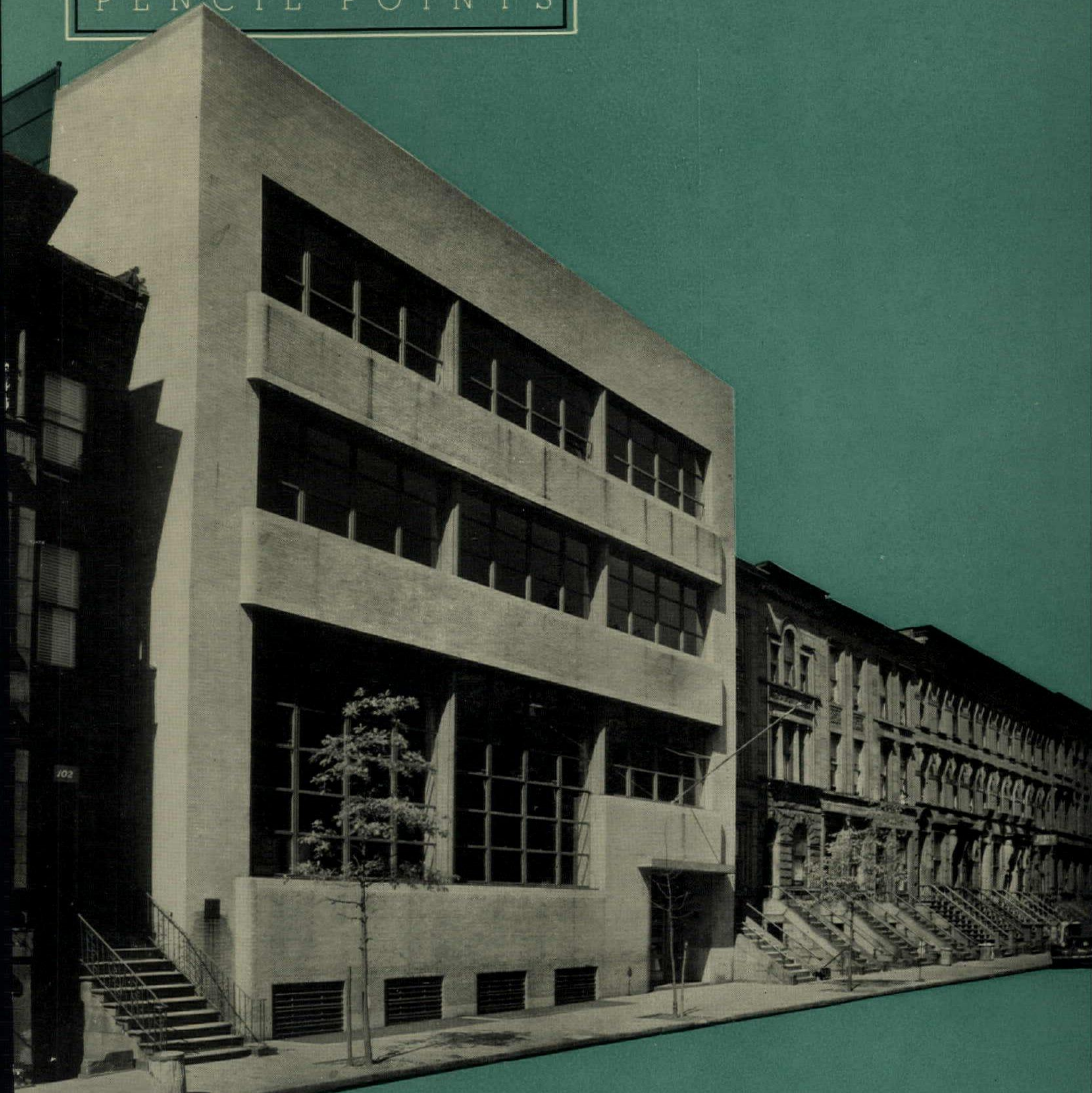
PROGRESSIVE ARCHITECTURE

PENCIL POINTS



AUGUST 1946

PROGRESSIVE ARCHITECTURE ACCEPTS YOUR ENDORSEMENT

Four years ago PENCIL POINTS, which had been a general journal for the drafting room, changed its name to THE NEW PENCIL POINTS and focused its attention on improvement in design. Through a challenging statement of purpose the magazine of architecture drew excited comments from progressive members of the profession who applauded its intention to "look forward, not back," to "fight for good architecture . . . fight against bad architecture . . . fight against the meretricious, the insincere. . . ."

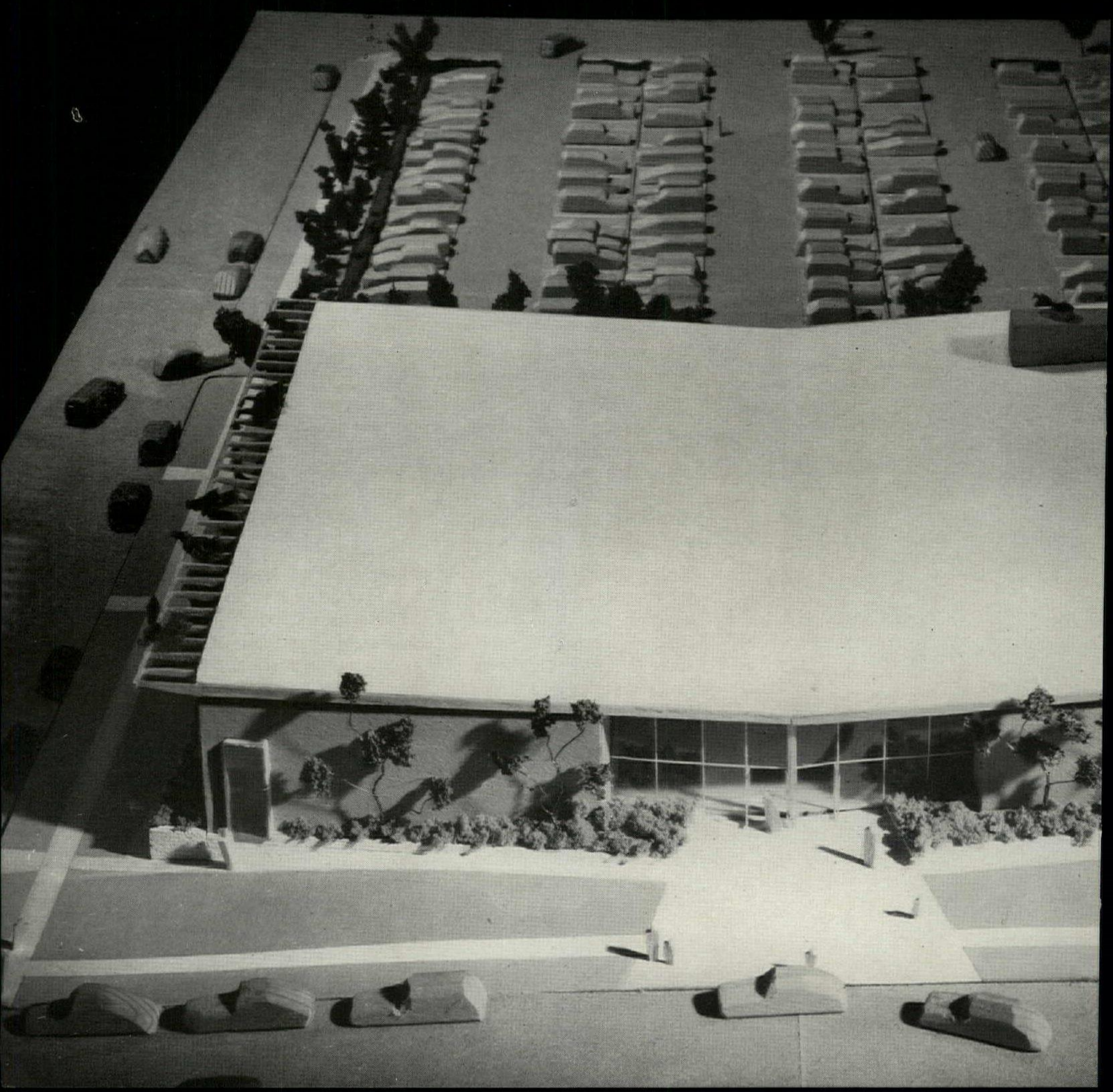
Two years ago the magazine, adopting the name PROGRESSIVE ARCHITECTURE, rededicated itself "to the vigorous promotion of what we believe to be good architecture and to the active encouragement of all . . . who work honestly at improving the human environment." Again there was applause from the designers who are concerned with progress in architecture in the United States.

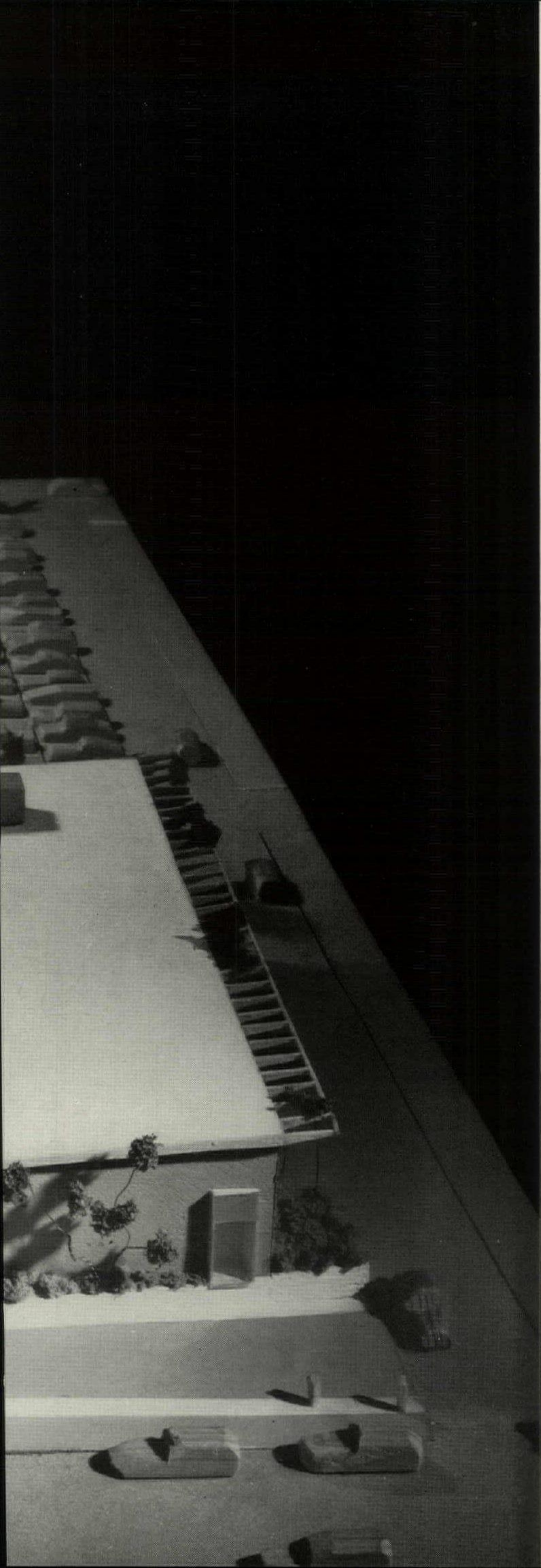
There were skeptics. Publishing an architectural magazine which is not a record of all current work, good or bad, which is not a forum where the business troubles of all segments of the disjointed "building industry" can be aired, but which is an honest, objective professional journal, dedicated to improvement in design, from broad planning to details of construction, is a nice idea—but it cannot succeed—these skeptics said. They were wrong.

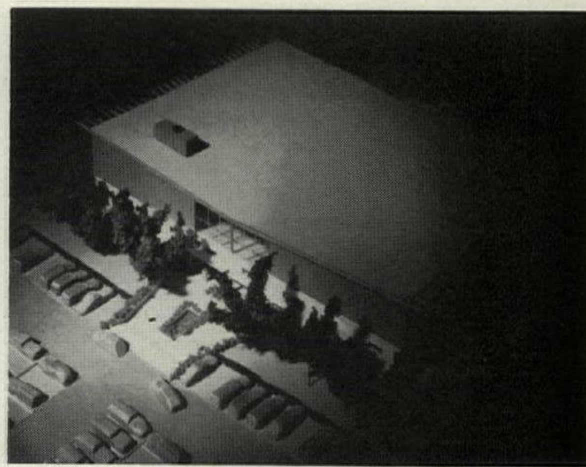
Today, standing as squarely as ever for PROGRESSIVE ARCHITECTURE, we are proud to announce that we have the largest professional circulation ever held by any architectural magazine. We have proved that we are not long-haired theorists removed from reality. The magazine is so thoroughly read by practicing professionals that we receive every month more than five thousand requests for technical information relating to building products, materials, and equipment. No other publication has ever approached this figure, either.

So PROGRESSIVE ARCHITECTURE, carrying the torch for good design related to contemporary needs, is at the same time the *practical, useful* magazine. The practice of architecture is moving forward, and our faith that this was so four years ago, restated two years ago, needs no further editorializing. We can point with pride. Be assured that there will be no wavering in our purpose.

The Editors







Model photos by Bennett Tucker

PROPOSED BRANCH DEPARTMENT STORE, ST. LOUIS, MISSOURI

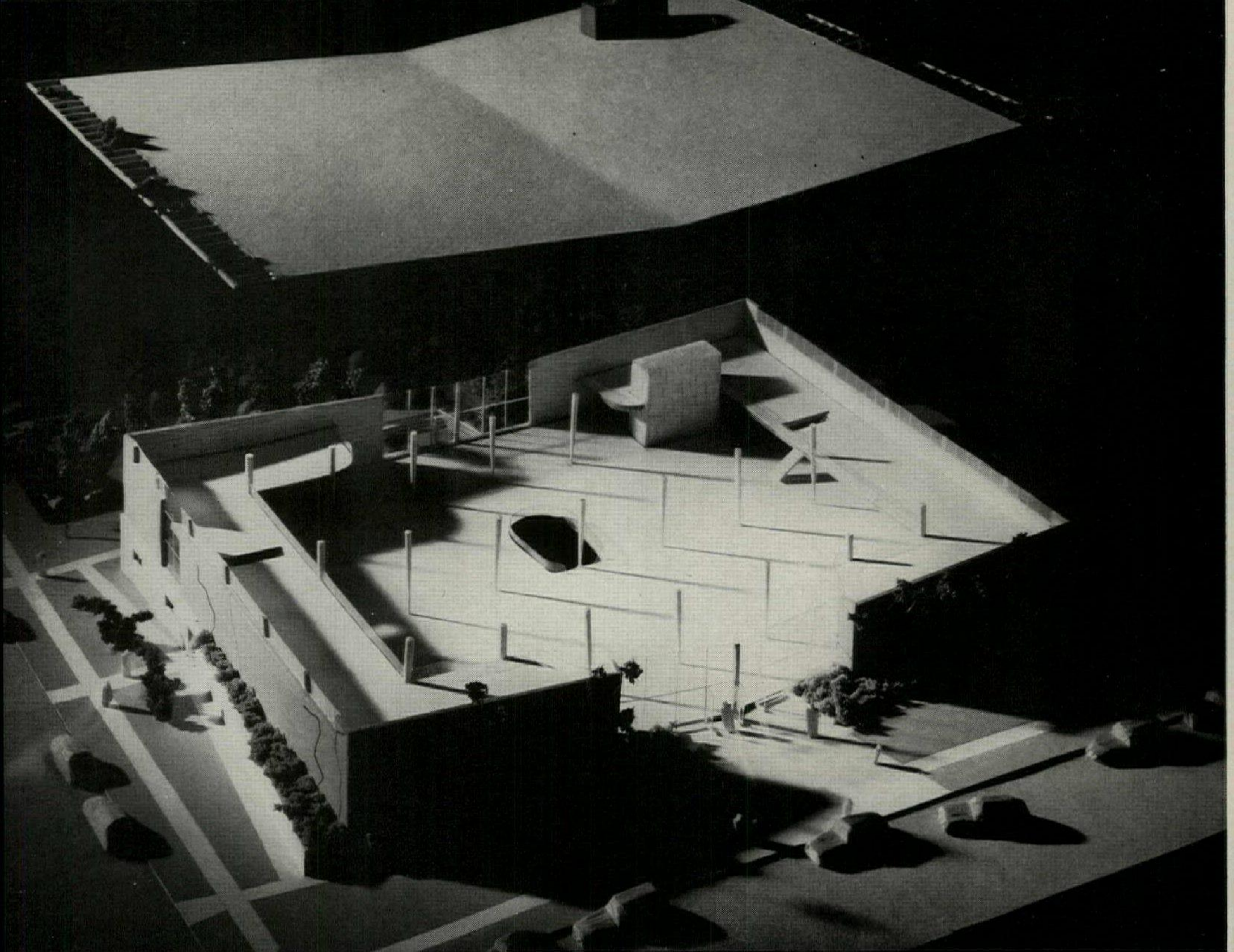
HARRIS ARMSTRONG, Architect

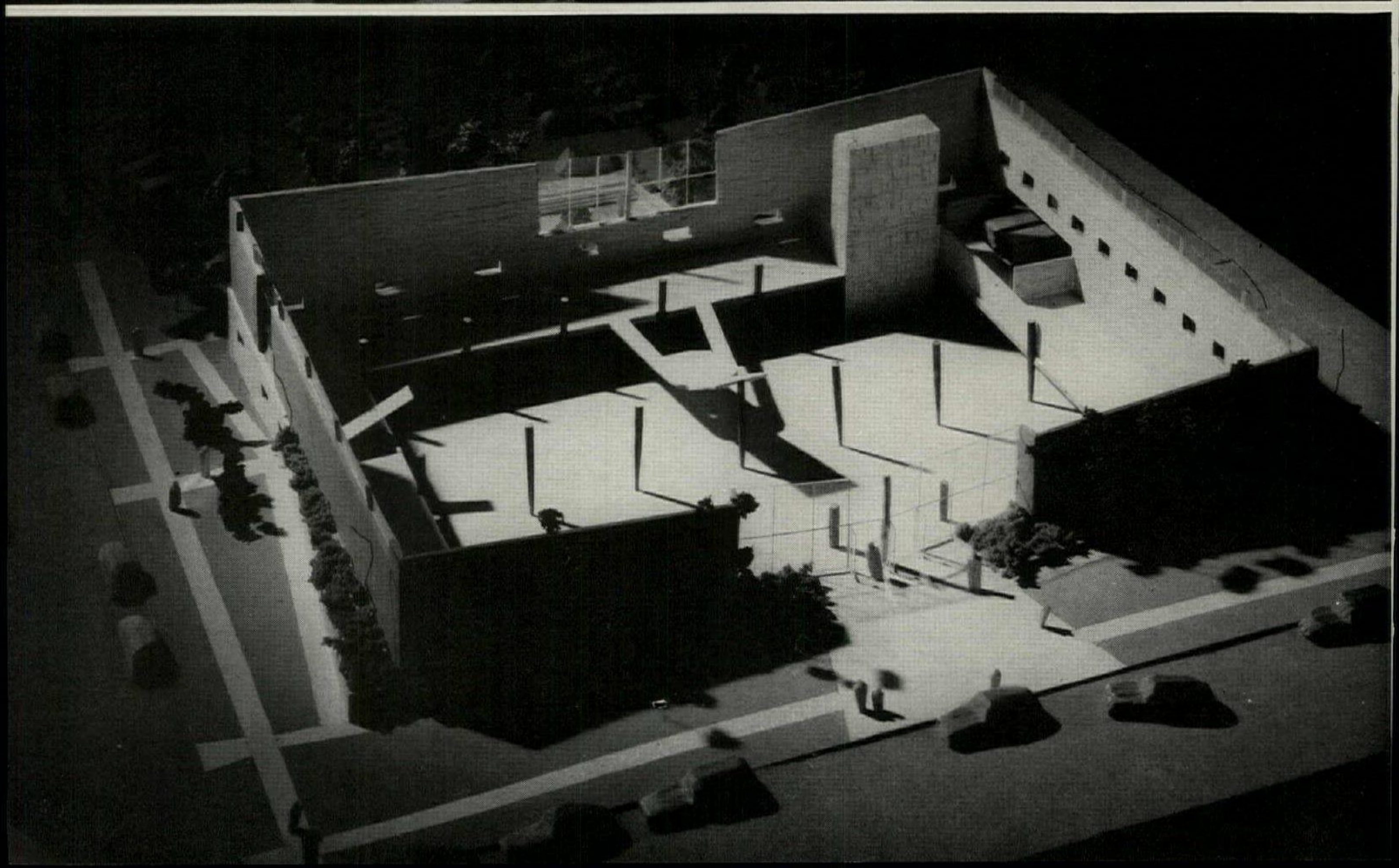
Ingenious use of a sloping site results in entrances at three levels, with the different types of circulation desirably separated. For an emporium whose business would be the display and sale of exciting new things for contemporary living, the simplicity of the plan and the forward-looking design expression seem eminently appropriate.

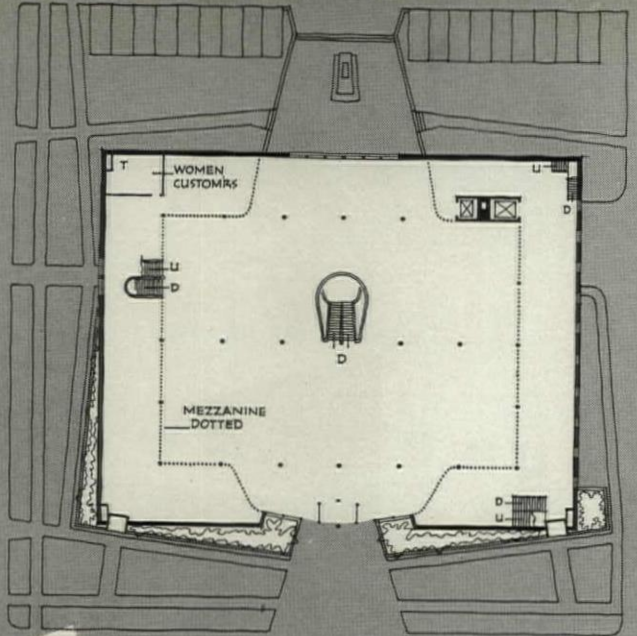
This proposed scheme was developed for the well known St. Louis merchants Scruggs-Vandervoort-Barney, Inc. Basic to the plan was the desire to extend the services of the department store out into one of the fastest developing areas of the city and to make shopping as convenient for the automobile customer as for the pedestrian.

The site, already acquired, is 190 feet by 400 feet in area, cut through by a 20-foot alley. The lot faces north, and the slope of the site allows for two main sales-floor levels, both of them at grade.

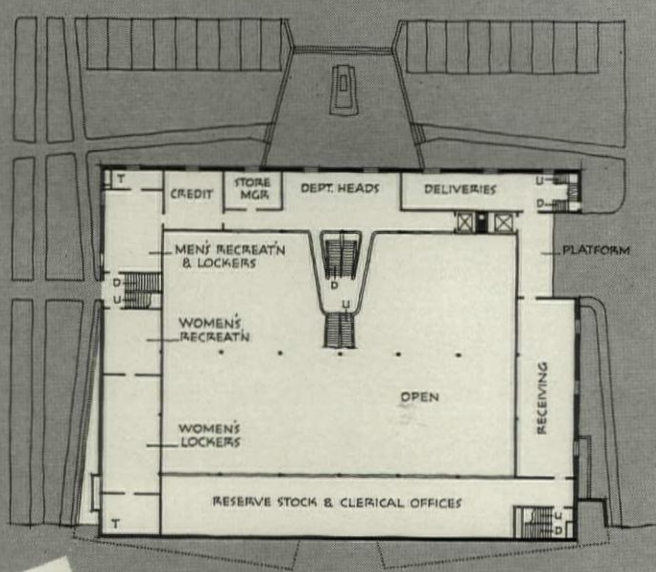
In design expression, the architect has consciously worked for an inviting, informal, gay atmosphere, as contemporary in appearance as the up-to-date merchandise which the store will distribute. Among the elements employed to gain this result are the butterfly roof, with broad outriggers to support planting; reverse diminution of the interior structural columns; the generous use of general landscaping, the large glass windows, and bright color schemes.



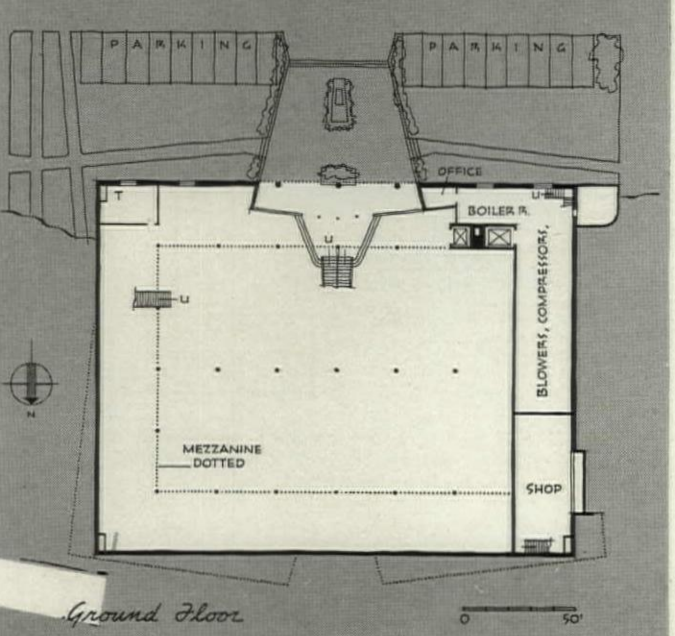




Main Floor



Ground Floor Mezzanine



Ground Floor

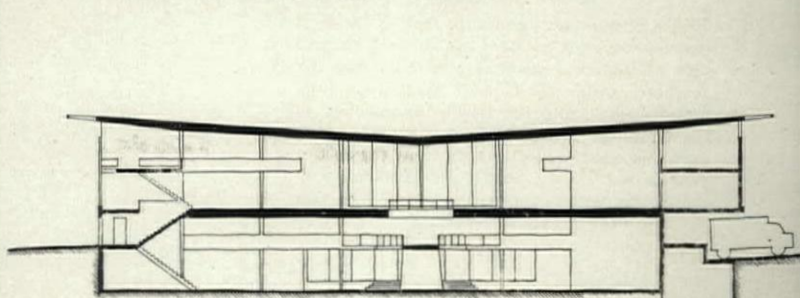
BRANCH DEPARTMENT STORE

HARRIS ARMSTRONG, Architect

The lot slope was utilized to solve the problem of providing separate but related circulation channels for customers, personnel, and merchandise. Ingress and egress of customers are served on the upper (streetfront) level by centrally placed doors, and on the lower floor by similar entrance and exit opening directly out to the landscaped parking area to the south. At the mezzanine level, separate entrances serve personnel and merchandise. Doors on the east bring personnel directly into locker space and thence, either up or down to work stations. On the west, merchandise enters the loading dock via the alley.

The flexibility of the sales-floor layouts is reflected in the standardized spacing of columns and proposed continuous placement of electric and telephone conduits and cash-tube outlets. The entire store may thus be rearranged without recourse to the building trades.

The proposed structural scheme consists of masonry walls, with large double-glazed areas; long-span steel joists, and steel columns. Heating and cooling would be handled from the four corners of the building, with boilers and compressors located under the loading-dock area. Ceilings are sound absorbent, and the upper floor will be carpeted to ward off the deadly decibels.

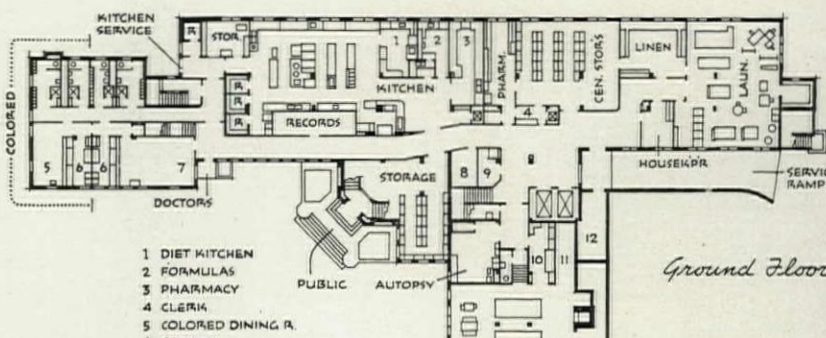


Section towards Rear

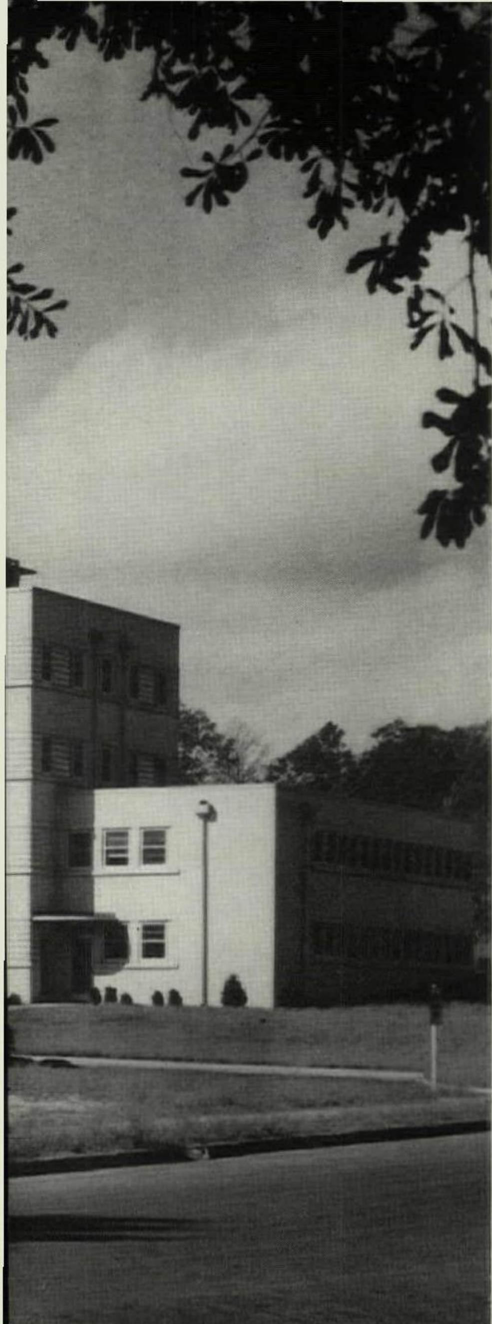
SYLACAUGA HOSPITAL, SYLACAUGA, ALA.

CHARLES H. McCAULEY, Architect

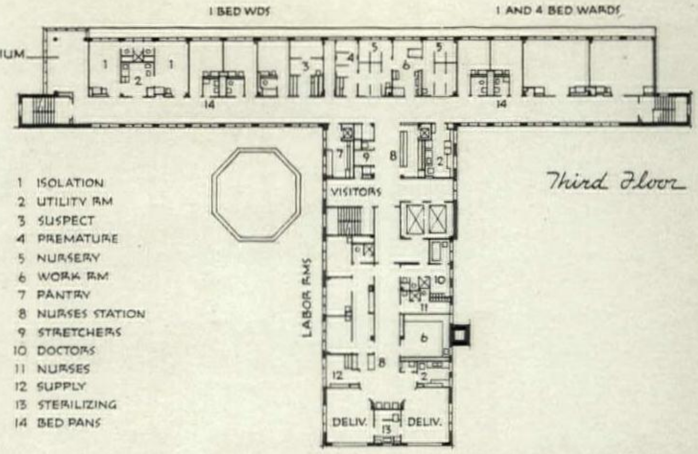
To the best of our knowledge, this is the first general hospital to be built in this country with all patients' rooms organized along the southern wall, completely separated from hospital noise and the traffic approaches to the building. In addition, it is extraordinary that this most progressive hospital yet to appear in the United States should turn up in the South, where conservatism and tradition have so often crowded the Muse.



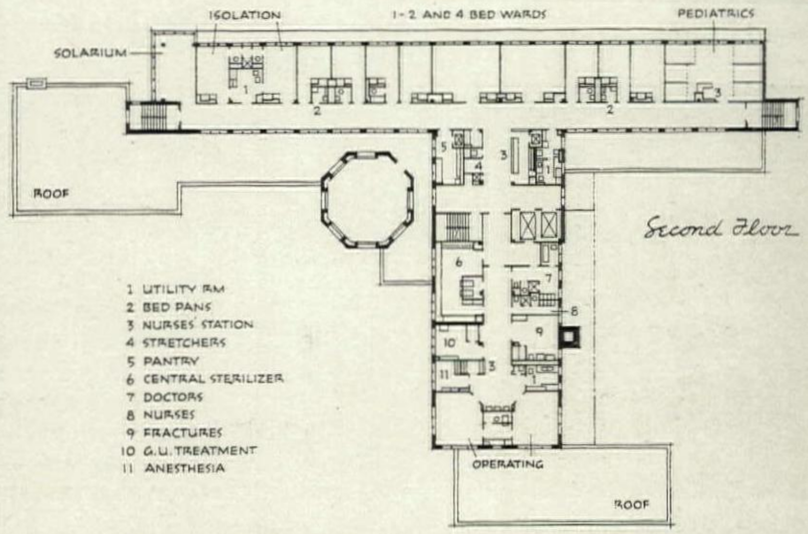
Raising of first floor provides complete above-grade daylighting for ground-floor rooms. Storage centrally located in relation to service entrance. Adequate facilities for nurses.



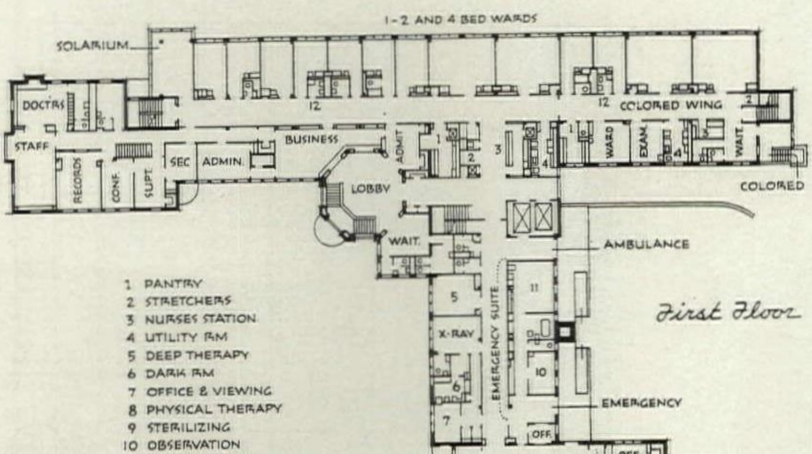
Photos by Rodney McCay Morgan



Delivery room suite (also operating rooms below) located in cul de sac, with no interfering traffic; two-way elevator to serve these. Well lighted cross lobby for elevator landings and visitors' space.

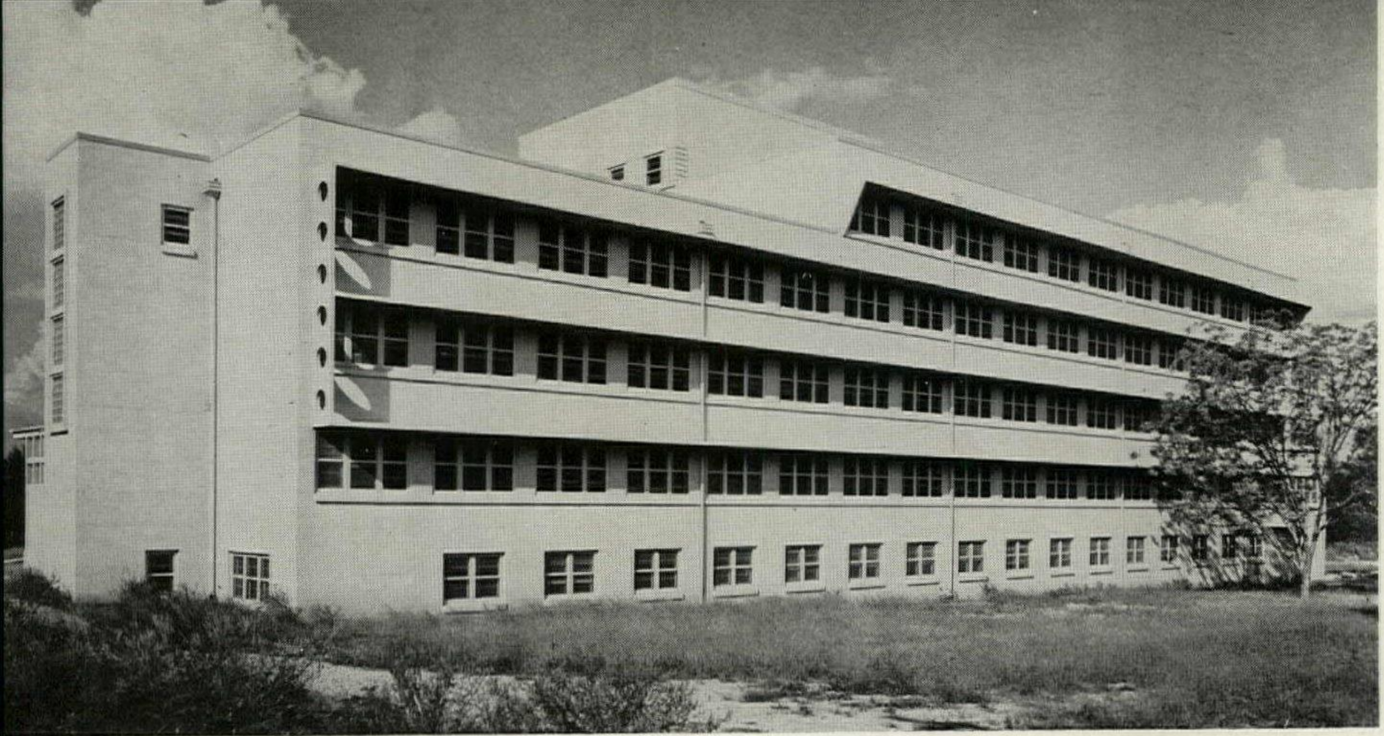


Excellent daylighting of nursing unit corridor in which all rooms are at one side; increased cross ventilation. Sink rooms, nurses' station, elevators centrally located but away from patients' rooms.



25-bed nursing unit with all rooms facing south. Complete emergency department, separate from all other services. Full adjunct diagnostic facilities. A questionable element: access to superintendent's office from main entrance involves passing through entire business office or traversing nursing-unit corridor.

The T-shaped plan is the key to this multiple-story 100-bed hospital. Entrance for visitors and doctors is in the northeast angle of the T; the service ramp occurs in the northwest angle. Thus, not only are private cars and delivery truck services separated, but all of this traffic is on the north, out of sight and sound of the nursing units, which are lined along the southern wall. In addition, placement of the elevators near the joining of the leg and cross arm of the T locates these important circulation elements as centrally as possible.



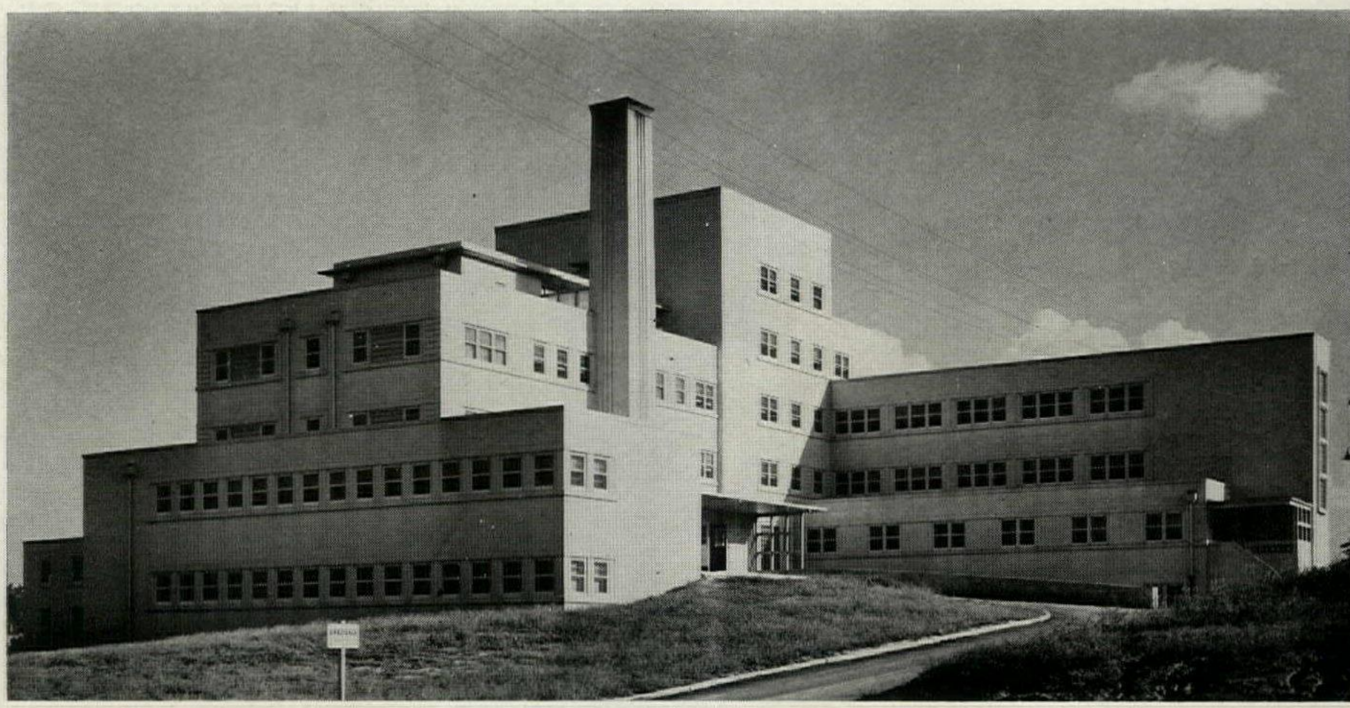
SOUTH ELEVATION, with continuous, concrete sunshades above windows of patients' rooms.

SOLARIA, at a southeast corner.

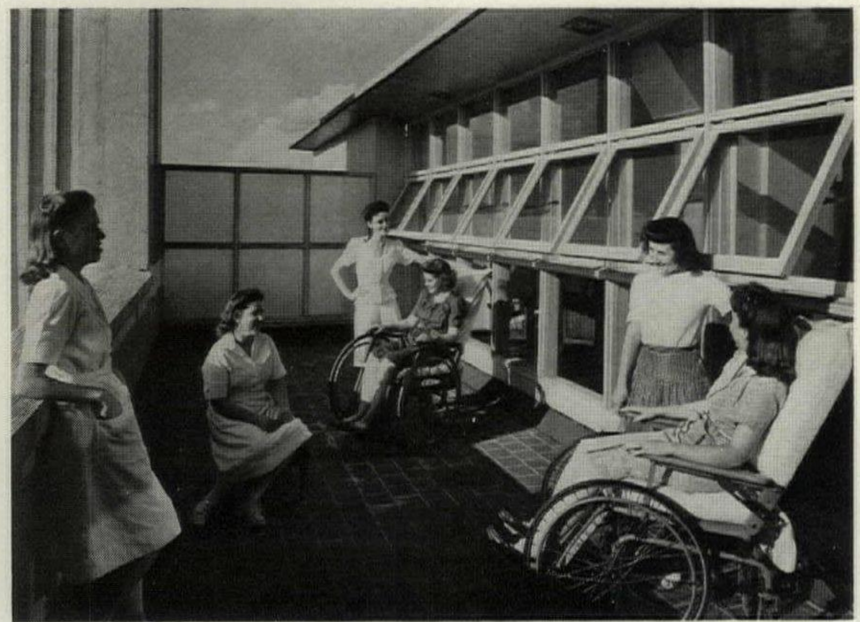
SYLACAUGA HOSPITAL

CHARLES H. McCAULEY, Architect

The separation between traffic entrances and the quiet patients' area is well illustrated in the photographs at top and bottom of this page. One wonders if convalescence would not be aided were there some sort of planned landscaping around the buildings. It would certainly improve the appearance of things. The structure is monolithic concrete built through use of removable metal panel forms.

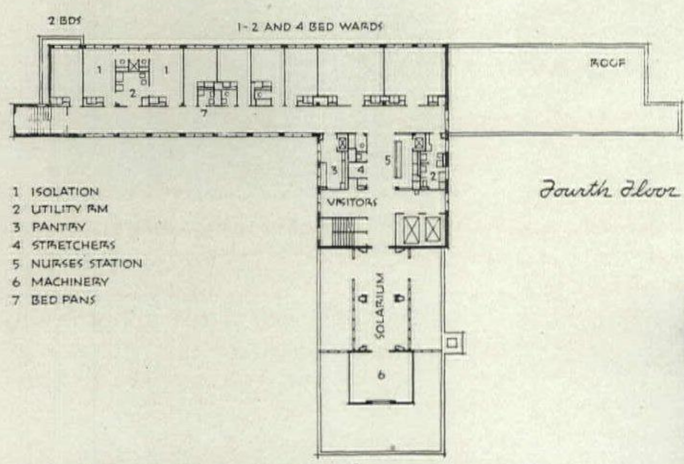


AMBULANCE AND EMERGENCY ENTRANCES come in the northwest angle of the building.



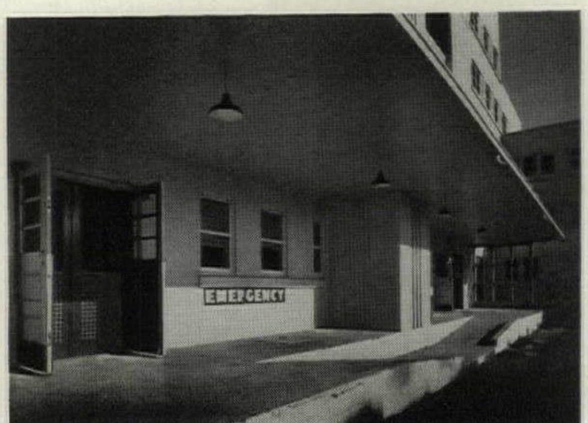
ROOFTOP DAY ROOM AND TERRACES open to both east and west.

The well lighted ELEVATOR-LANDING, cross corridor.

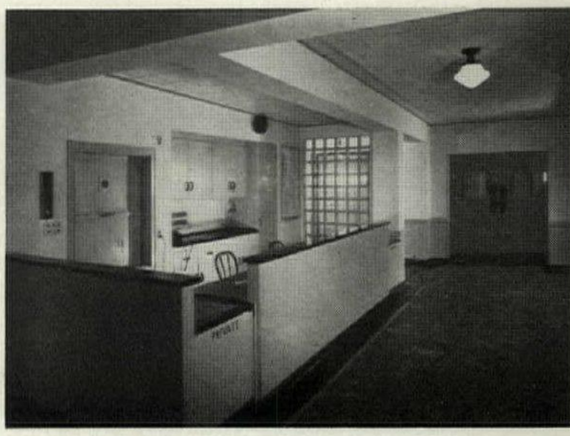


Partial floor; could be extended to form another complete nursing unit. Rooftop terraces on both east and west.

