PROGRESSIVE ARCHITECTURE
PENCIL POINTS

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ARCHITECTURE AND THE CHURCH

The design of a church building should be a creative act, motivated by the love of God and of humankind.

Too often, within our times, it has been approached as a matter of business, and the designer's stock in trade has been an extensive knowledge of historic details, rather than understanding and imagination. The result is that too few churches of today are true works of Architecture.

We are all about to build together a new period of history. It is a time when spiritual as well as physical reconstruction must be undertaken all over the world. The Churches of all faiths have at the moment an opportunity to begin to restore religion to as vital a place in the life of our times as it held in the middle ages. God knows, the world needs it! To do this the Church must go forward; it cannot expect the people to turn back to the ways of other centuries. Will it meet the challenge?

One of the infallible indications we will have of whatever progress the Churches may make during these next years will appear in their plans for new buildings. If they insist upon clinging to the superficial architectural forms that have grown meaningless in today's world, we will know that they are not yet awake to their responsibility as a part of evolving society. If, however, they return to the basic architectural virtues that marked the truly fine church buildings of all times, we will have evidence of a sincere intent to be a genuinely influential part of contemporary life.

The church must, above all buildings, be honest. Its architecture must be as truthful in plan and structure as its teachings. And since it is a center for the expression of the finer emotions, it should be as beautiful as the collaborative genius of architects, artists, and craftsmen can make it.

This clearly does not mean applied archeology: neither does it mean "modernistic" design or any other stylistic fad. It means Architecture. Every real creative architect knows what that is. The others don't count.

Kenneth Reid

Sanborn

Chapel Of The Transfiguration, Moose, Wyoming

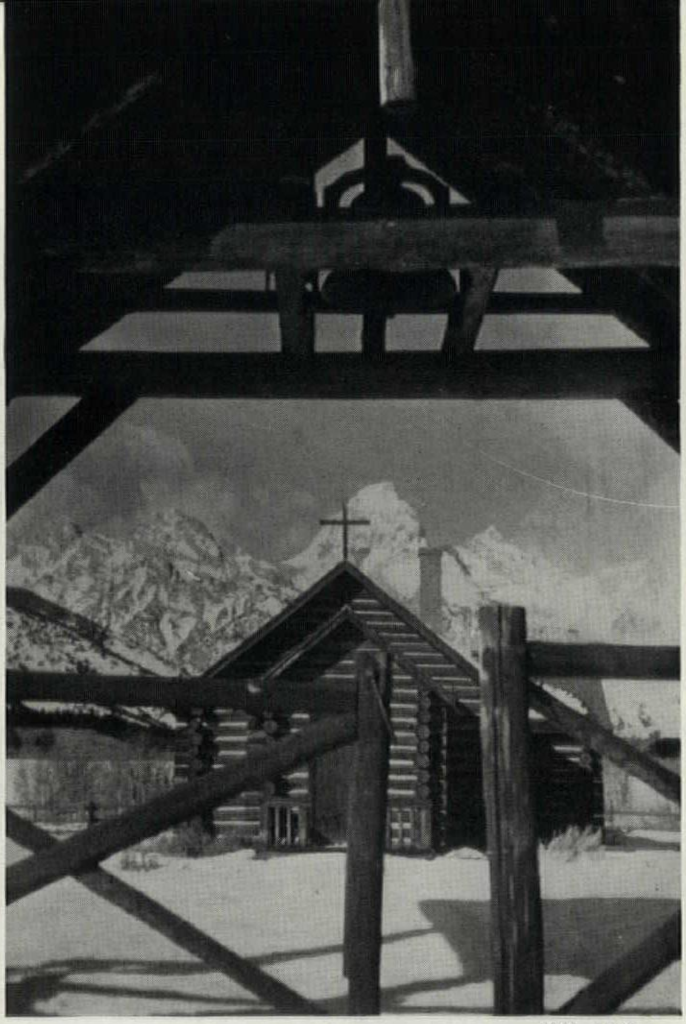
It would be heavy-handed to indulge in a technical, architectural analysis of this disarming little Chapel. The word "reredos," for instance, would seem uncomfortably sophisticated to apply to the dramatic over-altar treatment—a sheet of plate glass that transmits a breath-taking view of the Grand Teton Mountains. Within its obvious limitations, however, the Chapel constitutes an exceptionally instructive juxtaposition of superb site, honest planning for use, and natural materials logically employed—good architecture, in short. That it also achieves a spirit that seems highly appropriate for a House of God makes it particularly pertinent to this issue.

Perhaps the most important factors affecting the development of this Chapel were the sincere faith and devotion that went into it—elements which cannot be learned from formulas or data sheets. In addition, however, the little structure possesses numerous notable characteristics that could practically serve as a check list for the progressive designer commissioned to design a contemporary house of worship—simplicity, dignity, directness in plan and structural expression, a site that makes a travesty of the city man's notion of values, restraint, unpretentiousness. With this example before him, the architectural stylist might ponder to what avail—either in God's honor or to the building committee's budget—are the costly architectural fragments with which he delights in loading his edifices.

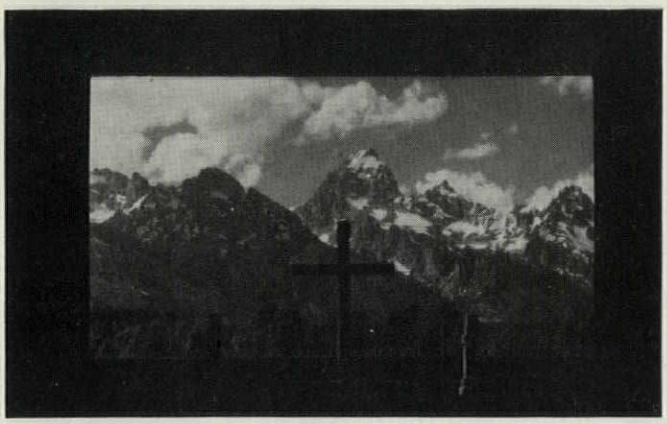
The Episcopal Chapel, located in the fabulous Jackson Hole section of Wyoming, was the gift of Mr. and Mrs. Charles B. Voorhis of Pasadena, in thanksgiving for their children, Virginia and Jerry—the latter, the present Congressman from California. Built in 1925, the Chapel was designed by the late Very Reverend Royal H. Balcom, who was then Archdeacon of the Diocese that includes this portion of the State. As Mr. Voorhis tells us, "Doctor Balcom chose the site and planned the chapel in every detail, arranging for getting the logs out of the forest and bringing them down."

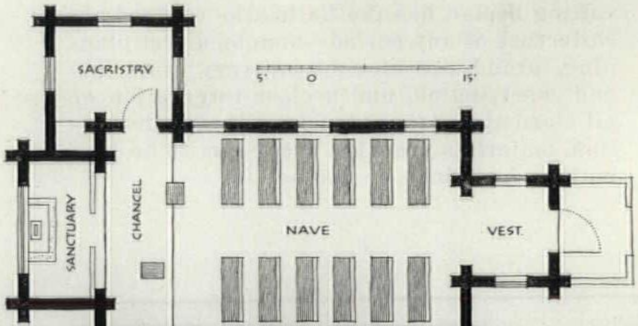
All of the log work was done by experienced local axmen. The pews are made of quaking aspen saplings, as are also the altar, the lectern, and the pulpit. The grounds are enclosed by a fence of lodge pole pine logs, and the sheltered entrance gate is covered with a roof of saplings, underneath which hangs a bell, brought from Dr. Balcom's old church at Irvington-on-Hudson, N. Y.

The Chapel is used only during the summer months, inasmuch as heavy snows make access in winter difficult. The congregation, coming from a wide surrounding area, includes many ranch visitors who arrive on horseback to attend services. The Chapel interior seats but 100; to provide for "overflow," an awning is arranged outside the building in fine weather. It is interesting to know that the Chapel has proved so popular that in one prewar summer, more than 16,000 persons signed the register.

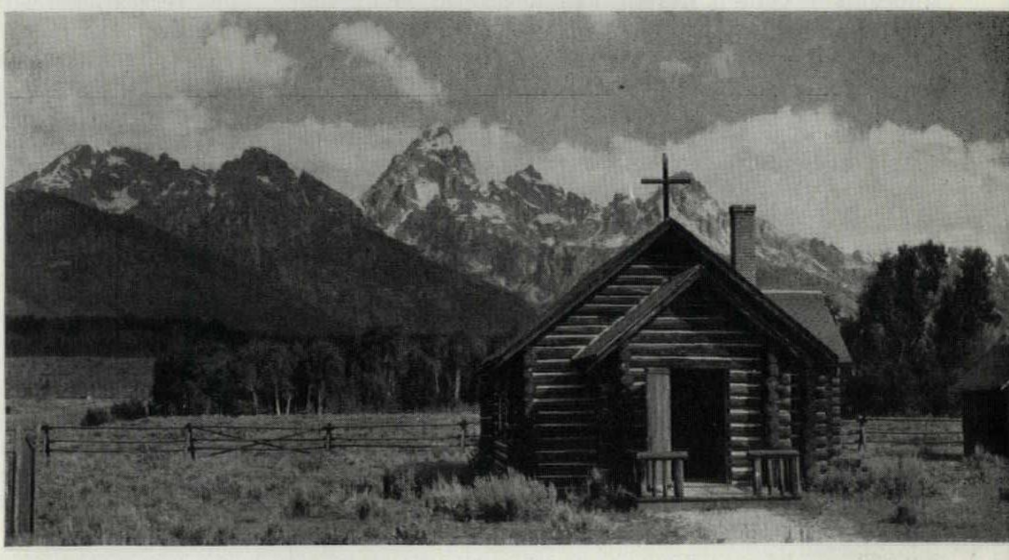


Mildred S. Capron





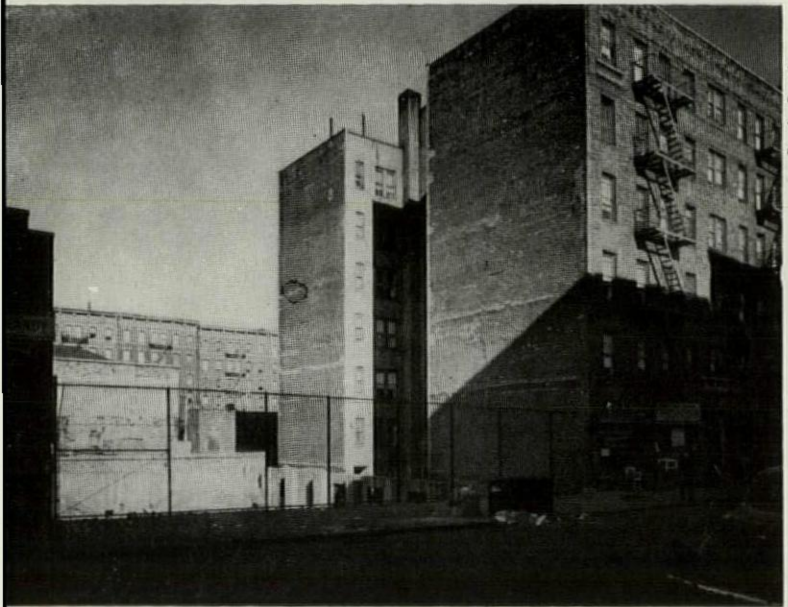
Above, at right: winter view of the Chapel, taken through the entrance gateway. Directly above: the plate glass window over the altar silhouettes the Cross against a view of the Grand Tetons. Below, right: general view of the Chapel taken within the yard enclosure.



Scholz

A Liberal Catholic Church For New York City

JEDD REISNER AND ASSOCIATES, ARCHITECTS



P. A. Dearborn

The site, already excavated (for a project that was abandoned), is 80 feet wide and 100 feet deep.

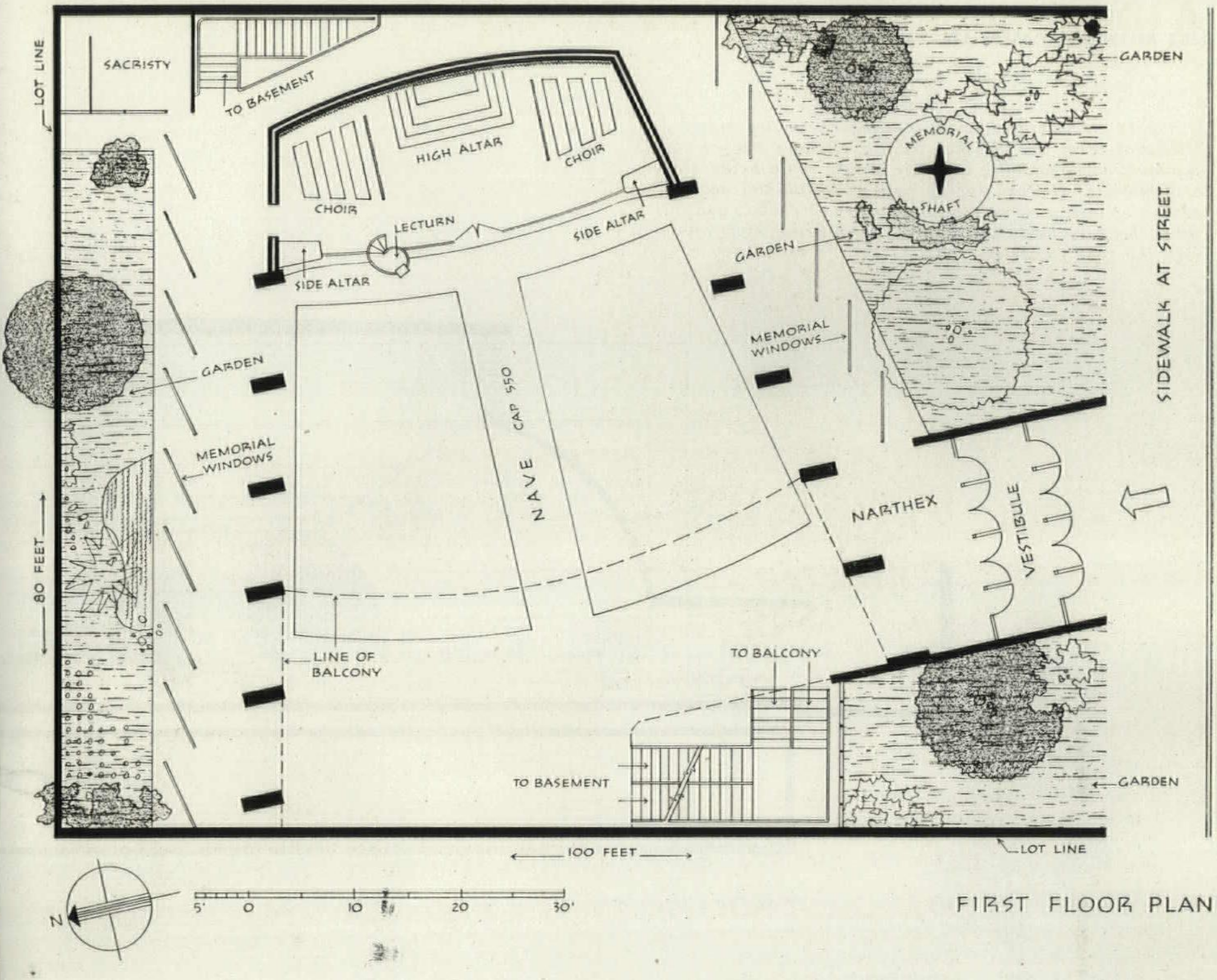
Architects and client: Jedd Stow Reisner, Architect; John P. Hunter, Associate; Manfred Hufschmid, Associate; the Rev. James P. Roberts, Rector.

Seldom does an architect have the opportunity to design a church with no stylistic strings attached. The church shown here is an exception. The only requirements were to meet the basic liturgical needs, provide space for the congregation, and stay within a modest budget. How these should be met was left entirely to the designers. Happily, progressive minds were at work, and the resulting design has the hallmarks of good architecture of any period—simple, direct planning, proud use of contemporary materials and construction, and a close integration of all elements so that structure is also decoration, materials are what they seem to be, and nothing is hidden or apologetic.

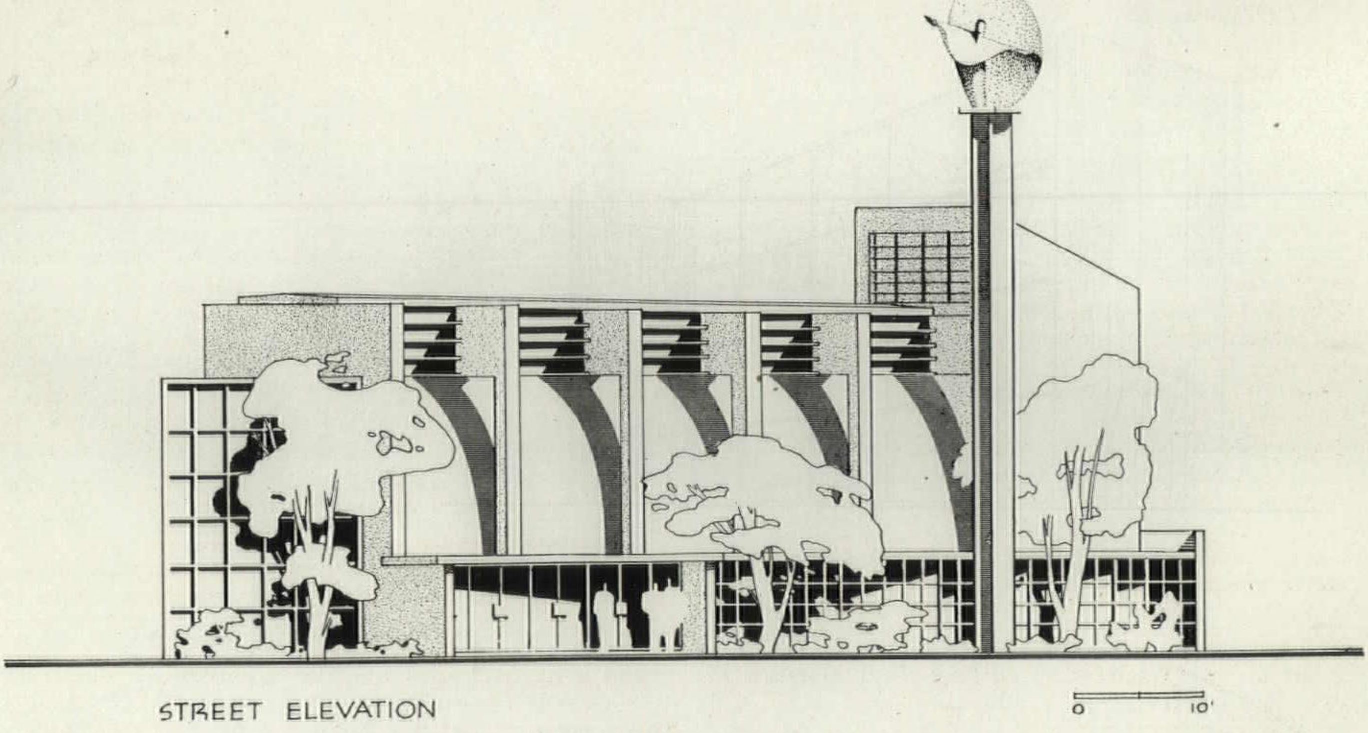
Requirements: The congregation for which this extraordinary church design was developed is of the Liberal Catholic faith. Not a branch of the Roman Catholic Church, it includes in its ritual some of the richness of that Church while maintaining many aspects of the preaching service of most Protestant Churches. The stated requirements were few and simple: the altar should be toward the east; the church should be the only room (except for the sacristy) at street level; two side altars should be provided in addition to the central high altar; and the auditorium should accommodate 500. Otherwise, the only limiting factor was the physical size of the site—80 feet wide toward the street, 100 feet in depth, and flanked on both sides by existing buildings.

Solution: In approaching the design, the architects gave first consideration to the particular spirit and needs of the congregation to be served. The religious functions were to be of utmost importance, as this group gives intense interest to its religious life and celebrates Sunday as a distinct day of worship. Social and recreational activities were assigned a minor role—and, in the plan, to the basement level. The architects' chief wish, therefore, was to provide for these people the best possible means for expressing their faith and conducting their services in a simple, straightforward building that could be maintained at minimum expense.

The site is in a crowded residential section of New York; little exists nearby in the way of planting or open space, and the congregation, for the most part, does not afford the luxury of country homes or frequent trips out of town. Hence, a touch of nature in the form of attractive landscaping was considered a "must." These planted areas, occurring at both front and rear, help insulate the auditorium from both street and inner-block distractions and, seen through the windows that line the outer walls of the auditorium, provide the congregation with a desirably peaceful outlook from within the church.

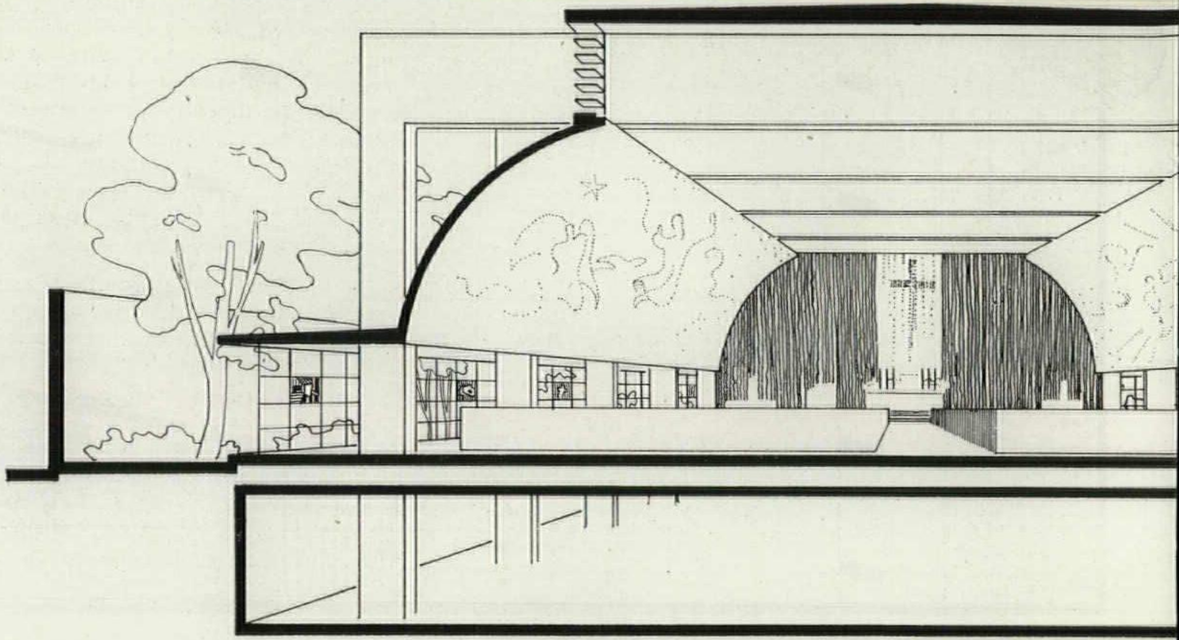


FIRST FLOOR PLAN

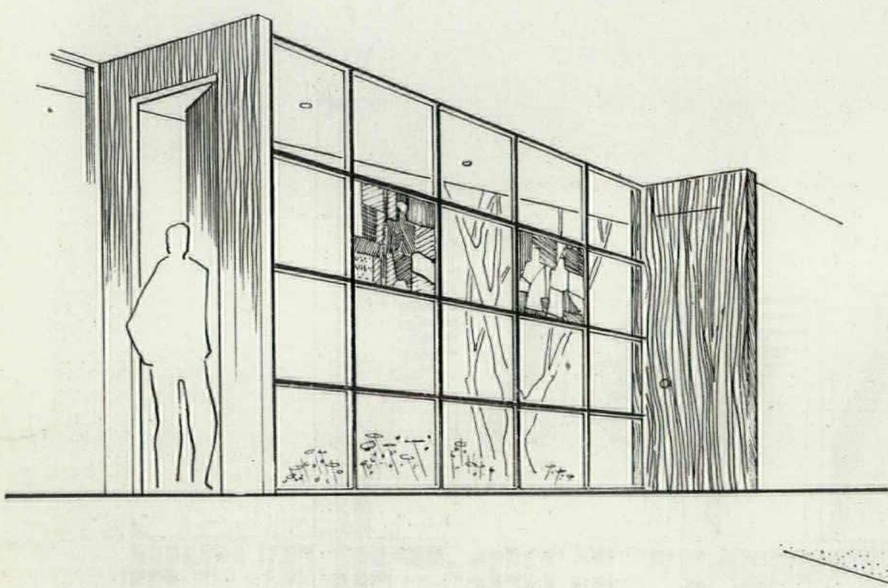


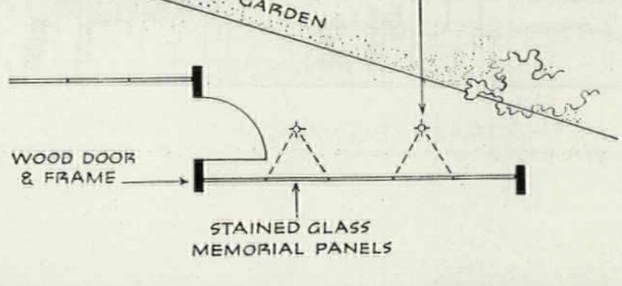
STREET ELEVATION

At right: transverse section showing the unity between structural form and finished design. Below: one of the step-back window walls; separate panels could be devoted to memorials. Bottom, facing page: longitudinal section, balcony at left, girders and clerestories at center, and, at right, the curtained, curved wall behind the high altar. Note the roof projection that floodlights this area.

