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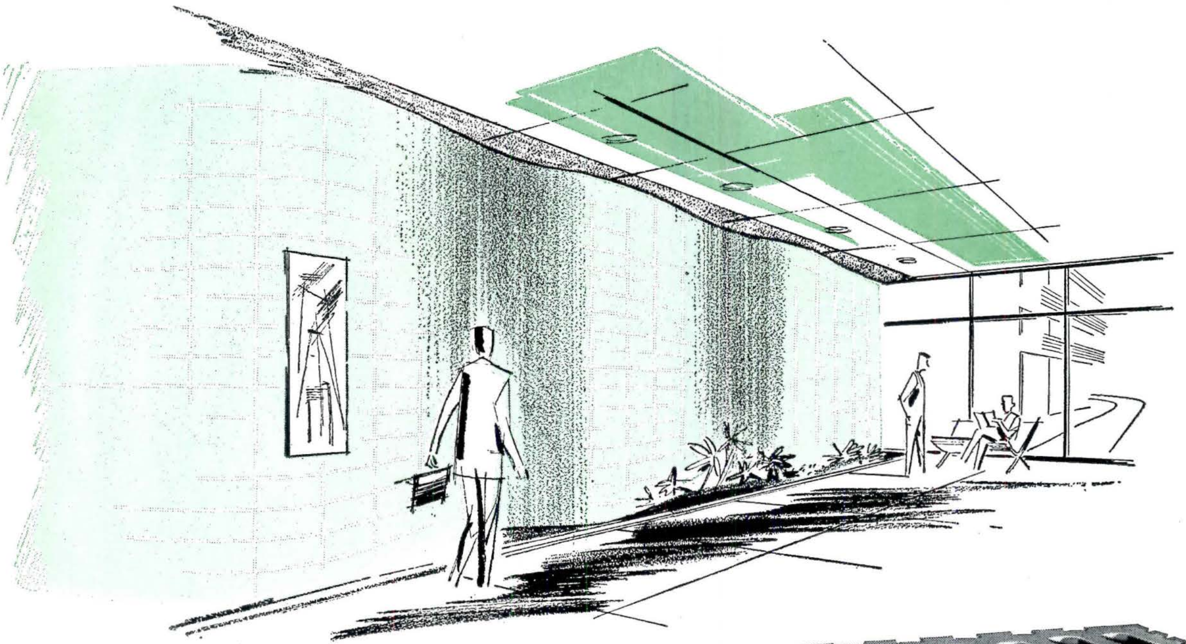

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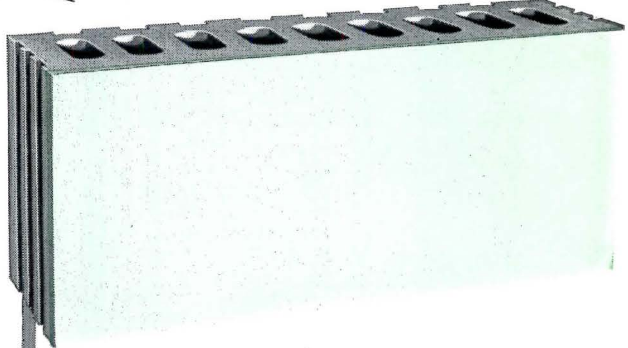

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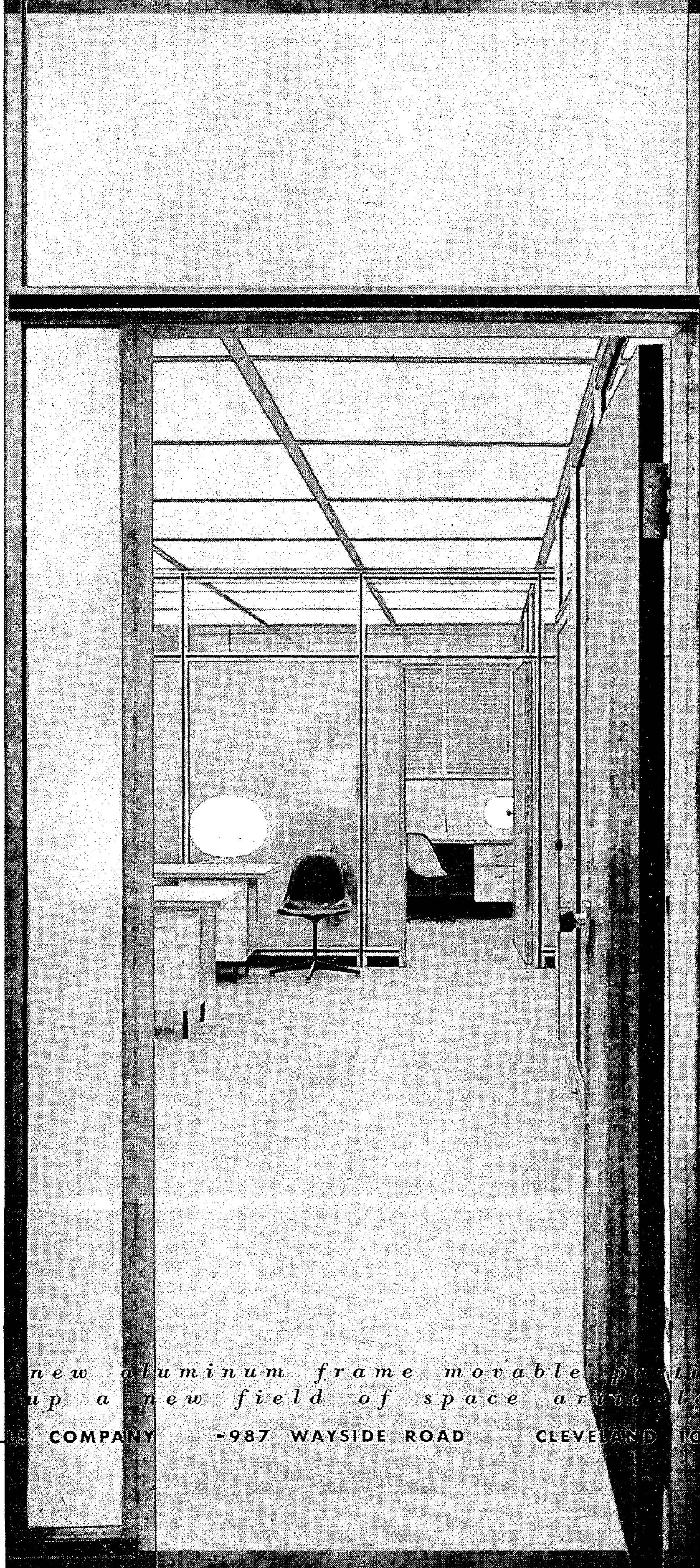

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PROGRESSIVE ARCHITECTURE

March 1958

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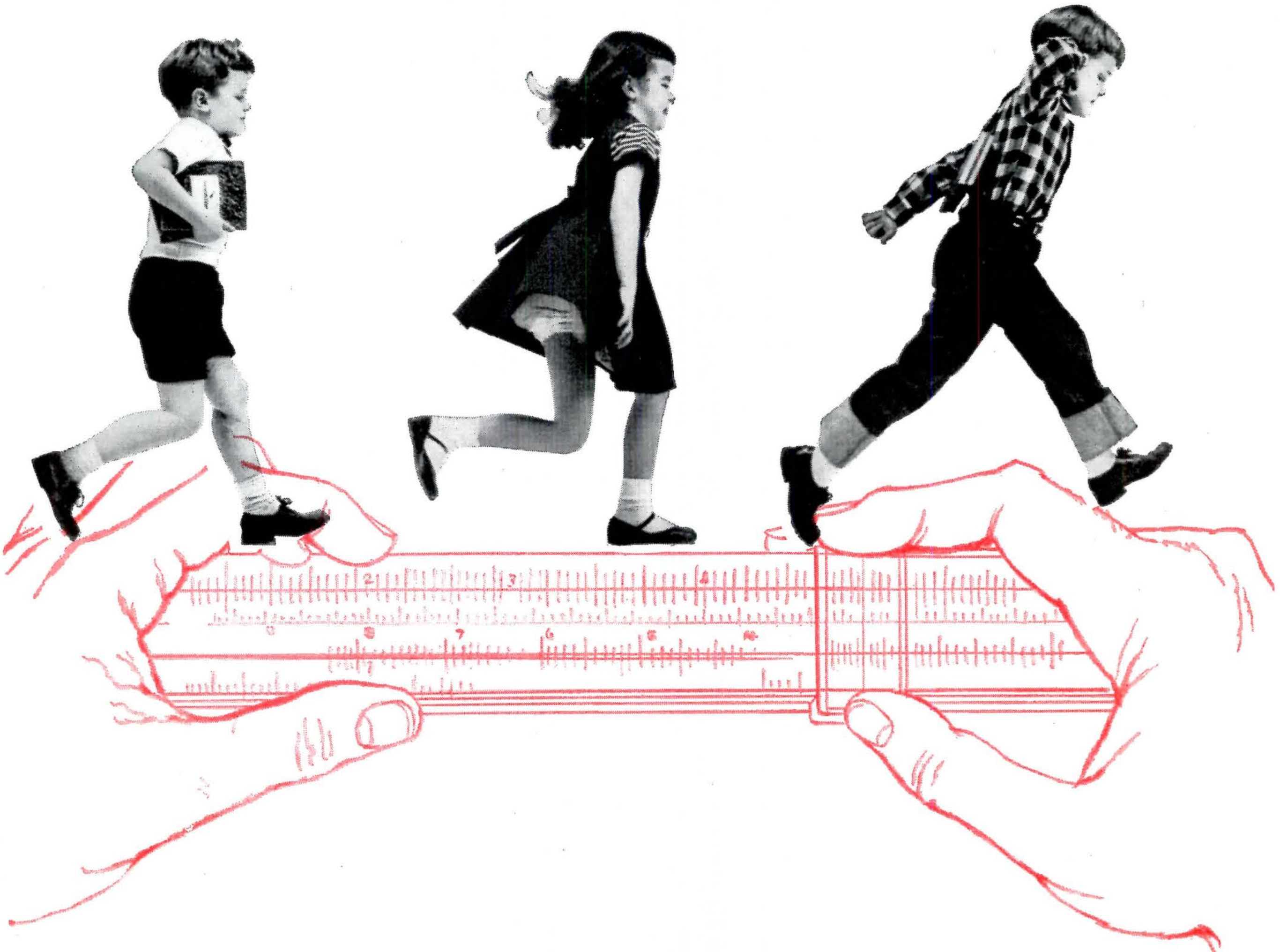
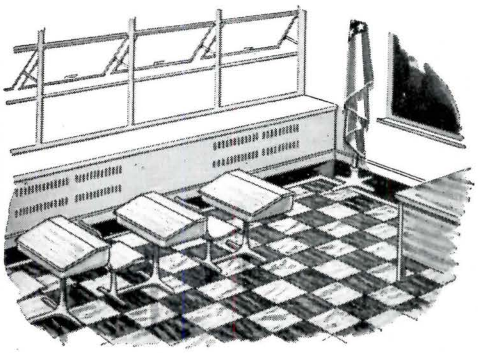


what's the R. P. M. of a schoolboy?



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It's the Law *by Bernard Tomson*

P/A Office Practice ***article discussing the propriety of delegating to the profession the determination of standards for licensing architects.***

Should a state registration or licensing board be guided by the profession in determining the standards for qualification of a person who seeks to become licensed as an architect? Is it lawful for a representative committee of the profession to prepare standards of qualification for licensing and otherwise to pass upon the qualifications of applicants? The Supreme Court of the State of Utah has been called upon to determine the validity and constitutionality of a statute which delegated the duty of preparing standards of qualification for licensing to representative committees of several professions (*Clayton* vs. *Bennett, et al.*) The Court upheld the validity of the statute, ruling that it did not result in an unconstitutional delegation of legislative powers.

In the Utah case, the plaintiff was a profesional engineer duly licensed as such under the Utah law. He also had a degree in architecture and made application to the appropriate administrative body for a license to practice that profession. The plaintiff was given an examination which he failed to pass. He then instituted a legal action on the ground that the right to engage in a profession was a property right of which he had been deprived under an unconstitutional statute.

The statute under attack provided in part as follows:

"*Sec. 58-1-5.* The functions of the Department of Registration shall be exercised by the director of registration under the supervision of the Commission . . . in collaboration with the assistance of representative committees of the several professions, trades (etc.) . . .

"*Sec. 58-1-7.* It shall be the duty of the . . . committees to submit to the director standards of qualification for their respective professions, trades . . . and methods of examination of applicants. They shall conduct examinations at the request of the director . . . (and) shall pass upon the qualifications of applicants . . . and shall submit in writing their findings and conclusions to the director.

"*Sec. 58-1-13.* The following functions and duties shall be . . . performed by the department of registration but only upon the action and report in writing of the appropriate representative committees:

"(1) Defining . . . what shall constitute a school, college (etc.), in good standing.

"(2) Establishing a standard of preliminary education deemed requisite to admission to any school, college or university.

"(3) Prescribing the standard of qualification requisite . . . before license shall issue.

"(4) Prescribing rules governing applications for licenses. . . .

"(5) Providing for a fair and wholly impartial method of examination. . . ."

The Court initially emphasized that it was within the police power of the state to establish reasonable standards which must be complied with as a prerequisite to engaging in a profession. The Court said:

"It has been recognized since time immemorial that there are some professions and occupations which require special skill, learning and experience with respect to which the public ordinarily does not have sufficient knowledge to determine the qualifications of the practitioner. The layman should be able to request such services with some degree of assurance that those holding themselves out to perform them are qualified to do so. For the purpose of protecting the health, safety and welfare of its citizens, it is within the police power of the state to establish reasonable standards to be complied with as a prerequisite to engaging in such pursuits. Architecture is recognized as one such occupation."

The plaintiff contended, however, that even if it be conceded that it is within the police power of the state to prescribe the standards of qualification, the statute in question was unconstitutional because it provided for the appointment of committees from the professions to establish standards of qualifications and to conduct examinations. The Court in rejecting this contention emphasized that the committee ultimately acted under the direction, control, and supervision of the appropriate administrative body which had the final authority. The Court said:

"In support of his first contention plaintiff points to the wording of the statute providing that the Department of Registration shall perform its duty, '*only* upon the action and report in writing of the appropriate representative committee' and reasons therefrom that the actual authority is reposed in the committee. A survey of the entire procedure set up by statute indicates that such is not the case. The Committee, at the request of the director, conducts the examination, making its report of the results thereof to him. If the report is satisfactory and other qualifications have been met, the duty then devolves upon the director to issue the license. He is appointed by and performs his duties under the supervision of the Commission of the Department of Business Regulation, which has final authority as to the carrying out of the functions of the Department."

The Court recognized the desirability of permitting each profession to collaborate with the administrative board in establishing appropriate standards.

The plaintiff also challenged validity of the statute on the ground that it prescribed no express or definite standards. The Court noted that the statute did contain certain basic qualifications relating to education, age, moral character, and the requirement of satisfactorily passing an examination and further emphasized that it would not be appropriate to require the legislature to set up something more than general standards. The Court, in concluding that the matters committed to the administrative board were proper, relied upon a decision of the United States Supreme Court *(Douglas* vs. *Noble)* in which Mr. Justice Brandeis in writing the opinion states:

"The statute provides that the examination shall be before a board of practicing dentists; the applicant must be a graduate of a reputable dental school; and that he must be of good moral character. Thus the general standard of fitness and the character and scope of the examination are clearly indicated. Whether the applicant possesses the qualifications inherent in that standard is a question of fact. . . . The decision of that fact involves ordinarily the determination of two subsidiary questions of fact. The first, what the knowledge and skill is which fits one to practice the profession. The second, whether the applicant possesses that knowledge and skill. The latter finding is necessarily an individual one. The former is ordinarily one of general application. Hence it can be embodied in rules. The legislature itself may make this finding of the facts general application, and by embodying it in the statute make it law. When it does so, the function of the examing board is limited to determining whether the applicant complies with the requirements so declared. But the legislature need not make this general finding. To determine the subjects of which one must have knowledge in order to be fit to practice dentistry; the extent of knowledge in each subject; the degree of skill requisite; and the procedure to be followed in conducting the examination; these are matters approximately committed to an administrative board. . . . And a legislature may, consistent with the Federal Constitution, delegate to such board the function of determining these things, as well as the functions of determining whether the applicant complies with the detailed standard of fitness."

Collaboration between the architectural profession and the administrative boards charged with the obligation of preparing standards for qualification for the practice of architecture is highly desirable. This is true not only from the viewpoint of maintaining proper and adequate standards but also from the viewpoint of the prestige and status of the architectural profession. Perhaps this association could lead to a further highly desirable association for enforcing the existing law—but that is another column.

Mechanical Engineering Critique *by William J. McGuinness*

P/A Office Practice *column on mechanical and electrical design and equipment, devoted this month to check lists for the planning of air conditioning.*

In their book, *Streamlined Specifications Standards, Volume 2, Mechanical and Electrical* (Reinhold, 1957), Louis Axelbank, engineer, and Ben John Small, architect, make the following statement: "Comfort air conditioning is still in a state of flux; consequently, year-round systems for large multistory buildings, with individual room control, do not lend themselves to any form of standardized specification writing. Of the major systems which have been developed since the end of World War II, for this type of building, no two can be considered sufficiently alike, except for the refrigeration cycle, to make a common descriptive specification of any practical value." This statement by these experts can be considered as an indication that if specifications vary, then the systems described must also vary. Usually the nature of the building and the needs of the owner will dictate the kind of system to be used. Often, more than one system may be suitable and a choice must be made. The engineer must choose the right method and develop it correctly. In this process, however, the architect should have a strong co-operating position, because of his concept of the final form of the structure and of the budget and wishes of the owner. Checking the final specification is hardly enough. The engineer's preliminary and periodic studies should be subject to his approval. The above statement of Axelbank and Small, which they apply to large, multistory buildings, applies with no less importance to residences or other structures. The architect might well make use of a check list in questioning the engineer's reasons for the choice of the system and of its component parts. The following outline is suggested. The criteria upon which the decisions must be based can be developed only by experience or by comparison of the project with other successful ventures.

1. ***Power Source.*** While electricity is very common, steam is sometimes used where it is available or can be purchased from steam generation and distributing companies in cities. Some of the units in the Air-Conditioned Village in Texas were operated by natural gas, very abundant in that area. Comparative studies of installation and operating costs are indicated. Cooling of the refrigerant can be by air, but this is usually practical only in plants of small capacity. Water is more generally chosen for this purpose. Cities set rather low limits on the amount of water that may be used, even if it is metered and paid for. Water may be re-used with only a very small loss, if cooling towers or evaporative condensers are employed. If ground water is available in sufficient quantities, it may be used for cooling and then be returned to the ground in a different location.

2. ***Type of Unit.*** Package units in quantity may be used to replace a conventional central-station plant. The units in dispersed locations may compete in installation cost with the central plant and also reduce the size and cost of ductwork. Sometimes their useful life is less than the central installation, but their use may reduce maintenance staff. One unit may be taken out for servicing without shutting down the entire system. Through-the-wall units seem to be favored in residential work and ceiling-hung horizontal units for industrial plants.

3. ***Air Distribution.*** A direct, ductless approach is possible. It may be appropriate in a factory where there is sufficient headroom for an adequate "throw" from individual units. For distribution to a more sensitive occupancy, and in cases where space is divided by floor-to-ceiling partitions, a system of supply and return ducts with well placed registers is desirable. A scheme which is gentler still is that of radiant cooling which may make use of either the floor or ceiling surface as a cooling panel. The air finally enters the room at a lower rate and with a smaller temperature differential. The usual method of introducing cool air below windows may be replaced by the use of ceiling diffusers, thus freeing the perimeter and the floor for a more flexible plan.

4. ***Conventional vs. High Air Velocity.*** In large multistory buildings, a central plant is often preferred. Air-handling equipment located in just a few spots instead of on every floor, contributes to economy. With conventional velocities the ducts become over-large for the resulting long runs. In these cases high velocity may be used, but space must be left for attenuation boxes at the terminal points in the system to slow the air down and to reduce sound. There are large savings in the material cost of ducts.

5. ***Heat Pump.*** Increasingly, where heating and cooling are both needed and are accomplished by an air system, the heat pump is becoming competitive. The sources of power are usually electricity and either air or water. Air-to-air systems are limited to use in warmer climates except where multiple-compression is employed. Water-to-air systems have a wider geographical scope, but depend on adequate water supply.

6. ***Ventilation.*** During the critical periods of cooling, a minimum of fresh air should be introduced, otherwise operating expenses go up. In the spring and fall it is sometimes possible to operate with 100 percent of fresh air and no cooling. If provisions are to be made for this condition, they should be planned early. An example of the use of fresh air for cooling is seen in the case of classrooms with glass to the sun. With outdoor temperature of about 50 F, room temperatures can rise well above a comfortable 70, due to the sun effect. Outdoor air at 50 can be used to offset this heat gain and return the room temperature to normal.

7. ***Duct Routing.*** Locations for main and branch distribution ducts should be chosen early and restudied as necessary. Difficulties arise at locations where ducts need to cross each other, resulting in inconveniently low ceilings.

8. ***Zoning and Controls.*** Operating economy and comfort result from zoning which activates or shuts down sections of the building, depending on their heat gains as set by sun or occupancy. Installation costs go up, however, when divisions are made in the duct systems and separate fans or motor-operated dampers must be provided. In public buildings, controls have to be sensitve to the changes which affect the comfort of occupants, and such controls should generally be beyond their reach. In dealing with tenants, it is often psychologically better to put the local variations of indoor climate under the control of those who will occupy the immediate space. In this way there is likely to be less criticism of the owner.

9. ***Effects of Planning.*** The engineer may be requested to make heat gain studies of a preliminary scheme and to make suggestions about shading, orientation, insulation, and other items which can affect installation and operating costs.

10. ***Comparisons*** can be made of the relative efficiency of installations in similar buildings. Records of previous jobs can be used to compare standard items—such as the number of sq ft of floor area accommodated by one ton of refrigeration and the cost of the air-conditioning installation per ton of refrigeration. Studies of the possible variations in installation cost and the corresponding operating costs may lead to some very important economic and design decisions.

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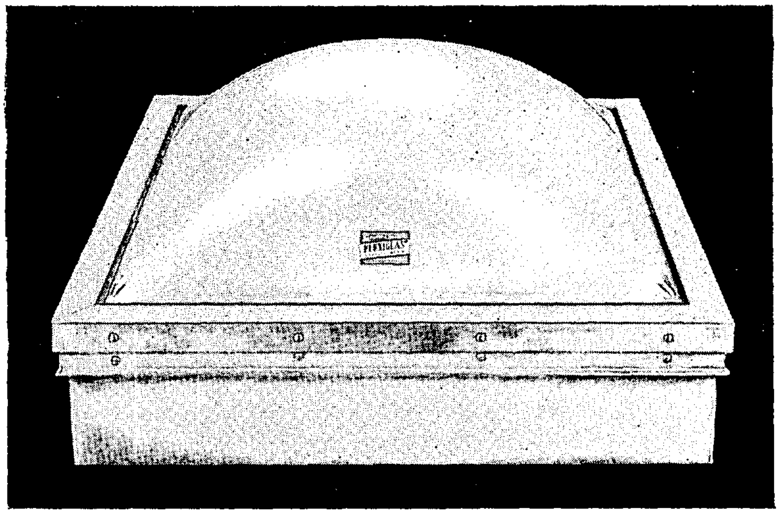

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Architect-Engineer Collaboration in Air-Conditioning Design

*by Rosario D'Agrosa**

P/A Office Practice ***article documenting, by a case study, the need for collaborative design effort by architect and engineer to achieve an air-conditioning system fully integrated with the architecture.***

In any structure there must be complete integration of architecture and mechanical equipment. This is particularly true in public buildings, where a pleasing appearance may pre-empt many other considerations.

Situations like this require a close co-ordination between the architect and the engineers concerned with design and installation of the mechanical equipment. Air conditioning often requires a great deal of specialized handling to achieve the desired ambient conditions, in co-ordination with both the exterior and interior architecture and decor.

Who, in this relationship, makes the primary, basic decisions which affect the ultimate comfort of the user of the building? Obviously, they must be joint decisions. The architect has the client's program to fulfill, and certain space requirements to meet. The engineer has the responsibility for designing an efficient and economical system which will integrate with the architectural concept, and therefore meet with the architect's approval. Under those circumstances, the architect must fully familiarize himself with the engineering problems—and solutions—and the engineer must fully understand—and work within—the architectural design, for the end result to be good.

Department stores are rather singular in this respect. By their very nature they consist of a number of segmentized areas, many of which require different handling for both cooling and heating. Further, a department store exists for only one purpose, to display and sell goods. The selling area must be kept to a maximum, while that devoted to mechanical services (no matter how essential) must be kept to a minimum, if not to absolute zero, by combining it with required structures and decorative treatments.

An outstanding example of the excellent results achieved by a mutually beneficial architect-engineer relationship is found in the Court House Square Development in Denver, Colorado. Here in the May D & F Department Store, Architects I. M. Pei & Associates, and Ketchum, Giná & Sharp, Associated Architects, and Consulting Engineers Jaros, Baum & Bolles have filled all the air-conditioning requirements of such a building with complete architectural integration.

The total Court House Square project consists of two city blocks of co-ordinated commercial development, including a hotel, a department store, an outdoor plaza and skating rink, and a three-level underground garage for parking 1500 cars. The plaza is an outdoor extension of both department store and hotel, and is suitable for promotional events. Department store and hotel are connected at the second floor by an outside bridge and also by the underground garage, served by elevators of both structures.

The department store building is set back from the street. Connecting it with this main shopping artery is an extension or "plaza" building, a single-story "glass box" with a reinforced-concrete roof in the shape of a hyperbolic paraboloid.

As mentioned earlier, the main integration problem in a department store is provision of the maximum possible sales space, unencumbered with confining walls and inflexible mechanical structures. The architect starts out with this foremost in his mind. The ideal basic structure then becomes an empty box with the desired number of levels, connected by stairs, escalators, and elevators. Some definite areas are then closed off for particular purposes, such as a beauty salon, rest rooms, employee work areas, executive offices, and other similar uses requiring privacy.

The engineer is left with very little in which to conceal his air-conditioning equipment and duct system. He has the wall, the ceiling, and the floor for ducts and the basement, roof or floor for his mechanical equipment. And for distribution between floors he has outside walls or the connecting cores of stairs and elevators.

These are the general problems. Further problems are the specific handling of areas with specific problems. For example, the beauty salon: a beauty salon is a source of excessive heat and humidity from washing and drying of hair, as well as heavy odors. Existence of such an establishment in a department store, as is true in the May D & F Store, necessitates special provisions above and beyond the normal system.

A similar problem to that of the beauty salon exists in the men's and women's clothing-alteration departments. Here pressing machines create a heavy burden of heat and humidity, although without the problem of abnormal odors.

Special provisions must also be made in air conditioning executive and general offices. As a rule, these offices are often in use beyond normal closing hours for the rest of the establishment. For reasons of economy, this may require an entirely separate air-conditioning system.

Many of these problems, while of main concern to the engineer, do not relate directly to the over-all problem. However, they are specific problems of department store air conditioning, and in that respect require some consideration in the architect-engineer integration.

The air-conditioning system for the May D & F Store in the Court House Square Development was designed by Jaros, Baum & Bolles for the maximum flexibility. There were several reasons

(Continued on page 10)

* *Ketchum & Sharp, Architects, New York*

Architect-Engineer Collaboration in Air-Conditioning Design

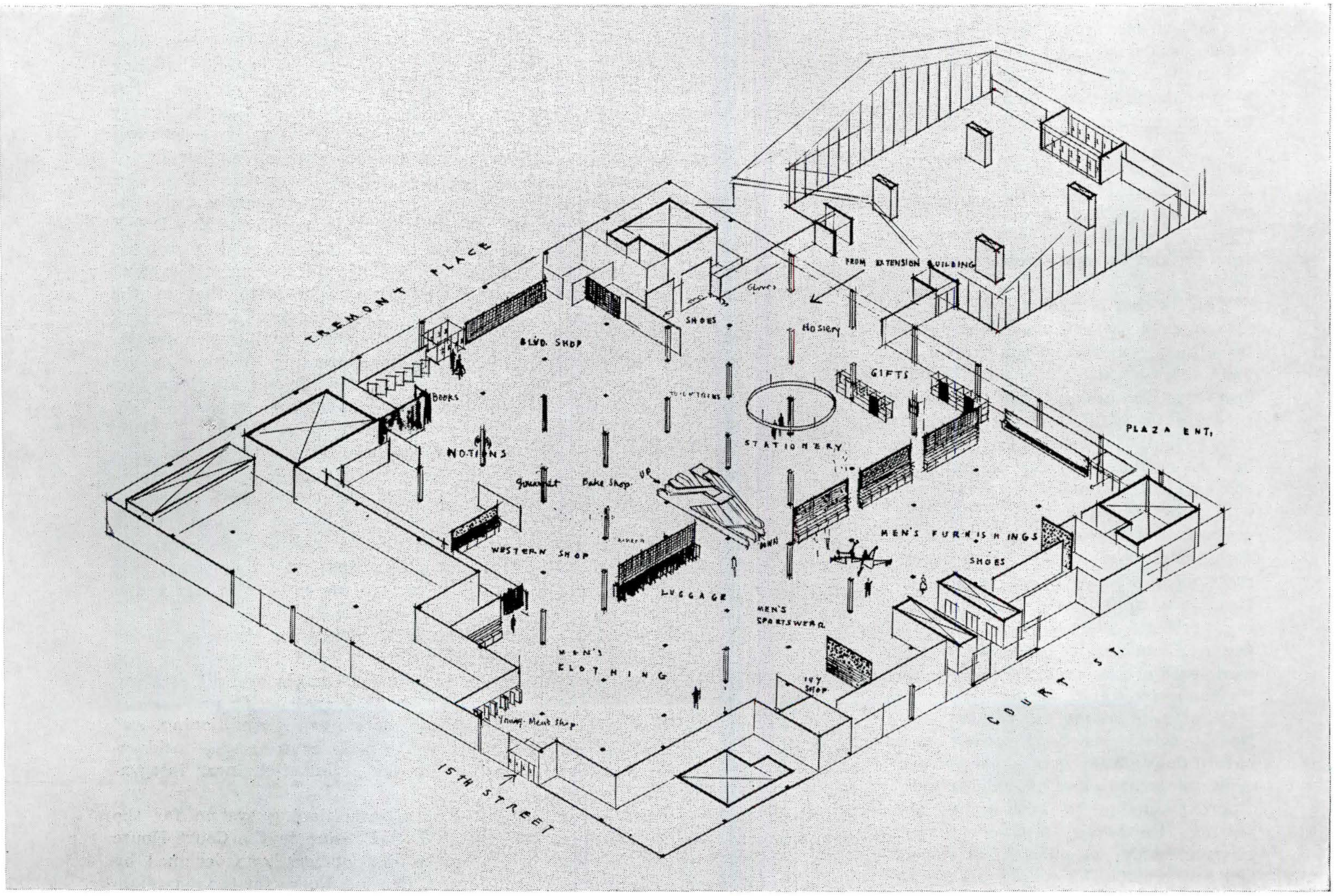
for this. These include the large size of the store (about 400,000 square feet of floor space), diversity of its operations as outlined above, and the changing population-density common to such establishments. Further, it was desired (for economy) to use the largest possible apparatus to eliminate duplication of basic components such as fans, motors, and temperature controls. The system also had to take advantage of Denver's low humidity, to minimize use of artificial refrigeration by passing air through a water spray whenever the weather permits.

To achieve these aims, the systems were designed in the following manner. The main store was divided for purposes of air conditioning into four quadrants, each approximately 133 feet on a side. A central station preconditions the air for delivery to a substation of that quadrant on each floor. This air is delivered through the four stair elements, which serve as a utility core for each quadrant. The substations consist of specially designed casings containing supplemental heating and cooling surfaces without fans.

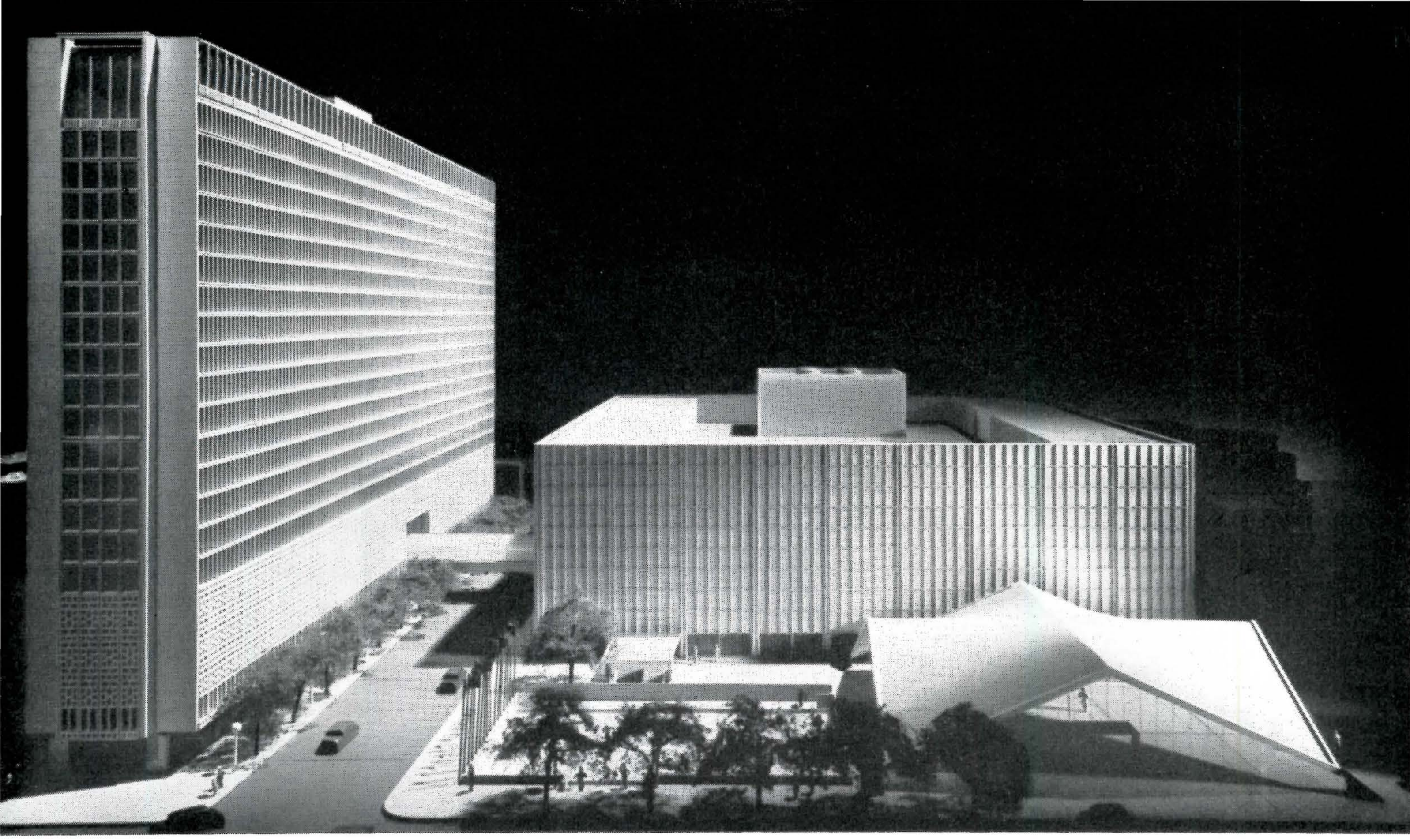
Air from the central station enters the substation and is cooled or heated to the temperature called for by the thermostat for the particular quadrant. A central absorption-type refrigeration plant, located on the first floor, cools the water supplied to the four central stations and their substations. Supplemental heating is supplied to the peripheral areas in close proximity to the outside windows and walls. This is accomplished by finned tube through which hot water circulates. The specialized areas, such as the beauty salon discussed earlier, are conditioned as required by the use of individual thermostats, and special ducts for delivery and return.

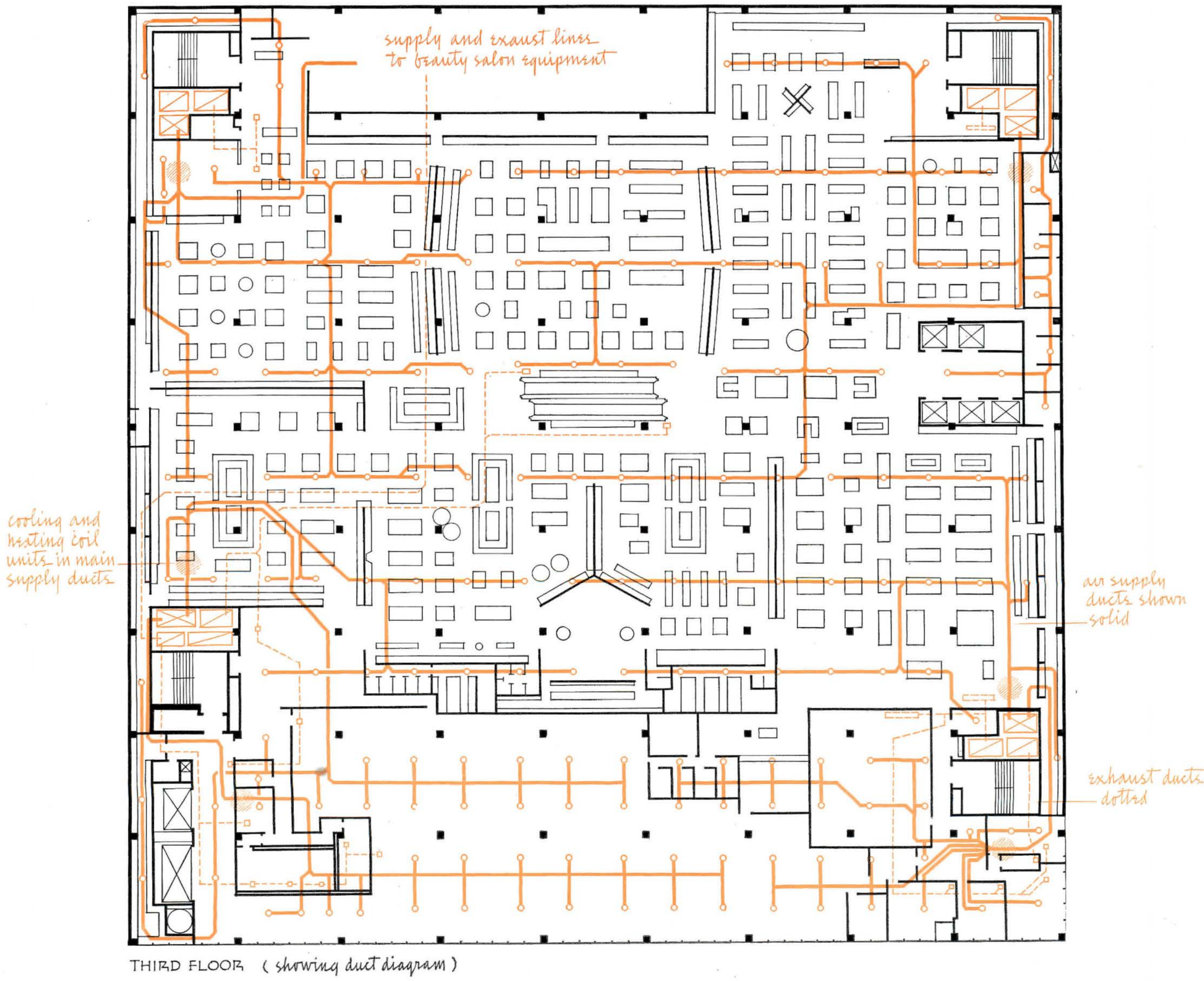
The extension or "plaza" building employs a novel air-conditioning system. This one-story building is air conditioned through use of restangular "fountains" that are spotted at four points on the floor. Conditioned air for

(Continued on page 13)



Isometric of first floor plan of main store building and extension Plaza Building (above) *showing use of stair elements as vertical distribution cores from which air tempered to special needs is distributed to four quadrants of main store, and four air "fountains" in Plaza Building. Plan of main store's third floor* (acrosspage, right) *shows dust distribution system in relation to fixture layout of that floor.*





THIRD FLOOR (showing duct diagram)

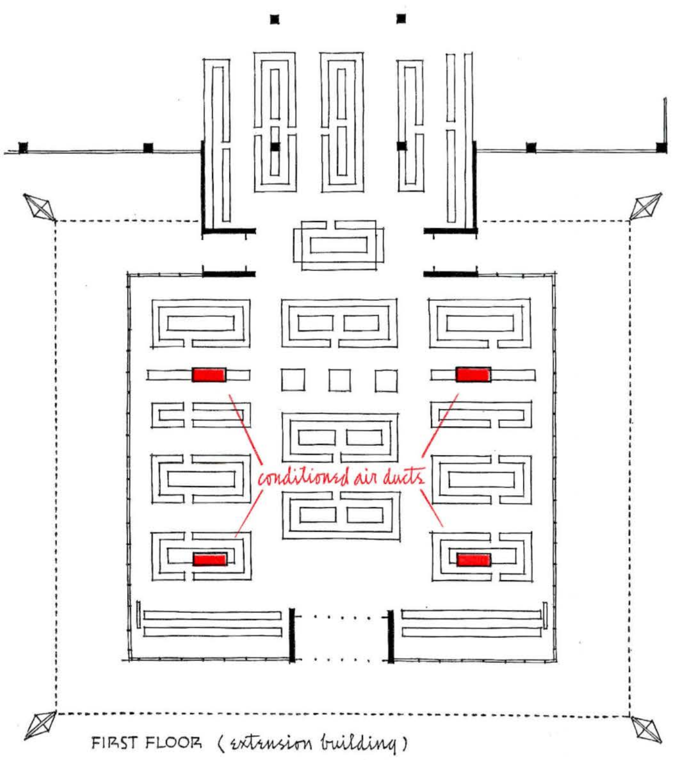
Architect-Engineer Collaboration in Air-Conditioning Design

these units is supplied from a system located in the main building through ducts running along the basement ceiling. Supplemental heating is supplied by baseboard convectors containing finned hot-water tube. This type of fountain supply was previously utilized, in the form of circular units, in the Transportation Building in the Mile-High Center, Denver.

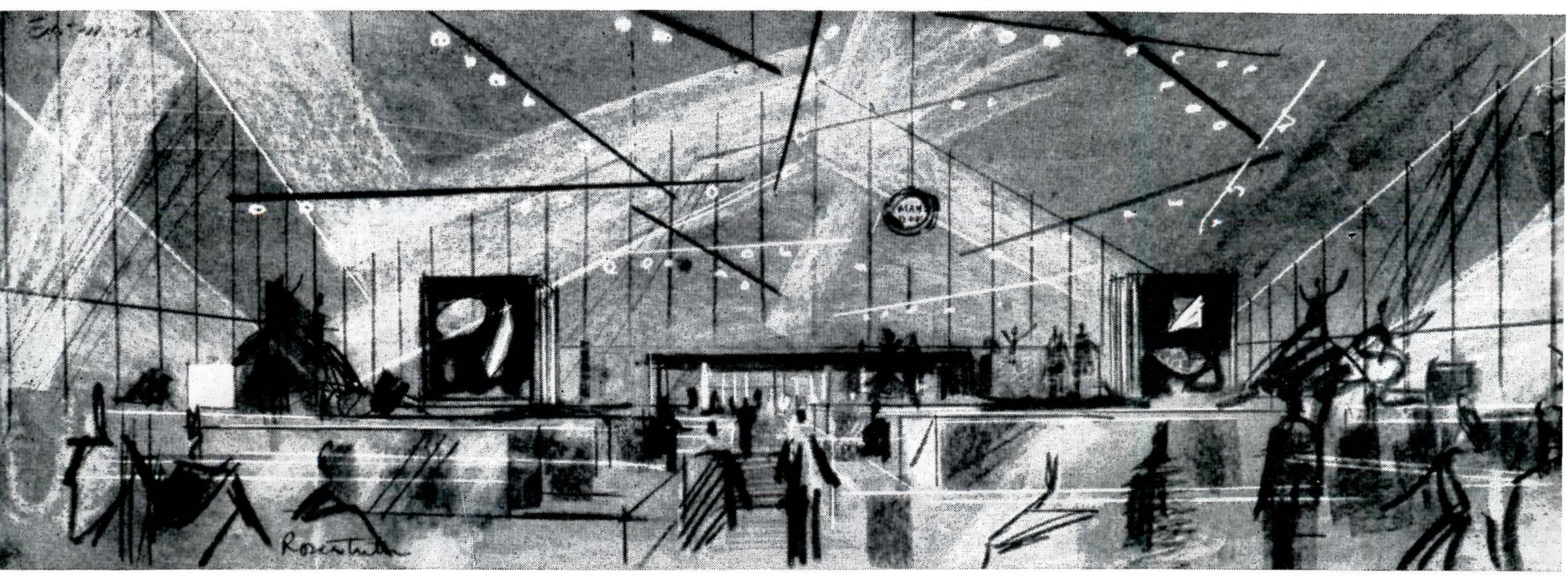
Architecturally, three types of space requirements exist for the air-conditioning system. These are the machinery spaces and the spaces for vertical and horizontal distribution. The architects employed two penthouses on the roof level, each running the full length of the building along two sides. The shaftways for vertical ducts and pipes were integrated within in the four stairway utility cores mentioned.

Horizontal distribution of mechanical service is in three ceiling layers, with the exception of the "plaza" building. This was necessary because the rib-type floor construction of the main building makes it impractical to set ducts between beams. As employed here, ducts are on top layers and lighting and sprinkler systems are below. The ducts are led to diffusers set into the ceiling tiles. Fibrous glass is used to insulate ducts. Ducts are made of galvanized sheet steel, with the exception of isolated instances where excessive moisture conditions, such as in pressing rooms, necessitated specifying aluminum ductwork.

Here, then, is an outstanding example of the value of integrated architectural-engineering design. Because of close collaboration from the early part of the job, an efficient air-conditioning result has been obtained in all parts of the store, smoothly integrated with the architectural space planning.



Air-conditioning "fountains" located at four points in extension Plaza Building are shown as red rectangles in plan (left) *and decorative elements rising above fixtures in perspective* (below). *Ingenious lighting system, as well as these air fountains, were designed in relation to hyperbolic-parabaloid roof.*



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Indexed in Art Index, Architectural Index.

REINHOLD

Chelazzi's "suspenarch" debated

Dear Editor: Paul Chelazzi's article "Axially-Stressed Wide-Span Structures" (DECEMBER 1957 P/A) presents the use of "suspenarch" systems for designs of wide-span structures. The posit is made that the mating of two established structural concepts—the arch and the suspension system—bred a "suspenarch" approach to design. It is assumed that the theory is applicable to the use of the several construction materials commonly employed. The structures must be properly shaped to follow pressure lines of carried load. Where possible, co-action is to exist between ribs or girders and the adjacent roof slabs.

No mention is made about deflection, which is an important detail in design of large-span cantilever roofs and other portions of the considered structures.

. . . The various included drawings, show possible combination for airplane hangars and other outline designs which are of current interest.

Designs based on ultimate load and on limit design are recommended to permit structural capacity beyond that allowed in our present codes. Such higher design stresses will allow increased spans or reduction in structural detail. However, there are many lines of thought on this matter, particularly so when slabs become reduced in thickness and the placing and spacing of reinforcing bars therein are difficult to maintain. Also, temperature differences will cause early cracking in the thin sections.

Chelazzi suggests that, beyond the elastic limit, construction materials have a strength reserve which should be used and which is accounted for in ultimate design and the limit design.

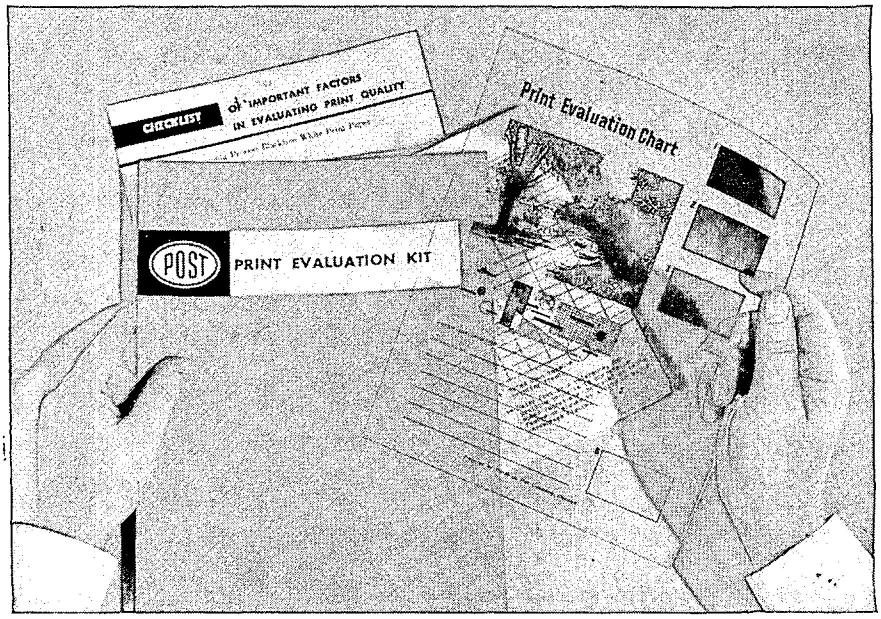
In Figure 4 is indicated a combination of a three-hinged arch and a suspension system. The assumption is made that one-half (½) of the gravity load is supported by the arch and the other one-half (½) of the load by the suspension system. Such assumptions produce reversed balancing of the horizontal components of thrust. The live loads will, in part, modify such reversed-balancing of thrust.

The article considers that the stresses beyond the elastic limit go into the plastic range and that, before failure, the stresses which have zero value at the neutral fibers become the highest stressed portion. The article further contends that a "hyperplastic" range of stress commences when the plastic range ends at appearance of initial cracking and is concluded just before collapse. These assumptions are subject to further tests on the several materials of construction. The problem involves the selection of design stresses by either the present specifications for working loads or the adoption of either ultimate design or limit design.

Of particular interest is the design shown in Figure 20, which could be applied for a hangar. The cables are supported on two central columns and connected to two twin arches. It is then assumed that the component systems become stressed evenly under loading. However, for partial loading the equality of loading between the component parts would be disturbed.

(Continued on page 18)

DRAFTING TRENDS



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p/a views

(Continued from page 17)

It is evident that the proposals by Chelazzi are not entirely applicable to designs by working-load formulas and that he bases his contention on the use of ultimate loads or limit design.

Chelazzi deserves commendation for his excellent exposition . . . we compliment your magazine for this presentation of current designs for wide span structures.

D. B. STEINMAN
Consulting Engineer
(Signed, Abraham Slavin)
New York, N. Y.

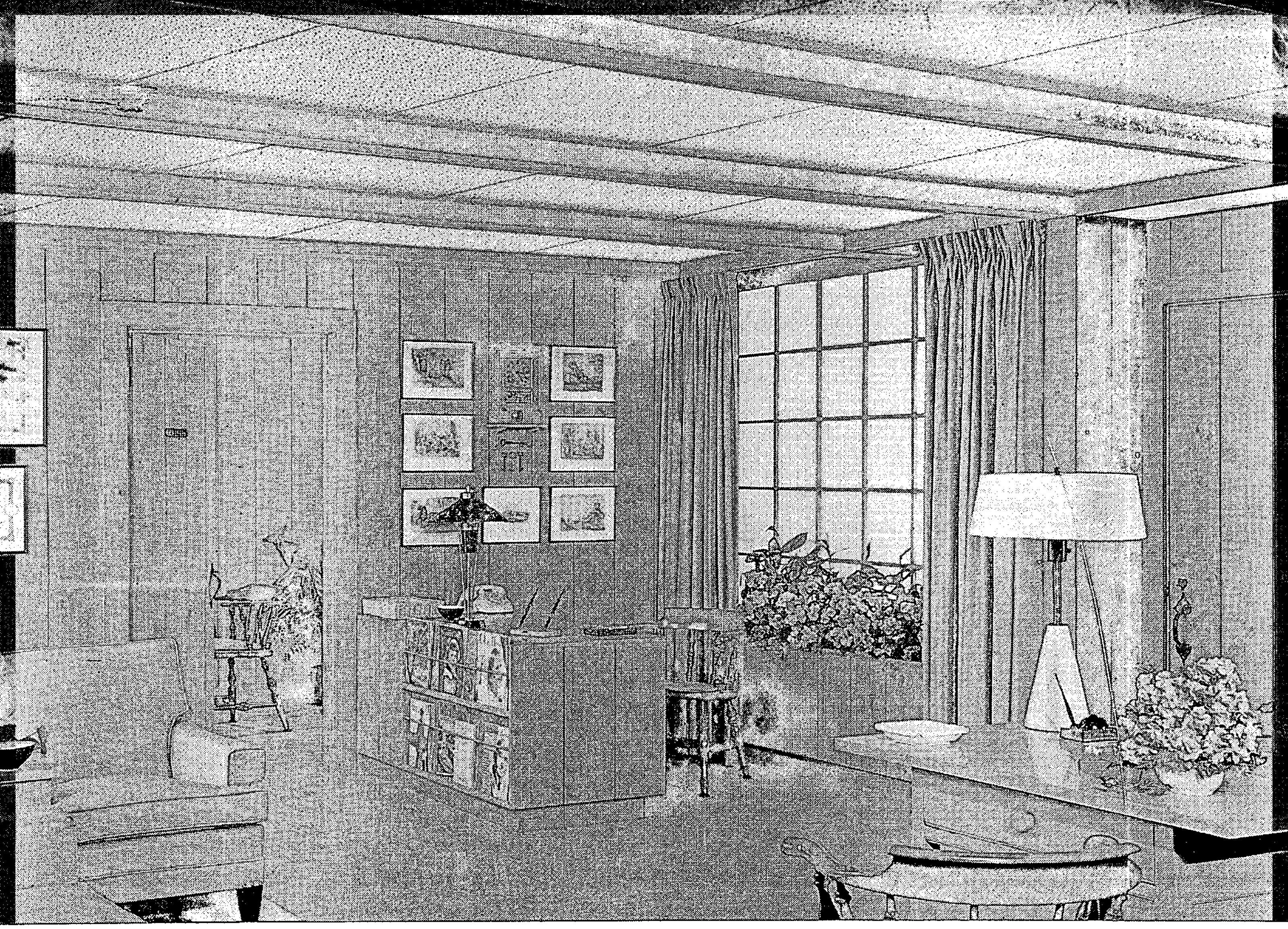
•

Dear Editor: In his article, Paul Chelazzi presents a third type of axially-loaded structure. Novel concepts which he discussed in earlier issues were tensioned membranes coacting with axially-loaded ribs, and the suspenarch. His latest article deals with various guyed and hung structures. Chelazzi's chief interest in this series seems to be the unique efficiency of axial stressing—each "fiber" in every section working at its fullest. Another kind of structure, however, continuous beams and frames, is enjoying an upgrading of its efficiency through wider acceptance of limit design. Such efficiency approaches that of axially-stressed members (to which limit design is not applicable). Since it appears that Chelazzi is pointing out this race for efficiency, it would be interesting if he could find a way to compare them numerically.

Chelazzi's purpose in writing so fully on the hypothetical "hyperplastic" stress range is not clear. It does not seem to be a useful range in building construction, as it commences at the point of actual destruction. Nor is its time factor clear.

Most of the structures illustrated are interesting and potentially useful. Yet they need a good deal of architectural attention and refinement to be made visually satisfying. It is hoped that Chelazzi can work

(Continued on page 20)



ere's a new, low-cost way to sound-condition light commercial structures. No suspended ceiling is required. No further acoustical installation is necessary.

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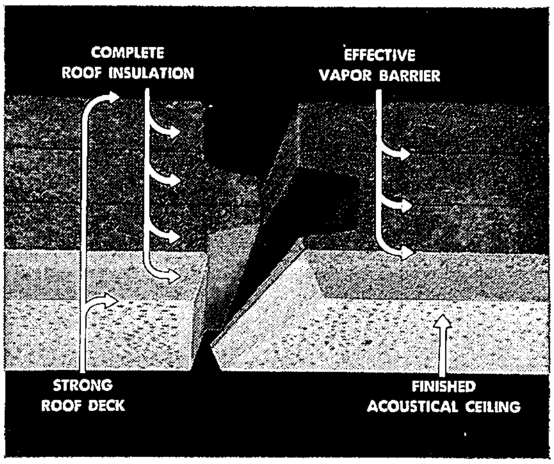

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(Continued from page 18)

with a sensitive designer and get some of these built.

There remains a way by which the efficiency of axialy-stressed structures can be increased: whereas Chelazzi's structures are stressed one-dimensionally, the use of two- or three-dimensional stresses would permit: (1) utilization of a material's ability to resist forces at a point in more than one direction; and (2) the use of limit design in rearranging plastic stresses to nearby material.

JOHN B. SHANNON
Child, Lawrence & Shannon, Architects
Boston, Mass.

•

Dear Editor: Paul Chelazzi's paper seems to contain some interesting layouts for wide-span roof structures. Under certain conditions, such designs can be economically built. It is my view, however, that the so-called "suspenarch" systems, are not, in a basic sense, a new type of design. I think the well-established forms of "tied-arch" and "self-anchored suspension bridges" have the same structural behavior as the systems described by the author.

In fact, the presence of one straight chord in the tied-arch and self-anchored suspension systems is a definite practical advantage over a layout with both chords curved. Only under special conditions is there any gain made by curving both chords. Some of Chelazzi's figures showing straight ties appear to be economical designs from a structural point of view, though they might not be architecturally desirable.

I think the author complicated the presentation of ultimate strength by trying to compare a simple formula for the load-carrying capacity of a rectangular section to Einstein's equation $E = mc^2$. Personally, I always prefer to describe statical relations in a simple manner so as not to mystify the issue.

T. Y. LIN
Professor of Civil Engineering
University of California
Berkeley, Calif.

•

Dear Editor: In this article, the author has again offered some thought-provoking ideas, with regard to both accepted structural forms and varied new approaches to old problems. His structual doctrine, that all parts of a member must work to maximum capacity and efficiency, is one which will of necessity be increasingly recognized by structural designers, whatever their specific approach may be.

In the discussion of simple beam behavior, I would disagree on the analysis of the death throes of a rupturing beam. True, cracks and other signs of imminent failure often appear in advance of total collapse; and these vary greatly with the type of material. I would identify them in some cases (especially in wood)

(Continued on page 22)

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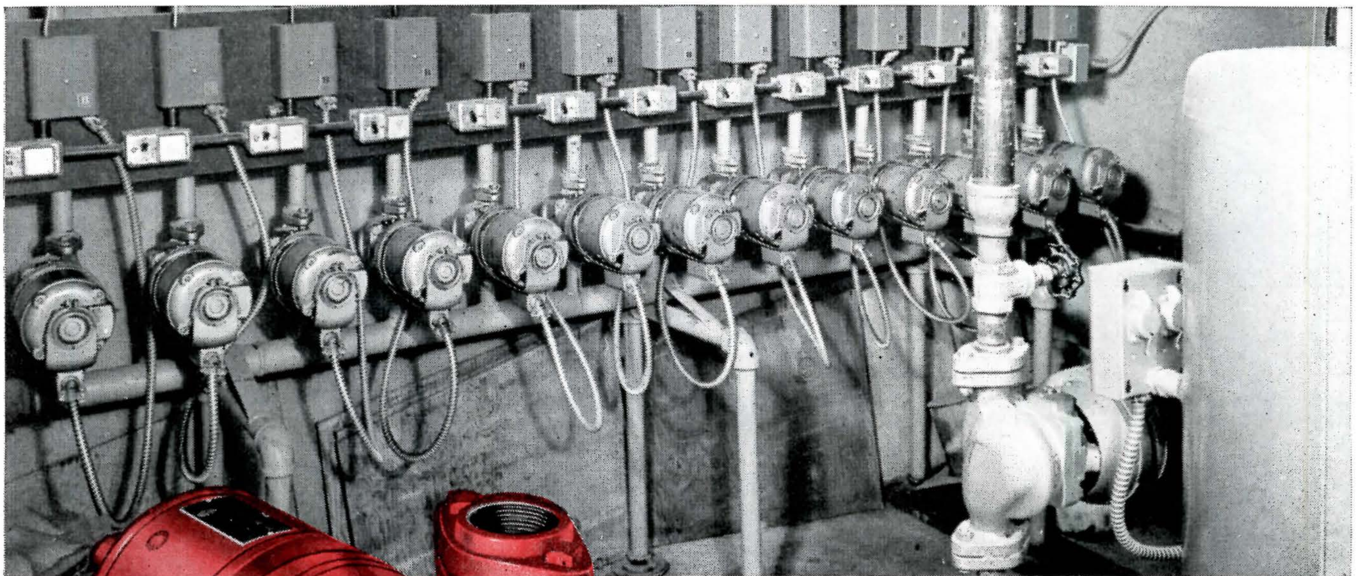

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p/a views

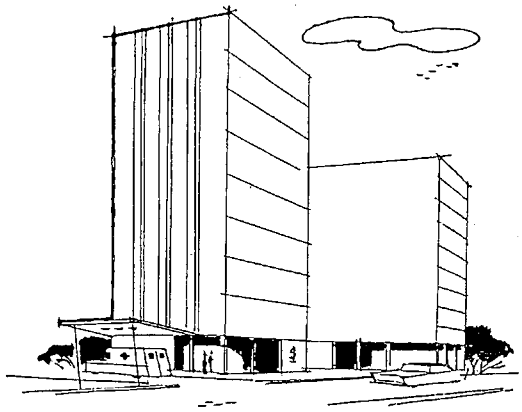
(Continued from page 20)

as failure of the weaker sections, which would fail before sufficient flexing occurred to permit a major resisting effort by the stronger portions of the beam. Another factor would be a consolidation or compaction of the compression fibers or particles, or "taking up the slack" in tension fibers. In a reinforced beam, stretching or minute slippage of reinforcing throws the center of compression resistance farther out, bringing into play the partial plasticizing which Chelazzi so lucidly illustrates, and thus by increasing the moment arm also increasing the beam strength. A third factor is the rate of failure, since some materials (most notably wood) display a great short-period strength, which would delay complete failure after some fibers had failed under long-period loading. Of course, in actual building structure, the beginning of failure in any member usually results in a shifting of some load to other members, due to normal inter-action of the members. Except for such factors, I find it difficut to believe that beam strength would be maintained by a partly fractured section.

