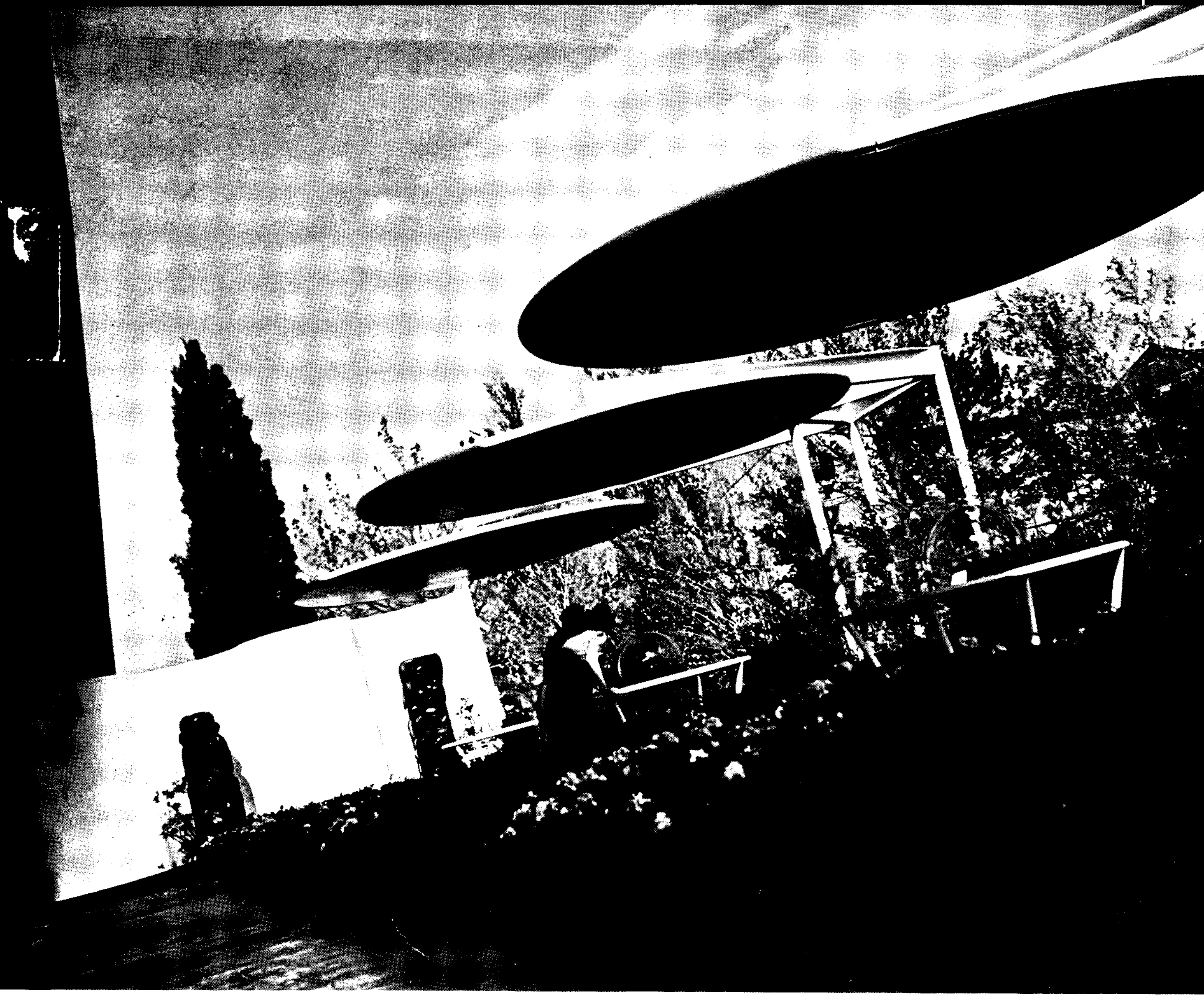
BUILDING NEWS

Specialized circulation in the World of Tomorrow . . .

ARCHITECTURAL RECORD



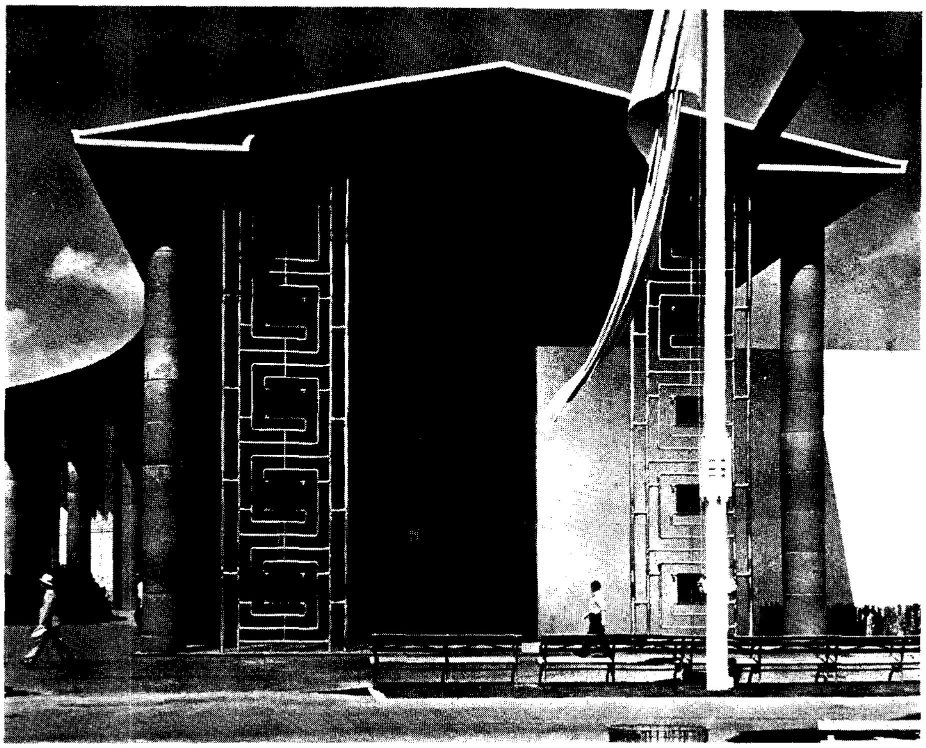
All photos pp. 40-47 by St. Thomas

Open air exhibits at the Venezuelan Pavilion and the Edward G. Budd Company are both provided with shade, but in each case a different structural means is used. Venezuela's wooden umbrellas (above) are hung from cantilevered steel beams; the Budd Company uses the stressed-skin principle for its stainless-steel umbrellas (left). This is perhaps the first actual application of the stressed-skin construction principle to building design.

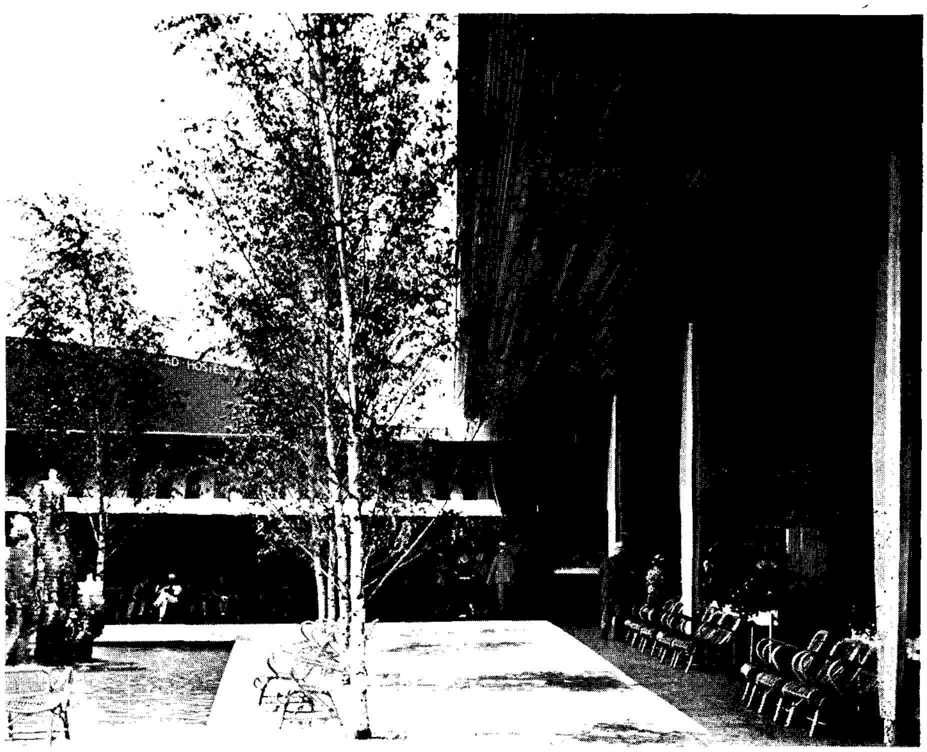
NEW YORK FAIR: FLEXIBILITY, CIRCULATION, LIGHT CONTROL

CONSPICUOUS at this year's "University of Flushing Meadow" are three problems which cut across the design of almost all building types—flexible organization of large areas, maximum control of both natural and artificial light, and easy handling of large crowds. The buildings at the Fair offer a great variety of solutions to some or all of these problems; the ones shown herewith solve them in noteworthy fashion.

The most flexible organization of space occurs where there are neither walls nor columns; realizing this the designers of both the Budd and Venezuelan exhibits have borrowed the umbrella with its single vertical support (facing page). The same general principle in the American Radiator Exhibit (top, right) and the Swedish Pavilion (bottom, right) led to omission of as many walls and columns as possible. In the French Pavilion, on the other hand (p. 42), flexibility has been achieved mechanically to yield open, partially open, or enclosed space.



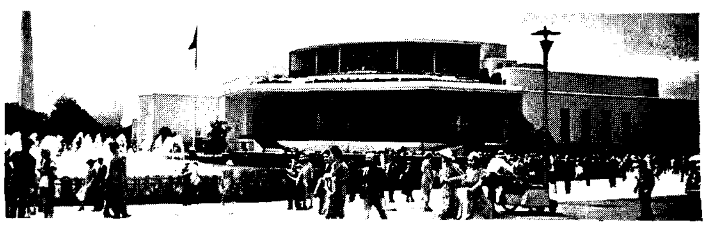
Open on three sides, the American Radiator Exhibit uses waterproof shower curtains for atmospheric control, sewer pipes for columns, radiators for decoration.



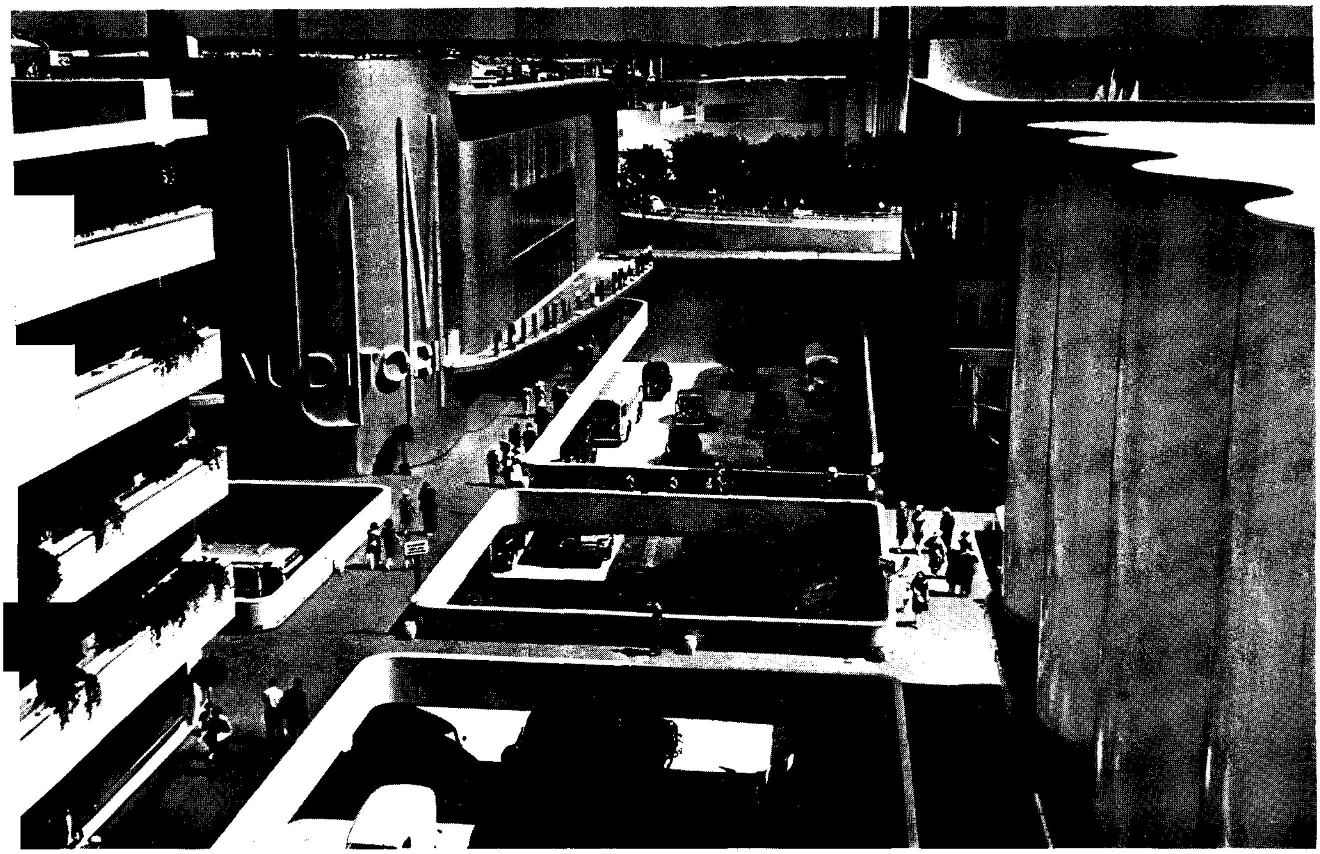
Sweden's Pavilion is built around a court onto which most of its exhibits open.

Venezuelan Pavilion: Skidmore and Owings, architects, John Moss, associate architect; Budd and American Radiator Exhibits: Voorhees, Walker, Foley, and Smith, architects; Swedish Pavilion: Sven Markelius, architect, Pomerance and Breines, associate architects.

The French Pavilion's terraced restaurant has sliding glass panels which can be adjusted to meet climatic conditions. In cool weather, panels are placed to cut off prevailing winds (top); in warm weather, terrace is entirely open (bottom), glass panels stored in chambers at each side. Expert and Patout, architects; D. Berninger, resident architect.



General Motors circulation is complex: visitors dismount from the moving platform which travels through the "Futurama" (top); an exhibit hall (bottom) reached by stairway, escalator, and ramp. Norman Bel-Geddes, designer.

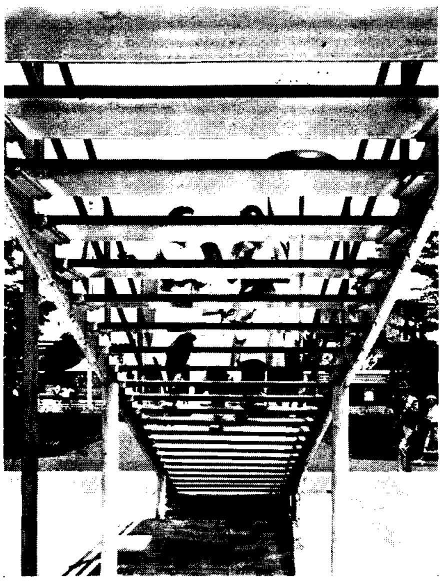


Traffic segregation in the "Street of Tomorrow"; pedestrians use elevated walks while motors flow freely below.

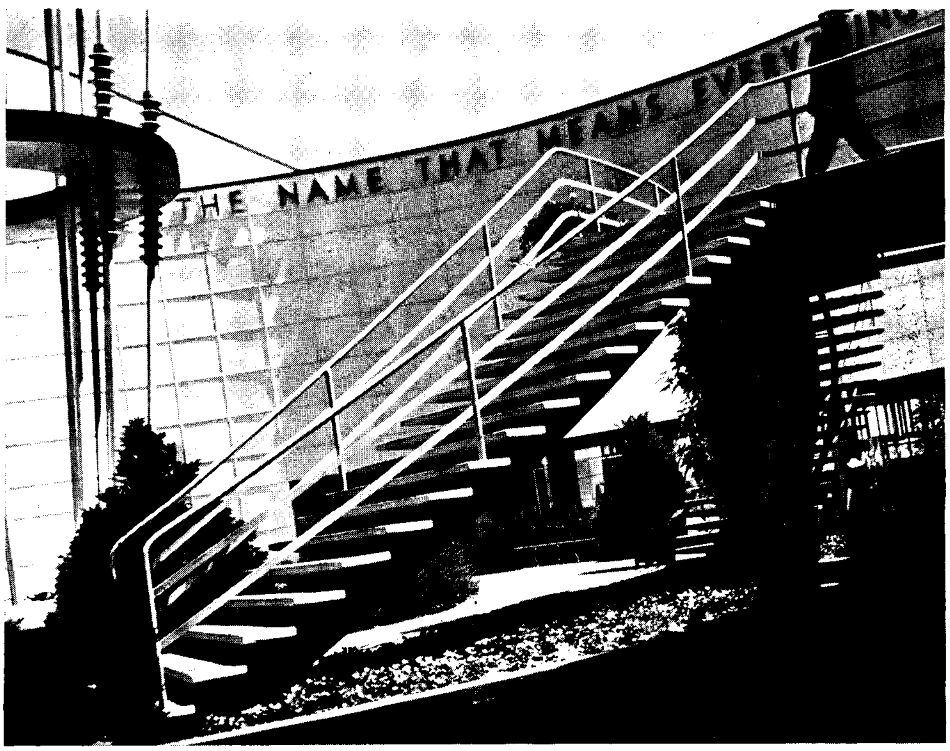
The ramp in the Yugoslavian Pavilion has an easy slope; figure-eight shape increases the building's apparent size.

Ireland's reinforced concrete spiral stair has treads cantilevered from central spine.

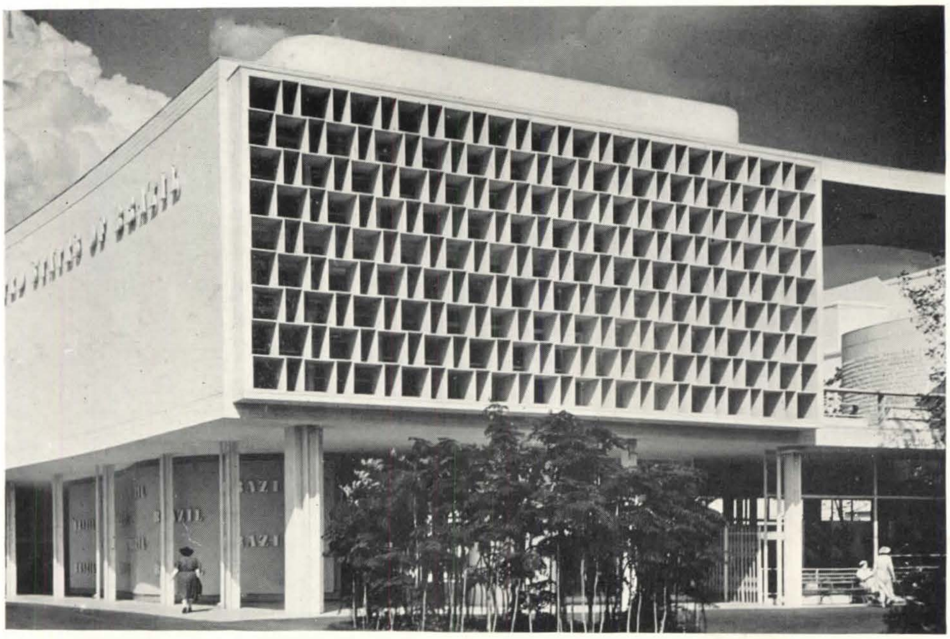
Yugoslav Pavilion: Ernest Weissmann, architect; Pomerance and Breines, associates. Irish Pavilion: Michael Scott, architect. Glass Center: Shreve, Lamb, and Harmon, architects. Westinghouse Exhibit: Skidmore and Owings, architects; John Moss, associate.



The Glass Center features treads of toughened glass on metal stringers.

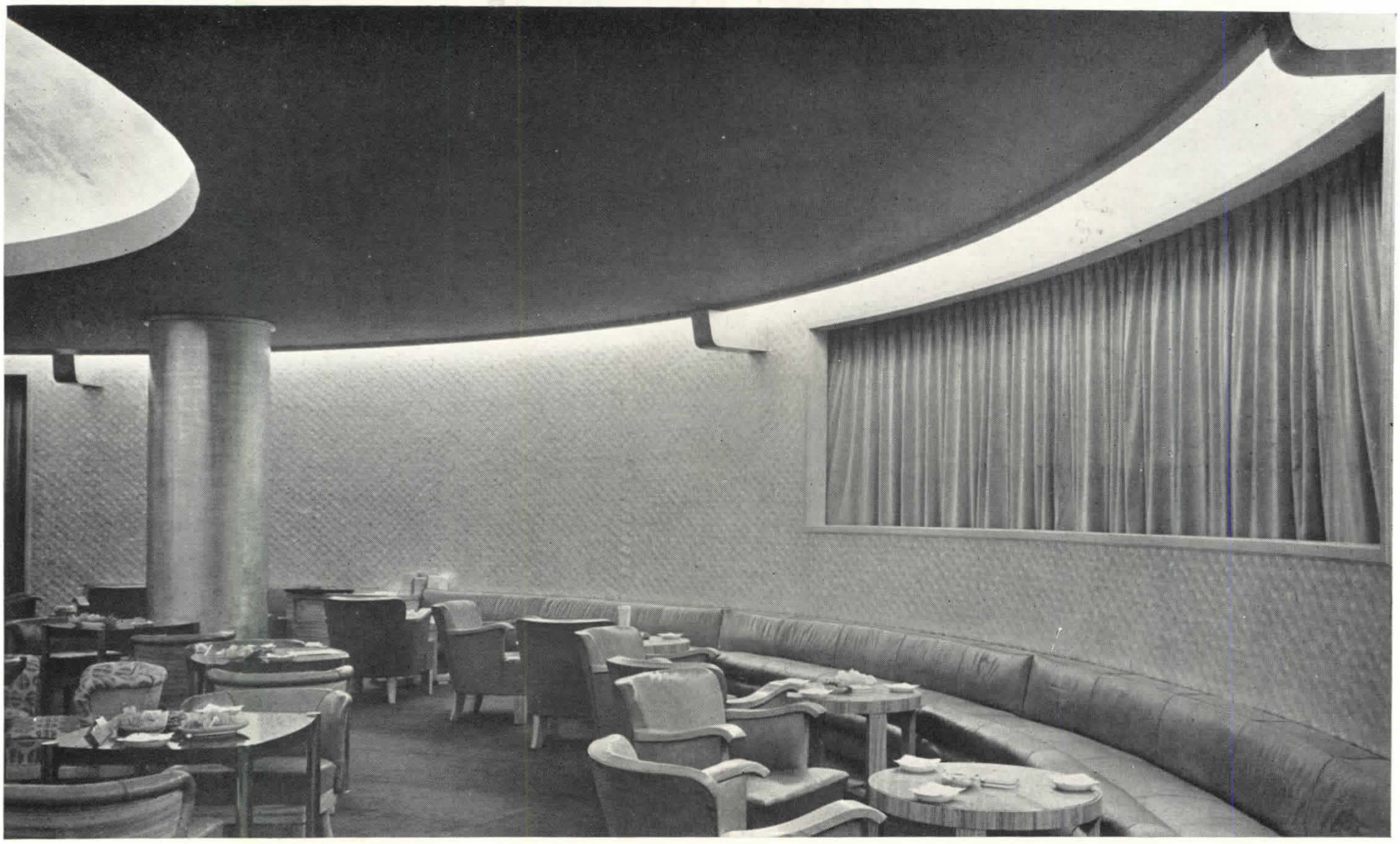


Similar in principle to Ireland's stairway is this stair at the Westinghouse Exhibit.



Considerable variety in light control is displayed at the Fair. Here are three noteworthy solutions: a cellular panel attached to the outer wall of the Brazilian Pavilion *(top) is designed* to keep out direct sun rays; ample light is admitted and the inside temperature is thus reduced. An extensive use of awnings on the Irish Pavilion (center) protects the interior from direct sunlight and glare. The corner rooms of the hotel on General Motors' "Street of Tomorrow" (bottom) have adjustable vertical metal fins.

Brazilian Pavilion; Lucio Costa, Oscar N. Soares, architects: Italian Pavilion; Michele Busiri-Vici, architect: Argentine Pavilion; Armando d'Ans, architect.



All light sources are recessed along the perimeter of this suspended ceiling in the Italian Pavilion's circular cocktail lounge.

Fluorescent tubular lamps, mounted side by side, are spiraled around the central post in a General Motors' salesroom.

Argentina displays its art under glareless artificial and natural light from glass louvered sides of suspended ceiling.

TELEVISED OPERATIONS MAKE HISTORY IN NEW YORK HOSPITAL

LOUIS PARKER
Engineer

Israel Zion Hospital

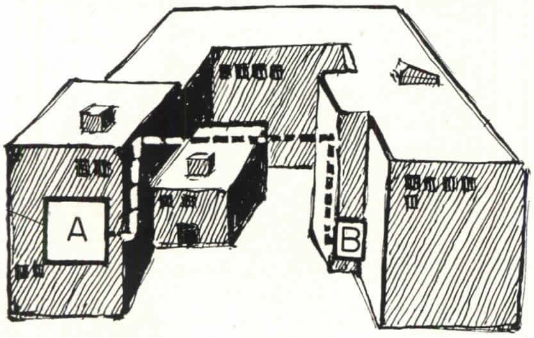
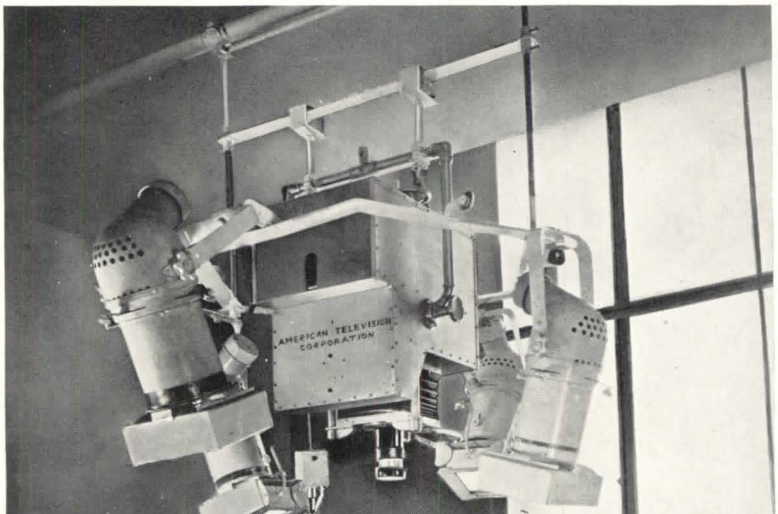


Diagram showing relative location of operating room (A) where operations were televised, auditorium (B) where students saw them.

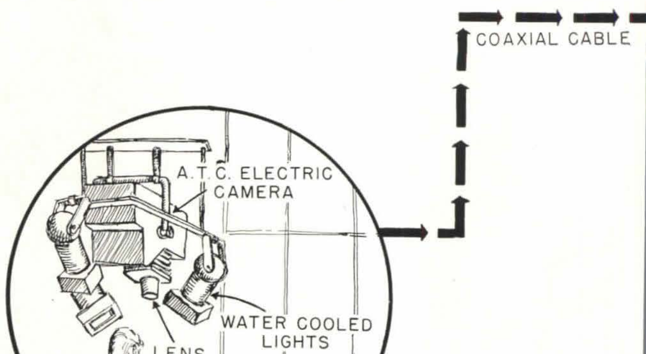
DEVELOPMENT OF telecasting on any national scale has so far proved difficult because of technical problems, high costs, and the exacting technique involved. Experimentation, however, is being pushed forward in two directions: toward a communication system which will compete with and possibly supplant radio and movie; and toward specific installations for utilitarian purposes.

This latter development had a notably successful beginning in the recent installation by the American Television Corporation in Israel Zion Hospital in New York City which permits more than 150 medical students to watch a surgeon perform a delicate operation. The audience was grouped about six viewing screens in the training-school auditorium more than 500 feet from the operating room. These viewing units, each with a 9 by $10\frac{1}{2}$-in. screen accommodating 20 to 30 spectators, were connected by coaxial cable to an automatic television camera, suspended with its lighting equipment and a microphone over the operating table.

This installation allowed a large audience for the first time to watch an operation at close range and to hear the surgeon's instructive comment. (A similar arrangement was suggested—with an entirely optical method—in the proj-



Over the operating table hang an iconoscope and a microphone.



The operation is televised while in another building ect for a hospital in Lille, France, by Paul Nelson.) It is claimed that this practical test of television will revolutionize the study of surgery, showing by actual example methods which would take years to piece together from distant views, blackboard and textbook illustrations. In theory, at least, this installation makes obsolete the operating room theater, since even the best theater provides only an inadequate view for a small number of observers. The image on the kinescope screen, although small, is, as Alva Johnston points out in an article in the *Saturday Evening Post*, "relatively larger than the figures on a movie screen are to spectators in the gallery."

In the Israel Zion Hospital the equipment used consisted of the following elements:

The *iconoscope*, invented by Dr. Zworykin, an essential part of the television camera. It contains a light-sensitive plate on which the scene to be televised is focused. A fine jet of electrons sweeps across the plate in a pattern of 441 horizontal lines; and, by a method too complex to be detailed here, lights and shadows are translated into impulses of corresponding intensities. The plate is completely scanned 30 times per second, the entire action being electronic, not mechanical.

The *coaxial cable* consists of a hollow tube with a central wire, the assembly acting as an ethereal speaking tube, directing and carrying multiple electrical impulses simultaneously and protecting them from interference from stray impulses set up by various kinds of electrical equipment. The cable used in the hospital installation was 5/8 in. in diameter, cost about 20 cents per foot. Radio-transmitted television (without the coaxial cable) is as yet highly subject to interference, causing rapid scrambling of the image. The range of this type of television is approximately 40 miles, but there have been many cases of erratic distant reception.

The *kinescope*, a funnel-shaped cathode ray tube, is the heart of the television receiver. Here, a fine ray of electrons, produced in the neck of the tube, is caused to play on a fluorescent screen at the large end of the tube. Contact of the beam with the fluorescent substance produces a spot of light which varies in intensity according to the strength of the received electrical impulse. Sweeping across the screen in 441 lines, synchronized with the beam in the iconoscope, the kinescope beam thus reproduces the lights and shadows which formed the original image focused on the plate of the iconoscope.

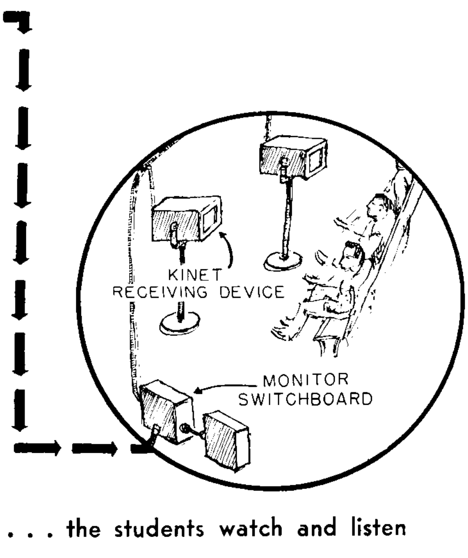
The only parts of this telecasting equipment which are ordinarily subject to renewal are the tubes; both types have a guaranteed life of 500 hours and often last several thousand hours in actual use. The iconoscope costs $650.00 and the 12-in. cathode ray tube, $46.00. The hospital installation described required 800 watts A.C., stepped up to 6,000 volts and rectified to D.C. for the camera. The six Kinets or viewing units required a total of 1,100 watts.

Television requires a brightly illuminated scene. The minimum illumination is somewhere around 15 foot-candles. In the hospital, proper lighting required four 500-watt lamps with water-filters (not water-jackets) to remove heat-causing infrared rays and, incidentally, to improve color rendition. The lighting problem requires high-speed lenses in the camera. Those used had a speed of f2.9 which limited the depth of focus in this case to about 12 in. without refocusing the camera. In other words, the surgeon's hands would go out of focus as he lifted them toward the camera more than 12 in. from the plane of sharp focus. The iconoscope is highly sensitive to red and infrared, while the human eye is most sensitive to green. This causes distortion of color values: for example, violet appears black, and red appears light. Surfaces which reflect bright spots of light also cause trouble, as they do in photography, and a camera angle must be selected to avoid them when possible.

Countless educational uses suggest themselves wherever experiments or processes should be demonstrated to an audience.

Equipment somewhat similar to that in Israel Zion Hospital was installed in a large New York Department store to show by television merchandise and models from other parts of the building. This was supplemented by televised motion pictures.

Methods are being perfected to permit projection of televised images on larger screens. The present small size is about the normal size of the pictures we see in books and periodicals, to which our eyes are accustomed. Television in full color is predicted by some, discounted by others, who point to the small percentage of motion pictures in color. It would have undoubted scientific, artistic, and educational value.

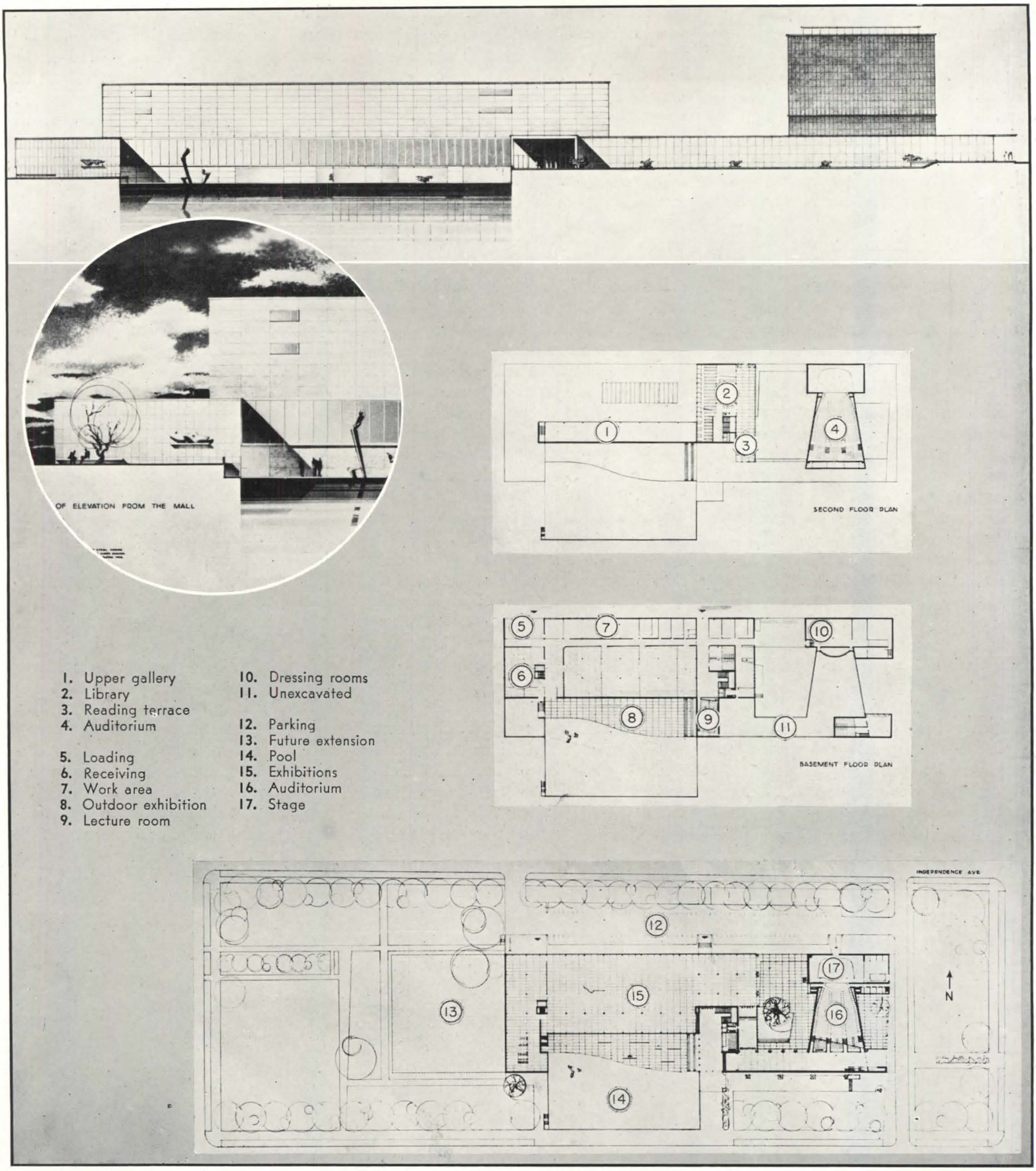


. . . the students watch and listen

Wide World

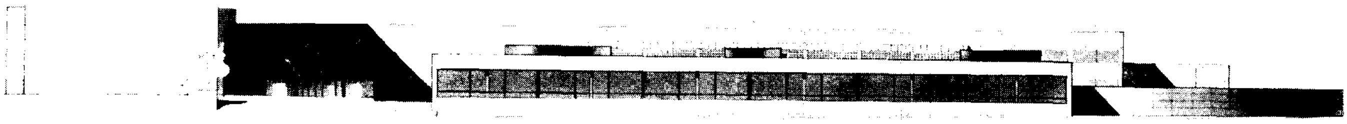
In six viewing screens students saw 9 by 10½-in. images of a Caesarean (top, right) and an appendectomy (bottom)

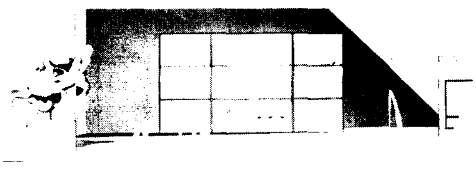
WINNERS OF SMITHSONIAN GALLERY OF ART COMPETITION

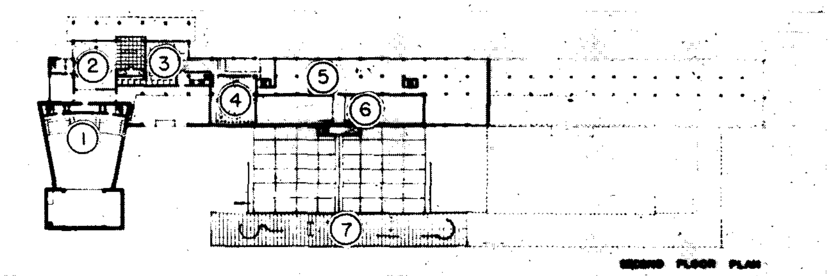


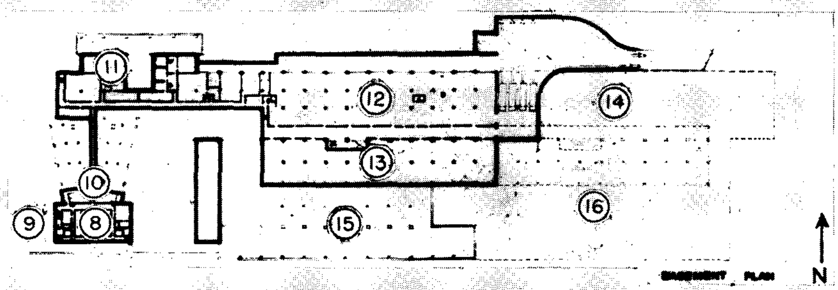
FIRST PRIZE: Eliel Saarinen. ". . . especially appropriate in its relation to the site. It offers a remarkable clarity of composition in mass and a restraint and dignity in expression . . . especially suitable for a building . . . on the Washington Mall."

THE WINNERS of the Smithsonian Gallery of Art Competition, chosen from among the ten final contestants who survived the preliminary contest, were announced on June 28. First prize of $7,500 was awarded to Eliel Saarinen. Second prize of $3,500 was awarded to Percival Goodman. (The remaining eight contestants will receive $1,000 each.) Of these two

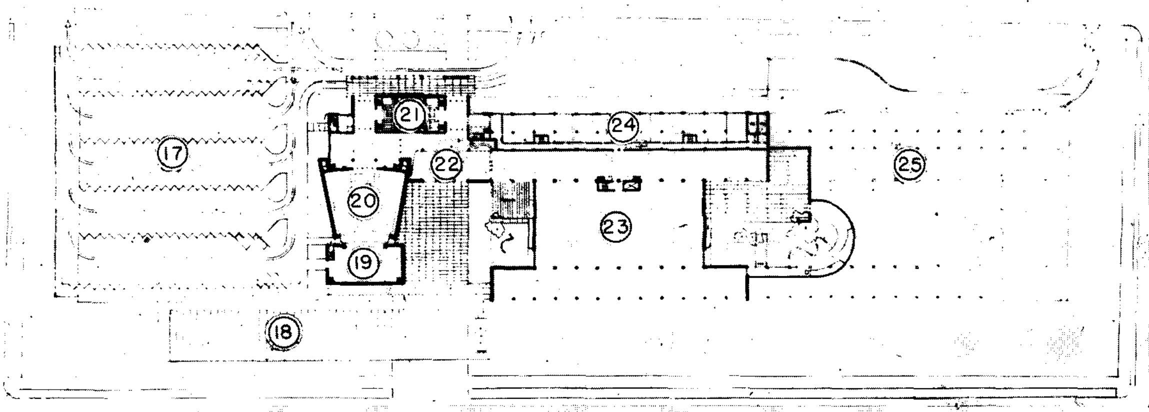








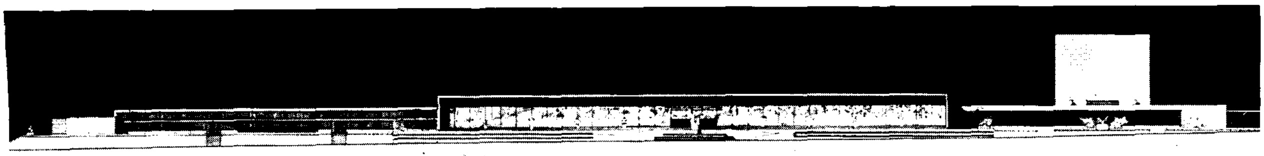
1. Balcony
2. Reception room
3. Library
4. Stacks and files
5. Reserve exhibition space
6. Upper part of gallery
7. Outdoor exhibition
8. Understage
9. Dressing rooms
10. Orchestra
11. Rest rooms
12. Work area and superintendent
13. Temporary and permanent stage
14. Service court
15. Unexcavated
16. Future storage
17. Parking
18. Outdoor exhibition
19. Stage
20. Auditorium
21. Lecture room
22. Entrance lobby
23. Exhibition space
24. Offices
25. Future reserve exhibition



SECOND PRIZE: Percival Goodman. ". . . commended by jury for the thorough study given to the organization of the elements of the plan. . . . The peculiar excellence of this design lies in its consistency throughout and its remarkable plasticity."