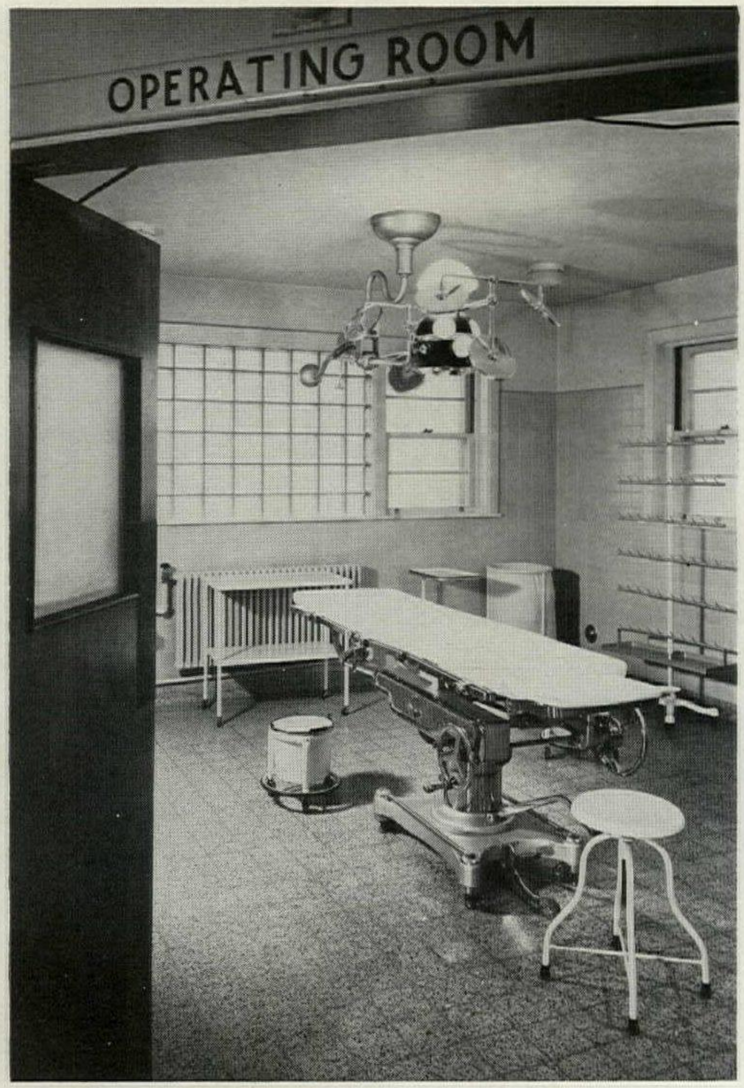
PATIENTS' ROOM



THE RAMPED EMERGENCY DOCK; ambulance dock at rear.



NURSES' STATION on third floor.



One of the pair of OPERATING ROOMS.

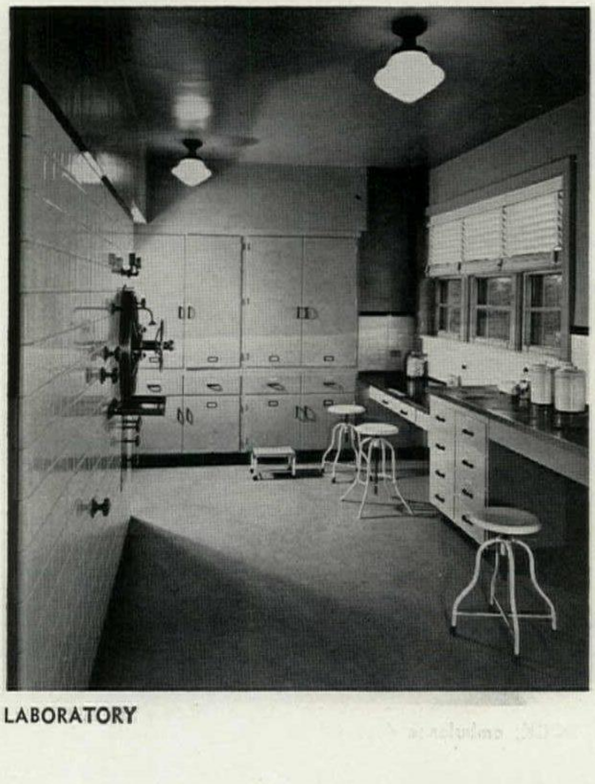
OFF-CORRIDOR PARKING provided beneath storage cabinets.

SYLACAUGA HOSPITAL

CHARLES H. McCAULEY, Architect

More than usual care has been given to the functional arrangement of the various plan elements. Operating and delivery room suites are placed at the end of corridors, so that there is no cross traffic; storage has been worked out to free the corridors of a clutter of miscellaneous equipment, and smooth, hard surfaces have been employed in those areas where absolute cleanliness must be maintained at all times.

The vertical scheme of the plan, with but a single nursing unit on each floor, is of the type which could readily be expanded upward, with duplication of functions to serve the added floors.



LABORATORY

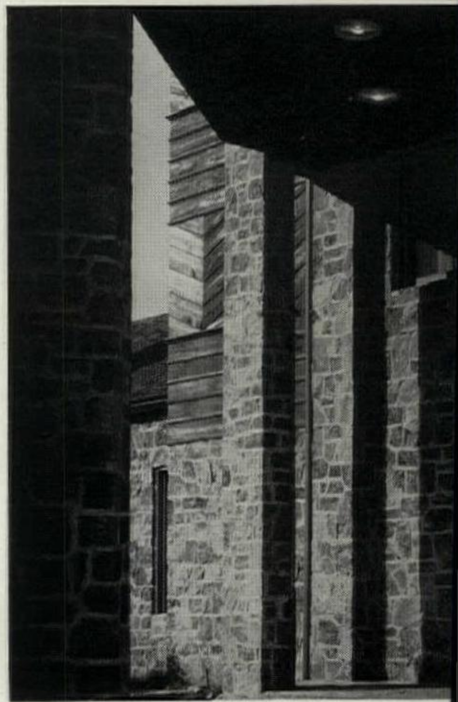
Photos by Everett Kroeger.

SYLVAN LAKE HOTEL, SOUTH DAKOTA

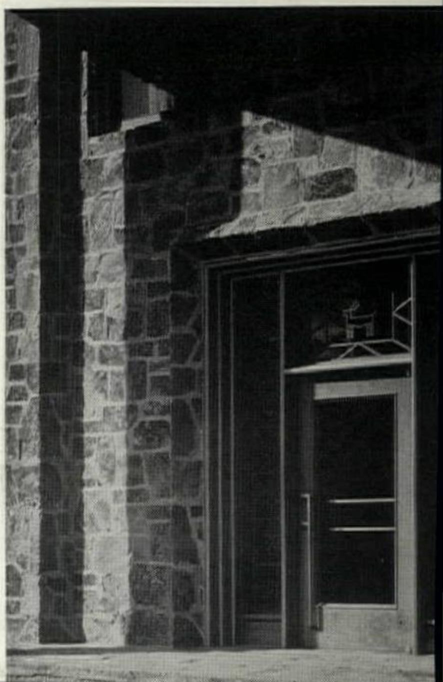
HAROLD SPITZNAGEL, Architect

One of the most engaging trends in architecture is the search for appropriate regional expression. Almost inevitably, as in the case of this resort hotel built some ten years ago, highly personal design results. The architect admits that, were he to handle this same commission today, he would open things up more. But considered in the light of the time when it was built and the established tradition of the National Park Log Cabin Style precedent, this represents a vigorous departure in form, structural expression, and amenity. From just such challenges to convention, progress comes.

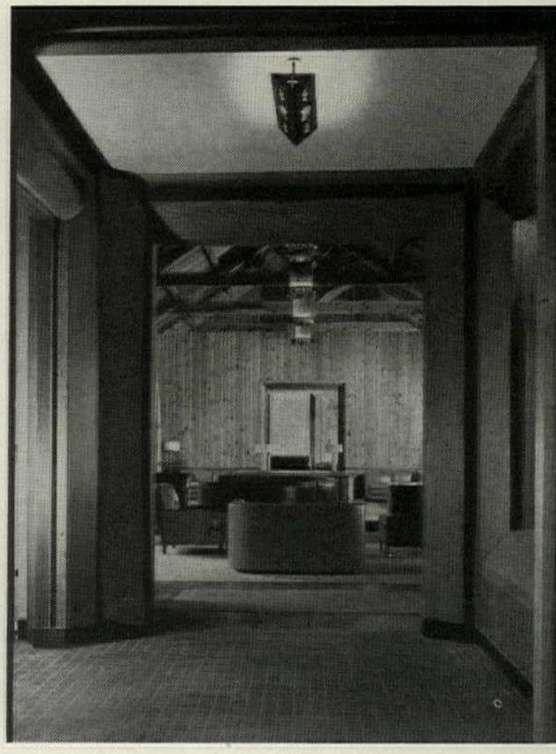
The hotel, built to replace an older one destroyed by fire, is operated by the South Dakota State Game and Fish Commission during the summer months. Located at the top of a ridge with sweeping views, it is arranged in plan to follow the crest of the hill. Masonry of moss-encrusted local stone and standard frame construction constitute the exterior fabric of the building. Roofing is of shingle tile, ranging from a deep tone at the eaves to red at the ridge. The entire hill is of solid rock; hence excavation work had to be kept to a minimum.



THE ENTRANCE PORCH is planned in the form of an Indian arrowhead.



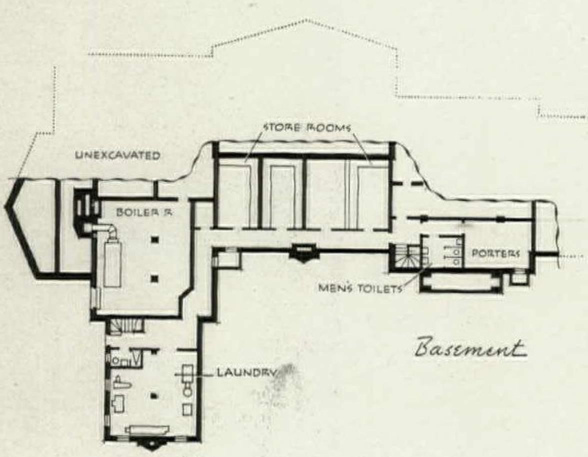
FRONT DOOR. Decoration throughout the hotel makes use of Indian symbols.



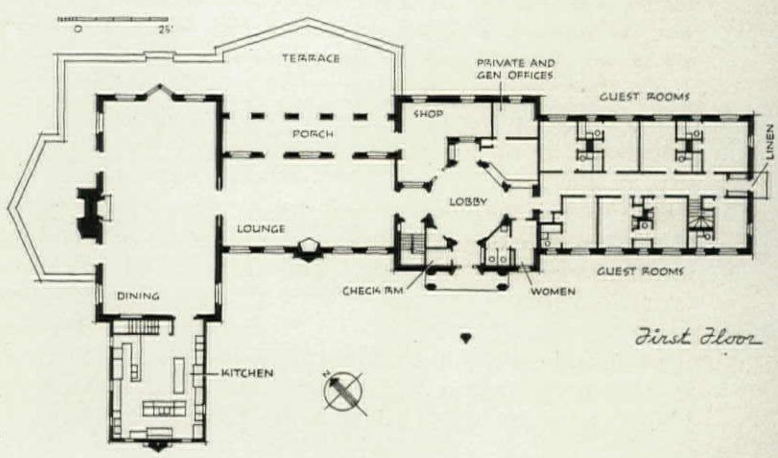
Looking into the **MAIN LOUNGE** from the entrance corridor.

THE LOUNGE: knotty-pine paneling; plank floors.

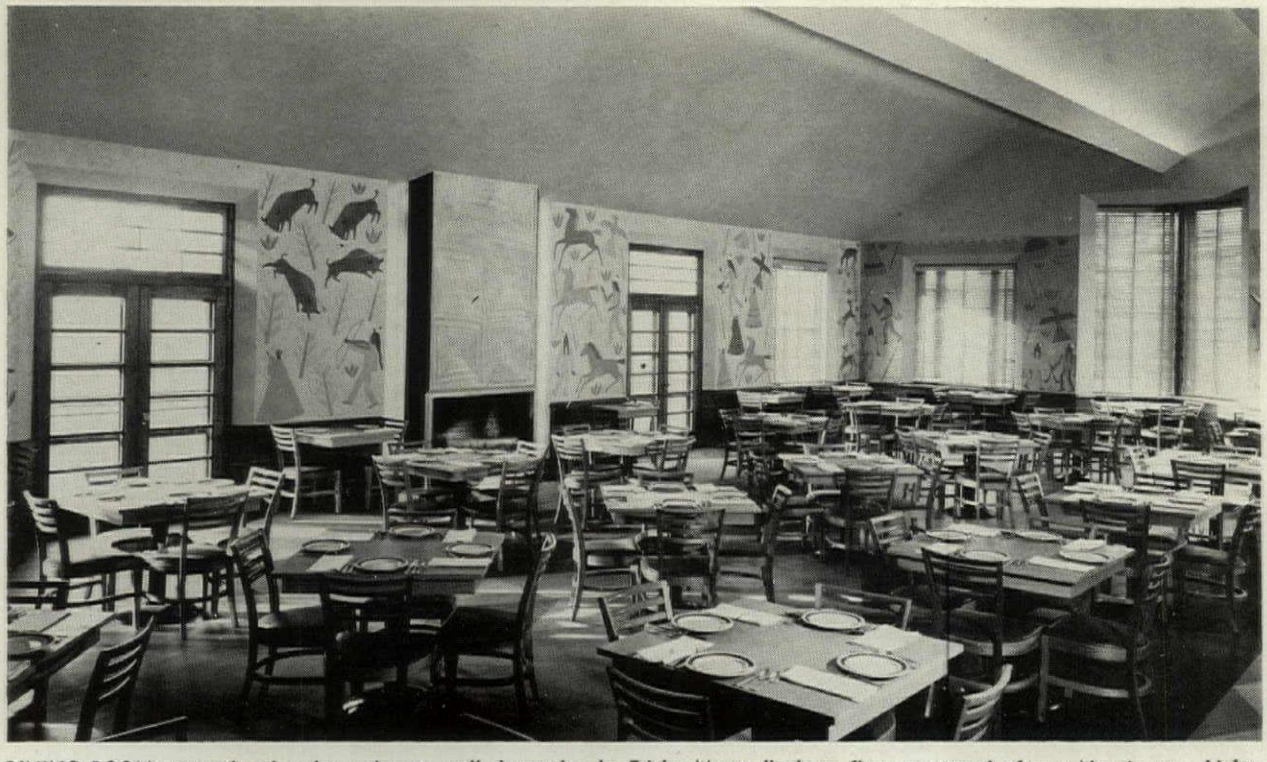
Photos by Hedrich-Blessing



Basement



First Floor



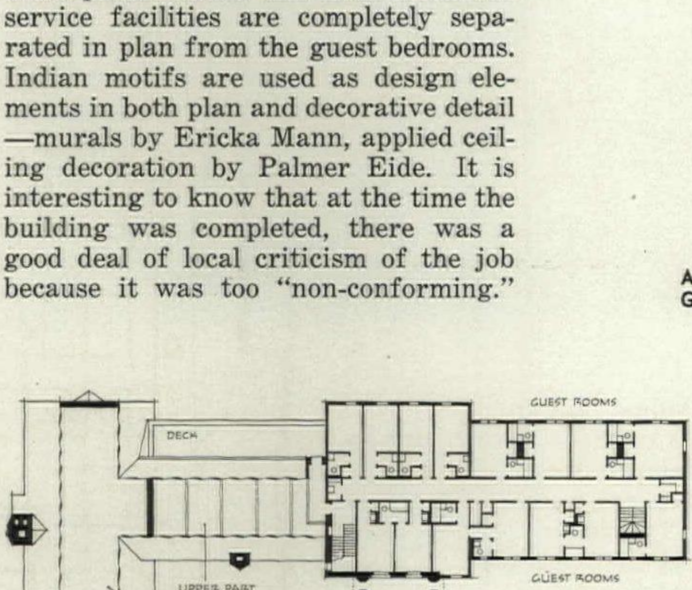
DINING ROOM: natural red cedar wainscot; wall decoration by Ericka Mann; linoleum floor, patterned after a Navajo rug. Light source is an inverted V, formed by a reversed ceiling pitch.

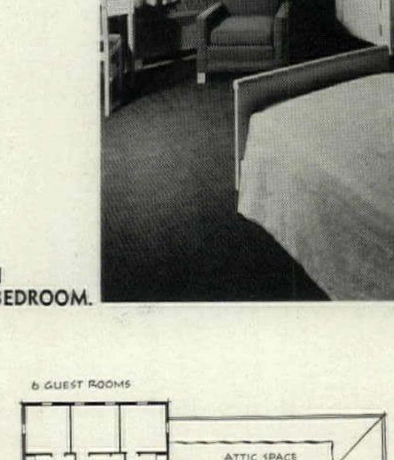
SYLVAN LAKE HOTEL

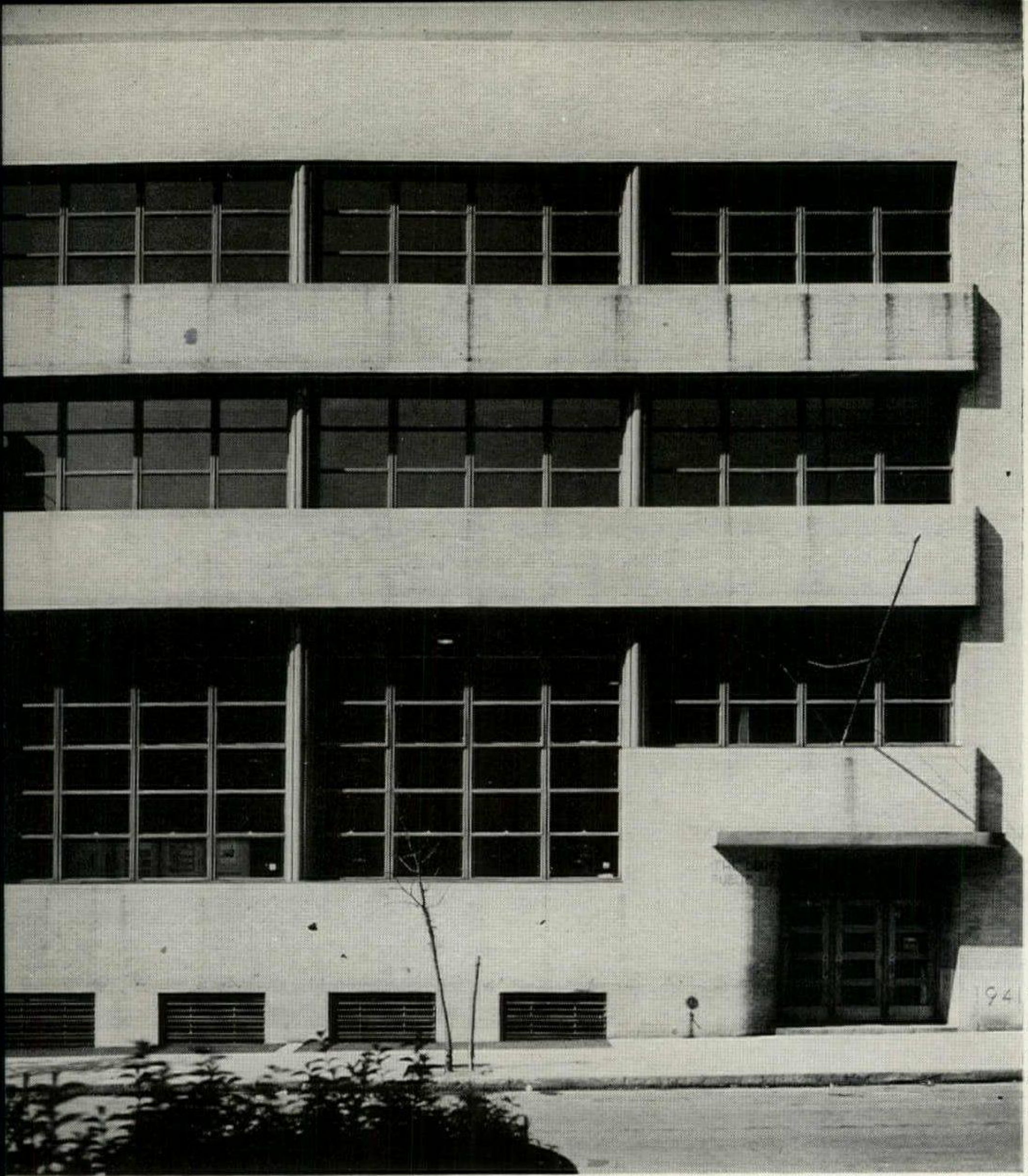
HAROLD SPITZNAGEL, Architect

The lounge and dining room serve many more than are accommodated as overnight guests. Hence, to obtain privacy, these public rooms and their attendant service facilities are completely separated in plan from the guest bedrooms. Indian motifs are used as design elements in both plan and decorative detail—murals by Ericka Mann, applied ceiling decoration by Palmer Eide. It is interesting to know that at the time the building was completed, there was a good deal of local criticism of the job because it was too "non-conforming."

A typical
GUEST BEDROOM.







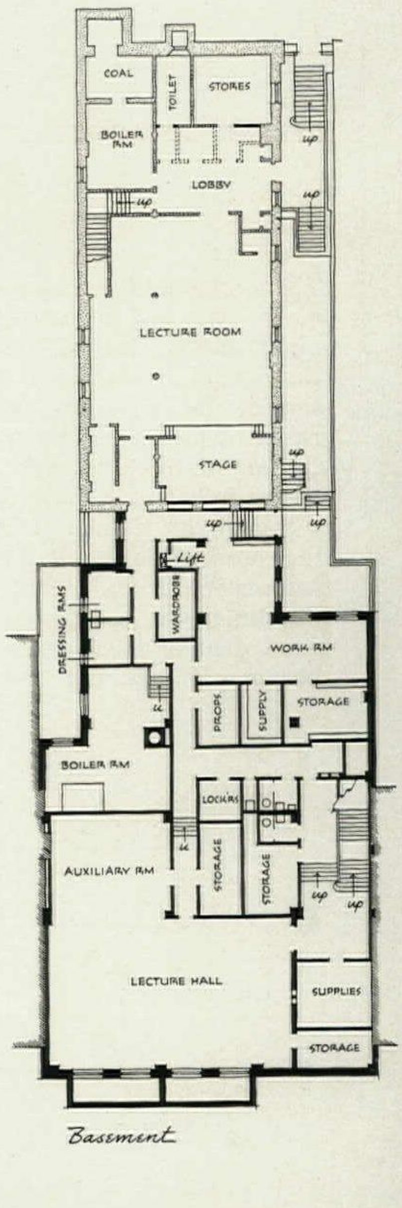
Photos by P. A. Dearborn

Concrete frame; slag paneled floor construction; walls of cinder block, furred inside and brick-surfaced on the exterior.

HARLEM BRANCH, N. Y. PUBLIC LIBRARY

LOUIS ALLEN ABRAMSON, Architect

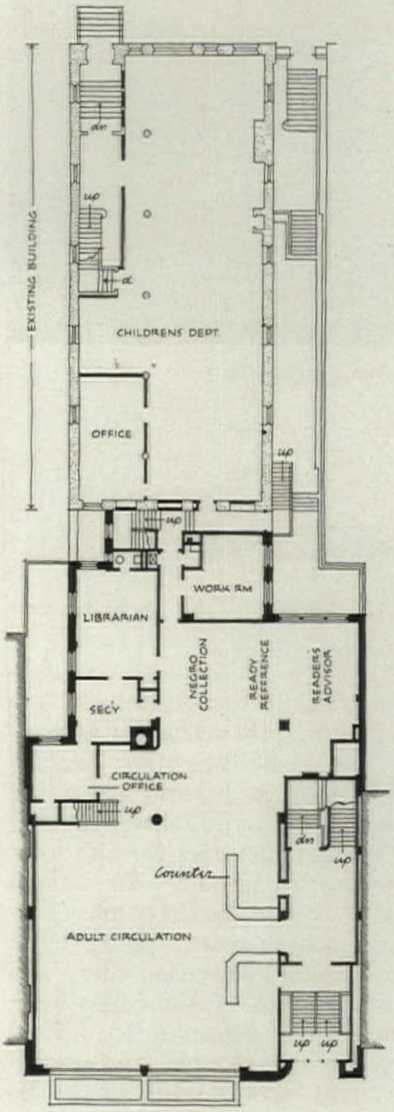
In "Smaller Public Library Buildings" (Pencil Points, July 1941), Talbot Hamlin stated: "However complex its mechanical details, at heart the library is but a study in the relationship of three elements: books, readers and the devices and personnel necessary to make the connection between them." This addition to an existing but inadequate library building at the rear is considerably more. It is the center of the intellectual, cultural, and educational interests of a large community, which happens to be almost entirely Negro. According to the architect: "The exterior was conceived to express the building's function in terms of stark simplicity, to the end that it might allay shyness and dispel reluctance to enter the building."



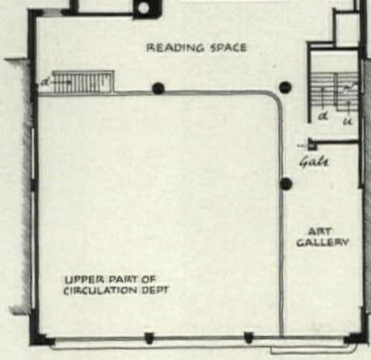
Basement

A wall of light in the adult-circulation room does its full share to assist learning.

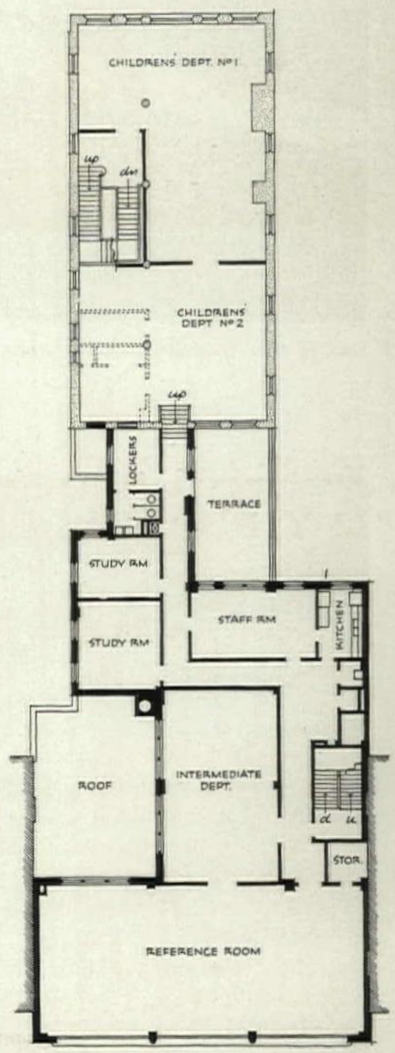
FLOOR PLANS. Basement lecture hall for use of community groups, lectures, etc. Here, local talent first performed the play, "Anna Lucasta." Adult and children's departments are separated on the first floor. On the mezzanine are an art gallery for display of work of Negro artists and an acoustically corrected audition room for microphone practice or listening to the rich collections of spirituals and modern music. Reference rooms, etc., on the second floor; Negro department, offices, an apartment, and storage space, on the third.



First Floor



Mezzanine



Second Floor

Looking down from the art-gallery mezzanine to the adult-circulation room. The flooring (as in most major rooms) is asphalt tile.

One of the upper-floor reference rooms.

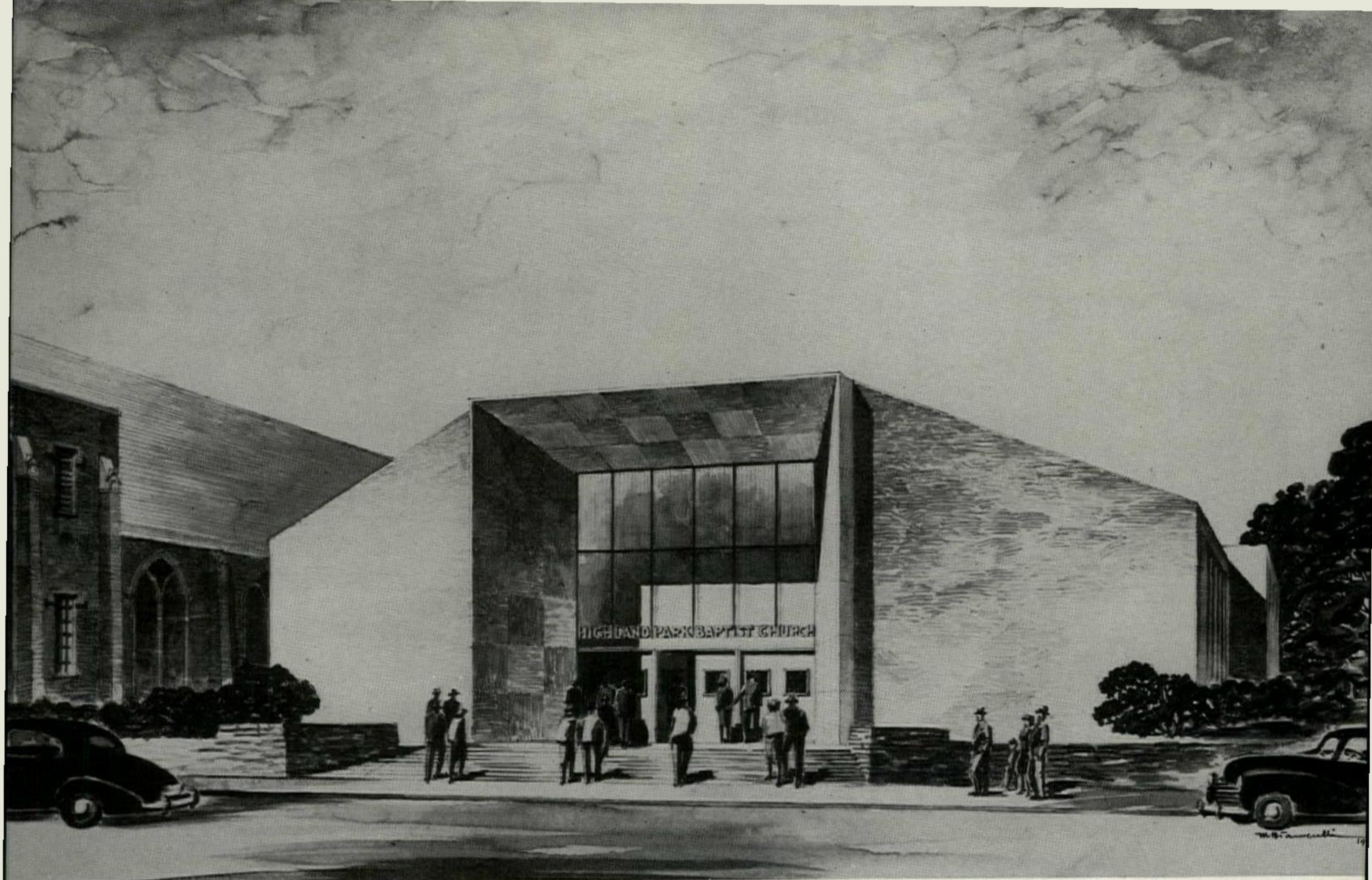
HARLEM BRANCH LIBRARY

LOUIS ALLEN ABRAMSON, Architect

The new portion of the building is for high school and adult activities and includes in its resources the famous Schomburg collection by and about the Negro. The existing building was altered to provide needed facilities for children, even including a fireside for story-telling groups where children may stay while their mothers work. In addition to the usual library services, there are the art gallery, the music collections, and opportunity for seminars for school work or research. Simple, unostentatious treatment and detail make the atmosphere inviting to all.

Toward the rear, from the mezzanine.

Stair to mezzanine; circulation desk in foreground.



PROPOSED DESIGN. Simple, well-integrated—but the clients preferred the solution shown across page.

HIGHLAND PARK BAPTIST CHURCH, CHATTANOOGA, TENN.

GILL & BIANCULLI, Architects

"Our new building is to fulfill the function of a tabernacle without involving expense to provide traditional ecclesiastic features," state the architects for this auditorium addition to two existing, but architecturally unrelated, buildings that now serve the congregation. It has significance for the progressive designer in that it attempts to restate in terms and techniques of today at least the basic FUNCTIONAL needs of one of the oldest of building types.

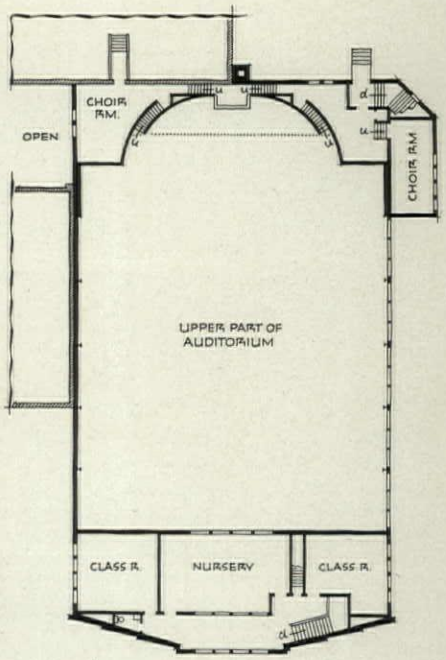
This new church was objectively designed to produce a house of worship that would be welcoming (emphasis on the great entrance doors) and serve the group's hearing, seeing, and simple ritual needs—a large, unobstructed hall to seat about 1,500 including a choir of 100; classrooms; provision for infants during church time, and broadcasts.

The site rises approximately eleven feet from the sidewalk to the rear of the tabernacle. The auditorium floor slopes toward the pulpit end of the room, terminated by the stepped-up choir. Choir-room facilities are divided so that the choir enters from both sides at an upper level. These rooms are also used as dressing rooms for the baptismal service by immersion.

Above the entrance lobby is a nursery ("cry room"), with double glazing toward the auditorium. Used by mothers and small children, this room is equipped with loudspeakers, served by microphones from the choir and pulpit.

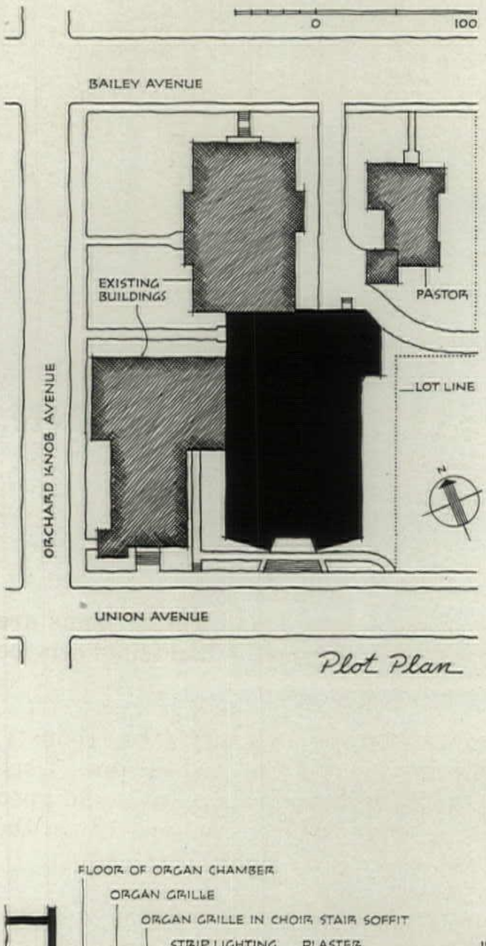
To provide a broad nave with a low ceiling, a rigid-frame structure is specified, with the framing members exposed on the interior. Heat-insulating and sound-absorbing materials are fastened underneath purlins which support plank over which built-up roofing is used. Exterior walls are brick veneer over cinder-block. Heating of the main floor is by radiant heating coils in the floor slab. Upper-level rooms are heated by hot-water convectors. Provision is made for future air conditioning. The main auditorium is lighted by floodlights placed at 8-foot intervals, concealed by a light trough in the frame.

ACCEPTED SCHEME

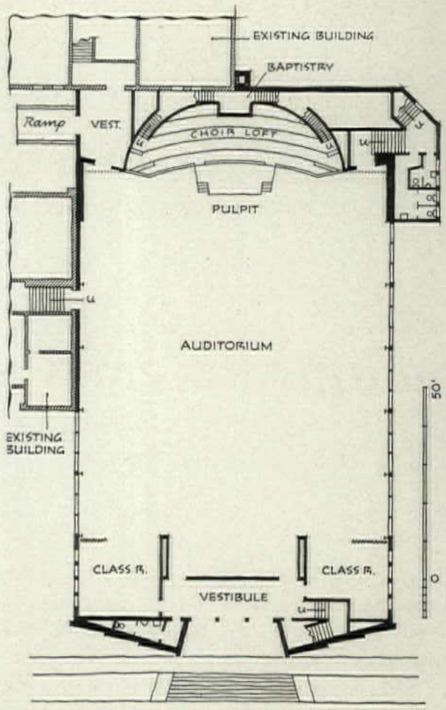


Second Floor

Above the nursery is a broadcasting-control booth; an adjoining projection booth takes care of moving pictures and lighting effects.

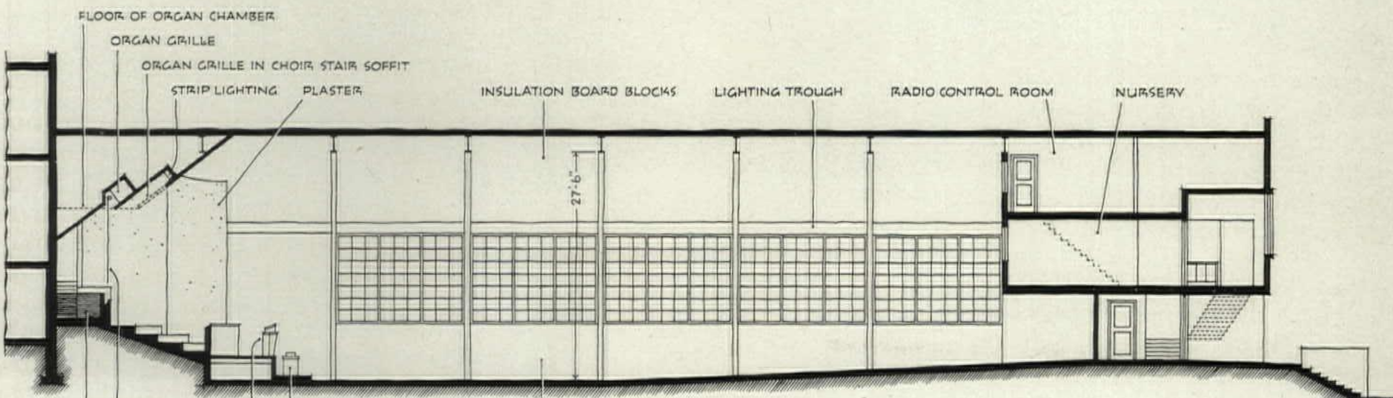


Plot Plan



First Floor

Ground-floor classrooms also serve as additional congregation seating space.



Longitudinal Section

EAST ELEVATION. Red boards and battens; white trim.

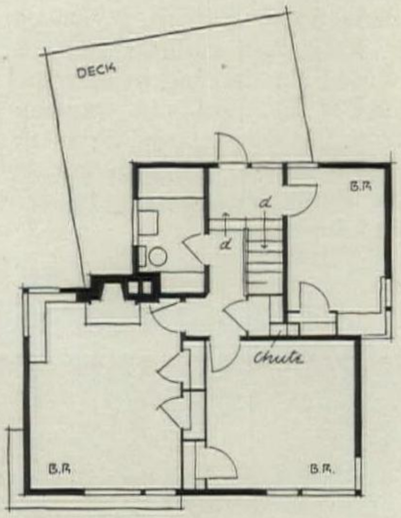
HOUSE AT SEATTLE, WASHINGTON

JOHN T. JACOBSEN, Architect

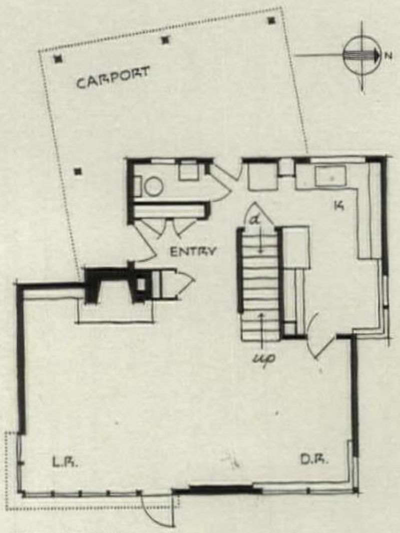
A hillside home for the northwest, organized on three levels.

Designed for a family with one son and one daughter, this compact, frame house is planned to make the most of the pleasantly wooded slope and view beyond. Even the kitchen (and the bedroom above) are stepped out in plan to provide generous corner windows. Every major room has cross ventilation, and the slope allows for an above-grade basement-laundry at ground level. The house is of frame, with board and batten exterior finish stained barn red; the fir trim is painted white.

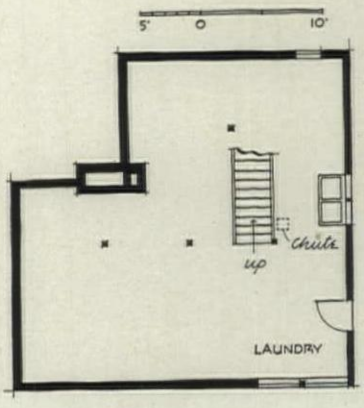
So many contemporary houses have been schemed on one floor, with emphasis on the horizontal, that architectural sit-tighters have been quick to argue that this is a limiting requisite of progressive work, even delighting to pigeon-hole this type of treatment as "Modern Style." It is, therefore, particularly agreeable to present a contemporary house that is organized vertically, in both plan and detail. Yet one more instance of the essential freedom from easy, stylistic rules which is implicit in the progressive approach.



Second Floor

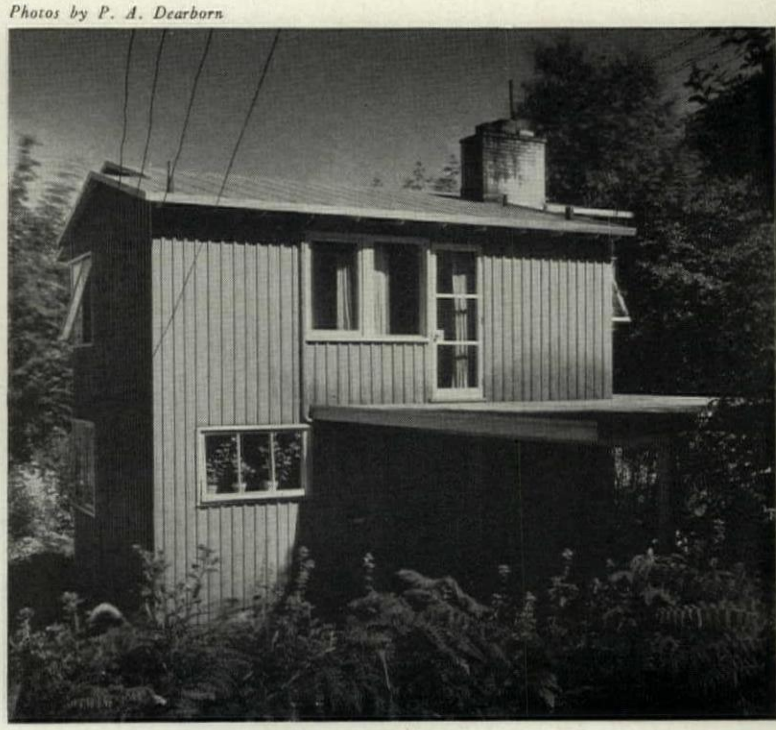


First Floor



Basement

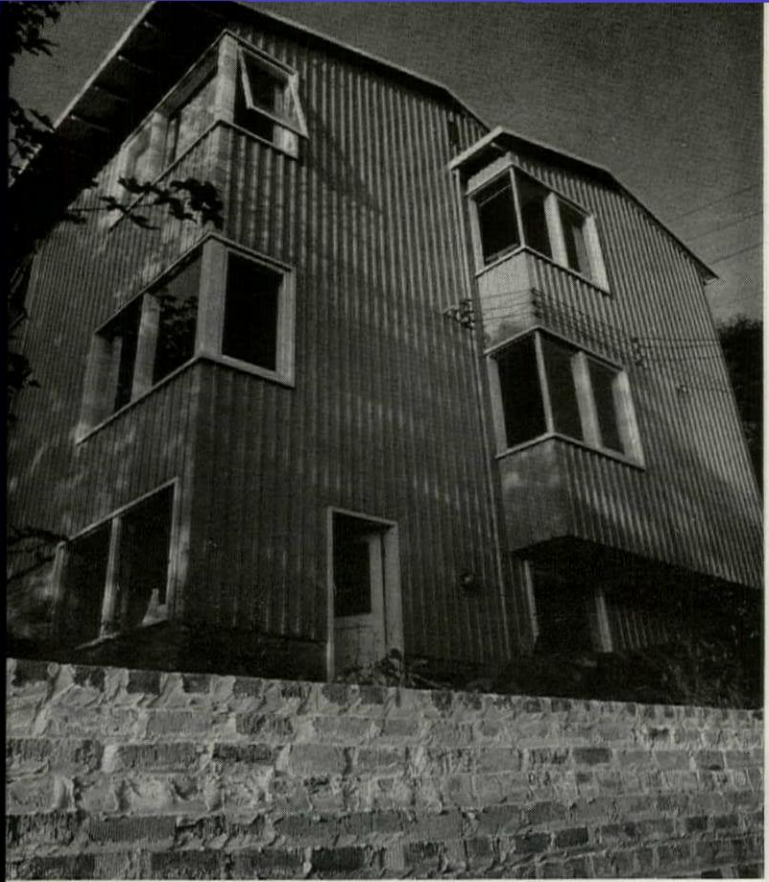
Photos by P. A. Dearborn



HOUSE AT SEATTLE, WASHINGTON

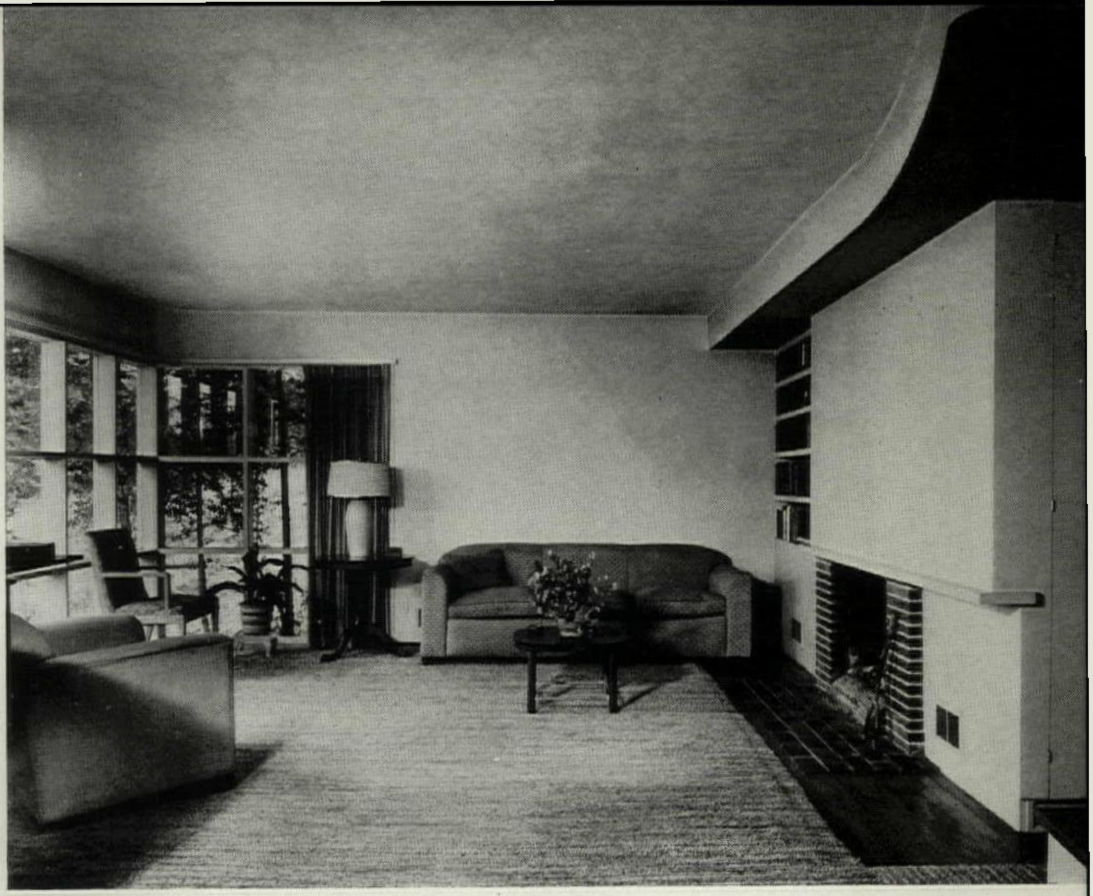
JOHN T. JACOBSEN, Architect

On the first floor, all rooms except the entry (which is finished in fir plywood) have plaster walls and ceilings and fir trim. Oak is used for flooring in all main rooms. Because of the uphill site, entrance doors (one from the carport, one from the side) are at grade, while the large corner window of the living room looks and opens out on a walled terrace.