In considering the suspenarch, one must realize that in its simplest form it is structurally unstable. In actual application the means of stabilizing it may be simple, and often are automatically provided by other parts of the structure, as indicated in several of the illustrations. The possible types of application would appear to be limited only by the designer's imagination. The *details* of application will also call for some imagination and ingenuity; and for a beginning, we must rely upon the suspension bridge designers. This should present no real problem; and I anticipate that much new and good will follow from this work.

Some confusion may result from the unorthodox use of "P" to designate ½ total uniform load. I feel that Equation 1 would be better

(Continued on page 26)



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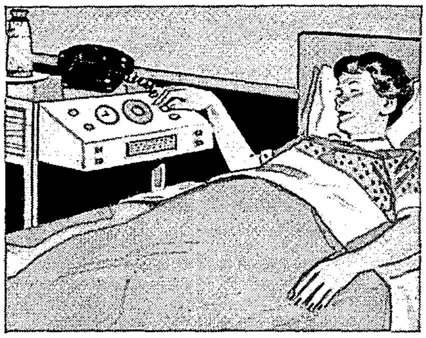

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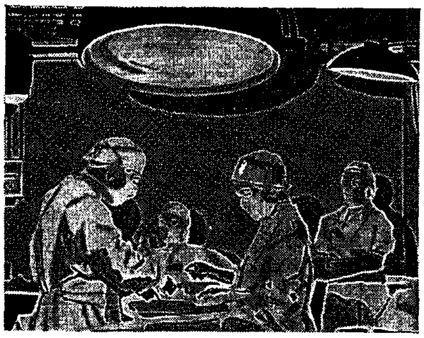

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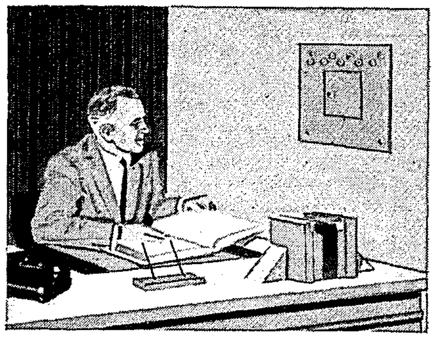

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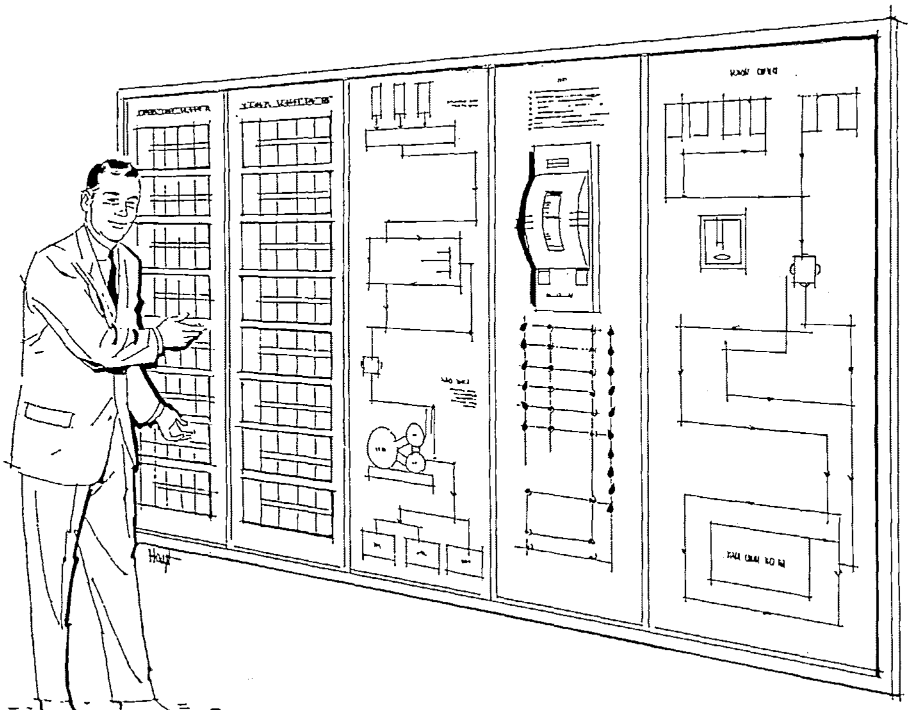

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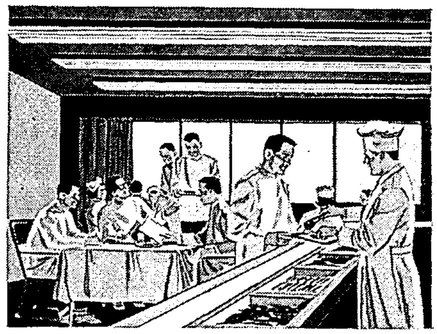

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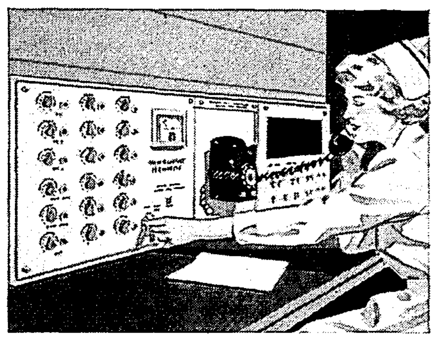

Centralized Remote Control and communication. A nurse can control temperature in sterile and other areas where control is undesirable for occupants, and can communicate with those areas through the same panel.

p/a views

(Continued from page 22)

accepted if stated as: $R1 = cd^2$.

KENNETH D. STORMENT, Architect
Spokane, Wash.

•

With reference to statements in my article regarding possible changes in the behavior of homogeneous-section beams after the first cracks have appeared due to loading, the following interpretation based on intuitive mechanics is submitted.

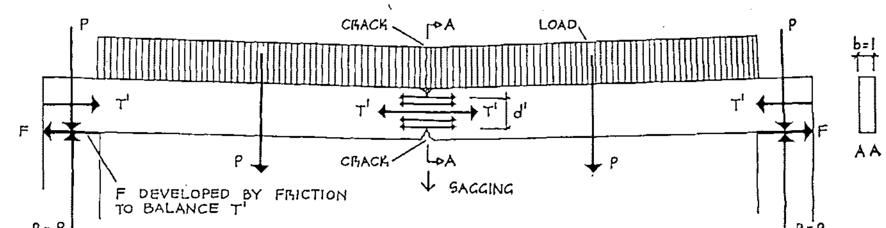

Figure 1 BEAM PERFORMING AS A TENSION MEMBER

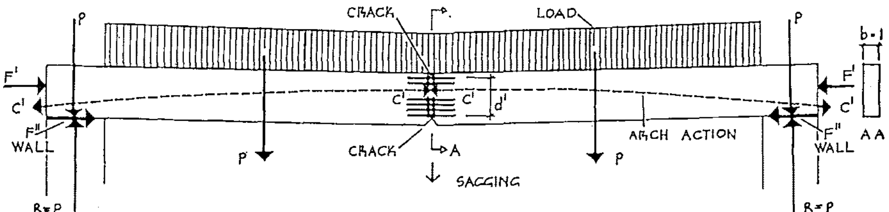

Figure 2 BEAM DEVELOPING ARCH ACTION

Rupture of top- and/or bottom-fiber layers causes sagging of the beam which, then, can no longer carry its load by bending resistance and acts either as a tension member (*Figure 1*) or develops arch action (*Figure 2*). In both cases, all unbroken fibers of the entire section, d′, become axially stressed in the same direction (compression or tension).

Thus, all fibers can contribute a full potential resistance which is considerably larger than the amount usuable in the preceding stage of resistance to bending when—due to the reversal of stressing within the section—only the upper half, d′/2, can work in compression and, similarly, the lower half, d′/2, in tension.

As shown (*Figure 1*), forces, F, balancing tension, T′, may be produced through friction on the support bearing area by P and R. Should arch action develop (*Figure 2*), reaction, F′, of the wall adjacent to the beam and/or frictional forces, F″, stabilize thrusts C′.

This visualization of the changes in behavior is validated, in my view, by concepts of the "economy of nature" philosophy from which the principles of least work was first developed by Menabrea (1858) and brilliantly elaborated by Castigliano (1875) and later applied by Frankel (1882).

It is interesting to observe that Nature ultimately provides extreme resistance in a partly-broken beam section by rendering it axially-stressed.

PAUL CHELAZZI,
New York, N. Y.

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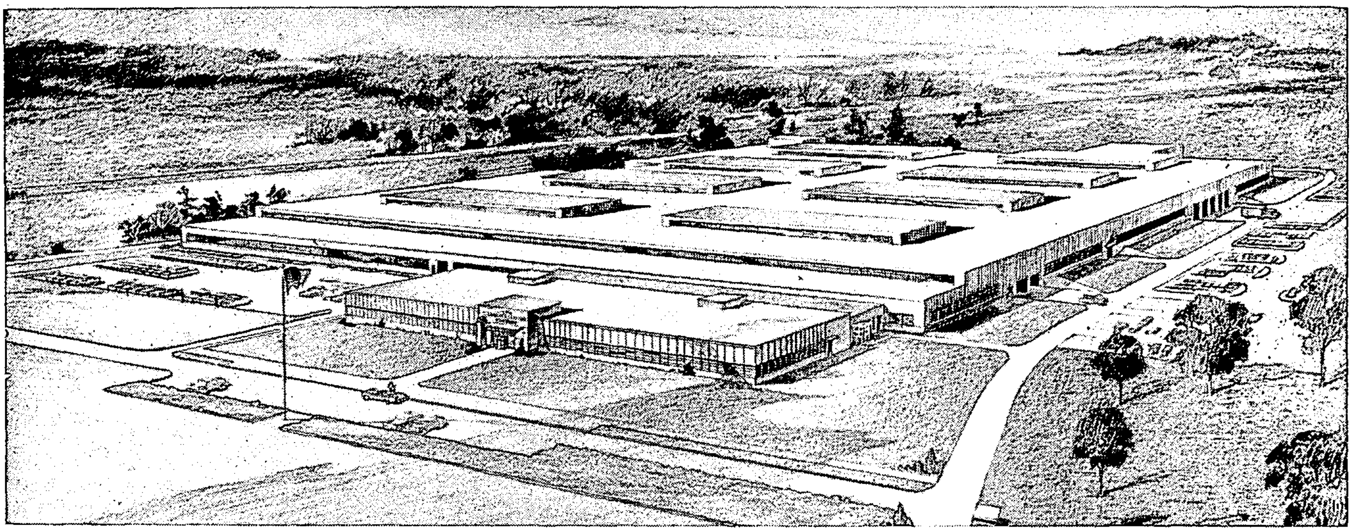

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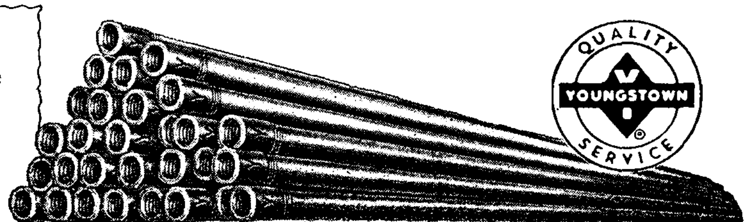

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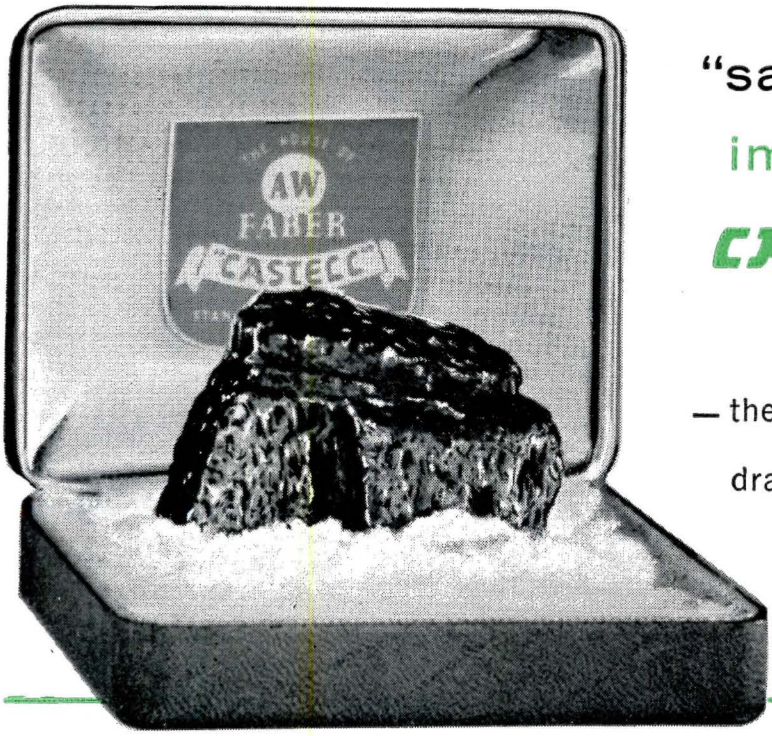

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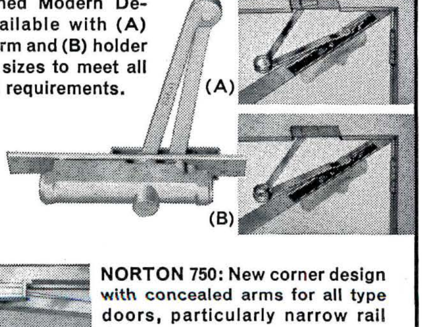

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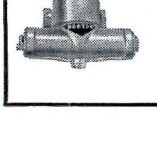

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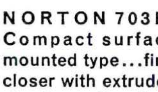

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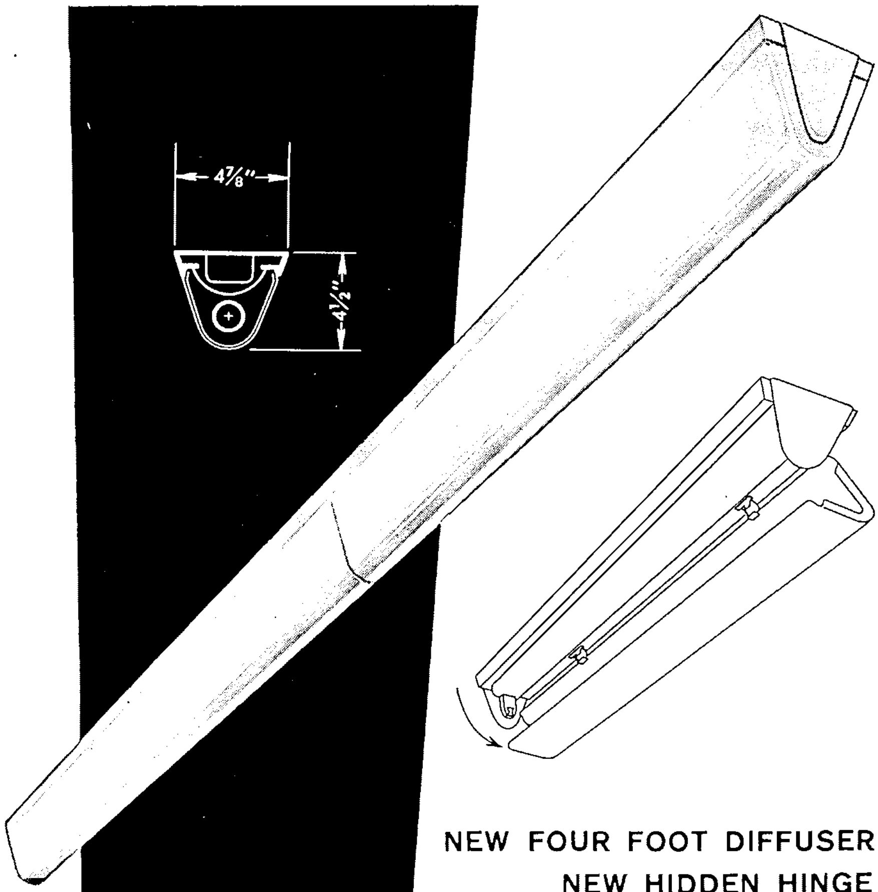

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Baton Rouge:
Electrical Wholesalers
New Orleans:
Interstate Elec. Co.
MAINE
Bangor: Standard Elec. Co.
MARYLAND
Baltimore:
Atlantic Illuminating Co.
MASSACHUSETTS
Boston:
Mass. Gas & Elec. Light Co.
Henry L. Wolfers Inc.
Fitchburg:
Service Elec. Sup. Co.
Pittsfield: Carr Supply
Springfield:
Eastern Elec. Sup.
Worcester:
Atlantic Elec. Sup.
Benjamin Elec. Sup.
MICHIGAN
Detroit:
Madison Elec. Co.
Michigan Chandelier Co.
Flint: Royalite Co.
Grand Rapids:
Purchase Elec. Sup. Co.
Pontiac:
Standard Elec. Co.
Saginaw: Standard Elec.
MINNESOTA
Duluth:
Northern Elec. Sup. Co.
Minneapolis:
Charles A. Anderson & Co.
Northland Elec. Sup. Co.
St. Paul: Lax Elec. Co.
MISSOURI
St. Louis: M. K. Clark
NEBRASKA
Omaha:
Electric Fix. & Sup. Co.
NEVADA
Reno:
Western Elec. Dists. Co.
NEW HAMPSHIRE
Portsmouth:
Mass. Gas & Elec. Light Co.
NEW JERSEY
Atlantic City:
Franklin Elec. Sup. Co.
Camden:
Camden Elec. Fix. Co.
NEW YORK
Albany:
Havens Elec. Co. Inc
Binghamton:
Freije Elec. Sup. Co.
Buffalo:
Buffalo Incan. Light Co. Inc.
Niagara Falls:
Hysen Sup. Co.
Poughkeepsie:
Electra Sup. Co.
Rochester:
Rowe Electric Sup. Co.
Syracuse: Superior Elec.
NORTH CAROLINA
Charlotte:
Independent Elec. Sup.
Durham: Noland Co.
Greensboro:
Elec. Sup. & Equip. Co.
Kinston: Kinston Elec.
Winston-Salem:
Noland Co.
OHIO
Akron:
The Sacks Elec. Sup. Co.
Canton: The Electric Sales
Cincinnati: B. & B. Elec.
Cleveland: H. Leff Electric
Columbus:
Elgee Elec. Co.
The Loeb Elec. Co.
Dayton: Martin Elec. Co.
Toledo: Gross Elec.
Youngstown:
Mart Industries
OKLAHOMA
Tulsa: Lawson Elec. Co.
PENNSYLVANIA
Allentown:
Coleman Elec. Co.
Erie: Kraus Elec. Co.
Harrisburg:
Fluorescent Sup. Co.
Hazleton:
Power Elec. Co. Inc.
New Castle:
Midwestern Elec. Co.
Philadelphia:
Ace Lighting Fix. Co.
Gold Seal Elec. Sup. Co.
Sylvan Elec. Fix. Co.
Pittsburgh:
Allied Elec. Sup. Co.
Argo-Lite Studios
Doubleday-Hill Elec. Co.
Wally Elec. Sup. Co.
Reading: Coleman Elec. Co.
Scranton: Lewis & Reif
Wilkes-Barre:
Anthracite Elec. Sup. Co.
RHODE ISLAND
Pawtucket:
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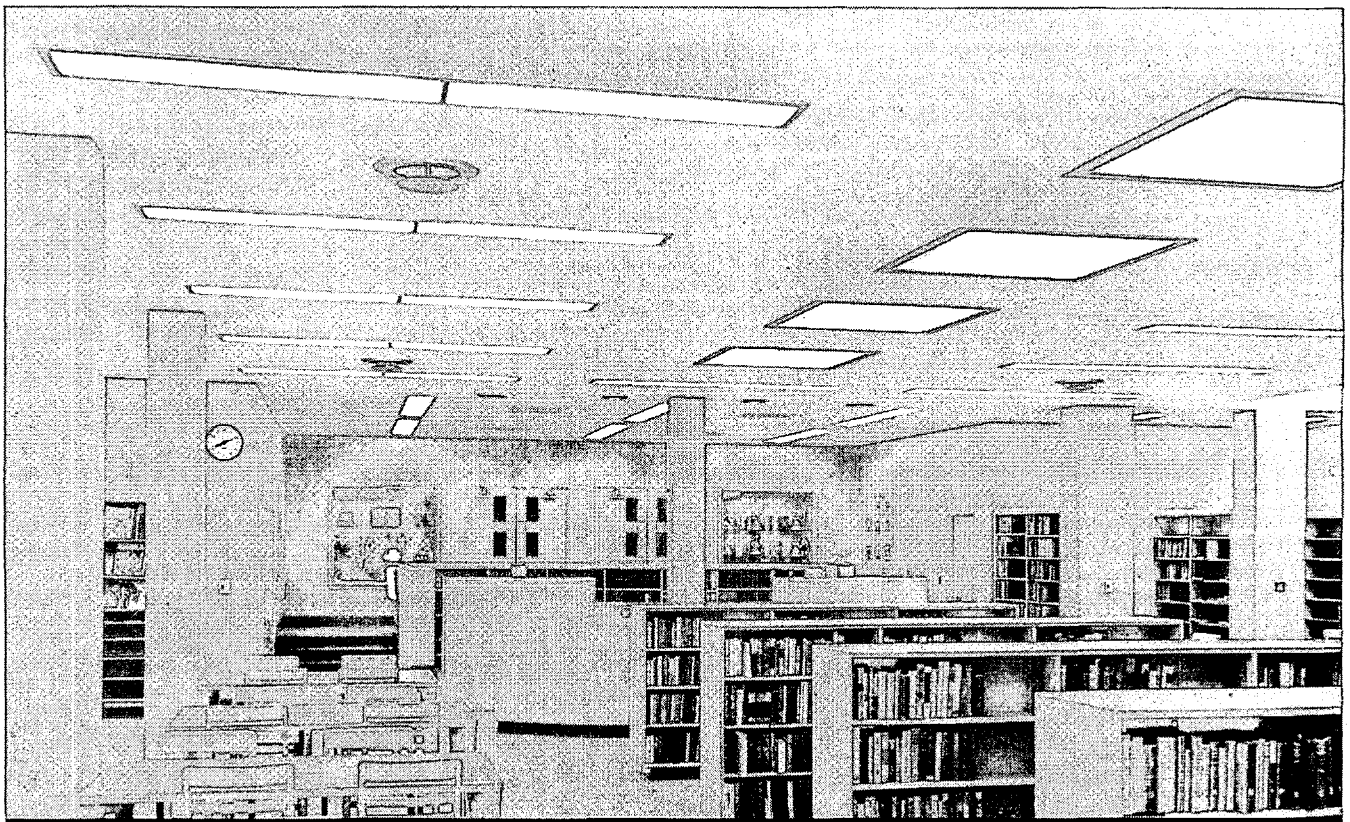
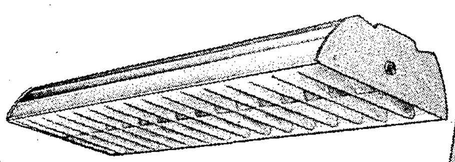
Leavitt Colson Co.
SOUTH CAROLINA
Anderson:
Sullivan Hdwe. Co.
Columbia:
Capitol Elec. Sup. Co.
Noland Co.
Greenville:
Sullivan Hdwe. Co.
SOUTH DAKOTA
Watertown:
J. H. Larson Elec. Co.
TENNESSEE
Johnson City: Noland Co.
Nashville:
Nashville Elec. Sup. Co.
TEXAS
Dallas: Rogers Elec. Sup.
Ft. Worth:
Anderson Fixture Co.
Houston:
Marlin Associates
San Antonio:
Southern Equip. Co.
VIRGINIA
Arlington-Rosslyn:
Noland Co.
Lynchburg:
Mid State Elec. Sup. Inc.
Norfolk: Noland Co.
Roanoke: Noland Co.
WEST VIRGINIA
Charleston:
Goldfarb Elec. Sup. Co.
Virginian Electric Inc.
Huntington:
West Virginia Elec. Co.
Wheeling: The Front Co.
WISCONSIN
Appleton:
Moe Bros. Northern Co.
Eau Claire:
W. H. Hobbs Sup. Co.
Milwaukee:
Lappin Elec. Co.
Standard Elec. Sup.
WASHINGTON
Seattle:
Seattle Lighting Fix. Co.
ALASKA—*Anchorage:*
Northern Supply Co.
CANADA
Montreal:
The Gray Elec. Co.
Toronto:
Revere Elec. Dist.
Toronto Elec. Sup. Co.
HAWAII
Honolulu:
Hawaiian Light. & Sup. Co.

Visioneers...and how they help young minds mature



Curtis Eye-Comfort Louvered Troffers and Sky-Lux Luminaires provide well diffused high-level illumination, pleasant, comfortable atmosphere at Hopkins High School library, Hopkins, Minn. Architect, Bissell & Belair; Engineer: G. M. Orr Engineering Co.

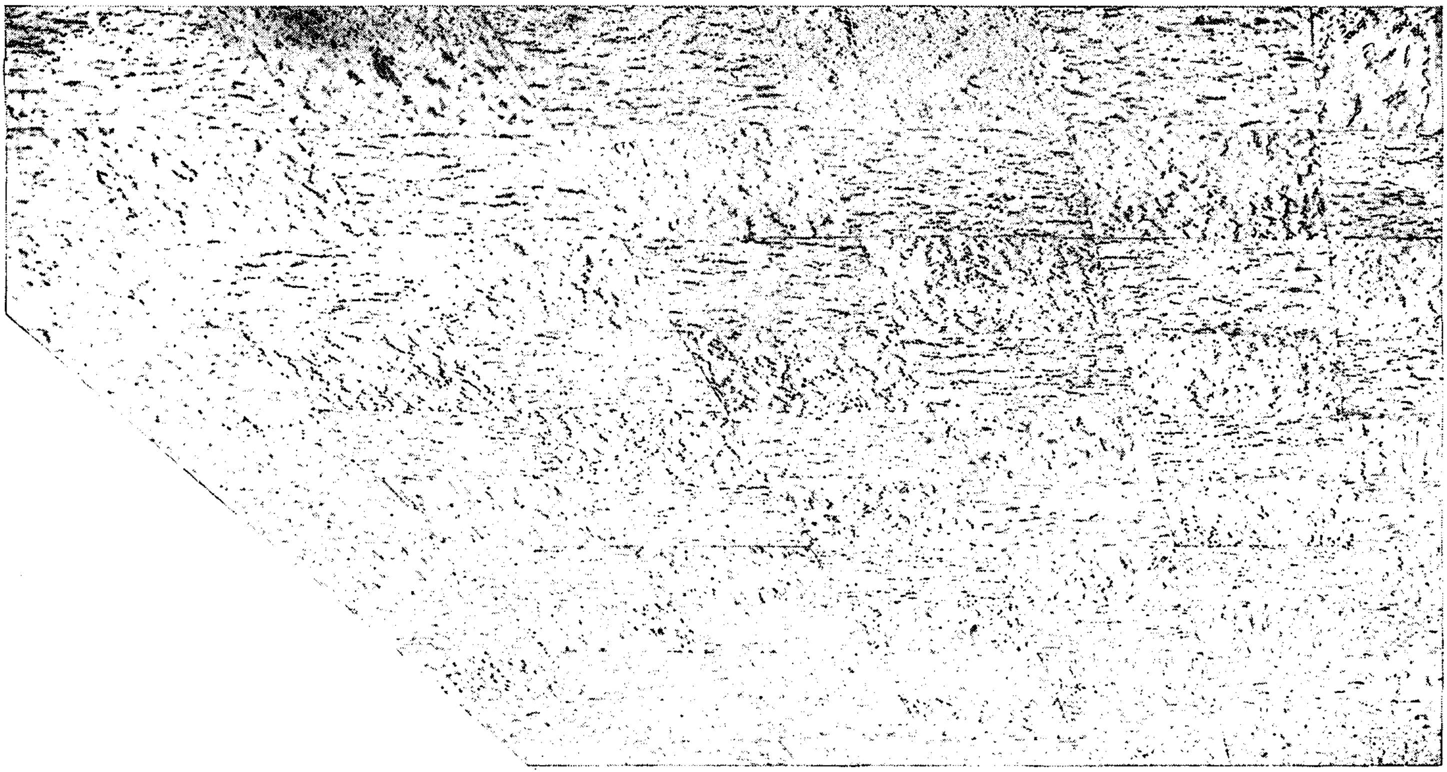


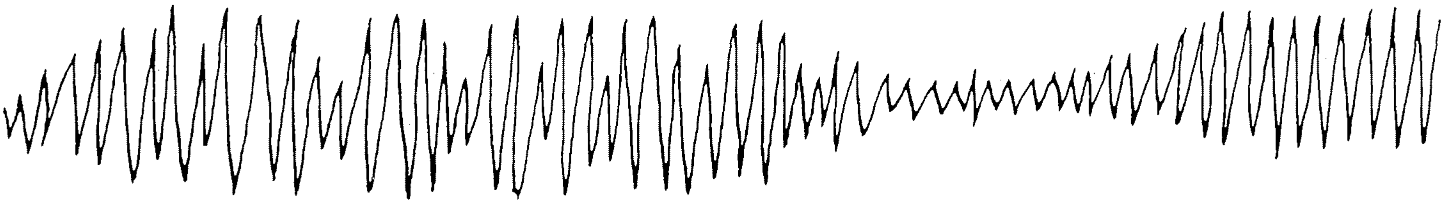
CURTIS FORTY-SIXTY SERIES LUMINAIRES are available louvered or unlouvered in either Alzak Aluminum or white Fluracite Enamel finish. Low-brightness blends with illuminated ceiling for high levels of illumination without glare.

Curtis Planned Lighting opens eyes to knowledge

In the process of learning, young people remember what they *see* much longer than what they hear. Recognizing this fact, school administrators value the importance of providing sufficient light for visual acuity in close classroom work, as well as other activities. Result: an ever-increasing demand for Curtis Planned Lighting Systems. Only natural, because Curtis Visioneers have made detailed and scientific studies of lighting problems inherent to schools. All Curtis school lighting—properly installed—offers uniform level of illumination without objectionable shadows or glare. Curtis Lighting also meets all requirements for *quality illumination . . . low initial cost . . . quick and easy installation . . . minimum maintenance . . . long-run economy*. So, whatever your lighting problem, write today for the name and address of the Curtis Visioneer in the principal city nearest you. Curtis Lighting, Inc., 6135 West 65th St., Chicago 38, Ill. In Canada: 195 Wicksteed Ave., Toronto 17, Canada.

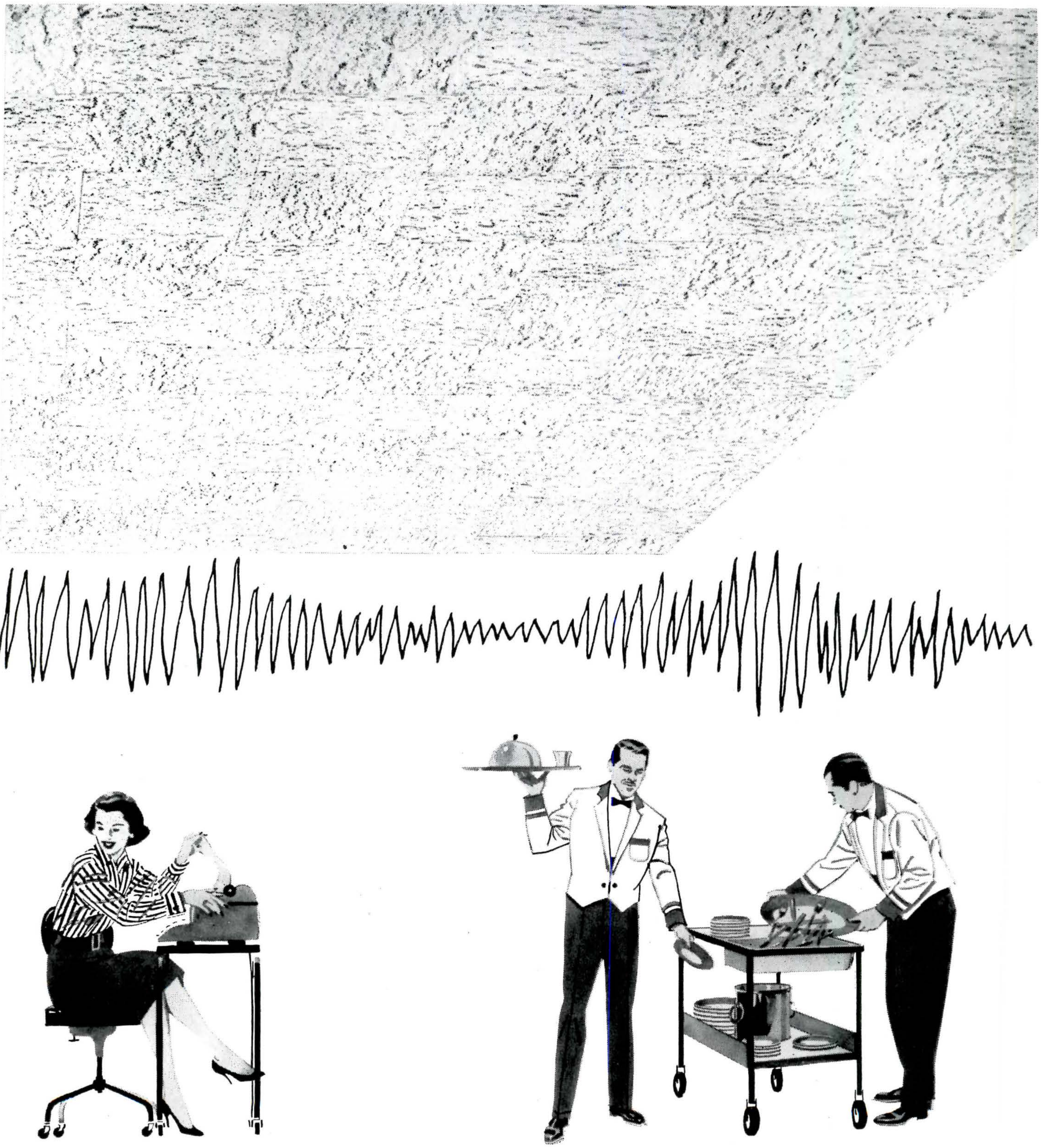
CURTIS
Visioneers in Planned Lighting





Gold Bond Travacoustic—where noise is a

Gold Bond Travacoustic—the Aristocrat of Acoustical Ceiling Tiles—is designed to help you build beauty and quiet into offices, hotels, hospitals, schools, restaurants and fine homes.



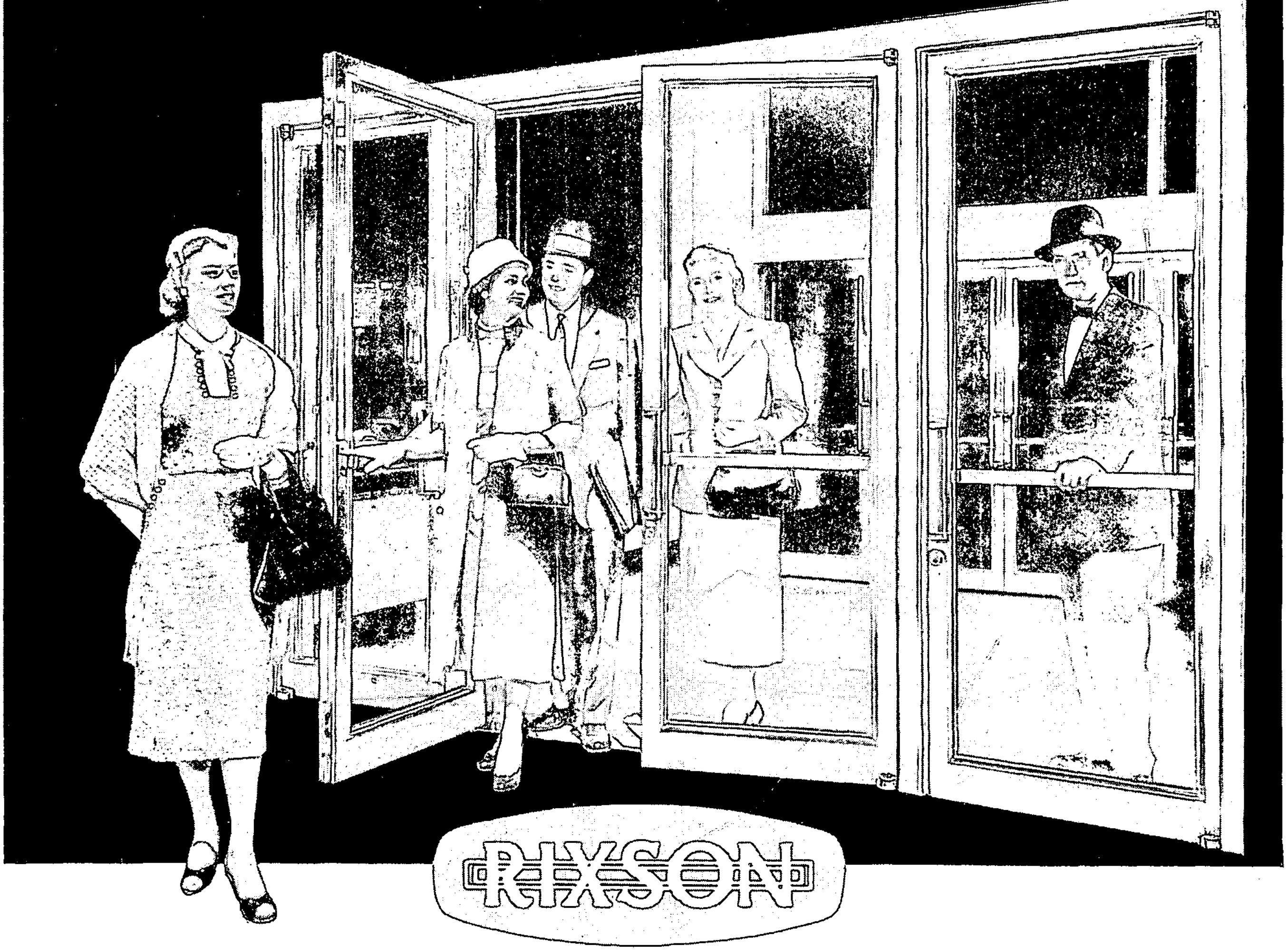
problem, and beauty counts

Quite frankly, there are less expensive ways to sound condition. There is no more handsome way. Gold Bond® Travacoustic absorbs up to 80% of all the noise that strikes it—and it gives ceilings the softly-fissured beauty of natural travertine stone. Travacoustic is fireproof... made from mineral fibers, it *can't* burn. And the clean, white surface provides high, glare-free light reflection (81%). Easily vacuum-cleaned... or repainted. May we send you Technical Bulletin No. 348 and samples? Write National Gypsum Company, Dept. PA-38, Buffalo 2, N.Y.

Gold Bond
BUILDING PRODUCTS

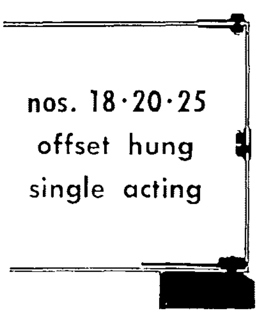
NATIONAL GYPSUM COMPANY

for the MODERN ENTRANCE

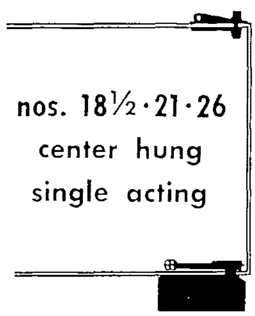


oncealed floor type door closers

4 basic styles in a variety of sizes and types to meet every installation requirement

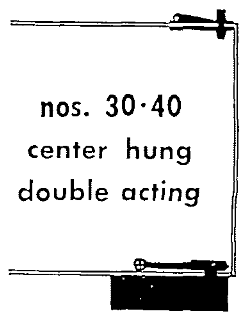


Allow full unobstructed door opening space and wide door swing to 180°. Has arm locking device for vertical adjustment of door.



Hanging hardware completely concealed. Ideal for batteries of doors. Require no mullions allowing greatest open entrance area.

For installations where it is desirable to have door hung independently from closer. RIXSON ball hinges with vertical adjustment recommended.



For doors that swing both in and out. Each swing separately adjustable to local wind and draft conditions. Completely concealed.

write for complete information and templates

THE OSCAR C. RIXSON COMPANY / *originators of the checking floor hinge*

9100 w. belmont ave. • franklin park, ill.

CANADIAN PLANT: 43 racine road • rexdale, ontario

take advantage of the modern use of marble

as a curtain wall

The increasing use of thin marble is brightening the skyline of America's cities. This is particularly true when facades are White Georgia, for this clear, sparkling marble is in great demand wherever distinguished beauty is sought. This is but one of more than thirty varieties of marble and limestone produced by one source—The Georgia Marble Company.

For information on marble curtain walls, write: General Sales Office, The Georgia Marble Co., 11 Pryor St., S.W., Atlanta 3, Georgia.

as roofing

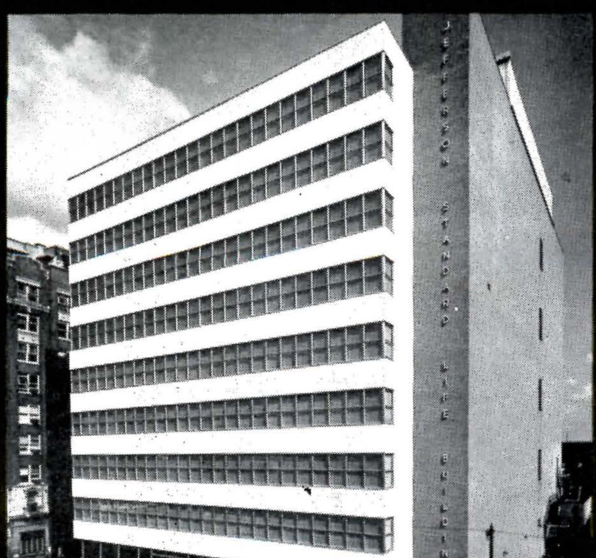
WHITE TOP Marble Chips offer you far more than gleaming white beauty. It has the highest reflective value of any roofing material. And the lowest absorption. Interiors will be many degrees cooler—air conditioning costs will be cut. Permanent, too. There's nothing to lift, to tear or rot. Rain only washes it clean. Cost? Little if any more than ordinary roofing materials.

For information on White Top Marble Chips, write: Calcium Products Division, The Georgia Marble Company, Tate, Georgia.

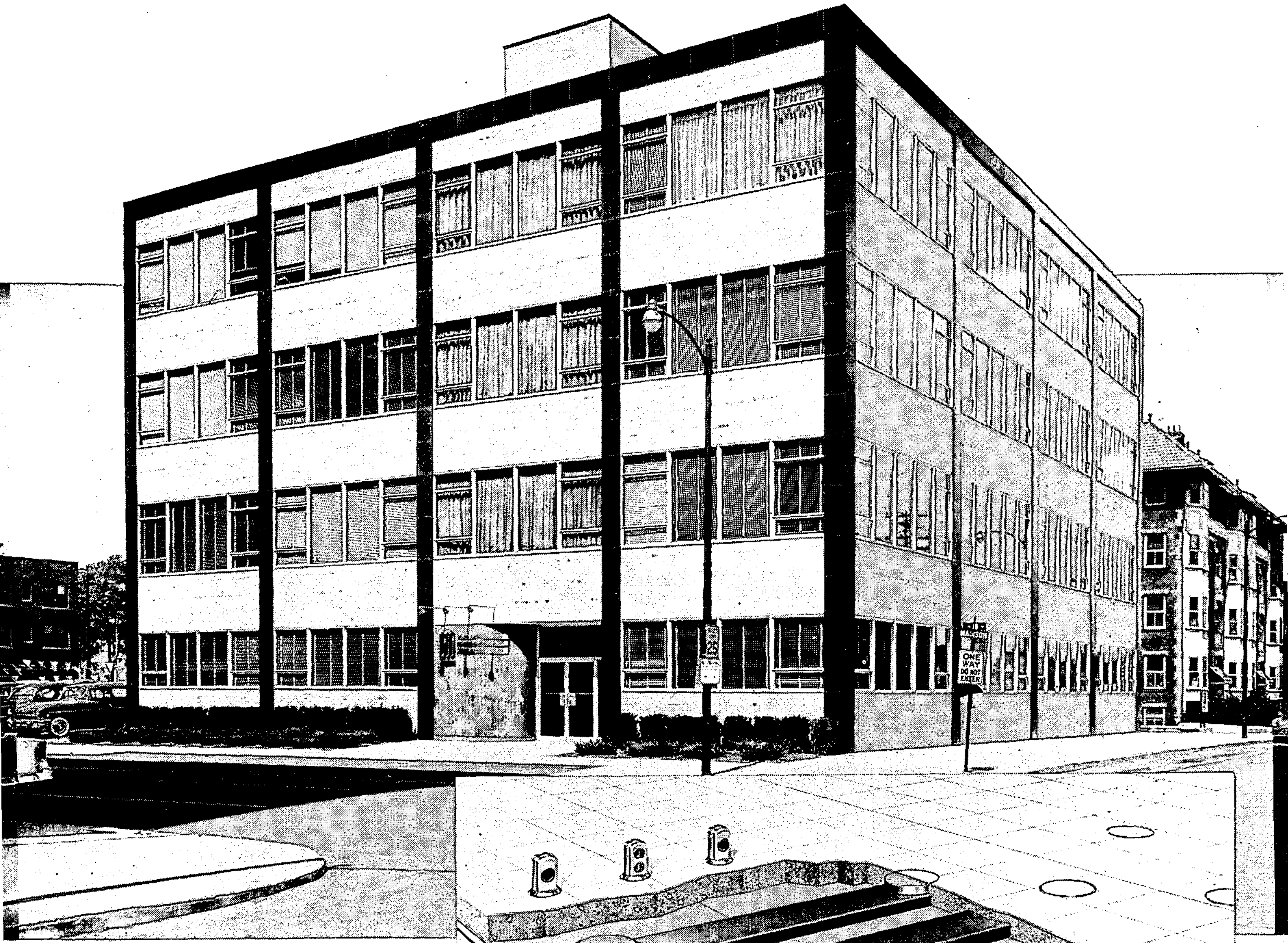
The GEORGIA MARBLE Co.

REG. U. S. PAT. OFF.

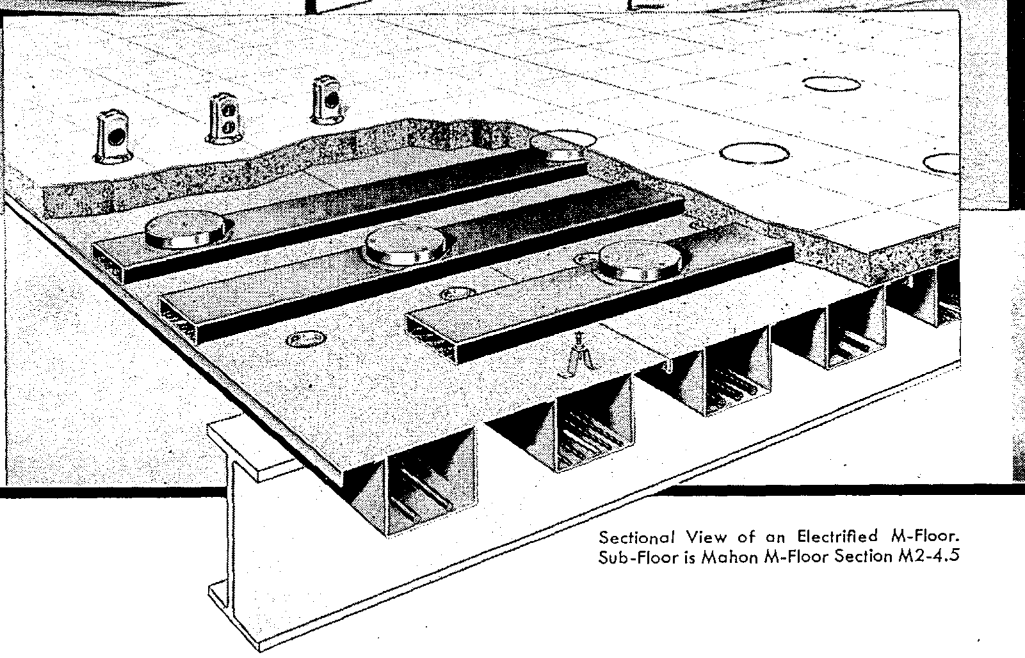
world's largest producer of marble & limestone



Mahon M-FLOORS Give You



Mahon M-Floor Construction was employed throughout in this Modern Office Building for the Manhattan Building Company, Toledo, Ohio. Bellman, Gillett & Richards, Architects. Geo. W. Lathrop & Sons, Inc., Gen. Contrs.



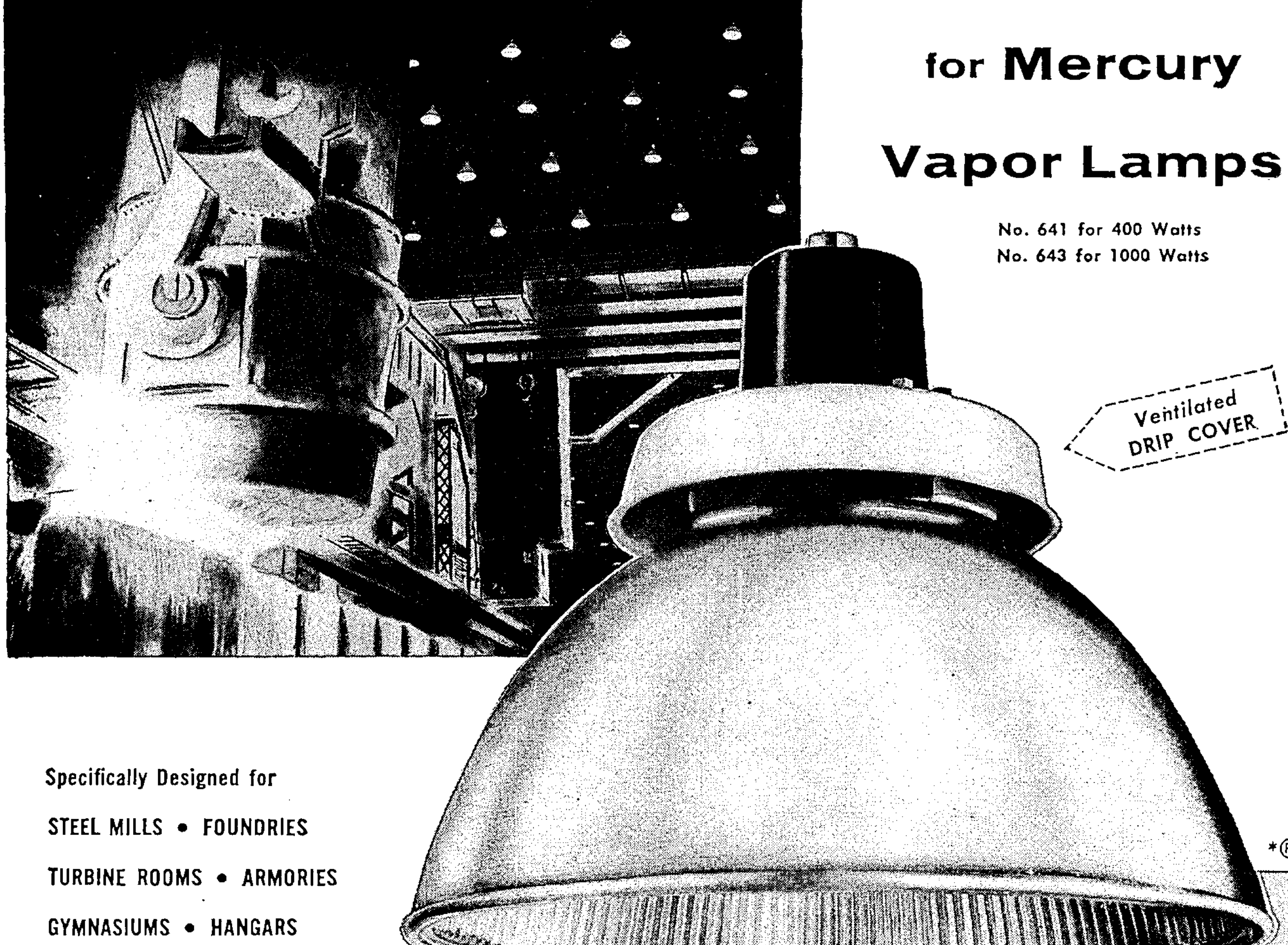
Sectional View of an Electrified M-Floor. Sub-Floor is Mahon M-Floor Section M2-4.5

Serving the Construction Industry Through Fabrication of Structural Steel, Steel Plate Components, and Building Products

NEW! HOLOPHANE HIBAY* REFLECTOR

for Mercury Vapor Lamps

No. 641 for 400 Watts
No. 643 for 1000 Watts



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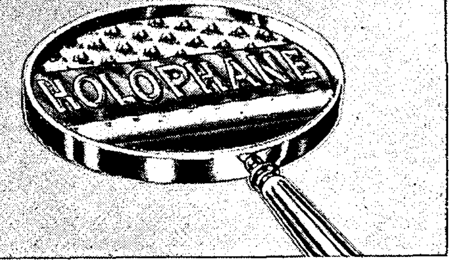
Another important contribution to effective industrial lighting developed by HOLOPHANE Research—a new HIBAY REFLECTOR for 400 Watt or 1000 Watt Mercury Vapor Lamps . . . Advantages:
• Prismatic reflector provides highest lighting efficiency from heights of 30 feet or more • glare is eliminated by proper shielding angle
• sealed metal cover keeps reflector clean, secures unit against mechanical or thermal shock • new drip cover protects lamp and reflector from moisture, condensation, seepage • low operating and maintenance costs . . .

To be sure of Quality in Lighting . . . look for the name HOLOPHANE impressed on each piece.



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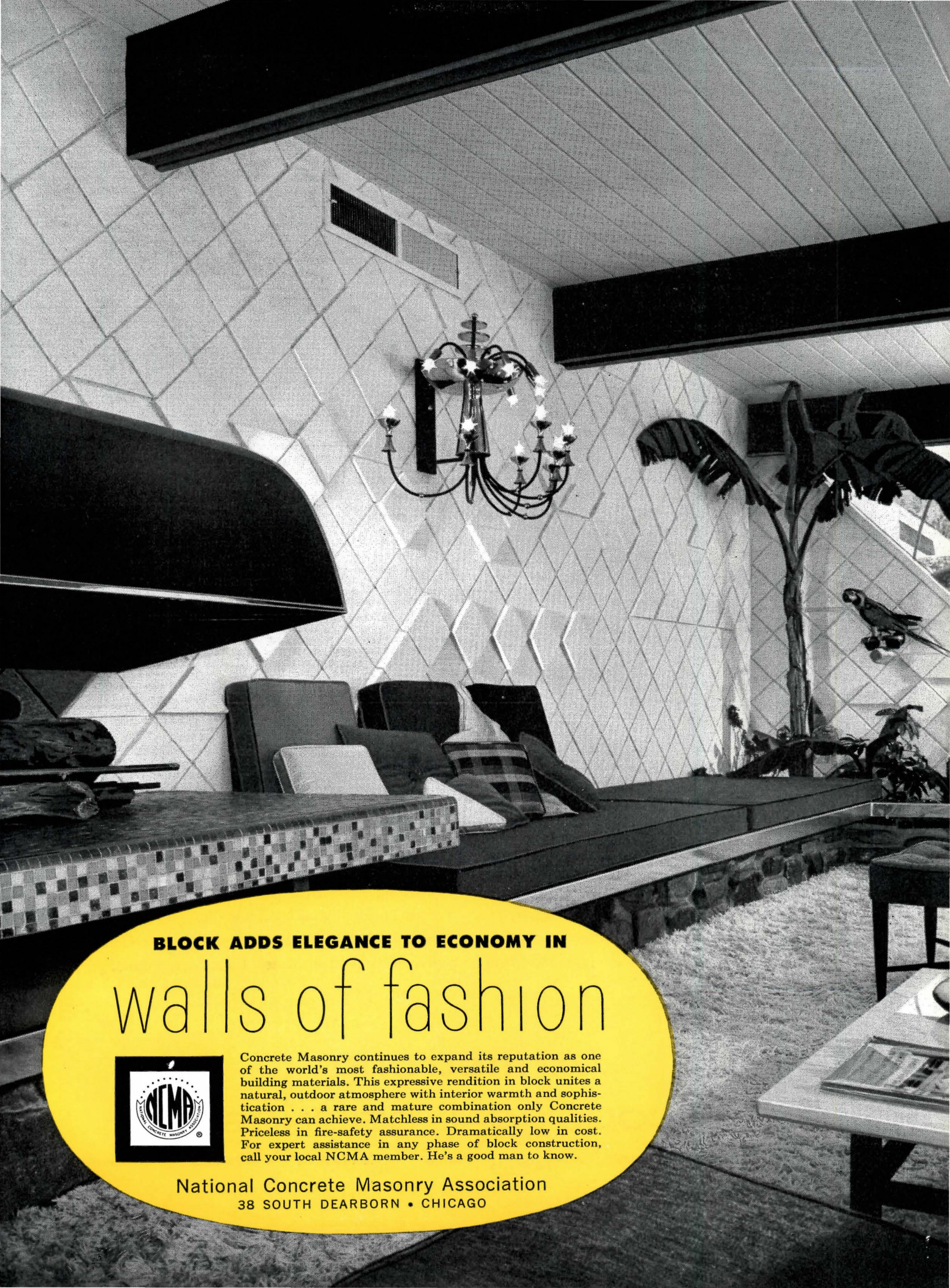
BLOCK ADDS ELEGANCE TO ECONOMY IN
walls of fashion
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NATIONAL CONCRETE MASONRY ASSOCIATION
Concrete Masonry continues to expand its reputation as one of the world's most fashionable, versatile and economical building materials. This expressive rendition in block unites a natural, outdoor atmosphere with interior warmth and sophistication . . . a rare and mature combination only Concrete Masonry can achieve. Matchless in sound absorption qualities. Priceless in fire-safety assurance. Dramatically low in cost. For expert assistance in any phase of block construction, call your local NCMA member. He's a good man to know.
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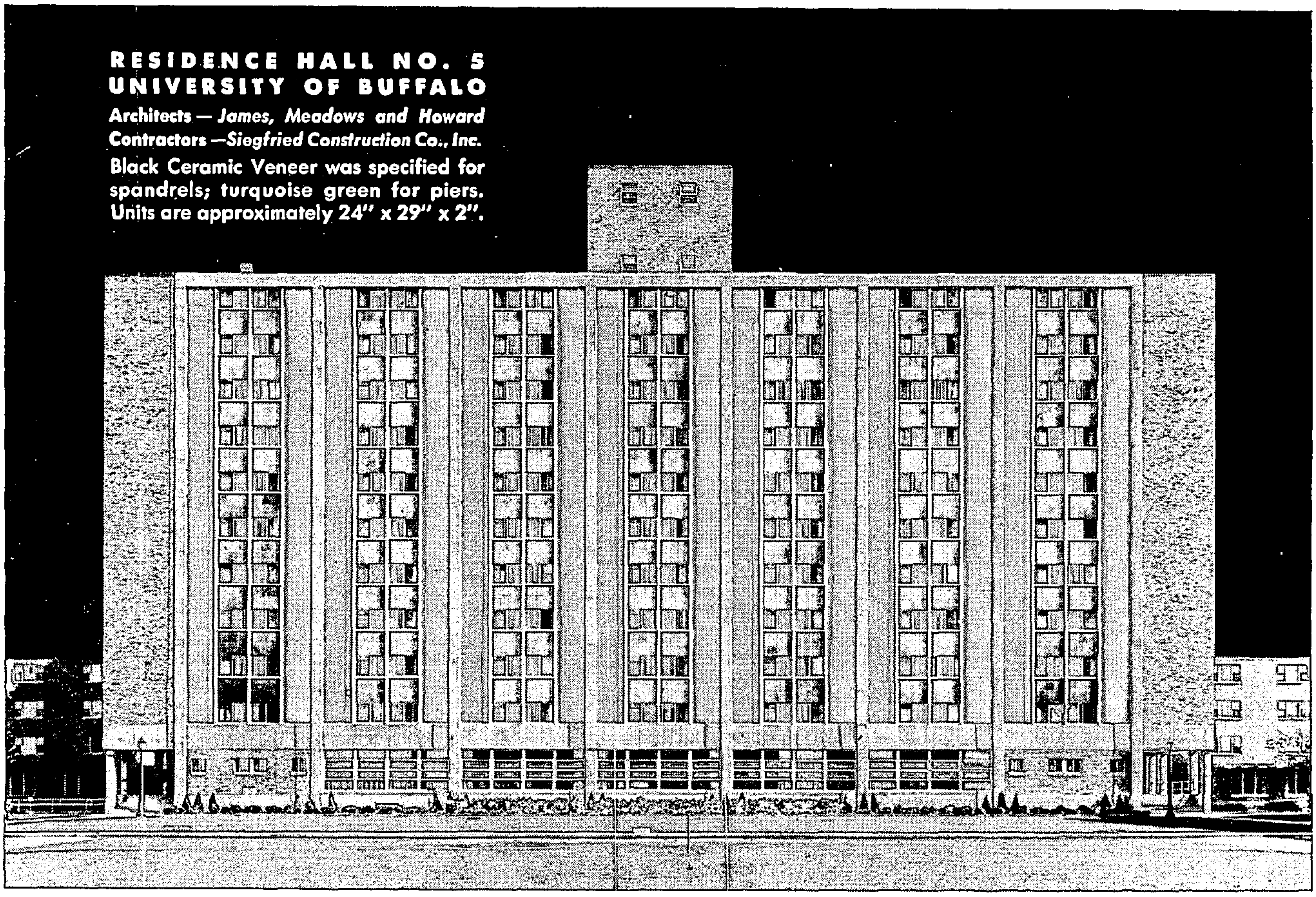
38 SOUTH DEARBORN • CHICAGO

Ceramic Veneer puts color on the campus

On the campus—and on city streets as well—color is being used to accent the character of many of today's most modern buildings. No other facing material offers you such a wide range of colors and textures as does Ceramic Veneer. It combines impressively with all other building materials—for both interiors and exteriors. Simple soap-and-water washings assure utmost cleanliness and lasting beauty. Thus minimum maintenance is another advantage you can add to low initial cost, versatility, quality and permanence. Whatever your specifications—plain surfaces, polychrome panels or decorative sculpture—every unit, large or small, is custom-made by Federal Seaboard craftsmen. Without charge, we will gladly furnish construction detail, data, color samples and preliminary sketches involving use of Ceramic Veneer—the modern architectural terra cotta.



