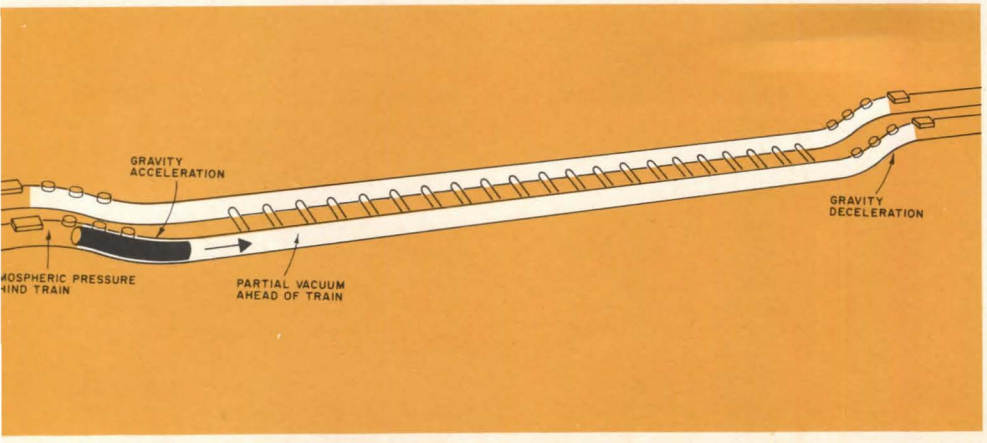


Photo: Steelways



freer to blue-sky in their study because of a looser mandate that did not include the rigorous analysis in which some proposals might drop out, and also as a result of their 50-year time horizon (base year, 1963). For example, the transportation subsystem includes not only the flow of people and commodities but has been defined as "carrying energy and information, since these flows are becoming increasingly important alternatives to the flow of mass."

Recommended investigation of possible future transportation technologies includes high-speed cargo ships "flying" a few feet above the water, pipelines capable of moving farm produce, and economical tunneling techniques, plus a number of systems comparable to those being considered by the NEC.

They also recommend consideration of developments that could attract large numbers of people to the parched deserts and other sparsely populated regions of California. The study foresees large new water sources from desalinization plants or off-shore pipelines from Alaska in 10–20 years; electrical power transmitted much like radio in 30 years; new waste disposal methods; communication devices enabling people to work at home; automation; ocean mining and oil recovery concentrating a high level of activity on and under the offshore waters.

Some advantages to the government of the projected study are seen not only as providing a number of "best" alternate networks and combinations of modes (new and old), but as possibly being able to assess the effects of controlling the location of people and industries so as to minimize transportation needs. That is, obviously, barring the work-at-home syndrome, which predicts advanced communications devices that will free people from the commuting grind.

HUD Looks at City Transit

Although the cities may be thought of as subsystems of the regional or national system, they seem to be subsystems that shape and sustain the larger systems around them. And the importance of mobility to the life of the city cannot be overestimated.

Under the Urban Mass Transportation Act of 1964, a number of capital grants have been made to bolster sagging city transit systems around the country. Last year, Congress asked for better solutions than this city-by-city patchwork and directed the Department of Housing and Urban Development (HUD) to commission comprehensive studies that can be used for advising cities on their over-all transit problems.

In February of this year, HUD awarded

four such research contracts, totaling $1,500,000. Their objectives are indeed broad: "Reconstruction of our cities, improvement of our urban transportation, and the protection of our environment." The four systems studies will serve much the same function as the California Study — as blueprints for further research and development programs.

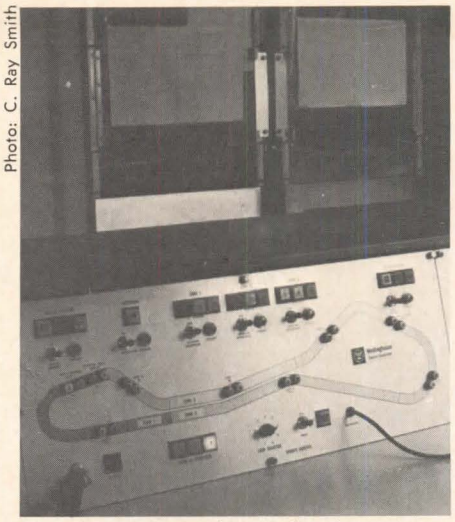
The following statement from HUD reveals its faith in the systems approach: "The systems analysis viewpoint, encompassing city planning as well as transport engineering, has been deemed so important that the fourth contract has been awarded to Defense Research Corporation [known primarily for its systems work for the military] of Santa Barbara, Calif., to conduct, with the aid of computers, a refined yet practical systems analysis of problems and solutions, strengths and weaknesses, origins and destinations, points served and lands traversed, in urban transportation."

The first three contracts are probing for nonpolluting transit solutions that might be feasible in 5–15 years; 3–8 years; and 6 months to 3 years. The unifying study will use three actual cities for models, and will be conducted by a 10-man team of experts in the fields of engineering, city planning, economics, social science, and mathematics. The deadline is December 31 of this year, giving Defense Research, recently renamed General Research Corporation about 11 months to complete the analysis.

Ben Alexander, Board Chairman of General Research, puts the systems analysis tool in perspective for studying civic problems. "I feel that while the systems analytic tools have a role to play, they are no panacea and must be used with extreme care," he cautions. "Where goals are reasonably simple, not themselves in serious contradiction, and expressible in quantitative terms, the formal techniques of analysis combined with the power of present-day computers offer unquestionable advantages over reliance on expert opinion and rules of thumb. For most civic problems, important elements of the goals fail to meet these criteria, and if converted into a common currency (in order to permit formal optimization), the real issues are often concealed rather than illuminated. If systems analysis is to be of value, it must be married to more traditional methods of considering civic problems, and each approach be used in the sphere in which it is most powerful."

One serious gap in Federal activities is at the urban-regional interface. DOT handles regional studies and HUD assumes responsibility for urban studies. How do the twain meet? After the fledgling Department of Transportation gets its bearings, it is hoped that some sort of coordinative body can be established to straddle the DOT-HUD line.

Photo: C. Ray Smith



Control console, tied into digital computer, provides visual monitoring of Westinghouse driverless commuter train. Project was partially financed by HUD.

BART's Simulator

Stormy relationships between San Francisco's Bay Area Rapid Transit District and its architectural advisors serve to point up how the best laid intentions of engineering-grounded transit proposals cannot be programmed.

But BART has a handy little systems device known as a Rapid Transit System Simulator that at least promises to insure superior service to Bay Area residents. It describes all essential physical parts of the railroad, plus train movement and passenger flow; and will be used in evaluating performance and service. With the completed program on paper, it will be possible to "look" at the system in operation every half second.

Although there seems to be some ambiguity in defining the exact limits of systems work, one breakdown divides it into three phases: (1) systems analysis; (2) systems engineering; and (3) systems management. BART's simulator is primarily an engineering and management tool for planning and supervising-in-action the controls, signaling, scheduling, and so on.

"The simulator program is a very stupid animal," Deane Aboudara, the program's supervisor, remarked in a diffident moment. "It will only do what you tell it to." In other words, it can remember but not initiate change if reality does not tally with projections. There must be a continuing check-and-correct process feeding back actual user data after BART starts carrying passengers. A permanent staff, including a scientific programmer, an analyst of passenger behavior, and a costs man may run through the check-and-correct cycle as often as once a a month in the first months of operation, and then go to six-month checks as they learn the habits of riders. It may even be refined to the point of making adjustments for seasonal fluctuations, the Christmas buying surge, or sports crowds.

Systems Programs in Private Industry

The programs discussed so far have all been government-administered, but the transportation industry (railroads, bus lines, and airlines) often takes advantage of systems analysis and systems engineering firms. And a number of manufacturers of transportation hardware maintain research departments with systems staffs. Notable among these is the Westinghouse Air Brake Company's Mass Transit Center, which is doing one of the HUD studies.

The most ambitious newcomer to these programs operated by private industry is Ford Motor Company's recently established Transportation Sciences Department, which will follow a "total" systems analysis approach, including urban and regional planning. It has already begun an urban study in cooperation with the City of San Diego.

"I should point out that our whole program (including our participation in San Diego) is, and will continue to be, entirely funded by Ford Motor Company," explained Foster Weldon, manager of the new department. One of its objectives is, of course, to "assess the evolving role of the personal vehicle and to pinpoint desirable new-product opportunities in future transportation systems," but Ford states that its long-range objectives do not include the search for ways to favor the automobile.

Where Will It All End?

Crystal gazing into the transportation future is a widespread and favorite pastime. It has even been proposed that homes, or possibly entire cities, might be self-contained mobile units that will one day wing south for the winter and north in the summer.

It does seem fairly certain that automation will cut down on work time and create more leisure — leisure that will be spent increasingly for pleasure travel. But will pleasure travel be pleasurable? Systems analysis promises to make it fast, safe, clean, and efficient in every way possible. And it will, if present trends are followed through, show increasing respect for the landscape, the cityscape, and the nonuser whose house happens to be adjacent to the right-of-way — i.e., it will be buried wherever possible. But will that be any fun? Will there be any enjoyment for those passenger-packages zinging along through darkened tunnels in trim, sterilized, efficient containers?

the changing practice

"It may well be that what we have hitherto understood as architecture, and what we are beginning to understand of technology, are incompatible disciplines. The architect who proposes to run with technology knows now that he is in fast company, and that in order to keep up he may have to discard his whole cultural load, including the professional garments by which he is recognized as an architect. If, on the other hand, he decides not to do this, he may find that a technological culture has decided to go on without him."

Reyner Banham, "Theory and Design in the First Machine Age."

To some, Banham's are strong words; to others, a statement of recognized fact. Those actively "running with technology" are well aware that they are in fast company. Some have already discarded their "professional garments" as an encumbrance. It is doubtful that the "technological culture will go on without" these architects, for they are in the middle of it, sometimes firing the starting pistol.

For those architects who conceive of architecture in its classic tradition, technology has quickened the pace. It affords stimulation in the perfection of the individual work of art. For these men, the pace has quickened but the path remains the same.

What are the changes in day-to-day practice brought about by performance design? How are these technological innovations altering the style of those "professional garments" by which the architect is recognized as an architect? Is the Emperor naked?

Is the systems approach of the aerospace industries compatible with architectural performance design?

Robertson Ward, Jr., who helped design the School Construction Systems Development (SCSD) components for Inland Steel, maintains that the problem is vastly more complicated than the "simplistic attitude" of the areospace people. "I think there is a tendency to confuse complexity of numbers with solving architectural problems," says Ward. "Sending a man to the moon is not nearly as complex as designing one small children's elementary schoolroom. That is a problem fantastically more complex than all of the computations aerospace is involved in. The interlocking social variable systems in any architectural problem are of a much higher level of complexity than any of the relative quantifiable researches that the aerospace people are involved in. I have the feeling that a lot of people in aerospace have considered it the reverse and have looked down disdainfully on the architect bumbling along, not being specific and precise.

"It is possible to set up a relatively closed system with systems analysis," continues Ward, "but, these are not always the priority problems. The tendency is to leave out many of the variables you cannot quantify. This is the mistake that most of the aerospace people make who plan to move into the physical environment.

"There are many things that need to be done to raise the rational threshold that the architect works on, and the architect has been very remiss in not doing this," he continues. "But it still is a complexity of problem that is not going to be taken over by aerospace."

Sim Van der Ryn feels that we are quite a way from using new techniques in performance design: "There are a number of deductive rational techniques for scheduling and programming the sequence of operations and decisions required to build. These techniques are extremely useful but serve largely to make the existing design and building process more efficient. There are mathematical models of various standard activity systems, but these have found no significant applications in architecture that I know of. There are models set to cost effectiveness comparisons of systems, but these require careful definition of measurable input and output functions. Architecture hasn't gotten that far yet. There are computer techniques to store and retrieve data, but we have yet to decide what data we want, and how to reliably obtain it. At this point, I make no strong claims for the 'new techniques,' since they are still states of mind and a way of working rather than a cookbook of methods.

"It is precisely the formalist architect's inability to relate beauty to any 'deliberate or conscious' concept that brought me to systems analysis in the first place," continues Van der Ryn. "Because if the architect cannot explain in understandable and operational terms what the properties of 'attractive, aesthetic, or beautiful' buildings are, then who can?"

Both Ward and Van der Ryn ask the question: Are the complex problems of physical and social environment beyond the technological scope of performance design?

The answer will be worked out with an instrument whose capabilities are revolutionizing architectural practice even more than steam did industrial production — the computer.

The Computer

The computer is the handmaiden of performance design. Beginning as a humble calculating tool to replace the engineer's slide rule or the bookkeeper's adding machine, it has branched out to encompass a range of activities inconceivable 15 years ago. As iron made its first appearance in building disguised as stone and gradually asserted its capabilities, the computer may change the shape of architectural practice through performance design, as much as the I beam and the wide flange changed the form of building.

Despite these possibilities, the computer, in many instances, still seems to be

making its entrance through the back door like purloined "hot goods." A recent AIA-financed study, entitled **Emerging Techniques of Architectural Practice,** stated, "The initial effort of this study has been directed toward management and business aspects of the practice." The study then proceeded to illustrate the tremendous versatility of the computer in speeding and simplifying architectural business procedures.

Some architects, however, see the hardware of systems, the computer, as more than Architectural Iron Works. "To say that there is nothing that cannot be done without the computer misses the entire implication," argues Professor Richard Bender of Cooper Union. "So much of what is being done in new techniques of drafting and reproduction and even systems analysis in the architect's office is being hampered by this concept. The only input you can use with this type of thinking is the input of form you have dealt with, and you end up with the same kind of building that you started with. The airplane and the horse may get you to the same place but they don't do the same thing."

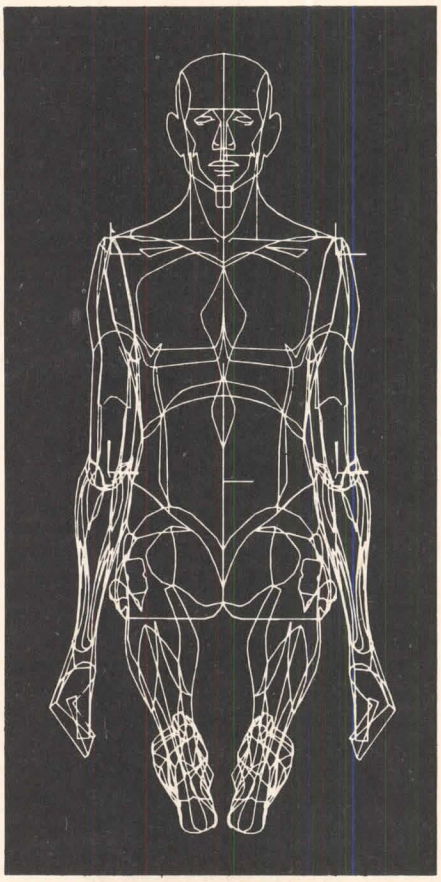
"The number of variables a computer can handle are small compared to the capability of the human brain," comments Professor Schiffer of Pratt Institute. "It is the computer's potential that is so engaging."

Architects at MIT's Center for Building Research see that their "hardware" gets some hard wear. They believe that, if the shoe fits, wear it, and they are not averse to measuring any foot. They use the computer for the most complicated programming as well as adapting it to what Calvin F. Opitz, research staff member, terms "dog work." Opitz uses the computer even if it is easier to do a problem by hand, to "keep thinking in terms of systems solutions." For such simple problems "you could teach a chimp to use the computer." To Opitz, the computer is a thinking animal that can also teach.

"It's a nifty tool that allows an immediate check of all factors against each other — finance, occupancy, etc." But, most important, "It's new to the architect; architects don't usually think this way," says Marvin E. Goody, MIT research associate. "The computer generates the tendency to think in broader terms to solve greater problems. If you lay out a street, you not only think of the curves and grades, but the lighting, snow removal . . . everything."

"What the computer does is to accelerate the acquisition of experience so that a person can sit down and play with complex structures and do three or four of them in a week, whereas before it took one man half his life to get that much experience," *points out* William LeMessurier, structural engineer of Boston.

Expo 67 demonstrated many of the computer's structural potentials (JUNE 1967 P/A). The Gyrotron, a huge space structure, was calculated in two hours of computer time on the largest computer in the world. The Theme Pavilions, designed by the Affleck/Desbarats/Dimakopoulos/Lebensold/Sise office of Toronto, were too complex for the McGill University computer and as a result it was said that their structural possibilities were unrealized. A proprietary space frame called the Triodetic system, which was employed in the Netherlands Pavilion as well as a number of other structures, was computer calculated. Describing the Triodetic System, Harold G. Fentiman, vice-president of Triodetic Structures Limited, notes: "A computer is now being used to provide structural solutions for three-dimensional structures and arrive at budgetary cost figures during the preliminary design stage. . . . Once the design is finalized, the computer solution gives complete and detailed material lists and final prices."



The impact of the computer is being felt everywhere. When The Architects Collaborative of Cambridge, Mass., decided to computerize their accounting, they purposefully selected a firm that was capable of computer graphics.

"It gives us the possibility of doing anything we do in the drafting room," says Morse Payne, Jr., of TAC. The system could be integrated to produce an immediate cost analysis during design.

The computer is bad news for the traditional draftsman and will probably force architectural offices to rethink the practice of making architectural school graduates "board jockeys" for the endless repetition of standard door bucks until they have put in enough time to sit for their architectural licenses. Sam Wallach, Jr., whose construction firm has moved entirely into data processing and computerized analytical activities, comments, "Draftsmen have been on the way out for some time. The last industry in which they still dominate is architecture and engineering." He believes their days are numbered. Payne agrees, "When SOM or some other major firm puts in computer graphics, the entire profession will change overnight and the draftsman will disappear."

There are a wider range of things for computers to do than drafting. "Computers don't only analyze," says Robert Pelletier of MIT; "they define the problem so that it makes sense. Today, anything is possible."

Proving Pelletier's statement, architect William W. Bond, Jr., of Memphis, Tenn., notes, "Computers are advancing the profession of architecture by taking the drudgery out of it."

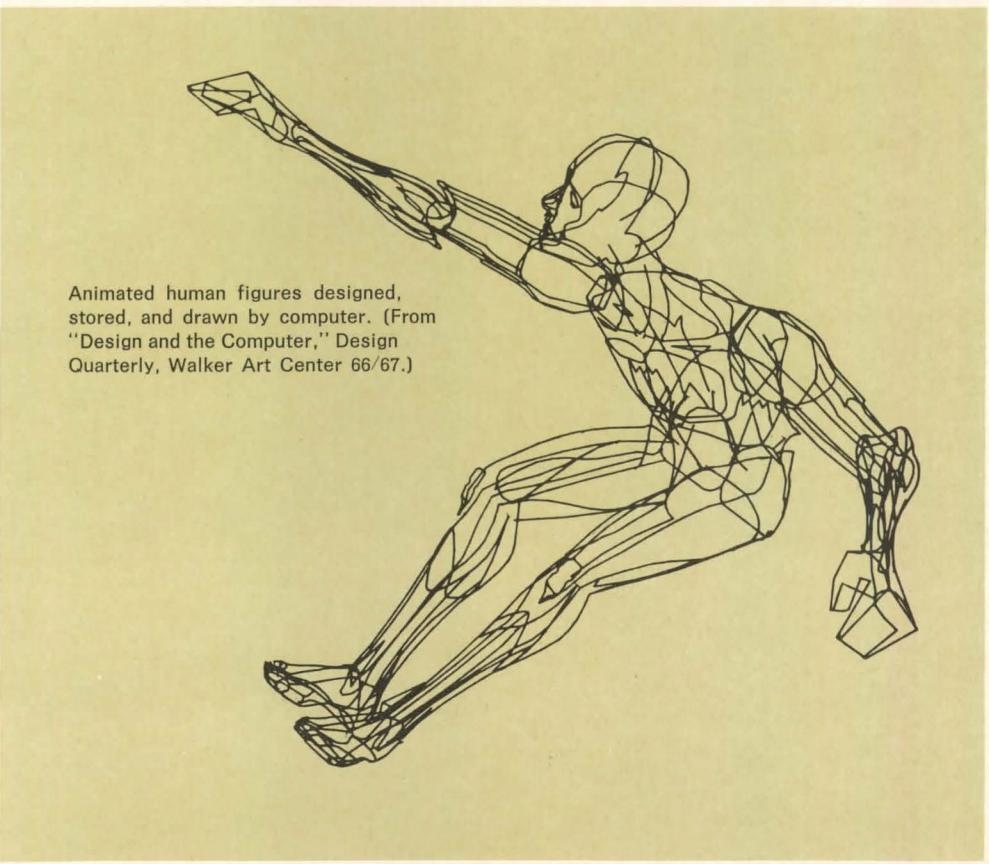
Bond anticipates the day when he will be able to give a client a set of plans by nightfall of the day the contract is signed. Computer manufacturers, points out Bond, only see the computer as a glorified adding machine. Bond will sign a contract for advanced equipment the day the manufacturer can deliver the new equipment he wants. "All we have is time, and by saving time, computers will allow creative people to be creative," says Bond, known nationally and internationally for his design of the Holiday Inns.

Computers are proving their usefulness to centralize information and information retrieval and evaluation. They are invaluable in keeping track of the large expenditures of client funds, which is part of the nature of the business of architecture. Product information is listed by them for the designer's evaluation. They are ideally suited to the printing of calculations, specifications, and working drawing information. In short, computers are presently being used successfully for all of the business of architecture.

But, with the development of performance design, are drawings and specifications the vehicle of communication the architect will use to transmit his instructions to the building industry of the future? Systems analysis applied to architectural business procedures are undeniably as efficient as they are applied to other business operations. But in their application to design, are they presently bogged

down in perfecting the mechanisms of an archaic building technology? The question asked by architects "running with technology" is not whether the present antiquated technology can be perfected, but whether it should be perpetuated. Even the computer's "light pen," which many architects hail as a computer design breakthrough, is not necessary for the simplified plotting chart evolved by Inland Steel for the SCSD program.

If the most important function of computers in the architect's office is their generation of thinking in terms of performance design, as the men at MIT say, can this thinking be generated by using the computer only as a substitute for the sliderule and the adding machine.



Animated human figures designed, stored, and drawn by computer. (From "Design and the Computer," Design Quarterly, Walker Art Center 66/67.)

Performance Design

The traditional design function seems to most architects to be the most precious article of their "professional apparel." What is the present effect of "systems thinking" on design?

"The talented designer in the old sense, the clever man with a pencil who knows what the styles are, tends to disappear," says Goody. "These men have a great ability to change a window detail and proportions because they 'look better that way,' but design has to be taken one step further. More and more architects are thinking in the broad terms of how to solve greater problems."

"A lot of the traditional procedures are breaking down," says Schiffer. "The profession is already quite polarized. There are the respected firms such as SOM, Rudolph, and Kahn, who have something unique to offer, which is the quality of their design. The only unique thing the architect can contribute," he adds, "is design." Schiffer defines design as the total conception of a project, the relationship of the client's needs to the finished product, the building. However, once this is put together into a unified whole, the working out can be done by specialists under the architect's direction. In some of these instances, specialties can be performed by machine systems.

Pelletier (an MIT research associate) and Opitz agree with Schiffer that someone has to control the design process, but they ask, "What is the design process?" They add, "It cannot be mechanically systematized until you know what it is." One of the difficulties in designing with systems is that there are no design criteria for deciding if buildings will meet the problem and no feedback after they have been built. "Today, anything is possible," says Pelletier. "When this is so, we need criteria evaluation and definition."

On the other hand, there are architects who do not seem plagued by such doubts. Bond, of Holiday Inn fame, knows exactly how he would like to design. It would be with a complete mechanization. His proposal, as outlined in **Holiday Inn Magazine,** is simple and direct. Bond would have stored in small file drawers about 20,000 key-punched cards, each with an aperture containing a 35-mm microfilm of a detailed drawing or document. These would be color-coded to different phases of design. The cards would describe all probable variations of every condition with which his staff is working or is likely to need.

"We would flit through the master deck of cards for all drawings and specifications of similar buildings. We would stay with the customer shuffling the decks . . . assimilating and . . . dissimilating until by night we would have pieced together a montage of all the necessary drawings for a complete design."

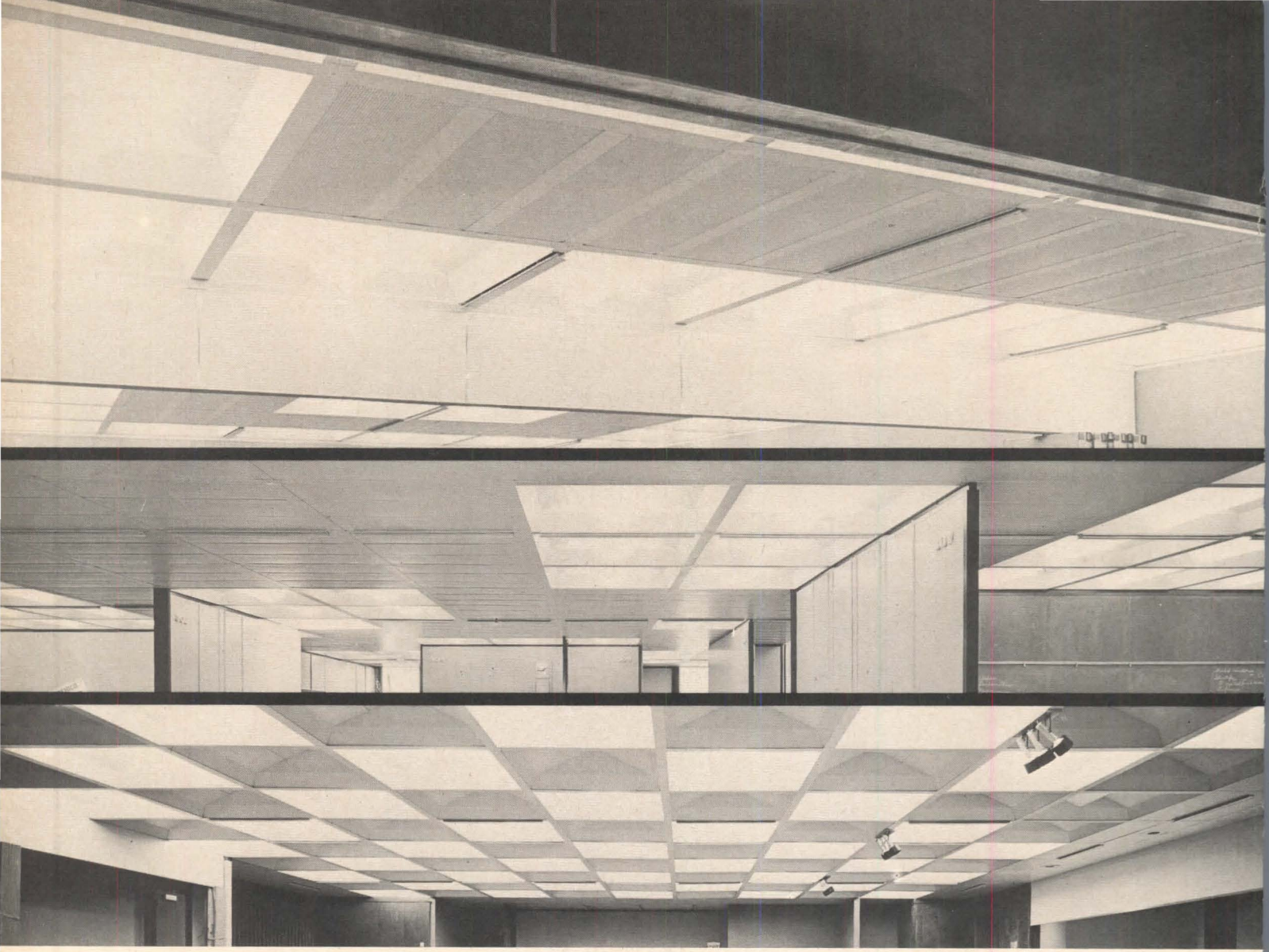
Bond concluded with this bit of advice, "Success in architecture, as in all things, would come to those who make themselves truly deserving of it. It doesn't really matter if you are fortunate enough to be considered talented. The important thing is whether you are determined to succeed. If this is the case, you will be successful."

Utilizing performance design to meet more human needs or grinding out buildings to meet the needs of the market are obviously miles apart. Bond is ready to put a computer where his mouth is. His staff of 50 is producing buildings both here and abroad. They stand ready to do more with less as soon as the equipment is available. While TAC considers computerized graphics, and Pelletier and Optiz ask what design is, Bond gives it a fast shuffle. In the gamble of which players will hit the building jackpot by the end of the century, it would appear that all of the cards are in Bond's hand. How those cards are played is, of course, another question. But it does seem a marked deck.

Design Is a Big Performance

The implications of performance design is bigness. "Ask the question," says Bender, "not what kind of an apartment house but how people are going to live. When goals are stated in measurable terms rather than in an existing form, the disciplines that are involved are of a much wider range than found in today's practice. The people most successful in solving the problems are bigger and bigger companies. It may be that the way of dealing with things on an intuitive basis is not suited to this scale."

"Some of the most intelligent design," comments Peter Cook, "is now being done by organizations that have architects, programmers, engineers, surveyors, technicians, and the rest — all in one design organization. Here the synthesis is



SCSD ceiling and wall systems varied for adjustable school spaces. Ceiling modules are adjusted for multiuse classroom spaces.

possible while the concept is being evolved."

One of the larger firms now applying the systems approach, Daniel, Mann, Johnson & Mendenhall (DMJM), calls it a logical framework within which the various members of their team can evaluate the total problem and assemble conclusions to cover total requirements. Stanley M. Smith, DMJM vice-president, predicts a widening of architectural services. "In our next study, we are entertaining the possibility of adding a sociologist to the team." Eventually, they may even add an anthropologist.

Large organizations lend themselves naturally to the systems approach. Their business procedures are more highly industrialized. "In the large offices, the design thing is separate; they don't want the design to mess up the manufacturing operation," commented one architect. "In architectural practice, after five years the bulk of architects are acting as technicians; even in their own office they hire a young man to do the design," he continued.

If offices do not become large enough to include outside professional services for their expanded architectural services, they may become what Peter Cook describes as " . . . small outfits where the use of industrialization is still a last resort when the 'hand-made' is impossibly expensive, where people trained as 'all-round' architects grapple with amateur systems, amateur engineering, and amateur sociology."