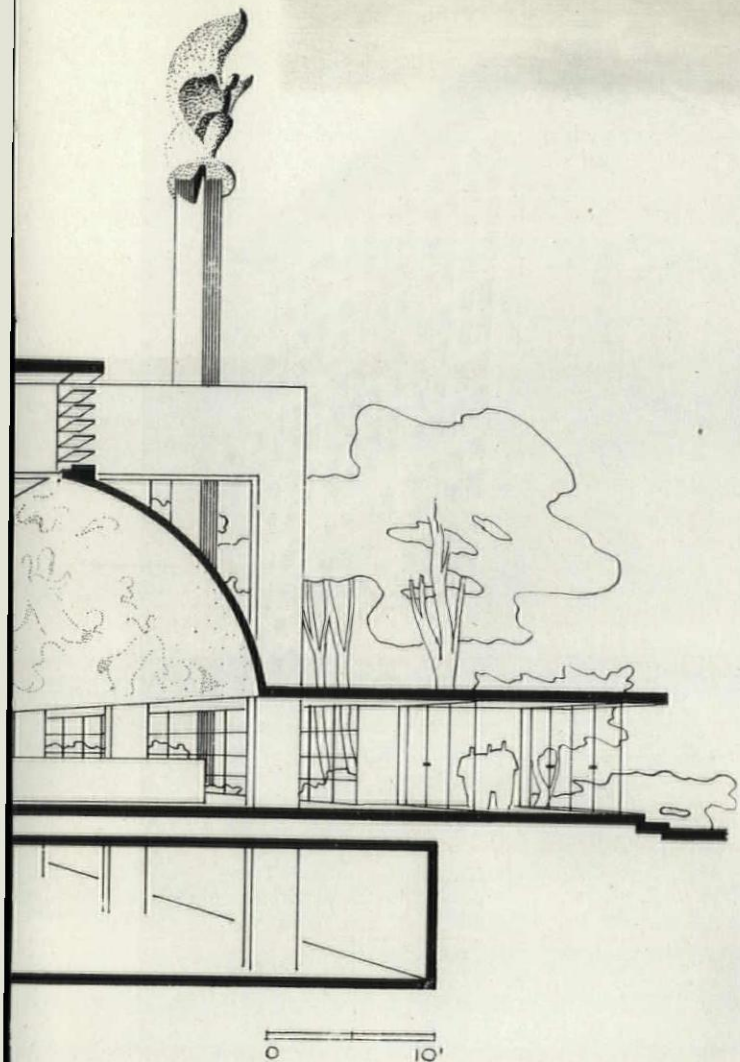


CROSS SECTION



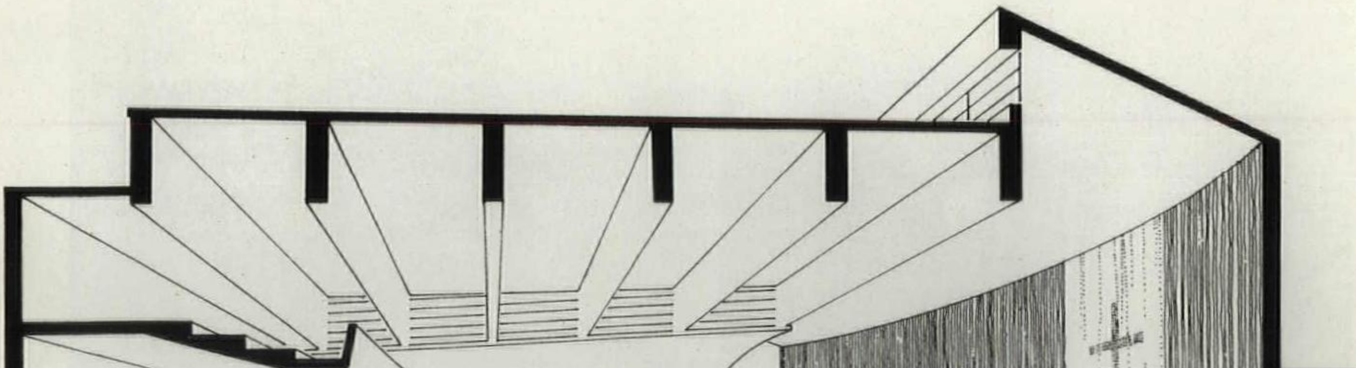


DETAILS OF
MEMORIAL WINDOW

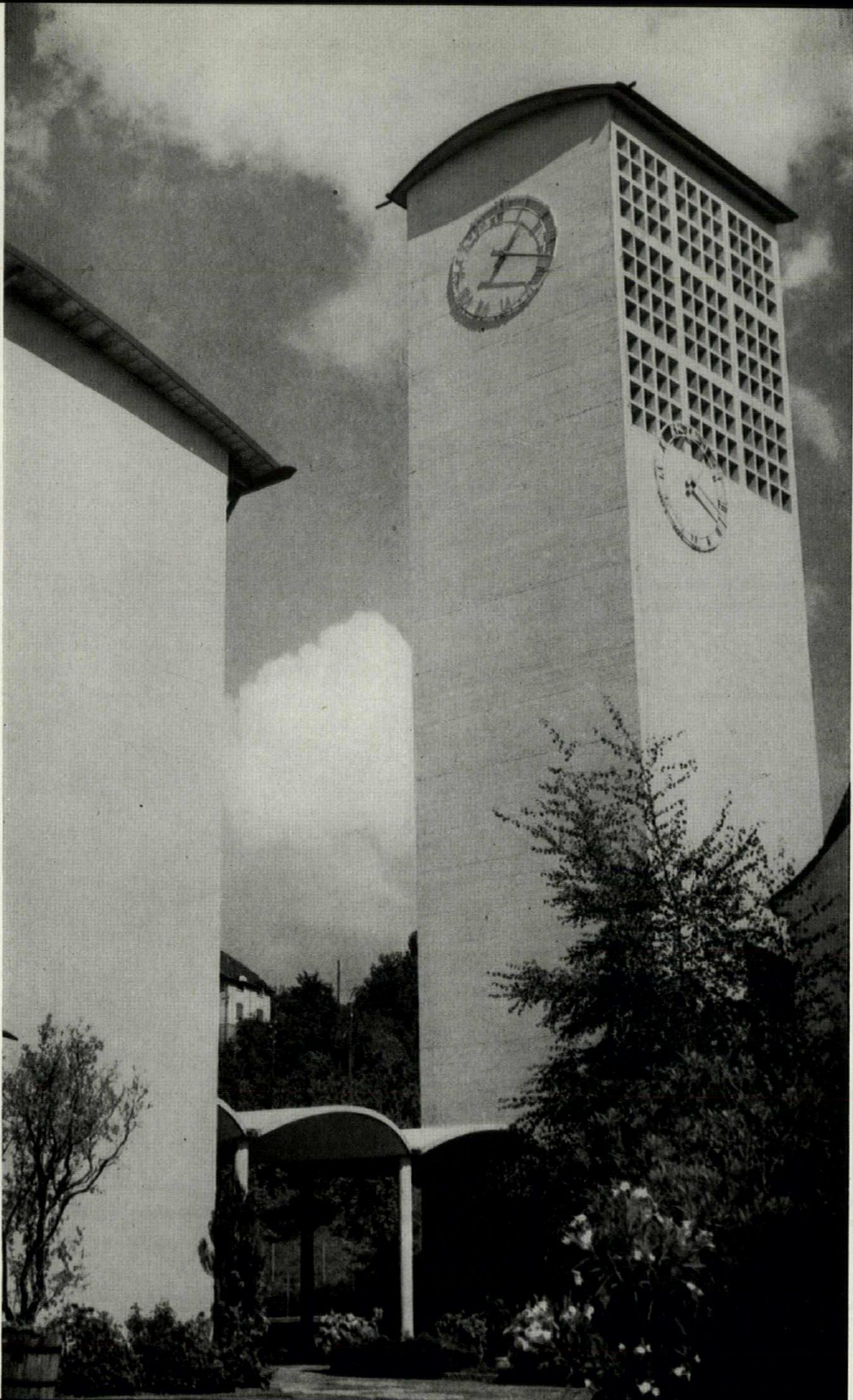


Structure: A series of rigid reinforced concrete frames is the basis of the structural system. In adopting the integrally poured column and girder method, the architects killed three birds with one stone: automatic fireproofing; simplified flashing and waterproofing problems around the clerestories between girders; minimum maintenance. The arched side walls are a further instance of integration—one element where otherwise there would have to be both a wall and a ceiling. The idea is that these curved surfaces would eventually be treated with a controlled scheme of memorial sculptures. Aside from the simple structural forms of the building, the only visual distraction is on the east or altar wall which is draped for its whole width from floor to ceiling. A roof projection just in front of this area throws a flood of daylight onto the altar and dais. Artificial illumination would be placed to parallel daylighting sources.

General Note: The architects comment: "It is interesting to discover in final analysis that a great many familiar church forms are present in this building—forms reminiscent of flying buttresses, recall of the barrel vault, clerestory lighting. There was no effort to bring these elements into the design . . . they appear because they did the best kind of a job for a church of this nature. The forms were dictated primarily by the physical needs of the church and the structural properties of the various building materials used and they had no preconceived relation to historical forms."



LONGITUDINAL SECTION



Peter Heman

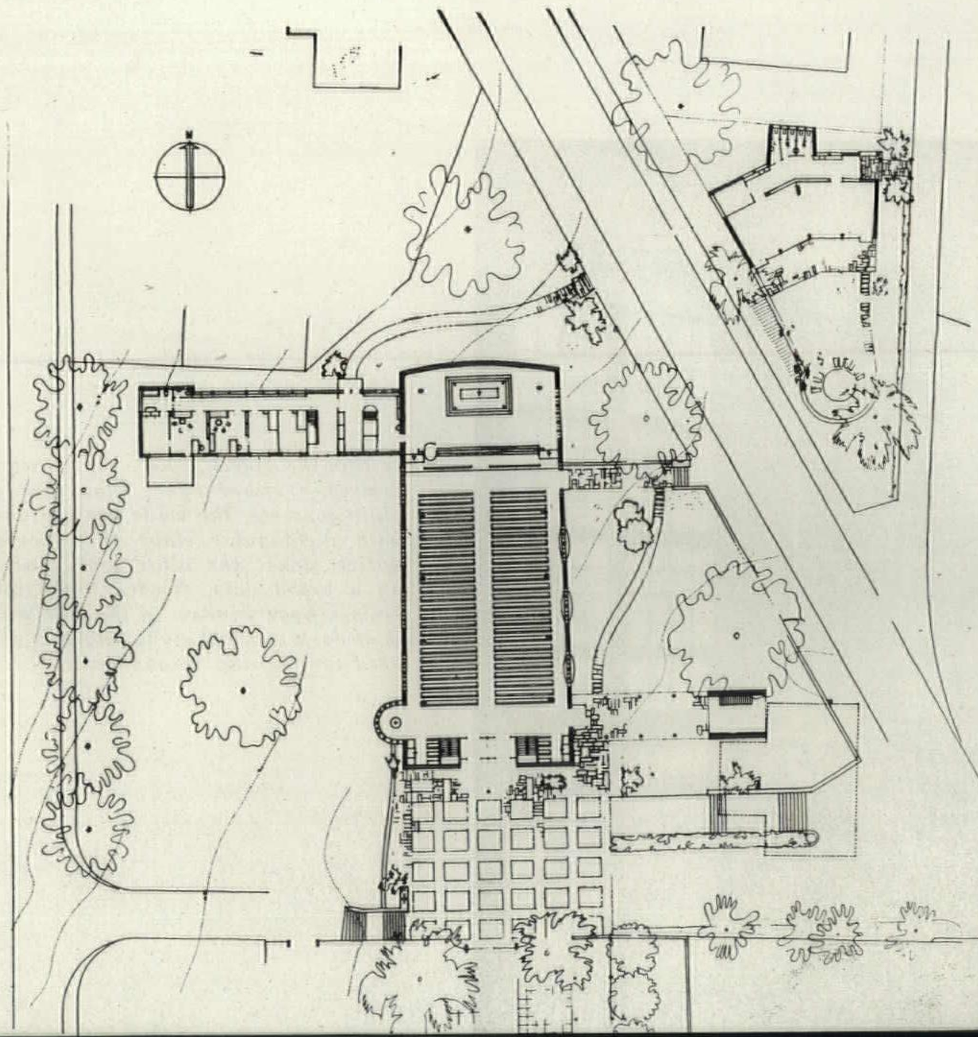
Roman Catholic Church, Dornach, Switzerland

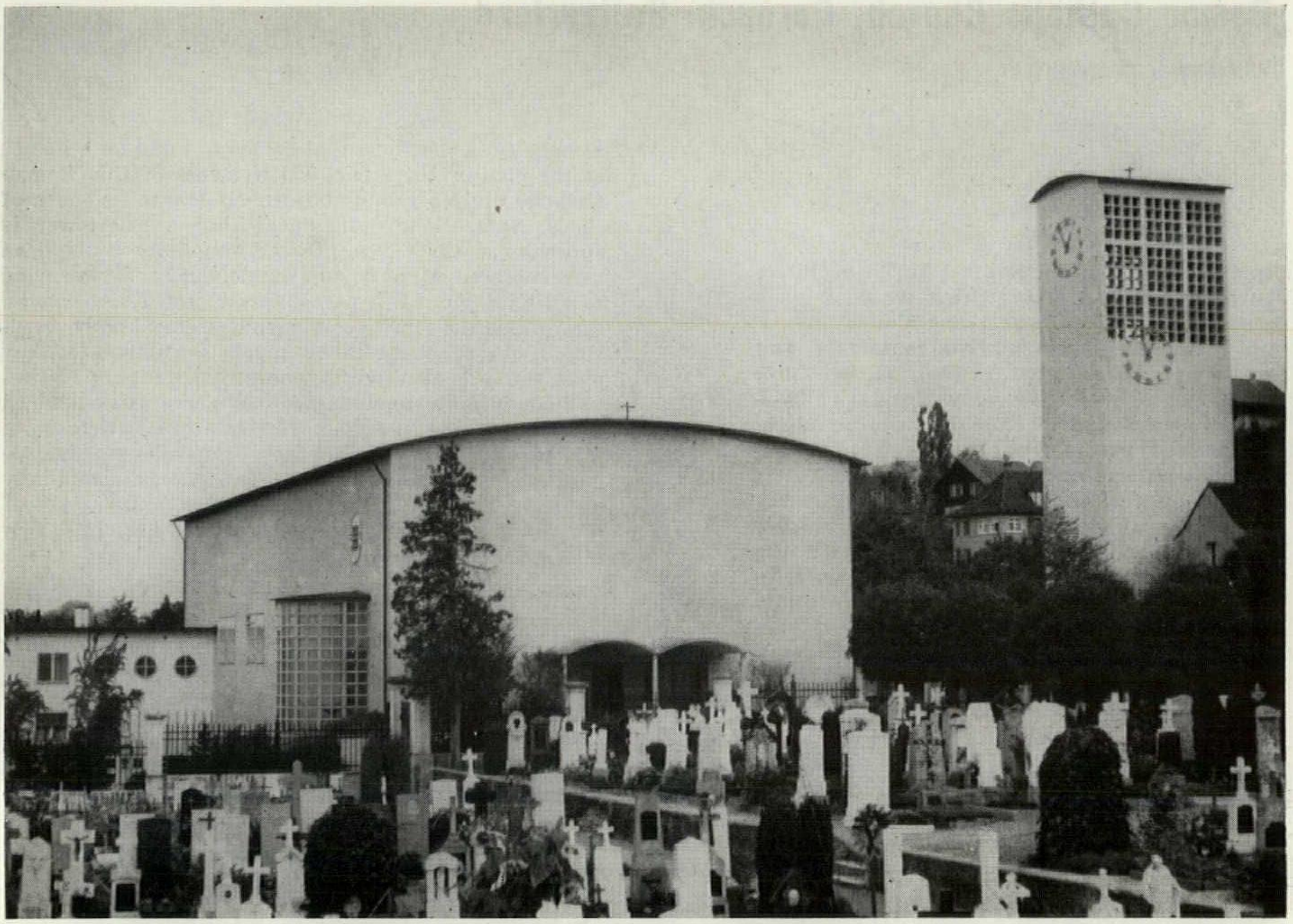
HERMANN BAUR, ARCHITECT

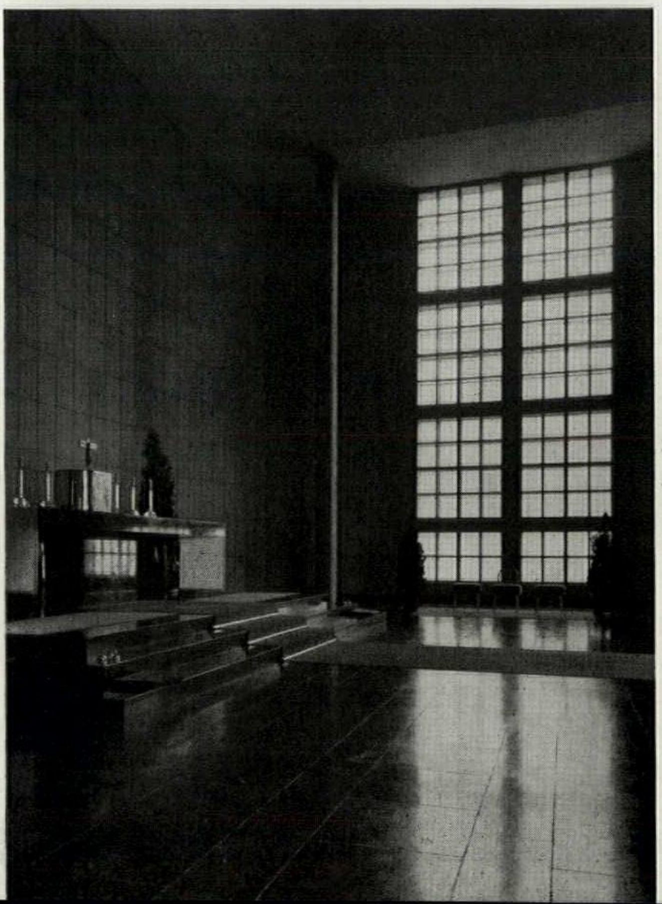
In the history of Christian Church architecture, the buildings to which we look back with the greatest respect are almost invariably those wherein native materials and methods, contemporary to their period, have been honestly — frequently dramatically — used and integrated into organic, beautiful structures, precisely designed to serve religious customs and needs of the time. It is a good sign of the vitality of contemporary architectural design that the progressive minds today attack the problem with the same sincere approach, searching ways to use modern structural systems honestly and vigorously to create dignified religious structures that are appropriate to the worship needs of contemporaries. The reinforced concrete church shown here, for example.

Simplicity is the word that comes to mind on a glance at the plan or the structural elements of this Roman Catholic Çhurch group at Dornach, five miles south of Basle, Switzerland. Argument that a bell tower is superfluous, that even greater simplicity could have been achieved might be admissible, but hardly germane to a discussion of this particular project. Furthermore, campaniles do serve certain ends, some highly functional, others symbolic, or purely sentimental. They place the bells at a height where their ringing reaches well out into the community; they serve as a standard that lifts the Cross (in a curiously attenuated form, in this case) above all else; they can—and do, here—raise clocks aloft so that many are informed, and they are also familiar, readily identifiable masses—one of the chief hallmarks to characterize church design through the centuries.

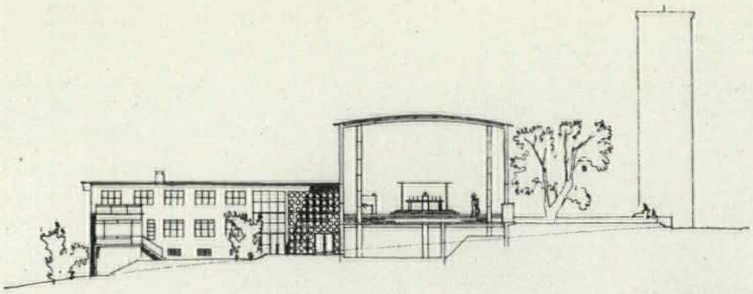
The related elements—tower, church, and priest's house wing—are all of reinforced concrete, which is variously used in severely plain wall masses that are typical of the simplest employment of the unornamented material, in thin, curved sections that shelter the entrance doors and roof the passageway between church and tower, in the fine lines of the semi-circular bay window enclosing the baptismal font, and in the lattice grid that opens into the bell chamber at the top of the tower. The plan needs little comment; its direct and unaffected provision of the essential elements is at once apparent.

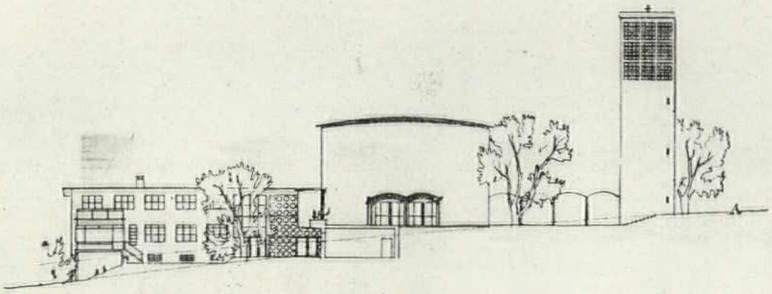


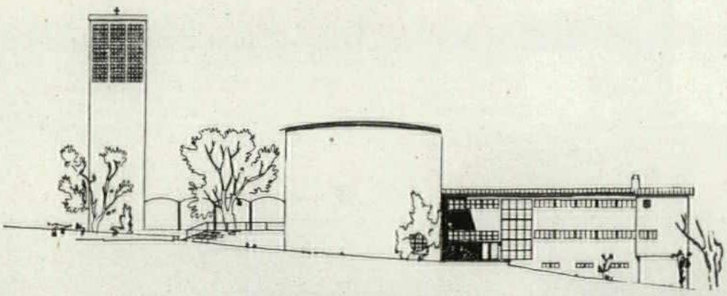




Within the church, where the architect desired a richer effect than that of plain concrete, the walls are surfaced with rectangular slabs of a porous native stone; the altar table, raised on a broad dais, flooded with light from a huge window in the side wall, is of dark polished stone; stone is also used for flooring throughout.