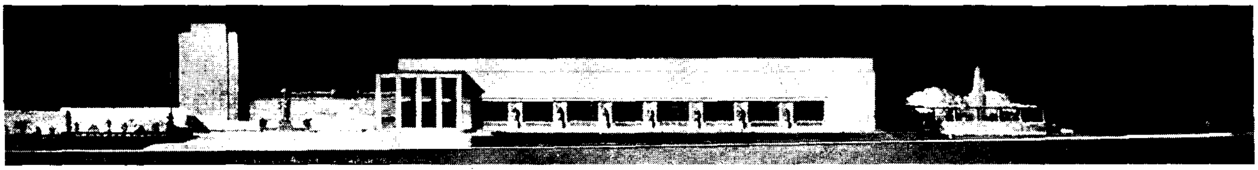
designs, the report of the jury of award declares: "Both offer simple, direct solutions in which all facilities are adequately provided for and in which the relation of part to part is correct. In both designs the location of exhibition spaces on the first floor and the immediate accessibility of these spaces to the entrances is commended."

WINNERS OF THIRD PRIZES

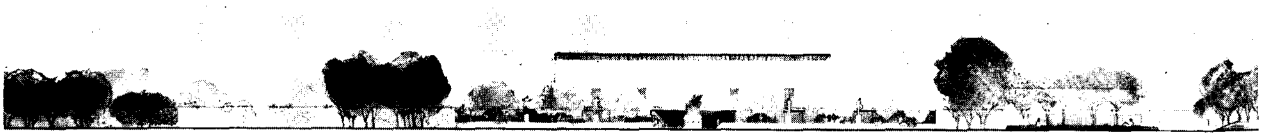


J. Mitchell, D. Ritchey. " . . . admirable scheme, but galleries too narrow, work areas unnecessarily broken up."

G. H. Perkins. " . . . well organized; faults are 2nd floor access to auditorium, excessive work-area lengths."

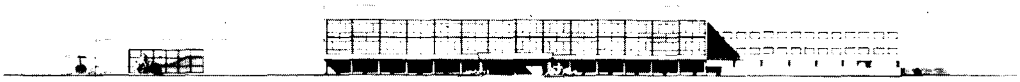


P. Cret. " . . . admired for presentation. Court impairs flexibility of galleries and . . . functioning of work areas."

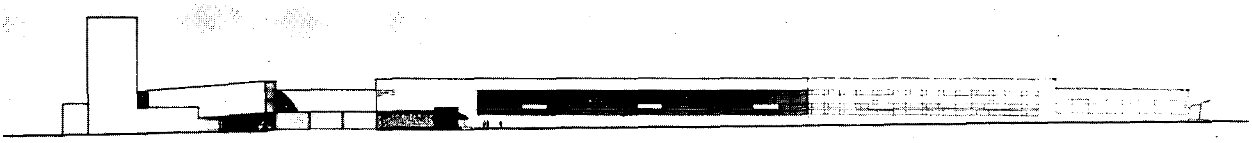


E. D. Stone. " . . . excellent grouping; introduction of overdeveloped circulation elements . . . impairs flexibility."

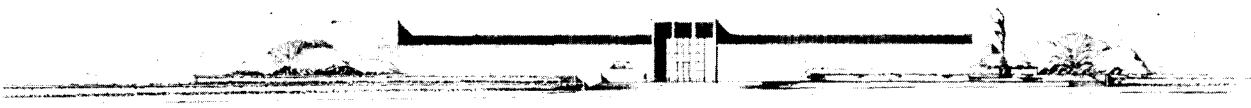
P. L. Goodwin. " . . . well organized; auditorium in center . . . results in . . . congestion in circulation."



Peter and Stubbins. "Unification of elements . . . considered excellent; . . . the two courts are . . . useless."



E. Noyes, R. Kennedy. " . . . compact plan; design unusually straightforward; . . . elevations unsatisfactory."

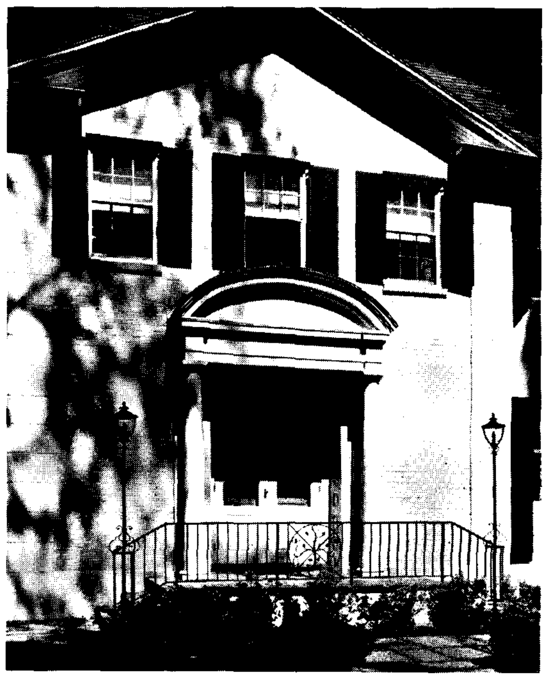


H. F. Manning, D. W. Carlson. " . . . well organized galleries; . . . complication of working areas a defect."

ATLANTA, GA.: LOCAL TRADITION ADAPTED TO MODERN REQUIREMENTS

LINTON H. YOUNG, Architect

Photos by Ernest Graham



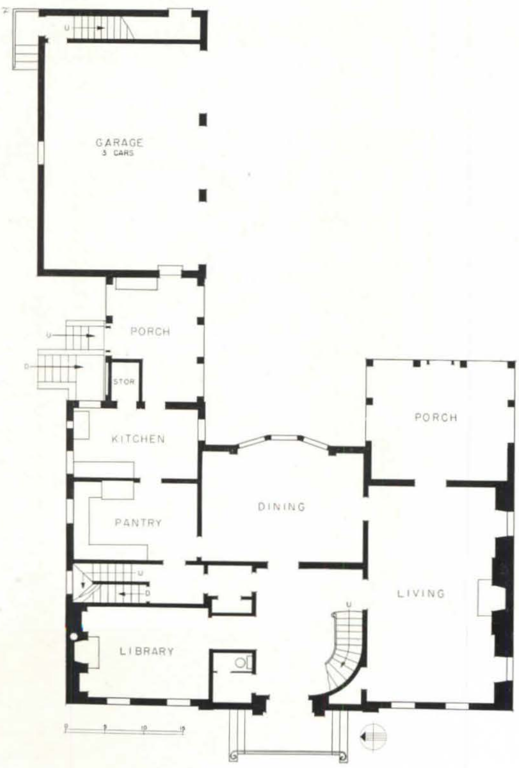
THIS RESIDENCE for Mr. and Mrs. Thomas P. Hinman follows local tradition in style and spaciousness of interior planning. Although the house occupies the greater portion of a relatively small city lot, any effect of crowding is avoided by landscaping. All main rooms face west except the dining room, which opens to the east on the garden at the rear. Reminiscent of older Southern Colonial houses is the connecting porch between kitchen and service wing. The house is of frame construction on concrete foundations. The exterior is brick veneer painted white; base and pilasters on the front are of stucco, also painted white. Windows are double and triple hung with white pine wood sash. Insulation (4-in. rockwool) is used in the ceiling of the second floor only. The interior finish is plaster on steel lath, painted in some rooms, papered in others; trim is of white pine, molded and plain. Floors are of select white oak. Heating is by a gas-fired furnace.

GEORGIA RESIDENCE

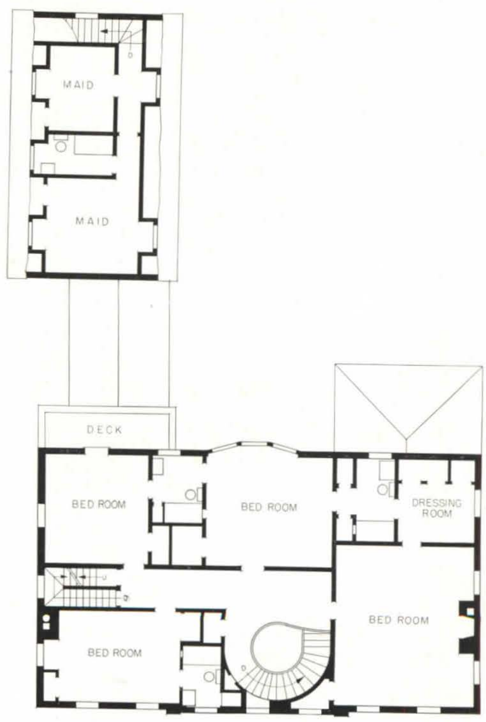
Photos by Ernest Graham

Entrance hall and stair

Library



First floor

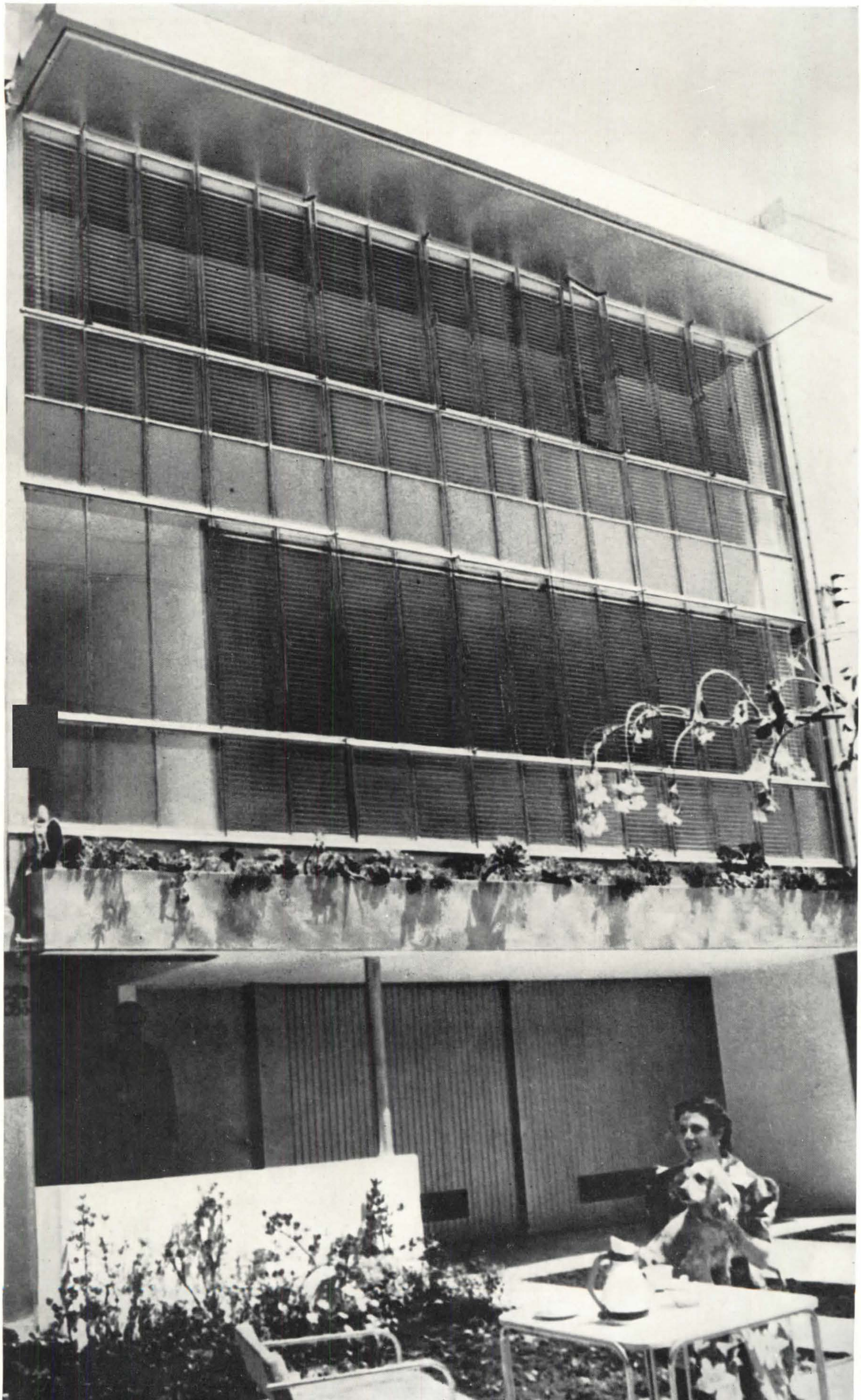


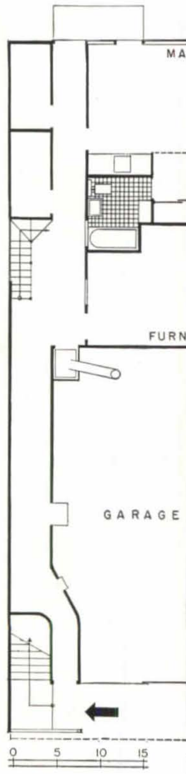
Second floor

Living room

Dining room

Kitchen



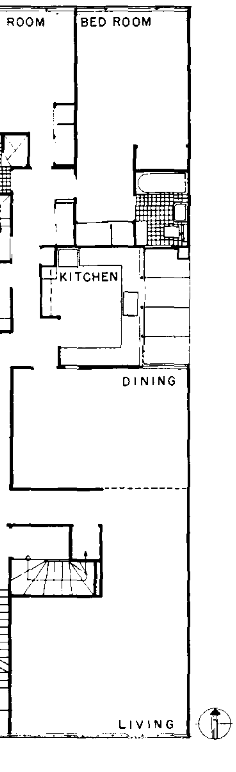


Ground floor

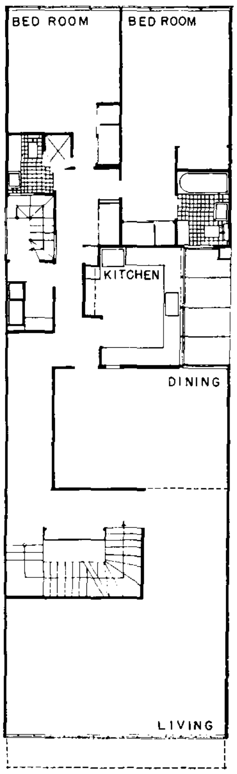
OPEN PLAN, GLASS WALL GIVE TWO-FAMILY DWELLING MAXIMUM LIGHT

RICHARD NEUTRA, Architect
OTTO WINKLER, Collaborator

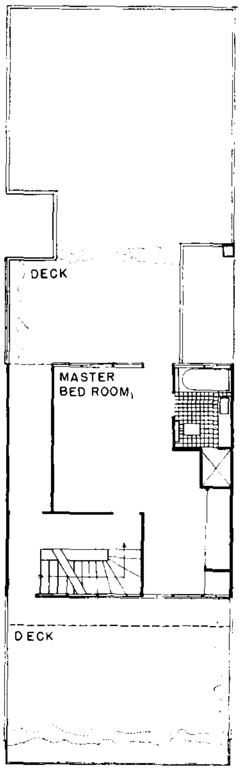
SITUATED ON A SMALL city lot (25 feet wide) in San Francisco, this two-flat dwelling for Dr. William Schiff and Dr. Ernest Wolfes obtains ample light from an extensive use of glass on the front (south) wall. For privacy, non-transparent glass is used up to the bottom of the vents; above this level, clear glass is used. The venetian blinds in the living rooms are of white spring steel. The main entrance is on the ground floor; on the same level, opening into the garden, is a servant's room with bath and kitchenette. On the second and third floor are the two flats, identical in plan except for the latter's penthouse. The connecting space between dining and living rooms is 10 ft. wide and is used as a den; this arrangement makes for a plan that is more open than usual. Walls of white Sanitas contribute lightness to the interior. Floors, except in dining rooms, kitchens, and pent room, are of oak. The pentroom has a large deck which overlooks the yacht harbor, the Golden Gate Bridge, and the Palace of Fine Arts, sole survivor of San Francisco's 1915 Exposition. A composite chassis of steel and wood constitutes the structure of the dwelling. The south wall is glass; the north wall is of cement plaster; and the east and west walls have redwood siding. All exposed doors, soffits, steel sash, and sheet metal work are aluminum painted; all other woodwork is white.



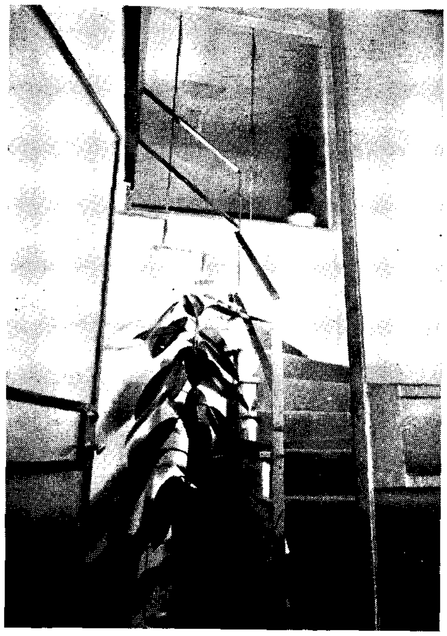
t floor



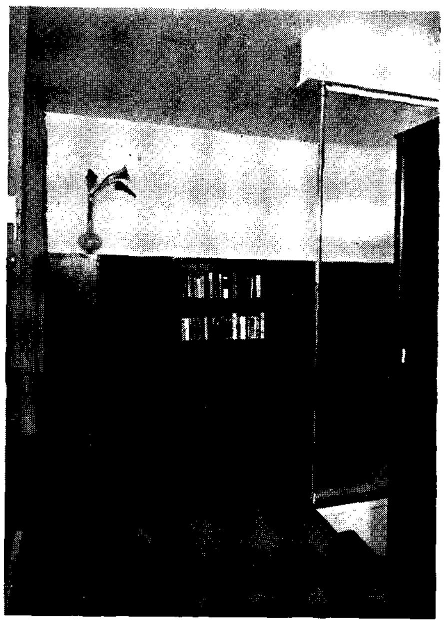
Second floor



Third floor

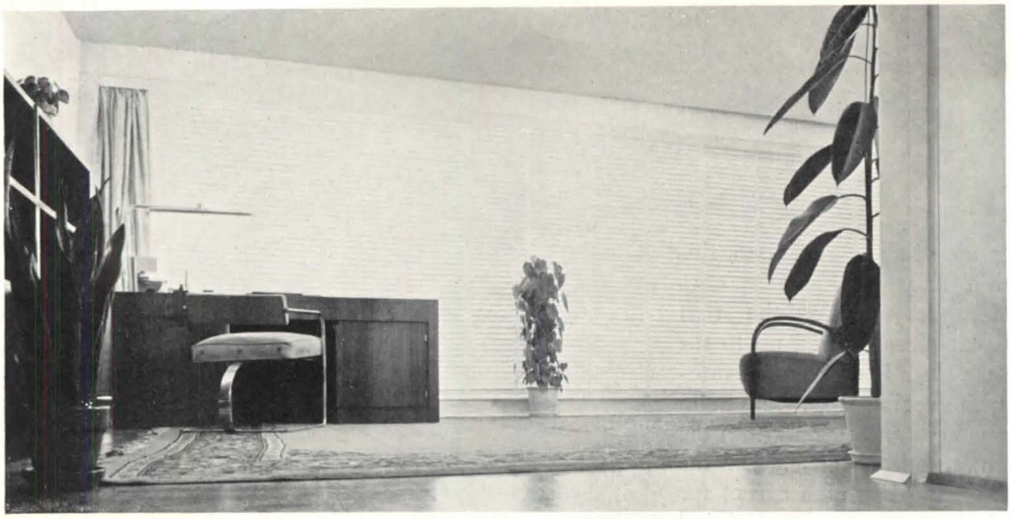


Stairway leading to second floor



Photos by Julius Shulman

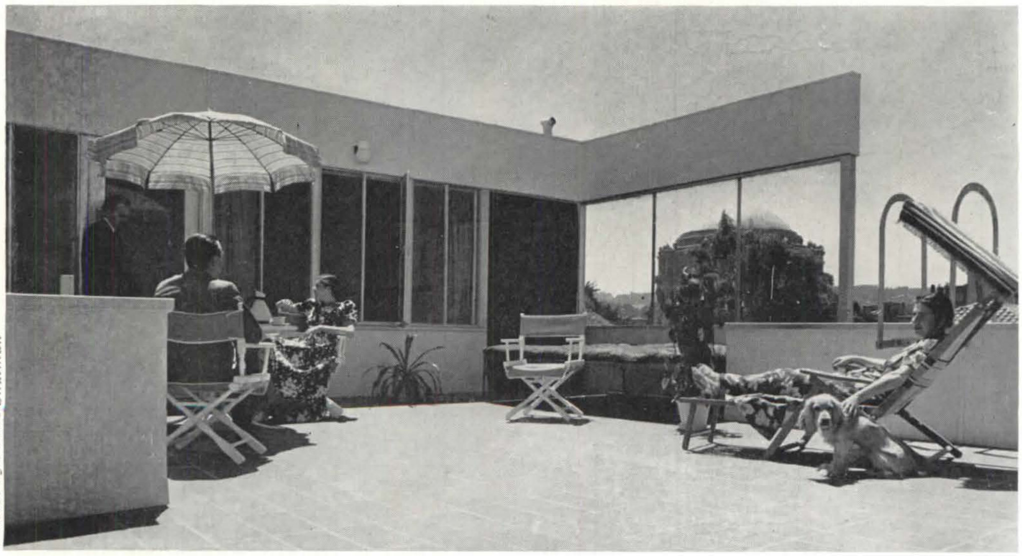
Second floor landing; den beyond



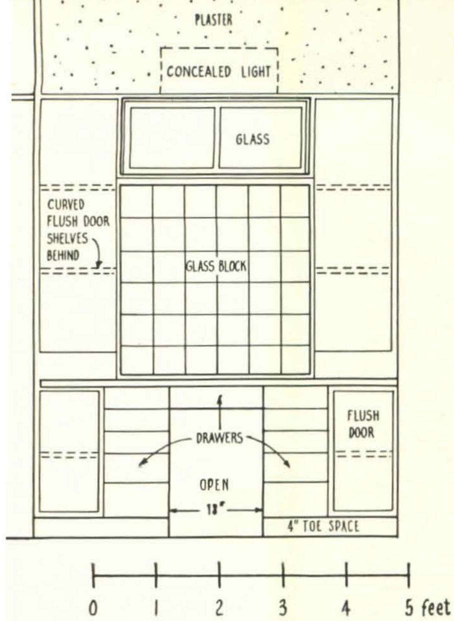
View of typical living room looking toward front wall which consists entirely of windows.

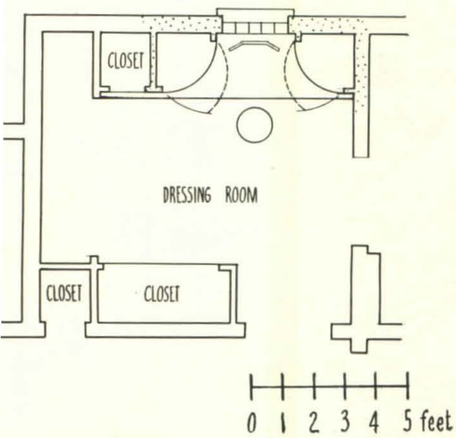
View from living room, looking through lobby toward dining room; stair well is glass-enclosed.

Photos by Julius Shulman



The roof deck, partially protected from winds by glass screens, is used by both families.





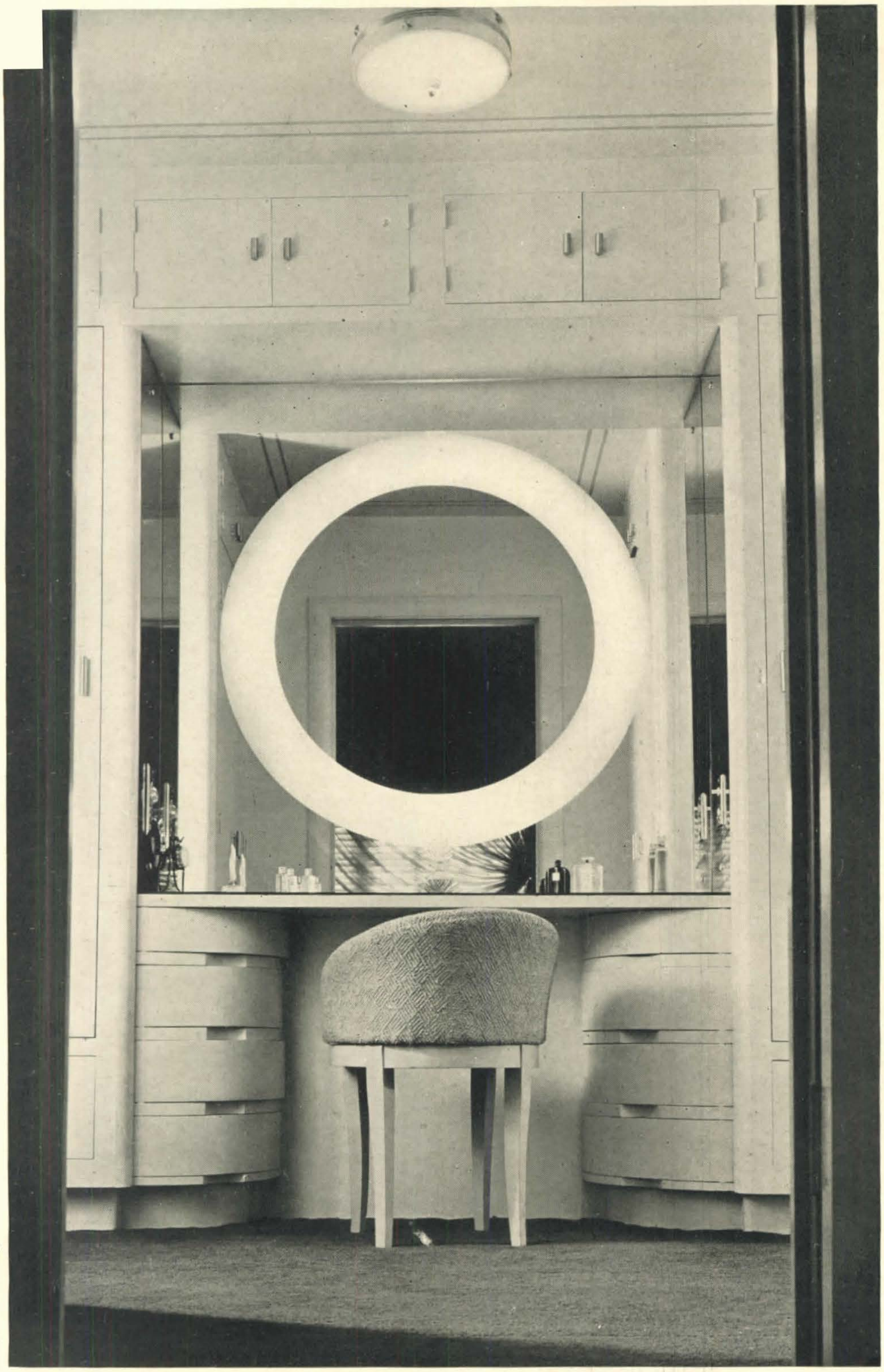
1. HERVEY PARKE CLARK
Architect

JAMES KEMBLE MILLS
Decorator

THE FOCAL POINT in this unit is the dressing table, with its plate-glass top and free-standing triple mirror. Glass block was used to give privacy, and a horizontally-hinged window above eye level for ventilation. A flush ceiling light over the center of the table provides artificial illumination. Dressing table, cabinets, and wardrobes are of wood painted white. The walls are of white plaster with stencilled design in geranium; the ceiling is plaster painted geranium red. The same color scheme is repeated in the round stool.


Sturtevant

NEW DWELLING UNITS
DRESSING



Hedrich-Blessing

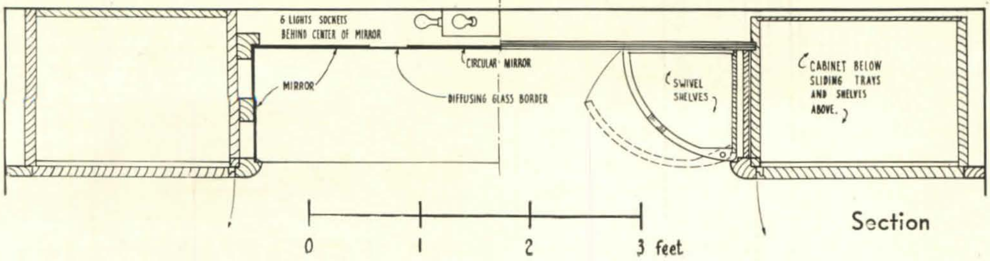
2. ROY BLASS

Architect

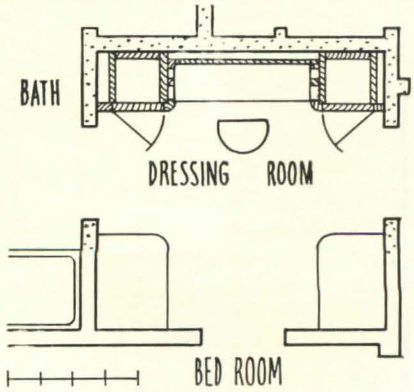
CONVENIENTLY SITUATED for access from bedroom and bath, this dressing unit features a built-in triple mirror with an unusual lighting installation. Behind the sand-blasted ring in the central mirror are six sockets for regular lamps which produce a soft glareless light. The dressing table has a mirror top; the curved shelves below swing out for easy access to toilet articles. All woodwork has a beige enamel finish; hardware is chrome. The chair is upholstered in a coarse wool fabric, slate gray in color; legs are beige enamel. The rug is deep rose.

Materials and equipment

Lighting: ceiling, Solar Light Co. Mirrors: Pittsburgh Plate Glass Co. Rug: Twistweave, Bigelow-Sanford Carpet Co.

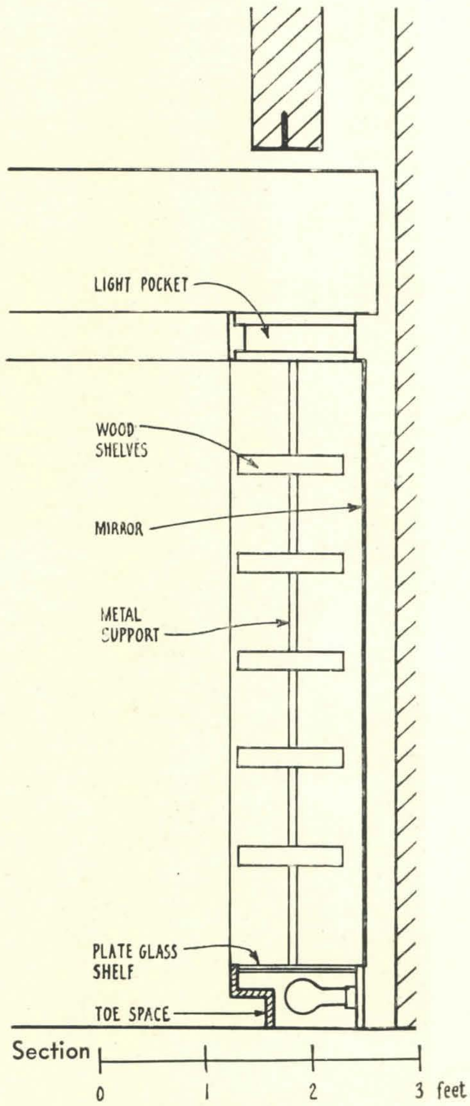


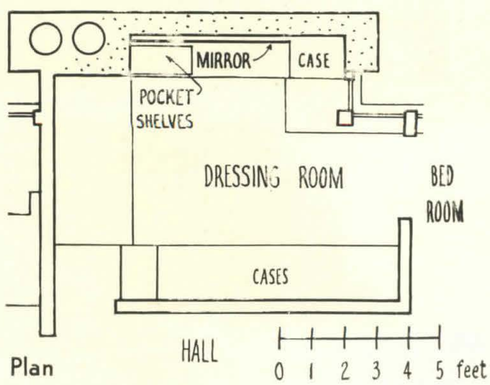
Section



Plan

Elmer Astleford



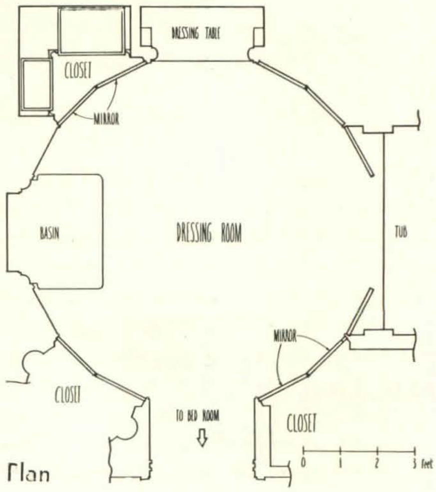


3. ALDEN B. DOW, Architect

IN THIS DRESSING UNIT the principal materials used are glass and Louisiana red cypress. Instead of the usual horizontal table top for toilet articles, a series of shelves is used along one side of the large mirror; a metal support in the corner holds the shelves in place. Ample light is obtained from above by lamps set in sockets behind a wooden beam, and from below by lamps installed under a frosted-glass shelf (see detail). The only colors used in the room other than the wood itself are the red upholstery on the stool and the green in the carpet.

NEW DWELLING UNITS: DRESSING

Drix Duryea



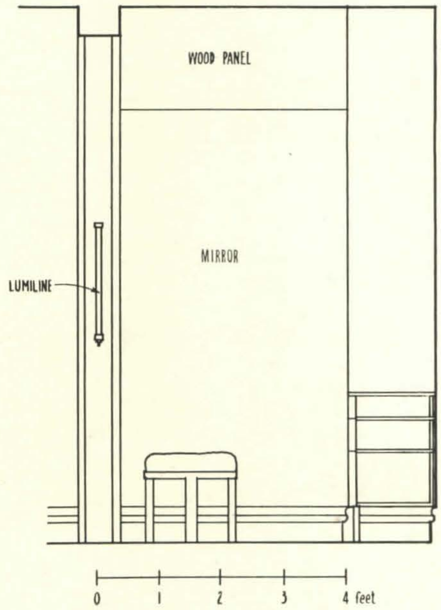
Plan

4. A. KIMBEL & SON, INC., Decorators

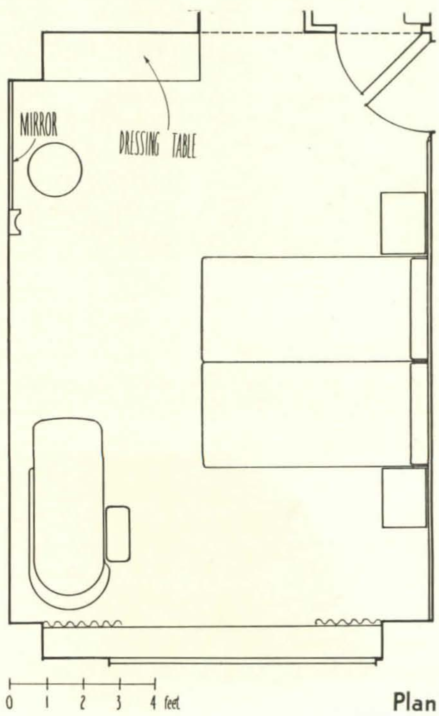
AN EXTENSIVE USE of mirrors increases the apparent size of this dressing unit which is combined with a bathing unit. Of particular interest is the lighting: overhead lighting is recessed in the several stages of the domed ceiling, and can be controlled as to intensity. In addition to this there are tubular lights on each side of the dressing table, the top and front of which are faced with mirrors. The only color note in the room is the antique blue-green tile floor.

Materials and equipment

Mirrors: Gotham Glass Co. Plumbing fixtures: Crane Co. Metal shapes: Charles Arcularius. Tile: Mueller Mosaic Co. Tubular lights: E. F. Caldwell.



Elevation



Plan

5. JOSEPH ARONSON, Designer

THAT A DRESSING UNIT does not necessarily need to be a separate room is evidenced by this example which utilizes one corner of a bedroom. Installed between two columns is a full-length mirror; adjacent to this is a chest of drawers which provides a table top as well as storage space. Walls and woodwork are of plaster painted off-white; the floor is covered with fawn-colored carpet. The chest has an off-white lacquer finish; the stool has off-white lacquered legs and a covering of dark blue chevron mohair.

Materials and equipment

Mirror: National Mirror Works. Carpet: Gotham Carpet Co. Upholstery on stool: F. Schumacher & Co. Light fixture: designed by Joseph Aronson; Lumiline light, General Electric Co.

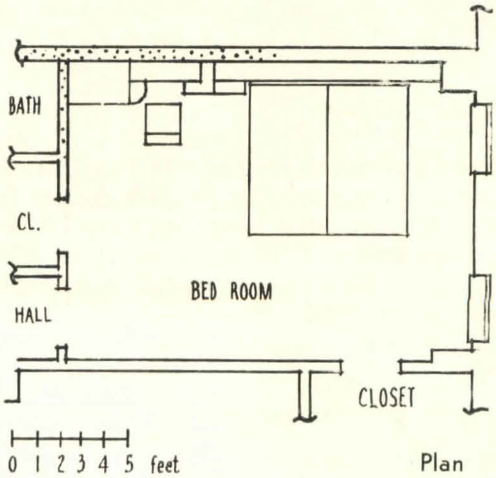
Nyholm

6. WILLIAM FRIEDMAN & HILDE REISS, Designers

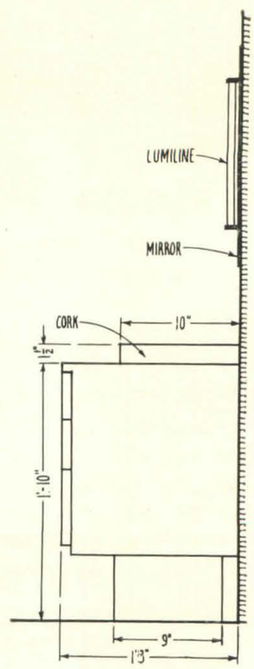
OF PARTICULAR INTEREST is the integration of this dressing unit with the headboard of the beds. Although designed as one piece of furniture, the various parts are separate, so that they can be moved easily. Zebra-wood veneer is used throughout, except for the tops of the dressing table, wardrobe, and headboard, which are of cork. The chair has Zebra-wood legs, and is upholstered in a deep blue-green basket weave cotton to match the bedspread. Lighting fixtures have satin chrome-finish shades.

Materials and equipment

Furniture: specially designed by W. Friedman and H. Reiss; executed by Cummings and Engbert. Upholstery: Howard and Schaeffer. Lighting fixtures: The Eglie Co.