Systematizing Performance Design

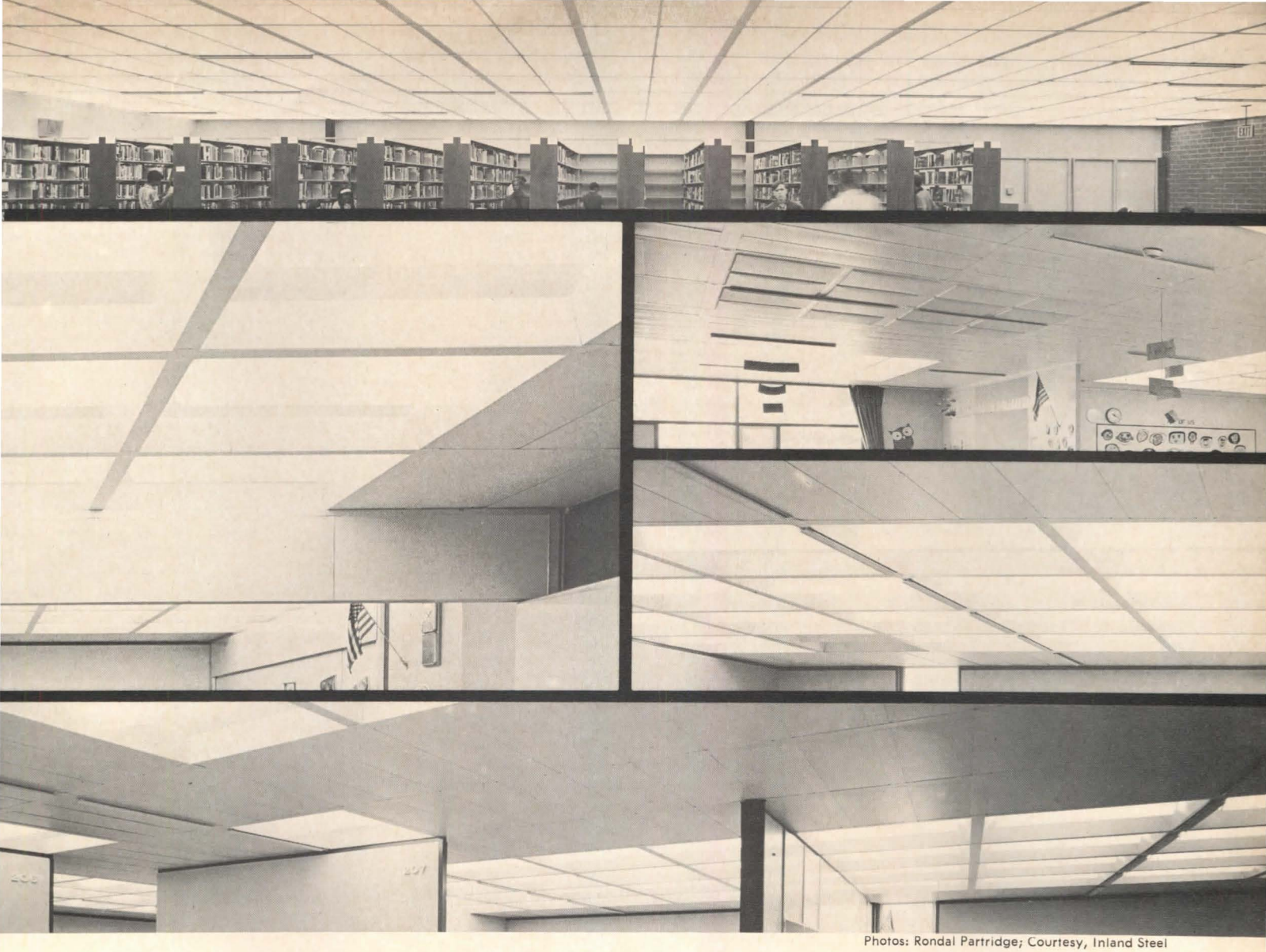
How much design freedom is there in using system building? Will the manufacturer make away with the designer's "pearl of great price?"

"There is an interesting thing about systems building," says Bender. "In Europe, there are half a dozen uniform systems that are used widely and the buildings look very different. In New York, every apartment building is designed from scratch, yet they all look alike. The reason for this is that, when you design from scratch, you have to reinvent the wall, which is a basic accomplishment for all time. You don't just do that on the side when you are making a building."

Joseph C. White of Inland Steel questions the quality of design freedom that ties the architect to the continual detailing of almost identical building components each time a building is erected: "Many consider this to be design freedom; but, if you think about it, is this freedom? It could be that, in this situation, the architect is just a prisoner of a chaotic society, having to create his own discipline in every building and trying to pull these uncoordinated, disorganized elements together.

"The architect has a very necessary preconception, traditionally, with design coordination," White continues. "This is what takes up the time, so much so that he doesn't have time to spend with his client on space planning. You may call that freedom, but I question just how much freedom that really is."

What White proposes to substitute for the architect's manipulation of uncoordinated products in a craft-oriented industry is most clearly shown in the example of the SCSD, how it worked and what the influences will be on performance design of this systems building.



Photos: Rondal Partridge; Courtesy, Inland Steel

Performance Design: The Manufacturer

The California SCSD program has thrown a strong light on the present practices of the profession and its readiness to adapt itself to systems thinking.

Jonathan King of the EFL says, "On the whole, architects do not seem equipped for systems. They can talk the language — everybody does; it's the argot of our age — but they do not think that way at all. It can almost be predicted by age whether an architect will be receptive to systems thinking or not.

"The strains on SCSD were mostly with traditional building and thinking," continues King.

In his experience through working with architects on the Inland Steel systems, Bud Breymann corroborated King's opinion. The smaller and younger architect knows that he must succeed on innovation. "He cannot show buildings he has done because he has usually not done any large impressive structures. These younger architects are usually very critical and examine very carefully. They then say an unequivocal yes or no."

White states the ground rules for working with systems. "First of all, and most essential, the architect has to understand and work within the systems discipline. He will see that he has a wide range of choice and still remain within the discipline of a well-designed system." He pointed out that design freedom is enhanced because the system is kept open, allowing continual cost analysis and redesign.

White feels that the system provides the architect with very valuable control tools, which he needs for both internal control of his own operations and external control of the whole job. Systems make it possible for the architect to use CPM and PERT, because the relations of one subsystem to another is known. "The system will allow the architect to know before he finishes design problems how long it will take to build the building and how much it will cost. In other words," says White, "it's possible for the architect to truly retain time and cost control."

Breymann pointed out that the architect is not dependent upon the general contractor's bid at the end of the job and the laborious reworking of drawings to reduce cost.

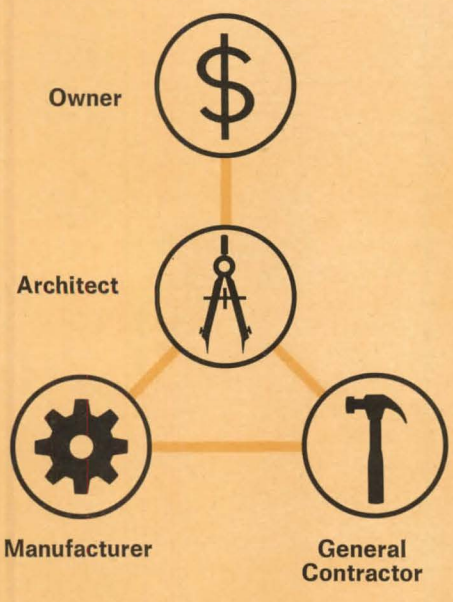
When the manufacturer is responsible for an entire operation, manufacture, transportation, and erection, he can guarantee cost within much more clearly defined limits than by the present piecemeal method of building. It is not only possible to guarantee costs but a constant feedback in relation to design change is possible.

"The manufacturer is no longer a vendor; he has to be involved from the beginning. This way, the architect can call upon the resources and the manufacturer to help him," assures White.

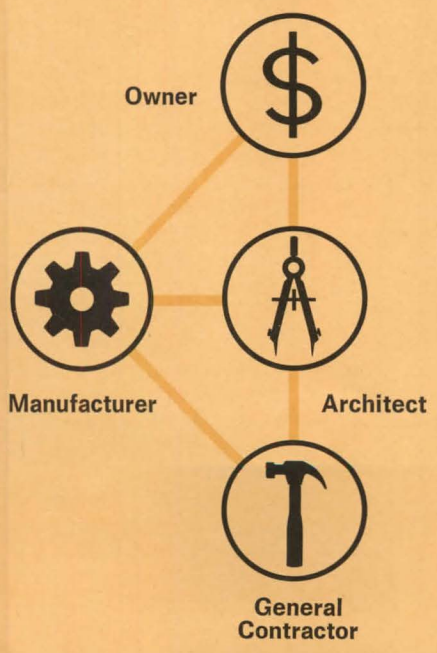
"He is forced to cut design time short because he has to spend so much time on working drawings. He doesn't have time to do what his client wants him to do — namely, control the process. To put it another way, a full set of working drawings means few schematics and no PERT.

"Because of the problem of working drawings and all of the rest, this uncoordinated process, the architect has had to turn over time and cost control of the project to the general contractor," said White.

A basic change in the profession from the application of systems building is the altered juxtaposition of the four principal members of the building team: client,



Systems building changes the manufacturer from a peripheral vendor to a direct participant of the design and building team.



architect, contractor, and manufacturer. The simple rearrangement of these four principals may alter completely the professional wardrobe of the architect. In some instances, he assumes the anonymous garb of one of a team, and in others dons the overalls of the manufacturer's helper.

"The main difference is performance instead of product," said King, speaking of SCSD. It is this kernel of difference that changes the manufacturer from a vendor of building products to a researcher, the erector, and even the maintainer of the building system. It is this change that may see the manufacturer as the architect, client, partner, and even employer instead of the vending salesman who is allowed to call at the architect's office between three and five on Thursday afternoons to see if he can have a draftsman detail his product into the plans.

Performance specifications transfer research, development, installation coordination, and maintenance from the architect's responsibility to the manufacturer. In short, the laborious tasks that comprise 80 to 90 per cent of the architect's time are put on other shoulders — shoulders that, some architects say, are better able to bear the burden than they are.

"The architect is freed of the cat-and-mouse game of costs," says Breymann. He is also freed from the great catch-all of "or equal." He does not have to police the contractor's substitutions, for which he is poorly equipped. Erection is no longer the race of who gets there first. Everyone has his spot; coordination is a manufacturer's responsibility rather than a contractor's headache and the architect's nightmare.

Goody sees the process taken a step further. With industrial capability, it should be possible to buy the completed structure from industry. He points to the massing of clients demonstrated in the SCSD program. "Industry will become involved in the end product," he says. "We tend to waste our prime thinking time on problems industry should have solved for us."

No one seems any readier to solve these problems than White. "Industry today is isolated from the market." It depends on other people to interpret needs for them, and he pointed as an example to Inland Steel, the largest manufacturer of roof decking in the world, which has no knowledge of where their products are used or how they function.

This means a tremendous waste of research talent. "The manufacturer is traditionally isolated from the market because of the product, material, and craft orientation of industry. Manufacturer contact with industry is minimal. We are condemned because we're not meeting the right needs and requirements, and we can't do that because we're not talking to the right people. There is no opportunity for us to discuss design plans at all."

Inland Steel was interested in SCSD because it was convinced that the owner's wants were being presented by someone who knew what the requirements were in a particular field. They decided to put forth the effort because the requirements were being presented and interpreted intelligently and the appeal was universal.

"If systems building is to be a success, the same team members would be involved — the owner, the architect, the manufacturer — but the role will change," says White. In the changed relationship, the owner will be talking directly to the manufacturer. "We don't know what these roles will be, but they will be somewhat different from what they are now."

White and several architects see a rearrangement of the architect's function into three distinct divisions. They say that there will be an architect who develops the system or program, the architect who uses the building systems components, and thirdly the architect who works on the manufacturer's team developing the system. We will then have as professional garments of the scientific systems analyst, the somewhat altered foulard of the traditional architect and the grease-stained overalls of the industrial design architect.

Performance Design: The Client

The architect is being pressed from both directions by systems building and the technology associated with them — from the bottom by the necessity of streamlining and making his practice more efficient, and from the top by client and Government.

"If the Federal Government is applying systems to their operations, and if the client whom the architect deals with is used to using a systems approach to solve his major problems, the architect will find that he is not communicating unless he can operate on the same basis. When the architect is called in to do a building for a large company, he will find that the company knows more about the building than he does," says Bender.

"Systems analysis is being pressed on the architect by a client who knows its value. If you did a building for Boeing, they will not put up with the approach of 'I have the feeling that this would work.' They are used to knowing exactly what the goals are and the implications of the decisions made."

Owners are more likely to be involved in systems than the architect. If the architect cannot talk a systems language, he may be left talking to himself, or an art dealer. The owner may use the systems analysis himself as a management tool to police the contract, and perhaps the ar-

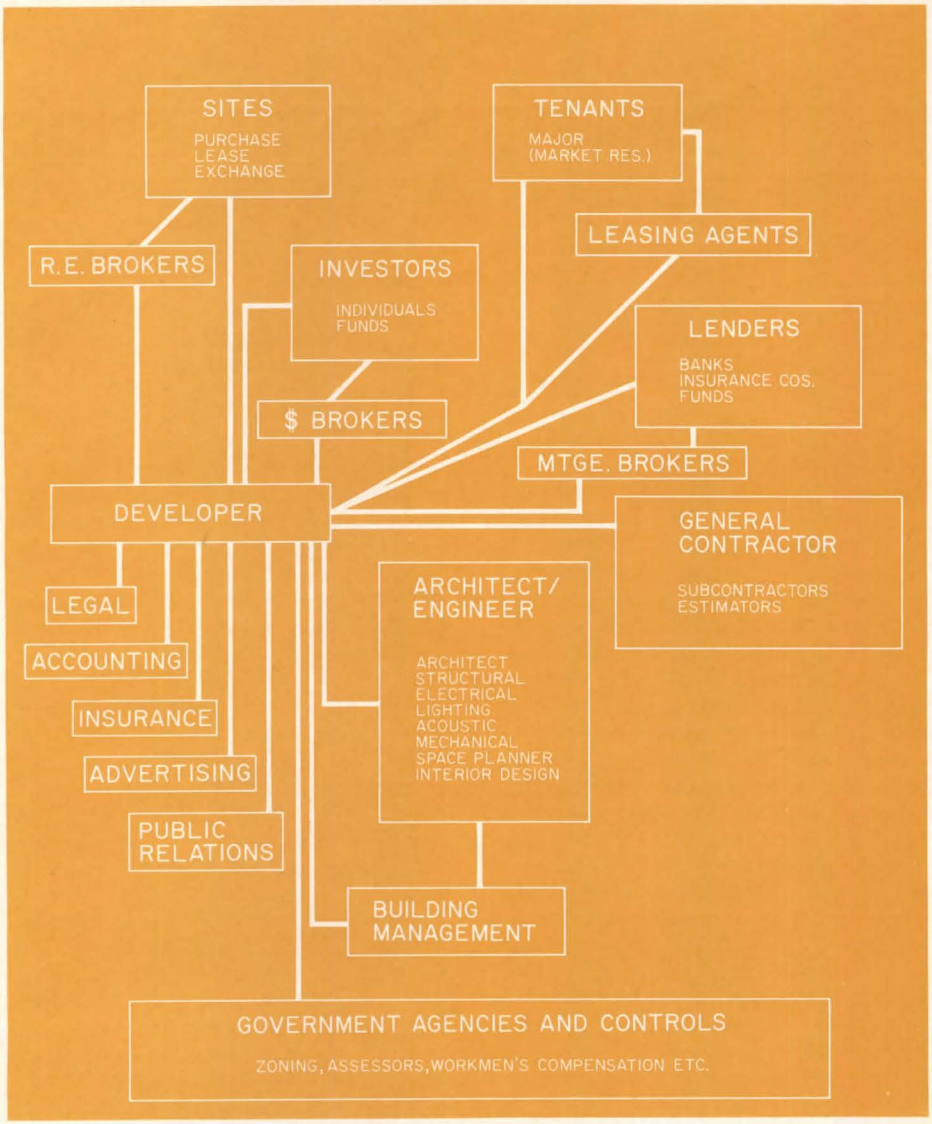


Chart prepared by Anthony Herrey, MIT property manager, to illustrate the extent that architects and engineers influence the development of a total building.

chitect and manufacturer as well. A dialogue is established by systems between the manufacturer and the owner. Such a dialogue is of benefit to the manufacturer, since he is trying to promote the use of his own system, thinks White. "The owner is normally the decision maker; but, in addition to this, the manufacturer suddenly realizes that this is the person who has the needs and requirements, and he should, therefore, be talking to him. Now he can bring the resources of industry to bear on the owner's problem directly. Major components may be purchased directly by the owner, where traditionally the general contractor was the purchasing agent."

The role of the manufacturer emerges from the SCSD as much stronger than it has ever been in traditional relationships. Bender tells of White recommending architects to prospective clients rather than having his products specified by the architect. One thing is certain — the manufacturer sees himself as part of the decision-making team. What this will mean for the future is as unpredictable as the difference in the role of the building team predicted by King.

What about the domination of the market by one manufacturer when he has perfected a building system? Changes will only be made if there is a good engineering reason for making them, said Breymann. The answer to this, thinks King, is competition between a number of building systems. It is necessary to broaden the field to allow architectural design choice.

Will Performance Eliminate the Architect's Function?

"I believe architecture should rightly focus primarily on product rather than process. We need competent architects committed to building," says Van der Ryn. "But we also need architects — call them systems analysts or programmers — whose job is defining the properties of new forms without necessarily preparing the construction documents."

"Systems presents a horrible threat to the profession as the profession is now constituted. The bulk of the profession is set to turn out working drawings, to act as agents, to overlook the client's supervision and costing. The present profession has very little to do with architecture. The implications are that the architect is released to spend more of his time on architecture, but there are few architects set to handle this," says Bender.

When the architect is divested of his traditional professional garments and has to compete like one of the boys, there is the possibility that he will be more subject to the determining forces of our economy than he is now cloaked in the robes of the artist. Robes that are all too often torn and worn threadbare against the hard surfaces of technology.

The influences on building are financing, real estate, and the entire entourage of architecture as a profitable profession.

If design supervision were decided by cost of building elements, the mechanical engineer might be the designer rather than the architect. In many structures, the mechanical systems are more costly than the architecture. This was true in the SCSD program.

The manufacturer is better equipped to research, develop, and install his own products. Factory-trained personnel are better equipped to erect manufactured building system components than the hand-trained craftsmen of the building trades. Large "owner builders," as the Tishman enterprises call themselves, say they are better equipped to oversee the design and erection of buildings and to carry out the client's needs, and they have said so, in a full section of the Sunday **New York Times.**

Where does this leave the architect? It may bring him to what he is originally trained to do and what many architects say he does best: the analysis of over-all human needs and space planning. He may indeed be freed to work on the larger canvas, as the building systems manufacturers and the owner-builders predict. The architect's fear is that he will have to assume the attire of the court jester or the court eunuch to do so.

Performance design is changing architectural practice rapidly. It is nothing like it used to be, but, then, it probably never was.

When the architect's traditional professional garments are removed, will there be nothing underneath, like the emperor's clothing, or are there enough foundation garments for him still to be decently attired?

the changing profession

Every profession likes to regard itself as composed of a body of men having such talents and skills as to be uniquely competent in some line of work. If possible, too, professional organizations like to convince the public that it "can't afford not" to use the services of their members — a doctrine that lawyers, say, or doctors have found the public generally willing to accept. Not so, architects; after all, one builds out of hope and one sees doctors and lawyers out of fear, prudence, or caution, and it is perhaps these latter states of mind that impel people most readily to pay the professional's fee. If a man needs medication, he will probably go to an M.D., although osteopaths, naturopaths, and chiropractors have their followings, and some persons put most of their faith in patent medicines. If a man has a legal problem, he will pay generously the person who can help him escape that particular nightmare. If a man needs a building, however, he may very well go to a builder or an engineering firm for it. The professionally presented image of an architect is that of an artist in building who is at the same time an all-round "practical man" — a person who analyzes his client's needs with care and sensitivity, who draws up a design in which every space and every solid, every bolt and every stud has its considered shape, size, and location, who sees the design through to realization on the site, and who finally turns over to the gratified client a building that is handsome, solid, convenient, and not unduly expensive. True, the architect has his consultants for a job of any considerable size, but these are like extensions of himself; ultimately, it is he (or his office, at least) that draws up the plans, working drawings, and specifications. The advantages he claims over his professional rivals — the builder and the engineer — are that he is an artist and they are not, and that his humanistic training has given him a unique competence in sensing the subtle ways in which true excellence can be brought to what is built. A fine self-image, this, in spite of which the very great majority of jobs the architect might be getting go to the engineers or builders. There are historical reasons for this, of course. The architect of today has evolved from two types of people, the talented amateur or versatile artist type, who might or might not know much about building, and the builder, a practical man who could work up tasteful designs out of his architectural manuals but whose first, and real, love was the bricks and boards. The architect, a designer who made money but did not build, was something of an anomaly, coming under suspicion of being rather contemptuous of practical considerations and rather inclined toward the entertainment of lofty ambitions at other people's expense. He has therefore been regarded as a person to call in when considerations of strongly individual taste, elegance, prestige, civic amenity, or the like seem to justify extra expense and perhaps a certain lack of convenience. A part of his potential market has doubtless been siphoned off by the readiness of builders and engineering firms to supply facings, applied ornamentation, and other arbitrary visual modifications of their constructions as an "architectural service."

The Anti-Albertian Architect

"Worse" is to come. As we have seen, the planned and constructed environment is coming to be thought of in a new way, for a new kind of client, and new methods of realizing it are being worked on. The boast of the systems analyst, who may come to rival the architect, is that he is a professional reasoner, a "generalist" able to deal intelligently with problems in any discipline in which precise data are wholly subject to known laws. That is not to say that he is prepared to act as a specialist in biology, say, or mechanics; that is not his job. His job, rather, is to be well-rounded in the realm of the wholly objective, so that if a given system requires for its proper devising information from both the biologist and the mechanical engineer, he will be able to absorb such information and put it to the best use. The architect, of course, is supposed to be a generalist of sorts, too, intelligent about structure, materials, lighting, acoustics, law, constructional methods, and so on, in much the same way, **and** be an artist **and** a sensitive interpreter of those mushy areas of human experience that are labeled "psychological." The trouble is that even though the architect should indeed be all these things, it may not be enough, because they are centered too narrowly upon the production of a physical environment, which, under the new philosophy of "performance design," will become only one possible solution of the essential problem.

The introduction of a new requirement into an existing system may lead to the provision of new space and shelter to house the fulfillment of the requirement, or it may not; the question of what exactly is wanted is to be pursued exhaustively before the question of means is considered. If it is decided that some special environment is needed, then the process of determining the location and form of this environment will be the responsibility not only of the person or persons who make the plans, determine the structural system, order the furnishings, and function generally as the "architect," but also of specialists who will work as a coordinated team with the architect to anticipate the consequences of the formation of the environment in various ways, thus creating the design substantially by the negative process of eliminating what is redundant or inadequate or pernicious. In the broadest sense, the "design" will be the plan, or strategy, of the "system" desired, and the building, community, or other tangible result of the specific determination of a system will be a means to the end of the system. Implicit in this new situation is what might be called an anti-Albertian principle. Alberti, you remember, declared that a good work of architecture could not be added to nor subtracted from, except for the worse. The building that meets the need of a system will be liable to frequent alteration and, eventually, to scrapping — hopefully, all for the best. Let

us attempt to illustrate the role anticipated for the architect by a musical analogy. If the present-day architect conceives of himself as a Chopin, a composer and soloist, or as a Mahler, a composer and a conductor, realizing in the here and now a composition that will also belong to the permanent lore of the art, he will in the future be a little like a jazz musician, working with other performers under a strong basic discipline, often subordinated but having his own solos, his own opportunity to c r e a t e something. What he creates, however, will be ephemeral, and the jazz itself will be very cool. One other matter, for which no musical analogy exists, because the realm of the subjective is abandoned: the advent of "feedback" as a subject of architectural concern. The architect will be expected to examine his work after it has been in use a while in order to assess the quality of its performance. Many of the industrially-oriented persons interviewed deplored specifically this lapse of the present-day architect from the standard procedure, to which they were accustomed, of seeing just how well something works in order to make adjustments and, more importantly, to become wiser through an understanding of just what, if anything, went wrong. Dr. Russell Ackoff, Director of the Management Sciences Center at the Wharton School of Business at the University of Pennsylvania (and formerly an architect himself), told P/A: "The simple fact is that in most architecture, the possibility of error is never contemplated by an architect. He designs the building so that it is there, and it's there for all time, and it frequently costs more to modify the building than it does to construct it originally. I don't think architects generally know what the costs of modifying are. In every building [designed by an ordinary architect today] is incorporated a set of assumptions that the architect made about the way that people behave in an environment. These assumptions are never made explicit, nor is there a systematic effort made to find out whether the building did what the architect thought it was going to do. Currently there is virtually no feedback, so that we have a marvelous way of perpetuating our previous errors." The architect's clients will come increasingly to be large businesses and governmental agencies, themselves becoming converts to the precise, skeptical, and synthetic philosophy of the systems analysis/operations research methodology, and these clients will demand that their architectural collaborators have this same philosophy and methodology.

The Systems Philosophy and the Architect

The architectural profession has been served notice of what is to happen, and some architects and architectural educators have revised their former ways of thinking. The AIA book, **Emerging Techniques of Architectural Practice,** summarizes nine "techniques and technologies," which, though not presented with any assumption of a fundamental change in the nature of the being we call an architect, are consistent with the new methodology of the architect's clients; this is true especially of the first five, which affect directly the envisionment of the design and the spending of the client's money. Last year's Boston Architectural Center Conference was an occasion for serious discourse between architects and informed nonarchitects on the obligations, threats, and opportunities that await the profession. The "proceedings," published under the title of **Forces Shaping the Role of the Architect,** are of the highest interest, and deserve to be widely known.

We have solicited the opinions of a number of informed persons, architects and others, as to how the systems approach will change the nature of architecture and the role of the architect. Herbert H. Swinburne, an architect and the AIA committee chairman under whom **Emerging Techniques** was produced, comments, "Systems theory will have swift, profound impact on the profession in all its activities of program, design, production, and construction." He offers the opinion that "the systems concept is nothing more than formalized common sense tied to new tools and management methods."

C. Theodore Larson, Professor of Architecture at Michigan State University, anticipates a new, universal, more "etherealized" concept of architecture: "The systems approach involves nothing more than what architects have always meant when they have talked about 'comprehensive design integration.' The key question is, how comprehensive should be the particular design integration? [In Larson's opinion, very comprehensive.] Any building, as an integrated system in itself, becomes a subsystem with respect to the neighborhood or town so as to produce a hierarchy of systems, ranging from the smallest to the very largest units of design. All can be classified under the heading of 'architecture.' The computer is the one white hope we have for being able to cope with all the many design complexities that are coming out of this Pandora's box which has been opened by the systems approach in architecture. The aerospace industry has had a relatively simple task. The design problems posed by the concept of environmental control for the benefit of man and society have no ultimate limits in time and space. Architecture, in this concept, becomes an ever-changing, ever-expanding d e s i g n continuum."

The Building and the Total System

Sim Van der Ryn, Professor of Architecture at the College of Environmental Design at Berkeley, emphasizes the new attitude that the decision to build will be a

single act in a continuous process that includes both the analysis and statement of a want and the statement of the solution: "Buildings get built because somebody decides that a particular type of physical facility is required to meet a particular social condition or s o c i a l objective. [Given such an objective,] **what** kind of a physical system (perhaps a building) can best implement the objective?" Professor Van der Ryn cites the example of public buildings, such as libraries, hospitals, and prisons, which are likely to take on radically new forms as the systems for which they are designed are altered. The problem of designing such new buildings is based upon that part of the performance of the library, medical, or correctional system evolved that requires a specific kind of place to house it. "Systems analysis in architecture," he goes on to say, "begins where social and human problems interact with the institutions and building forms that have been devised to meet these problems. We need competent architects committed to building. But we also need architects — call them systems analysts or programmers — whose job is defining the properties of new forms without necessarily preparing the construction documents. I consider myself part of this latter group."

Education, of course, must adapt itself to the need for a new type of architect. Jerzy Soltan, chairman of the Department of Architecture in the Harvard Graduate School of Design, emphasizes the general importance of "thinking techniques" for designers and others, especially in situations requiring cooperative effort. Charles Burchard, Dean of Architecture at Virginia Polytechnic Institute, whose new method of teaching was outlined in "Revolution in Architectural Education," MARCH 1967 P/A, tells us that he is attempting to meet "the need, as we see it, for architects and environment designers to function across a considerably broader range of scales and in a variety of different levels than the customarily considered domain of the 'conventional' architect. [The present] level of involvement does not appear enough if we are to become influential in the forming of environments. For this, we must reach into new areas and influence a volume of building construction greater by 300 to 400 per cent than now. Part of this involvement must inevitably include systems analysis and a systems approach to environmental design." In a paper prepared for the **AIA Journal,** Dean Burchard describes the program studies being evolved at VPI, whose emphasis is on "environmental design" rather than simply upon the design of buildings, on the consideration by the student of all the factors that may affect the environment under study, and on giving the student the responsibility for finding the expert help he needs (and he has the right to call upon any member of the VPI faculty for advice) in order to solve the problem as a totality. One interesting aspect of this program is that the specific content of the curriculum is adaptable to the attitudes of the students toward various methods of solving their problems, as such attitudes become evident. Explaining the reasons for his educational m e t h o d, Burchard says, "Prevalent curricula in architecture lack the dynamism demanded by a fast-changing technological society. [Architects'] capacity to perform is not only limited by an incomplete understanding of the operational characteristics of the environment as a design system, which is, after all, not surprising in this state of the art, but perhaps more immediately by the role of 'problem solvers' that we accept. We will need a new generation of environment designers who understand the importance of concept as a general intellectual activity of social involvement, [trained by means of] situations in which they discover the importance of their particular sets of abilities in the resolution of the problems of contemporary settlements; in which they may establish their contributory interrelationship with other disciplines."

A New Type of Creativity

In the future, then, the architectural profession will be under pressure to abandon many of its present individualistic attitudes; it will be expected to provide a service coordinated with other services, for the benefit of the state, of business, or, hopefully, of society; it will be expanded conceptually into the design of environments, rather than just buildings, the emphasis being not upon the adaptation of a fixed set of architectural forms or building technologies to the needs of the environments, but rather on the evolution of precisely those forms and technologies that will best serve the carefully stated purposes that a certain environment is to fulfill. The architect as a master planner will disappear, because the plan itself will be for a system to which the physical environment will be an accessory, and will thus be essentially a statement of procedures to be followed by many kinds of persons, one of whom will be the architect. The architect's plan, with the structure realized from it, will therefore be simply the most inert and tangible manifestation of the general system plan. Some architects may not be reluctant to admit that they do not know absolutely everything, on their own, about the way a building should be laid out, or that they cannot guarantee that a plan of their devising is the perfect solution to a need. After all, architects have consultants even today without being ashamed of a lapse in their expertise. What **will** worry many architects is, first of all, that in a project that results in a building, they may have a smaller share of the glory than before, and, secondly, that the creativity of building design may be lost. To the first worry there is little consolation to offer, but this is the lesser worry by a great deal. To the question of creativity, the comments offered by our correspondents are unspecific but reassuring. Many believe that the opportunities for creative design will actually be increased, once the problem-solving methodology of the new environmental design is fully worked out and adopted. "Design," as used here, means more, however, than the devising of elevations and details; it suggests, rather, the intensive consideration of the provision of good environments in particular cases, visible order and beauty being among the qualities that such environments should have. This sort of creative opportunity here is one that could elevate the architect from a designer of aesthetically attractive buildings not inconsistent with the explicit, preconceived wishes of a client to an architect somewhat of the sort that we have in mind when we talk of The Architect of the Universe, or of a politician as being the architect of a national constitution — that is, a being whose concern with something new is primarily that of giving it formal order, starting from the moment when the analysis of its nature and objectives is undertaken. Dr. Ackoff told us: "If the architect continues to do what he does now, then he **is** threatened. However, if he is able to reconceive the role and nature of architecture, then this offers him the opportunity to make architecture a lot more important as a social institution than it is now. He can be dealing with a whole system of which a building is just a part. He can start to raise and concern himself with questions a lot more important and exciting than those he currently engages himself with in the design of a building. If the problem is a school, he becomes a member of a complex interdisciplinary enterprise designed to produce a better school, not a better school building, but a better school. And that will involve a better building, better teaching, better students, everything, rather than keeping this thing off to one side as something that is done after all the other important problems have been solved."