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Now! The Sargent IntegraLock . . . the only modern key-in-knob lock offering deadbolt security and all conventional functions, has a thrilling new appearance.

Total beauty
Sargent IntegraLock

The Garfield design pictured here is just one of several new designs . . . available in any combination of many contrasting finishes which include: Dull Bronze, Polished Bronze, Dull Chrome, Polished Chrome, Polished Brass and Satin Aluminum.

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The same integrity of construction that is built into the IntegraLock . . . the same kind of advanced styling . . . goes into Sargent Exit Devices and Sargent Door Closers.

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You can make design changes simply . . .

and save hours of drafting time . . . with Ozalid's family of intermediate materials

Once . . . just once . . . you run your original drawing through your Ozalid machine with a piece of Ozalid intermediate material. Then file away your drawing. Your Ozalid intermediate copy becomes a duplicate original—all set to give you important benefits.

Take design changes, for instance. With an Ozalid intermediate print, there's no need to trace or redraw the original design. Changes are as easy as 1-2-3 . . . just see below!

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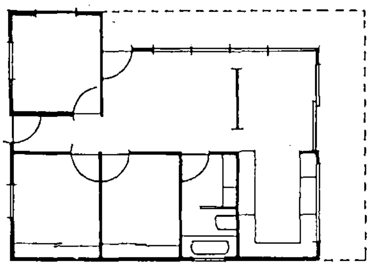
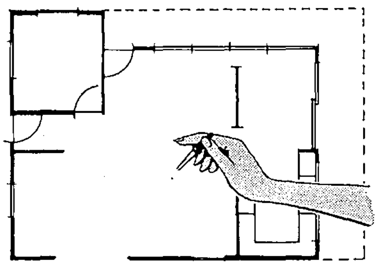
There's an Ozalid intermediate material for every drafting room need: film, translucent paper, and cloth.

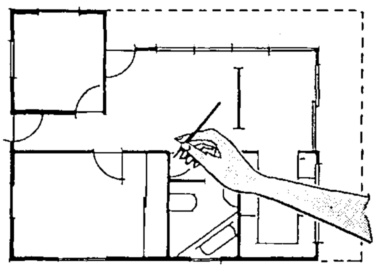
See for yourself how quick and easy you can make design changes with Ozalid intermediates. Contact your local Ozalid man—his name is in the phone book—or write for free folder. Write to Ozalid, Dept. DD-3, Johnson City, N. Y. In Canada: Hughes Owens Co., Ltd., Montreal.



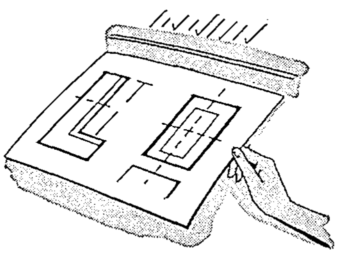
1. This is an Ozalid intermediate (translucent) print of the original drawing.



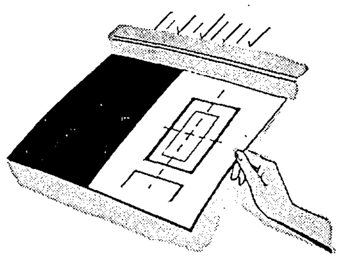
2. Draftsman eradicates obsolete lines with Ozalid Corrector Fluid.



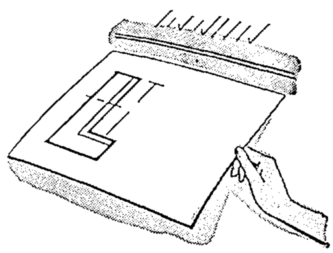
3. New design is drawn in. Prints can now be run from this intermediate "master."



1. Expose original drawing in the usual manner on Ozalid intermediate paper, cloth, or foil. But do not develop!



2. Cover all printed yellow lines which are to be retained on the intermediate with a mask of black opaque paper—re-expose in Ozalid machine. The light will remove all obsolete details left uncovered.



3. Develop the intermediate...and you have a clear, up-to-date "framework" to which you add the new design. Use this intermediate master to produce prints.

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Products for Design

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In Canada: Hughes Owens Company, Ltd., Montreal

preview

for april

PROGRESSIVE ARCHITECTURE

HEALTH-CARE FACILITIES

Hospital and institutional buildings will account for about 10.7% of the business in the average architectural firm in 1958. This "healthy" building type is increasing in importance and diversity as our health-care facility needs become greater and the trend to specialization continues. The major portion of APRIL P/A will be devoted to an examination of a number of interesting buildings for health care, including:

- Riverview Extension, Home for the Indigent Aged, Philadelphia, Pennsylvania
  Architects: Bellante & Clauss
  (A P/A Design Awards Winner)
- Coney Island New General Hospital, New York
  Architects: Andrew J. Thomas and Katz, Waisman, Blumenkranz, Stein, Weber, Architects Associated
- Blackwell General Hospital, School of Practical Nursing & Convent, Blackwell, Oklahoma
  Architects: Coston-Frankfort-Short, Architects-Engineers; Edward J. Romieniec, Associate Architect
- Blakeley Psychiatric Group Clinic, Seattle, Washington
  Architects: Paul Hayden Kirk & Associates

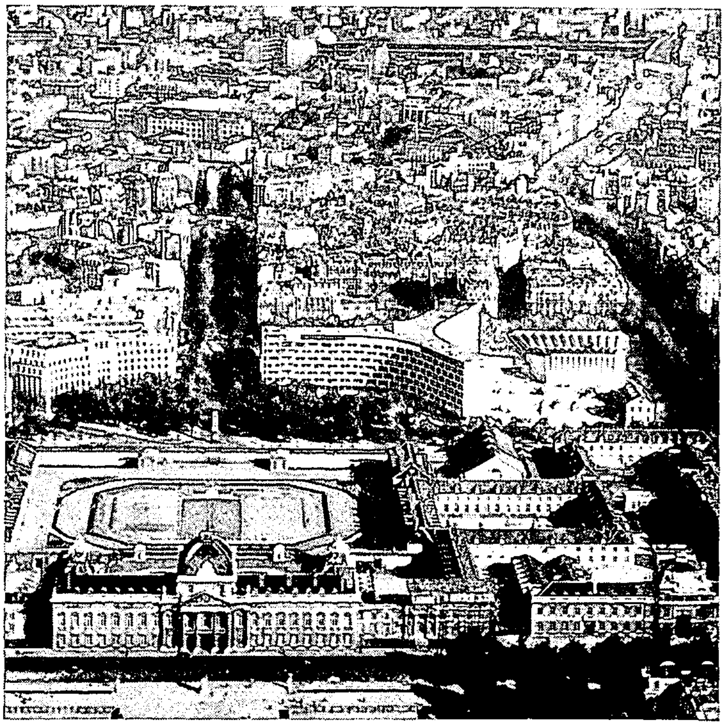
Interior Design Data for April will be concerned with Hospital Interiors. Louise Sloane has selected two notable hospitals for presentation: the Rockford, Illinois, Memorial Hospital by Perkins & Will, and the Swedish Hospital by Seattle Architects Naramore, Bain, Brady & Johansen.

PROGRESSIVE ARCHITECTURE

means

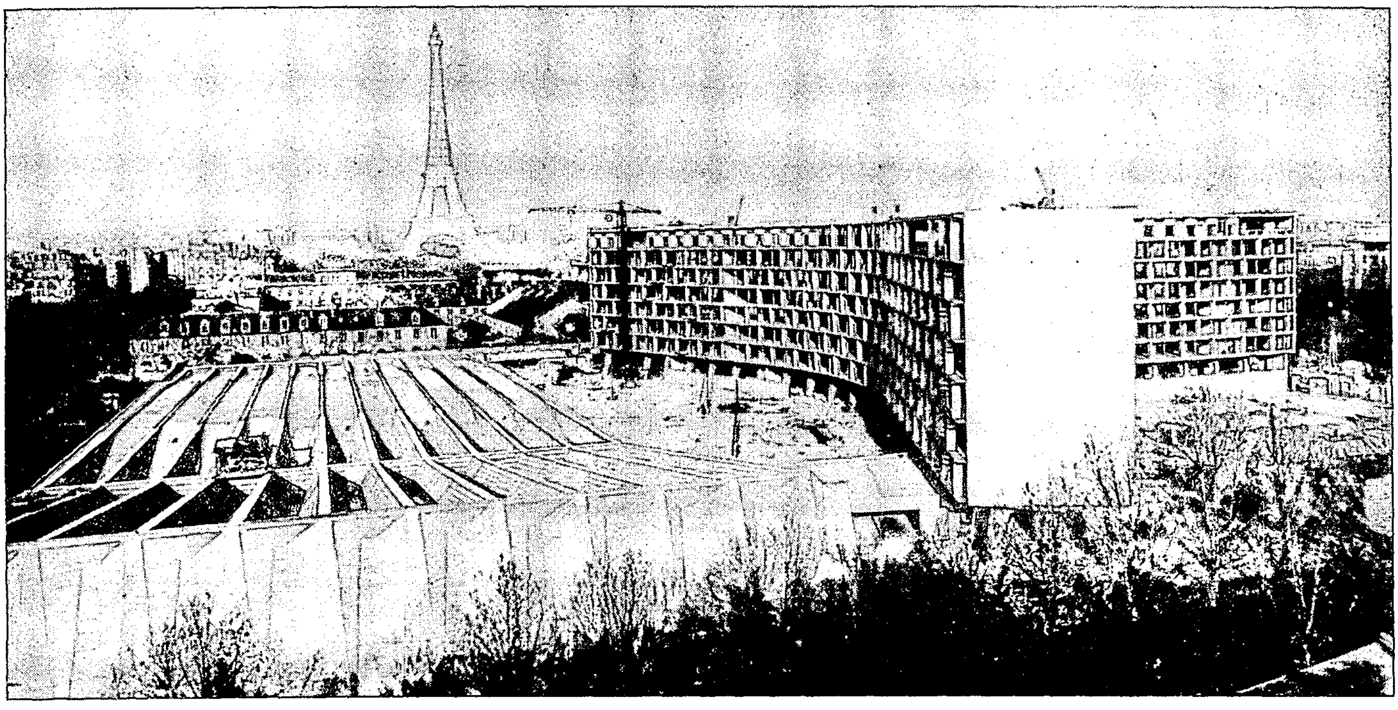
ARCHITECTURAL PROGRESS

'a news survey


Marc Riboud

UNESCO HEADQUARTERS IN PARIS NEARING COMPLETION

A distinguished architectural landmark, the new headquarters for UNESCO, is taking shape on Place Fontenoy in the vicinity of the Eiffel Tower and just behind L'Ecole Militaire. The building complex, designed by Breuer, Nervi, and Zehrfuss, is composed of three units—the secretariat (below right), the conference building (below left), and the annex (to be a four-story structure). The seven-story secretariat is the largest of the structures, attaining the maximum height permitted by the Paris prefecture. Its plan, in the form of a Y, is well suited to the demands of an office building since a maximum number of well lighted offices is thus provided, with service and circulation areas confined to a central core. A major part of the seven-acre building site is to be a park and plaza, and a Japanese garden by Noguchi.



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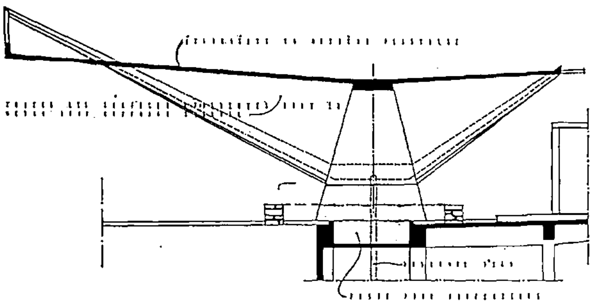
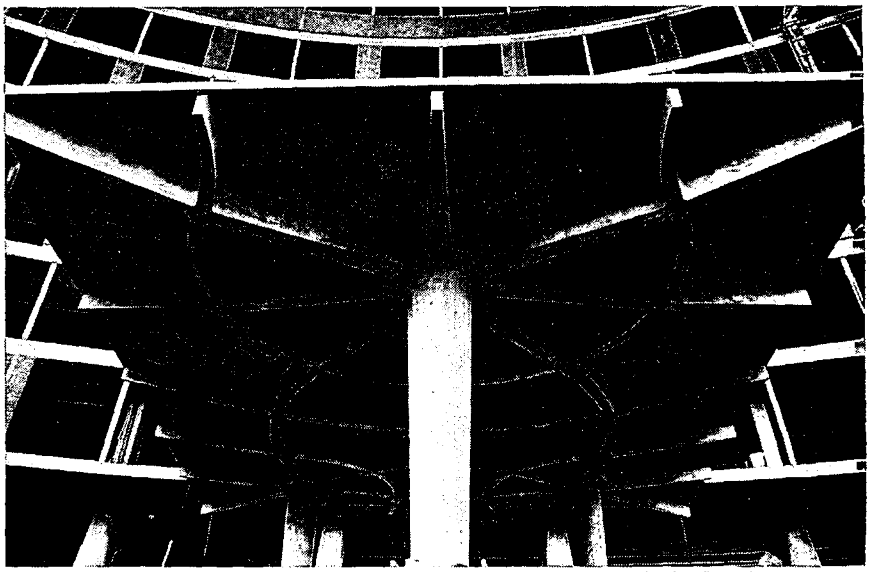
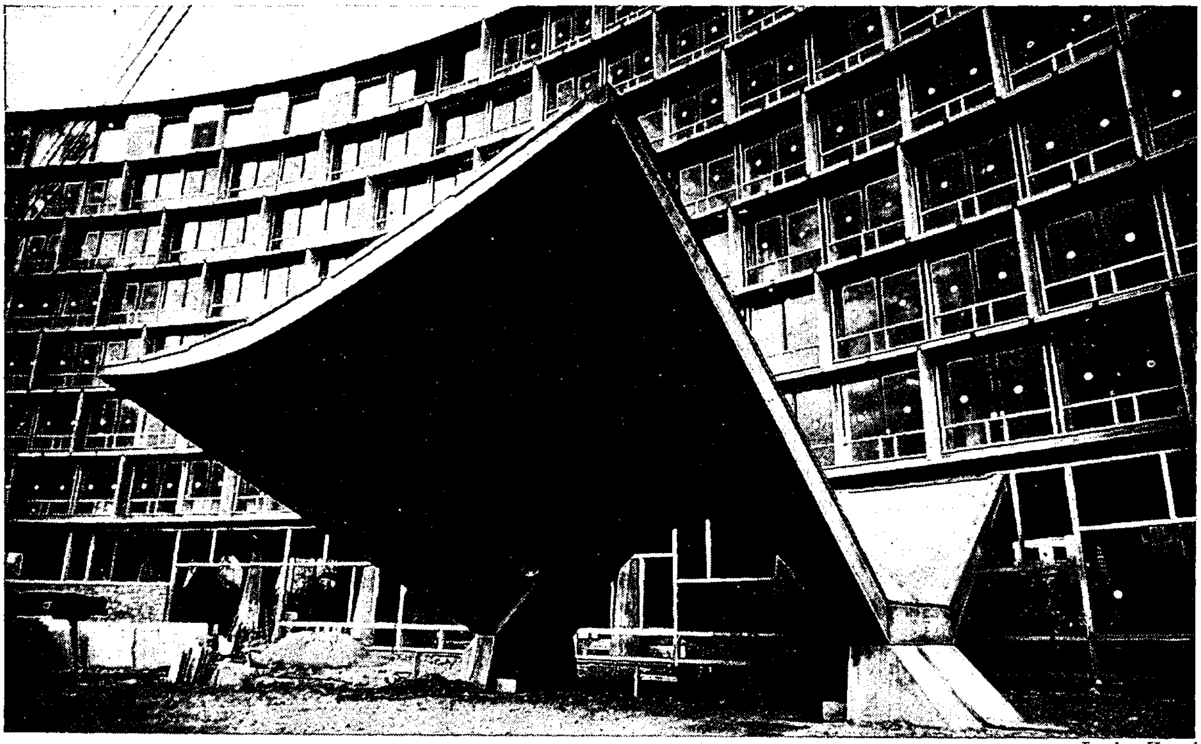
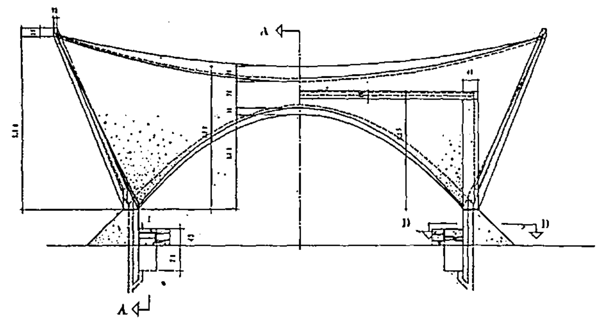




Lucien Hervé

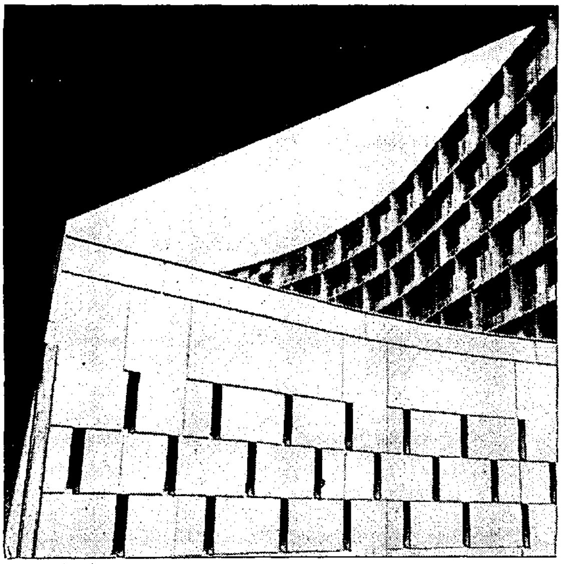


Lucien Hervé

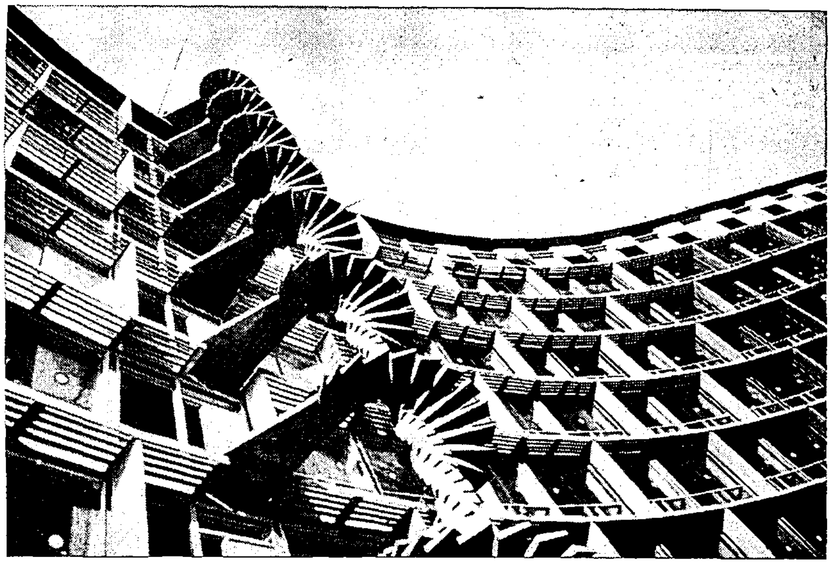


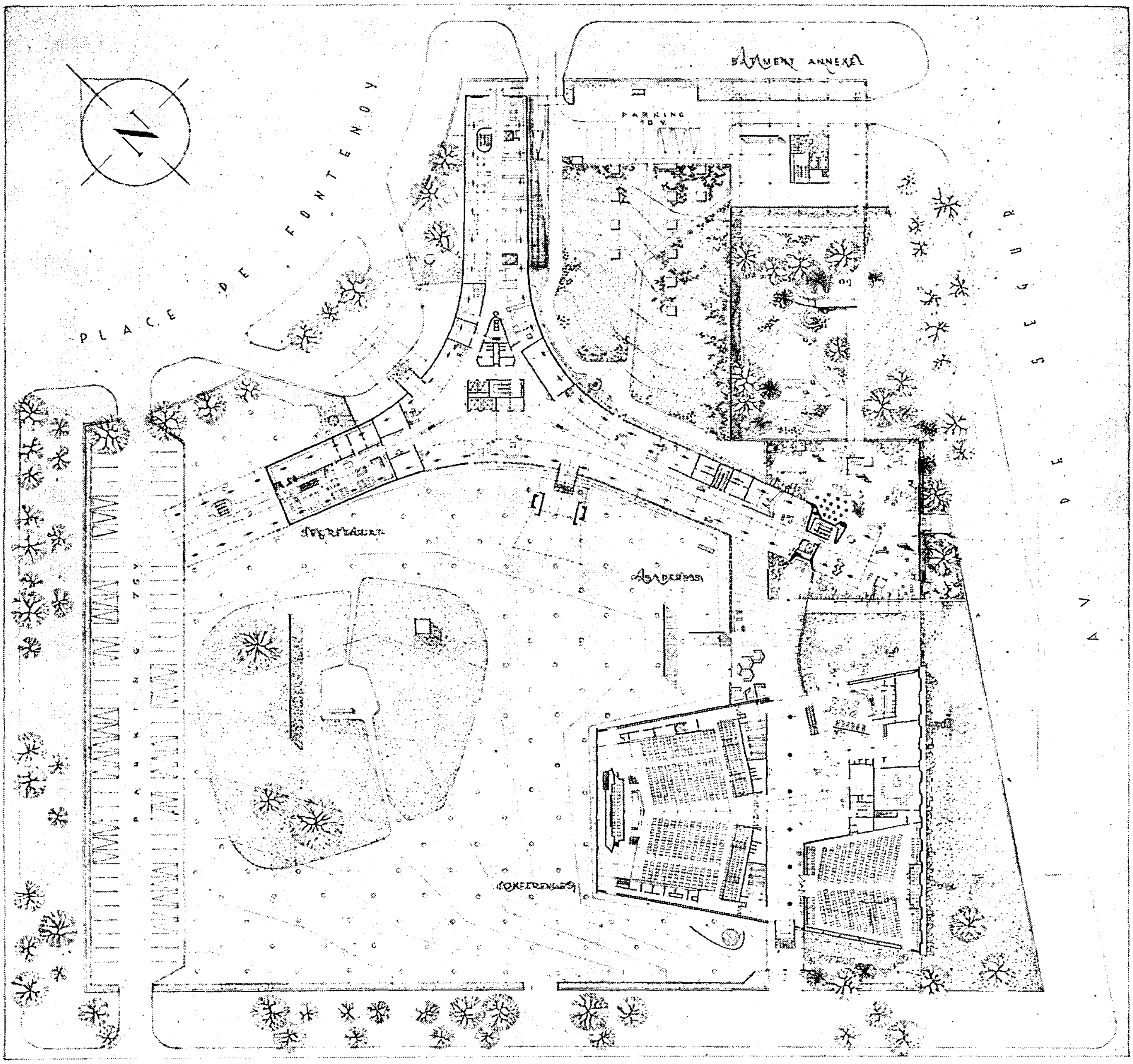
The secretariat (above and acrosspage) contains offices as well as medical and social center for employes, library, bank, radio and TV studios, print shop, co-operative store, stockrooms, bar, cafeteria and restaurant for delegates and staff. The structure is of reinforced concrete. Pairs of columns, six meters o.c., support the cantilevered floors. For the construction of floors, a diaphragm system of main and secondary beams has been designed; to this, prefabricated reinforced-concrete slabs are fastened. The slabs (approximately 15 sq ft in area) are secured to the top as well as the bottom of the floor grid, and are designed to act, together with the grid, as one structural unit. The ceiling line slopes upward toward window openings, following the form of the floor structure. Concrete eyebrows, vertical panels of travertine, and glare-reducing glass panels bracketed out from the façade provide protection from sun. City regulations required provision of exterior stairs for the use of firemen (not an escape for inhabitants).

Marc Ribaud



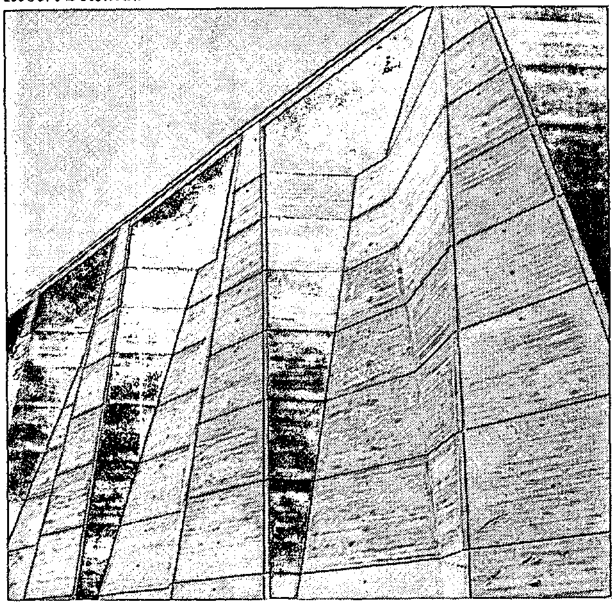
Lucien Hervé

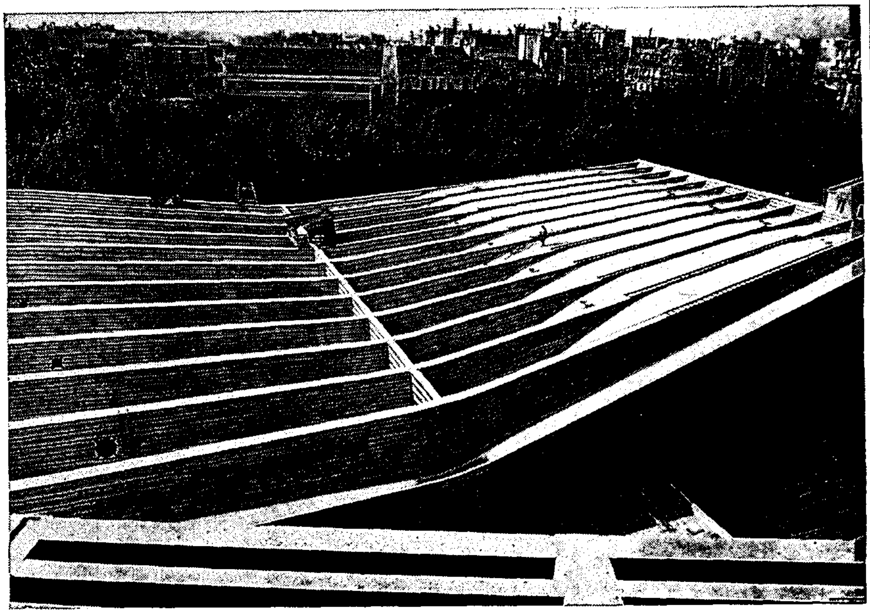




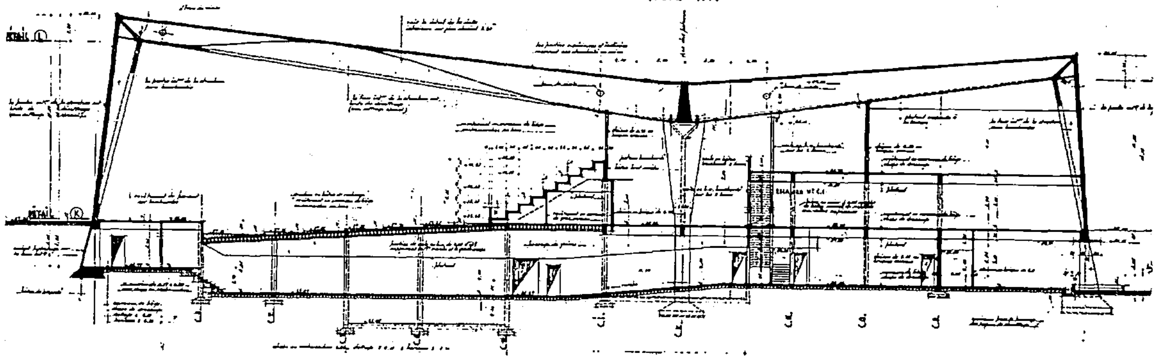
p/a news survey

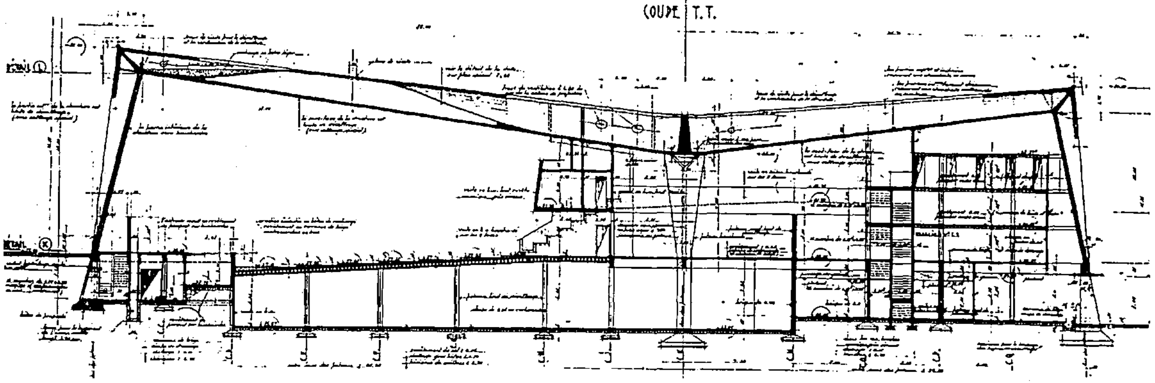
Robert Doisneau





Robert Doisneau

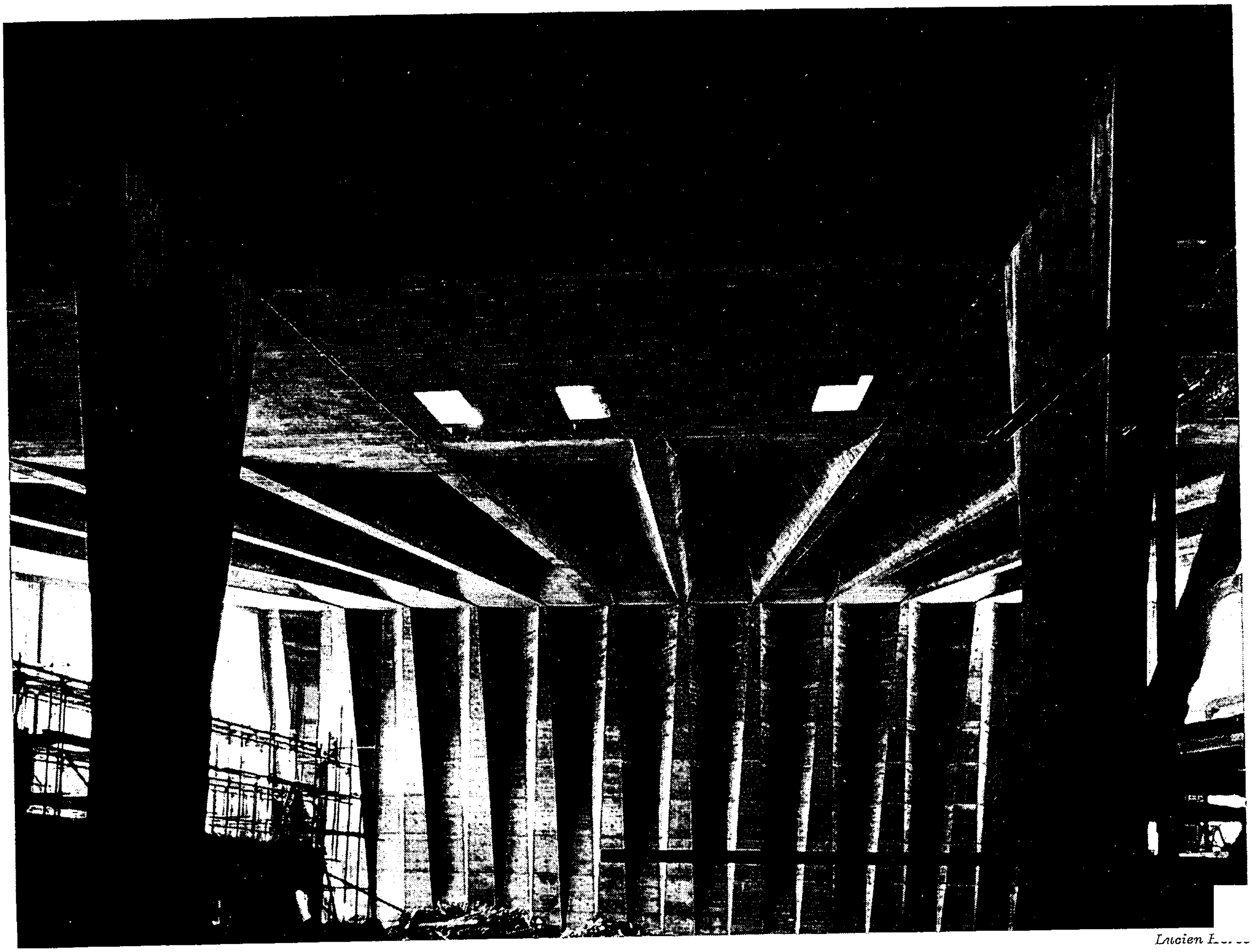




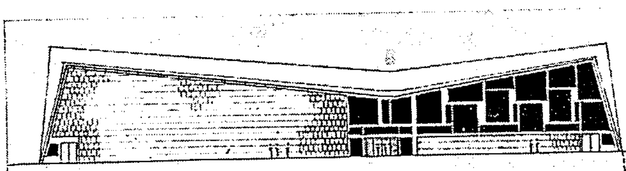
The conference building (above and acrosspage) contains several meeting rooms, the largest seating 1000 persons. The trapezoidal structure of reinforced concrete employs the structural principle of folded plates. The problem of demarcation between subsequent pourings of concrete, and the expansion and contraction of large areas has been solved by incorporating spaced grooves into the design of all concrete surfaces.

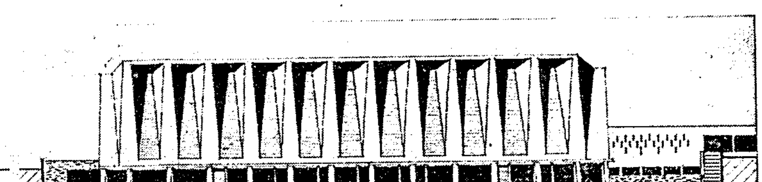
Interiors are for the most part designed by the architects, excepting those rooms for which designs and furnishings were donated by member states. Works of art are to be closely integrated with the architecture. Among them will be a mural by Picasso for the conference building; a sculpture by Moore for the main piazza; a bronze relief by Arp; a mobile by Calder; a ceramic mural by Miro; and works by Matta, Appel, Affro, and Tamayo.

Robert Doisneau



Lucien H





Washington report

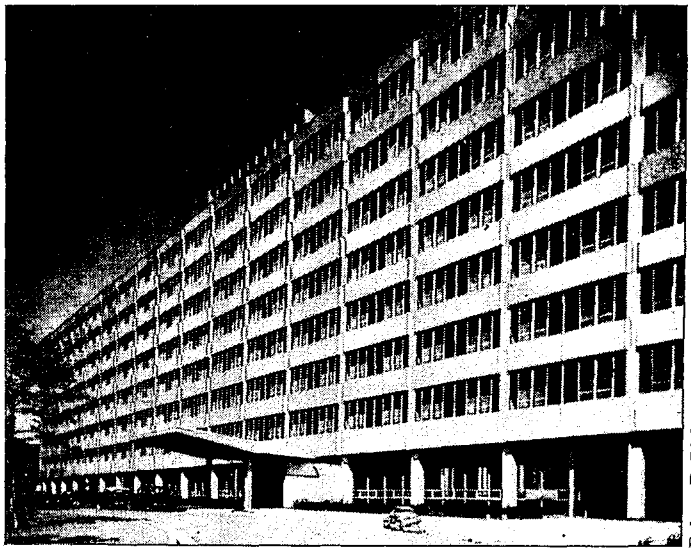
by Frederick Gutheim

The economic slump is generating talk about a national public works program from Senators as far apart in geography, ideology, and party as Gore of Tennessee and Knowland of California. While it is not likely that anything will come of all this, the chances being loaded pretty heavily in favor of an upturn by mid-year, this is a moment to give a silent word of thanks for the modest labors of Maj. Gen. John S. Bragdon. His duties in support of a national shelf of public works programs, both Federal and local, have been strictly contingent on the possibility of some recurrence of the need for such a national effort (November, 1955 P/A). At a level slightly more remote from reality, in the staff of the Council of Economic Advisers, have labored in the same cause such economists as Robinson Newcomb and Lee Grebler. Thanks to these officials, a public works program, should it be instituted, would be no hurly-burly on the 1933 model but an orderly acceleration of projects in a six-year program, most of which has already been blueprinted. Strengthening and advancing this effort would be a useful precautionary measure. But long before such a program were put into action, it is fair to say, there are many other depression-fighting instruments that would probably be used. Relatively few of them are in the building field. Most have to do with ways of rapidly expanding the purchasing power. In the construction industry, the best and fastest way of influencing economic activity is not the slow and laborious public-works method but the far faster method of stimulating deferred maintenance, repair, and modernization. The backlog of such work is enormous; it can get started instantly (without waiting to draw plans, procure sites, obtain approval, etc.); and you see results a month or so after the go-ahead is given. Despite the advance planning of public works, this is still too cumbersome a method to suit the needs of a managed economy.

• Washington's second commercial airport, designed for jets and longer flights, will be located between Chantilly and Herndon, Va., some 25 miles due west and a bit less than an hour's drive from the center of the city. The decision, after a special Presidential inquiry, marks the end of years of squabbling between the Civil Aeronautics Administration, which favored a more southern site at Burke, Va. (violently opposed by suburban interests in that neighborhood), and Maryland interests favoring the use of Baltimore's new but still little-patronized Friendship Airport. The question now is

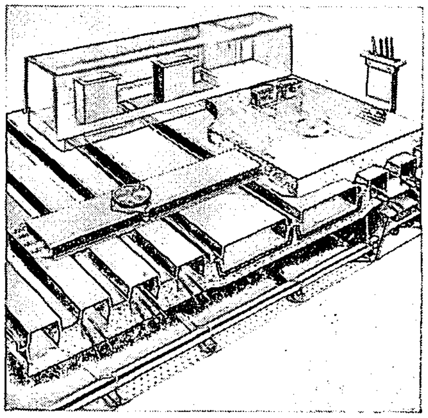
/a news bulletins

• Recently completed John J. Kane Hospital, located eight miles from downtown Pittsburgh, offers latest design for therapeutic care of indigent sick. Designed by Button & McLean—Mitchell & Ritchey, Architects Associated, $22-millions structure took six years to plan, three to construct. Institution, set on 126-acre site, has 2100-bed capacity and comprises main 8-story building (right), two 3-story convalescent wings, two ambulatory dormitories surrounding park area, auditorium, interdenominational church, power station, facilities for hospital personnel.



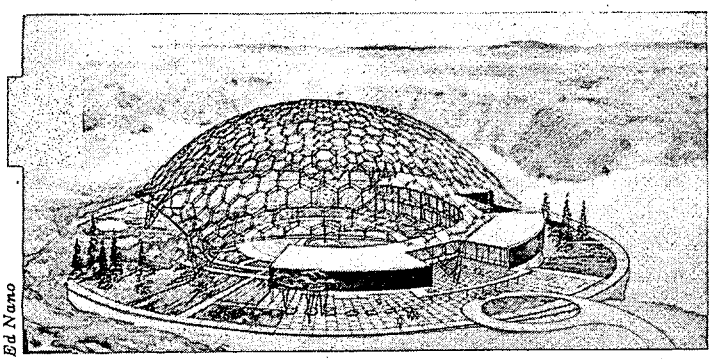
Robert E. Dick

• Air distribution cells—now incorporated in H. H. Robertson's cellular floors—add air conditioning and heating distribution to other services previously accommodated (cutaway right). Q-Air Floor, its proprietary name, is a dual-duct, high-velocity system. During winter, duct pairs carry both hot and cold air; the two are modulated at windows by dampering. Hot and cold dampers operate at right angles to each other—tempering air to produce desired temperatures. In summer, however, both ducts supply cooling and both dampers operate in unison. Yearly operating costs are reduced, since only 65 percent of duct space is needed for heating season. By placing lateral secondary ductwork in the structural slab, ceiling-to-floor dimension is reduced from eight to 16 in. (A fuller report on Q-Air Floor will appear in JUNE 1958 P/A.)



whether the new airport will be developed as a "gateway," comparable in its architectural standards to the existing National Airport, or to the St. Louis or New York International Airport in our own time, or if it is to be just another "utility model" airport. While CAA has yet to announce its selection of architects and engineers, the chances are fairly good that they will strike for something that will be outstanding. One theme that might well be adopted is a prototype field for jets, with model standards of approach and sufficient area to prevent residential and industrial development from crowding up to the very runways. Another would plan the total airport as a more self-contained facility, with its own internal transportation system serving passenger and freight movement, plane servicing, and perhaps a small industrial park. Some better relationship of the Federal project to local government is also needed. Agitation to turn over the ownership of the Washington airport (which is technically located in what has been declared to be the State of Virginia) to some authority which could pay local taxes, is being followed by a search for ways to exploit Chantilly as a source of suburban tax revenue. If this is not resolved at a fairly high level, the struggle could destroy whatever chance the airport has of becoming a national landmark. The only clue thus far to the manner in which Federal officials will proceed is the preliminary conference on highways that are needed to connect the airport to the city. It is proposed that airport traffic use part of the George Washington Memorial Parkway, now being extended to Great Falls, and then proceed by a new Federally-built parkway to the airport. This suggests superlative and beautiful highway connections to the city, and a magnificent approach down the Potomac River—not the sort of approach demanded by a "utility model" airport.

• Another page in the physical expansion and modernization plan for the Smithsonian Institution has been opened, to show McKim, Mead & White's sketch for the Museum of History and Technology. The museum will displace a pair of wartime temporary buildings and occupy a site on Constitution Avenue at 14th Street. To the east of the building, the National Museum (Natural History) is being enlarged. North, across Constitution Avenue, stands the huge porticoed front of the Government Auditorium, part of the Labor Department building. The published sketch for this museum looks rigidly symmetrical, and crushingly monumental. Beyond that, it is difficult to tell what the building will develop into as it is detailed. The main fact about it seems to be that 5,000,000 people annually are expected to visit the building. It certainly looks like the architecture for an age of crowds. The Smithsonian's approach will offer the tightly scheduled tourist an orientation gallery, both a synopsis and a suggestion of further specialized collections in the museum. Experimental gallery designs have been studied which should set a new mark in institutional displays, but the conception of the Museum as a whole is still vague and the depersonalized design of the building does nothing to sharpen it.



Ed Nano

• Suburban Cleveland will be site of American Society of Metals new $2-millions headquarters. Main feature of unit will be "space lattice"—aluminum and stainless steel geodesic dome, 275 ft diameter, 100 ft high. Dome will be double—two units 30 in. apart, formed in 11-ft hexagons, supported at five points with 22-ft arched trusses anchored in concrete. Semicircular building and dome (left) will be erected in garden piazza, 400 ft in diameter. Kelly & Kress & Associates, Architects for the project, designed 3-level structure to effect screen wall. First level opens to meadow land, second to garden piazza, containing sunken mineral garden. Principal construction materials will be flat slabs, reinforced concrete on exposed steel columns. Building is scheduled for completion mid-1959.

Kranzten Studio Inc.

• 19-Story Inland Steel Company Building (left), designed by Skidmore, Owings & Merrill, Architects, is latest addition to Chicago "loop" area. Windowless service shaft extending 25-stories and 2-story annex complete building. To accentuate exterior height and give unobstructed interior work area, steel skeleton appears on outside of building and is supportd by seven columns on west and east walls. Stainless steel and glass are principal materials used. Cellular floors supply all utilities. Interior utilizes modular construction to give flexibility to individual office requirements. First two stories are set back on one side to provide lobby entrance. Stainless-steel sculpture by Richard Lippold and Seymour Lipton's sculpture of 24-gage sheet steel are featured decorations in lobby and executive office reception room.

p/a financial news

by William Hurd Hillyer

Seldom have so many minus signs appeared in a marshaling of current economic figures, as during the first two months of 1958. Were Kipling alive today he could very well write a new "Recessional," with Dun & Bradstreet's Weekly Business Review as a motif. For example, that firm's statistical analysis of 10 categories for the week ending January 31 reveals only two plus signs—and those on the wrong side—in comparison with a year ago: an increase of 29 in number of business failures and a 5.8% index rise in wholesale food prices. Steel-ingot tonnage leads the minuses, with a 40.8% decrease. Bank clearings, off only ½% on the year-ago basis, declined 7.6% as compared with the previous week, thus indicating a day-to-day slip. In a word, no matter how impressive the gains in various quarters for 1957 as a whole, a recession is unmistakably aslide and may even plummet into a depression before 1959. What blunts the peril of such a catastrophe is not a prospect of increased defense spending, but favorable factors in a realm peculiarly dedicated to architects, namely, building construction.

Those of us who witnessed the post-'29 depression will recall that it was substantially cushioned by the construction of Rockefeller Center, Empire State Building, and other large business edifices in various areas. Today, led by the huge Chase-Manhattan Building, major quarters for business are rising or are about to rise in important centers throughout the country. Contrary to common belief, defense spending is not at this time a likely panacea for business depression. Its projected $3-billions increase for '58 will be offset by a probable curtailment of similar amount in the field of industrial plant and equipment expansion. By contrast, housing totals are mounting: December went up 9% on a yearly comparison to a $9-billions average rate. A single sector of the National Association of Home Builders plans to start over 5000 dwellings in 1958, which is 14% more than in '57. Nonresidential structures, such as schools, after a year-end weakness are now holding their own.

• A new source of capital is being tapped for construction of post offices and other Federal buildings—as foreseen on this page some months ago. Specifically, Public Buildings Service of the General Services Administration is giving private investors the opportunity to finance 13 lease-purchase projects, "with interest assured of repayment by U. S. Government of obligation to amortize investment." That is to say, investors will finance the public buildings and the Government will take them over on a lease-purchase basis. The 4% interest formerly offered having proved inadequate, investors may bid the interest rate at which they will finance each project. The Government will consider lowest interest rate which is obtainable and at the same time deemed reasonable. Investors may receive, if desired, "certificates of contract obligation," so that the investment can be traded in or split up amongst a number of bidders. The current offering of some $7 millions covers projects in smaller towns and cities, the largest being at Lake Charles, Louisiana, and the smallest at Sedan, Kansas. This pattern of finance for new public buildings apparently holds great possibilities of growth, nearly all of which should be reflected on architects' drawing boards. A $700-millions backlog of these lease-purchase deals is being eyed, say informed observers, by such lenders as Penn Mutual Life, First National City Bank of New York, Kidder Peabody, and Eastman Dillon.

• Public construction at state and local levels is increasingly sustained by notable activity in the municipal bond market, coupled with a large volume of present and prospective issues. The weekly average of long-term offerings during January of this year was around $150 millions. Early February saw awards exceeding $325 millions. The Bond Buyer's price average reflects "some softening," in its 20-bond list. Municipal securities enjoy mounting popularity with the banks, which have increased their holdings to $14 billions.

• Money in general is becoming cheaper as a result of declining interest rates, paced by Federal Reserve discount cuts. Bankers' acceptance rates have ebb-marked down ¼ percentage point; commercial-paper dealers have reduced the yields to investors by ⅜ point—the largest reduction since the Great Depression of the '30s. Short-time business-paper rates and U. S. Treasury bills have coincidentally dropped to a 31-month low of around 1½%.

• Luxury houses have not shared the downcurve that overtook residential activity last year, say pundits. National Association of Home Builders declares that the building of homes costing $20,000 or more has actually increased during the past few months. Other authorities have referred to 300 new homes costing $100,000 and up, recently erected or being erected for "recession proof" clients.

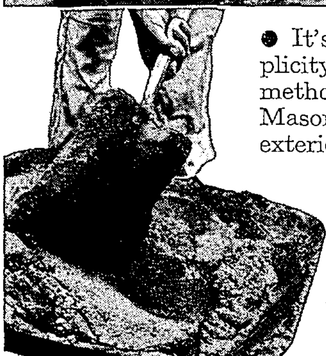
• Unfavorables: Job-lack expands—large industrial layoffs are reported almost daily at a rate of several hundred thousand a month; steel output continues to fall, according to last reports; first quarter of 1958 may show a 5% to 7% seasonally adjusted drop to $35.5-billions rate in plant and equipment outlays; First National City Bank of New York sees "further evidence of business downtrend."

• Favorables: Deposits in mutual-savings banks nationwide enjoyed a record-breaking increase of $400 millions during December, augmenting total assets at '57 year-end to more than $35 billions; another record high of $49.16 billions—a $2.4 billions gain over last year—is expected for value of 1958 new construction by U. S. Department of Labor; mortgage funds, becoming suddenly plentiful, have found realty loans, with their high percentage of repayments, more attractive to large investors than bonds, savings authorities declare; scrap-metal market, a tested economic pre-index, is showing signs of recovery and $6 a ton mark-ups are reported at Chicago; depleted inventories here and there spur cautious but substantial buying.

SCHOOLMATES...

...a trowel, an "educated" hand, lightweight block and Lone Star Masonry Mortar

RESULT: low cost, low upkeep, quality schools for economy-wise Tarrytown.



● It's the familiar story of *simplicity*—simplicity of design and simplicity of construction method. These, together with Lone Star Masonry Cement—used on both interior and exterior work—gave these modern school buildings their quality plus economy.

Interior walls and partitions were built of integrally-tinted 8" Waylite block made with 'Incor'* and laid up with ready-to-use Lone Star Masonry Cement.

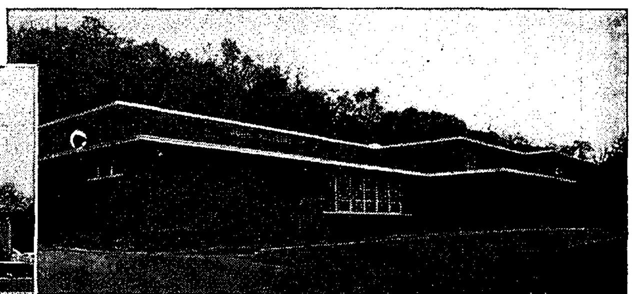
This high quality masonry cement is preferred by experienced masons for many reasons. It is easy to mix; no lime or portland cement need be added, no soaking or slaking necessary. Spreads smoothly, tools easily without gumming the trowel. Every batch is quality controlled for quality results. For the highest attainable standards, build with Lone Star Masonry Cement—job after job!

*Reg. U.S. Pat. Off.

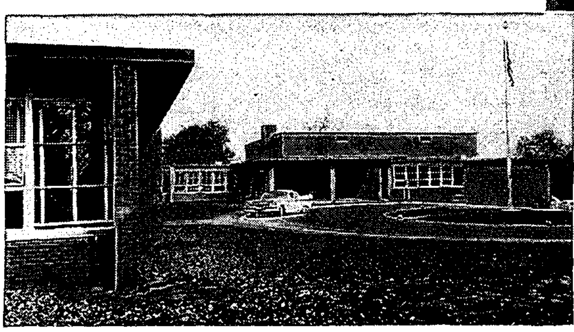
TAPPAN HILL and JOHN PAULDING SCHOOLS, Tarrytown, N. Y.
Architect: ROBERT A. GREEN, Tarrytown, N. Y.

Contractors:
JAMES ROMEO & ASSOCIATES, Tuckahoe, N. Y. (Tappan Hill)
STEWART M. MULLER, INC., Croton, N. Y. (Paulding)
TOMRICH CONSTRUCTION CO., INC., Hartsdale, N Y. Masonry (Paulding)
"Incor" Waylite Block: CASTLE BLOCKS INC., Tarrytown

"Lone Star" Masonry:
A. P. HUSTED CO., INC., Tarrytown
HUDSON RIVER YARDS CORP., Tarrytown



JOHN PAULDING SCHOOL (above): Attractive, low-cost primary school in Tarrytown, N. Y. Classrooms are self-sufficient each with own facilities.



TAPPAN HILL SCHOOL (right): Interior walls are of 'Incor' Waylite block, brick exterior. Lone Star Masonry Cement used throughout.

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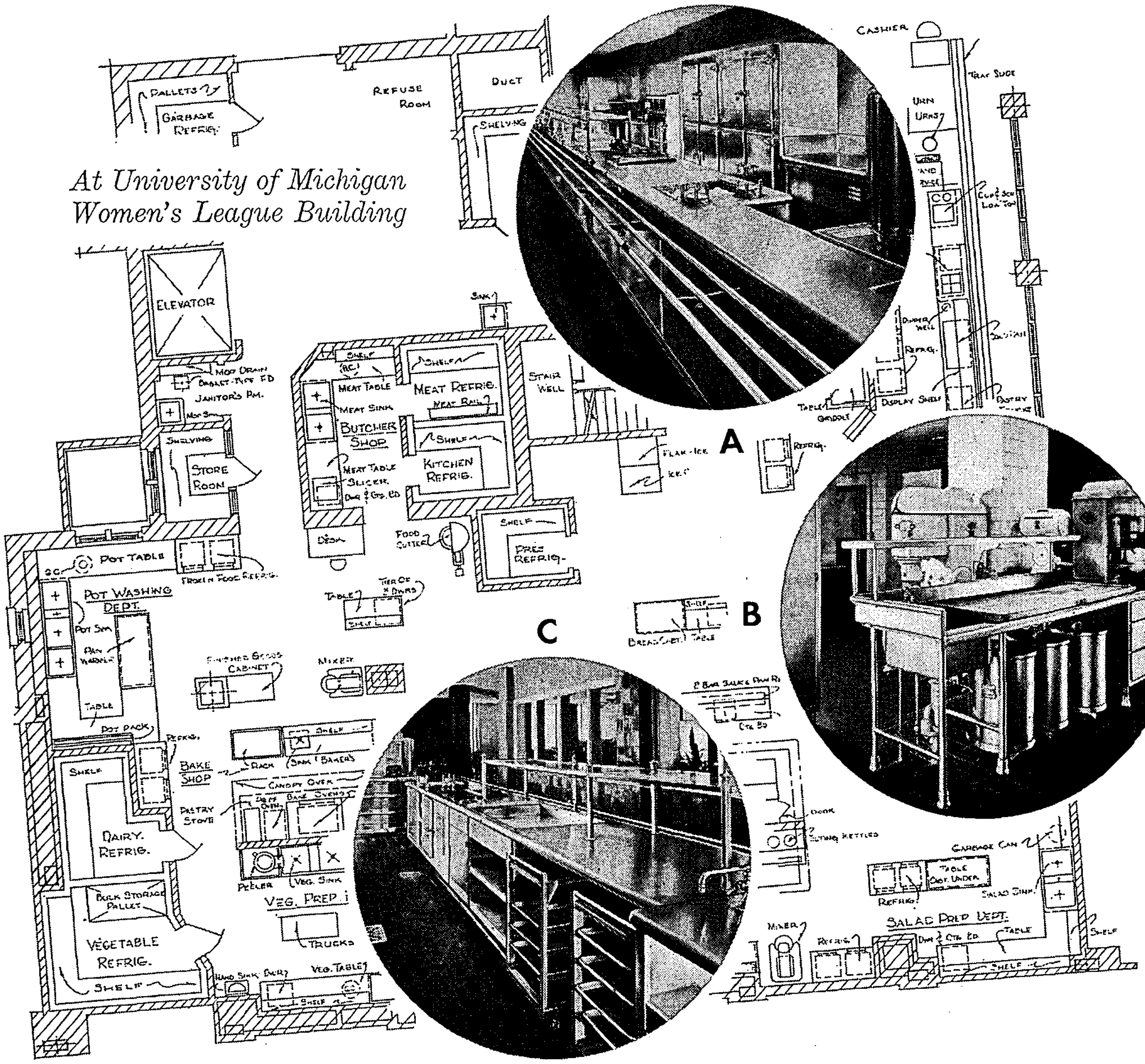

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B. PORTABLE BINS ELIMINATE WASTE MOTION—Bins are wheeled directly to supply section and filled with ingredients. Rehandling is eliminated—waste motion reduced to a minimum.

C. MOVABLE CARTS SAVE LABOR—Working side of stainless steel cafeteria counter. Movable carts beneath counter can be loaded with food, avoiding unnecessary handling of separate dishes.

Completely modern in every detail—this cafeteria reveals how more and more institutions are approaching mass feeding problems. The underlying theme: scientific planning to attain greatest efficiency and economy of operation.

Each step in the food processing operation, for example, is arranged in a direct line to eliminate waste motion. In the kitchen, food flows smoothly from receiving to storage and refrigeration...then directly to the preparation areas and cooking section. From here the distance to the storage spaces in the cafeteria line are short and direct.

The equipment itself is of stainless steel construction with rounded corners, rolled edges and crevice-free surfaces to facilitate cleanliness...simplify maintenance. Speedy, step-saving service is further aided by use of portable bins, under-counter carts and pass-through facilities. Blickman's experience in planning, fabricating and installing completely integrated food service systems can be applied to your particular problems as well. For full information write: S. Blickman, Inc., 9803 Gregory Avenue, Weehawken, N. J.