Plan



Section

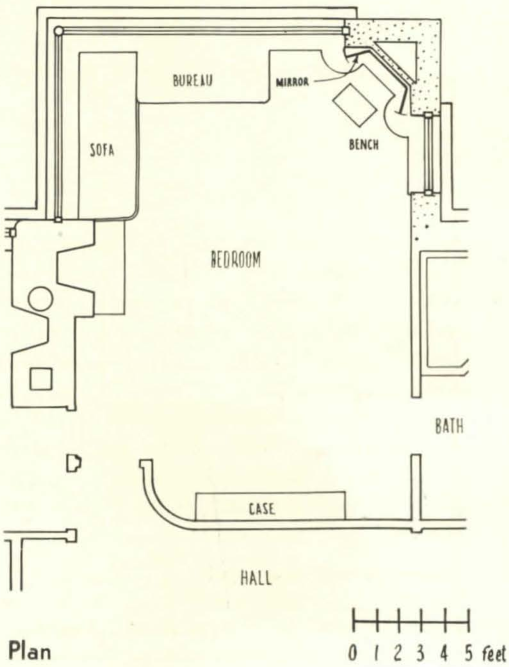
C. V. B. Hubbard

7. KENNETH DAY, Architect

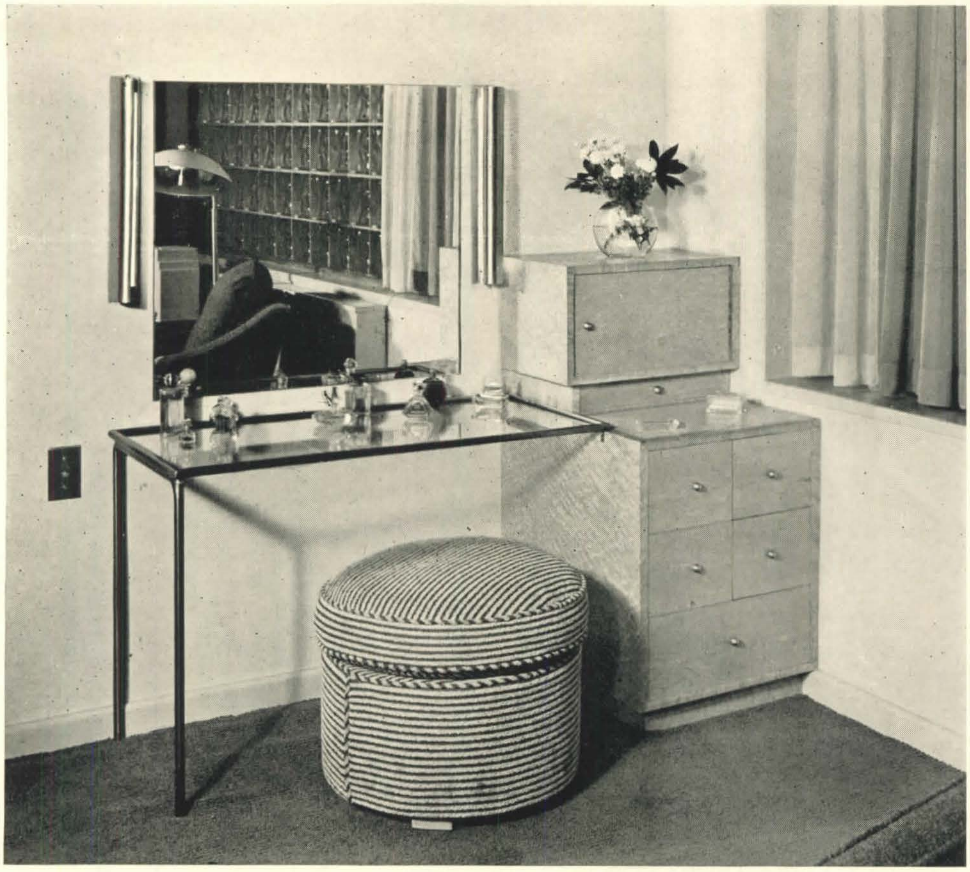
THE MAIN FEATURE of this dressing unit is its arrangement for flexible lighting. Mounted on each of the adjustable wings of the triple mirror are two separately controlled tubular lights with adjustable metal reflectors. The dressing unit is placed at a 45° angle against a corner of the room where the inside of the hipped roof forms the ceiling; since the intersection of this plane with a vertical plane would give a triangular effect, the central mirror was designed to follow this line. The built-in table and drawers are of lacquered white maple, except for the dresser top and window sills which are varnished.

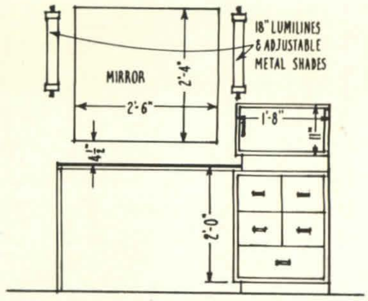
Materials and equipment

Mirrors: copper-backed, Libbey-Owens-Ford. Furniture: specially designed by architect; executed by Erik Jansson, Inc. Lighting: dull-chrome reflectors, Henry Hagert; Lumiline lamps, General Electric Co.



Plan





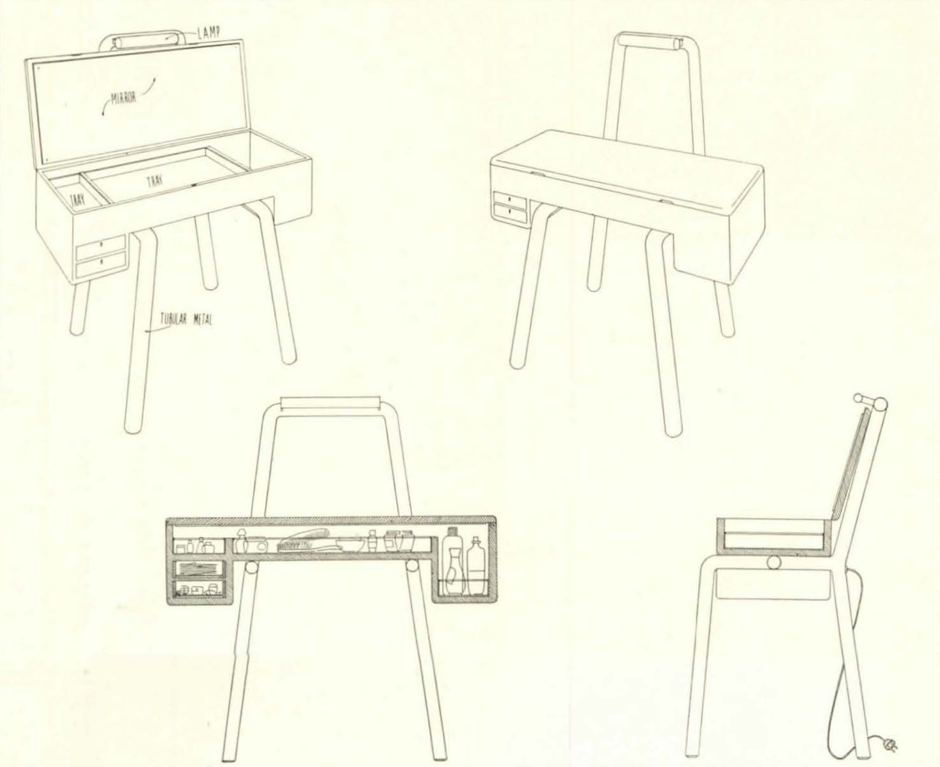
8. HERBERT SPIGEL

Architect

This compact dressing table is constructed of metal, glass, and bird's-eye maple. The table top is of glass set in stainless steel; legs are also stainless steel. The chest consists of two parts: a compartment for toilet articles and a flat drawer for jewelry; and smaller drawers for handkerchiefs, gloves, etc. The open tops of the chest are finished in leather. The tubular lights have adjustable metal shades.

Materials and equipment

Table top: Herculite, Pittsburgh Plate Glass Co. Lighting: Lumiline, General Electric Co. Ottoman and rug; Madame Majeska.



Longitudinal section

Latitudinal section

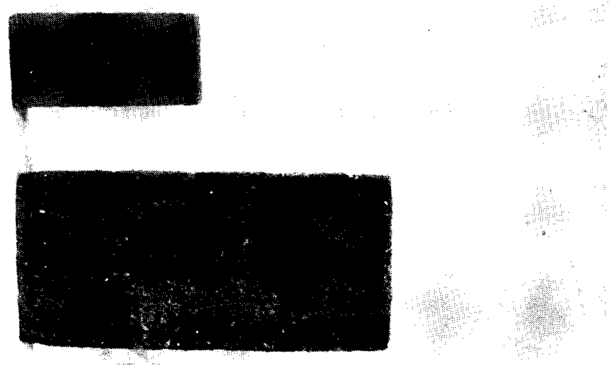
9. TORBEN MULLER

Designer

THE DESIGN FOR this dressing table is such that the top can be closed to keep toilet articles entirely dustproof. The trays are of aluminum and are all removable for cleaning or for use elsewhere. Provision is made, by varying the shape of these trays, for taking care of all types of dressing accoutrements: on the left are drawers for cleansing-tissues and jewelry; on the right is a deep space for tall bottles. The central portion is for comb and brush, jars, manicure set, etc. Attached to the top of the frame is a tubular light. The frame is $1\frac{1}{4}$-in. metal; the table can be of enameled wood or metal.

DESIGN TRENDS

This brick can be sawed, drilled, nailed, like wood . . .

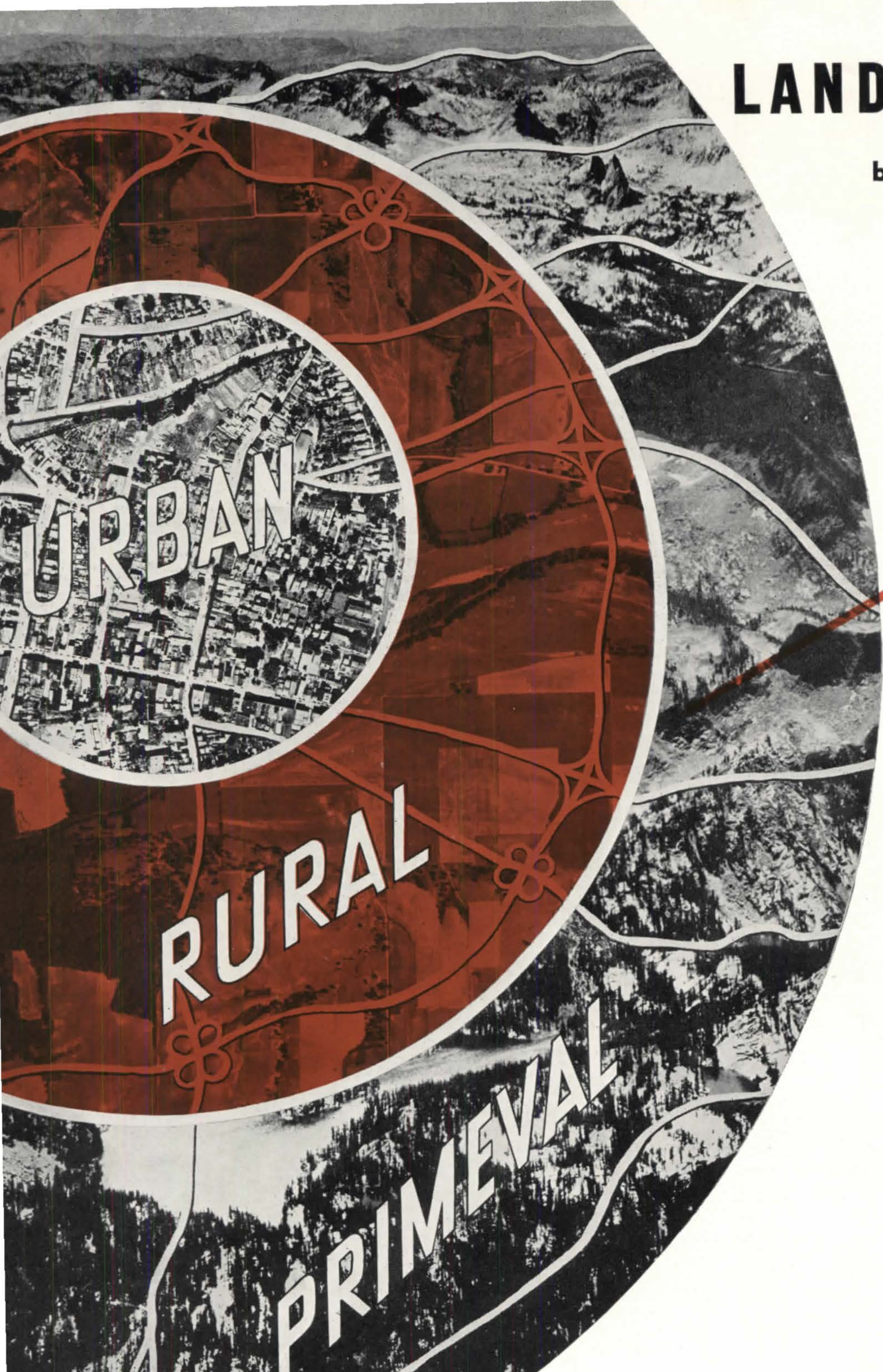


Courtesy N. Y. State College of Ceramics

and weighs 66% less than its predecessor . . . See p. 75

ARCHITECTURAL RECORD

LANDSCAPE DESIG



by **GARRET ECKBO**
DANIEL U. KILEY
JAMES C. ROSE

"THERE IS A sentimentalism in America about 'the country' as a place to live," says Mr. Will W. Alexander in a report on rural housing. "Fresh air, in the minds of many of our people—particularly city people—is thought of as a satisfactory substitute for a decent income, wholesome food, medical care, educational opportunities, and everything else which the city dwellers think of as necessary. . . ." Such a romantic attitude is all too apparent among American designers, who fail to see that the "old swimming hole" needs lifeguards and pure water, that the baseball field needs illumination, or that the farm boy may be quite as interested in aviation or theatricals as his city cousin. On the other hand, there is the danger that—once recognizing these needs—the building or landscape designer (because of his own urban background and experience) will uncritically apply *urban* design standards to a *rural* problem.

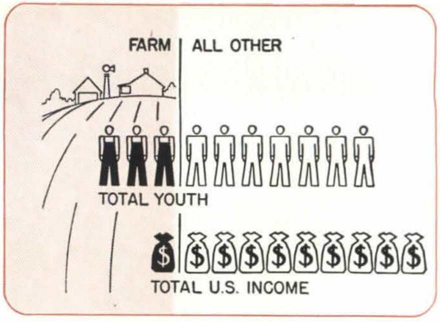
The irreduceable requisite of any successful planning is that the forms developed will direct the flow of energy in the most economic and productive pattern. This is the criterion in the design of the power dam, the automobile, and the modern cotton field: it should also hold in landscape and building design, where the energy and vitality directed is that of human beings. But to organize the rural areas into the most productive pattern requires an intimate knowledge of the characteristics, rhythm, and potentialities of rural life. For if it is true that people differ little in the fundamental living needs of food, shelter, work, and play (regardless of the locality in which they live), it is equally true that the physical aspects of that locality (its topography, fertility, accessibility, exploitation, and industrialization) influence and condition the extent to which, and the method by which, it can be adapted to the needs of its people.

Homesteading and the rugged individualism of the pioneers determined the general characteristics of the rural scene. This system necessitated staking out claims and living in relative isolation to defend and improve these claims.

HOW CAN MAN MOST CONSTRUCTIVELY USE HIS LEISURE?

What physical accommodations are essential to his recreation? How shall they be designed? In their first study (AR, 4/39, pp. 70-77), the authors explored such questions relative to the urban environment; this study covers the rural scene; the final one—scheduled for an early issue of ARCHITECTURAL RECORD—will analyze the primeval.

N THE RURA ENVIRO MENT



Low incomes handicap rural youth.

The family became the social and recreational unit, supplemented by the school and church in the village which grew up for trading purposes. But, as Mr. David Cushman Coyle has pointed out, with changing technology and local depletion of mine, forest, and soil, we find a new type of rural population which no longer fits into the pattern of living developed by the pioneer. Recent surveys show:

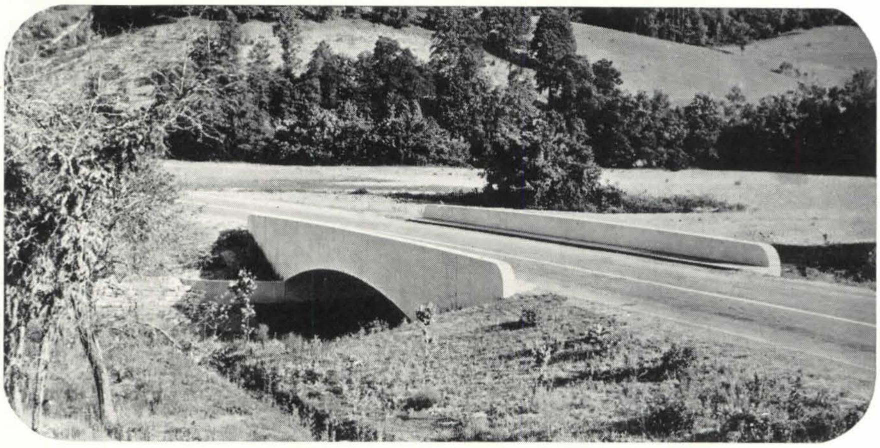
1. Mechanization of agriculture has cut in half the man labor required per bushel of wheat in 1919. In one county of western Kansas, it is cut to one quarter.

2. The nation's supply of farm land is steadily decreasing. The National Resources Board reports that as a result of soil erosion, 35,000,000 acres of farm land have been made entirely unfit for cultivation, while another 125,000,000 acres have had topsoil largely removed. A good deal of land to be inherited by farm youth is practically worthless, and will be abandoned.

3. In spite of decreasing birth rate, we have a large surplus of rural youth in proportion to farms available, and our expanding farm population is squeezed within a shrinking area of farm land. In 1920, for example, 160,000 farmers died or reached the age of 65; and in the same year, 337,000 farm boys reached the age of 18. In 1930, the surplus of boys with no prospects was 201,000. Vital statistics indicate that with the decrease in infant mortality, this surplus will increase.

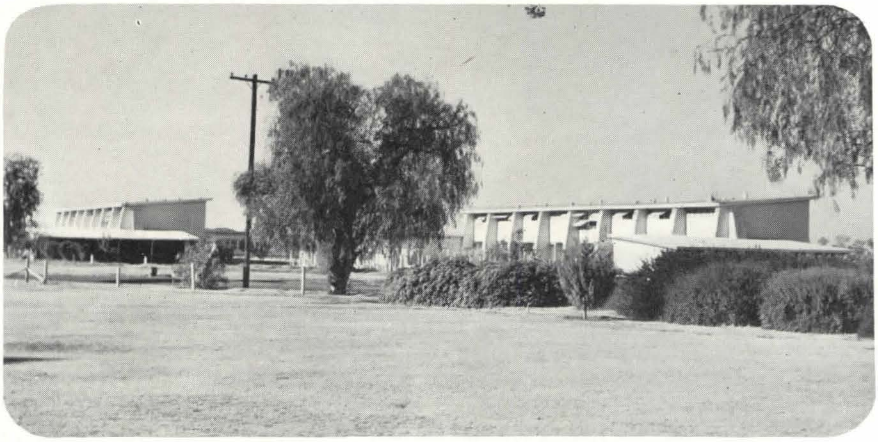
4. The present and future farmer is also the victim of an accumulating drain of money from the farm to the city. He sells in a city market controlled by the buyer, and buys in a city market controlled by the seller. The farm youth is educated in rural districts, and then finds it necessary to migrate to the city to make a living. Dr. O. E. Baker, of the U. S. Department of Agriculture, estimates that this movement of population from 1920 to 1930 carried to the city human values that had cost over 12,000,000,000 dollars in private and public cash spent by rural districts.

5. The exhaustion of the farmland in some areas—such as Oklahoma or



Courtesy TVA

LOCAL ROADS are the first essential to any rural recreational system—good roads which provide quick, year-round, and economical access to recreation.

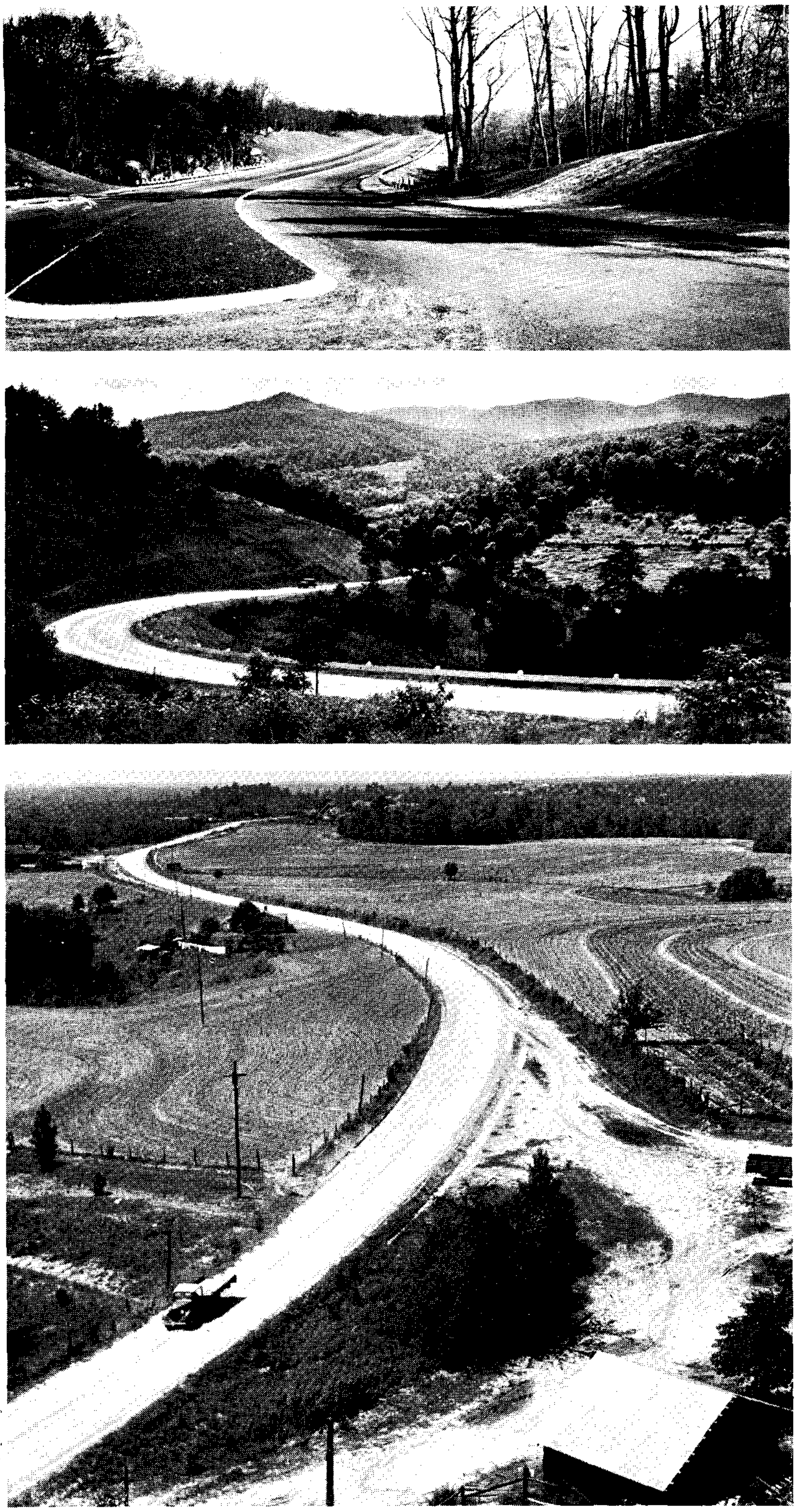


Courtesy FSA

RURAL HOUSING is not only substandard technically but so scattered as seriously to impede the development of vigorous community recreation.

Picture Records Section, WPA

RECREATIONAL TYPES of primary importance in the rural environment are those which emphasize group activity—the farmer has solitude enough.



Courtesy TVA

Courtesy Information Service, WPA

ROADS: The specialization in automotive transportation has led to a similar specialization in road design—the parkway (top), the trunk highway, the "freeway" (center). But these are of only secondary interest to the ruralite; most necessary to him is a good system of local-access roads (bottom) to carry him to school, to church, to market, and to play.

Kansas—and the simultaneous development of a highly mechanized agriculture in others—California, Texas, or Florida, for example—has meanwhile given birth to a new rural phenomenon —the migratory agricultural workers. This group constitutes a quite special and pressing problem over and above that of the rural population generally.

Special characteristics of rural life

What do such trends as those listed above imply in the design of rural recreational systems? A recognition of the facts that first and foremost *the country must be redesigned for country people*—i.e., neither from the viewpoint of nor for the benefit of the urbanite. Second, in view of constantly changing social and economic conditions, that such systems should provide a plastic and flexible environment for both local and migratory farmers. Third, that such systems should be closely integrated with both urban and primeval areas, providing the greatest possible intercommunication between all three. Finally, that the following special and fairly constant factors of rural life be recognized:

1. The periods during which recreational facilities can be used by most rural inhabitants are more seasonal than daily. Whereas the city worker usually has a certain number of hours each day with a summer (or winter) vacation of short duration, the farmer has a majority of free time during winter months. This implies an emphasis on enclosed and roofed facilities.

2. Since rural labor is largely physical, and requires the use of the larger muscular system, it is reasonable to supply facilities for recreation which afford experience which is physically, mentally, and psychologicaly different from the major labor experience, i. e., folk dancing, swimming, arts and crafts, dramatic production, folk pagentry, etc.

3. The present relative isolation of farm families and dependance upon automotive transportation make it desirable for the entire family to seek recreation at one time. This places emphasis on the school, church, and country park as centers for recreation, and requires facilities for participation by all age and sex groups at one time.

4. Since the mobile fraternity has become such an important part of the rural scene, special facilities are necessary for the migratory laborers, the tourists, and the vacationists. It is necessary to provide for these groups, and integrate their activities with those of

the more permanent residents without destroying the economic and social balance. The need here is for multiple-use and flexibility in design with particular emphasis on a system integrated with the highway, shore front, waterways, and spots of scenic, natural, and historic as well as scientific interest.

Thus it can be seen that rural recreation is based on an entirely different set of conditions than urban, and it can be approached only by detailed study of specific local requirements in their relation to the region. In general, one can say that whereas in the cities the need is for *more free space* (decentralization), the rural need is for *more intensive use of less space* (concentration) to permit and provide for the social integration of a widely distributed population. But the latter does not imply mere urbanization of the country any more than the former means mere ruralization of the city.*

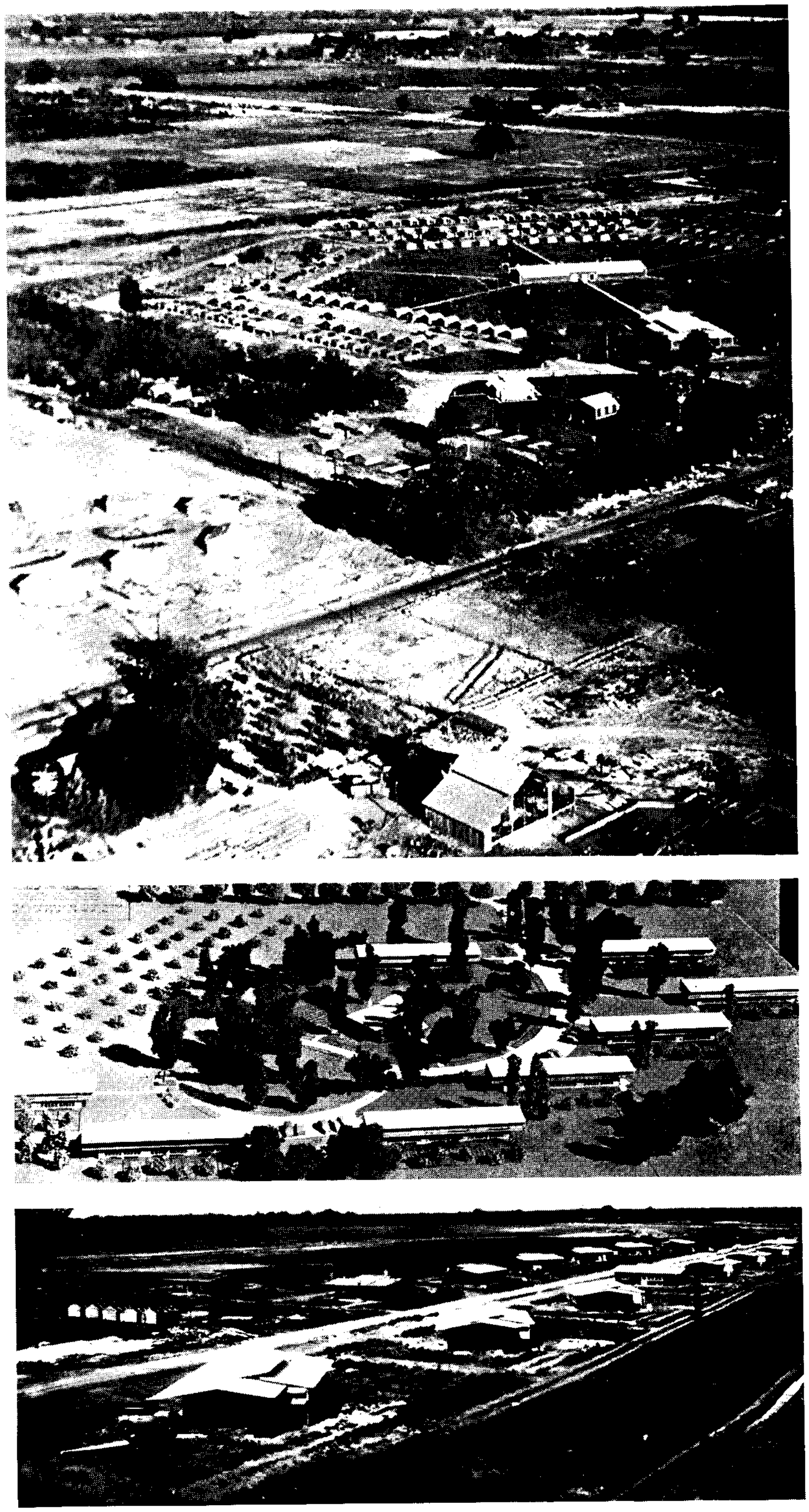
Roads are first

The first and most essential element of any rural recreational environment will necessarily be an adequate highway system. Yet, despite the gigantic advances in highway construction in the past decade, the fact remains that most rural communities are without a road system adequate for their needs. Consciously or otherwise, the majority of federal and state construction is designed to facilitate communication between one city and the next. "With the by-pass or through-highway principle on the one hand, and the freeway or border-control principle on the other, we have the tools to adapt our future network to meet recreational needs . . . but that is only part of the highway problem. There are still the problems of local access and touring. . . . We must not only provide good trunk-highway access, but also good local-access roads. These local roads must serve directly the various cities, towns, and villages; and must open up recreational lands."**

Consolidated communities mean better recreation

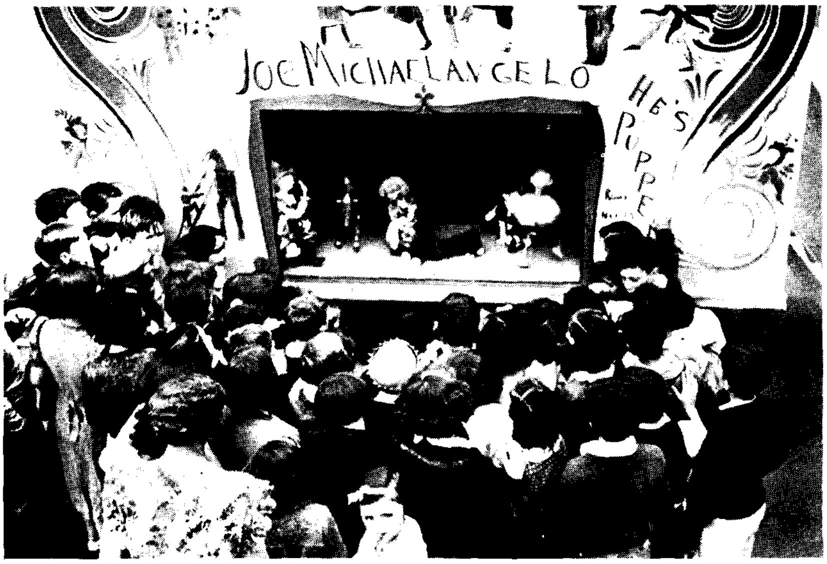
Closely allied with the problem of transportation is that of rural housing. As long as the traditional pattern remains—thinly scattered houses, one to each farm—it is quite possible that a genuinely satisfactory recreational environment will not be evolved. In this

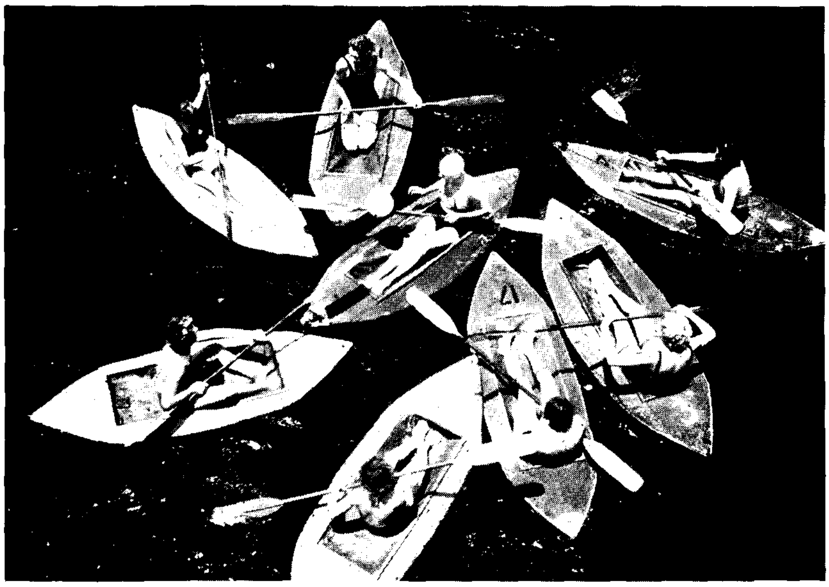
*See "Landscape Design and the Urban Environment" by Eckbo, Kiley, and Rose, ARCHITECTURAL RECORD, May 1939, pp. 70-71.
**From a paper by Roland B. Greely read at the Outdoor Recreation Conference, Amherst, Mass. March 11, 1939.



Courtesy Farm Security Administration

HOUSING: Although designed for landless migrants, the physical organization of many of FSA's western projects is something the farmer may well envy (top). If multiple or row-housing (center) is strange to American rural traditions, there is the possibility of grouping single-family houses into tight communities with outlying farms (bottom).





Photos courtesy Picture Records Section, WPA

RECREATIONAL TYPES: Since the "major labor experience" of the farmer is manual and much of it lonely, it is not surprising to find the "get-together" an American institution. Whether for singing, dancing, baseball, or theatricals, the emphasis is on group activity, competition. The need for trained organizing and supervising personnel is at least as great as in the city where such personnel is a recognized necessity.

connection, it is interesting to note how quickly *social integration* has followed *physical integration* in the new towns by TVA, FSA, and in the Greenbelt towns of the former Resettlement Administration. As a matter of fact, leading agricultural economists are *advocating* a similar consolidation—the regrouping of farmers into villages from which they can work their land within a radius of 5 to 10 miles of them. (This type of village is of course prevalent in Europe and in isolated spots of America). There is already a general trend towards consolidation and reorganization of schools and school districts. And the recent western projects of the Farm Security Administration—while of course designed for the landless migrants—clearly indicate the physical advantages of a similar concentration of housing facilities.

What types of recreation are required?

WPA research reveals that the average rural community needs provision for the following types of recreation:

1. Crafts and visual arts, graphic and plastic. (These might well be organized around the rapidly developing science and manual arts curricula in most rural high schools.)
2. Recreational music, including outdoor concerts, popular orchestras, group singing, etc.
3. Dancing—ballroom, folk, social square, tap, ballet, etc.
4. Recreational drama, including marionettes and puppets, plays, motion pictures, pageants, festivals, etc. The outdoor theater is recommended as an ideal form; it also encourages children in their own improvisations.
5. Childrens' play center, including such equipment as slides, horizontal bars, swings, see-saws, trapezes, marble courts, sand box (preferably adjacent to the wading pool with an island where children can play and sail boats).
6. Sports and athletics (conditioned by the major labor), including baseball, softball, football, basketball, tennis, archery, horseshoe pitching, swimming and water sports, snow and ice sports, hiking, camping, and nature study.
7. Other activities and special events: picnics require an area of several acres with outdoor fireplaces, barbecue pits, wood supply, and provisions for waste disposal (can also serve as a wayside camp for motorist). Occasional field days, community nights, agricultural fairs, carnivals, traveling circuses can occupy the largest free area used for sports at different seasons.

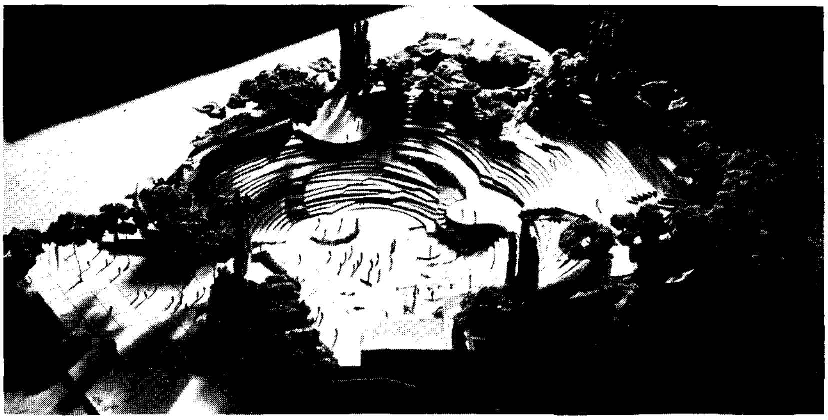
What sort of facilities are implied?

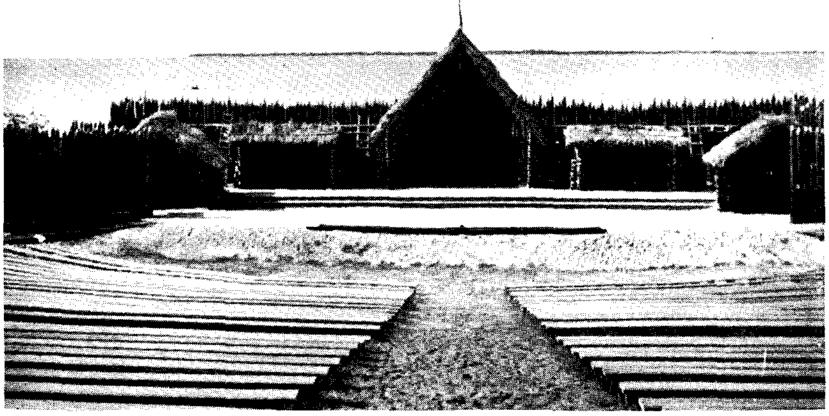
All these activities require special equipment centering around the district school, rural park, or other location designed to serve the rural inhabitants rather than the urban overflow. The usefulness is multiplied by complete and well designed flood lighting, since most outdoor activities come in the summer —precisely when the majority of rural inhabitants are busiest during the day.

Although there is perhaps no single form which meets so well the various needs of the rural community, the outdoor theater has never been satisfactorily reinterpreted as a present day recreational form in its own right. Developed as an integral part of the rural park, and in a dynamic, three-dimensional pattern, it provides for almost constant use by all age groups. Actual productions require the assistance of practically all types of craftsmanship which are physicaly, mentally, and psychologically different from the major labor experience. With stages at different levels, following the natural contours, and seats ingeniously arranged to accommodate both large and small audiences (top, right); with the present perfection of sound amplification; and with "scene-shifting" by spotlights instead of curtains, a type as flexible as the auditorium without its expense or intricacy is achieved. Its utility is as flexible as its organization, since it accommodates both large and small productions, festivals, pageantry, improvisations, summer-theatre groups, exhibitions, meetings, picnics, and talks.

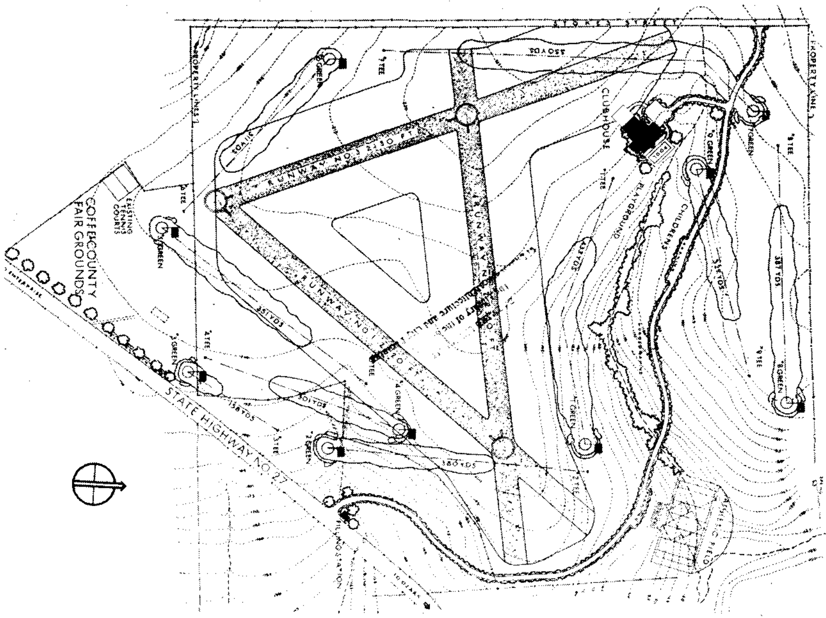
Many opportunities are overlooked, by sticking too closely to arbitrary and static concepts of receational planning. For example, the local airport is a form which deserves attention because of the interest and activity which surrounds it. Already a center of Sunday afternoon interest for many an American farm family, it orients the rural population to a larger social concept of the world outside, as well as satisfying the characteristic American interest in the technical. The same thing might be said about the old canal, the abandoned railroad engine, and the automobile junk pile—all of which hold an endless fascination for small children.*

*Recently, a recreational expert, showing some distinguished visitors in Washington the advanced planning of children's play areas in one of the greenbelt towns, was somewhat chagrined to find them quite deserted. But, as they started back to Washington, they passed the town's children playing on a dump used for fill along the roadway. One of the ladies of the party turned to the expert and inquired brightly: "And I suppose you will plan something for these children, too?"