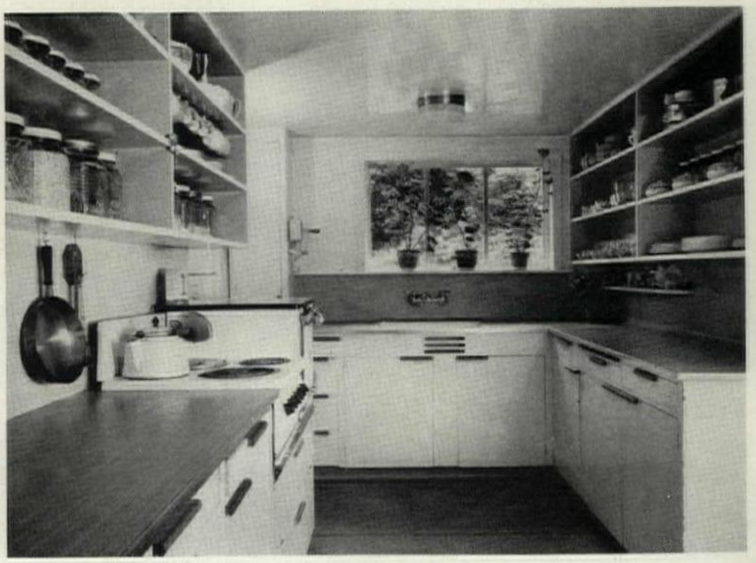
SIDE VIEW of house showing the two levels of corner windows, above the basement floor.

The full-height corner window in the living room; the door leads out to a raised terrace and lawn.

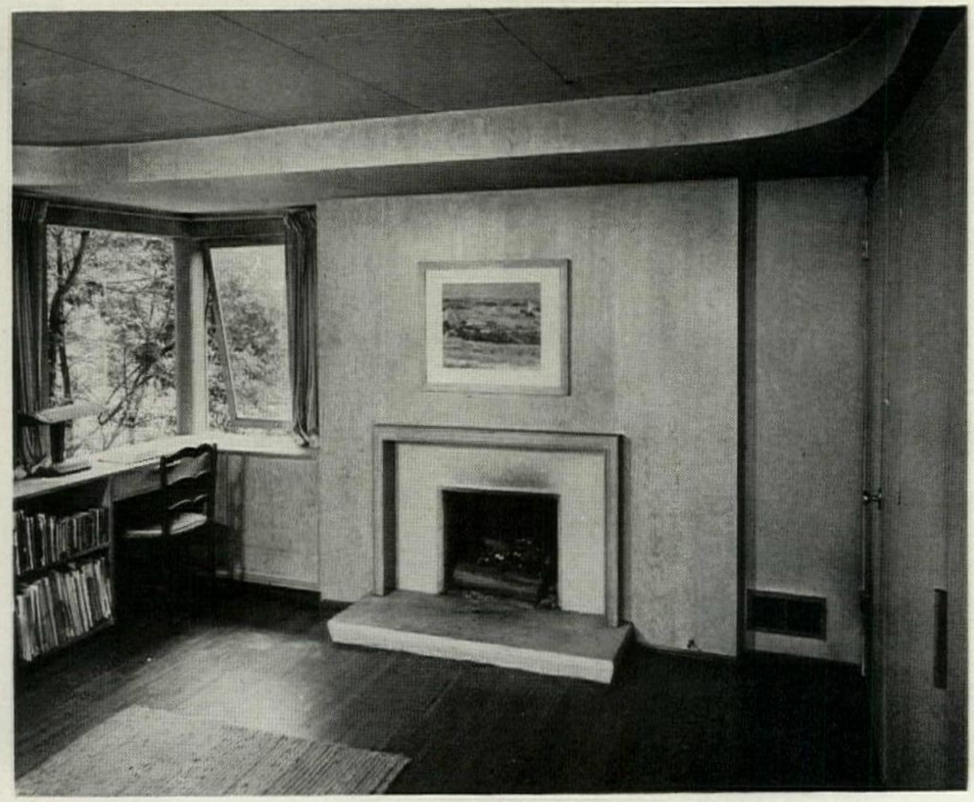


LIVING ROOM. The furred down portion of the ceiling continues the lower ceiling line of the entry.

FIREPLACE CORNER, arranged in an out-of-traffic location.



KITCHEN, with open shelving. A windowed dining corner occurs just out of right foreground of picture.

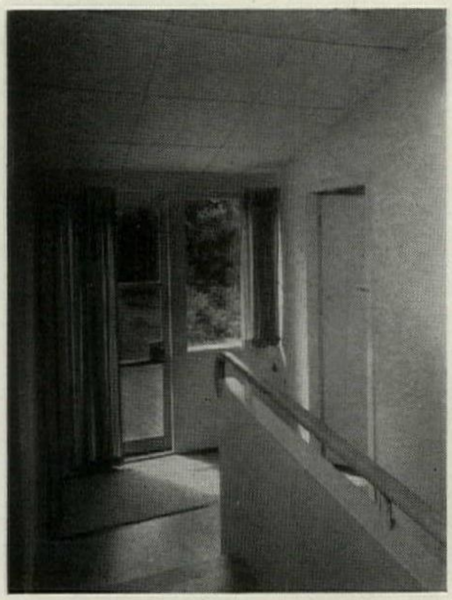


THE SOUTHEAST BEDROOM, with built-in work area organized in the window corner.

HOUSE AT SEATTLE, WASHINGTON

JOHN T. JACOBSEN, Architect

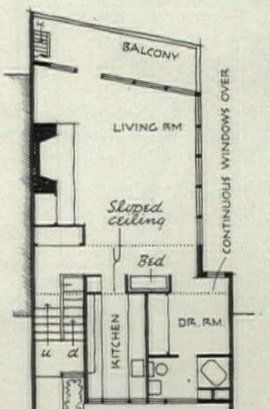
All bedrooms have wood veneer wall finishes, ceilings of fiber-board tile and fir trim. From the upper stair landing, a door opens to a roof deck above the carport. As on the first floor, floors are of oak, except in the bathroom where linoleum is used. Interior decoration throughout the house is by Hope Foote.



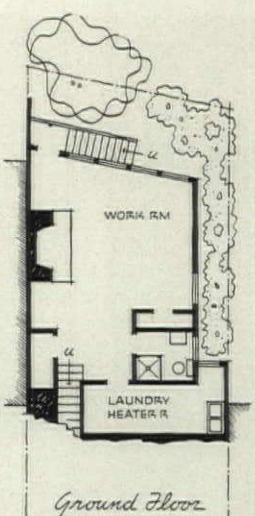
THE UPPER HALL, with door to carport roof deck.

STAIRS up from the living room; entry closets in background.

Photos by Roger Sturtevant



First Floor

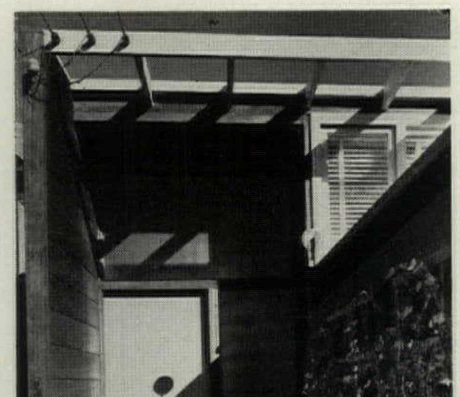


HOUSE AT SAN FRANCISCO, CALIFORNIA

DINWIDDIE AND HILL, Architects

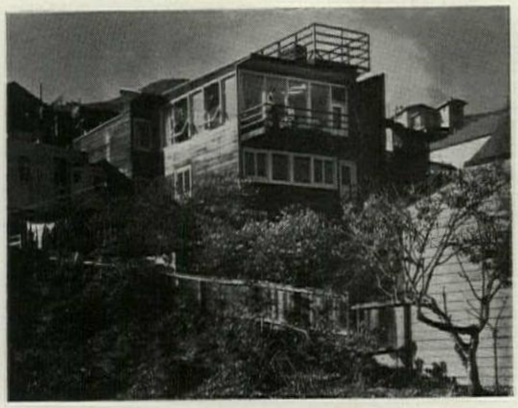
An attempt to obtain a measure of security in an insecure world, this city house is so planned that, while it makes an efficient home for one family, it is readily convertible for two and presumably could be rented or sold at the drop of a hat.

In effect, this house consists of two small apartments, one above the other. The owners now use the whole house, but the conversion could be made simply by addition of a partition with a door on the stair landing. The house turns its back on the street to take advantage of the view to the east; diffusing glass in a clerestory above the kitchen-bath area provides cross light and ventilation.

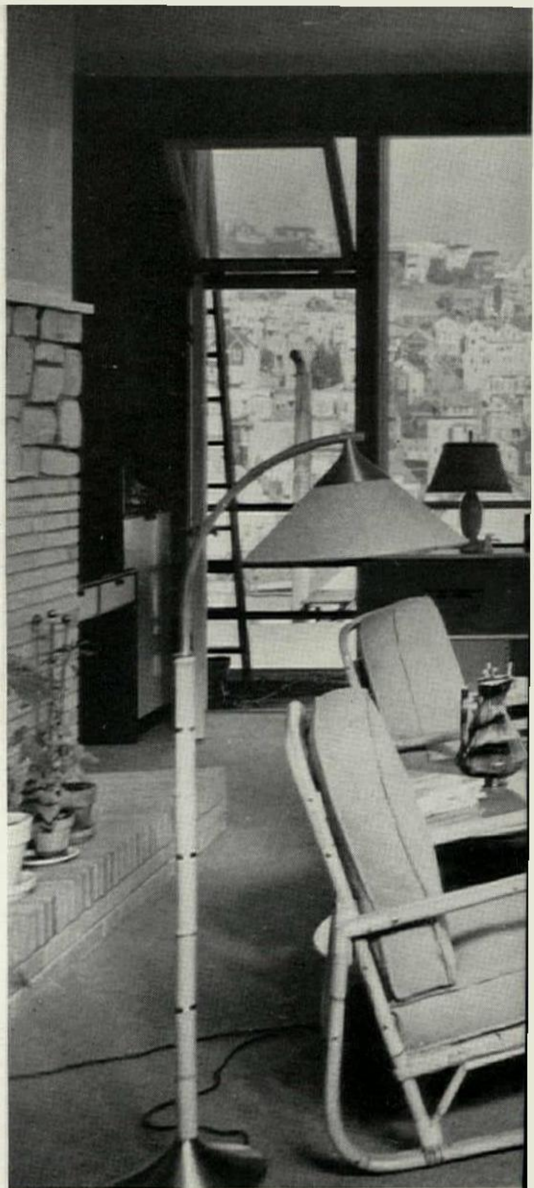


ENTRANCE DOOR

STAIR HALL



REAR, showing the steep site.



HOUSE AT SAN FRANCISCO

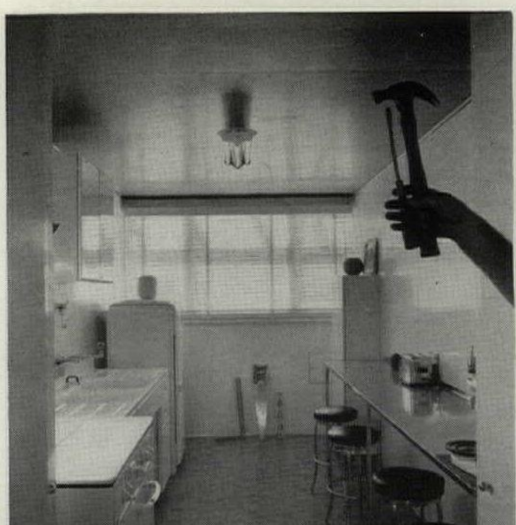
DINWIDDIE AND HILL, Architects

Compact, apartment-like efficiency typifies the planning; the bed folds back into closet space; a small dressing room adjoins the bath; from the rear deck, a ladder-stair leads up to a roof deck. To make the house gee with a limited budget, the owners accepted just a shell to start and have installed finishes and details to suit themselves. A case in point is the breakfast bar in the kitchen. The steep pitch of the site places the main living room high off the ground, which dramatizes the view. At present the downstairs living room is used as a game and work room.

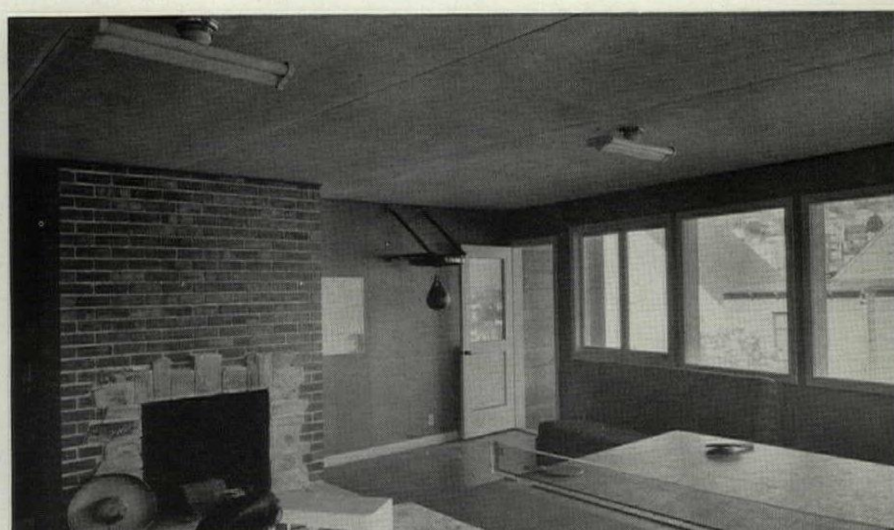
LIVING ROOM, looking toward the entrance stair.

THE DRESSING ROOM serves a dual purpose.

LIVING ROOM with southeastern windowed walls.



KITCHEN, homemade breakfast bar, and symbolism.



THE LOWER LIVING ROOM, now a work room.

A WORLD CENTER

By LEWIS MUMFORD

Above the confusion that has developed around discussion of permanent quarters for the United Nations, Lewis Mumford's voice rises with an important suggestion. In a provocative letter which we published in April, Mr. Mumford warned us to stop and think about preliminary considerations before rushing into an architectural commission (or even, as PROGRESSIVE ARCHITECTURE has urged, an international competition). Now he gives us the result of his thinking since then in the form of three exciting proposals.

Mr. Mumford recently read a paper at a meeting of the R.I.B.A. amplifying the ideas here briefly presented, on the occasion of his receiving the Howard Memorial Medal.

The committee that was designated to choose a permanent home for the United Nations performed that task before it had formulated a program. On the basis of the directives they received, the committee might have been composed of political Aristotles and technological Leonardos, and they still would not have been able to make a sound selection. At this late date, one can hardly hope that better counsels will prevail in the United Nations, and a more thorough study of the program effected, before any further commitments are made. But this only makes it more imperative that a more searching preliminary study should be begun; for the mistakes that are being made now must be corrected within another generation.

There can be no purely architectural analysis of this problem; it is a matter on which an insight into politics and history must lie at the base of every practical decision. To formulate a program for the United Nations buildings, we must first ask these questions: What is the object of the new organization, and what developments is it likely to undergo during the next generation and the next century?

The answers to these questions cannot be found merely by consulting the preamble to the United Nations charter, for we have to consider this organization, not merely with a view to the pressures and compromises that called it into existence, but with a view to the momentum it carries over from the past and to the potentialities that may or may not be evoked in the future. If the organization were destined to remain abortive, even the worst of the present suggestions would suffice.

Now, in broad terms, the United Nations is the second great effort in our time to give political expression to the processes of a uniting, if not yet united, world. This union of mankind is not the dream of a few scattered idealists wandering in a dazed way between the permanent battlelines of the nations; nor is it the accidental outcome of an effort to fight a global war. Our present efforts at worldwide political cooperation are but the last developments in a process that has been going on, through trade and cultural interchange, even through the spread of conquering armies and widening empires, since man's earliest departure from the safe, limited routine of the tribe.

This unification of mankind has been delayed and halted by the barriers of geography, by the taboos of the tribe, by the impediments of language, by all the institutions that put a premium upon isolation and non-intercourse with the world outside one's parish. Nevertheless, the process itself has steadily gathered momentum, and it now has in its service most of the forces of modern technology. Boston is closer to London today than it was to New York a century and a half ago. Today the voice of a single speaker may reach countless millions by radio half

FOR THE UNITED NATIONS

way round the earth before it can travel, without mechanical aids, to the rear of the hall in which he is speaking. Phrases like "the human race," "mankind," "humanity," have ceased to be purely figures of speech; they now stand for visible and operative realities.

All this is of course a commonplace and a platitude. It was already so visible thirty years ago that a far-sighted Dane, Hendrik Christian Andersen, gathered together a group of technical and political collaborators to outline concrete plans for the creation of a World Center of Communication, a city that would be a focus of all our international organizations. In Andersen's elaborate plans, only one element was omitted: the political organization. Today most of those who have thought of the United Nations center have gone to the other extreme; they have thought of it only as a political headquarters, and they have forgotten that in the nature of things, it will be the center of a new age and a new culture.

The basic need in a world center, then, is a provision for further development; it must not merely record and embody the degree of unity we have so far achieved, but open the way for a much fuller accord, a much wider cooperation. Even the charter of the United Nations lays stress on fostering the economic, the educational, the cultural advancement of the peoples of the world; and if the political facilities of the United Nations are to be adequate, the plan must allow full play to all the developing organs of the common life. Some of these international institutions, like the Rockefeller Institute for Medical Research, have long been operating impartially on a world basis; still other institutions must be brought into existence, and a place must be left open for them in our plans. In working out a program for the United Nations we must be bold enough to make it one of the great focal points in a world community. To think in smaller terms is to plan for defeat and to court frustration.

These general considerations dispose, I believe, of the suggestion that the headquarters of the United Nations be small, inconspicuous, secluded, either lost in the urban mass of some great metropolitan area, or removed, for the sake of extra parking space, recreation grounds, and housing quarters to some suburban site wtihin easy automobile access of a great city—as if it were an insurance company or a popular periodical. The future, if not the present, requirements for a world organization prescribe something more than the building of a modest Trading Estate, as the British would call it, for politics. The future demands nothing less, in fact, than the building of a complete city.

As soon as we reach this conclusion, our choice of sites automatically becomes limited, for a world city cannot be conjured up overnight; indeed the most favorable sites for world cities have already been preempted and built upon by great metropolises that have long been in existence. Such cities belong only partly to their immediate region and country; they have become big, they have become powerful, precisely because they have reached out for goods and men throughout the planet. In that fashion, they have even become centers for higher education and research. Partly because of the diversity of their inhabitants and the presence of considerable foreign groups, there is a perpetual interchange of ideas and cultural forms here which quickens all the intellectual processes; in London, Paris, New York, Rome, Berlin, Buenos Aires, a real society of nations tended to grow up. It would be a major sociological blunder to overlook the importance of this fact.

Admittedly, the growth of great world cities during the past century has not been a healthy one—far from it. These formless metropolises were the victims of giantism, imposed upon them by their false ambitions and their perverse economic activities; the incoherent planning, the depressed housing, the contrasts of extreme luxury and extreme poverty, the purposeless materialism of the whole routine were the expressions of a society that was out of balance. While imperialism furthered the processes of world organization on the economic side, its very success resulted in political claims and clashes that undermined even the economic benefits that were achieved. On one hand, the world city was La Ville Lumiere; on the other, the City of Dreadful Night. At the center, beauty, order, wealth, civic vitality; on the periphery, or rather just behind the imperial facade, poverty and corruption, misery and blight.

Today, by one process or another, the overgrown metropolises of the imperial age are on the way out. They will either be liquidated by a benign intelligence, as the planners of Greater London and Manchester propose, or they will be obliterated by the diabolical weapons science has now placed in man's too apelike hands. If we would avoid this second terminus, so near, so threatening, that few even dare look the danger in the face, still less take action against it, we shall have to transform the United Nations into a true World Government. Unconditional cooperation has become the price of man's survival. Such a world organization must bring into existence a new kind of world city, a city that will utilize all the present organs and functions of the world community and turn them to the benefit of mankind as a whole. There is no cheaper and easier way out.

Our problem, then, is not to look for an entirely new site for the United Nations. We must rather choose one of the existing world capitals and make it over in such a fashion that it will both serve and symbolize the new order that lies before us. In the very heart of the dying world, we must make visible the human plans and purposes that will save mankind from the agents of disintegration that now threaten it. If we are not to sink rapidly into a Dark Age, we must prove by our plans and our actions that the Children of Light, far better than the Children of Darkness, have the courage to plan ahead for the next thousand years.

What does the present analysis lead to? Does it imply that it has become the duty of the United Nations to build a separate world capital comparable in population and area to London or Moscow? No, the city of limitless population and expanding territory, spreading in every direction, is a product of the very forces we must now subject to our control. What I am suggesting is something much more modest, yet more audacious, than the creation of an independent metropolis, more closely linked with history, and yet a far bolder essay into the future mankind must create.

First: I propose that the new city be created by a large-scale process of slum clearance, removal, and rebuilding, financed wholly by the United Nations, *within* an existing world metropolis.

Second: I propose that this new center be projected as a balanced urban community, definitely limited in population and area, with all its land permanently owned and controlled by the United Nations, on the lines Howard originally laid down for the creation of the garden city.

Third: I propose that the new world center be within the old metropolis but not of it; on the contrary, that in layout, in design, and in the actual processes of construction, it become a bold demonstration of the very methods of cooperation we must now apply throughout the planet to preserve order, to keep the peace, to establish a decent minimum of living, and to make the maximum human use of the energies man now commands.

At the start, a city so conceived would have the benefit of the colossal resources that the existing world cities already possess; but within its own area the United Nations would set up a new pattern of life. He who entered the new community would have a foretaste of all that the arts and sciences can produce for the humanization of man in society. To the extent that world cooperation prospered, the changes first instituted in a single center would spread to other urban communities.

What may seem the most radical part of this proposal for a new world center, namely, the placing of the new city close to the very heart of the existing world city, is on the contrary the step for which a striking historic precedent actually exists. Politically and legally, as well as physically, we have an example of this arrangement in the relation of Vatican City to the municipality of Rome, a universal institution functioning alongside a purely local and national one. In planning for a world center along garden city lines, we would provide for a better-balanced community; but the principle remains the same.

As for the process of land acquisition, replanning, and building, all that comes under the familiar head of slum clearance and reconstruction. In choosing the first of the world centers to be built, the final decision—after geographic, climatic, and social data have been fully appraised—would probably be made on the basis of the degree of interest shown by competing municipalities. Very possibly a blasted city like Berlin or Leningrad might offer opportunities and incentives that New York, clinging to its costly obsolescence, would not provide. Even in New York or Paris, however, it would not be difficult to find plenty of land, on the scale of two to three thousand acres, whose gradual clearance for a world center would immensely revitalize the whole city.

Where is the money for such a gigantic enterprise to come from? Can the impoverished and exhausted peoples of the world afford such a large-scale expenditure, not merely to house the organs of the world community with their personnel, but to rehouse the local population that is displaced? In war, we do not ask ourselves such questions, and unless we are prepared to cooperate and sacrifice for peace as unconditionally as we do for war, the age of the atomic bomb will mar the end of our whole civilization, along with the science that produced it.

If we are not to make a mockery of modern science and technology, we must now create an urban environment capable of sustaining the political and economic and social processes essential to man's further development. The planning of a new world center gives us such an opportunity.

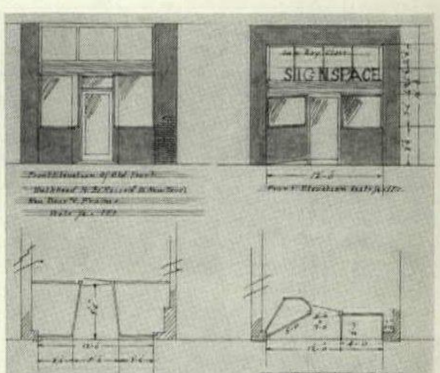
(Details on following page)

Ezra Stoller

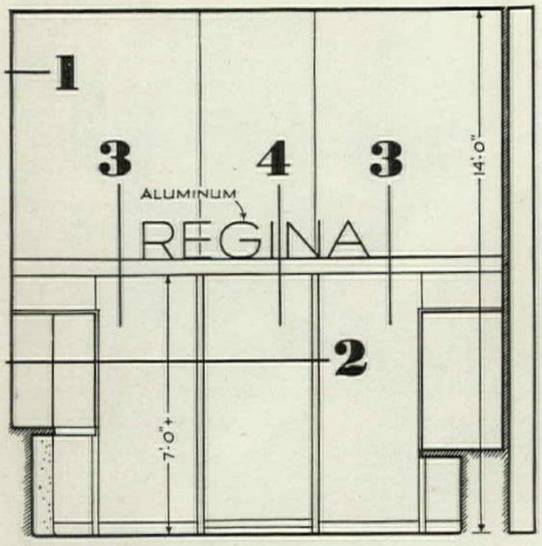
INEXPENSIVE DESIGN FOR SPECIALTY SHOP

NEW ROCHELLE, NEW YORK **MARIE FROMMER, Architect**

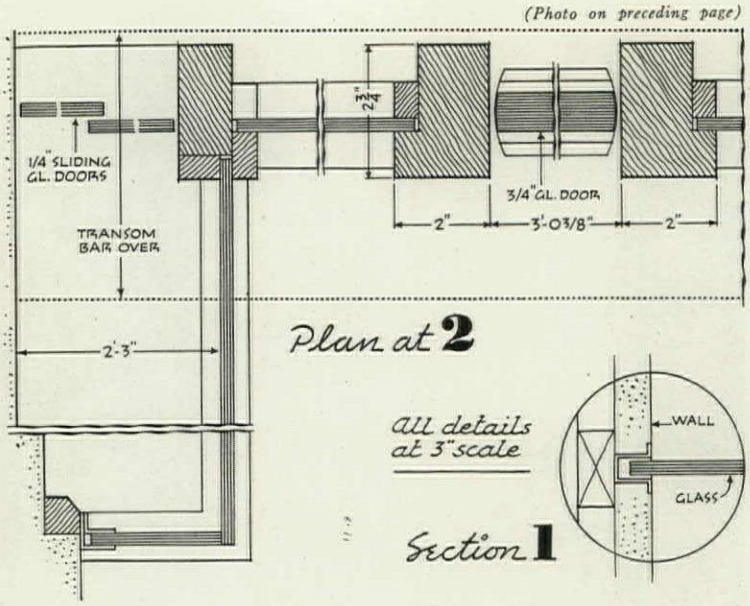
The tenant of this narrow, deep store (14 ft wide, 14 ft high) first went to a fixture contractor, intending to eliminate "unnecessary" fees. For his budget, he was assured he could get nothing better than is shown in the small sketch at right. Dissatisfied, he approached Miss Frommer, who produced for him the shop pictured above for the same total budget, which was approximately $7,000. Economies achieved by such means as substituting black ceramic tile (laid up in squares 2½ x 2½ ft with gray cement joints between squares) for terrazzo and dividing strips, made possible such essentials as the hung ceiling, painted midnight blue to help concentrate attention on the merchandise. No exterior sign space was available; name appears in aluminum letters at rear of 10-ft deep vestibule.



(Photo on preceding page)



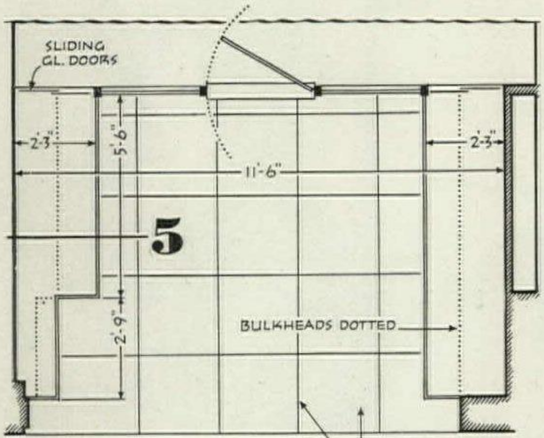
Section 3/16" SCALE



Plan at **2**

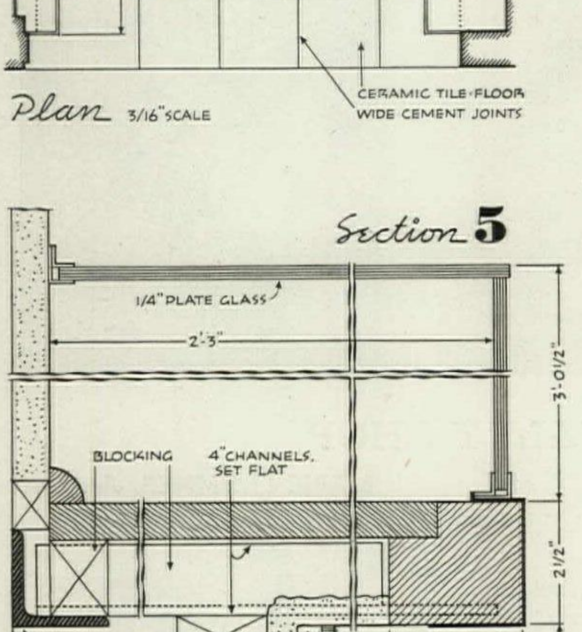
All details at 3" scale

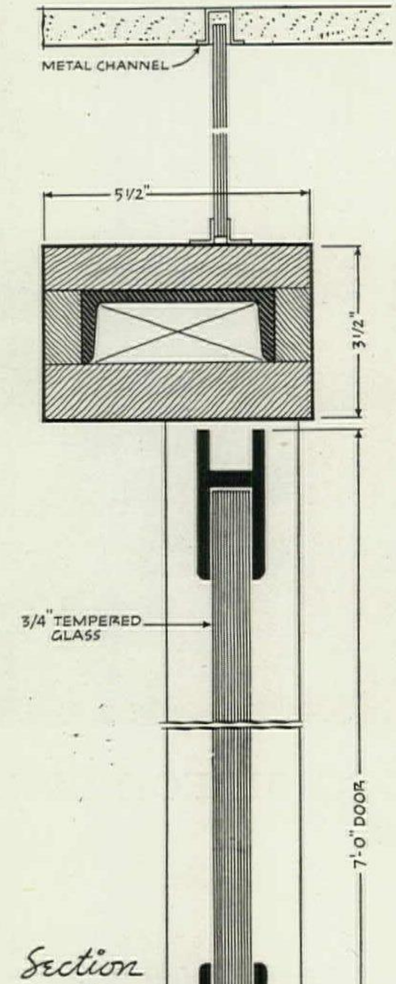
Section **1**



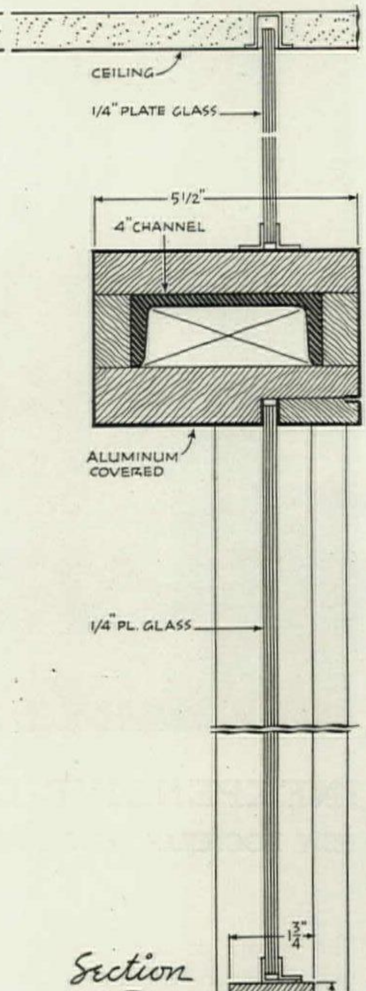
Plan 3/16" SCALE

Section **5**





Section **4**



Section **3**

SPECIALTY SHOP

NEW ROCHELLE, N. Y.

MARIE FROMMER

Architect

(Details on following page)

Ezra Stoller

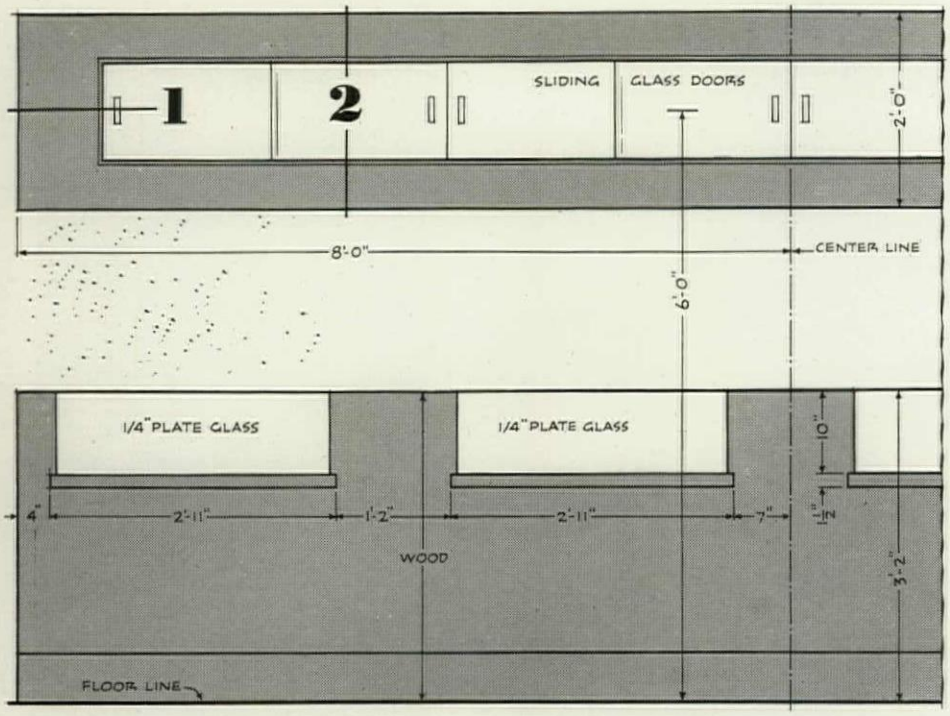
CASES, SPECIALTY SHOP

NEW ROCHELLE, N. Y.

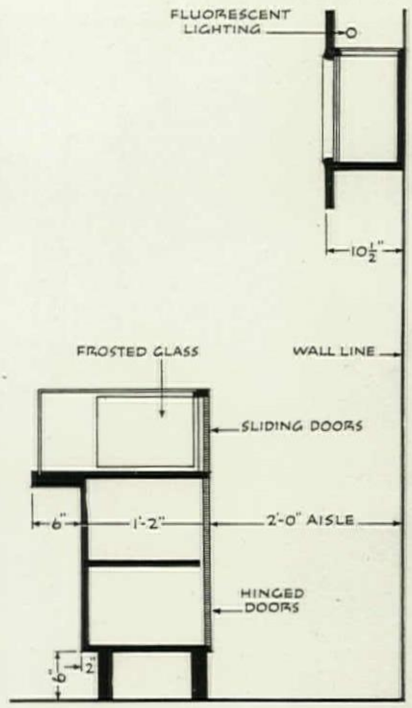
MARIE FROMMER
Architect

Ceiling is dark blue, walls light gray, lighting (mostly fluorescent) is built-in. Exposed wood is oak with rubbed gray finish except wall fixture shown above, which is yellow, repeating the narrow yellow stripe set in the black linoleum floor. All fixtures, including those in the lobby, were proportioned to display a particular type of merchandise (jewelry, handbags, luggage) to fullest advantage.

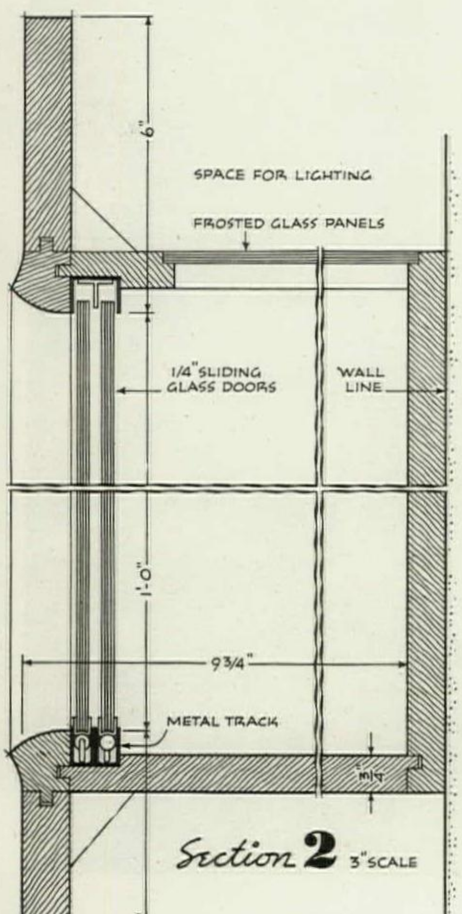
(Photo on preceding page)



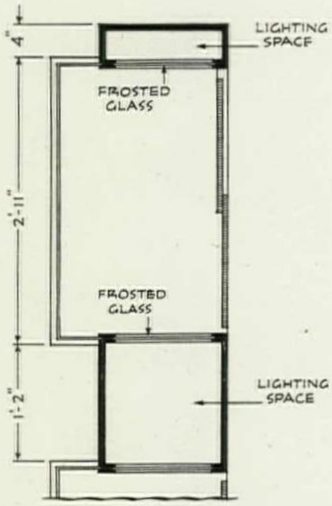
Half Elevation 1/2" SCALE



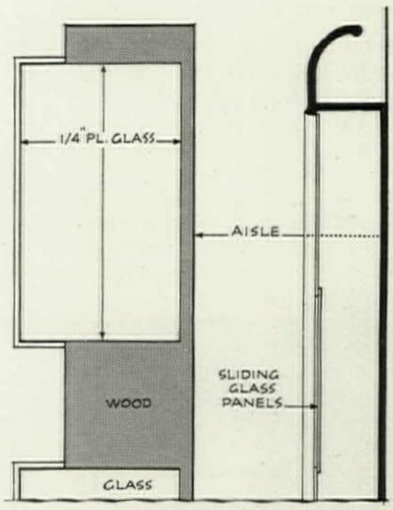
Section 1/2" SCALE



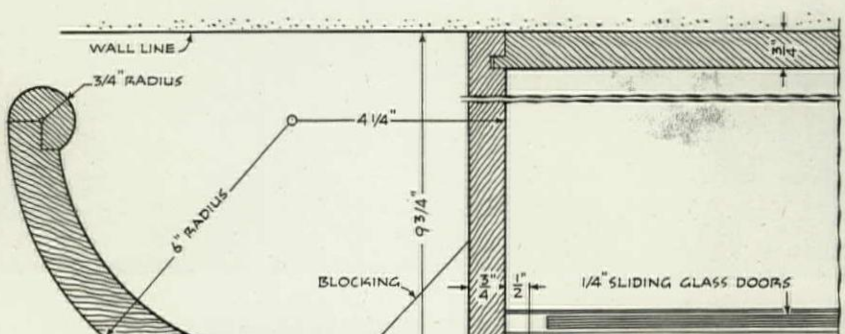
Section 2 3" SCALE



Plan thru Counter



Plan above Counter



Section 1 3" SCALE

SPECIALTY SHOP

NEW ROCHELLE, N. Y.

MARIE FROMMER
Architect

THEORY AND BASIC PRINCIPLES OF INSULATION

By PAUL D. CLOSE, formerly Technical Secretary, American Society of Heating and Ventilating Engineers, and Insulation Board Institute; author of a condensed manual on the insulation of dwellings and other buildings, to be published shortly by Reinhold Publishing Corp.

What are the characteristics of an insulation that cause it to retard heat flow and thereby save fuel and perform other valuable functions? The complete answer to this question involves an understanding of the nature of heat and of the mechanics of heat transfer through walls.

MOLECULAR THEORY OF HEAT

However transcendental the idea may appear to the average individual, heat is molecular motion or vibration. The modern concept of heat is that all substances are composed of minute particles or molecules which are in a constant state of motion. The temperature of a substance is due to the rate of motion or vibration of the molecules composing it. Energy the molecules possess due to this motion is called kinetic energy. The temperature of a substance is therefore the measure of the average kinetic energy of the molecules composing it. Adding heat energy to a substance either increases the temperature or increases the energy of the position of the molecules, as when melting or bailing occurs. For example, if heat is added to a piece of ice having a temperature of say 0°F, the kinetic energy or motion of the molecules increases. When enough heat has been added to raise the temperature of the ice to 32F, the ice begins to melt or change its state. Thus the molecules of ice have reached the maximum speed possible in their relatively fixed positions and additional heat is not causing an increase in their speed, but a change in their position, and hence a change in state.

Unit of Heat. The English unit of heat in common engineering use is of course the *British Thermal Unit,* familiarly known as the *Btu,* which is defined as the amount of heat energy necessary to raise the temperature of one pound of water from 63F to 64F. The metric system heat unit is the *calorie,* and is the amount of heat energy necessary to raise the temperature of one gram of water from 15C to 16C.

Heat Content of Fuels. When a quantity of fuel is burned in the air, a definite number of heat units are given off. The heat content or calorific value of fuel is the number of Btu evolved when one pound of fuel is completely burned in air or oxygen.

METHODS OF HEAT TRANSFER

Heat always seeks the lowest temperature level. In other words, the transfer of heat always takes place, or heat is said to flow or pass, from a warmer to a colder body. Thus when fuel is burned in a heating furnace the heat generated is dissipated to the outside by transmission through walls, roof, and glass areas, and by air leakage through cracks, crevices, and open doors and windows. Heat transfer takes place in three ways, (1) by conduction, (2) by convection, and (3) by radiation.

Heat Transfer by Conduction. Conduction is transfer of heat through matter unaccompanied by any obvious motion of the matter. If an iron bar is thrust into an open fire, the molecules at the end of the bar in the fire will immediately speed up. These in turn will bombard adjoining molecules, causing them to speed up until all the molecules in the bar are vibrating more rapidly. This is transfer of heat by conduction.

Metals are good conductors and have the highest *conductivity*—or rate of heat transfer by conduction—of any materials. Steel, for example, is roughly 400 times as good a conductor as soft woods. Silver is about seven times as good a conductor as steel.

Conduction Formula. The amount of heat transferred by conduction is directly proportional to temperature difference ($\triangle t$), area (A), and time and rate of heat transfer or conductivity (k), and inversely proportional to thickness, (x). If the time is one hour, the amount of heat transferred by conduction is given by the following formula:

$$q_c = \frac{\triangle tAk}{x} \qquad (1)$$

Moisture increases the rate of conduction or conductivity (k) because water, which fills the voids, conducts heat more rapidly than the air it displaces. The rate of heat transfer through most homogeneous materials also increases with the mean temperature.

Heat Transfer by Convection. Convection is transfer of heat by moving matter, as for example the heated air rising from a warm air register. When air is heated it expands and thus becomes lighter than the surrounding air. This heated air rises and heavier cold air replaces it nearer the source of heat. This process is repeated and the convection currents thus set up continually transfer heat. Such currents can actually be observed in the case of smoke from a chimney and "heat waves" rising from a pavement on a hot summer day.

Heat Transfer by Radiation. Radiation is transfer of heat through space without the presence of matter. Heat is received from the sun by the process of radiation. While heat is being transmitted in this way it is *radiant energy;* it is not heat until it is absorbed by some surface or object. Most of the heat from a fireplace or a radiator is transmitted by radiation. Every wall surface is continually giving off heat by radiation to colder wall surfaces and other objects it can "see," and likewise every surface is receiving heat by the process of radiation from warmer surfaces and objects. Thus there is a continual interchange of radiant heat energy between surfaces and objects of different temperatures.

Radiation Transfer Across Air Spaces. Transfer of heat by radiation across an air space is dependent upon the temperature of the two boundary surfaces and their respective *emissivities.* The emissivity of a surface is merely a factor indicating the relative amount of radiation absorbed by a surface as compared to an absolutely black body under the same conditions. A black body or surface absorbs all the radiation which strikes it and reflects or transmits none, and therefore has an emissivity of unity (1.0). All other surfaces have emissivities of less than 1.0.

Most non-metals have high emissivities (in the neighborhood of 0.9) while metals, when not oxidized, have very low emissivities—around 0.05. Aluminum foil has an emissivity of about 0.05. Aluminum and bronze paints, a combination of metals and non-metallic vehicle, have emissivities about half-way between the two values stated.