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FOOD SERVICE EQUIPMENT

special air-conditioning advertising section

Manufacturers' information in the pages of the section which follows were devised especially to help architectural design and specification teams and engineers who work with them in choosing air-conditioning and heating equipment, systems, components and controls that will be suitable and most efficient for the job at hand. (See pages 76 to 110.)

The helpful messages on these and other advertising pages of this issue complement and extend the fund of educational material assembled by P/A's editors to show our 36,000 professional readers how there can be absolute control of indoor climate.

ll· ir igh elocity ystem
provides versatile, draftless air conditioning for Smith-Douglass

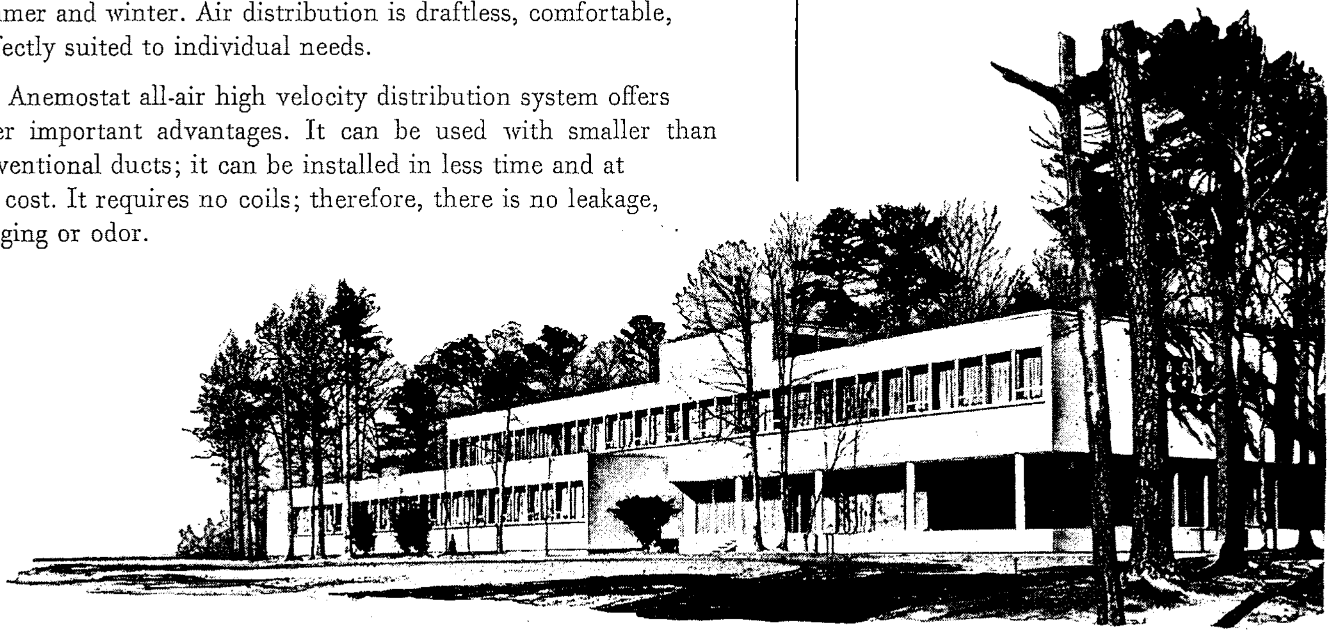
The new office building of the Smith-Douglass Company, leading fertilizer manufacturer, is fully air conditioned with a dual duct Anemostat all-air high velocity system.

Conditioned air is supplied to the Anemostat all-air high velocity units through two parallel ducts—one carrying cold air and the other warm air. The all-air high velocity units draw air from both ducts in any desired proportion to meet the temperature requirements for each area in both summer and winter. Air distribution is draftless, comfortable, perfectly suited to individual needs.

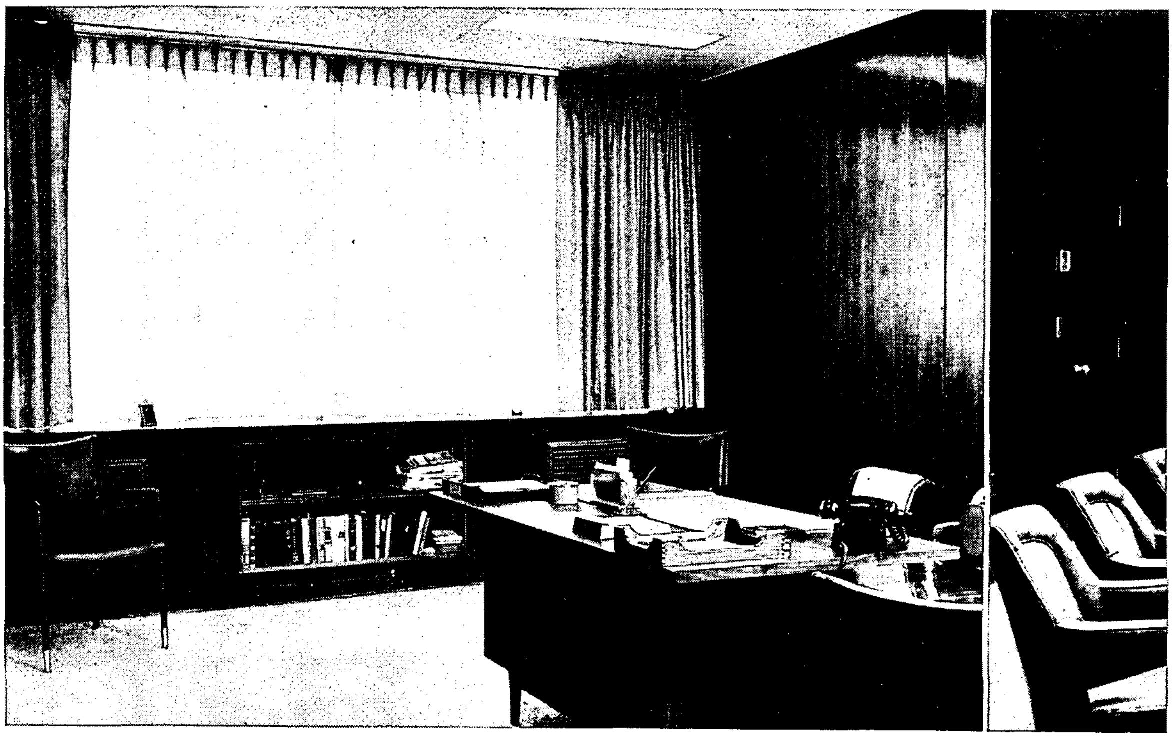
The Anemostat all-air high velocity distribution system offers other important advantages. It can be used with smaller than conventional ducts; it can be installed in less time and at less cost. It requires no coils; therefore, there is no leakage, clogging or odor.

ARCHITECTS—
Attention Please!

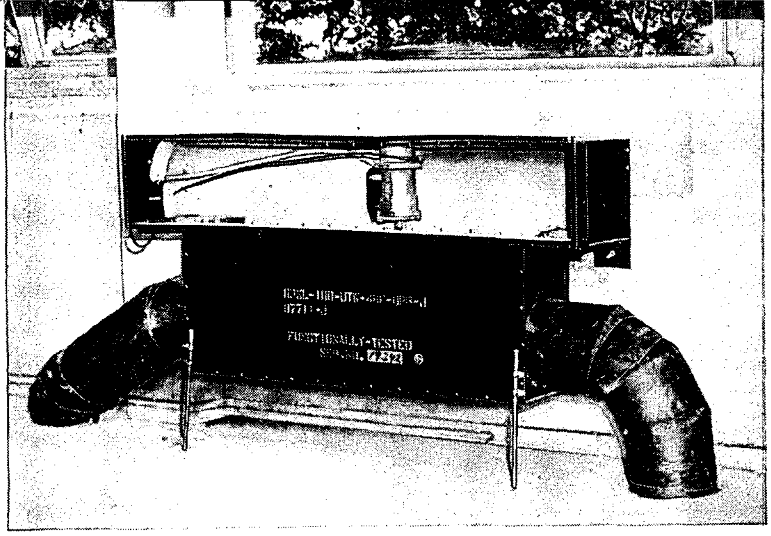
Anemostat round, square and straight-line diffusers used with high velocity units can be adapted to a wide variety of architectural designs.



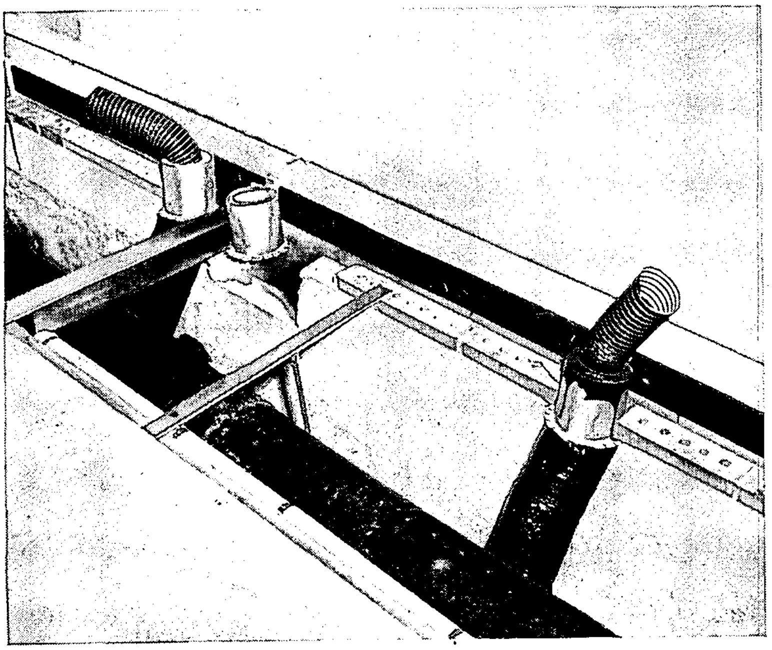
This modern structure is located in Princess Anne County near Norfolk, Virginia.
Architect:
T. David-Fitz-Gibbon, Norfolk, Virginia
Design Consultant:
Thaddeus G. Crapster, New York.
Consulting Engineer:
J. Robert Carlton, Richmond, Virginia.
General Contractors:
Doyle & Russell, Norfolk, Virginia.
Mechanical Contractors:
B. & G. Olsen Company, Richmond, Virginia.



Anemostat all-air units form an integral part of the interior design and can be easily combined with built-in cabinets or bookcases. →

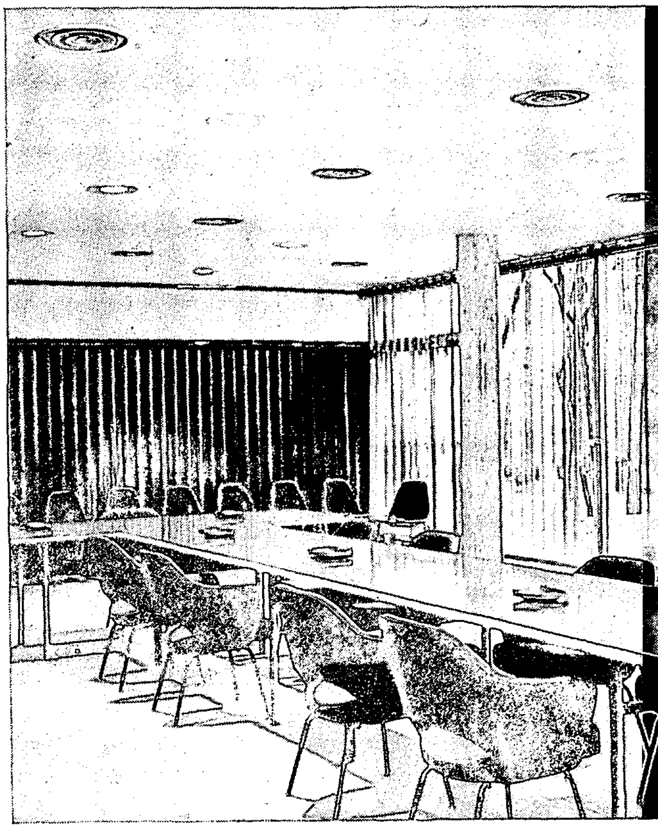


Anemostat UTW units before being enclosed.

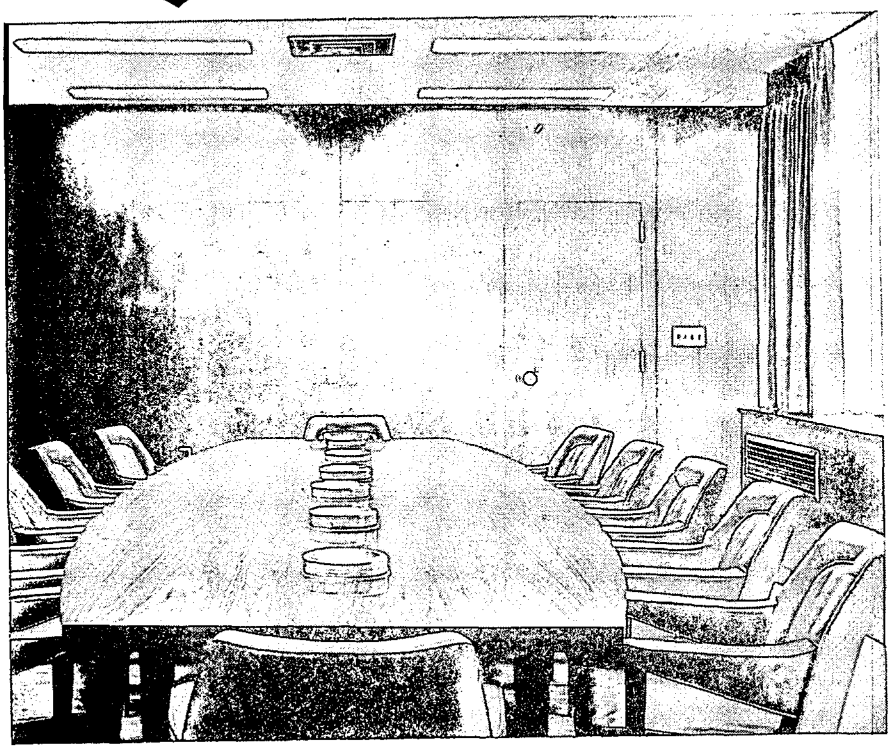


Typical take-offs from main supply duct located in the floor. High velocity ducts can be buried in the floor.

Air is perfectly distributed in large meeting room by means of Anemostat ceiling air diffusers.



Meeting room of the Board of Directors.
Note Anemostat ceiling and under-the-window units.



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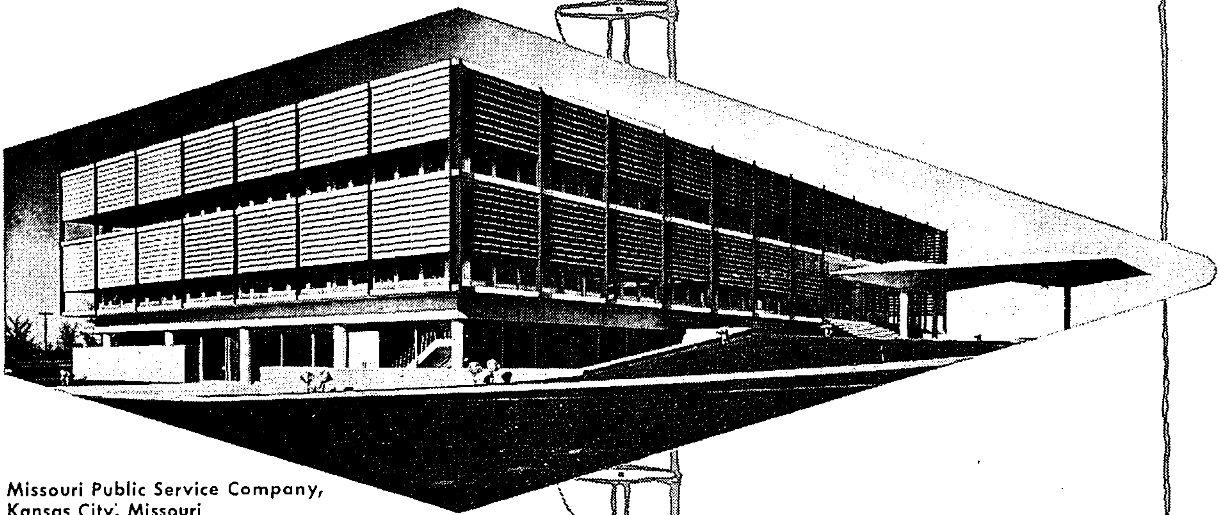

Missouri Public Service Company,
Kansas City, Missouri
Kivett, Myers and McCallum, Architects
J. E. Dunn Construction Company, Contractors

for this handsome office building. Heat gain through the large fenestration areas was reduced so greatly, it saved 28 tons on the cooling load. This initial savings more than paid for the Brown Sun Controls. The owners will also save on reduced operating expenses throughout the life of the building.

This job features a true solar control (Brown's electric control #3). With this system the sun activates the operators to automatically adjust the vanes. This permits maximum vision and light consistent with effective control of solar heat.

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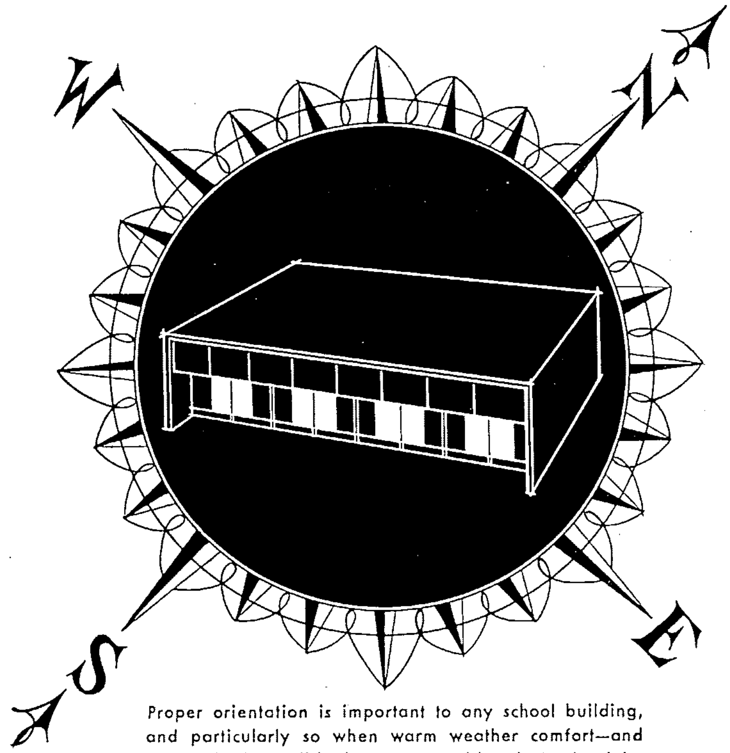


Proper orientation is important to any school building, and particularly so when warm weather comfort—and eventual air-conditioning—are considered. At the John Jay High School, the middle portion of south-facing wall is 50% glass, 50% light-colored panels to reduce glare and solar gain. Continuous glass in upper portion admits a maximum of useful light to the ceiling. As warm weather approaches, the shadow of the darkening-glass screen, shown below, covers more and more of the window until—in May and June—it is entirely covered.

CLASSROOM AIR CONDITIONING, more and more is becoming a basic factor in school design. Architects everywhere are recognizing the trend in their structural considerations for school buildings.

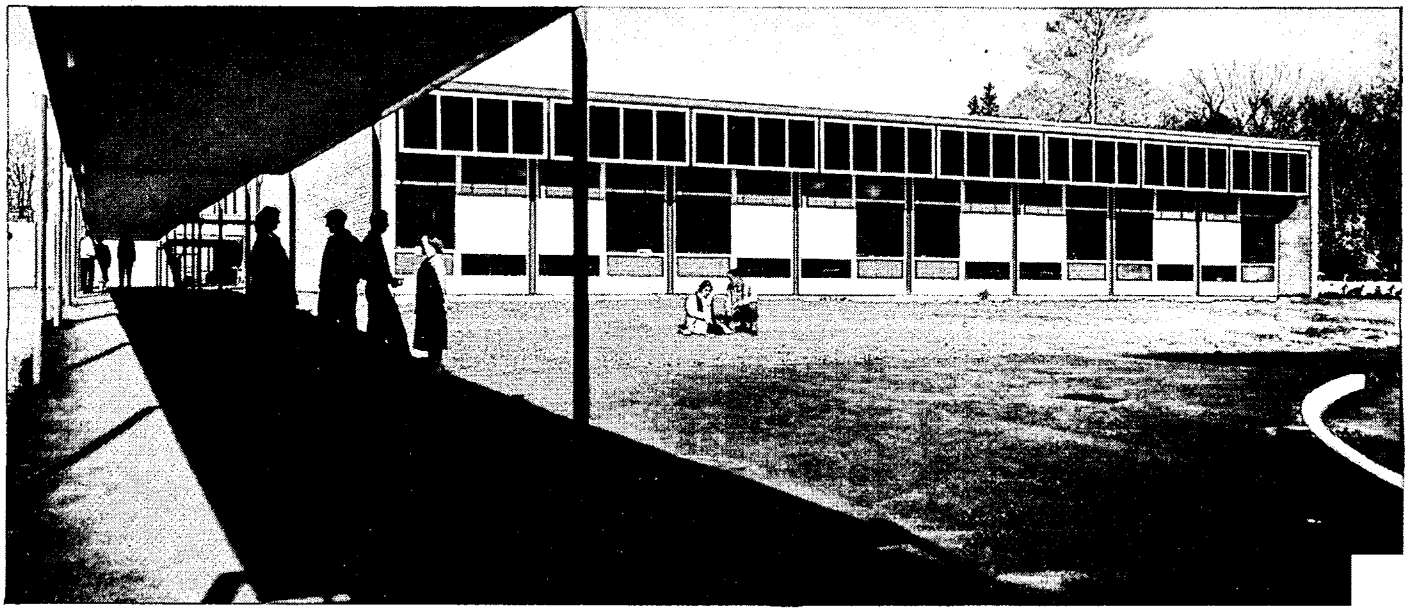
Educators, too, are thinking—talking—stressing air conditioning. They have found that classroom temperature, air movement and humidity have a direct bearing on learning and development. They realize that it is just as important that a child be comfortable in hot weather as it is in wintertime.

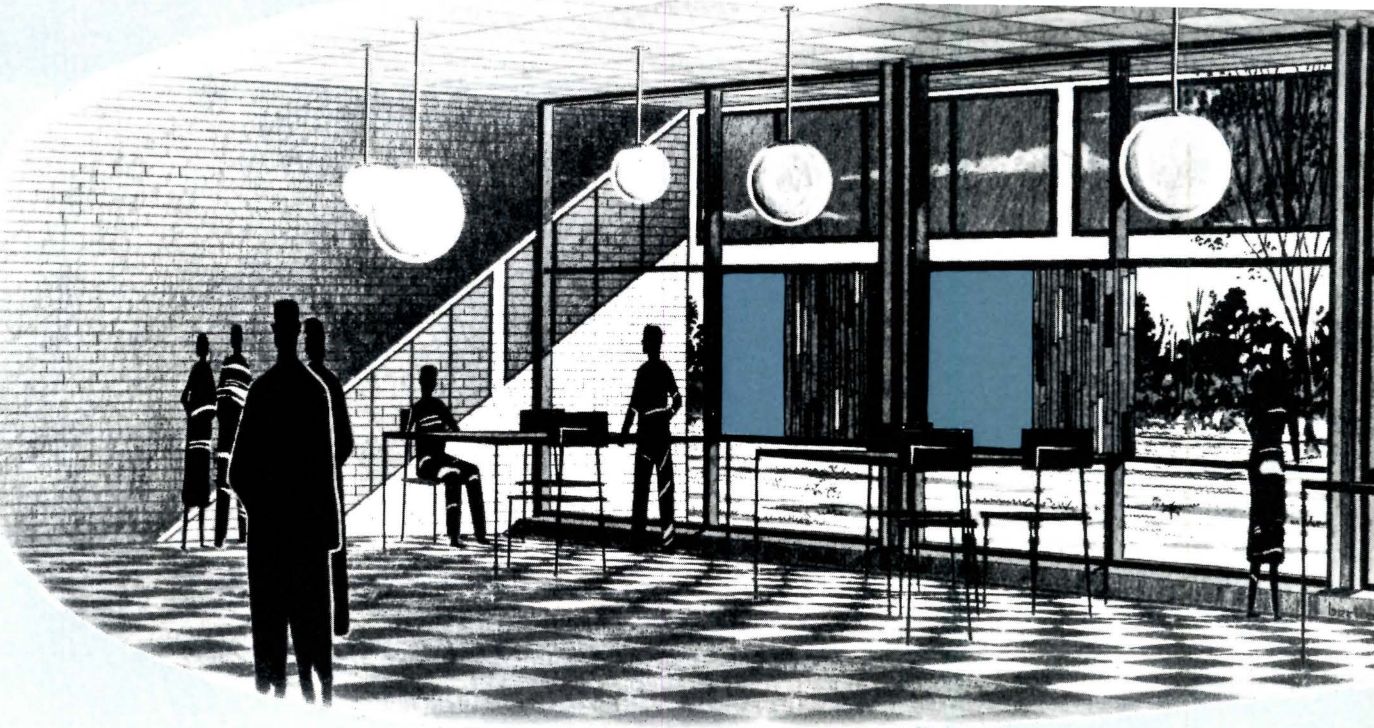
For these reasons, many schools are already air conditioned, or are planning for it in the future. Throughout the country, the need for air conditioning is being reflected again and again in basic school design. The building plan shown on these pages is an outstanding example.

Does the school you are planning include eventual air conditioning? Think it over. Chances are—it should.

Number two of a series . . .

The herman nelson file f





Stanley Sharp designs school window wall completely compatible with air conditioning

In the John Jay High School, Westchester County, New York, architects Ketchum, Giná and Sharp recognized window-wall as a key element in school design. Their approach was based on a conviction that control of solar heat is at least as important as admission of daylight to schoolrooms—and especially so in view of the likelihood of future conversion to air conditioning.

In the cafeteria, shown here, they developed a unique application of low-transmission glass, suspended vertically from the roof overhang—and a pattern of glazed and opaque panels in the window itself. Direct solar gain is greatly reduced in winter, completely eliminated in hot weather. Light distribution and visual comfort are actually improved.

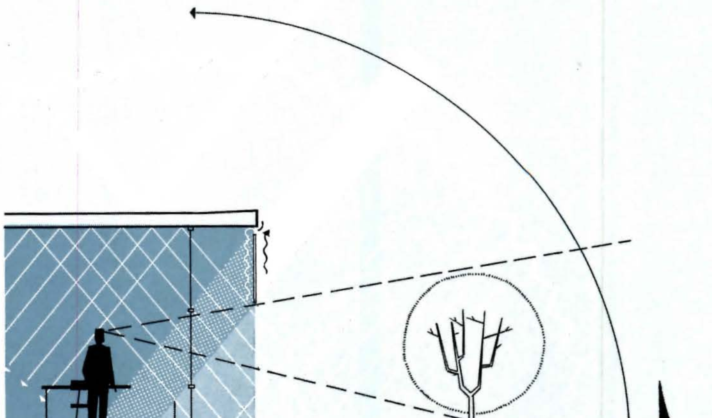
If, at any time, warm-weather cooling is added to the heating and ventilating functions of the mechanical equipment, the building will be far easier to cool than if it had continuous, unprotected windows. Meanwhile, the design is paying off in greater thermal and visual comfort from the start.

air conditioned school design

Schematic section through south-facing window-wall shows how low-transmission, glass screen blocks sun-heat, an important factor in eco*nomical air conditioning.* Diffuse reflected light penetrates deep into the room.

The darkening-glass screen also reduces sky glare without obstructing the view. Location of the screen at a distance from the window shadows its middle portion. This allows absorbed heat to escape to the outdoor air *on both sides of the glass,* and admits reflected "ground light" to the *entire* ceiling area.

Stanley Sharp, who designed the building, feels that *"the architect's obligation is to create a pleasant environment for people to live with and in. Our task is to arrive at a fine balance of many independent factors . . ."* This window-wall treatment is an excellent example of his philosophy.



JUST HOW MUCH DOES PROVISION FOR FUTURE CLASSROOM AIR CONDITIONING COST? The answer is: probably far less than you think—when you install HerNel-Cool II air conditioning unit ventilators. Actually, it costs only fifteen to twenty cents per square foot more than the cost of basic heating and ventilating equipment in average new construction—or between one and two percent of total building cost. Complete, immediate air conditioning is approximately fifty to fifty-five cents more.

By using Herman Nelson unit ventilators, schools have held heating and ventilating costs—including provision for future air-conditioning—to a total of less than $1.35 per square foot. Other schools have heating, ventilating and immediate air conditioning—for a total per square foot cost of less than $2.00! (And, in many cases traditional design concepts were used.) These are current costs, too! HerNel-Cool II unit ventilators have been available for little more than a year.

Look at the costs shown below. They are particularly interesting when you realize that they are truly representative—for Herman Nelson equipped schools in all parts of the country. Locations range from California to New York, from Wisconsin to Georgia.

TEN SCHOOLS ON WHICH BIDS WERE TAKEN ON HERMAN NELSON UNITS FOR HEATING AND VENTILATION ONLY

School	Total Cost	Total Cost Per Sq. Ft.	Heating & Ventilating Cost Per Sq. Ft.	Per Cent of Total Cost
A	$ 659,000	$15.33	$1.15	7.6
B	416,211	9.05	1.13	12.4
C	435,270	11.21	1.48	13.2
D	131,223	9.00	1.98	22.0
E	260,164	13.56	1.47	10.9
F	1,013,960	11.27	1.25	11.1
G	577,193	8.39	1.07	12.9
H	310,178	9.84	1.05	10.7
I	344,291	10.43	1.11	10.7
J	118,147	12.38	2.09	16.6
Average	$ 426,564	$11.05	$1.38	12.8

SEVEN SCHOOLS ON WHICH BIDS WERE TAKEN ON HERMAN NELSON UNITS FOR HEATING AND VENTILATION PLUS FUTURE AIR CONDITIONING

School	Total Cost	Total Cost Per Sq. Ft.	Heating & Ventilating Cost Per Sq. Ft.	Per Cent of Total Cost
K	$ 666,000	$15.49	$1.32	8.5
L	423,511	9.21	1.29	14.0
M	356,800	10.04	1.55	15.4
N	2,813,000	15.44	1.78	11.5
O	2,745,381	16.54	1.76	10.7
P	1,311,000	10.40	1.55	14.9
Q	500,000	15.63	1.72	11.0
Average	$1,259,385	$13.25	$1.57	12.3

Avg. add. cost provisions for future air conditioning..0.19

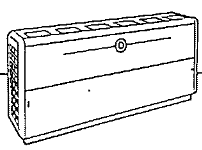
FOUR SCHOOLS ON WHICH BIDS WERE TAKEN ON HERMAN NELSON UNITS FOR HEATING AND VENTILATION PLUS COMPLETE AIR CONDITIONING

School	Total Cost	Total Cost Per Sq. Ft.	Heating Ventilating & Air Conditioning Cost Per Sq. Ft.	Per Cent of Total Cost
R	$690,000	$16.04	$1.88	11.7
S	371,100	10.44	1.95	18.7
T	406,463	14.38	2.41	16.8
U	360,700	13.11	2.22	16.9
Average	$457,066	$13.49	$2.12	16.0

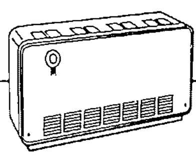
Average added cost for complete air conditioning......................0.73

Complete cost studies—for schools employing immediate air conditioning as well as for those which are planning for its installation later—are available upon request.

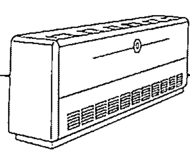
Get all the facts now. Classroom air conditioning—immediate or eventual—is being included in more and more school planning. You'll want to consider it in yours. Write today to Herman Nelson Unit Ventilator Products, American Air Filter Company, Inc., 215 Central Avenue, Louisville 8, Kentucky.



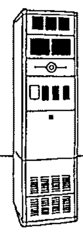
Hot water or steam unit ventilators



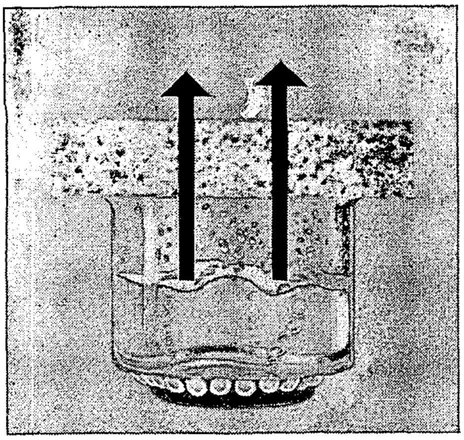
Amervent unit ventilators

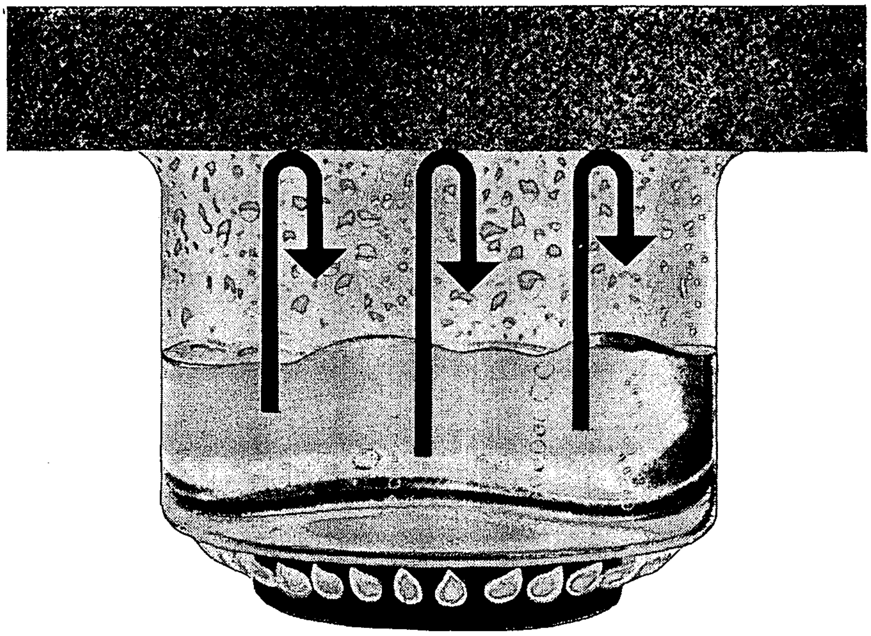


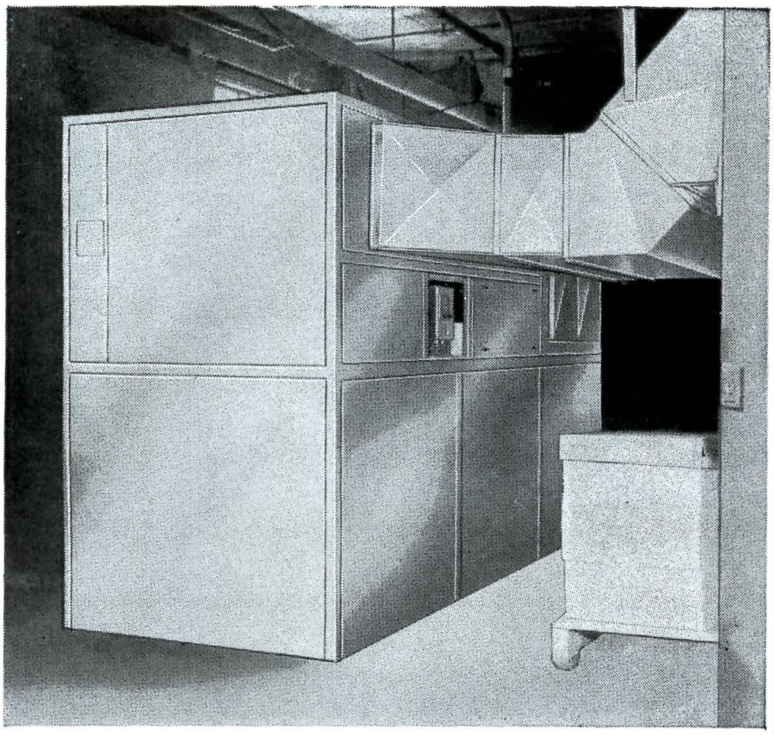
Electric unit ventilators



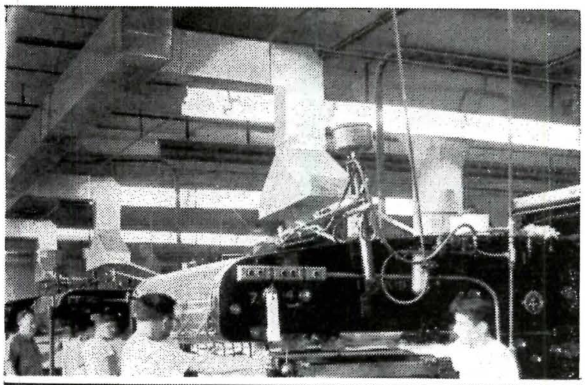
UniVent gas-fired unit ventilators

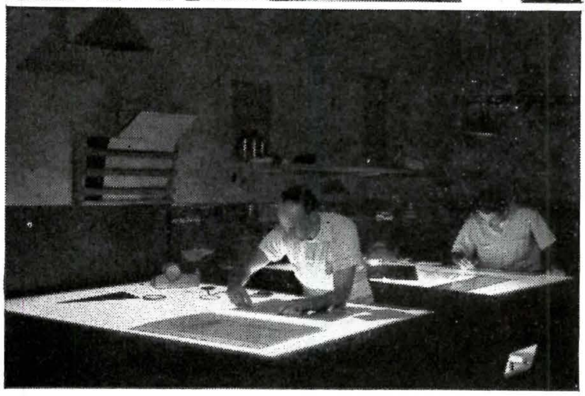






Engineers and Contractors: Tryon, Inc., Springfield, Mass.





IMPLE TO SPECIFY...
IMPLE TO INSTALL...
pre-engineered 'CPU' Air Conditioning Package
by DUNHAM-BUSH

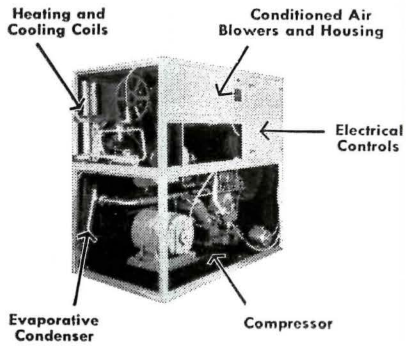
Proper control of humidity is an important consideration in a printing plant. At General Offset and Printing Company in Springfield, Mass. the decision was made to air condition the paper storage area, pressroom and "stripping" room.

Once this had been decided, top management executives naturally wanted the installation made quickly.

A Dunham-Bush 'CPU' Pre-Engineered air conditioner was selected. This unit is a complete air conditioning *system* housed in one cabinet—containing evaporator, compressor, evaporative condenser and pump, fans, motors, piping and controls.

Installation required only connection of power supply to control panel, connection of water make-up line and necessary duct connections.

For *your* next air conditioning job, why not eliminate specification and installation worries by selecting a Dunham-Bush 'CPU' Commercial Package Unit.



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There's a SUN VALLEY* All-Year® air conditioner to fit any size home you design . . .
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Plan and build around an Arkla-Servel SUN VALLEY* All-Year® Gas air conditioner.
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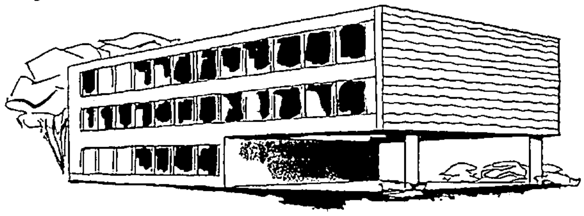
Another FIRST for CYCLOTHERM!

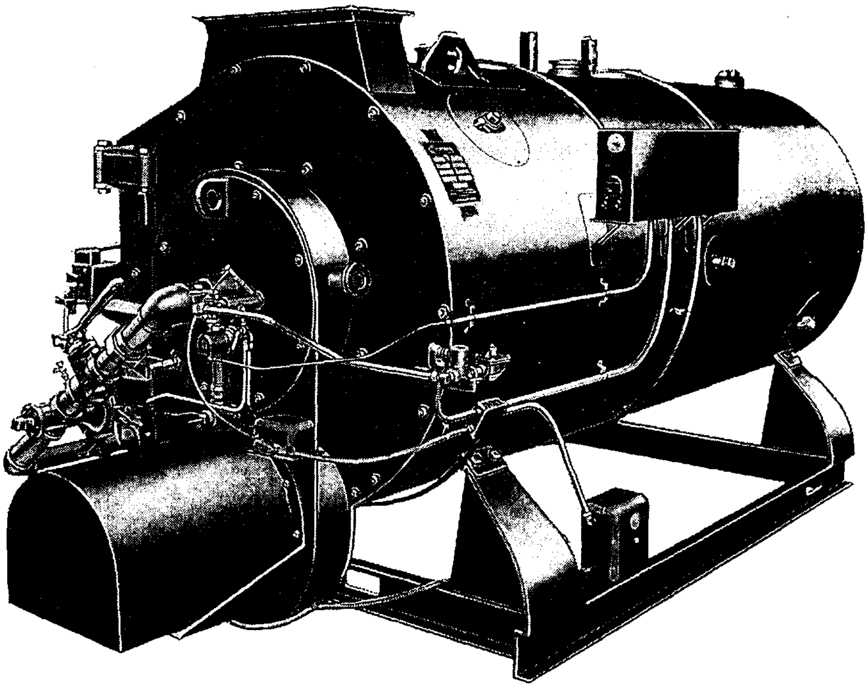
The only Package Hot Water Generator designed exclusively for Forced Circulation Hot Water Systems!



Here's why the new Cyclotherm Hot Water Generators are the biggest step forward in many years of hot water generator efficiency:

1. Internal design distributes water evenly to all of the effective heating surface.
2. At the same time, Cyclonic Combustion—Cyclotherm's patented combustion method—distributes heat evenly throughout the combustion chamber.
3. It is the combination of a controlled, directed flow of water with a controlled, directed flow of heat that puts these hot water generators so far ahead of the field.
4. Minimum operating efficiency of at least 80% is guaranteed without qualification.
5. Ten models, with capacities from 670,000 Btu per hr to 6,700,000 Btu per hr make these hot water generators available both for large and small hot water systems.

No other package generators incorporate these principles of design. Built exclusively for forced circulation hot water heating systems, they have broken entirely away from principles of steam design that are not applicable to hot water production. Write today for descriptive folder No. 34.



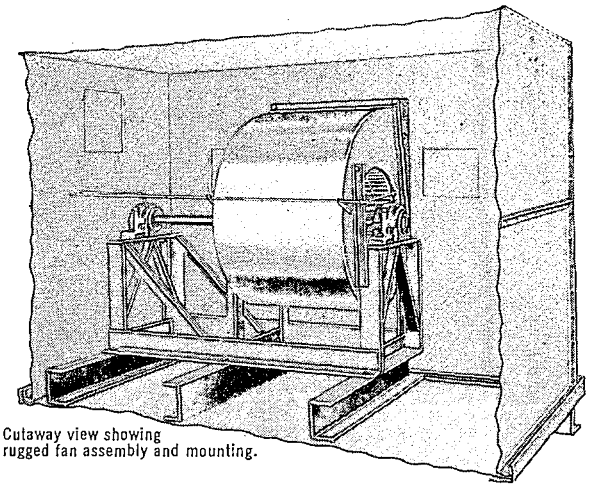
YEARS AHEAD IN STEAM GENERATION

CYCLOTHERM®

STEAM AND HOT WATER GENERATORS

Cyclotherm Division National-U. S. Radiator Corporation, Dept. 33, Oswego, N. Y.

A new pace-setter



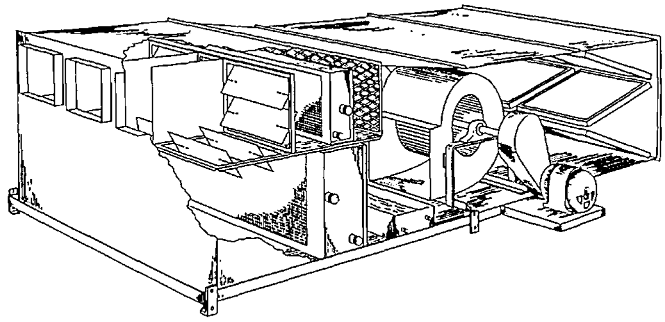
Cutaway view showing rugged fan assembly and mounting.

Clarage Hi-Static Multitherm for High Velocity Air Conditioning Systems

INTRODUCED IN 1955 by Clarage, this new line of Draw-Thru type units fully answers the requirements of conduit type systems where high duct velocities and pressures to 8″ static are involved.

FIRST INSTALLED IN 1956 in the Pennsylvania Lumbermen's Mutual Insurance Building, Philadelphia. Since then numerous Clarage Hi-Static Multitherms have been specified and used because of stable, efficient operation. Request Bulletin 1312 covering the 7 sizes, capacities 2,500 to 22,000 CFM.

Still a pace-setter



Clarage Blow-Thru Multitherm for Central Station Zone Control Air Conditioning

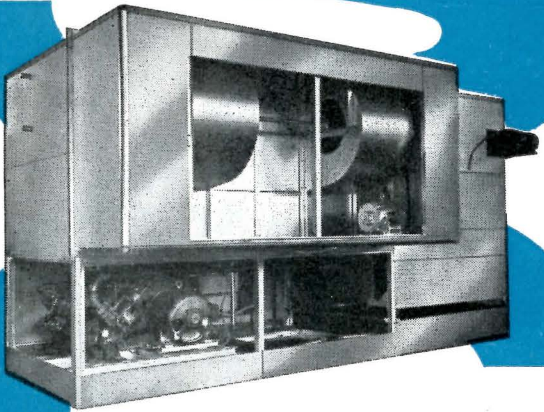
INTRODUCED IN 1939 by Clarage, the pioneer and perfecter of this type of equipment. A single Blow-Thru Multitherm Unit can handle as many as 8 different zones for different area requirements.

FIRST INSTALLED IN 1940 in the Northern Indiana Brass Co. office building, Elkhart. Over 1000 Clarage Blow-Thru Multitherms have now been installed the nation over—selected because of their unique feature of *mixing* hot and cold air to prevent stratification... their quiet, economical, dependable performance. Request Bulletin 1310 covering the 12 sizes, capacities to 12,000 CFM.

CLARAGE *... dependable equipment for making air your servant*

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

"SATISFABRICATED"© For Your Requirements . . .



GOVERNAIR'S NEW

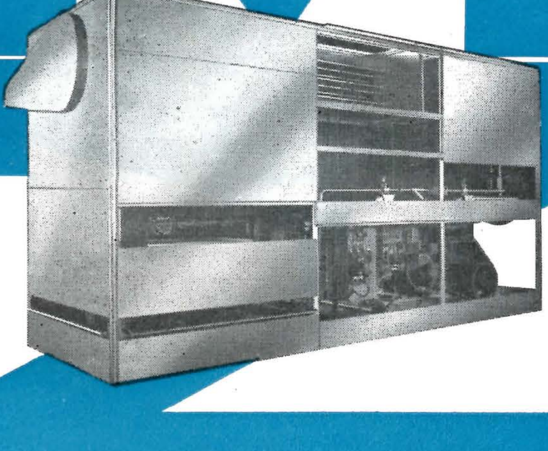
Self Contained Multi-Zone Conditioners . . . Type SCMZ

IMPORTANT FEATURES:

- FROM 7½ to 60 TONS COMPLETELY PACKAGED
- EITHER 4 ROW, 5 ROW OR 6 ROW COILS
- TWO INDEPENDENT REFRIGERANT CYCLES, IF REQUIRED
- DESIGNED WITH F-22 COMPRESSORS
- LESS INSTALLATION TIME AND TROUBLE
- ONE UNIT SATISFIES YOUR AIR CONDITIONING REQUIREMENTS

The new SCMZ is designed for complete flexibility . . . provides the desired latitude necessary to meet the exacting requirements and unusual space limitations not available in the majority of today's mass produced, unalterable packaged conditioners.

Governair's "Satisfabricated" Self Contained Units have all the basic components of a complete air conditioning system, conditioner section, compressor section, and evaporative condenser section. In these units all refrigerant piping and electrical connections are completed internally by factory-trained craftsman, and carefully supervised to assure proper operation on the job. Simple connection of duct work, electrical, make-up water and drain provide fast and economical installation.



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GOVERNAIR CORPORATION
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"ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS"

New from Lennox! Fresh ai
for classrooms...for as little

Lennox Air Processing Unit introduces fresh air in adjustable volumes (A); transmits warm air (B) from adjacent or remote heating unit; continuously recirculates indoor air (C); filters air clean (D). Lennox' exclusive floating blower (E) and acoustical lining (F) assure a degree of quietness never before achieved.

LENNOX COM

heating and ventilating

s $1.03 per square foot!

New Lennox Comfort Curtain system automatically draws in fresh air from outside...warms, cleans, circulates air...provides tons of needed cooling without the cost of refrigeration!

Across the country, the Comfort Curtain system is drastically reducing the cost of school heating and ventilating. Costs per square foot of $1.03 in Indiana, $1.15 in Montana, $1.12 in South Dakota are typical examples. One job went in for a cost so low we hesitate to quote it—*just 65c per square foot.* That was in Potosi, Missouri!

A NEW APPLICATION

These exceptional savings are the result of a new approach to classroom heating and ventilating, provided by the Lennox Comfort Curtain system. This new system applies to schoolrooms the sound, tested principles of warm air heating (long the preferred method of residential heating), thus eliminating the pipes, boilers, towering chimneys and inflexible heating plants that have made average heating installation costs considerably higher.

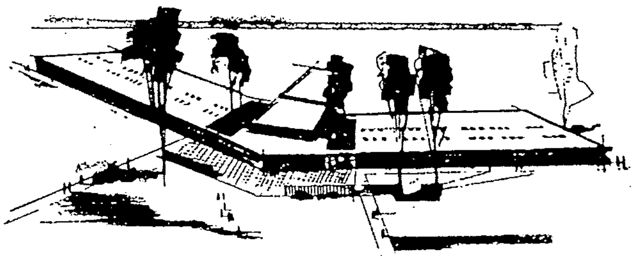
Nor is this all. The Lennox Comfort Curtain can easily save hundreds of dollars per classroom each year it is in use. Fuel is consumed only when heat is required, maintenance and service are amazingly simple and low-cost—well within the capacity of any competent local heating dealer.

And most important, the Lennox Comfort Curtain system actually does a *far better* job than costlier systems used previously. The Comfort Curtain does a *complete* job, provides a full, even flow of air throughout its entire length along the exposed classroom wall. It is amazingly quiet. And it holds room temperatures to a variance of six-tenths of one degree, circulates air continuously for perfect distribution, introduces a continuous supply of fresh air during the daytime heating cycle, and provides *tons* of needed cooling without the cost of refrigeration.

COOLING WITHOUT REFRIGERATION!

Extensive surveys show that on almost every day when the temperature is above freezing, the classroom no longer requires heat, shortly after pupils assemble. True, at 33° the average classroom needs about 20,000 Btuh. But 30 pupils will generate about 12,000 Btuh, lighting will add another 8,000 to 10,000 Btuh, and the sun load can account for as much as 15,000 Btuh. Since the amount of heat being generated exceeds the classroom heating requirement, it becomes necessary to *cool* the classroom to maintain a healthful, comfortable temperature. The Lennox Comfort Curtain system does this automatically by introducing cool, fresh outside air to meet the need. Even if the temperature of the outside air is as much as 50°, the equivalent of two tons of cooling can be provided in this way

There is today no possible way to achieve all these advantages at so little cost—except with the Lennox Comfort Curtain. The system is completely flexible, uses child-proof wall- or bookshelf-ducts, installs readily in any size or design of school, comes completely equipped with a "laboratory matched" control system. Send coupon below for free booklet.



The 24-classroom Junedale school, located in Gary, Indiana, will be heated and ventilated by the Lennox Comfort Curtain for $1.03 per square foot. Architect: David J. Katz, A.I.A. Heating Contractor: Quality Heating and Air Conditioning.

LENNOX

Lennox Industries Inc., Dept. PA-81
1701 E. Euclid Ave., Des Moines 5, Iowa

Gentlemen: Please send me your free booklet on the Comfort Curtain system of classroom heating and ventilating.

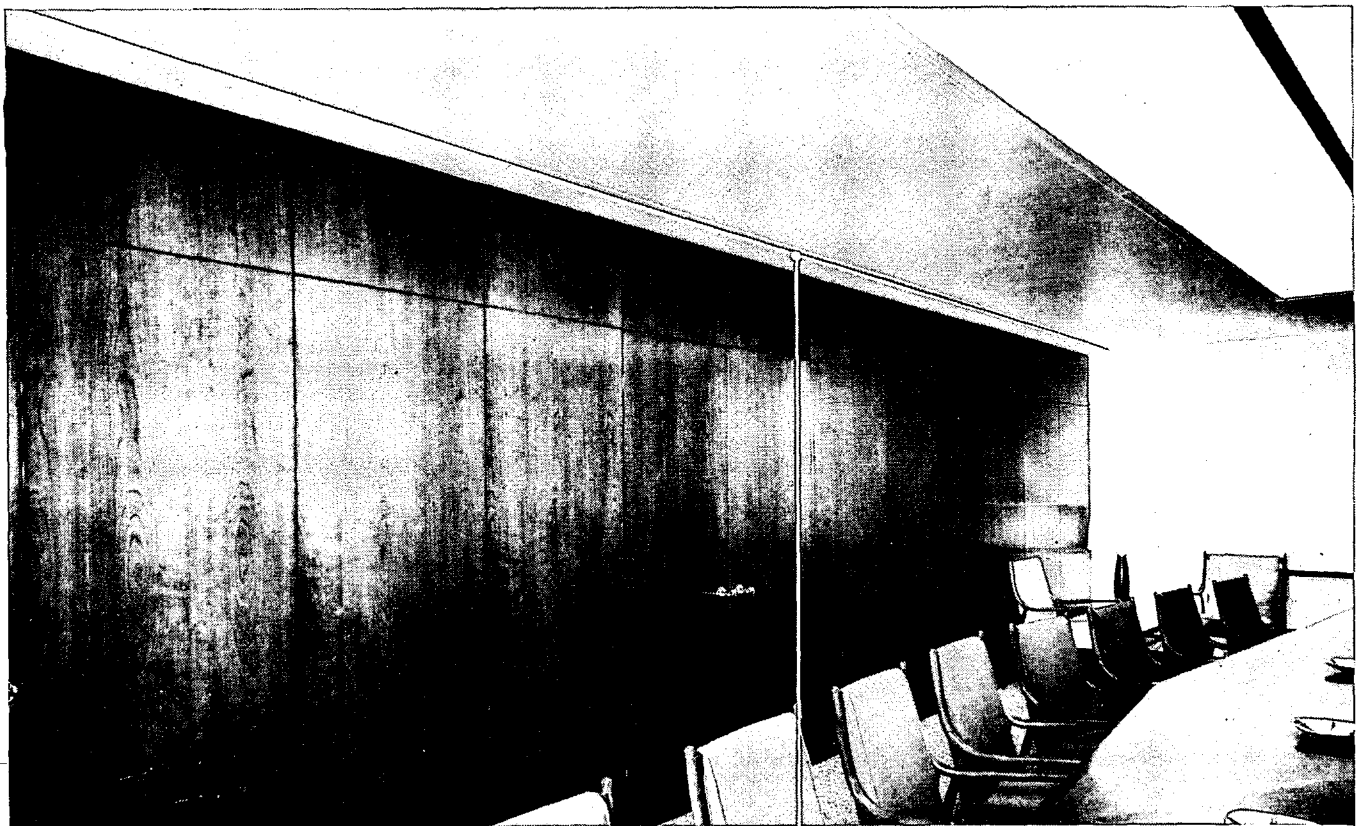
NAME__________

ADDRESS__________

____

CITY__________ZONE____STATE__________

FORT CURTAIN



Designer:
Maria Bergson Associates

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Distinctive SLOT TYPE Diffusers

Look around . . . you'll see STRIPLINE by AGITAIR everywhere. And no wonder. STRIPLINE combines the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length.

Slender, inconspicuous, practical and versatile . . . STRIPLINE slot diffusers can be located in walls, ceilings, coves, moulds, window reveals, stools . . . yes anywhere to suit interior design.

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high velocity units • punkah louvers
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Sold exclusively by representatives for:

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185 MADISON AVENUE, NEW YORK 16, N. Y.

Write for Complete Stripline Catalog

Type H Stripline shown in above installation

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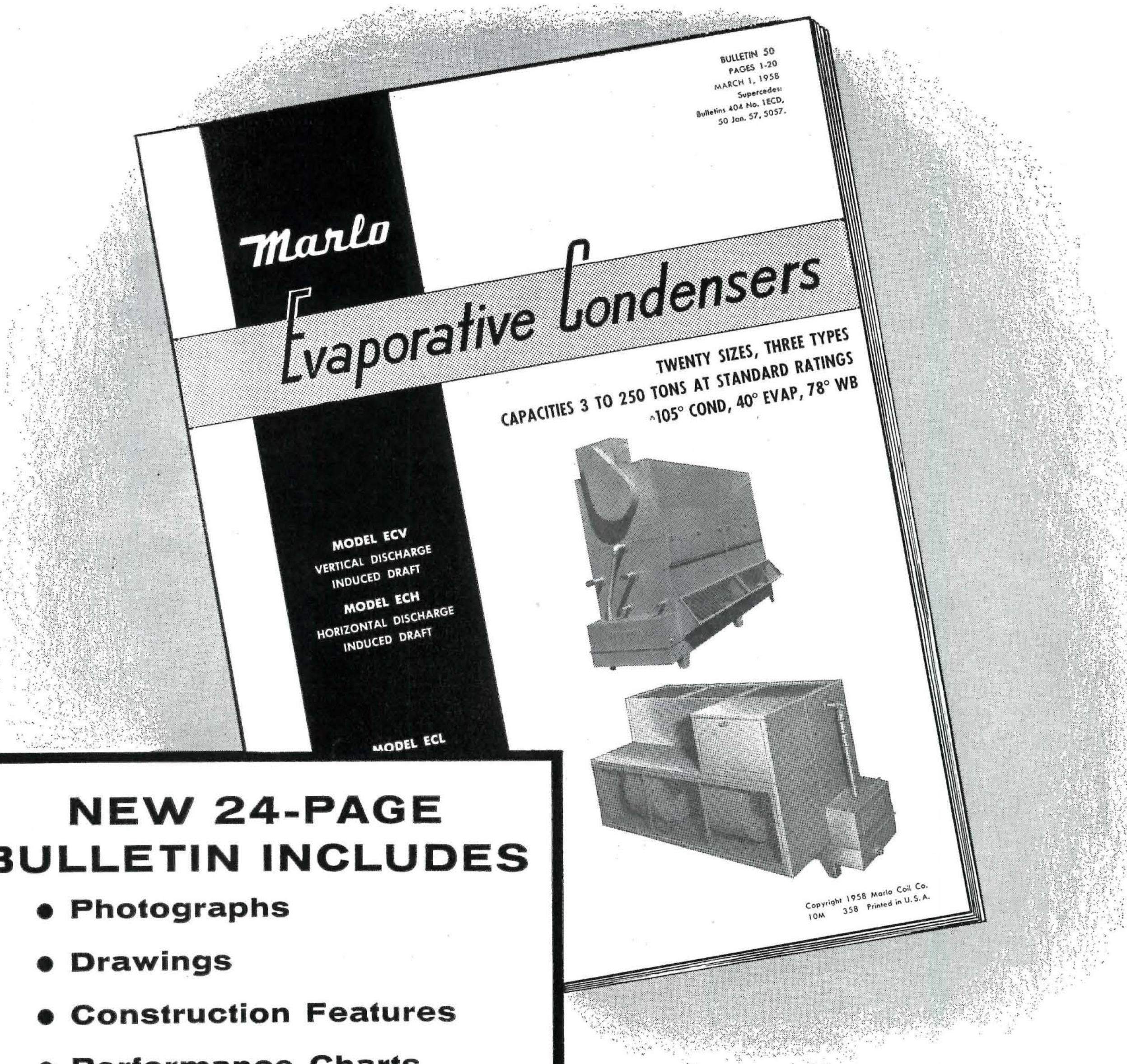

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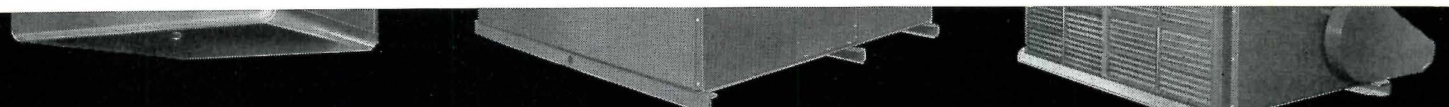
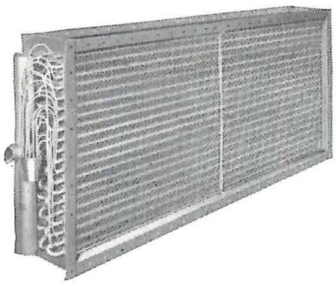
Quality Air Conditioning and Heat Transfer Equipment since 1925



"RH" Air Conditioner. Water and direct expansion models in four sizes from 1000 cfm to 3000 cfm. Heating coils for use with steam or hot water and cooling coils for use with water or Freon available to provide year 'round operation. Can be installed in an adjacent area if needed.