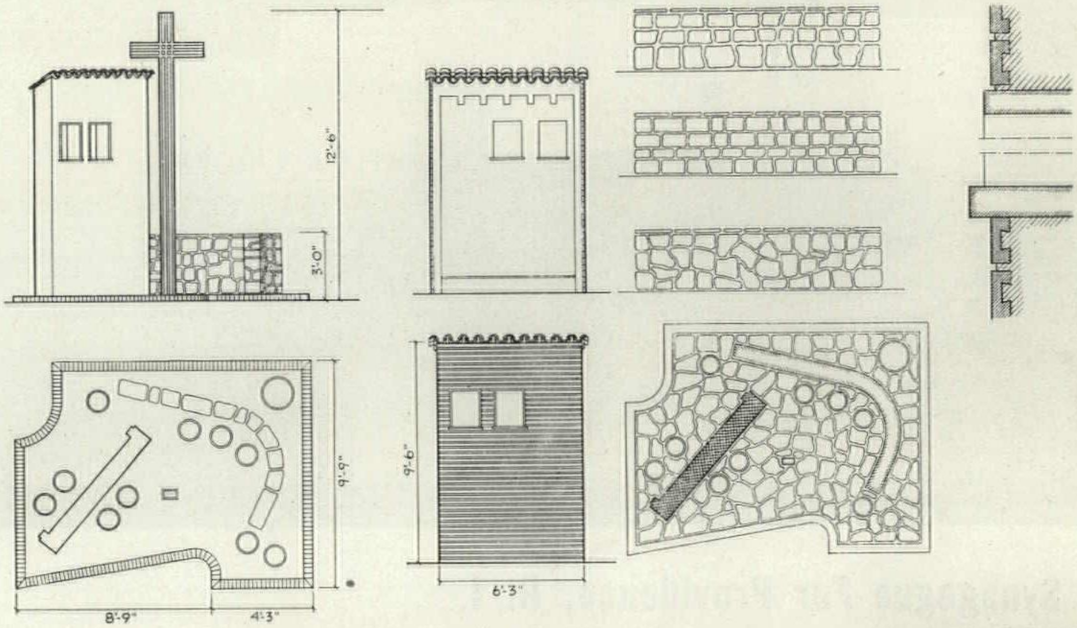
Shrine In A Convent Cemetery, Rovereto, Italy

LUCIANO BALDESSARI, ARCHITECT

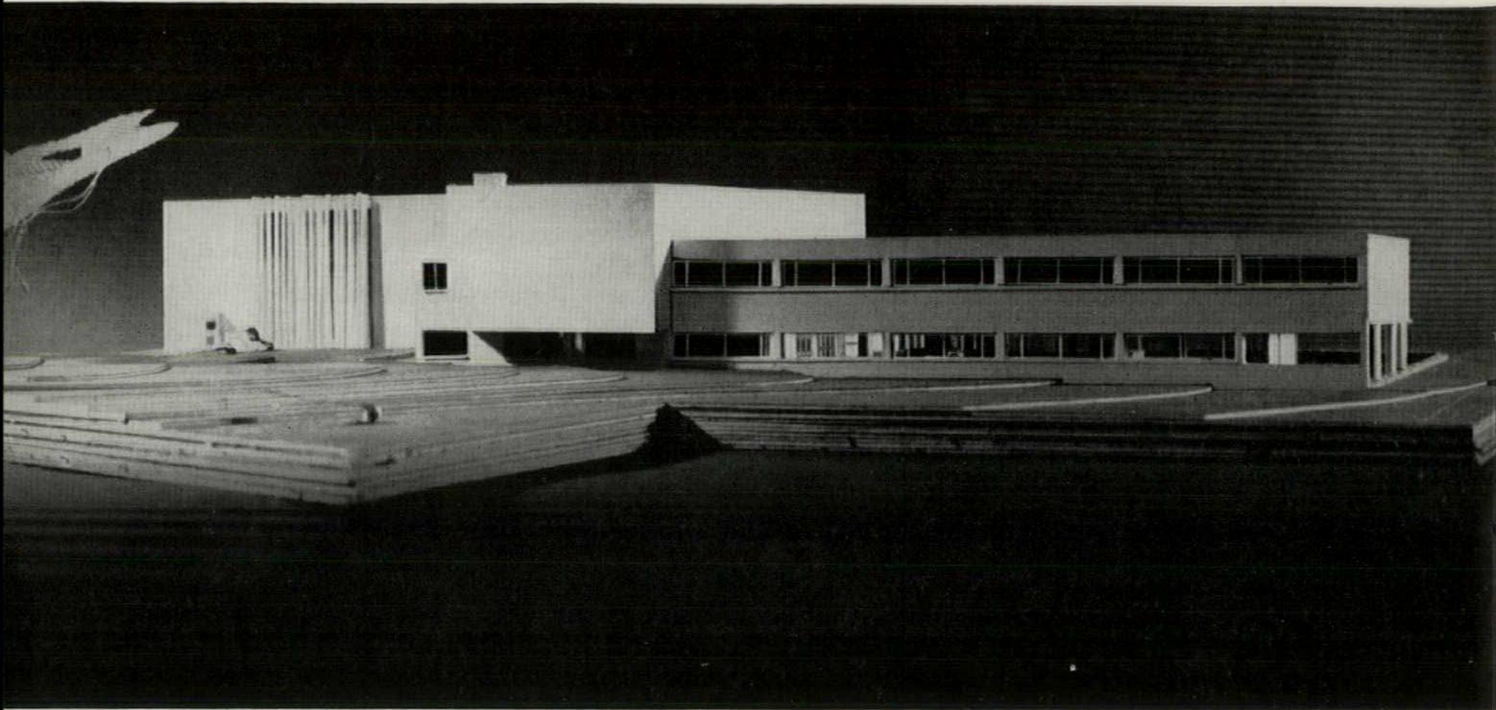
Advocates of "living memorials"—and we are on record as among them—cannot but include in this category the infrequent instance of the shrine of a purely symbolic or sentimental nature which, in the hands of an inspired designer, is imbued with vitality and artistic integrity of continuing worth — a "living memorial" in the broadest sense of the term. Such a one, we believe, is the little convent shrine shown here.

Reverently conceived, beautifully executed, this serene monument marks the burying ground reserved for the Sisters of the Blessed Virgin Mary. Set in a simple field within the cemetery grounds, the shrine is bordered by orchards of peach and cherry trees, seen against a typically sparkling Italian backdrop of rounded hills, blue sky, and bright sunshine.

The symbolism of the design is a joyful expression of faith: from the windowed wall—the convent—a flock of doves which represent the souls of the departed Sisters is arranged in flight toward the Cross, draped with the sudarium. Built on a base of slabs of red-purple porphyry edged with brick, the symbolic windowed wall is topped by terra cotta roof tile; the doves, the work of the sculptor Voltan, are of green-toned hand-wrought copper; the iron Cross is enameled in green. A small garden, made up of a series of flowerpot receptacles, is enclosed in a low stone wall; a laurel tree and a midget cypress stand in back of the enclosure.



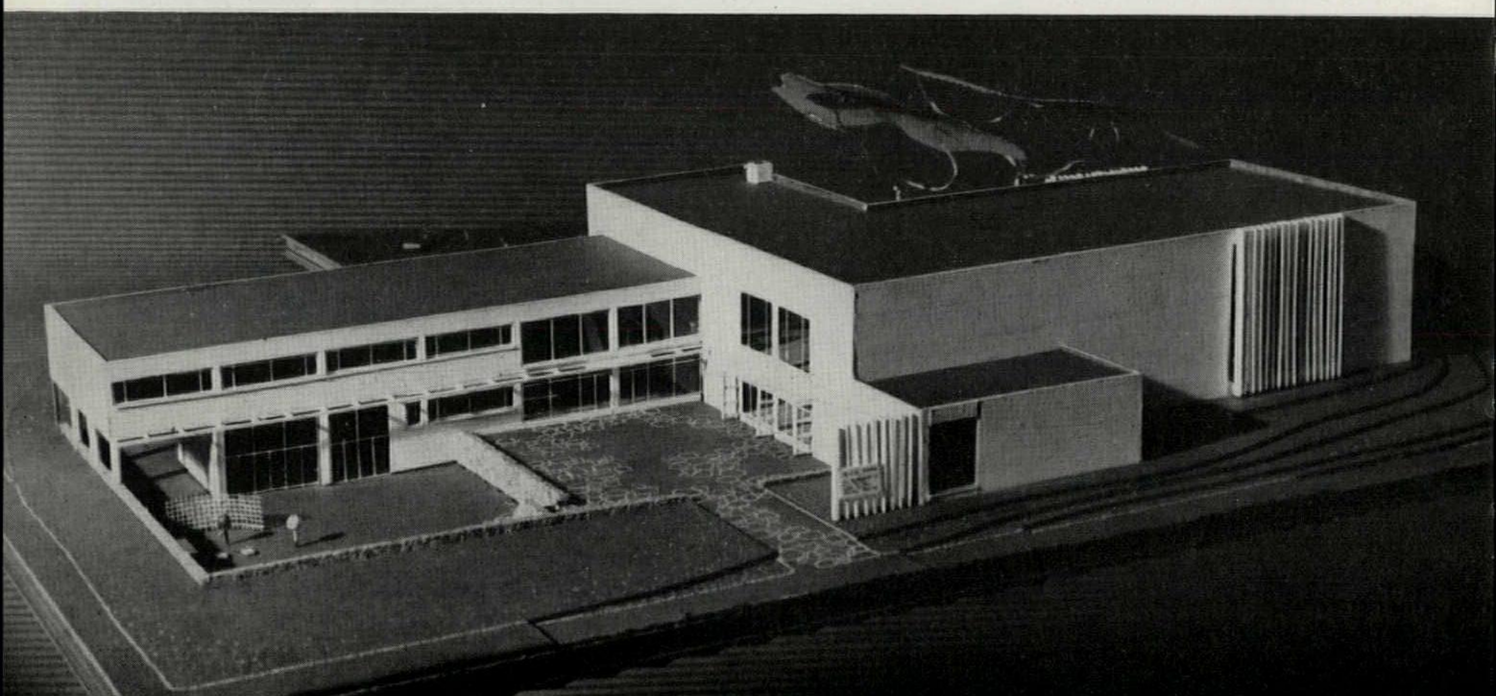
12'-6"
3'-0"
9'-9"
8'-9"
4'-3"
9'-6"
6'-3"



Synagogue For Providence, R. I.

A THESIS DESIGNED BY IRA RAKATANSKY, HARVARD UNIVERSITY

In a school design problem, the student, free from the restraints imposed by actual building committees and budgets, can happily work toward ideals. Though the project may never be realized, fresh ideas emerge; new potentials are indicated; old habits and prejudices receive a healthy jolt—all of which constitute sustenance for architectural progress. Thus, the Reform Temple design shown here may well have the effect of a pebble dropped into a pond—with the ever-widening ripples stirring the imaginations of others to create synagogues for tomorrow of greater comfort, convenience, and beauty.

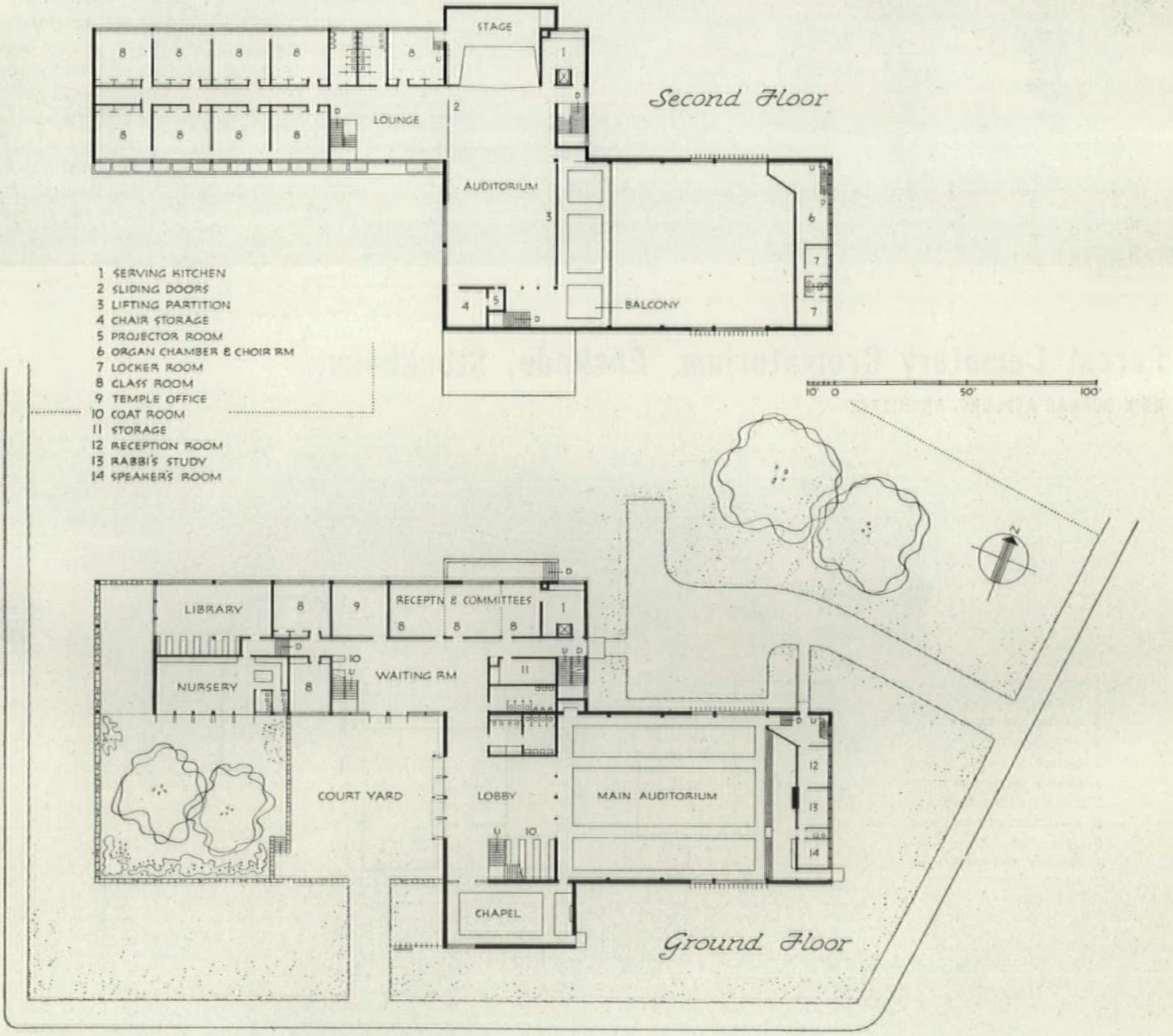


Problem: To design a Reform Temple for an actual Providence, R. I., congregation and a site of 88,609 square feet. The designer lists the requirements as follows: a Temple (auditorium for 800, rabbi's study, etc.); a Chapel (for small weddings and daily services) to seat 100; and a Meeting House, including religious school rooms, a nursery, a gymnasium-dance hall—dining room, the Temple offices, and a library.

Solution: The three major elements are arranged around and entered from a central courtyard. Both Synagogue and Chapel face east (according to tradition) and are directly served (without stair climbing) from the main doors. The court is also useful as an off-sidewalk gathering place after services.

A thoughtful provision is the coat-checking room at the entrance to the Synagogue. To accommodate crowds on high holidays, a lifting partition is provided at the rear of the main auditorium balcony. The kitchen is placed so that it serves both the ground floor rooms and (by means of a dumb-waiter) the upstairs social hall.

Construction: The proposed structural system is a steel frame with concrete rib floor slabs and 12-inch masonry filler walls, except in the Chapel where a two-way pan concrete slab on a masonry bearing wall is used. For heating, the proposal is to use a split system—panel heat for the first floor slabs and on the side walls of the main auditorium and the Chapel, supplemented by a blower to circulate air in the auditoriums. In summer cold water would be circulated in the floor panels. Convectors are specified for the second floor. Fixed, structural fins outside the large windows of the main auditorium are arranged for favorable daylight control.

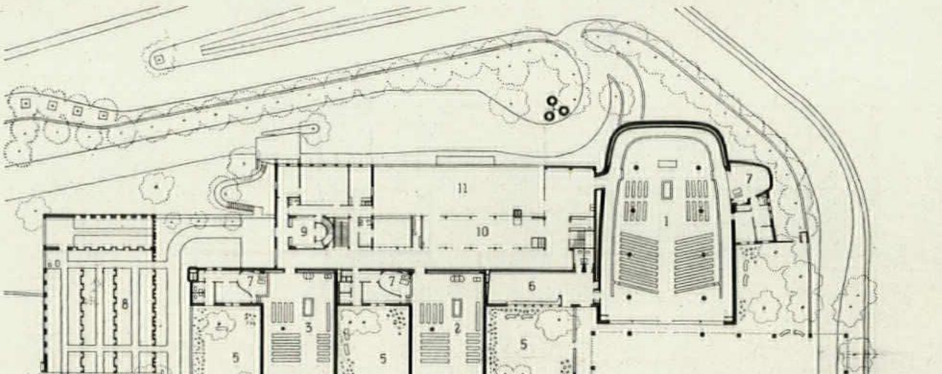


Photos by Sandels (Swedish Press Bureau—Simons)

Forest Cemetery Crematorium, Enskede, Stockholm,

ERIK GUNNAR ASPLUND, ARCHITECT

1 HOLY CROSS CHAPEL
2 CHAPEL OF HOPE
3 CHAPEL OF TRUTH
4 ATRIUM
5 GARDEN
6 FAMILY RETIRING ROOM
7 ORGAN AND CHOIR
8 WALL NICHES FOR URNS
9 URN STORAGE
10 FLOWER PREPARATION
11 ROOF DECK

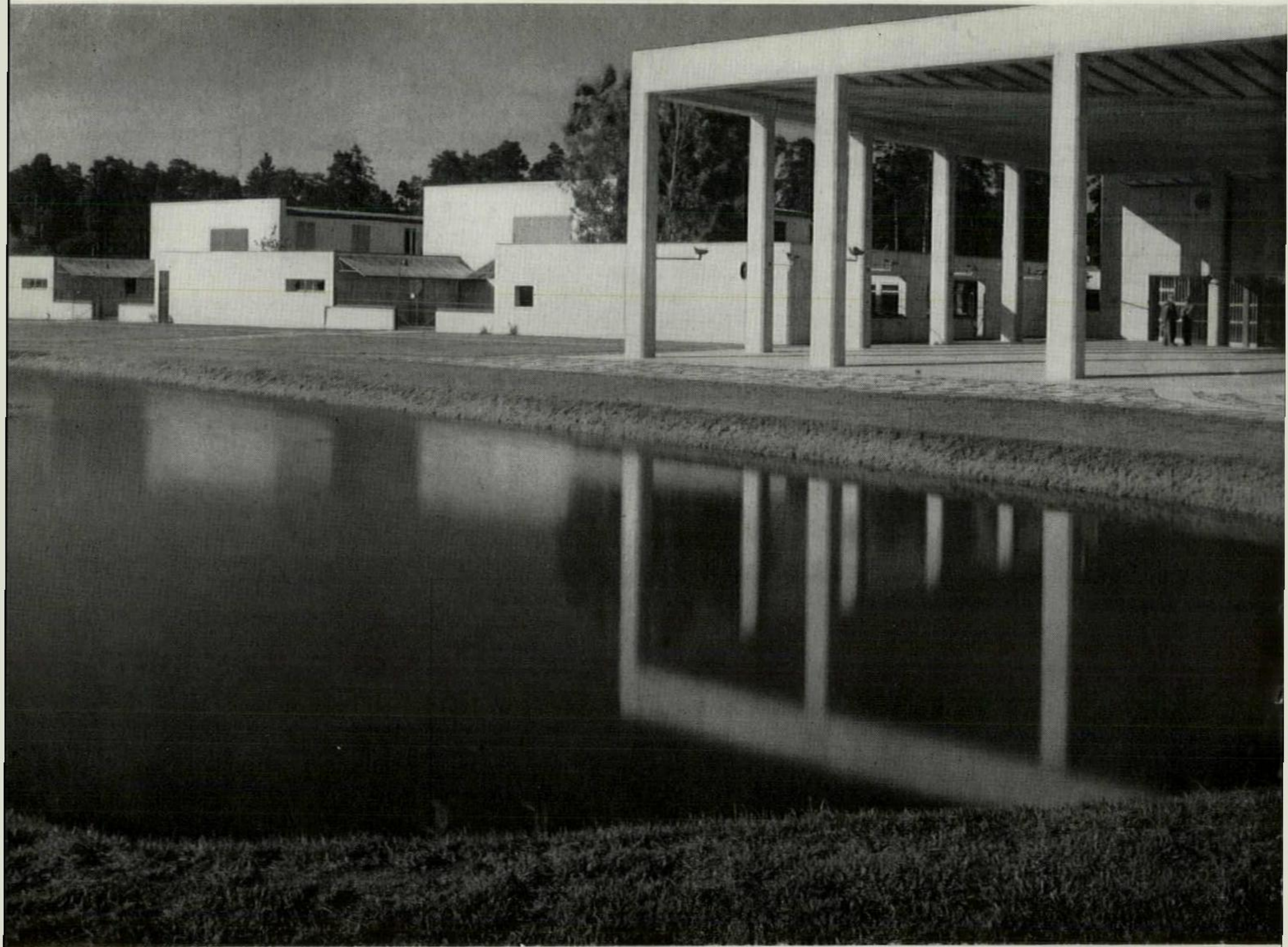


Of all buildings having a sacred or religious function, none, we believe, deserves greater subtlety of handling than the chapels and attendant offices that serve the bereaved and administer last rites to the departed. Yet, curiously, structures of this nature err more often than most on the side of vulgar pretentiousness. In sharp contrast is this serene group which was Asplund's final work. Imaginative, sensitive, almost archaic in its simplicity, the conscious composition of landscape and buildings achieves in a contemporary medium a dignity reminiscent of the consummate monuments of Classic times.

This is one of those fortunate instances where the site was selected—even, to a degree, created—for the buildings several years before they were built. Asplund, with Sigurd Lewerentz, designed the entire Forest Cemetery grounds, and the long approaches and gentle slopes are a carefully conceived landscaping scheme that included rearrangement of certain natural elements to form dramatic sites for the buildings and studied focal points.

There is a subtle relationship between the areas of grassy slopes and the backgrounds of dense pines. The giant marble Cross is placed at just the point where, from the approach side, it boldly proclaims its authority as a dominant in the composition. The building group, in addition to serving its specific functions, is also a unit in this superb, grand-scale plan, of which the sky itself is a commanding element.

In the building plan, the provisions for cremation ceremonies and for serving the tender needs of the bereaved include several niceties that should not be overlooked. For each of the three chapels—the large Chapel of the Holy Cross and the lesser Chapels of Hope and of Truth—there is provided a family waiting or retiring room which, through its windowed wall, looks out on a peaceful walled garden—private, quiet, beyond the reach of the eyes of others. The plans and seating arrangements of the small chapels are thoughtfully worked out so that when only a few friends are gathered, there is no sense of emptiness; yet a rearrangement of the seating and full use of the space can accommodate as many as 100. The great atrium, framed with square, marble-surfaced columns, defines a sheltered space where persons attending the larger ceremonies can gather and look out on the natural beauty framed by the rectangular openings. Because of its openness and height, the atrium emphasizes rather than interrupts the continuity of the landscape.



As the photograph at the top of this page shows, the impressive columned atrium at the front of the Chapel of the Holy Cross possesses an extraordinary ability to catch and emphasize the sunlight; by contrast, the depth of the element produces shadows of exceptional richness and transparency. The result seems to be an environment with a quality of combined mystery and serenity—the exact spirit, it would seem, that should surround buildings designed for the purposes involved here. A reflecting pool echoes the patterns of light and shade, and the whole group shines in front of a backdrop of deep woods.

Photographs from either side or from the front all illustrate the degree to which the Crematorium commands the site; at the same time, it appears to be one with the surroundings rather than competing with them.

Each of the chapels has been given a distinctive decorative treatment; the simplest is the Chapel of Truth shown at the bottom of the facing page. Here, reliefs by Ivar Johansson are composed on the blank wall above the altar; the flooring is a rich pattern of various stones and kiln products; a vigorous abstract pattern is formed by the studied arrangement of the organ pipes at left, and the whole, while rich in embellishment, achieves a suitable dignity and simplicity.

In sum, the Crematorium is a particularly happy example of contemporary design of a religious structure that neither makes compromises with tradition nor displays any of the banalities of stylistic modernism. Some critics have found the work a bit stark and severe, and it must be confessed that it seems as if the geometric lines of the mass might better be relieved by a little more planting close to the structure. It may be, however, that the camera's close-up views are somewhat deceptive in this regard. Probably the bolder contrasts of the total building mass against the vast luxuriant natural setting are sufficient—and all the more impressive—for not being cluttered up with incidental planting.

At top: view of the Crematorium from the north; center: looking down on the building from the hillock in front; bottom: the Chapel of Truth.

Gottscho-Schleisner

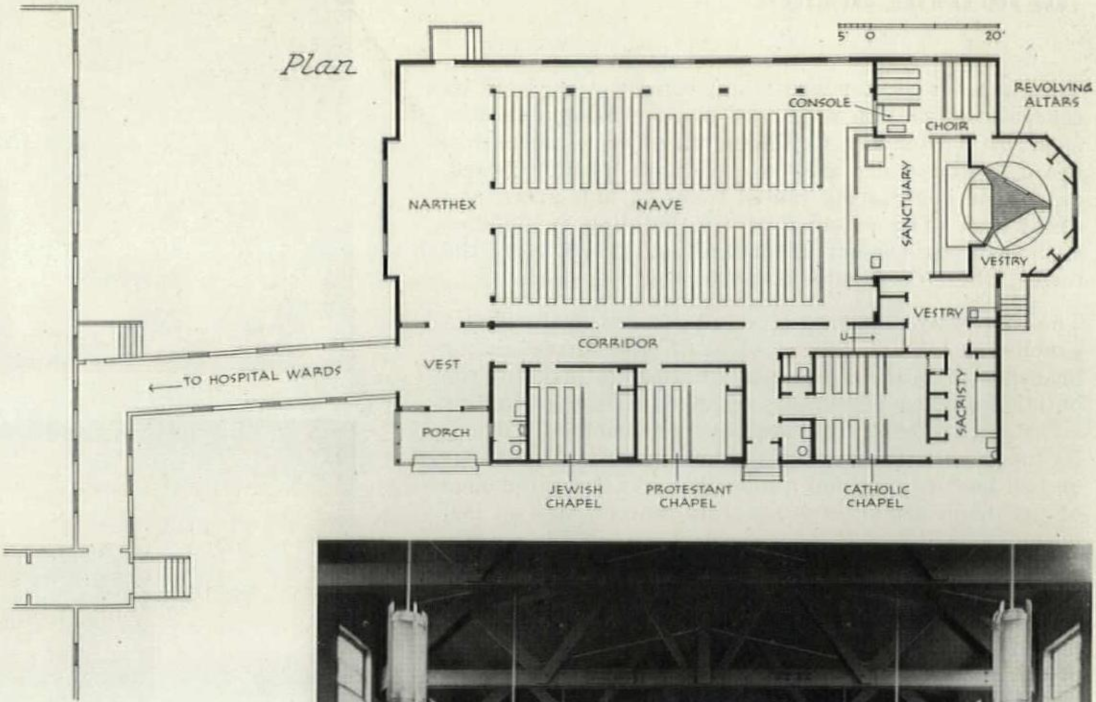
Chapel, U. S. Naval Hospital, St. Albans, N. Y.