Radiant heat waves coming in contact with an opaque surface are either absorbed or reflected. The absorbed and reflected radiation together must equal the radiation striking the surface. If a = absorptivity, e = emissivity, and r = reflectivity of a surface, then $a = e = 1 - r$

Stefan-Boltzmann Radiation Formula. The Stefan-Boltzmann formula for heat transfer by radiation between two parallel surfaces of the same area is as follows:

$$q_r = 0.172eA\left[\left(\frac{T_1}{100}\right)^4 - \left(\frac{T_2}{100}\right)^4\right] \qquad (2)$$

where

q_r = heat transferred by radiation, Btu per hour

e = effective emissivity $= \dfrac{1}{\dfrac{1}{e_1} + \dfrac{1}{e_2} - 1}$

e_1 = emissivity of radiating surface

e_2 = absorptivity of receiving surface

A = area of surface, square feet

T_1 = absolute temperature of radiating surface $= t_1 + 460$ (t_1 = temperature of radiating surface)

T_2 = absolute temperature of receiving surface $= t_2 + 460$ (t_2 = temperature of receiving surface)

Example: Calculate heat transfer by radiation across an air space if emissivities of the two surfaces are both 0.85, area is 100 sq ft, and radiating and receiving surface temperatures are 100F and 50F, respectively.

Solution: $e = \dfrac{1}{\dfrac{1}{.85} + \dfrac{1}{.85} - 1} = 0.74$

$T_1 = 100 + 460 = 560$

$T_2 = 50 + 460 = 510$

$A = 100$

Substituting in formula (2):

$$q_r = 0.172 \times 0.74 \times 100 \left[\left(\frac{560}{100}\right)^4 - \left(\frac{510}{100}\right)^4\right]$$

$= 0.172 \times 0.74 \times 100 \times 309$

$= 3940$ Btu per hour

Heat Transfer Through Building Materials and Construction. Transfer of heat through building materials is almost entirely by conduction, except that in the case of fluffy or highly attenuated substances there may be some convection. Transfer of heat through air spaces, and from or to wall surfaces, involves all three processes, although the percentage of heat transferred by conduction through air is comparatively small. Therefore, passage of heat through a wall from air to air involves all three methods of heat transfer.

WHY IS AN INSULATION?

Consider now the characteristics of an insulation which cause it to retard heat flow, save fuel, and provide increased comfort. The subject must be considered according to the type of insulation, that is, (1) the reflective which depends solely on surface characteristics, or (2) other types such as blankets, batts, board, and fill, which depend on thickness and may be termed mass insulations. The principles are entirely different in the two cases. Consider the so-called mass insulations first.

Principle of Mass Insulations. Heavy, dense materials such as concrete, stone, and steel are not classified as insulations because they have a high rate of heat conduction, whereas lightweight, porous substances which have a low rate of heat conduction are classified as insulating materials. If, however, a heavy, dense material (such as rock) is subdivided or fiberized (rock wool), the rate of heat conduction will be greatly decreased. This low rate of heat flow (which means a high degree of heat resistance) is due to the millions of air cells or voids resulting from the degree of subdivision of the material. Mass insulations therefore retard heat flow simply because they have a low rate of heat transfer by conduction due to the degree of subdivision, and permit little or no heat transfer by convection or radiation. Some materials have what is called an "optimum" density, that is, a density which will result in the minimum rate of heat flow.

The molecular theory of heat explains why porous, lightweight insulating materials containing millions of air voids have a lower rate of heat flow than hard, dense materials. If the molecules of a material are packed together solidly (as in the case of steel or concrete) any vibration or motion of the molecules is readily communicated from one part of the substance to the other and thus the material has a high rate of heat transfer. With lighter, more porous materials, any motion of molecules due to heat applied to one side is not readily transmitted through to the other side by impact with adjoining molecules and the material therefore has a low rate of heat transfer.

Principle of Reflective Insulations. Reflective materials reduce the rate of heat transfer simply by reducing the amount of heat transferred by radiation across the air space. At ordinary temperatures, from 55% to 70% of the heat may be transferred across an air space by radiation. By replacing one or both of the surfaces enclosing the air space with a reflective material such as bright aluminum, heat transfer across the air space would be reduced about 95%. These percentages refer only to heat flow across the air space and not to heat flow through the entire construction, which is considerably less.

VALUE OF AIR SPACES

Air spaces such as exist between studs of an ordinary frame wall, in hollow tile, and in the cores of cement blocks are sometimes referred to as "dead" air spaces, implying that air in them is motionless, whereas in fact there is always considerable air motion due to convection when a difference in temperature exists between the sides of the space. An air space of sufficient size does have some heat-resistance value, though much less than is generally supposed.

The actual value of an air space depends on many factors including temperature, width and orientation, direction of heat flow, and particularly the character of the enclosing surfaces. For vertical surfaces bounded by ordinary materials, heat resistance increases with increase in width of air space up to about ¾" or 1", but there is no appreciable increase in heat resistance with increases beyond this width. Therefore, a one-foot space is little or no better than a 1" air space.

A *vertical* wall-thick (3⅝") air space bounded by ordinary building materials has an insulating value equivalent to about ¼" of efficient insulation. If one surface of the air space is replaced by a reflective material (having an emissivity of 0.05), its insulating value is more than doubled—the net increase is equal to about ⅓" of efficient insulation.*

* The conductance generally used for computing heat loss coefficients for air spaces bounded by ordinary materials is 1.10 and that for air spaces bounded by reflective surfaces such as bright aluminum foil is 0.46. The resistances are $\frac{1}{1.10} = 0.91$ and $\frac{1}{0.46} = 2.17$ respectively. An air space bounded by ordinary materials is therefore equivalent to about ¼" of an insulation having a conductivity of 0.27. The increase in resistance due to the aluminum foil, using these values, is 2.17-0.91 or 1.26. This is equivalent to 0.34" of insulation having a conductivity of 0.27.

METHODS OF INSULATING

It will be apparent that there are several possible methods of reducing heat flow by the use of insulating materials:

1. **By replacing structural materials** having a high rate of heat conduction with materials having a low rate such as the use of insulating board sheathing and lath in place of non-insulating sheathing and lath.

2. **By adding insulating materials** to the construction, such as by partially or completely filling air spaces. Blankets, fills, and batts are commonly used for this purpose. An insulating material generally has substantially greater heat resistance than the air space it fills.

3. **By replacing one or both surfaces** of an air space with a material of low emissivity, that is, with a reflective insulation. Reflective insulation may also be installed in such a manner as to divide the air space into two or more air spaces.

WHERE TO INSULATE

While special considerations may alter the situation, in general, the following surfaces should be insulated against heat loss (or gain):

1. **Walls.** All outside walls and walls adjacent to such unheated spaces as enclosed porches, unheated garages, etc.

2. **Ceilings.** Where the roof is pitched and the attic unheated, the ceiling should be insulated—a more effective installation, under these conditions, than roof insulation. If the roof is pitched and the attic occupied and heated, insulation should be applied as a part of the roof structure, either as a ceiling on the underside of the rafters (using structural insulating board interior finish, for example), or between the rafters (using batts, blanket, or fill insulation), or both. Roof insulation may also be applied over the rafters under the sheathing, using insulating board.

3. **Roofs.** Where the roof is flat and the ceiling approximately parallel with the roof, either the roof or the ceiling may be insulated.

4. **Floors.** Floors over unheated crawl spaces should be insulated. Floors over basements need not be insulated, except in unusual circumstances, such as where the basement is subjected to temperatures approaching outside temperatures, or where the basement is exceptionally warm due to heat from a heating plant or other source.

Insulation of concrete slabs laid on the ground has limited value because the rate of heat transfer into the ground is comparatively low. However, edge insulation should be used around the concrete slab, between the slab and the walls or foundation, to isolate it.

HEAT LOSS COEFFICIENTS

Building materials, including insulations, are evaluated according to the rate at which heat will pass through them; the lower the rate of heat flow, the greater the heat-resistance of the material. Compound structures such as walls and roofs, consisting in most instances of two or more materials, are similarly rated. These units of measure of the rate of heat loss are known as heat loss coefficients.

COEFFICIENTS DEFINED

The various heat loss coefficients used for building materials and insulations, air spaces, surfaces, and compound structures, and the symbols used, are as follows:

k = thermal **conductivity**, or the amount of heat (Btu) transmitted in one hour through one square foot of a homogeneous material *one inch thick* for a difference in temperature of one degree Fahrenheit *between the two surfaces.*

C = thermal **conductance**, or the amount of heat (Btu) transmitted in one hour through one square foot of a non-homogeneous material or a combination of materials, for the thickness or type under consideration for a difference in temperature of one degree Fahrenheit between the two surfaces of the material.

f = film or **surface conductance**, or the amount of heat (Btu) transmitted from a surface to the air surrounding it, or vice versa, in one hour, per square foot of surface, for a difference in temperature of one degree Fahrenheit between the surface and the surrounding air. To differentiate between inside and outside surfaces, f_i is used to designate the inside film or surface conductance, f_o the outside.

a = thermal **conductance of an air space**, or the amount of heat (Btu) transmitted in one hour through an area of one square foot of an air space for a temperature difference of one degree Fahrenheit.

U = over-all **coefficient of heat transmission**, or the amount of heat (Btu) transmitted in one hour, per square foot of wall, floor, roof, or ceiling, for a difference in temperature of one degree Fahrenheit between the air on the inside and outside of the wall, floor, roof, or ceiling.

R = resistance or **resistivity**, which is the reciprocal of transmission, conductance, or conductivity. This is explained under the heading *Resistance.*

Difference Between Conductivities and Conductances. It will be noted that conductance (C) is similar to conductivity (k) except that conductivity is based on a 1" thickness whereas conductance is for a thickness other than 1" and often embraces combinations of two or more materials. Certain heterogeneous materials or combinations of materials are of such character that it would not be feasible to give the coefficient in terms of an inch thickness. Materials of this type include hollow tile, cinder and concrete blocks, roofing, combinations of building materials and air spaces. Coefficients for these materials are termed conductances, and are given in terms of the actual thickness or construction stated, such as 4" hollow tile, or a combination of wood sheathing, building paper, and stucco. Both conductivity and conductance express the rate of heat transfer between the two surfaces. Conductivities and conductances of various materials are given in **Table 1.** Conductivities in most instances were determined by means of the hot-plate test method. Conductances are determined either by the hot-plate method or the hot-box method.

Conductivities and Conductances Not Additive. Conductivities and conductances are not additive. In other words, two or more conductances or conductivities cannot be added together to obtain any rational or significant result. For example, if the conductivity of material "X" is 0.30 and the conductivity of material "Y" is 0.40, their combined conductivity will not be the sum of these quantities, or 0.70—although it is, of course, greater than either conductivity value alone.

Coefficients of Transmission (U Values). Conductivities and conductances of materials or conductances of air spaces and surfaces are not applied directly in estimating heat losses through walls, floor, roof, or other parts of a structure, but are used in the proper formula for deriving the over-all coefficient of transmission which is the ultimate objective. This over-all coefficient of transmission (U) expresses the rate of heat transfer from the air on one side to the air on the other side and is the quantity used for heat loss calculations.

It will be noted that **Table 3** may be used in conjunction with **Table 2** for determining coefficients of transmission of frame constructions with the types and thicknesses of insulation between the framing indicated in Columns A to D inclusive. **Fig. 1** may also be used for this purpose. This figure, however, may be used for materials having conductivities between 0.2 and 1.0 and therefore covers a wider range of materials than Table 3.

Resistances. As previously explained, conductivities and conductances are not additive; neither are coefficients of transmission. Resistances, however, can be added. These are simply the reciprocals of conductivities and conductances. The reciprocal of a number is one (unity) divided by the number. For example, the reciprocal of 2 is ½ and the reciprocal of 6 is 1/6. The resistances of various building and insulating materials are given in the right-hand column of **Table 1.** (For tables see accompanying BPF sheets.)

FORMULA FOR CALCULATING U VALUES

The basic formula for calculating the U values of simple walls is as follow:

$$U = \frac{1}{\frac{1}{f_i} + \frac{x}{k} + \frac{1}{f_o}} \qquad (3)$$

where

x = thickness of wall (inches)

U, k, f_i and f_o are as previously defined

Example 1: Calculate the U value of a 10" concrete wall, assuming the conductivity of concrete to be 12.0.

Solution: According to Table 1, the inside surface conductance (f_i) is 1.65, the outside surface conductance 6.00. k = 12.0; x = 10. Substituting in Formula (3) :

$$U = \frac{1}{\frac{1}{1.65} + \frac{10}{12} + \frac{1}{6.0}} = \frac{1}{1.58} = 0.62$$

If the construction contains one or more air spaces, formula (3) should be modified to include a factor $\left(\frac{1}{a}\right)$ in the denominator for each air space. If the construction contains other materials there must be an $\left(\frac{x}{k}\right)$ or $\left(\frac{1}{C}\right)$ for each material.

RESISTANCE METHOD OF CALCULATING U VALUES

The U value of any construction can be obtained by adding the component resistances of the various materials in a wall or roof plus the inside and outside surface resistances and the resistance of any air spaces (¾" or more in width) in the construction. The U value is then obtained by taking the reciprocal of the sum of the resistances. Consider again the foregoing example for a simple 10" concrete wall, with resistances as follows:

Outside surfaces	0.17
10" concrete = 10 x 0.08	0.80
Inside surface	0.61
Total resistance	1.58

$$U = \frac{1}{1.58} = 0.62$$

If the wall had contained an air space and the same thickness of concrete, the resistance of the air space (0.91) would be included, making the total resistance 1.58 + 0.91, or 2.49; the U value would then be: $U = \frac{1}{2.49} = 0.40$

The calculated coefficients of transmission (U values) of many common types of construction are given in **Tables 2 to 14**, inclusive. These were originally calculated by the author from the conductivities and conductances in Table 1 and are similar to those in the Guide of the American Society of Heating & Ventilating Engineers. U values for doors and windows are given in **Table 15.**

TECHNICAL DEFINITION OF THERMAL INSULATION

A thermal insulating material qualifies as such because it possesses "concentrated heat resistance" or has a "high degree of heat resistance per unit of thickness." These statements are general and do not permit differentiation between insulating materials and non-insulating materials. For the purpose of this text, therefore, a thermal building insulation is defined as a proprietary (owned) manufactured building material having a rate of heat flow (conductivity) not to exceed 0.50 Btu per hour per square foot per degree Fahrenheit per inch thickness, as tested by a recognized authoritative laboratory, and having, when installed, a total heat resistance of not less than 1.0.

DEFINITION OF INSULATED BUILDING

An insulated building is here considered to be one having a U value for both walls and top floor ceiling (plus roof) of 0.20 or less.

CONDUCTIVITIES OF PROPRIETARY INSULATIONS

Many manufacturers of insulating materials have had tests conducted on their products by recognized testing laboratories and will supply such data upon request. However, too much importance should not be attached to minor differences in the conductivities of insulating materials. Other practical factors may be of far greater importance than differences of say one or two hundredths (0.01 or 0.02) in theoretical conductivities of two materials. Other things being equal, the material with the lower conductivity has the greater heat resistance for the same thickness of insulation but small differences in heat resistance can readily be offset by improper application or by damage to, or misuse of, the material. It should also be remembered that the total resistance of the material depends on the thickness used as well as the conductivity.

Published conductivity values are not always representative of the values of the material as sold or applied. It is possible in some cases that the tests may have been conducted on specially prepared samples of a density which may not correspond with that of the material as sold or applied. The reputation of the testing laboratory should also be considered.

Conductivities shown in **Table 1** for the various types of insulating materials have been used for many years for calculating heat loss coefficients. The calculated U values based on these conductivities have been found to compare favorably in most cases with actual test values for the various types of construction. Conductivities of individual proprietary insulations may deviate by various amounts from the values given in Table 1.

Comparisons on Basis of Resistances. Comparisons are sometimes made on the basis of the resistances of two or more materials. Such comparisons can also be misleading.

For example, it is sometimes assumed that a material having twice the heat resistance of some other material has twice the insulating value. This is not correct because insulating value, so-called, is not proportional to resistance if the term "insulating value" refers to the percentage reduction in the rate of heat transfer. Consider for example a wall having a U value of 0.25 and insulations A and B having total installed resistances of 2 and 4, respectively. Insulation B therefore has twice as much resistance as insulation A. However, when added to the wall, insulation A reduces the U value from 0.25 to 0.167, or 33⅓%, and insulation B reduces the U value from 0.25 to 0.125 or 50%. Therefore insulation B is not twice as effective in this case as insulation A, but in the ratio of 50% to 33⅓%.

INSULATING EFFICIENCIES

An insulating material reduces the rate of heat loss through a wall, roof, or other structure to which it is applied. That part of the reduction due to insulation is known as the insulating efficiency. This quantity of relationship is expressed by the following formula: $E = \frac{100 \times (U - U_i)}{U}$ (4)

E = Efficiency of insulation (percent)

U = Coefficient of transmission of uninsulated construction

U_i = Coefficient of transmission of insulated construction

Example: What is the efficiency of 1" of insulating board applied to a 4" concrete roof deck having a metal lath and plaster ceiling?

Solution: According to Table 12, the coefficient of transmission (U) of the uninsulated construction is 0.40. The coefficient of transmission (U) of the insulated construction is 0.18. Therefore, the efficiency of the insulation in this case is: $E = 100 \times \frac{(0.40 - 0.18)}{0.40}$

$$= 100 \times \frac{0.22}{0.40} = 55.0\%$$

The efficiency of an insulation is the same as, or equivalent to, the amount of heat, expressed as a percentage, prevented from passing through the wall, roof, or other construction in either direction in a given period of time.

WATERPROOFING AND DAMPPROOFING

PART I (Part II will appear in the September 1946 issue)

By BEN JOHN SMALL

Organized information relating to most waterproofing and dampproofing materials and methods has been infrequently presented in abbreviated form. The terms "waterproof," "dampproof," "weatherproof," "weather-resistant," "water-repellent," and similar expressions have been employed rather loosely. Under the prodding of the Federal Trade Commission, a product described as "waterproof" soon becomes "weather-resistant" or some other dilution of the word "waterproof," the contention being that few materials are truly waterproof. (Science claims that water can be forced through glass.)

To help clear a path in the lush forest of technical and commercial literature on the subject, an outline of current practice becomes helpful.

WATERPROOFING

Waterproofing is a process wherein an impermeable barrier is created to withstand water pressure. Generally, three methods are employed:

I —Membrane Method
II —Integral Method
III—Plaster Method

★ ★ ★

I—MEMBRANE METHOD is a system of waterproofing with continuous impermeable membranes cemented together. Materials frequently used:

1. **Membranes:**
   - (a) Coal-tar-saturated woven cotton fabric (Fed. Spec. HH-C-591 or ASTM 173) for use with coal-tar pitch
   - (b) Asphalt-saturated woven cotton fabric (Fed. Spec. HH-C-581a or U. S. Navy 81-38 or ASTM 173) for use with asphalt
   - (c) Coal-tar-saturated felt (Fed. Spec. HH-F-201 or ASTM 227) for use with coal-tar pitch
   - (d) Asphalt-saturated felt (Fed. Spec. HH-F-191 or ASTM 226) for use with asphalt
   - (e) Combinations of fabric and felt

Note: Fabric is more durable than felt and is recommended where there is deflection and vibration; for corners, angles, and irregular surfaces and where no protection courses are used.

2. **Cementing Materials:**
   - (a) Coal-tar pitch (Fed. Spec. R-P-381, Type II or U. S. Navy Spec. TW or ASTM 450, Type B)
   - (b) Asphalt (Fed. Spec. SS-A-666, Type III, Class A or U. S. Navy Spec. AW or ASTM 449, Type B)

3. **Primers:**
   - (a) Asphalt (Fed. Spec. SS-A-701 or U. S. Army Spec. 3-116 or ASTM 41)
   - (b) Coal-tar creosote (Fed. Spec. TT-W-560 or ASTM 43)

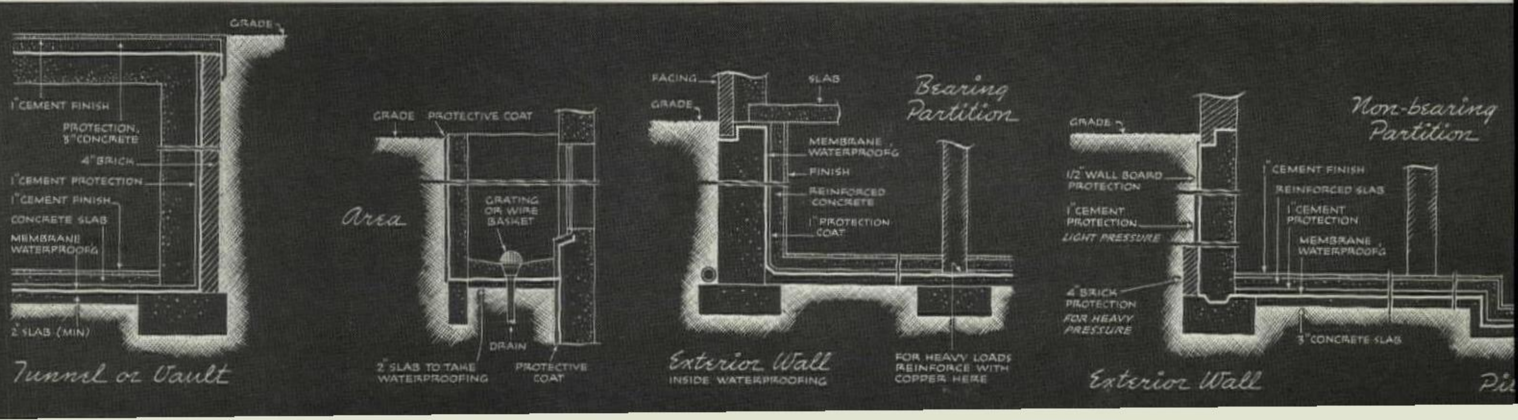
4. **Protection Course** is a layer of material intended to prevent disintegration and puncture of the membranes. Materials frequently used:
   - (a) Brick
   - (b) Tile
   - (c) Concrete
   - (d) Cement Mortar
   - (e) Composition Boards
   - (f) Impregnated Composition Boards

5. **Protection Course and Wearing Surface** is a layer of material intended to prevent disintegration and puncture of the membranes and also serve as a wearing surface. Materials frequently used:
   - (a) Brick
   - (b) Tile
   - (c) Concrete
   - (d) Cement Mortar
   - (e) Asphalt Paving Blocks
   - (f) Impregnated Composition Boards
   - (g) Granite Blocks
   - (h) Bituminous Paving Mixtures

6. **Advantages Claimed for Membrane Method:**
   - (a) Membranes yield with movement of structure
   - (b) Porous concrete weaknesses overcome in a measure by use of membranes

7. **Disadvantages:**
   - (a) Poor accessibility for repair purposes in the event of membrane failure.

MEMBRANE METHOD



RECOMMENDED NUMBER THICKNESSES-MEMBRANE WATERPROOFING - for varying water pressures				
HEAD of water (ft)	FABRIC & PITCH		FELT & PITCH	
	Plies fabric	Mopping pitch	Plies felt	Moppings pitch
1-3	2	3	2	3
3-6	2	3	3	4
6-9	3	4	4	5
9-12	3	4	5	6
12-18	4	5	6	7
18-25	5	6	7	8
25-35	6	7	10	11
35-50	7	8	11	12
50-75	8	9	13	14
75-100	10	11	14	15

THICKNESS & REINFORCING OF SLAB - WATER HEAD 1 to 10 Ft., SPANS 6 to 24 Ft.

Table based on simple spans. Concrete stress 650 psi, steel 1600 psi. Mix: 1-2-4. *Provide distribution rods perpendicular to main reinforcing and wired thereto, 3/8φ-12" o.c. for slabs 8" or less; 1/2φ-12" o.c. for thicker slabs.*

Head of water above bottom of slab	Lifting pressure in Lb. per sq. ft.	SPAN	6'	8'	10'	12'	14'	16'	18'	20'	22'	24'
1'	62½	SLAB	4"	4"	4"	4"						
		STEEL	3/8φ-12"	3/8φ-12"	3/8φ-12"	3/8φ-12"						
2'	125	SLAB	4"	4"	4"	4½"	5"	5½"	6"	6"	6½"	6½"
		STEEL	3/8φ-12"	3/8φ-7½"	3/8φ-5"	1/2φ-7½	1/2φ-7"	1/2φ-6½"	1/2φ-6½"	1/2φ-5½"	1/2φ-5½"	1/2φ-4½"
3'	187½	SLAB	4"	4½"	5"	5½"	6"	7"	7½"	8"	8"	8½"
		STEEL	3/8φ-7½"	3/8φ-5"	1/2φ-7"	5/8φ-9	5/8φ-8"	5/8φ-8"	5/8φ-7"	5/8φ-6½"	5/8φ-5½"	5/8φ-5½"
4'	250	SLAB	4"	5"	6"	6½"	7½"	8"	9"	9½"	10"	10½"
		STEEL	3/8φ-5"	1/2φ-9"	1/2φ-6"	1/2φ-5"	5/8φ-7"	5/8φ-6"	5/8φ-6"	3/4φ-8"	3/4φ-7"	3/4φ-6½"
6'	375	SLAB	4¾"	6"	7"	8"	9"	10"	11"	11½"	12½"	13½"
		STEEL	1/2φ-7"	1/2φ-5"	5/8φ-7"	5/8φ-6"	5/8φ-5"	5/8φ-4½"	5/8φ-4"	3/4φ-5½"	3/4φ-5"	3/4φ-5"
8'	500	SLAB	5½"	7"	8"	9½"	10½"	11½"	13"	14"	15"	15½"
		STEEL	1/2φ-6"	5/8φ-7½"	3/4φ-8½"	3/4φ-7½"	7/8φ-8½"	7/8φ-7½"	7/8φ-7"	7/8φ-6½"	7/8φ-6"	7/8φ-6"
10'	625	SLAB	6"	7½"	9	10½"	12"	13"	14½"	15½"	16½"	18"
		STEEL	1/2φ-5"	3/4φ-9"	7/8φ-10"	7/8φ-8½"	7/8φ-7½"	7/8φ-6½"	7/8φ-6"	7/8φ-5½"	7/8φ-5"	7/8φ-5"

★ ★ ★

II—INTEGRAL METHOD is a system of waterproofing by means of compounds added to concrete and cement mortar during mixing.

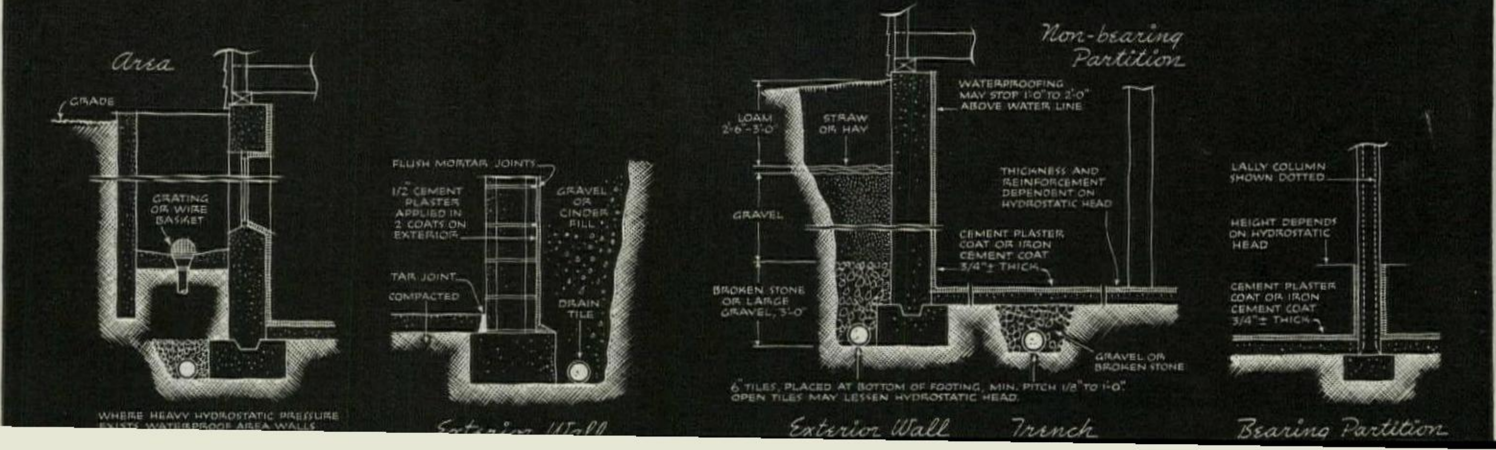
1. **Compounds Frequently Used:**
   - (a) Calcium chloride (liquids, powders)
   - (b) Calcium chloride admixtures (semi-liquids, liquids, pastes)
   - (c) Soaps (semi-liquids, liquids, pastes)
   - (d) Hydrated lime and soaps (powders)
   - (e) Fine fillers (ground silica, lime, soapstone, flint)
   - (f) Miscellaneous compounds (semi-liquids, liquids, powders, pastes, heavy oils, fatty acids, metallic powders)
2. **Advantages Claimed:**
   - (a) Shrinkage reduction
   - (b) Segregation prevention
   - (c) Void filling
   - (d) Increased workability
   - (e) Increased chemical activity of cement
   - (f) Permeability reduction
   - (g) Waterproofing
3. **Disadvantages:** This method cannot obviate leakage due to:
   - (a) Settlement
   - (b) Expansion
   - (c) Excessive shrinkage
   - (d) Poor construction and expansion joints
   - (e) Poor bond between fresh and hardened concrete or cement mortar
   - (f) Improper mixing, placing, or curing of concrete or cement mortar.

★ ★ ★

III—PLASTER COAT METHOD is a system of waterproofing by means of trowelled-on coatings.

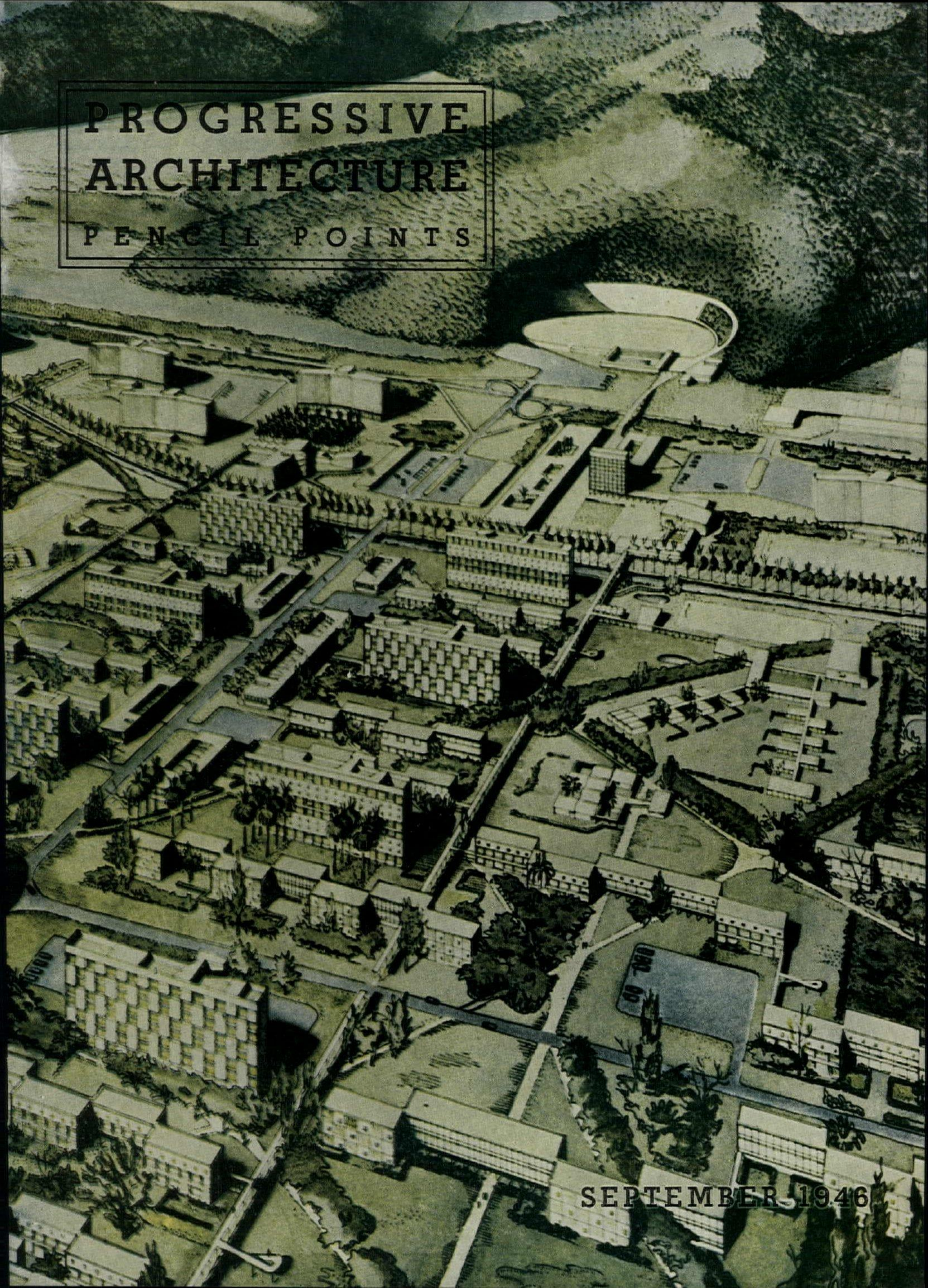
1. **Materials Frequently Used:**
   - (a) Portland cement and sand mixture containing iron powder and sal ammoniac, ½" to ¾" thick
   - (b) One part Portland cement, one-quarter part lime putty, and three parts sand, by volume, ½" to ¾" thick
   - (c) Portland cement, sand, and integral compounds (see Integral Method)
   - (d) Bituminous plaster coats. Usually composed of asphalt or other bituminous material in combination with mineral fillers, asbestos fillers, and volatile solvents. Usually ⅛" thick on walls; ¼" thick on floors covered with cement mortar. [Fed. Spec. SS-C-153, Type 1, asphalt base; or asphalt mastic, ASTM 491; or bituminous grout (below ground) ASTM 171; or bituminous grout (above ground) ASTM 170]
   - (e) Asphalt emulsion (asphalt, clay, and water). Usually ⅛" thick
2. **Advantages:**
   - (a) Cracks can be repaired without excavation or removals
3. **Disadvantages:**
   See Integral Method

PLASTER COAT METHOD



PP-1946-09

PROGRESSIVE ARCHITECTURE
PENCIL POINTS



SEPTEMBER 1946

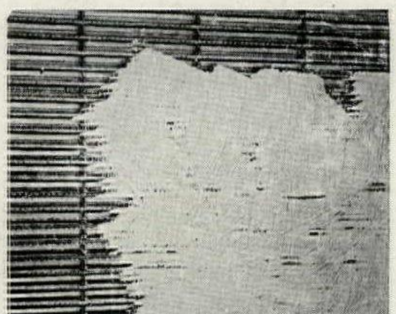
Where your plans specify walls and ceilings of

MILCOR

Metal Lath and Plaster...

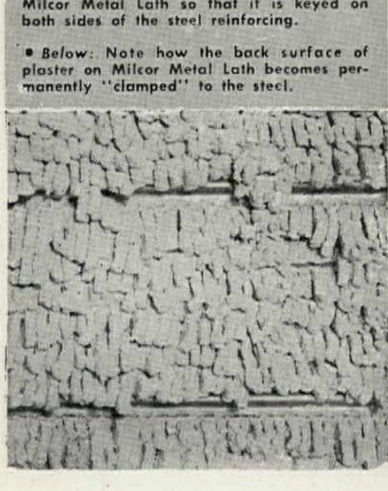
—you provide the advantages of

fire-safety . . . permanence . . . lasting beauty

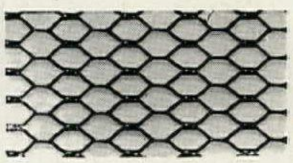


• Above: The scratch coat is forced through Milcor Metal Lath so that it is keyed on both sides of the steel reinforcing.

• Below: Note how the back surface of plaster on Milcor Metal Lath becomes permanently "clamped" to the steel.

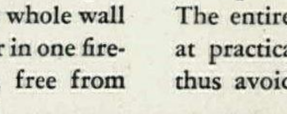


ON the drafting board, Milcor Metal Lath gives you unlimited freedom to develop structural forms and shapes.



Milcor Netmesh Metal Lath

On the job site, Milcor Metal Lath provides maximum rigidity with light weight. The whole wall and ceiling is held together in one fire-resistant monolithic slab, free from cracking, warping, and shrinking tendencies.



Milcor Specialmesh Metal Lath

Although not plentiful today, metal lath is more easily obtained than substitutes which do not have the fire-safety, permanency, or vermin-resistance of steel . . . and which have never equalled metal lath as a satisfactory plaster base.

Steel-reinforced plaster faithfully expresses your conception of form and color tone. The entire plastered surface remains at practically the same temperature, thus avoiding condensation and resultant plaster blemishes such as lath streaks. The plaster stays new-looking longer, a credit to your reputation.

Consult the Milcor catalog in Sweet's. Or write today for the Milcor Manual.

F-268

MILCOR STEEL COMPANY

MILWAUKEE 4, WISCONSIN

Baltimore 24, Md. • Buffalo 11, N. Y. • Chicago 9, Ill.
Cincinnati 25, O. • Cleveland 14, O. • Detroit 2, Mich.
Kansas City 8, Mo. • Los Angeles 23, Calif. • Rochester 9, N. Y.

PROGRESSIVE
ARCHITECTURE
PENCIL POINTS

WHY PUBLISH ARCHITECTURE?

We are proud of the fact that PROGRESSIVE ARCHITECTURE has always been a professional magazine. In somewhat the same way that doctors use their medical journals and lawyers their law journals for the discussion of professional problems and the dissemination of professional knowledge—for the general elevation of the body of practitioners—all the architects must have available a fully illustrated publication intended solely for those engaged in the design of buildings, communities, and cities.

A magazine intended to reach a large lay group, or even a group engaged in *related* activities, obviously could not deal with professional matters in the same detailed, technical way that a purely professional magazine can. A medical journal edited for laymen, for example, would have to present medical material in the *Reader's Digest* manner; if its readership included X-ray technicians and morticians, it would be either vague or subdivided in its contents. The same thing is true of an architectural magazine. That is why PROGRESSIVE ARCHITECTURE, and before it PENCIL POINTS, has always insisted on remaining a magazine edited solely for the designing profession.

If this fact is granted, then the thoroughness with which a completed work of design or technical discussion is published becomes important. We believe that the casual showing of a plan and several pictures would not be a professional presentation. Our editorial judgment is weighted by the consideration that experts will be reading our pages, and those pages will be worthless if the experts do not gain something from the reading. That is why we have to refuse a good many interesting contributions; we prefer to use the available space to describe fewer projects more thoroughly. In this issue, for instance, Brasil's new city is rather completely studied. Its many excellences in town planning and building design could not have been explored, professionally, in less space. The same thing is true when we deal with important developments in materials and equipment. We could have printed one photograph of an electric radiant heating installation and covered its news value; we preferred to study its advantages and disadvantages, the methods of design and installation, and costs.

Professional editing differs from popular editing. We appreciate the fact that our readers evaluate the material we present month by month for its worth to them in their practice, not for its appeal to any other group.

The Editors

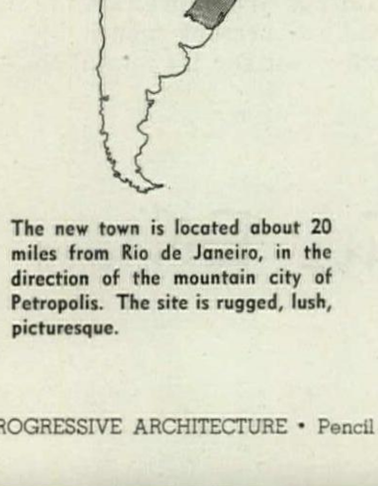
BRASIL BUILDS A NEW CITY

CIDADE DOS MOTORES, BRASIL

PAUL LESTER WIENER AND JOSE LUIS SERT,
Town Planners

OTTO DA ROCHA E SILVA,
Architect and Builder

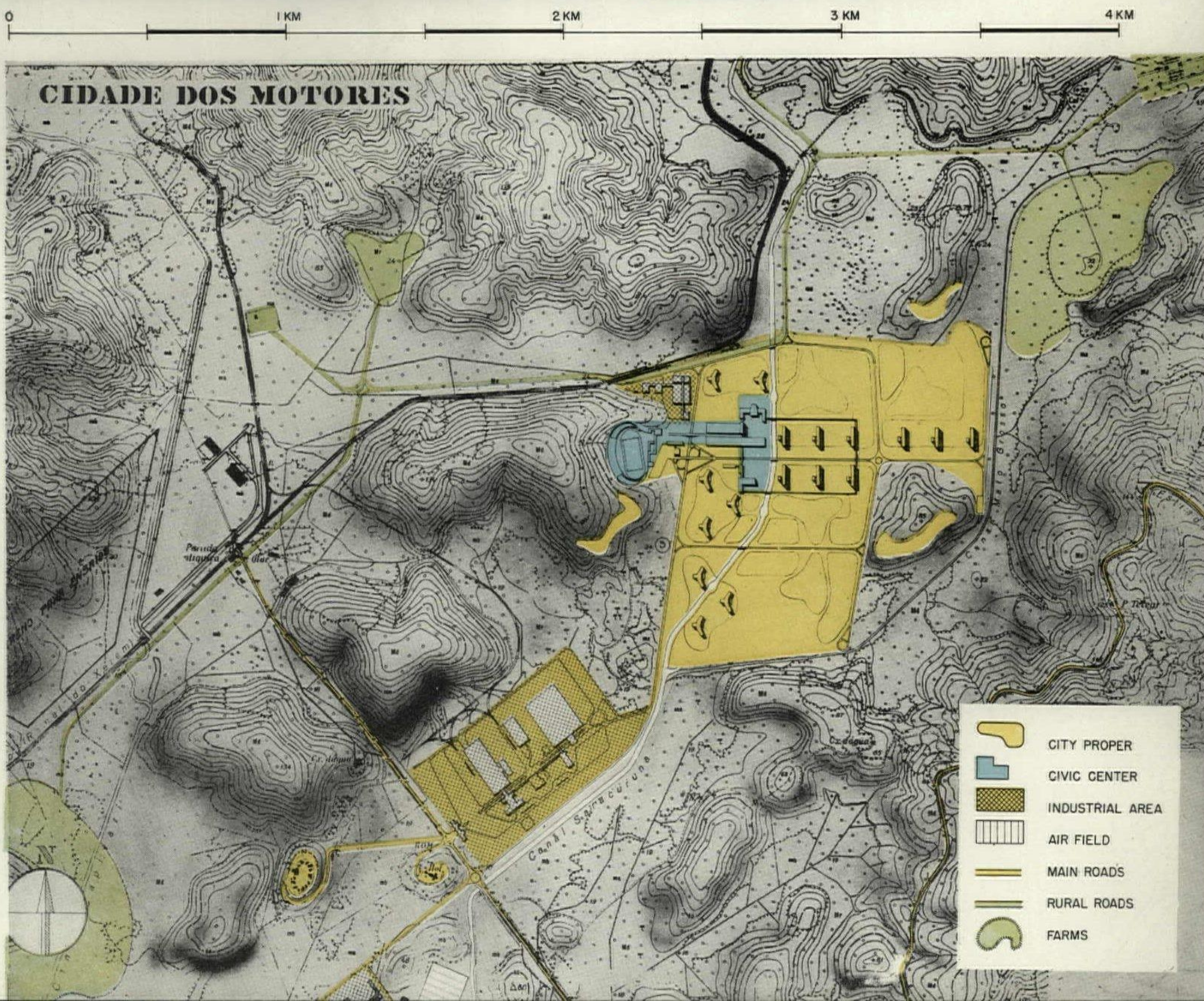
Many planners have dreamed of designing a complete new city, but that chance has come to very few. PROGRESSIVE ARCHITECTURE is proud to present Brasil's Cidade Dos Motores, an industrial city for which ground is now being broken. Today there is a tropical Brasilian plateau on which the only buildings are a factory and some farms. Tomorrow a modern city of 25,000 people will begin to rise there. The Brasilian Government and a pioneering official—Brigadier-General Antonio Guedes Muniz, the Chief of the Brasilian Airplane Engine Factory Commission, in charge of this whole regional development—recognized in their program that the haphazard growth of the region would repeat the chaos which exists in most industrial cities.

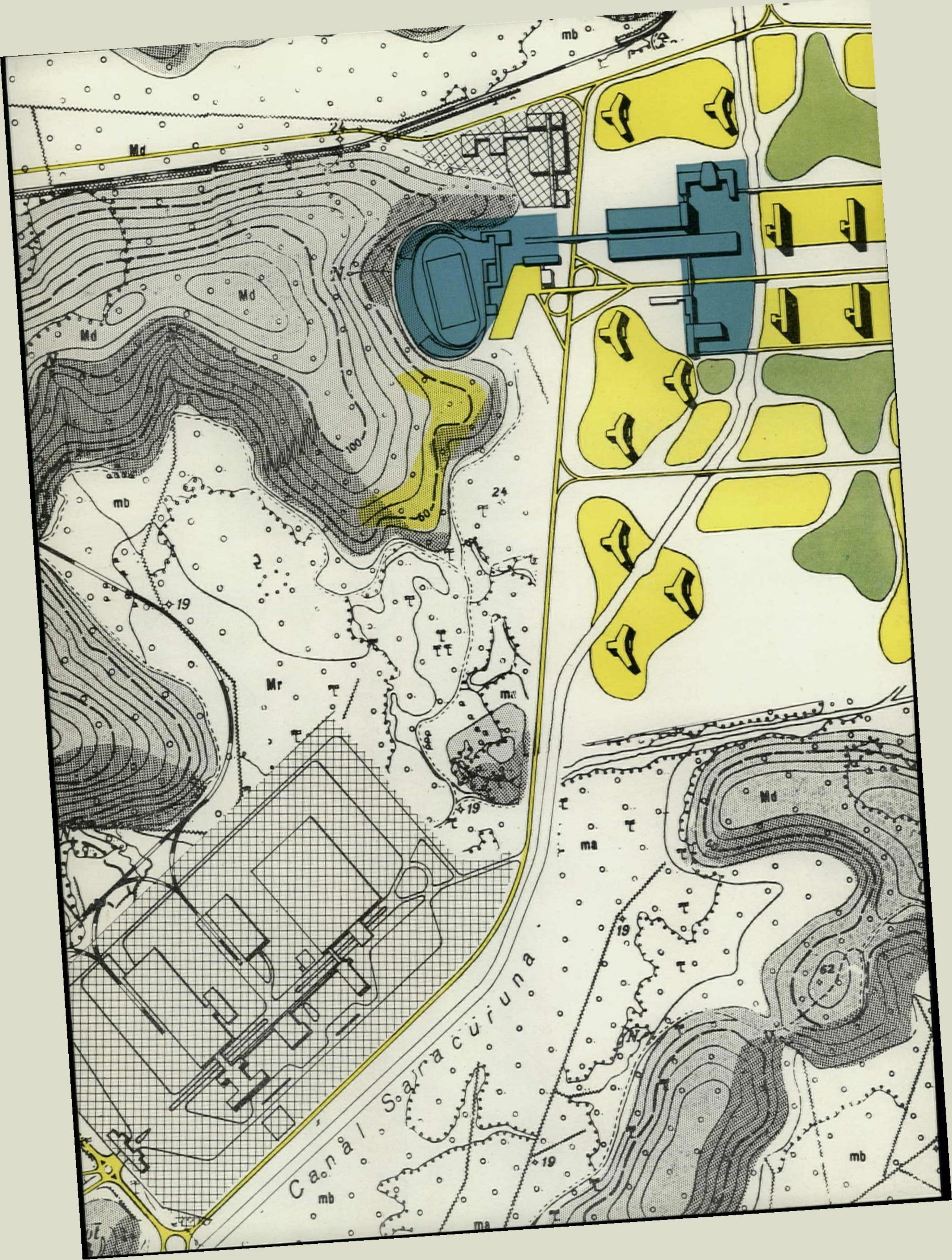


The new town is located about 20 miles from Rio de Janeiro, in the direction of the mountain city of Petropolis. The site is rugged, lush, picturesque.