Horizontal Multi-Zone Air Conditioning Unit. Outside weather conditions, or inside requirements may make it necessary to heat some sections of a building at the same time that other sections require cooling. Ten sizes from 1370 cfm to 29000 cfm. Available with 6 to 22 zones.

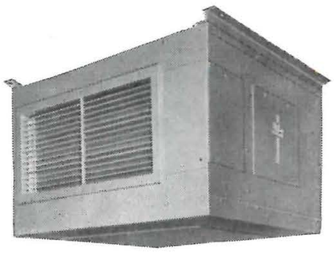
Vertical Multi-Zone Air Conditioning Unit. Specifically designed for simultaneous heating and cooling. Eight sizes from 1370 cfm to 21000 cfm. This unit is so constructed that it can deliver to any one of many different zones in a building, either cooled, filtered dehumidified air, or heated, filtered and humidified air, or a mixture.



McQuay Direct Expansion coils have the exclusive Ripple-Fin and staggered tube construction for maximum heat transfer, strength and rigidity. Made in an exceptionally wide variety of sizes, styles and capacities to meet the requirements of every application.

McQuay Water Cooling coils are available in a wide variety of sizes, styles and capacities, 1 to 10 rows. Staggered tubes and rippled fins create air turbulence to give maximum air side heat transfer. Mechanical expansion bond insures permanent metal to metal construction.

Floor Type Seasonmaker for free standing floor mounting. 4 sizes, 200 cfm to 600 cfm, ½ to 2 ton nominal cooling capacity. Thermally and acoustically insulated. Choice of 3 air discharge grilles. Basic type for fully recessed applications is also available.



Ceiling Type Seasonmaker. For suspended mounting. Seven sizes from 200 cfm to 2000 cfm, ½ to 5 ton nominal capacity. Thermally and acoustically insulated. Designed for multi-room buildings. All units have the famous McQuay Ripple-Fin coils.

Giant Computers are made here

Architect: **L. Rossetti**

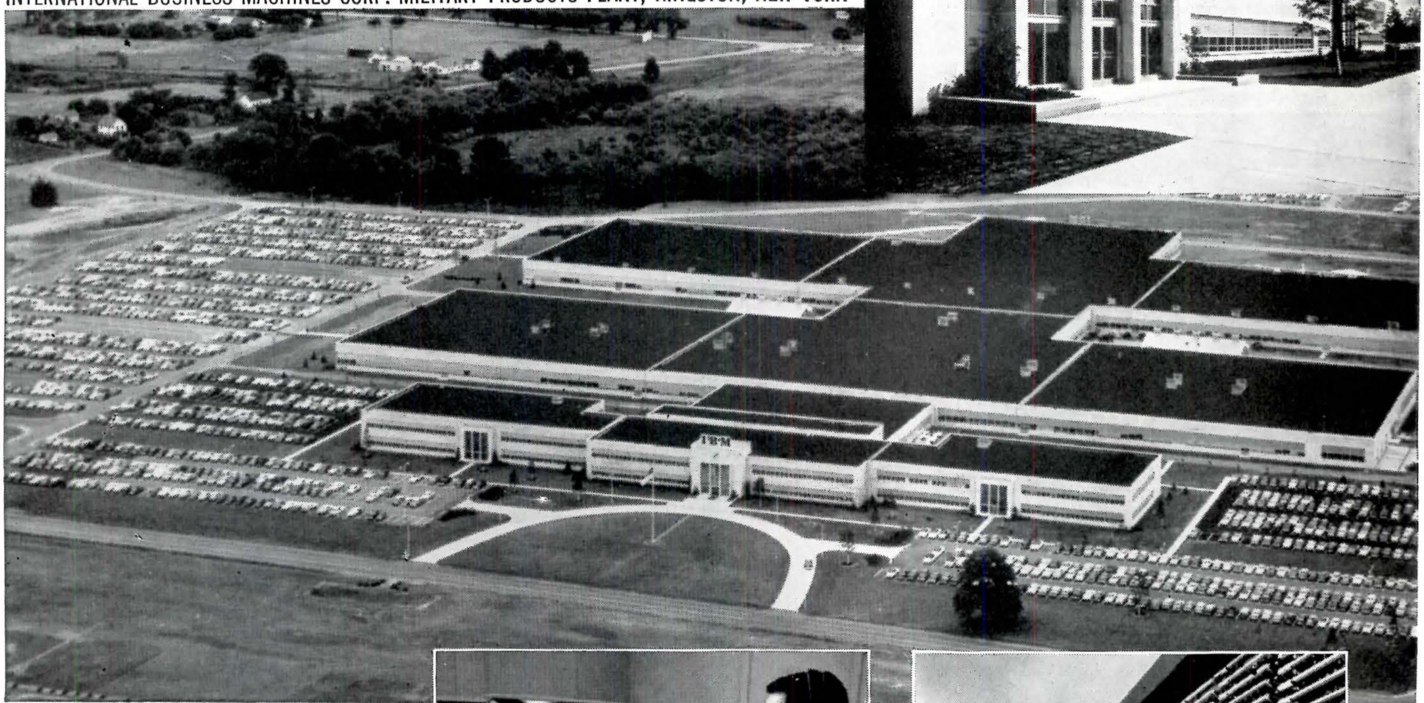
Engineers: **R. F. Giffels and V. E. Vallet, Detroit, Mich.**

Contractors for heating and air conditioning:

Rowland Tompkins & Sons, Hawthorne, N.Y.

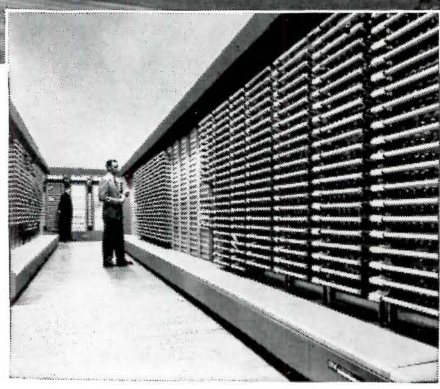
Carrier Corporation, New York City—subcontractor

INTERNATIONAL BUSINESS MACHINES CORP. MILITARY PRODUCTS PLANT, KINGSTON, NEW YORK



Focal point of the SAGE Air Defense System is the round scope portion of Display Console shown in photo at right. It can depict the over-all battle or focus on part of it. Powers Precision Control of Temperature and Humidity is important in all spaces shown here at the IBM Kingston Plant

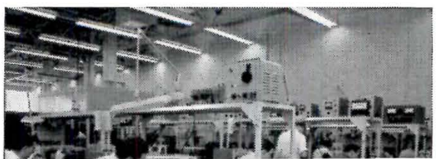
One of the SAGE Air Defense System Display Consoles.



Input frames (front view) thru which all radar information is processed.

View of Pluggable Unit Assembly department.

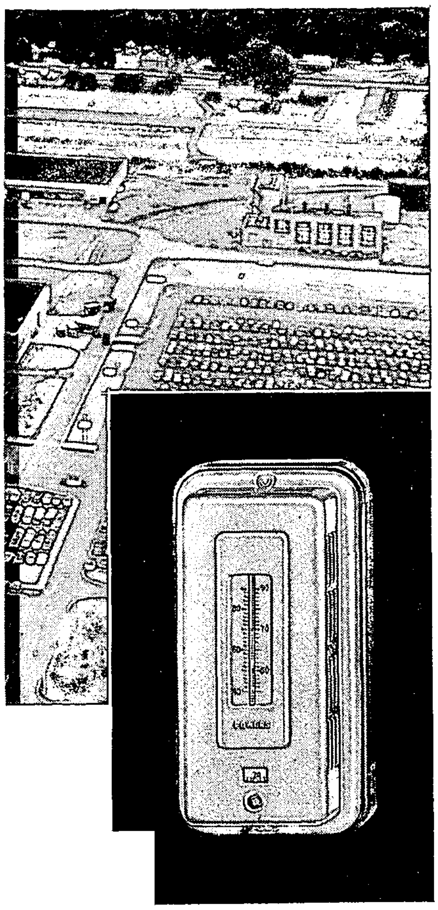
One of many Quality Control areas.



View of Manufacturing-Engineering department.

where Employees both THINK and work better in proper Thermal environment provided by

POWERS AIR CONDITIONING CONTROL SYSTEMS



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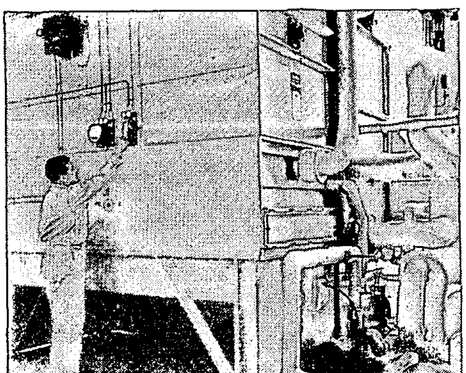
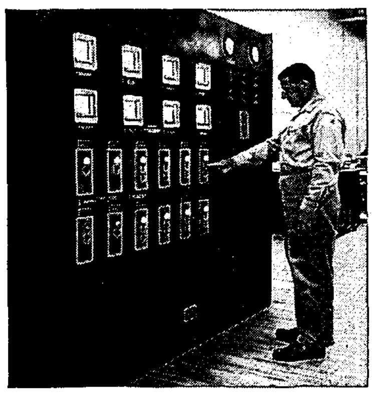


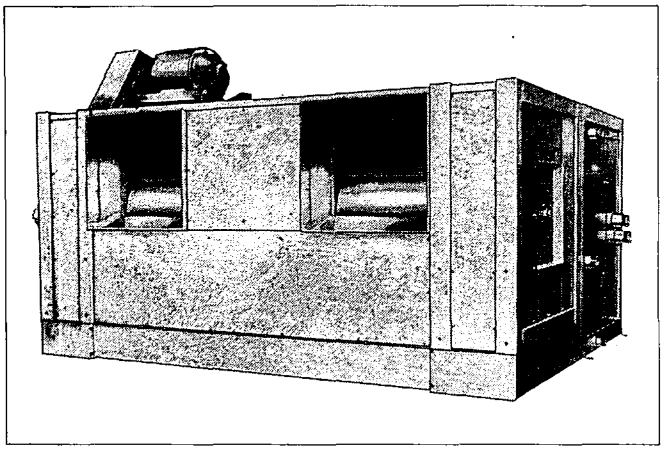


In 4 special SAGE Computer test areas are dehumidifiers (above), a central control panel (right), and dry air coolers (left). On the latter, fluid drive variable speed control is operated by a 6″ Powerstroke motor controlled by Powers Static Pressure Regulator and Submaster K Thermostat.

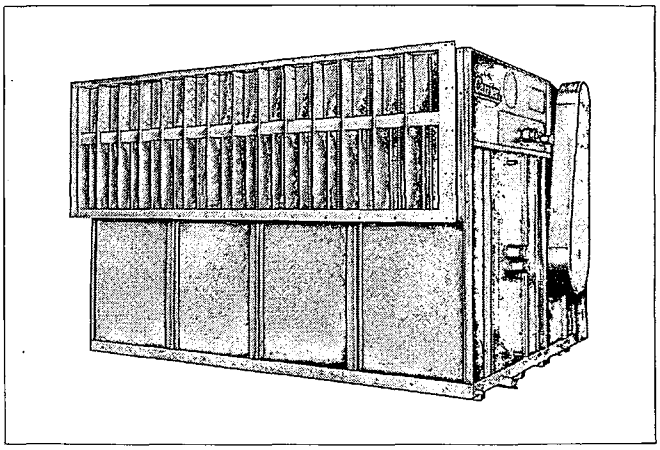
(C-57)

These two new Carrier Central Station Air Conditioner can save hours of design time

Today, tomorrow or the day after, someone in your office will be face to face with the time-consuming problem of locating and selecting the right fan-coil unit for an air conditioning system. Now Carrier cuts hours off the job with these two new central station air conditioners. They're so compact they go places where others won't. They make piping layouts a cinch. Connections are all on one side or the other. Truly horizontal or truly vertical air discharge solves location headaches. Centrifugal fans develop up to four inches static pressure to handle air distribution at higher velocities. Larger sizes often make one unit do the work of two. Cooling and heating capacity requirements can be closely matched. Equipment selection is hours quicker from only one catalog by either the Entering Wet Bulb or the Apparatus Dewpoint method. No basic data calculations required. For your copy of the 72-page catalog that provides complete, detailed information, phone the nearest Carrier office. Or write Carrier Corporation, Syracuse, N. Y.



39AC SYSTEM WEATHERMAKERS for conventional central station applications. Building block construction for easy field handling. For use with direct expansion or chilled water cooling systems; steam or hot water heating systems. In eight sizes, from 3000 to 41,000 cfm and air velocities from 300 to 700 fpm.



39W ZONING WEATHERMAKERS for simultaneous independent cooling and heating of up to 14 different zones. For use with direct expansion, chilled water or brine cooling systems; steam or hot water heating systems. In eight sizes, from 3000 to 35,000 cfm and air velocities from 300 to 600 fpm.

man-made climate

Although the full definition of air conditioning—which includes heating, cooling, cleaning, controlling humidity, and moving of air—has been established for at least 30 years, a few architects and a majority of their clients still think of it as the provision of cooling for summer comfort. However, past and present attention devoted to popularizing the concept of year-round comfort air conditioning will ultimately correct this misconception.

The following pages of this review—which document man-made climate in office buildings, industrial buildings, schools, hospitals, residential structures, and specialized installations—unquestionably demonstrate the high plateau that has been achieved in the development of environmental control and the acceptance of its appealing benefits by owners. In his definitive round-up, "Air Conditioning: Principles, Systems, and Applications," John K. M. Pryke in this issue finds that the architect and consulting mechanical engineer must agree at an early date on what effects structural and mechanical designs may have on each other and how their integration will affect the ultimate esthetic appearance of the building. Pryke also demonstrates, by examples, what specific mechanical factors should be given special attention due to the basic plans and forms conceived by the architect.

Although the achievements in air conditioning during the last twelve years have left behind many important milestones and some individuals may now share a sense of arrival at optimum, others will recognize that momentum is still gathering and will be curious about the control of environment in another dozen years. In his discussion, "The Outlook for Air Conditioning," E. J. Benesch cites in this issue trends and influences that will be reflected in the fundamental principles of year-round air conditioning and that will have a bearing on the design of future buildings. Projecting even further into the future, one might look forward to vastly improved techniques of providing the ideal environment for any climate. One might contemplate systems that would not rely on mechanical methods of heating and cooling coils, on mechanical movement of air over exchangers of predetermined temperatures, on mechanical humidification, or on mechanical methods of air cleansing. A better understanding of thermodynamics coupled with the advantages of future developments in electronics and tomorrow's nuclear resources of power will all contribute to the progressive evolution of our man-made climate.

the scope of man-made climate

In addition to providing capacity for satisfactory year-round comfort for all types of occupancies, present-day air-conditioning equipment is also called upon to perform a number of more specific duties. For special cases, pin-point control may be required as, for instance, in a gambling club, a data processing equipment room, or a limited area of a TV stage. Churches and auditoriums present another type of problem, since they need only occasional conditioning; in many buildings of this type economies can be achieved by not conditioning the entire volume (*see Church of Our Saviour in this issue*). At the other extreme of "special" problems are the large building complexes, often best served by a separate plant serving the heating and cooling needs of all structures in the grouping.

At Harold's Club, Reno, Nevada — claimed the world's largest gambling club—a method of temperature control has been specially designed to meet the divers needs caused by constantly moving crowds of people (**1,2**). A thermostat is placed in the heart of the area to be controlled, above the heads of the people, and in the center of the air pattern set up by the diffuser. As the heat load in the area changes, the thermostat automatically changes the proportions of warm and cool air supplied by a dual-duct high-velocity system and it is distributed over a relatively small area by the related diffuser.

Another instance of pin-point type of control is found at IBM's Endicott plant where No. 650 data-processing units are tested. Normally this machine does not require air conditioning to operate successfully; however, certain optional features must be operated under controlled atmospheric conditions. Testing the optional features must be under the same conditions. Heated air from each machine (**3,9**) is drawn up into a hood and through a four-row coil in which chilled water is circulated. After passing through the coil, the cooled air is passed back into the room.

All four buildings comprising the Monsanto office-building grouping have been provided with year-round air conditioning (**4,5,6,7**). The central power plant houses two water-tube boilers that furnish steam to heat exchangers throughout the installation and two centrifugal compressors—800- and 600-ton capacity—provide 45 F chilled water for the various cooling units. Hot-water converters and pumps are in the penthouses and down feed to convectors at each floor.

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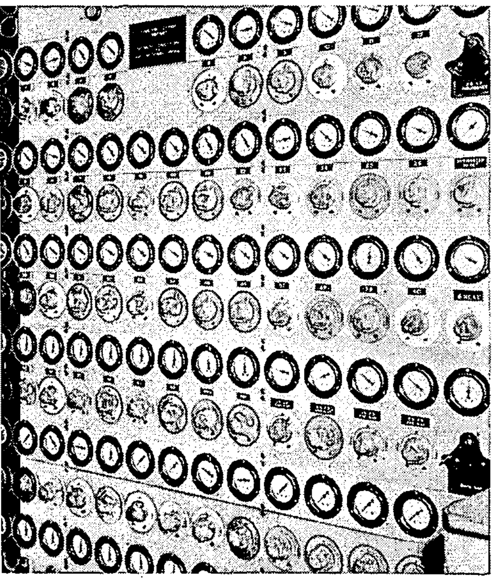

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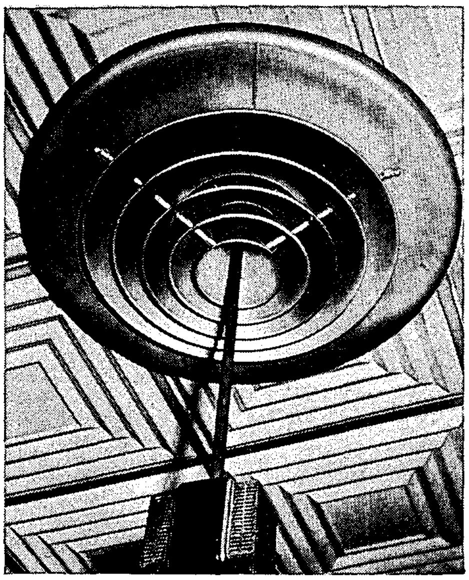
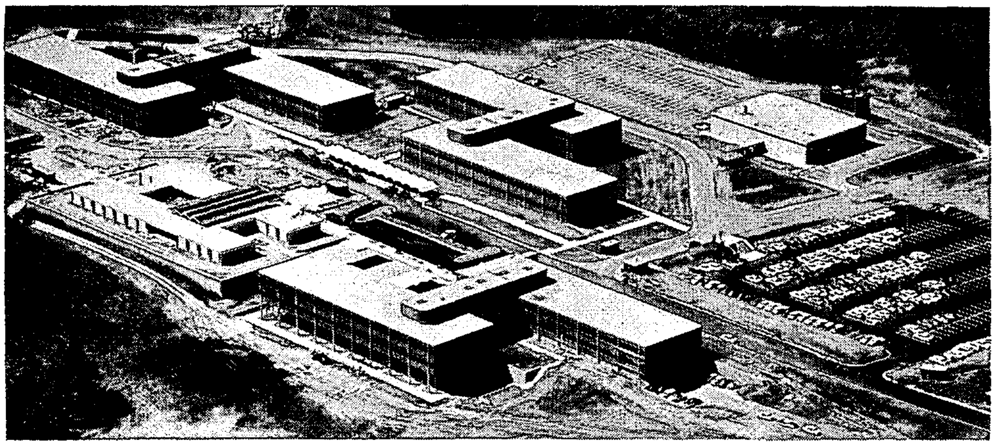


Automatic temperature and air-conditioning panel (above) *controls 110 diffusers individually in response to humidity-compensated thermostats suspended beneath diffusing units and directly above gambling tables. Architects, Ferris & Erskine; Mechanical Engineer, Clyde E. Bentley, Mechanical Contractor, Earl O. Stice.*

Testing area for data-processing machines (right *and* acrosspage) *has individual hoods for each machine. After being cooled, air is discharged back into room. These air-heat exchangers keep room at designed conditions and provide adequate air circulation. Air-conditioning system was designed by IBM Plant Engineering Department.*

Photos: Anemostat and International Business Machines Corp.

3



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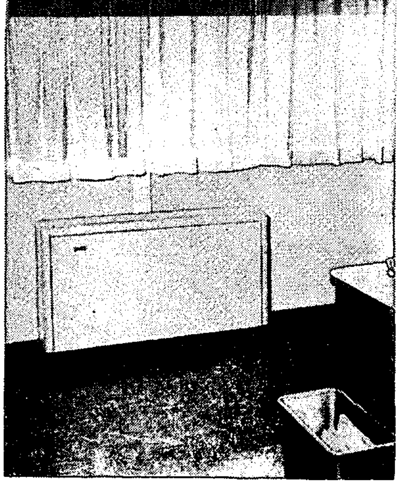

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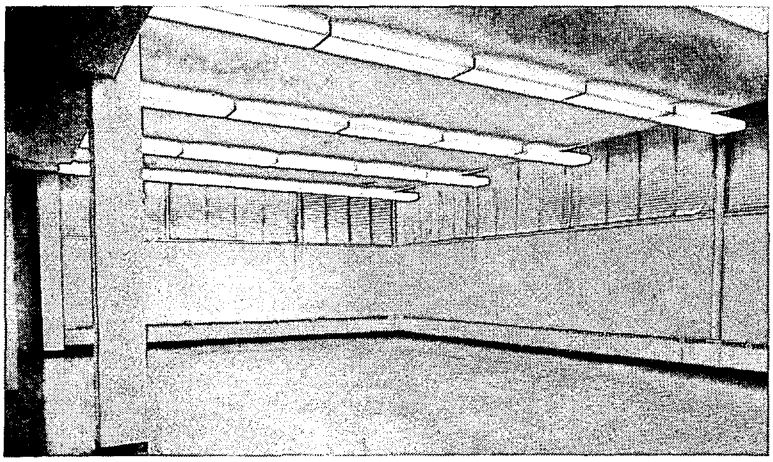

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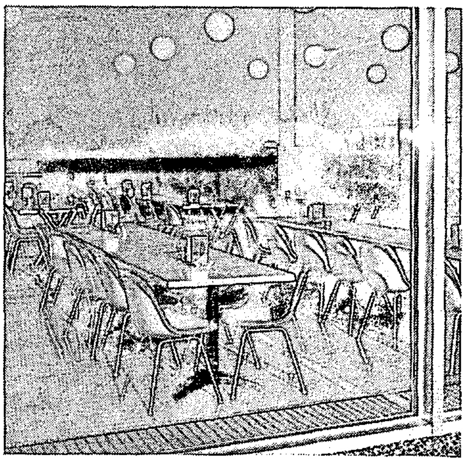

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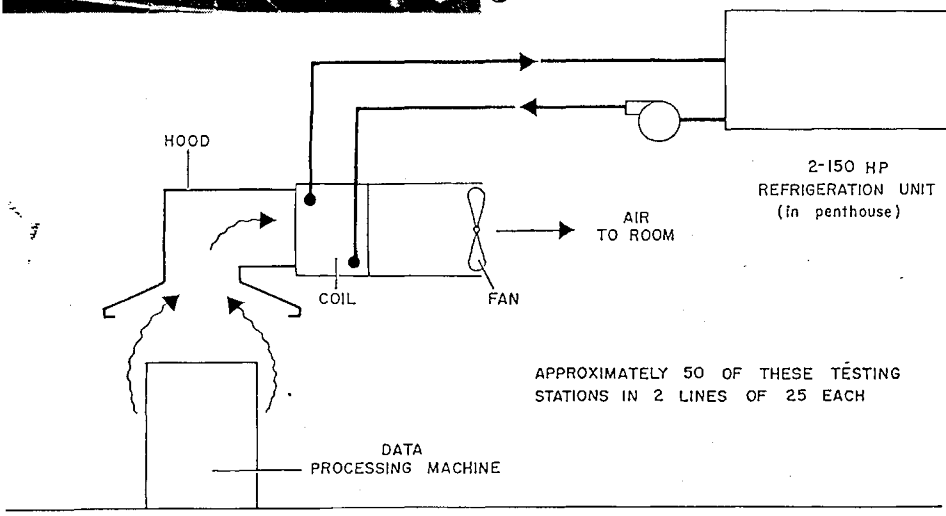
Perimeter offices of the administrative sections in Monsanto's new buildings at Creve Coeur, Mo., are provided with fan-coil units, zoned by exposure, and an overhead ventilating system (above). *Interior offices are air conditioned by overhead distribution on a common zone. Only executive-building units have individual controls. Architect, Vincent G. Kling; Mechanical Engineer, A. Ernest D'Ambly.*

Two main studios of Production Center, Inc., New York, have 32 vertical air-conditioning ducts—24 of which are telescopic and can be raised or lowered (left). *Sound stage is divided into quadrants with eight ducts each. Control engineer can bring one or more quadrants into operation—each developing 12,500 cfm. Other studio ducts deliver standby of 2500 cfm. Architect, Joseph B. Klein; Mechanical Engineer, Wolff & Munier, Inc.*

Although round diffusers are mechanically excellent, that shape is not always desirable. Straight-line diffusers have been found particularly suitable for museum air conditioning (below right).

Photos (left and below): Anemostat

9



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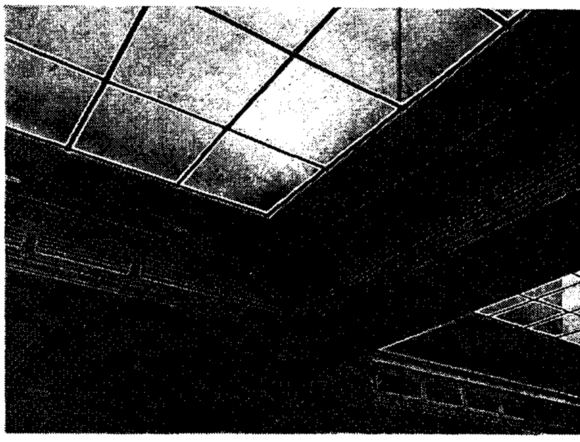
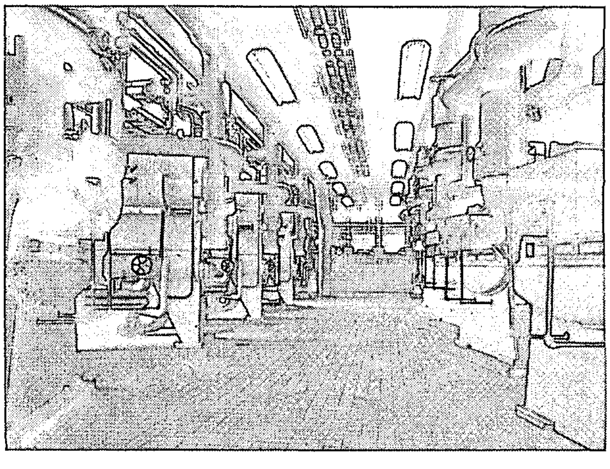


Rockefeller Center—New York's unique 15-building development (**11**)—is not only the world's largest privately owned business and entertainment center, but also its integrated air-conditioning system has become the largest in the world for office buildings. The 15,382-ton capacity —the equivalent of melting the same weight of ice in each 24 hours—exceeds even that of the Pentagon, which takes second place with 14,300 tons. Six central plants serve the 12½-acre center.

At Idlewild Airport, New York, special attention has been given to the design of the new $5-millions heating plant which houses a high-temperature hot-water system (**12,13**). The plant was designed to supply hot water and chilled water to the Arrivals Building, the airline-wing buildings, and the various unit terminals in the terminal area. Most unusual is the fact that for the first time a cooling system is operating in connection with high-temperature hot-water, the latter being used to operate the absorption machines. Within, there are nine absorption machines, each capable of producing 700 tons of cooling power. Besides the absorption units, the central heating plant will be able to develop 160 million Btu/hr. To distribute the water, 11 separate pumps, each capable of pumping 2800 gal/min—six for chilled water and five for hot water—can be called on. Being a closed-cycle system, the pipes can follow the contour of the land and the pumps provide the force necessary to circulate the water over high elevations and through the relatively small diameter tubes.

11

12



13

Rockefeller Center (above) *has largest integrated air-conditioning system in world with six central plants. Chief Mechanical Engineer, Louis Schoeller.*

At Idlewild Airport, New York, high-temperature hot-water is used for first time to operate absorption units (right). *Architects, Skidmore, Owings & Merrill; Mechanical Engineers, Seelye, Stevenson, Value & Knecht.*

Photos: Thomas Airviews and Gottscho-Schleisner

the outlook for air conditioning

by E. J. Benesch*

As is convincingly illustrated on the following pages, air conditioning is an essential component of today's better living. It is an integral part of the office building, department store, theater, and home, and will be a must for schools and colleges that find a 12-month academic year a necessity. *However*, like the automobile, air conditioning is increasing in initial cost. From our cars, we demand more and more in the way of comfort and performance. Manufacturers are meeting these demands, yet we must pay for them in the higher prices of the cars. Similarly, we are asking for more in our buildings: greater window area; higher ceilings, with the same or slightly increased story heights; higher levels of illumination; better styled, less conspicuous supply and return diffusers; cooling when we want it, regardless of season; reduction of operating costs; and so on. Do we genuinely feel that these demands are in keeping with requirements for better living? If so, we must be prepared to pay for them just as we pay for better cars. In our engineering and manufacturing, however, let us not fail to put our ingenuity to work before initial cost becomes prohibitive.

Comfort and performance advances not only make the car cost more, but also they may make it necessary for us to enlarge the garage to accommodate it. And so it goes with air conditioning: the space required for equipment—particularly if it encroaches on rentable area—becomes too much, just as the story height needed to accommodate ducts and pipes becomes too great. It would be pleasant to contemplate the gain in basement area and cost reduction for excavation, if chilled-water or brine service, similar to steam, were available. Such a service could eliminate refrigeration rooms, cooling towers, electrical switchgear, and room for compressors—in the same manner that district steam eliminated boiler rooms. Would a district refrigeration service, however, be a profitable venture for a public utility? Perhaps not. Otherwise, we shall have to continue to depend on central building plants. Can we expect smaller machines? We saw the centrifugal type replace the reciprocating type in larger sizes. Then the hermetic centrifugal was developed to compete in limited ranges of capacity. The slow-speed reciprocating machine has been replaced with the smaller, high-speed, direct-connected hermetic. Why can't we, then, look forward to centrifugal machines (including coolers and condensers) becoming smaller in size, yet maintaining the same or increased capacities?

Today's condenser water-cooling systems, with huge cooling towers and evaporative condensers, require a great deal of space. The weight that must be carried by the structure, provisions for operating during freezing weather, and requirements for air to and from the tower are all too much. What is needed is a more efficient refrigerant-condensing process.

Floor area required for air-handling equipment is a function of the quantity of air handled. This quantity of air is, in turn, a function of the heat to be removed. Thus, to maintain the smallest equipment (consistent with the heat to be removed) we supply the coldest possible air that will not cause condensation. We have been able also to reduce the size of the equipment by replacing some of the air supplied to perimeter areas with chilled water supplied directly to the rooms, as in the air induction or fan-coil type under-the-window units. Ducts, of course, could be eliminated entirely by the use of self-contained, complete air conditioners; however, their application is limited by architectural considerations. The use of cooled metal-pan ceilings will also help reduce the size of air-moving equipment.

Further reduction in the size of filters, fans, and cooling and heating coils can be hoped for. Without sacrificing air-cleaning efficiency, can we hope for smaller filters with reasonable pressure drop? May we also hope for higher velocity across cooling coils without carry-over of removed moisture and without excessive pressure drop?

Ducts that take up so much space are required because of large window areas and high illumination levels that we wish for better living. What about smaller ducts? These require more fan horsepower; the motors and fans operate at full load constantly, with no chance for part or reduced loads, as with refrigeration. Small ducts also create noise problems, due to the increased velocity of air needed.

What is needed is an economic balance between architectural design, increased floor-to-ceiling height, and annual owning and operating costs of the air-conditioning system. Power costs for operation will vary with the size and type of system. In our efforts to control initial costs, we should not be misled by an attractive first cost—and lose sight of heavy, future operating costs that may result. An annual owning and operating cost, at a figure that can be afforded, should be the goal. Designs that minimize the area occupied by air-conditioning equipment should not squeeze the components into such a tight space that maintenance costs will equal or sometimes rise above operating costs.

In our eagerness to take advantage of automation of air-conditioning systems by means of remote starting, stopping, resetting, and so on, we should not overlook that the operator who is freed from certain duties may be required for duties other than those which the automation system eliminated. And automation is, of course, a part of the annual owning and operating cost.

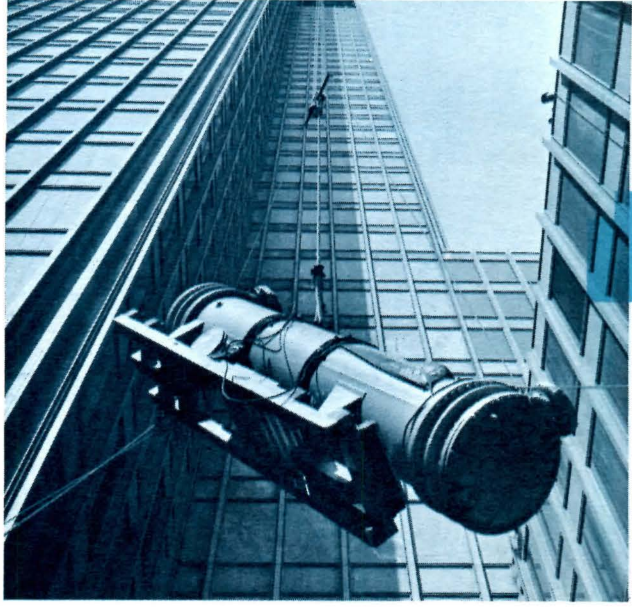
**Vice-President in Charge of Engineering, Syska & Hennessy, Inc., New York, N.Y.*

AIR CONDITIONING: office buildings

Office structures vary greatly in size—from the small building with but few tenants to the skyscraper with thousands of individuals using it daily. Because the mechanical problems of the latter are more complex and, perhaps, more interesting, let's examine three which though similar reflect conditions peculiar to each *(illustrated acrosspage)*. At 425 Park Avenue, New York, perimeter heating is by a conventional high-velocity induction system. During winter cycle, primary air—supplied at constant cool temperature—induces room air at unit to flow through a secondary water coil, carrying hot water, to provide necessary heating. The interior system contains a cold duct carrying 85 percent, and a hot duct carrying 15 percent of air required. A special tempering box blends sufficient hot air into the main supply duct to maintain area temperatures. In the cooling system, perimeter primary air is cooled and dehumidified by sprayed chilled-water blast coils and supplied to window units. Additional cooling capacity is provided by unit water coils carrying chilled water. During summer operation, the interior-cooling system also has chilled water supplied to a sprayed-water coil in the conditioning unit.

Because of the large ratio of fixed-glass window area to minimal mullion and spandrel areas in the curtain wall of 375 Park Avenue, a special design was developed for peripheral air conditioning. Low modular units, 12" high and 11" deep, provide a wall of conditioned air over the entire inside of the glass to neutralize winter cold or summer heat transmitted through the glass. Each unit consists of a sound-attenuator chamber, a cooling and heating coil, distribution nozzles, and a metallic lint screen within the enclosure. Units on southern exposure have extra capacity. Conditioned air, from apparatus on roof and in basement, is distributed by vertical risers to branch ducts serving all floors. Five-in. ducts, running just below floor, supply air to unit immediately above. Air from within room is induced by nozzles to pass through filter and over coil containing either chilled or hot water, depending on season. A double-duct system serves the interior zones.

At Bloomfield, Connecticut, the exterior zone of the Connecticut General Life Insurance Building is heated by means of high-pressure ducts. Interior areas are heated and ventilated by low-pressure duct systems distributing tempered air through ceiling diffusers located above an open-baffle ceiling. The building is cooled by two centrifugal compressors which account for two-thirds of the cooling capacity; the remaining third is provided by a well-water system. Chilled water is pumped directly to coils in air units and to secondary coils in perimeter units. Well water is finally discharged into an artificial lake.

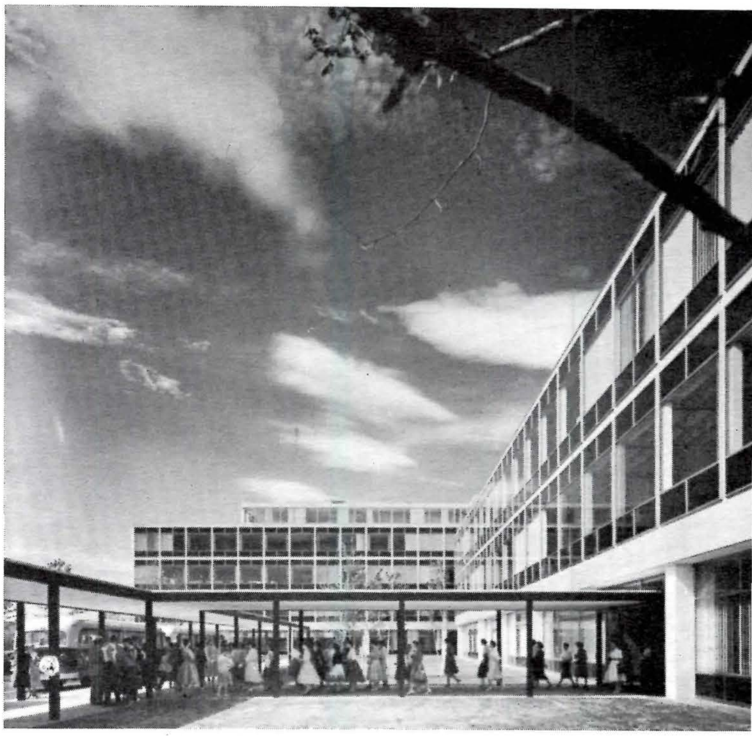


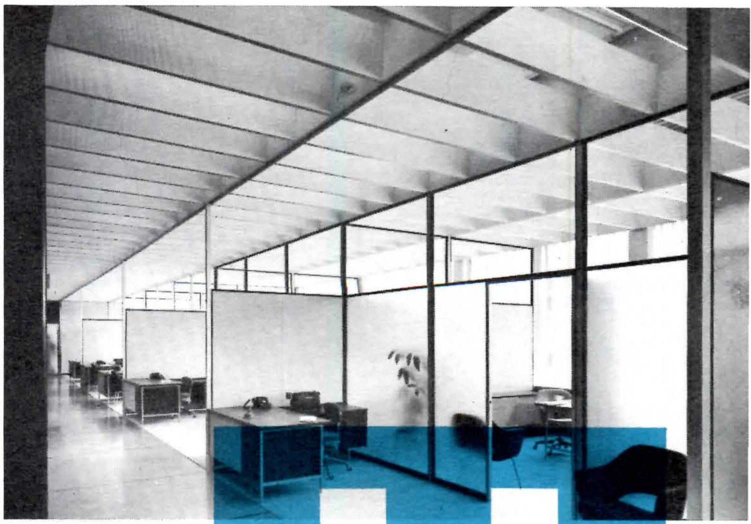
375 Park Avenue *(House of Seagram), New York, New York* (above). *Mies van der Rohe and Philip Johnson, Architects; Kahn & Jacobs, Associated Architects; Jaros, Baum & Bolles, Mechanical-Electrical Engineers; Severud-Elstad-Krueger, Structural Engineers. Photo at right shows a 23,000-pound refrigerating machine, 17 ft long, being hoisted to the power-equipment room.*

Overlapping color blocks (above, acrosspage, *and* below) *are at same scale and indicate comparative dimensions of these buildings.*

Photo: Carrier Corporation

Connecticut General Life Insurance Co., *Bloomfield, Connecticut* (right). *Skidmore, Owings & Merrill, Architects; Syska & Hennessy, Inc., Mechanical and Electrical Engineers; Weiskopf & Pickworth, Structural Engineers; Knoll Associates, Inc., Interior Design.* Photos: Ezra Stoller

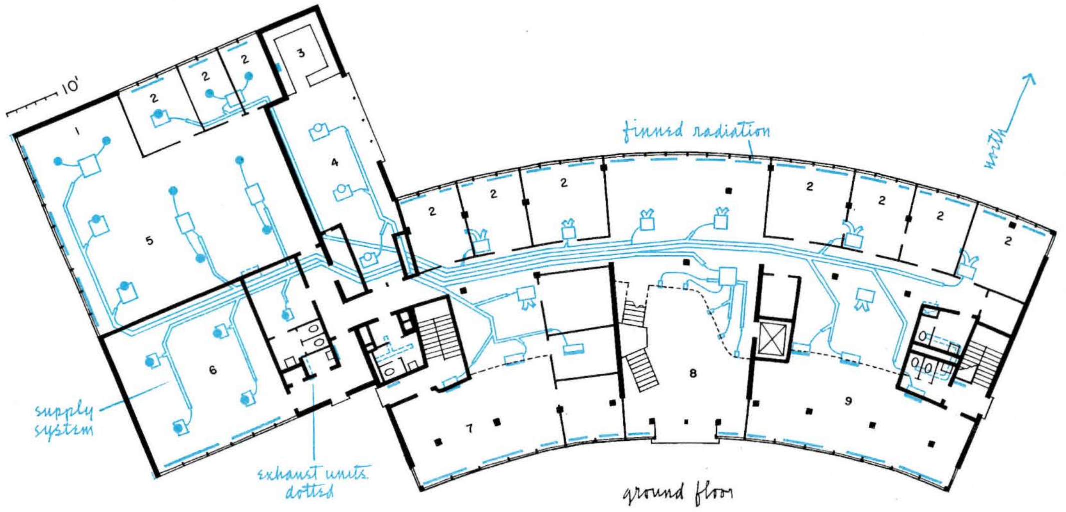




425 Park Avenue, *New York, New York* (acrosspage). *Kahn & Jacobs, Architects; Partner-in-Charge Ely J. Kahn; Project Manager Arthur Frappier; Consulting Engineers: Slocum & Fuller (Mechanical); Charles Mayer (Structural). Reception room* (below) *is for the offices of Carson & Lundin, Architects, located in 425 Park.*

Photos: Gottscho-Schleisner; Lionel Freedman

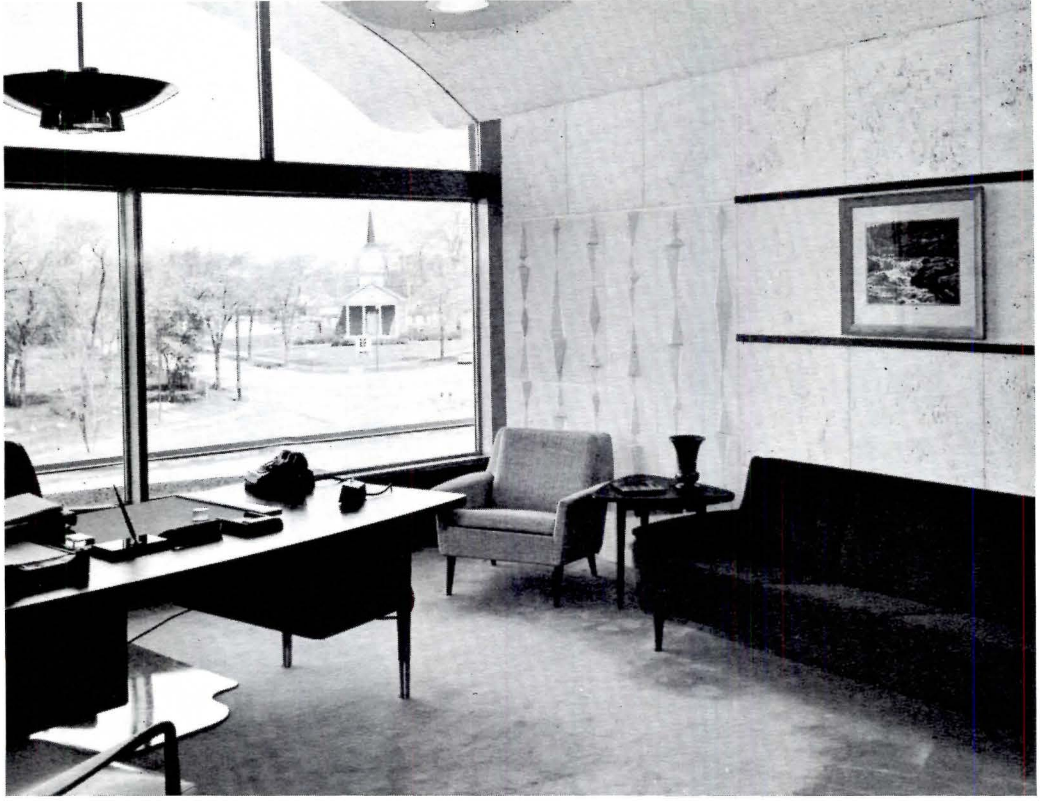
Company Headquarters: Cleveland Heights, Ohio

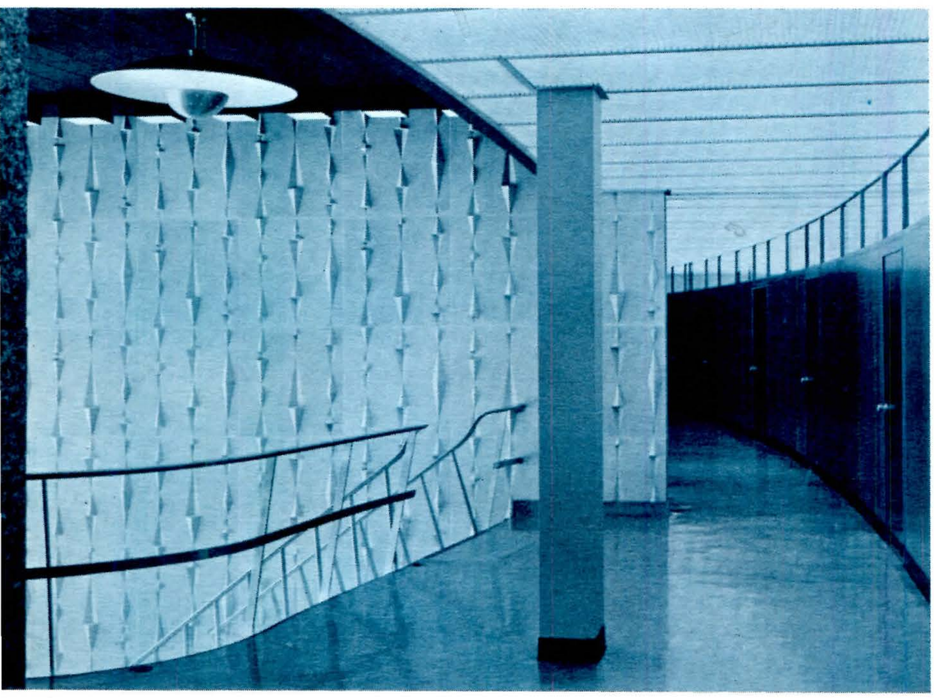


1 comptroller
2 office
3 kitchen
4 snack bar
5 accounting
6 mailing and storage
7 financial department
8 lobby
9 sales department

Cleveland Heights, Ohio, home-office building for Medusa Portland Cement Company designed by Architect Ernst Payer, is developed in a curved plan that echoes the line of a bordering boulevard. Built by the lift-slab method, the main element has curtain walls of precast, insulated, terrazzo-surfaced panels that are hung from the floor slabs; subsequently, a building-height aluminum grid was applied to join the panels and form window frames. Separating general office areas is a two-story-high central lobby; private offices line the north wall; accounting and shipping departments occur in a one-story wing; and executive offices are in a penthouse, roofed with thin-shell concrete. Sculptor for a cast-terrazzo Medusa on the east wall was William McVey. Part of main lobby is a waiting lounge *(below)*. **Air conditioning** includes a basement mechanical room containing a central-heating boiler, a 60-ton water and an air-conditioning unit serving the chiller, first floor; a second conditioner in the penthouse serves second floor and penthouse. Each conditioner consists of a hot deck and cold deck to provide modulated air temperature to each control zone, with fresh air introduced and filtered. Heating and cooling can be supplied simultaneously depending on needs of zones. Delivery, by high-velocity ducts to attenuators above luminous ceilings, is through ceiling slots, wall outlets, or ceiling diffusers. Correlated with this is a continuous row of radiation units along perimeter of the building, controlled by indoor-outside thermostats; air being controlled by zone thermostats.

Structural Engineers, Gensert, Williams & Associates; Heating-Mechanical Engineer, Howard D. Bennett; Electrical Engineer, Anton Eichmuller; and Contractor, Brown Construction Company.





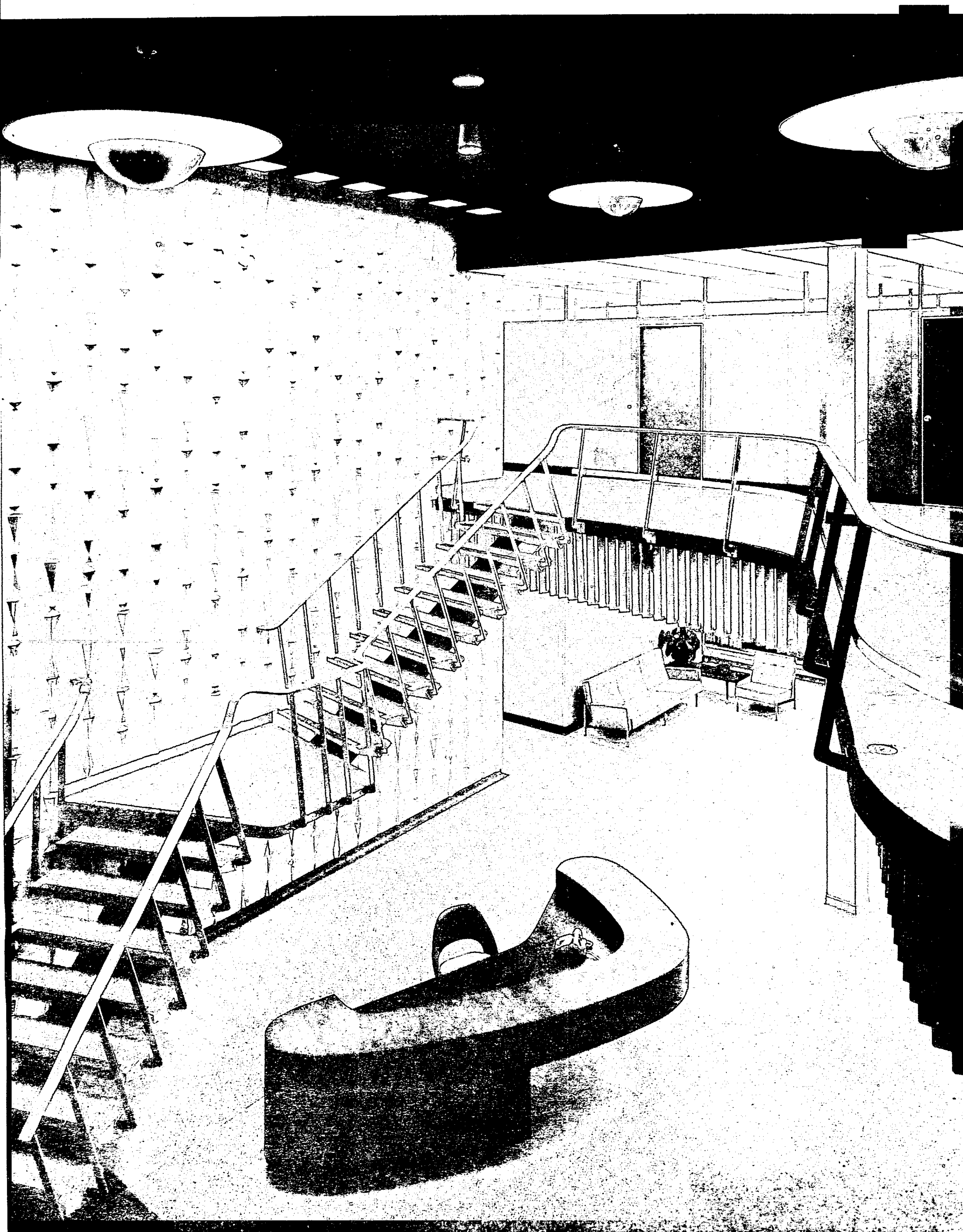
An important aspect of the design is imaginative use of the company product. In the penthouse office of the president (top), *walls are of 2′ x 2′ imitation-travertine panels and 3′ x 3′ precast panels like those used on the west wall of the main lobby, which were designed by Sculptor William McVey.*

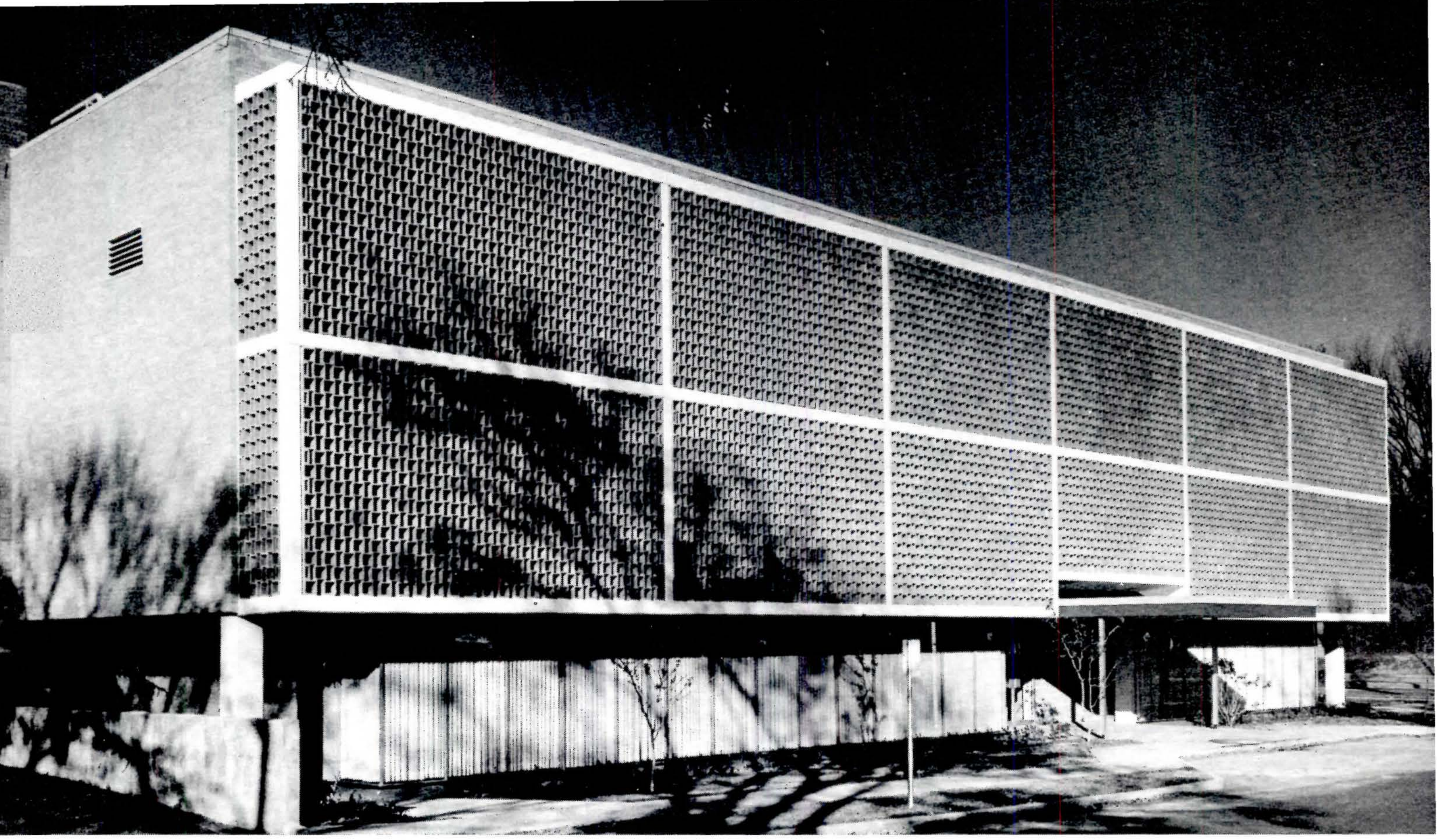
Treads of the riserless stair in the lobby (across-page) *are precast, polished terrazzo supported on a poured, central stringer. Flooring is terrazzo in three shades of green. The patterned panels are of white cement, with small white marble aggregates.*

The curve of the plan eliminates the "endless tunnel look" in the corridor (left), *and the architect also points out that it offers a slightly different view from each office.*

The snack bar (bottom) *overlooks a free-form pool, with a McVey-designed fountain.*

Photos: Hedrich-Blessing

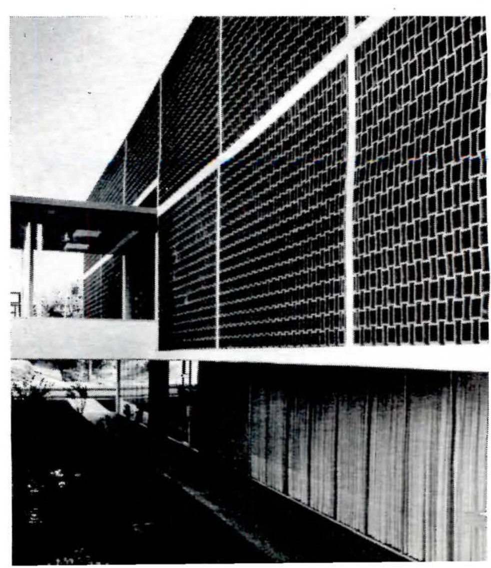


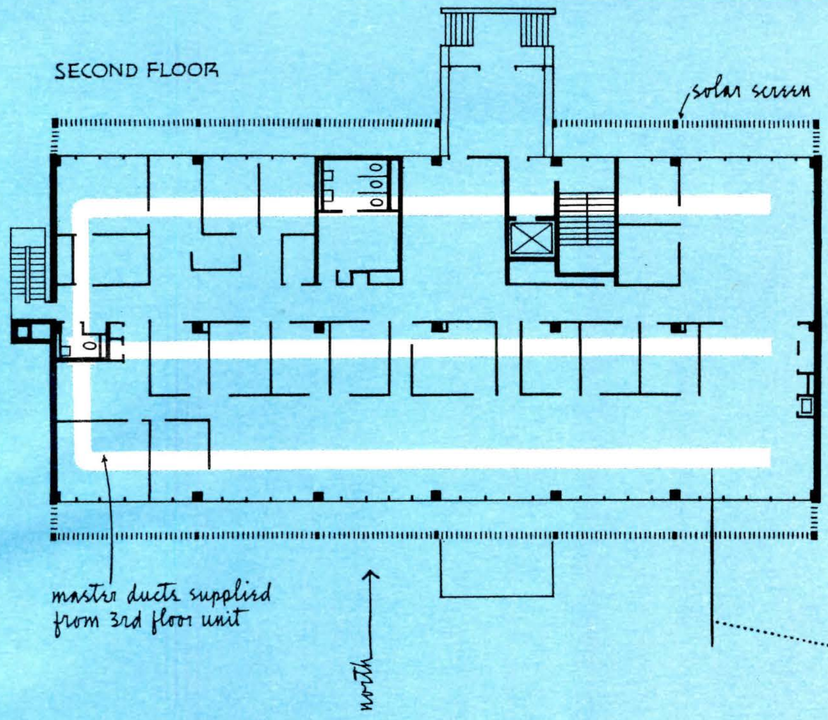


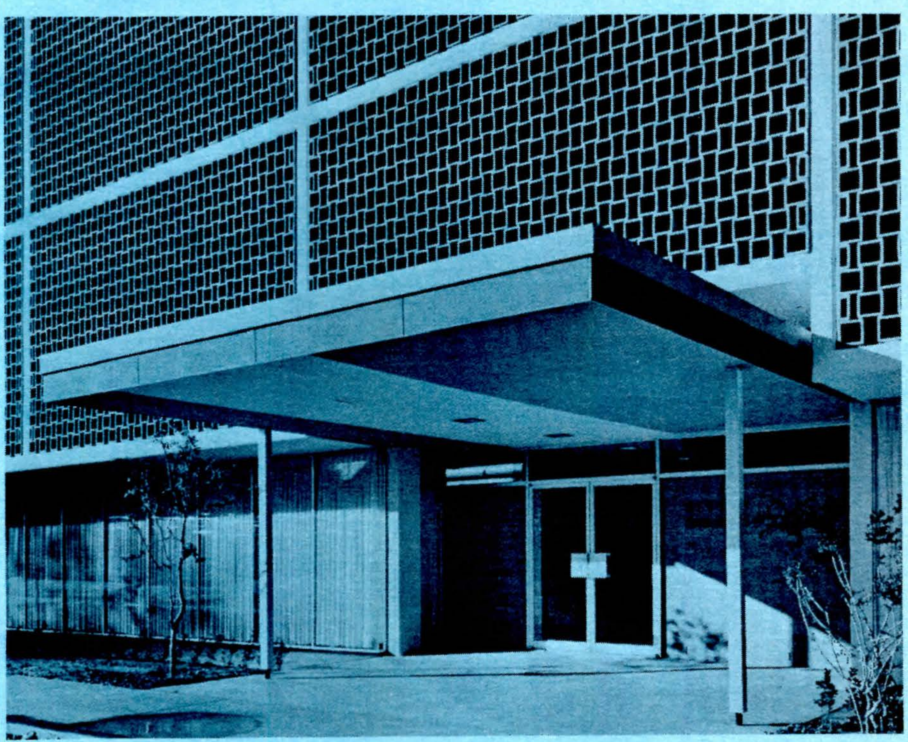
Building with Rental Areas: Oklahoma City, Oklahoma

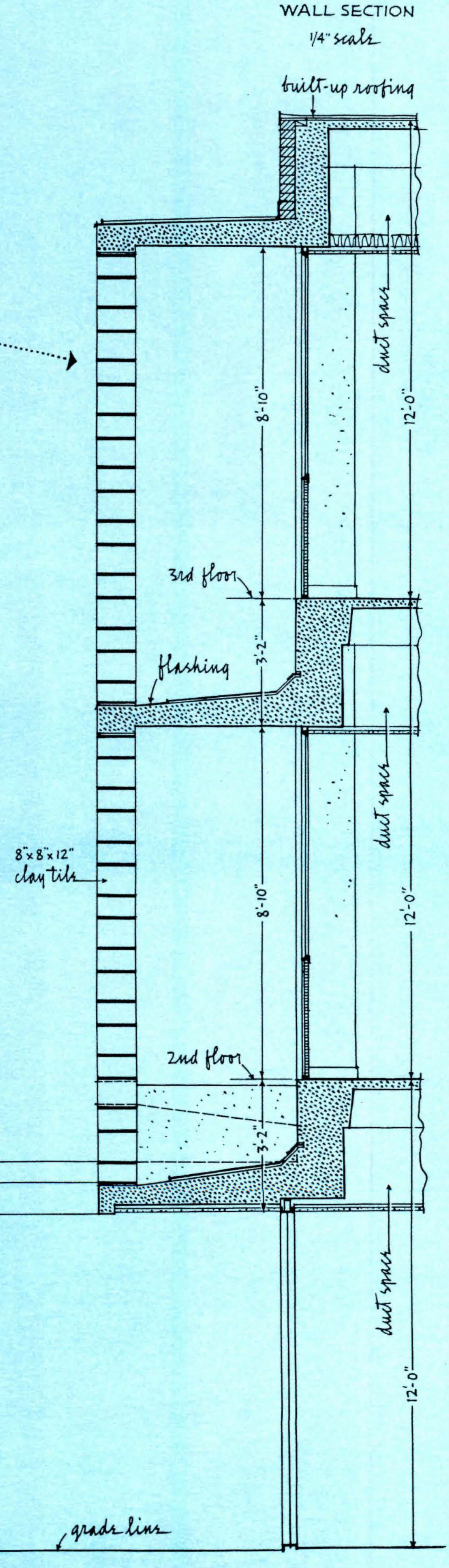
Among salient points of this office building for a mortgage banking firm and its tenants are: (1) two of the three floors are at ground level—one approached from street (*above* and *acrosspage*), the other via bridge from the parking lot at a higher elevation (*right*); (2) the building, bordering a busy highway on the outskirts of Oklahoma City has been placed at right angles to the road for reduction of traffic noises, desirable north and south exposures, advantageous placement of parking lot, and most dramatic aspect of building from passing cars; (3) economy, structural simplicity, and plan flexibility have been achieved by a reinforced-concrete frame, equal bay spacing, and an off-center corridor; (4) tile screens were designed to cut glare, eliminate the need for expensive window-wall materials, blinds, and drapes, and, most important, to keep direct sunlight off glass and thereby reduce cooling load.