**SPECIALLY DESIGNED BY YORK AND SAWYER, ARCHITECTS
UNDER THE DIRECTION OF THE BUREAU OF YARDS AND DOCKS**

Among the chief hallmarks of architectural progress are close integration between form and function, materials and structure, and structures and their environment. In this wartime chapel for a Naval hospital, there is, in addition, a striking physical integration between the three major faiths—the Catholic, Jewish, and Protestant groups being divided by nothing more than a standard frame partition. Admittedly more a product of the demands of economy than of any concerted effort to erase barriers between beliefs, this successful experiment appeals to us as a symbol of hope for eventual realization of an integrated society.

This interfaith chapel is built as the terminus of one of the wings of the great pavilion-type Naval hospital at St. Albans, Long Island. The ramped entrance corridor indicated on the plan leads from the main, interconnecting hall-traffic system of the institution, so that persons may reach the chapel from any of the wards without going out of doors. Patients in wheel chairs can maneuver the ramps, and a portion of the pew area is left vacant to accommodate this segment of the congregations. Wartime restrictions demanded simplicity of design and construction; yet, though there is an almost barracks-like severity to the design, it is instructive to see what a suitable house of worship can be achieved with such Spartan resources. The tower, occurring above the altar area, both recalls a familiar church-design element and serves, through its high windows, to focus daylight down onto the center of interest—the three-way, revolving altar, with spaces on its turntable equally divided between the Catholic, Jewish, and Protestant faiths (see photos, Page 74).

Plan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CONSOLE
REVOLVING ALTARS
CHOIR
NARTHEX
NAVE
SANCTUARY
VESTRY
VESTRY
CORRIDOR
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TO HOSPITAL WARDS
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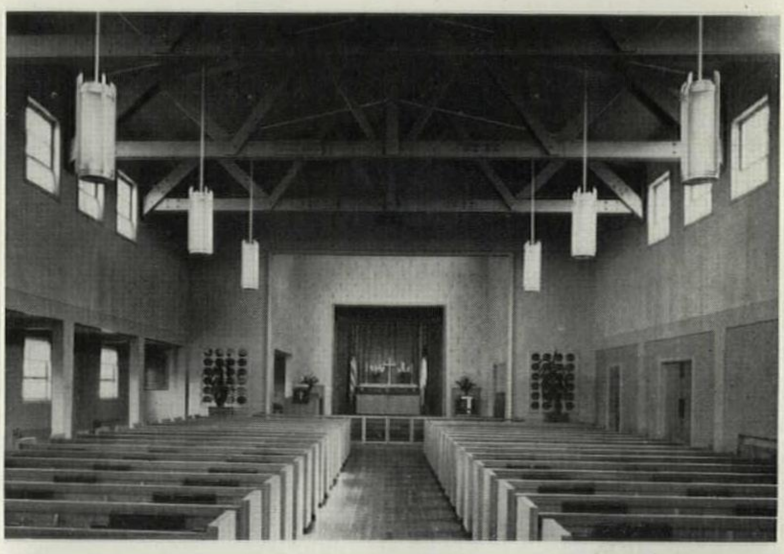
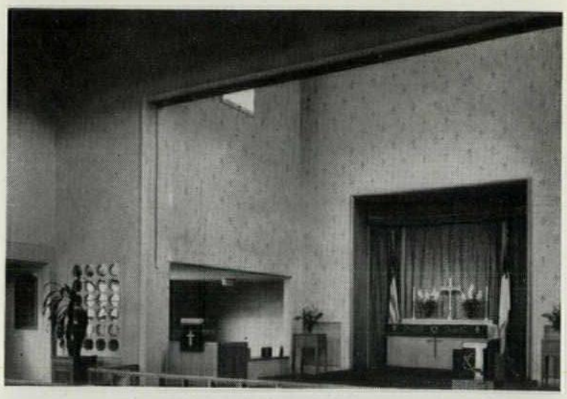
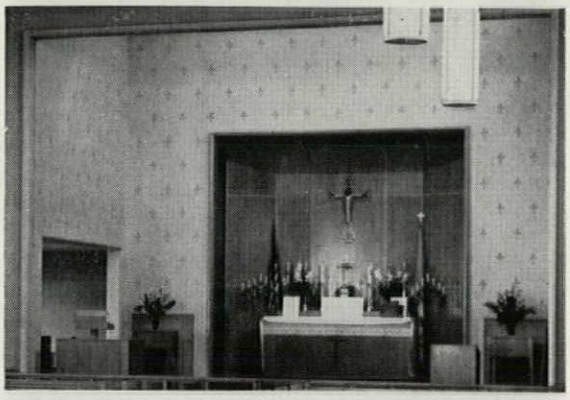
JEWISH CHAPEL
PROTESTANT CHAPEL
CATHOLIC CHAPEL

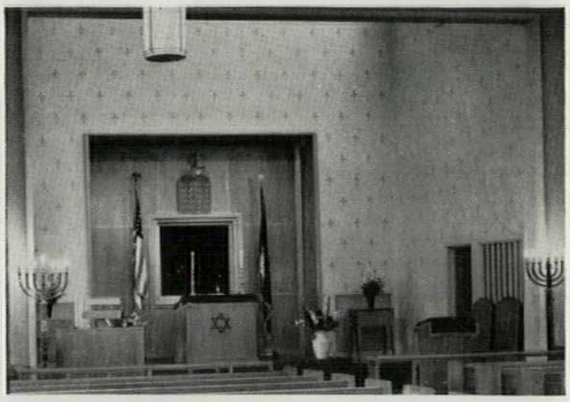




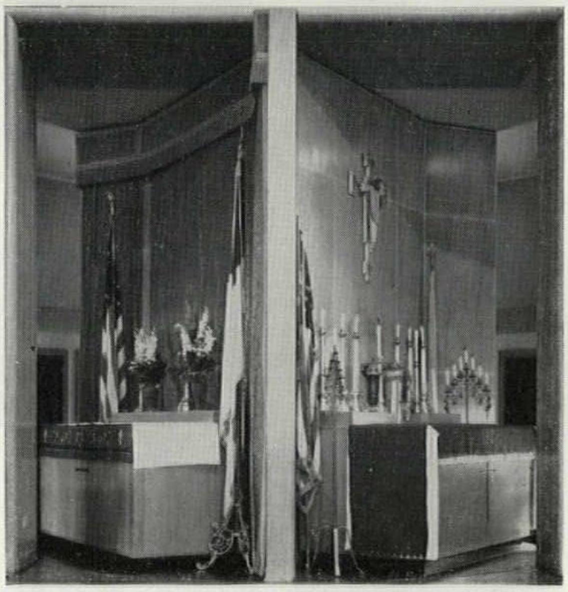
The chapel is of standard frame construction, built on concrete foundation walls and piers. Exposed trusses span the auditorium. Ceiling surfaces are of acoustical board, while walls are covered with plaster board, painted in contrasting muted tones of blue-green and sandy tan. The exterior of the building is finished with asbestos-cement clapboarding, except for the tower, where corrugated asbestos board is used.

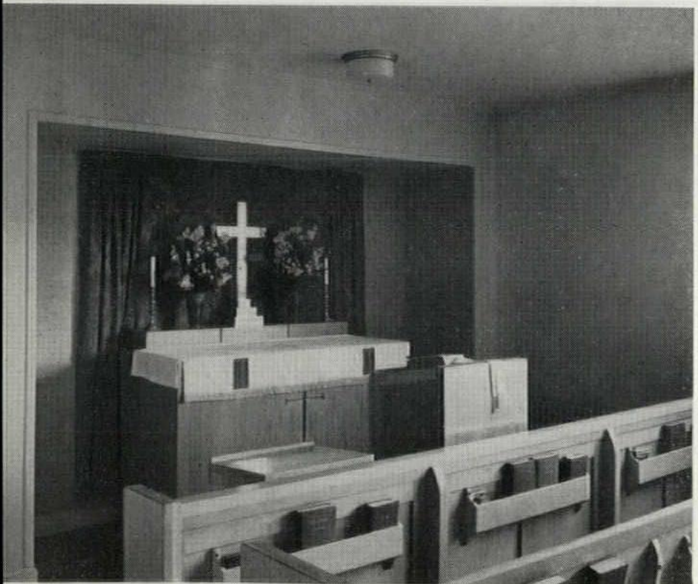


The three-way revolving altar, illustrated in the photographs at right, allows each of the three major branches of faith, literally in rotation, to make of the building a house of worship equipped with the familiar signs and symbols. The mechanism consists of a drum, its top flush with the floor of the chancel, which turns on ball bearings around a pipe axle. At the outer edge of the drum are eight supporting wheels, also on ball bearings, which ride on a continuous circular metal plate or track. The appropriate altar is turned to face the congregation during scheduled service times, and, in between times, the three altars take turns in commanding the setting, a week at a time each. The walls of the tower surrounding the altar opening are painted light tan and decorated with a blue-green, stenciled fleur-de-lis pattern. Along one side of the main chapel are three small chapels, one for each faith, which are used for incidental daily or private services or for any ceremony not requiring the full auditorium.



It might be worth while to consider whether the idea of this combined-use type of religious structure could possibly find wider application in certain civilian communities. In smaller towns, where church groups have limited budgets, it occurs to us that a pooling of resources might well produce a structure better than any one group could afford while in no way interfering with the prerogatives of the separate faiths. Not the least attractive factor might be the single maintenance problem.





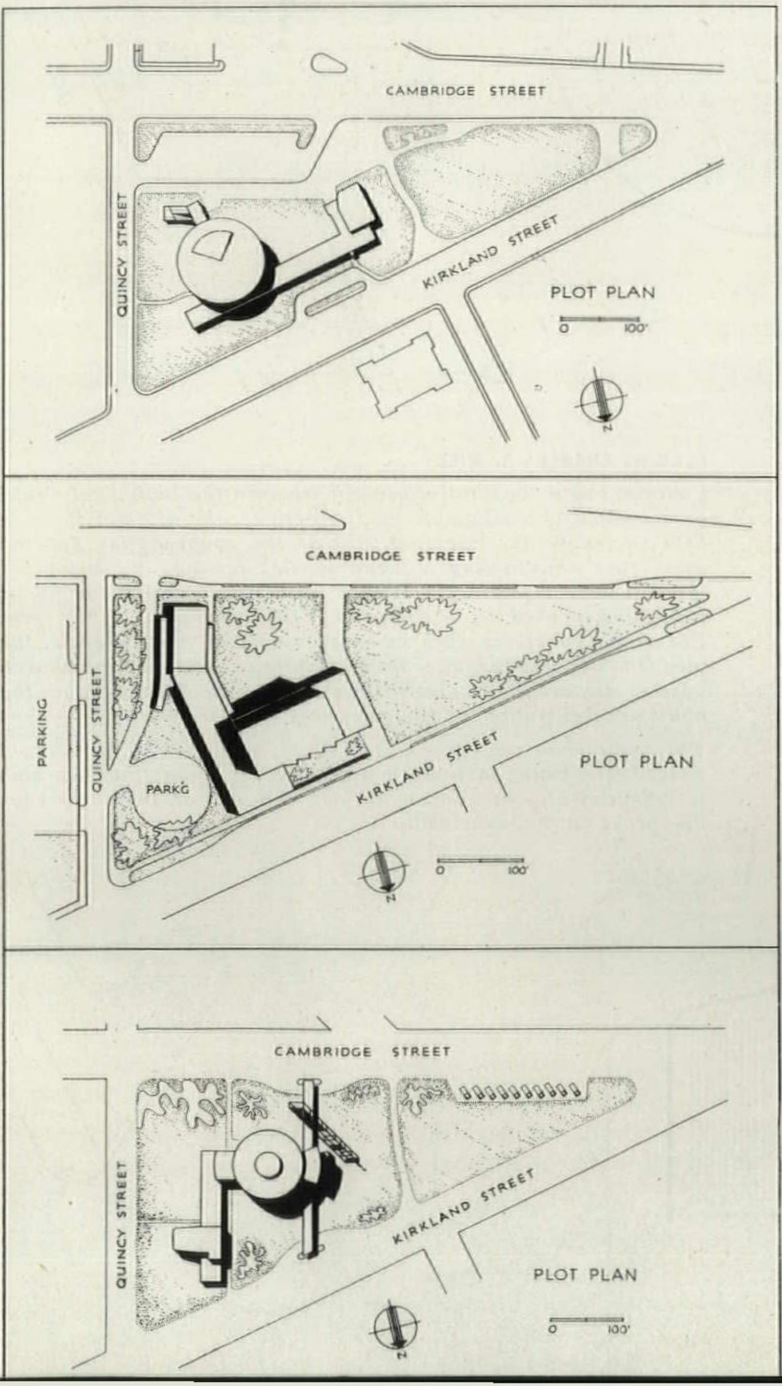
Above: the small private chapel for the Protestants. Both the Catholic and Jewish groups have a similar accommodation. Photos at right; top: the altar arranged for Protestant services; next below: the Catholic altar; below that: the chapel arranged as a Synagogue; and at bottom: the revolving altar partially turned, showing the Protestant and Catholic altars.

Three Student Solutions To A Church Design Problem

CONDUCTED AT HARVARD UNIVERSITY BY DR. WALTER GROPIUS

In an age such as ours wherein the word "Almighty" is indiscriminately applied to both God and the dollar, it is not surprising that, in general, contemporary church architecture presents so indecisive a character. All the more fortunate that architectural students, as yet not overly enmeshed in the snares of life's "realities," should undertake to discover direct answers to the problem. Here, at least, may be found a progressive point of view, an earnest wish to achieve a proper contemporary expression. The projects summarized here appeal to us as provocative cases in point.

Below, comparative plot plans. At top, design by Charles D. Wiley; center, the work of Charles G. MacDonald; bottom, solution by Norman Silby O'Sullivan.



The Program. Our unstable period of shifting social standards has much unbalanced the spiritual life of the people. As a result many have lost contact with the Church, though their religiousness has increased on account of the course of events and their longing for a new expression of faith.

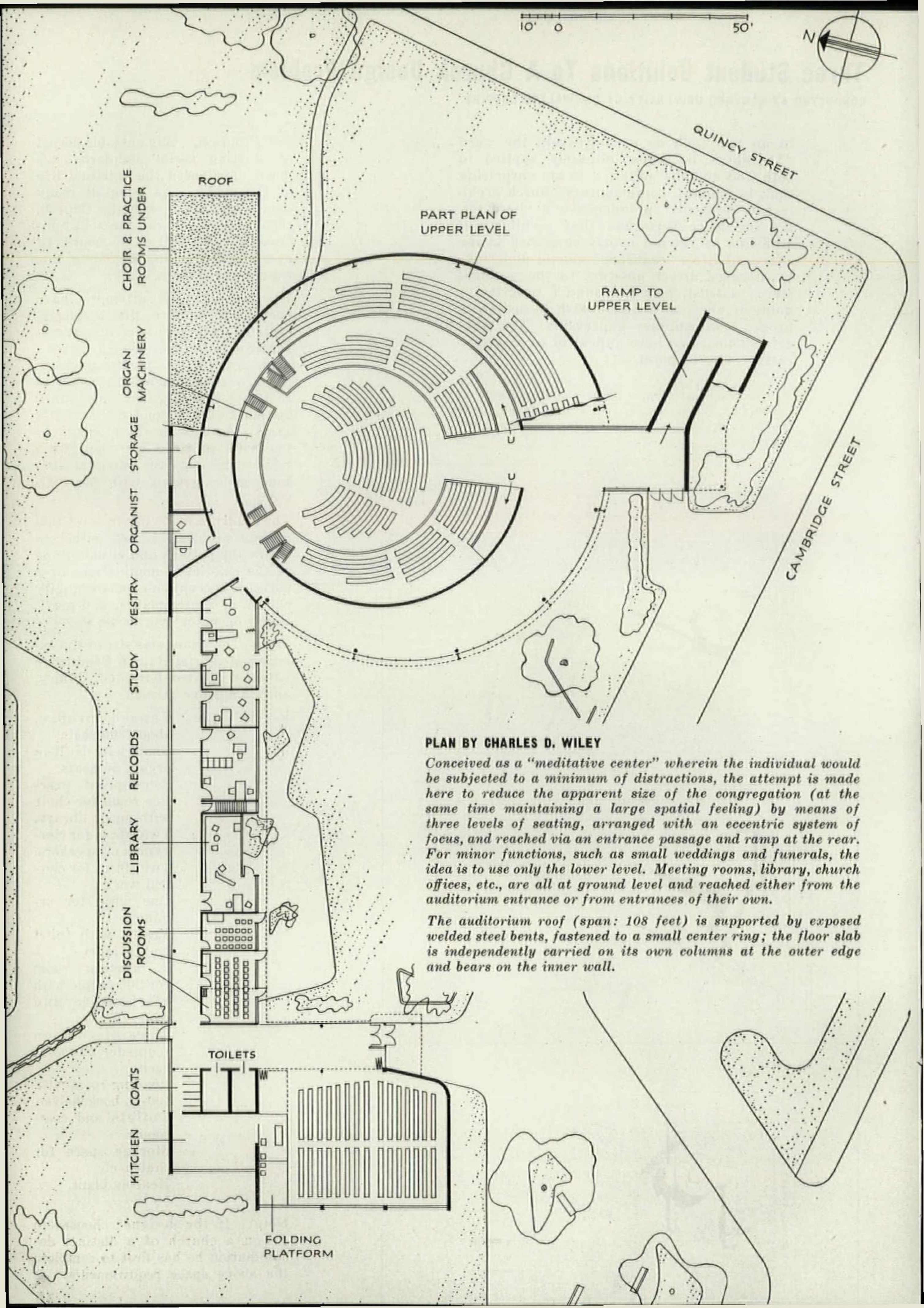
Few satisfactory attempts have been made today to find a solemn, contemporary, architectonic expression for buildings devoted to worship. A designer's success in creating a work which will characterize in a contemporary way those inner human forces beyond material life greatly depends on the intensity of his vision and the direction of his religiousness, as the spiritual attitude varies greatly with the individual.

The students in trying to solve this present problem are free either to follow the pattern and ritual of one of the existing denominations or a personal conception of a community church of contemplation and meditation open for everybody.

Site. The triangular site of the existing Memorial Hall in Cambridge (Mass.) between Kirkland, Quincy, and Cambridge Streets.

Requirements.
- Church proper, about 800 seats.
- Choir with built-in organ, 50 seats.
- Sound-proof practice room for choir with music library.
- Two offices for clergymen or speakers.
- Two offices for clerical work.
- One office for organist.
- Vestry with toilet and lavatory.
- A meeting room for 200 people with kitchenette and pantry.
- Three discussion rooms for 20 people each.
- Reading room with 400-ft. bookshelves.
- Toilets and coatrooms.
- Storage space for chairs, etc.
- Heating plant.

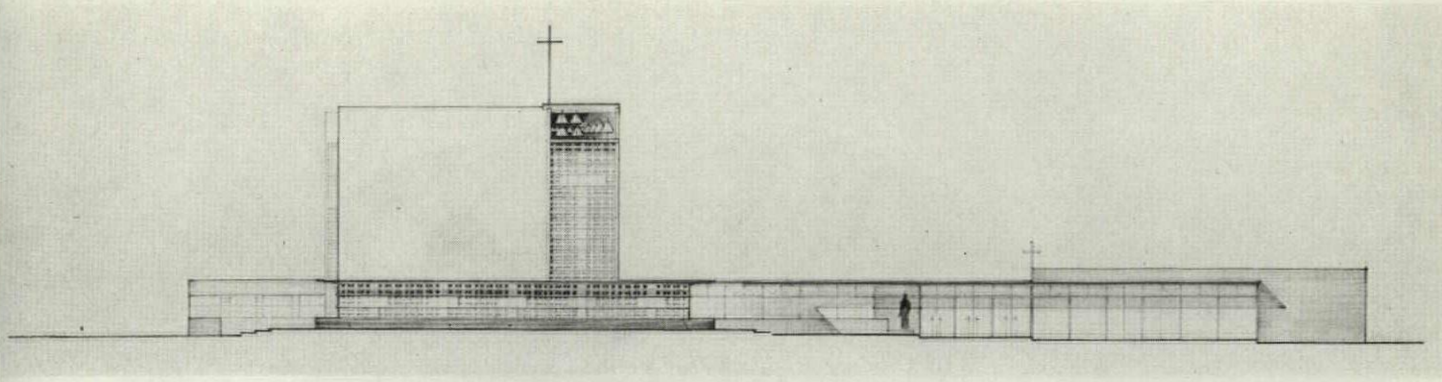
Note: If the designer chooses to design a church of a distinct denomination he has first to complete the above space requirements.



PLAN BY CHARLES D. WILEY

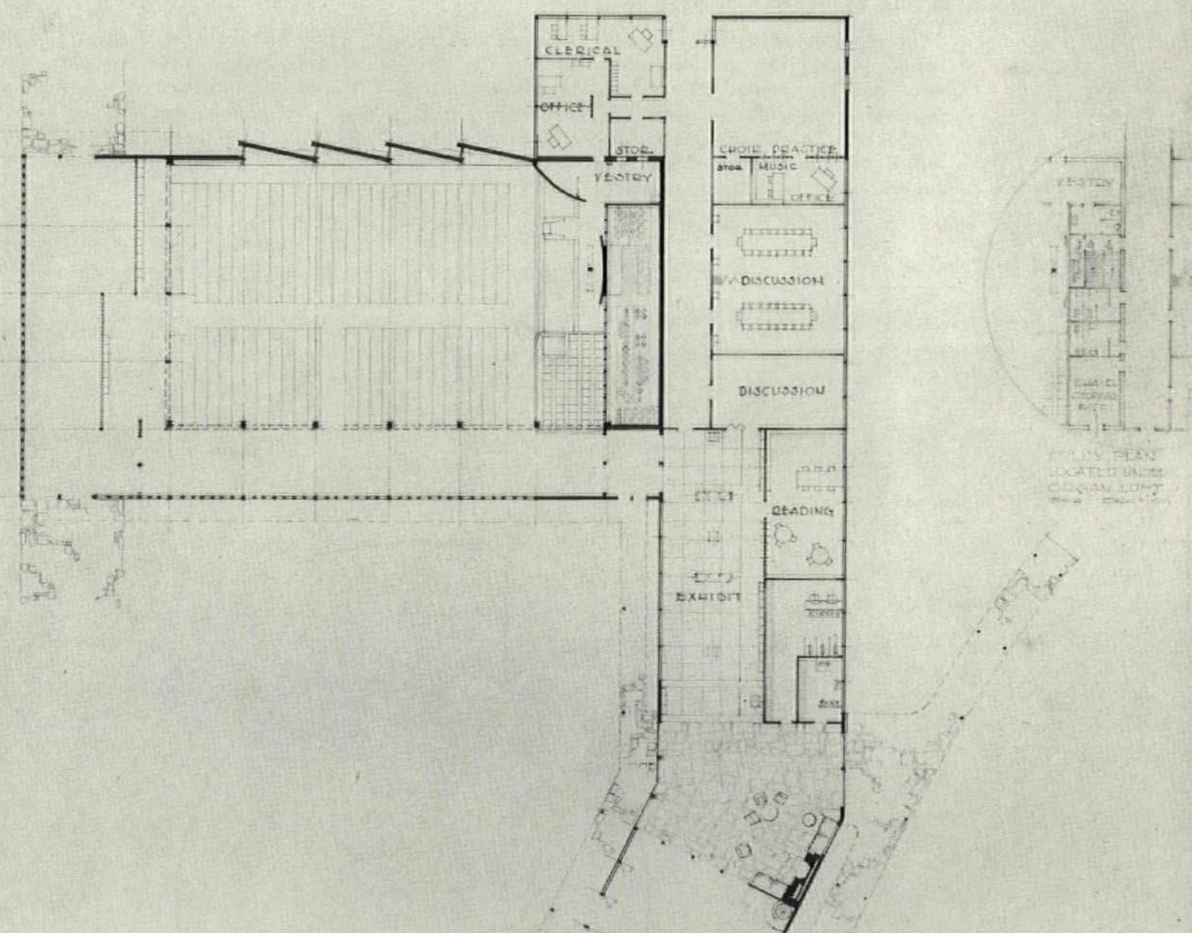
Conceived as a "meditative center" wherein the individual would be subjected to a minimum of distractions, the attempt is made here to reduce the apparent size of the congregation (at the same time maintaining a large spatial feeling) by means of three levels of seating, arranged with an eccentric system of focus, and reached via an entrance passage and ramp at the rear. For minor functions, such as small weddings and funerals, the idea is to use only the lower level. Meeting rooms, library, church offices, etc., are all at ground level and reached either from the auditorium entrance or from entrances of their own.