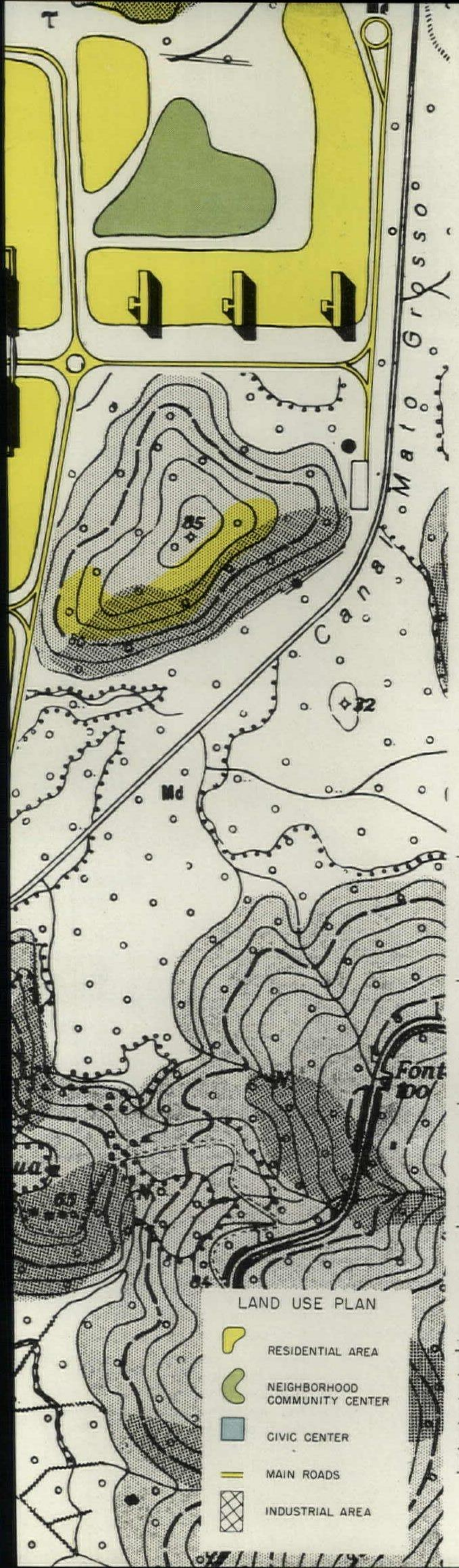
After they had completed a comprehensive study looking toward the growth of a new city, the planners were commissioned to make a master plan within flexible outlines and prepare working drawings. The program called for the new town plan to serve as a model for Brasil, to demonstrate a harmony of industrial efficiency with high living and welfare standards. The aim was to set a new town plan standard and at the same time use new technics of construction. Mass produced building parts were to be used in a way that would produce variety of appearance as well as economies in construction cost. The following pages will show, step by step, with what complete success the planners met these aims from the over-all pattern to the last detail of construction.

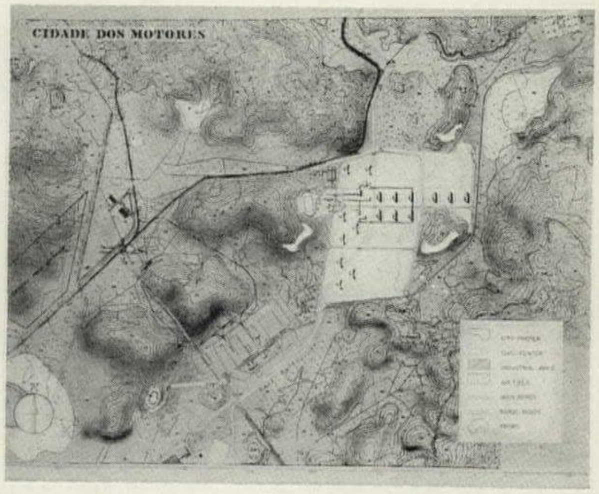
The first stage was the development of the region. The expanded factories, the farms, and the airport are related to the site, to the highway, and to the city. Industrial, agricultural, and urban development have a planned relationship. The main highway by-passes the city, yet is linked to it in a logical manner.


0
1 KM
2 KM
3 KM
4 KM
CIDADE DOS MOTORES
CITY PROPER
CIVIC CENTER
INDUSTRIAL AREA
AIR FIELD
MAIN ROADS
RURAL ROADS
FARMS



Canal Saracuruna
Md
mb
Mr
ma





THE CITY PLAN

ADAPTS ITSELF TO THE SITE

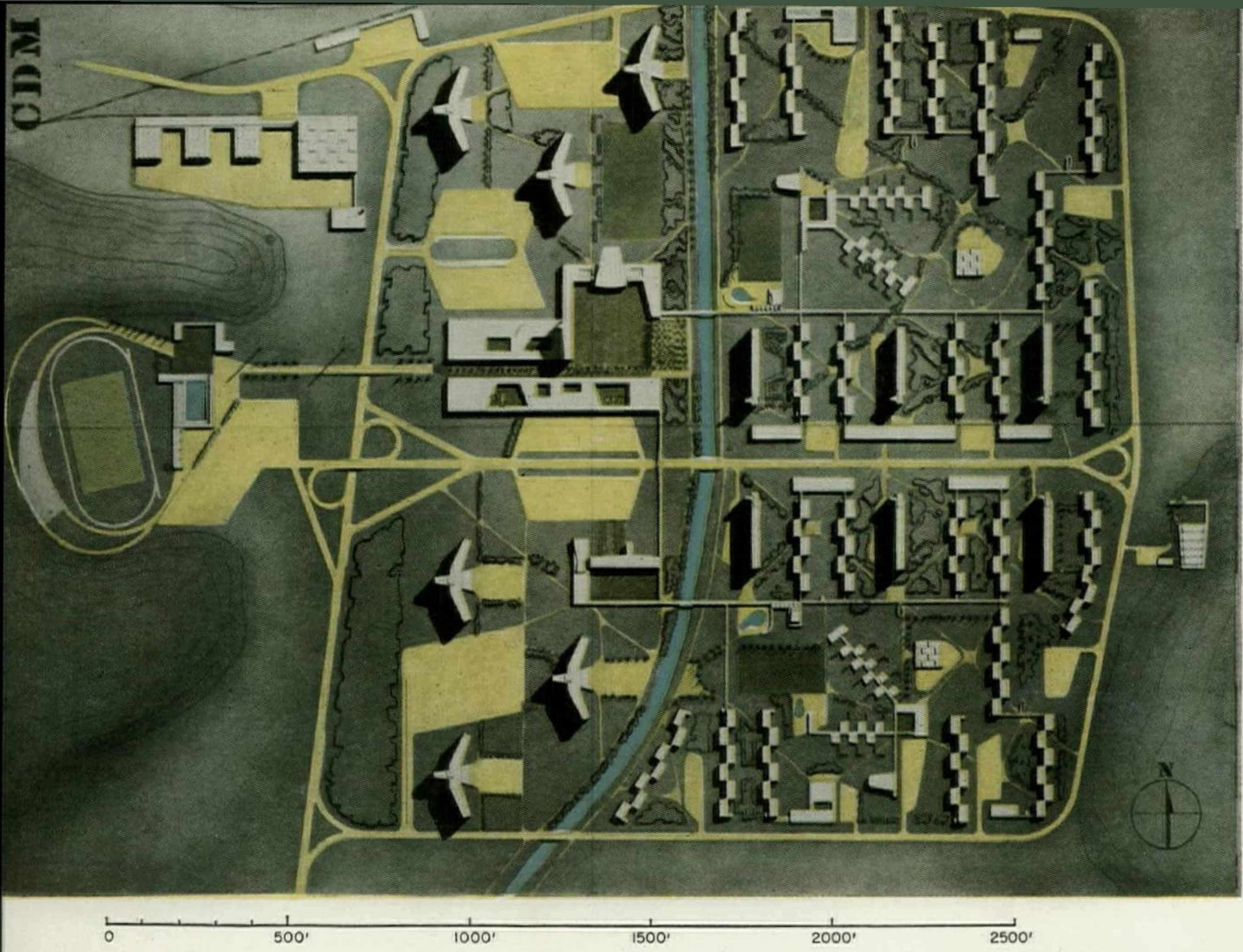
Planned in four neighborhood units, the city is shaped to the contours of the plateau. Through it flows a canal, whose banks will be used for walks and pleasant recreational areas.

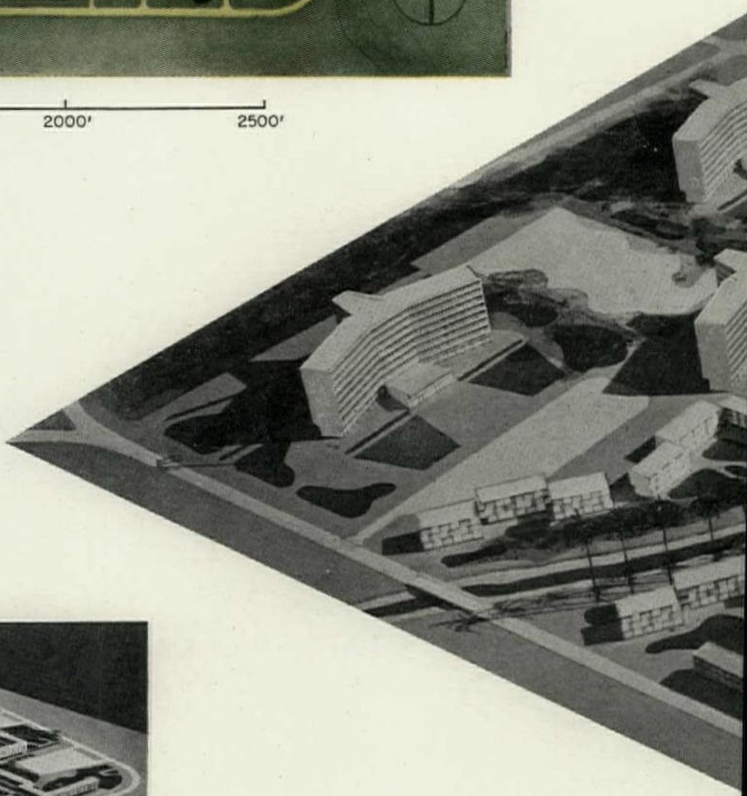
The cohesive arrangement of the four units makes traffic simple, and economizes on road surfacing. Planning throughout has been kept in the scale of the pedestrian citizen; average walking distance to the civic center is under a quarter of a mile. Peripheral roads allow for automobile access to the neighborhoods, but within the units all traffic is by foot, under covered passageways which protect from the tropical sun.

In each neighborhood unit there are several types of group housing. Some individual houses will be built on the outskirts of the city, at the foothills. In addition to housing, the neighborhoods will have their own community buildings, schools and playgrounds, dispensaries, shops, and restaurants.

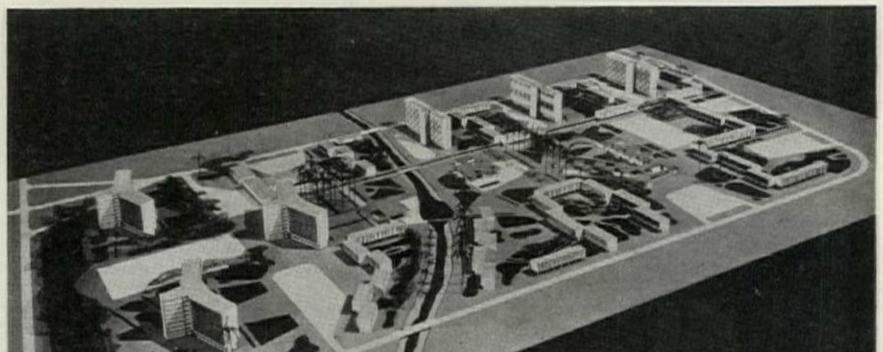
In addition to these neighborhood services, there is a civic center located towards the center of the first two neighborhoods to be built, which will eventually serve the whole city. Tall apartment buildings together with the civic center form a "spinal" architectural composition in the center of the city.

The population density is about 100 persons to an acre, a figure reached after considering climatic conditions, walking distances, and maintenance problems. Accessibility and usability for the individual have determined this city's plan in all its elements, with the over-all result well fitted to a challenging terrain.





Photos of model by Anna Wachsmann



Here is the neighborhood developed as an integral part of the city, with its open areas functioning as usable, thoughtfully planned community space. Repetition of a constant module for all buildings (3.5 meters, or about 11½ feet) provides a pleasing consistency.

Nothing is mechanical or tiresome about the unit plan, yet the arrangement is well studied. Open spaces and free arrangement of the buildings should result in pleasant and varied vistas.

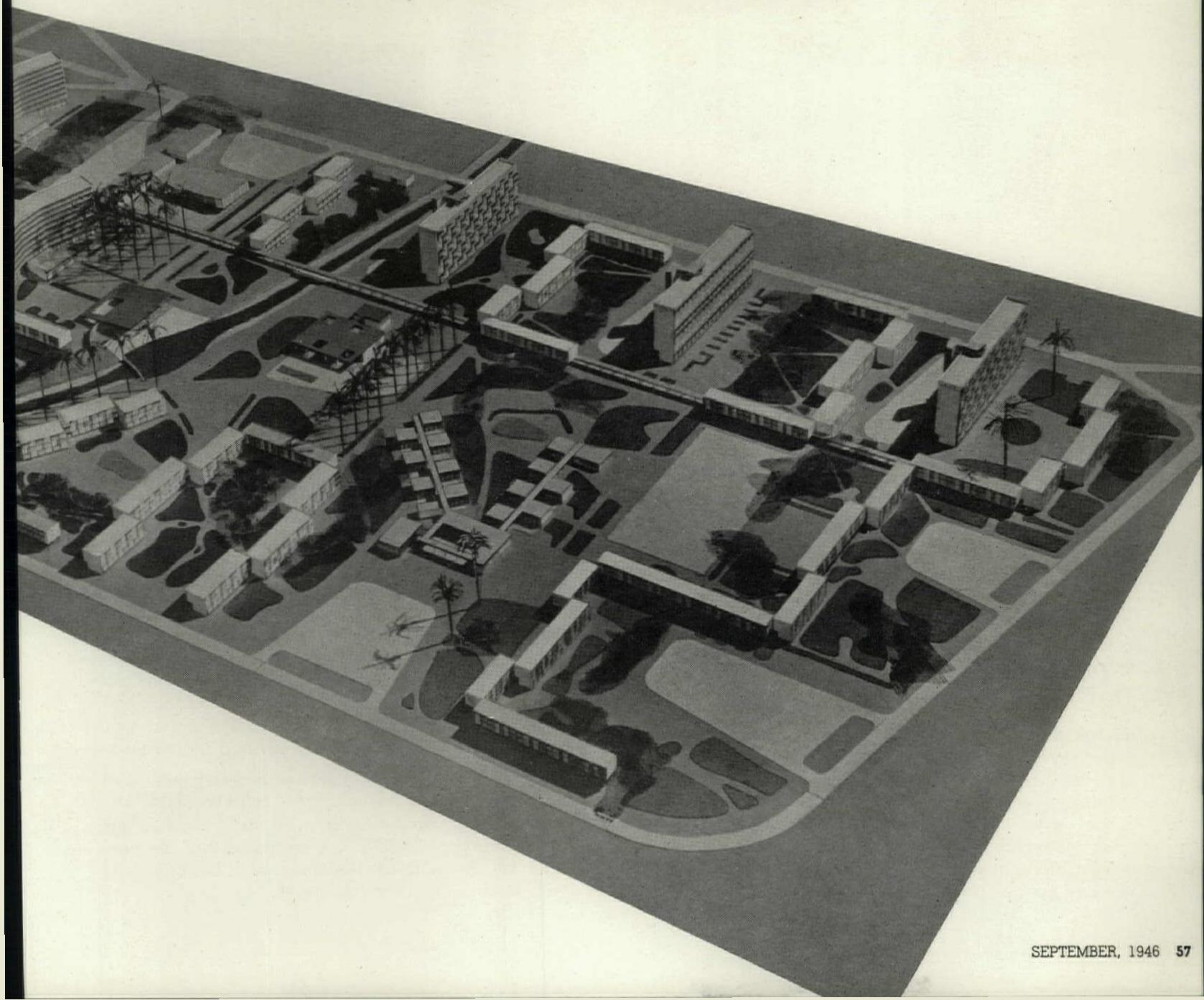
FIRST STAGE OF CONSTRUCTION

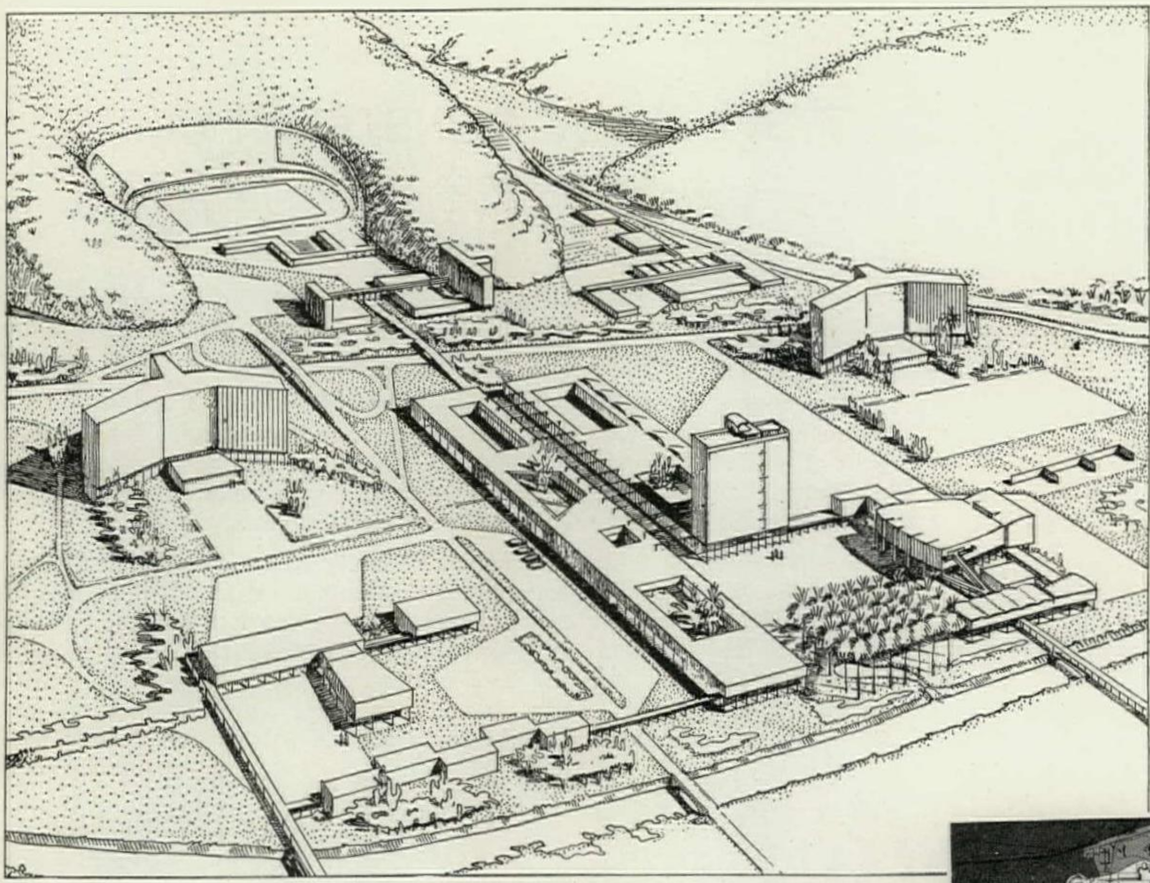
WILL BE A COMPLETE NEIGHBORHOOD

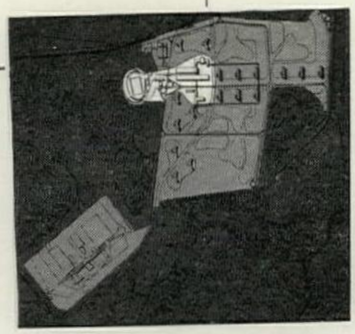
First neighborhoods to be constructed will be the two in the center of the ultimate city, shown at left. The photographs indicate the southerly one of these two units, studied more fully in a diagrammatic model.

Of the 6200 people living in this quarter of the city, some 2400 will be housed in dormitory buildings, 1200 in eight-story apartments arranged near the city's principal interior street, and about 2600 in three-story apartment blocks freely disposed within the neighborhood. Each of these living units will have its own parking space and will be near the neighborhood community facilities.

The elementary school is convenient to all family apartments and adjoins a large playground area. The community building is on another side of the playground. Neighborhood shops are conveniently located with road access for deliveries. The bachelor dormitories are close enough at hand to make use of community facilities in the civic center and yet are near the highway which leads to the factory. Thus bachelor activities will least interfere with the daily life of the families in the neighborhood.







THE CIVIC CENTER

DESIGNED AROUND A TOWN SQUARE AND A PROMENADE

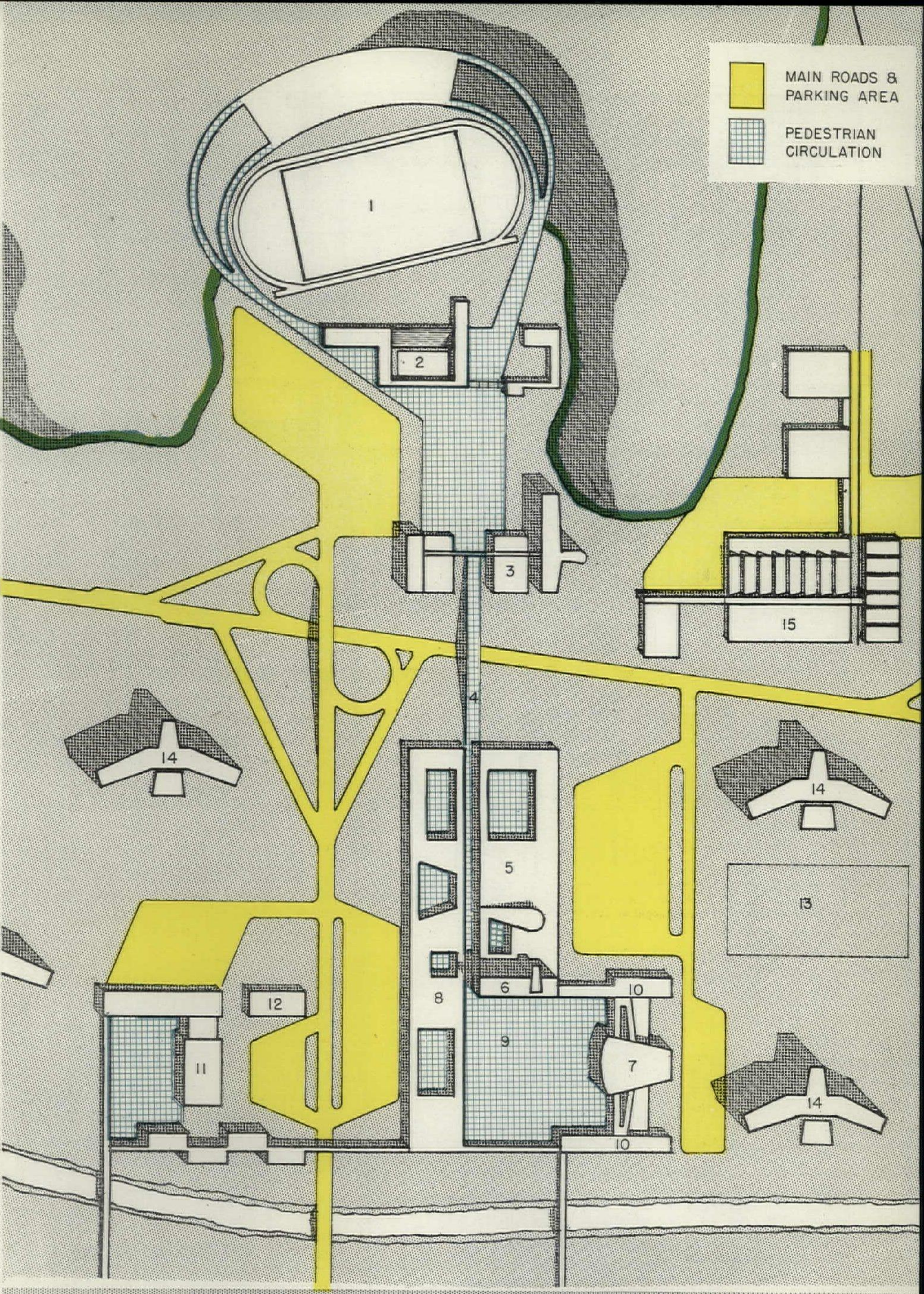
The civic center of the new city features a "praca," or town square, and an element more familiar in Brasil than here—the "corso," or "passeio," a promenade which caters to the natural desire to parade, to meet, to see and be seen. Three main divisions of the civic center have been defined: the administration, amusement, and commercial section; the cultural section; the sports section.

The administration, amusement, and commercial section is built around the town square and along the promenade. Here are a shopping center, a hotel, a moving picture theater, and a central restaurant and cafes. Coffee houses are under the moving picture theater which is built on stilts and connected with the praca by two ramps. On the other side of the main highway, reached by a pedestrian overpass, is the cultural center. Principal buildings here are a technical school with its workshop, exhibition halls, and a library. Beyond the cultural center is the sports area, with a stadium and its auxiliary structures designed to serve people from surrounding regions as well as the city's population. The church is on the hillside between the first two neighborhoods.

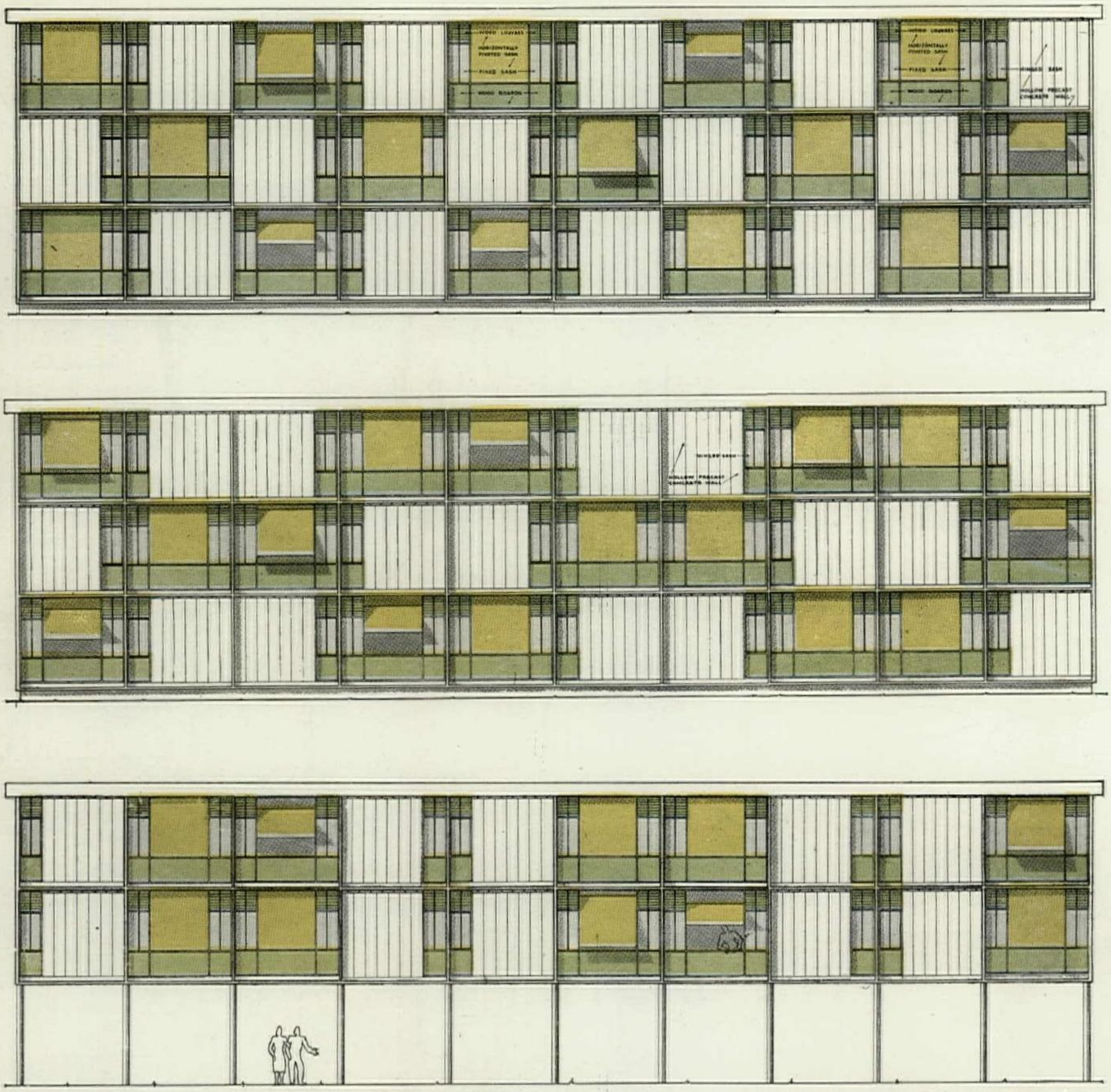
Pedestrian circulation is segregated from all vehicular traffic. Roads and parking lots feed the civic center from the sides but do not cross the praca or the corso.

The shopping, restaurant, and cafe facilities are under a continuous slab on posts, a sort of extended parasol, which starts near the canal and extends around the corso and the praca past landscaped patios and pleasant fountains. The designers point out an antecédent to this in the Arab bazar, where shoppers are protected from the sun and a free architectural arrangement is possible under the "parasol." The corso itself has been so scaled that it can be covered by awnings.

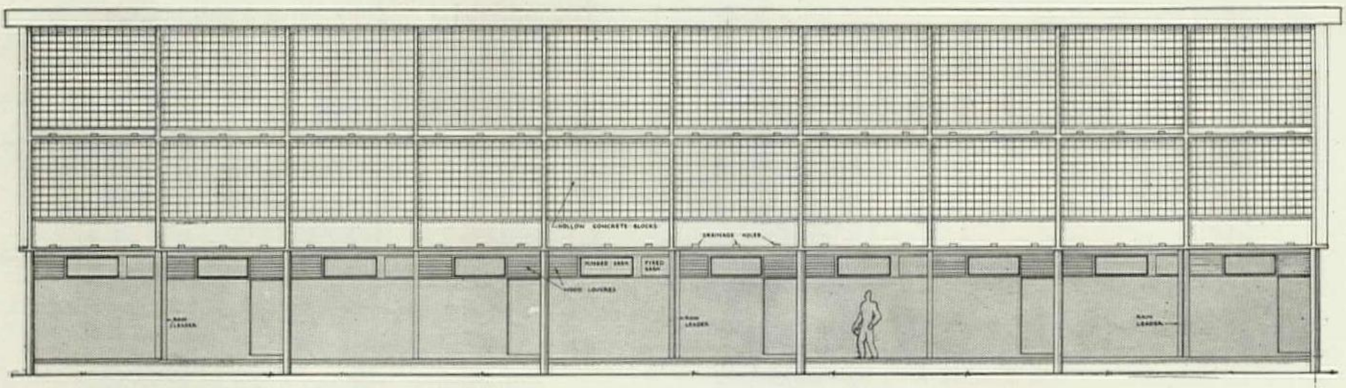
The visualization above has been developed from general layouts and the site plan, together with estimated building cubages based on the needs of the total population of 25,000. It is expected that the final designs for the various buildings will be made by several leading **Brasilian architects.**



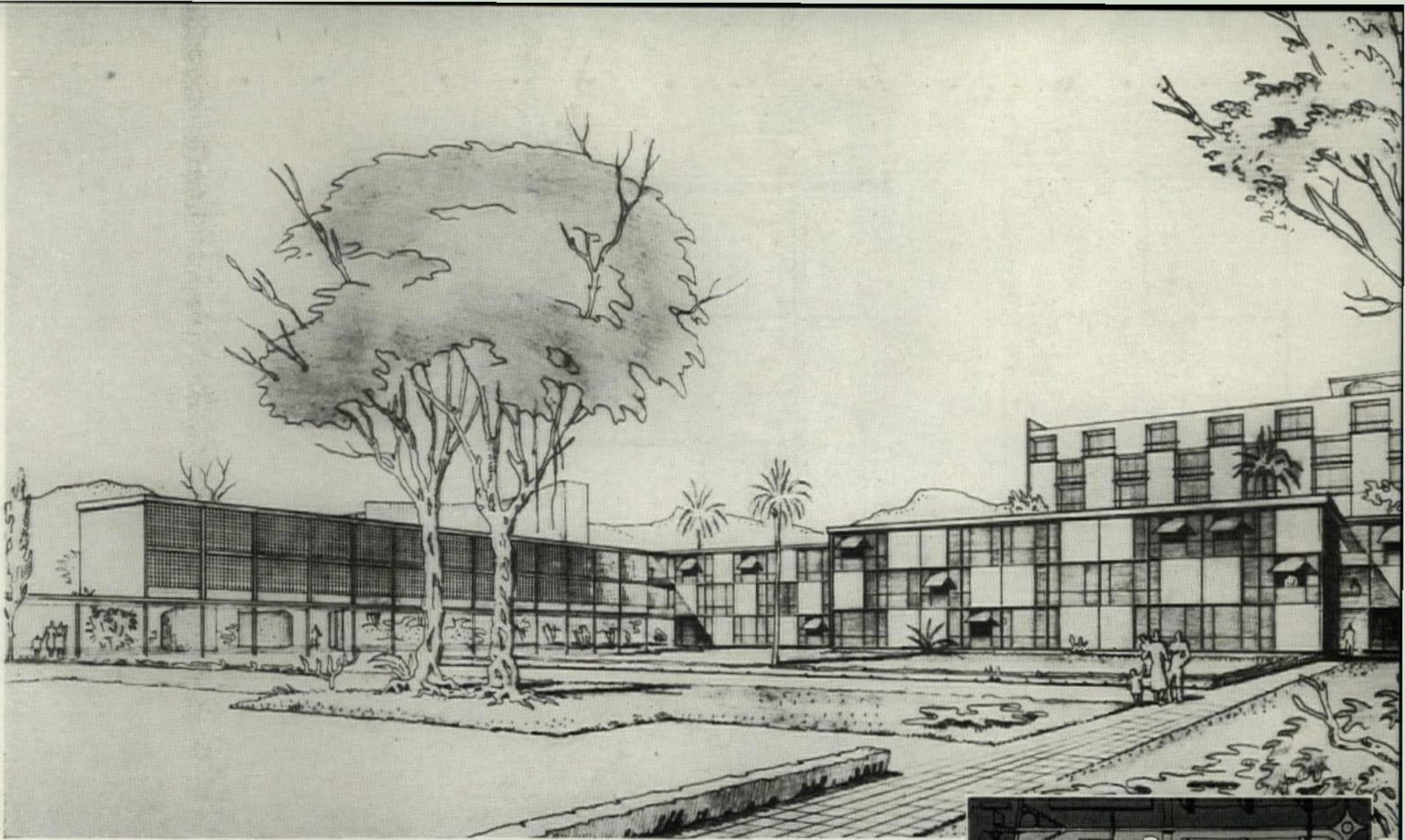
1 STADIUM
2 SWIMMING POOL
3 TECHNICAL SCHOOL
4 "CORSO"
5 CENTRAL RESTAURANT
6 HOTEL
7 THEATER-MOVIE
8 SHOPPING & BUSINESS CENTER
9 "PRAÇA"
10 MUNICIPAL OFFICE BUILDING
11 CLUB
12 DISPENSARY
13 PLAY FIELD
14 DORMITORY
15 KITCHEN FACTORY

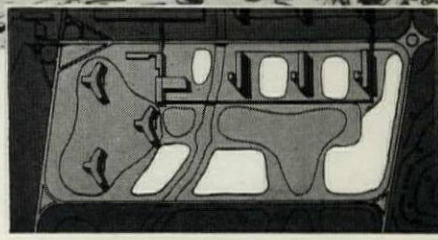


FRONT ELEVATION. Three of many facade patterns possible by alternating and reversing one typical apartment plan. Living rooms have louvred pivoting wall; bedrooms a single window on this elevation.



REAR ELEVATION. Outside corridors are protected by pierced masonry units.

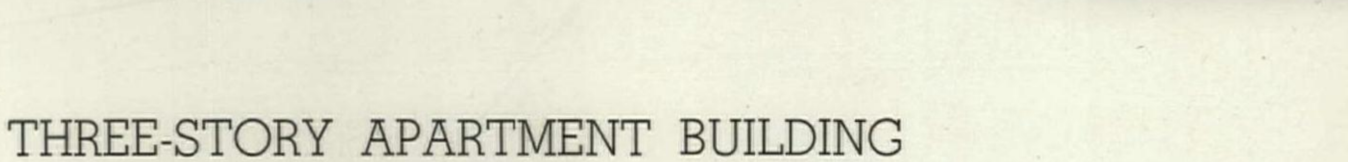




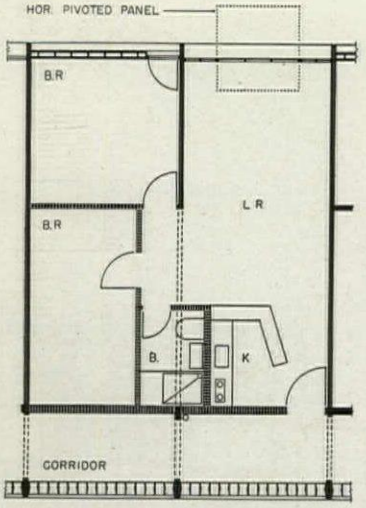
THREE-STORY APARTMENT BUILDING

ASTONISHING VARIETY FROM FEW BASIC ELEMENTS

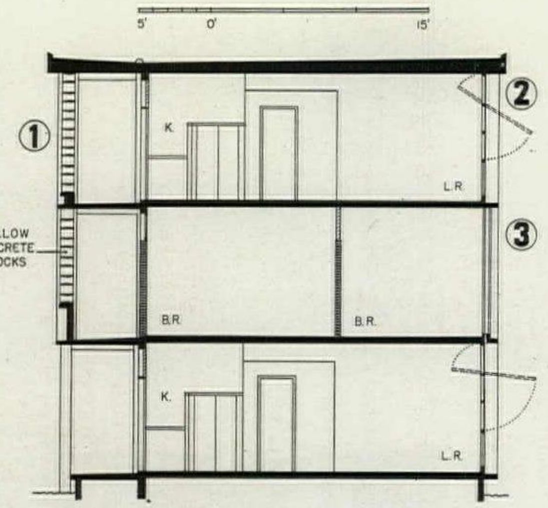
The standard wall systems for all apartment buildings are discussed on the following spread. Familiarity with these makes the various facade elements readily recognizable as living rooms, bedrooms, or corridors. There are numerous types of three-story buildings. Some are entirely made up of simplex apartments. Others have duplex units above simplex apartments (and vice versa) or interlocking schemes whereby a simplex fits in between two duplexes on the living-room floor. From such combinations, reverses in plan, and different location on floor levels, a great variety of accommodations and appearance is achieved.



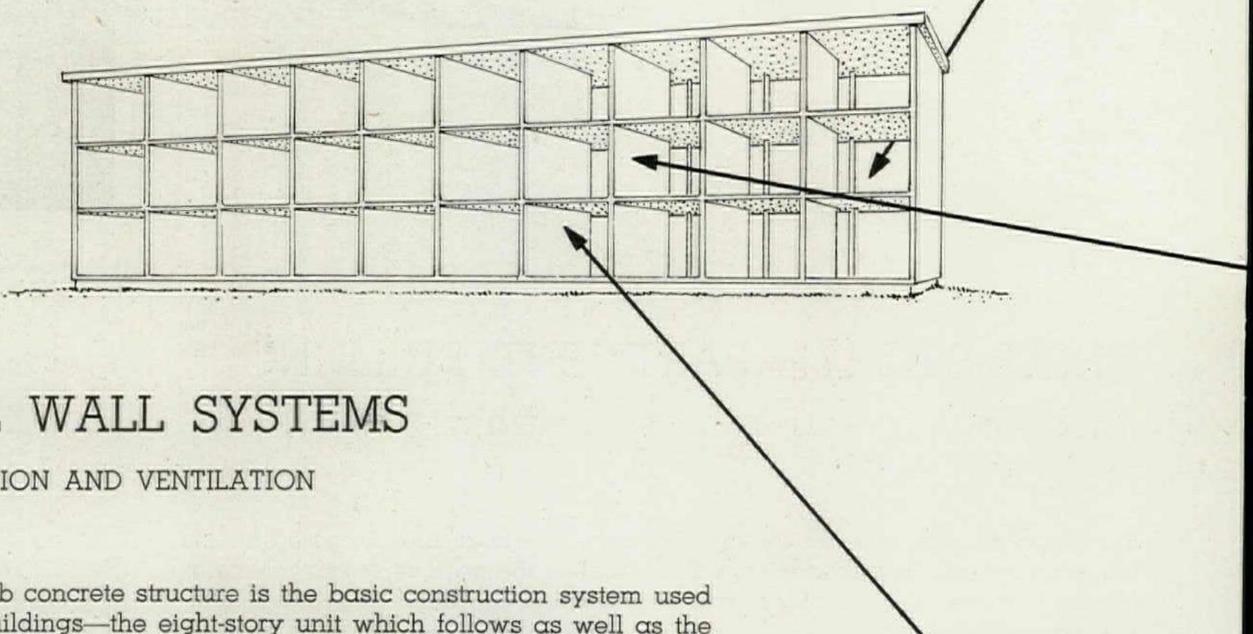
PLAN OF TYPICAL APARTMENT GROUPING.



TYPICAL SINGLE APARTMENT. Repeats, reverses, and alternates to provide variety.



TYPICAL CROSS SECTION. Based on simple structural frame shown below.



3 SPECIAL WALL SYSTEMS

PROVIDE PROTECTION AND VENTILATION

A simple honeycomb concrete structure is the basic construction system used for all apartment buildings—the eight-story unit which follows as well as the three-story type pictured on the preceding two pages. The same forms can be used throughout, as only the thickness of the walls will vary.

The aim is to obtain maximum variety of combination using the fewest possible standard elements. The pleasing play of light and shadow which patterns the facades results from three wall systems specially devised for corridors, bedrooms, and living quarters, respectively. They are inexpensive solutions to the problems raised by strong sunlight, driving rains, and the need for through ventilation.

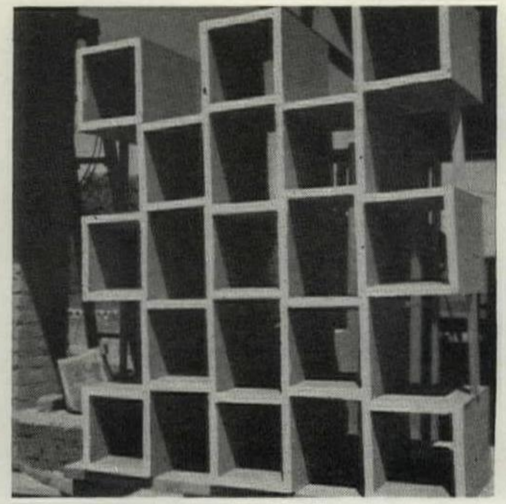
No buildings are more than one apartment deep, and the corridor runs along an outside wall. Since the customary "brise de soleil" was deemed too expensive, the pierced concrete screen construction (Type 1) was developed for corridor walls. Living rooms, the architects felt, should be as open as weather permits. Hence they designed a pivoting wall section (Type 2) large enough to act as door, window, or awning, depending on its position. Bedrooms must remain cool, so the ventilated cavity-type "double membrane" wall was developed, to be built of precast concrete units (Type 3).

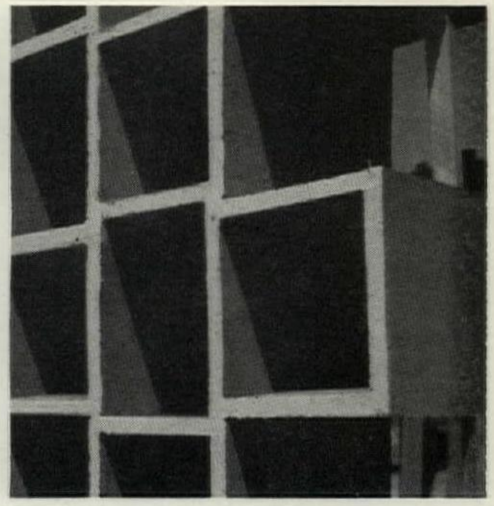
All precast concrete parts are vibrated and can be rapidly demolded, making it possible for each mold to produce at least sixty units a day.

1

SUN-BAFFLE

To protect corridors against excessive sun and driving rain the precast box here pictured is laid up as a masonry unit. About a foot deep with an opening eight inches by eight inches, it makes possible an open light passageway, with doors and windows to the apartments fully protected. Manufacture and erection can be simply accomplished by local workers.