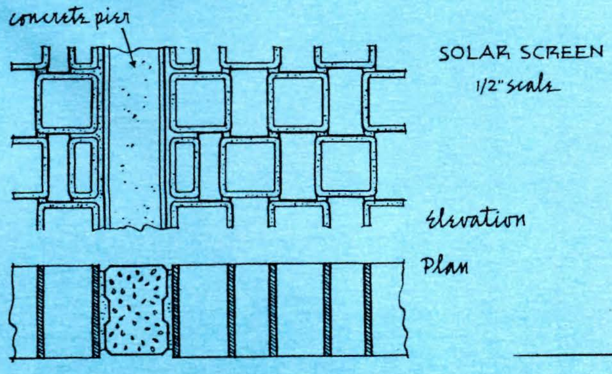
Air conditioning is accomplished by two packaged units—one located in the basement, the other installed on the third floor. "Each unit," report the architects, "contains two compressors which are controlled in steps by the temperature-control system. The heating unit utilizes the package-unit fans, but each unit has three hot-water heating coils in the three-zone supply ducts. The zones are: north, south, and interior; ceiling outlets supplied from a master ductwork system were located according to the tenants' requirements. The heating coils are served from a hot-water boiler and controlled with modulating valves. The outside-air and return-air dampers are controlled to maintain a 60 F mixed-air temperature." Had the solar screen been omitted, it would have been necessary to supply four additional tons of air conditioning per floor. Caudill, Rowlett & Scott were Architects; James M. Samis, Mechanical-Electrical Engineer; James G. McDonald, Structural Engineer; Grant C. Carpenter Construction Company, General Contractor.



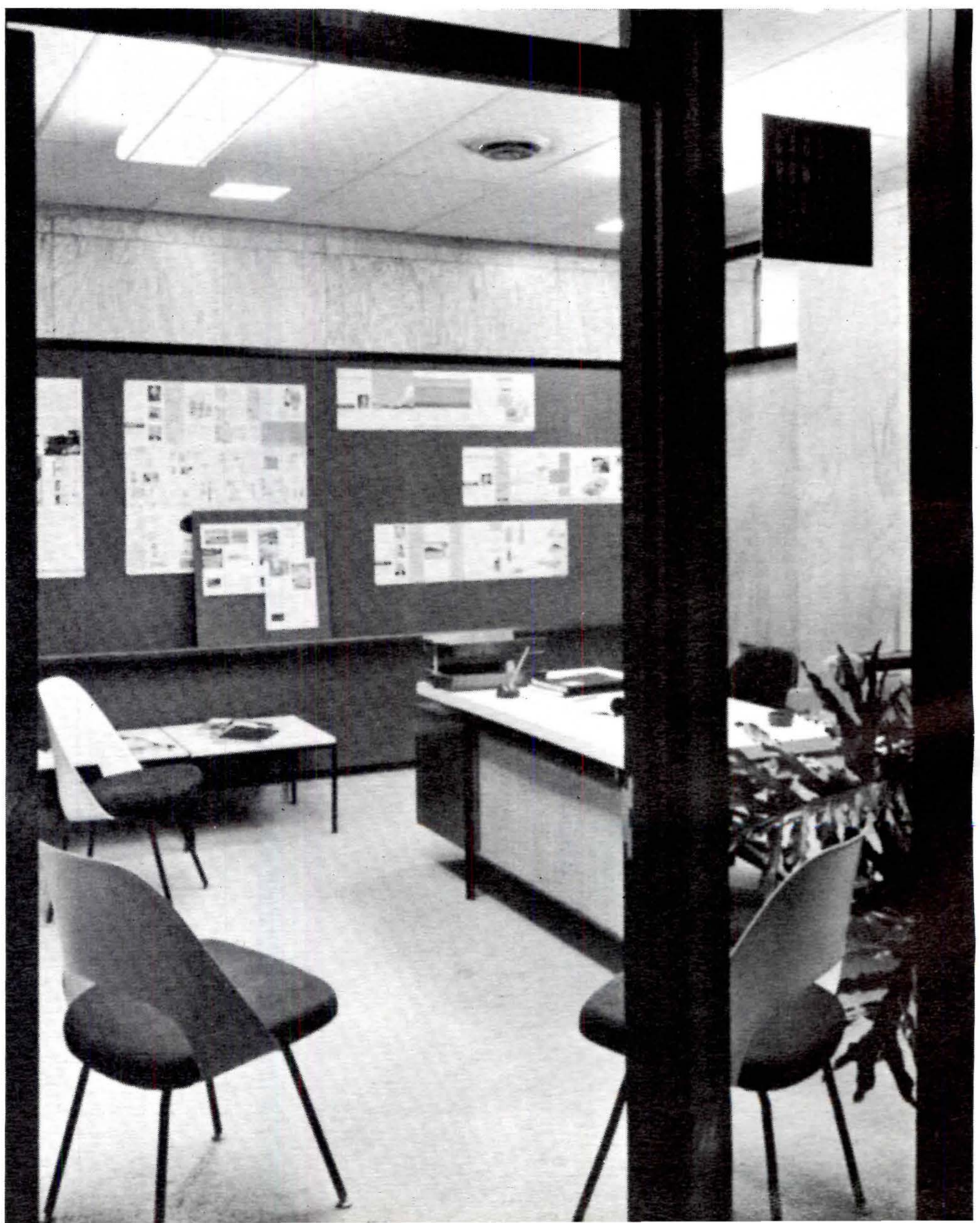

SECOND FLOOR
solar screen
master ducts supplied from 3rd floor unit
north

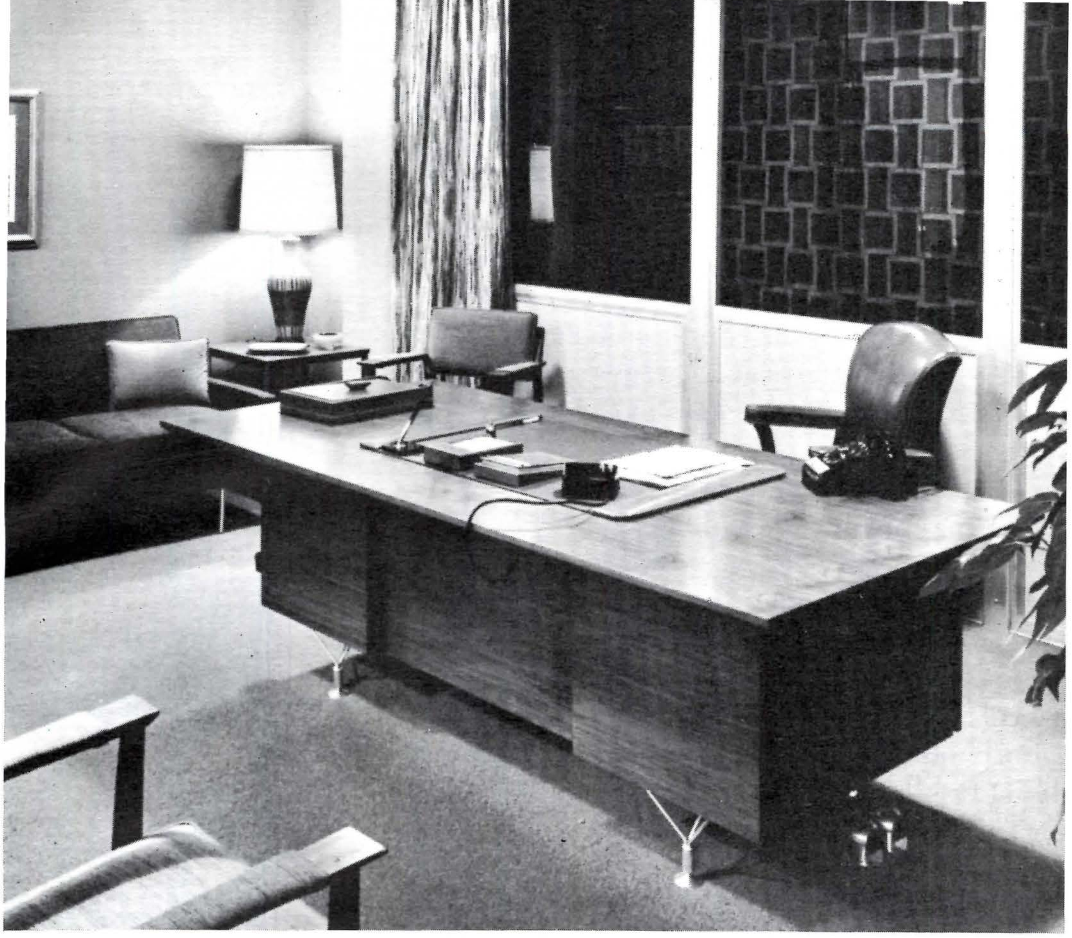


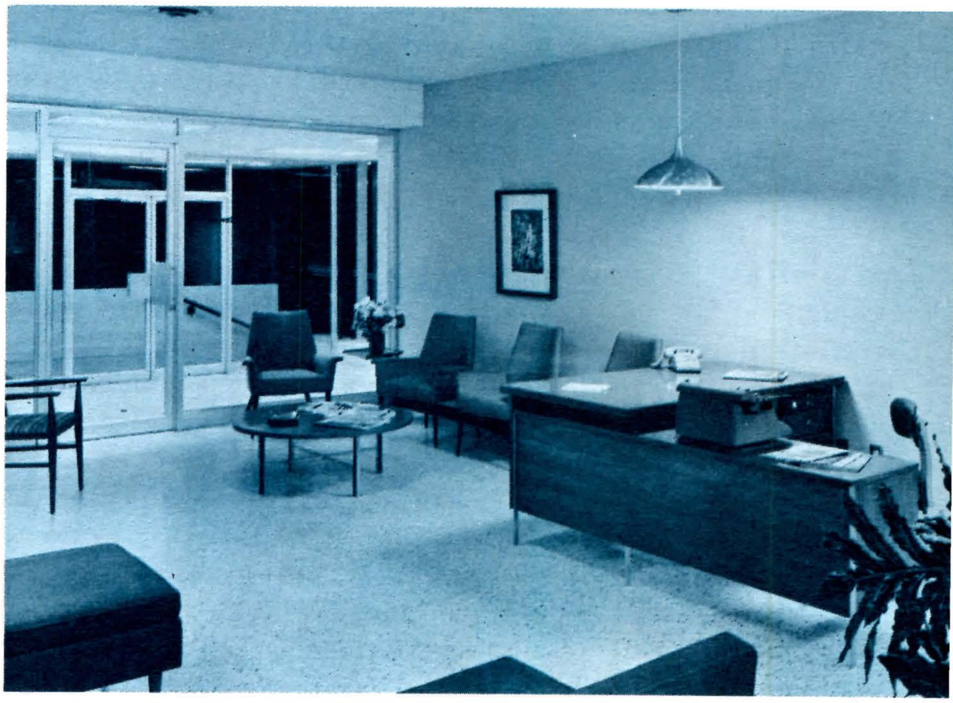

WALL SECTION
1/4" scale
built-up roofing
duct space
8'-10"
12'-0"
3rd floor
3'-2"
flashing
8"x8"x12"
clay tile
2nd floor
grade line


concrete pier
SOLAR SCREEN
1/2" scale
elevation
Plan

Colors throughout the building are predominantly warm, achieved by terra-cotta screen and brick walls on the exterior, wood paneling on the interior. For accent on the exterior, concrete has been painted white. Inside, door frames are black; door panels, brightly colored. Photos: Bob Hawks, Inc.







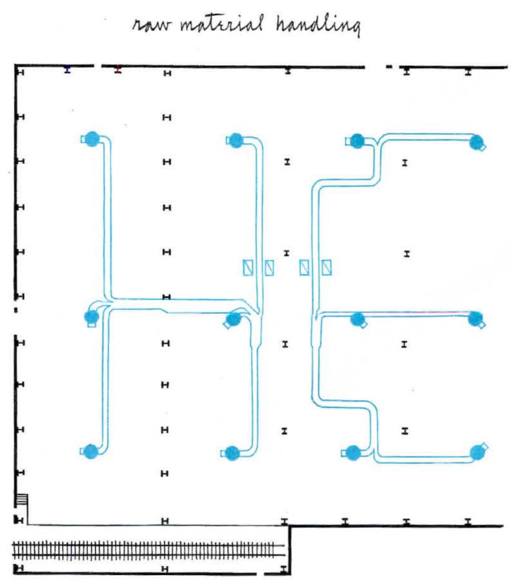
Window wall, protected from rain and sun by solar screen, is made up of fixed aluminum sash, cement asbestos panels, and concrete spandrels. Stacked flue tile—7½" x 15", 12" deep on the south side, 5" deep on the north side—diffuses soft, even, natural light throughout the offices. "Visually," state the architects, "the screen changes constantly as different intensities and angles of light fall on the tile. . . . From the outside at night the effect is equally interesting as lights show through the screen."

AIR CONDITIONING: industrial plants

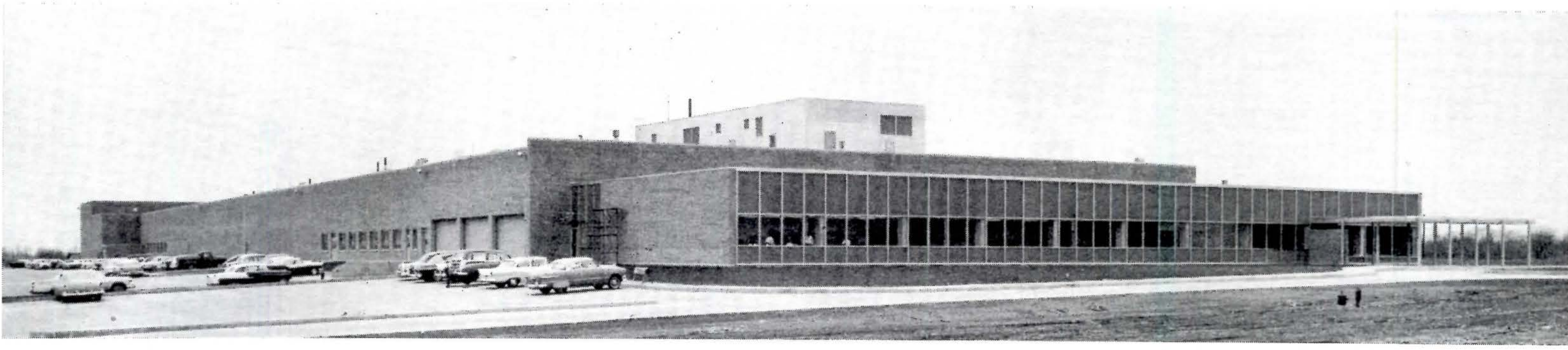
Perhaps the largest remaining opportunity for air conditioning — now receiving little attention — is in industrial structures. The need is not only for some processes but also for employe—both office and factory—comfort as well. In many instances, office areas do have comfort cooling for summer months; yet the factory employe, usually exerting the most strenuous physical effort, has received the least benefit. Many believe, however, that a long-awaited break-through for factory-employe comfort may be in the offing. Manufacturers of air-conditioning equipment who have been watching the industrial field for some time report that a strong growth pattern is forming. "We've seen similar trends develop in the office and existing building fields," says Trane President D. C. Minard. "The potential is so great in the industrial market that we believe it will take years to develop comparable penetration."

At Lexington, Kentucky, the 153,000-sq-ft Switchgear Manufacturing Plant just completed for the Square D Company is a good example of air conditioning for all workers (*acrosspage*). With the exception of a 27,000 sq ft area—in which operations requiring a large quantity of process exhaust are performed—the entire plant is comfort air conditioned. The air-conditioned portion of the factory is divided into two sections—each served by two air-conditioning stations in penthouses on the factory roof. In the north portion, raw-materials handling plus enclosure and fabrication occur. Materials next are fed into the ventilated center portion where welding, painting, plating, and other finishing operations occur. Components leaving this area enter the south air-conditioned area and are assembled there as finished products—and stored.

The factory is designed for expansion to the west. A separate boiler house at the north of the factory (which houses the centrifugal water-chilling equipment and a high-pressure water-tube boiler plant) has been designed to permit installation of additional units for future requirements.



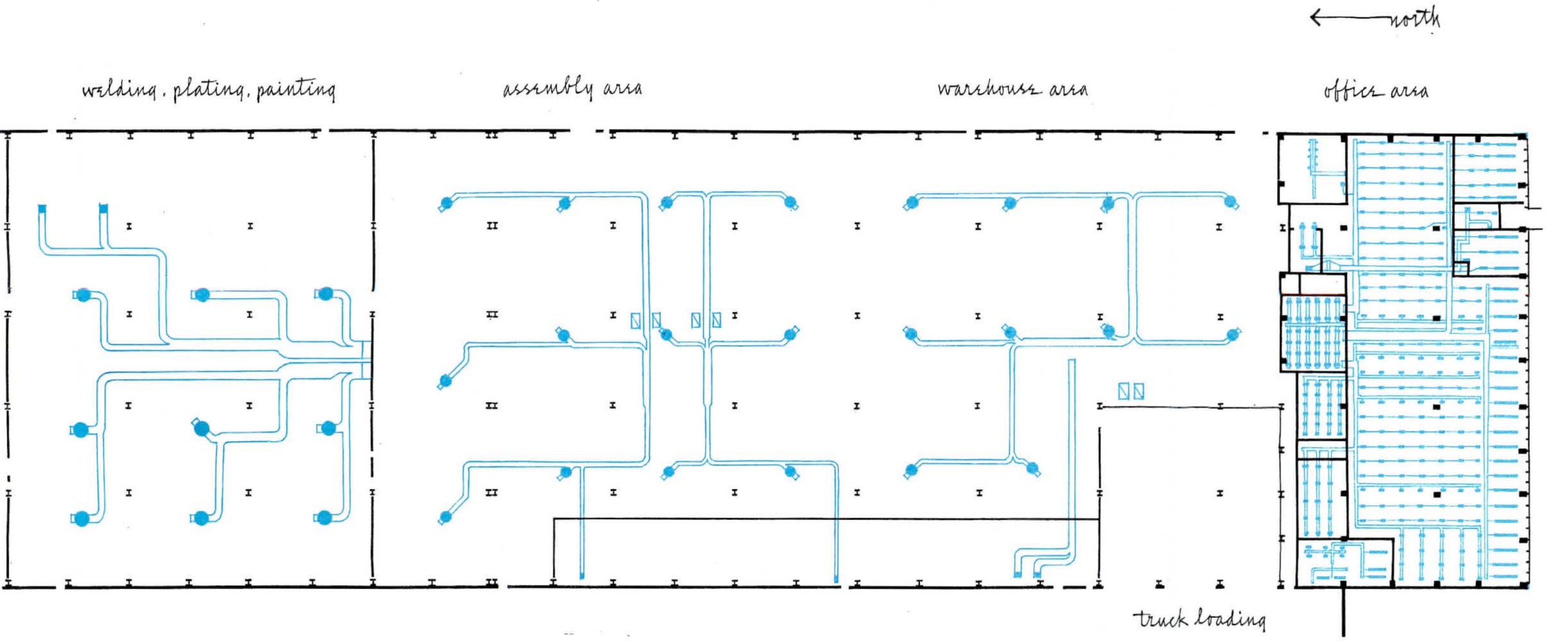
Factory air conditioning is achieved with four built-up air-conditioning units, two serving each section of the plant through a duct-and-diffuser supply system. Air is returned to the fan stations through dampered openings in the floor of the penthouses inside of the air-conditioning units above the conditioned space. The office air conditioning is supplied by a multi-zone air-handling unit delivering air through a ductwork system and perforated, flush, ceiling, diffusion panels matching the acoustic-ceiling panels. Air return is achieved with low-level registers near the floor, a return-ductwork system, and return-air fan.



***Switchgear Plant,** Square D Company, Lexington, Kentucky. Giffels & Rossetti, Architects-Engineers. Exterior view* (above) *shows south elevation behind which office area is located.*

Interior of factory (left) *points up ductwork and distribution points.*

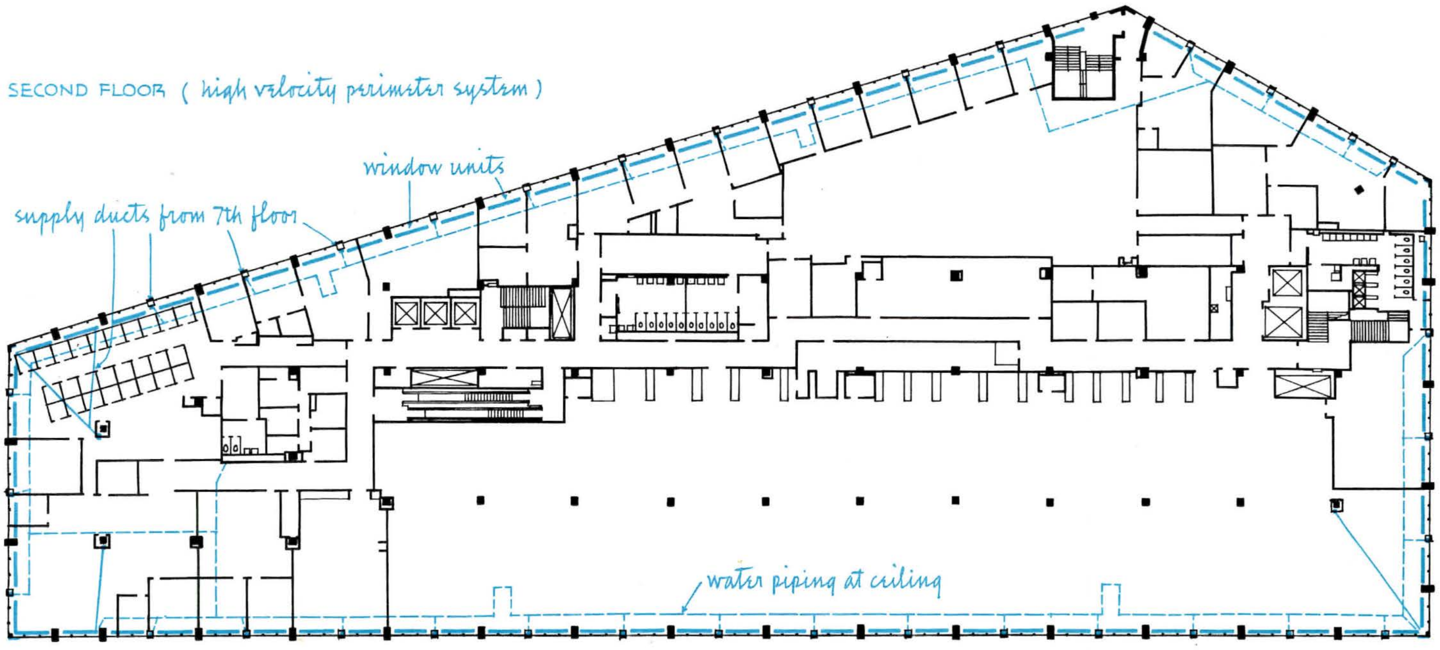
Plan (below) *indicates locations and differing character of air-conditioning distribution in factory and office areas.*

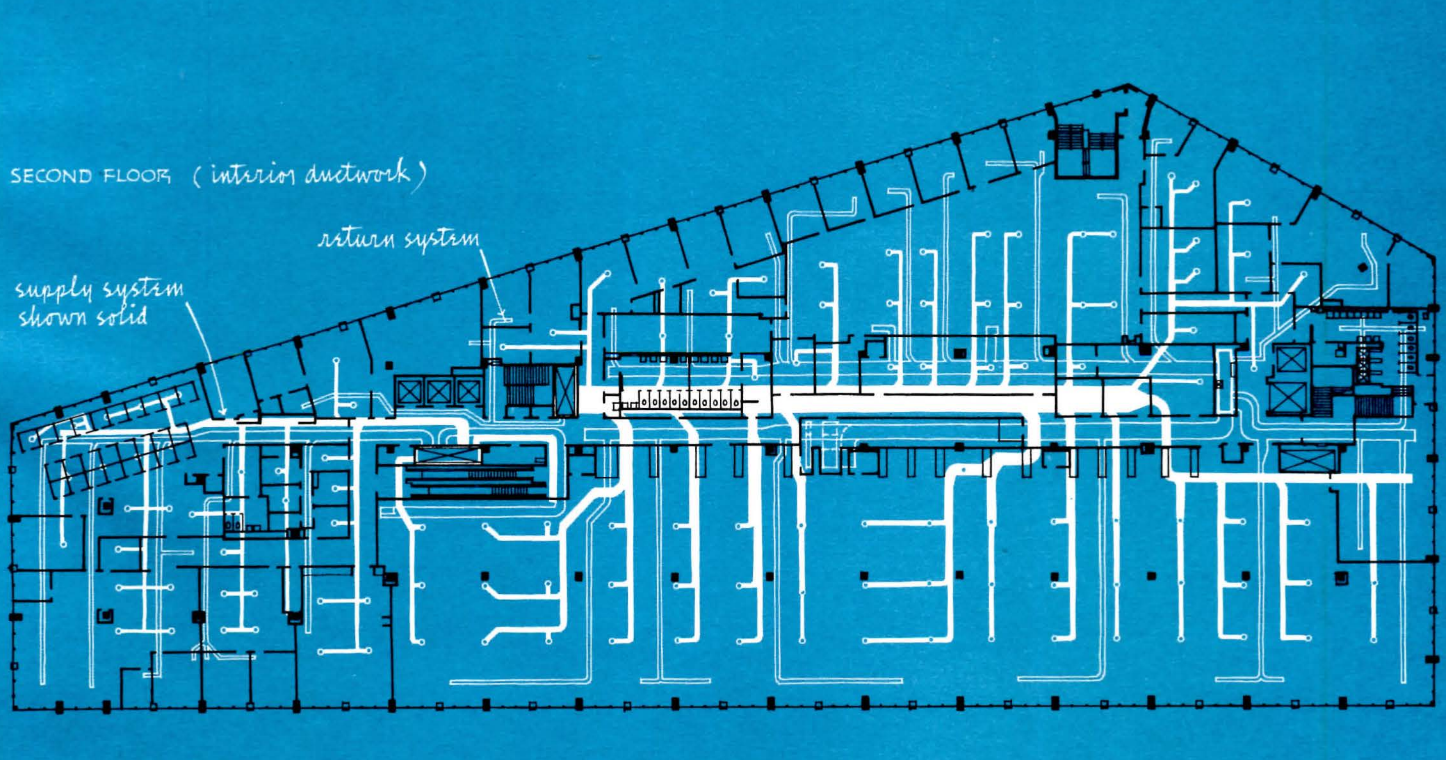


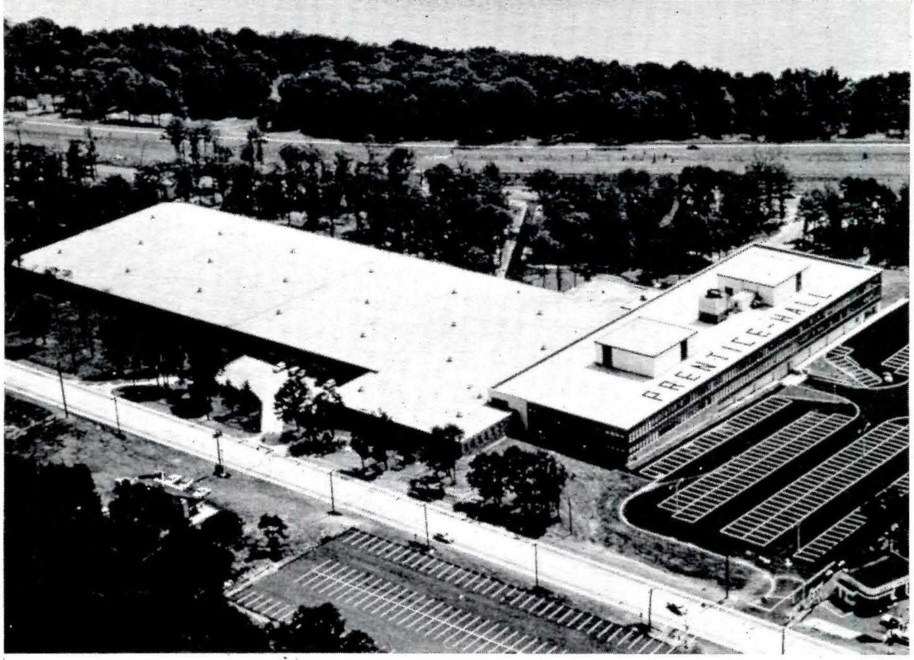
Newspaper Plant: Chicago, Illinois

This recently completed structure houses printing facilities and offices for a leading Chicago newspaper. The two floors below street level contain pressrooms, machine shops, paper storage, and trucking concourses. Newsrooms and offices are located above—the two topmost floors being leased to tenants, until needed for further expansion. The building's strategic location on the north bank of Chicago River permits direct deliveries of newsprint from ships. In addition, two railroad sidings and truck routes enter the building. Mechanical equipment, normally located on lower floors, has been placed at the top of this building, on the seventh, eighth, and ninth floors.

Air conditioning consists of two 500-hp combination gas and oil-fired boilers, two compressors, and fan equipment. Above the first floor, a high-velocity induction system has been installed for perimeter heating and cooling. "In this system," explain the architects, "centrally conditioned primary air is supplied from the seventh-floor fan room, through round ducts, to units under each window. This primary air enters the unit-air plenum where system noises are attenuated. The primary air then passes through plastic ejector nozzles and the air streams draw in a large quantity of room air by induction. This air is either heated or cooled as it passes over the water coil to produce the desired room temperature. A suitable valve controls the capacity of the water coil by varying the flow. Then, the conditioned mixture of primary air and recirculated room air is discharged, through adjustable grills in the window sills, into the room." The remainder of the space, not serviced by the perimeter system, is conditioned by air distributed through ceiling diffusers. Centrifugal fans of the air-foil type disperse the cooled or heated, humidified or dehumidified air at velocities of about 5000 fpm to ceiling diffusers which are equipped with special damper controls for uniform air distribution. Air from the perimeter as well as the interior system is returned to fan rooms and either exhausted or recirculated. "Chilled water for the air-conditioning system," continue the architects, "is obtained from two centrifugal refrigeration compressors, each driven by a 700-hp synchronous motor. The water is chilled to 42 F and returned to the chilling units at 54 F under full cooling requirements. The heat removed from the chilled water is conveyed to the condenser. Of special interest is the fact that water from the Chicago River, at a temperature of approximately 75 F during the summer, is used for condensing water. The use of this water eliminates the need for a cooling tower on top of the building. River water is also employed in the newspaper plant as a coolant for the plate casters and plate shavers.... The water is returned to the river at a temperature of about 90 F." The pressroom, reel room, and paper storage areas are supplied with filtered fresh air, suitably tempered during the heating season. Special filters installed in the pressroom prevent entry of ink, thrown off by high-speed rotary presses, into the air stream. Air from the pressroom and paper-storage areas is exhausted through these filters, carried through the building, and eliminated at the top. Designers of this air-conditioning system were Naess & Murphy, Architects-Engineers of Chicago, Illinois, who were also responsible for all phases of architectural planning. The building is to be shown in its entirety in a future issue of P/A.



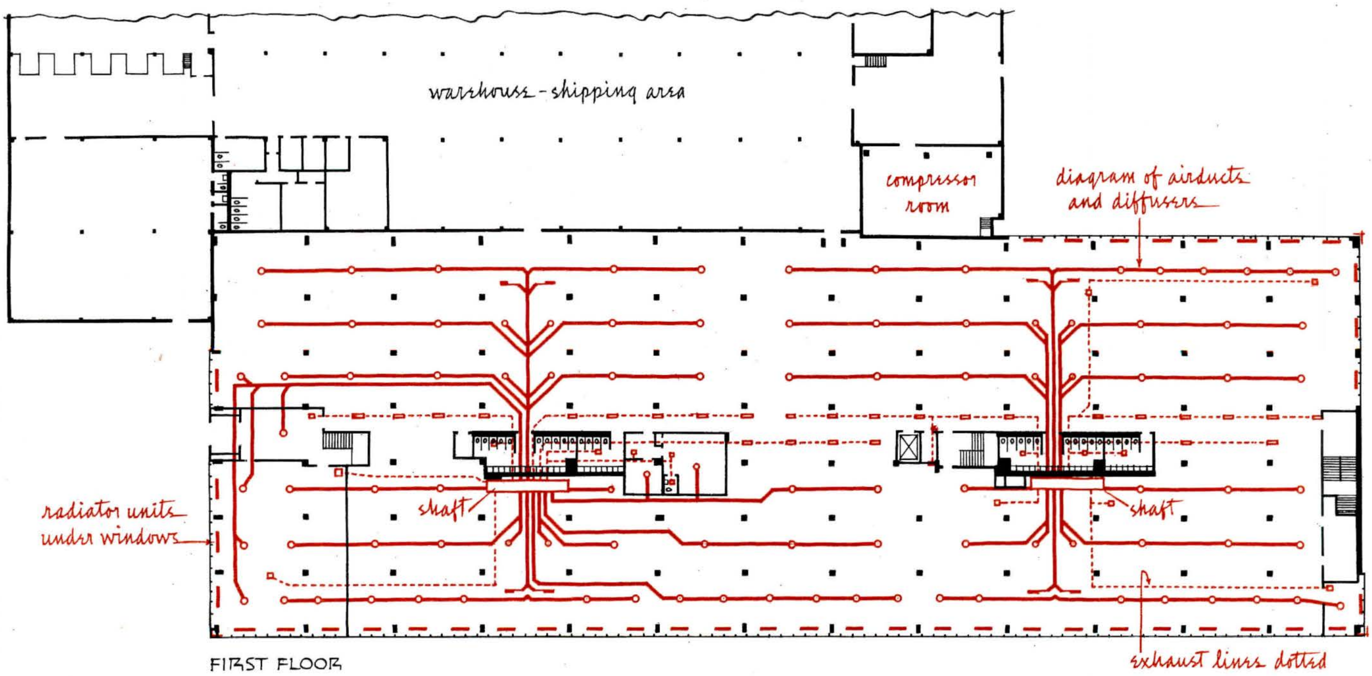




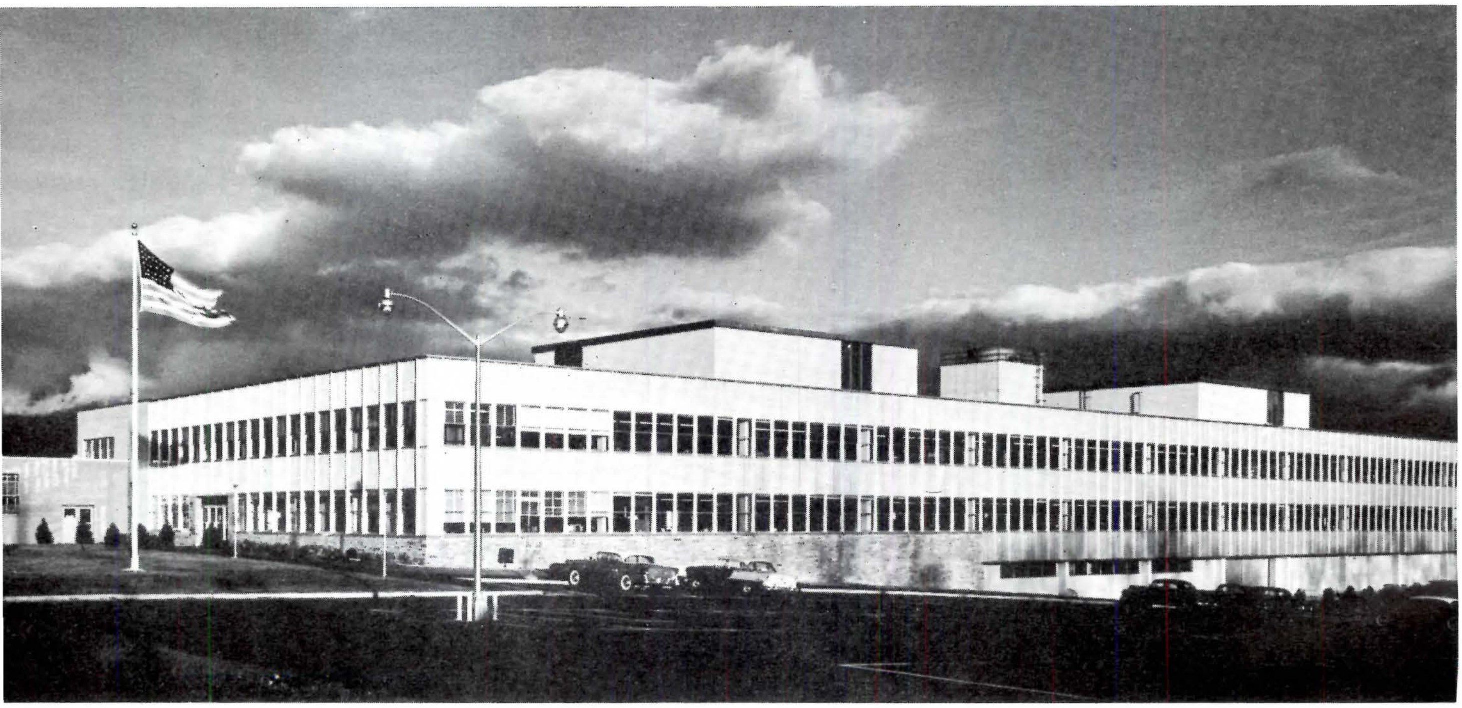
Publishing Warehouse: Englewood Cliffs, New Jersey

Built on a 17-acre wooded site on the west shore of the Hudson River, in Englewood Cliffs, New Jersey, this plant for Prentice-Hall, Inc., book publishers, accommodates all of the activities involved in warehousing, packing, shipping, billing, and mailing books. Kahn & Jacobs were the Architects. Two main elements comprise the present plant—a one-story unit, 150,000 sq ft in area, wherein a highly mechanized system, developed around central conveyors with storage bins at either side, makes the filling, packing, and shipping of orders as expeditious as possible; and a two- and three-story, fully air-conditioned office building, with company cafeteria, lounges, and lending library. Structure includes glazed-brick cavity walls, aluminum panels, and some wall areas of stone. Floors and roofs are reinforced concrete. **Air conditioning** of the office-building unit involves seven different systems. Five of these, serving first and second floors, employ site-erected, multizone air handling units; the remaining two serve cafeteria and private dining room at lower level. To meet design requirements, the units must provide a total of 170,000 cu ft of air per minute. Bulk of fan equipment is located in roof penthouses; internal distribution is provided by ceiling diffusers which, during winter, supplement heating provided by hot-water convectors under windows. Chilled water is provided by a 400-ton centrifugal refrigeration machine, located in the compressor room. Only unit operating separately is one that serves private dining room—a 12-ton, self-contained device. Condenser water is supplied by a roof cooling tower.

Consulting Engineers were Syska & Hennessy, Inc. (Mechanical-Electrical); Severud-Elstad-Krueger (Structural); and Ralph Eberlin (Site Plumbing). White Construction Co., General Contractor.

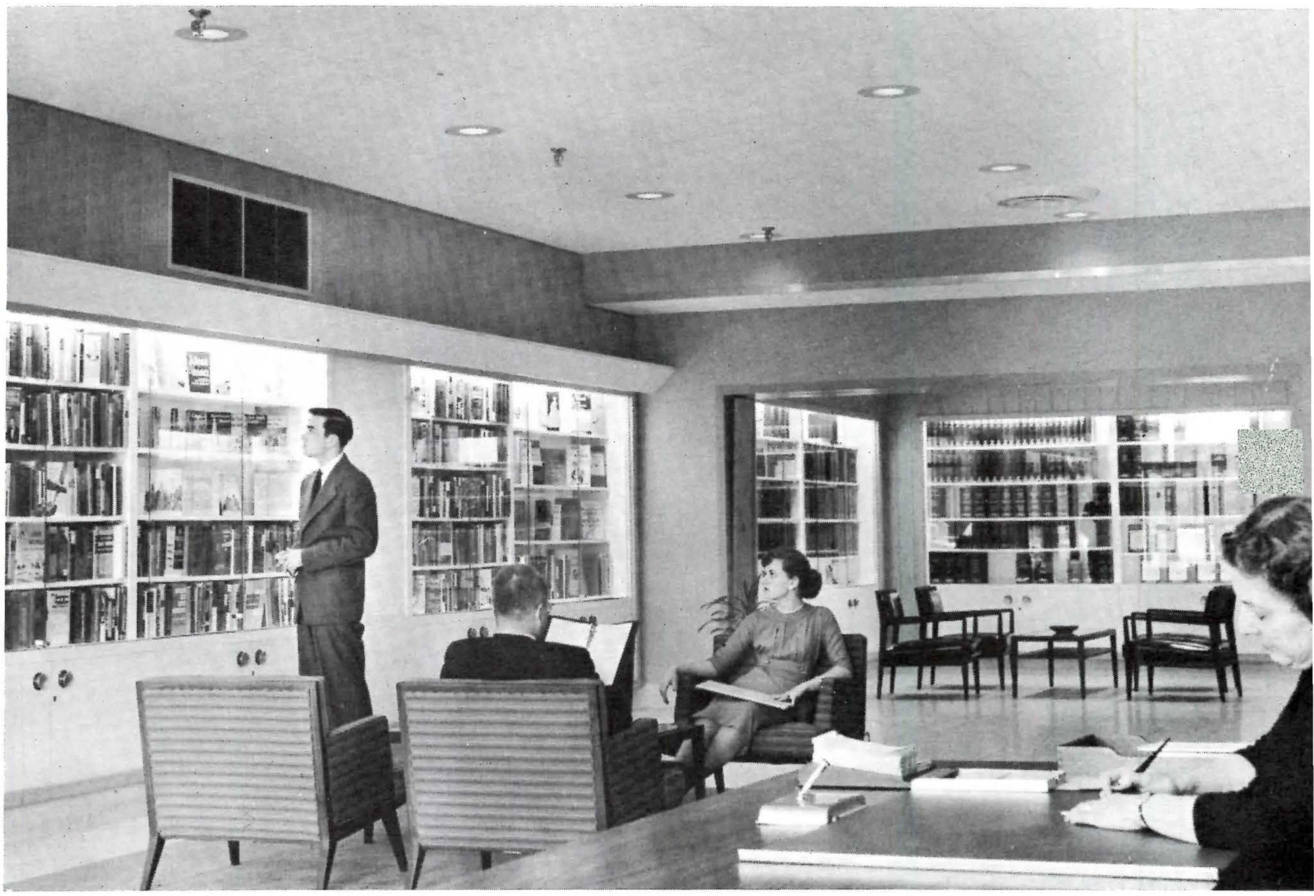


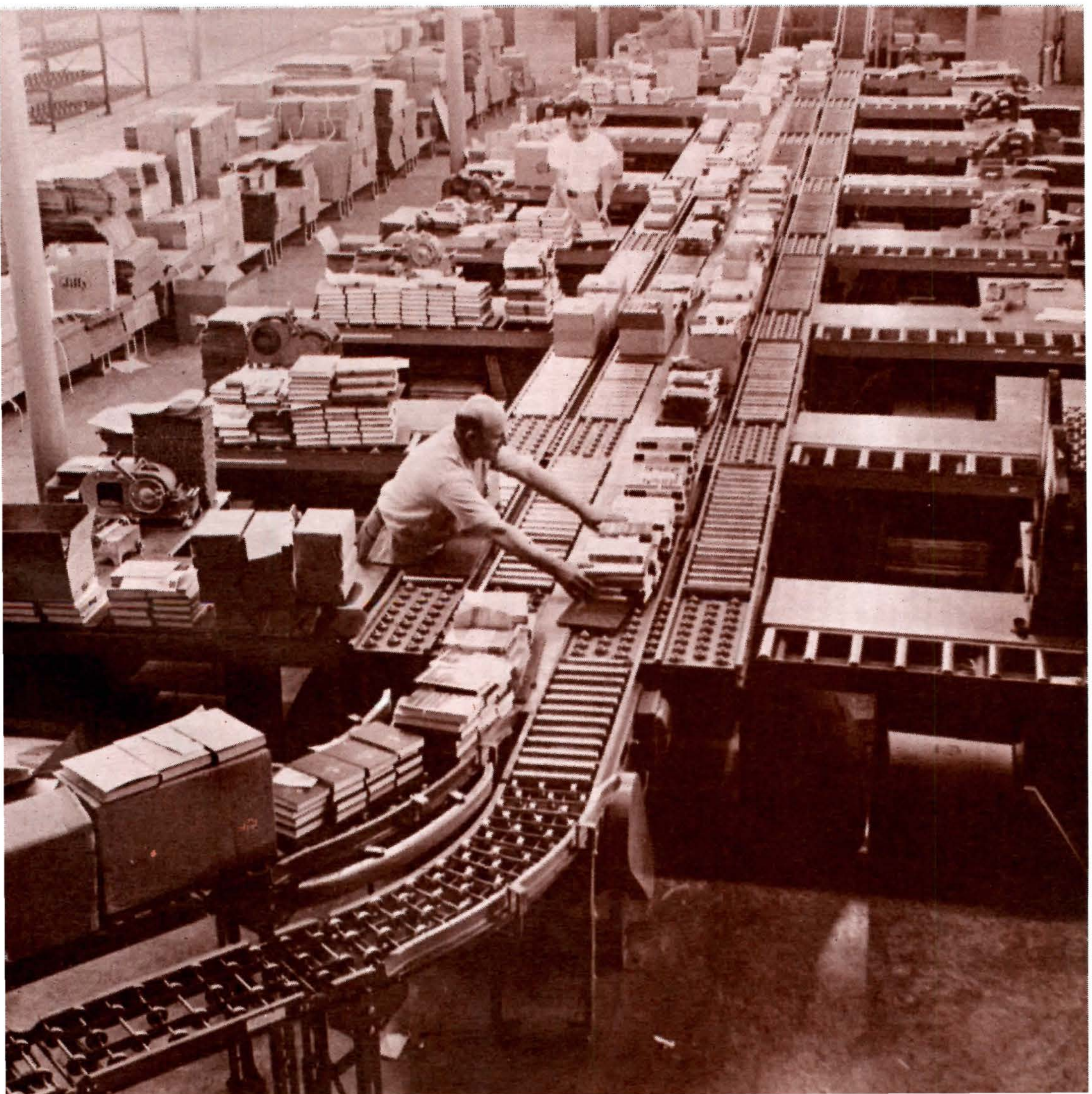
FIRST FLOOR



The warehousing and shipping wing (top) *encloses an area of three acres. Setback of cavity-wall portion of the structure, with strip windows at top, provides sun and light control.*

The aluminum-and-stone office building (above) *occurs at the south end of the plant and is year-round air conditioned.* Photos (except as noted): Felix Gilbert





The reception room, like all other areas in the office-building portion of the plant, is air conditioned.

At one stage in the conveyor operation, book checkers make sure that orders are filled accurately; dispatchers weigh shipments before routing them to the mail room.

Photos this page: Burt Owen

AIR CONDITIONING: schools

Regarding air conditioning for schools—particularly at elementary and secondary levels—there are opposing points of view. A principal factor in the determination of air-conditioning need is, of course, the total number of months during the year that the classrooms will be occupied. Certainly, if 12-month operation is contemplated, the case for air conditioning is a compelling one. According to a study completed by John J. Nesbit, Inc., it was concluded that "year-round air conditioning systems are justified in schools only if there is to be extensive use of classrooms at outside temperatures above 60 F, auditoriums at outside temperatures above 55 F, and offices at outside temperatures of 75 F."

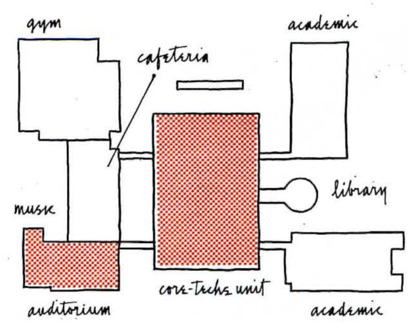
San Francisco Architect John Lyon Reid reports that his much discussed Hillsdale High School, which is served only by mechanical ventilation, seems to operate quite satisfactorily: "Although nine changes of air per hour seems to be the accepted standard, at Hillsdale we are providing 11. . . . I believe that 13 or 14 changes would represent a desirable condition in warm climates; however, we have had no experience with such abnormally high rates of air change. . . . The demands for economy in school construction place air conditioning in the luxury category."

Edward L. Varney, Jr., whose practice is at Phoenix, Arizona, reports that air conditioning is now an accepted standard there. (Additional discussion by Varney, on succeeding pages.)

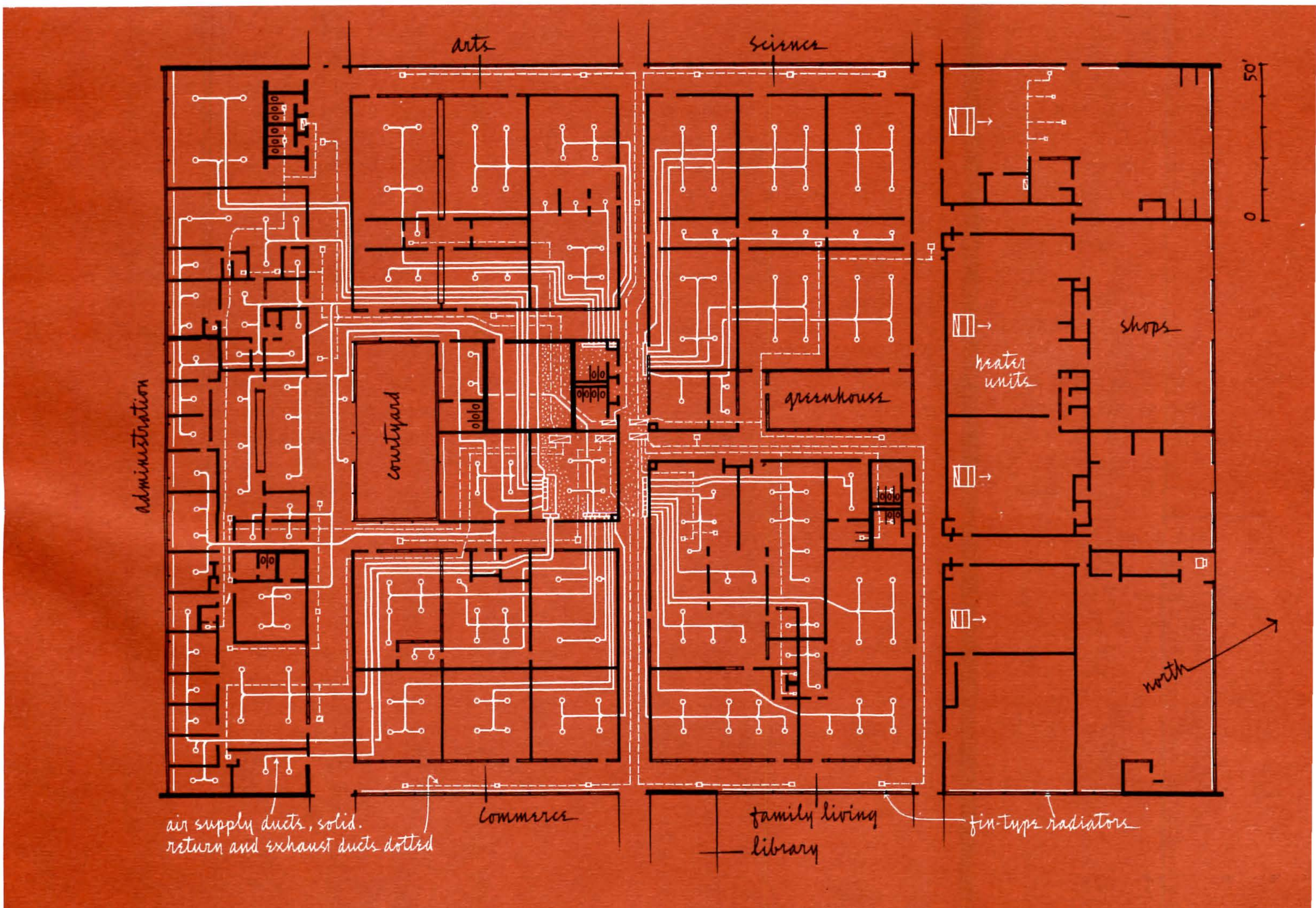
Universities, however, are blazing the air-conditioning trail because, according to a Carrier Corporation statement, "30 percent of all regular college students enroll in summer classes; warm-weather ranks are further swelled by elementary and high school teachers working toward advanced degrees."

One of the most discussed aspects of the Linton High School (*acrosspage*) is the year-round air conditioning of the core-techs unit—including classrooms for science, family living, arts, and commerce, plus library, shops, and administrative offices. Mechanical cooling for these areas, and the auditorium (in separate wing), is provided from a central refrigeration plant located in the core-techs building. The plant consists essentially of a centrifugal refrigeration compressor and condensing unit, an induced-draft cooling tower, a condenser-water circulating system, and a chilled-water circulating system. Its capacity is ample to serve the requirements of the core-techs and the library simultaneously; the system permits air conditioning of the auditorium when the classrooms are not in use. For reasons of economy, both areas cannot be conditioned at once. All of the various air-conditioning and ventilating systems are controlled from a central temperature control panel located in the boiler room (situated in the auditorium-cafeteria-gym wing).

Linton High School, *Schenectady, New York. Perkins & Will, Architects; F. Lee Cochran, Partner-in-Charge; Emmit Ingram, Project Manager; Don Martell, Job Captain; Ryder & Link, Associated Architects; E. R. Critschke & Associates, Inc., Mechanical Engineers.* Photo acrosspage: Hedrich-Blessing



New York School



School Air Conditioning in The Southwest

In face of the general belief that air conditioning of schools is a luxury that seldom can be afforded, it is of more than passing interest to have the testimony of Architect EDWARD L. VARNEY, *whose firm (Edward L. Varney Associates) is one of the most active in school design in the Phoenix, Arizona, area, that here "cooling of some type has become not only accepted but demanded." Below is his discussion of how this has come about —a trend that may be echoed in other areas in the years ahead.*

Early History. The earliest local form of summer cooling was the Mexican "Olla," a porous clay water vessel that cooled the contents by allowing some of the water to escape through the walls and evaporate on the outside of the vessel. Most of us can remember the back-porch food safe, a screened box which could be covered with wet burlap in hot weather. During the Thirties, some enterprising soul put a blower in the food safe and developed what we call "evaporative cooling." The evaporative cooler began as a box having three sides enclosed by excelsior pads with water dripping through them. The manufacture of these devices was becoming a booming industry with the advent of World War II, when a temporary halt was called. By that time, however, practically every residence in our area was equipped with one.