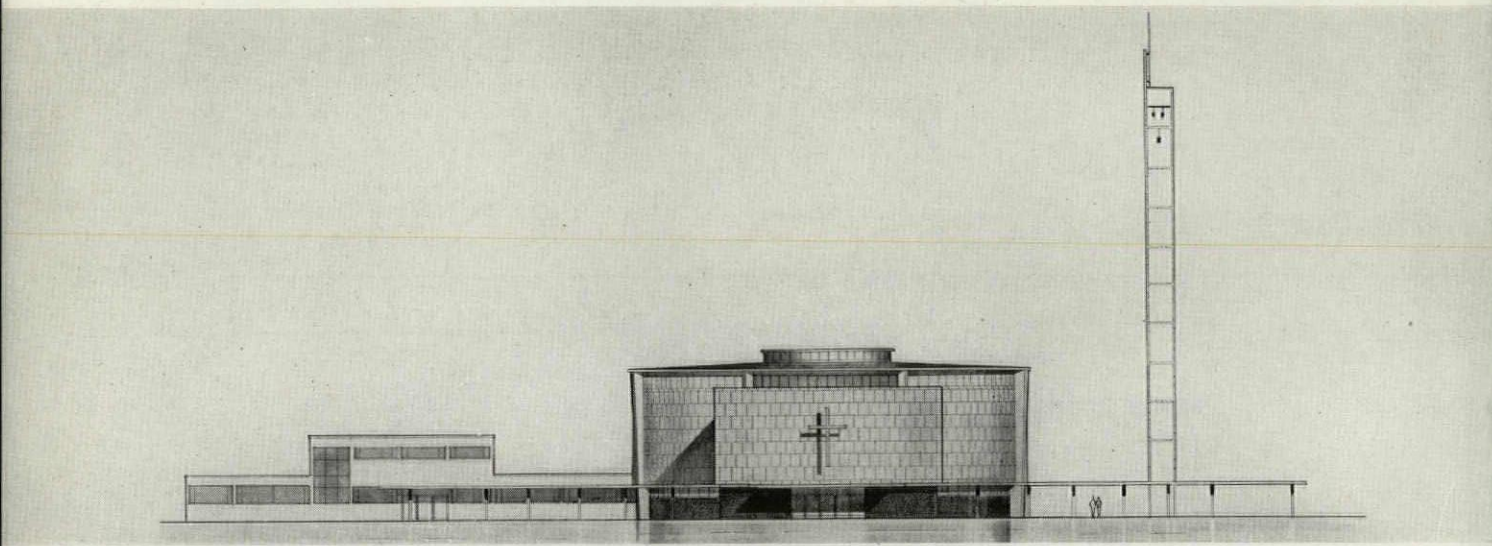
The auditorium roof (span: 108 feet) is supported by exposed welded steel bents, fastened to a small center ring; the floor slab is independently carried on its own columns at the outer edge and bears on the inner wall.



SCHEME BY CHARLES G. MacDONALD

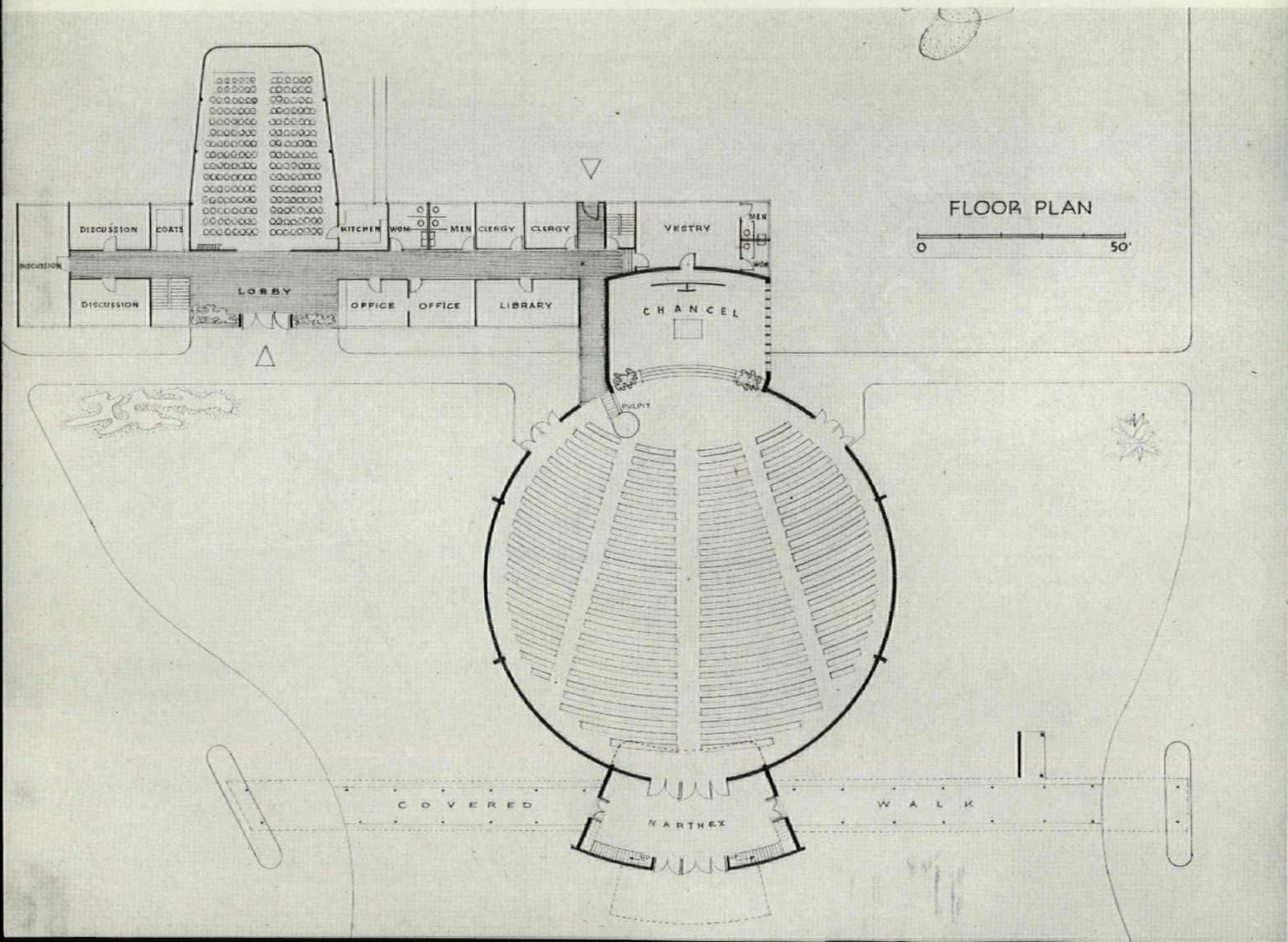
Planned to embrace social and group-meeting activities as well as worship functions, this scheme is organized into three distinct but interrelated areas. The New England location suggested brick as the chief structural material. Daylighting of the church is accomplished by soft, indirect light admitted through the sawtooth projections in the north wall and through stained glass, introduced in pierced terra cotta blocks that occur in the south wall, protected against strong sunlight by a roof projection.





DESIGN BY NORMAN SILBY O'SULLIVAN

"The circular plan was chosen," the designer tells us, "for the purpose of grouping the people nearer the preacher than is usually accomplished by the traditional plan with nave and transepts." To avoid the following and focusing of sounds around the wall perimeter, an interior wall surface made up of a series of convex-curved sections is proposed. This device, according to the designer, "would also produce an even distribution of sound due to dispersion." Auditorium construction is of two-hinged, reinforced concrete arches, connected under the floor level by tie beams.

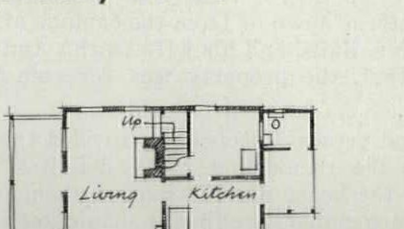


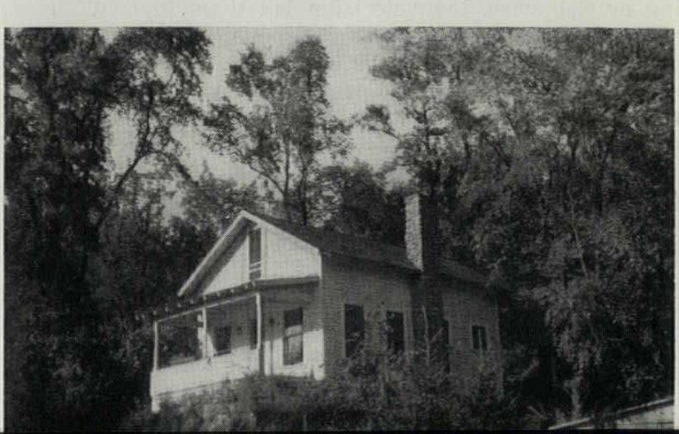
P. A. Dearborn

From Lake Cottage To Year-Round Home, Ithaca, N. Y.

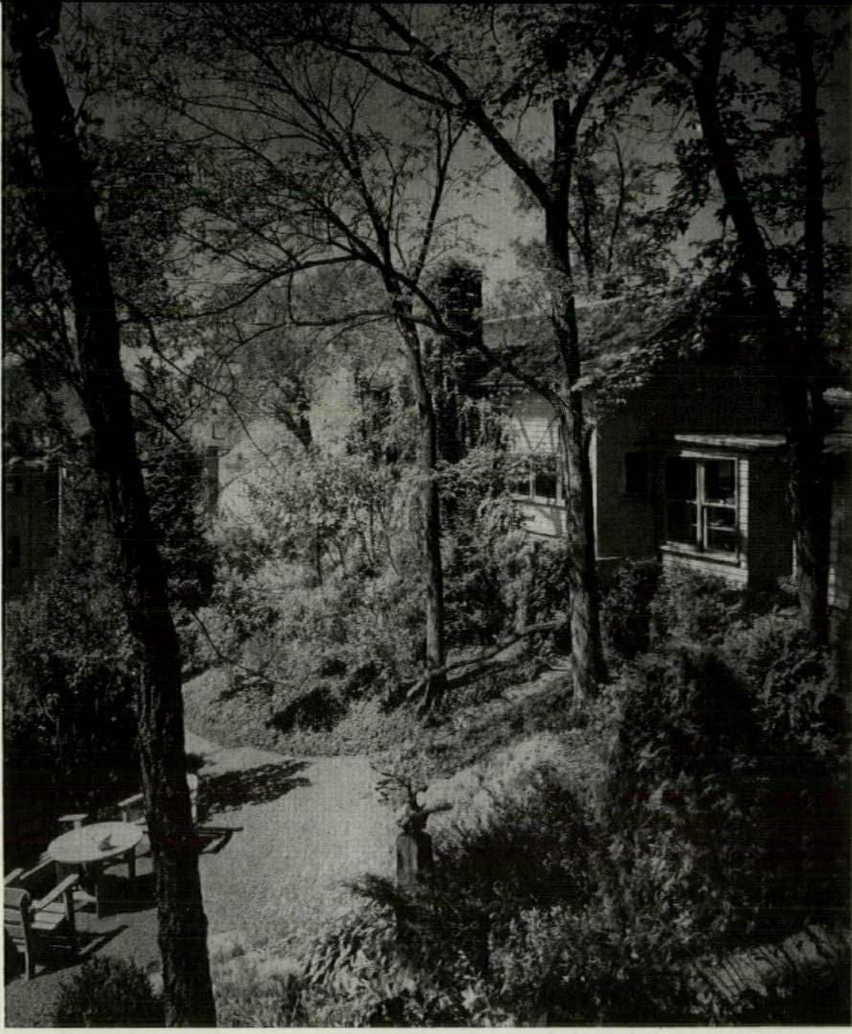
THOMAS J. BAIRD, DESIGNER AND OWNER

It would take a long search to find a more average and uninspired little summer cottage than the one around which this project developed—an ungainly affair two rooms deep, with turned columns bordering an inadequate front porch. Hardly promising material for a contemporary scheme for living! But the site was a beautiful wooded hillside with a bird's-eye view over Lake Cayuga, and Thomas J. Baird, Architectural, Landscape, and Regional Planner, and Associate in Housing Research at Cornell University, saw its possibilities. His remarkable performance in lifting this drab little cottage up into the category of progressive residential architecture is described on this and subsequent pages.





Before



The site is, as the designer-owner puts it, "one of those rare happenstances where Nature outdoes herself." At either side (about 90 feet apart) is a glen with a waterfall pouring down from the wooded hillside toward Lake Cayuga. In front of the house and considerably below it is the wide expanse of the lake itself. Recreational opportunities offer themselves on every hand—swimming and boating, picnicking, hiking, gardening, country life to suit almost any taste. In addition to all this, it is only seven minutes' drive from the center of town or from the campus of Cornell, where both Mr. Baird and his wife teach. And in addition to all that, the property was for sale for only $2,000.

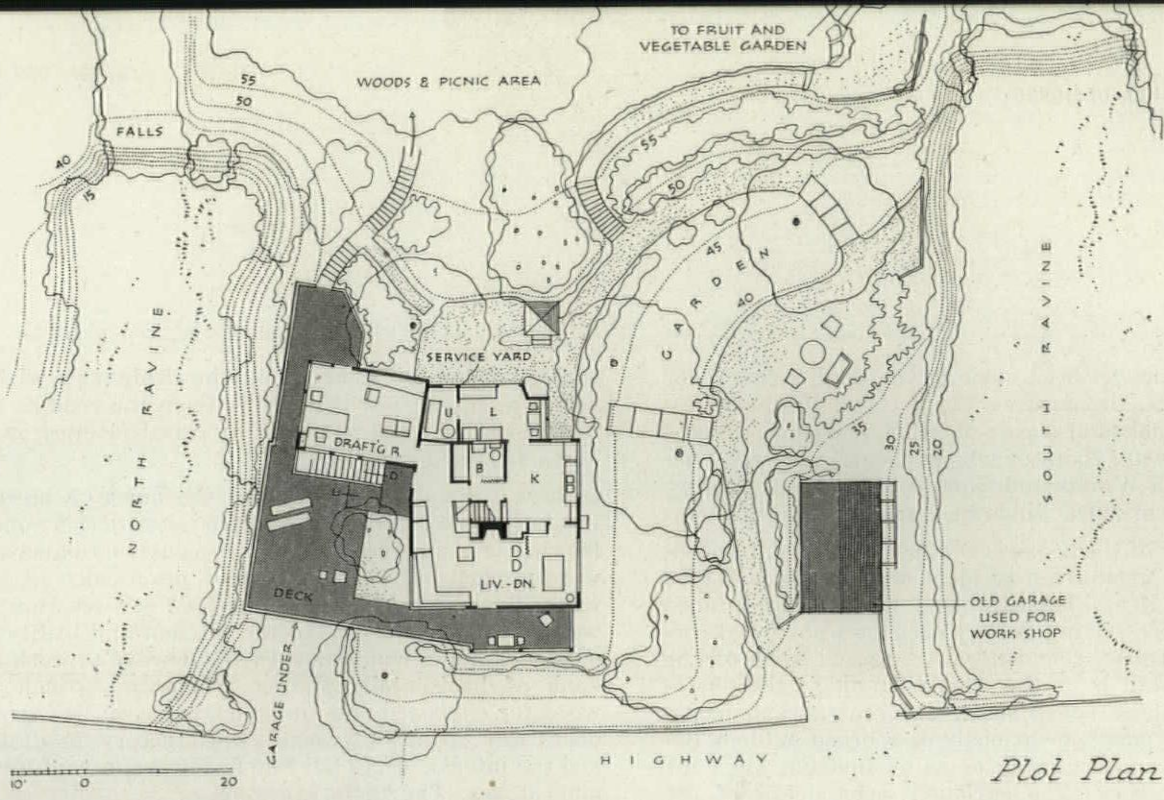
An initial and personal decision controlled the Bairds' approach to the remodeling. "We definitely decided that neither the house nor the garden should ever become such an encumbrance that it should keep us from enjoying this 'find.'" So, instead of much expanding or anything remotely connected with stylistic detailing or elegances, their decision led them to think in terms of "a 'minimum' house, the smallest investment possible, avoidance of rooms that are bigger than necessary and a minimum of possessions and things that require time-keeping upkeep." In creating their garden on a luxuriant gentle slope off the kitchen corner (photo above), the approach was the same—"a garden planned so that very little of it would require upkeep —in fact," as the designer sums it up, "in an avoidance of all the luxuries which the freedom-from-care philosopher cannot afford to indulge in." Essentials, in the Bairds' scheme for living, consisted in only those things that they felt necessary to carry on a gracious life in these fortunate surroundings.

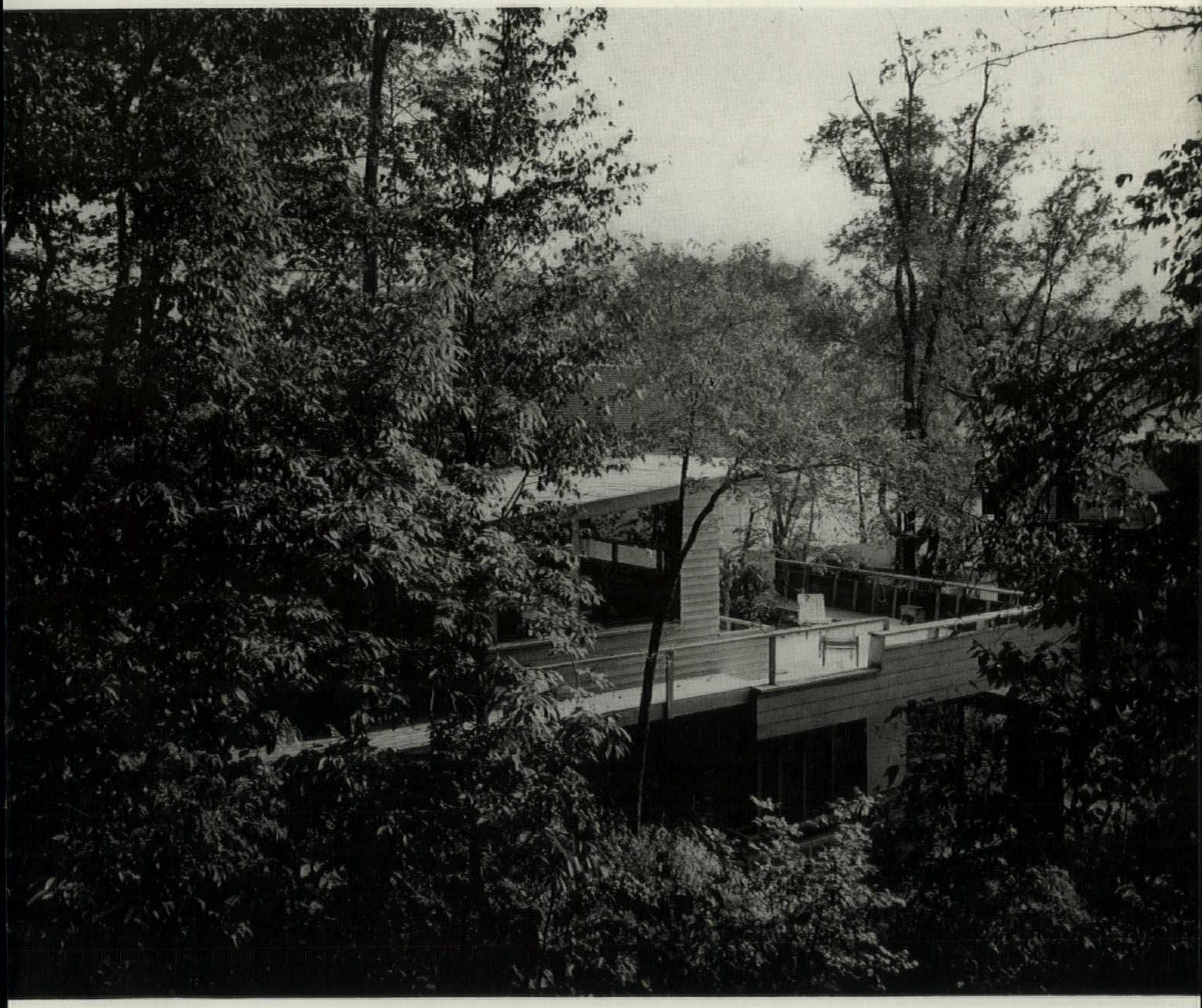
For our part as editors, we should like to point out that only through the use of contemporary design thinking and tools could so much have been accomplished so simply. And, with this house as an example, we should also like to emphasize the part that good architecture can play toward making people's lives what they would like them to be—a progressive approach of a high order, in complete distinction to the doctrinaire approach of architectural authoritarians of the Gothic or Functional Schools.

The plan hardly needs explanation. Everything is organized in relation to the site's amazing advantages. The garage deck and other porches or terraces are all schemed "to provide protection for every sort of outdoor weather from sunny March to sunny November days, and the connecting catwalks and paths and steps create an illusion of much greater space than actually exists on the narrow lot."

The "drafting room" addition is what Mr. Baird calls the "safety valve" of the house, and it was designed to avoid the difficulties which usually beset a minimum house, "taking care, as it does, of all the 'extra' occasions—picnics called indoors by rain, unexpected guests, etc."

Placement of the bathroom, the designer admits, is thoroughly unorthodox and disregards standards for bathroom planning. "Nevertheless (with the exception of a few embarrassing moments during parties) it has served us admirably." There is more to its location than meets the eye, however. In Winter, during the day when no one is home, it is necessary to heat only the three service rooms—kitchen, bath, and utility. Result: "Our fuel bill is but $50 a year."