The architect, then, is offered both less and more in the way of creativity than he now enjoys. If he loves to detail, to specify special materials and finishes, then he may be frustrated. If, however, he loves to plan, to think problems through, he will be more at home in a "systems" or performance-design world than he is at present, since industrialization and the computer will have taken most of the time-consuming drudgery out of the business of being an architect.

the changing aesthetic

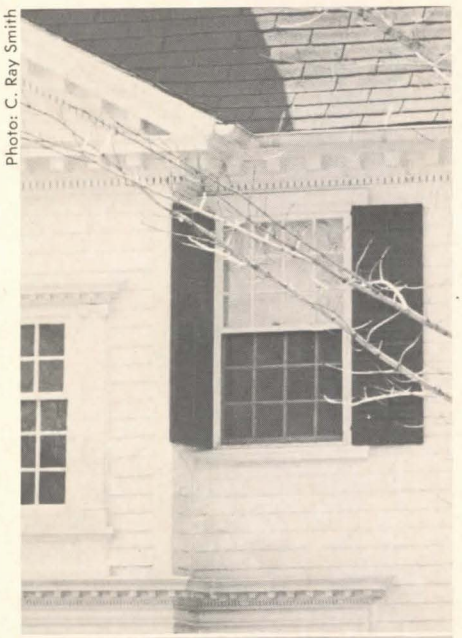


Photo: C. Ray Smith

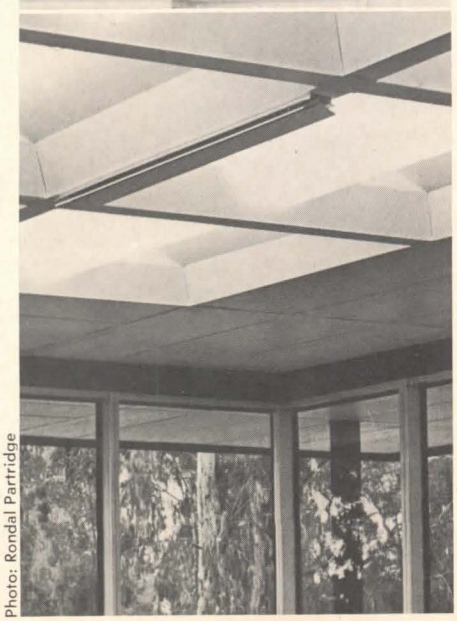


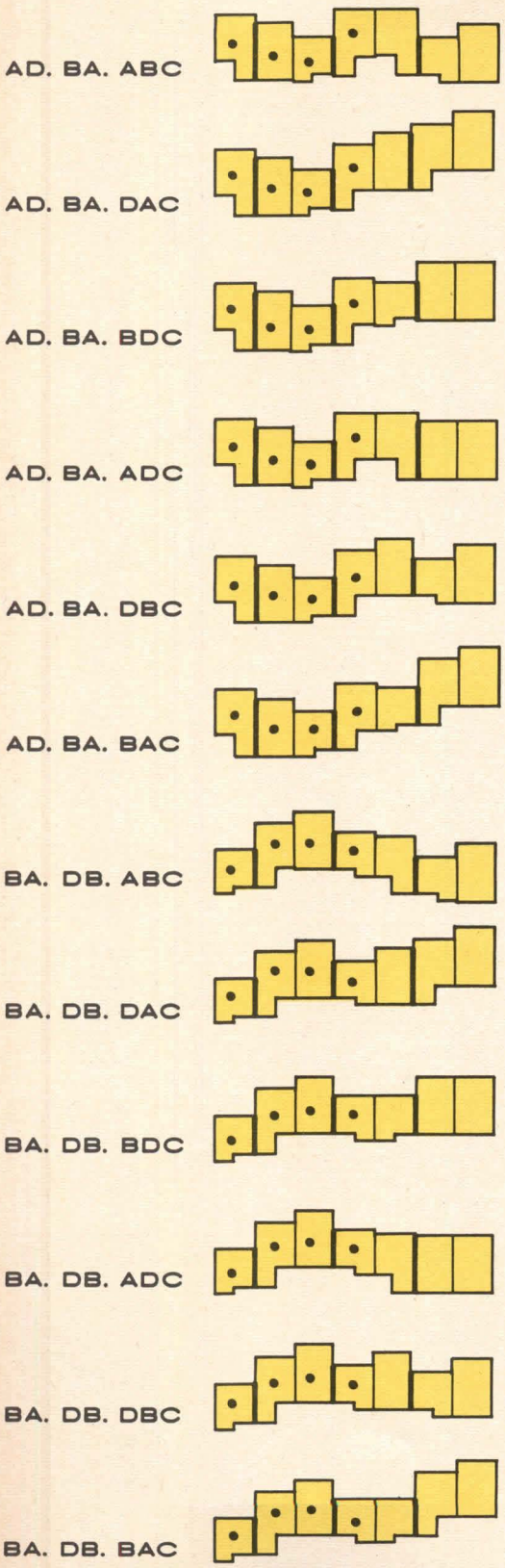
Photo: Rondal Partridge

The architect, the client, the philosophy of planning, and the technology of building are all destined for change. Obviously, the physical environment will be affected in its turn, and will have a more or less new look and feel.

The architectural/environmental aesthetic is conventionally regarded as something derived from the resources of visual art: scale, proportion, space, volume, form, color, texture, and so on. To these abstract values we may add, as further visual resources, symbolic or associative ones: traditional details like the white marble steps of Baltimore; things expressly symbolical, such as allegorical statues or crosses. Each person, however, brings to what he sees his own tastes, his own set of associations, and his own iconography. Furthermore, his emotional relationship to his environment — the "aesthetic" that the environment has for him — derives mostly from circumstances and events that the visual arts have nothing to do with. As the man-made environment becomes more closely controlled by plans that are devised to meet the needs established by surveys, the chance to do well — or badly — by the person who inhabits the environment will increase. One way of looking at a comprehensive, detailed plan for an environment is to realize that you cannot escape the specific provisions of the plan unless you quit the environment; and that, in time, is likely to be impossible this side of the grave. For this reason, it is important to all of us that what is planned and constructed and devised not simply fulfill the textbook requirements made in the name of health, safety, the creature comforts, and "psychological" factors, but that it allow some element of the theoretically superfluous, the uncalculated and the irrational, wherein the unexpected can occur and the spontaneous be perpetrated. We shall presently have a glance at the "humanists," who are worried about science-oriented planning, fearing, at the very least, that something subtle but essential to human well-being will slip through the meshes, however fine, of accumulated data. It is a possibility. The psychologist and the sociologist, in their researches, can weave a fine net that will hold many of the things that the makers of environments should know about human beings, but the architect, or whoever draws the actual plans, will have an opportunity to perfect the environment if he brings a quality of imaginative rationalism to his work. The "architectural" aesthetic, the traditional creative field of building design, can be expanded conceptually into an aesthetic of the good experience of the environment, if someone such as the architect wishes it strongly enough.

The Look of the Building

"Performance design," in practice, means design related to the resources of industry. Of the various specific proposals for megastructures, trailer-like dwellings that can be moved by helicopter at will, undersea communities, communities on structures rising from the sea, nothing specific can be said; there are too many of them, and most are likely to be blind alleys. Also, it seems unlikely that the architect, as opposed to the industrial designer or the interior decorator, would have very much of a creative opportunity with such tightly engineered constructions, with the exception of some of the megastructure proposals. The more conservative advocates of performance design envision a building technology employing standard, factory-made major building components, to be assembled into individual buildings by architects as they choose. These components would be so proportioned and detailed that a large



Possible seven-house combinations for the Île des Soeurs development. Standard house plans A, B, and D are used with elements distributed either from left to right or from right to left (see use of plan B in the upper row). Plan C is used only at the end of a row. Arrangements marked R are rejected because of undesirable repetition of *plan types.*

number of combinations would be possible. Some choice among a number of
R standard finishes and trims would probably be offered. At best guess, the components would be faced with metal or plastic, or possibly made of precast concrete. If a component-assembled building would provide nothing specific to look at — no carving, no inlay — it would be no worse off than most modern buildings in that respect, and would hardly fall short of our expectations. After all, there are very few buildings that have, through their functions, any special claim on the attention of the public, and the best aim of the obscure majority is inoffensive good taste. Perhaps the greatest aesthetic shortcoming that may be anticipated for the com-
R monplace component-assembled building, externally viewed, is the absence of texture; the sleek industrial finishes may never be as interesting as wooden siding or masonry. As to the interiors, they will have such architectural beauty as can be provided by well-proportioned spaces, readily adaptable to the changing needs of the occupants in combinations always harmonious through modular repetition. To
R the factory-produced, architect-assembled shell will be added furnishings, decorations, possibly also craft-assembled structural additions — the expedients that people have always used to purge shelter of anonymity.

The Look of the Street

Predictions as to the aesthetic of the community as a whole had better remain fairly abstract. We may assume that megalopolis, land-hungry with an increasing population, will abandon free-standing homes,
R stores, factories, and so on, as too extravagant, in favor of combination with other such places either in building complexes or in multistory structures, and that most of these unified constructions will be assembled from components. A street or a city, then, will "read" to the passer-through as a slightly differentiated continuum, having a variety-in-unity created by the repetition of identical modules with variation of specific forms in a series of
R planar and prismatic constructions. To the person who sees the street or city over a number of years, the sense of variety will be enhanced in a peculiar way, as individual structures are scrapped or take on
R new forms (as the components readily permit), in order to meet the changing demands of old tenants or the novel demands of new ones. Monuments — ceremonial buildings, historically valuable ones — may be the only buildings to be preserved in much the same form over generations, and thus become the community's only tangible reminder of even the fairly recent past.

Stanley Tigerman, a Chicago architect, has worked out a plan arrangement for the Île des Soeurs development at Montreal that suggest a way in which a residential neighborhood using a building system may be designed. His problem was to provide standard architectural plans for row houses that could be used over and over again, but to provide ways of combining them so as to give the illusion that no one house was duplicated. To do this he developed three plans, which could also be repeated as mirror images, along with a fourth plan for a house to be entered from the end of the house row rather than the front. Some of the façades were joggled, and the depths of the house types were varied. Tigerman then worked out mathematically the possible combinations of house plans that would avoid the conspicuous repetition of any one plan, and drew up patterns for the alignment of the houses that would take advantage of the joggled fronts and the unequal depths to give a joggled effect along both fronts of each row, thereby giving each householder some sense of living in an individually designed house. This, it should be noted, was a planning, as opposed to a building, system; the houses were to have traditional sloping roofs, and to be assembled by traditional methods. It would not, however, be difficult to work out a similar set of combinations for standard building components to vary the elevations of a block front — with or without joggling the facades.

The "Systems" Approach and the Aesthetic

Architects and others who have adopted the systems philosophy are convinced that the architect as a visual artist is not going to suffer in the new roles assigned to him.

P/A asked a number of architects, deans of architecture, systems analysts, and others concerned in some way with architecture, planning, and building to comment on the aesthetic of the man-made environment to come and on the opportunities for the architect.

C. Theodore Larson, Professor of Architecture at the University of Michigan, feels that aesthetic problems can be integrated into a performance-design program: "The systems approach cannot be limited to just a consideration of physical forms or things. If people are introduced into the design problem, then we must also reckon with all their cultural differences as expressed in different goals and aspirations, national as well as individual. Why shouldn't beauty, as a conceptual system itself, be treated and analyzed as something that affects the design of a building and all its subsystems and sub-subsystems? Beauty has to be related to

performance as well as to form, and the higher the level of design integration the more important and also the more difficult seems to be the measurement of performance. If the building is to be evaluated according to an aesthetic of performance, then a more sophisticated kind of measurement is needed. Some 15 years or so ago, I recall being a participant in a panel discussion by school architects as to what constitutes a beautiful schoolhouse. The panel wound up with a consensus that a beautiful schoolhouse is one that makes beautiful schooling possible. I believe systems analysis offers a fruitful technique for the measurement of a more dynamic, more humanistic, and more beautiful kind of architecture."

Russell Ackoff, an architect and presently Director of the Management Sciences Center at the Wharton School of Business, University of Pennsylvania, feels that, "In time, science will come around to trying to produce an understanding of what, currently, is referred to vaguely as the aesthetic response. I don't think this is going to kill creativity at all, which is one of the great fears of the artist — that once we understand what makes people react favorably to form, color, and so on, it is going to destroy the role of the artist. This is as ridiculous as saying that being able to express the relationships in the solar system mathematically has removed either the creativeness of astronomy or the wonder of the solar system. On the contrary, our appreciation and our ability to respond to the solar system aesthetically is tremendously enhanced by our ability to quantify the relationships [that exist]. The gradual penetration of scientific research into every aspect of human activity is inevitable. It's happening. This doesn't mean the take-over of science; it simply means the **involvement** of science in every activity."

Concerning the sensitive problem of the individual house, Dr. Ackoff comments: "The manufactured shelter will provide considerably more opportunities for individualized homes than is currently available for low- and middle-cost housing. The designs I have seen make it possible for every house in a neighborhood to be different in external appearance or internal layout. Furthermore, they are easily subject to change externally or internally after occupancy. They can vary in shape, materials, and colors. There is, of course, a consistency in general concept. It will be possible for buyers to design their homes in advance by use of modularized scale models so that they can see exactly what they are buying. Competition between manufacturers will produce a varied set of styles and produce a better aesthetic, in my opinion, than current practices do."

Knud Lŏngberg-Holm, formerly editor with **Architectural Record,** agrees, with reservations: "Intelligently a p p l i ed [to architectural problems], systems analysis is a productive extension of the design process that should lead to a better environment. [However,] without imagination, it might lead to a bureaucratic nightmare of supra-design organization."

Paul Schweikher, an architect and Head of the Department of Architecture, Carnegie Tech, also agrees: "[The constructional techniques anticipated for the future are] in no way a loss to the architect or to architecture; the architect, the artist, is still needed as the creative, dominant, coordinating force. It is apparent that the scope and scale of architecture will expand to new dimensions. Specific individual buildings may give way to building complexes bigger than towns but they will have his pleasure, his delight, from beginning to end. The kind and size of the units need not frighten him. He has learned to use new tools. We will learn to see and care about new forms. Summing up, there is every reason to believe that [in the future] the general level of creative productivity will increase both qualitatively and quantitatively and that the specially gifted will be even more productive and creative, while the general level of significant design will come up."

"Humanist" Misgivings

Not everyone is so optimistic. There are persons, whom we may, for the sake of an epithet, label the "humanists," who have grave misgivings about the implications of performance design, about intervention in every aspect of the environment of scientifically-oriented, rationalistic planning. Perhaps the commonest objections they raise are these: that analytical methods of assessing human needs can never be as subtle as intuition and sympathy; that the persons who will use these analytical methods may have neither the breadth of imagination nor the basic good will to use them for the true good of the citizen; that the more comprehensive the plan, the m o r e universal the consequences of any mistakes; and that it lessens the dignity of a person to have a higher authority determine his needs, including those irrational, messy, thus far private and personal ones labeled (perhaps with latent contempt) "psychological." These observations of Lewis Mumford's t y p i f y the "humanist" attitude: "There is no reason for architects to be overawed by computerized thinking and systems-analysis techniques. The very qualities that make these methods so efficient in designing rockets, space satellites, and similar instruments or weapons, cripples them for more humane uses. Systems analysis cannot handle organic or human complexities without eliminating precisely those very qualities that make them organic or human. For all their glib talk about feedback, the exponents of systems analysis seem incapable of recognizing any feedback that would call into question the method they are so fanatically propagating. With every further extension of this compulsive technology, whose chief human aim is to provide profit, prestige, and power to those who work the system, the area of irrationality, perversity, and crime [among those who react negatively to the environment created by the technology] continues to grow. To be persistently blind to the meaning of this situation is almost an indispensable qualification for becoming a favored member of the military-scientific-industrial elite. Current high-rise housing developments already demonstrate how inhumane even a half-baked system of mechanization can be. What prevents decent houses from being built is not old-fashioned m e t h o d s of designing and building, but the rejection of any method that does not p r o v i d e the maximum amount of profit and the maximum amount of bureaucratic organization to insure conformity. [Systems analysis and what it represents is] rapidly threatening to destroy the natural environment, the continuity of historic institutions, and the balance of mankind."

P/A disagrees that systems analysis — or p e r f o r m a n c e design, as we have chosen to call the architectural design approach based upon it — is hostile to human values. It is true, however, that a computer or an analytical technique is indifferent to values, unless these values are written into the terms of the program or the givens of the problem. The measurers and calculators — the industrialists, scientists, and administrators — must, h o w e v e r, work with the observers and the creators —architects, psychologists, sociologists, and others — to see that the human environment is a good one, even beyond the provision of adequate shelter and creature comforts. What is needed is a fine combination of objectivity and imagination, even of inspiration: an informed flair for taking data, cold, inert data, and finding the possibilities in them of live solutions. As was noted at the beginning of this chapter, the aesthetic of a home or a street or a city is more than a matter of architectural composition. Every man's home and every man's community is different from those of every other man; his unique experiences and his individual personality insure this. The way that rooms join to rooms, however, and streets to streets, can help his daily experiences of his world to be good ones, and no one should *know that better* than the architect. It is for the architect, then, to understand what is happening and prepare himself to take part in it.

the unchanging building industry

The management sciences, operations research, and systems analysis are technological tools, and, as Arthur C. Clarke observed at the technology session of the recent AIA convention, the obstacles to vastly improved transportation, community planning, and environmental design are not technological. They are political and economic.

Operations research and systems analysis require a hospitable climate in which to flourish. OR germinated in the fertile soil of the World War II military establishment. Here, conditions were ideal — a monolithic organization engaged in an undertaking of unprecedented magnitude whose long-term objective was never in doubt. Ranking military commanders may plan on a broad scale; when plan becomes action, the commander does not feel obliged to convince those who will execute the plan of the wisdom of his decisions, relying instead upon a disciplinary machine that is as swift as it is sure.

In its shift from military to civilian applications, operations research has gravitated toward industries where conditions are parallel if not the same — the petroleum industry, for example. Here, a few immense corporations have full control of a product from its initial discovery at the God-forsaken corners of the earth to its final point of sale at the corner of the block. These and all the intermediate steps — production, refining, and distribution — are under the direction of an executive group with near-absolute authority. Like the military, a vertically integrated industry has both opportunity for long-range planning and the executive capability to execute its plans.

The conditions that now prevail in the building industry, of which architecture is just a part, could hardly be further from those in either the military or the monolithic corporate giants. In fact, there is no separate, distinct building industry; buildings are put in place by a loosely coordinated group of speculators, money lenders, manufacturers, contractors, subcontractors, and, occasionally, professional designers.

If large-scale, well-integrated operations, coupled with commensurately broad executive authority, are prerequisites to meaningful systems analysis, as the historical development of the profession would suggest, then the building industry is not ready for the systems analyst. (Conversely, the industrial giants — the success of their systems-analysis solutions to the problems of space, aeronautics, and armaments notwithstanding — may nevertheless not yet be ready to cope with the peculiar politics that characterizes the industry they seek to invade.)

What Role for the Government?

If size and authority are essentials that must be embodied in whatever organization undertakes to apply systems analysis to architectural planning and design, then the Federal Government might seem a logical candidate to assume this role. Indeed, one objective of a systems analysis project that the National Bureau of Standards has embarked upon on behalf of the General Services Administration is, to quote a member of the building systems team that is doing the work, "to advance the state of the art of building technology." But even if that objective is realized, it will be a secondary, almost unavoidable, consequence of the primary objective, which is to develop general performance specifications for Federal Government office buildings. Congress, responding to the loudest if not the wisest voices within the building industry, has specifically declined to appropriate Federal funds for the general purpose of advancing the state of the art of building technology.

A look at some fairly recent history illustrates this. About four years ago, the U.S. Department of Commerce conceived a program that would accelerate the development of new technology in civilian industries. The program was inspired by the belief of the then-reigning Presidential science advisors that civilian industries were being technologically shortchanged by comparison with space and defense industries, into which a substantial fraction of the national budget was flushed each year.

As a timid beginning to the program, the department sought a modest appropriation — something under $1 million — that would be applied to research in three industries judged to be particularly disadvantaged: textiles, machine tools, and building. Representatives of the textile and machine-tool industries accepted their new role as beneficiaries of Federally aided research with good grace, both then being sorely troubled by competition from abroad.

But the reaction of the building industry's Washington lobby was both violent and effective.

- Federal Government involvement in building research would upset the delicate balance of the free-enterprise system.
- It would contribute to the growth of an already bloated Federal bureaucracy.
- Who said the building industry was technologically backward, anyway?

So ran the arguments.

By the time the request for funds came before the appropriations committee, enough dissenters had been aroused to insure that the entire program intended to advance the technology of civilian industries was dropped.

Beneath the ostensible arguments advanced to defeat the measure lay the understandable desire of established building product manufacturers to maintain the status quo; they saw no reason to lend their support to Federally aided research that might lead to the development of products that could displace their own.

Too Many Commissions

When questioned about the feasibility of designing whole cities by systems analysis, one professional operations researcher told P/A:

"First of all, the city is the wrong unit

to analyze. The region is the appropriate unit, and there is no central government for a whole region. Currently, the nature of the political beast is such that many different plans are under way, for different agencies that are in control of different parts of the community. One of the real shortcomings of present public planning is this decentralization of authority.

"The Ford Foundation sponsored a study of the Cleveland area, called the Metro Study. The study sought to identify areas in which to economize in the conduct of public government in the Cleveland area, which embodies some 60-odd separate governmental bodies. It showed the tremendous cost to the public of maintaining 40 to 50 different water systems, school districts, and police departments. James Norton, the political scienist who headed the study, offered an extensive list of recommendations, of which only a very few were enacted — I believe the zoo was made a county activity instead of a city one, for example.

"Given the choice of either modifying the structure of metropolitan area governments and planning with relatively simple, traditional methods, or using the best available planning tools within the existing governmental structure, I suspect the first alternative would be the better. But, the current political structure protects principles, values, and vested interests that politicians are not yet willing to give up."

Business Can Bungle

Despite the optimism currently voiced by spokesmen for big corporations about their ability to design, fabricate, and erect whole communities, recent history evidences more failures than successes among corporate attempts to penetrate the building market, even on the much less ambitious level of single-family houses and individual building components. Major chemical manufacturers, aluminum and steel producers, and an asbestos-cement supplier have all been hurt in unsuccessful land-development and construction projects.

One aircraft maker, caught with an idle plant during a dip in defense spending, sought to take up the slack by producing a metal curtain wall system. The metalworking technology necessary to produce the components was child's play by comparison with the plant's aircraft component capability; To management, the transition seemed logical and likely to be profitable.

To market the wall, the company relied upon its existing force of airplane salesmen. These men were specialists; they knew whom to see, and when and where to see them in the Pentagon, in the civilian aviation agencies, and on Capitol Hill. But in the building market they did not find single large buying influences to which they were accustomed. Instead, they found the architects — big ones, small ones — all with the absolute power of veto, a power they exercised often enough to put the whole curtain-wall venture well into the red. All in all, the big corporations have not fared well attempting to meet the building industry on its own terms.

Aware of this, the task forces planning corporate penetration of the building industry have placed high priority on efforts to change the rules of the game. According to one architect who has been associated as a consultant with several corporations actively interested in entering the building business, their Washington represenatives are "busy among the Federal agencies searching out procedures that could ultimately lead to legislation establishing a program for Federal certification of public health and safety requirements for buildings." Such a program would hopefully apply to all building financed by the Federal Government, aided or insured by the Federal Government and all buildings initiated under Federal legislation.

Any attempt to establish a Federal agency empowered to rule on the adequacy of building designs with respect to public health and safety would have two far-reaching implications, both of which undoubtedly would be resisted fiercely. Such an agency would:

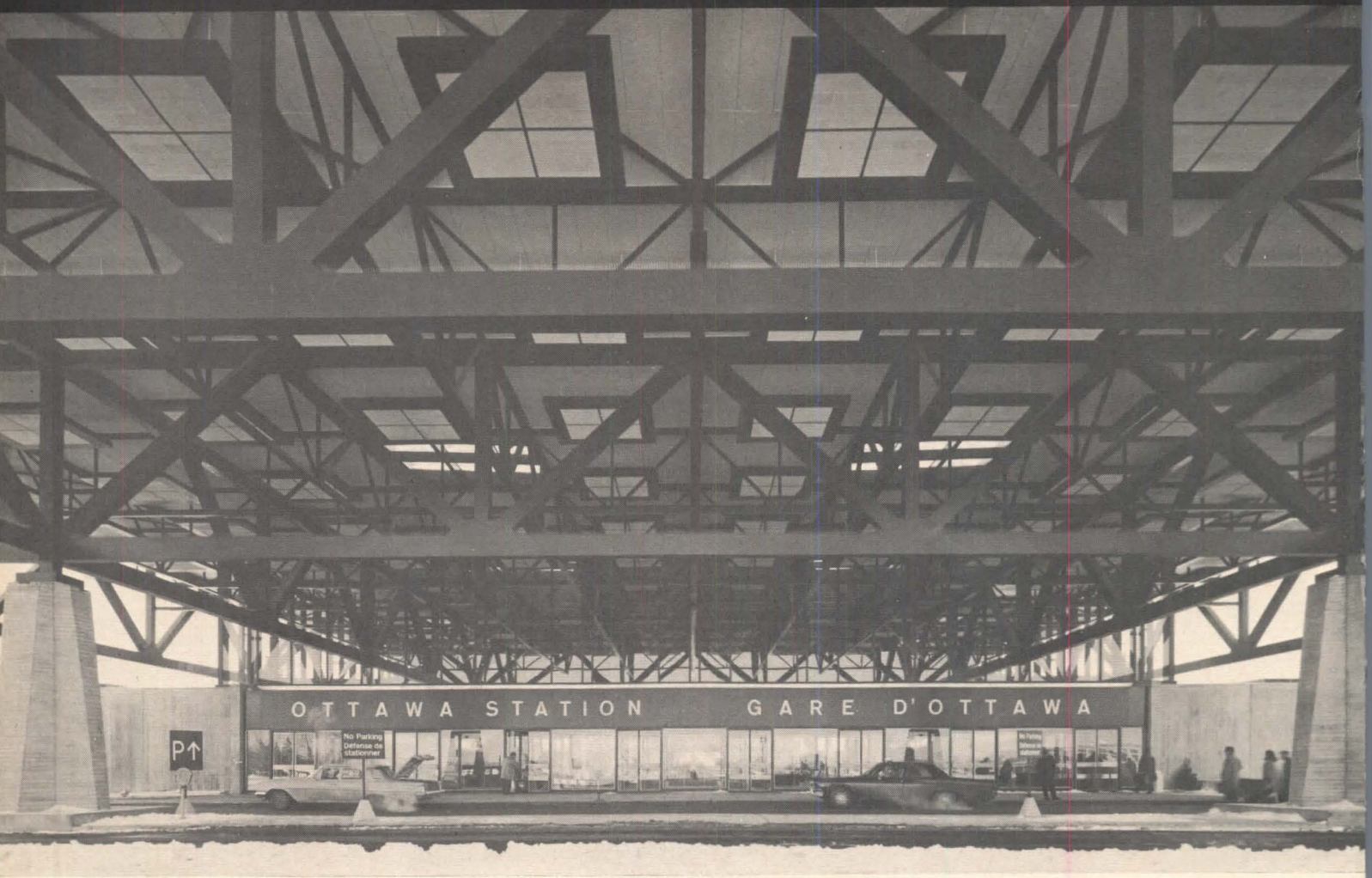
- Seriously undermine the established pattern of local building codes.
- Threaten the position now occupied by architects as guardians of public health and safety, the position underlying all state licensing laws.

Local building codes have been attacked before and have weathered the storm intact. The durability of this country's patchwork building code pattern is due not to the logic marshalled by its defenders, which at best is leaky. Rather, it is due to the reluctance of politicians to take any action that would tend to diminish the police power of individual states. (Local building codes stem from the police power of the state, even though that power is usually delegated to municipalities.) The traditional building codes are further bolstered by established building industry suppliers who are inclined to favor an existing code, however bad, over an unknown code that might emerge from a rational nationwide reform.

Certainly, any proposal that threatened, however remotely, to knock the legal prop of state licensing out from under the profession would be vigorously opposed by architects themselves.

We have attempted in this issue to examine many facets of systems analysis and operations research in order to give architects and planners an idea of what **Performance Design** means. As the last four chapters have shown, there will inevitably be a change in the practice, aesthetic, and profession of architecture as the needs and uses of Performance Design become more prevalent. We have also shown that the building industry itself is not now in a position to suffer change gladly, even though the continuing impact of new problem-solving techniques, ever more widely used, will also inevitably, as Adlai Stevenson once said in another context, drag it, kicking and screaming, into the 20th (and 21st) Century. Economic and political self-preservation, if not more eleemosynary motives, will demand it.

The same may be said of the architect. Whether, given Performance Design, we will evolve something called Performance Designers is questionable. Probably, as noted in the last chapter, there will be a need for control of the design and planning process as it relates to Perfomance Design. Will this control be taken over by the architect or be taken away from him by a more powerful agency? Or can the architect enter that agency and exert that power himself? That would be, for the "survival" of the species, the logical move, it seems. How it will be done, if it can be done, remains for the future to show us. We hope that today's architects, alerted to the potentialities and — to some — the pitfalls of Performance Design, will be somewhat better prepared to assume new roles as a result of the discussions we have presented in this issue.

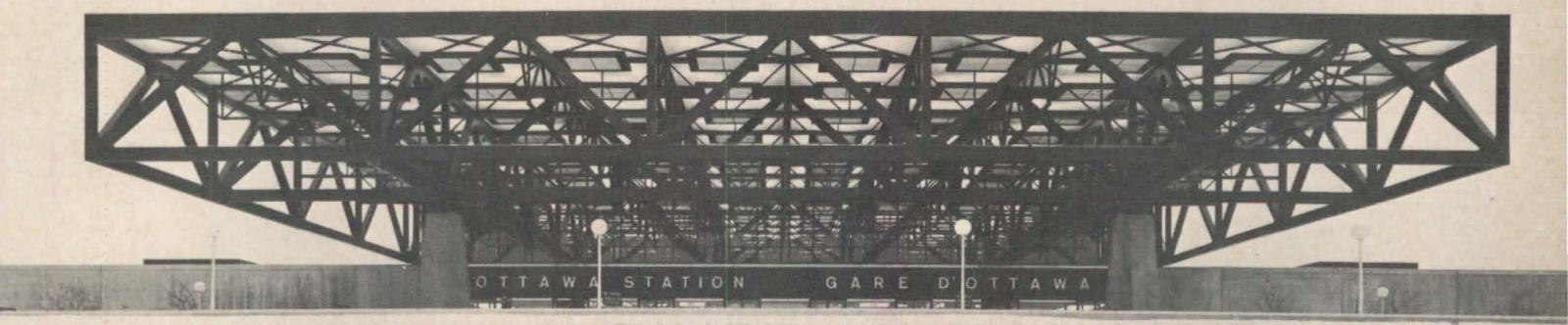


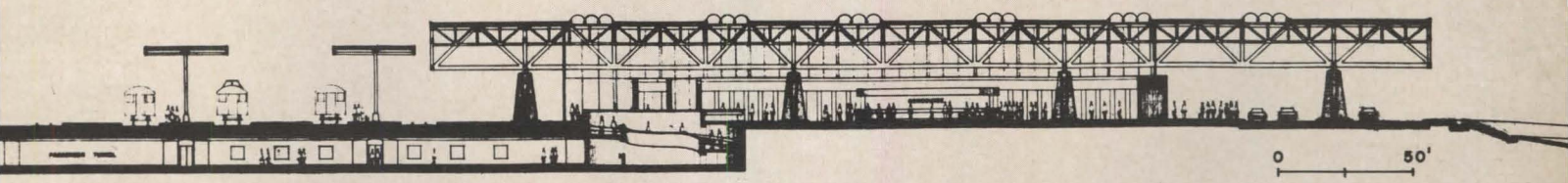
TRADITION REINVIGORATED

While the eyes of the world were turned toward Expo 67 in Montreal, Ottawa built itself a crisply handsome example of that fast-vanishing species: the railroad station. Designed by John B. Parkin Associates (Toronto, Los Angeles, Montreal, and Sault Ste. Marie), the station replaces the old Union Station (1910), which disappeared during the redevelopment of Confederation Square in downtown Ottawa. The new station is two miles from the city center, but convenient to a major traffic interchange.