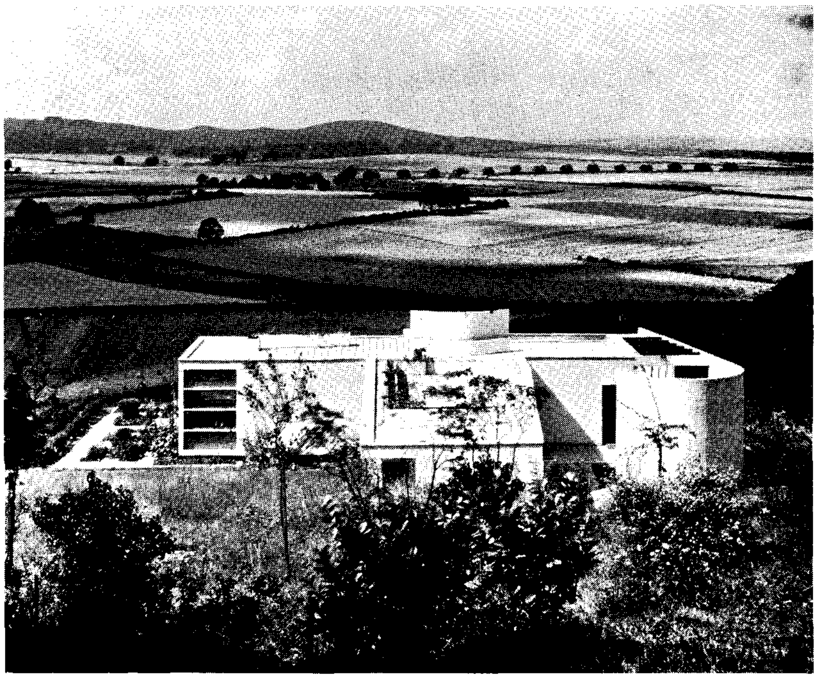




Mary Haynsworth



RECREATIONAL AREAS: Recognition of rural recreational needs is too recent to permit of much agreement as to design standards. An Alabama airport (bottom) has been designed to include a club house, golf course, athletic field, and tennis courts; an outdoor theater in North Carolina is already famous for its folk festivals; and Mr. Rose has designed an outdoor theater in which multiple stages surround the audience, permitting great flexibility of use, elimination of elaborate equipment.



Snider-Triangle

DESIGN: The alleged "romantic informality" of the countryside is not borne out by the fields themselves. Here the face of nature is being quite as consciously reorganized by man for his increased welfare as in the city. These fields (top) do not "blend" with nature—they are in great contrast with it. Whence, then, the theory that landscape and building design must go rustic in the rural areas?

Towards scientific landscape design

With the exception of urban infringement in the form of summer colonies, tourist camps and hotels, and commercial recreational facilities designed mainly for the use of urban motorists, little provision for recreation exists outside America's cities. Indeed, urban invasion—in the form of commercialized amusements, billboards, suburbanization and the "naturalism" of "preserving rural beauty" by screening out rural slums with a parkway—prevents an indigenous and biological development of rural beauty. It is thus that we handicap ourselves with a static and inflexible environment, and lose the opportunity of developing forms which express the needs of the people and the qualities of the region.

This is particularly unfortunate as concerns landscape design. The country is thought of as a restorative for the exhausted city dweller, and a land of plenty for the farmer. When help is offered by well-meaning urban societies it is, as often as not, "for the preservation of rural beauties" which look well on a post card. Another group is afraid of destroying the "delightful informality" by intelligent and straightforward reorganization of nature for the use of man. They resort to "rustic" bridges, and "colonial" cottages which will "blend" with nature. Obviously this point of view can be held only by those who do not live on the land.

We may as well accept the fact that man's activities change and dominate the landscape; it does not follow that they should spoil it. Writing on the redesign of the American landscape, Paul B. Sears has said*: "Not only must the scientist of the future work in awareness of social and economic processes, but he must clear a further hurdle. . . . The scientist must be aware of the relation of his task to the field of aesthetics. What is right and economical and in balance is in general satisfying. Not the least important symptom of the present decay of the American landscape is its appalling ugliness. . . . The landscape of the United States, with its two billions of acres for a potential population of one hundred and fifty million, or even two hundred million, can be made a place of plenty, permanance, and beauty. But this most assuredly cannot be done without the aid of science. Nor can such aid be rendered by men of science unaware of the task which confronts them."

*"Science and the New Landscape," Harper's Magazine, July 1939, page 207.

CLAY PRODUCTS IN MODERN BUILDING DESIGN

Gottscho

In this study, third in a series on the subject of recent trends in building materials, Mr. Hansen traces the main lines of current development in clay products and indicates the new potentialities inherent in one of man's oldest and most important building materials.

By JAMES H. HANSEN

THE FIRST 6,000 YEARS of the history of clay products in architecture is easily summarized: together with wood and stone, it shared a three-way monopoly of the field. It was only in the latter half of the nineteenth century that new materials and then new structural systems began seriously to threaten the supremacy of brick and tile. In this country, the last decades of the century saw first the introduction of structural steel and then the rapid expansion of steel framing. Meanwhile, in England, a group of enterprising engineers, experimenting with the possibility of reinforcing brick masonry, discovered that a mortar of Portland cement gave greater strength in brick beams. This simultaneous discovery of reinforced brick masonry and Portland cement was overlooked by the brick industry. Yet it was only a step for the next experimenter to eliminate the brick from the beam entirely, and arrive at what we know today as reinforced concrete. Soon to follow was the structural concrete frame; and thus began the "confused" phase of clay products history.

That such a description is well-merited is obvious when we analyze the developments of the period—thick, heavy walls of load-carrying type were suddenly placed on beams and columns—the design of which was, to a large extent, controlled by the weight of these same walls; meaningless non-supporting

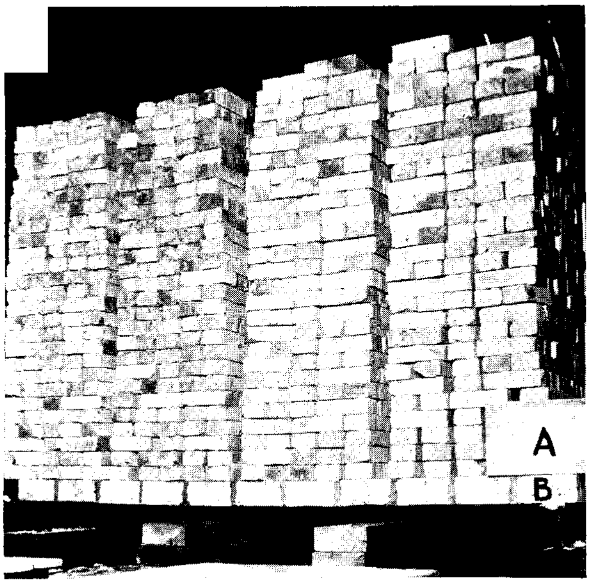


Fig. 1. Reinforced brick slab, 3¾ in. by 2 ft. 8 in. by 8 ft. 0 in., with load of 397 lbs. per sq. ft. Reinforcing members are six ⅜-in. round bars placed longitudinally ½ in. from bottom of slab.

Fig. 2. Reinforced tile beam and slab, designed for a load of 50 lbs. per sq. ft., with 180 lbs. per sq. ft. Similar tests ran up to 720 lbs. per sq. ft.

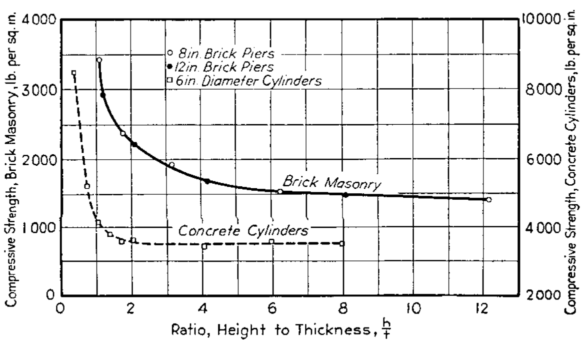


Fig. 3. How shape affects strength of specimen.

	Com-pressive Strength	Tensile Strength	Modulus of Rupture	Modulus of Elasticity
	Expressed in pounds per square inch			
Bricks	2,000-33,000	50-1,000	150-2,500	400,000-5,000,000
Average	7,500	200	800	
Brick masonry	Up to 4,000	Up to 120	Up to 150	300,000-3,000,000
Tile				
Gross end area	1,000-15,000			
Net end area	1,500-30,000			Maximum 3,000,000
Gross side area	700- 6,000			
Tile masonry				
End construction	Up to 900			
Side construction	" 400			

Table 1. Showing disparity between unit and wall strengths.

Unit Strength	Mortar Strength: Cured Dry	Mortar Strength: Cured Wet	Wall Strength	Source
	Expressed in pounds per square inch			
Brick				
17,600	1,390	3,220	3,374	(1)*
2,670	465	640	1,040	(1)
5,124	1,847	2,696	1,402	(2)†
Tile				
Net end area 9510			500	(1)
Gross end area 3540	465	640		(1)
Gross side area 1590			275	(1)

* "Structural Properties of Six Masonry Wall Constructions" by Herbert L. Whittemore, Ambrose H. Stang, and Douglas E. Parsons, Report BMS-5 of the U. S. Dept. of Commerce.
† "Effect of Shape of Specimen on the Apparent Compressive Strength of Brick Masonry" by W. J. Krefeld. Report of Committee C-15. Appendix 363, *Proceedings* of the Forty-first Annual Meeting of the American Society for Testing Materials, Vol. 38, 1938.

Table 2. Recent tests on specimen walls 8 ft. high.

Type of stress	1C-½L-4½S Mortar	1C-4½S Cement Grout
	Expressed in pounds per square inch	
Compression		
Extreme fibre stress in bending	400	500
Direct compression on Piers	300	400
Shear		
No web reinforcement	25	30
With web reinforcement, taking entire shear	50	60
Bond (Deformed bars)		
Vertical	60	60
Horizontal	80	80
Modulus of electricity E	*1,200,000*	1,500,000
Modulus of rigidity G (Modulus of Elasticity in shear)	480,000	600,000

Table 4. Uniform Building Code for reinforced brickwork.

arches; elaborate piers and buttresses for which steel did the real work; etc., etc. In other words, this was the transition stage between the bearing wall and the skeleton frame, with the construction habits of the former superimposed on the latter.

Today there is accumulating evidence that a third—and functional—phase is arriving, which will see structural clay products frankly and efficiently solving the construction problems of the day with little or no recourse to trite imitation of the feats of a glorious past.

It is not surprising that there has been so much confusion and bad practice in the design and use of clay products. In contrast, the orderly development and exploitation of recently developed materials appears extraordinary —new materials which did not carry with them the burden of tradition and the centuries-old habits of use. New requirements brought forth these specialized materials, but little attention was paid to similar possibilities in the most common material—clay.

Here, then, lay the real problem for those interested in structural clay products, which long preceded testing machines, and were regulated by archaic traditional assumption. The problem has been to determine—after 6,000 years of use—the characteristics of the material and exploit its advantages scientifically. This problem has been faced after a long delay. As the study proceeds, we find a rather surprising and confusing array of data, which when compared with popular assumptions is little short of amusing. We find on analysis that burnt-clay products rank either at the top, or very near the top, of many of the scales ordinarily used to measure the value of building materials.

Analyzing performance of clay products

Analysis of the relative values of building materials must always be qualified by the further question: *relative to what?* Clay products have often suffered from such incomplete analyses. For example, in the case of insulation against heat flow, comparisons have been made between purely insulating materials and multi-purpose structural materials such as clay products. As logical would be the comparison of the one lineal foot of 4-in. brick masonry capable of sustaining a load of 100,000 lbs. to the infinite amount of insulation material necessary to carry the same load. No attempt will be made to detail their properties here, but the reader is asked to name for himself building materials which will come through fire with as little damage as unit clay masonry; which have given evidence of equal resistance to decades of exposure; which are as effective against sound penetration; which have as little volume change or plastic flow.

So common are some of these misconceptions about structural clay products that brick and tile masonry is seldom stressed to more than 100 lbs. per sq. in., and most building codes limit tile to around 100 lbs. per sq. in., and brick to 225 lbs. per sq. in. Yet all laboratory tests indicate that even under ordinary conditions and using ordinary materials, the ultimate compressive strength of brick and tile masonry is much greater than the above (See Tables 1 and 2.)

Unfortunately the use of clay products in masonry construction has been the responsibility of several groups—manufacturer, architect, builder, and the various specialists. The consequence has been a tremendous variation in results—even though most of these variations are above the safe requirements of construction practice. On the other hand, there are deficiencies inherent in unit clay masonry which must be overcome if this method of construction is to continue in wide use. These disadvantages—water penetration, efflorescence, excessive weight, lack of tensile strength, intricate dimensional calculations, and costly job installation —are being carefully studied and some progress made on their elimination. In general, this progress takes place at three distinct qualitative levels: (1) improvements in the use of standard clay units in standard masonry assemblies—i.e., improvement of mortar joint, elimination of moisture, etc.; (2) development of new clay units and new masonry assemblies for larger unit size, greater strength, less weight, etc.; (3) development of entirely new processing methods—i.e., rolling and annealing of red-hot molten clays, chemical (instead of fire) curing of clay products, etc.—for highly specialized use.

Improvements in use of standard units

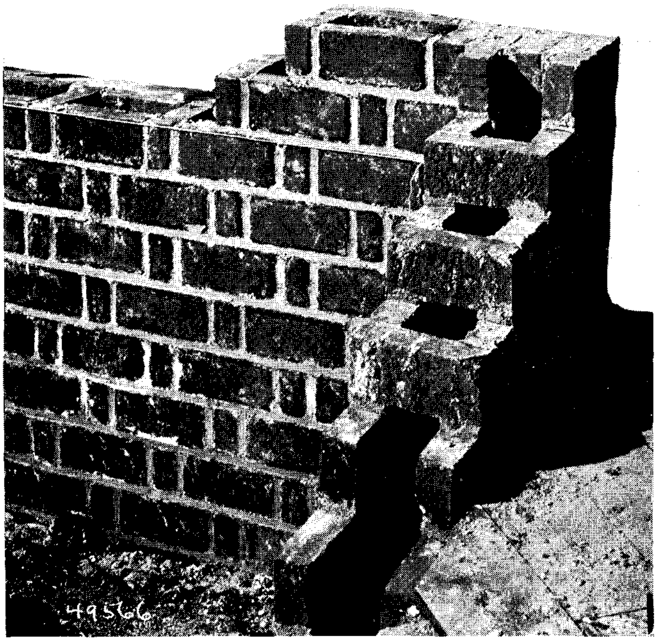
Cutting through all problems of masonry construction is the one of jointing. Until recently the clay-products industry has left this problem in the hands of other people. The result has been most confusing, and the data available—furnished in the main by proponents of one mixture or another—is so contradictory that the industry has been put on a spot. A thorough investigation of the problem is now in progress. Pending its conclusion, the clay products industry has presented the following recommendations for mortars:

Mix by Volume Cement	Lime	Sand	Recommended Use	Minimum expected mortar strength. lbs. per sq. in.
1	1	6	General use	600
1	2	9	Unexposed Non-load bearing	200
1	1/4	3	Reinforced brick masonry, extreme loads, exposure, sewers, etc.	1,500

It is probable, however, that the difference between all the customarily recommended mixes are again variations above a satisfactory minimum under normal circumstances. The main trouble is that few of the mixes actually used follow the recommended formulae and are seldom used in the manner prescribed for them. For this reason, it appears that the real solution to the jointing problem will be found in some manner that eliminates dependence on job manufacture. Certainly it seems strange that since mortar joints have always been the most vulnerable spot in masonry construction, no change or improvement has been made in them in hundreds of years.

Closely linked up to the problem of mortar control is that of efflorescence. The origin of all efflorescing salts is not as yet known. Indications are that some of them are formed after the building is up, due to chemical reactions with air-borne gases, etc. A simple test called the Wick test will help eliminate most of the salts in the beginning, however. This involves setting samples of the brick to be used on end in each of six pans. Into the pans is then poured, to a depth of about ½ in.: (1) distilled water; (2) distilled water and the cement; (3) distilled water and the lime; (4) distilled water and the sand; (5) mixing water to be used; (6) actual mortar combinations proposed. The water is replenished for five days to prevent drying. If efflorescing salts are present in any of the materials or combination of materials, they should appear upon drying. Then, by a process of elimination, salt-free materials can be selected.*

*Mortar and clay-products engineers working independently on this problem have recently come to the conclusion that joint effort is necessary. Consequently, a joint committee composed of members from ASTM committees C-15 (masonry units) and C-12 (mortars) has been appointed. From this it seems certain that tests similar to the above will be written into ASTM specifications for the various materials in the near future.



Graham

Fig. 4. Simplest of all advances in ordinary brick masonry is this hollow wall construction. Although boasting some advantages, moisture can still penetrate via headers.

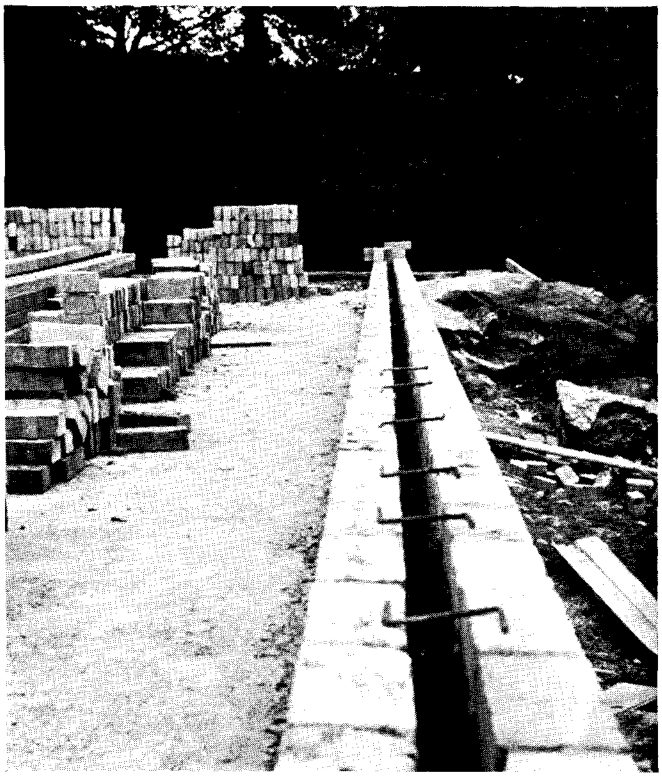


Fig. 5. Moisture penetration is eliminated, strength unimpaired by Cavity Wall construction. Tied by 1/4-in. steel rods, outer 4 in. serves as surfacing, inner carries load.

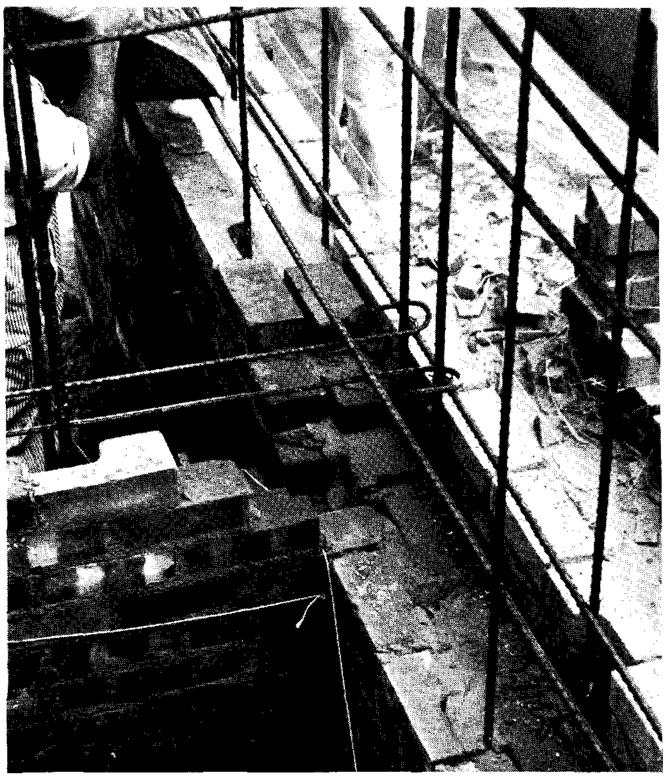


Fig. 6. Reinforced brick adds potentialities to the field of *small-unit* masonry construction, particularly valuable where unusual stresses necessitate structural flexibility.

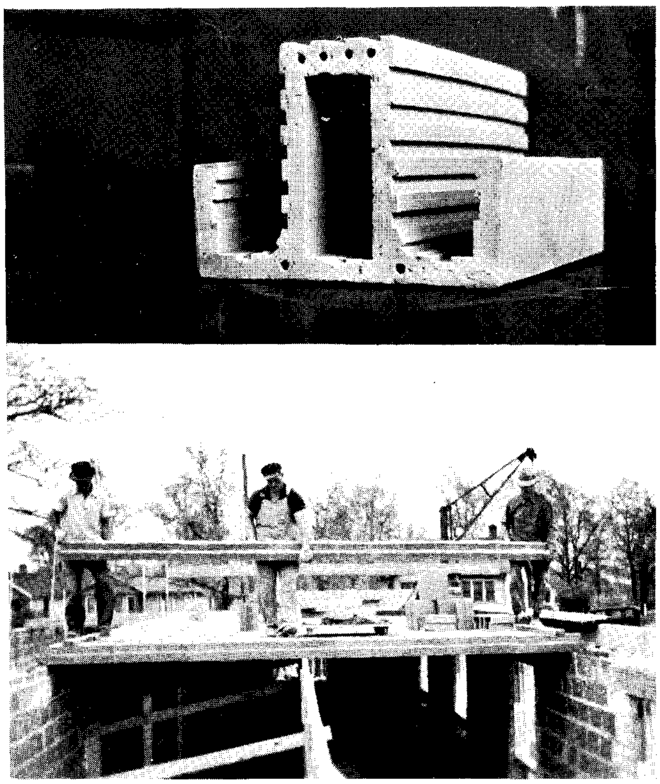


Fig. 7. Increasing variety of shapes in hollow tile yield possibility of prefabricated reinforced members. Typical unit employed (top) in prefabricated beams (bottom).

Improved performance from cavity walls

Extensive research indicates that moisture-proof walls can be made with almost any reasonable selection of bricks and mortar and reasonably competent workmanship; but job conditions are such as to cause failure in both respects. Facing this fact and realizing that job conditions are beyond its control, the clay-products industry has, aside from publishing general recommendations, introduced a new method of construction designed to overcome these job defects. This method is Cavity Wall construction (Fig. 5), consisting of two 4-in. (greater if loads demand) walls which, except for 1/4-in. steel ties, are completely separated by a 2-in. air space. Moisture or water penetrating the outer 4 in. can go nowhere except down and out again, thus leaving the inner section dry. The load is, except for the roof, carried only by the inner 4 in. of masonry. This forms a truly functional arrangement of clay masonry. The inner 4 in. is, under average conditions surrounding two-story residence construction, capable of sustaining 25 times the load to which it is subjected, and the outer 4 in. forms a durable protective skin. The result is a much more efficient organization of the same quantity of brick or tile than usual. Cavity walls, aside from a load-carrying capacity almost equal to a solid wall, offer considerably greater protection against dampness, and yield better heat-transmission coefficients.

Reinforced brick and tile

The use of steel rods in ordinary brick and tile masonry is so logical and has been so thoroughly investigated that it is surprising so little use has been made of them. Similar in theory to reinforced concrete—the design formulae are almost the same—there are many situations in which they can effectively and economically compete with reinforced concrete and steel. When walls are built of masonry it is a simple matter to transform the masonry above an opening from a dead load on a steel or concrete beam, into a functioning beam that will carry not only itself but the floor loads also. Using the same quantities of bricks and mortar, it becomes only a matter of balancing the cost of temporary centering and reinforcing rods against the cost of a steel beam and bearing plates to determine whether it pays or not. The writer recently utilized this principle of Cavity Wall construction over 11-ft. openings by the simple expedient of using 22 in. of the wall as a beam, spacing 5/8-in. rods at required distances, and filling the cavity with mortar to that height. Reinforced brick floor slabs, just emerging from the laboratory stage (Fig. 1), also give promise of economical and satisfactory performance.

Complete regulations for the use of reinforced brick masonry are included in the Uniform Building Code on the Pacific Coast. Earthquakes aroused engineers in that territory to the necessity of reinforcing unit masonry, and the result has been very successful. Complete structural frame and walls are regularly built of reinforced brick masonry in that area (Fig. 6).

The variation in the method of laying the units indicates that our habit of cross bonding bricks is open to question. Groutlock (reinforced brick) masonry uses no headers. A wall similar to the cavity wall is built with horizontal and vertical reinforcing rods placed in the cavity, which is poured full of grout as the work progresses. Such brick walls are the strongest ever built. Furthermore, in most load tests on plain brick masonry the headers were always the first to break, thus throwing a sudden load on half the wall, causing final failure through a shock simliar to impact. The elimination of headers will also reduce the tendency for water to penetrate, since at all points in the wall the moisture will be faced with two surfaces to break through. It takes longer for water to penetrate an 8-in. assembly of brick, mortar, and brick than 8 in. of the same brick alone, or 8 in. of the same mortar.

Reinforced hollow tile beams and lintels are of course more widely known. Enterprising producers in the mid-west are now marketing precast reinforced tile beams up to 22-ft. spans in competition with other fireproof floors. Advantages claimed for them are good strength-weight ratios and great reduction in volume change, which has caused defects in masonry construction when concrete floor and roof were poured against the walls (Fig. 7).

Standardization of units needed

Commencing with a cored rectangular hollow tile unit, the industry now produces dozens of shapes and types of hollow tile for various uses. The latest improvements, in which more attention was paid to use and handling, have been most successful. A broader use would no doubt be made of such hollow units were there not such a variety to choose from—causing confusion and variations in installation technique and results. Many of these shapes were developed to avoid patent trouble, and it seems that a greater use of hollow tile as a whole would result from the general scrapping of patent rights—many of which have not been profitable to the holder. This would permit concentration on a few of the best type, and greater standardization of construction practice.

Double-size brick are now popular in some sections and the trend towards large slabs and "stave" tiles is described below (Figs. 10, 11). The gradual increase in the size of glazed products has been most noticeable. A few years ago brick-size glazed ware formed half or more of the output—today larger units notably 5 by 12 in. or 8 by 16 in. play the dominant role—both for interior and exterior use. Lower in cost, and with a greater variety of shape and color and increasingly high standards of performance, glazed brick and tile are readily finding new uses. Simpler processes, which permit the use of glazes on the more common clays and shales, are making it possible to use this material more generally. Light-weight acoustical tile, with suitable finishes, having sound absorption factors of 20% or more, are now commercially produced.

New forms hold great promise

Further variation in shape and assembly is illustrated in Rhombrix, introduced recently in England (Fig. 9). Here the traditional shape of bricks was discarded in an attempt to make walls stronger and more flexible, and to achieve greater moisture resistance by the use of rhomboid shapes instead of rectangular. Another variation, the Tight-Wall brick, is being offered in this country (Fig. 8). Working on the correct assumption that most leaks through walls occur because of faulty vertical joints, a slotted brick—which provides greater space in which to make the vertical joint—was devised. The advantages claimed are that vertical joints, made by pushing mortar down into the slot and between the bricks after the bricks are placed, instead of making vertical and horizontal joints at the same time, result in better adhesion and tighter work.

Changes in both shape of unit and method of erection have been used on the construction of the Belgian Building at the World's Fair (Fig. 10) in

CLAY PRODUCTS: New Forms

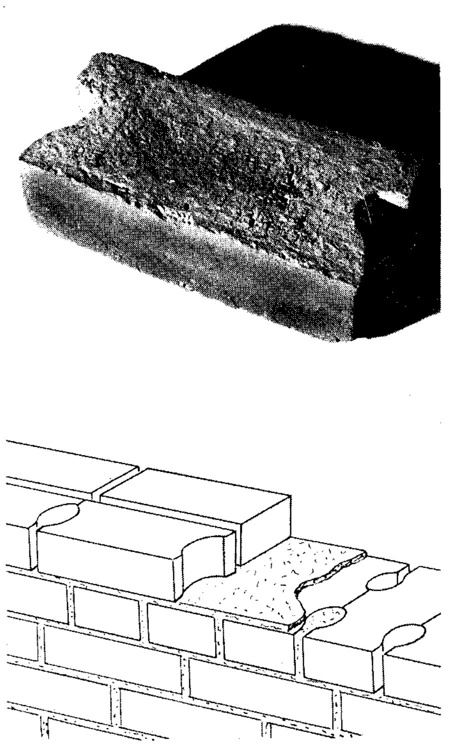


Fig. 8. The new "Tightwall" brick provides slotted ends for improved vertical joint. Claimed for this brick are better adhesion and tighter work.

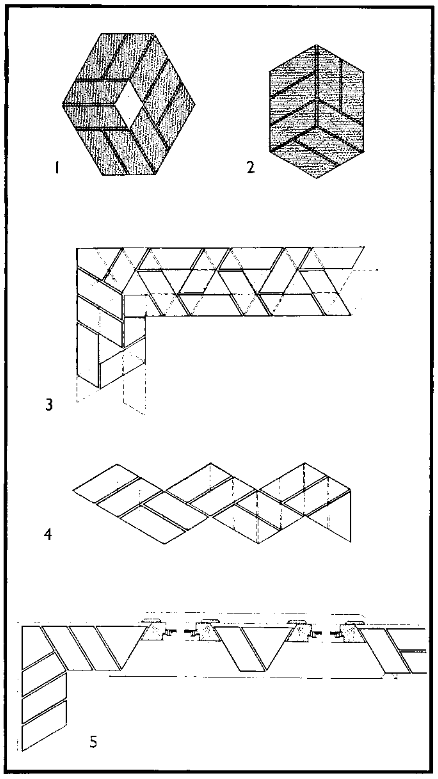
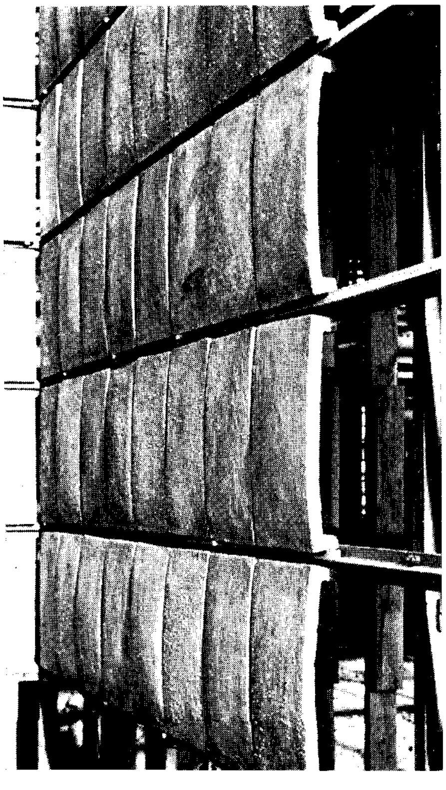
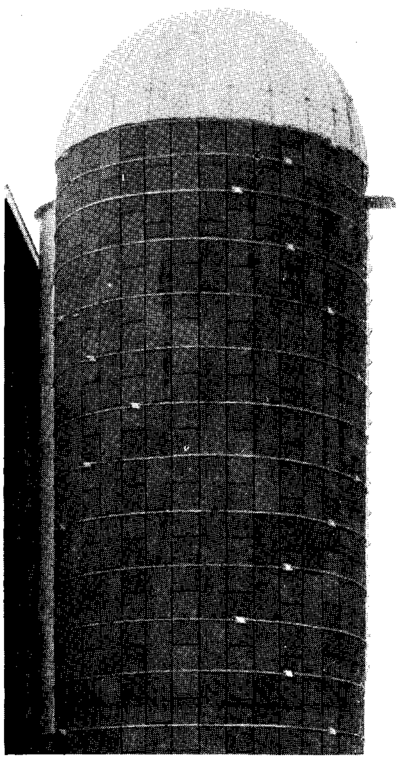


Fig. 9. Abandoning the rectangle, England's new "Rhombrix" claims increased strength and moisture resistance, with greater flexibility in use.



St. Thomas

Fig. 10. Use of light clay units as a nonstructural surfacing medium exploits inherent resistance to weather and fire, thermal *and acoustical* insulation.



Courtesy Independent Silo Co.

Fig. 11. Use of large, load-bearing clay units and elimination of mortar joint yields efficient and economical construction system in this new silo.

which clay slabs 2 by 18 by 24 in. are hung on light steel cross members and later caulked up with a mastic.

One of the most interesting uses of these new types of clay units is in the "tile-stave" silo construction, now being very successfully employed in the midwest (Fig. 11). Here the mortar is dispensed with, since it is claimed silage acids have a harmful effect on the cements. Hollow tile "staves" 4 by 12 by 24 in. are set on end in beds of asphaltic mastic, and the continuous vertical joint is insulated with strips of redwood caulked with mastic. The whole circular construction is then tied in place with hoops of galvanized steel rods and tightened to form a rigid structure. Advantages claimed for this method of silo construction are greater durability, strength, and insulation, as well as greater protection against acids, fire, frost, and defects in appearance.

New processing methods ahead

Perhaps the most stimulating possibilities of all lie in the introduction of entirely new methods for processing the clay itself.

Laboratory experiments in moulding and rolling red-hot clays into various shapes indicate a radically different method of clay-products manufacture. After the shapes are moulded they are annealed at high temperatures, the result being a product which does not shrink after forming, and is considerably lighter in weight. The lack of shrinkage and warping make it possible to form very thin clay slabs, judging from the few samples of 4 by 8 by 1/8-in. slabs that were successfully made. The use of large thin clay slabs for durable surfacing of other materials is the goal. This treatment should make it possible to incorporate tensile steel rods into the unit itself. Thus, there is a real prospect of prefabricated reinforced clay beams, columns, and wall units—of large size and good strength-weight ratio.

The substitution of chemical treatment for fire treatment of clays has also been accomplished, and the experimental units so produced show remarkable possibilities. If somewhat lacking in durability, they have greater flexibility for use in interior and unexposed situations.

The making of porous bodies is still more or less in the laboratory stage. There are, however, some encouraging reports from that quarter. Clay bodies weighing only 2 to 3 lbs. per cu. ft. have been made—which show possibilities as insulating material as well as raw material for further processing.

CURRENT TRENDS OF BUILDING COSTS

Compiled by Clyde Shute, Manager, Statistical and Research Division, F. W. Dodge Corporation, from data collected by E. H. Boeckh & Associates, Inc.

CURVES INDICATE trend of the combined material and labor costs in the field of residential frame construction. The base line, 100, represents the U. S. average for 1926-1929 for residential frame construction.

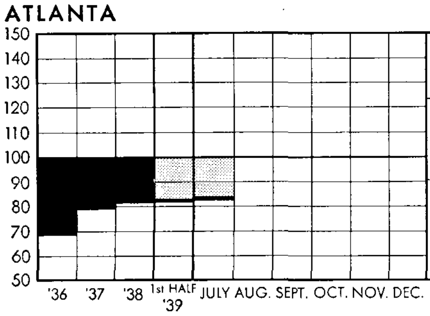
Tabular information gives cost index numbers for the nine common classes of construction. The base, 100, in each of the nine classes represents the U. S. average for 1926-1929 for each particular group. The tables show the index numbers for the month for both this year and last.

Cost comparisons, as percentage differences for any particular class of construction, are possible between localities or periods within the same city by a simple process of dividing the difference between the two index numbers by one of them. For example: if index for city A is 110 and index for city B is 95 (both indexes for A and B must be for the same class of construction), then costs in A are approximately 16% higher than in B $\left(\frac{110-95}{95} = 0.158.\right)$ Conversely it may be said that costs in B are approximately 14% lower than in A $\left(\frac{110-95}{110} = 0.136.\right)$

Similar cost comparisons, however, cannot be made between different classes of construction since the index numbers for each class of construction relate to a different U. S. average for 1926-1929.

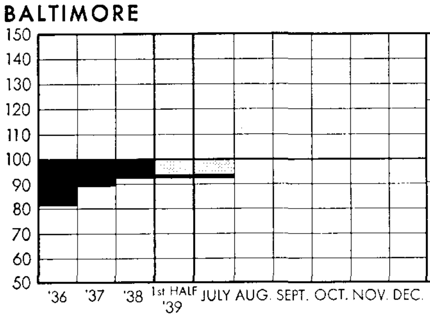
CONSTRUCTION COST INDEX U. S. average, including materials and labor, for 1926 - 1929 equals 100.