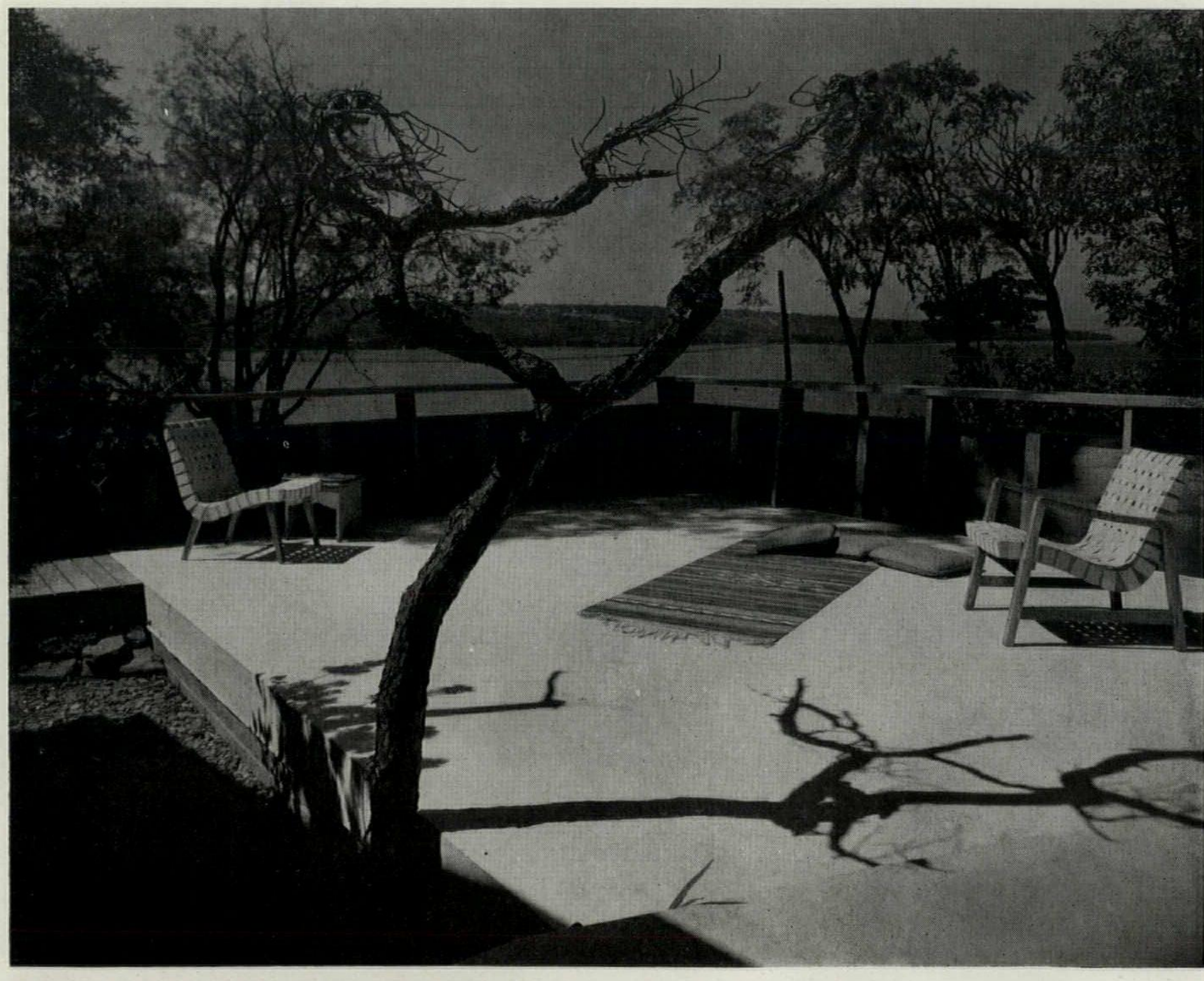

TO FRUIT AND
VEGETABLE GARDEN
WOODS & PICNIC AREA
FALLS
NORTH RAVINE
SERVICE YARD
GARDEN
SOUTH RAVINE
DRAFTG R.
U
L
B
K
LIV.-DN.
DECK
OLD GARAGE
USED FOR
WORK SHOP
GARAGE UNDER
HIGHWAY
10' 0 20
Plot Plan



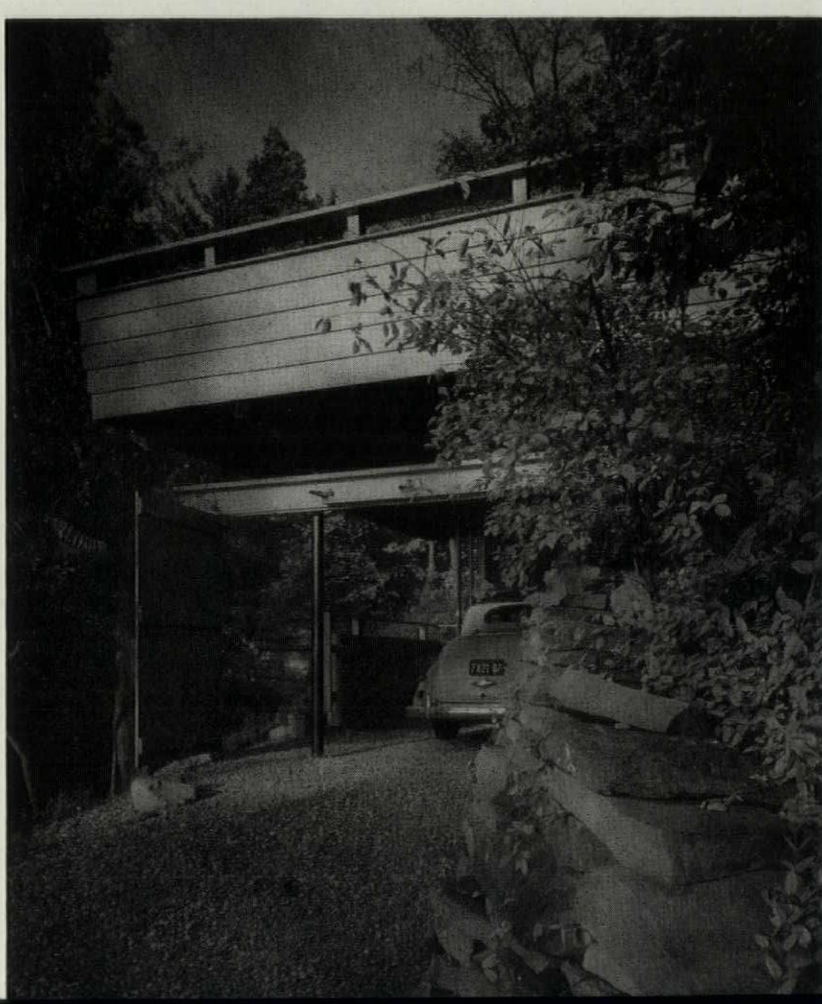
No change has yet been made in the small second floor of the house—"because we did not feel it was necessary." It consists of a pair of small bedrooms, divided by the stairway, "both of which, though low, are comfortable both Winter and Summer. . . . Some day we will give them more windows, however."

The exterior of the house is surfaced with cedar boarding, painted gray-green to blend with the mossy rock ledge in the glens. The thin window jambs are a faded rose color. The living deck, placed in a sheltered corner of the house, commands a nonesuch view of the lake. All detail is of the simplest and, as the photographs on these pages show, different arrangements of furniture adapt it variously as a broad outdoor living room for entertaining or as an inviting place for casual relaxation. The curiously open detail of the carport below is explained by the designer's wish to "allow as much view through it from the road as possible, to satisfy the passerby's natural interest in the north falls and glen."

In both the floors and walls of the house, a layer of insulation was introduced into the construction; underflooring is of plywood. Numerous construction savings were worked out—elimination of practically all millwork; fixed glass used for simplified construction and weatherproofness; use (in the kitchen and utility) of old double-hung windows turned sideways to work as a bank of horizontally sliding windows; $\frac{3}{4}$-inch plywood for cupboard and closet doors. Even the garage doors are $\frac{3}{4}$-inch plywood—"satisfactory to date"—and the interior doors have no hardware, except hinges and catches. The knobs are wood.

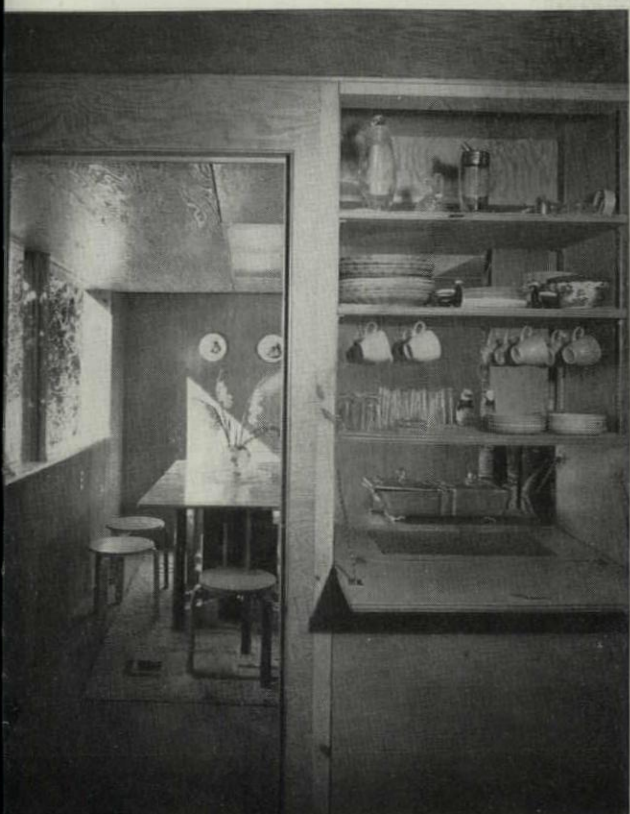


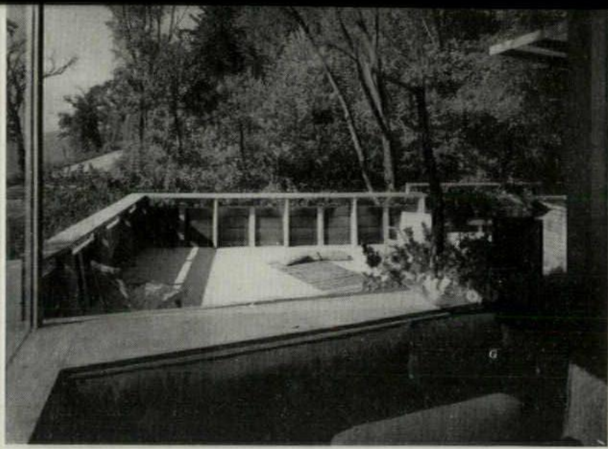
The carport below the living deck was made as open as possible to maintain a view of the glen beyond.

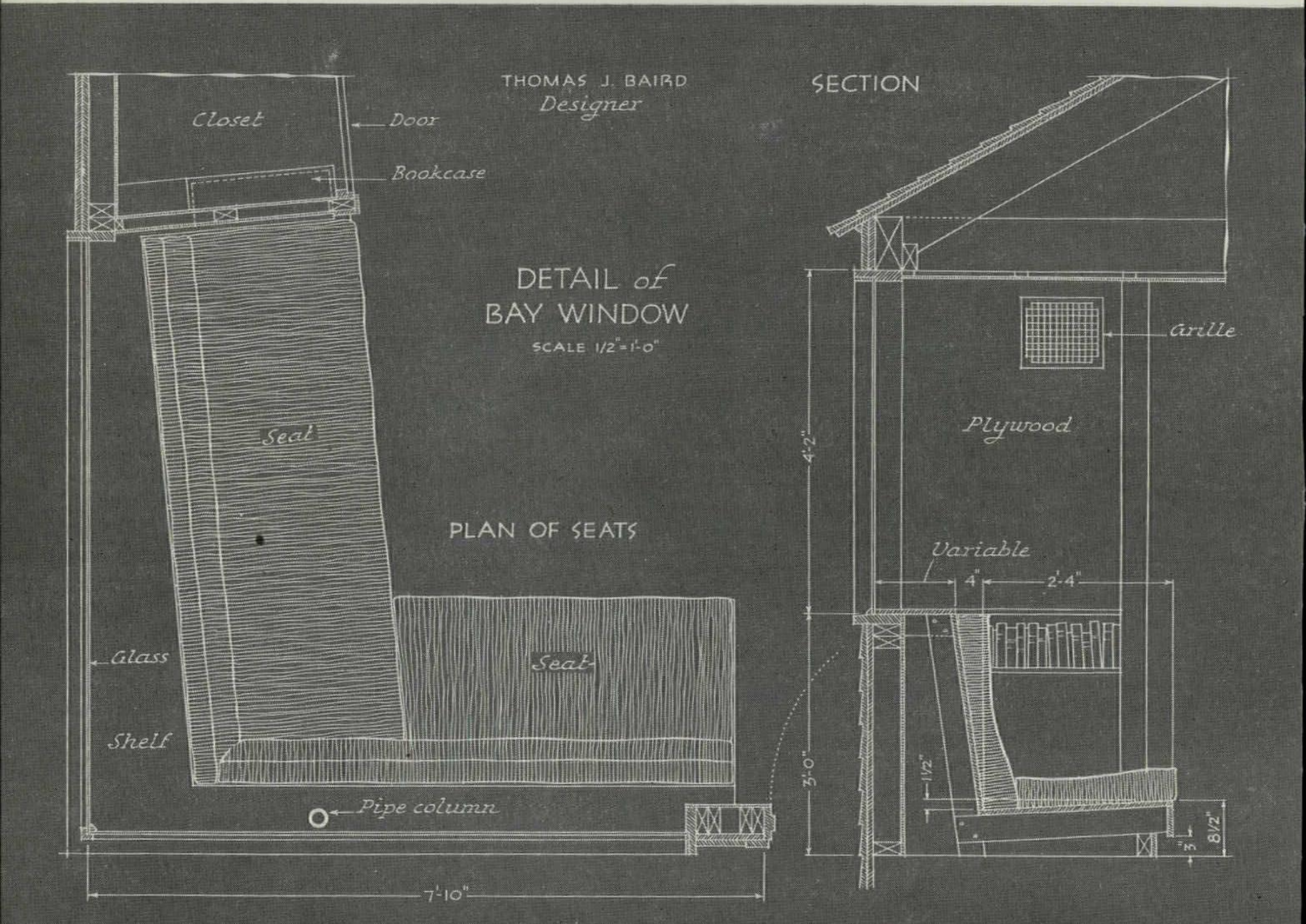


All interior finish, including ceilings (plywood), is of natural wood. Scored plywood surfaces the walls and built-in work of the living room. The living-room floor is covered by a broadloom carpet; elsewhere, floor surfaces are linoleum. Fluorescent lamps occur in the drafting room, above the dining table, and in the kitchen. The house is heated from a forced warm air furnace. The total bill for remodeling came to $4,000!

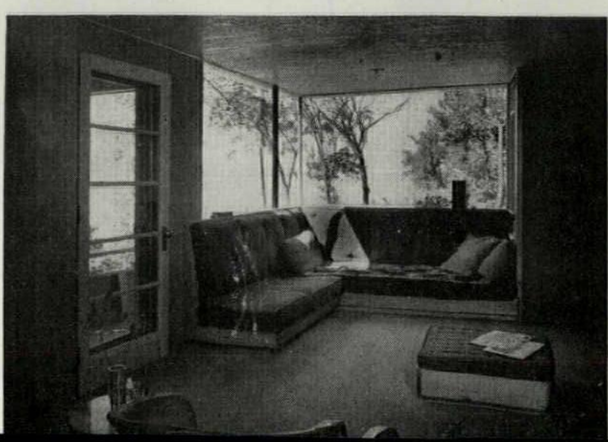
"The living room, with its long seat, carpeted floor, broad stool and pillows, provides for both Winter social evenings and easy-going day-to-day living."



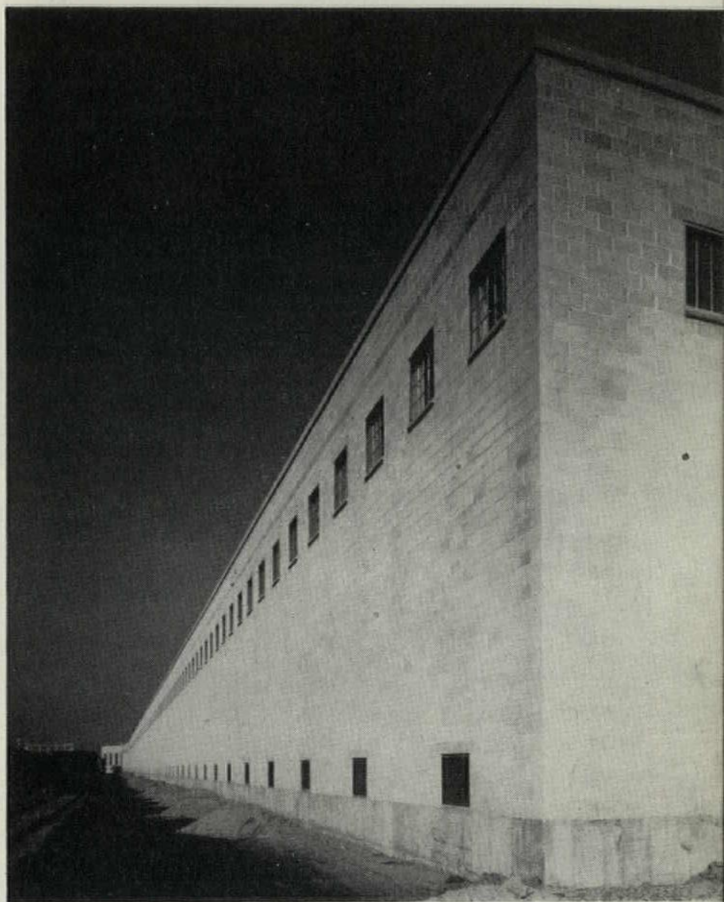




THOMAS J. BAIRD
Designer
DETAIL of
BAY WINDOW
SCALE 1/2"=1'-0"
PLAN OF SEATS
SECTION
Closet
Door
Bookcase
Seat
Seat
Glass
Shelf
Pipe column
7'-10"
Grille
Plywood
Variable
4"
2'-4"
4'-2"
3'-0"
1 1/2"
3"
8 1/2"



SELECTION AND USE OF CONCRETE BLOCK



U. S. Army's Postal Concentration Center, Long Island, N. Y., where concrete block was carefully selected for texture and structural suitability. Alfred Hopkins and Associates, Architects.

Concrete block, available for many years, has possibilities far greater than its common use where it won't be seen. For example, it can be obtained in various surfaces, colors, and textures; its strength can be varied to suit the intended use; it can be made with thermal insulation and acoustic properties. Like any other building material, concrete unit masonry can be used carelessly with sad results, or employed with care and discrimination to produce work good from any point of view. Since thorough knowledge of a material is necessary before it can be used intelligently, this article cannot be regarded as exhaustive; but in it are included the types and sizes available, their manufacture, indications of their use, and means of obtaining a high quality of work when using them.

KINDS AND SIZES

Concrete building units are available in a wide variety of standard shapes and sizes to fill virtually every construction need. Sizes of "quality" concrete block conform to modular dimensions; standard units are made 16" long, 4" to 12" thick, 8" high (including joint allowance). To provide for random ashlar patterns, block are also made from 4" to 24" long, and in various heights. Block are classified as load-bearing or non-load-bearing; types available include: *building units, partition* and *back-up units, filler tile, surfacing units, chimney, joist, sash* and *jamb units*, and *slabs*. Drawings on pages 88 and 89 show the most frequently used kinds and sizes.

Texture of block surfaces varies from coarse to fine, according to the grading of the aggregate used. Block of lightweight aggregate have better acoustical properties than those made of heavy aggregate, and greater thermal insulation value.

MANUFACTURE

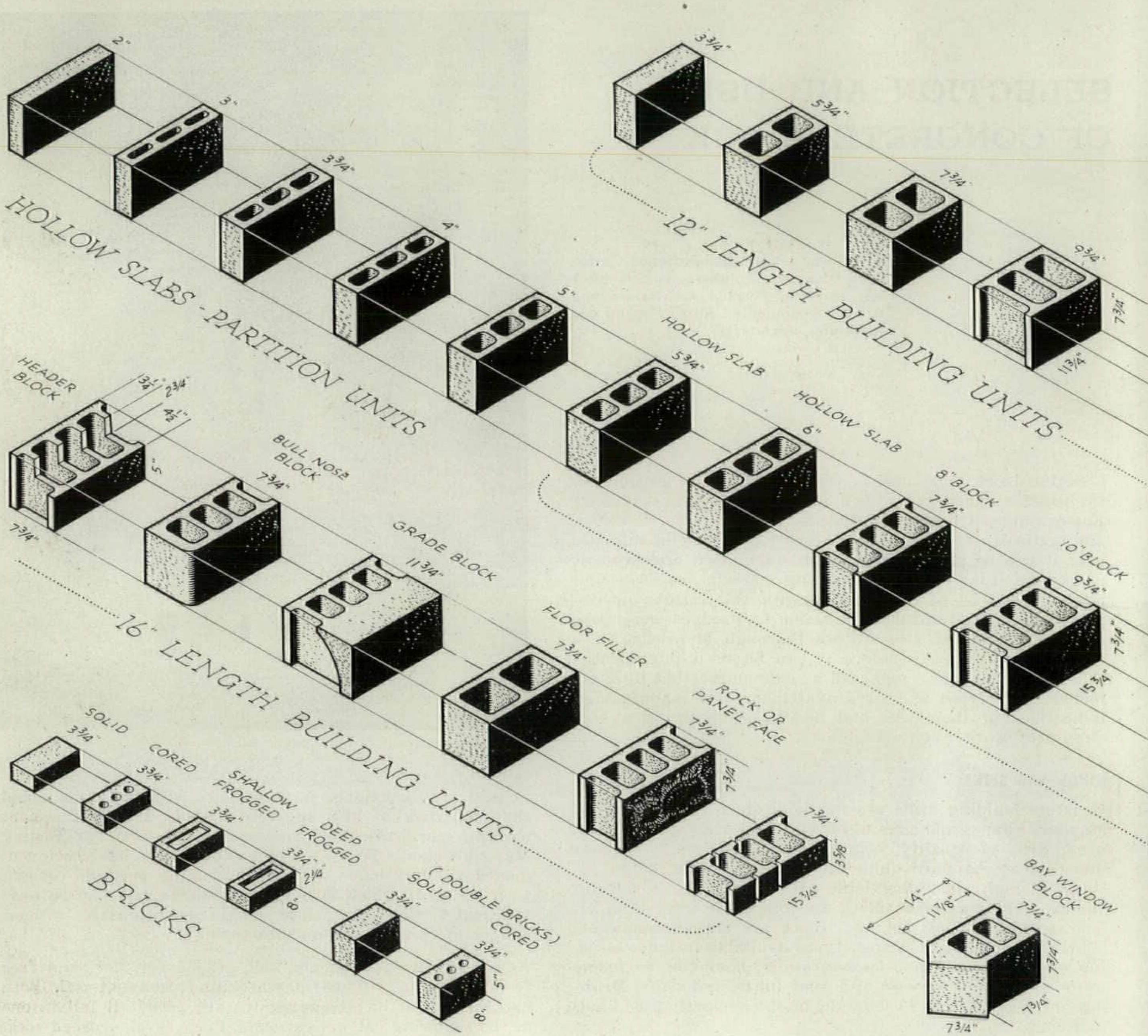
A.S.T.M. and Federal specifications, and the A.S.A. Masonry Code, contain quality requirements for concrete block; all the designer need do to insure standard quality is to require that block meet these specifications. Color, texture, and other non-standard requirements should be specifically described.

Concrete block are a combination of portland cement, aggregate, and water, usually in a mix such that surface texture can be controlled easily and forms re-used rapidly. A wet mix is sometimes used to secure a very dense surface and to obtain web markings which may be desired. Too wet a mix, because it produces a block which will slump if forms are removed too soon, prevents rapid production. Too dry a mix produces block of poor strength.

Cement is proportioned in accordance with the amount and characteristics of the aggregate used. Portland cement meeting specifications of the American Society for Testing Materials should be used. Some experiments have been conducted on block made with air-entraining portland cement, as a result of which it is claimed that a mix can be used sufficiently wet to achieve maximum strength, without danger of slowing the manufacturing process.

Aggregate must be clean, well graded for size, and free from acid, alkali, industrial waste, or frozen material. Both natural and artificial aggregates are used; all fall in one of the following categories: sand, fine gravel, crushed rock, heavy slag, expanded slag, burned shale, cinders. Both manufacturers and such associations as the Portland Cement Association and National Concrete Masonry Association are constantly testing new aggregates. Manufacturers can furnish various types of artificial aggregates which are usually sold under a brand name, such as: *Gravelite, Tuf-Lite, Waylite, Cel-Seal, Super-Rock, Haydite,* or *Celocrete.* Most manufacturers usually have available more than one of these materials, so that a proper aggregate can be employed in making block to meet specifications exactly. Sand and gravel combined form a "heavy" aggregate which is used in approximately 60% of the block manufactured today. For many uses, such "heavy" block may be found superior to or more economical than lightweight block. For instance, the extensive development of concrete masonry in Florida, where hurricane-resistance is a factor, is based on use of such "heavy" block.

Water is extremely important. Water should be potable, the mix semi-wet for reasons previously explained. Quantity of water, as well as of cement, is determined by the kind of aggregate employed. Each block manufacturer, knowing the cement and aggregates available locally and his



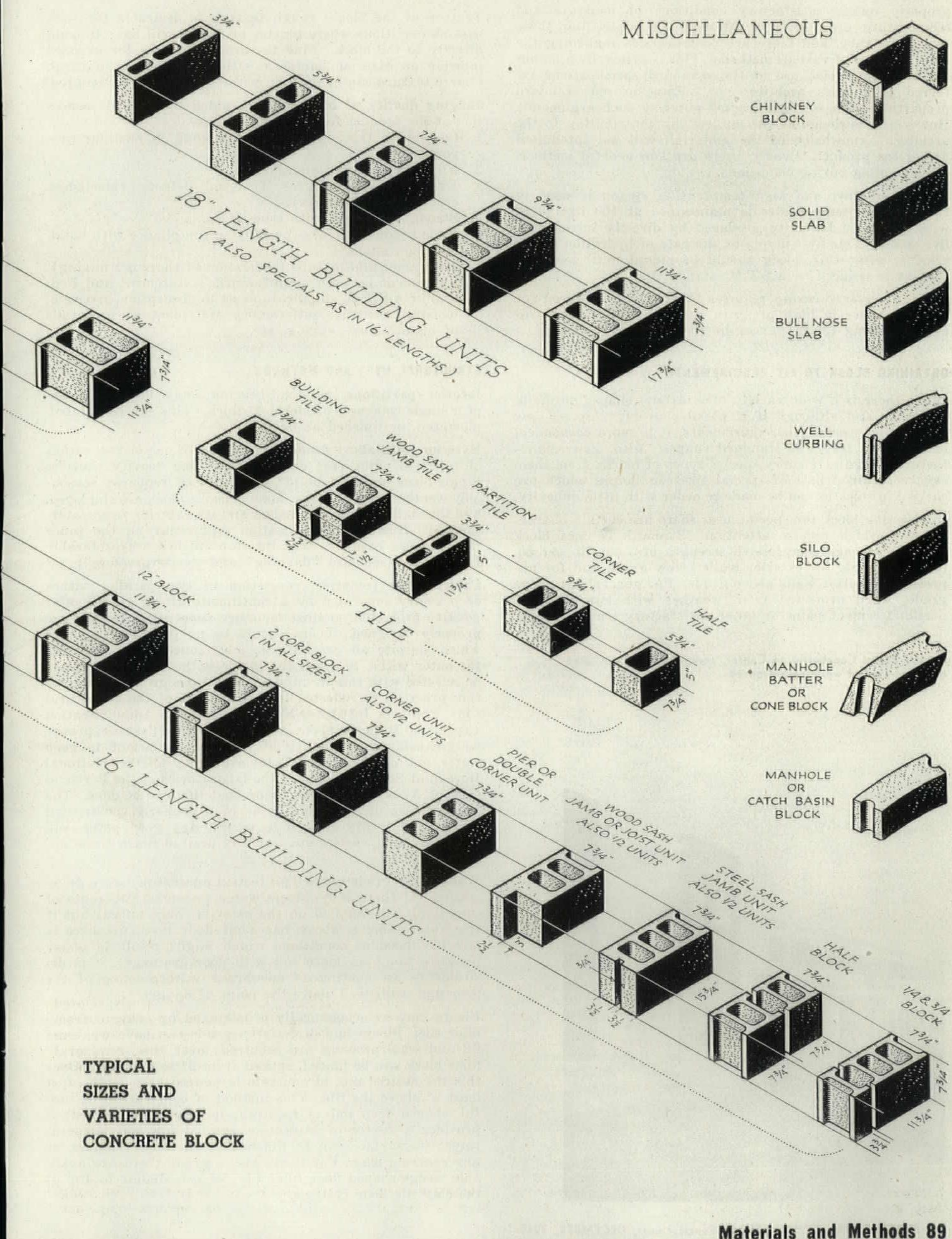
own production methods, has developed his own formulae; using these, he can produce block which conform to A.S.T.M. standards, particularly as to strength.