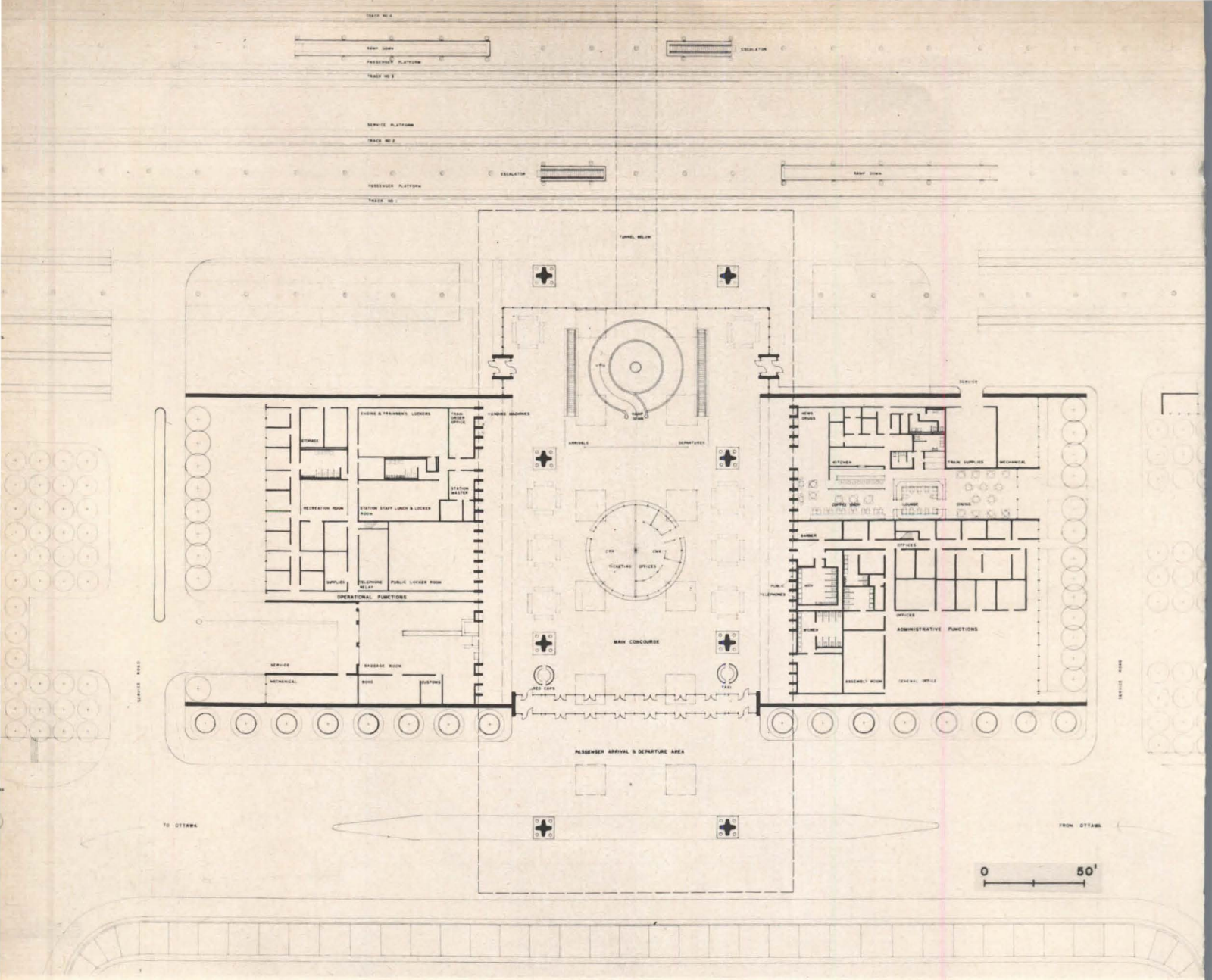
The masterly use of a great steel truss roof over the passenger concourse immediately recalls the magnificent iron-and-steel-framed train sheds of the 19th Century, and the awesome arrivals chamber of the lamented Pennsylvania Station, now relegated to a burrow in the ground under Madison Square Garden. If this is architectural reminiscence, however, it is quite capably accomplished in appropriate terms of today's technology, and not dependent for effect on the funny "transitional" cutout elements so beloved by a small coterie of architectural Pre-Raphaelites these days.

The roof is supported by pin connections on eight monolithic tapering cruciform concrete columns. It is structurally a two-way steel truss with a 30 ft cantilever on all four sides. The main trusses, 15 ft deep, form a grid 90 ft longitudinally and latitudinally. The secondary trusses are 7'-6" deep and spaced at 15 ft intervals. The entire roof is 150 ft wide by 330 ft long, and hovers 33 ft above the concourse floor. Plate-

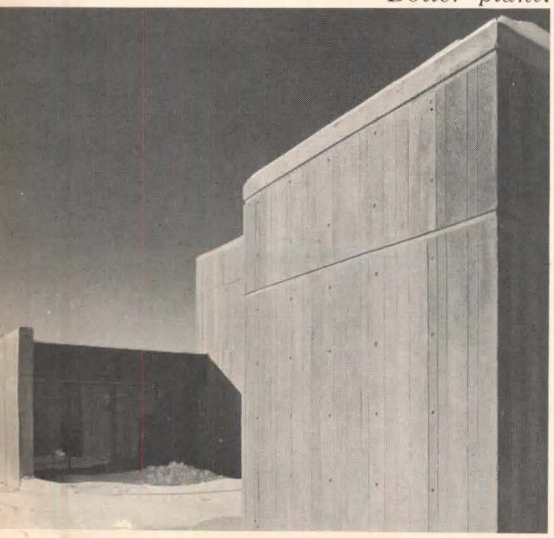




Section



Boiler plant.

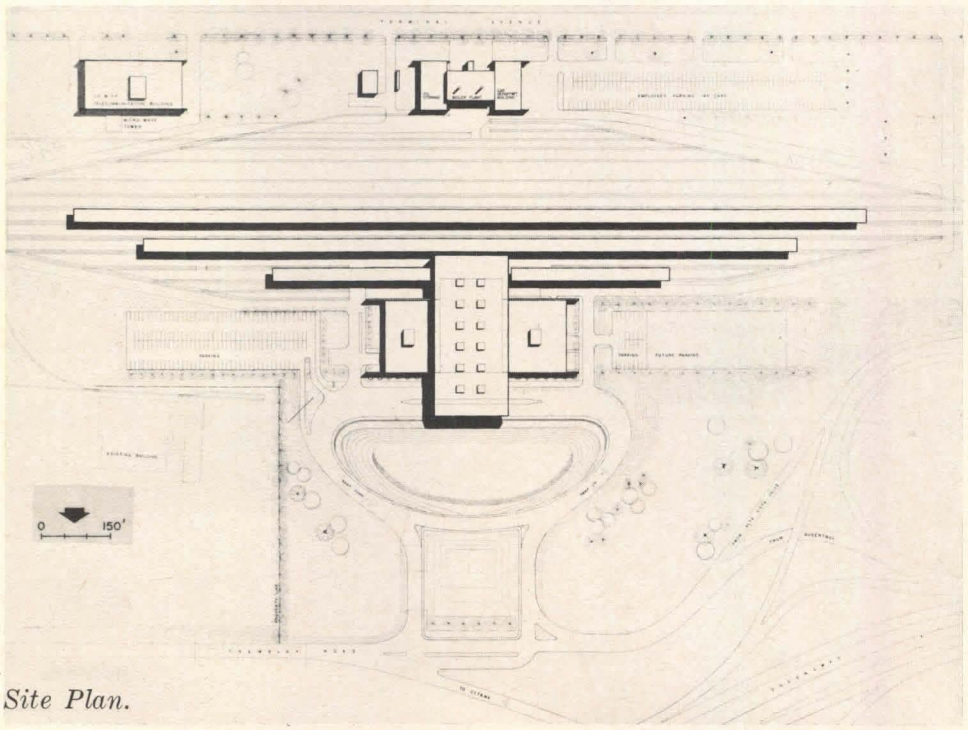


glass panels in black aluminum mullions enclose the four sides of the concourse. Operations and administration wings extend at either end, modestly clad in concrete detailed in a tongue-and-groove pattern.

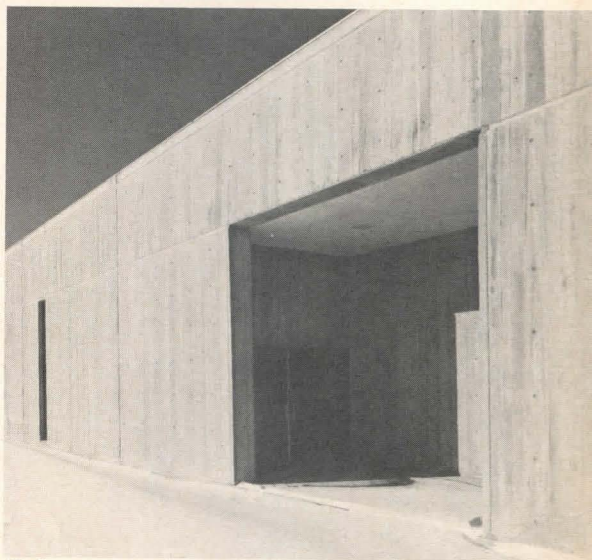
Approach to trains is through an underground passage reached down a helical concrete ramp which, with its curvaceous form, furnishes a contrast with the angularity of the concourse's machine-made precision. The telecommunications building and boiler plant and car department building have been built as separate structures on the opposite side of the tracks from the station. They, too, are clad in striated, nonloadbearing concrete in order to give all the attention to the generous space and expressive roof frame of the concourse.

One of the last things we would have expected to be writing about in the second half of 1967 is a railroad station — unless it were to write the obituary of another one. But Ottawa, the Parkin designers, and the railways of Canada have given us an unexpected delight and shown that a good design tradition is not dead, but enjoying robust contemporary health north of the border. — JTB

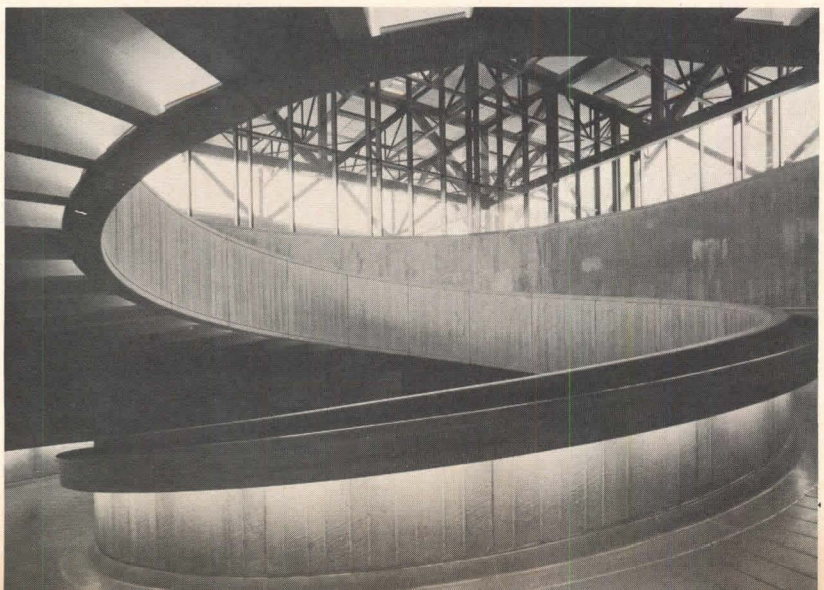
Photos: David G. Harris



Site Plan.

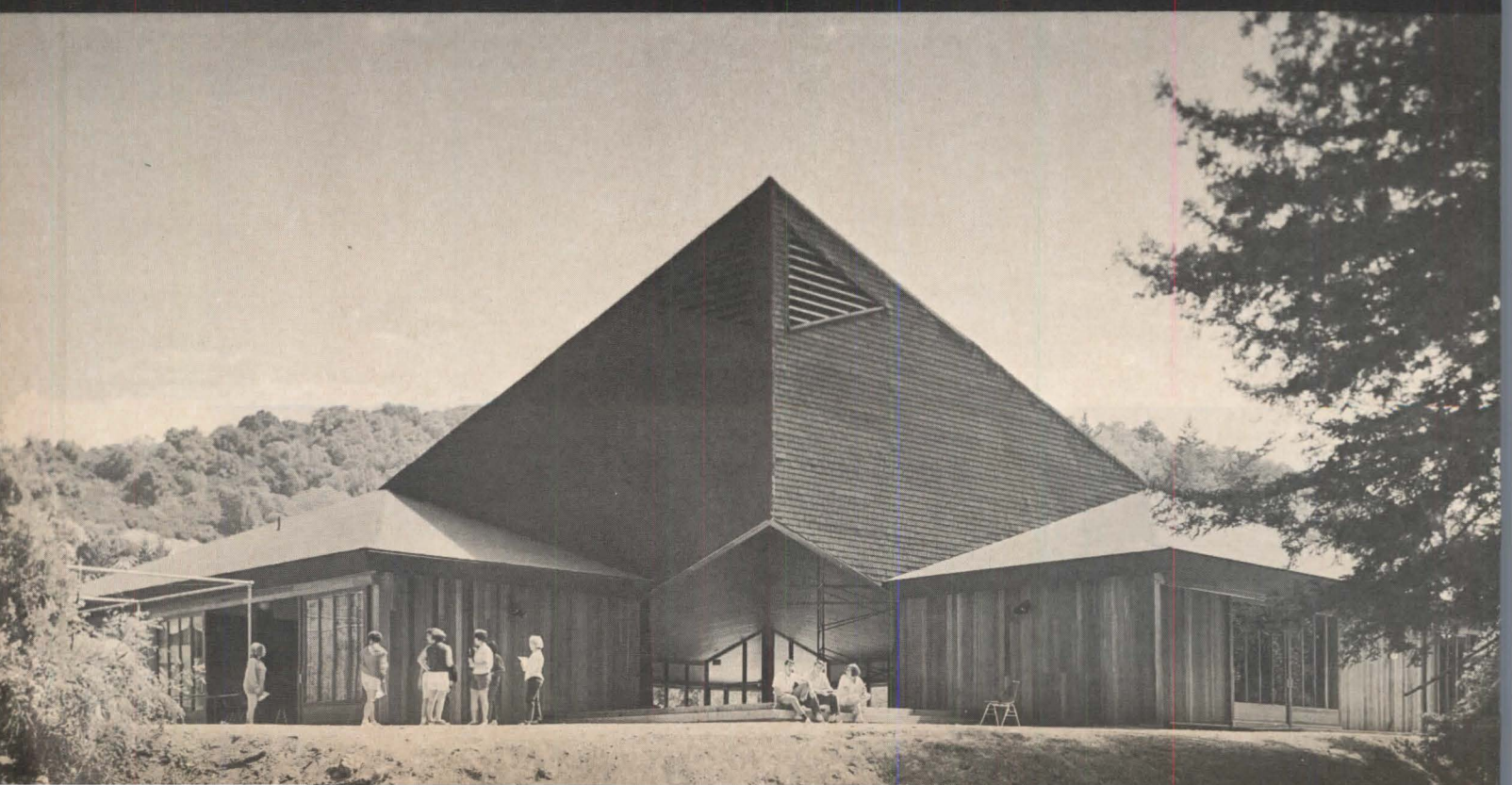


Telecommunications building.



Helical ramp to tunnel.

TWO-WAY STAGE



A multiuse building for a summer camp by Henrik Bull of San Francisco conceals within its simple form a multitude of uses.

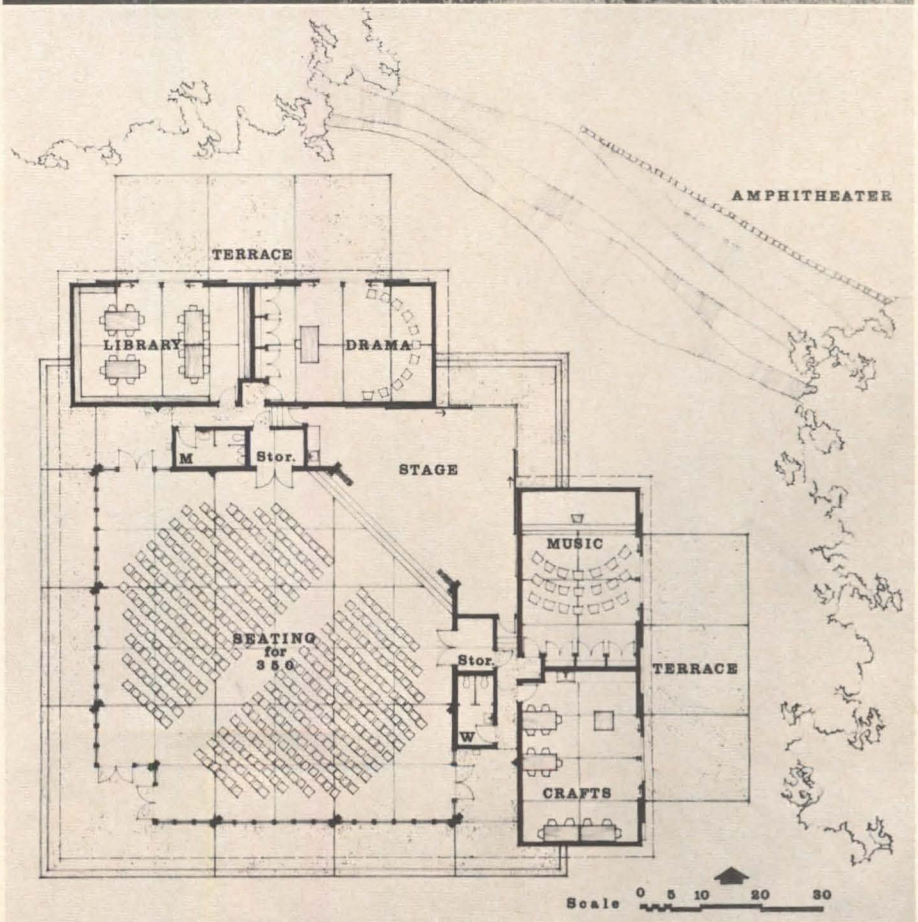
Camp Swig is a religious camp for Jewish boys and girls in the California redwoods. Its population in summer — campers and counselors combined — is about 200. The Bull building provides space for all the cultural and crafts activities of the camp. Grouped around a central auditorium holding 350 are a library, drama classroom, music room, and crafts studio. The auditorium is used for dances and other social gatherings when the stack chairs are removed, and has served for religious services as well. Sliding doors at the rear of the triangular stage can be rolled aside, revealing an outdoor amphitheater. Thus, performances can be given in two directions. We do not know whether the obvious has been tried at Camp Swig, but the two-way arrangement should lend itself admirably to a production of "A Midsummer Night's Dream," with the actors playing to audiences both inside and outside. One drawback to dramatic performances, from the plan at least, seems to be the lack of adequate dressing rooms and scenery shops.

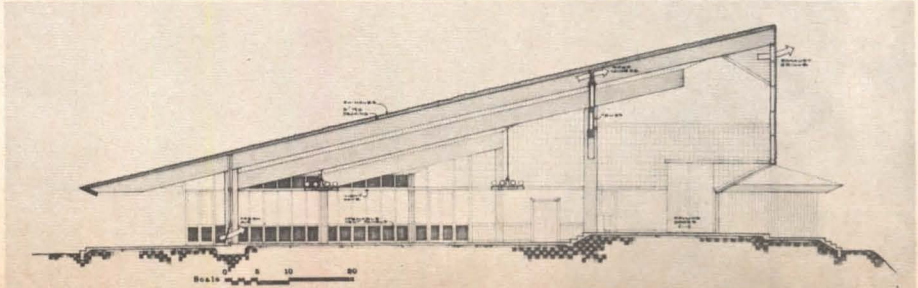
The building, which is in a hot area, is naturally ventilated: Air is drawn in through panels near the floor under the two window walls facing the stage. It rises through louvers over the proscenium and is expelled through more louvers at the peak of the roof (see section).

Construction is heavy timber with glued laminated beams and 3-in. wood decking. Exterior and interior trim is natural redwood. Cost in 1966 was $107,000, or $14.31/sq ft.

The shape of the building is particularly felicitous for a summer camp. It somewhat resembles a simple origami left among the redwoods by a camper. And the inside-outside stage system should provide a great deal of creative fun for imaginative performers.

Photos: Jeremiah O. Bragstad



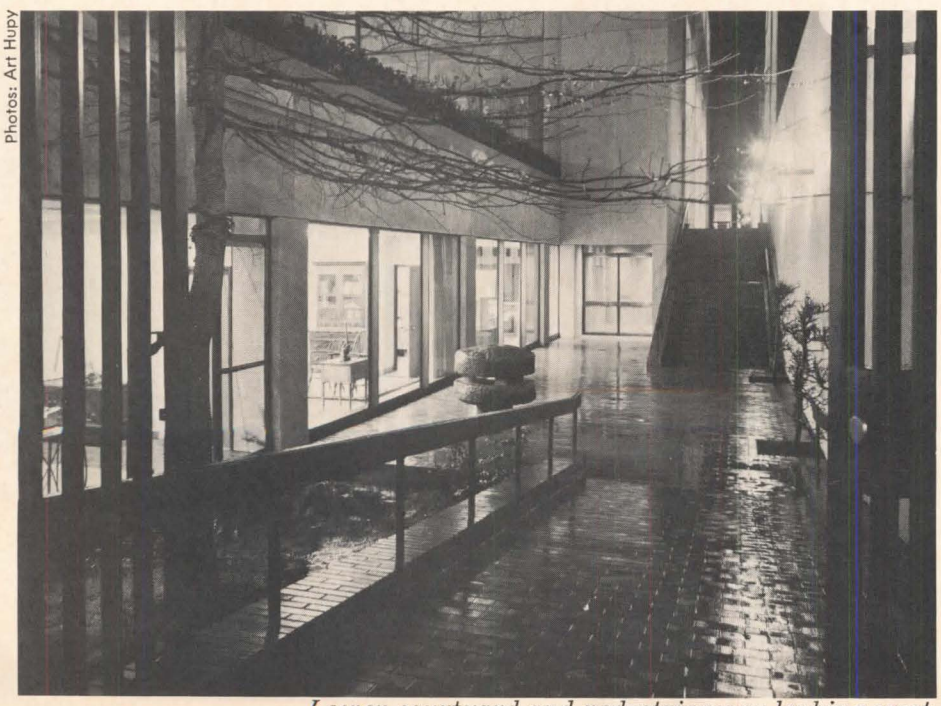


SECTION AT RIDGE

Main entrance.

SEDATE OREGON

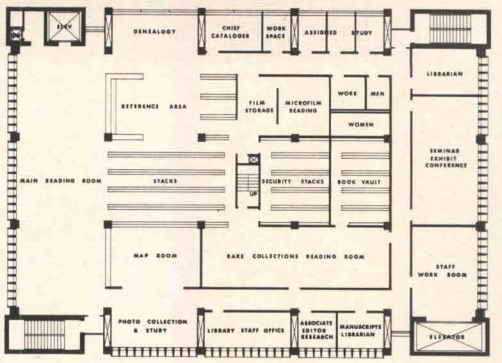
Photos: Art Hupy



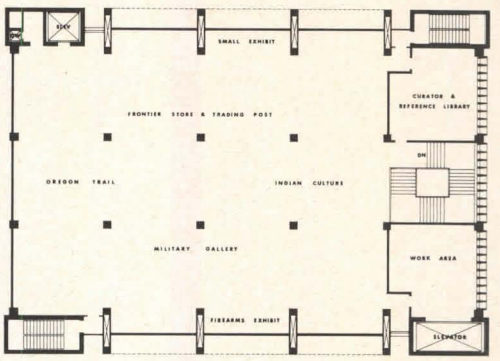
Lower courtyard and pedestrianway looking west.

Situated between a parklike institutional area of Portland and the downtown commercial district, the new headquarters of the Oregon Historical Society has an appropriately calm monumentality that is aristocratic without being forbidding. The concrete building, by Wolff-Zimmer-Gunsul-Frasca (Pietro Belluschi, Consultant), is a cube form with horizontal elements expressed for what they are: glazed entrance and changing exhibit space on the ground level; permanent galleries and curatorial areas behind precast panels on the second floor; slit windows of the upper library floor forming a deep fascia at the top. Perimeter columns are articulated, as are giant corner piers containing stairs and elevators; these elements lend verticality and

View from southwest.

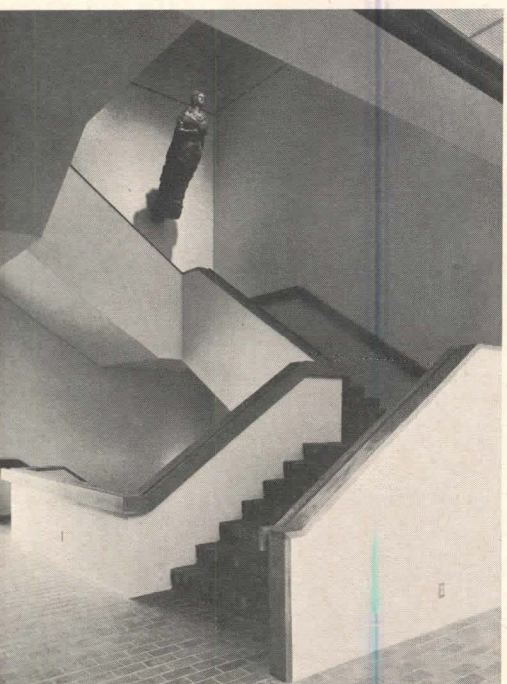


Third Floor

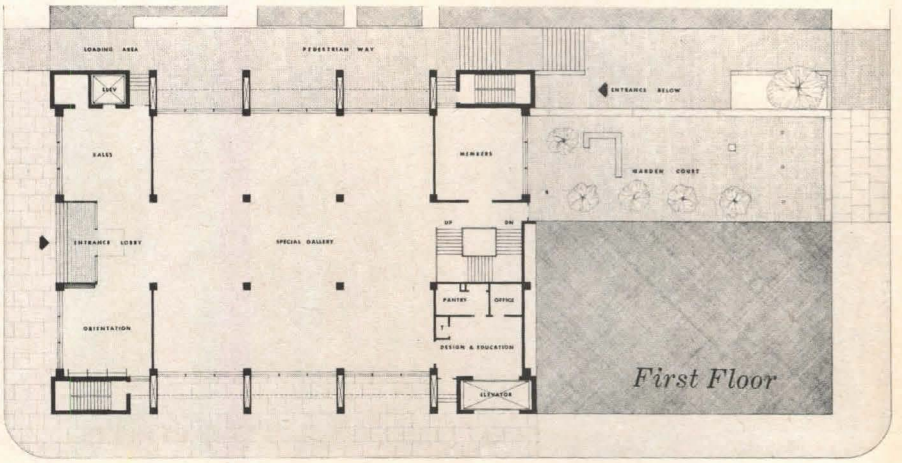


Second Floor

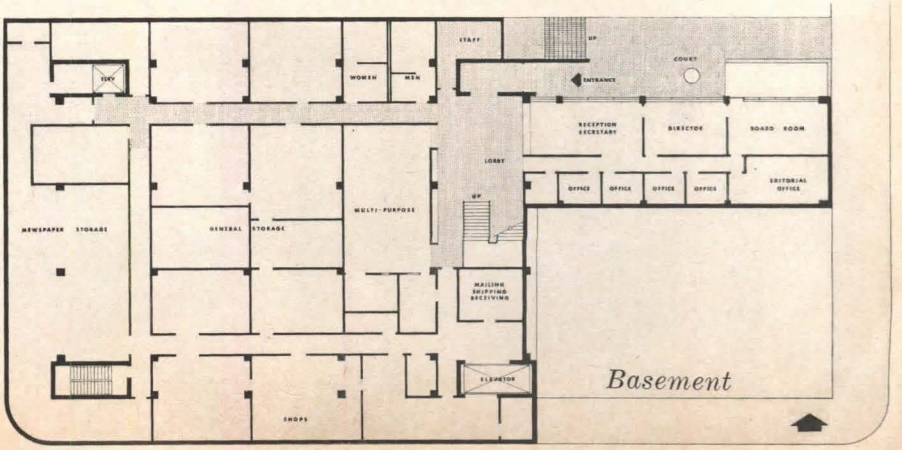
REPOSITORY



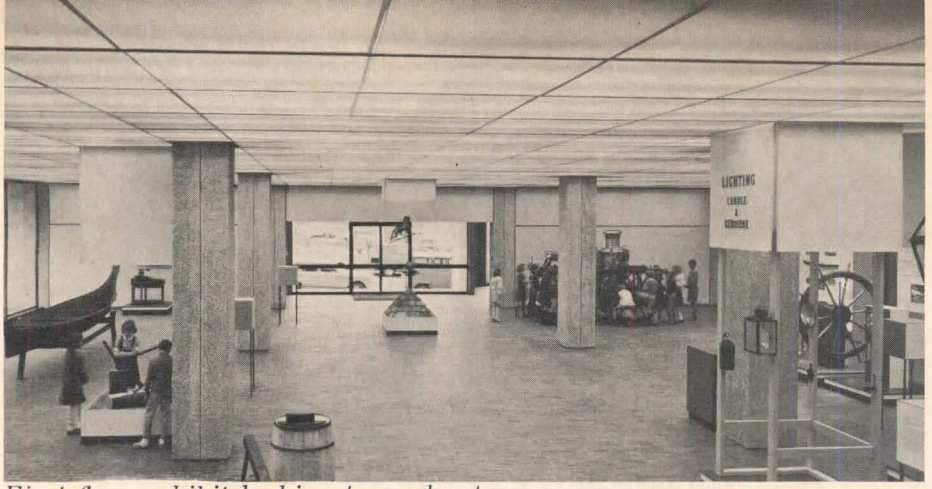
Main stairway from first-floor gallery.