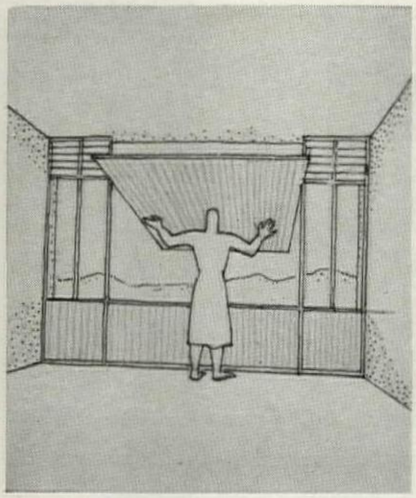


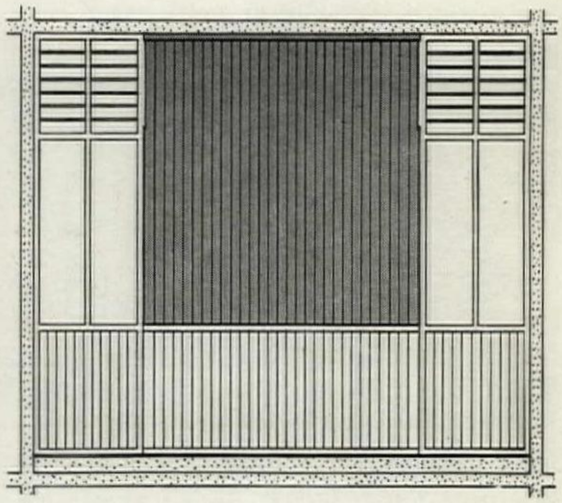


2

PIVOTING WALL SECTION

This pivoting counter-weighted panel will serve many functions at the end of the living room. When it is fully open, it lies in a horizontal position above head-height and acts as an awning. Partly open, it provides sun protection while allowing breezes to circulate at top and bottom. In particularly bad weather, it can be completely closed and then functions as a wall. Construction is a light wood frame with tongue and groove slats. Fixed glass panels at the sides provide light at all times.

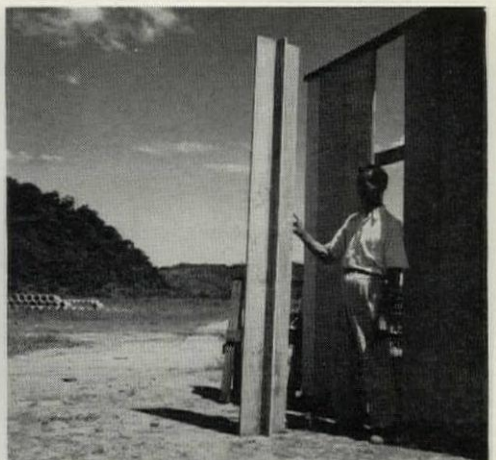


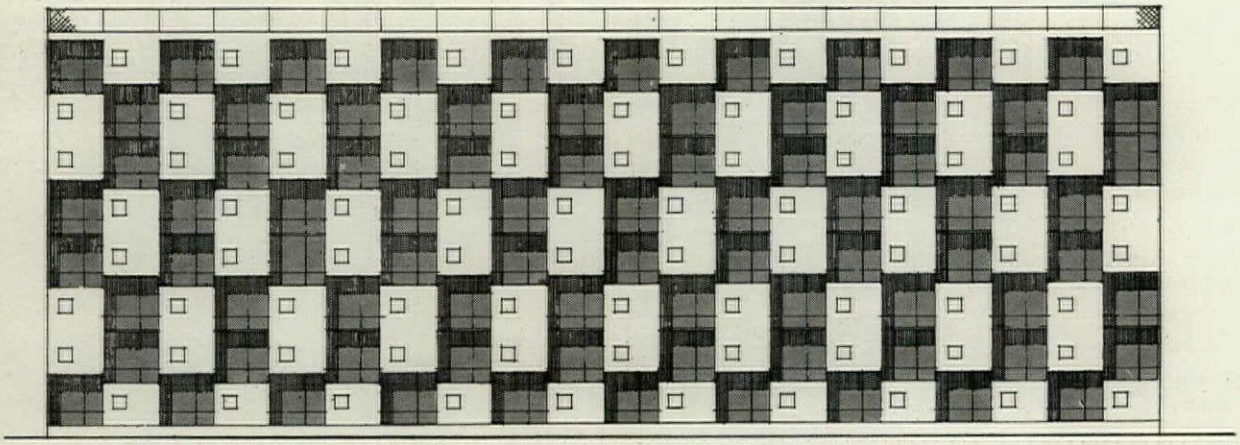


3

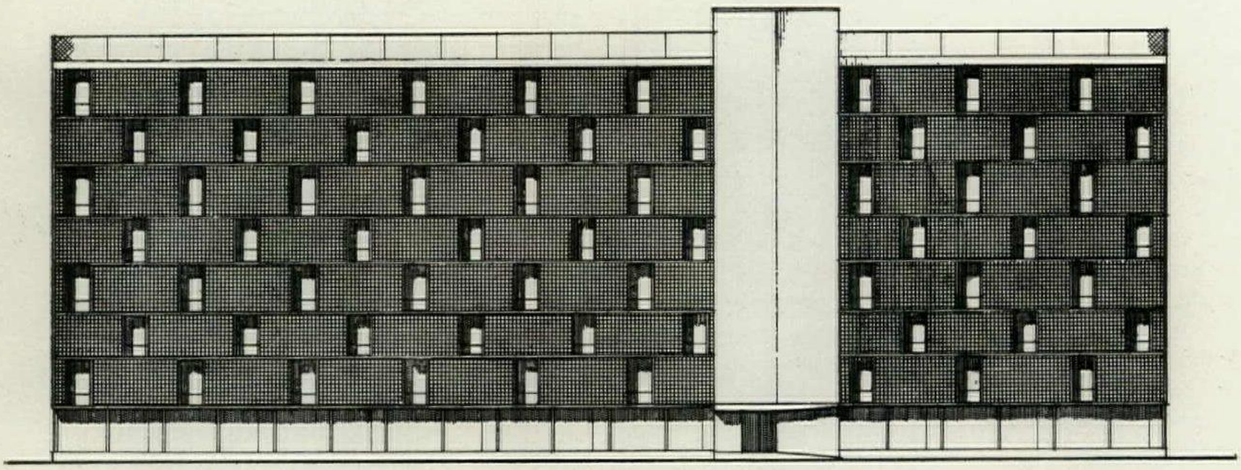
DOUBLE MEMBRANE WALL

Photographs show the precast concrete units which will form a ventilated cavity wall at bedrooms. Air is free to circulate between the inner and outer wythes. Units are full-story height, cast in a T-section for greater stability of the thin membrane. The flange, or wall face, is 14 inches wide, and an inch thick. As in the case of the sun-baffle above, local labor can easily manufacture the simple unit on the site. Windows can be simply set in a precast concrete box frame.

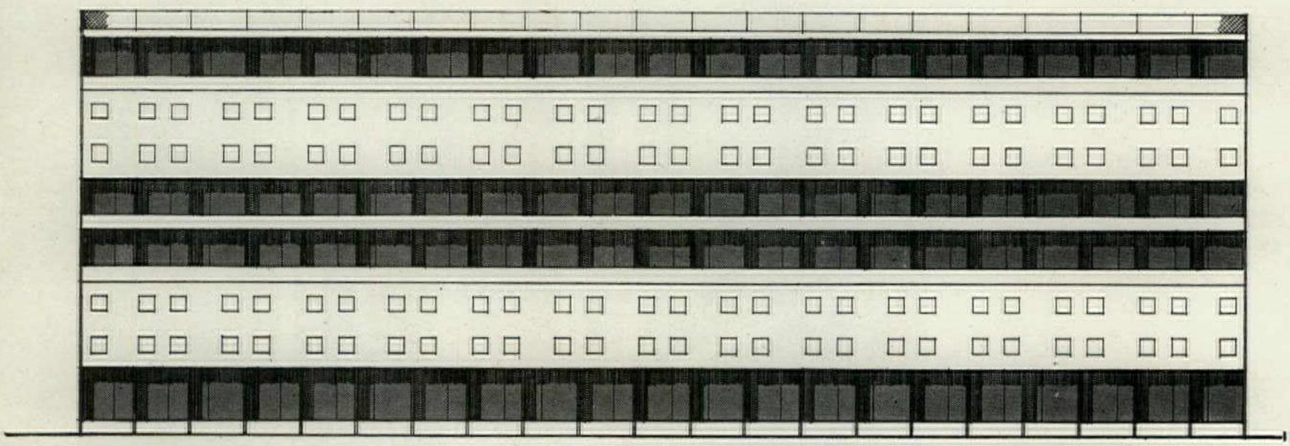




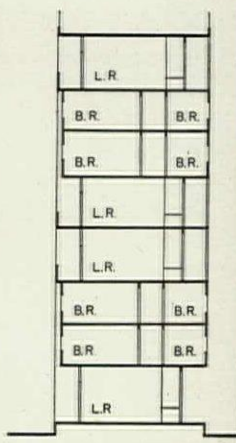
FRONT ELEVATION OF SIMPLEX ARRANGEMENT. As in the case of the three-story buildings, various patterns are made possible by reversing a typical two-bedroom apartment plan.



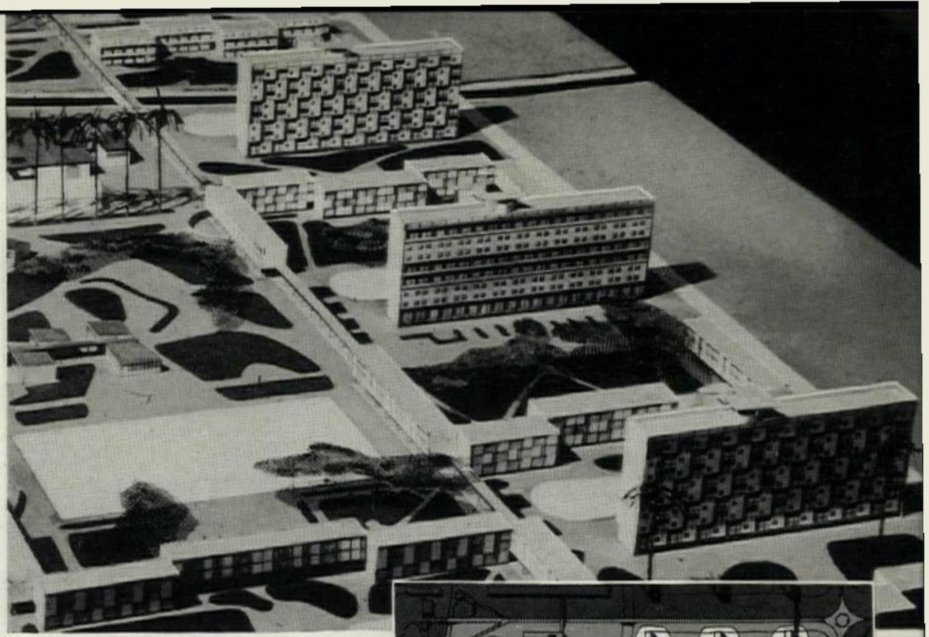
REAR ELEVATION OF SIMPLEX. The west facade of the simplex building presents seven floors of pierced-wall corridors above an open walkway. Occasional breaks in the corridor wall permit greater vision.

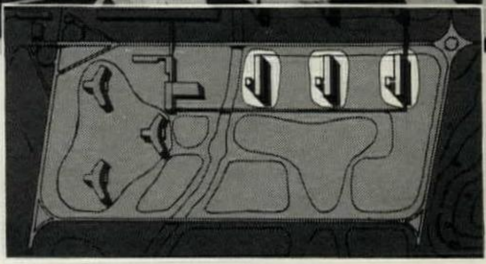


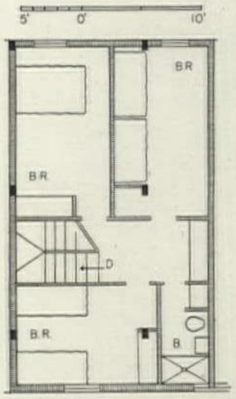
FRONT ELEVATION OF DUPLEX ARRANGEMENT. Pairs of bedroom floors are sandwiched between levels where duplex living rooms and the one-room apartments occur. Section shows the corridor and access to apartments at living-room floors.



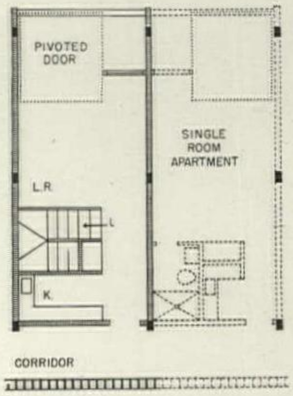
CROSS SECTION OF DUPLEX







UPPER FLOOR



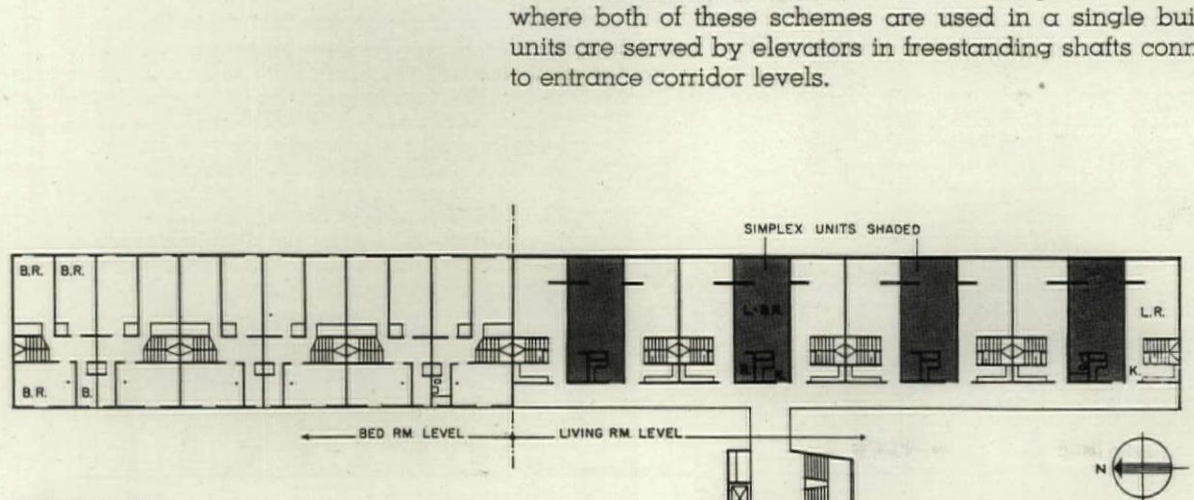
LOWER FLOOR

DUPLEX APARTMENT

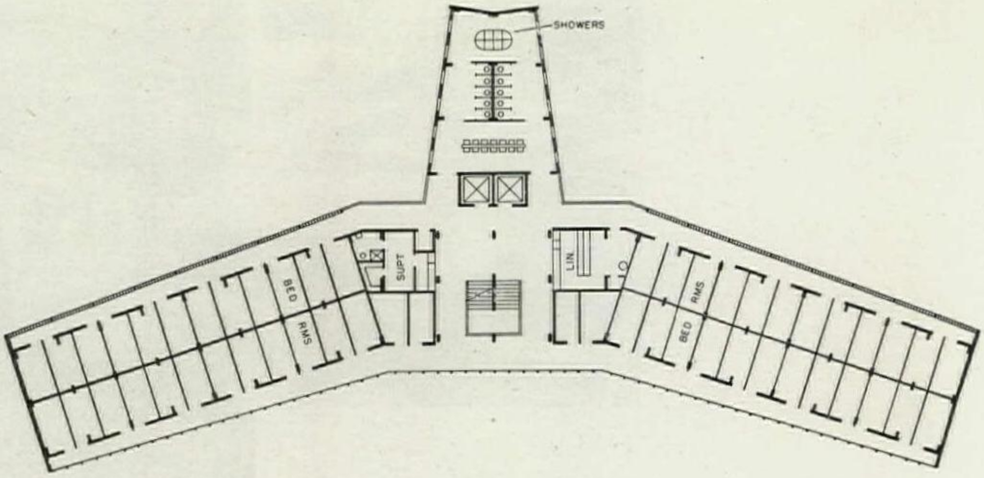
EIGHT-STORY APARTMENT BUILDING

TWO BASIC TYPES, WITH VARIATIONS

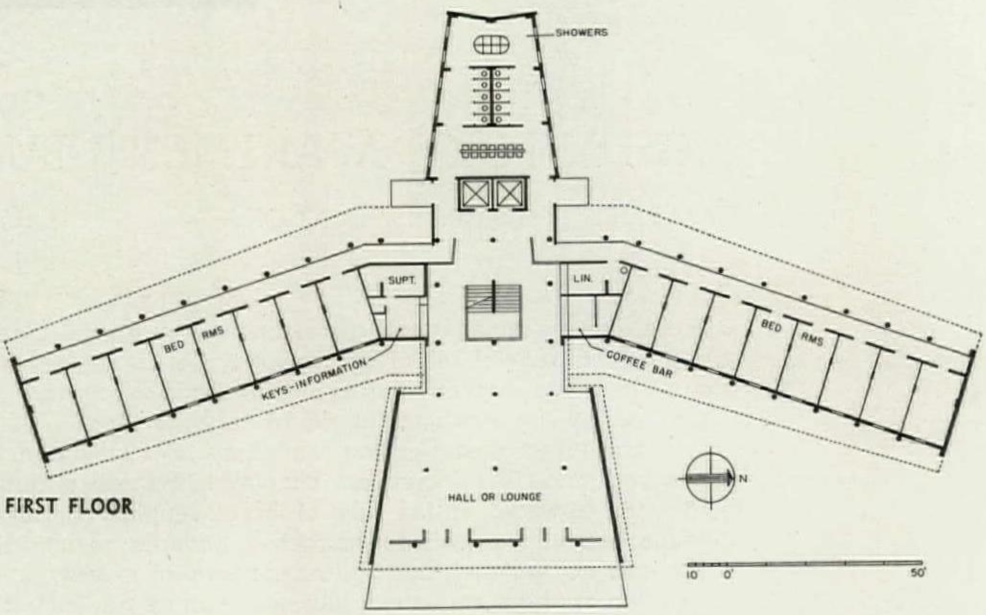
Like the three-story buildings, the eight-story apartment blocks are made up of various assemblies of apartment types. In some, entire buildings are of 2-bedroom simplex apartments, arranged in rows on all eight floors (illustrated by the elevation at top of opposite page). The other major type is constituted of interlocking combinations of 3-bedroom duplex apartments and small living-bedroom simplexes. Facade variations occur in both types, however. In the case of the all-simplex buildings, either regular-checkerboard or offbeat-staggered patterns result, depending on whether or not unit-apartment plans are used in reverse. In the buildings where duplexes are combined with one-room apartments, different ordering of floor levels produces design variety. In some of these buildings, bedroom floors of duplex units occur conventionally above living-room floors; in others, this arrangement is reversed, and living floors come above bedrooms. Bottom elevation, facing page, shows the design result where both of these schemes are used in a single building. Eight-story units are served by elevators in freestanding shafts connected by bridges to entrance corridor levels.



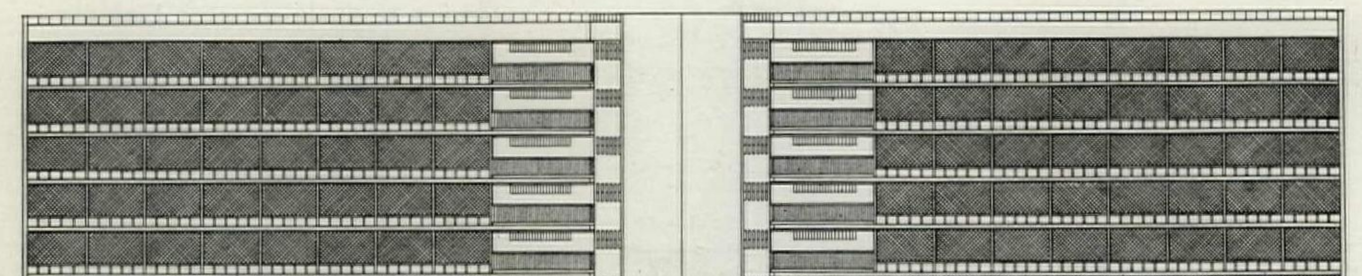
DUPLEX PLAN



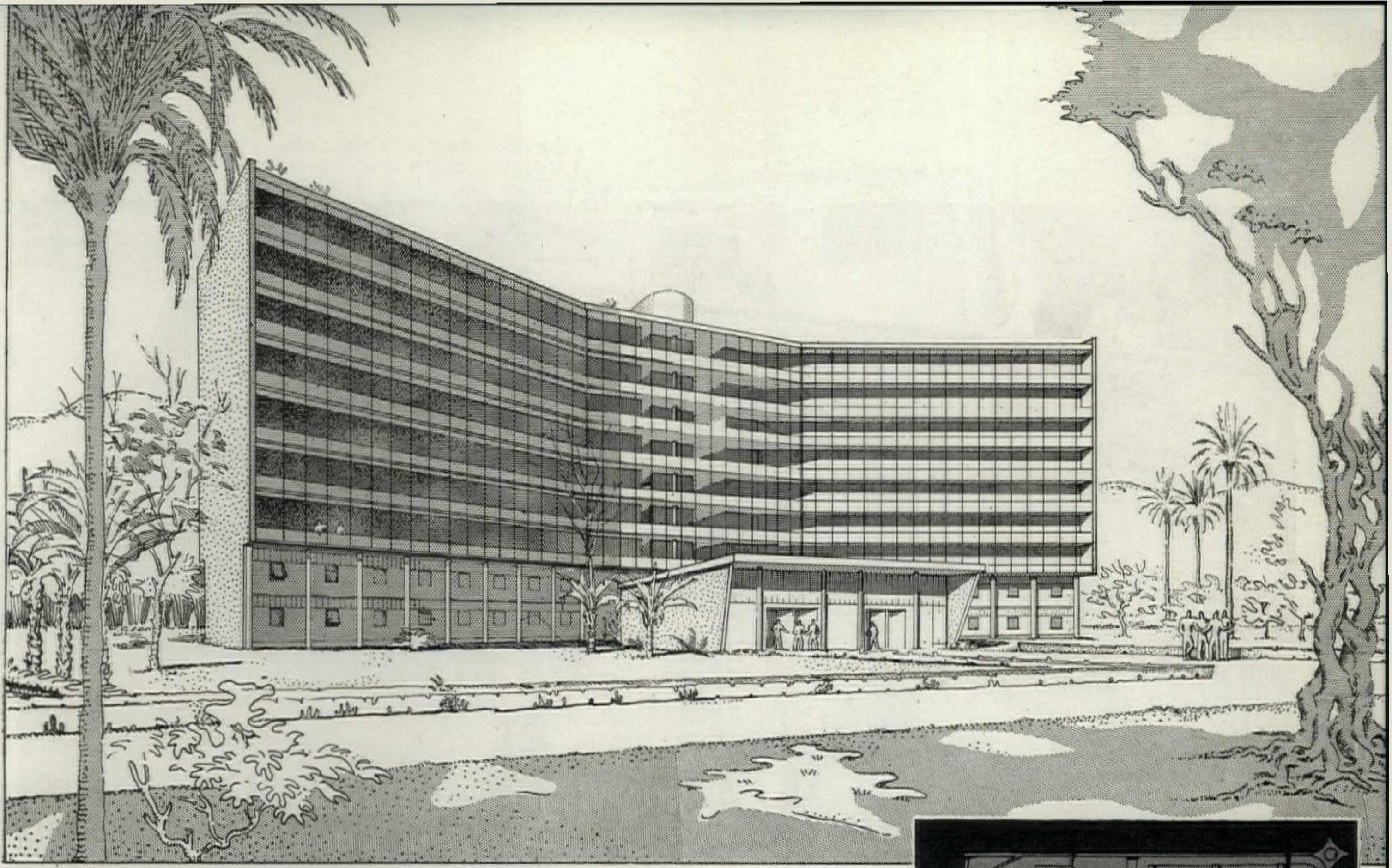
TYPICAL FLOOR

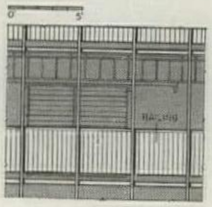


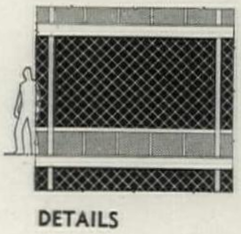
FIRST FLOOR



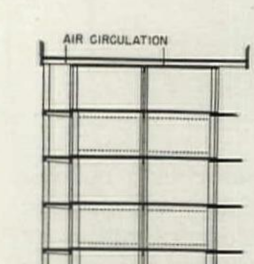
REAR ELEVATION







DETAILS



SECTION THROUGH BUILDING

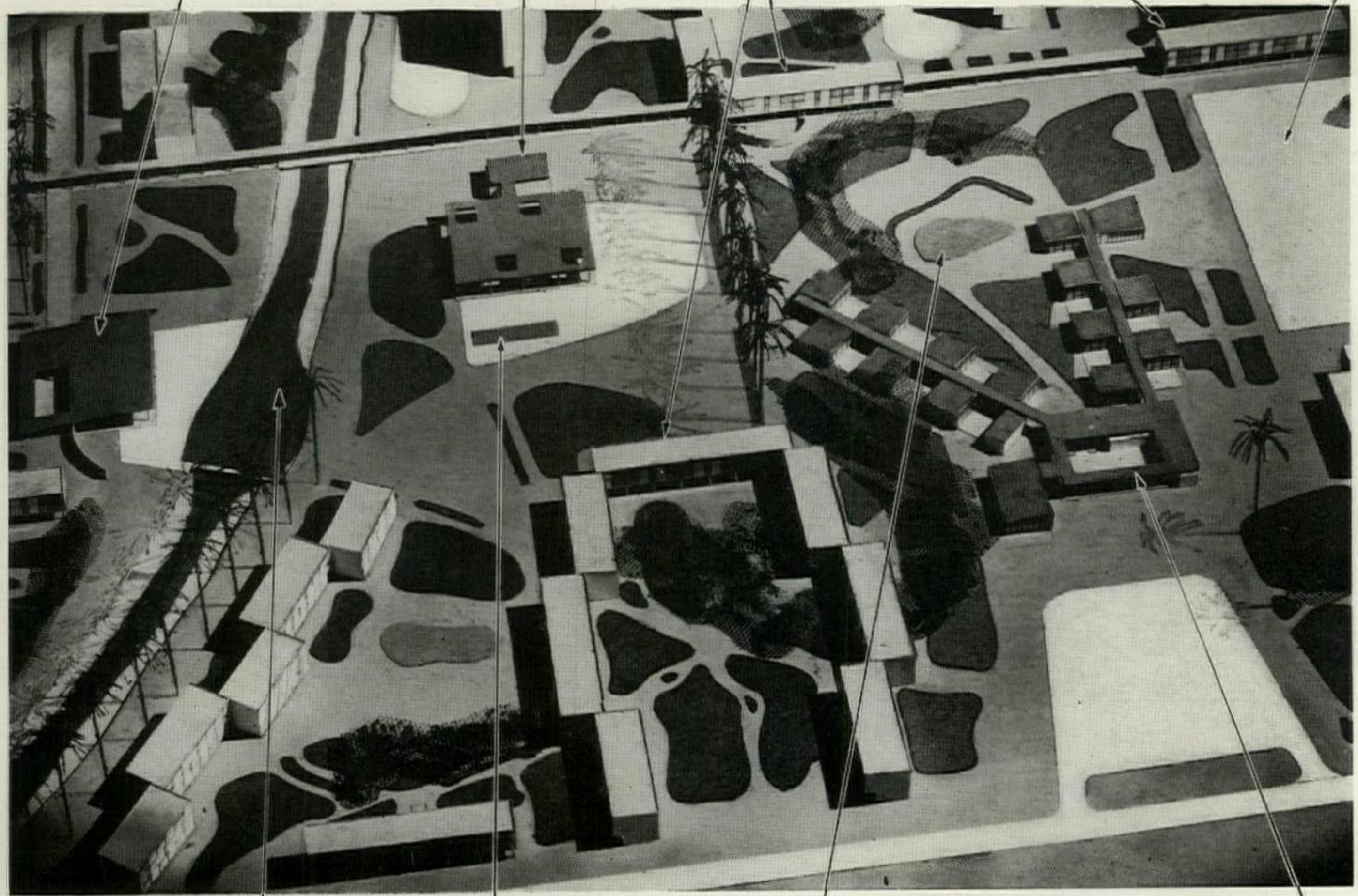
DORMITORY BUILDINGS

FOR UNMARRIED MEN

Located on the western side of the city are the nine-story dormitories for bachelors. In the first neighborhood there will be three such buildings, each housing 801 men. This location places the buildings across the canal from the family dwellings, allows separate playground space for grownups, and ranges them close to the civic center, where it is assumed that bachelors will spend much of their spare time.

On the first two floors the bedrooms, with five men in a room, are reached by a corridor in the rear of the building. Above the second floor, the dormitory wings are protected on both east and west by cantilevered balconies which also serve as passages for access to the various bedrooms. On these upper floors the rooms have one, two, or three occupants. The balcony rails are of precast concrete, secured and tied together from the third floor level to the roof parapet by vertical tubular rail supports. Fixed glass and ventilators above entrances provide ventilation and light. Sliding, louvered wood doors open to the corridor-balconies, while the central halls are left open to allow full circulation of air.

A wing in the center of the building at the rear contains all of the washrooms, with showers, lavatories, and toilets.



EDUCATION AND RECREATION AREAS

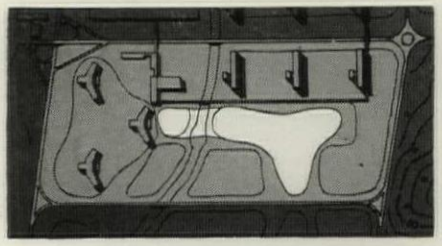
FORM THE NUCLEUS OF THE NEIGHBORHOOD

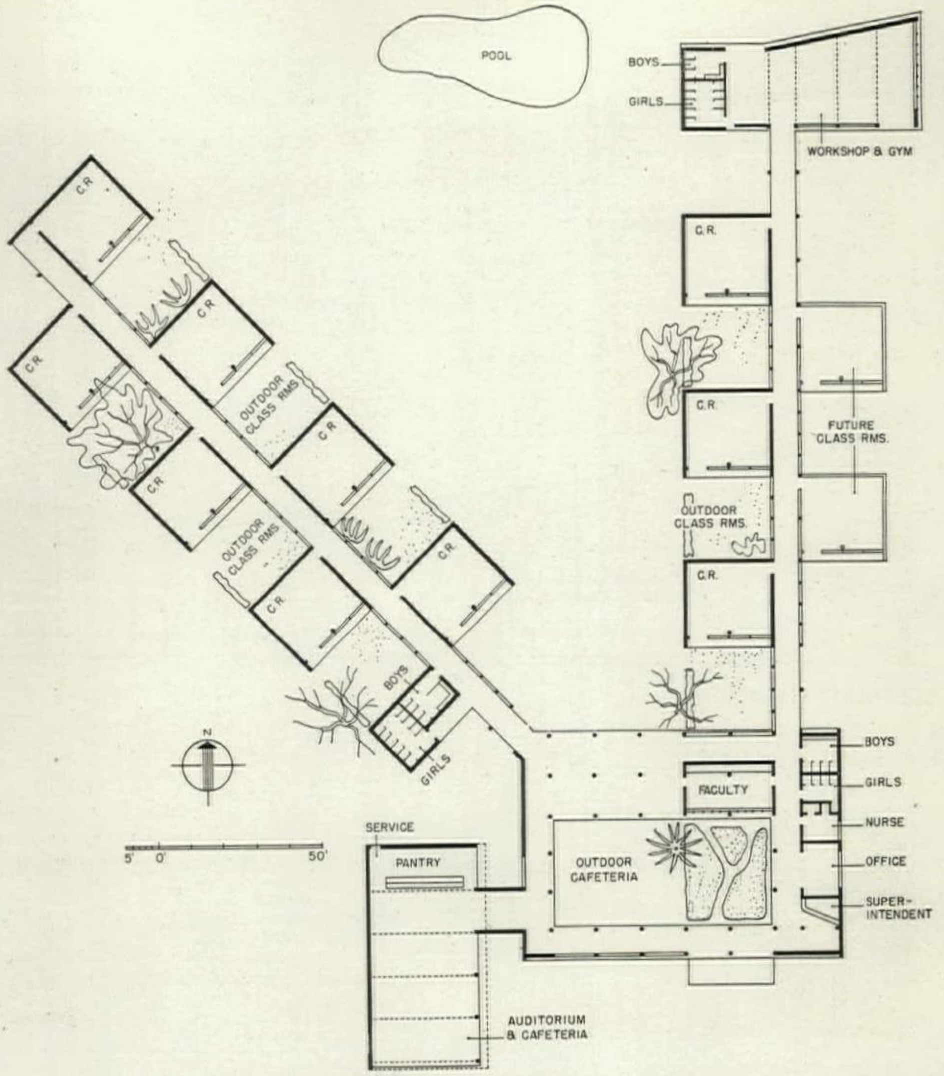
Neighborhood centers, planned for family living, are developed around a children's section and an adults' area.

Included in the children's services are several 30-crib creches for babies under two years old, a kindergarten (another will be built if it appears to be needed), an elementary school, a dispensary with a prenatal clinic, and a lactorium for milk pasteurization. In addition there are play areas and swimming pools.

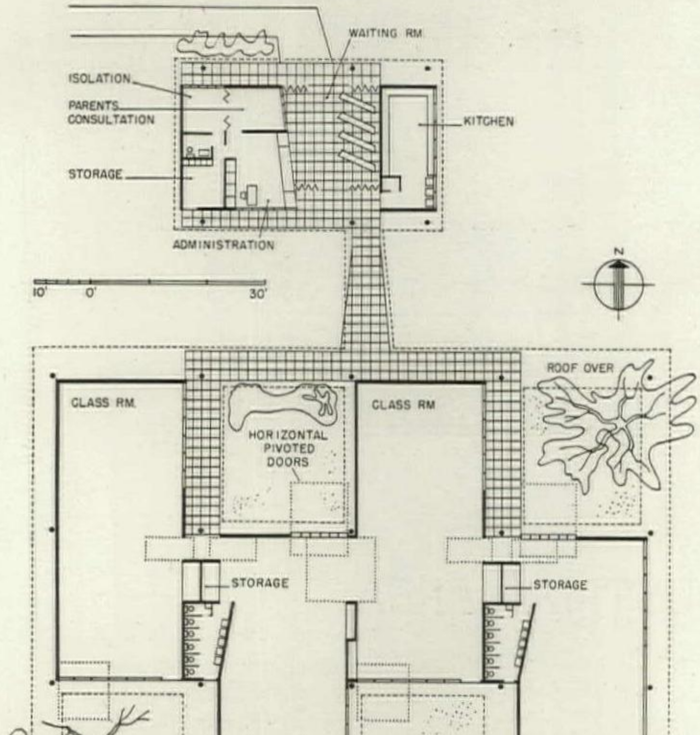
In the adult section the canal is widened to form a large swimming pool, near which is built a sun-shed for the bathers. The community club is housed in a building which, until the civic center is completed, will also contain a restaurant, kitchen, bakery, and local milk plant. Eventually the space these services occupy will be available for meeting rooms, playrooms, and adult classrooms.

On the periphery of this community nucleus will be other services, such as the dispensary, laundries, repair shops, grocery stores, bicycle parking space, management offices, etc. Reached easily from any of the apartment buildings, protected from any traffic, here is the core of community life.





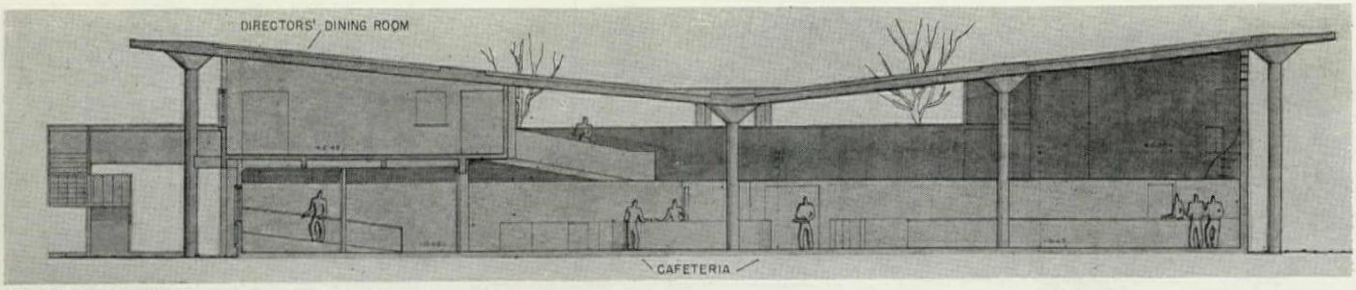
ELEMENTARY SCHOOL. Each classroom opens to its own outdoor study space.



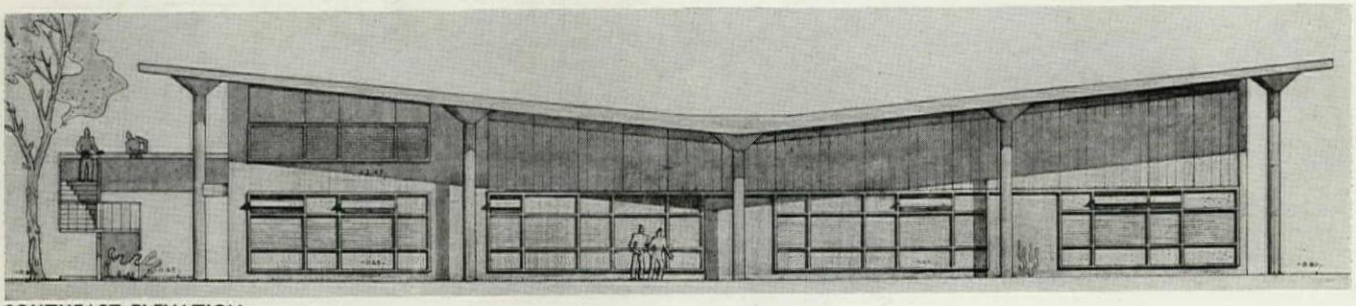
KINDERGARTEN. Classrooms are staggered to form patios, for outdoor play and colorful planting.

THE SCHOOL is organized around an administration and control unit from which branch out corridors leading to individual classrooms and their patios. Advantages of this scheme are that the full plan can be built in stages, study and play areas are pleasantly interrelated, and classroom noise is naturally baffled. Walls open out (operating like garage doors) from classrooms to patios.

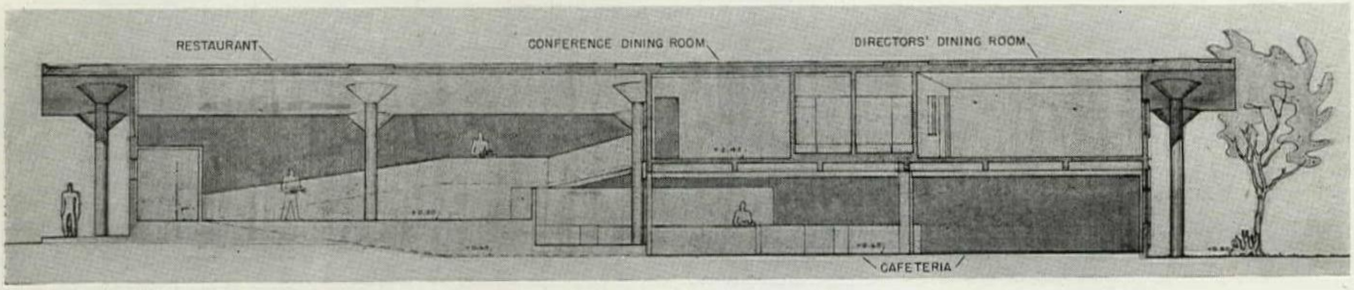
THE KINDERGARTEN has four classrooms, each for 30 children, opening to individual outside play areas. A covered walk surrounds the building and extends to the service and administration wing. Food will be prepared in a small kitchen and delivered by carts to the playrooms. A system of concrete vaults makes possible cross ventilation in the center of the building. Access from the inner to the outer play space is by means of counterbalanced, pivoted glazed wall sections.



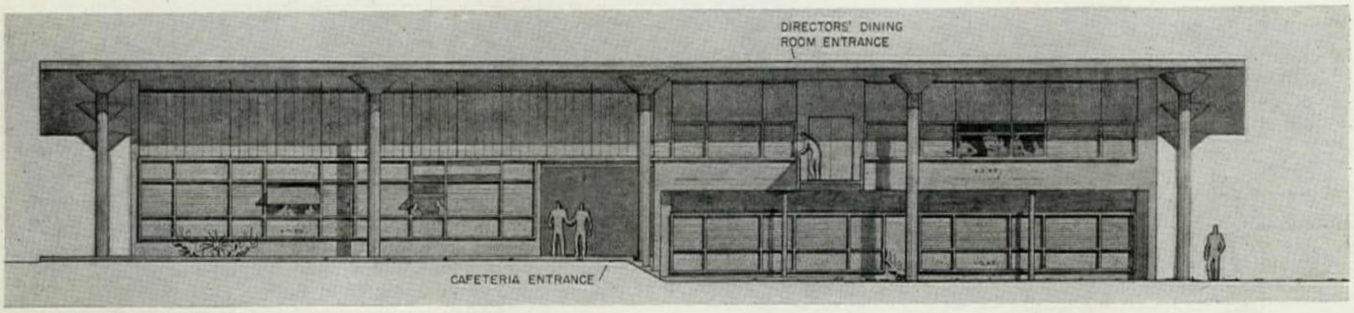
CROSS SECTION



SOUTHEAST ELEVATION



CROSS SECTION



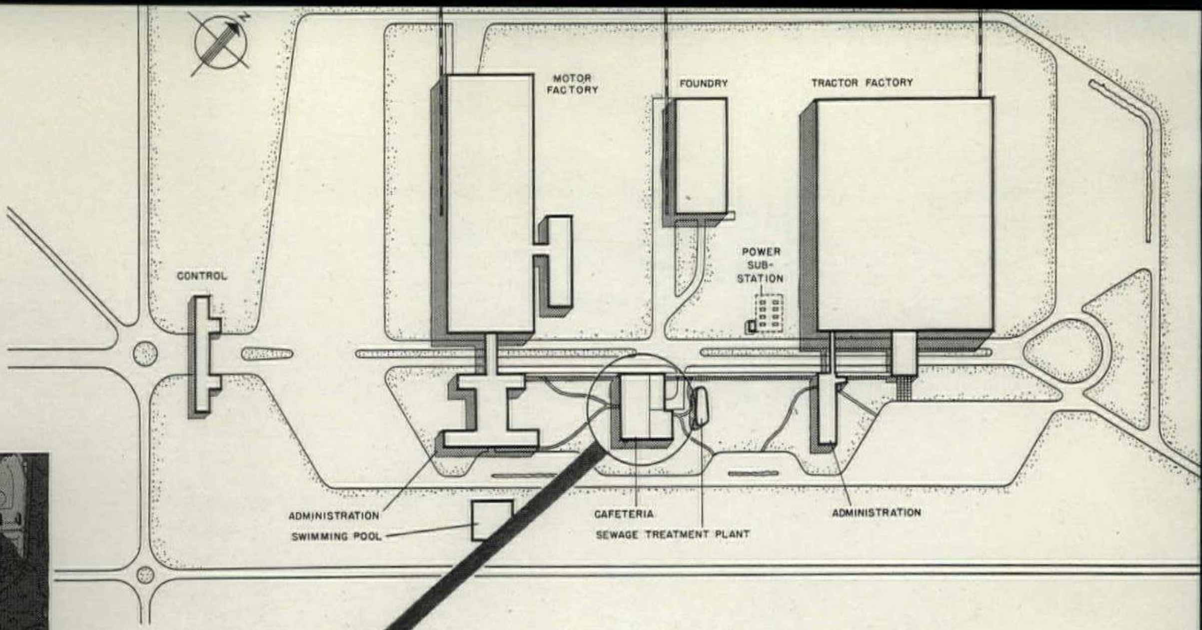
SOUTHWEST ELEVATION

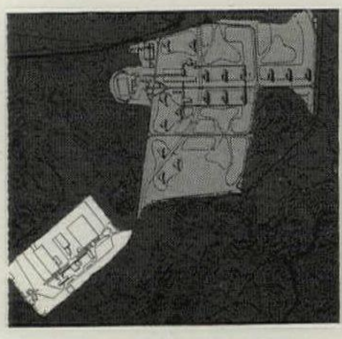
CAFETERIA IN THE INDUSTRIAL AREA

SERVES SEVERAL FACTORIES EFFICIENTLY

Designed to seat 650, the cafeteria for factory workers provides two serving lines leading into two main dining areas. Though the lines approach from different directions, the food preparation space supplies them efficiently, and traffic in and out is well controlled. Storage and basic preparation spaces are small, since a central "food factory" will supply partially processed foods to all local cafeterias.

The roof is a 2-way concrete slab on posts rising from a central low point to help carry off warm air and food odors. This construction permits walls to be opened where orientation is favorable. Sun screening is provided by concrete blocks and pivoting shutters, and fixed louvers allow continuous cross ventilation.