ATLANTA



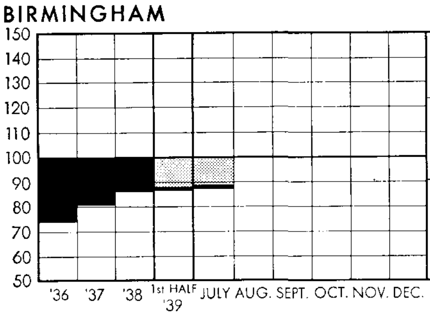
	July '38	July '39
Residences		
Frame	82.2	83.3
Brick	85.3	86.5
Apartments		
Br. & Wood	85.9	86.4
Br. & Conc.	96.4	94.8
Br. & Steel	96.8	94.5
Comm. & Fact.		
Frame	80.0	81.1
Br. & Wood	87.9	88.9
Br. & Conc.	98.5	93.3
Br. & Steel	97.8	97.2

BALTIMORE



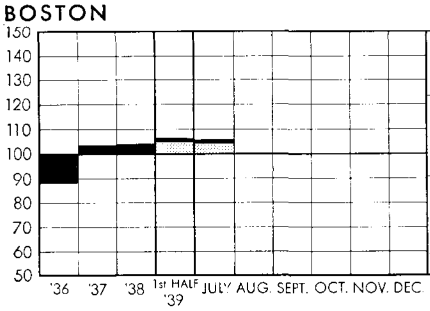
	July '38	July '39
Residences		
Frame	92.1	93.2
Brick	95.0	95.0
Apartments		
Br. & Wood	94.3	95.6
Br. & Conc.	98.6	100.2
Br. & Steel	98.6	100.0
Comm. & Fact.		
Frame	91.8	93.7
Br. & Wood	95.9	96.8
Br. & Conc.	99.0	101.3
Br. & Steel	100.6	103.1

BIRMINGHAM



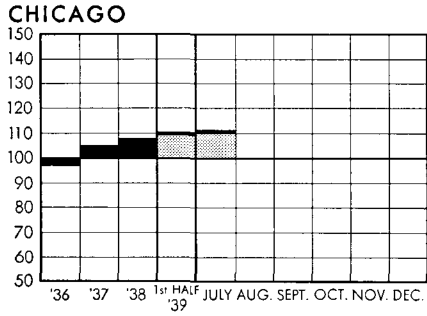
	July '38	July '39
Residences		
Frame	86.4	87.7
Brick	89.6	90.8
Apartments		
Br. & Wood	90.3	91.4
Br. & Conc.	96.5	96.2
Br. & Steel	93.6	96.3
Comm. & Fact.		
Frame	83.1	84.4
Br. & Wood	93.7	94.9
Br. & Conc.	96.5	96.0
Br. & Steel	96.3	95.3

BOSTON



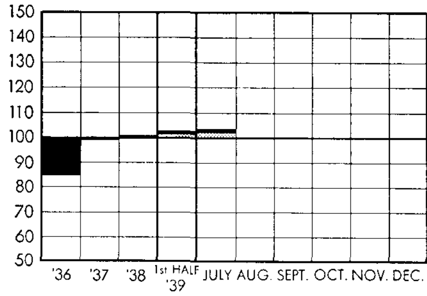
	July '38	July '39
Residences		
Frame	103.4	105.2
Brick	109.0	109.6
Apartments		
Br. & Wood	107.2	109.1
Br. & Conc.	113.9	115.8
Br. & Steel	111.3	112.8
Comm. & Fact.		
Frame	103.0	104.5
Br. & Wood	108.4	110.9
Br. & Conc.	115.3	118.3
Br. & Steel	115.8	117.2

CHICAGO



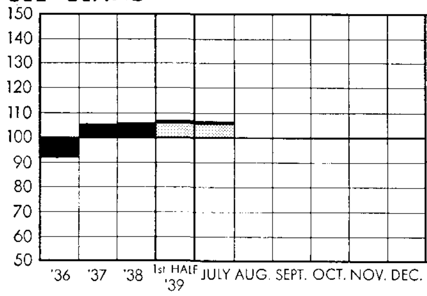
	July '38	July '39
Residences		
Frame	107.7	110.4
Brick	110.3	112.6
Apartments		
Br. & Wood	108.9	111.1
Br. & Conc.	123.0	124.0
Br. & Steel	118.0	118.9
Comm. & Fact.		
Frame	110.7	113.9
Br. & Wood	107.9	109.7
Br. & Conc.	127.1	128.4
Br. & Steel	122.9	122.8

CINCINNATI



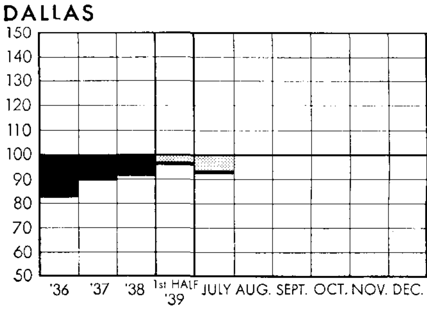
	July '38	July '39
Residences		
Frame	98.6	103.3
Brick	102.3	106.4
Apartments		
Br. & Wood	102.1	105.9
Br. & Conc.	112.2	114.9
Br. & Steel	108.6	110.9
Comm. & Fact.		
Frame	98.0	103.0
Br. & Wood	104.3	107.3
Br. & Conc.	114.3	118.3
Br. & Steel	112.7	114.0

CLEVELAND



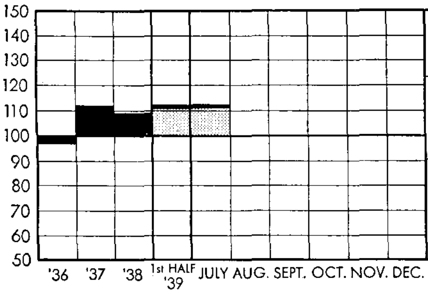
	July '38	July '39
Residences		
Frame	105.9	106.0
Brick	109.9	109.7
Apartments		
Br. & Wood	109.6	109.3
Br. & Conc.	116.4	116.0
Br. & Steel	113.5	113.2
Comm. & Fact.		
Frame	106.7	107.1
Br. & Wood	110.4	109.9
Br. & Conc.	119.5	119.1
Br. & Steel	118.7	118.4

DALLAS



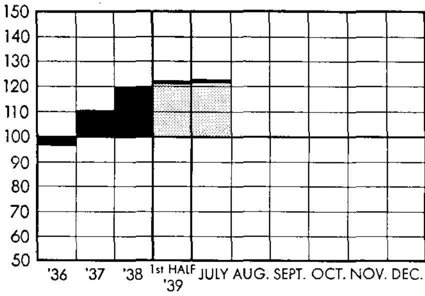
	July '38	July '39
Residences		
Frame	91.9	93.2
Brick	93.0	94.7
Apartments		
Br. & Wood	93.5	95.8
Br. & Conc.	98.5	97.8
Br. & Steel	98.5	99.6
Comm. & Fact.		
Frame	91.4	92.5
Br. & Wood	93.9	95.2
Br. & Conc.	98.2	98.7
Br. & Steel	100.3	101.3

DENVER



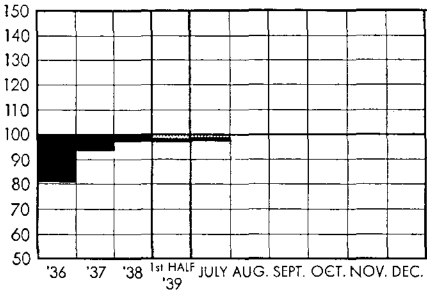
	July '38	July '39
Residences		
Frame	109.2	111.9
Brick	110.0	111.4
Apartments		
Br. & Wood	105.3	110.6
Br. & Conc.	114.8	115.3
Br. & Steel	113.2	114.0
Comm. & Fact.		
Frame	111.3	114.4
Br. & Wood	107.0	108.7
Br. & Conc.	116.1	116.6
Br. & Steel	106.8	116.4

NEW YORK



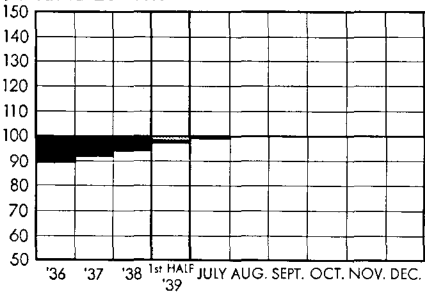
	July '38	July '39
Residences		
Frame	119.3	122.1
Brick	121.1	123.6
Apartments		
Br. & Wood	119.5	122.6
Br. & Conc.	128.2	130.9
Br. & Steel	123.8	126.1
Comm. & Fact.		
Frame	122.7	125.3
Br. & Wood	116.3	120.1
Br. & Conc.	130.3	133.8
Br. & Steel	128.1	130.2

DETROIT



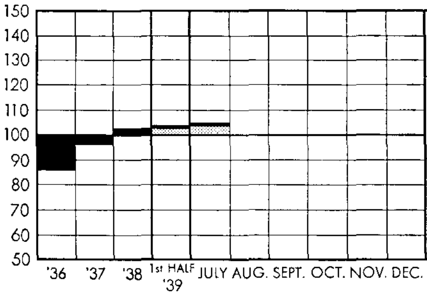
	July '38	July '39
Residences		
Frame	96.3	98.2
Brick	100.8	102.0
Apartments		
Br. & Wood	101.1	102.3
Br. & Conc.	108.4	108.0
Br. & Steel	107.2	107.1
Comm. & Fact.		
Frame	96.0	97.8
Br. & Wood	103.0	103.7
Br. & Conc.	110.1	109.3
Br. & Steel	112.0	110.9

PHILADELPHIA



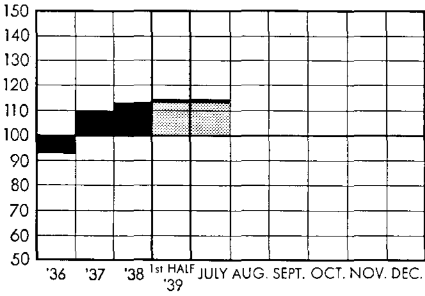
	July '38	July '39
Residences		
Frame	93.9	99.1
Brick	98.4	102.3
Apartments		
Br. & Wood	98.5	102.8
Br. & Conc.	105.3	105.6
Br. & Steel	102.7	104.4
Comm. & Fact.		
Frame	91.3	97.6
Br. & Wood	102.5	105.2
Br. & Conc.	107.9	106.8
Br. & Steel	105.0	106.0

KANSAS CITY



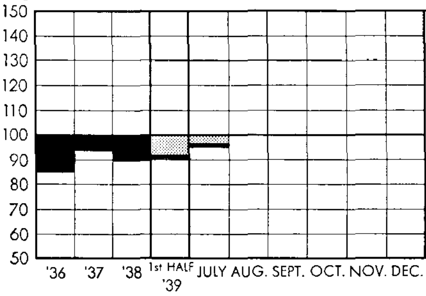
	July '38	July '39
Residences		
Frame	101.2	104.0
Brick	107.2	109.5
Apartments		
Br. & Wood	107.0	109.3
Br. & Conc.	117.8	118.1
Br. & Steel	114.8	115.2
Comm. & Fact.		
Frame	100.5	103.0
Br. & Wood	110.4	112.7
Br. & Conc.	121.2	121.5
Br. & Steel	119.0	120.1

PITTSBURGH



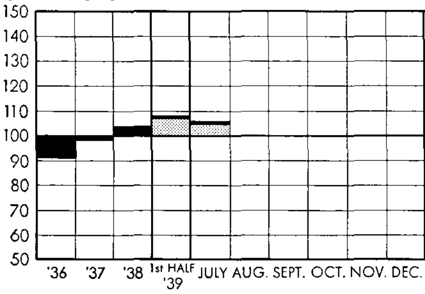
	July '38	July '39
Residences		
Frame	113.2	113.8
Brick	116.8	117.3
Apartments		
Br. & Wood	115.1	115.6
Br. & Conc.	117.2	117.5
Br. & Steel	113.8	114.2
Comm. & Fact.		
Frame	113.4	114.1
Br. & Wood	116.0	116.4
Br. & Conc.	119.0	119.1
Br. & Steel	117.3	117.2

LOS ANGELES



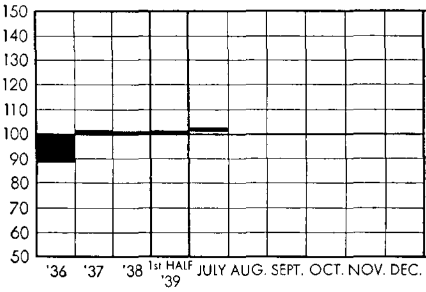
	July '38	July '39
Residences		
Frame	87.8	95.8
Brick	94.3	97.5
Apartments		
Br. & Wood	94.7	97.8
Br. & Conc.	102.3	104.0
Br. & Steel	103.9	105.2
Comm. & Fact.		
Frame	92.2	95.4
Br. & Wood	93.8	97.2
Br. & Conc.	102.3	105.5
Br. & Steel	105.9	106.5

ST. LOUIS



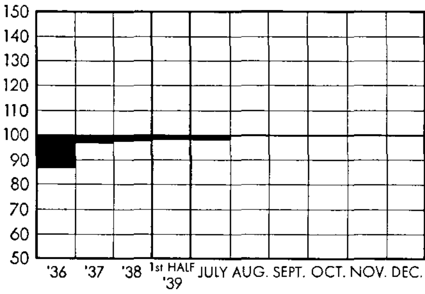
	July '38	July '39
Residences		
Frame	103.3	105.4
Brick	107.4	108.9
Apartments		
Br. & Wood	107.3	108.6
Br. & Conc.	118.3	118.3
Br. & Steel	115.8	115.7
Comm. & Fact.		
Frame	113.3	105.9
Br. & Wood	108.3	109.4
Br. & Conc.	119.6	119.6
Br. & Steel	119.4	118.2

MINNEAPOLIS



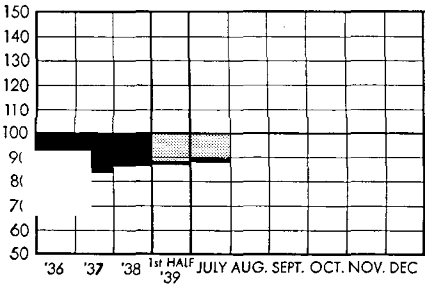
	July '38	July '39
Residences		
Frame	100.5	101.6
Brick	106.5	104.8
Apartments		
Br. & Wood	103.2	104.0
Br. & Conc.	112.9	113.6
Br. & Steel	110.6	110.7
Comm. & Fact.		
Frame	101.3	102.3
Br. & Wood	102.9	103.5
Br. & Conc.	116.6	117.2
Br. & Steel	114.4	114.5

SAN FRANCISCO



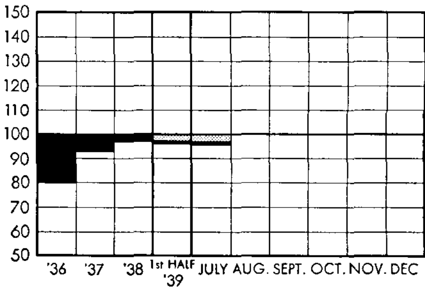
	July '38	July '39
Residences		
Frame	97.5	98.7
Brick	105.4	104.7
Apartments		
Br. & Wood	102.3	104.3
Br. & Conc.	116.0	116.8
Br. & Steel	112.5	113.5
Comm. & Fact.		
Frame	95.9	97.1
Br. & Wood	105.9	107.2
Br. & Conc.	120.9	121.2
Br. & Steel	116.2	114.4

NEW ORLEANS

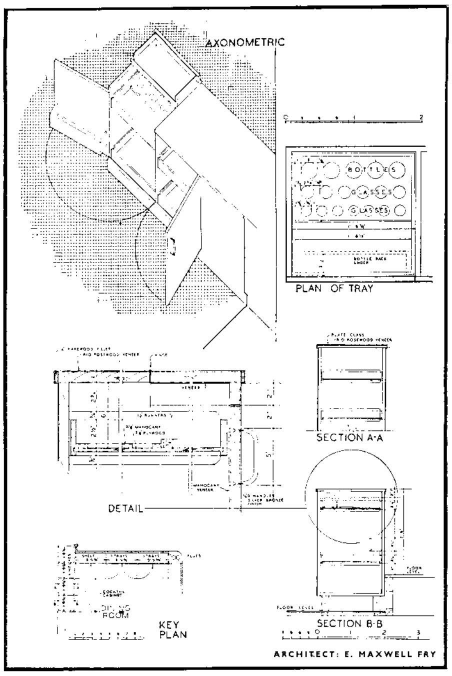


	July '38	July '39
Residences		
Frame	86.8	88.6
Brick	87.9	90.4
Apartments		
Br. & Wood	89.1	91.3
Br. & Conc.	92.9	96.0
Br. & Steel	96.2	98.6
Comm. & Fact.		
Frame	85.5	87.8
Br. & Wood	89.6	91.8
Br. & Conc.	92.0	96.1
Br. & Steel	96.6	99.1

SEATTLE



	July '38	July '39
Residences		
Frame	95.4	96.0
Brick	103.4	103.8
Apartments		
Br. & Wood	103.0	103.1
Br. & Conc.	119.9	118.5
Br. & Steel	115.6	114.1
Comm. & Fact.		
Frame	92.8	93.7
Br. & Wood	107.8	107.8
Br. & Conc.	126.2	124.5
Br. & Steel	120.4	117.0



From "Working Details." Plans and drawings for built-in units treated in the section on furniture.

NOTES ON NEW BOOKS

WORKING DETAILS, PART I: DOMESTIC, edited by Mildred W. White, A.R.I.B.A. Published by The Architectural Press, London. 139 pp. 9¼ by 12½ in. Sold in the United States through *Architectural Record,* 119 W. 40th Street, New York City. Price, $4.00

NICELY paced with the present progressive trend towards closer integration of functional units with the general considerations of over-all design, the timely appearance of this volume greatly increases its value to the designer. It represents one of the first comprehensive studies on the subject of such planning. By means of photographs, axonometrics, sections-through, and fully dimensioned working plans, the book illustrates the contemporary handling, by various internationally known architects, of such details as: windows, doors, staircases, kitchens, furniture, and fireplaces. It also demonstrates how the newer materials and finishes—plywoods, plastics, etc.—have been employed, and to what degree of success, in these types of construction.

The material for the volume—the first in a series of four, the others of which will successively consider public, commercial, and industrial details—was selected from issues of the Architects' Journal since 1934.

THE 1940 BOOK OF SMALL HOUSES, by the Editors of the Architectural Forum. Published by Simon and Schuster, Inc., New York. 240 pp., 8¾ by 12 in. Price, $1.96

THIRD in the series of small-house design books, jointly fostered by the Architectural Forum and Simon and Schuster, this latest volume offers a collection of plans, photographs, and drawings intended to expedite the proprietary venturesomeness of prospective home owners. Complete specifications and cost figures are provided to guide the judicious builder, and a table of admonitions to restrain the overly impulsive. In addition to the Portfolio of Homes which presents examples from here and there about the country, the book includes a Portfolio of Remodeling, the Life Magazine Houses for "typical" American families, and the small-house designs submitted in the Ladies' Home Journal and American Gas Association competitions. Other features are a comprehensive bibliography and a check list of questions and answers.

THE HUMAN HOUSE, by Dorothy J. Fields. Published by Houghton Mifflin Co., Boston. 156 pp., 7¼ by 9¾ in. Price, $2.75

HOUSE planning, Mrs. Fields believes, should involve many considerations which, though to her mind as urgent as those of more immediate professional concern such as elevations, exposures, and operational convenience, are in the main perfunctorily handled by otherwise competent designers. She feels that insufficient provision is generally made in planning for the needs of small children, adolescents yearning for sacrosanct retreats, young ladies with gentlemen callers, and ivory-tower scholars in the home. With charts, sketches, plans, and photographs supplementing her text, Mrs. Fields presents her solution to these problems—a system of home "zoning" for the segregation of individual activities and the resultant obviation of family neuroses. Her intention is to supply the prospective home owner with new concepts which may assist him in articulating to the designer the individual needs of his family and his own ideas on the provisions which should be made for them in planning the house.

TOMORROW'S HOMES, by F. Vaux Wilson, Jr. Published by the Homasote Co., Trenton, N. J. 241 pp., 10½ by 8½ in.

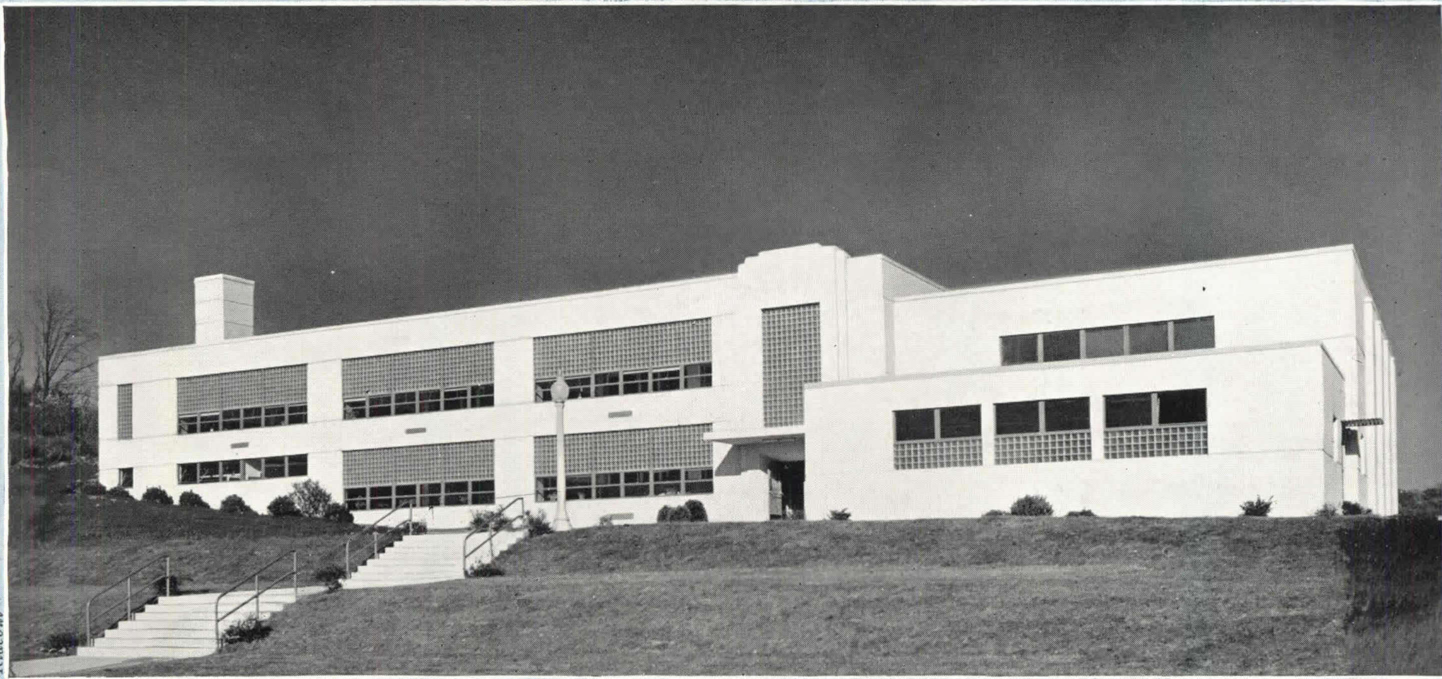
"THERE has been really no microscopic examination of the various parts of a house by the building industry as a whole," declares the author of this work, "and surprisingly little standardization of details or procedure." Mr. Wilson's book is intended to establish this recognition before the building industry and demonstrate the benefits that may accrue from the use of the Precision-Built System, and show how, by the Merchandising Plan, new business may be created for this more efficient and integrated method of building construction. The author commences by stating his views on the national housing problem and in relation to this follows with a description of the Precision-Built System developed on the Bemis 4-in. cubicle module, and explains the Precision-Built Merchandising Plan.

The book includes a set of modular tables.

BUILDING TYPES

HIGH SCHOOLS

FORTHCOMING ISSUES: 1939 — September, Apartment Houses; October, Theaters; November, Houses; December, Hospitals. PRECEDING ISSUES: 1939 — July, Houses; June, Factories; May, Houses; April, Retail Stores; March, Housing Developments; February, Elementary Schools; January, Restaurants.



Rideout

Louft & Wolf

Louft & Wolf

Exterior and typical interiors of the Kensington Junior High School in Montgomery County, Md., near Washington, D. C., the first unit of a 25-acre community school development. According to plans of Rhees E. Burkett, architect, the site will ultimately contain two other academic buildings, a group of related "cottage laboratories", a separate gymnasium, and complete outdoor recreation facilities for student and community use.

The following material dealing with advanced standards of high school design is complementary to data published in the February 1939 Building Types section on Elementary Schools. Both subjects were compiled from research data made available through the courtesy of Teachers' College of Columbia University. Particular acknowledgment is hereby made to Dr. N. L. Engelhardt, Professor of Education, and to Stanton Leggett, Graduate Fellow, for their active help in the preparation of this material. Credit and thanks are also due to Dr. N. L. Engelhardt, Jr., and to educational research workers, school administrators, and architects who, although too numerous to list individually, have generously contributed to the variety of information contained in the following pages.

MODERN HIGH-SCHOOL P ANT DESIGN

PRE-COLLEGE educational systems throughout the country are currently on the threshold of important evolutionary developments. On the basis of educational experiments and such surveys as the Regents Inquiry into the New York State education system (reported in the recently published "Education for American Life," by Dr. Luther Gulick), policies are being formulated which are unique with respect to presently accepted educational concepts.

These policies embody the principle of integrating educational activity with the democratic ideal in this country. Thus, they look forward to the time when scholastic education will be commonly recognized as the most potent shaping force, not only of a student population, but of the community of which such population is a part. And because this new concept is already emerging into a practical program with well-defined and far-reaching values, it has an immediate bearing upon the solution to current school design problems.

Strong forces have been, and are being, instrumental in forming such new educational policies and in developing requirements which condition the modern school-building plant. Many are linked to social and economic changes—such matters as population trends and problems of national and regional economy, which have lately been grave concerns of the National Resources Committee. Others have developed from the changing social patterns that have brought the Civilian Conservation Corps, the Works Progress Administration, the National Youth Administration, and other such agencies into focus as educational instrumentalities. All are linked with the ever more apparent need for providing our national youth with an educational background which will serve as a more immediately practical tool for adult life. In combination, they constitute a sort of prism through which educators have viewed the component parts of our present educational systems, and by means of which they are formulating new policies which are already influencing development of high-school programs and plants in all parts of the country.

Expressed technically, from the curriculum point of view, the new policy recommended by advanced educators involves an NS-K-6-4-4* program, in contradistinction to the commonly accepted K-6-3-3* program which, in itself, marked an advance from the primary-grammar-high-school program which was commonly accepted in this country as late as 1915.

Applied to the high-school plant, this new program confronts the designer with a three-fold problem: *a.* of providing a wide range of educational facilities for children from 12 to 16 years of age and including the grades from 7 to 10, in an intermediate school; *b.* of providing a more advanced type of instructional facilities for youths from 16 to 20, in a secondary school to include grades 11 to 14; and, *c.* of providing facilities adequate for adult educational programs and general community activities of both instructional and recreational character.

Analysis will show that facilities for intermediate and secondary schools overlap to a certain extent. Therefore, provision of individual plants for each school group will normally depend upon the financial support involved and the organization of a school district. In some cases, a single plant can meet the triple set of requirements indicated above. In other instances, the designer may be concerned with the provision of intermediate and secondary facilities in separate plants, in both of which provision for adult and community facilities are desirable.

Because of this overlapping characteristic, material in the following pages has been presented under headings applicable to both intermediate and secondary classifications, as flexible aids in solving the local problems with which a designer may be confronted.

It should be borne in mind, however, that the NS-K-6-4-4 program is an educational organization that embraces the desirability of educational plants designed specifically for the scholastic categories implied in the designation. In the February 1939 issue of the Record appeared a "Building Types" study on the type of elementary schools which would logically be a part of this program. The study in this issue treats high-school plants from generally the same point of view. Therefore, to complement information in the former study, it is desirable to touch generally on what educators regard as an ideal high-school plant organization.

Intermediate school. This is visioned as a community school to provide, within an area of from 15 to 40 acres, the type of instructional facilities which will develop an integration of scholastic work with the life of both home and community. This implies a plant in which classroom regimentation gives way to a more informal experience program in which the teacher, in the role of advisor, encourages pupils in independent thought and action.

The plant must provide an extension of the "learning by doing" principle which is increasingly being accepted as an important part of the elementary-school curriculum. The formal class- or home-room will tend to be supplanted by the instructional suite combining a recitation and lecture area, with one or more workrooms, library, storage and mechanical facilities in the form of "general educational laboratories." Administration areas will expand to include facilities for lay organizations, for the increasingly important health service, and for student activities and government. Increasing stress will be laid on industrial arts and crafts; and shops adaptable for use by adults, as well as by students, are necessary.

Equally necessary will be the recreational facilities of auditorium and gymnasium, each planned to provide a wide range of uses for both students and adults. Out-of-doors education is also important and the plot will necessarily include areas for use by children's and adults' non-scholastic organizations.

---

*NS-K-6-4-4 implies a year or two of nursery school, one year of kindergarten, six years of primary and upper elementary school, four years of intermediate school, and four years of secondary school. The terminology is advanced, "intermediate" including what have been known as grades 7 to 10 inclusive; the "secondary" including the last two years of present high-school work and additional years for terminal courses, or for those corresponding to the present junior-college program.

The K-6-3-3 program is the familiar kindergarten, elementary, junior and senior high school progression.

Secondary School. Because the secondary school is regarded by advanced educators as a place where wide educational opportunity may develop youths into resourceful members of a democratic community, it is visioned as a regional educational center of the campus type. An area of 50 to 100 acres may include a number of school buildings and complete provision of outdoor recreation facilities for students and adults. In general, provisions of the secondary-school plant will be comparable in type to those of a small, well-equipped college. Buildings and landscape, however, will be developed particularly to serve as a community center as well as an attractive and efficient plant for a well-rounded curriculum.

As in the intermediate school, an educational experience program will permit students to prepare themselves according to their abilities and interests for a productive adult existence. This suggests emphasis on industrial arts and indicates a major need for shops fully equipped for instruction and practice in such activities as wood- and metal-working, printing, automobile and airplane mechanics, etc. Social and physical sciences will be increasingly taught in laboratory suites similar to the "general education laboratory" of the intermediate school, but embodying a larger number of instructional units integrated within a separate area.

The administration unit is of special importance. It must provide facilities adequate for personnel and vocational guidance, health service and instruction, student and community activities, and the cooperative development of varied educational programs by community organizations, educational administrators, and the students themselves. To meet these needs, suites of offices and conference rooms may be located centrally with respect to other school buildings and to the community.

Concerning indoor recreation, the community educational center should embrace an auditorium which, in effect, will become a community theater, complete with stage-craft and service areas and provisions for both legitimate and moving-picture productions. Logically included will be rooms for orchestra and instrument practice, for theatrical rehearsals and club meetings. Also desirable is space for both student and community gatherings such as dances and banquets, which suggests a multi-purpose hall adjacent to kitchen, pantry, and storage areas.

The gymnasium will be developed as a complete physical recreational plant, patterned after a collegiate field house and adaptable to a wide range of athletic activities including group activities which can be enjoyed by adults, as well as by youths.

Outdoor facilities may follow the general pattern of the intermediate school with the addition of play areas such as full-size baseball and football fields, hockey rink, a swimming pool, etc.

The foregoing paragraphs outline what progressive educators regard as ideal. But they reflect only the *trend* of present practice in educational plant design. In a number of progressive communities a start has been made toward this ideal, however; and, therefore, designers cannot ignore either the concept which implies the need for such educational plants, the scope of the plants themselves, or the increasing necessity that they be integrated with community interests and activities.

Bibliography

General

Educational Policies Commission: *The Unique Function of Education in American Democracy* (1937); *The Purposes of Education in American Democracy* (1937); *The Structure and Administration of Education in American Democracy* (1938); *Social Services and the Schools* (1939). National Education Association, Washington, D. C.

Engelhardt, Fred and Overn, A. V. *Secondary Education: Principles and Practices.* D. Appleton-Century Company, 1937.

Everett, S. *The Community School.* D. Appleton-Century Company, 1938.

Harap, Henry (Editor). *The Changing Curriculum.* D. Appleton-Century Company, 1937.

Hopkins, L. Thomas. *Integration: Its Meaning and Application.* D. Appleton-Century Company, 1937.

Langfitt, R. E.; Cyr, F. W.; and Newsom, N. William. *The Small High School at Work.* American Book Company, 1936.

Strayer, G. D.; Engelhardt, N. L.; et al. *A Report of the Survey of the Schools of St. Louis, Mo.* Bureau of Publications, Teachers' College, Columbia University, 1939.

American Association of School Administrators. *Schools in Small Communities.* Seventeenth Yearbook, 1939. Washington, D. C.

Newsom, N. William and Langfitt, Roy Emerson. *Administrative Practices in Large High Schools.* American Book Company, 1939.

Junior High Schools

Baldwin, J. W. *Classroom and Equipment Requirements for the New Social Studies.* Eleventh Yearbook, American School and University, 1939. 470 Fourth Avenue, New York, N. Y.

Engelhardt, N. L. *Standards for Junior High School Buildings.* Bureau of Publications, Teachers' College, Columbia University, 1932.

Holy, T. C. and Arnold, W. E. *Standards for the Evaluation of School Buildings,* Bureau of Educational Research, Ohio State University, Monographs, No. 20, 1936.

National Council on Schoolhouse Construction. *Proceedings, Fifteenth Annual Meeting,* Columbus, O., 1937; and *Proceedings, Sixteenth Annual Meeting,* Frankfort, Ky., 1938. Ray L. Hamon, Secretary, George Peabody College, Nashville, Tenn.

Pringle, Ralph W. *The Junior High School.* McGraw-Hill Book Company, 1937.

Stoneman, Merle A. and Broady, Knute O. *Supplementary Standards for the Small Twelve-Grade School Building.* University of Nebraska, Lincoln, Nebr., 1939.

Review of Educational Research. *The School Plant and Equipment.* October 1938.

Senior High Schools

Campbell, Harold G. *All the Children.* Fortieth Annual Report of the Superintendent of Schools, City of New York, 1939.

Donovan, John J. and Others. *School Architecture: Principles and Practices.* Macmillan, 1921.

Minnucci, Gaetano. *Scuole.* (Printed in Italy). May be secured through The Architectural Book Publishing Co., New York, N. Y., 1936.

American Council on Education, A Study of the. *School Buildings and Equipment.* 744 Jackson Place, Washington, D. C., April, 1939, Series 1, Volume III, No. 8.

Strayer, G. D. and Engelhardt, N. L. *Standards for High School Buildings.* Bureau of Publications, Teachers' College, Columbia University.

The American School and University. Eleventh Annual Edition, 1939. American School Publishing Corporation, 470 Fourth Avenue, New York City.

Special Report Submitted with the Thirty-ninth Annual Report of the Superintendent of Schools, City of New York, School Year 1937-1938. *Vocational High Schools: Trends and Forecasts.*

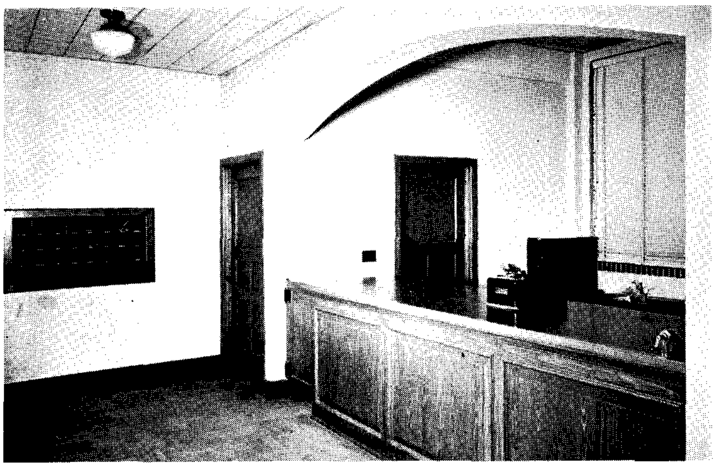
EDITORIAL NOTE: Time-Saver Standards data on pages 89 to 103, inclusive, suggest the advanced standards which progressive educators regard as desirable to the well-rounded development of an expanded educational program. Various factors of a local situation may prevent development of an ideal school plant, however; and, therefore, this material should be regarded *primarily* as a flexible basis for solution of current design problems rather than a series of specific recommendations. Tabulations, text, and diagrams, developed from a number of widespread surveys, reflect the consensus of advanced educational thought; plans and photographic illustrations report the manner and extent to which these suggestions for advanced standards have already been adopted in a number of recent school designs.

DESIGN DATA FOR SCHOLASTIC UNITS: administrative, classroom, shop, home-training, and recreational areas adaptable to intermediate and secondary schools.

ADMINISTRATIVE


Land Co., Inc.

Private office, and Business Manager's office, Fresno, Cal., school-system Administration Building; Franklin and Kump, architects.



Bill Wood

Public and secretarial space, Junior-Senior H. S., New London, Tex.; Preston M. Geren, architect.

Land Co., Inc.

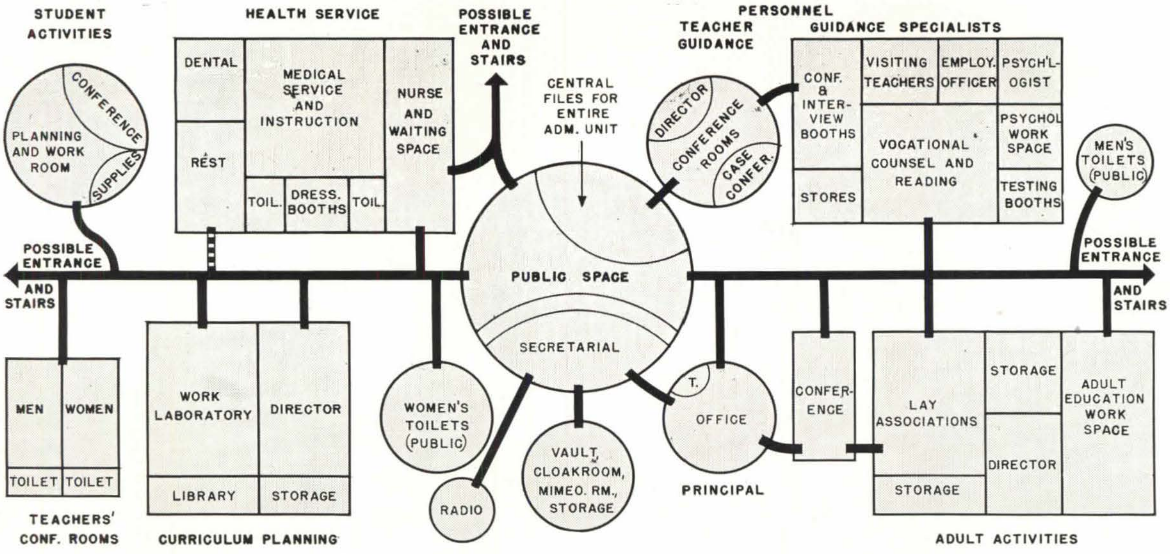
Curriculum planning: picture files and movie screen in Visual Education Department, Fresno Administration Building.

ADMINISTRATIVE officers are responsible for providing, with the cooperation of the entire educational staff, the best possible environment for each child in the school; and for encouraging effective community-school relationships. In view of the trend toward *democratic* evolution of school programs and curricula, administrative areas are becoming co-operative planning and research areas.

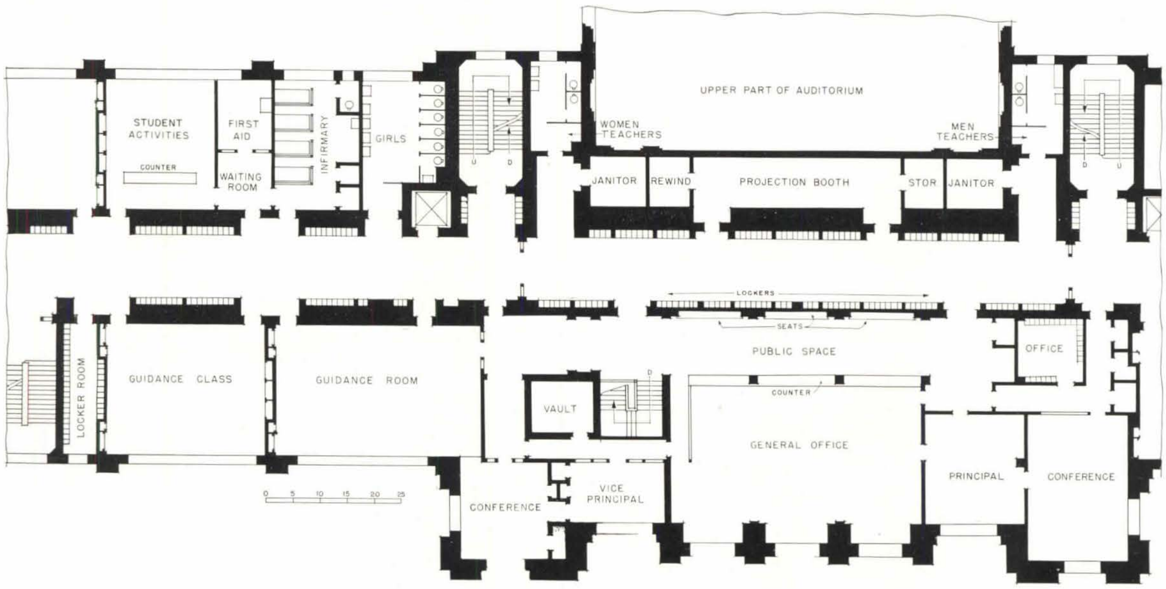
Size of the school and the importance attached locally to various functions will determine number of workers, range of activities, and space to be provided. To maintain efficiently the usefulness of an expensive plant, school administration should be flexible, easily adaptable to changing conditions; spaces should be responsive to new demands.

Community relations: While school principals have the major responsibility for the effective functioning of the entire school, community relations constitute a large portion of their work. This includes: direction of adult education, provision for community study excursions, cooperation and integration of the activities of community-school associations, parent and public education work. Principals may have co-workers delegated, such as assistant principal, and director of adult education.

Personnel work: Attempts are made to discover each child's problems, potentialities, interests, and goals. The school then attempts to provide proper environment for each child. There is a tendency to turn this work over to professionally qualified teachers, assisted by specialists: doctors, dentists, oculists, psychologists, psychiatrists, and vocational-guidance experts. Employment offices are becoming integral parts of administrative suites. Number and variety of such specialists may vary with the size



Schematic diagram, showing relationship and approximate space proportions of administrative areas. Importance of centralized files, containing data on students and adults, as well as business administration, is stressed.



Administrative area of Mt. Pleasant Ave. Senior High School, Providence, R. I., Erik Andersen, architect and deputy superintendent of schools. An existing example containing many of the areas diagrammed above. Large conference rooms may be used, if necessary, for lay adult meetings.

of the school; all are to some degree necessary.

Social welfare: Visiting teachers gather knowledge of home environment of each child; and aid in relieving distressing home conditions so far as school resources, working with other community agencies, allow.

Health services consist of frequent examinations, follow-ups when needed, diagnosis, general emergency work, and, in some cases, treatment. Location of the school may make it advantageous to install community health clinics.

Curriculum planning is closely related to personnel work. Courses of study, formerly fixed and inflexible, are now recognized as constantly in need of change. Experience and study of teachers, coupled with knowledge of children's changing needs as determined by the personnel workers, are vital elements. A director of curriculum study is desirable in many schools.

Student activities (often called "extra-curricular") have proven of such value that in many cases they are incorporated in the regular school curriculum. Student government, clubs, and school publications require space in which students can inaugurate and carry through activities.

Business administration, including clerical and secretarial facilities, may profitably be centralized as much as is consistent with efficient functioning of the school. Centralized files (records of school children and possibly adults) have been found valuable aids.

Francis, T., and Deal, G. V., *Executive Offices for a Large High School*, July 1938, p. 532.
Engelhardt, N. L., *Standards for Junior High School Buildings*, pp. 144-150.

SPACES	SUGGESTED AREAS (in sq. ft.) Acceptable Min.	Avg.	Usual Max.	SUGGESTED EQUIPMENT
Principal				
office	250	300	400	Flat-topped desk, chair, table, upholstered chairs, files, outside and house telephone, 40 lin. ft. shelves, closet.
toilet	12	20	30	....
gen'l office	600	1000	1400	Telephone switchboard, counter, files, cash drawers, 34"x 60" desk, typewriter (1 per sec'y), vault, chairs, radio.
Adult education				
director	250	300	400	See "Typical Office Equipment."
work	600	800	1000	Counter, desks, typewriters, mimeograph.
conference	300	400	450	Tables, chairs, portable blackboard.
P. T. A.	200	300	350	....
Personnel Guidance				
director	200	300	350	See "Typical Office Equipment."
empl. office	200	300	350	....
interviews	120	150	150	Desk, chairs, storage cabinets, files.
reading	80	150	400	Chairs, tables, files, magazine racks, min. of 150 lin. ft. shelves.
vstg. tchrs.	40	60	80	See "interviews."
psychol.	266	320	370	3 to 5 booths.
Student Guidance				
director	250	300	350	See "Typical Office Equipment."
conference	80	100	100	Desk, 2 to 4 chairs.
case conf.	300	400	450	Tables, 10 chairs, 12 sq. ft. blackboard, 24 sq. ft. bulletin board, files.
Health Services				
nurse	220	330	380	Chairs, desk, couch, screen, files, floor scale, weight scales, sink, medicine cabinet, table.
waiting	125	150	300	Chairs, couch, table, hat tree.
Health Services (continued)				
medical	350	400	500	Surgeon's sink, septic bowls, examination table and chair, instrument cabinet, sterilizer, sanitary waste cabinet, doctor's desk and chair, stool and sink.
dental	100	150	200	Dental chair, instrument cabinet, dentist's light, lavatory, desk, record cabinet, table.
dressing	20	24	24	Seat and clothes hanger, toilet facilities.
rest	200	400	450	Cots, chairs, toilet facilities.
toilets	20	30	40	....
Curriculum				
director	250	300	350	See "Typical Office Equipment."
work lab.	600	800	1000	Desks, chairs, storage cabnets 12"x12"x24" (1 per teacher), 40 lin. ft. shelves, easy chairs, magazine rack, files.
Student Activity				
work	600	800	1000	Desks, chairs, tables, files.
conference	200	400	500	Tables, 10 to 20 chairs.

TYPICAL OFFICE EQUIPMENT

Item	Acceptable Minimum	Average	Usual Maximum
Desks	1	1	2
Swivel chair	1	1	2
Chairs	2	4	5
Tables	1	1	2
Wastebasket	1	1	2
Filing cabinets	3	5	8
Storage cabinets	10 cu. ft.	30 cu. ft.	60 cu. ft.
Book shelves	40 lin. ft.	60 lin. ft.	70 lin. ft.
Telephone—outside	1	1	2
house	1	1	2
Closet	1	1	1

Principal's office requires direct access to adult conference room, secretarial space, and corridor.