First Floor



Basement

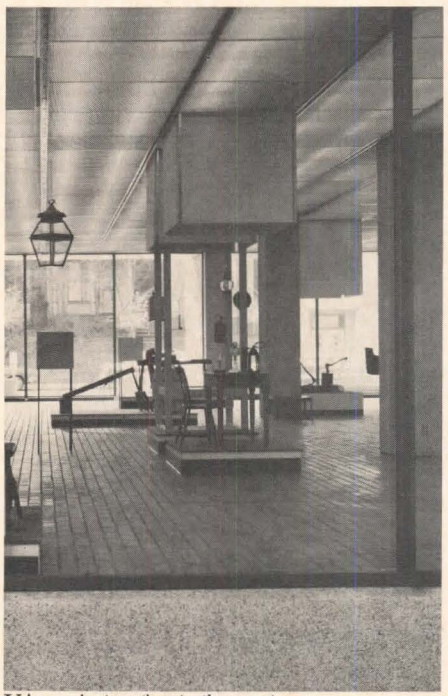


First-floor exhibit looking toward entrance.

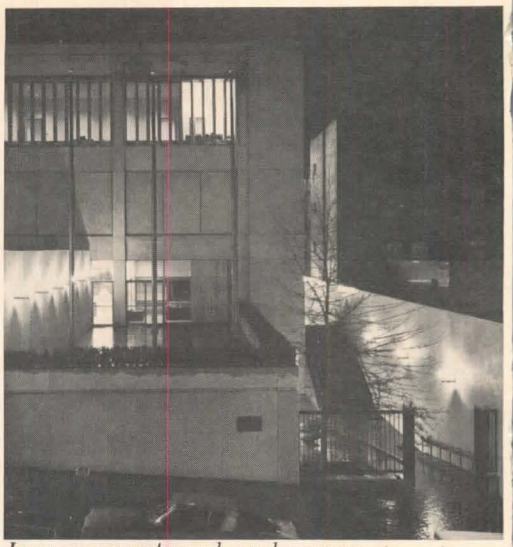
keep the cube from appearing dumpy. The seeming austerity of the building is enlivened by a series of exterior spaces, including a pedestrianway through the block at the north of the site; a lower courtyard admitting visitors to a secondary entrance; and a terrace court opening from the changing gallery and members' lounge. The pedestrianway appears to be particularly inviting — with views into the gallery areas, crystal globe lighting, ramps and stairs, and an old millstone topping a shaft containing a time capsule.

The plan is compactly arranged with service to the basement level (the director and his staff also look onto the courtyard here); lobby and changing gallery on the first floor; permanent collection and curator's office on the second floor; and the more private precincts of the library and reference facilities on the top story. Interior finishes are rich and simple: precast concrete, plaster, and fabric walls: hard-burned brick pavers on the lower floor and oiled teak parquet and carpets on the other floors; especially crafted furniture in fumed oak and selected fabrics. Lighting is generally fluorescent with integral air supply, and incandescent lighting occasionally for warm accents. The floors are connected by a major public stairway as well as public and service elevators and fire stairs.

The Oregon Historical Society has a dignity that is at the same time inviting, a serenity that is alive rather than somnolent. It is a repository for the state's history that reflects a living history, not a dead past.



View into first floor from pedestrianway.



Lower courtyard and upper terrace looking west.

Library lounge reading area.

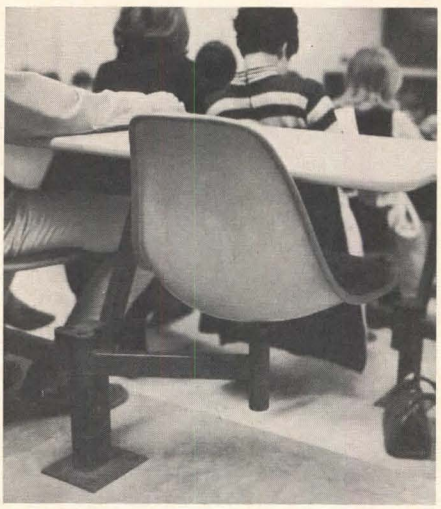
Rare Collections room.

SWINGING SEATS

The State University of New York Construction Fund has a vast building program that is keeping countless good, bad, and indifferent architectural offices busy. Most of the good stuff comes from the determination of the administrators and their staff to have superior architecture and planning in the university system; a great deal of the more mundane product is coming from the usual source: offices with old-time local political and business connections.

One fortuitous product of the massive building program so far has been a seating arrangement that is a far cry from the old take-notes-on-the-wing-arm-and-shove-the-books-under-you situation most of us were accustomed to.

Beginning five years ago, the state's university design advisors (Elwin Stevens, in this case), asked Alan Green and Morton Gassman, then at the RPI School of Architecture, to investigate the needs, drawbacks, and potentialities of lecture hall communication centers under an EFL grant. Seating and desk spaces were of course major elements in the survey, and turned up a number of deficiencies, including too-small desktop space, uncomfortable seating, poor spacing, bad seat-to-seat and seat-to-desk relationships, and the like. Two systems, called Eames Educational Seating and Mounted Base Pedestal, were devised to answer most of the problems, but the state and the designers did not think that the case had been wholly resolved. Five firms specializing in educational furniture were invited to examine the problems further and constructed full-scale mock-ups matching the State University of New York's (SUNY's) specifications. Herman Miller, Inc. (which did the EES and MBP systems), with Robert Blaich heading its Product Planning and Development Group and Peter Protzmann performing as Project Designer, eventually did new lecture hall seating for three schools at Buffalo, Oneonta (shown), and Cortland.



The system, called Integral Seating, can be used either in an aisle plan, as shown, or in a continental seating arrangement (as at Buffalo). The seats are hung in pairs from a floor-anchored housing that also supports a steel cantilever for the continuous tabletop. The housing for the "works" contains two self-returning spring-loading pivot mechanisms, each of which operates and controls a seat. The seats turn from side to side, tilt, and return to the table automatically when unoccupied. Instructors and tardy students can walk between them and dally for a few words with pupils or friends. Materials are cast iron, painted; steel supporting structure; and plastic laminate tabletops with vinyl corners. The seats are holdovers from the Eames system.

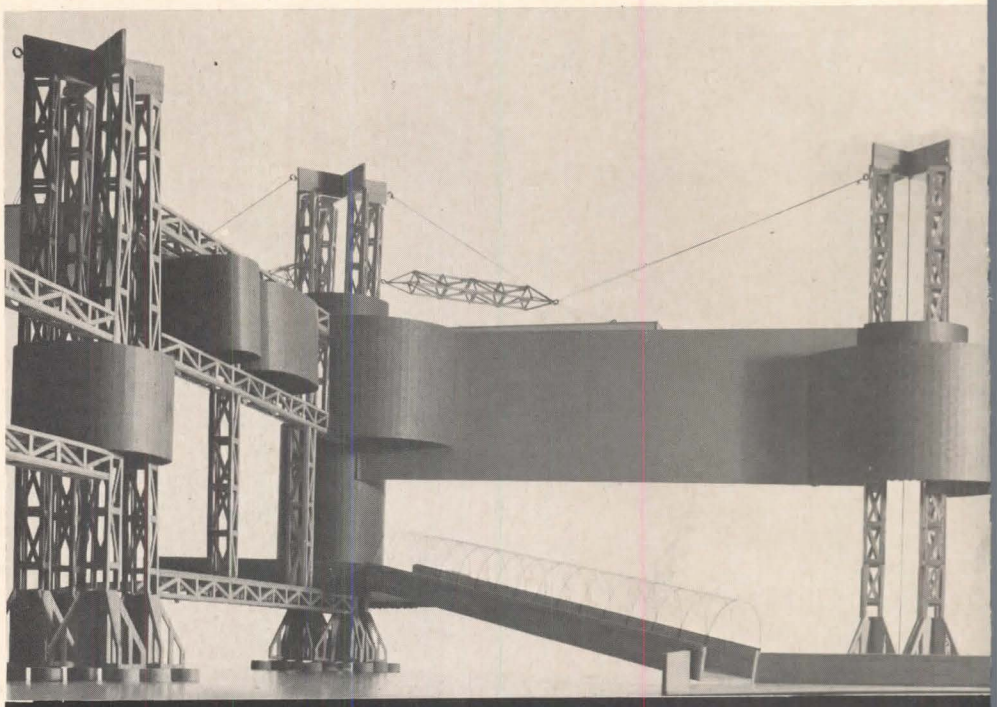
Elwin Stevens remarks that the system is notable because it is an attempt "to involve ourselves [industry and SUNY] in problem-solving *now* rather than to design for obsolescence." If he is right, and if the intention of the designers is correct — to give "adaptability for future installation of electronic devices such as a student response system in which each student-station would be capable of being wired with a finger-touch input set or plug-in headphone" — then we should be seeing Integral Seating in quite a few "learning environments."

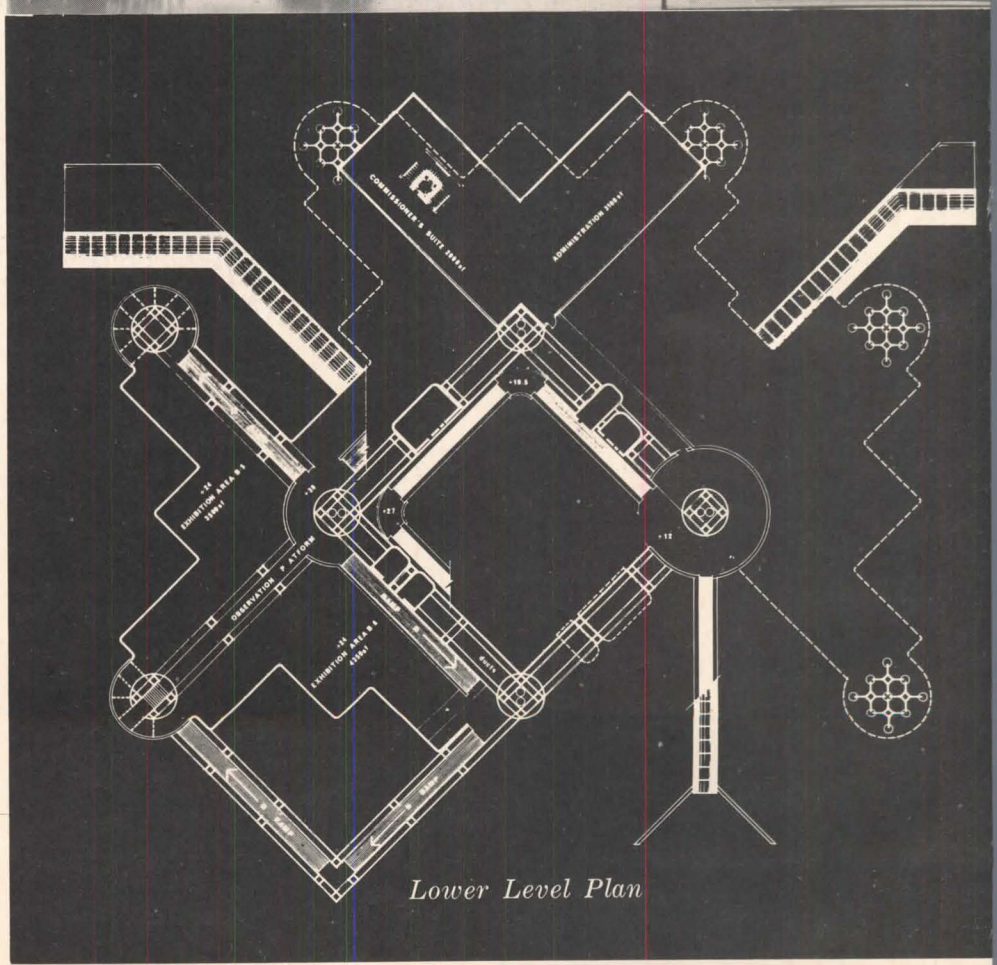
A GALLANT TRY

Aside from being involved with its own smashing Expo, Canada is finding the time to plan for its national pavilion at the next official world's fair in Osaka, Japan, in 1970. To select the design, a two-stage competition is being held. The first stage has narrowed down the 285 entries to six finalists — plus a group of "Top 40" that will go on exhibit.

Among the top 40, but, unfortunately, not the top six, is a hugely imaginative industrial solution by architects Melvin Charney and Harry Parnass and engineers Janos Baracs and Marcel Pageau.

Recognizing that technology and industry will undoubtedly be paramount for an international exposition in a "reborn" nation, Charney and his associates devised a system whereby the construction cranes become the structure of the pavilion. He writes, "The design vocabulary of the pavilion uses the vocabulary of the construction process — steel masts, booms, cables, and stressed-skin plywood panels. The equipment used to erect the building becomes part of the building. Prefabricated, pre-welded steel modules are bolted together on the site and post-tensioned. Booms suspended on cables support the roofs; these booms can be used in the assembly of the building, to place exhibits within it." The system of movable exhibit units on booms and cables is obviously extremely flexible and, although the architects did not explicitly say so, should be amenable to constant changes during the six months of the fair (one observer asked why they shouldn't be in constant motion). The 11 masts of the pavilion (bearing the heraldry of Canada's 11 territories) would rest on exposed caisson pods, which the designers see as a tribute to the traditional Japanese concern with the way — post on boulder — the building meets the ground. Spanning between the



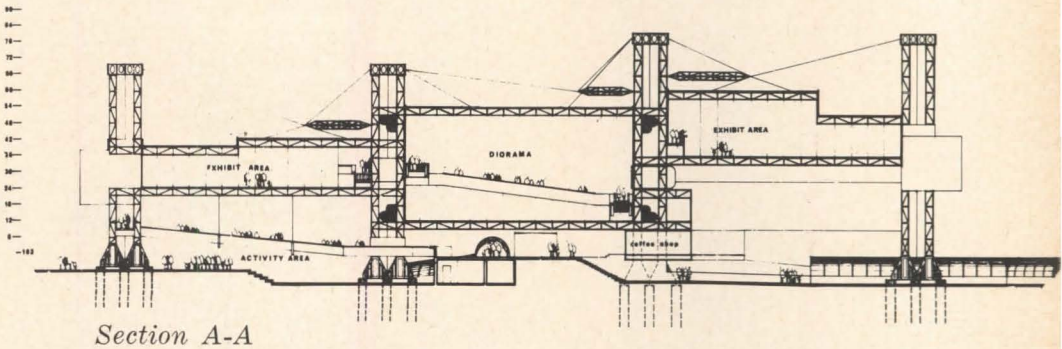


Lower Level Plan

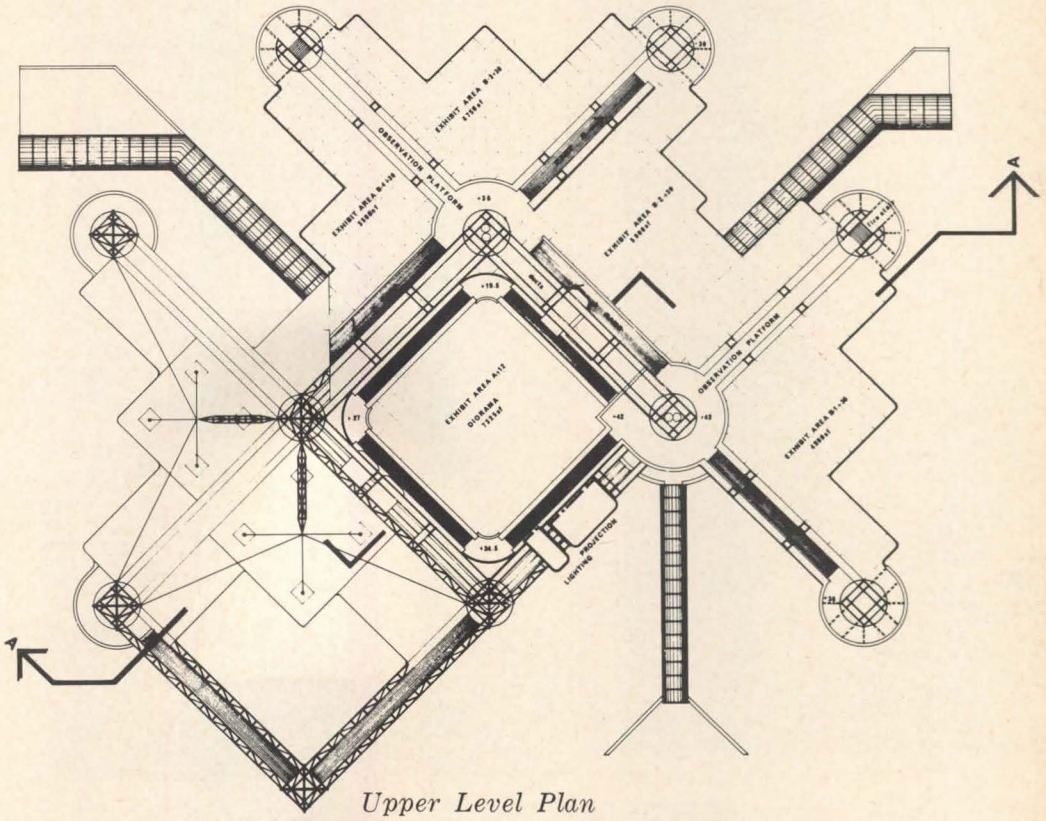
cranes would be Vierendeel trusses built up of sections whose chords would be as deep as the floor and roof dimensions of the clip-on exhibit units. The main roofs are proposed as triodetic two-way space frames suspended on cables radiating from the masts; one horizontal boom member per roof acting to stabilize the hanging point in space.

Roofs would be prefabricated, precoated stressed-skin plywood panels; walls would be metal spline system with clip-on precoated plywood or transparent glass or plastic panels. The structure's main grid would carry all the trunk lines for mechanical and electrical services. Charney notes that, when the cranes have dismantled the pavilion at the end of the fair, they could be sold in Japan, thereby recouping a large part of the original cost of the pavilion.

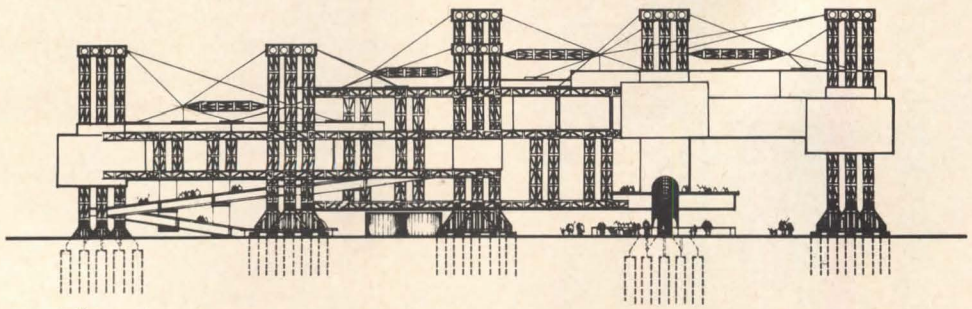
This is altogether an intriguing and exciting concept, suggesting the application to a real situation of the theorizing of the plug-in and Archigram people and Japan's own Metabolists. We hope that the pavilion Canada eventually builds is as forward-looking as this competition loser and that, even better, some other exhibitor will pick up this design and build it. — JTB



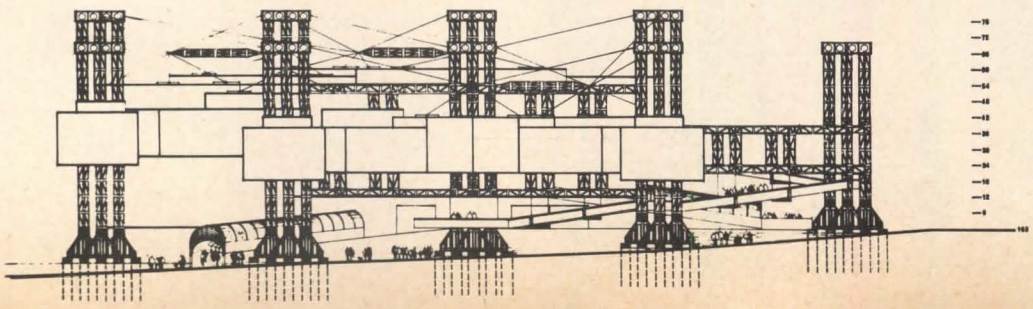
Section A-A



Upper Level Plan



Elevations



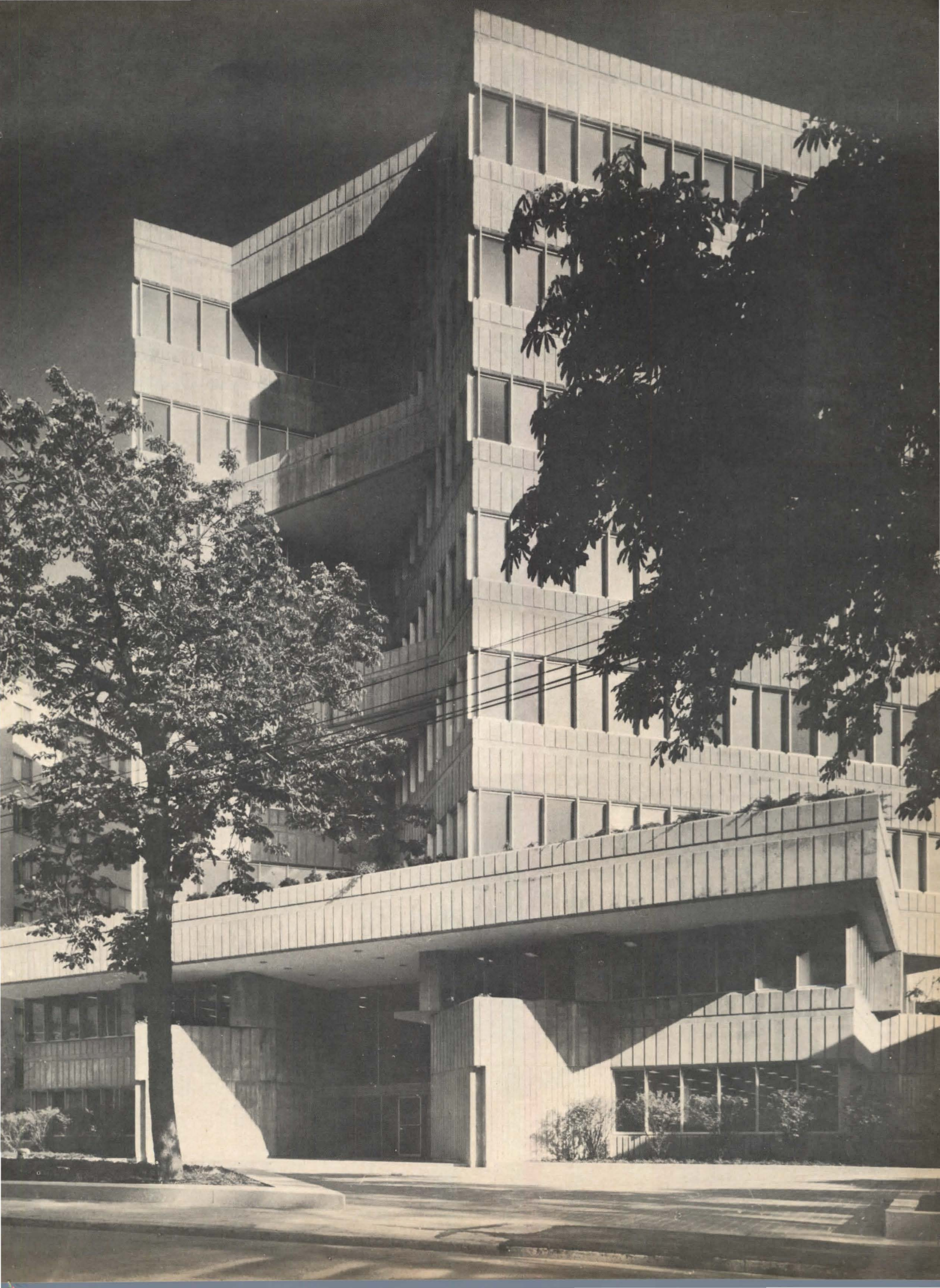
TOWER ON BIAS

Photos, except as noted: V. Svarre of Clive Peacock Associates Ltd.

Canadian architecture, remarkably producing quality building after quality building at a tremendous rate, has turned out a small, speculative ($19/sq ft) office building that puts all the by-the-yard glass-and-metal stuff still proliferating in the U.S. to shame.

Situated on a nondescript one-way street in Toronto, the building, by Fairfield & DuBois, consists of a two-story, four-square base facing the street supporting a six-story tower turned at a 45° angle to the lower floors. This arrangement not only lets light and air flow around all sides of the building, it also creates eight corner offices in the tower, compared to the usual four in the common variety of speculative building. The architects had taken care to try and create a distinct building that at the same time respects the street and conforms to Toronto's zoning regulations, which allow just three times lot size for the permitted above-grade floor space (excluding balconies). They made a model of the street and experimented with several zoning envelope models, eventually deciding on one, for which they designed two plans. The owner-developer, Standard Life-Taylor Woodrow, happily chose the less conservative version in order "to strengthen the idea of a strong statement on the street." The horizontal of the two-story base emphasizes the continuity of the street, while the angled tower furnishes a strong accent that, as noted, also opens the street façade to light and air. The architects state: "Some planning device must be found to encourage this idea in the streetscape, for it is just as nonsensical

Photo: Panda Associates



to continue to build isolated blocks of urban offices as it is to do so with urban housing, and light and sun must be allowed to penetrate [to] the street."

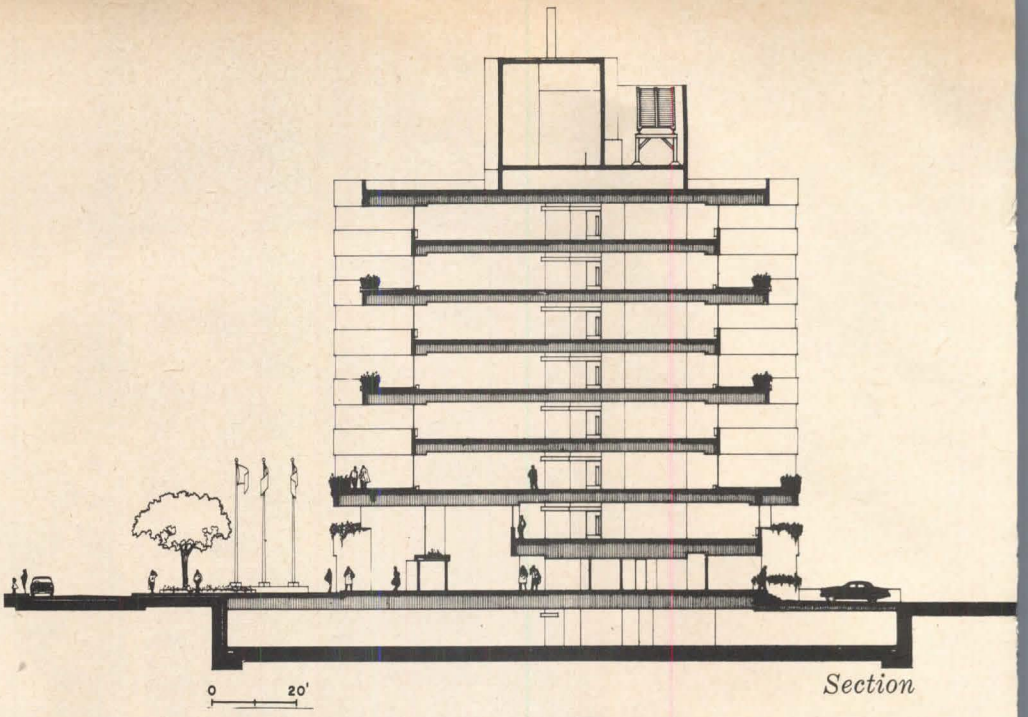
An added, and pleasing, conceit, was the extension of balconies across the angles of the tower on every other floor. These, though not extensively used, carry the landscape from grade, past the terrace created by the roof of the second floor, and on up the building. They are reportedly "remarkably pleasant covered with snow."

Structure is reinforced concrete, and concrete is exposed both inside the building and on the exterior. Windows are heat-absorbing gray glass with an integral venetian blind framed with natural-color aluminum sash.

Fairfield & DuBois were evidently pleased with what they wrought at 45 Charles Street East, because they now have their offices there (see third floor plan). The four-increment nature of the tower plan makes the space easily divisible for smaller tenants, a requirement of the client.

New York, Los Angeles, Chicago, Dallas, Houston, take heed: This small rental office building on a Toronto side street has a lot to teach you about designing quality speculative buildings if you and your developer-clients will only look and listen.