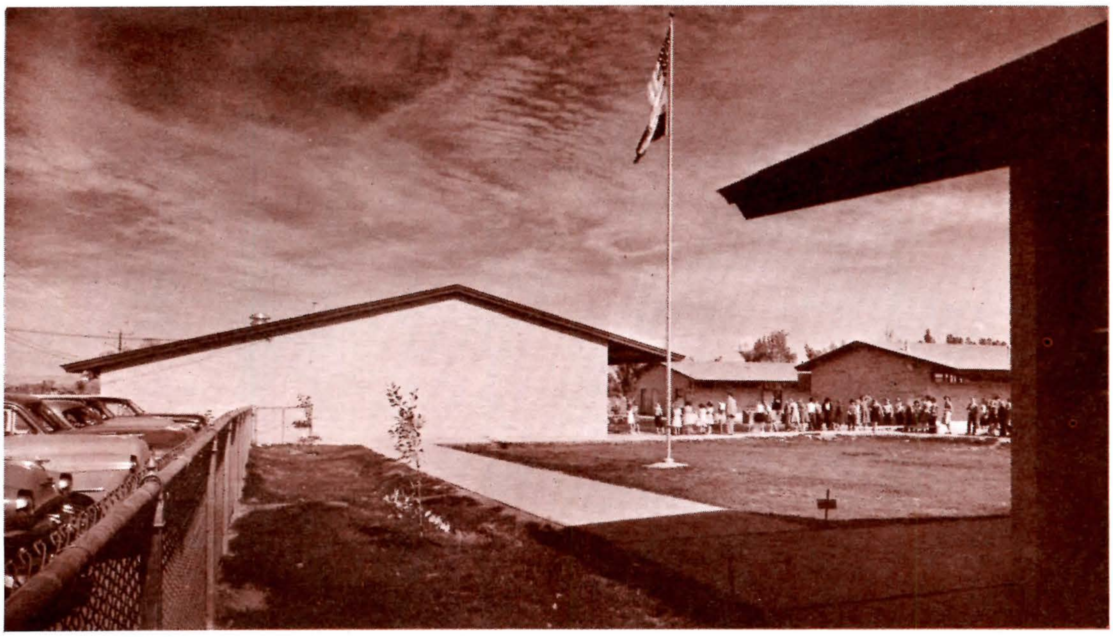
The evaporative-cooling process is simply the addition of water vapor to air, and the transfer of sensible heat in the air to latent heat in the water vapor. In other words, we lower the sensible heat and raise the humidity. In our Southwestern desert we have many days with 110 F outside air temperature and low relative humidity. These are ideal conditions for the efficient functioning of evaporative cooling.

The advent of mechanical refrigeration as a method of cooling room air produced far superior results. While evaporative cooling was comfortable on dry days, it was unbearable on hot humid days. However, prior to and immediately after the war, mechanical refrigeration applications were limited to hotels, stores, and expensive residences, because of first cost and also cost of operation. Schools, since they were not used in midsummer, had no cooling of any kind.

Summer Air Conditioning for Schools. The situation in Arizona at the close of World War II was ideal for the development of school air conditioning. To use the Phoenix area as an example, the population was centered in the city limits, also the approximate limits of School District No. 1. This district had the only important school buildings in the area, and they were typical two- and three-story heavy masonry structures built in the 20's and 30's. The close of the war saw the typical migration to the suburbs, but magnified here by the tremendous population influx to the Southwest. This meant that what had been country schools suddenly found themselvse large suburban school districts. In 1945, we saw the beginning of contemporary school building design with its over-emphasis on physical values of good visual, audio, and physiological environment. Since heating was not a major problem, it was natural to think of cooling in the search for this physical environment.

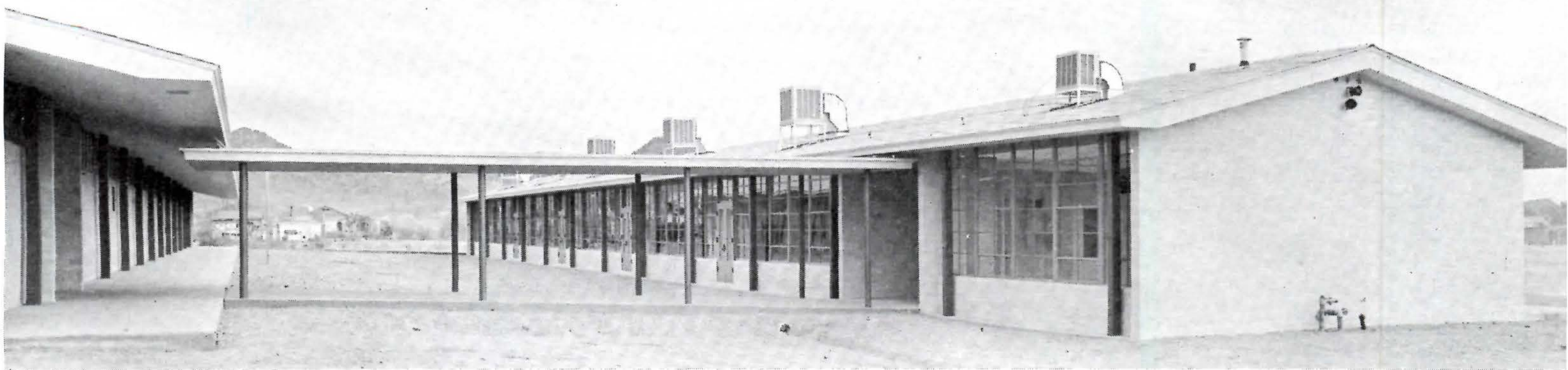
The typical elementary school of this period was a bilaterally lighted finger plan. Individual evaporative coolers were placed on the roof over each classroom. Water valves and electric switches were provided in the classroom. Waste water was disposed of on the grass. Certain disadvantages began to appear, such as damage to roofs in servicing the coolers, mud puddles where waste water was dumped, improper water regulation, and excessive noise level in the classroom. The roof problem was solved by hanging the cooler under the eave and blowing the air through the north window wall. Pumps were developed to recirculate the water. These eliminated the need for disposing of waste water and for regulating water supply. Oversize, slow-turning blowers were used to reduce noise level. Technically, these refinements provided a good cooling job, but esthetically left a lot to be desired. We tried several schemes using larger central air washers, enclosed in rooms, and distributing air through underground or overhead ducts to several classrooms. These were not satisfactory because of the lack of individual room control. Today we are still using individual coolers where the budget is low.

In 1951, we began to think about mechanical refrigeration. In a project where the budget permitted a high-class heating system — such as circulating hot water piped to forced-air convectors in the classrooms—cooling could be accomplished by the addition of a water chiller in the boiler room, circulating chilled water through the same pipes to the same convectors. The added cost included the boiler-room equipment (compressor, chiller, evaporative condenser), larger pipe size, and additional pipe insulation, and larger coils and blowers in the convectors. Also the electrical load was increased by approximately 3 kw per classroom. This idea met with a lot of resistance because the layman associates mechanical refrigeration with high operating cost (it costs about one dollar a day for electricity to cool a 1200 square foot house). We finally convinced one school board with a set of figures that took into account the short operating period (maximum six weeks in spring and six weeks in fall, and with only 12-hour operation), lower annual maintenance cost, and the fact that the increased first cost could be distributed over a 20-year life instead of seven or eight years for evaporative coolers. This first job, the Chandler Junior High School (*acrosspage*), was completed in 1952 and has served as the prototype for many others. In five short years, cooling of some type has become not only accepted, but also demanded in every school in central and southern Arizona.



The three schools illustrated on these two pages were all designed by Edward L. Varney Associates: Junior High, Chandler (acrosspage); *Sunland School, Phoenix* (left); *Sunnyslope School, Phoenix* (below).

Photos: Stuart Weiner

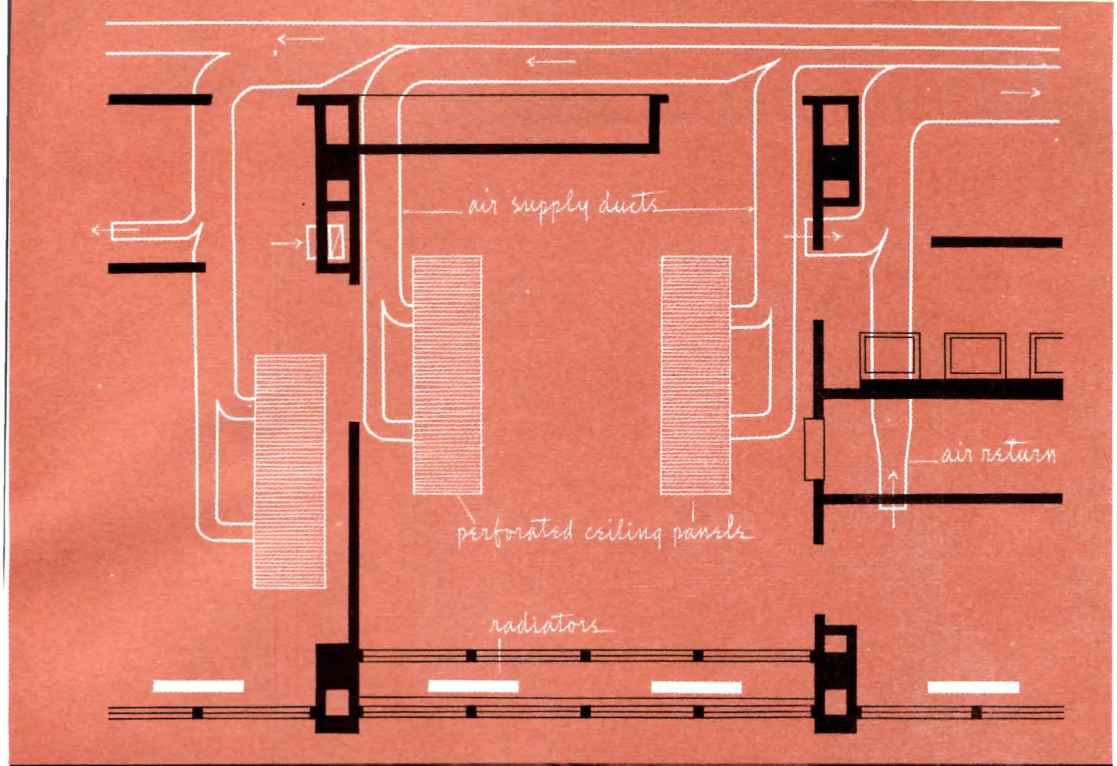


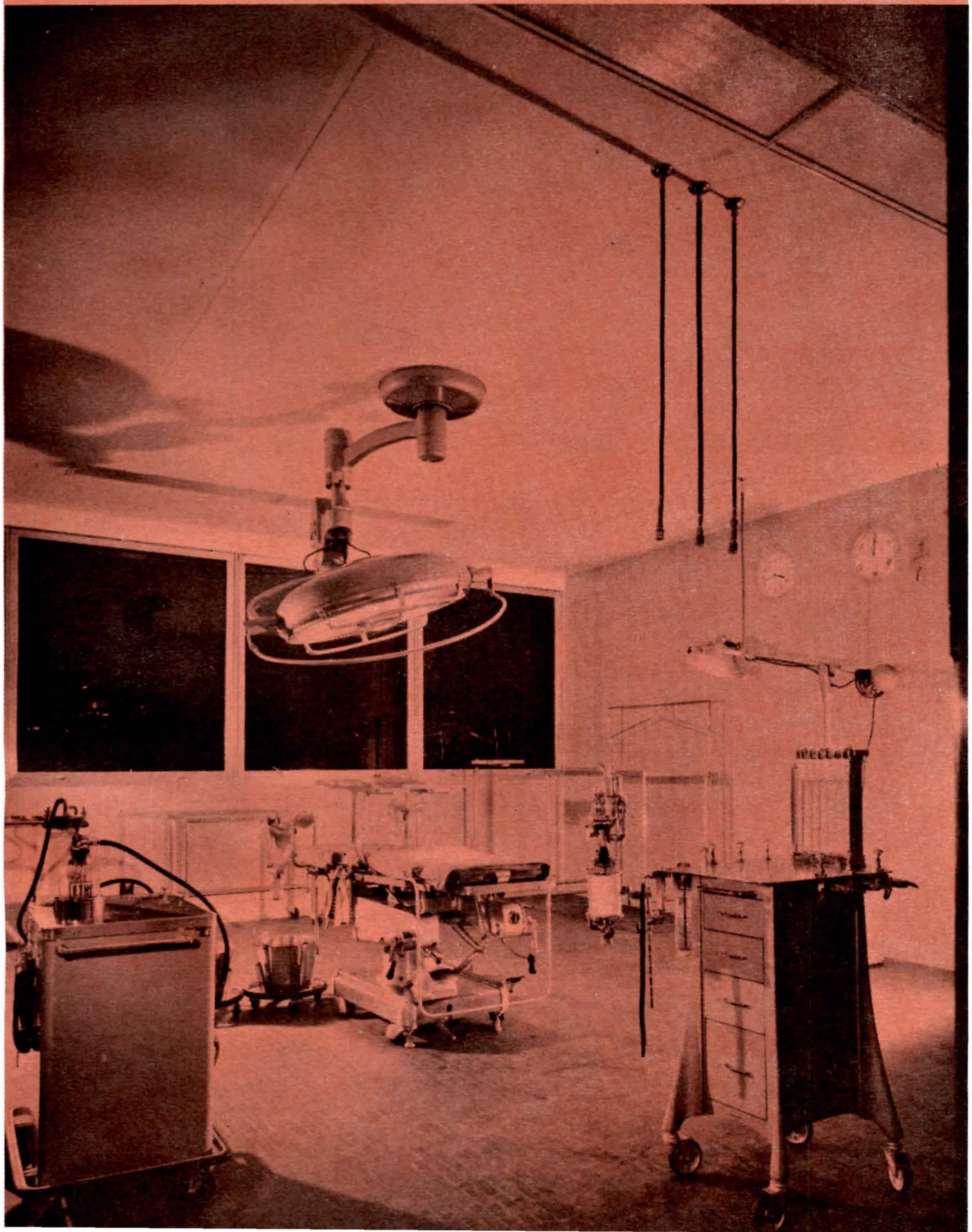
AIR CONDITIONING: hospitals

Throughout the country, air conditioning is commonplace for hospital operating rooms, delivery rooms, and recovery rooms. Quite apart from the comfort that accrues to both patient and staff—lessening the tensions of one and sharpening the efficiencies of the other—the effects of total conditioning, including proper humidification, filtration, and sterilization of air, contribute immeasurably to safety and health of the patient while he occupies one of these rooms. However, what happens to the patient's ideal thermal environment when he is returned to hospital room or ward with still many hours, or even days, remaining until he eventually recovers his basic health? The adaptability of the human body is so remarkable that the patient usually recovers without benefit of man's highest achievement in environmental control. Nevertheless, it does seem paradoxical that where air conditioning might have its greatest benefit—not only to comfort the ill person but also to assist therapy by controlling the temperatures in concert with the demands of his physical condition—it is remarkably missing. An examination of hospitals in this country would point up sharply the very small number that extend year-round comfort conditioning to patients' rooms and wards.

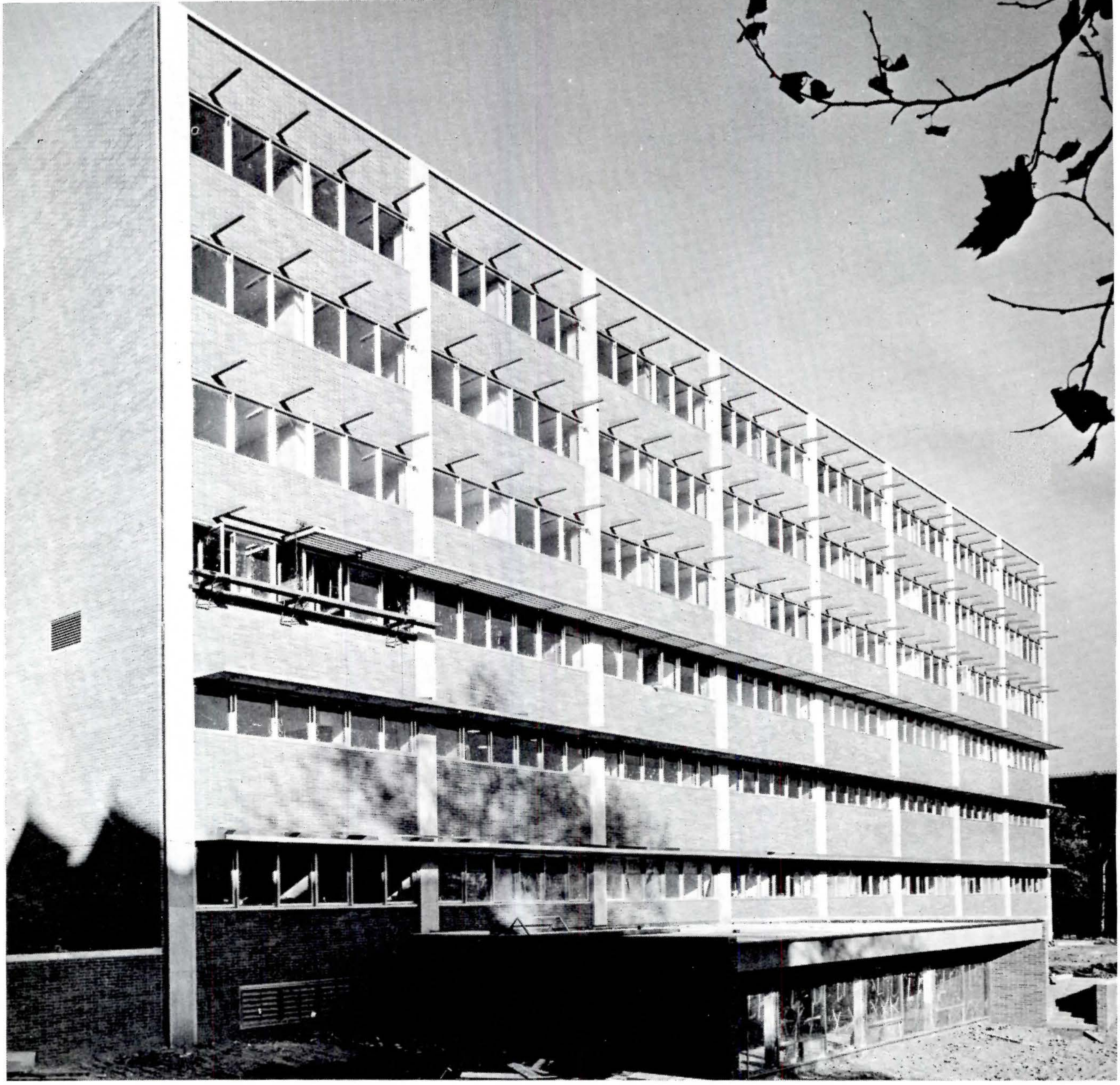
An exception to this rule, however, is the Episcopal Hospital Addition, at Philadelphia, where in addition to the normal air-conditioned areas, all bedrooms are provided with year-round comfort (*discussed in detail on succeeding page*).

At the Coney Island General Hospital, New York, complete air conditioning was installed for the operating rooms, delivery rooms, labor rooms, premature nursery, animal rooms, fluoroscopy and radiography, central supply, auditorium, and encephalography suite. A central refrigeration plant on the seventh floor of the nine-story building supplies chilled water to air-handling units servicing operating rooms, recovery, labor rooms, and so on. Of special interest is the air conditioning of the typical operating room (*acrosspage*). For the 20′ x 20′ operating room, approximately 1000 cu ft of conditioned air is introduced per minute, using 100 percent outdoor air. This air is filtered by a centrally located automatic, oil-bath-type filter and is cooled by chilled-water coils located in the fan room adjacent to the main refrigeration plant. By introducing air through perforated ceiling panels from a plenum chamber above, drafts are avoided and uniform air distribution is achieved. Temperature and humidity are individually controlled in each of the operating rooms.

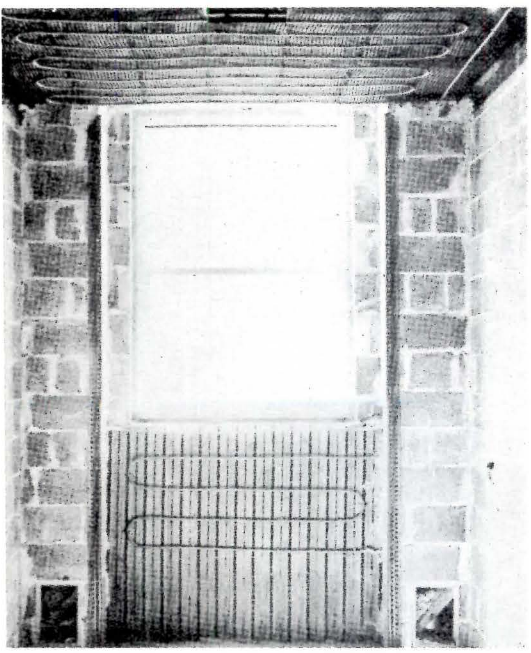




Coney Island General Hospital *for Department of Hospitals, City of New York. Katz Waisman Blumenkranz Stein Weber, Architects Associated, with Andrew J. Thomas, Architect; V. L. Falotico & Associates, Mechanical Engineers; Farkas & Barron, Structural Engineers.* Photo: Ezra Stoller



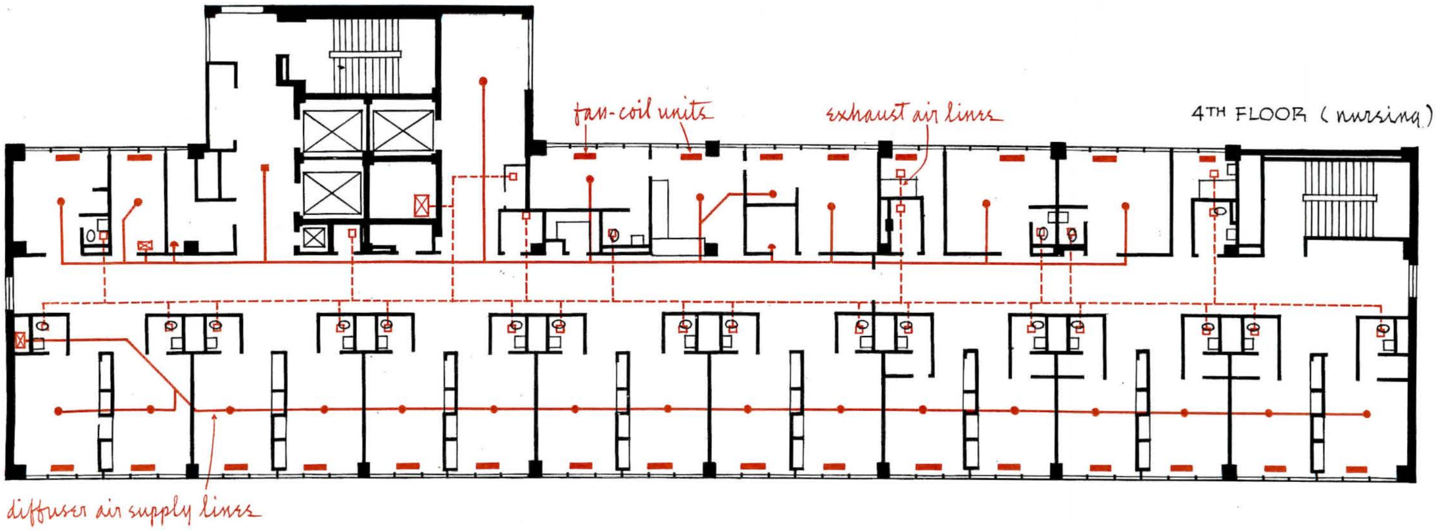
Lawrence S. Williams



Glen Oaks, New York

This 5-story hospital, the first part of a three-stage construction program, has a sub-basement, ground floor, and five upper stories. Ultimate bed capacity will be 500. **Air conditioning** is of particular interest on the nursing floors, where radiant heating and cooling are employed. Well water, found in abundance at the site and ranging in temperature from 50 F to 55 F, is piped through copper and steel radiant coils for summer cooling. Controls keep the temperature above the dew point to avoid condensation. Average summer indoor temperature has been 79 F dry bulb with an outside air temperature of 90 F dry bulb. Heating is by hot water through the same coils embedded in ceiling and beneath windows (*construction photo, left*). The heating system is divided into three zones—north, south, and service areas. Two 22,000 lb/hr boilers, sized for the eventual 500-bed capacity, supply steam. "We took winter heating," says John K. M. Pryke, Senior Partner of Slocum & Fuller, Consulting Engineers for this work, "and got as much cooling out of it as we could."

Operating rooms, obstetrical department, and cafeteria are fully air conditioned. Kitchen and hospital service areas employ 100-percent-fresh air. Louis Allen Abramson was Architect.



Philadelphia, Pennsylvania

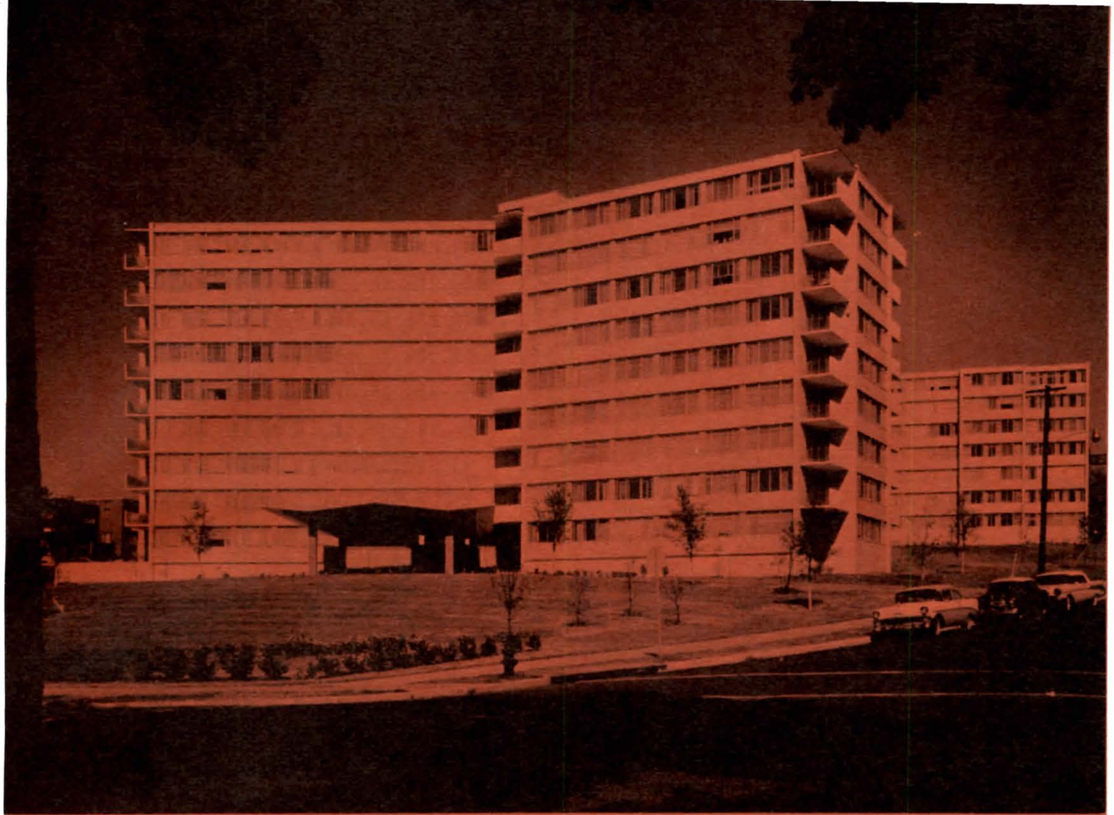
On completion, this hospital will provide doctors' offices on the first floor, operating rooms on the second, X-ray rooms on the third, nursing areas on the upper floors. **Air conditioning** is accomplished by split systems for both heating and cooling. The first floor will be serviced by individually controlled fan-coil units, as are all of the hospital rooms on the fourth, fifth, and sixth floors. These same units are used for heating as well as cooling. In the operating rooms and X-ray rooms, thin wall convectors will be used for heating in conjunction with air-conditioning units. These specialized areas will receive 100-percent-fresh air through air distribution panels located in the ceilings. In addition, these rooms are to have temperature and humidity controls. Steam will be conveyed to mechanical room from a central boiler house remote from the new building, brought in at a little more than 100 lb pressure, reduced to 60 lb for the servicing of sterilizers, 30 lb for kitchen equipment, and further reduced to 5 lb for conversion to hot water. Chilled water is to be supplied by reciprocating compressor and condenser supplying water at 35 F for both the fan-coil units and the air-conditioning units. The basement will be equipped with large heating and ventilating units mounted to the ceiling. Vincent G. Kling, Architect; A. E. D'Ambly, Mechanical-Electrical Engineers; Chester I. Duncan & Son, Structural Engineers; A. E. Beck, Project Manager.

Ben Schnall

AIR CONDITIONING: residential

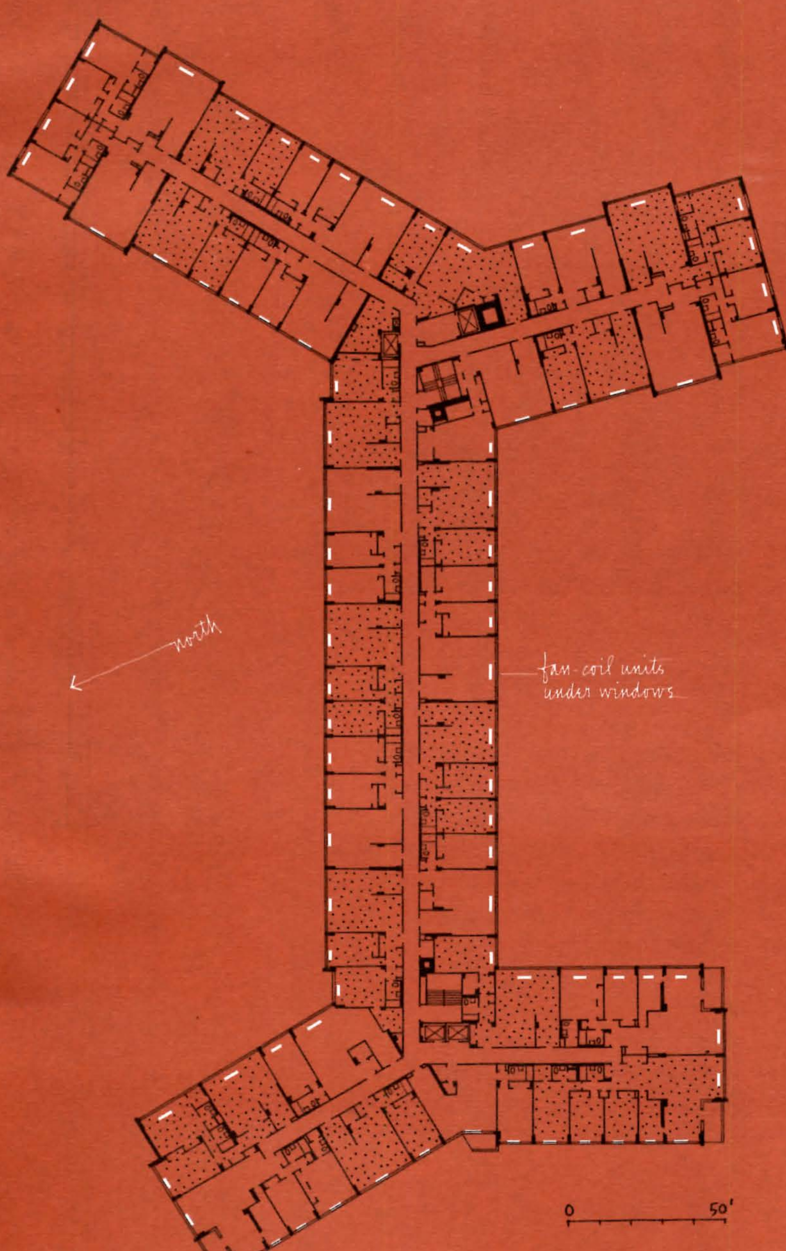
Residential air conditioning has gained tremendous consumer acceptance in the last few years, has been exploited as a standard sales persuader by many project builders, and has become an essential consideration in the planning of any first-rate apartment building, hotel, or motel. Range of choice for the type of system to be installed varies widely, depending on design of structure, suitability of system, budget limitations. In house construction, packaged units are widely used, as are central-type systems using ducted air or variations on wet-type methods of distribution. For apartment buildings—especially in the East—wall units have been extensively installed in new construction. They are self-sufficient, requiring only an electrical connection and outside grill, and have solved a good many problems for the apartment-house owner. It is difficult to find many apartment houses that contain true central air-conditioning systems; however, it is reasonable to assume that their number may increase as advantages for these systems are applicable to apartment house construction. An installation in Washington, D.C., having a typical fan-coil type of operation is described (*below*). Although there has not been a large number erected, new hotel construction does invariably include year-round air conditioning. High-velocity systems are particularly appropriate, since the small size of required ducts permits their placement above hung corridor ceilings. Related savings in space and economy now make it possible to add air conditioning in hotel buildings where previously it could not have been added under any circumstances. Of prime importance to the owner is minimum revenue loss during installation.

The Rittenhouse apartment building (*acrosspage*) is air conditioned by means of fan-coil units located under windows. Each unit has a three-speed fan with wall thermostat controlling the fan at desired setting. Hot water, circulated to units in winter, is modulated in accordance with outdoor bulb and heated in two water-tube, hot-water boilers. Water is chilled by a 340 hp centrifugal compressor with cooling tower on the roof. Bathrooms in service areas are heated by an independent hot-water system operating at 200 F; corridors are ventilated with 100-percent-outside air, conditioned all year. Noise is always a problem in apartment buildings, particularly where apartments are located over equipment rooms. At the Rittenhouse, transmission of noise was reduced by construction of a double concrete slab over the equipment room—each slab 6½ in. thick and separated from the next by several feet. Additional precautions to insure reduced noise were installation of a gearless-type of centrifugal compressor with an enclosed door and selection of pumps especially chosen for quiet operation.

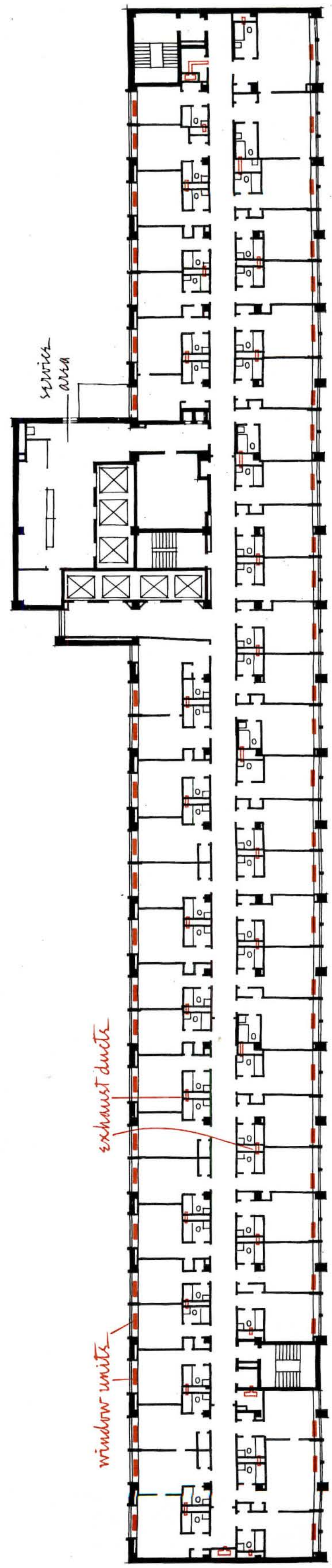


The Rittenhouse *apartment building, Washington, D.C. Berla & Abel, Architects; General Engineering Associates, Mechanical-Structural Engineers.*

Photo: Robert C. Lautman



William F. Howland

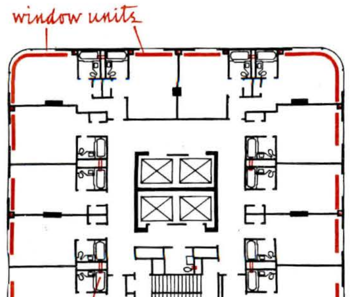


Hotel: Philadelphia, Pennsylvania

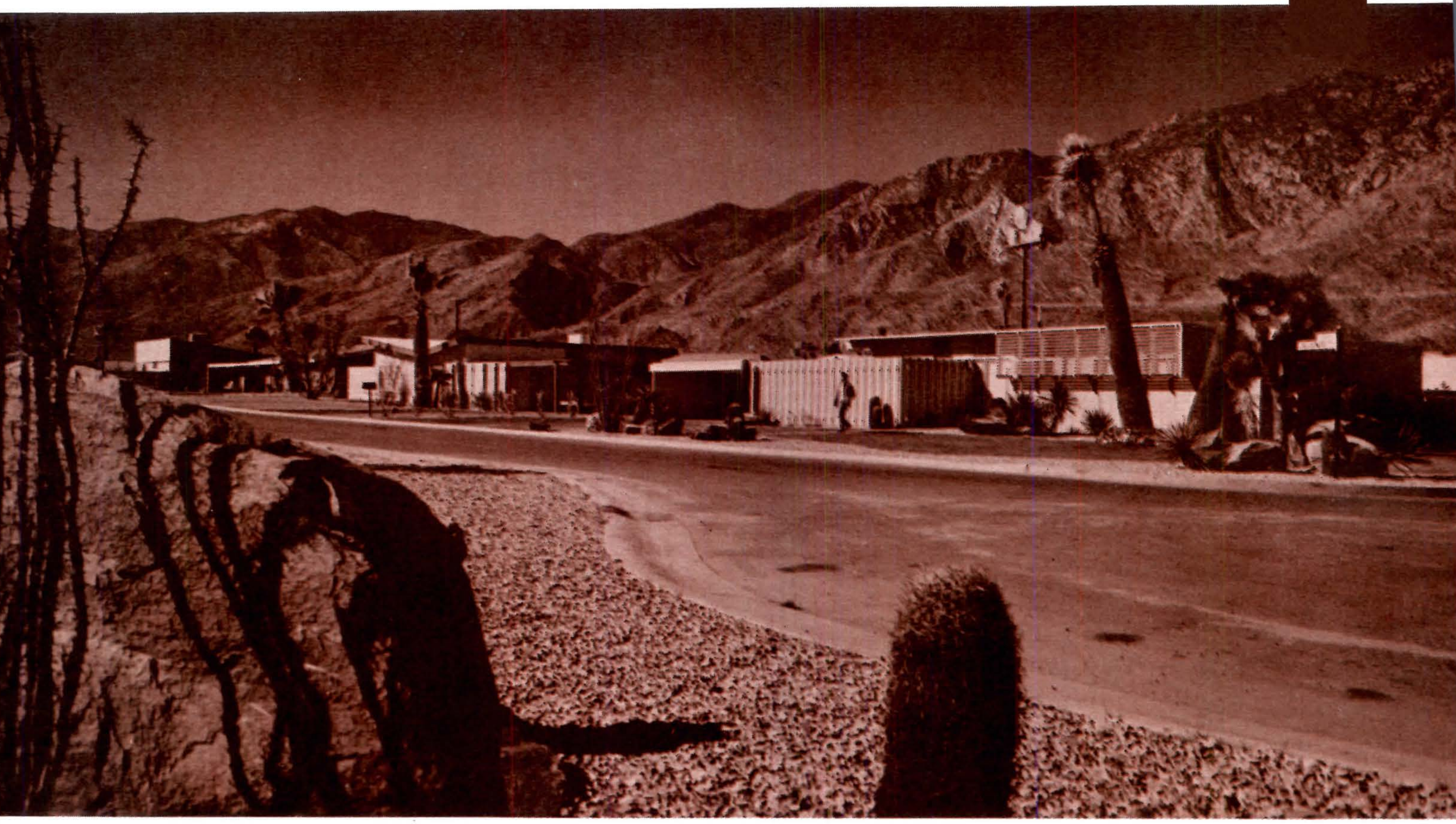
Air conditioning of the guest rooms in the Philadelphia Sheraton (September 1957 P/A), for which Perry, Shaw, Hepburn & Dean were Architects, and Slocum & Fuller, Mechanical Engineers, consists of a fan-coil heating and cooling system. Individual room units operate wholly on recirculation of room air. For bathrooms, positive exhaust ventilating, with air supplied from the corridor system (plus infiltration through windows) is used. A preset four-position, three-speed manual selector switch serves each unit. Room conditions are maintained automatically by an adjustable, single-pole, double-throw, wall-mounted thermostat. On the cooling cycle, a rise in room temperature starts the fan; on the heating cycle, a drop in temperature actuates the fan; changeover is automatic. A finned coil on top of the unit is used for both heating and cooling. Chilled water from a central (4th floor) refrigeration plant is circulated through mains and risers which, in heating seasons, conduct heated water. High speed, single stage, centrifugal refrigeration compressors with a capacity of 750 tons serve the central system.

Rendering: Rudolph Associates

Hotel: Denver, Colorado



Air conditioning for the extension to Brown Palace Hotel, Denver, Colorado (William B. Tabler, Architect; Slocum & Fuller, Mechanical Engineers), is year-round. Primary heating source is street steam which, via exchangers, provides hot water both as main heating medium and in heating coils of air-handling equipment. Miscellaneous areas utilize fin-tube convector radiation and heating coils delivering tempered air; bedrooms have high-velocity induction units, with individual room thermostats; and the perimeter and top-floor toilets use radiant ceiling panels. Primary components of each system are located in the mechanical-equipment room, while air-handling equipment for main lobby and rental areas occurs in hung ceilings. Temperature of hot water is varied with fluctuations in outdoor temperature. For cooling, chilled water from refrigeration equipment in the existing hotel is delivered to cooling and dehumidifying coils in the air-handling equipment and is also used as make-up water for the secondary water system serving the high-velocity induction units. Cooling system tonnage: 325.

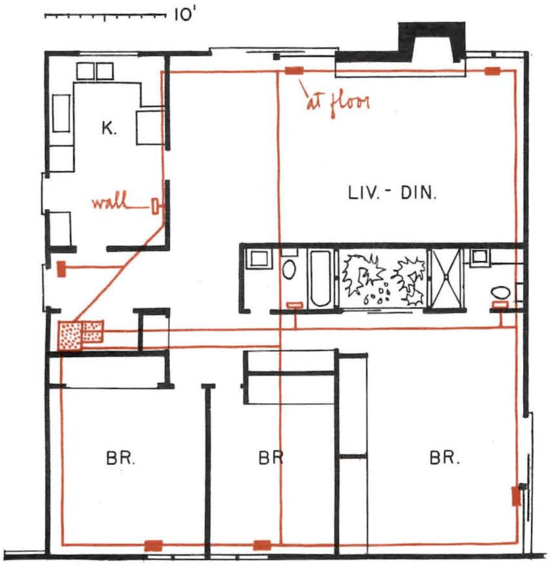


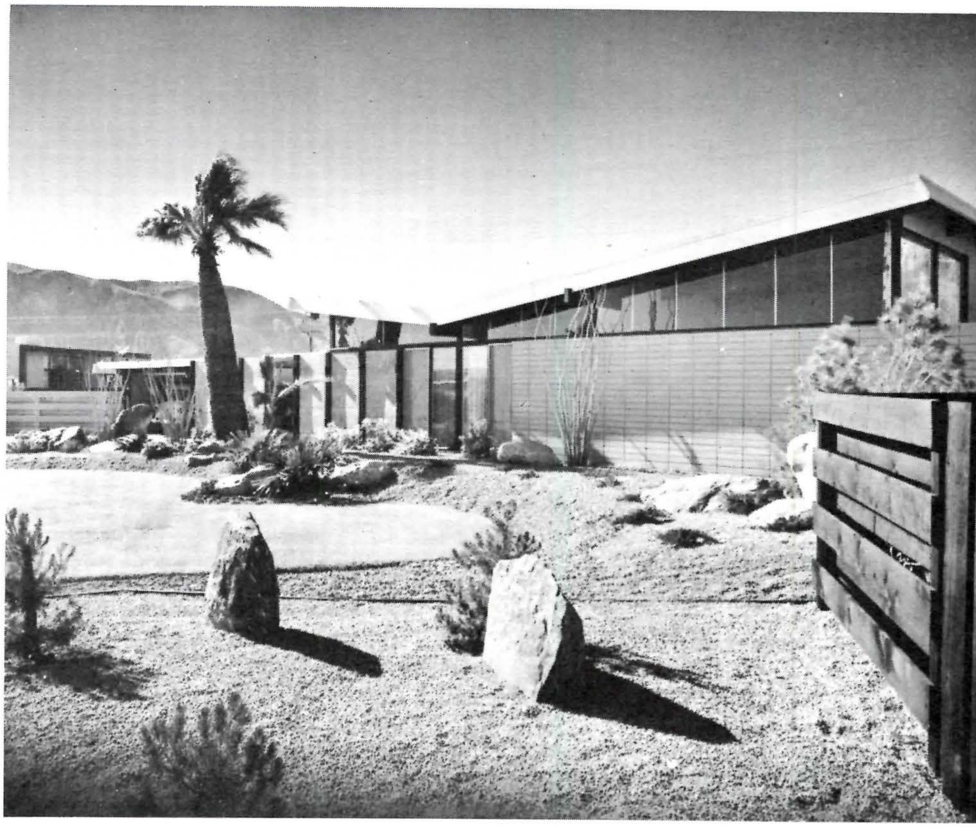
Speculative Builder Houses: Palm Springs, California

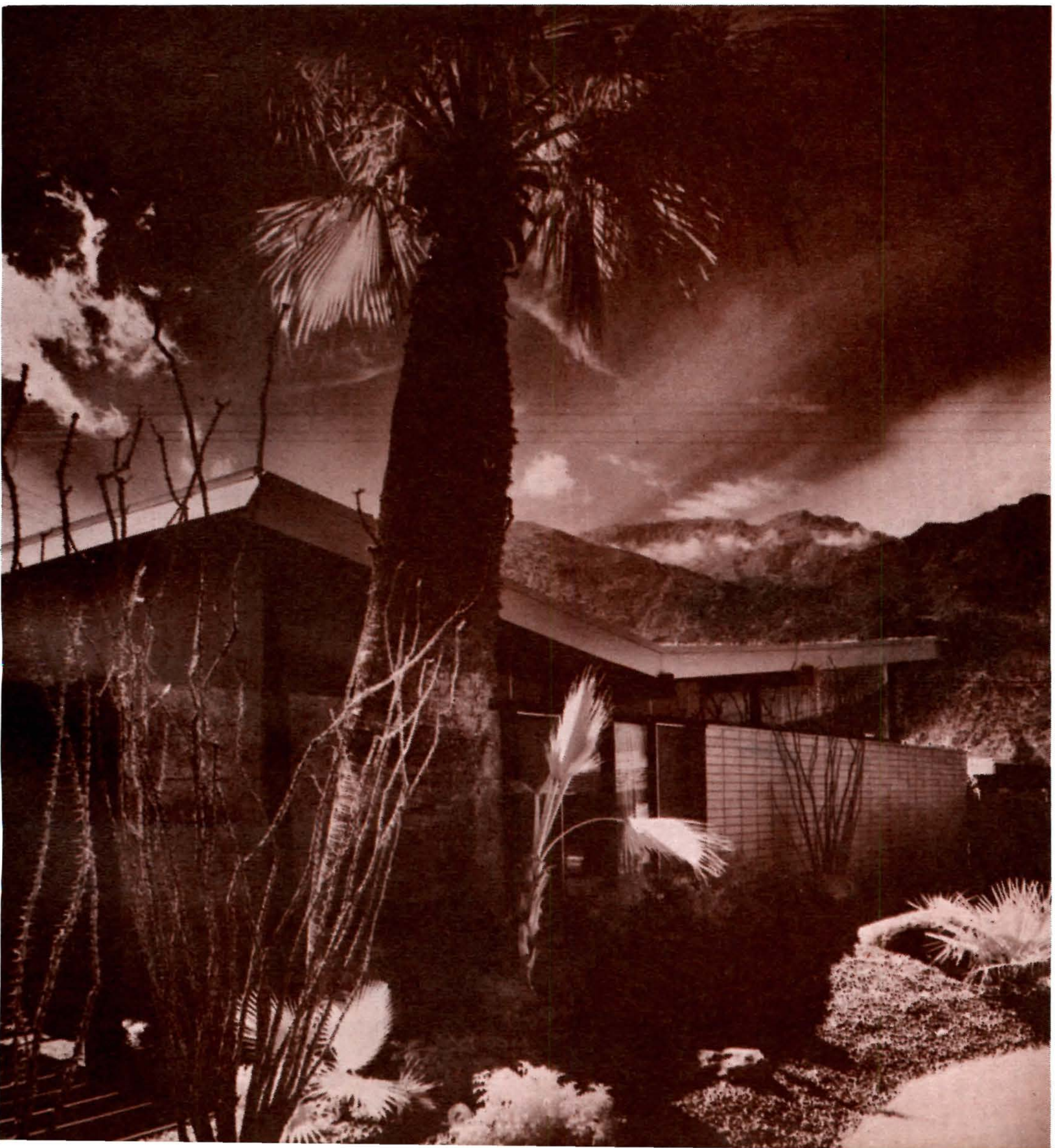
This entire group of 66 air-conditioned houses constituting Smoke Tree Valley Estates, in Palm Springs, is developed around a single floor plan with variations—reversal of location of bath and air-conditioning space; variations in orientation and fenestration; "flopping" of the plan; different roof lines and finish materials. This was consciously done to minimize the "tract" look, since the houses are in a price range greater than that of usual tract houses. Palmer & Krisel were Architects, Engineers, and Interior Designers; William Krisel, Landscape Architect; and Doris Palmer, Color Consultant. General Contractor, Builder, and Owner is George Alexander Company. The program called for 3-bedroom, 2-bathroom houses, suitable for desert living, that would be used mainly as weekend or second homes for families living elsewhere. The site is level, with magnificent views to the mountains on every hand.

Air conditioning is completely automatic, controlled from a thermostat on the interior of the house and an anticipator outdoors. Local conditions are such that cooling may be required in daytime, and heating at night. A gas-fired, forced-air heating unit and an air conditioner that cools air by means of chilled water are located in each of the mechanical alcoves; as variously activated by the inside and outside controls, these furnish warm or cool air to a perimeter-loop system of ducts (beneath the floor slab) which feed registers in the different rooms.

The structural system is post-and-beam with exposed 2-in. T&G sheathing for the roof. No interior walls are bearing, since the floor system consists simply of a perimeter footing, slab floor, and concrete piers located to support structural columns on the interior. In the attempt to create variety mentioned above, exterior wall finishes include stucco, siding, concrete block, and stone. Rock-surfaced composition roofs are treated in various colors. Natural light is variously controlled by roof overhangs and "sun flaps."

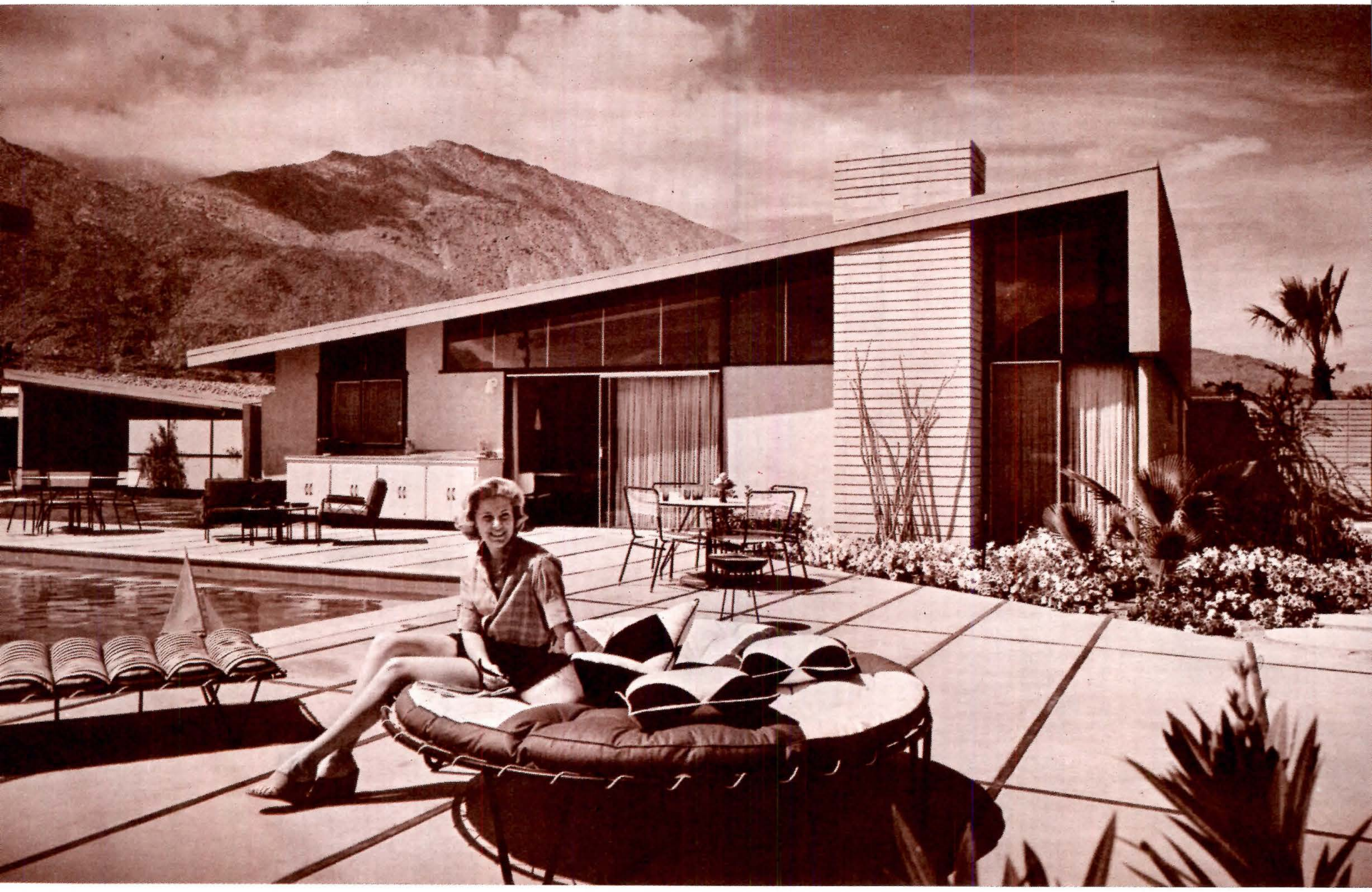


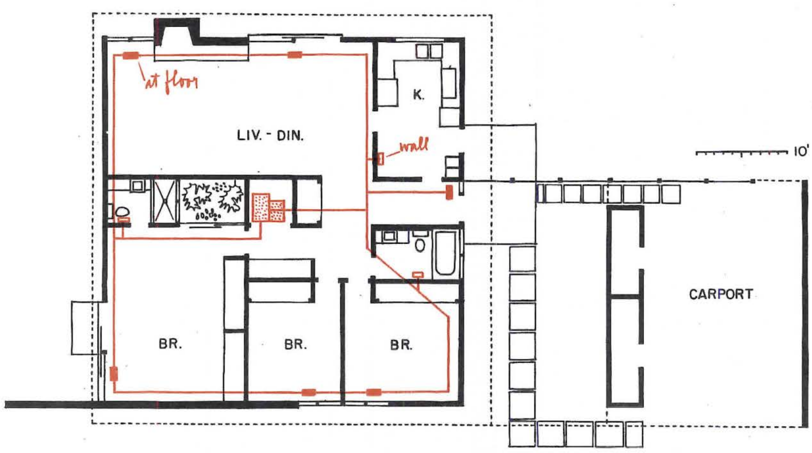


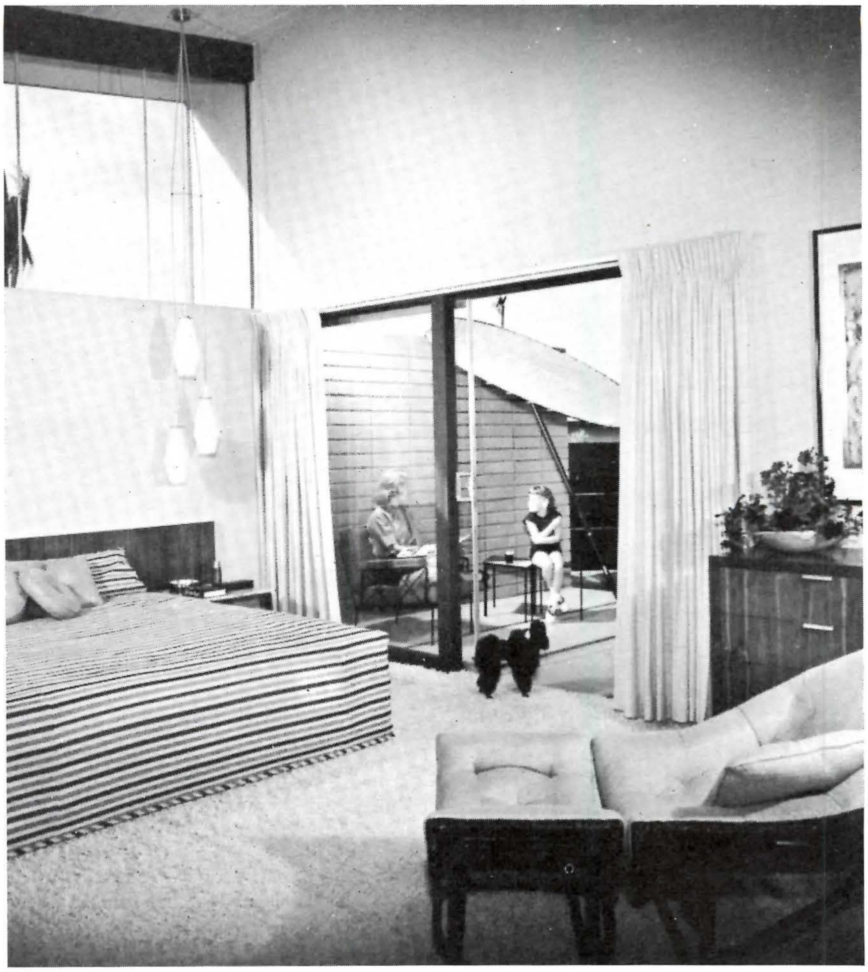


Different roof lines, various exterior wall materials, and a carefully considered color scheme; all contribute to avoiding uniformity.

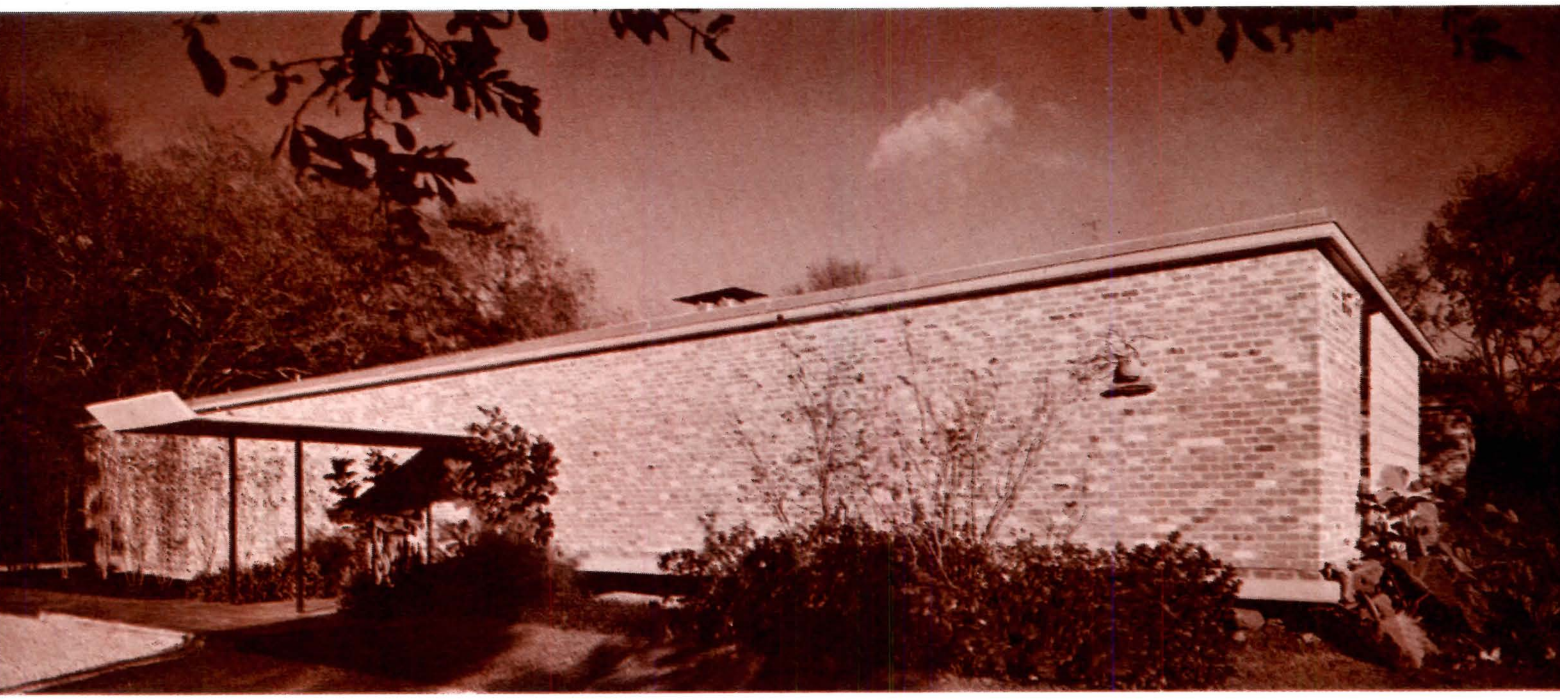
Photos: Julius Shulman




at floor
LIV. - DIN.
K.
wall
10'
CARPORT
BR.
BR.
BR.