Secretarial, or business office: Counter separating waiting space and work space is preferably approximately 42 in. high, 28 in. wide, with files, drawers, and shelves built in as needed. Incorporating a desk and telephone switchboard in the counter permits the telephone clerk to give information to inquirers without leaving the desk. The entire space requires artificial lighting to provide an intensity of 20 footcandles at work levels, and adequate natural lighting such as that obtained from an entire wall devoted to windows. Acoustic treatment of ceilings and resilient flooring materials are desirable. Supplies may be stored on a lower floor, with access by stairs or a dumbwaiter.

Adult education offices are often used at night. Files are preferably combined with the central filing system.

Curriculum planning: More elaborate plants than are here contemplated include library reference rooms, additional conference rooms, and teachers' recreation rooms.

Personnel area: Teacher-student conference room may have an independent waiting room, or the general public space may be used. Nearness to central files is important.

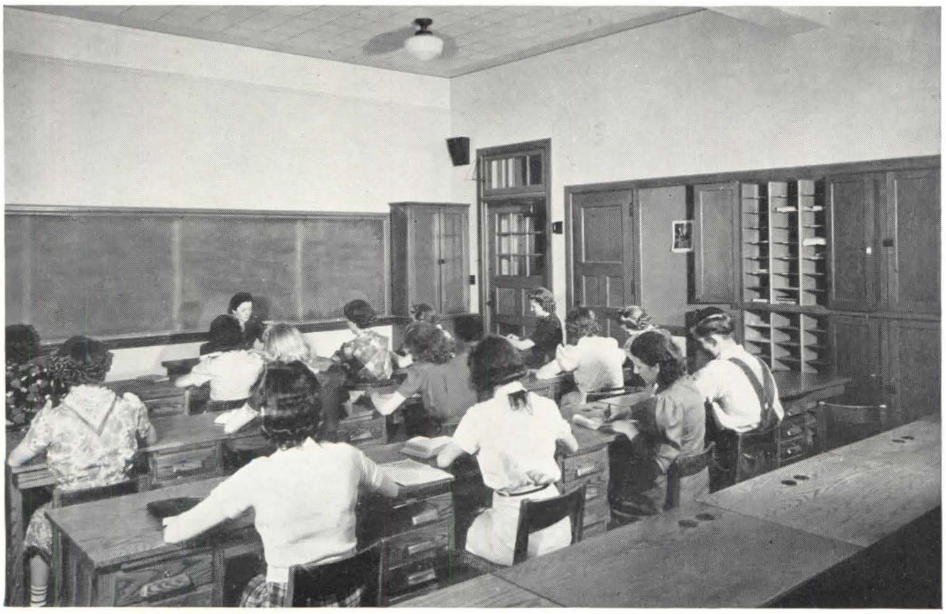
Health services: Extent of community facilities provided may modify the requirements tabulated above. Special attention to design and finish is necessary for sanitation. For eye testing, a space 22 ft. long (min.) is needed. Waiting space may be combined with nurse's office. and ought to have a direct community entrance. A maximum of natural lighting is essential in medical and dental spaces. Rest rooms may have subdued lighting (5 to 8 footcandles).

Location of the entire administrative unit is preferably central, near public entrances and main corridors. Outdoor circulation is preferably routed away from administrative-unit windows; a desirable degree of seclusion may be obtained by proper landscape planning.

CLASSROOMS

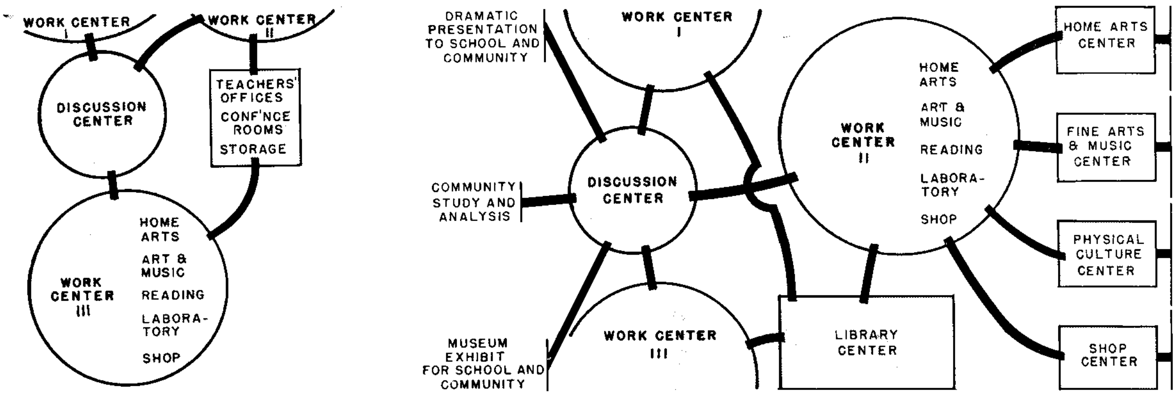
Learning by doing: activity program in progress in an English classroom, Junior-Senior High School, New London, Tex. Preston M. Geren, architect.

Library, also in New London Junior-Senior High School, for both co-operative research and study. Note reading alcove in rear.

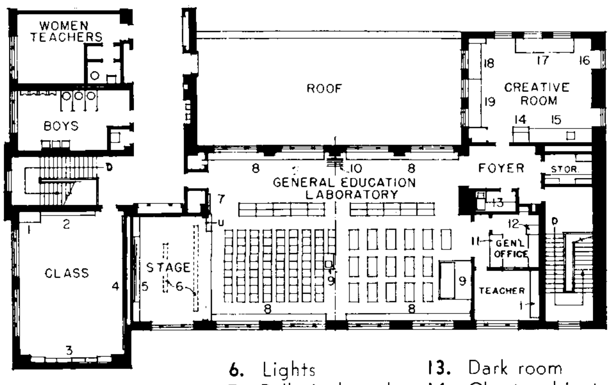


Photos by Bill Wood

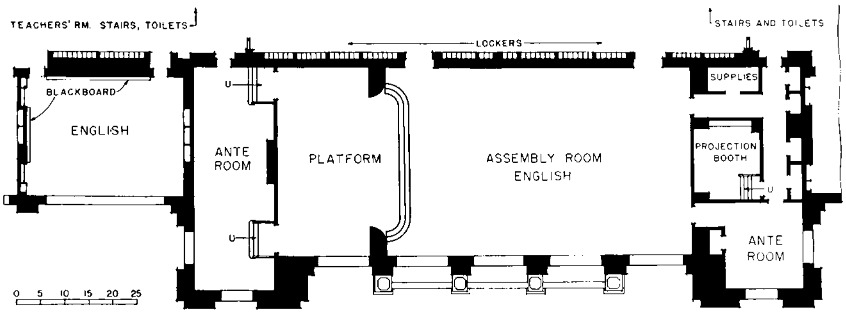
Commercial classroom, same school: office conditions are simulated by substituting commercial equipment for typical classroom furniture. Note acoustic ceiling.



Space relationships for modern general-education laboratory units for study of the social sciences. Diagram at the left indicates requirements for a comparatively small unit, reasonably limited in scope. Workrooms only partially indicated are intended to have similar functions to those shown in full.



1. File cabinet
2. Chart case
3. Bookshelves and magazine racks
4. Blackboard
5. Projection screen
6. Lights
7. Bulletin board
8. Bookcases and drawers
9. Platform
10. Folding partition
11. Counter
12. Mimeograph
13. Dark room
14. Chart cabinet
15. Claymodelling
16. Tools
17. Cabinet making
18. Metal working
19. Paint bench



Above: Activity classroom layout for teaching English, Mt. Pleasant Ave. High School, Providence, R. I.; Erik Andersen, architect. Assembly room becomes a laboratory-theater, used also for visual education.

Left: General-education unit, Senior High School, Beacon, N. Y.; Tooker and Marsh, architects. Note the divisible theater-discussion-laboratory central area.

CHANGES IN curricular standards affect school programs in two related ways. The first is due to the basic social program, a series of experiences in co-operative living which may reasonably be expected to face people in adult life. Second, the socially oriented curriculum places increasing emphasis, particularly in higher grades (secondary), upon development and stimulation of strong individual interests. Some of these, toward the end of the school program, merge with vocational training.

Direction of social programs may be determined by joint action of pupils and teachers. Thereafter, the group may move into a work or experience center. Part of the work center may house shop and laboratory activities: models, tests, and experiments. Tests made in laboratory areas may serve as guides in other sections. Art and music areas may be utilized to illustrate influence of art on modern life, and satisfy creative energies.

The discussion center serves for presentation of results of analyses, and as exhibit and demonstration space. Audio-visual aids can be used here.

Tabulations on the following page indicate requirements for general education units into which experience programs are incorporated to varying degrees. *Recitation-discussion* types provide for substantial advances over "classrooms" as commonly accepted in the restricted sense; *discussion-activity* types are intended to include a medium degree of pupil activity; *experience-program* types provide full realization of the discussion - activity - experience ideal.

Classroom units ought to have, where possible, direct exits to outdoor classrooms, yet need to be segregated from noisy outdoor areas. Except in very large schools, distance from auditoria is not of special importance, except that circulation requires study to prevent loss of time caused by congestion. Although classroom book collections are required, individual research and motivated reading necessitate integration of library and classroom areas. Satisfactory classroom orientation, in order of desirability, has been found to be southeast, east, west, or south.

Engelhardt, N. L., *Better Classroom Provisions for High School Work*, American School and University, 1937, pp. 263-267.

Wrightstone, J. W., *Classroom Facilities for the Progressive School*, American School and University, 1937, pp. 268-272.

Engelhardt, N. L., Jr., *Unit Planning, IV: Classrooms*, American Architect, April 1937, pp. 101-109.

CLASSROOMS (continued)

Luckhaus

Classroom; Richard Neutra, architect

Bill Wood

Science room; Preston Geren, architect

"RECITATION-DISCUSSION" GROUP

SPACES	Acceptable Min.	Avg.	Usual Max.	EQUIPMENT	Amount
Classroom†				Chairs	30-40
total area (sq. ft.) . . .	660	704	770	Tables (4 seats)	8-10
pupils per rm.	20-25	30	40	Teachers' chairs	1-2
area per pupil*	22	23.4	25.6	Teachers' desk	1
Auxiliary spaces				Easy chairs (reading alcove)	1-3
storage (cu. ft.) . . .	125	170	250	Magazine rack	1
reading alcove (sq. ft.)	64	100	176	Chart & map rack	1
book shelves (lin. ft.) . . .	30	50	60	Teachers' files	1-4
				Screen (visual aid)	1
				Motion-picture machine stand	1
				Blackboard (sq. ft.)	20-60
				Bulletin—As much as possible	

"DISCUSSION-ACTIVITY" GROUP

SPACES	Acceptable Min.	Avg.	Usual Max.	EQUIPMENT	Amount
Classroom†				Chairs	25-40
total area (sq. ft.)	704	828	1200	Tables (4 seats)	8-10
pupils per rm.	20-25	30	35-40	Teachers' chairs	1-3
area per pupil*	23.4	27.6	40	Work benches	1-3
Auxiliary spaces				Sink	1-2
workroom (sq. ft.)† . . .	176	230	360	Clay modeling table	1
reading alcove (sq. ft.)	64	100	176	Experiment table (acid-proof top)	1
stage (sq. ft.)†	140	252	352	Magazine rack	1
teacher's office (sq. ft.)	100	100	150	Chart & map rack	1
book shelves (lin. ft.)	40	55	70	Teachers' files	1-3
storage (cu. ft.)	200	320	400	Screen (visual aid)	1
				Motion-picture & lantern-slide machine stand	1
				Easels	1-3
				Display cases	1-3
				Aquarium	1
				Growing bed	1
				Blackboard (sq. ft.)	20-60
				Bulletin—As much as possible	

"EXPERIENCE PROGRAM" GROUP

SPACES	Acceptable Min.	Avg.	Usual Max.
Discussion†			
pupils per rm.	25	30	35
total area (sq. ft.)	616	736	864
seating area per pupil (sq. ft.)	10	10	10
Auxiliary (discussion)			
stage area (sq. ft.)† . .	140	288	396
exhibition . . . as much space as available			
storage (cu. ft.) . . .	80	100	140
Work Center[a]			
pupils per rm.	25	30	35
total area (sq. ft.) . . .	875	1200	1800
area per pupil* (sq. ft.) . . .	29	40	60
storage cubicles	25	30	35

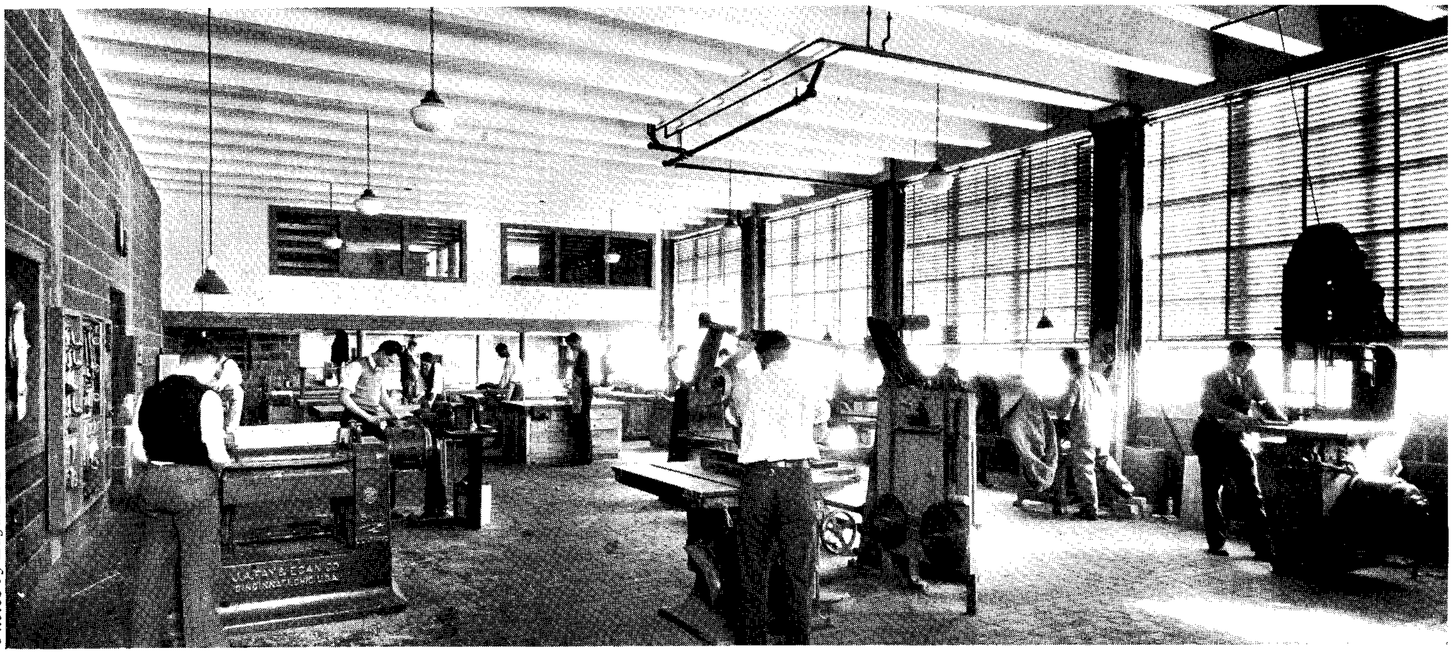
EQUIPMENT	Amount
Home training (see pages 98-99)	
Arts and music	
Art tables	1-3
Chairs	4-10
Easels	1-3
Drawing or drafting table	1-2
Clay modeling table	1
Radio-phonograph	1
Piano	1
Storage (cu. ft.)	70-150

EQUIPMENT	Amount
Tablet arm chairs	30-40
Movable platforms (3'x1½'x6')	2-6
Exhibit cases	2-5
Exhibit tables	2-5
Demonstration table	1
Sink	1
Motion-picture & lantern-slide screen	1
Blackboard (sq ft.)	18-30
Bulletin board	as much as space permits
Window blinds, 1 per window	
Reading area	
Tables	2-4
Chairs	4-8
Easy chairs	1-3
Magazine racks	1
Newspaper rack	1
Book shelves (lin. ft.)	50-125
Laboratory-shop	
Science tables	2-5
Work benches	2-3
Stools (lab.)	6-10
Aquarium	1
Animal cages	1-2
Growing table	1
Sinks	1-3
Fire extinguisher (lab.)	1
Storage (cu. ft.)	
—science materials	40-90
—shop materials	48
—tool cabinet	1

*Legal minimum in many states is 15-16 sq. ft. per pupil. †Desirable width for classrooms and work rooms, based on lighting and similar factors, ranges from 22-24 ft. Length is variable. Most practical stage depth: 14-18 ft.; width variable. [a]Practical width for work center: 25-30 ft.; length variable.

Environment: Natural lighting from two or three sides becomes desirable as "experience" programs develop, and as greater room widths and flexibility of arrangement become important. Natural illumination may be controlled by translucent shades, blinds, draperies; or by exterior awnings or permanent canopies. Glare from reflective outdoor surfaces is to be avoided. Use of visual aids (movies) requires provision for darkening rooms. Glareless artificial lighting, which supplies 20 footcandles at working levels, is essential. Interior rows of fixtures may be independently circuited. Automatic (photo-electric) control is available.

Heating and ventilating requirements are similar to those for Elementary Schools (AR, February 1939). Sound control, as provided by acoustically treated ceilings, is desirable in "activity" classrooms; in work areas, absorption not lower than 50% is needed. Gas, electric, hot and cold water outlets are required for the various work centers and activity programs.



Photos by Edgar B. Smith

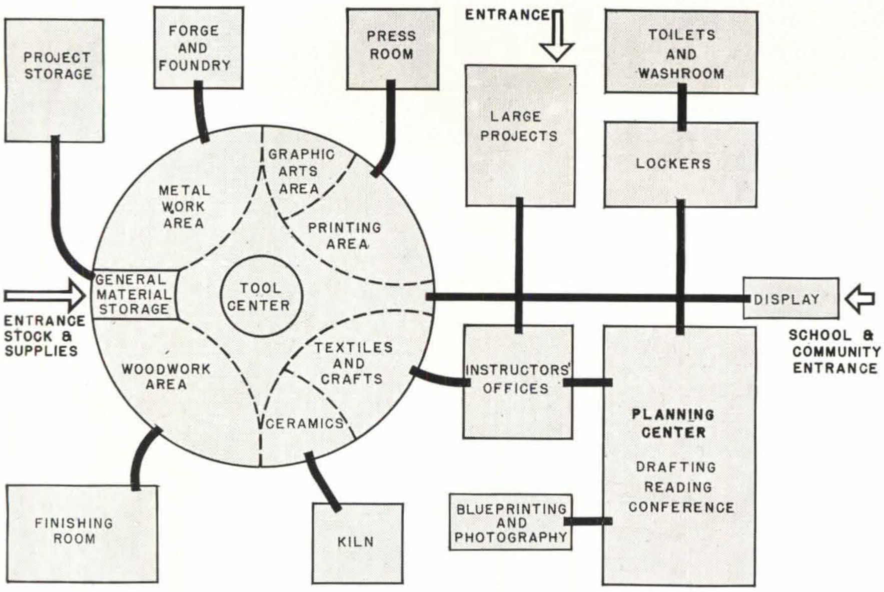
Drafting and woodworking shops, Wichita High School North, Wichita, Kan.; Glen H. Thomas, architect

In industrial arts curricula, emphasis may be placed not only on vocational training as a means of integrating students with their environment, but is also being increasingly placed upon the necessity for broad educational foundations in terms of present-day life. Training in industrial arts can contribute to wise use of leisure time by stimulating creative impulses, arousing the desire for skill, and consequently developing good work habits and attitudes. Another function is that of teaching appreciation of design and construction, and of human interrelationships.

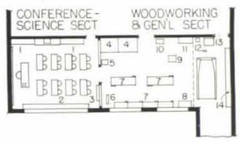
As applied to high schools, industrial arts curricula are preferably not planned for specialization in early (or intermediate) grades. An enriched program integrated with other fields of learning is here more important. In higher (secondary) grades, specialization may be introduced. Pupil adjustment here needs constant attention. To avoid waste, types of courses may be based on surveys of local vocational opportunities. Thus, in a rural community, shops may not only be smaller, but may offer agricultural training which would be out of place in urban districts. In addition, shops may be planned for community use, both vocational and avocational; courses may be correspondingly broadened and intensified.

Plant: Rectangular spaces have proven most economical for equipment layout. All portions of the area are preferably easily visible from any point within it. Independent buildings, or separate wings, segregated from quiet areas, are desirable. Ease of access to storage space and large project areas, and entrances for adult use, are important. Independent service facilities are highly desirable.

SHOPS (continued)



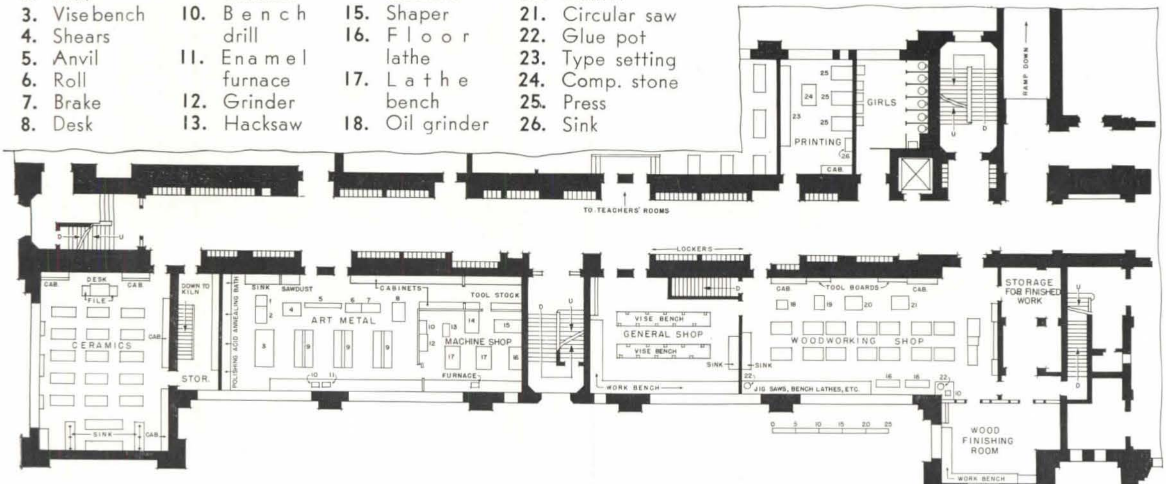
Diagrammatic representation of shop facilities considered essential to a complete unit, showing space relationships and approximately proportional areas. Selection of specific shop types, laboratories, etc., depends on local considerations: vocational opportunities, type of school, as discussed in preceding text.



Rural laboratory-shop designed by Thomas Francis, Superintendent of Schools, Lackawanna County, Pa.

1. Dairy-equipment cases
2. Laboratory table
3. Magazine rack
4. Wiring booth
5. Jigsaw
6. Harness bench
7. Vise bench
8. Concrete mixing
9. Bandsaw
10. Jointer
11. Tool cases
12. Drill press
13. Forge
14. Auto bench

1. Grinder
2. Drill
3. Visebench
4. Shears
5. Anvil
6. Roll
7. Brake
8. Desk
9. Double benches
10. Bench drill
11. Enamel furnace
12. Grinder
13. Hacksaw
14. Milling machine
15. Shaper
16. Floor lathe
17. Lathe bench
18. Oil grinder
19. Bandsaw
20. Jointer
21. Circular saw
22. Glue pot
23. Type setting
24. Comp. stone
25. Press
26. Sink



Urban shop unit, Mt. Pleasant Ave. Senior High School, Providence, R. I., Erik Andersen, architect.

Planning center: space is needed for discussion, conference, reading, research, drawing, design, and drafting. Quiet is essential; hence the room should be segregated from noisier shop activities. Soundproof partitions are desirable. Good natural and artificial lighting is required.

Woodworking: Floors may be of such materials as end-grain wood blocks, wood block tile, or maple flooring. Equipment ought to be arranged so as to provide direct routing of materials through the machinery in the order in which machines will be used. Machinery is preferably placed to eliminate possibility of accidents in travel aisles, with *danger zones* clearly marked.

Ceramics shop is preferably close to woodworking area. The kiln is usually in a separate space, with highly fire-resistive walls, heat insulation, and special ventilation.

Metal work: Floor finish, in general metal-working areas, is similar to that in woodworking spaces. Fire-resistive flooring is needed in forge, welding, and foundry units; earth or unfinished concrete is desirable in casting room to prevent spread of spilled molten metal. Foundries and forges need special ventilation. This is one of the noisiest areas of the shop. Machines such as forges may be isolated from the general construction; or soundproof partitions, and ceiling and wall absorptive treatment, may prove satisfactory.

Printing and graphic arts: To eliminate noise transmission the area in which presses are installed should be separated from the general shop by soundproof partitions. For presses, wooden floors with concrete bases, reinforced to reduce vibration, are desirable.

Instructor's room: It is essential that the instructor have a clear, unobstructed view of a major portion of the work area. The room is devoted to study, planning, and individual conferences.

Tool rooms may have partitions of wire netting. Central location is desirable.

GENERAL AREAS	Acceptable Min.	Avg.	Usual Max.	EQUIPMENT	Amount
Total area (sq. ft.)	1200	2100	4000*	Drawing tables (2'6"x4') Conference table (3'x6')	3-15 1
Height (ft.)	12	14-15	depends on room size	Chairs Book shelves (lin. ft.) Files Blackboard panels	10-30 40-75 1-2 1-3
Planning center (sq. ft.)	200	600	1000	Bulletin board	as much as space permits
Instructor's office	80	140	225	Desk Chairs Locker Files	1 2-3 1
General storage	300	400	625	Bookcase (lin. ft.) Sink Pipe rack for lumber Shelving	40-70 1
Tool room	36	100	225	Racks and cabinets Lockers 12"x12"x72" 14"x14"x72"	 1 per pupil 1 per 2 pupils
Locker space, including circulation: area per pupil (sq. ft.)	3	5	6	Metal-stain and varnish wall case Metal-covered table Electric gluepot Fuming vat Metal container for oil waste	
Project storage (sq. ft.)	60	100	140	Fire extinguisher Washing basin Drying shelves	
Finishing room	80	200	400	Fume exhaust hood Blueprint wash basin Blueprinting machine	
Dark room (blueprints, photog.)	40	80	100	Blueprint press Enlarger Printer Sinks Dryer	

SPECIAL AREAS	EQUIPMENT
Woodworking	Workbenches, planer, band saw, jointer, lathes, circular saw, grinder
Ceramics	Kiln, clay bin, drip pan, plastic bin, casting table, pottery wheels, marble slab, spray gun
Leatherwork	Special craft equipment, storage
Textiles and crafts	Looms, spinning equipment, tables, chairs, rug frame, sink, dye-storage cabinet
Electrical work	Wall benches with vises, switchboards, motor
Radio	Batteries, radio benches, test panels
Printing	Layout table, presses, paper cutter, stitcher, type cabinets, proof press, utility table, imposing-table rule case, galleys, stock cabinet
Etching, linoleum-block printing, bookbinding	Linoleum-block printing press, etching press, acid bath and acid storage, benches
Farm mechanics	Similar to automobile space
Metal work—Machine	Engine lathes, (individual engine driven) drill press, bench grinder, shaper, miller
Metal work—Welding, forging, and foundry	Welding benches, molding bench and pan, bench furnace, brass-melting furnace, forge, anvil
Metal work—Automobile mechanics	Auto entrance with 9' wide ramp, chain hoist, motor blocks, tool grinder, electrical drill, valve grinder
Metal work—Sheet and Bench	Utility benches with vises, gas and electric outlets; heavy general bench equipped for soldering; layout bench; bar folder; circular shear; squaring shears; gas furnace, soldering iron heater; sinks; acid storage
Large projects	Accommodations for airplanes, gliders, boats, stage scenery, etc.; chairs
Cement work, bricklaying	Storage, mixing, and work space

*3000 sq. ft. is usual desirable maximum area when not more than one teacher is normally present in shop.

General storage space requires direct access from an outside driveway, and is preferably planned for ease of handling large stock. Indoor direct access to milling machines, etc., is desirable. Flexibility of shelving is important.

Lockers may be in a separate room, in groups about the shop, or in special alcoves. Box (filing) lockers, with independent clothing facilities, are also used, sometimes under bench tops. Lavatories may be provided, one for each 10 pupils in the shop at one time.

Project storage may be in large lockers, shelves, etc., perhaps on a mezzanine over part of the shop space.

Project finishing requires good natural and artificial lighting, and special ventilation. Dust-proofness is essential.

General data: *Heating and ventilating* by mechanical systems is advisable; 1 to 12 cu. ft. per minute per sq. ft. of floor area is recommended by the N. Y. Commission on Ventilation. Air washing is desirable. Common heating range is from 65 to 68F, supplied by recessed or hung units. Local control of special ventilation equipment (forge, foundry, welding, dust-removal, etc.) permits economical operation.

Lighting (natural) is considered best when available from two or three sides. Control, as furnished by light-colored venetian blinds, is necessary. Drafting rooms require north light. Artificial light which delivers 20 footcandles on general work areas, or 30 to 50 footcandles for precision work or drafting, is found satisfactory. Light sources shielded from view are preferred.

Sound and vibration control is essential. In the general shop, treatment providing 50% sound absorption is currently considered advisable.

Services (gas, electricity, compressed air) require outlets so distributed as to permit flexibility in arranging machinery. Electricity wired in separately-fused multiple circuits, through a central panel, prevents disruption of service. Hot and cold water taps are desirable throughout the shop area.

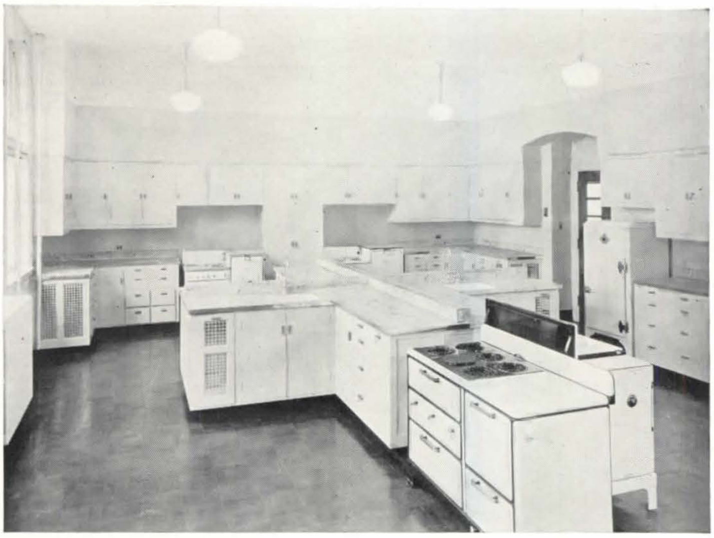
Pease, H., *General Industrial Arts Laboratory,* Industrial Arts and Vocational Education, March, 1938, pp. 124-127.

Warner, William, *Studies in School Shop Planning,* Industrial Arts and Vocational Education, February, 1934, pp. 31-38.

Whitehead, Willis, *Planning and Equipment Industrial Arts Laboratories,* American School and University, 1939, pp. 508-518.

HOME TRAINING

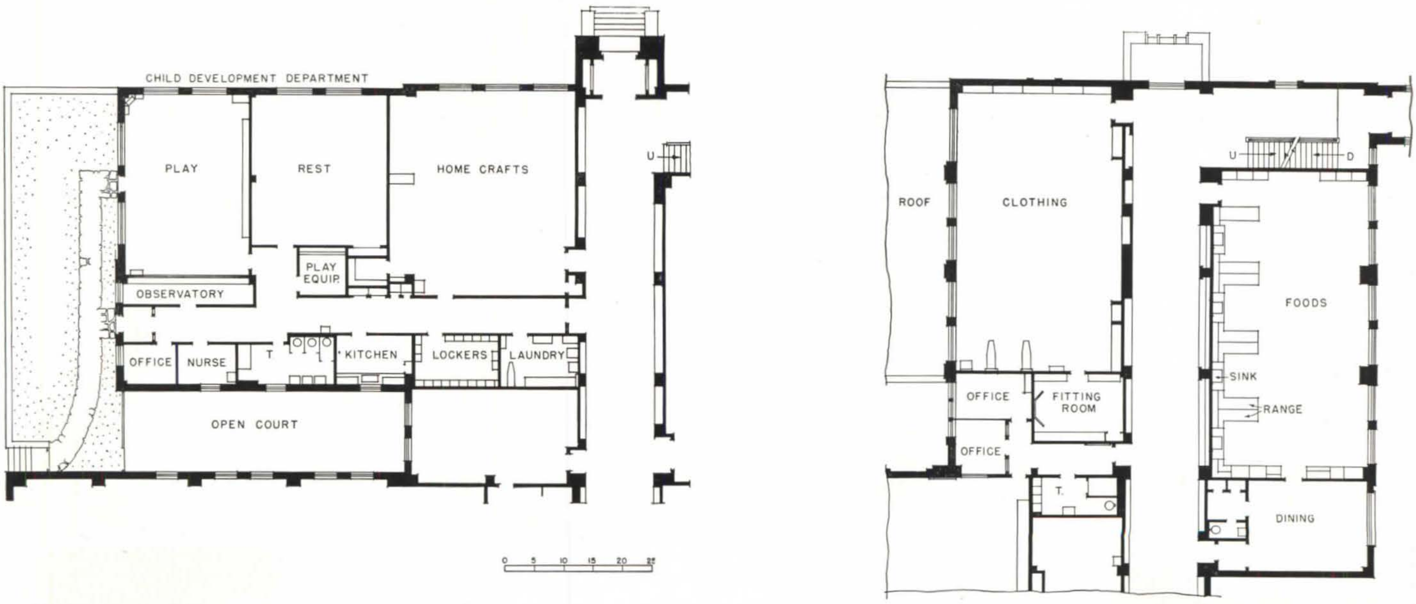
Photos by Robert J. Arnold



Left, model living room and, right, foods laboratory containing four unit kitchens, Dean High School, Gouverneur, N. Y.; D. Kenneth Sargent, architect.

Edgar B. Smith

Clothing room, Wichita High School North, Wichita, Kan., showing machines, cutting tables, color charts, corkboard, blackboard, magazine racks, ironing board, and instructor's desk.



First and second floors, Home Training Unit, Will Rogers High School, Tulsa, Okla.; Leon B. Senter and Joseph R. Koberling, associated architects. The child development department contains a complete nursery school, with observation space, similar to those studied in the February 1939 Architectural Record.

HOME TRAINING ACTIVITIES—SUGGESTED AREAS (sq. ft.) and EQUIPMENT

LIVING SPACES	Acceptable Min.	Avg.	Usual Max.	EQUIPMENT	Amount
Kitchen	120	180	300	Four-burner range with oven	1
				Sink	1
				Cupboards, cabinets, refrigerator, kitchen table	
				Ironing board	1
				Planning desk	1
Dining room	224	252	280	Dining table and chairs	
				Buffet	1
				Serving table	1
				China cabinet	1
Living room	308	352	432	Rugs	1
				Sofa	1
				Chairs	
				Desk	1
				Coffee table	1
				End tables, book cases, lamps	
Bedroom	196	224	288	Beds	2
				Clothes closet	1
				Dresser	1
				Chiffonier	1
				Dressing table	1
				Lamps	
				Pictures	
Bathroom	63	70	80	Bathtub	1
				Shower facilities	
				Watercloset	1
				Lavatory	1
				Medicine cabinet	1
				Mirror	1
				First aid kit	1
				Clothesbasket	1
Storage room	48	48	48	Shelves (storage)	
				Storage closets	
Laundry	150	300	300	Washing machines	
				Tubs	
Teachers' suite				Wringer	
office (sq. ft.)	100	100	150	Desk	1
conference & general office				Tables	1-3
				Chairs	5-11
(sq. ft.)		140	225	Files (each office)	1-6
storage				Typewriters	1-2
(sq. ft.)	8	50	150	Duplicator	1

AUXILIARY SPACES	Acceptable Min.	Avg.	Usual Max.	EQUIPMENT	Amount
General work area	792	912	1152		
Foods laboratory	792	920	1152	Kitchen tables	4-8
				Sinks	4-8
				Four-burner ranges, ovens	4-8
				Kitchen cabinets	4-8
				Stools	
				Refrigerator	
				Demonstration table	1
				Cupboards	
				Blackboard panel	
				Bulletin board (sq. ft.)	20
				Lantern, screen	
				Tablet arm chairs	
Clothing				Acid-proof tables	1-2
laboratory	748	912	1008	Tables	3-4
				Chairs	
				Desks	2
				Files	
				Drawers	
				Bookcases	
				Easy chairs	1-2
				Sewing tables (36"x70")	
				Cutting table	1
				Electric sewing machines	
				Ironing boards	
				Laundry tub	1
				Large sink	1
				20"x22"x82" cabinets	
				Lockers (6"x12"x24")	1 per pupil
Fitting room	48	48	48		
				Screens	
				Fitting stand	
				Fitting mirror	
				Modeling stand	
				Art tables	
Furniture storage	200	330	660	Chairs	
Central storage	200	600	600		
Child care*					

*See Arch. Record, Feb. 1939, pp. 89-100.

An outline of a modern home training program may comprise: (1) *Family relationships*, including study of marital psychology; mental hygiene; psychology of adolescence; recreation; development of interests, attitudes, and philosophies of life; balance between work and play; music, art, and literature in the home. (2) *Design and care of the house and surroundings;* (3) *Maintenance of family health*, including preventive and home nursing work; (4) *Home management;* (5) *Provision of food;* (6) *Consumer education;* (7) *Clothing*, both making and selecting ready-made items; (8) *General problems of home life*, such as economic and old-age problems and housing.

There is a trend toward development of cottage-laboratories, planned similarly to typical residences, to accommodate programs and spaces listed above. It is at present more common, however, to provide spaces, wings, or other isolated units within the school plant. Whatever its location, design of areas and equipment has to take advantage of the best offered by modern residential planning practice in order to provide up-to-date instruction. Use of the area by adults necessitates a direct entrance from outdoors.

Foods laboratory: Unit kitchens have been found satisfactory for teaching, and may be separated by low, preferably hollow, partitions, not more than 52 in. high to permit easy supervision.

Clothing laboratory may be located near bedroom space. Northern exposure, and lighting from several sides, are important. Work tables may be informally grouped. Overhead electric outlets make for convenience when ironing. A large sink for dyeing is desirable. Provisions for using lantern slides or motion pictures may be advisable. Illumination for sewing is preferably not less than 50 to 100 footcandles; for drawing and design, 30 to 50 foot-candles.

Child-care area may be developed from data contained in the February 1939 issue of Architectural Record.

General work area, approximately 25 by 40 ft., can be used for student and adult classes in interior decoration, consultation service, groups considering relational problems in the home, etc. The space should be well lighted and preferably free of fixed equipment.

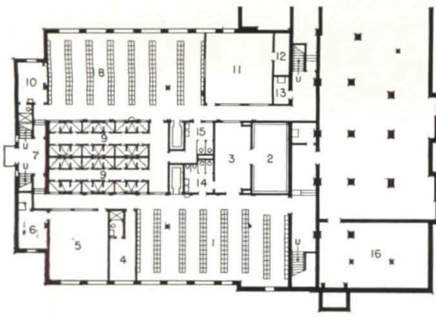
Central storage requires a dry, cool, vermin-free space for surplus supplies for all home training areas.

Brodshaug, Melvin, *Buildings and Equipment for Home Economics*, Bureau of Publications, Teachers' College, Columbia University, New York, 1932.

Herrington, Evelyn M., *Homemaking and Integrated Program*, New York, Appleton Century Co., 1934.

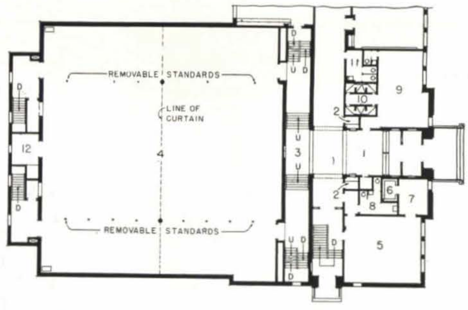
Pollard, L. B., *Adult Education in Homemaking*, Wiley, 1939.

RECREATION—Indoor



Basement

1. Boys' locker room
2. Boys' shower
3. Boys' drying room
4. Instructors
5. Boys' team room
6. Rubbing room
7. Foyer
8. Girls' locker room
9. Girls' showers
10. Instructors
11. Girls' team room
12, 13. Storage, janitor
14, 15. Toilets
16. Storage

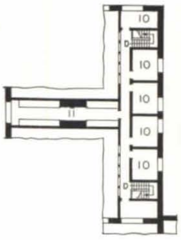


First floor

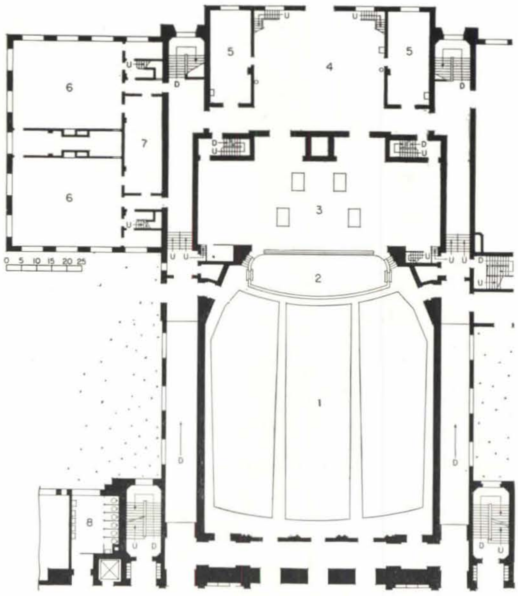
1. Foyer
2. Tickets
3. Gymnasium corridor
4. Gymnasium
5. Boys' visiting team
6. Showers
7. Drying room
8. Toilets
9. Girls' visiting team
10. Showers
11. Toilet
12. Storage

All plans on this page are at the same scale

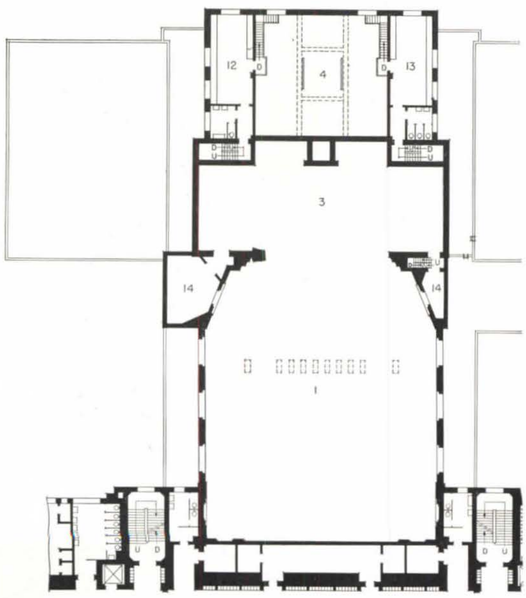
Gymnasium wing, Spaulding High School, Rochester, N. H.; C. R. Whitcher, architect. Curtain is used in gymnasium to partition off space when necessary. Removable posts serve to delimit basketball space; but area is not designed solely for basketball.