Structural Engineers: *Farkas, Barron & Jablonsky.* ***Electrical Engineers:*** *Jack Chisvin & Associates.* ***Mechanical Engineers:*** *G. Granek & Associates Ltd.* ***Landscape Architects:*** *H. Oswald Konway Associates.* ***General Contractor:*** *Taylor Woodrow of Canada Ltd.*



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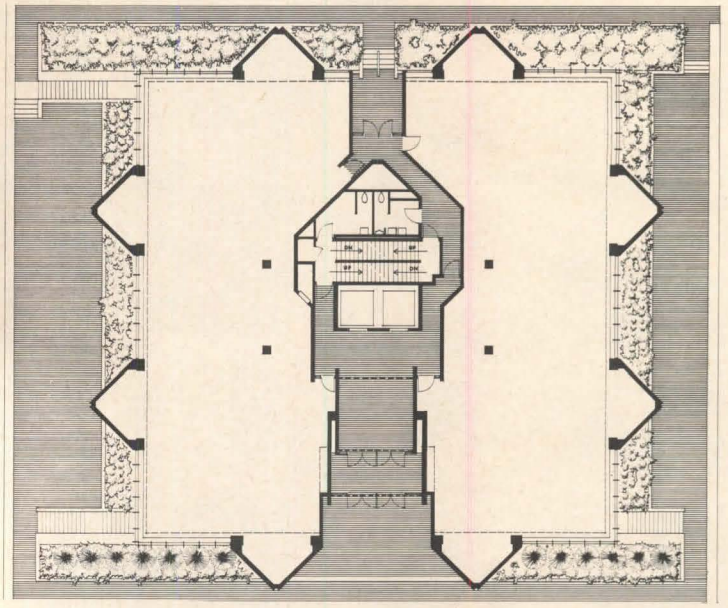
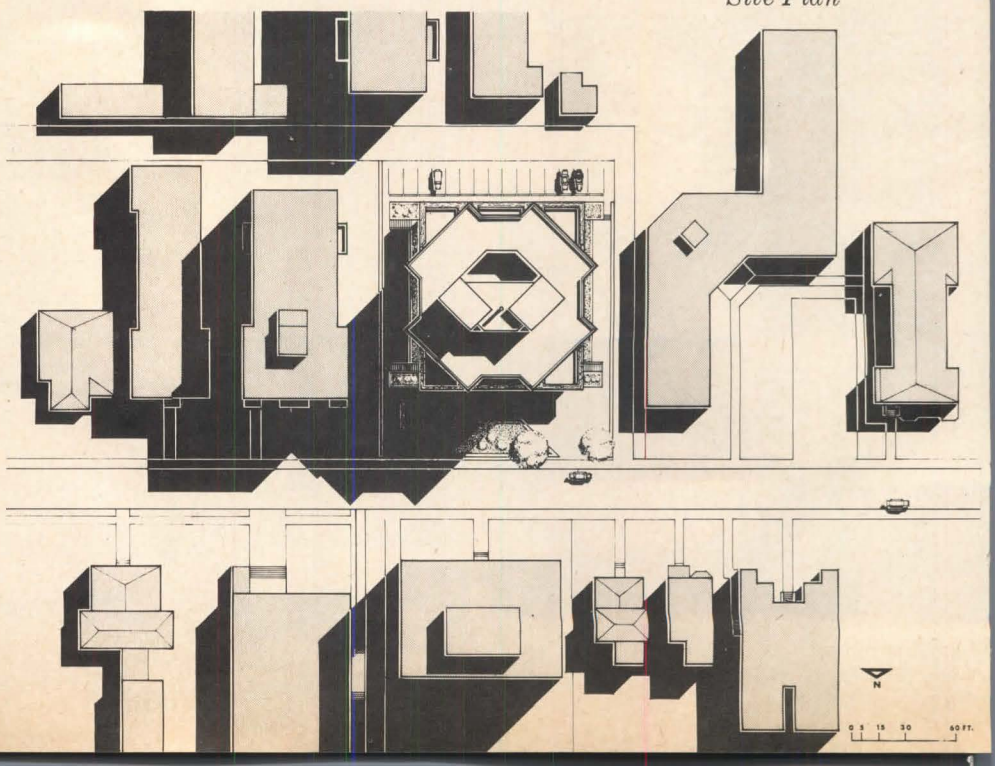
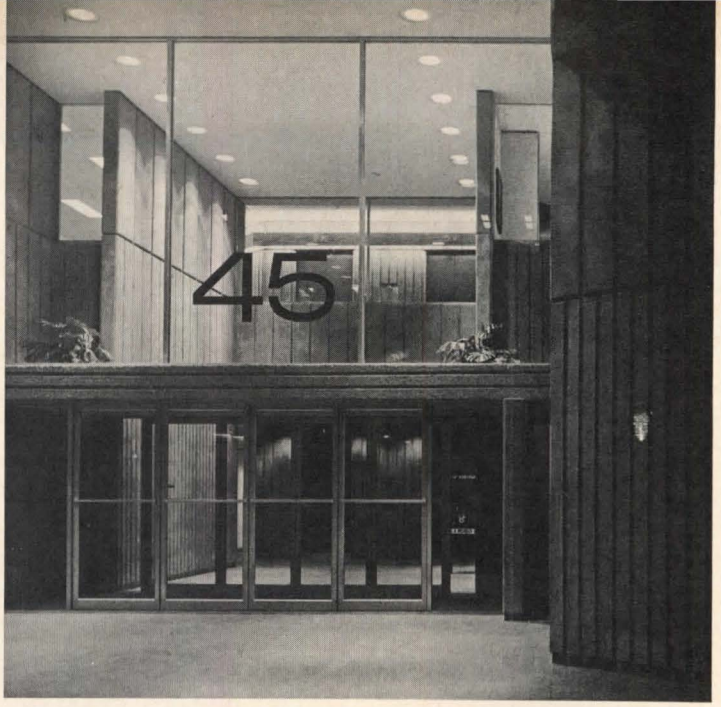
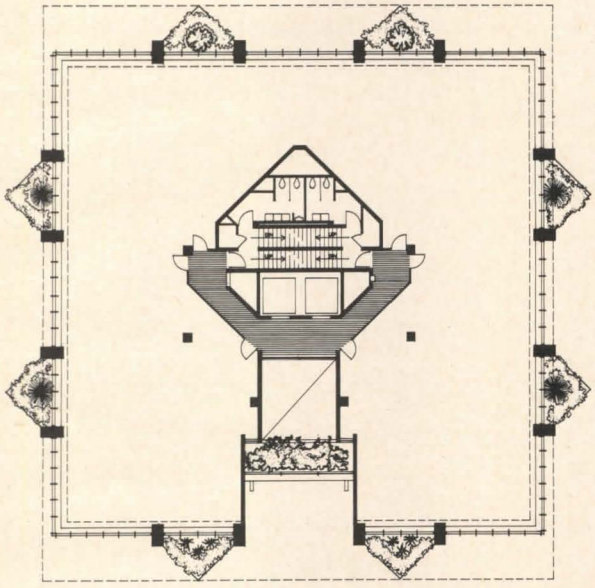


Ground Floor

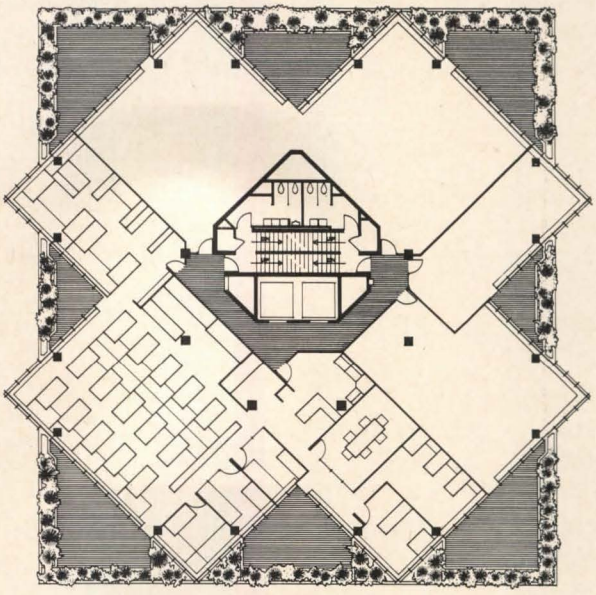
Site Plan





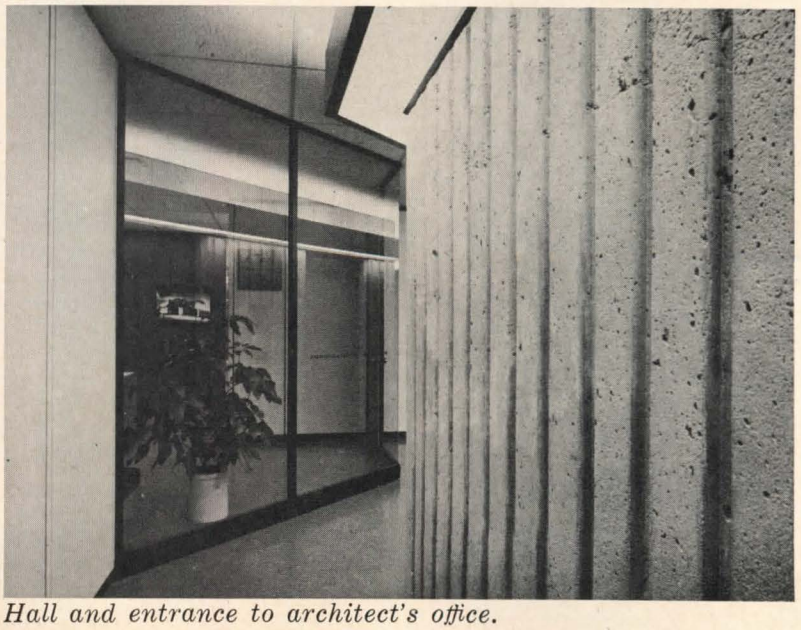


Second Floor



Third Floor (with Architect's Offices)

Terrace outside architect's office.



Hall and entrance to architect's office.

MECHANICAL ENGINEERING CRITIQUE

AIR-COOLED CONDITIONERS INCREASING

BY WM. J. McGUINNESS

Present applications and future possibilities for air-cooled equipment are discussed. McGuinness is a practicing engineer in New York City.

Comfort cooling, now so universal, is achieved in diverse ways. There are many interesting methods of distributing the cooled air on the other side of the refrigeration cycle, disposing of (rejecting) the heat. This discussion concerns itself primarily with the latter process.

The simple window unit, or through-wall unit, is air-cooled. The condenser coils are cooled by outdoor air blown over them. The tendency in recent years has been to break this type of self-contained unit in half, placing the compressor and the condenser coil in an outdoor unit and the evaporator coil indoors (see diagram). Advantages of this system are apparent. The wall is only perforated by two small copper tubes instead of by a large box. Flexibility is achieved by the possibility of positioning both elements to advantage. The noise of the compressor is outdoors, instead of adjacent to indoor space.

Sizes and Applications

For a long time, the capacity of such systems was limited to about 5 tons of cooling. Over this limit, water cooling of the condenser was generally employed, the water being recirculated to a cooling tower, which, by partial evaporation of the water, cooled it for re-use at the condenser. This is a little more economical than air cooling. The once-through use of city water wasted to the sewer, in either small or large installations, has diminished, due to the need for conserving municipal supplies.

Two typical applications of the air-cooled system with remote condenser have been small residences and the public rooms of motels. In the former, the compressor-condenser element usually sits on a concrete pad on the ground. In the latter, it is often on the roof over a single story.

Now, manufacturers are producing equipment of this type with capacities of 20 tons and more. Many new uses for air-cooled systems of this size are visualized.

Air vs. Water

Before exploring the new possibilities, it would seem appropriate to compare the use of air as a condenser coolant with that of water from cooling towers, which had formerly been most common in large systems. Despite the fact that water is a more efficient medium for this purpose, it has a number of shortcomings that make air-cooled methods reasonably competitive. Deterioration of cooling towers is rapid and maintenance difficult. Water in the form of misty vapor picks up chemical pollutants from the air in industrial areas. These often give the water an acid reaction that is destructive to cooling-tower metals. The make-up water that replaces the evaporated water carries chemicals that also call for continual treatment. Even with treatment for air-borne and water-borne contaminates, a costly maintenance routine, obsolescence is a problem.

Other qualities favor air. In mid-winter, with outdoor temperatures at 0°F and lower, interior zones require cooling to cope with so-called "people load" — the heat to be removed from densely occupied areas. Without special precautions, freezing in the cooling tower poses a problem. Obviously, this is avoided when air is used. Although the cooling tower can often be a single unit by comparison with a number of air-cooled elements, modern manufacturing methods have made the sealed, trouble-free air units competitive in many installations. The use of multiple-air units lends itself to zoning.

A Recent Installation

In its own building in New York, the General Electric Company has used its equipment to eliminate towers. In this multistory office building, there are two 20-ton air-cooled condensers on each 12,000 sq ft floor. Each condenser connects to a corresponding evaporator in an air-handling unit. The compressors and condensers are placed in sound-controlled equipment rooms at the building perimeter. Outdoor air is drawn in through a grille to free-standing units. The discharge side, however, is ducted by short, low-friction elbows to another wall-grille. The close proximity of the inlet to the outlet grille in the outside wall has not lowered the efficiency perceptibly. There appears to be little recirculation of the hot rejected air.

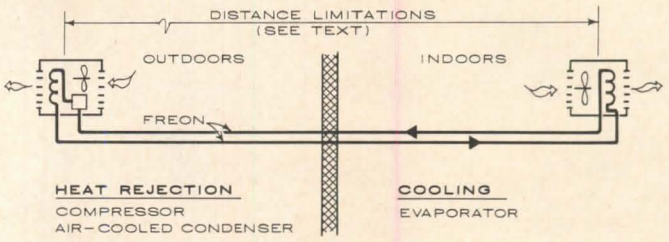
Each ton of refrigeration takes care of about 300 sq ft of floor space, a reasonable figure for this kind of occupancy. The air-handling units are ducted to ceiling registers. The use of four such units adapts well to zoning.

Possibilities

The new higher capacity air-cooled equipment may lead to a fresh kind of planning in buildings of moderate height and even in tall multistory buildings. New façades of rugged concrete elements often provide a deep exterior wall in which the condensers can be "lost."

Two qualities of the system may tend to establish its character. The condensers presently manufactured are not suited to overcoming much duct friction. This anchors them to the building perimeter or other location near free air. The horizontal distance limitation (see diagram) is currently about 60 ft, the vertical limit about 30 ft. In large buildings, this suggests multiple sets of units on each floor when the two mated units are on the same level. If they are separated vertically, the limit is about 30 ft. One can visualize a five-story "zone" with condensers on the middle floor supplying evaporators on two stories above and two stories below; a number of other variations are of course also possible.

Increased use may prompt manufacturers to engineer their future equipment to extend the distance limitations and to provide greater power in the fans of the condenser units.



SCHEMATIC DIAGRAM OF AN AIR-COOLED CONDITIONER

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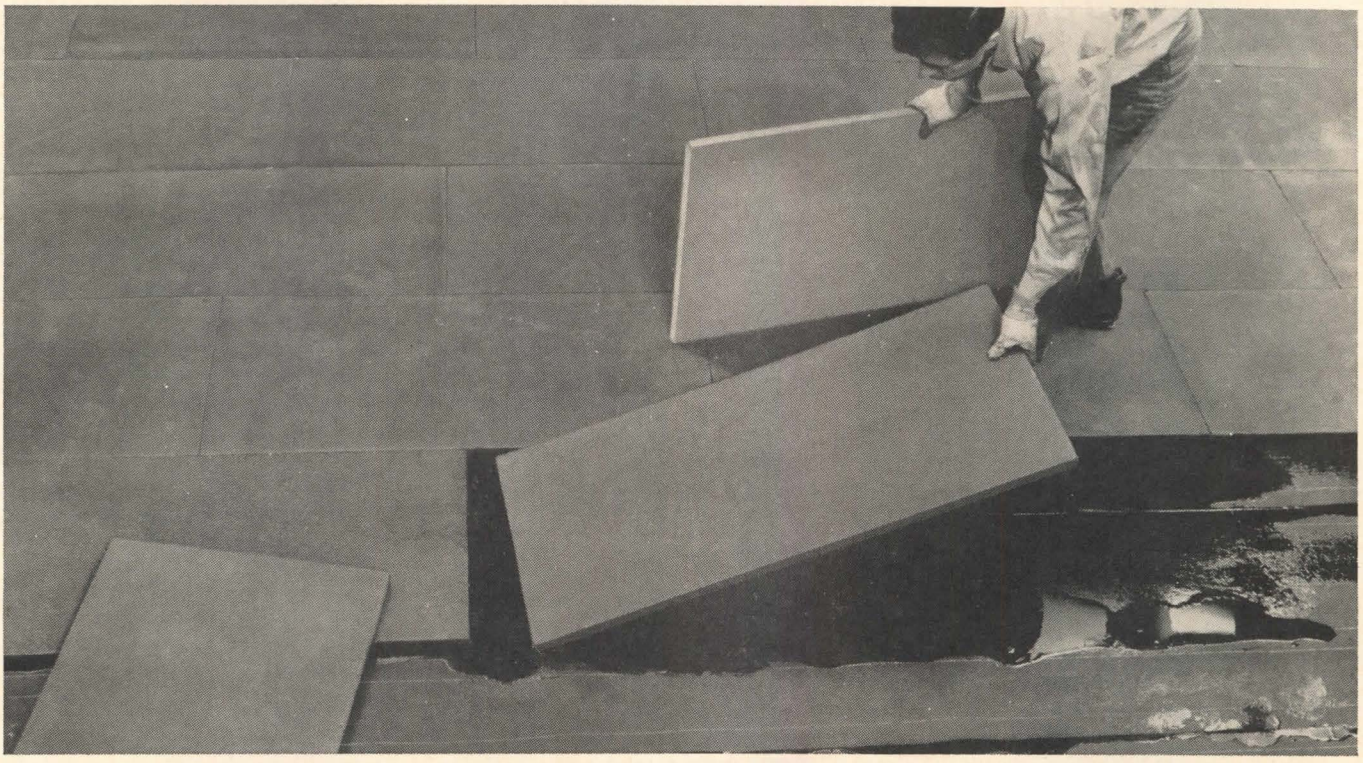

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SPECIFICATIONS CLINIC

MAXIMS OF SPECIFICATIONS WRITING: PART 1

BY HAROLD J. ROSEN

Useful guides to be considered in the preparation of specs are offered. Rosen is Chief Specifications Writer for Skidmore, Owings & Merrill, New York.

E. Griffith Edwards, an architect and authority on specifications, has collected a series of maxims for specifications writers, which are presented here as a useful guide. These maxims were culled from many articles and books on specifications writing, in the hope that they might contribute to improving specifications writing.

The aim in specifications writing should be a clear presentation of facts, rather than preparing them in elegant or impressive style. Edwards recommends that, with these maxims, one should read critically specifications already written, including one's own, to study how different paragraphs might have been expressed more intelligibly and economically, while constantly striving for clarity and brevity. He suggests that, though a manufacturer's printed specification may be copied, one should rewrite it, since specs of this type are not generally written in an acceptable form.

Maxim No. 1—Be Fair: Do not attempt to throw all risks and responsibility on the contractor. Unfortunately, there are some government agencies that require architects to use the agency General Conditions, throwing so much risk on the side of the contractor that a tough project representative, backed up by the architect and owner, could easily cause the contractor to have a substantial loss instead of a modest profit on any project performed under them. Specifiers should always avoid the use of so-called "weasel," "shotgun," or "murder" clauses, making the contractor responsible for possible errors or omissions of the architect, such as the following: "The contractor shall carefully read and note the work included in the specifications and shall include all other work that may be required to complete the building."

A paragraph used by a state agency in its Supplemental General Conditions, and objected to strenuously by contractors, is the following: "The contractor will furnish the names of subcontractors he will use on the work. The furnishing of such names shall not affect the authority of the architect under Article 36 to reject any subcontractors as incompetent or unfit and there shall be no claim against the owner for any adjustment in the contract sum on account of such rejection."

Maxim No. 2—Be Brief: Specifications tend to be too lengthy in spite of the greatest economy of words. A constant effort should be made by all specifiers to condense statements. Avoid long and involved sentences. The following submaxims will help in this regard.

(a) Specify Standard Articles by Reference to Accepted Standard Specifications: For example: Many words would be necessary to describe properly a common product such as portland cement, its chemical composition, fineness, soundness, compressive strength, tensile strength, and so on. All these words are eliminated by a single reference to the standard, thus: *Portland cement* shall meet the requirements of ASTM Spec C150, Type 1.

(b) Avoid Repetition of Information shown or scheduled on the drawings. Also, avoid duplication within the specifications themselves. This will eliminate words and the possibility of contradiction.

(c) Do Not Include Inapplicable Text: Avoid discussion of materials or methods that could not pertain to the actual construction work for which a set of specifications is prepared, since it is confusing to bidders. When old project specifications are used for the preparation of the new project specifications, the writer sometimes carelessly overlooks deleting inapplicable material.

(d) Never Make the Word "Contractor" the Subject of a Sentence. Instead, make the material or method the subject. Not only will this make your sentence shorter, it will also put up front the key word to serve as a title. For example: (Poor): *Rubbed finish:* Contractor shall apply a rubbed finish to exposed surfaces of concrete. (Better): *Rubbed finish* shall be applied to exposed surfaces of concrete.

(e) Minimize the Use of a Scope Article: In each technical section, the maxim should be: Never use a scope article. This is a dangerous practice, since it causes duplication and increases the chance of contradiction.

(f) Eliminate Superfluous Words: The following paragraph reads better when the deletions indicated by italics have been made: "*The contractor shall* strip *the* topsoil from *the* areas to be excavated and graded, and neatly pile it on *the* property; then, after *all the* backfilling is finished and *all the* areas graded, *the* available topsoil shall be spread over the areas to be seeded or planted."

(g) Use Numerals Instead of Writing Out Numbers.

(h) Use Well-Known and Accepted Abbreviations: The use of abbreviations facilitates reading, reduces typing, and shortens text without sacrificing clarity.

(i) Use Simple Imperative Mood: (Poor): Contractor shall install lighting fixtures, which will be furnished by owner. (Better): Install lighting fixtures furnished by owner.

(j) Consider the Use of Streamlined Specification: For example:

Portland cement: ASTM Spec C150, Type I.

Masonry mortar: ASTM Spec C91, Type II.

Slag cement: ASTM Spec C358.

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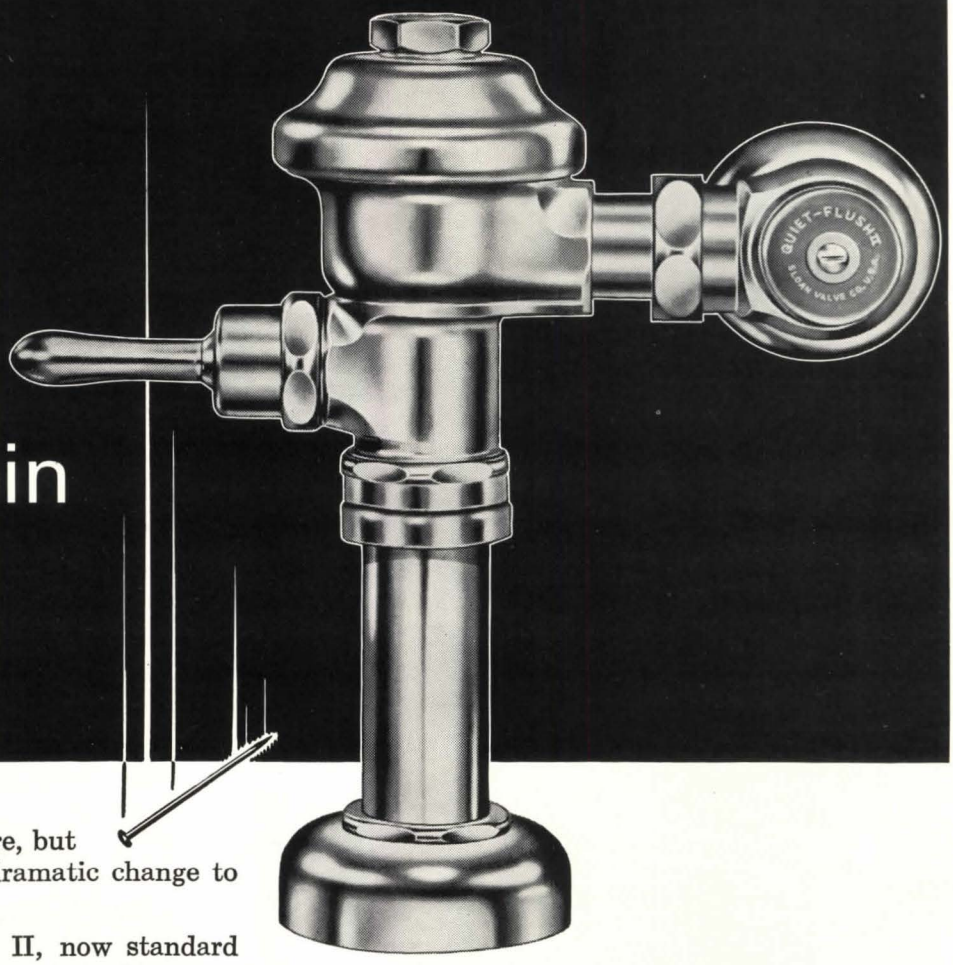

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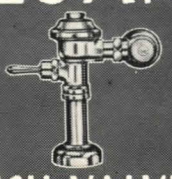

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IT'S THE LAW

AESTHETICS AND THE LAW: PART I

BY BERNARD TOMSON AND NORMAN COPLAN

P/A's legal team examines a case that challenged the constitutionality of a zoning ordinance governing billboards. This is the first of two articles, which will include a general discussion of aesthetics as a valid legal basis for zoning and regulatory ordinances.

Aesthetic objectives as a valid legal basis for zoning or other regulatory ordinances is progressively finding more favor with the courts of the United States. Traditionally, it has been the rule that a zoning law based solely upon aesthetic factors will not meet constitutional requirements. In recent years, however, the courts have increasingly recognized aesthetic considerations as at least a partial basis for validating regulatory laws. The time may not be too distant when aesthetic objectives alone will be deemed sufficient to uphold the validity of zoning regulations. A long step in this direction has recently been taken by the courts of New York in a very significant decision upholding the constitutionality of a zoning ordinance that prohibited "nonaccessory" billboards *(Cromwell v. Ferrier,* N.Y.L.J., May 1967).

The petitioner in the *Cromwell* case was the owner of a 200-acre tract of land in the town of Walkill, N.Y. This parcel was divided by a highway that passed through the property in a north-south direction. After purchasing the property in 1961, the petitioner constructed a service station and a diner upon that half of the property west of the highway.

In 1963, the town of Walkill adopted a zoning ordinance that contained detailed and comprehensive provisions regulating signs in the town. This ordinance, however, only permitted signs that were "related to an establishment located on the same lot." Such signs were designated as "accessory," and, by implication, "nonaccessory" signs were prohibited anywhere in the town.

In 1964, the petitioner commenced to construct two billboards advertising petitioner's service station and restaurant. The signs were being erected on that portion of the property east of the highway. Prior to the completion of the signs, the Building Inspector secured a stop order on the ground that the signs were in violation of the ordinance. When this action was affirmed by the Zoning Board, an appeal was taken to the courts challenging the constitutionality of the law.

It was the position of the town that the billboards advertising the petitioner's service station and restaurant were not on the same lot as the buildings that they were advertising and, therefore, being "nonaccessory," were excluded by the ordinance. The petitioner, on the other hand, argued that the prohibition of "nonaccessory" signs anywhere within the town limits was arbitrary and unreasonable and that the application of such a law resulted in "an unconstitutional deprivation of the property of petitioner" if based on aesthetic reasons only. The lower court dismissed the petition on the ground that the zoning statute did not prohibit signs, but merely regulated them. On appeal to an intermediate court, this decision was affirmed on the same rationale. On further appeal to New York's highest court, the Court of Appeals, the decision was affirmed, but the reasoning of the lower courts was rejected.

In order for the lower and intermediate courts to find that the ordinance before them was constitutional, they were required to reject the application of an earlier determination by the New York Court of Appeals *(Mid-State Adv. Corp'n v. Bond,* 274 N.Y. 82), which held a statute unconstitutional that prohibited billboards or other signs in any part of the community except signs erected upon buildings three stories or more in height. The court in that case questioned the validity of a restriction on outdoor advertising based solely on cultural or aesthetic reasons, and found, in any event, that a prohibition that included "all land" could not be sustained consistently with fundamental constitutional principles.

The New York Court of Appeals, in the case under discussion, in rejecting the grounds upon which the lower courts had attempted to reject the application of the *Bond* case, concluded that a re-examination of the *Bond* case was in order, and that it should be directly determined whether that case should be overruled. The court quoted with approval the statement of the dissent in the *Bond* case as follows:

" 'It is not unreasonable for a municipality or State to desire to beautify its streets and highways,' and that an ordinance should not be declared unconstitutional simply because it sought to achieve that end. . . . 'The constitution, it is true, does not change with the times, nor does an emergency or unusual circumstances warrant a disregard of constitutional provisions. A determination of what is due process, aside from procedural matters, however, depends upon the reasonableness of the legislation. Circumstances, surrounding conditions, changed social attitudes, newly acquired knowledge, do not alter the constitution, but they do alter our view of what is reasonable. Restrictions upon the use of property, which were deemed unreasonable in 1909, are regarded today as entirely reasonable and natural.' "

The Court of Appeals concluded that the rationale of the *Bond* case should no longer be applied and that a zoning law is not necessarily invalid because its primary objective is based upon aesthetic considerations. The Court said:

"One important factor in the courts' increasingly permissive treatment of similar zoning ordinances has been the gradual acceptance of the conclusion that a zoning law is not necessarily invalid because its primary, if not its exclusive, objective is the aesthetic enhancement of the particular area involved, so long as it is related if only generally to the economic and cultural setting of the regulating community."

In next month's column, we will continue the discussion of this case and, in general, of aesthetics as a valid subject of legislative concern and a permissible exercise of the police power.

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THE PEOPLE'S ART

BY ERVIN GALANTAY

DESIGN OF CITIES. *By Edmund N. Bacon. Viking Press, 625 Madison Ave., New York, N.Y., 1967. 296 pp., Illus., $15. The reviewer, an Associate Professor of Architecture at Columbia University, practices as a consultant in urban design and is the architectural critic of* The Nation.

Edmund Bacon's long awaited book on the design of cities is *sui generis:* Two-thirds of its pages deal with the development of cities, yet it is neither a book on urban history nor does it present a systematic theory of design method. Above all, the book is an extension of Bacon's dynamic personality, but due to Bacon's impact on the city of Philadelphia, and the influence of Philadelphia's renewal on other cities, the book may rank as an historic document.

While reading *Design of Cities*, I was reminded of the book written by the great baroque architect J. B. Fischer von Erlach: His *Entwurf einer Historischen Architektur* has long been replaced by more up-to-date volumes on the history of architecture, but the book remains invaluable as a key to the essence of baroque architecture and above all to the thinking of Fischer von Erlach. In this sense, the personal statement of an important designer is a less perishable intellectual commodity than a scholastic compendium of facts that is soon superseded and then serves only as a source of footnotes for the next-in-line specialized scholar. Bacon, like Fischer von Erlach, is a designer and the historic examples in his book do not purport to offer a balanced presentation of urban development: They are the result of a search for antecedents of Bacon's design concepts and offer a highly personal interpretation of the models that influenced his philosophy.

As Bacon states it, the purpose of his book is to "dispel the idea so widely and uncritically held that cities are a kind of grand accident." To him, the city is an *act of will* in the sense of the Schopenhauerian "Objektivation des Willens." He exhorts the reader not to "surrender to a mathematically extrapolated future," which, being the projection of past trends, can be no more than an "extension of what existed before." During the last decades, statistical planning has been on the ascendance, but Bacon will not concede the triumph of file-clerks' talents over creativity. "The future," he insists, "is what we make it." Bacon admits that the modern city is shaped by a multiplicity of wills and is resigned to the fact that the American political system provides so many safeguards and processes of rejection that the "final product of the designer on the city scale will be quite different from the original proposed." Yet he believes that a great design idea has the effect of polarizing fields of interest and causing a multiplicity of wills to coalesce into parallel action. This is achieved by the empirical tactics of throwing design ideas into the democratic arena to be acted upon by the forces of the community. This way, city design can become a "people's art," a shared experience — if provision is made for "democratic feedback" — the channelling of popular reaction back to the drafting tables. The value of this communication process is lessened at present by the lack of sensitivity and understanding concerning urban spaces and city-wide planning abstractions; even architects believe that large-scale design problems can be solved by simply pumping up small-scale ideas.

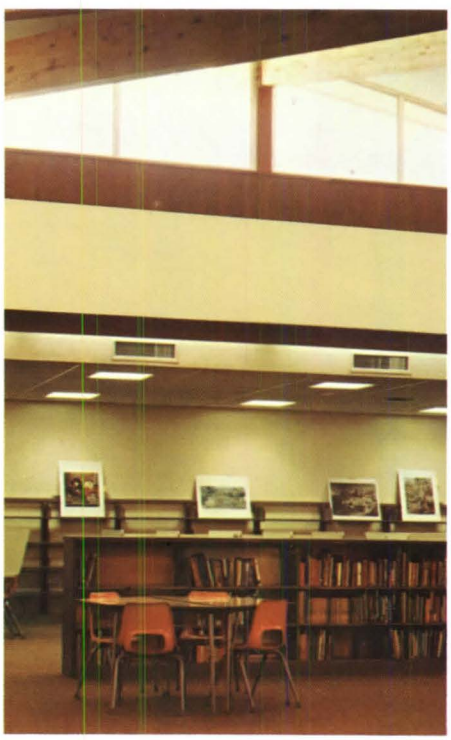
To demonstrate the processes by which successful city structures have developed, Bacon takes the reader on an educational tour of some 30 cities, a fascinating historical excursion with an inspired and knowledgeable guide. At first, this selection of examples seems eclectic: Among such predictable choices as Rome, Nancy, and Bath, we find equal weight given to such charming but minor urban entities as Panza, Zaltbommel, and Wijkbij-Duurstede. But, gradually, one comes to understand that Bacon demonstrates two valid paths toward the achievement of over-all urban order: first, the articulation of city fabric starting from selected nodes of architectural importance that generate fields of influence, creating a spatial "thrust" and a compelling urge toward their interconnection; and second, the establishment of a preconceived framework of order to which all later design decisions are subordinated.