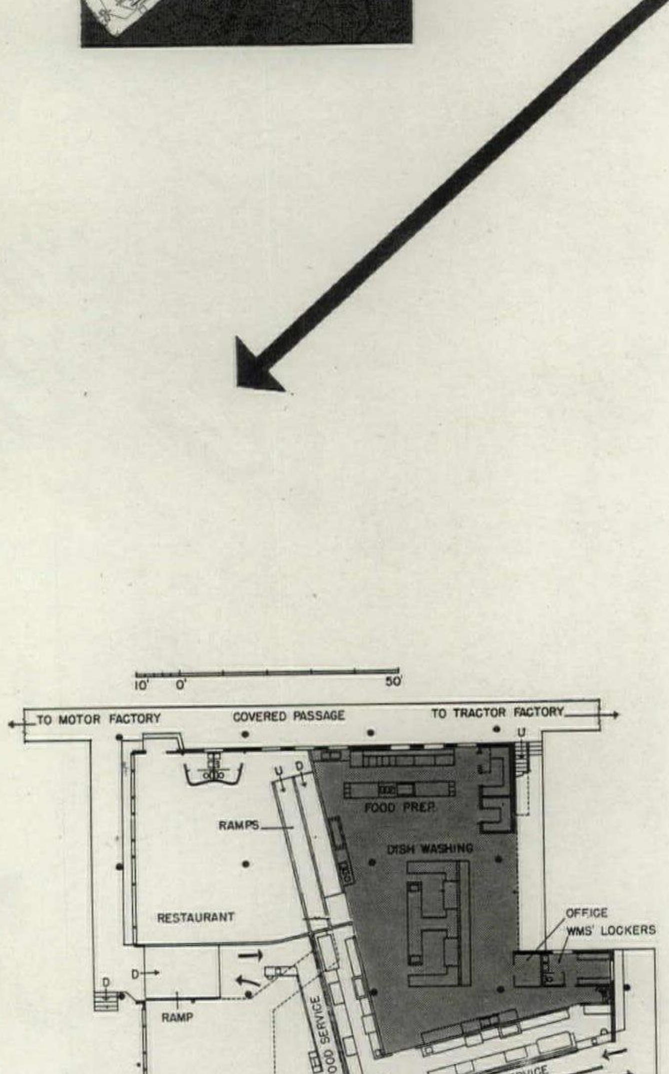




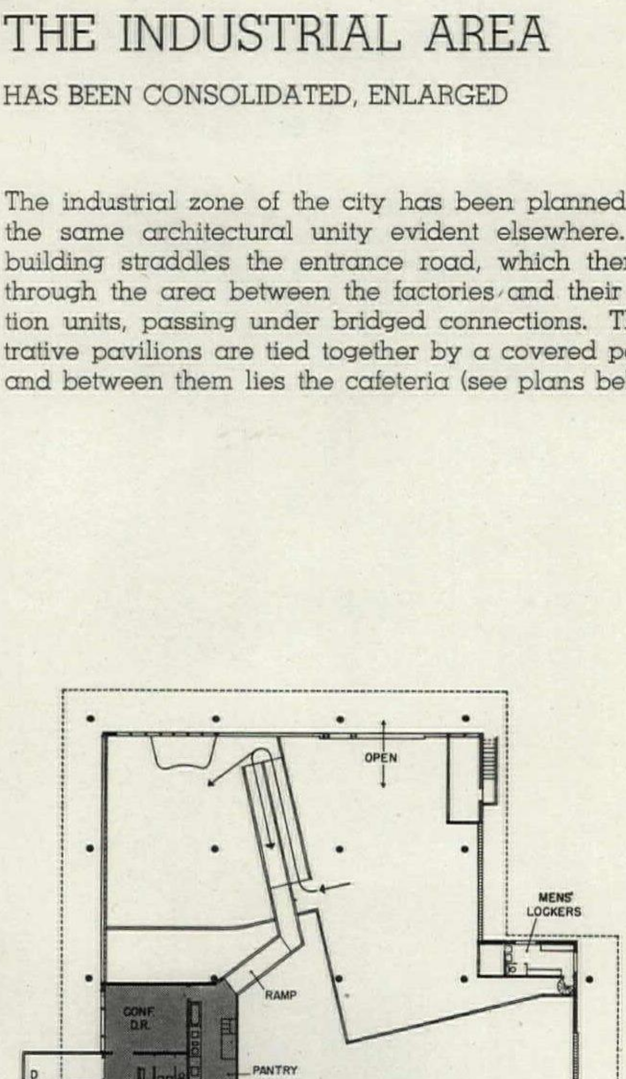
THE INDUSTRIAL AREA

HAS BEEN CONSOLIDATED, ENLARGED

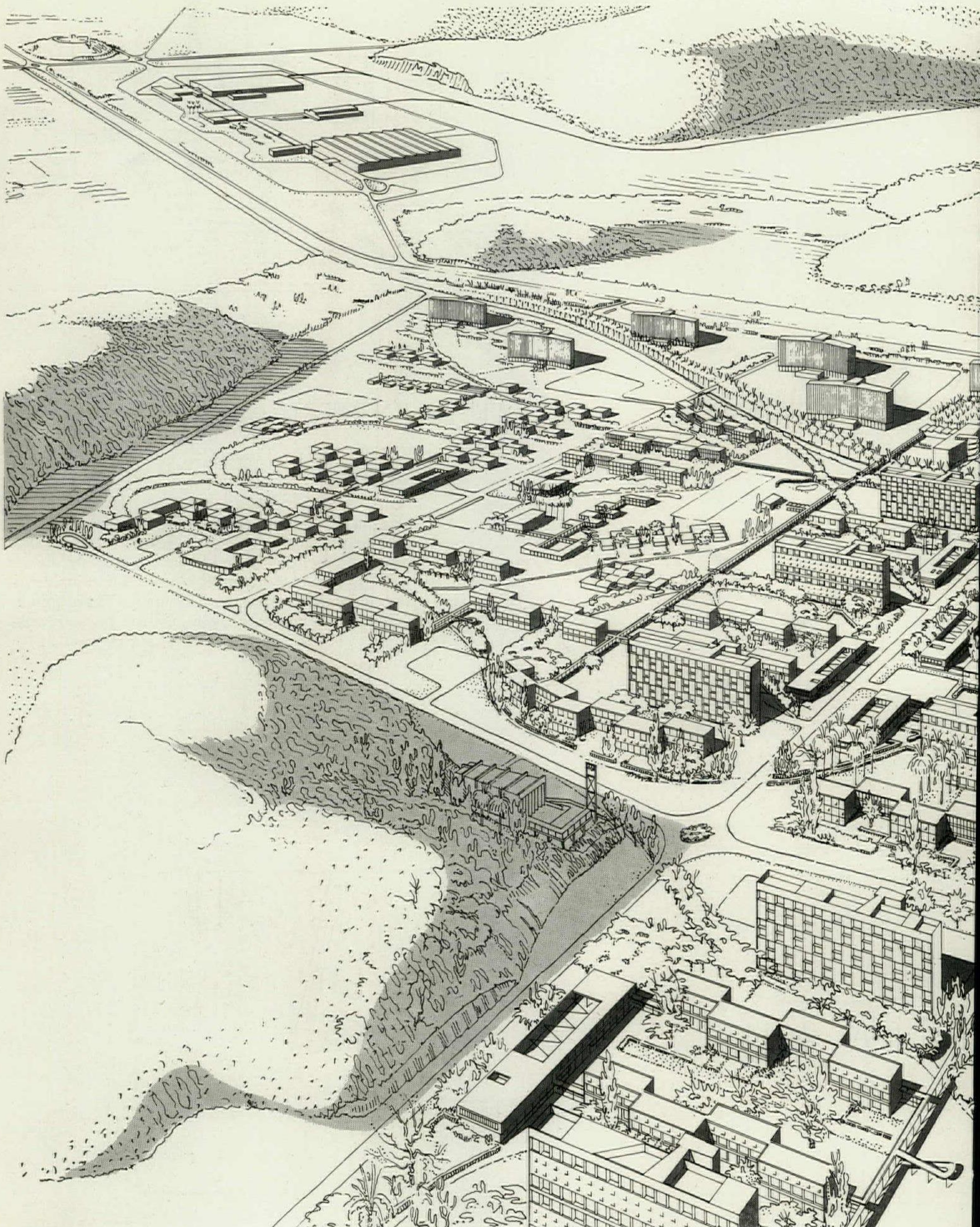
The industrial zone of the city has been planned to achieve the same architectural unity evident elsewhere. A control building straddles the entrance road, which then continues through the area between the factories and their administration units, passing under bridged connections. The administrative pavilions are tied together by a covered passageway, and between them lies the cafeteria (see plans below).



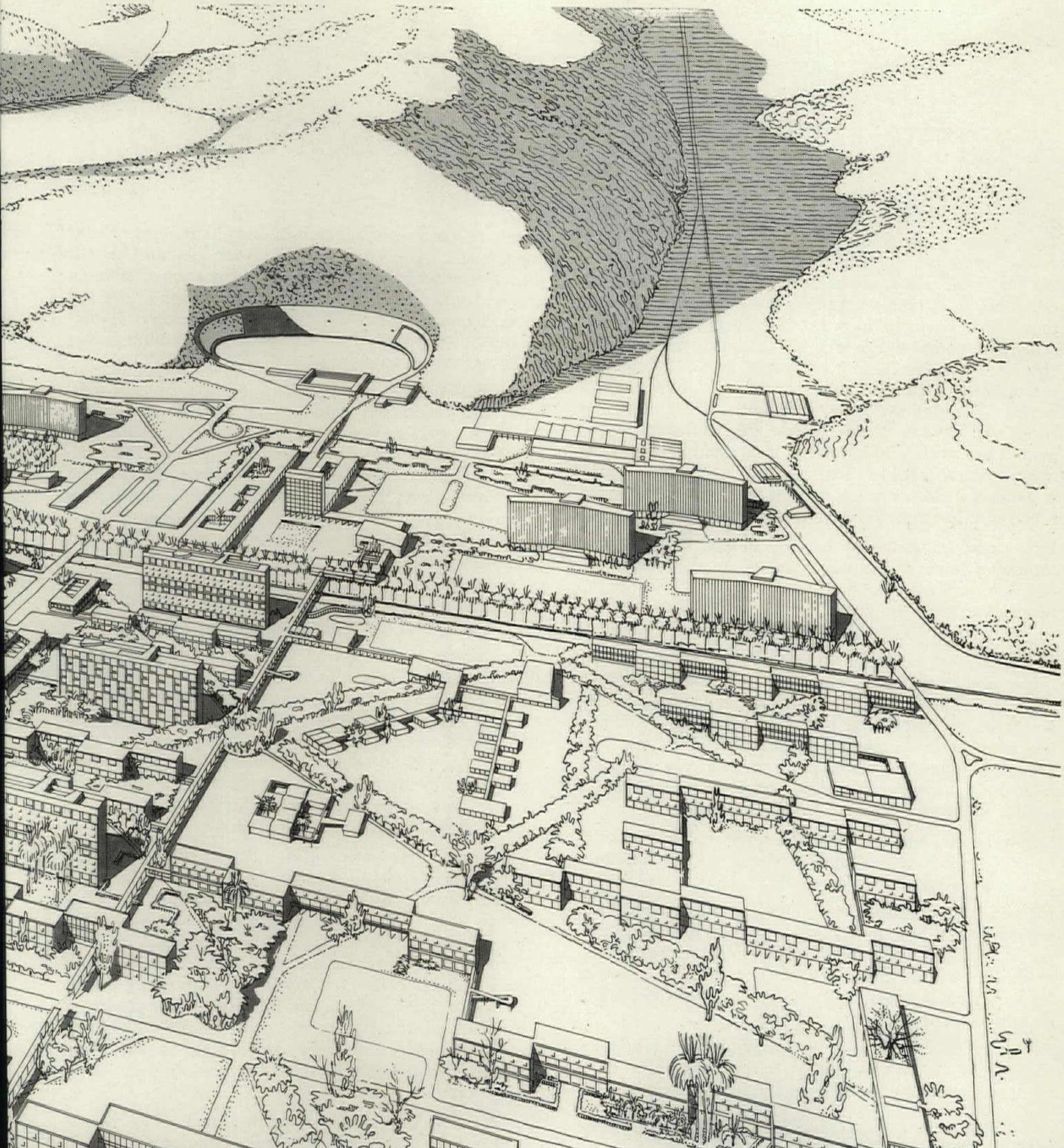
FIRST FLOOR. Food preparation, service, and dishwashing have been efficiently organized.



SECOND FLOOR. Directors' dining room occupies best corner. Space is separated for luncheon conferences.



RELATED and carefully studied buildings make the neighborhood. . . . . **INTEGRATED** neighborhoods make the city. . . .



CORRELATED city, industry, transportation, and site make the region.

A CITY MEASURED BY ITS PEOPLE

The master plan for the Cidade dos Motores is, of course, primarily designed for the fullest satisfaction of the physical and spiritual need of its population. Experiences in scientific planning are utilized in the town plan. The master plan is not merely a predetermined pattern: it charts the course of the development of the city for a period of about ten years, and it follows the program of industrialization and agriculture for the region. The city will grow neighborhood by neighborhood; experiences gained in one will influence the design of the next. The master plan is flexible enough to absorb unforeseeable changes. It is, at the same time, a defined framework into which the increasing population will be organically and integrally fitted.

Since man is the measure of all things, let us take a family of four, consisting of father, mother, and two children, and see how their lives can evolve within the twenty-four hour life cycle.*

The man probably works in the factory and lives with his family in one of the apartments. He may walk under a protected passageway, which shields him from the sun, to the nearest bus station (an average of 200 feet from his home) and arrive at the factory within a few minutes; or he may take his bicycle from the shed provided in the apartment group and bicycle along the river front, protected by shade trees, reaching his destination within an average of seven minutes.

During lunch hour he may return home but, more likely, he will remain at the factory where a large cafeteria serves a well balanced meal.

His wife will probably take her baby, under two, to a nursery near her apartment. Here scientifically prepared food is available and care and advice can be obtained. During pregnacy she can obtain prenatal care and other medical advice in her own neighborhood dispensary.

Her other child may go to kindergarten or the near-by elementary school. She can reach all these places unhindered by traffic and at most times protected by covered passageways which in this climate are of vital importance. The kindergartens and schools are planned with the advantages that modern experience affords, and with play areas and landscaped patios to aid the spiritual and mental development of the children. Health services are available near home, incorporating recent findings of medical science.

When the family is reunited at night, near-by neighborhood clubs and swimming pools provide recreation. Dinner may be served at home or taken in the neighborhood restaurants, where carefully prepared diversified menus are part of the nutrition program. An evening walk in the Latin manner is made sociable and agreeable by the civic center, passeio, praca, moving picture theater, and coffee houses. Here the social life of the whole town takes place, where one meets, can see and be seen. Because of the heat of the tropical sun, walking distances from one part of the town to another are held to less than a quarter of a mile.

On Sundays family life evolves according to the Brasilian pattern. Especially in the early evening hours when the sun begins to set, young men and women go strolling arm in arm, listen to concerts played on the praca, and walk along the palm-lined corso and the river-front promenade. During the day football matches are played in the neighborhood sport fields and there may be swimming tournaments or national and regional football games in the stadium.

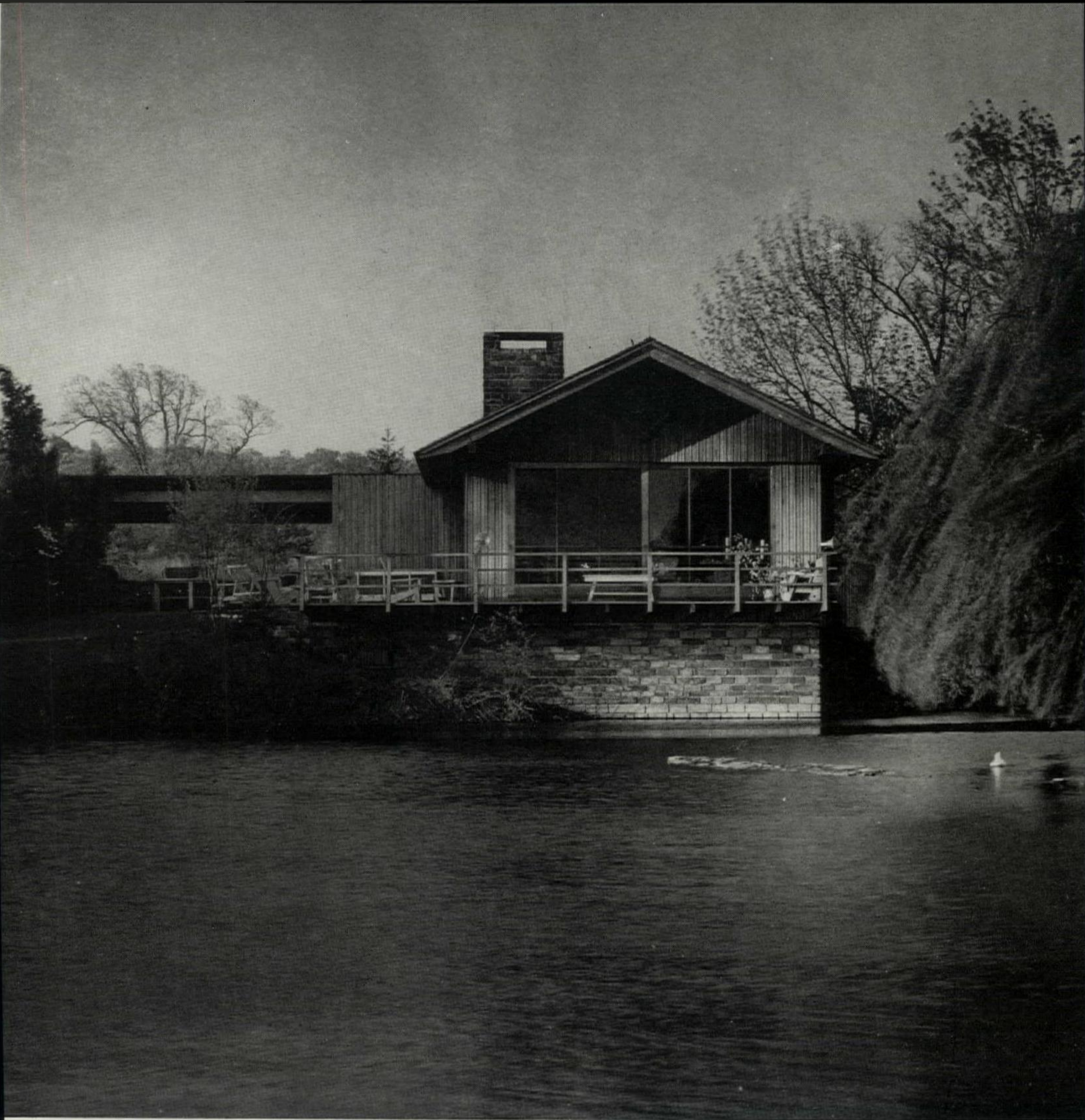
Most modern cities lack a civic nucleus such as existed in the past. The old pracas and passeios in Latin America were built so that the whole community could partake in gatherings and festivities. These were laid out according to the town planning charter of Philip II of Spain (1573). Many Latin American towns still have a clearly-defined civic center where people can gather together as they used to on the old village greens of New England, but the Cidade dos Motores will be the first modernly-planned city that maintains this good traditional feature, bringing it into relationship with present day life.

Our town plan aims, as far as any such plan can, at creating a physical and spiritual background against which the modern Brasilian way of life may be carried on, with ever greater health, happiness, and efficiency.

Paul Lester Wiener

José Luis Sert

* The town planner should also establish the relationship between places of dwelling, work, and recreation in such a way that the daily cycle of activities going on in these various districts may occur with the greatest economy of time. This is a constant factor determined by the rotation of the earth on its axis. (*The Town-Planning Chart*, Fourth Congress of C.I.A.M.—International Congress for Modern Architecture—Athens, 1933)



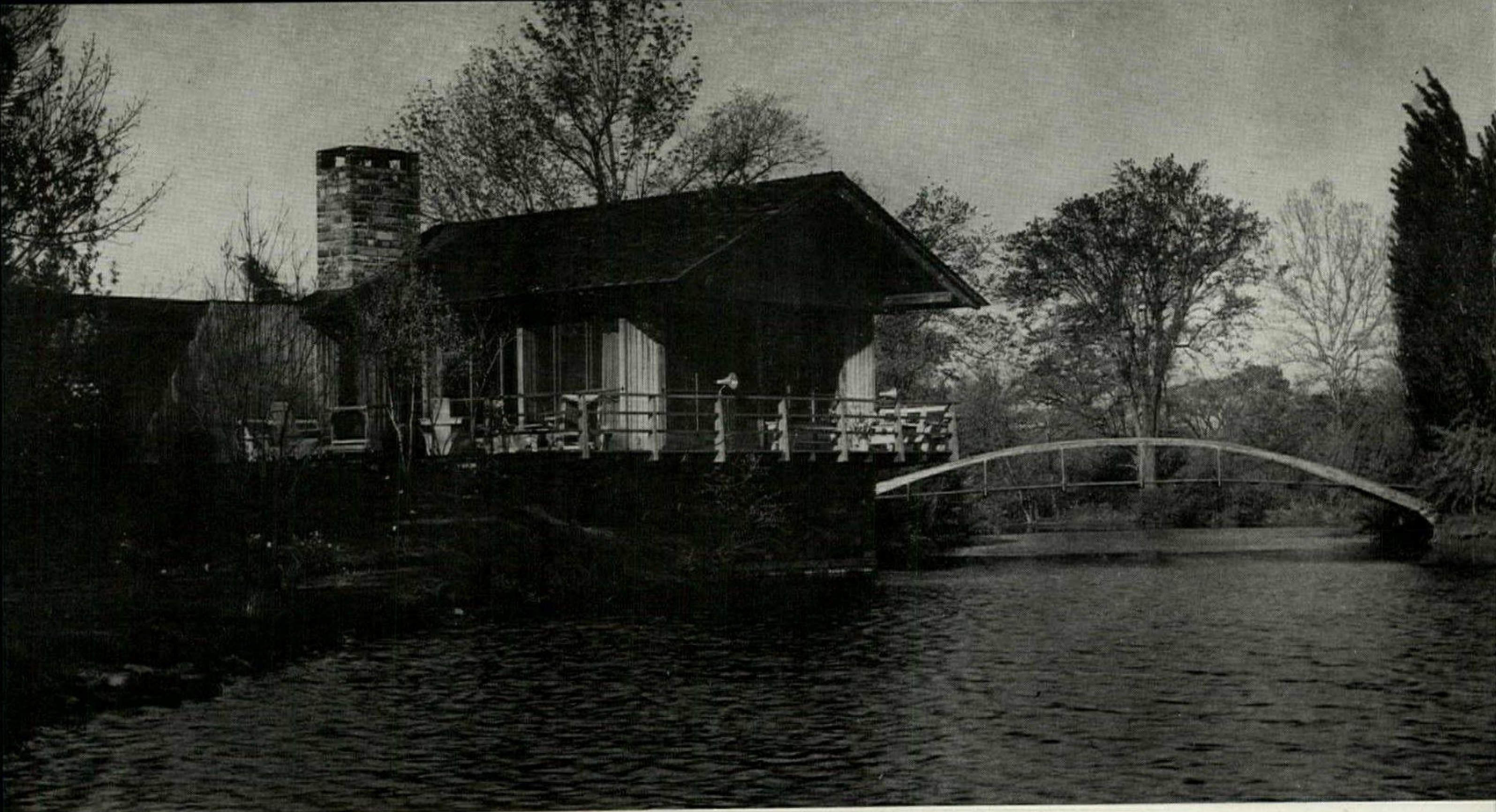
Photos by P. A. Dearborn

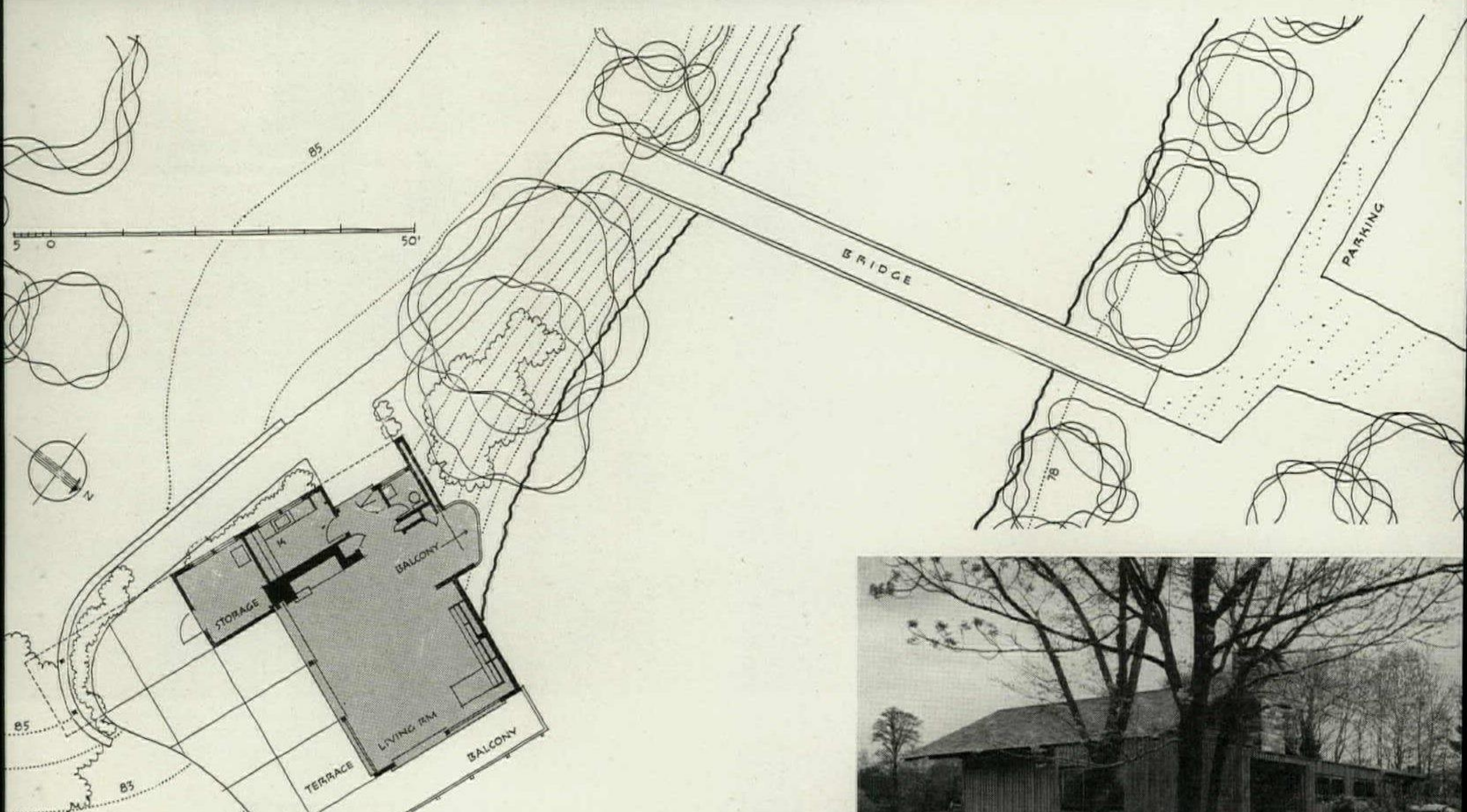
"BROOKHOUSE," NEAR PRINCETON, NEW JERSEY

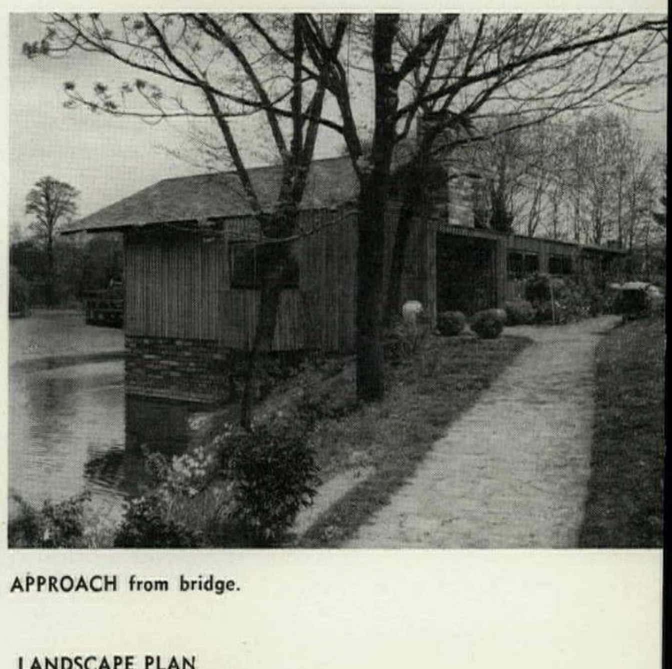
KENNETH KASSLER
Architect

DANIEL U. KILEY
Landscape Design

Planned primarily as a study or retreat—some 300 yards from the owner's home—this imaginative little structure is also used for entertaining and dining. In a day when mundane functional considerations usually take top priority (and frequently consume the entire budget), it is a delight to focus on a building that was planned for pure pleasure. It is also illuminating to see what pleasant architecture results—in the hands of a skillful designer.





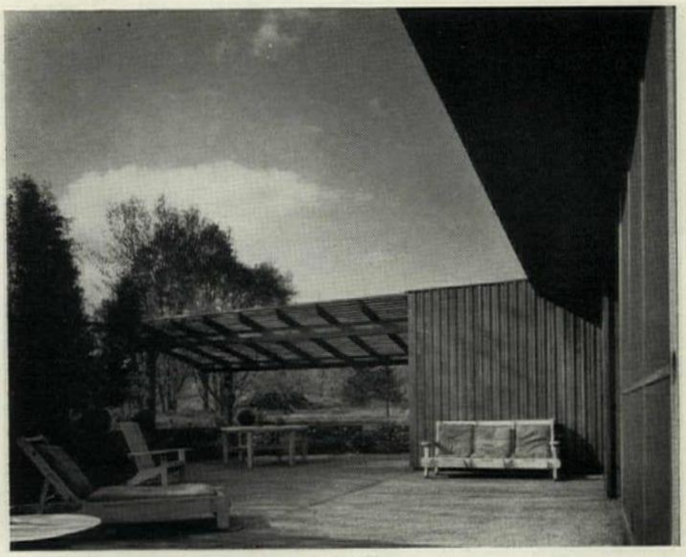


APPROACH from bridge.

LANDSCAPE PLAN
by Daniel Urban Kiley.

"BROOKHOUSE," NEAR PRINCETON, N. J.

KENNETH KASSLER, Architect



THE SHELTERED LOUNGING TERRACE.

Built on the site of an old icehouse overlooking the ice pond on the owner's farm, the house is oriented for protection against late afternoon summer sun and the most agreeable view.

The whole parti is based on the relation of the house to the pond and the desire to obtain as much openness as possible. The main room and adjacent terrace are large enough to accommodate a sizable number of guests. Kitchen and storage facilities are purposely limited in size, since their use is only occasional.

The structure is of local quarry stone and frame. Exterior wood finish is of natural rough sawn battens over boarding. Roofing is of wood shingles. Terraces are of exposed aggregate concrete.

VIEW FROM LIVING ROOM looking out to terrace.

TERRACE END of house.

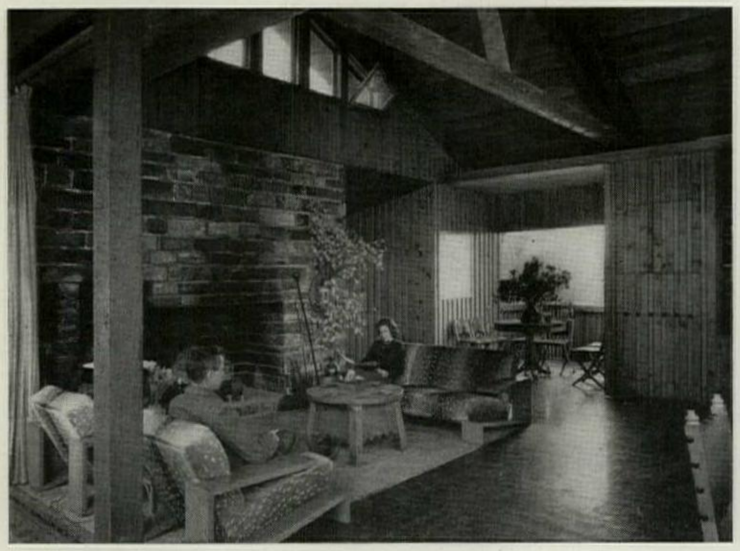
SLIDING WALLS provide maximum openness.

STUDY CORNER alongside shelves and cupboards.

"BROOKHOUSE," NEAR PRINCETON, N. J.

KENNETH KASSLER, Architect

Throughout the house, interior surfaces are of either wood or stone; no plaster is used. Roof trussing is of fir; walls of the main room are finished in knotty pine, lacquered and waxed; flooring is pine end-grain block. The dining bay opens onto a small balcony so placed that it commands a view of the wooden arch suspension footbridge spanning the stream just above the house site.



FIRESIDE looking toward dining alcove.

DINING BAY; bridge beyond.

(Details on following page)

P. A. Dearborn

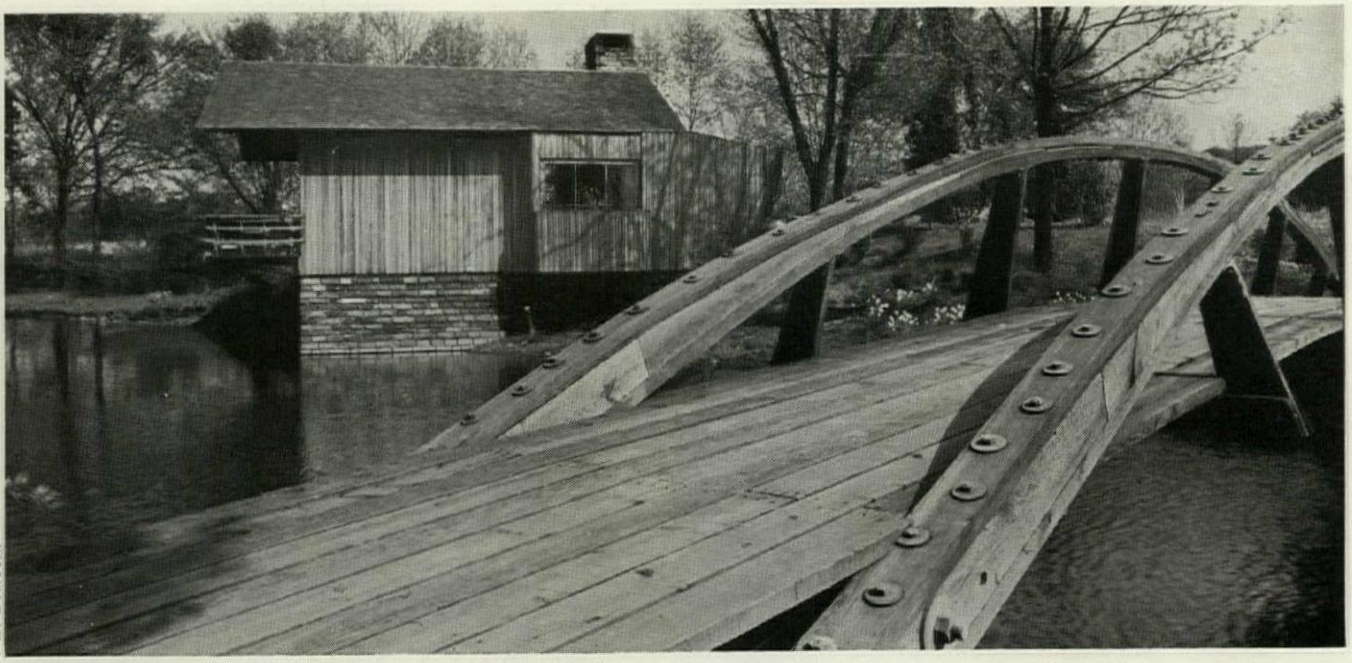
WOODEN ARCH FOOTBRIDGE

NEAR PRINCETON, N. J.

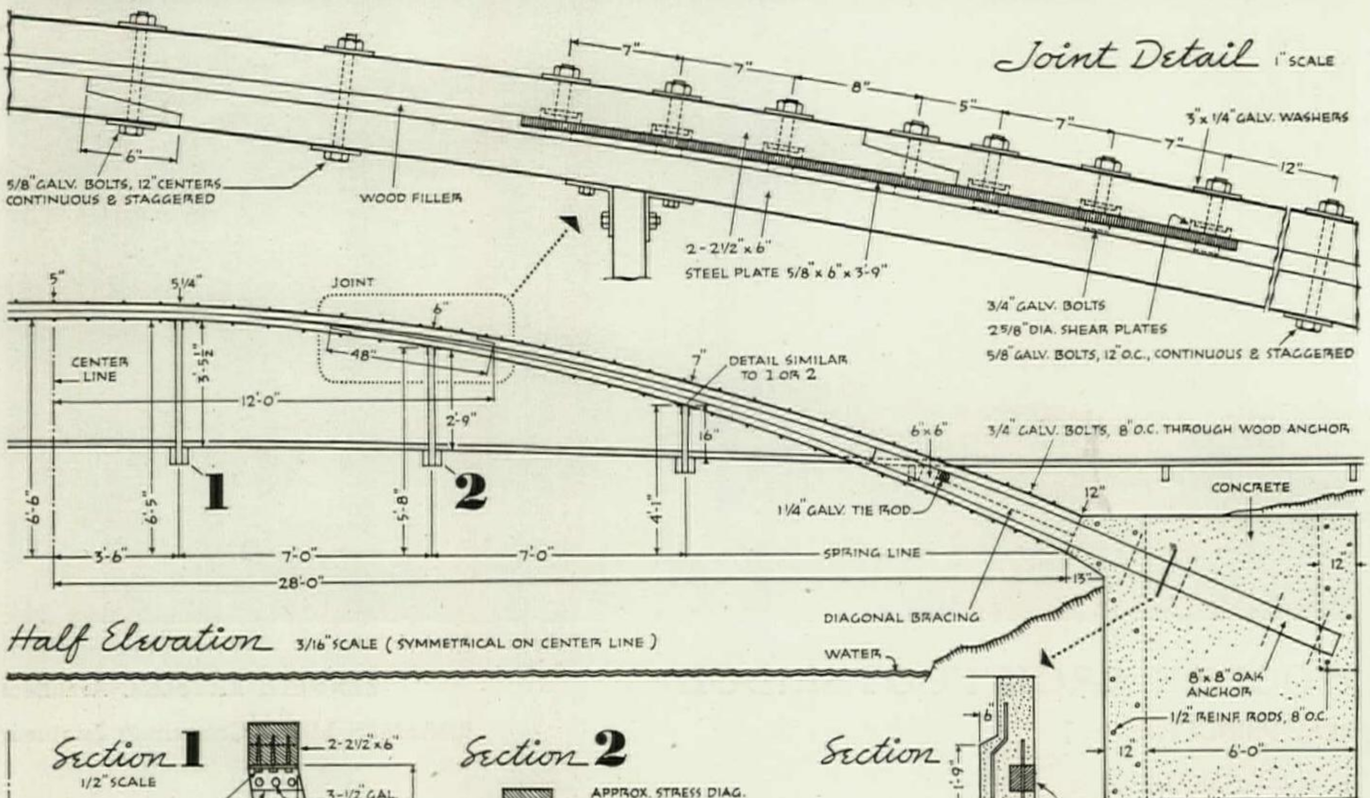
KENNETH KASSLER, Architect
KRAEMER LUKS, Consulting Engineer

This footbridge connects the main house and gardens (located some 300 feet back on the right bank of the stream) with the "Brookhouse" shown in the preceding pages. Over page are construction details of the bridge, which is an outstanding example of coordinated architectural and engineering design. Use of the minimum of materials in precise relationships here produces an esthetically satisfying result. The arches are built up; at joints, top members, which are in tension, are secured to steel plates; bottom members, in compression, hold their position without such mechanical fastening. The wood suspension members which support the footway are splayed outward so that stresses are applied to resist any tendency to splitting at the joint (see stress diagram). Comparable considerations governed design of sway bracing and of arch side-filler pieces which tie the arches to the concrete abutments. All lumber is zinc chromated under pressure.

(Photo on preceding page)



P. A. Dearborn



WOODEN ARCH FOOTBRIDGE

PRINCETON, N. J.

KENNETH KASSLER, Architect

KRAEMER LUKS, Consulting Engineer

(Details on following page)

Chicago Architectural Photographing Co.

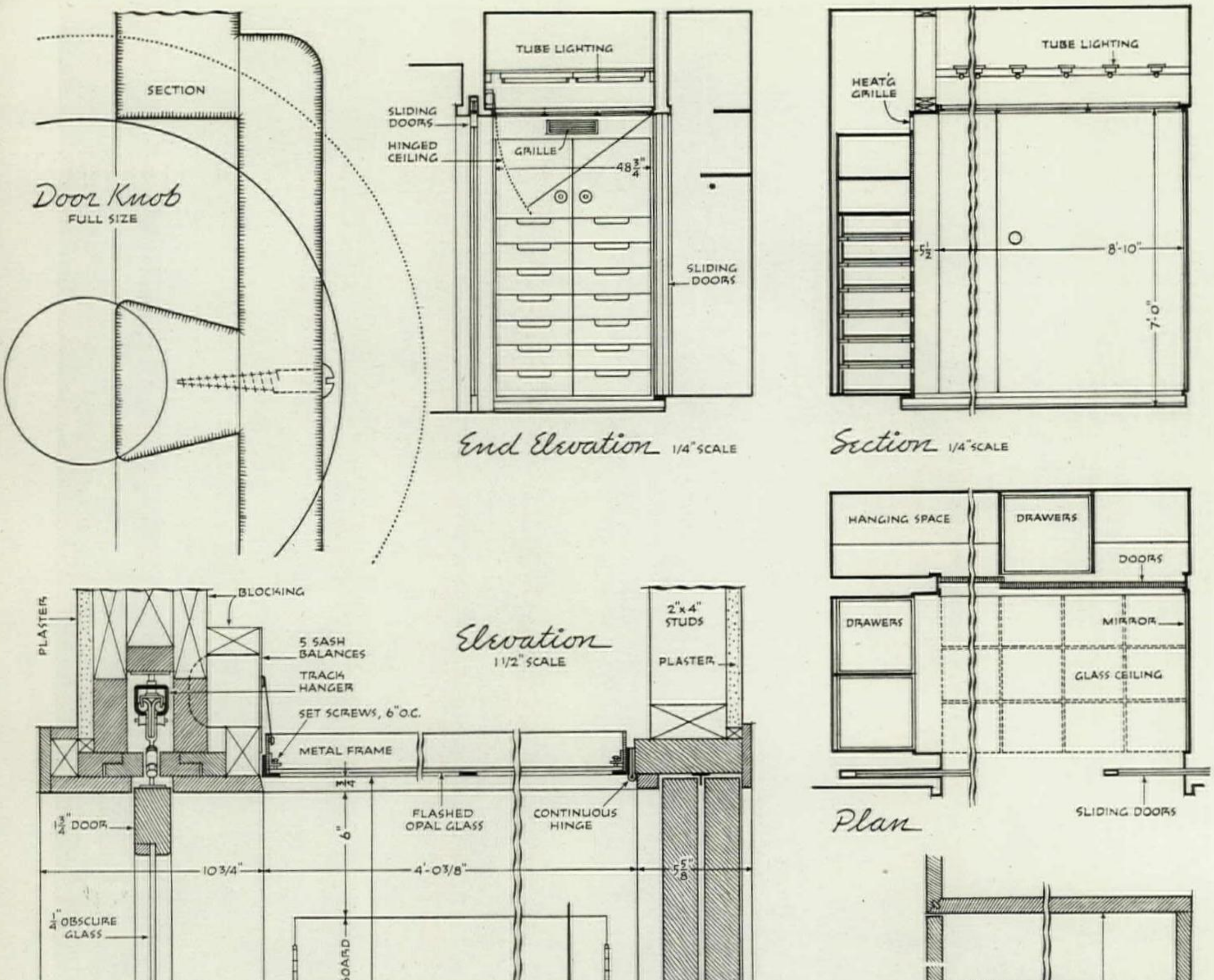
DRESSING ALCOVE IN MASTER BEDROOM

CHICAGO, ILL.

McSTAY JACKSON CO.
Designers

An end of the master bedroom has been set off for dressing space by the use of sliding opaque glass doors which are suspended from track hangers. The ceiling acts as a lighting source, since flashed opal glass panels are suspended below fluorescent fixtures. At one end of the dressing space a drawer unit has cupboards above, while on the long wall sliding doors (on floor tracks) conceal hanging space and additional drawers. No applied hardware is needed, as cupboard and cabinet doors are fitted with recessed wood pulls and drawers have hand slots.

(Photo on preceding page)



DRESSING ALCOVE IN MASTER BEDROOM

CHICAGO, ILL.

McSTAY JACKSON CO.
Designers

WATERPROOFING AND DAMPPROOFING

PART II

Part I of this article, which dealt with waterproofing, appeared in the August 1946 issue.

CORRECTION: In Part I, page 84, Aug. 1946, Table "Thickness & Reinforcing of Slab," steel stress should read 16,000 psi.