Mezzanine



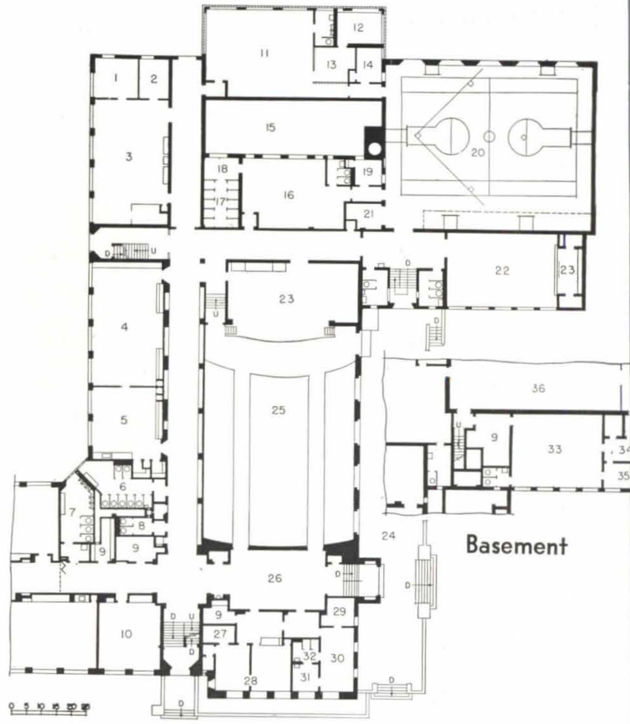
First floor



Basement

1. Auditorium
2. Orchestra pit
3. Stage
4. Band room and stage storage
5. Storage
6. Music room
7. Instrument storage
8. Girls
9. Boys
10. Practice room
11. Uniform room
12. Boys' dressing room
13. Girls' dressing room
14. Organ chamber

Auditorium wing, Mt. Pleasant Ave. High School, Providence, R. I.; Erik Andersen, architect.



Basement

First floor

1. Printing
2. Finishing
3. General shop
4. Art
5. Crafts
6. Girls
7. Boys
8. Women
9. Storage
10. Conference and guidance
11. Boys' lockers
12. Boys' showers
13. Drying room
14. Physical instructor
15. Light court
16. Girls' lockers
17. Girls' showers
18. Drying room
19. Physical instructor
20. Gymnasium
21. Apparatus
22. Playroom
23. Stage
24. Terrace
25. Auditorium
26. Foyer
27. Vault
28. Principal
29. Dental operating
30. Nurse
31. Examination
32. Dressing
33. Visiting nurse
34. Waiting room
35. Doctor's room
36. Bicycles
37. Shipping and receiving

Areas for both community and school use are grouped in a common wing in the Lawrence School, Hartford, Conn.; Carl J. Malmfeldt, architect. First floor contains administrative and shop units, as well as gymnasium and auditorium; two types of health services are contained in first floor and basement.

PHYSICAL RECREATION AREAS (sq. ft.)	Acceptable Minimum	Average	Usual Maximum
Swimming pool*	1500	2625	9900
Beginners' pool*	600	1000	
Fieldhouse†			
Basketball	5000	6000	
Volleyball		3000	
Indoor baseball		10,000	
Tennis (1 doubles court)		7200	
Corrective gym	600	800	1250
Boxing, wrestling	600	1000	2000
Apparatus storage	200	400	400
Instructor's office	64	120	300
Court games			
handball court		800	
squash court		1080	
badminton (per court)		1800	
Additional areas			
fencing (each lane)		165	
bowling (per alley)		792	
social dancing		as desired	
golf cage		400	
archery range		11,700	

*Pool area only, given in table; end and side runways required. Exact dimensions and specifications for competitive diving and swimming are available from National Recreation Association; see also American Architect & Architecture, August, 1937. †Gymnasia of the "traditional" type range in area from 2400 to 5400 sq. ft., with spectator space in balconies, or provided through use of portable or folding bleachers.

AUDITORIUM AREAS	Acceptable Minimum	Average	Usual Maximum
AUDITORIUM			
Seating capacity	200-300	600	1000 to 1200
Area per seat (sq. ft.)	$6\frac{1}{2}$-7	8-10	
Stage dimensions (feet)			
Depth	18	30-35	50
Width (including wings)	44	90	120
Proscenium width	25	30-35	50
Proscenium height	12	15	18
Orchestra space	Approx. 20-30 ft. between seats and stage		
Projection room (sq. ft.)			
2 projectors only		100	
Additional equipment		50	100
Sound amplifier		30	
Sound generator		25	
Rewind room (if required)		25	
Check room (sq. ft.)		600	
Box office (sq. ft.)	40	60	
Workshop—area	1500	2000	2500-3000
—height	Half may be 12-20 ft. in height		
Costume preparation area	750	1000	1000
Dramatics classroom area	1000	1200	2000
Practice stage area	200	300	300
MUSIC ROOMS			
Instrumental rooms, etc.	1500	2400	3500
Area per player		10	
Chorus room	1000	2000	3000
Area per student		6	
Practice rooms			
1 instrument	48		
Piano and 1 instrument		80	
2 pianos or small ensemble, or storage	350		120
Instrument storage	350	500	500
Office or offices	200	250	250
Music appreciation room	600	1000	1500
INTERPRETIVE DANCING		1500	
CLUB & LOUNGE ROOMS		(see text)	

Physical education. Modern educators consider that indoor physical education plants should house not only the gymnasium planned primarily for basketball, but also: a certain proportion of community and school health service facilities; provision for games in which all school children (rather than only the teams) may partake; and provisions for a maximum of general community use.

Colleges and some few secondary schools have met this situation by providing large open spaces, similar to field houses, instead of gymnasia. Cost of such apparatus as parallel bars, climbing ropes, etc., is considered to prohibit their installation, in view of their limited use. Swimming pools, on the other hand, being usable by the entire school and community, are considered a good investment.

Field-house construction may be as simple as is desired. Finish, in the usual sense, may be omitted on the interior; floors may be of a clay, sand, and sawdust mixture, with portable wooden floors for indoor tennis and basketball. Exact layouts and equipment for the activities listed above are obtainable from the National Recreation Association, and from various sport associations or manufacturers.

Auditorium design has become increasingly complicated as its use by school and community has expanded. From the point of view of safety, the auditorium is preferably located on the ground floor, with direct access to outdoors, and sufficient exits to permit emptying in two minutes. Regulations of local and national codes should be complied with. Steps in aisles are preferably eliminated in favor of ramps; and the stage requires exits and a fire-curtain.

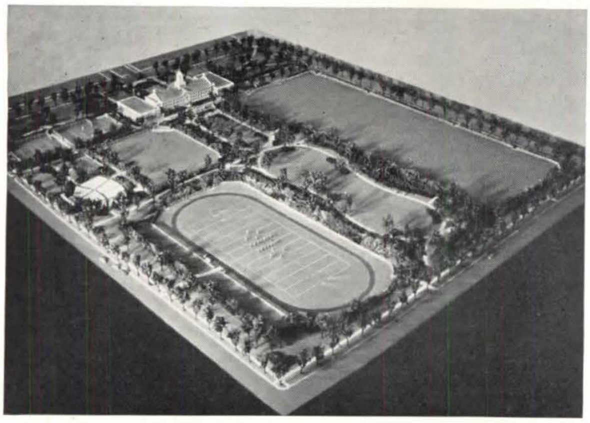
In respect to natural ventilation and lighting, school auditoria differ from professional theaters in that natural lighting is often both allowable and desirable. For natural ventilation, bilateral exposure is preferable; unilateral fenestration is a minimum.

Use by school children requires an entrance from the building's main travel corridor; avoidance of traffic congestion necessitates careful planning of corridors and doors. Study of stagecraft, music, the dance, and speech arts require laboratory and similar spaces specifically planned and equipped. Location requires isolation, as for instance in an independent wing.

For community use, public entrances independent of school entrances are required for access to auditorium, workshops, and all areas in which public participation is expected. For data on seating and sight lines see American Architect and Architecture, July, 1937. For information on acoustic treatment and equipment consult AR, July 1938, and October 1939.

Blair, Herbert, *Physical Education Facilities for the Modern Junior and Senior High School*, A. S. Barnes and Co., New York, 1939.
Luehring, Fred W., *Swimming Pool Standards*, New York, A. S. Barnes and Co., 1939.
Cochrane, Blake, *The School Auditorium: A Culture Center*, School Executive, June 1938, pp. 469-472.
Ebey, George W., *The Planning of the School Stage*, American School and University, 1939, pp. 304-311.

RECREATION—Outdoor



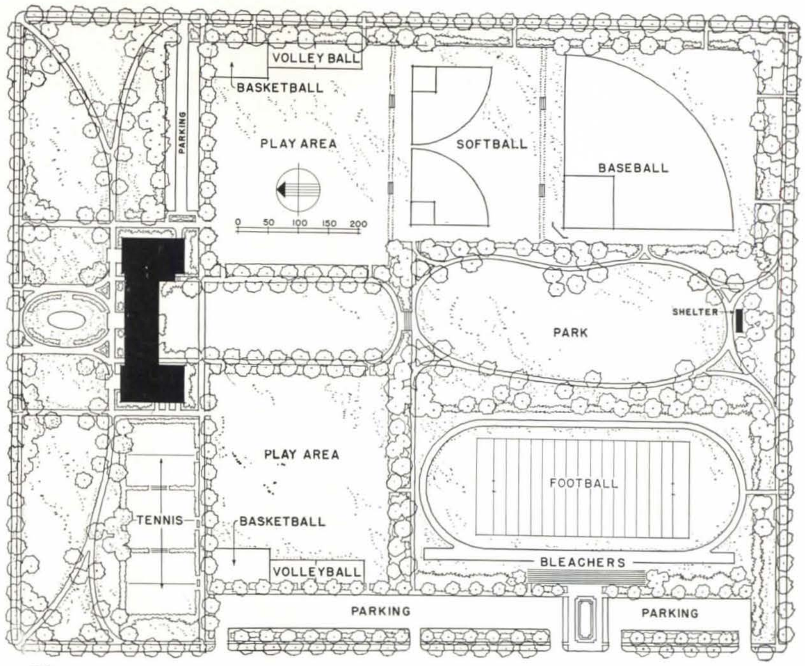
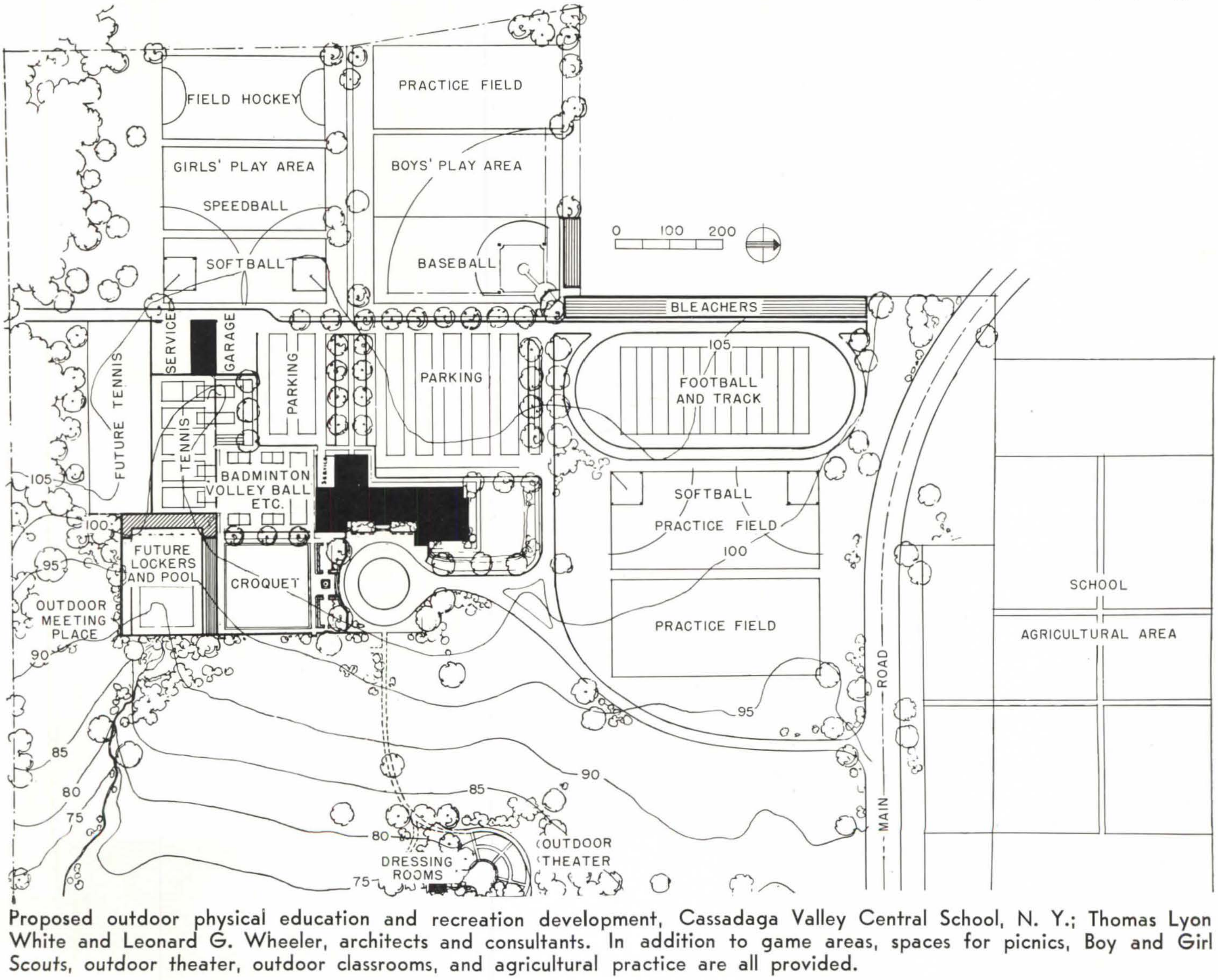


Photo of model and plan at right show two stages in development of outdoor areas for the Arlington Heights High School, Fort Worth, Tex., designed by a local organization with Hare and Hare, landscape architects, as consultants. Grassed and surfaced play areas, amphitheater, and park space are provided.



Proposed outdoor physical education and recreation development, Cassadaga Valley Central School, N. Y.; Thomas Lyon White and Leonard G. Wheeler, architects and consultants. In addition to game areas, spaces for picnics, Boy and Girl Scouts, outdoor theater, outdoor classrooms, and agricultural practice are all provided.

BASEBALL / SOFTBALL	For INTERMED. SCHOOL Accept. Min.	Avg.	Usual Max.	For ADULTS Accept. Min.	Avg.	Usual Max.
Baseball						
side of diamond (ft.)	75	82	82		90	
home plate to outfield limits (ft.)	200	250		300		
home plate to backstop (ft.) .		40		60	75-80	90
pitcher's box to home plate (ft.)	45	52			60'6"	
1st and 3rd base lines to spectators' stand (ft.)				60	75	
Total Area (sq. ft.)		62,500			97,500	
Softball						
side of diamond (ft.)	45			45	60	
home plate to playing field limits (ft.)	125			200		
pitcher to home plate	30 (girls)	35		35 (women)	40	
Total Area (sq. ft.)		22,500			50 000	

TRACK and FIELD*	Standard dimensions (feet unless otherwise noted)
Broad jump	
runway length	90-120
pit	5 x 15 to 30
take-off board from pit (adult)	10-12
(children)	5-6
High jump	
runway radius	35
pit	14 x 12
between standards	12
Pole vault	
runway	4 x 100
pit	14 x 12
between standards	12
Shotput, weight throw	
diam. throwing circle	7
throwing radius	50-60
Discus throw	
diam. throwing circle	8 ft. 2½ in.
throwing radius (ft.)[a]	120
Javelin throw	
space needed	200 x 70

OTHER GAME AREAS	Sq. ft. unless otherwise noted: For INTERMED. SCHOOL	For ADULTS
Archery†		
max. length (ft.)	450	450
min. width (ft.)	50	50
Badminton	1800	1800
Basketball		
men	3650	6000
women	3600	5500
Clock golf	700	700
Deck tennis	1300	1300
Field hockey	37,500	57,600-73,500
Football	Not usually advisable	75,000
Handball	1320	1320
Horseshoes	600	600
Shuffleboard	570	570
Soccer	30,000	86,400
Speedball	36,400	68,400
Tennis		
per court	7200	7200
Touch football	39.000	54,500
Volleyball	2800	3100

*For track dimensions, see text. †Standard shooting distances: 30, 40, 50, 60, 70, 80, 100 yds. [a]90° arc with throwing circle at center.

As WITH indoor recreational areas, probability of use by the community as a whole is a factor in designing outdoor areas for schools.

*Building settings** are planned to eliminate active play in this area. Broad walks are used to accommodate heavy, concentrated traffic, and are placed along natural lines of travel to avoid formation of paths across grass areas.

Parking facilities, where space is limited, consist of 18-ft. setbacks on bordering street curbs for head-in parking. Where room is available, paved areas 60 ft. wide for double-row head-in parking are considered desirable. Service drives for various building units lead directly to spaces served.

Grass play fields are bordered where possible with fences 5 or 6 ft. high set back at least 15 ft. from street walks and screened from outside view by planting. Fence prevents children from running into streets. Top fence rails are used for sprinkler systems for watering shrubbery. Underground hose connections, so placed that not more than 150 ft. of hose is needed to reach any portion of the field, are used in grass areas. Field sizes are controlled by natural conditions, but at least one softball space is desirable in each development. Finish grades range from ½ to 2½% slopes.

Hard-surfaced areas are paved with concrete or asphalt, for tennis, volley ball, quoits, badminton, etc., and are extremely popular for community use. Grades are best developed to a maximum slope of 1%.

Park areas, with shaded lawns and vistas, are developed where space permits, to provide a needed and appreciated respite from congested urban life.

Practice fields, including areas for football fields, track and field games, have "turtle-back" grading with a rise of approximately 1 ft. 6 in. through the center. Fields used only for practice may have a constant diagonal 1% slope.

Amphitheaters are included where possible, with stages large enough to accommodate graduating classes, for community gatherings, theatrical performances, etc. Seats may be, as in Fort Worth, cypress with concrete supports. Lighting systems for night performances are provided. An average 10% slope was found satisfactory.

Game areas. Dimensions and layouts may be obtained from the National Recreation Association and from sports association and sporting goods manufacturers. See also AR, June 1937.

Lamar, Emil, *The Athletic Plant*, McGraw Hill Book Co., New York, 193?.

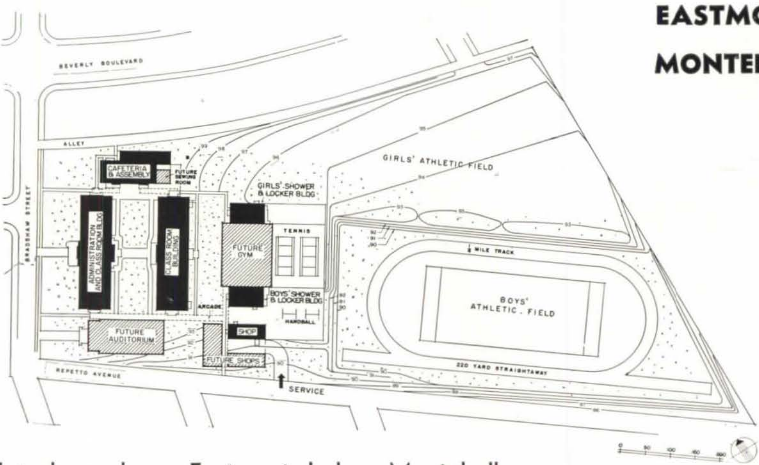
Butler, George D., *The New Play Areas*, A. S. Barnes, New York, N. Y., 1938.

Hill, C. S., and Taylor, A. D., *Principles Governing the Landscape Development of Grounds for Educational Institutions*, American School and University, 1939, pp. 203-215.

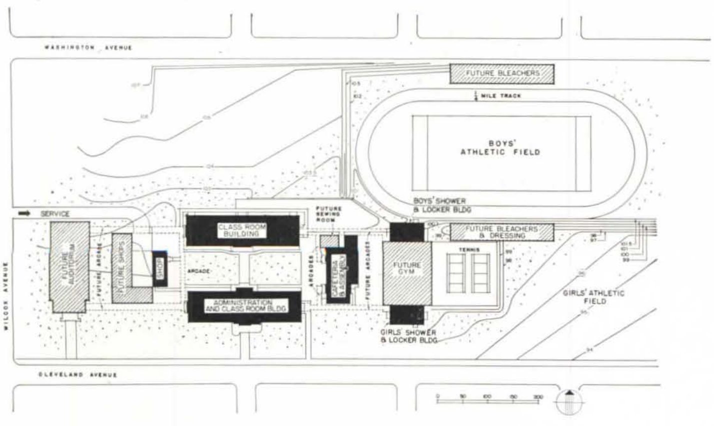
*Much of this data is based on experience of the Fort Worth, Tex., school grounds planning committee, consisting of R. C. Morrison, director; Eugene H. Carter, landscape architect; Hare and Hare, landscape architects and consultants; and others.

BUILDINGS DUPLICATED FOR TWO JUNIOR HIGH SCHOOLS

Photos by Mott Studios



Plot plans: above, Eastmont; below, Montebello



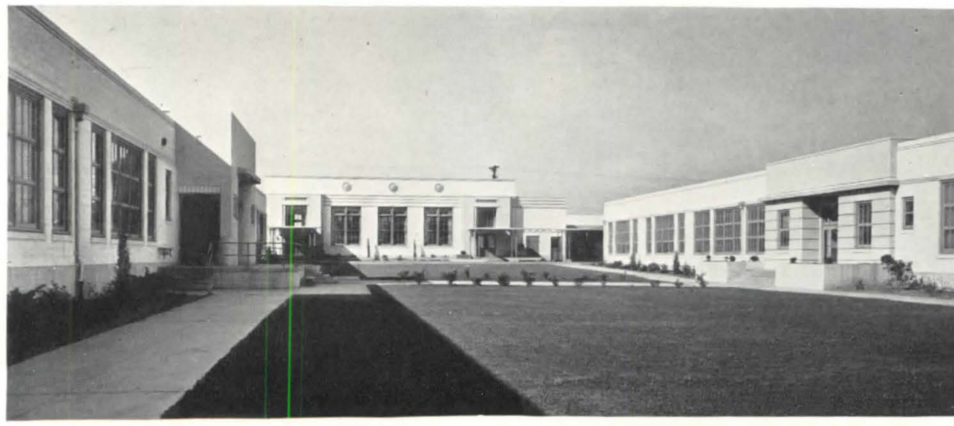
EASTMONT and MONTEBELLO JUNIOR HIGH SCHOOLS, MONTEBELLO, CALIFORNIA

T. C. KISTNER, architect

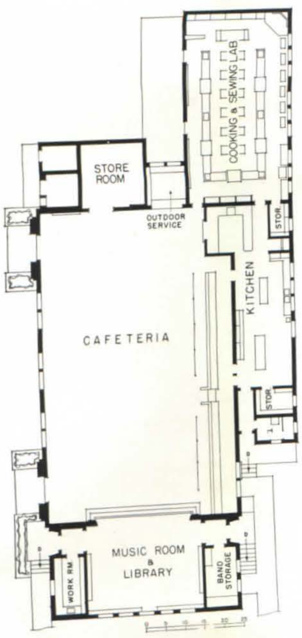
IDENTICAL INTERIOR building layouts are used in both schools. One set of building plans was prepared. In both cases, the "campus" type of development, with independent one-story buildings for various departments, was used, and laid out for a planned expansion program. All but one of the buildings have reinforced concrete walls and floors, with wood-framed partitions and roofs. The exception, the cafeteria-assembly unit, is wood frame, stuccoed, on a concrete floor. Arcades connecting buildings have steel pipe columns and metal roof decks.

In classroom, administration, and cafeteria-assembly buildings, floors are asphalt tile, upper walls and ceilings are acoustic plaster on metal lath. In shops, showers, and lockers, floors are cement. Wood is lead-and-oil stained, with aluminum powder added to reduce raw color, and with flat varnish finish. Artificial classroom lighting is adequate to provide 15 footcandles throughout. Windows are screened awning-type sash with venetian blinds. Heating is by gas radiators except in cafeteria-assembly buildings, where circulating gas furnaces are used.

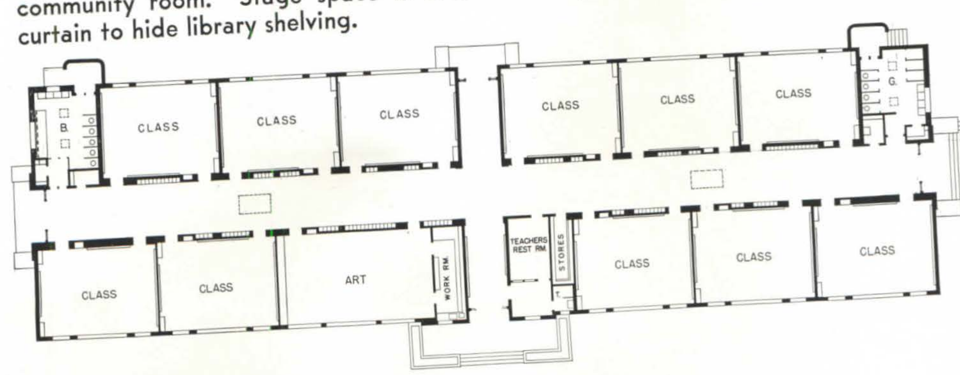
Present shop unit



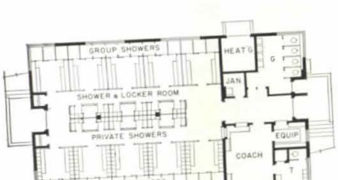
Top, view of "campus"; lower, cafeteria-assembly room, used also as study hall and community room. Stage space is available on platform by drawing a cyclorama curtain to hide library shelving.



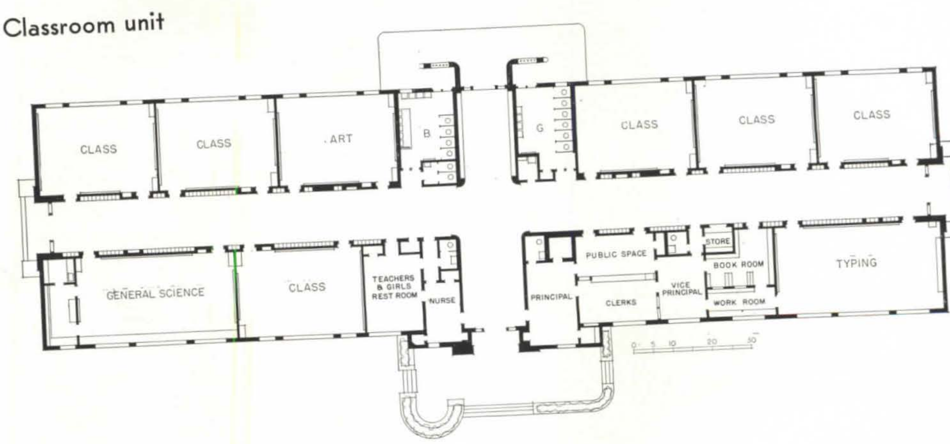
Present cafeteria-assembly unit; sewing room is to be added.



Classroom unit



Girls' shower and locker unit



Administration unit

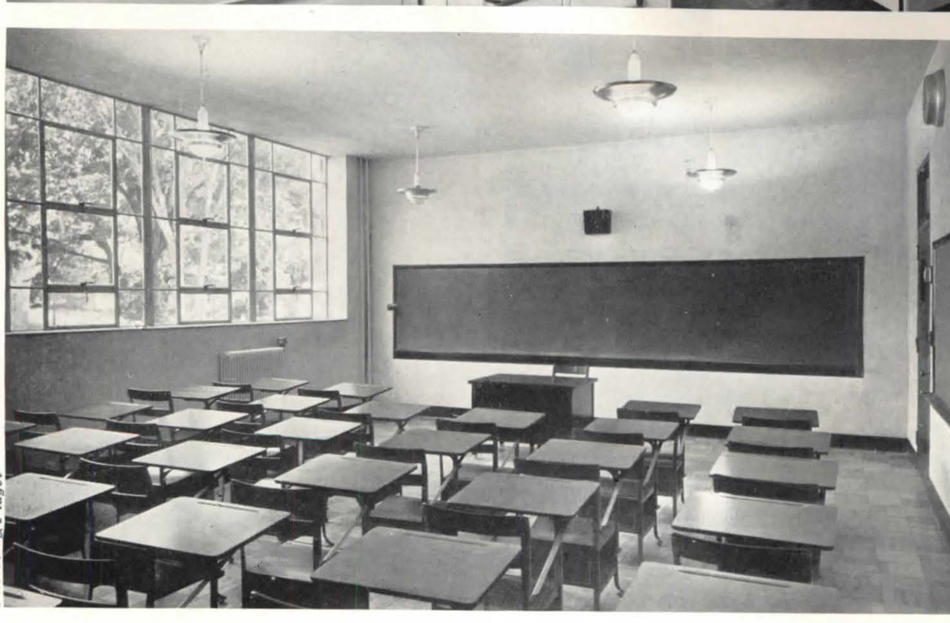
Boys' shower and locker unit

HIGH SCHOOL FOR 750 PUPILS

SPRINGFIELD HIGH SCHOOL

Audtorium is planned for community as well as school use, and is equipped with a mechanical ventilating system.

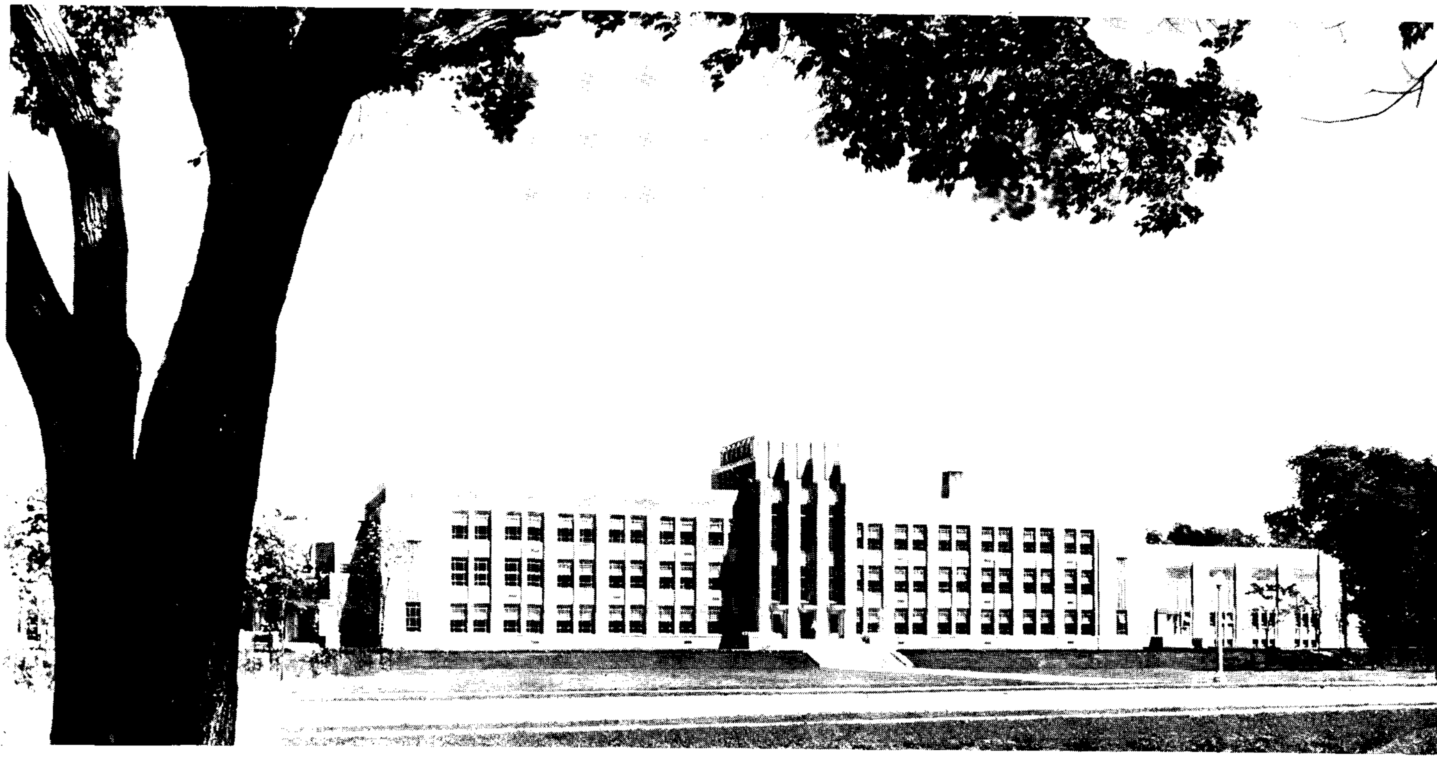
Study of food preparatio carried o in a series of unit kit s, duplicatin desirable home cond ns.



Photos by Piaget

Typical classroom: note flexible seati and flush window heads. Roll shad are used here; venetian blinds in a ministration and library areas.

HIGH SCHOOL FOR NEW SCHOOL DISTRICT



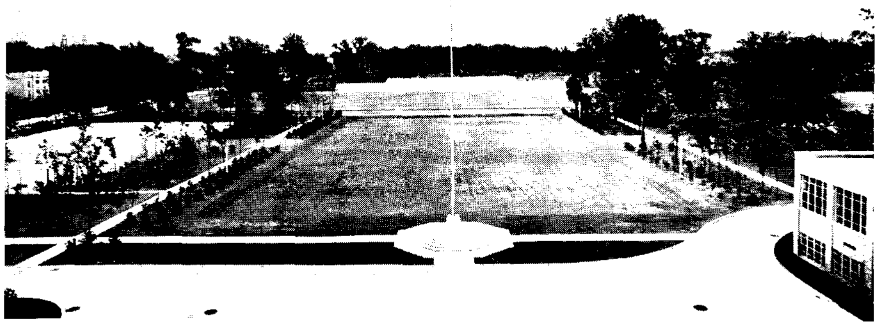
NILES TOWNSHIP HIGH SCHOOL
NILES CENTER, ILL.

ROYER, DANELY, and DAVIS, architects

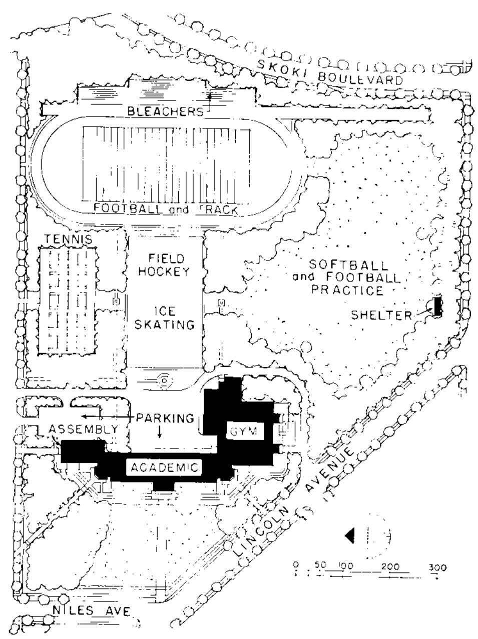
ROBERT BRUCE HARRIS, landscape architect

THIS SCHOOL serves a newly organized high-school district consisting of five suburban residential communities. Present and probable future enrollments, and curricular and community trends were surveyed; conclusions were: (1) With a present population of 12,000, a present enrollment of 500 would reach 1200 in five years. (2) Accommodations for 1200 pupils were desirable. (3) Planning should provide for college-preparatory and commercial curricular requirements, and for community use.

The site contains 20 acres, is heavily wooded, and lies largely below street level. Buildings were located to provide east-west lighting for classrooms, and north light for art rooms and shops; convenient access to the various units and the parking area; and maximum land-use with provision for a future addition to the east. Terraces, steps, and sunken areas take advantage of natural grades. Bleachers will accommodate 1500 spectators.

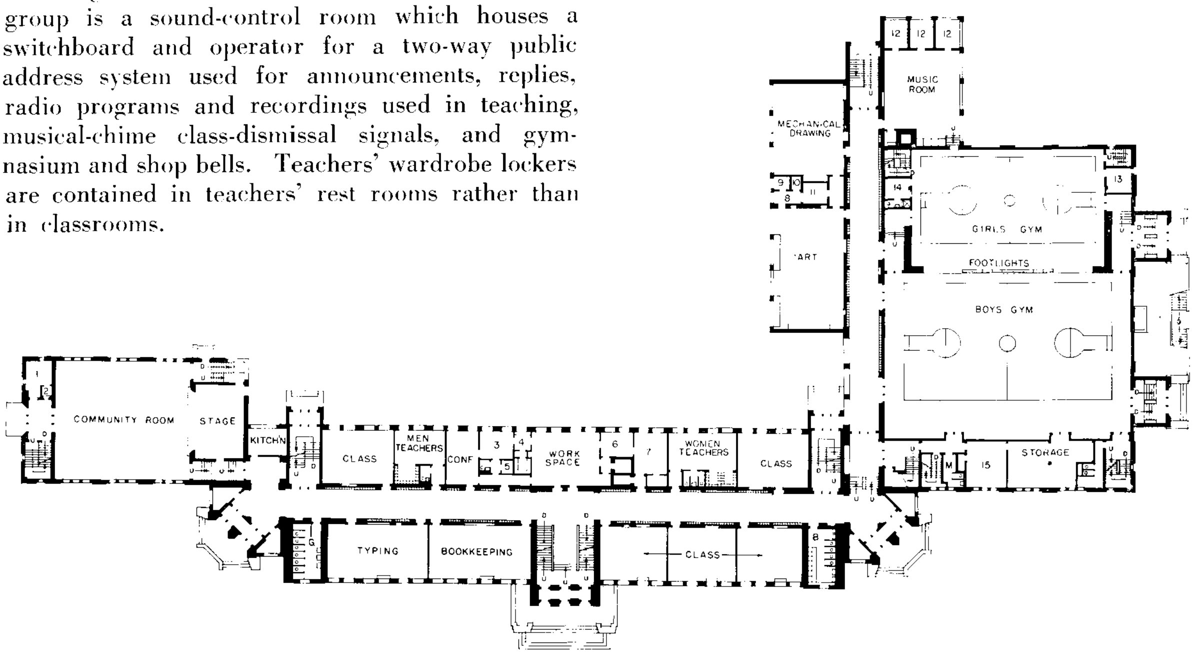


Sunken area for field hockey and ice skating



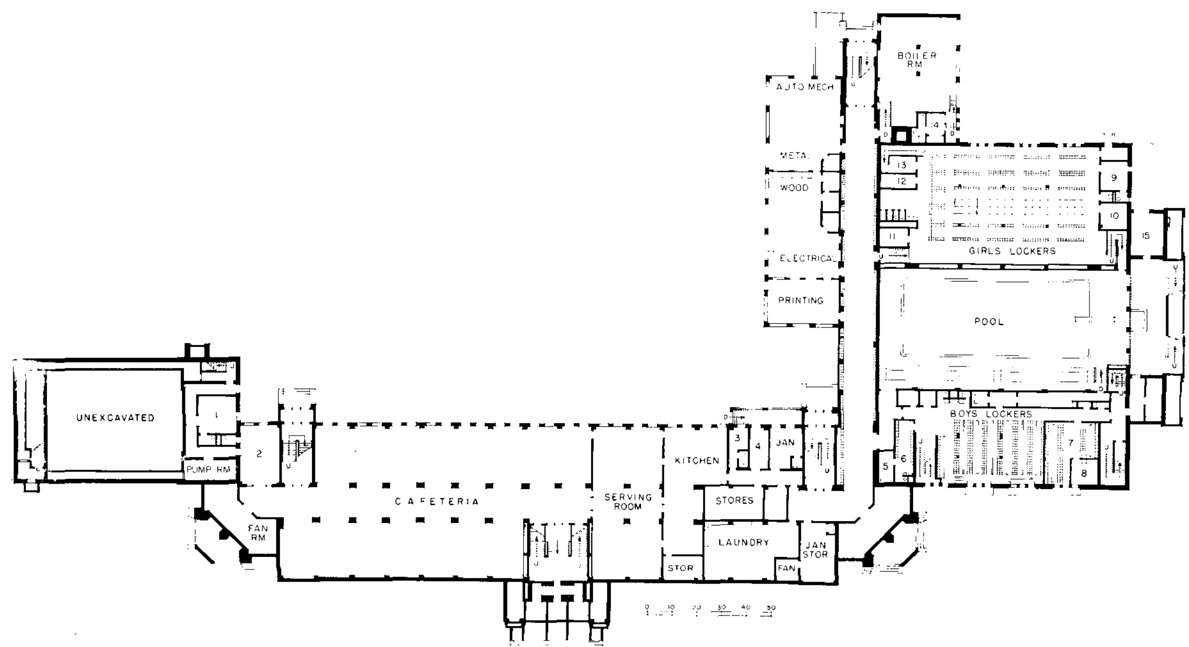
Plot plan

Each of the three units in this building may be isolated by closing gates at the ends of the central portion; this arrangement facilitates use of any unit after regular school hours. In the administrative group is a sound-control room which houses a switchboard and operator for a two-way public address system used for announcements, replies, radio programs and recordings used in teaching, musical-chime class-dismissal signals, and gymnasium and shop bells. Teachers' wardrobe lockers are contained in teachers' rest rooms rather than in classrooms.