In the first, the author assumes that an initial design idea can radiate a "shaft of energy" that later designers will be consciously or subconsciously affected by. Hence, the sensitivity of the "second man" is crucial, and an over-all design structure can emerge only if each successive designer is willing to accept the dominant theme established by the first designer. The second case of preconceived order finds its highest expression in the layout of cities that are ideograms of religious and magical concepts of the universe, like the city of Peking, which Bacon greatly admires. Yet such ordering principles become a game of geometry-for-its own sake when deprived of their symbolic substance (as in the sterile exercises of Beaux-Arts "compositions").

Dismissing geomancy and pure geometry, what else can provide a meaningful organizing principle for the modern city? Bacon's answer lies in an order derived from movement systems, since the modern city differs from historic cities mainly in the variety of modes of movements. Different rates of speed require design on varying scales to satisfy different rates of perception. The key to the design of such "simultaneous movement systems" lies in the nodal transition areas, where people not only change their means of transportation, but also transfer from one mode of perception and one speed/scale continuum to another. To conceive a city-wide design structure by this method calls for a "difficult creative process." Alas, at this point the reader is

Continued on page 182

NEW SCHOOL USES ACRYLIC SHEET OF LUCITE* TO CREATE A MODERN VISUAL ENVIRONMENT



The Marbrook School, an Elementary School pilot project of the State of Delaware, is an example of modern school-building design that reflects modern educational philosophies. It achieves a general openness and relatedness of educational facilities, combined with careful control of thermal, sonic and visual environments.

Since it is estimated that 80% of all learning is by eye, particular care was devoted to the creation of a proper visual environment. Shown above are three examples of the imaginative use of modern designs and materials to achieve balanced lighting. At left above is the skylight of the Physical Education Shelter, an open-air facility. Acrylic sheets allow daylight and sunlight to flood the area while providing resistance to breakage. The center illustration shows the use of clerestory windows to provide uniform light distribution with glare-reducing sheets of gray-tinted acrylic plastic. These are used in the Instructional Materials Center and the Cultural Arts Center. Throughout the classrooms, acrylic lighting shields provide even, well-distributed lighting, with an intensity of approximately 70 foot-candles on all desk surfaces (above right).

The architects – Dollar, Bonner, Blake and Manning, of Wilmington, Delaware – specified acrylic plastic to meet the exacting requirements of these installations, and acrylic sheet and lighting lenses made from Du Pont LUCITE more than filled the bill.

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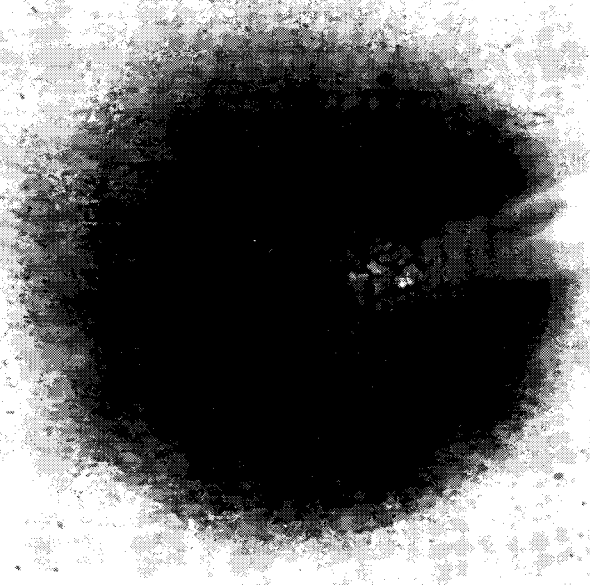

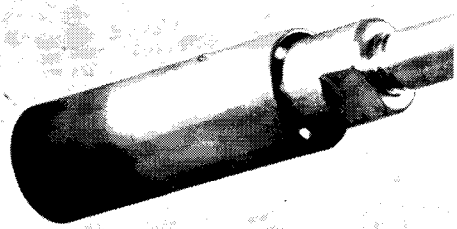

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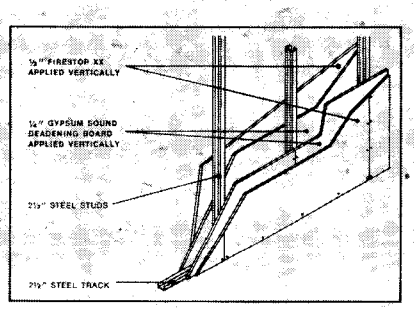

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*Geiger & Hamme, Inc., July, 1966

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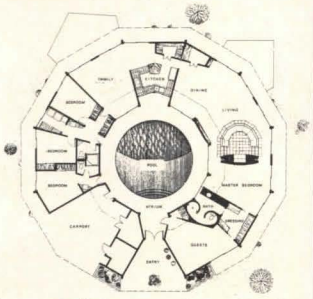
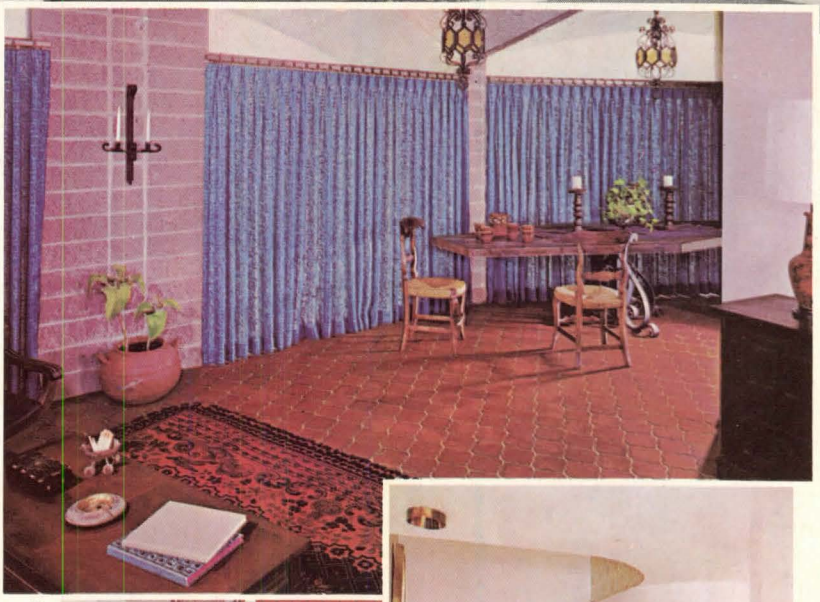
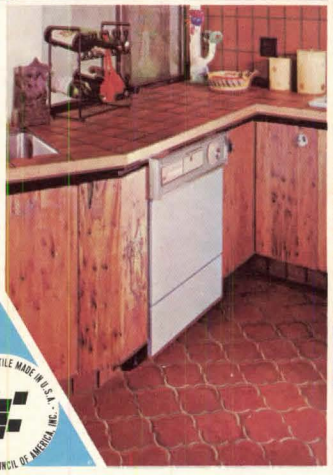
On Readers' Service Card, Circle No. 402

Ceramic tile lends carefree warmth to an unusual circular home by John Nyberg.







Located in Pasadena, California, this circular home has an atrium as its focal point. All rooms of the masonry and tile structure open off the atrium with its circular pool.

Designed by the firm of Nyberg and Bissner as Mr. Nyberg's home, ceramic tile is used both decoratively and functionally. Quarry tile floors are found in the living room dining, area, kitchen and den. It is also used for kitchen counter tops and back splashes.

Scored glazed tile is used for bathroom counter tops and walls including a unique circular treatment of the walls of the master bath.

In keeping with the contemporary Spanish feeling sought for, extensive use of tile is made throughout other areas of this five bedroom home. Tile contractor for the home was C&D Tile Company of San Gabriel.

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Continued from page 178

not permitted to follow the author into his inner sanctum. The door closes as Bacon withdraws, saying, "It is not my intention nor would it be possible to explain exactly what this creative process is." He refers the reader to artist Paul Klee's primal law of growth, "the central organ of motion in space and time . . . inspires all functions of creation."

By analogy, Bacon's method seems to lie in the selection of principal lines of movement and the assignment of their areas of influence, firmly guiding the development of major elements, which then will generate sub-themes according to their own potency. Bacon quotes the Rev. J. Lowell's motto, "In essentials, unity; in non-essentials, liberty; in both, charity," to define the delicate relation between regimentation and the freedom left for the individual architect toward the creation of great civic architecture. Bacon states that Klee's sensitivity opened a path to his understanding of spatial development. It is characteristic that Bacon found this revelation in the work of a contemporary artist, like the Renaissance architect and artist found a shared passion in "sweet perspective."

It is not easy to decide for what group of readers *Design of Cities* has been written. Its lavish production by the Viking Press seems to indicate that Bacon's interest in the education of the general public has coincided with the publisher's desire to enlarge the market by making the book attractive to the gift-book trade. I find the illustrations too variegated and the graphics too affluent. The use of color is merely disconcerting: Some pages, like those on Rotterdam, would look nice in a flower catalogue. As a result, the book lacks convincing visual unity of the somewhat comparable *Towns and Cities* by Steen Eiler Rasmussen. The book contains a liberal helping of illustrations from Rasmussen, Reps, Bunin, and others, but many beautiful plans have been specially drawn. Thus, it is a pity that some plans do not indicate the scale, and notations (like 1:17000 or 1:3300) on others must be quite meaningless to nonarchitects. A visual scale on each plan would have given even an average housewife a good dimensional grasp of the size of unfamiliar urban spaces. The lavishness of the graphics contrasts with the sparse, unaffected and direct prose of Bacon's text. In an age of effeminacy and mannerism in both architecture and writing, it is pleasant to encounter the dense baroque maleness of Bacon's imagery as his references to that unequivocally "pleasurable human experience — penetration in depth."

The last 40 pages of the book are devoted to "Putting the Ideas to Work" in

Continued on page 188

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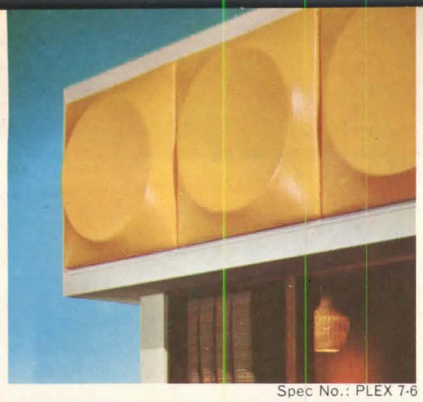

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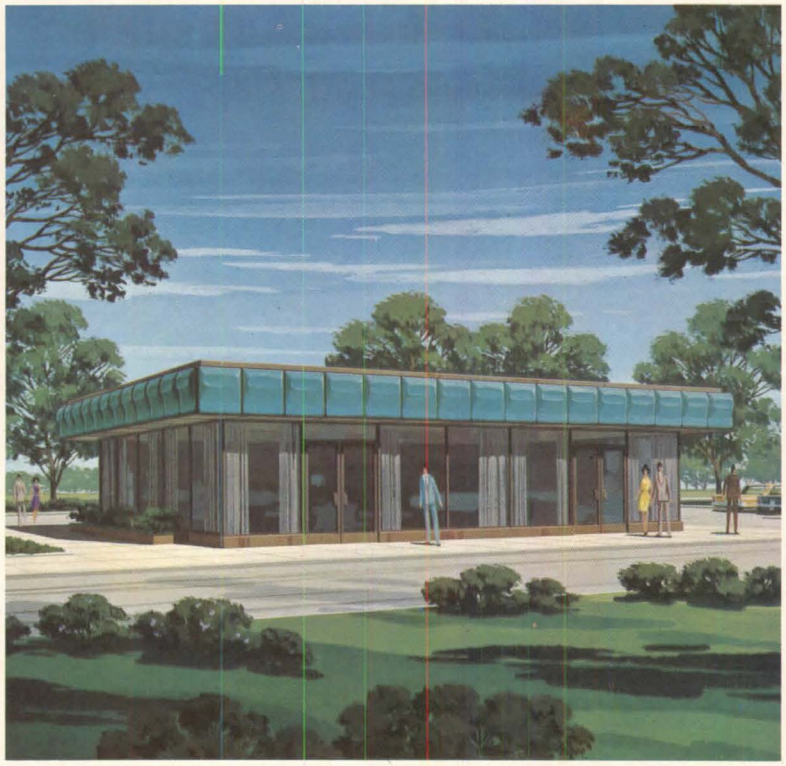

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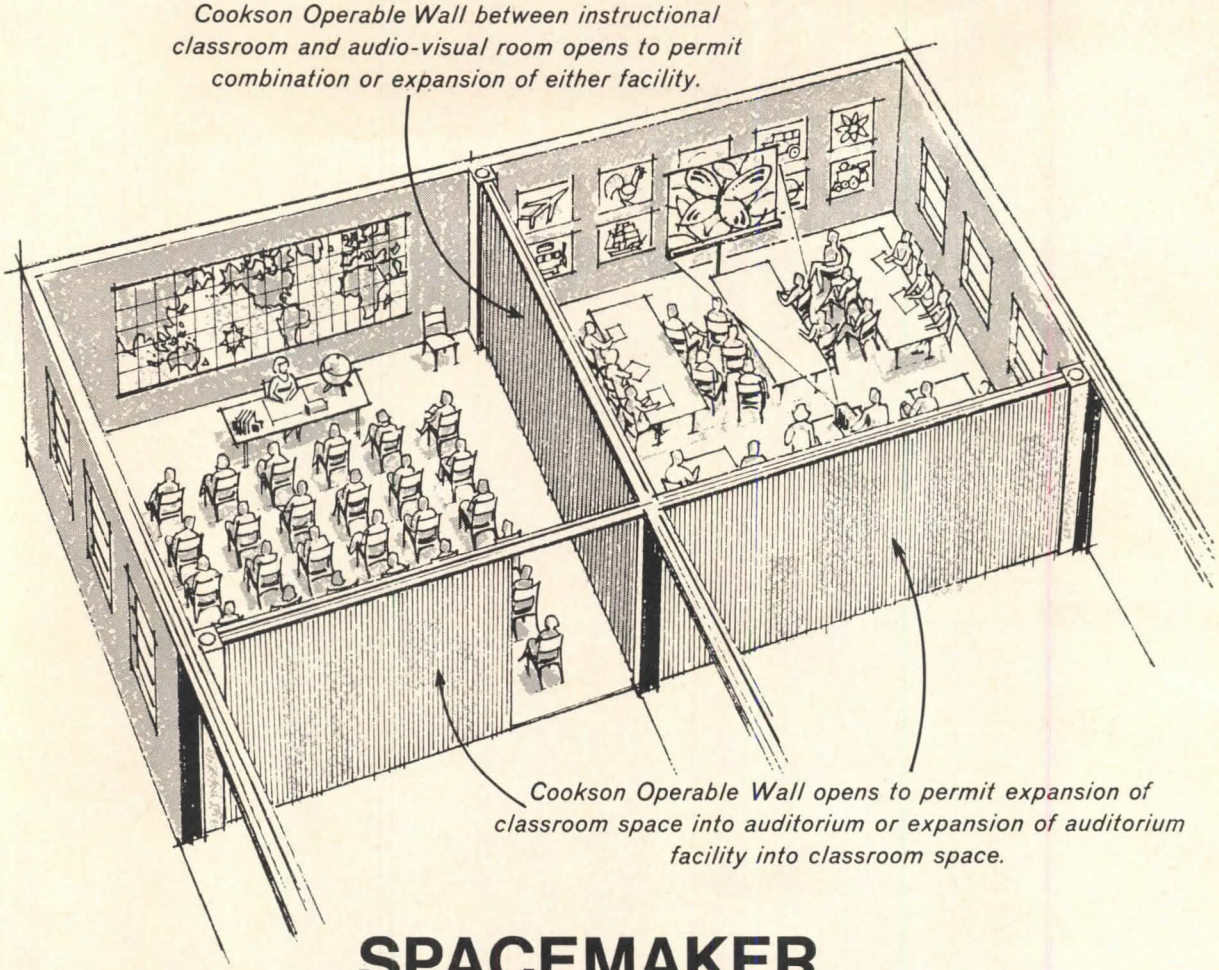

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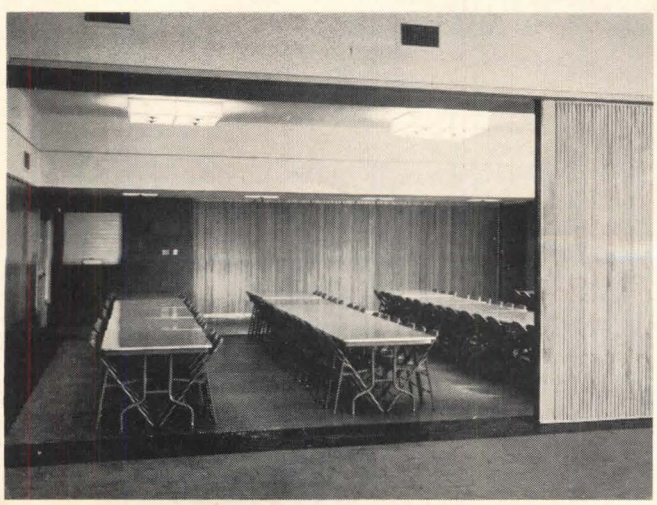

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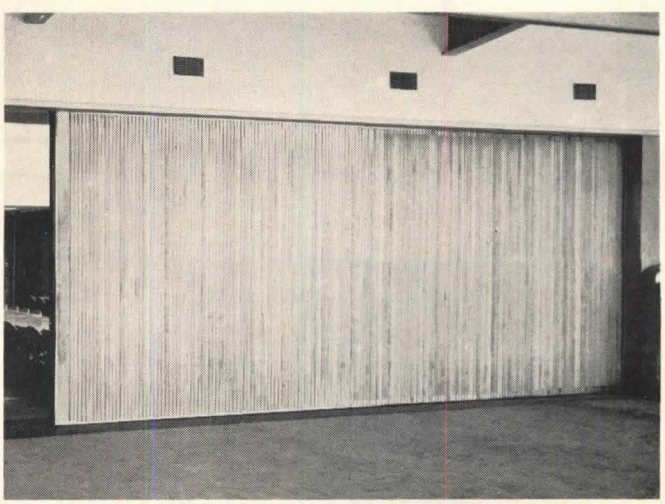

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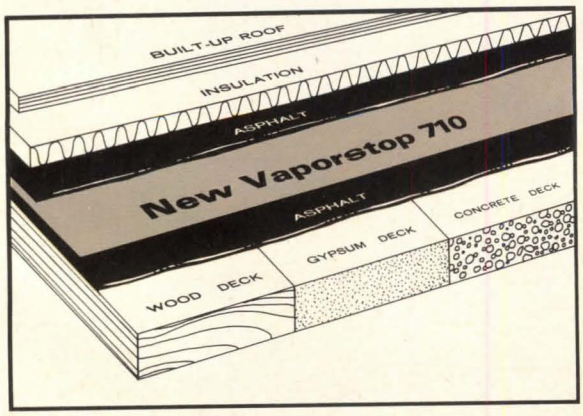

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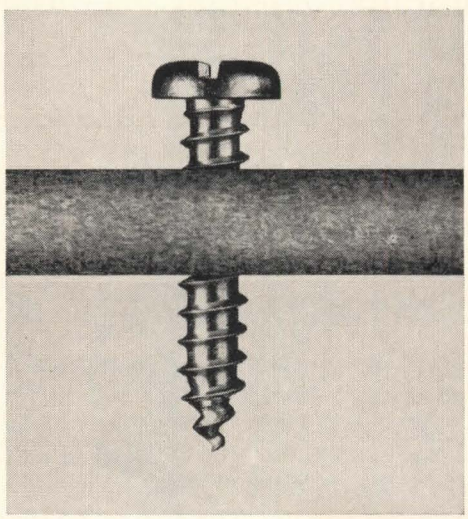

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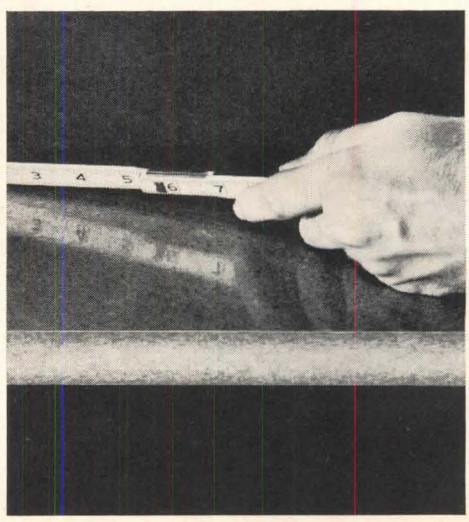

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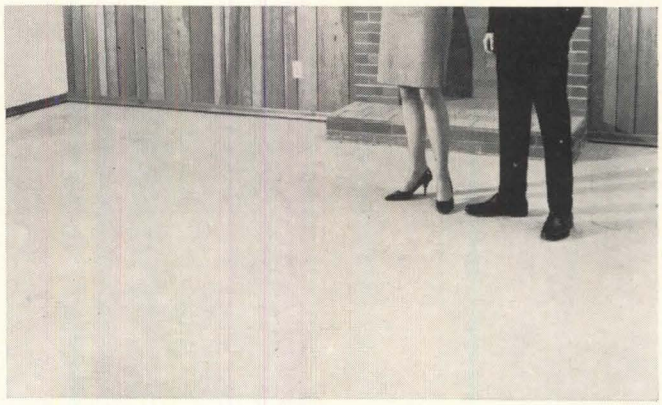

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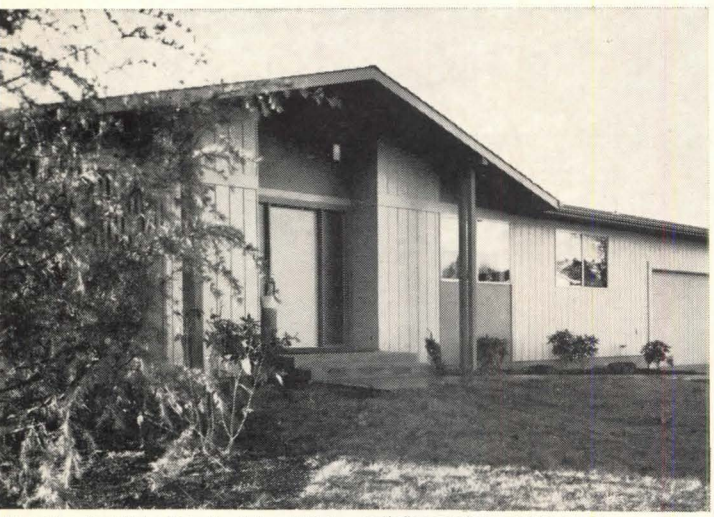

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Continued from page 182

Philadelphia. These are, in many respects, the most rewarding. At the 1966 commencement exercises at Columbia University, Bacon advised the young planners to "decide for one city and devote your life to it: immerse in it wholly and see everything in function of its needs." In this, Bacon recommended the pattern of his own immensely effective professional life in Philadelphia, where he has been active for 29 years, first at the Philadelphia Housing Association, and, since 1947, as Executive Director of the Philadelphia Planning Commission. As a perfect "second man," he accepted the dominant theme set for Philadelphia by Penn's plan of 1682 over which he gradually superimposed his "simultaneous movement system." Starting with two nodes of renewal at Penn Center and at Independence Mall, he pursued with dogged tenacity his concept of interconnecting historic buildings and renewal areas. In implementing his vision, he brought to the city leading outsiders, like Ieoh Ming Pei, and, perhaps even more importantly, managed to attract to civic design the best architects locally available, thus contributing to the emergence of a "Philadelphia School" of distinct identity.

Bacon likes to speak of the "shaft of energy" generated by great buildings that become determinants of later design action. In a sense, such a "shaft of energy" is Bacon himself on the civic scene of Philadelphia: His design concepts have served as a model for the renewal of many American cities, and ideas first pioneered in Philadelphia are now turning up from Montreal to Osaka. Bacon's belief that a great design idea contains "seminal forces capable to influence future development" places him in American planning history as the man who has inherited the cape of the great Daniel Burnham. This defines the power of his vision and perhaps helps to explain the one-sided emphasis of his *Design of Cities.*

One could lament that design as a process is given only perfunctory mention on two pages; that the social and economic determinants of urban design are hardly considered; that the influence of activities other than circulation is neglected while formal factors are overemphasized. But in this decade, when planners find it fashionable to ignore the bountiful table of urban design to chew instead on the dry bone of sociometry, it is refreshing to read a book full of unabashed lustful statements as to the power of design. For this reason alone, I hope that *Design of Cities* will be read by civic leaders and little old ladies alike, and it should be brandished and recited by young urban designers like that little red book by the cohorts of Mao.

Continued on page 196

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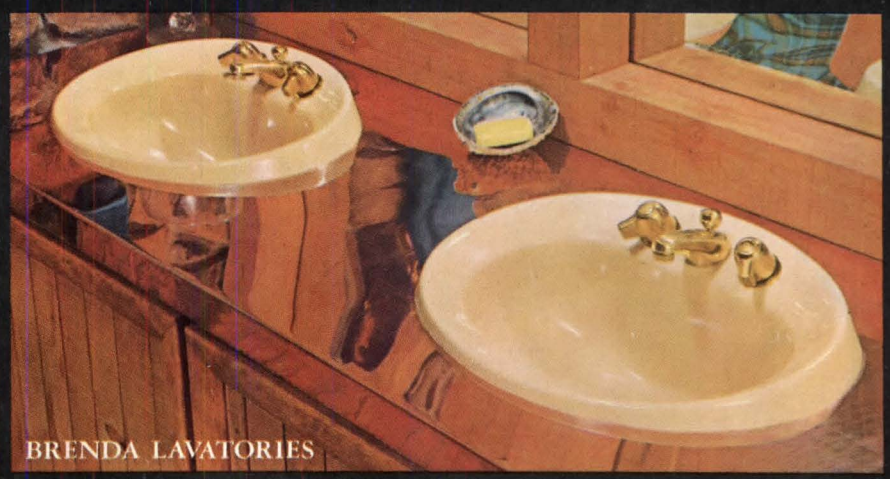

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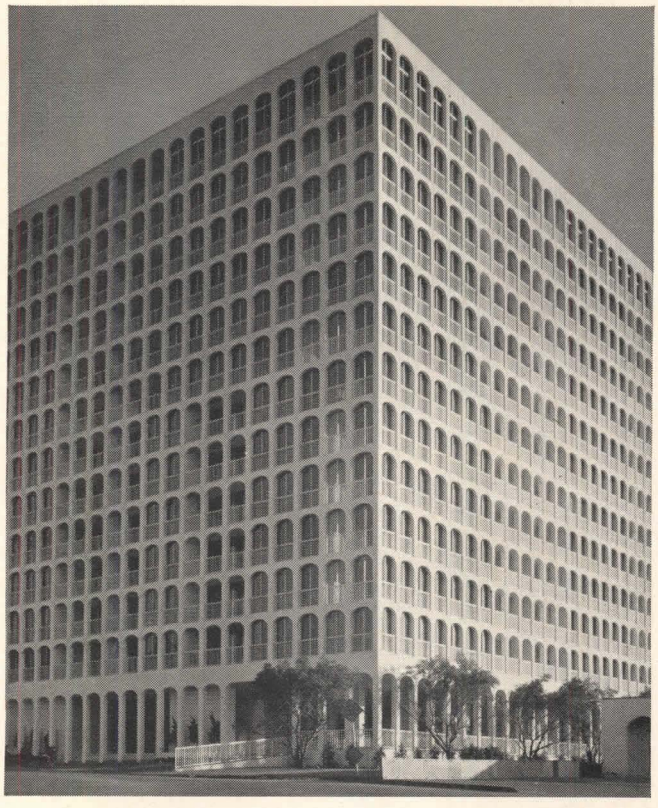

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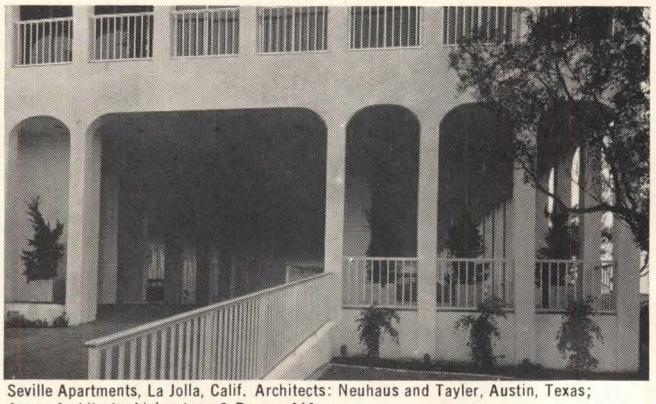

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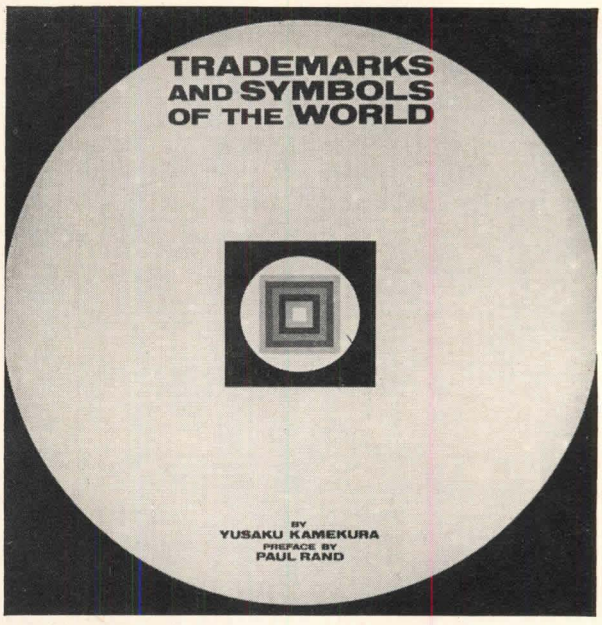

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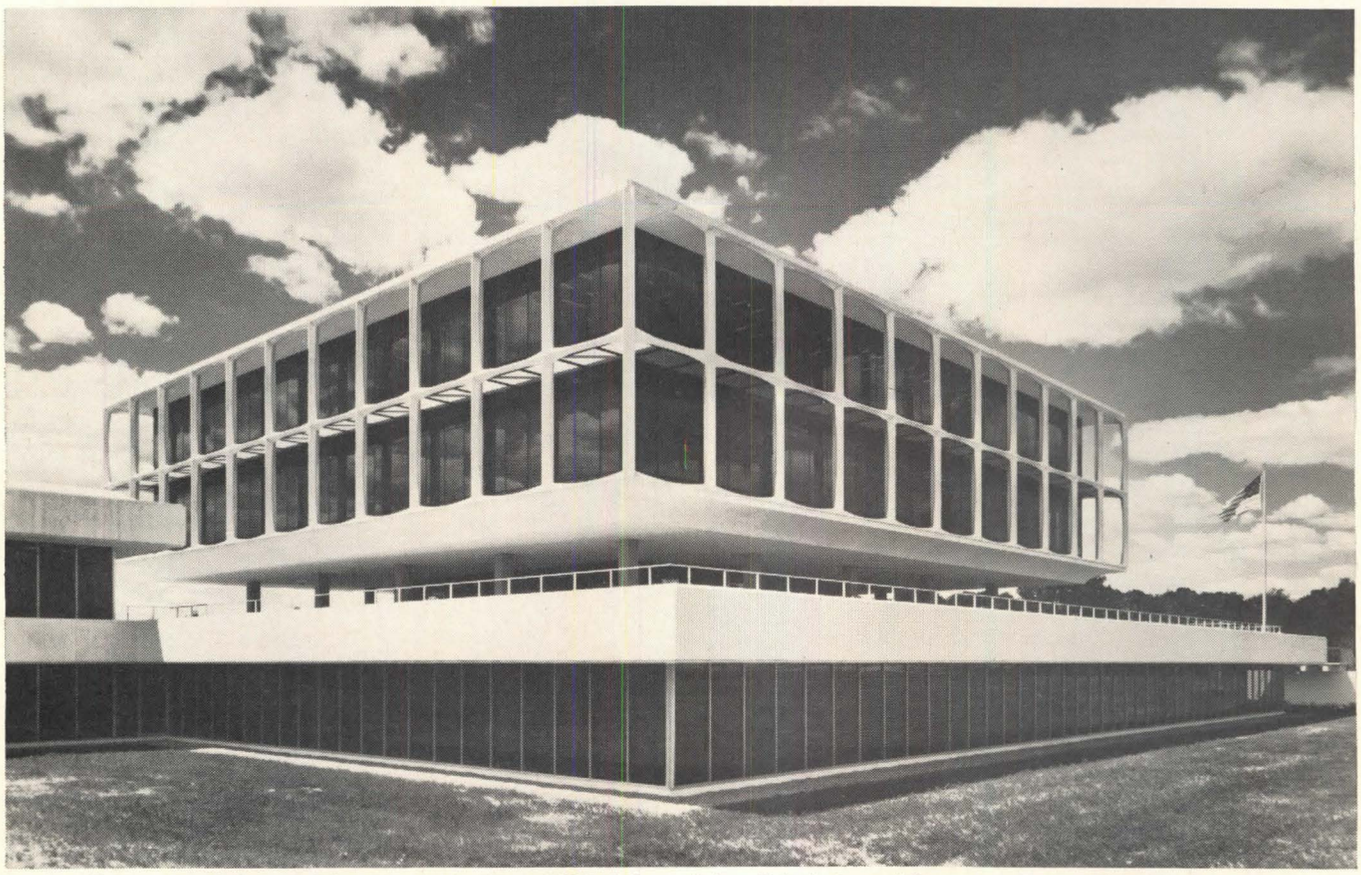
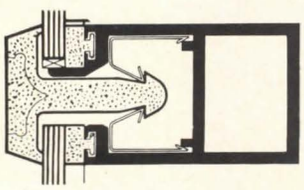


Federal-Mogul Corp. Building, Detroit. Architect: Giffels & Rossetti, Inc., Detroit. General Contractor: Barton-Malow Co., Detroit.