Mixing thoroughly is necessary to produce block that are structurally satisfactory. Properly mixed materials will result in block with firm, true edges, even, regular surfaces, and the desired strength.

Forming the block is greatly facilitated by the use of modern machinery; this includes mixing, discharging, and molding equipment. In the mold the mixture must be vibrated or tamped well to insure complete filling of the mold, homogeneity, strength, density, durability, and desired surface texture of the finished product.

Color. The various aggregates produce differently colored block, ranging from an off-white to gun-metal gray, or from light tan to brownish shades. A wider range of color can be obtained by using in the mix commercially pure mineral pigments singly or in combination. Integrally colored block can be produced with the following pigments:

Blues: cobalt oxide
Browns: brown oxide of iron
Buffs: synthetic yellow oxide of iron
Greens: chromium oxide
Reds: red oxide of iron
Grays, slate colors: black oxide of iron or Germantown lampblack, preferably iron oxide. *Never* use common lampblack.



TYPICAL SIZES AND VARIETIES OF CONCRETE BLOCK

Curing. Concrete block, like any concrete, will not cure properly unless satisfactory conditions of moisture and temperature are provided. Methods of controlling these conditions vary, and there are controversies regarding the relative value of various methods. This is primarily a manufacturer's problem; use of the standard specifications referred to enables architects to obtain desired standard properties in the finished product entering such arguments. However, knowledge of the subject, by contributing to the architect's knowledge of the material, will aid intelligent use of the product. Briefly, there are two general methods of controlling curing conditions.

1. Low pressure and high temperature curing is done in rooms where temperature is maintained at 100 to 180°F, with saturated humidity produced by directly introducing live steam. This first increases the rate of hydration of the cement; after this, block should be stored until moisture content is reduced to A.S.T.M. standards.

2. High pressure curing requires the block to be cured for about 8 hours in high pressure cylinders under pressures approximating 125 lb. per sq. in.

OBTAINING BLOCK TO FIT REQUIREMENTS

While there is a wide variety of sizes and shapes normally available, and although it is possible to cut, chip, or saw block to fit special job requirements, it is more economical to design in terms of standard shapes. Also, some manufacturers regularly carry special types of block; from them can be obtained lists of special sizes or shapes which are carried in stock or can be made to order with little difficulty.

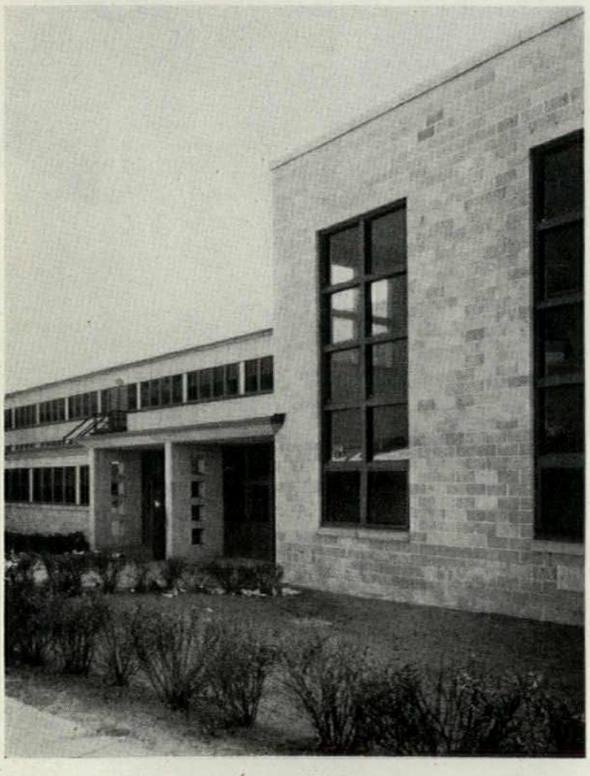
In selecting block for specific uses there are certain characteristics which require attention. Strength is one; block with an average compressive strength of 1,000 lb. per sq. in. are suitable for exterior walls below grade and for unprotected interior walls above grade. For general use above grade, when protected from weather with two coats of portland cement paint or other satisfactory waterproofing, compressive strength may be reduced to 700 lb. per sq. in.

Texture of the block: rough texture is desirable for such uses as partitions where plaster or stucco will have to bond directly to the block. Fine texture is suitable for exposed interior or exterior surfaces, either painted or natural. Coarse texture can be used on exteriors if properly painted.

Judging quality of block will be aided by careful inspection of the product for such qualities as:

1. Consistent, true, regular dimensioning in modular proportions.
2. Firm, sharp edges and corners.
3. Even-textured surfaces free of defects (blemishes, cracks, pits, markings).
4. Strong, firm webs with true edges.
5. Wide bedding surfaces permitting compliance with building regulations.
6. Even color and texture (indication of thorough mixing).
7. Agreement between manufacturer's statement and Federal or A.S.T.M. specifications as to absorption, strength, moisture content; satisfactory statement as to details of manufacture, curing, etc.

On the Postal Concentration Center, concrete block was used even for pierced walls at entrances.



STRUCTURAL USES AND METHODS

Interior partitions, non-load-bearing, may be constructed of a single thickness of block, 4" thick. This can be painted, plastered, or finished as desired.

Exterior walls above grade may consist of one or two withes of concrete units (for double withes see "cavity walls"). Single-block walls 8" to 12" thick can be rendered reasonably weatherproof if dense, homogeneous block are employed, and the wall is properly flashed and its exterior face waterproofed. However, condensation will occur on the inner face in some cases, so that interior finishes are preferably furred out (see also "flashing" and "waterproofing").

Cavity walls (exterior, consisting of two parallel withes of masonry separated by a continuous 2" air space) offer positive protection against moisture penetration if they are properly designed. There should be no path for moisture which, despite all precautions, may conceivably penetrate the outer withe, to reach the inside withe; wall ties should be selected with this in mind. Current design and construction practice, as reflected in publications of the Structural Clay Products Institute, National Housing Administration (Technical Bulletins), etc., require adequate flashing, proper workmanship, and quality of materials sufficient to keep water out of the wall. Extensive tests at the National Bureau of Standards and in the laboratories of the Portland Cement Association demonstrate that this can be done. The interior face of the inner withe of a properly constructed cavity wall is dry enough to permit any good paint—oil, resin emulsion, casein, etc.—or any desired finish to be applied directly.

Walls below grade require protection against moisture penetration. If there is no static water pressure, two coats of cement plaster, applied on the exterior, may suffice; but if the water table is above basement floor level, or there is any likelihood of conditions which might result in water pressure (such as dense soil with poor drainage), it is desirable to use continuous membrane waterproofing of the floor and walls well above the point of danger.

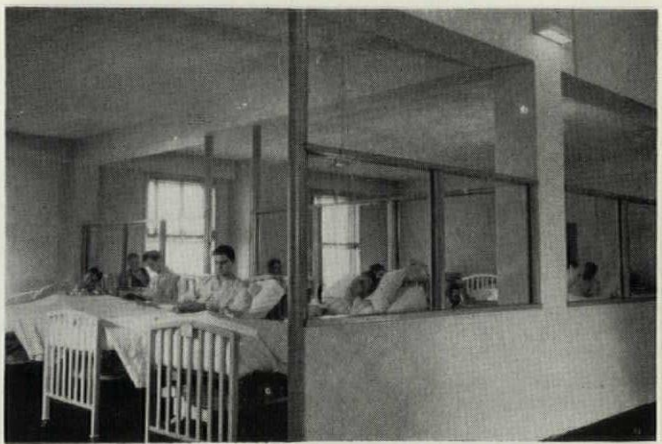
Floors may be economically constructed by using concrete filler tile. Floors laid directly on grade can have whatever fill and waterproofing are required; over this, rows of 4" filler block can be placed, spaced from 2" to 4" apart. Over this the desired mix of concrete is poured to a depth of at least 2" above the tile. This method of construction is useful when a deep slab is required; it may be reinforced; it provides a degree of insulation against low soil temperatures; its surface can be finished in the same manner as any concrete slab. For floors above grade there are available wedge-shaped floor filler tile for use similar to any of the clay tile floor systems.

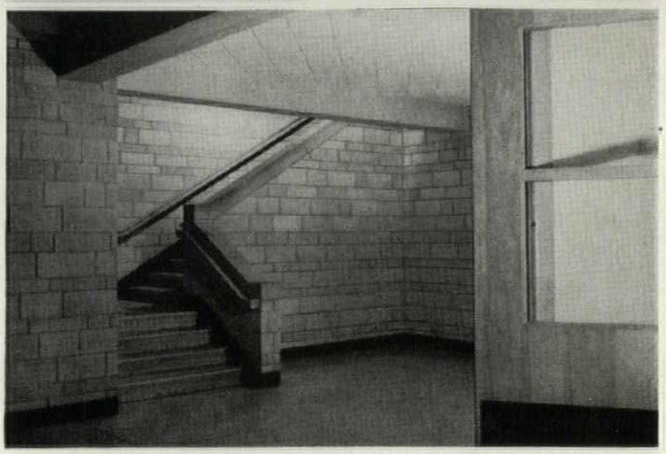
Structural elements and services. Wood and metal door casings, window sills, furring, baseboards, and trim of all kinds can be nailed directly to lightweight concrete block, which holds nails. Electric conduit and many plumbing lines can be run vertically in the voids of the block. Access panels, apertures for outlets, switches, faucets, horizontal piping, etc., may be cut in the block. If chases are used, special concrete units may be used to close the chases, and "broken" joints may be employed to match the remainder of the wall so that no evidence of the chase will show on the face.

Thermal expansion, reinforcing. There are too many factors involved in thermal expansion to permit a full discussion here. Large areas of concrete masonry normally require expansion joints; their design and placement is an engineering problem on which competent assistance should be obtained. Other pertinent questions include: How about contraction joints? Has the building a structural frame? How close are the columns? What kind of floors are included? Where are the openings placed? How is the building fastened to its foundation? Where is the building located—southern California or northern Minnesota? What was the condition of the block when laid? What time of year? What mortar (some mortars may expand ½ per cent or more)? What width of mortar joints? What tensile strength of units? There are many others. If, for any reason, reinforcing is necessary in wall construction, rods should be installed in horizontal face joints, ½" back from the face, with the rod completely encased in mortar.

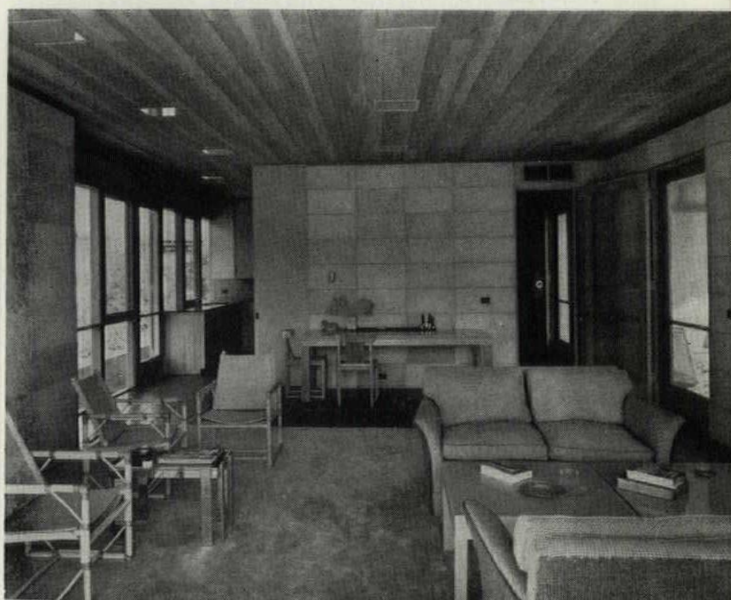
Waterproofing, flashing, damp-proofing. To waterproof exterior faces of walls above grade at least two coats of portland cement paint—not an oil-base paint—should be used. The first is a seal, the last a finishing coat. Paint should meet specifications of the National Bureau of Standards; application should follow manufacturer's directions. This type of paint is available in several colors, and can be used as a finish on both exterior and interior surfaces. It will not waterproof walls when applied to interiors. Some manufacturers recommend that walls stand 30 days before painting, so that paint will seal any shrinkage cracks in mortar. Waterproofing for floors and walls below grade has been discussed previously. Flashing should be used even in walls one block thick, at joints and apertures where moisture may collect, around window and door frames, etc. Damp-proofing courses, not always used in this country, are desirable, particularly when it is likely that excessive soil moisture may rise and keep the wall damp.

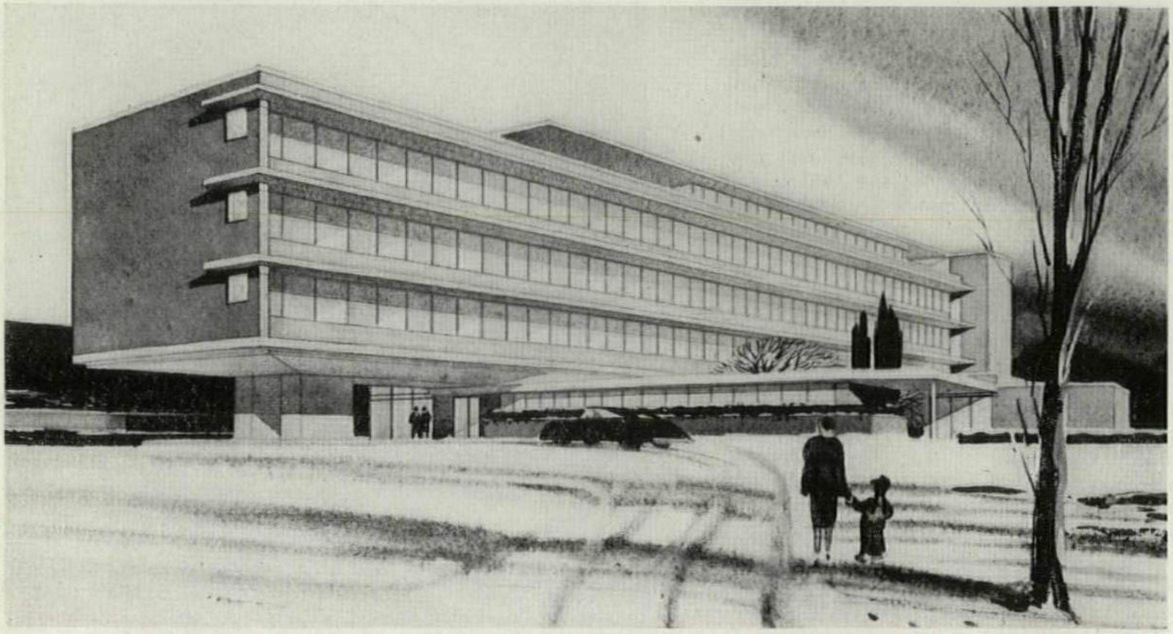
Storing, handling, and laying concrete block. Keep block dry and clean; store on platforms, keep covered during rain and overnight; similarly cover walls under construction. Patterns for block usually provide hand-holds at both ends, placed to facilitate proper setting. Block should be laid with the wider edges of the webs up; when the next block is laid on top, narrow edge down, mortar is forced up inside the core to give better bond. For average work, mortar may be of 1:1:6 mix, using portland cement, lime putty, and clean, sharp sand; water must be of potable quality. Higher cement content is usually required for work below grade. Integral coloring may be used. Mortar bed should be placed on outer cell walls, never on webs; vertical joints should have only the vertical webs buttered with mortar. No mortar or droppings should be permitted in the hollow cores unless cores are to be filled for inserting anchors or similar purposes. It is the practice in some localities to lay across the cells a board sufficiently wide to cover the cores, but narrow enough to permit proper mortar placement. Excess mortar should be so cut off that mortar is not pulled away from the surfaces to be bonded. If masonry is being laid up to modular dimensions, joints should be ⅜". Block should be laid plumb, square, and true, with cells vertical. Corner block have finished return ends, and should be of a length which will preserve the bond pattern. In cavity walls it is particularly important that no mortar drop into the cavity; if any falls in, it must be removed.





Above, two interiors of the U. S. Coast Guard Hospital, Sheepshead Bay, N. Y., Alfred Hopkins & Associates, Architects, showing (top) paint applied directly to interior concrete block partitions and walls; and specially selected block, laid up with raked mortar joints, in the stair hall. Below, interior of living room with walls of exposed concrete block, house in California, William Wilson Wurster, Architect.





Proposed Faith Hospital, St. Louis, Mo.; Joseph D. Murphy, A. G. Corrubia, Associated Architects. View shows maximum sun penetration in winter.

DAYLIGHTING FOR HOSPITALS—Part I

By ISADORE ROSENFIELD, Architect and Hospital Consultant

This is the first of two parts of an article on a subject in which interest has increased tremendously. The second will be published in February 1946.

We associate with hospitals the two concepts of cleanliness and light. Yet are hospitals amply DAYLIGHTED? Before you answer, examine critically any hospital you're familiar with; you'll probably find it is not. And why shouldn't cleanliness and daylighting be characteristic also of public buildings, factories, shops, and so on? Particularly in the case of hospitals, is good daylighting important?

SHOULD DAYLIGHTING BE BANISHED FROM BUILDINGS?

No one has yet built a hospital, school, or house completely without windows, but other structures have been so built. Once an engineer-inventor, suggesting that I wasted the public's money by designing hospitals with windows and balconies, urged me to use windowless wards; in them a patient would be connected to two pipes, one marked "fresh air," the other, "vitiated air."

That suggestion may be in the lunatic fringe, but consider windowless factories. They emerged just prior to the war as an answer to the need for "controlled conditions;" that is, for complete control over atmospheric conditions, including heat, light, humidity, air cleanliness, etc. During the war, of course, they also met the problem of blackouts. There is no question that precision production requires a high degree of atmospheric control; but there is probably a fallacy in the assumption that atmosphere control and windows are incompatible. Only when control of light is essential to an extremely high degree, so that normal fluctuation in quantity and quality of daylight becomes intolerable, is the assumption justified. Indeed, with modern techniques and contemporary glass products it is entirely possible to achieve a high degree of control of daylight distribution in the interiors of buildings, even when considerable glass is used. In a recent building for the Sperry Gyroscope Corp. in Long Island, N. Y., for instance, there is a substantial amount of glass enclosing a very precise manufacturing operation.

As for the psychological factor—an extremely important one—factory workers have stated that while they like the comfort of controlled conditions they also like glass enough at least to see what the weather is.[1]

People *like* fresh air and natural light; whether the reaction is emotional or not is important. No matter how good artificial light is (and with modern equipment it can be excellent) it cannot wholly supplant the natural product unless our whole concept of living and comfort changes. Before natural means are abandoned, studies should be made to establish a basis for evaluating artificial means. In factories such studies might indicate the actual relative output of windowless and windowed plants, also the relative rates of absenteeism due to illness from respiratory infections. We have both kinds of factories producing comparable goods; they should furnish examples for comparative study.[2] In these days when psychosomatics, "the emotions that make us sick," are gaining increasing recognition as powerful factors in human behavior, the psychological value of good natural light deserves full consideration.

[1] *Last Word In Factories*, *Fortune*, May 1945; *Windows or Windowless*, *Weekly Bulletin*, Nat'l. Council of Arch. Reg. Boards, October 9, 1945.

[2] Such a study has been made in England: *An Experiment in Lighting*, Messrs. Ferranti, Ltd., Hollinwood, Lancashire (Vitaglass Corp., N. Y. C.).

WE KNOW SOMETHING ABOUT USING DAYLIGHT

A great deal is known about "daylight designing" for factories and schools. Investigation of publications of the Illuminating Engineering Society indicates that illumination of a desired intensity on a working level can be produced with almost the same exactness with daylight as with artificial illumination. In factories, where such practice pays the most tangible dividends, application of these design principles is common; but museums and many schools are still daylight-engineered by guesswork, and most houses by intuition—if at all. (This was obviously true in the submissions for a recent architectural competition in which the maximum use of glass was required.) The British Government, through its Building Research Station, has prepared a valuable series of publications called "Postwar Building Studies," of which No. 12 is: *The Lighting of Buildings.*[3] In it daylighting, particularly of dwellings and schools, is treated. Similar publications are listed below, and in justice to the architectural profession it must be noted that architects are responsible for most of them; also, that at least one School of Architecture, that at Columbia University in New York, teaches students to analyze their work in terms of orientation for sunlight. Yet, of the two kinds of illumination, natural and artificial, natural lighting has received far too little practical attention from either the general public or the building designer. The compelling technical problems of artificial lighting have engaged the major portion of our attention; we have neglected the relatively simple problems connected with daylighting. If we are to put daylight to work for us with comparable efficiency we must ferret out its potentialities and arrive at ways of using it well to achieve better vision and psychological satisfaction, and to combat disease.

IS DAYLIGHT A LIFE-AND-DEATH MATTER?

To narrow the subject to hospital design, good daylighting is of great import to hospitals for precisely those three reasons: *proper vision, psychological effect,* and *protection from cross-infection.* As to vision, it is important in the hospital to be able to read a thermometer readily and to see abnormalities in color of skin, lips, finger nails, wounds, pus, and all the other symptoms in terms of which the most elementary clinical procedures are taught and practiced.

Equally important are the psychological factors. A moribund patient may be beyond caring whether the sun shines or not, but even this may not always be true. A very sick

[3] *Museographie,* Ch.III, "Eclairage Naturel et Artificiel," by Isadore Rosenfield and Clarence Stein; Office Internationale des Musées, Paris.

The Lighting of Buildings, in which P. V. Burnett, F.R.I.B.A., and F. Jackman, A.R.I.B.A., collaborated; Postwar Building Studies, No. 12. British Ministry of Public Works. Available in U. S. from British Information Services, 30 Rockefeller Plaza, N. Y. C. 75 cents.

Solar Radiation, study by H. N. Wright made for J. B. Pierce Foundation, 1936, now available through Robert L. Davison Assn., N. Y. C.

Recommended Practices for Lighting California Schools. Calif. State Dept. of Education, Sacramento, Calif.

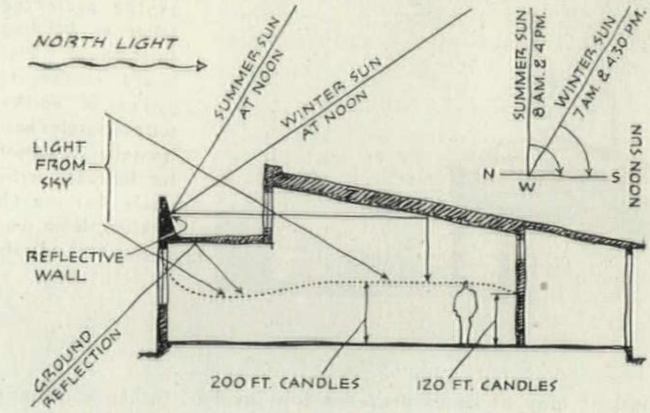


FIG. 1—Daylighting levels obtainable in school classrooms with clerestories.