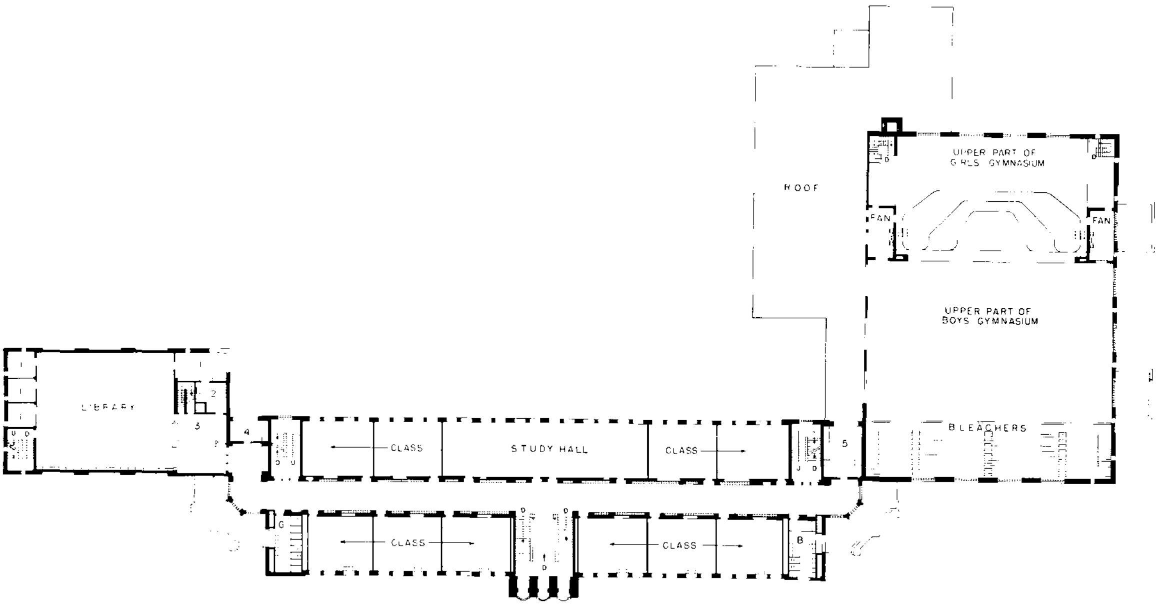
1. Check room
2. Ticket booth
3. Principal
4. Mimeograph
5. Sound control
6. Ass't principal
7. Administrative assistant
8. Office
9. Spray room
10. Kiln
11. Supplies
12. Practice
13. Office
14. Examination
15. Instructor

First floor: Community room (auditorium) and library wing is at the north; administrative-academic unit in the center; gymnasium-shop, or noisy unit, to the south. Boys' gymnasium is 68 by 100 ft.; girls' is 50 by 78 ft. and is convertible into a stage. Folding bleachers on this floor accommodate 300 spectators; when used as an auditorium, 1,800 may be seated.



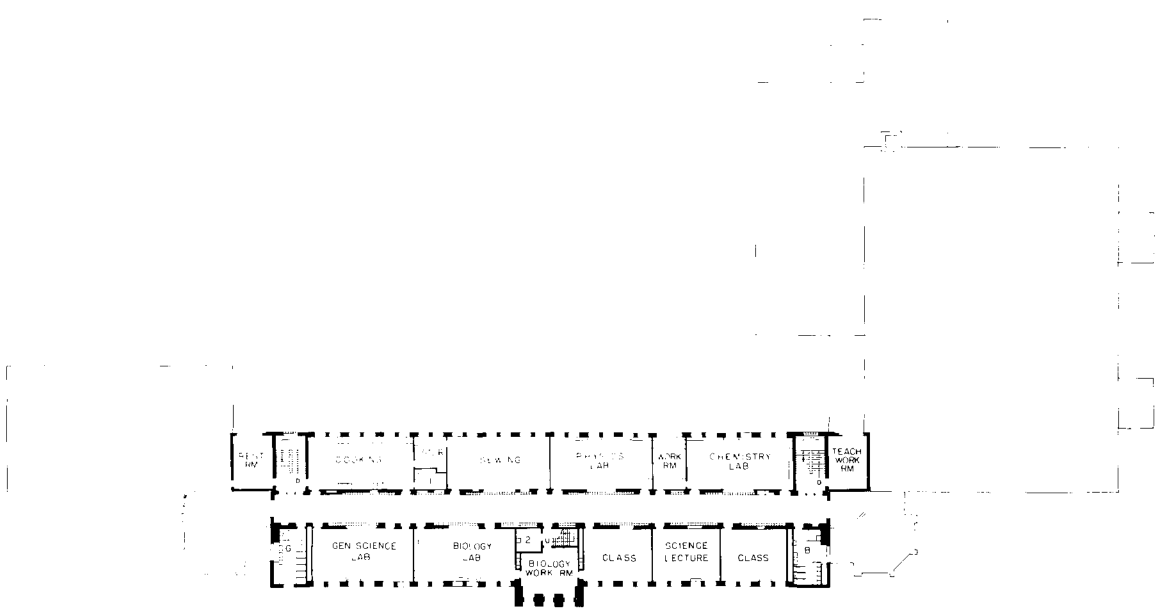
1. Dressing and storage
2. Teachers' dining
3. Rest room
4. Receiving
5. Shower
6. Visiting team
7. Home team
8. Rubbing room
9. Girls' rest
10. Matron
11. Suits and towels
12. Fan room
13. Storage
14. Office
15. Grounds equipment

Basement cafeteria accommodates 500. Odors are drawn off by an independent ventilating system. Locker rooms are intended for use of both pool and gymnasium occupants. Girls' lockers are so placed that addition of a few metal panels and curtains forms dressing booths. Pool is 30 by 75 ft., and has bleachers for 250 spectators.



1. Conference room
2. Work room
3. Librarian
4. Teachers' room
5. School store

Second floor: Over the library conference rooms are located clubrooms; over the librarian's space is the stack room. Folding partition between boys' and girls' gymnasia may be slid to any of the three cyclorama positions shown in the plan of the girls' gymnasium, thus forming stages of varying depths.

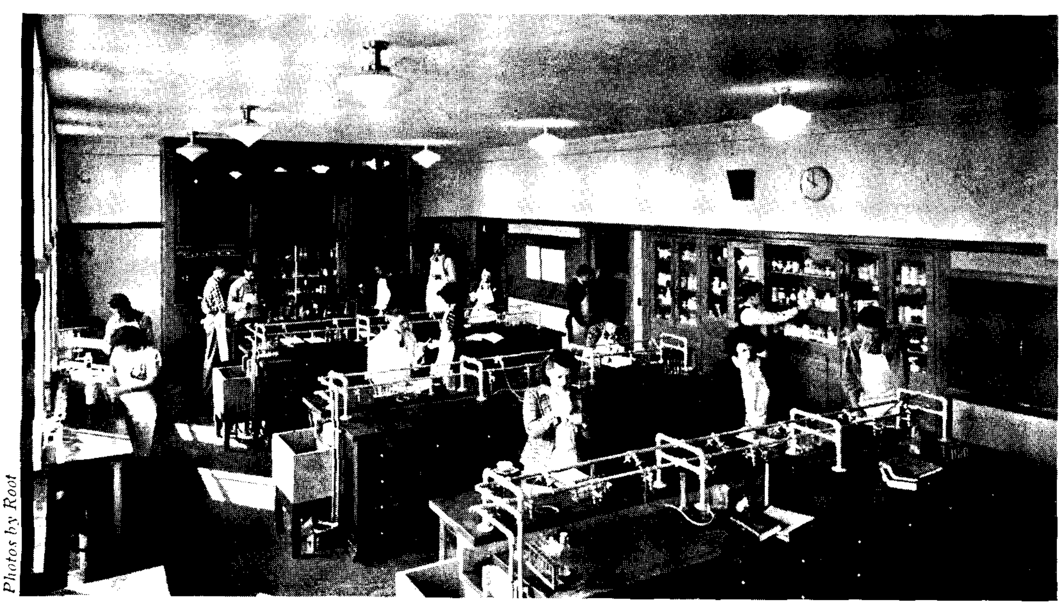


1. Storage
2. Dark room

Third floor contains the science and home-training divisions of the academic unit. Foods laboratory contains a series of unit kitchens and a practice dining room. Biology growing room is high-ceilinged.

Library, looking from balcony, below which are conference rooms. Charging desk (upper right) is at main entrance.

Foods laboratory, arranged in units, has a practice dining room adjoining.

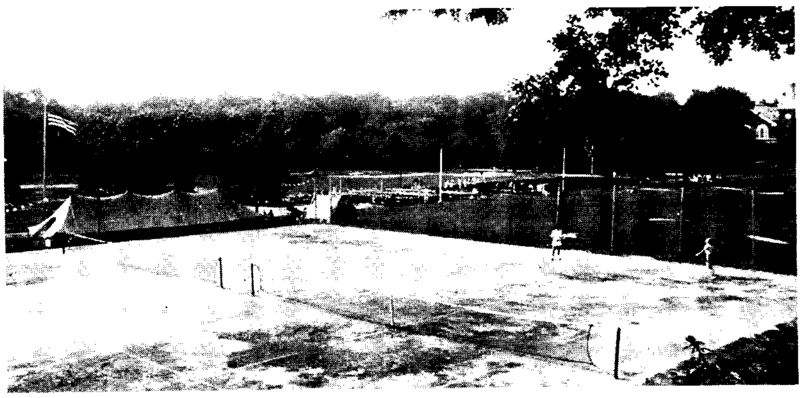


Photos by Root

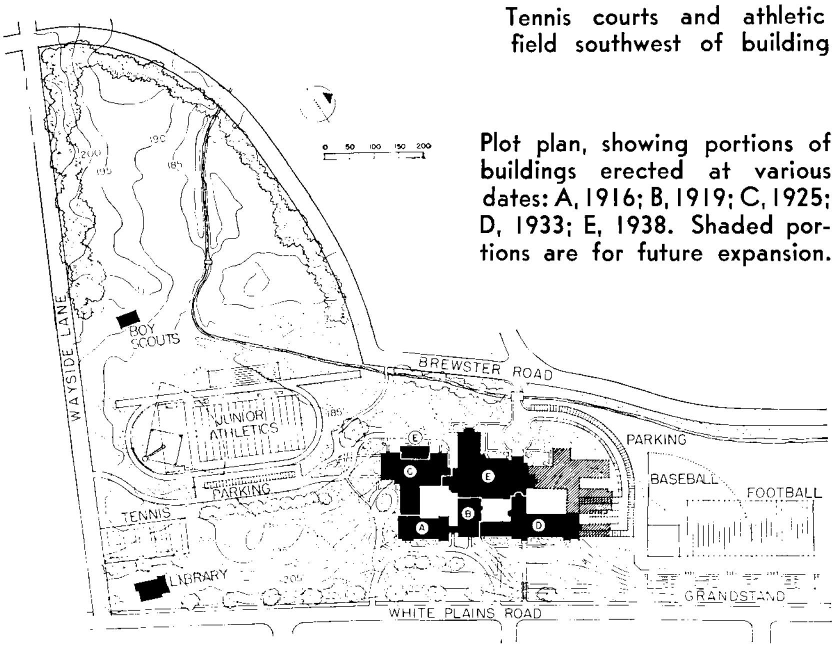
Chemistry laboratory, one of the few areas where equipment is not movable.

SCARSDALE HIGH SCHOOL, SCARSDALE, N. Y.

ROSSITER and MULLER, architects



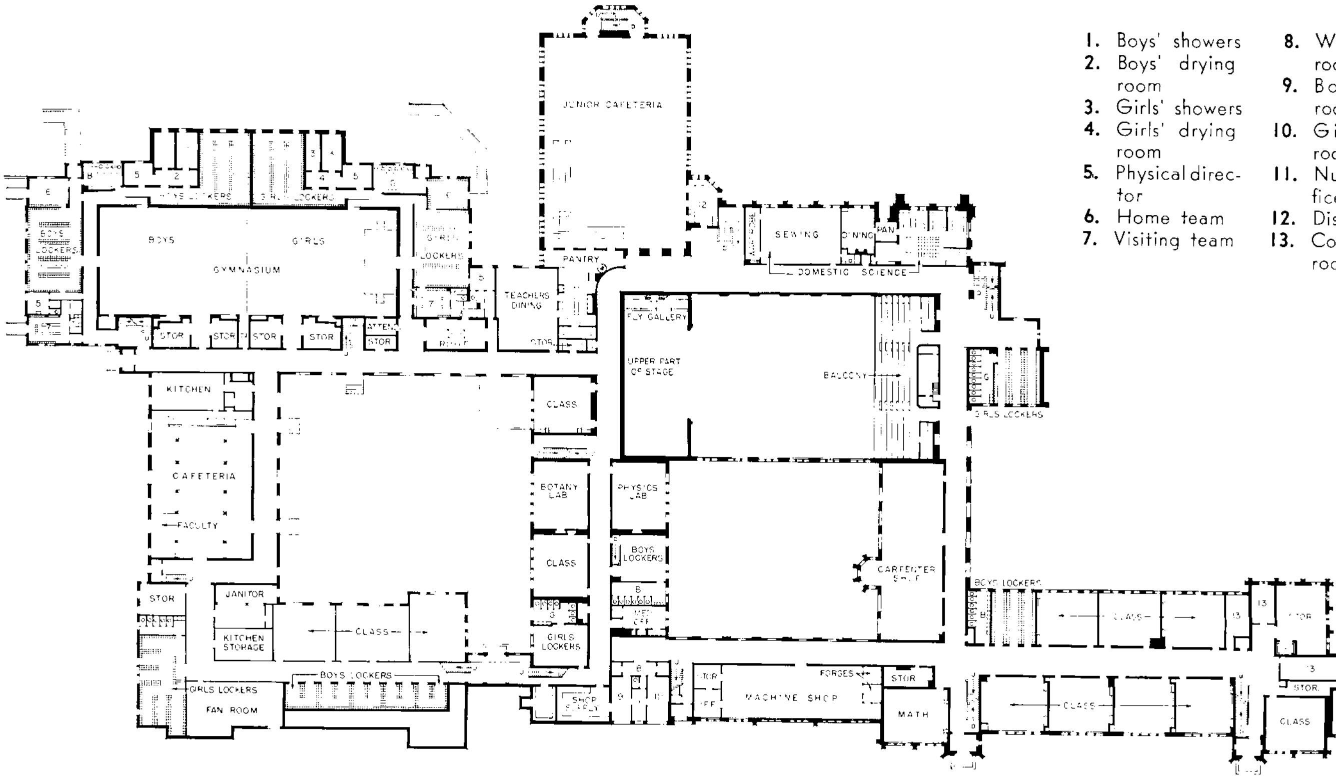
Tennis courts and athletic field southwest of building



Plot plan, showing portions of buildings erected at various dates: A, 1916; B, 1919; C, 1925; D, 1933; E, 1938. Shaded portions are for future expansion.

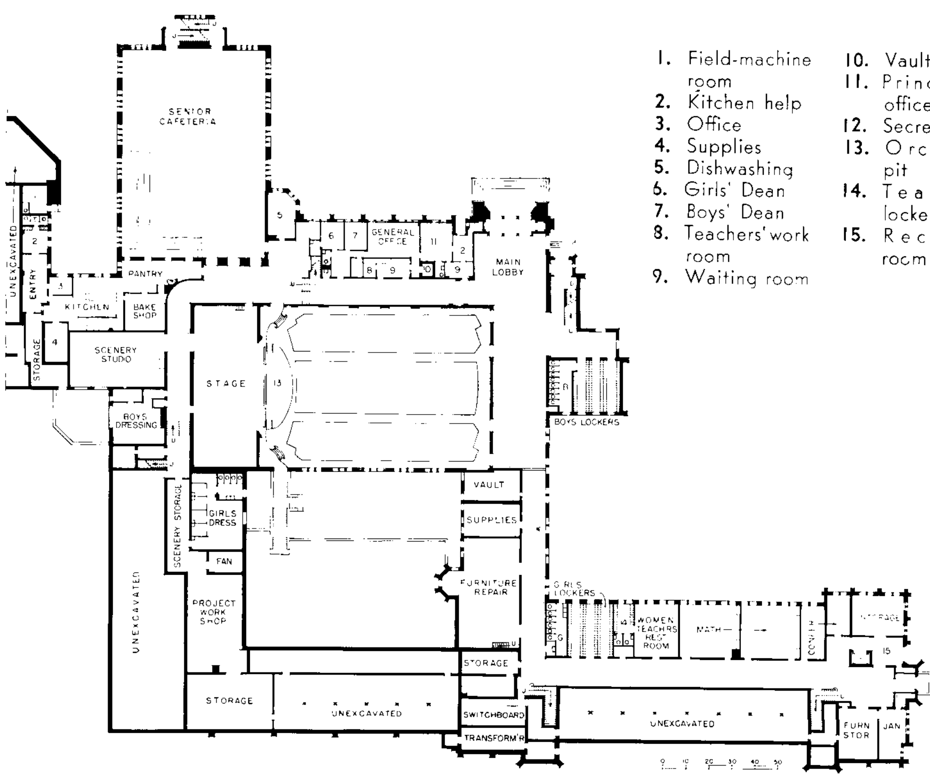
THE JUNIOR HIGH SCHOOL occupies the southeasterly buildings; senior high school uses northwesterly units. The first building was designed by Guy Lowell, architect. Since that date, a comprehensive scheme of progressive developments has been evolved and serves as a continuing guide. Building additions shown are those contemplated in the reasonably near future. They are planned to contain two gymnasia, boys' and girls' locker spaces, an additional auditorium and music rooms, cafeterias for junior and senior schools, and various laboratories, shops, and classrooms.

Site developments north of the building are not yet completed as drawn; when finished, they will serve as the senior athletic fields. Field to the south will be used by juniors. Grounds as a whole, and certain portions of the buildings, are intensively used for local community functions.



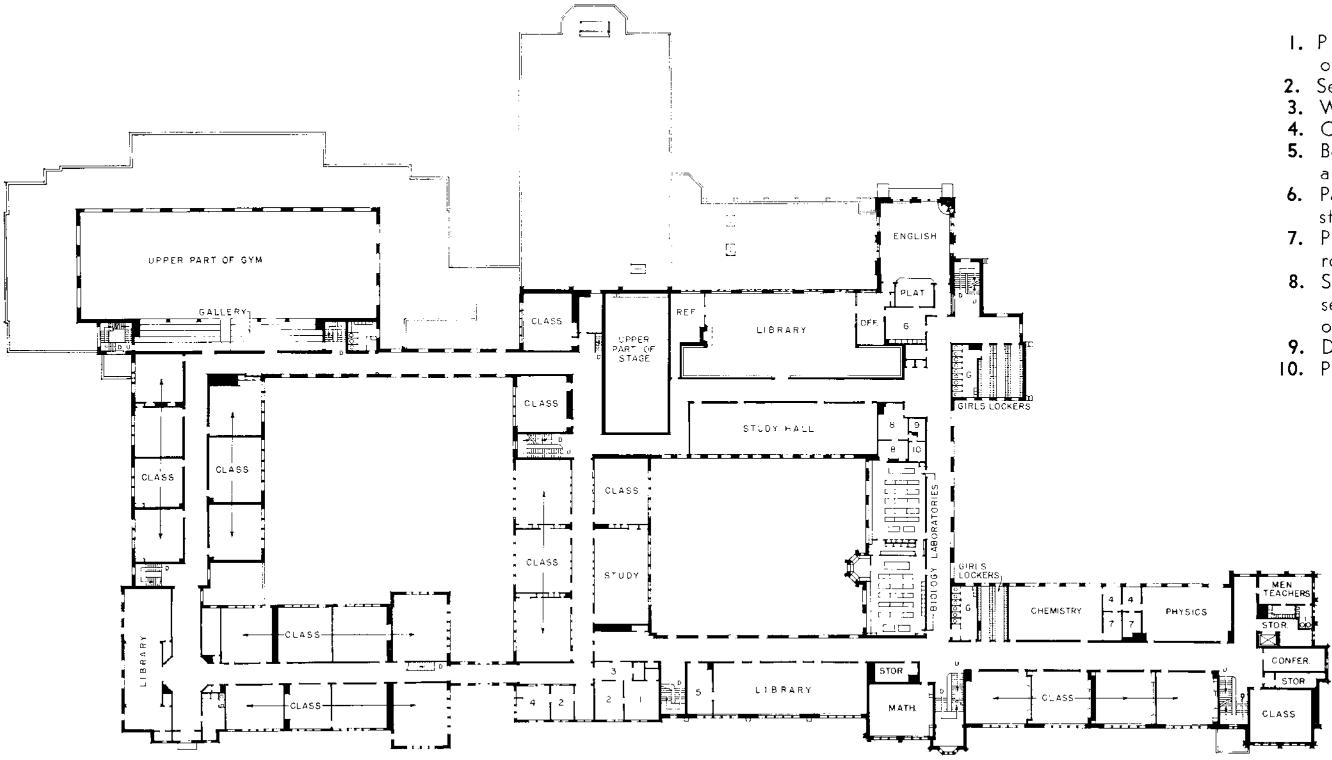
1. Boys' showers
2. Boys' drying room
3. Girls' showers
4. Girls' drying room
5. Physical director
6. Home team
7. Visiting team
8. Waiting room
9. Boys' rest room
10. Girls' rest room
11. Nurse's office
12. Dishwashing
13. Conference room

First floor: gymnasium and appurtenances constitute only part of the projected physical-education plant. Use of a folding partition here introduces a certain amount of flexibility. Throughout the school, pupils' lockers are grouped in conveniently located rooms rather than along corridor walls.



1. Field-machine room
2. Kitchen help
3. Office
4. Supplies
5. Dishwashing
6. Girls' Dean
7. Boys' Dean
8. Teachers' work room
9. Waiting room
10. Vault
11. Principal's office
12. Secretary
13. Orchestra pit
14. Teachers' lockers
15. Receiving room

Ground floor is built into hillside; building services are concentrated in basement areas. Location of auditorium, cafeteria, and services for both adjacent to main entrance increases their usefulness to the community as a whole.



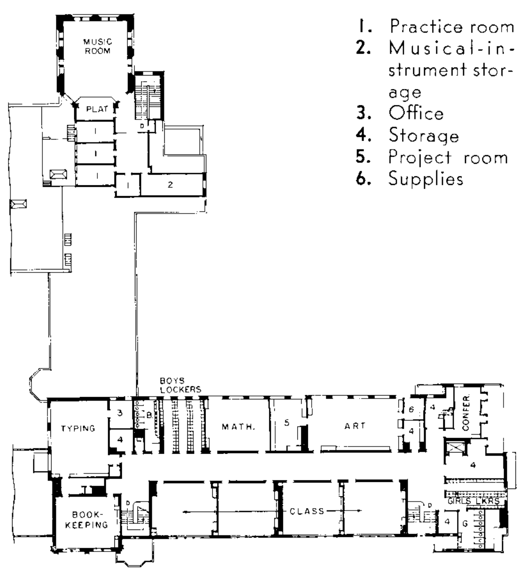
1. Principal's office
2. Secretary
3. Waiting
4. Office
5. Book storage and work
6. Pantry and storage
7. Preparation room
8. Science research laboratory
9. Dark room
10. Print room

Second floor contains a series of education units consisting of classrooms, research centers, work rooms or laboratories, and conference rooms. As the plan has expanded, room uses have changed; biology laboratories occupy space once given over to a combination assembly-study hall.

PLANS SHOWN on these two pages require study in relation to the complete program as projected. For instance, what may appear to be physical-education facilities inadequate for a school of this size will eventually be increased to ample provisions. Attention has been concentrated on those portions of the plant which local authorities considered to be of prime importance; other activities are somewhat restricted until funds for building become available.

This type of planning in a series of steps, all keyed to a master plan, is suitable for many communities; and may, in some cases, be the only way in which a maximum of up-to-date facilities can be secured. In order to achieve such a maximum of usefulness, flexibility of the master plan is highly important. Otherwise it becomes impossible to keep abreast of advances in educational theories; and changing uses, to which certain earlier portions of the buildings may be put, are poorly accommodated.

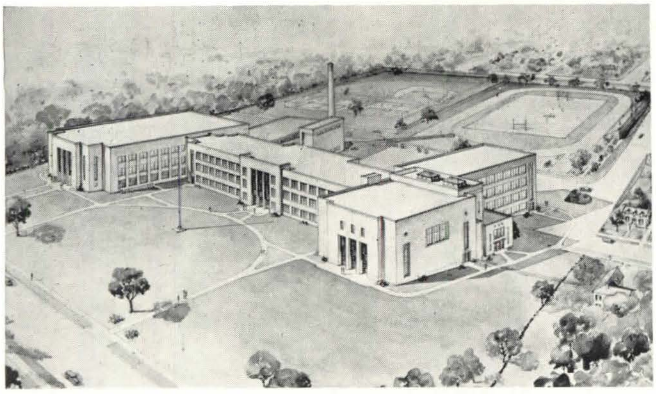
To point a single example of such flexibility for changing use, the small bay projecting from the biology laboratory space on the second floor had limited usefulness when these two rooms constituted assembly space. Now, however, the bay houses an aquarium, germinating bed, soil bins, etc.



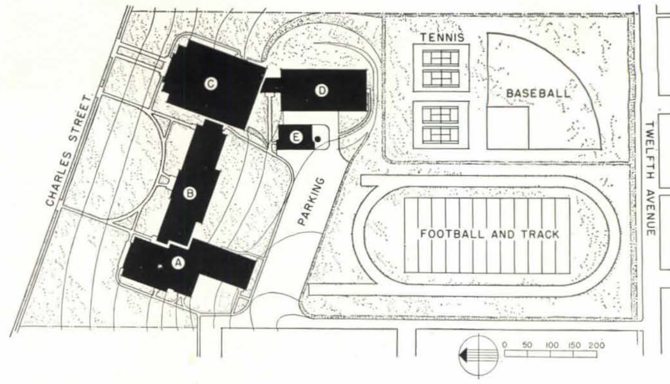
1. Practice room
2. Musical-instrument storage
3. Office
4. Storage
5. Project room
6. Supplies

Third floor contains art, music, and commercial units segregated to avoid conflict with other types of spaces.

COMMUNITY HIGH SCHOOL FOR INDUSTRIAL TOWN



Perspective

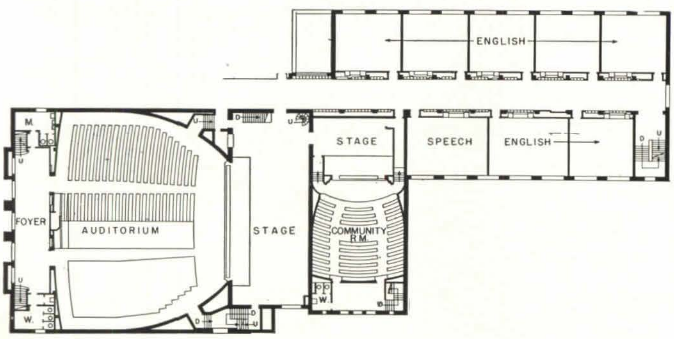


A, Auditorium; **B**, Administration; **C**, Physical education; **D**, Shops; **E**, Boiler house

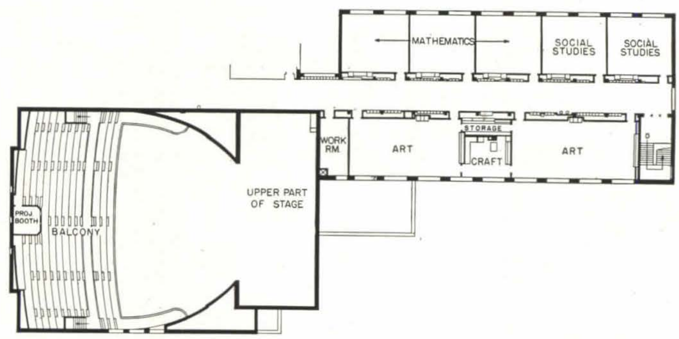
EAST SENIOR HIGH SCHOOL, ROCKFORD, ILLINOIS

GILBERT A. JOHNSON, architect; WILLIS W. HUBBARD, consultant

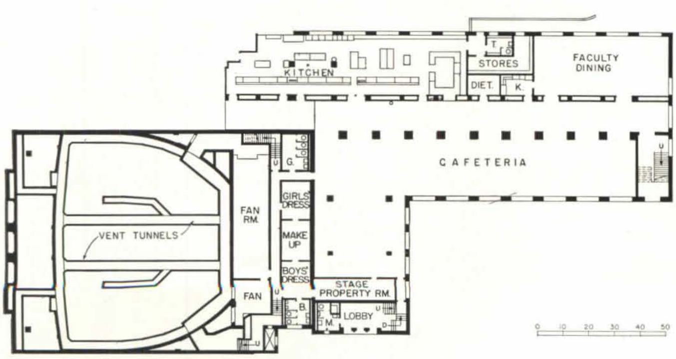
UNIT A: Auditorium, community room, instruction area



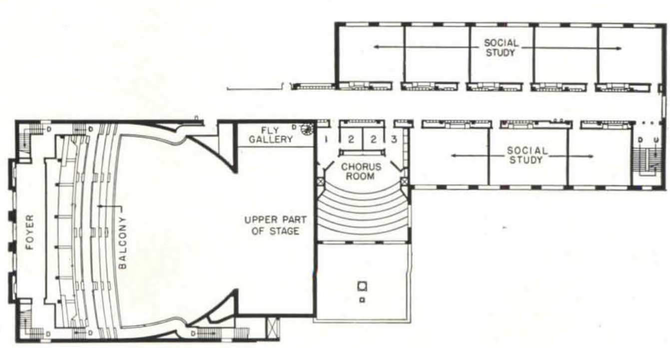
First floor: Arrangement of community room and auditorium, with connecting stages, is noteworthy. So also is allocation of space for speech and English study, which may use auditoria as laboratories.



Third floor contains a complete arts-and-crafts unit. In the crafts room are contained a kiln for firing pottery, a work-bench, and a sink, as well as storage cabinets and cases.



Ground floor: use of grades permits use of lobby as an entrance to both community room and cafeteria for public purposes. Lobby may also serve as stage entrance.



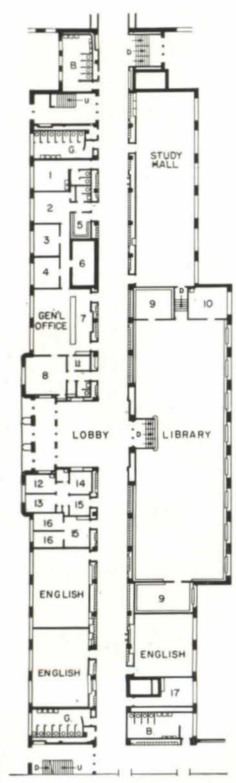
Second floor: Stage is completely equipped with fly gallery, grids, and lighting necessities. Legend: 1, instructor's office; 2, practice rooms; 3, music room.

ROCKFORD being an industrial town, this school is planned with emphasis on commercial, vocational, and home training. However, provisions for other studies are by no means neglected. The school's estimated capacity is 2000.

Since a maximum of adult education is carried on in communities like Rockford, rather complete facilities for this type of work are included. Segregation of the auditorium and community room is obtained by placing them in a separate wing; physical education and shop units, where noise is unavoidable, are likewise placed in independent wings. Land available did not permit development of parks and similar recreational areas; but, even so, inclusion of such a unit as tennis courts marks an advance over the type of land-planning formerly considered adequate. Parking space, with direct access to auditorium and shop wings, and to athletic fields, is also only a short distance from the secondary entrance which serves both administrative-classroom and physical education units.

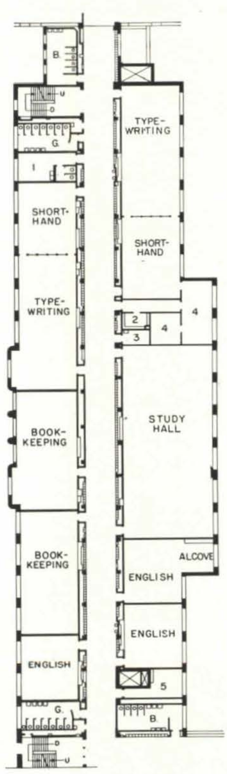
Almost all of those areas, for which suggested standards are presented on previous pages of this study, are included in East Senior High School. Simplicity of planning, integration of the various well-defined units, and free circulation attained by use of wide connecting corridors, are all worthy of study. The gymnasium (see page 118) is of a size which will accommodate not only basketball, but also other indoor sports in which a great number of students may participate; audience facilities, arrangements for the band to take part in indoor athletic functions, and separate gymnasia for girls and for corrective work, are also provided.

UNIT B: Administrative, commercial, and laboratory areas



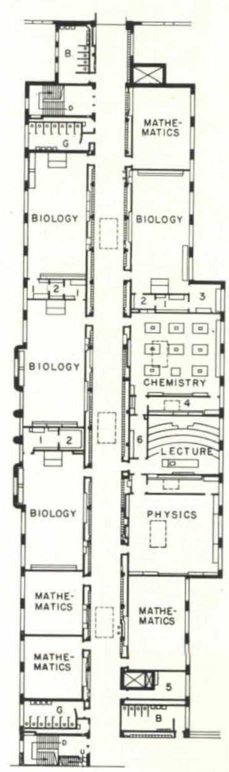
1. Women teachers
2. Workroom
3. Dean
4. Ass't principal
5. Books
6. Vault
7. Public space
8. Principal
9. Conference
10. Office and work
11. Radio
12. Nurse
13. Girls
14. Boys
15. Waiting
16. Employment
17. Teachers' work

First floor houses business administrative, guidance, employment, and health units, as well as a study-library-conference group, English classrooms, and teachers' workrooms.



1. Men teachers
2. Stores
3. Janitor closet
4. Office practice
5. Teachers' work

Second floor English classrooms are grouped closely to similar classrooms in Unit A. Besides commercial instruction areas, rooms are provided for practical office training.

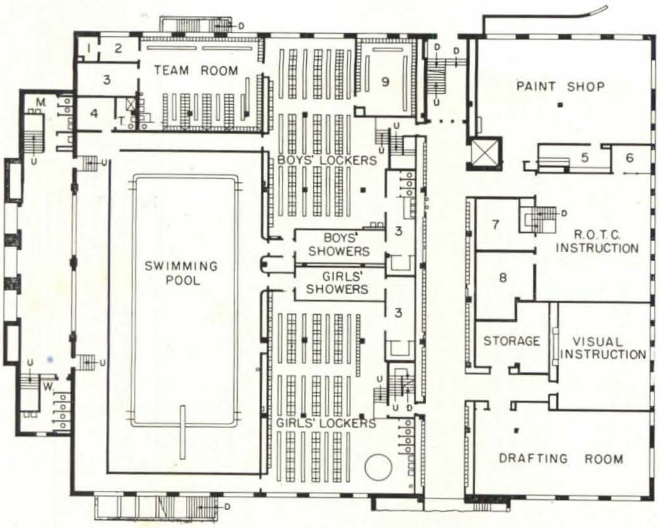


1. Preparation room
2. Storeroom
3. Plant room
4. Workroom
5. Teachers' work
6. Dark room

Third floor contains science laboratories grouped about a common lecture, or discussion, room, which has facilities for *preparing the slides used* there for visual instruction.

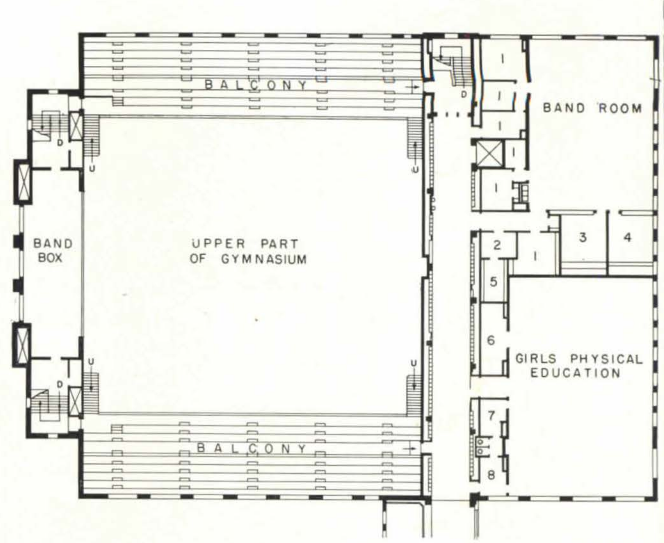
EAST SENIOR HIGH SCHOOL

UNIT C: Physical education, shops, home training



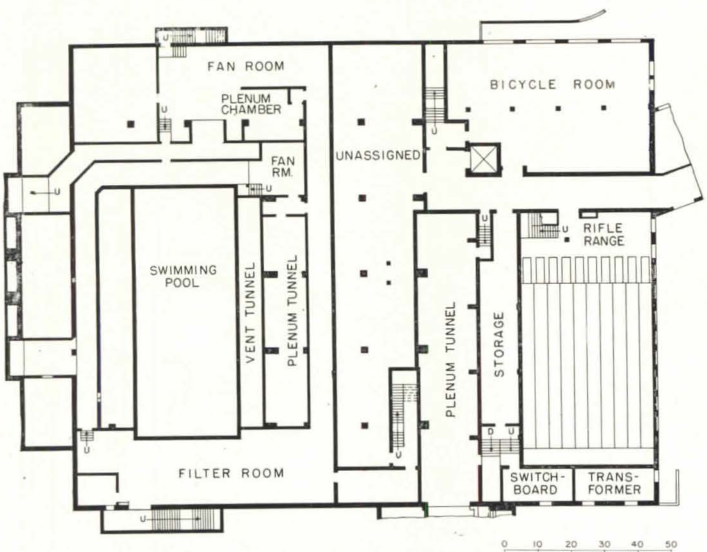
First floor illustrates separation of physical education department from other areas.

1. Equipment
2. Coach
3. Drying room
4. Instructor
5. Storage
6. Office
7. Uniforms
8. Rifles
9. Visiting team

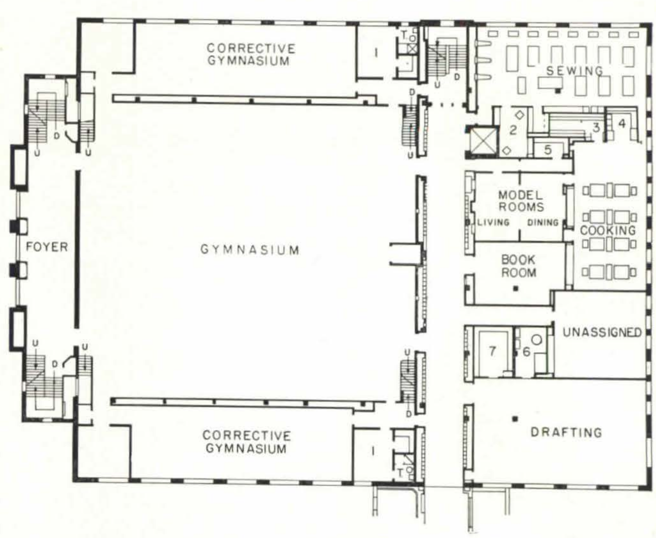


Third floor: Instrument storage rooms have linoleum-covered wood shelving.

1. Practice rooms
2. Dressing room
3. Orchestra storage
4. Band storage
5. Wardrobe
6. Equipment
7. Examination
8. Office



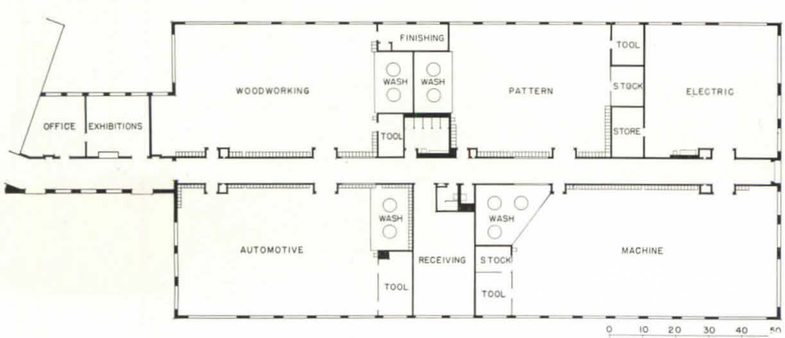
Ground floor is principally service area.



Second floor contains a home training department.

1. Instructor
2. Fitting room
3. Pantry and linen dryer
4. Model kitchen
5. Storage
6. Blueprint room
7. Supplies

UNIT D: Shops



Shop building is one story high, and follows closely principles outlined on pages 95 to 97. The corridor connects drafting and planning areas in Unit C with instructor's conference room and individual shops in this unit. Washrooms have factory-type circular wash fountains.