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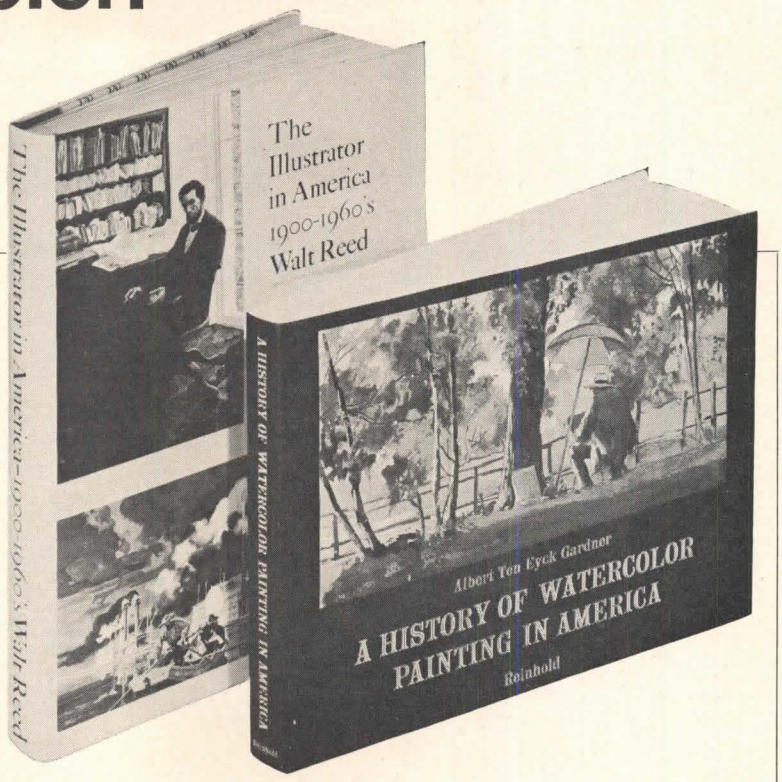

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Continued from page 188

Hot Sun, Burning Walls

BY FORREST WILSON

BUILDERS IN THE SUN: FIVE MEXICAN ARCHITECTS. *By Clive Bamford Smith. Architectural Book Publishing Co., 151 East 50 St., New York, N.Y., 1967. 224 pp., illus., $12.95. The reviewer, who did the drawings that accompany this review, is an Associate Editor of P/A. He spent more than a year working in Mexico and has written several articles on Mexican architecture.*

The story is told of a proselytizing existentialist who arrived in Mexico City, saw a Mexican child bite the head off a sugar candy skeleton, turned around, and returned to Paris.

Most of the architecture done in Mexico since the conquest has been designed by existentialists who stayed. The rich mestizo culture has enriched everything it has touched and in so doing has created a Mexican national art. But it has never been able to establish continuity with the pre-conquest Indian culture to which all eras of Mexican art pay homage. The 16th Century conquistadores put steel chisels into the hands of the Mexican artisans who cut stone like butter and created a riotous profusion of forms that submerged even the flamboyant baroque.

The great muralists of the 30's — Sequeros, Orozco, Rivera and the rest — created a style of mural painting in commemoration of the liberation brought about by the Mexican Revolution, and enslaved Mexican art for decades. Since the pre-Hispanic culture never arose again after the conquistadores, Mexican art has never completely liberated itself from the trappings of the Mexican Revolution — trappings which, ironically, are now often the marks of reaction rather than the freedom fought for by the camposinos.

The base upon which all Mexican art is built is that of the Indian, yet his talents remained untapped. Even the greatest of them, Juarez, the full blooded Oaxacan Indian, could not reestablish the continuity of pre-Columbian art. Yet Mexico creates its own artists, no matter what their antecedents.

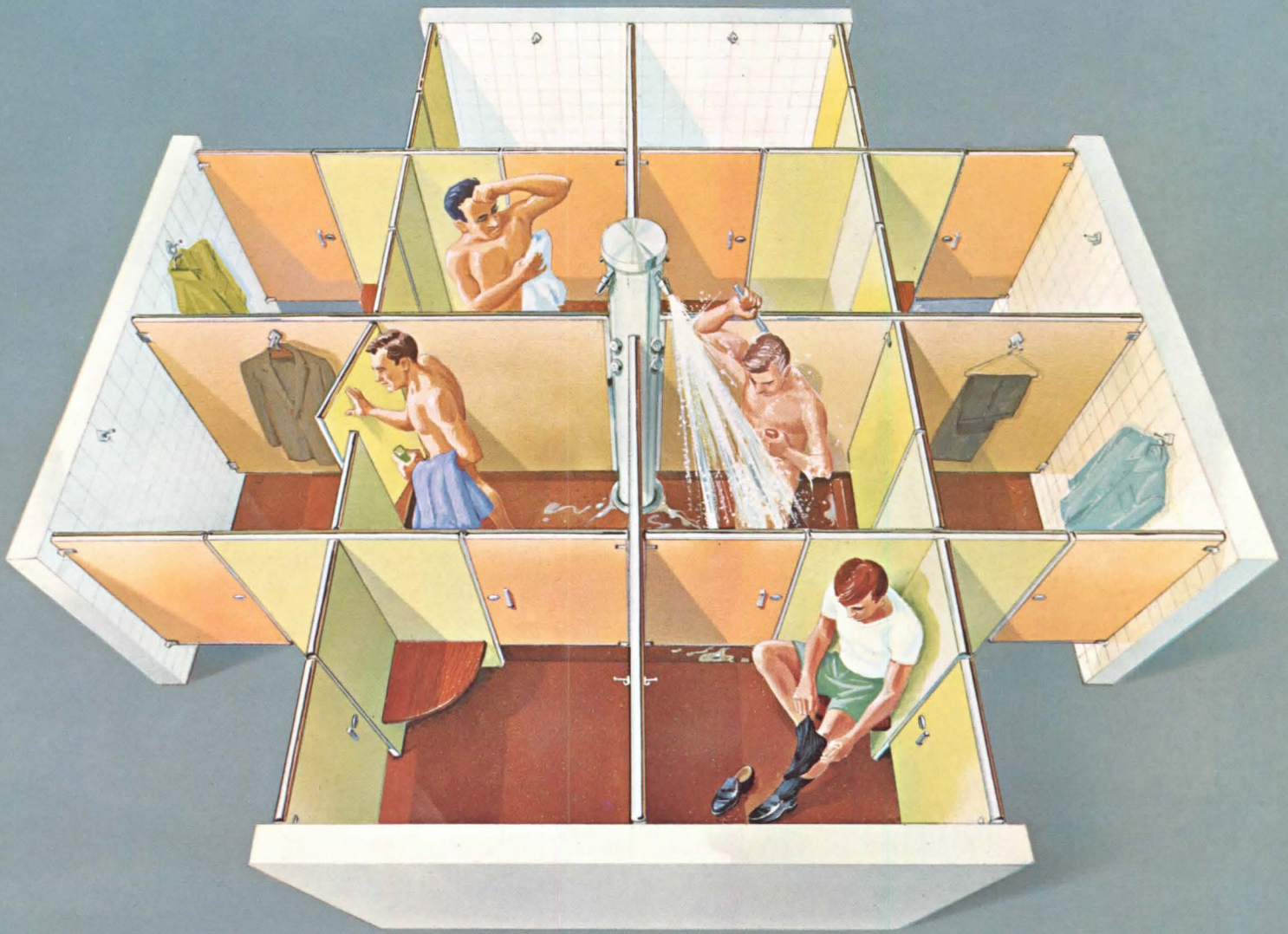
It was from this Mexico that the journalist Clive Bamford Smith chose his "five builders in the sun": Juan O'Gorman, Louis Barragan, Felix Candela, Mathias Goeritz, and Mario Pani. It is typical of the incongruity Mexico breeds that the five men selected should be totally unrelated to each other except that they sometimes practice the same art. O'Gorman is a painter and muralist, Barragan a developer and landscape artist, Candela an engineer, Goeritz a sculptor, and Pani a city planner. All of them are competent architects.

Builders in the Sun is not particularly well written, considering the subject. Its charm lies in the author's having reduced a cultural explosion to a modest pop. Although photographs are magnificent, the biographical material is disappointing. However, despite its shortcomings, the book is fascinating simply because of its subject matter.

Since the talents of the men are so divergent, it is useless to attempt generalities. They must be discussed individually. We can begin with O'Gorman, which is proper because he is a remnant of the national art of Mexico, the fresco painters of the 30's. His architecture has run the gamut from stark Corbusian "machines for living" to his own organic-historic-pop-art-mosiac-encrusted home. Despite a deep social conscience, O'Gorman has not worked at creating an architectural solution to relieve the abysmal, poverty stricken condition of the Indians who swarm from the campos to live in cardboard and tin shacks on the outskirts of Mexico City. There they patiently await assimilation into the urban proletariat. O'Gorman has given them symbolic mosaics.

Barragan is the most interesting architect of the group. The gardens of his houses in Pedregal (of which he was a major developer) are oases in a 15-square-mile sea of lava beds. His houses are sensitive creations, like the natural stone and wood sculptures in his gardens. The precision of place and economy of form create a spatial richness. Somehow he has distilled the essence of Orozco's lithographs into his architecture.

Continued on page 206



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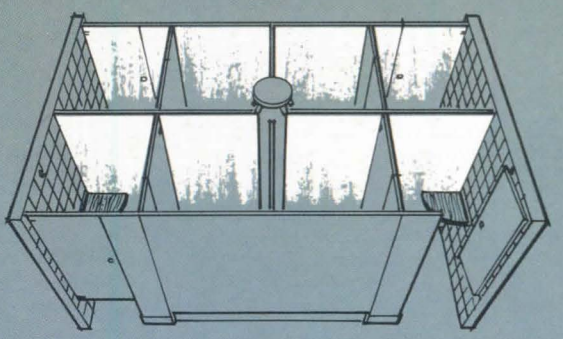

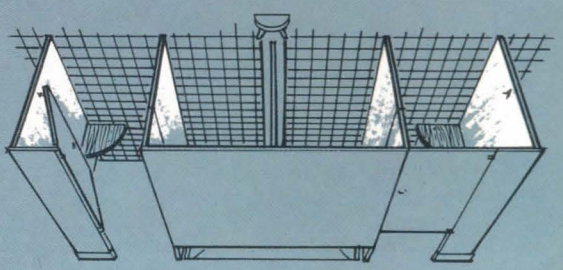

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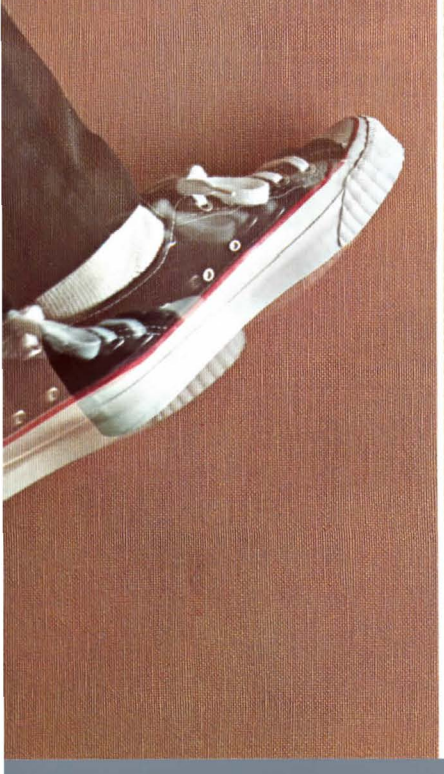

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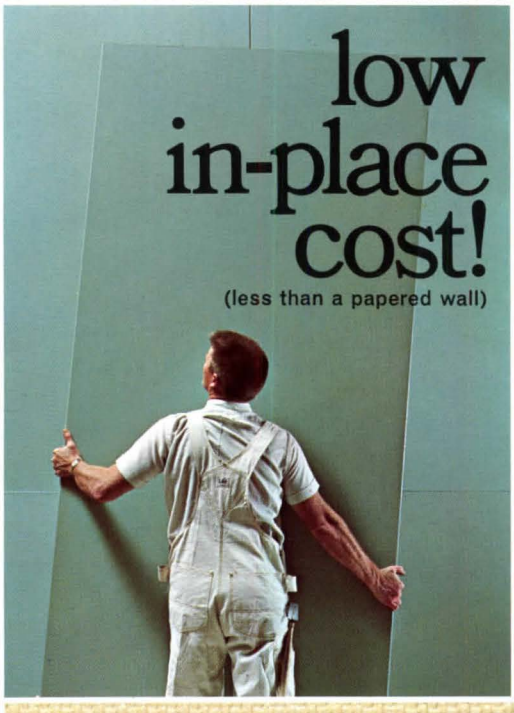

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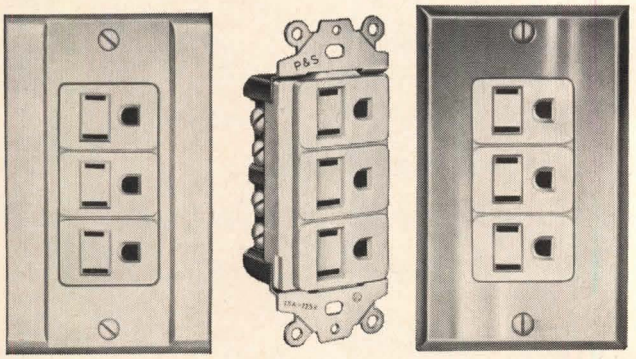

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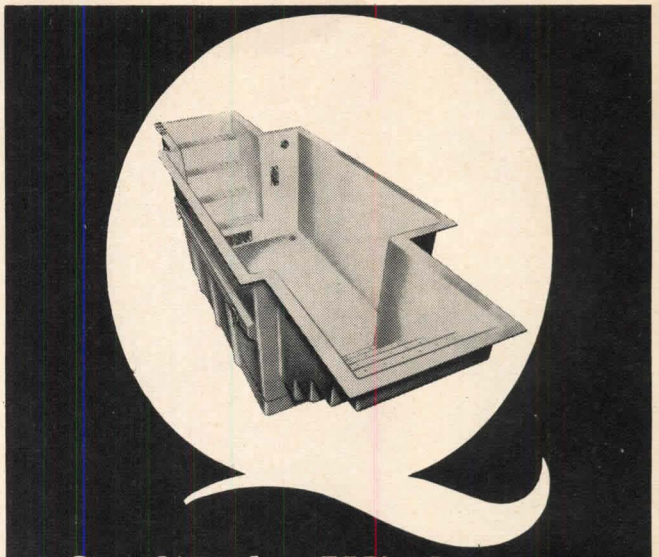

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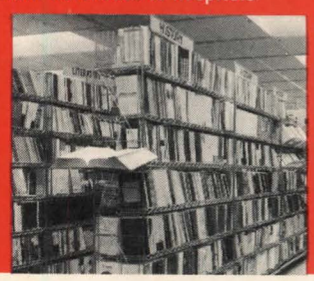

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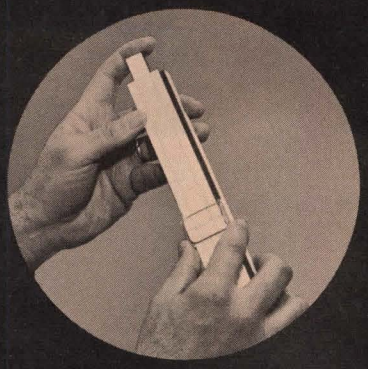

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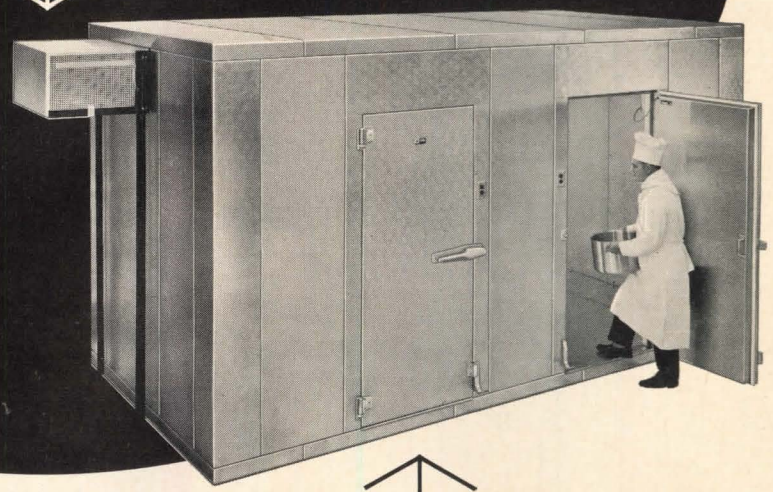

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Continued from page 196

Candela is Candela, and international. The Mexican element in his work is his love of working close to the bull's horns with structural geometry. Photographs, drawings, and plans of his now familiar shells are excellent, although nothing new is said about his work, by the author or Candela himself.

Goeritz, designer of the Satellite City Towers, is shown as the universal jack-of-all-trades. His architectural sculptures are just that and, for Mexico, fittingly surrealistic. What ever is done in Mexico is done big — good or bad — and Goeritz's architecture makes a point, one would suppose, by simply being there. However, his "Emotional Construction," exhibited in a public square of a working-class area in Mexico City that would make our ghettos look like Park Avenue, is an absolute affront. It provides neither shelter nor a place for children to play. It is an intellectual Marie Antoinette-like statement saying, "let them eat carbon steel."

Pani, the planner, is perhaps the most significant, after Candela, of the group presented. His plans are on the Mexican scale — huge. They are justified by economic rather than aesthetic reasons. If this type of planning had to happen, it is best that Pani did it, for he made the best of a bad situation. Most of his earlier apartment buildings shown are flamboyant Mexican middle class. His buildings are dated, but the dates are reversed, for Pani was the originator. A surprising note is one photograph of experimental housing units on the outskirts of Mexico City to replace the cardboard and tin shacks of the camposinos. The solution looks surprisingly sensitive for a designer of Pani's tastes. This is the type of design one would have expected from O'Gorman.

All of the overly familiar elements that we have come to associate with Mexican architecture are here: the long perspectives stretching away to an infinity basking in the hot sun, burning walls with black shadows, rich textured natural materials, lava, concrete, stone, rough stucco, flat surfaces with brutal delineation — all appear repeatedly in the book. This is the essence of Mexico that has worked on all of her builders, from pre-Columbian times to the present.

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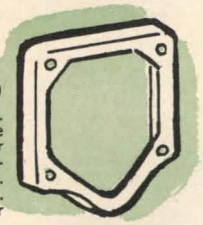

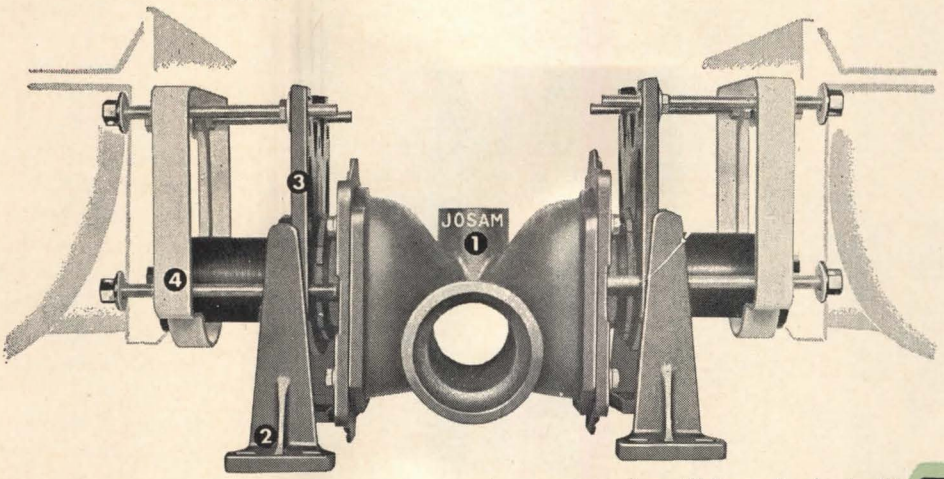

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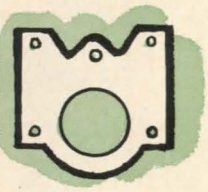

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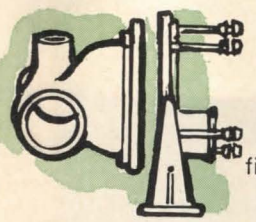

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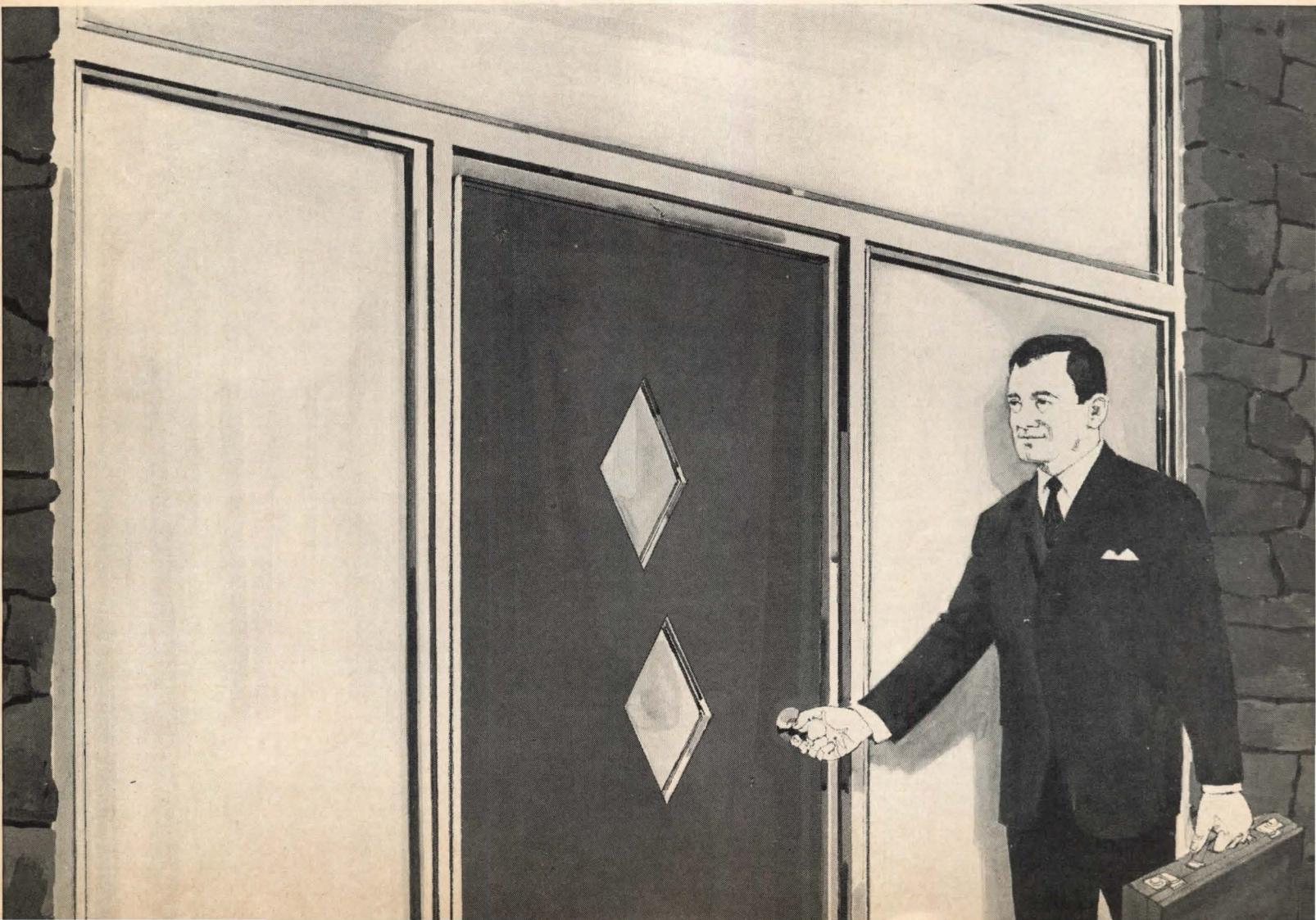

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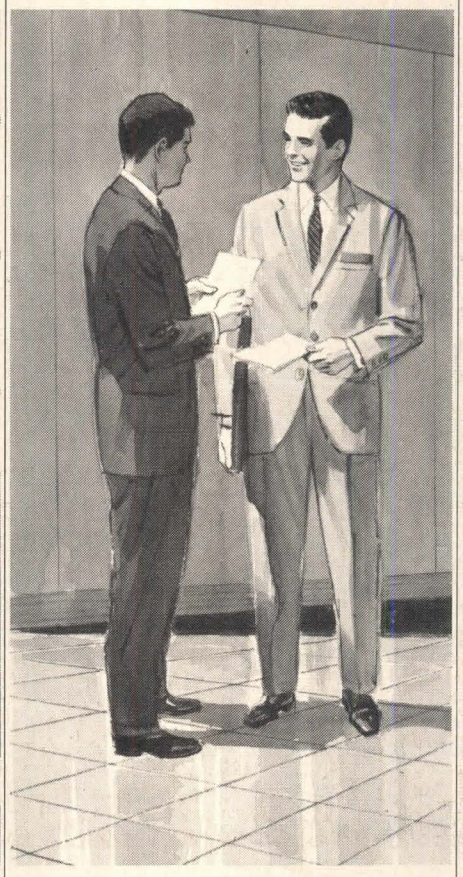

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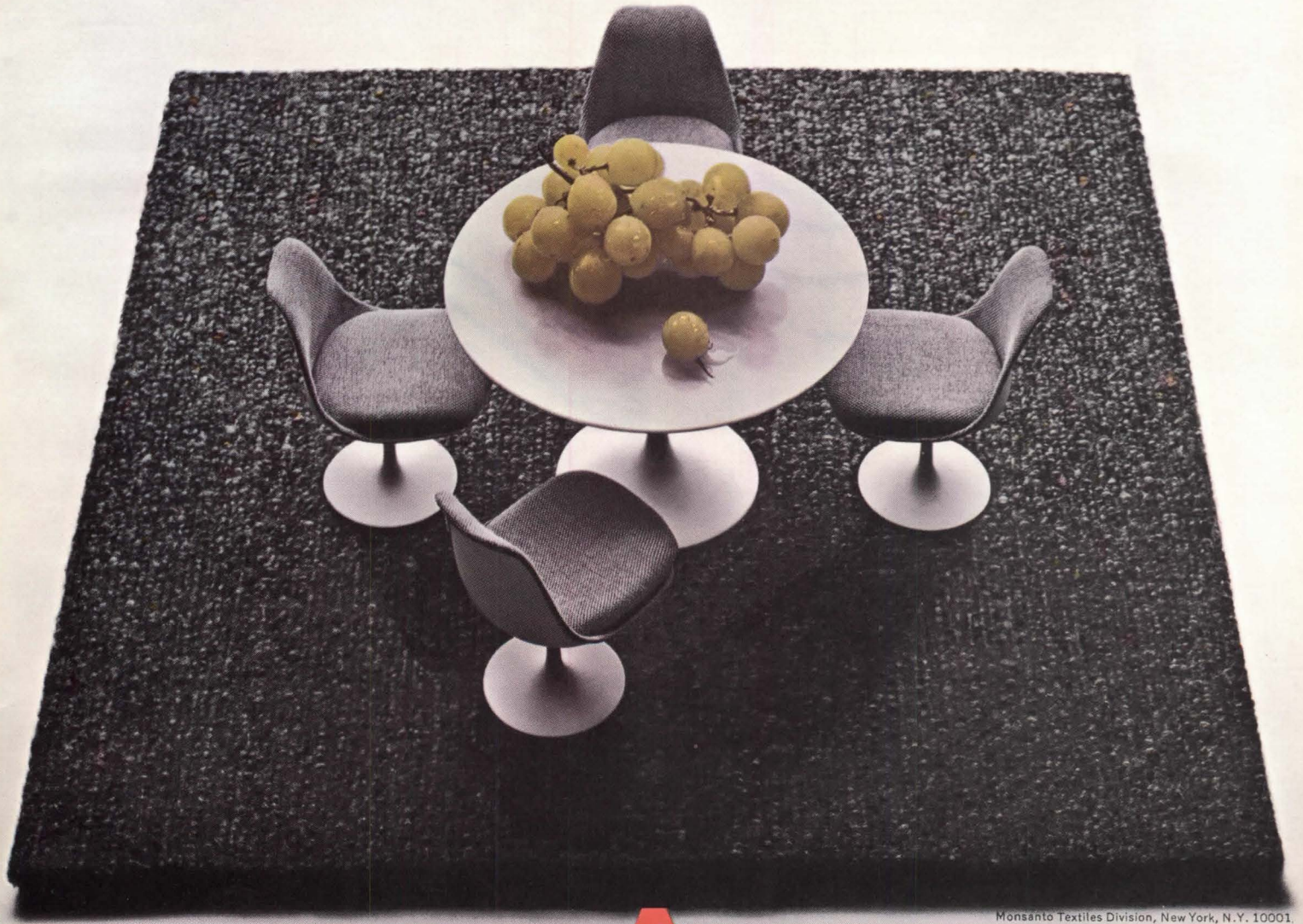

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