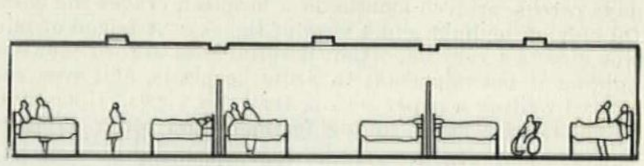


FIG. 2—Section through Riggs ward showing low partitions. Similar cubicle divisions in contagious wards provide limited assistance in controlling spread of infection.

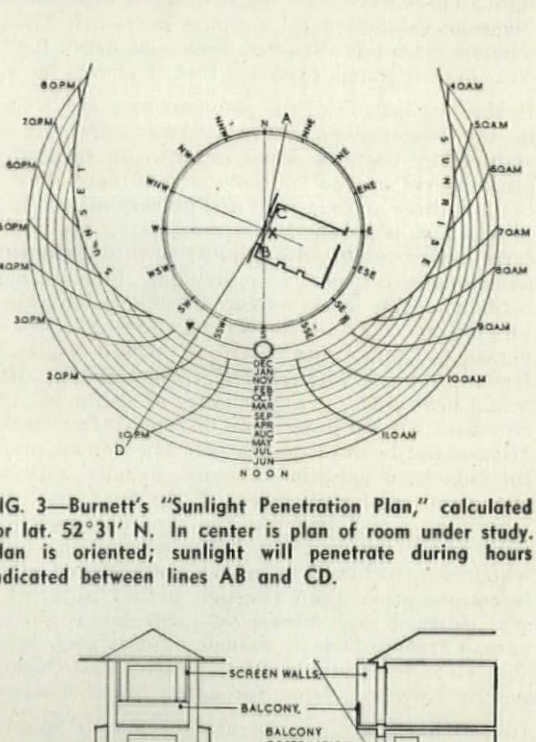


FIG. 3—Burnett's "Sunlight Penetration Plan," calculated for lat. 52°31′ N. In center is plan of room under study. Plan is oriented; sunlight will penetrate during hours indicated between lines AB and CD.

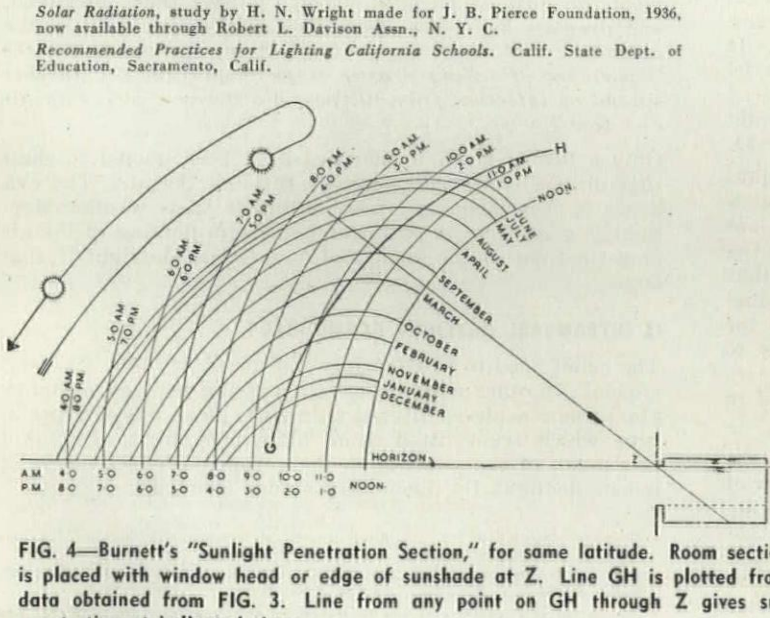


FIG. 4—Burnett's "Sunlight Penetration Section," for same latitude. Room section is placed with window head or edge of sunshade at Z. Line GH is plotted from data obtained from FIG. 3. Line from any point on GH through Z gives sun penetration at indicated time.

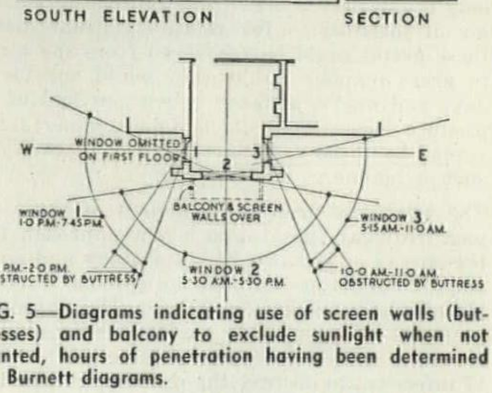


FIG. 5—Diagrams indicating use of screen walls (buttresses) and balcony to exclude sunlight when not wanted, hours of penetration having been determined on Burnett diagrams.

Figs. 3, 4, 5, 6 from Postwar Building Studies No. 12, "The Lighting of Buildings," Ministry of Works, Great Britain.

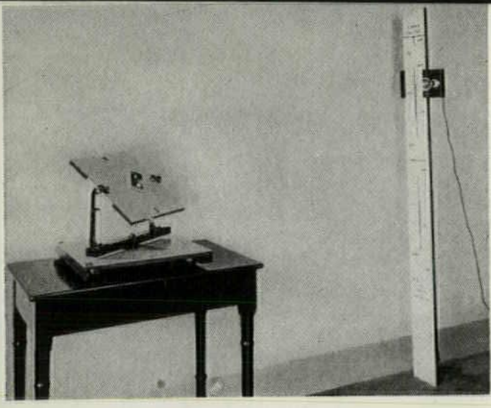


FIG. 6—The Heliodon, a device for determining insolation using a model of the projected house or building development. Flat board represents portion of earth's surface, rotates horizontally to adjust for latitude, vertically for earth rotation; lamp represents sun, adjusts for declination.

patient may at times prefer a low level of light; abundant light can be easily cut down to the desired level by using curtains or blinds. The average patient, however, particularly the long-term patient who must spend many weary days, weeks, or even months in a hospital, craves the cheerful play of daylight and a view of the sky. A friend of mine who directs a very important hospital once argued that daylighting is not important in acute hospitals, and even considered writing a paper setting forth his views. Upon study he published a paper calling for more and better daylight!

This much is usually granted the proponent of good daylighting design: natural light costs less than artificial illumination in the middle of the day. But now we come to a different potentiality, the *life-or-death* quality of daylight. There have been vague ideas as to methods of hospital planning calculated to minimize cross-infection, but use of window glass has not often been considered for the purpose. Yet there is ample evidence that it should be so judged.

In the last decade of the previous century—relatively early in the bacteriological era—it was allegedly shown that respiratory bacteria when coughed or sprayed into indoor atmospheres spread for only a relatively short distance in the air, three or four feet, and quickly settled to the ground. It was also believed that after leaving the body these bacteria deteriorated quite rapidly with a concomitant loss of ability to infect another individual. In substance, then, according to this so-called contact theory, disease of respiratory origin could be spread only over a short distance. A person in close contact with a sneeze might contract infection, but one who entered a room shortly after a sneeze would have little, if any, chance of doing so. On this basis measures for the prevention of cross-infection in contagious disease wards were instituted. The device resorted to was the cubicle, a partitioned space, usually with a completely open front and with sides off the floor and extending not more than 6 or 7 feet into the air. The cubicle's main purpose was to prevent the propulsion of the liquid droplets which were believed to be the main means of transferring infections other than through actual physical contact. It was believed that disease of bacterial origin could not be spread from cubicle to cubicle; but it soon became evident that virus infections such as measles and chicken pox could not be prevented from spreading by such means (Fig. 2).

Honest hospital administrators began to admit their difficulties in the late thirties after new bacteriological, epidemiological, and clinical findings had begun to show that not only could disease organisms be readily spread through the air of institutions for relatively great distance, but that these germs could be recovered from the air and floor dust in great numbers; that they could survive sometimes for days and weeks, apparently without loss of their ability to produce disease; and also and more importantly that diseases spread by these very bacteria *were actually transmitted* in such a manner.

The relatively firm establishment of these concepts in the past five years has led to a new approach to prevention of the spread of diseases of respiratory and similar origin not only in hospitals but also in schools, barracks, and other places where people congregate. The approach, to date, has consisted of interposing sanitary means (ultraviolet light, chemical sprays, floor and bedding oils) to break the chain of infection, to destroy the microorganisms in their journey from one person to another. One approach, however, whose possible importance has been indicated, has not been followed as yet. This attack involves the use of glass.

As previously mentioned, the "contact" or "close proximity" theory of the spread of infection, which took little if any cognizance of ambient respiratory microorganisms in our indoor environments, prevailed from relatively early in the bacteriological era, the eighteen-nineties, until the middle nineteen-thirties. This theory, however, was not adhered to by everyone. Certain laboratory scientists refused to accept the premises as well as the conclusions. One scientist stands out among these, a Frenchman, Trillat, who for some thirty-odd years devoted himself to laboratory work in order to demonstrate that infection is spread via the air at relatively great distances and to show that such infection could be prevented by sanitary means. Another, a physician, Dr. Joseph De Lee, a Chicago obstetrician, by observation and logic came to the conclusion that some of the infections which occurred in maternity hospitals were spread through the air. He advocated radical changes in hospital technic and hospital construction, and went to the great length of advising that mothers have their babies delivered at home rather than in the hospital. There was great agitation in the medical profession, Dr. De Lee was pilloried for his beliefs, and was cast out of the local medical society. He failed to live to see his beliefs vindicated a few years later.

The individual who beat the drum loudest for the sanitary control of air-borne infection in the nineteen-thirties is Prof. W. A. Wells, formerly of Harvard and now of the University of Pennsylvania. His pioneering efforts were largely responsible for the birth in this country of new technics for the prevention of the spread of respiratory infection. The relative respectability of this new idea was demonstrated in 1942 when a symposium on the general subject, "Aerobiology," was held by the American Association for the Advancement of Science and a volume of the papers presented was published.[4]

Aerobiologists W. F. and M. W. Wells, of the Laboratories for the Study of Air-Borne Infection of the University of Pennsylvania School of Medicine, have made discoveries which have led them to the conclusions "*that the atmospheres of our habitations provide a vehicle for the epidemic spread of contagion,*" that even "*evaporation of minute droplets expelled in expiratory processes enables infection to ride these droplet nuclei on air currents,*" and that "*inhaling nuclei-infected air demonstrates the penetration of these nuclei to the depths of the lung with consequent production of disease.*"[5]

Writing on the subject of the spread of pneumococcal and streptococcal infections in hospital wards and families,[6] Maxwell Finland reports that he "recovered pneumococci from the dust of hospital wards," states that "air, dust, and droplets have now been shown to play a role in the spread . . ." of many types of infection, and points to "*the importance of taking drastic steps to prevent the further spread of infection from all possible sources, including air and dust.*"

Only a few of many authorities have been quoted to show that disease can be transmitted through the air. The evidence is overwhelming. What interests us is whether daylight is germicidal to pathogenic bacteria floating in the air or settled out in the dust, and how to use daylight if that is so.

IS INTRAMURAL DAYLIGHT GERMICIDAL?

The belief used to be that only unfiltered daylight was germicidal. In other words, daylight passing through ordinary glass was considered filtered unless the glass was of a special type which transmitted some ultraviolet light. Pursuant to a series of experiments on the germicidal effectiveness of indoor daylight Dr. Leon Buchbinder concludes:

[4] American Association for the Advancement of Science, Smithsonian Institute Building, Washington, D. C.

[5] *Air-borne Infection as a Basis for a Theory of Contagion*, by W. F. and M. W. Wells, *Aerobiology*, Am. Assn. for the Advancement of Science, 1942.

[6] *The Spread of Pneumococcal and Streptococcal Infections in Hospital Wards and in Families, Aerobiology.*

"The effects of sunlight and daylight which had passed through the glass of a window and the glass covers of Petri plates were tested on streptococci and pneumococci which had settled out of the air into the bottoms of Petri plates. It was found that under those conditions *diffuse daylight was a patent lethal agent.* The lethal effect of daylight was found to be dependent on both quantitative and qualitative factors. Diffuse daylight from blue skies exerted a maximal effect per foot-candle, whereas light from gray skies produced a minimal one. The total lethality even under overcast skies, however, was not insignificant. Direct sunlight through glass under similar conditions was about ten times as potent as diffuse daylight. It may be concluded, then, that if the air-borne route for respiratory infections is important, *(1) the concentration in our environment of organisms of the types which cause these infections is reduced by natural daylight and sunlight, and (2) this suggests the planning of a maximum of window space in new hospitals, schools, and homes.*" [7]

Dr. Buchbinder's experiments are conclusive enough, but more dramatic evidence comes from England.[8]

During the war ground floor windows of English hospitals were protected against shrapnel by heavy brick walls which caused ground floor wards to be very poorly daylighted. A high incidence of respiratory infections was observed on the ground floor in contrast to observations made on the upper floors, where the windows were not protected. So striking was the apparent difference that a study of the two environments was undertaken. The report states that ". . . the difference between them was so evident as to suggest the overriding operation of one factor, and the one positive factor appeared to be light. . . ." "Hemolytic streptococci were found to be most numerous in floor dust and were absent from many specimens of dust in the same wards collected from sites on or close to the windows. They were found more often in dust from exceptionally *dark wards* than in comparable specimens from normally lit wards. Hemolytic streptococci . . . in naturally infected dust . . . survived in the dark at room temperature for 195 days." The authors conclude that "*ordinary diffuse daylight is*

[7] *The Transmission of Certain Infections of Respiratory Origin,* Journal of the Am. Med. Assn., Feb. 28, 1942.

[8] *Some Observations on Hospital Dust, with Special Reference to Light as a Hygienic Safeguard,* Lawrence P. Garrod, M. D., F.R.C.P., British Medical Journal, Feb. 19, 1944.

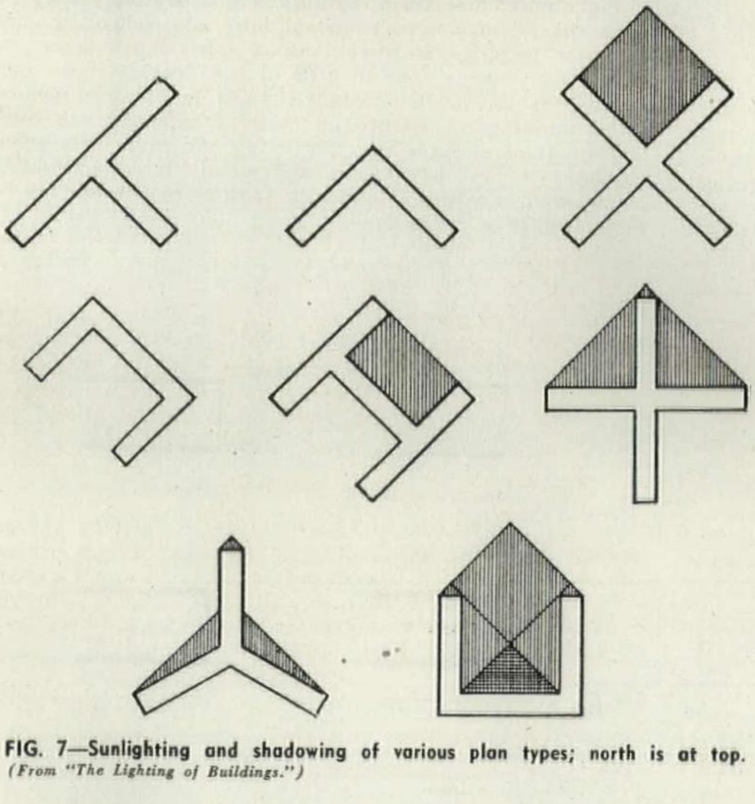


FIG. 7—Sunlighting and shadowing of various plan types; north is at top. *(From "The Lighting of Buildings.")*

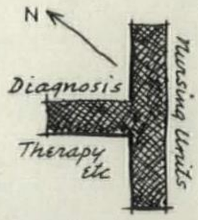


FIG. 8—T-shape, adapted to hospital layout.

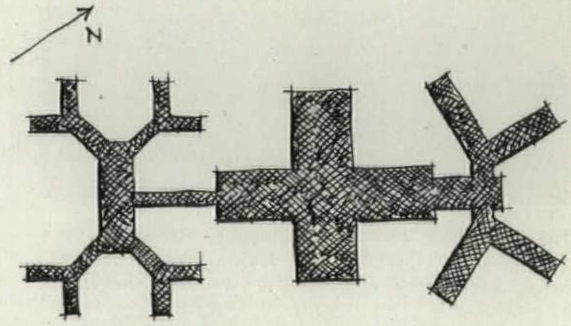


FIG. 9—Multiple L-shape, hospital building for bed-ridden chronic patients, Welfare Island, N. Y.

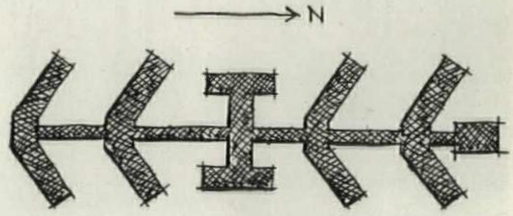


FIG. 10—Chevron shape, a series of flattened L's, Goldwater Memorial Hospital.

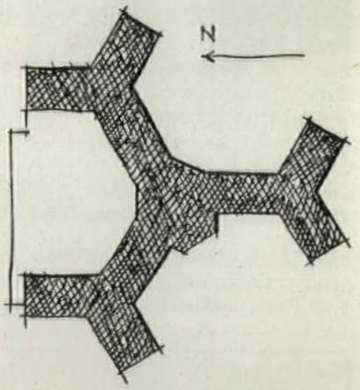


FIG. 11—Y-shape, Sea View Hospital for Tuberculosis.

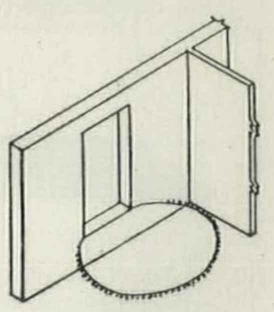


FIG. 12—Contour and depth of area lighted by a conventional window. *(From "The Lighting of Buildings.")*

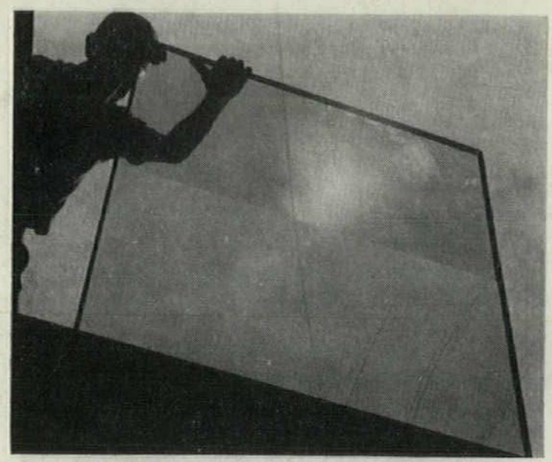


FIG. 13—Glare; photo taken directly into sun through "Thermopane" (prefabricated double glazing) incorporating heat-absorbing glass, lower portion sandblasted.

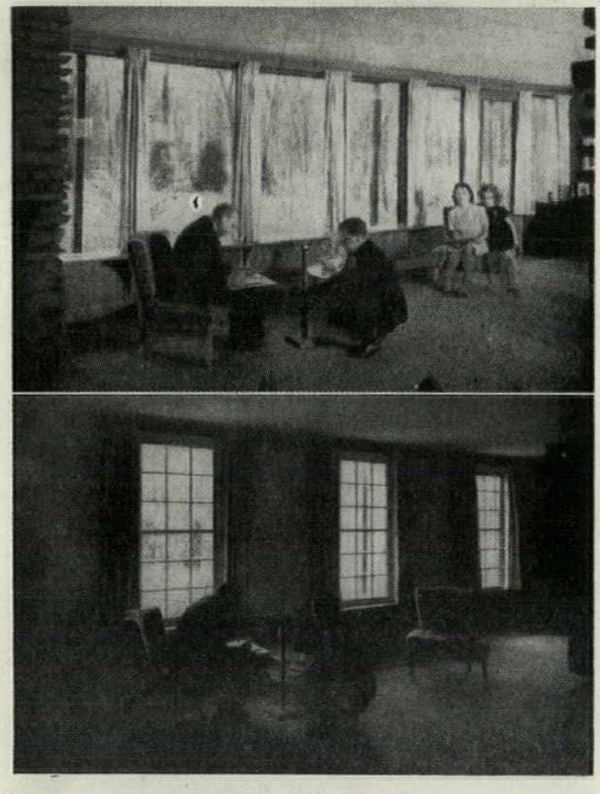


FIG. 14—Brightness contrast in a living room: top, contemporary fenestration; bottom, conventional windows. George Fred Keck, architect.

bactericidal to hemolytic streptococci. The interposition of glass does not prevent this effect and it occurs even under winter conditions in England. These facts suggest the possibility that *good natural lighting* may be a factor in preventing the atmospheric spread of infection in surgical wards and elsewhere."

Therefore it may be said, from a germicidal point of view, that:

1. The more indoor daylight, the better;

2. Sunlight is faster in its effectiveness than light reflected from the sky or clouds;

3. The less filtering daylight is subjected to in entering a room, the better, but *light from gray skies, even though filtered through two thicknesses of ordinary glass, is still germicidal.*

SPACING AND ORIENTATION OF BUILDINGS

To achieve more daylight, greater expanse of glass area is needed, and to obtain sunlight it is necessary to pay attention to proper orientation of buildings. In both cases it is desirable to space buildings so as to let as much light as possible into them.

The principles of orientation are different in different climates. Thus, in the tropics where the sun is generally very bright and hot, the preferable orientation is away from the sun and in the direction of prevailing breezes. If the wind is generally from the south or west then it may be better to face the building accordingly, but in that case the direct glare of the sun must be eliminated through the use of vanes, louvers, shelves, or other means. It is difficult to formulate rules for the tropics; for instance, great altitudes there may take one into sub-arctic temperatures, in which case the problem in the "tropics" becomes the same as in more temperate latitudes.

In temperate zones buildings must be designed for two distinct climates: tropic in summer and sub-arctic in winter. To meet both conditions is the problem of northern architecture. In southern climates the architect's problem is ever so much simpler.

Since sunlight contributes considerably to the warmth of buildings and to the psychological well-being of the individual, since it is ten times more germicidal than light reflected from the sky, and since in temperate zones it is desirable to make maximum use of sunlight eight months out of the year, the problem is so to orient hospitals, schools, homes, and even factories, as to capture as much sunshine as possible. Only during four months of the year is there such a thing as too much sunshine. As it is not practical to rotate buildings in the present state of technological development (and perhaps never will be) we must orient our buildings to best advantage, and when direct sunlight is not wanted in excessive quantity various techniques for its control must be relied upon.

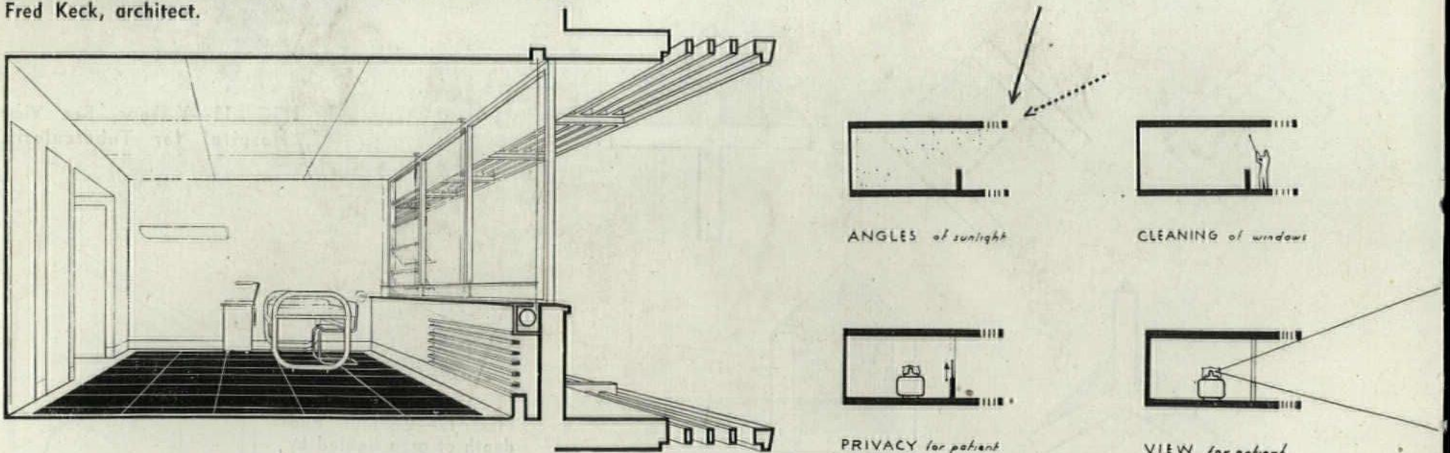


FIG. 15—Typical patient's room in proposed Faith Hospital, St. Louis (Murphy and Corrubia, Associated Architects), has freedom from glare, from unpleasant contrast, plenty of sun when wanted.