By BEN JOHN SMALL

DAMPPROOFING

Dampproofing is a process wherein an impermeable barrier is created to withstand moisture (dampness). Generally three methods are employed:

I —Surface Coating Method
II —Face Joint Method
III—Flashing Method

★ ★ ★

I—SURFACE COATING METHOD is a system of dampproofing with film coatings. Materials frequently used:

1. **Colorless Type:**
   - (a) Paraffin, tung oil, and mineral spirits
   - (b) Aluminum stearate and mineral spirits
   - (c) Linseed oil, turpentine, and paint drier
   - (d) Molten paraffin
   - (e) Chlorinated rubber and benzene
   - (f) Organic oil and gum varnishes
   - (g) Proprietary solutions and emulsions

   Advantages:
   - (a) Where transparency is a necessity, and after determining that moisture is penetrating through masonry, and after correction of structural defects

   Disadvantages:
   - (a) Cannot fill holes in masonry
   - (b) Cannot correct structural defects
   - (c) Effectiveness lasts for limited period of time
2. **Resin-Emulsion Paint Type:**
   - (a) Civil Aeronautics Administration Spec. CAA-577
   - (b) U. S. Navy Spec. 52P75
3. **Oil-Base Paint Type:**
   - (a) Fed. Spec. TT-P-24
4. **Synthetic Rubber-Base Paint Type**
5. **Magnesium Oxychloride Paint Type**
6. **Cement-Water Paint Type:**
   - (a) Fed. Spec. TT-P-21
   - (b) Proprietary mixtures (mostly powders)
7. **Cement-Water Paint and Sand (Grout Coat) Type:**
   Usually used as first coats on coarse surface masonry
8. **Bituminous Coatings Type:**
   - (a) Hot asphalt (primer: Fed. Spec. SS-A-701 or U. S. Army Spec. 3-116 or ASTM 41, and hot asphalt: Fed. Spec. SS-A-666, Type III, Class A or U. S. Navy Spec. AW or ASTM 450, Type B)
   - (b) Hot coal tar (creosote oil primer: Fed. Spec. TT-W-561a, and coal tar pitch: Fed. Spec. R-P-381, Type II or ASTM 450, Type B)
   - (c) Water-gas tar. Usually, four thin coats
   - (d) Asphalt roof coating (Fed. Spec. SS-R-451 or U. S. Army Spec. 81-6B). For use over primer
   - (e) Prepared bituminous paint
9. **Cementitious Brush-Coating Type:**
   - (a) Portland cement and sand wash coat. (Use white Portland cement where appearance and brightness are required.)
   - (b) Iron powder and sal ammoniac
   - (c) Portland cement, iron powder, and sal ammoniac

★ ★ ★

II—FACE JOINT METHOD is a system of dampproofing by (1) repointing and tooling joints and (2) grouting, or filling cracks in or between joints and adjacent masonry units. Materials frequently used:

1. **Repointing:**
   - (a) Mortar, same as originally used
   - (b) One part Portland cement, three parts lime putty, 12 parts sand
   - (c) One part Portland cement, one part slaked lime putty, 4 parts sand
2. **Grouting:**
   - (a) Portland cement and fine sand
   - (b) High-early-strength cement, flint, and sand
   - (c) Portland cement and flint
   - (d) Wax (paraffin and tung oil)
   - (e) Proprietary mixtures

★ ★ ★

III—FLASHING METHOD is a system of dampproofing by diverting water from vulnerable parts of a wall to the exterior. Materials frequently used:

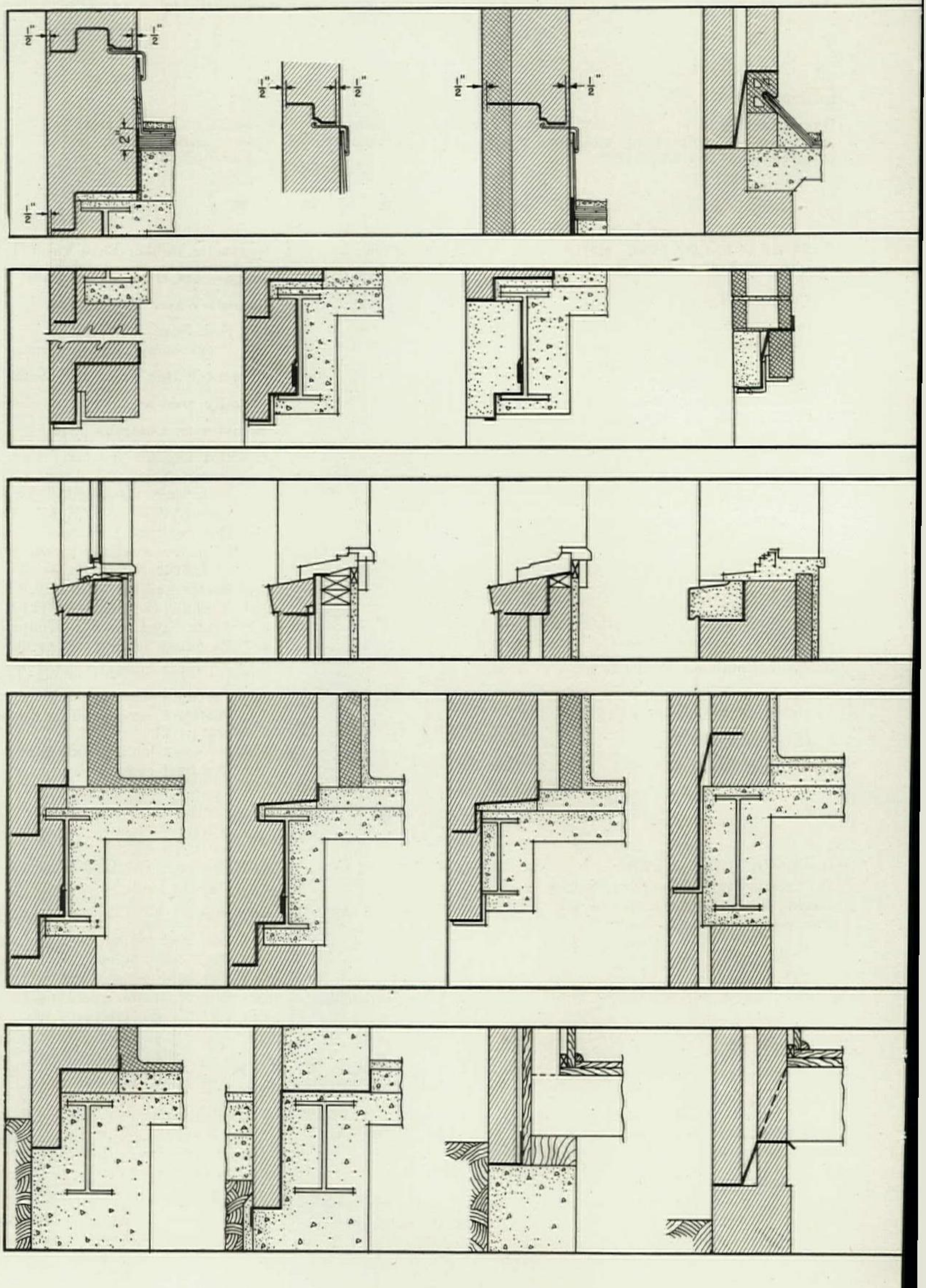
1. **Metals:**
   Lead, zinc, aluminum, monel metal, tin (terne) plate, galvanized iron, copper (plain and corrugated), copper-bearing galvanized steel
2. **Coated Metals:**
   Lead-coated copper, fabric-coated copper, asphalt-coated copper, bitumen-saturated wire mesh, asphalt-saturated-cotton over wire mesh
3. **Miscellaneous:**
   Kraft paper, saturated canvas, roofing felts and cap sheets, copper-coated fabric, asphalt-saturated cotton, im-

pregnated and non-impregnated fabrics laid in mastic

4. **Principles of Flashing Design:** Investigate material for:
   (a) Corrosion resistance of metallic flashings with regard to atmospheric conditions and contacting masonry and mortars
   (b) Solubility of bituminous materials insofar as staining of masonry is concerned
   (c) Resistance to perforation and pliability without fracture for required contours
   (d) Effectiveness of bond with adjacent materials

5. **Design:**
   (a) Locate flashing at all vulnerable points; direct water to exterior (through mortar or weep-holes)
   (b) Stabilize copings above through-wall flashings
   (c) Provide sufficient number of clear weep-holes in cavity and non-cavity walls
   (d) Avoid intricate flashing design.

FLASHING DETAILS



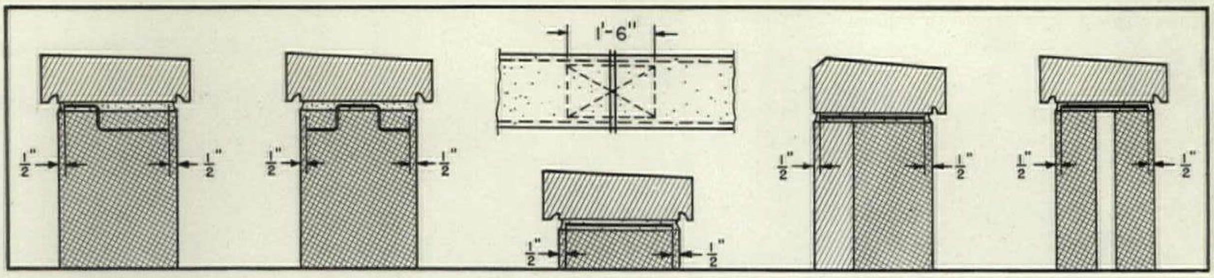
PARAPETS

HEADS

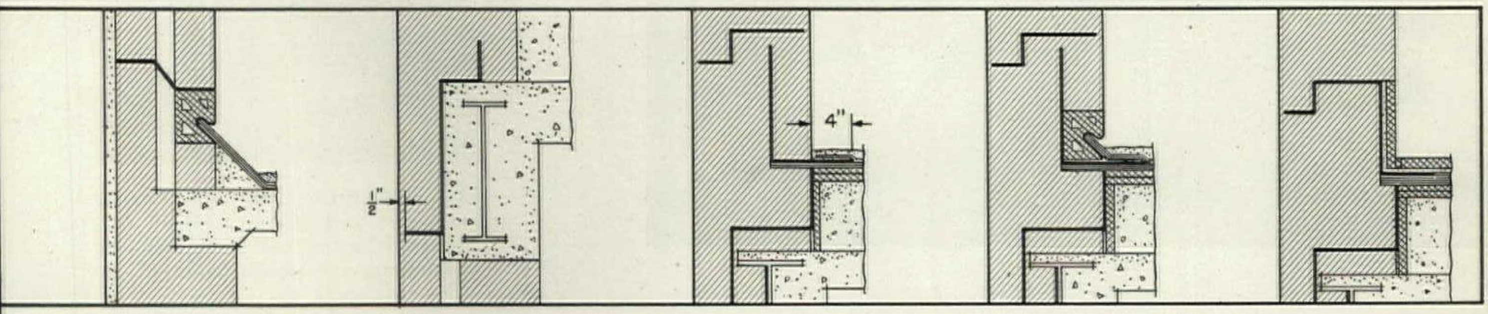
SILLS

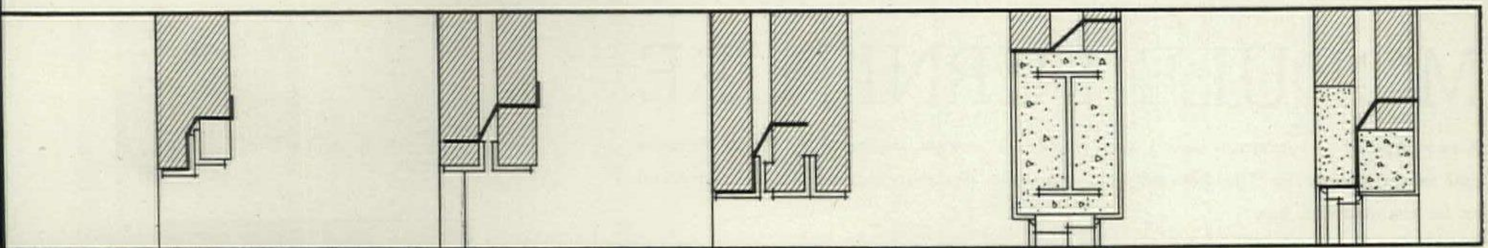
SPANDRELS

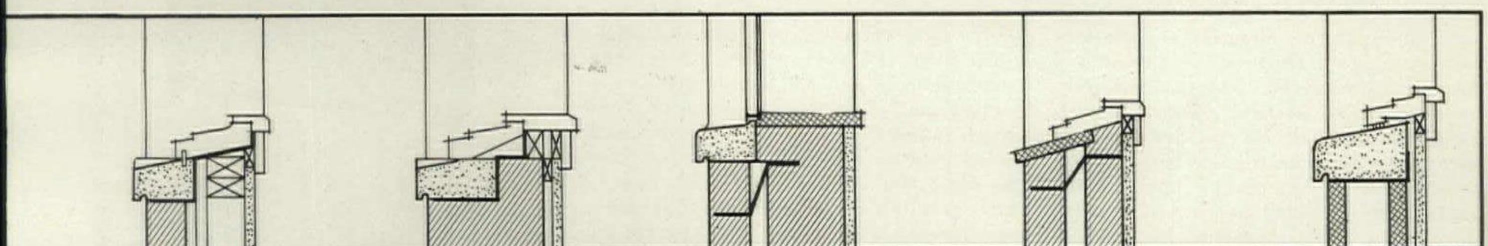
FOUNDATIONS

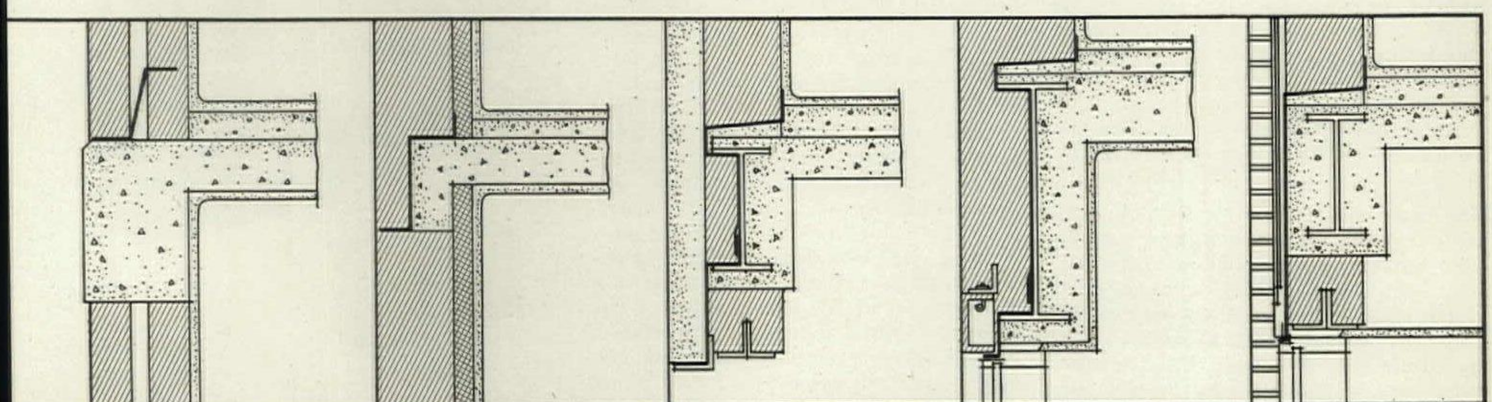


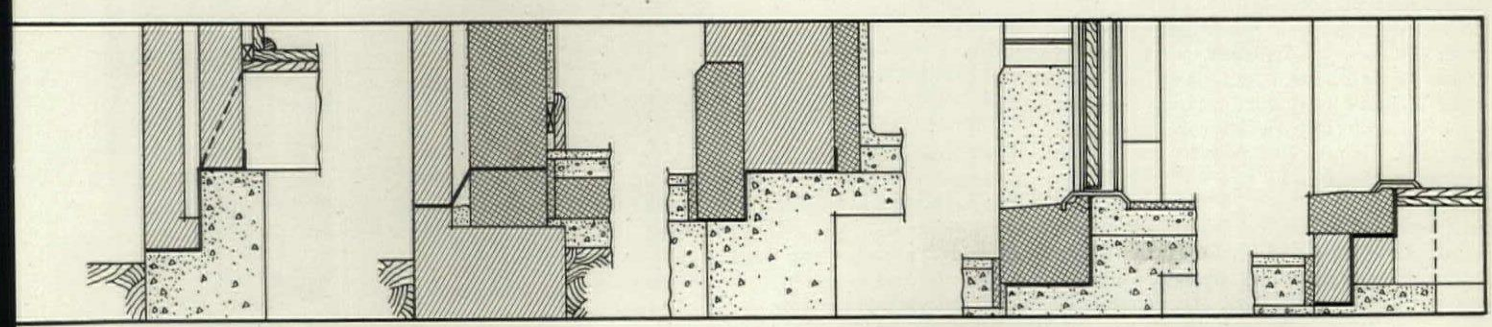
COPINGS











Hedrich-Blessing

BASIC CASE and four other standard units combine in endless variety. Photo, left, also shows Sanders' chairs, etc., designed to harmonize with Module furniture.

MODULE FURNITURE

A new type of unit furniture based upon a six-inch module, designed by Morris Sanders and manufactured by The Mengel Co., offers the designer storage pieces conceived on an architectural basis.

Late in July, the Mengel Co., possibly best known to architects as plywood and door manufacturers, held the first public showing of Mengel Module Furniture. Before that, Morris Sanders had spent nine years perfecting, simplifying, and finding a commercial sponsor for his brainchild, which consists of a series of standardized, assemblable, interchangeable storage pieces. Five units are in production, with more to be added to the line if demand warrants; the initial five may be assembled in almost endless variety. Ingenious as the furniture and its assemblies are, it remains utterly simple—a result of the exhaustive study which went into its design.

The basic unit is 18"x18"x36", consists of four sides and a back, and may be used horizontally as well as vertically. All four sides contain bolt holes in which can be inserted the simple metal "Module Connectors" that secure adjacent units in an assembly. Into the same holes may be inserted drawer slides or aluminum-channel shelf brackets, etc. Units may be fitted with solid or grilled doors, with sliding plate glass doors, with shelves or drawers, with one of three types of standard bases, or with wood spacers used, for instance, to separate top units of a two-tiered chest from the base. Other sizes now in production are 12"x18"x36"; 12"x24"x36"; 18"x18" x18"; and a flat unit, 6"x18"x36", useful both as a drawer case and as a small table top. Additional auxiliary parts include specially designed metal-dowel hinges, table legs, etc. Assembly of the most complex piece can be accomplished by the average housewife; the screw-slots in the bolt heads are so designed that a 25-cent piece works them more easily than the conventional screwdriver. The bolt holes may also be used for wiring radios or lights; when not in use, the holes are filled with removable plastic plugs that provide an appearance distantly reminiscent of Early American pegged cabinet work.

But Module furniture is far removed in conception from such handicrafted forebears. It owes something to the sectional bookcase of the early 1900's and other predecessors; however, it is designed for mass production using contemporary materials and techniques. Although its price—it is on sale in department stores, at first in New York, later in most cities—is upper medium, probably it will eventually be produced in a different wood at lower prices. The present material is mahogany-surfaced, resin-bonded plywood, with strong, machine-milled, specially mitered joints at case corners, and with an integral, permanent, synthetic-resin finish that preserves the light caramel color of natural mahogany. Drawers are of molded plywood, with integral sides and bottom and rounded interior corners, easy to keep clean.

The furniture itself is a strong incentive to individual experimentation. It can be used as free-standing pieces, as storage walls, or built-in; even the standard handles and drawer pulls can easily be replaced with hardware to suit individual tastes.

ELECTRIC RADIANT HEAT

By L. N. ROBERSON, President, L. N. Roberson Co., Seattle, Washington

We have wondered for years about the possibility of heating houses economically and well with electricity. PROGRESSIVE ARCHITECTURE here presents the first description published in the United States of an electrically powered radiant panel system, economical at least where electric rates are reasonable, with individual room controls, requiring no central heating plant. A discussion of the system appears also in this month's issue of HEATING AND VENTILATING. —THE EDITORS

A Swedish electrical engineer, noticing the snow melting above an overloaded power cable, wondered if he could use a similar system to start his vegetables early and eventually developed a lead-covered cable for that purpose. When the Farm Electrification Department of the Puget Sound Power & Light Company heard of the cable about twenty years ago, they imported some and, after experimenting with it, induced the General Electric Company to manufacture a similar lead-covered, soil-heating cable, which was soon being used for a number of applications other than its intended purpose. To meet some of the new requirements, another cable, insulated with plastic of high water, acid, and alkali resistance, and smaller (approx. $\frac{1}{8}$ in.) in diameter, was developed by the L. N. Roberson Company. The Roberson cable, called "Heatsum," has high electrical strength and the ability to withstand continuous temperatures of 167F.

In 1940 the author explored the possibilities of using electric heat in the plaster, only to find that it had been done in England since about 1907. However, little design data were available and dire predictions as to results were received from all quarters. Professor Lionel H. Pries, of the School of Architecture of the University of Washington, offered one of the few bits of encouragement, based on personal observations of hot water radiant heat installations in this country and abroad. The Puget Sound Power & Light Company also cooperated by providing test meters for segregating the load. It soon became apparent that electric radiant heat was entirely practical with the electric rate prevailing in this area and a number of installations were made.

There are now over 150 installations using "Heatsum" cable for electric radiant house heating. The Federal Housing Authority has been approving loans on houses so heated for about five years. Insurance companies have been willing to insure all the houses so heated. The Underwriters' Laboratories say that, inasmuch as electric radiant heating does not become a complete system until it is installed, its safety is a matter for local inspection authorities. Some state and city codes are so worded that legislative action may be required before installations can be made, while other inspection authorities are very cooperative.

Features of the system that have excited favorable professional comment include: *absence of a central heating plant, freedom of design afforded by the elimination of duct work or piping, and individual room control.* Other factors, common to most types of radiant heating, are: cleanliness; the appearance of newness in houses so heated even after five or six years of occupancy without redecorating; and, in ceiling panel systems, a temperature differential between floor and ceiling of only 2 to 3F.

MATERIALS, SYSTEM DESIGN, CONTROLS

A Roberson electric radiant heating system consists of standardized lengths of "Heatsum" cable secured in intimate contact with wall, ceiling, or floor surfacing materials, connected through ordinary junction boxes to a power source, with each panel or group of panels controlled by a simple room thermostat and wall switch. Lengths of cable (or heating elements) are available in 250, 500, 1500, and 3000 watt capacities.

Design procedure is based on conventional convection heating using an air thermostat to meet individual requirements, usually a temperature between 58 and 72F. Examination of the comfort zone for radiant heating shows that, as the air temperature approaches 70F in the average well designed room, the heating panel temperature also approaches 70F if it is of correct size. As the outdoor temperature drops the increased radiation loss causes a demand for more heat, resulting in increased panel temperature.

This makes a much simpler condition to control than to maintain an air temperature of 64F and a panel temperature sufficient to balance outside conditions, particularly when outdoor temperatures rise slightly above the inside air temperature, a condition which would call for heat when no heat would be supplied by the panel if it were controlled by air temperature alone. While there are controls now on the market for meeting conditions of this type, their installation cost would be increased considerably when used with electric radiant heat where each room is individually controlled.

When considerable moisture has to be

Photos by K. S. Brown

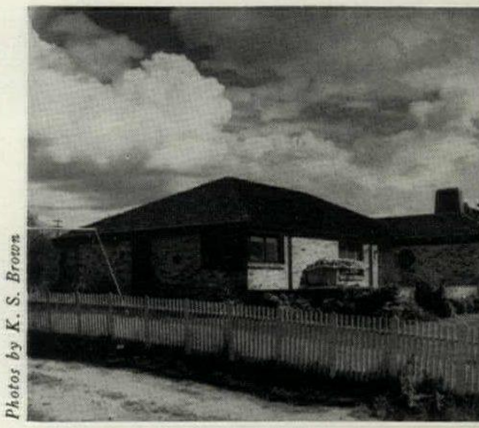


FIG. 1—Denny Grindall Residence, Seattle, Washington; electric radiant heated since 1941.

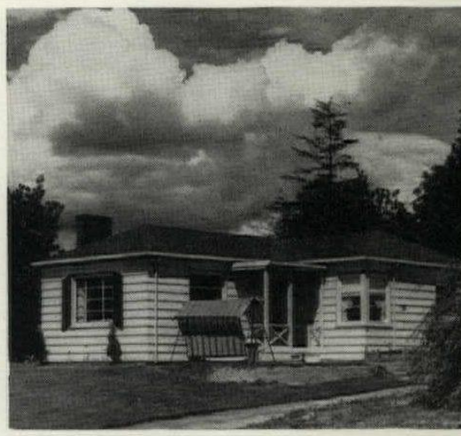


FIG. 2—Francis Hoover Residence, Seattle, Washington; electric radiant heated since 1943.

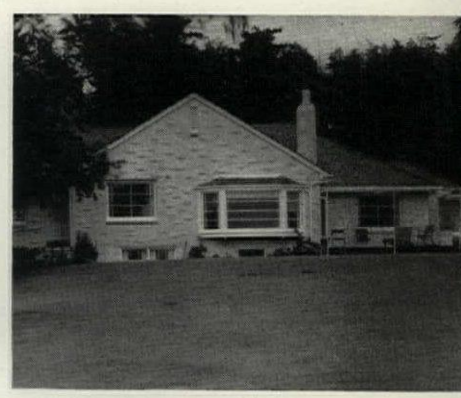
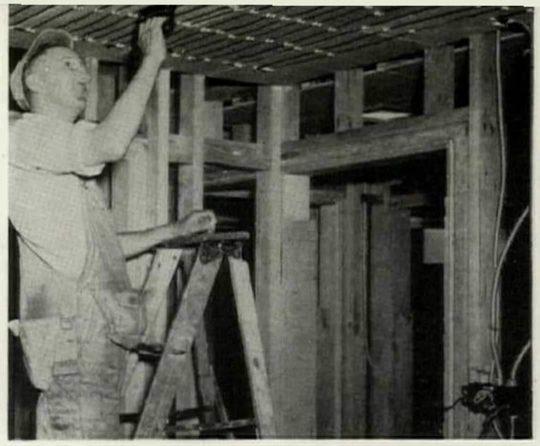


FIG. 3—R. B. Newbern Residence, Seattle, Washington; electric radiant heated since 1941. House designed by the owner, a mechanical engineer; general contractor, J. L. Grandey; electrical contractor, Hartzell Electric Co.



FIGS. 4 and 5—Top, dinette and kitchen, Newbern house; dark switch controls heating. Rooms had not been redecorated in 4 years when this photo was taken; note fresh appearance. Same is true of adjoining dining and living rooms (bottom photo, same house) which have independent thermostats and switches for controlling each room independently.

removed from the plaster and temporary circulating heaters are used to aid drying, the body feels increased warmth from the radiant heat as soon as the circulating heaters are *dis*connected, even though there may be an actual drop in air temperature of several degrees. This is true because body-heat loss is greater with convection than with radiant heat. To prevent such losses one should try to avoid cross drafts which introduce excessive air circulation. On the other hand, it has been possible successfully to heat rooms or porches open to the weather on two or three sides, so that the occupants may enjoy them even during cool days and evenings. See Fig. 13, which shows such a room heated by a panel in the ceiling —which is quite high (approximately 18 ft at the ridge). A floor panel would have been equally satisfactory.

Adjacent rooms, even though not separated, are individually controlled to compensate for temperature variations due to solar and other heat sources, because radiant heat does not flow from room to room in the same manner as convection heat. Electric ranges, toasters, mangles, lights, and even electric refrigerators emit heat which adds materially to the total heat available; this auxiliary heat may be used to advantage depending on how quickly the individual room thermostat responds to compensate for the additional heat in a particular room, whether from one or

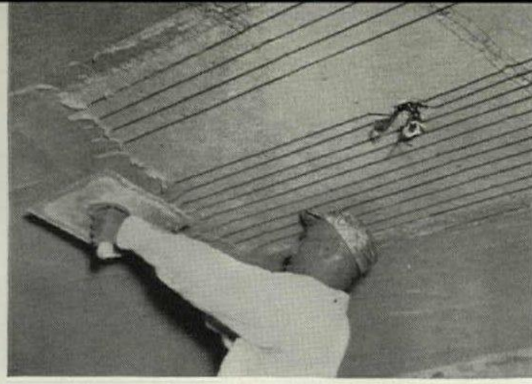
TABLE NO. 1 COST AND CONSUMPTION DATA ON ELECTRICAL HOUSE HEATING EQUIPMENT*

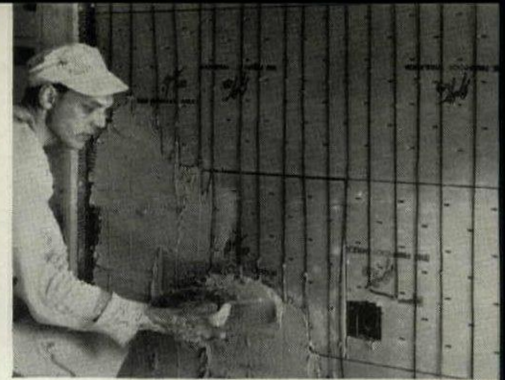
House	No. Rooms	Cu ft Air Space	Connected Heating Load (KW)	KW Consump. 1945	Total Annual Bill 1945	Annual KW per cu ft	Annual Cost per cu ft	Construction
1.	6	16,750	12.	30,510	$253.49	1.82	$.015	Brick Veneer
2.	5	6,400	10.5	26,460	245.78	4.07	.038	Frame
3.	6	7,750	9.2	12,740	144.20	1.65	.019	Frame
4.	5	6,000	9.0	16,500	157.19	2.75	.026	Frame
5.	5	6,800	7.5	20,080	170.04	2.95	.025	Frame
6.	5	6,450	9.0	16,000	160.65	2.48	.025	Brick Veneer on tile
7.	5	7,800	7.5	15,258	121.44	1.95	.016	Frame
8.	8	22,800	15.5	24,168	226.46	1.06	.01	Brick Veneer
9.	5	6,150	13.5	19,062	191.35	3.10	.031	Frame (also 2 HP pump)
10.	6	9,280	10.5	29,768	246.49	3.21	.027	Frame
11.	5	8,000	9.5	14,318	144.55	1.79	.018	Frame
12.	4	9,950	18.3	22,180	228.54	2.24	.024	Frame
13.	7	19,500	19.5	30,557	249.41	1.65	.013	8" Brick furred & Plastered
Average						2.36	.022	

REMARKS:

All houses have ceilings insulated with 3 to 3½ inches of noncombustible fill type insulation. Houses 7 and 12 also have walls insulated.
House 8 has three baths. House 12 has two baths.
House 12 has 32% glass walls.
House 9 consumption and cost figures include a 2 HP pump.

* Cost and consumption figures include electricity consumed for *all* purposes, including lighting, cooking, water heating, etc. All of the houses were heated by radiant heat from "Heatsum" cables installed in the ceiling or floor.
The houses listed in this table are on various rate schedules and for that reason the kilowatt hour consumption is a better index as to performance than is cost.
The rates varied from .7 of a cent to 1 cent per kilowatt hour on the final step. Most of the homes were on the final rate step after using approximately $5.00 worth of electricity.





FIGS. 6, 7, 8, 9—Heating elements must be installed over non-metallic plaster base when imbedded in plaster. Fig. 6 (far left) shows elements ending several inches from the wall to permit reinforcing the corner with metal lath, which must not touch element. Fig. 7 (left center): no reinforcing over lath joints, plaster applied parallel to element runs. Fig. 8 (right center) shows two common errors: elements run across metal joint-reinforcing, which should have been omitted; and two elements should not terminate in a single box—yet this installation remains satisfactory after 6 years' service and 2500-volt test. Fig. 9 (right): elements installed in a wall.

from a combination of several heat sources. Fig. 5 shows adjacent rooms, separately controlled, with the thermostat in each room visible. Data available from actual homes heated with "Heatsum" cable show roughly half the power consumed is used primarily for purposes other than heat, although the final result from the major part of this miscellaneous power consumption is usable heat.

HOUSE DESIGN CONSIDERATIONS

Fruit and flowers mature rapidly and so should be kept from under direct radiation. We also try to make ceiling heating surfaces as large as possible in order to keep the radiating surface temperature low, because high temperatures from overhead panels may cause discomfort, particularly to light-complexioned people. Houses with concrete floors show effects of condensation in "sweating" of the floor around the edges of rugs and carpets on the bare concrete when only the ceiling, walls, or both, are the source of heat. This may be remedied by placing the element in the slab when concrete floors are used.

A concrete floor requires approximately four hours to come up to temperature, drops 10F overnight when turned off, and requires about a week to drop back to normal temperature of soil below it. Plaster ceilings and walls reach a comfortable temperature in approximately 30 minutes from a cold start, although it may be several hours before the heat shuts off for the first time. After the plaster has a sufficient heat charge the element is rarely "on" more than one-third of the time. Moreover, the highest demand recorded in a 6-year period was 34% of the connected load. Tests conducted in the winter of 1945 on the author's residence (Fig. 10), by Washington State College in conjunction with the Puget Sound Power & Light Co., showed that the power consumed per room when the heat was turned off upon retiring and turned on again in the morning was the same as when left on continuously.

Double glazing apparently causes no greater heat saving than single glass in electric radiant heated homes. Present data actually show a lower power consumption for single glass, although more information, secured under controlled conditions, is required on this subject. Apparently double glazing reflects a greater part of the solar heat than single glazing. Brick veneer homes show a greater over-all heat economy than frame houses, while a calculation of comparative heat losses through walls would indicate the reverse!

There is less than 3F differential from floor to ceiling with electric radiant heat even with a 20- to 22-ft ceiling, and with the heat in the ceiling. Cold "shadows" remain under tables and desks when the angle from the extreme sources of ceiling heat is less than 45° off the vertical. In such cases, part of the heat should come from a wall or floor panel. If the wall is exposed, insulate with incombustible fill or bats.

INSTALLATION OF THE CABLE

Ceilings, walls. Where attics are accessible, "Heatsum" cable may be attached to the top of the plaster lath or plaster board from the attic side by insulated staples; or by loops of asbestos cord attached to the plaster board with a stapling machine; or with patching plaster. It may also be similarly secured to the surface to be plastered. When plastered in, the cable acts as a reinforcing over the plasterboard joints. No other metallic reinforcing should be used at any point where it will have to be crossed by the cable; this condition will cause a hum in the wire when the heating element is "on."

Plastering. When the element is plastered in, a standard brown coat is placed over it and allowed to dry at least three days before heat is applied through the embedded cables to finish drying. The plasterer should apply the brown coat parallel to the elements. For this reason, wall elements are run vertically. The brown coat should be thoroughly dry before applying finish coats. If the surface is sand-finished, heat may be turned on in three or four days, or as soon as the surface appears dry. Turning it on sooner may cause a water mark at each run of element which will show through water-mix paints. Putty coats should set for seven or eight days before applying heat, in order to prevent checking as the putty sets.

FIGS. 10, 11, 12—Top photo shows the author's house in Seattle; electric radiant heated since 1940. Center, two houses, part of a 29-house Seattle project for which Stuart and Durham are architects; all houses to be electric radiant heated. Bottom, another Stuart and Durham house, similarly heated.

TABLE NO. 2 ONE YEAR'S MONTHLY BILLS — HOUSE NO. 12

Month	KWH Used	Amount Billed	Non-Heating		Heating	
			KWH	Cost	KWH	Cost
January	2610	$ 26.27	414	$ 6.43	2196	$ 19.84
February	2890	29.07	962	10.28	1928	18.79
March	2430	24.47	888	9.75	1542	14.72
April	1620	16.37	632	8.00	988	8.37
May	1220	12.37	682	8.30	538	4.07
June	800	9.15	558	7.45	242	1.70
July	620	7.89	588	7.65	32	.24
August	660	8.17	580	7.60	80	.57
September	860	9.57	636	8.00	224	1.57
October	1360	13.77	798	9.15	562	4.62
November	2980	29.97	818	9.25	2162	20.72
December	4130	41.47	914	9.95	3216	31.52
Totals	22180	$228.54	8470	$101.81	13710	$126.73

TABLE NO. 3 TYPICAL DESIGN CALCULATION FOR A CEILING PANEL HEATED ROOM

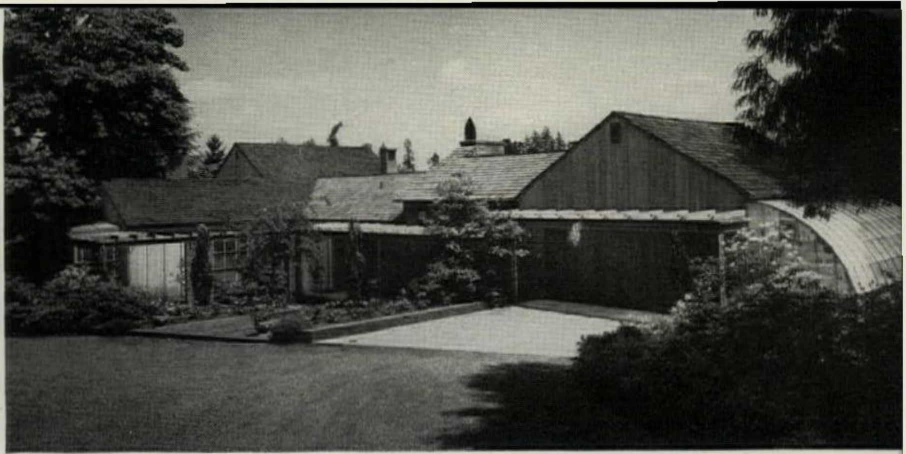
						Btu/deg. F
1. Ceiling area in sq ft	(256)	X	"U" factor for plaster board and plaster plus 3⅝" vermiculite insulation	(.07)	Equals	18
2. Floor area in sq ft	(256)	X	"U" factor for hardwood floor over fir sub-floor	(.34)	Equals	87
3. Window area in sq ft	(37)	X	"U" factor for glass	(1.13)	Equals	42
4. Net exposed wall area in sq ft	(169)	X	"U" factor for brick veneer, 1" wood sheathing, ½" rigid insulation, ½" plaster	(.20)	Equals	47
5. Cubic contents	(2048)	X	Hourly air changes *(1)* by infiltration, 1 wall exposed *(Btu/degree/cu ft of air)*	(.018)	Equals	37
TOTAL Nos. 2 to 5						213
A. No. 1 *(above)*	(18)	X	Maximum ceiling temp. minus minimum outside design temp.	(84 - 10)	Equals	1,332 Btu
B. Total of Nos. 2 to 5 *(above)*	(213)	X	Surface temp. of room side of exposed surfaces minus outside design temp.	(50)	Equals	10,650 Btu
TOTAL Items A. and B.						11,982 Btu

C. Correction factor for heat gain from lights, space occupied by furniture, etc. X Total Btu divided by Btu/kwhr Equals Maximum heating load

(.8) X $\frac{11,982}{3,413}$ Equals 2.8 kw Maximum design demand

CHECK:* $\frac{(1\frac{1}{2})\ (2048)}{1,000}$ Equals 3.07 kw Use 3 kw element

* As room has over 2,000 cu ft of contents, 1½ watts per cu ft is used. Had the room had under 2,000 cu ft, 2 watts per cu ft would have been used.



FIGS. 13, 14, 15—C. R. A. Pearce Residence, Seattle; Paul Kirk, architect for remodeling in 1940. Original unit heated by hot water radiators; dinette, kitchen, bath, by hot water radiant panels; living room, dining room, outdoor living room by electric radiant heat. In dinette, hot water panels were replaced with electric ceiling panels after 5 years. Entire heating is to become electric radiant according to present plans. Left-hand photo shows electric radiant heated outdoor living room (see text); bottom photo, indoor living room heated by electric panels in ceiling, which is approximately 20 ft high at ridge.

Finishes. So far we have found no finish—water paint, paint, or paper—which is adversely affected by this method of heating, except that the finish stays clean for a long time with electric radiant heat. We have found that a dark area will appear on an uninsulated portion of a ceiling after a few months. Hence, care should be exercised in placing insulation to make sure that it covers the entire ceiling area, and even laps over any adjacent unheated area if necessary.

Floors. Magnesite flooring may be poured over the "Heatsum" element in much the same manner as plaster. The scratch coat is usually poured first with considerable sawdust added. The element is then stapled to the scratch coat and covered with the finish coat. In concrete floors, the cable should be evenly spaced in parallel lines over the area to be heated, and laid approximately one inch below the finished surface. Leads may be brought from the concrete to a terminal box in conduit providing the leads are insulated from each other by loom, glass or asbestos sleeving, or other suitable means. Not more than the two leads of one circuit may be enclosed in one conduit. A two-hole rubber cork may be used as a stopper in the concrete end of conduit.

Thermostat location. The thermostat is located 5 ft above the floor, in the room it controls. Where practical, it is placed over the switch controlling the circuit and on an inside wall that does *not* contain a heating element. Presence of a heating element in the wall adjacent to the thermostat causes erratic temperature control.

DESIGN CALCULATIONS

We try to obtain a "U" factor for insulated ceilings between .005 and .007 (this is usually obtained with 3½ or 4 in. of incombustible insulation), and an exposed wall and floor factor of approximately .25. For concrete floor slabs on the ground we use .19 providing suitable insulation is used between the slab and the footings or exposed walls. (Otherwise we increase the factor to .30.) We assume a soil temperature of 50F. These slab assumptions are empirical, based on the theory that sandy soil in this area acts as floor insulation as well as a means of heat storage; performance of actual installations indicates that these factors are adequate. For concrete walls and other types of construction, we use the factors shown in the ASHVE "Guide."

When the "U" factors are approximately as outlined, and the minimum design temperature outside 0°F or above, a quick check of the load required may be made by allowing 1½ watts per cu ft for large rooms (over 2,000 cu ft) and 2 watts per cu ft for rooms under 2,000 cu ft of space to be heated. Of the heating elements available, one should use the size larger than the total wattage required per room. Where more than one element is required, use of two or more of the same size simplifies control. Each room is figured as a separate unit. The Roberson Company maintains an engineering department to assist in design and installation. A nominal charge is made for this service when drawings are prepared.

SUMMARY

1. Electric radiant heat is economically practical on electric rates of one cent per kilowatt hour. When higher rates prevail, one must consider whether added convenience and other desirable features warrant the additional operating cost.

2. No heating plant or fuel storage space is required.

3. Individual room control is simply accomplished.

4. Conventional plaster is entirely satisfactory; conventional finishes may be used.

5. Maintenance is extremely low; practically the only replacement is on toggle switches. Four element breaks have occurred in 150 installations. About 30 minutes is required to locate and repair such a break and it is only necessary to open up a small hole, approximately 1½ in. long by ¾ in. wide.

6. Heat calculations for electric radiant heating are the same as for other forms of radiant heating although we use some shortcuts.

7. Electric radiant heating provides the same all-pervading warmth and cleanliness as other radiant heating systems.

FIG. 16—Portable electric radiant heating screen plugs into suitable outlet, affords heat enough for small bedroom or bath. Screen is also available in larger sizes—3 or 4 panels, has thermostatic controls, is manufactured by Electric Radiant Heat Co., Seattle, Washington.

MANUFACTURERS' LITERATURE

★ *Editors' Note: Items starred are particularly noteworthy, due to immediate and widespread interest in their contents, to the conciseness and clarity with which information is presented, to announcement of a new, important product, or to some other factor which makes them especially valuable.*

Affixing Means

1-52. *Nailock Steel Channels,* Sanymetal Products Co., Inc. Reviewed August.

Air Treatment

1-53. *Strato-Liminator,* illus. consumer folder (5x4½) and data sheet; ceiling-mounted fan with circular directional vanes for recirculating room air. Wilster, Inc.

18-31. *Worthington Equipment for Refrigeration and Air Conditioning (Bulletin WP-1099-B48),* Worthington Pump & Machinery Corp. Reviewed August.

1-51. *Young Heating, Cooling, Air Conditioning Equipment,* Young Radiator Co. Reviewed August.

Awnings

1-54. *Aluminum Awnings Are Something Between You and the Sun,* illus. folder (6x9) on roll-up aluminum awnings for store fronts. Aluminum Awnings Co.

Communication Systems

3-65. *Amplified Intercommunication Systems, AIA File 31-i (TL-36),* 16-p. illus. technical folder; specifications; "Teletalk" systems for industrial, institutional, business installations. Webster Electric Co.

Controls

3-64. *Penn Automatic Controls for Heating Service (Bulletin 1508-K),* Penn Electric Switch Co. Reviewed August.

Doors

★ 4-57. *Berry Aluminum Overhead Type Garage Doors,* 4-p. illus. folder. 60-lb all-aluminum garage door (residential); specifications; installation instructions. Berry Door Co.

4-55. *Kennatrack, AIA File 27-A,* Jay G. McKenna, Inc. Reviewed August.

4-58. *Truscon Straight Slide Steel Hangar Doors (C-30),* 24-p. catalog. Descriptions, illustrations, specifications, for manually or motor operated straight slide doors and tail doors. Truscon Steel Co.

Drafting Room Equipment

4-56. *What's Your Postwar Problem?* Charles Bruning Co., Inc. Reviewed August.

4-59. *Pomeroy Stereograph Drawing Machine,* 4-p. folder on device for making perspectives mechanically. Instructions for use, drawings. Pomeroy Stereograph Co., Inc.

4-60. *The New Universal Boardmaster,* 8-p. illus. pamphlet explaining operation of drafting device convertible to changing requirements. Universal Drafting Machine Co.

Electrical Equipment

5-31. *Hanger Outlets and Floor Boxes (No. 72), AIA File 31-C-72,* Frank Adam Electric Co. Reviewed August.

5-32. *Electrical Modernization Guide,* General Electric Co. Reviewed August.

5-33. *Four Degrees of Home Electrification (B-3774),* Westinghouse Electric Corp., Better Homes Dept. Reviewed August.

Fireplace Equipment

6-66. *Your Fireplace,* Majestic Co. (25 cents per copy—make check or money order payable to Majestic Co.) Reviewed August.

Flooring

"Idea" portfolios on store modernization, based on trade association recommendations. Armstrong Cork Company:

6-69. *Ideas for the Retail Confectioner Who Wants A Shop That Attracts Customers.*

6-70. *Store Planning Ideas for the Appliance Dealer Who Wants to Build a Successful Business.*

6-71. *Maximent,* 4-p. illus. folder describing advantages of Maximent, an aggregate and cement mix (dry-packed) for finishing concrete floors. Specifications. Maximent Corp.

6-72. *Industrial Flooring and Marine Decking,* 6-p. illus. pamphlet explaining types, applications, and characteristics of "Millerite" heavy-duty synthetic resin flooring with abrasive surfacing. Miller Marine Decking, Inc.

6-68. *Norton Floors (1935),* Norton Co. Reviewed August.

Gypsum and Gypsum Products

7-52. *Architectural Specifications, AIA File 37-A,* U. S. Gypsum Co. Reviewed August.

Hardware

8-120. *Door Holding Devices & Builders' Hardware Specialties for Distinctive Buildings, AIA File 27B,* 1941 catalog of doorholders, shock absorbers, bumpers, stops, latches, pulls, door silencers, mutes. Operation descriptions, specifications, installation template drawings. Glynn-Johnson Corp.

8-121. *Lockwood Finishing Hardware, Simplified Specifications,* 20-p. illus. guide for selection of locks and hardware for 6 building types: apartments, hospitals, hotels, institutions, residences, schools. Specifications. Lockwood Hardware Mfg. Co.

8-122. *Schlage Luster Sealed Aluminum Locks (Form 364),* illus. consumer folder on a push-button, knob-keyed lock with "alumilited" finish. Detail drawing. Schlage Lock Co.

Heating and Heating Equipment

8-103. *Quikheter Convection and Radiant Heat (73), AIA File 31-K-3,* Frank Adam Electric Co. Reviewed August.

8-104. *Aldrich Heat-Pak Oil-Fired Boilers (BB4512-10),* Aldrich Co. Reviewed August.

8-105. *Quick Heat Oil Furnaces for Automatic Heating,* 6-p. illus. folder on an automatic oil furnace unit with pressure fan, for small homes. American Stove Co.

8-106. *New Units of Complete Norge-Heat Line,* 2-p. illus. folder on oil-burning winter air conditioners, furnaces, hot water heaters. Borg-Warner Corp., Norge-Heat Div.

8-124. *Radiant Heating the Smart Modern Way With Radiant Baseboards (Form 859B),* 4-p. illus. folder; hollow cast-iron baseboards for hot water, 2-pipe steam, or vacuum heating systems. Burnham Boiler Corp.

8-109. *Century Oil Burner, Model L,* Century Engineering Corp. Reviewed August.

8-108. *Electrol, A Complete Unit for the Small Home (Form 578),* Electrol Incorporated. Reviewed August.

★ 8-125. *Electromode Electric Home Furnace,* illus. 2-p. sheet on electric central heating unit for warm air systems for small homes, offices, plants. Electromode Corp.

8-126. *Herco Residential Oil Burner,* illus. pamphlet (6¼x6¾); oil-burning unit for houses. Herco Oil Burner Corp.

8-113. *Iron Fireman Model V Oil Burner (1145),* 2-p. illus. looseleaf folder on an oil burner unit (luminous vortex flame principle). Dimensions, controls, specifications. Iron Fireman Mfg. Co.

8-127. *Petro Automatic Boilers (Form 7),* 4-p. illus. folder on 2 sizes of oil burners for average houses; E.D.R. ratings. Petroleum Heat and Power Co.

8-114. *No Basement Necessary with the Quaker Hi-Boy (611),* Quaker Mfg. Co. Reviewed August.

8-115. *Rexoil Fuel Saving Oil Burner (641),* Reif-Rexoil, Inc. Reviewed August.

8-128. *Mammoth Certified Vertical Steel Tubular Heaters (216C),* 4-p. illus. bulletin on gravity and forced warm air units for commercial and industrial buildings, auditoriums, schools, churches. Specifications. Stainless & Steel Products Co.

8-129. *Triplex Products That Assure Hot Water at Its Best (Bulletin 246),* 16-p. illus. booklet. Hot-water heating system with accessories: circulators, flow control valves, distributors, expansion tanks, air eliminators, control units, sump pumps, etc. Triplex Heating Specialty Co.

Hospital Equipment

Laundry layouts for hospitals of varying sizes; plans; water, steam, power, and equipment requirements; recommendations. American Laundry Machinery Company:

8-131. *Typical Laundry Layout for 25-Bed General Hospital.*

8-132. *Typical Laundry Layout for 50-Bed General Hospital.*

8-133. *Typical Laundry Layout for 100-Bed General Hospital.*

8-134. *Typical Laundry Layout for 150-Bed General Hospital.*

8-135. *Typical Laundry Layout for 200-Bed General Hospital.*

★ 8-130. *Sterilizers, Operating Lights, Infant Incubators, Laboratory Apparatus for Every Hospital,* looseleaf portfolio of data including size standardization of sterilizers; price lists. Wilmot Castle Co.