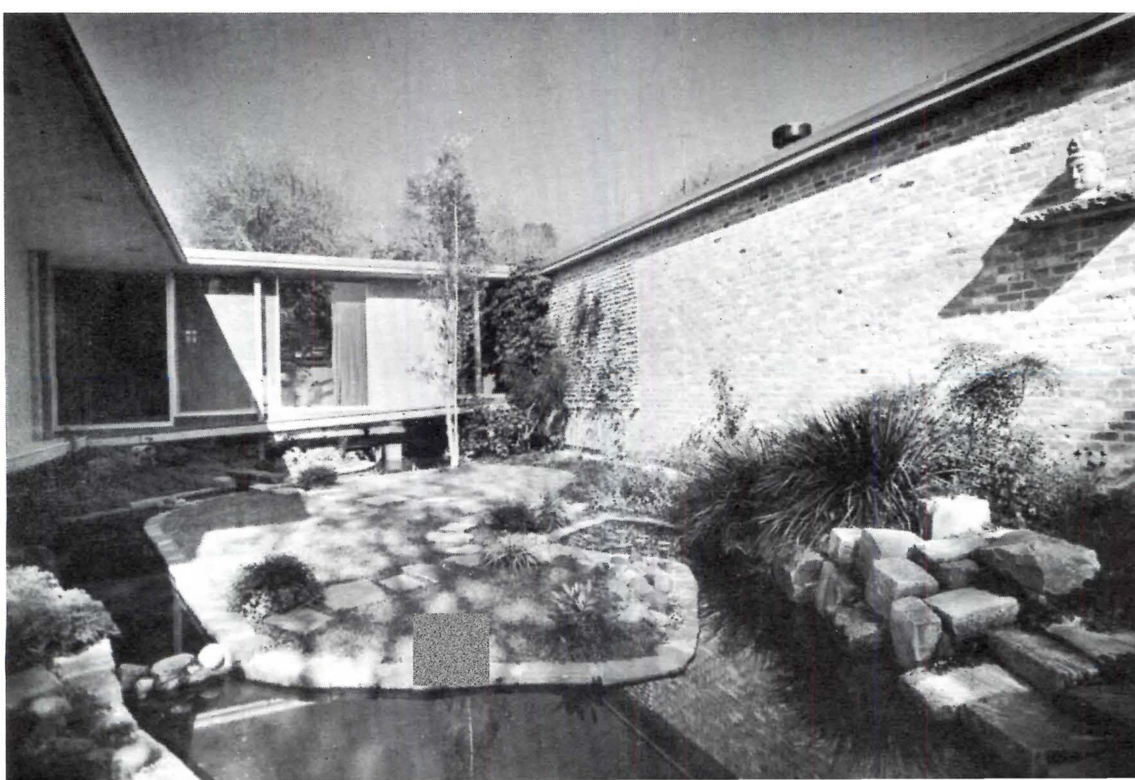


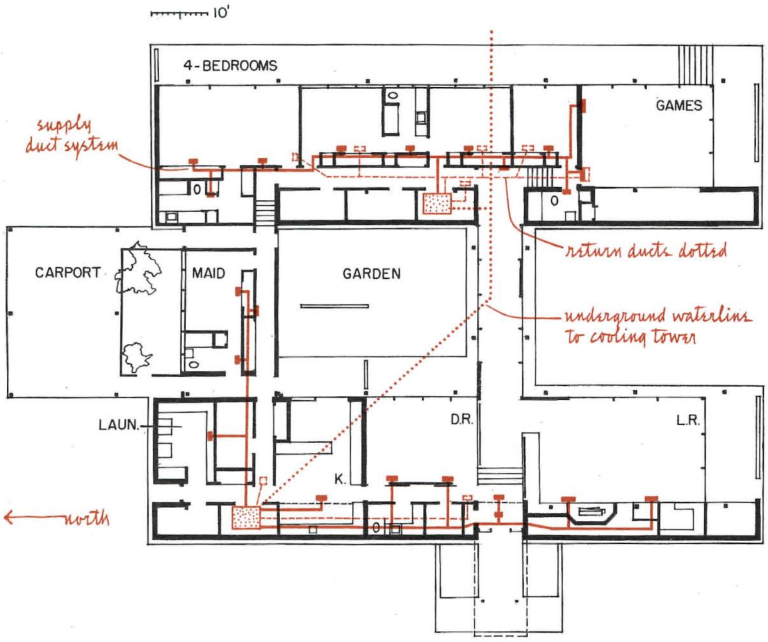
The houses—in the $30,000 to $32,000 price range (complete with lot, swimming pool, terraces, air conditioning, and built-in equipment)—were all sold before completion.

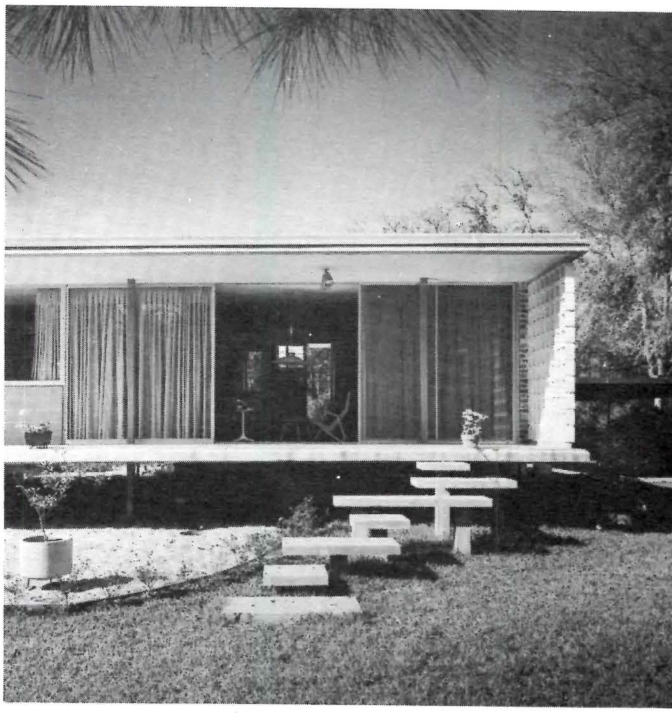


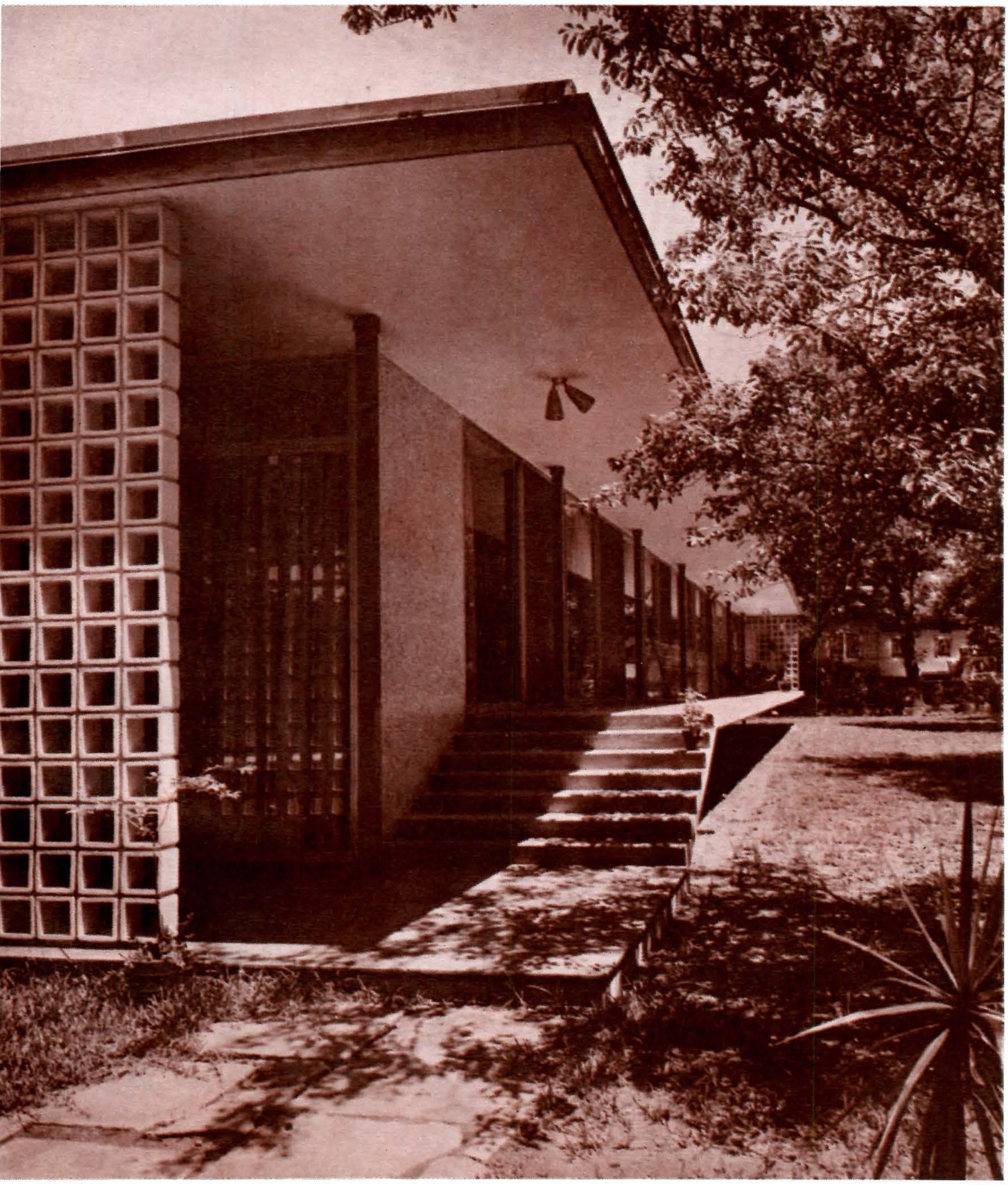
Private House: New Orleans, Louisiana

Climate control—not only mechanically but architecturally as well—played an important role in the design of this home for Architect Arthur Q. Davis and his family. "Orientation," he says, "was a prime consideration." All major rooms face toward the east, considered the most desirable exposure in this semi-tropical climate. Multipurpose room and living room have southern exposure as well. On the east, rooms are protected by a 9-ft overhang, on the south by a 12-ft roof projection. Solid-masonry walls block severe sun from the west and storms from the north. In addition exposed parts of the structure are well insulated by foamglass blocks applied directly to the slabs. **Air conditioning** consists of two gas-fired year-round units—one serving the front wing, the other the back wing and servant's quarters. Gas-fired units, found to be most economical in this location and extremely simple to control, were selected. One switch per unit controls heating as well as cooling. Sound-absorbing units on the return-air outlets in the bedrooms insure quiet operation. Ducts, containing side-wall outlets, have been suspended from the ceiling and are used throughout the house (*see plan*). Curtis & Davis, Architects; Edward L. Moroney, Consulting Electrical Engineer; deLaureal & Moses, Consulting Mechanical Engineers; Haase Construction Company, Inc., General Contractor.







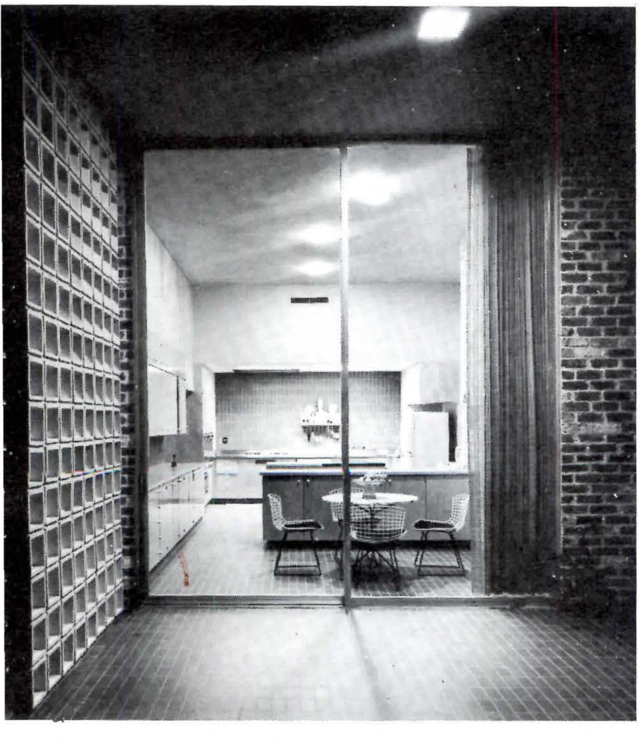


Structurally the house is of interest for its use of lift-slab construction. Slabs were poured on the ground and raised to their proper elevation. "In order to have ample volume and flow of space," writes Davis, "the roof was established at a fixed level and the floors set at different elevations depending on size and use of rooms.... It was a simple matter with lift-slab construction to connect the front and rear wings which are at different heights by means of a ramp (acrosspage bottom) *which was lifted into place on an angle."*

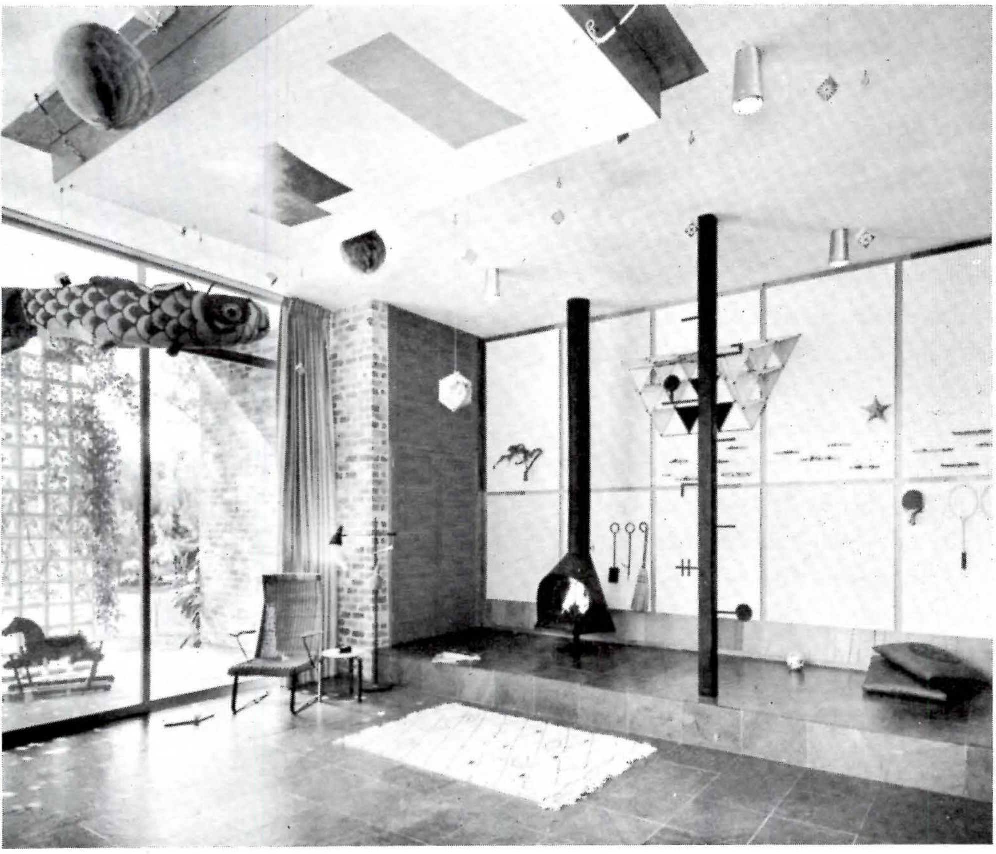
Exterior materials are brick, glazed tile, and glass set in aluminum frames.

Photos of bedroom wing (above and left) *were taken at different stages of landscape development.*

The dining room (left *and* below) *and kitchen* (bottom left) *were given the full 12-ft height, achieving continuity between interiors and the patio. The living room, 2½ ft higher and on a level with the base of the ramp* (left), *was intentionally detached from the ground. Floor surface of ramp and dining room is slate; quarry tile in the kitchen.* Photos: Frank Lotz Miller



Master bedroom (above) faces east, as do children's bedrooms. Multipurpose room (left), at end of bedroom wing, opens toward east and south. Floor is slate, perforated panels and ceiling hooks serve as mountings for toys and room decorations. Raised portion of floor may be used as a stage.



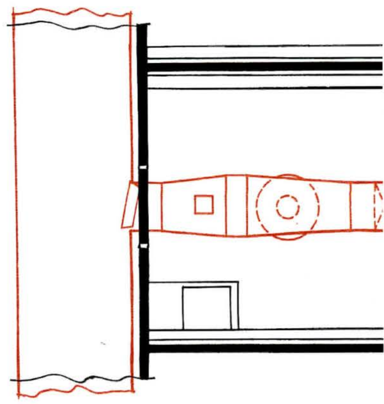
Living room (right) overlooks garden court (opening page) to the east. South-facing sliding glass panels are protected by 12-ft overhang and open tile screen. Floor is of marble. Wood wall conceals bar, TV, radio, phonograph equipment, and storage areas.

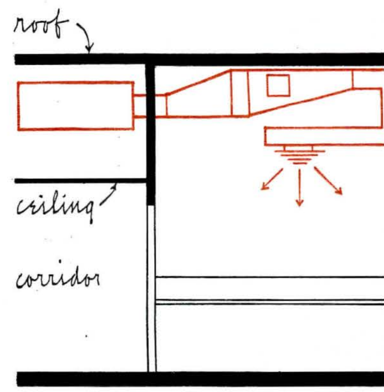
AIR CONDITIONING: specialized needs

From the preceding discussions of air conditioning, it could be observed that although the various types of occupancies may have had differing systems there were, nevertheless, similarities in the services to be performed within each building category. There exists, however, a number of building types, rather specialized in their use, that require individual mechanical designs that are unique to their particular function. A few examples of this kind are laboratory buildings, churches, sports arenas, etc. A pertinent instance of specialized air-conditioning requirements is found in Union Carbide's future Basic Research Lab *(illustrated acrosspage)*. There, 40 labs located at first-floor level will be exhausted through two roof monitors, each containing 40-ft-long louvers and a fan gallery. Air-conditioning studies for the first-floor resulted in a "once-through" system where no recovery is made of the conditioned air. In other areas, such as basement and offices, however, there will be some recirculation, since no serious fume problems will exist. Should the basement be transformed into additional labs, extra mechanical equipment will be installed in already allotted space. Anticipating future demands, basement ducts have been amply sized to accommodate any new conditioning. Hot and chilled water are supplied through underground piping from central plants.

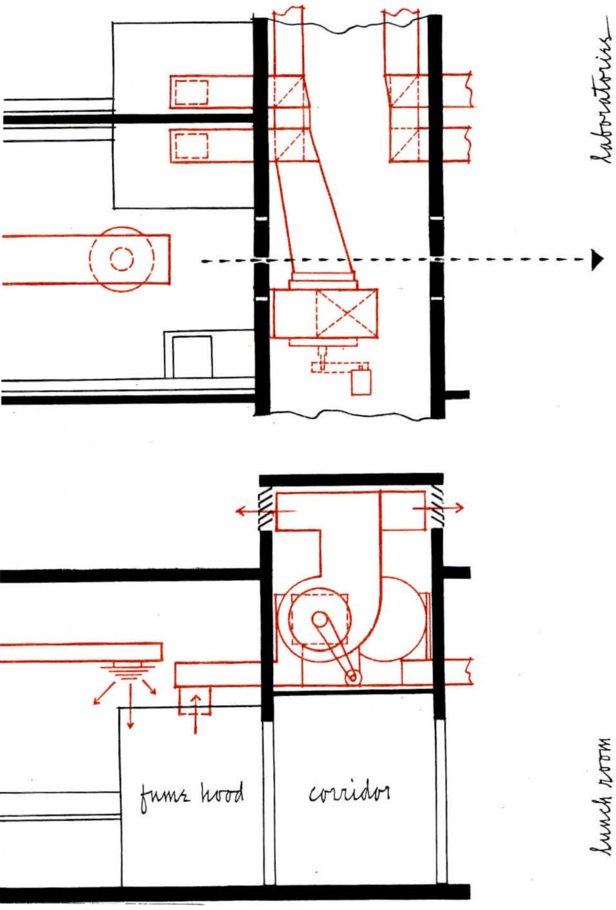
Because of the relatively large volume of the sanctuary and because occupancy is for shorter durations of time with long intervals between, churches present other special problems for the mechanical designer. The Church of Our Saviour, now being completed on Park Avenue, New York, is thought to be the first church in this country that has been designed for year-round air conditioning, prior to construction. At the beginning of its design, two major needs presented themselves: provision of complete flexibility to meet the constant change in the number of occupants, and concealment of all mechanical devices. The nave has been designed to seat 600 persons and the basement chapel, 400; the air-conditioning system may be required to serve the nave and chapel separately or both at the same time. Grills, diffusers, and convectors were designed in such a way that only the lower 20 ft of the 40-ft-high sanctuary will be air conditioned. All intake and exhaust ducts, as well as grills, are concealed behind an 11 ft wainscoting. One factor simplified the design—there will be no problem of exhausting smoke as there is in most auditorium designs. Necessary exhaust of stale air will be accomplished by fans located in the spire. Any amount of outside air, from zero to 100 percent, can be introduced as conditions demand. Architect for the church was Paul C. Reilly; Mechanical-Electrical Engineers, Syska & Hennessy.

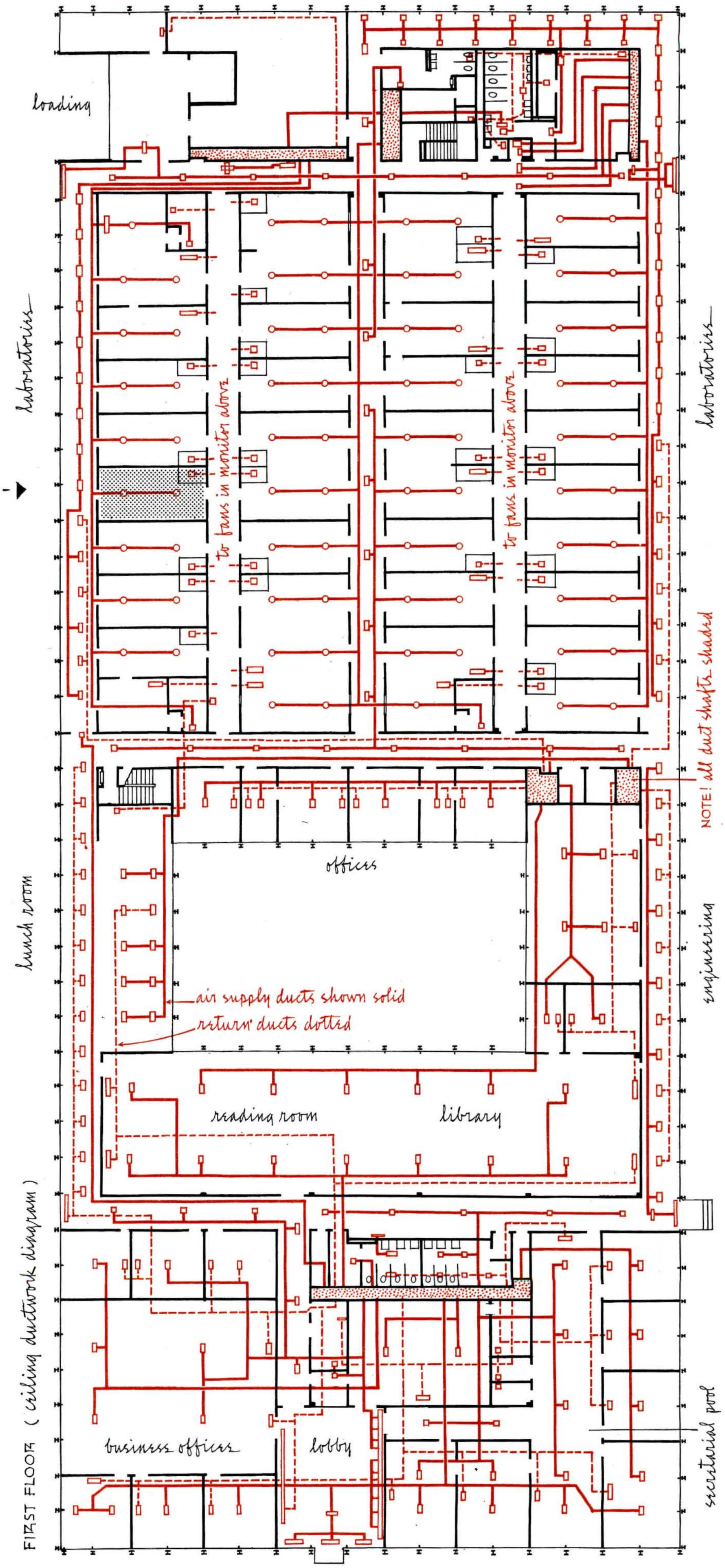
PLAN (above corridor ceiling)



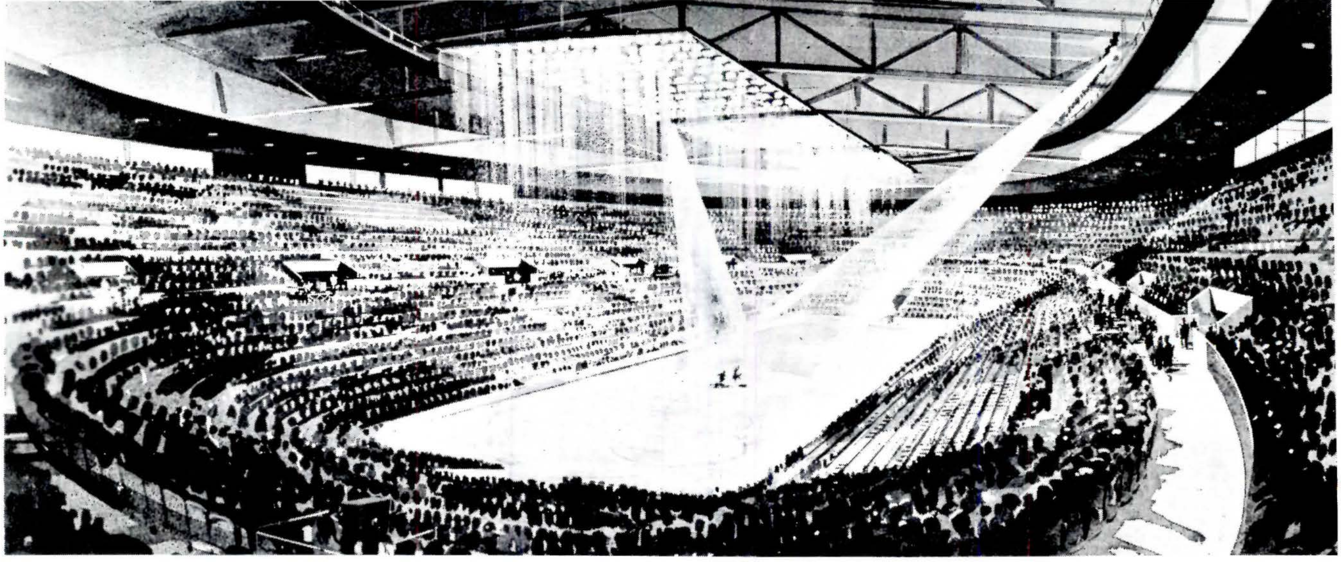


SECTION 1/8" scale





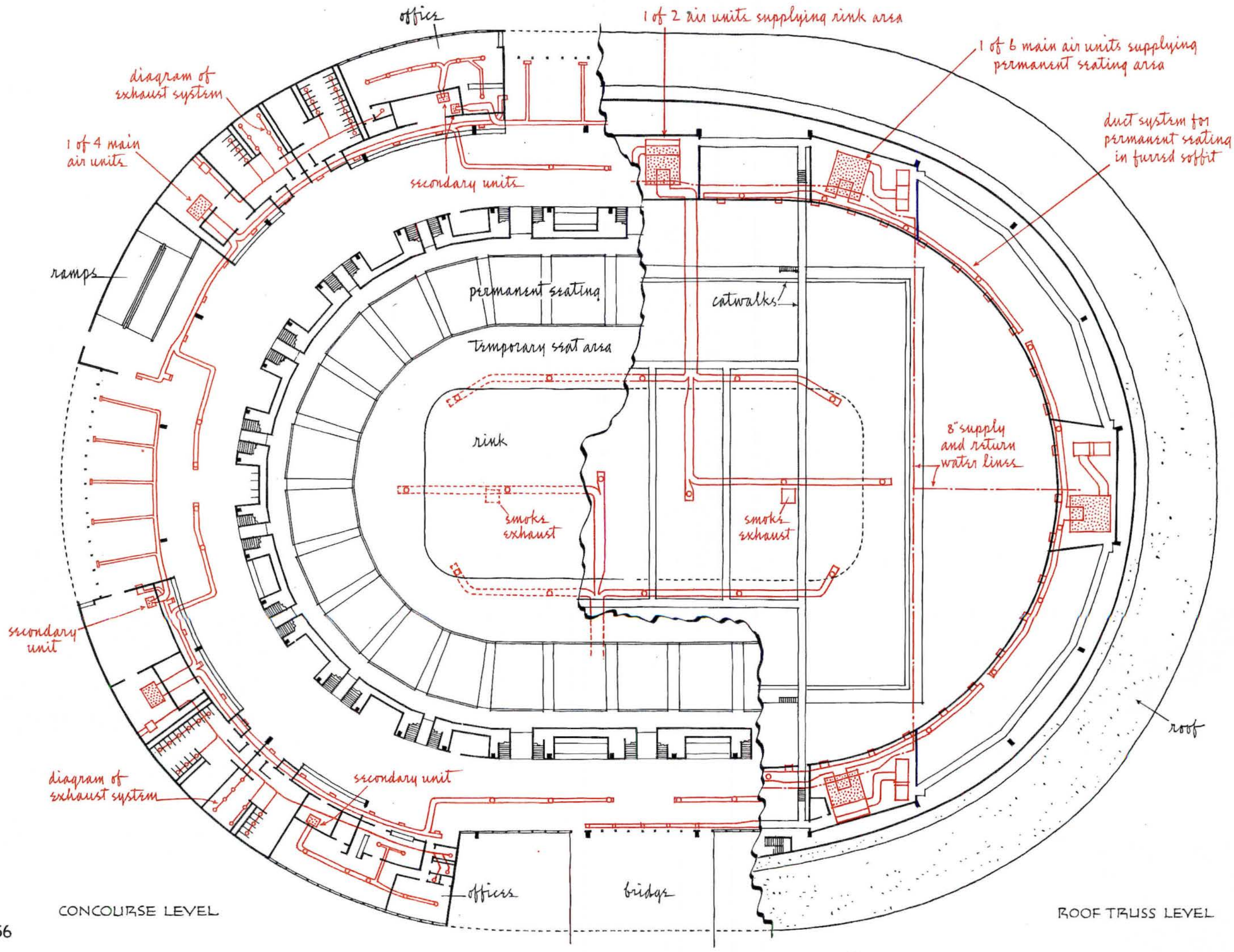
Basic Research Laboratory for Union-Carbide Corporation, *Eastview, New York. Architects: Skidmore, Owings & Merrill; Mechanical Consultants: Syska & Hennessy.*



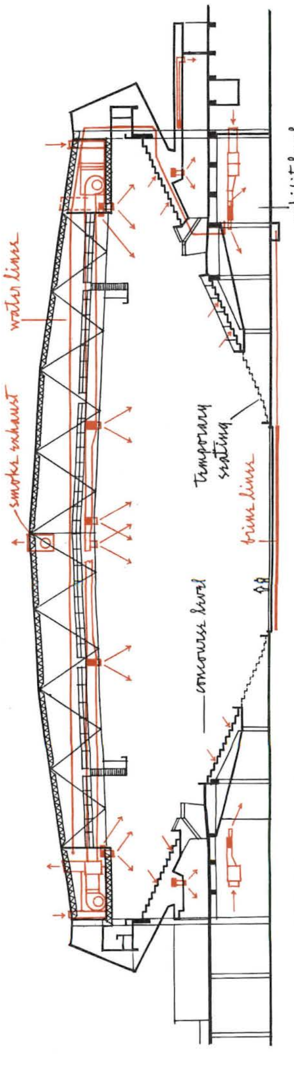
Sports Arena: Los Angeles, California

Los Angeles Memorial Sports Arena, designed by Welton Becket & Associates, Architects-Engineers, is a vast elliptical dish, with a one-story concourse.

Air conditioning was complex, inasmuch as it had to provide for 20,000 persons at boxing matches; 18,000 at basketball games; 15,000 at hockey matches; 9500 at trade shows, etc. Studies showed that for ice shows and hockey games about one third of maximum capacity would not be used; hence, this excess capacity will provide refrigeration for the rink. Four packaged water-chilling plants were designed—two of which can chill either brine or water. The air-distribution system was designed to serve the arena floor, concourse, and seating area independently of one another. For the permanent seating area, there are six central fan units located in an overhead furred soffit, each unit designed to deliver 50,000 cu ft of air per minute to the arena. Each is equipped with outdoor and recirculation air dampers, combination return and exhaust fan, and dual temperature heating or cooling coils. The piping system supplying these units is arranged as a two-pipe reverse return water system, providing chilled or hot water as required. The arena floor area is served by six air-handling units, also located in the furred soffit. These supply either heating or cooling, with each unit responsive to temperature of area it serves. The concourse floor is treated as four zones, with each



zone having its own air-handling unit capable of supplying either heating or cooling. Ventilation of the individual systems is normally controlled thermostatically, but a central station control allows prompt correction if any area needs more or less air tempering. The systems were designed by Becket Mechanical Engineering Department: Paul B. Sessinghaus, Director of Engineering; Ivan Garet, Chief Mechanical Engineer; and William J. Whitley, Project Engineer.

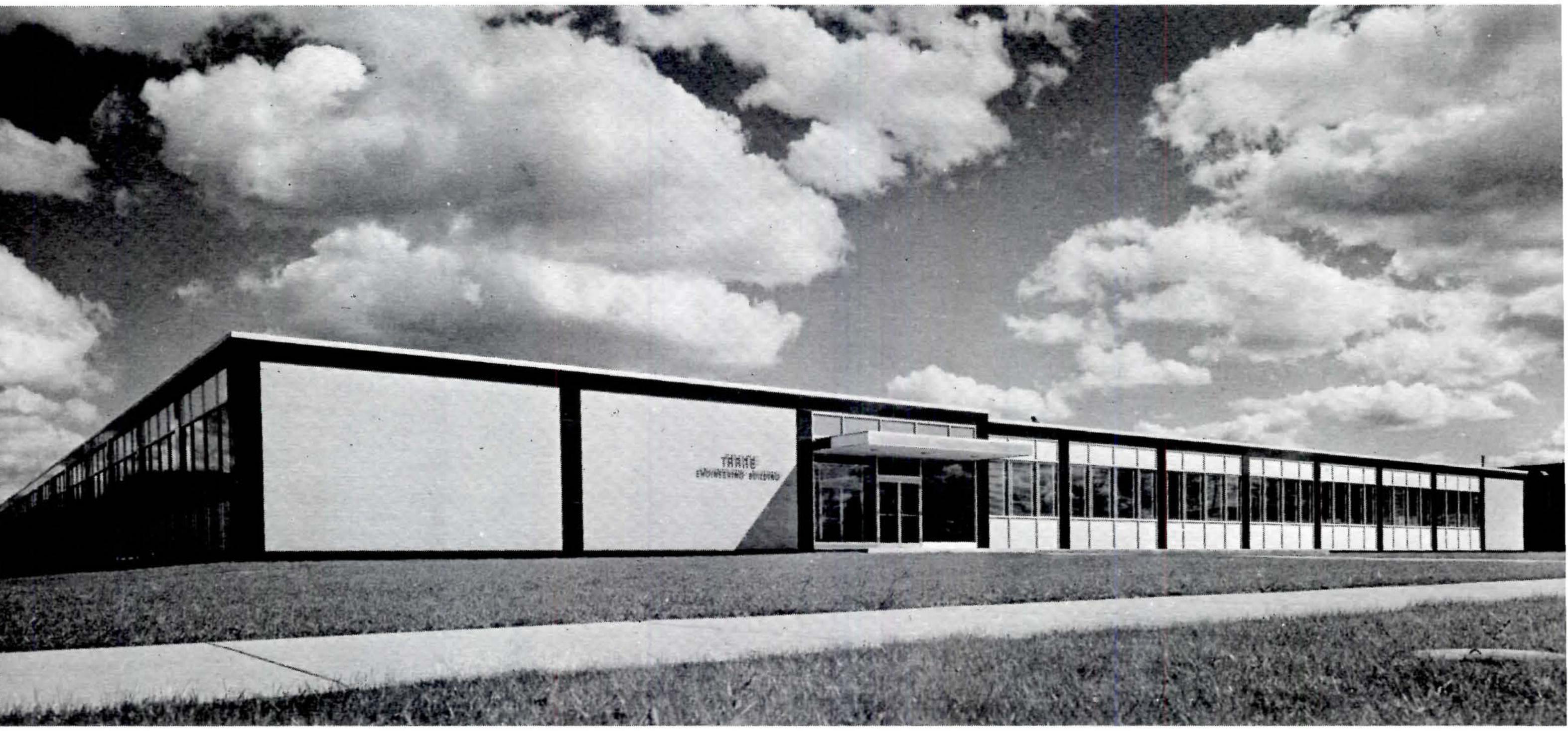


TRANSVERSE SECTION

Store: White Plains, New York

Taking advantage of the steep site, with streets on three sides, Architects Ketchum, Giná & Sharp (Fred Treffeisen, Associate-in-Charge) planned Alexander's Department Store on three levels, with parking space and pedestrian entrances at each level. (*See also* INTERIOR DESIGN DATA.)

Air conditioning system, developed by Mechanical Engineers Syska & Hennessy (A. C. Zuck, Project Engineer) is unique in that it is chiefly fueled by discarded wrappings, cartons, and other refuse that accumulate daily. Fed into a bin from chutes on each floor, this travels (after culling) into the boiler firebox. The boiler, with an induced draft fan, is connected to the incinerator breeching in by-pass arrangement with the incinerator stack. Automatic dampers located in the incinerator breeching to the boiler and in the by-pass breeching to the incinerator stack are operated from a pressure control on the boiler-room steam header to regulate production of steam in the boiler. The steam is then used to operate an automatic, 700-ton, push-button-type absorption machine. Chilled water is pumped to air-handling units in fan rooms on each floor. When the incinerator is not in use, and during peak conditions when capacity of the boiler is not sufficient to satisfy requirements, the pressure control on the boiler-room steam header automatically operates the boiler-burner unit. In winter, steam both heats the building and provides domestic hot water.

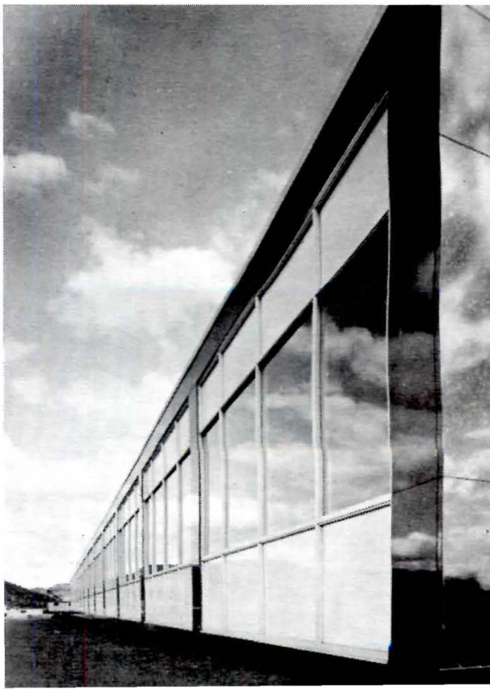


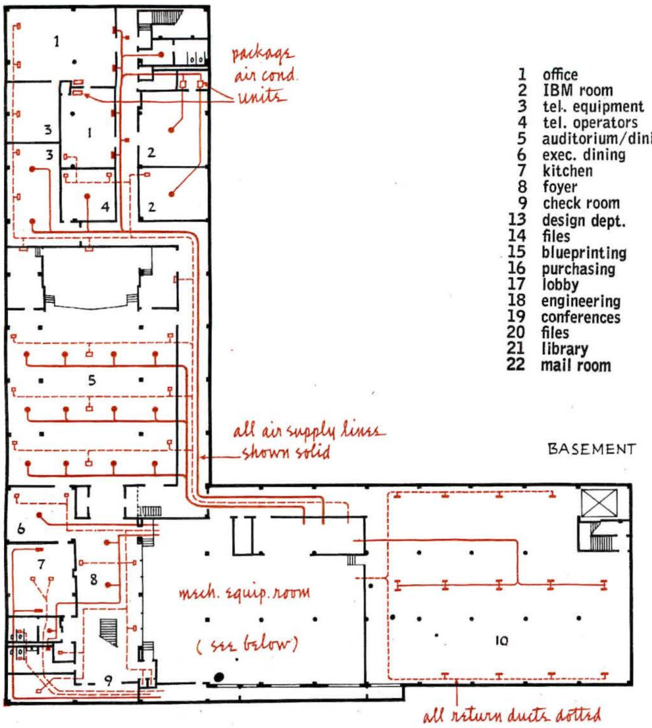
Engineering/Office Building: La Crosse, Wisconsin

It is not surprising that in the design of the new Technical Center for the Trane Company, manufacturers of refrigeration, heating, and ventilating equipment, particular emphasis was placed on the provision of optimum climate conditions. On its upper level the building houses the Product Engineering and Design Departments. The lower level is devoted to a mechanical equipment room (*acrosspage*), open to visitors' viewing, and an auditorium.

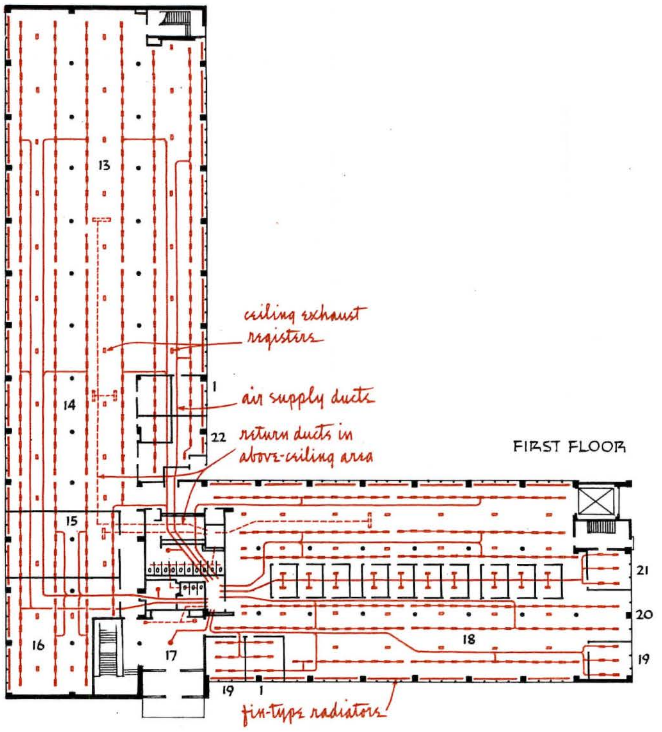
Air conditioning is comprised of two central built-up systems—one to serve the lower level, the other the upper floor. Included in the equipment are centrifugal fans, cooling coils, zone heating coils, and the necessary controls. Zoning of the system was determined on the basis of exposure and room use. The upper floor is divided into six zones, the lower into five; separate ducts from the fans lead to each of the zones. Each has its own heating coil, supplied with low-pressure steam, controlled by room thermostats. These coils are also used for reheating purposes in the summer air-conditioning cycle, when the air is cooled to 58 F by the cooling coils. In the water-cooling system it is of interest that well water, after being run through the precooling coils, is used for condenser water and may then be discharged to the lawn sprinkler system. To take care of heat loss through walls and windows on the upper floor, a perimeter forced-hot-water heating system has been provided.

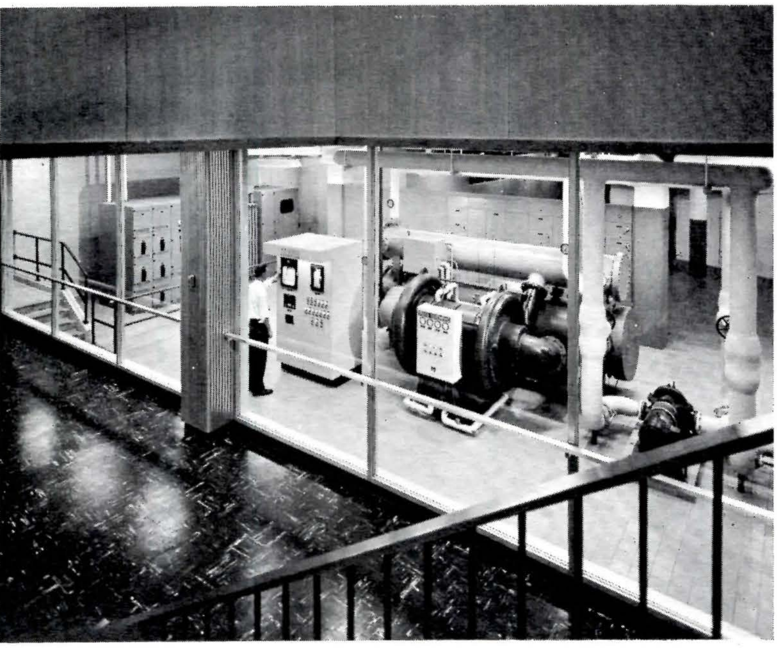
Structurally the building is of reinforced concrete using flat-slab design. Provisions have been made in the design for a future second story. Exterior materials consist of aluminum frames, preformed insulated panels, fixed aluminum sash, face brick, and dark stone. Architect and Engineer for this building were F. A. Fairbrother and George H. Miehls; Albert Kahn, Associated Architects & Engineers were Consultants; Peter Nelson & Son, Inc., General Contractor.

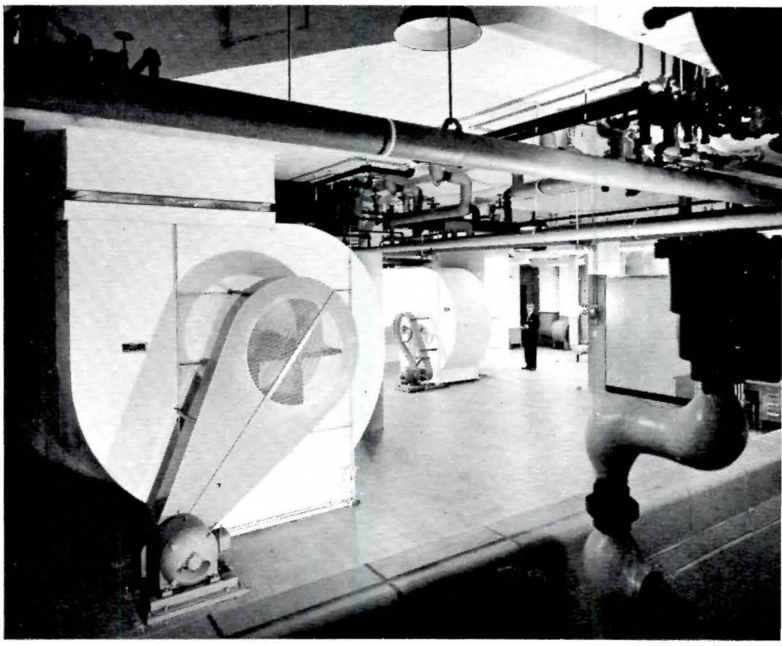


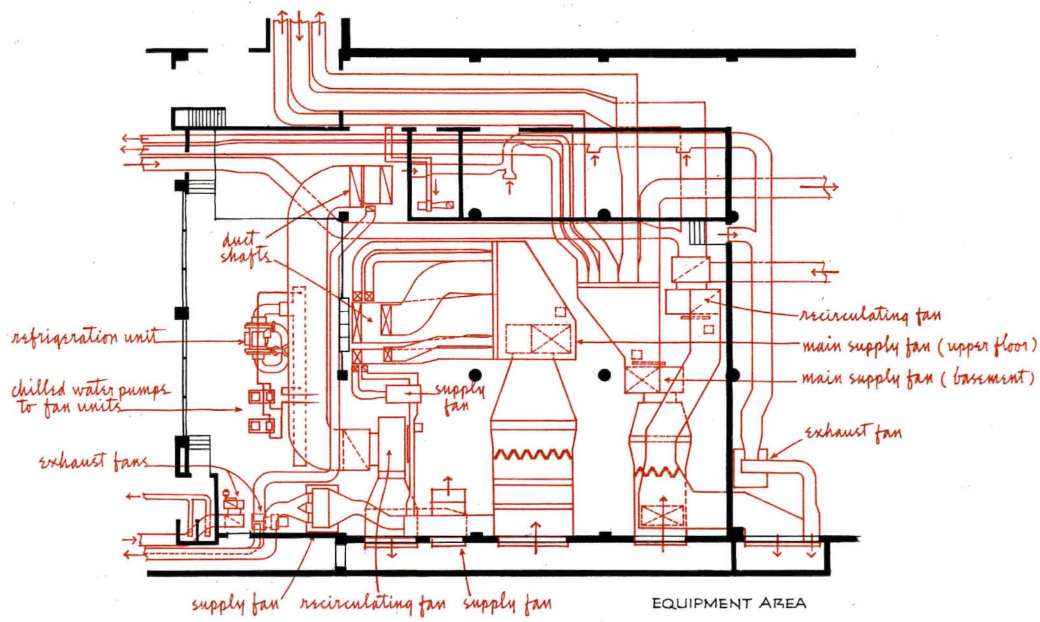


1 office
2 IBM room
3 tel. equipment
4 tel. operators
5 auditorium/dining
6 exec. dining
7 kitchen
8 foyer
9 check room
13 design dept.
14 files
15 blueprinting
16 purchasing
17 lobby
18 engineering
19 conferences
20 files
21 library
22 mail room





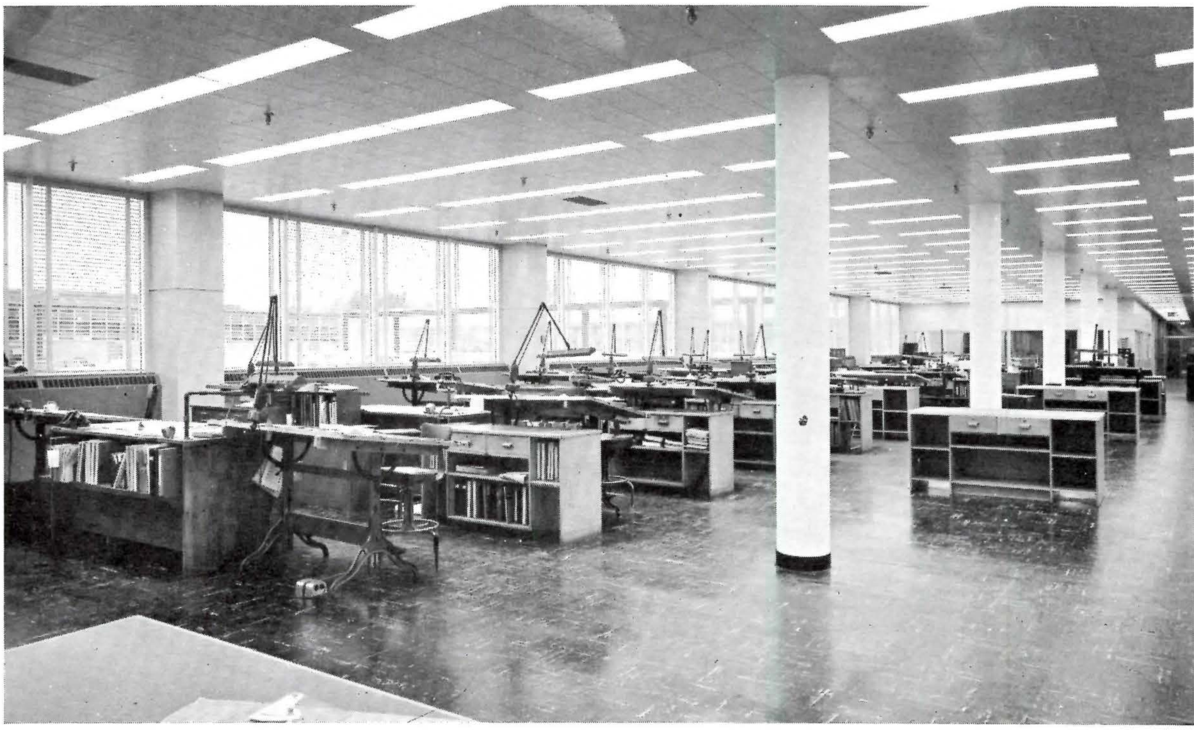




Lobby and vestibule (left) *are heated and cooled by a high-capacity unit separate from the building's system. Two recessed heaters, one on each side of the vestibule, are supplied with steam at five psi and automatically temperature controlled.*

Mechanical equipment room may be viewed from lower floor lobby (below). *Dining room* (below left) *and auditorium* (bottom) *are located on the lower level. For demonstration purposes steam, air, water, and electrical services have been provided under the stage of the auditorium.* Photos: Hedrich-Blessing

Blueprint room (left), *design drafting room* (below), *and drafting room for Products Engineering Department* (bottom) *are located on the upper floor. On this level, air is delivered to rooms through perforated-ceiling-panel diffusers. These diffusers are spaced to conform to the building module, making it possible to relocate partitions without requiring major changes in ductwork. Return air is drawn into a plenum chamber above the ceiling and carried to the recirculating fan.*



AIR CONDITIONING:

principles, systems, and applications

by John K. M. Pryke*

FUNDAMENTALS

It is not the purpose of this article to attempt in any way to give technical details of air-conditioning installations. Rather, its object is to outline briefly fundamental air-conditioning principles, describe basic equipment and systems used, and finally enumerate the factors and considerations which influence the engineer in his basic design thinking so that he may produce the "most suitable" system for the particular building concerned.

Nowadays, the term "air conditioning" is perhaps second only to "electronics" and "atomic" as one of the great catch-all phrases of modern times. We live today in a world that is "atomic" powered, controlled by "electronics," and fully "air conditioned"—real science fiction stuff!

Unfortunately, one's purpose here is to take some of this "science fiction" approach out of air conditioning and to present in a generalized way—for architectural consumption — some of the plain facts, instead. After all, architects and engineers must study and live by facts—so perhaps their simple presentation may be helpful and of assistance when approaching the design of some of the structures with which our architect-engineer profession is concerned today.

To start right at the beginning, what is air conditioning? Basically, it is the science of producing a controlled temperature and humidity environment which will give the maximum of comfort for human beings, or which will, in the case of industrial work, produce the best conditions to meet a particular manufacturing processes' requirements.

Air is a mixture of gases, as we all learned in our school physics, which can be heated or cooled and which is capable of absorbing, and holding in suspension, moisture. The measure of the amount of suspended moisture is the air's humidity. The warmer the air, the more moisture it can hold, and vice versa. Cooling air automatically dehumidifies it, and it will then deposit its moisture. To increase humidity, water must be supplied and means to entrain it into the air must be furnished. In general, over most of the continental area of the United States, the summer outdoor-air temperatures, and hence humidities, are too high for reasonable human comfort; and in winter these conditions are reversed. It is therefore necessary for "comfort" air conditioning to cool and dehumidify during the summer, and heat and humidify during the winter. For industrial design, the ideal conditions required vary vastly with different manufacturing processes; however, the requirements of being able to cool and dehumidify as well as heat and humidify at different times still apply.

MAJOR FACTORS AFFECTING CONDITIONED AIR

Let us consider, briefly, the factors that may affect the controlled environment produced by air conditioning. Primarily, they are anything that produces heat and anything that gives off moisture which can be absorbed by the air. Thus, air conditioning is affected by human beings (who give off both heat and moisture), electric lights, motors and electric appliances of all types, gas-heated appliances, industrial equipment and machinery, and also the outside weather which heats and cools the building structure itself.

Then there is the matter of ventilation. It is necessary, and a usual code requirement, that a reasonable amount of fresh air, i.e., outdoor air, be introduced constantly into the air-conditioned space. This air, whose condition varies with the weather, must be brought to the same conditions as the controlled environment. Further, it is often desirable to vary its amount at different times, and in addition to vary the supply between individually controlled areas, particularly in relationship to human occupancy.

Consideration of these factors illustrates the importance of individual space control. Take, for instance, a system which serves both a large general typing office and a series of small individual executive offices. The average human being gives off some 400 Btu/hr; so, if 50 people are in the typing space, there is an hourly heat emanation of 20,000 Btu, which is a load on the air-conditioning system. At 5:00 p.m. the typing office closes, but the executives work later. So, very quickly, the 20,000 Btu load is removed from the system. What will happen in the executive offices if no individual controls are provided?

It is well known that people are very sensitive to their environment, and their individual reactions vary enormously. It is inherent, therefore, that the air-conditioning system will be the most sensitive part of the finished building—even more than the color schemes. Everyone has encountered the case of Executive "A" wanting his office warm all the time, while Executive "B" wants his office cool all the time. Thus, the air-conditioning system must meet the criteria, not only of individual space control, but also of flexibility in furnishing such control.

BASIC AIR-CONDITIONING MACHINERY

To maintain the controlled environment in the space, conditioned air must be constantly "pumped" into it, and just as constantly the air within the space, having picked up the local heat and humidity loads, must be removed. It will be necessary, too, to clean the supply air by filtration.

The air-conditioning equipment will

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therefore comprise essentially an air "pump" (fan) together with cleaning filters, cooling and dehumidifying surfaces, and heating surfaces, over which the air can be passed and, finally, water sprays to humidify the air when required. Additionally, there must be means of distributing the air and of controlling its supply, such as dampers and air mixing devices, etc.

All of us are familiar with the usual types of finned heating-and-cooling coils in universal use. Also, the use of steam, hot water, or high-temperature hot-water as heating media are well known. For cooling, refrigeration plants of either mechanical or absorption types are used. Both require means of condenser cooling. Where so-called "direct expansion" is used, the actual evaporator coils of the refrigeration plant are used to cool and dehumidify the air being conditioned. In larger installations, however, chilled water is used for cooling, this in turn being cooled by the refrigeration evaporator.

The increasing use of high-pressure air distribution at supply duct velocities of 3000 to 4000 ft/min is becoming well known. Such distribution involves the use of high-pressure fans and of circular-section ductwork due to the pressure characteristics of these velocities. The space-saving factors involved predicate such usage more and more frequently.

Chemical air-conditioning equipment need not be described here, as its use is generally confined to special applications —and it will be dealt with later.

For filtering, two basic principles are used: first, that of physical attraction—holding dust and dirt particles in the air by means of an oily or other sticky media; and second, that of ionization of the particles by means of a high-voltage discharge, which causes them to become charged with static electricity in which state they can be attracted to and held by metal plates having the opposite polarity of charge. The first principle is used in the various commercial makes of so-called mechanical filters, while the second is used in the electrostatic, or to choose a modern term, electronic types.

BASIC SYSTEMS

Having dealt with the fundamentals, it will be appropriate to consider next the practical applications of the basic equipment and to describe briefly the more standardized forms of air-conditioning plants and systems. Consider the simplest first:

"Package Units" and "Window Units." Both of these "boxes" are identical in their basic equipments and fundamental functions. The essential ingredient is the refrigeration plant: a complete compressor, condenser, and evaporator with interrelated parts. Then the air-supply fan, or fans—often two of these operating in parallel, the air filters, and the intake and discharge connections or grills. The fans draw the air through the filters from the intake over the refrigeration evaporator thus cooling and dehumidifying it, then deliver it through the discharge grill or connection to the distribution ductwork.

In the case of the window unit, this completes the equipment with the addition of a fan to cool the condenser. This is placed in the section of the "box" outside the window and merely circulates outdoor air over the condenser. The conditioned air-supply fan usually located in the room side of the box merely circulates room air over the evaporator coil, which cools and dehumidifies it. Provision for ventilation air is made by means of a damper which admits air to the suction of the air-supply fan from the outside section of the box.

For winter warming, a steam- or hot-water-heated, finned-tube, type coil placed in the air stream is provided for the package units. Some window units are furnished with similar purpose electric-strip heaters or are arranged to operate in winter as heat pumps to furnish warm air.

Rarely, in the ordinary, standard, commercial package unit, is a water spray or similar equipment provided for positive humidification, although some units have provision for this as an alternate, extra piece of equipment. No humidifying equipment is furnished in window units.

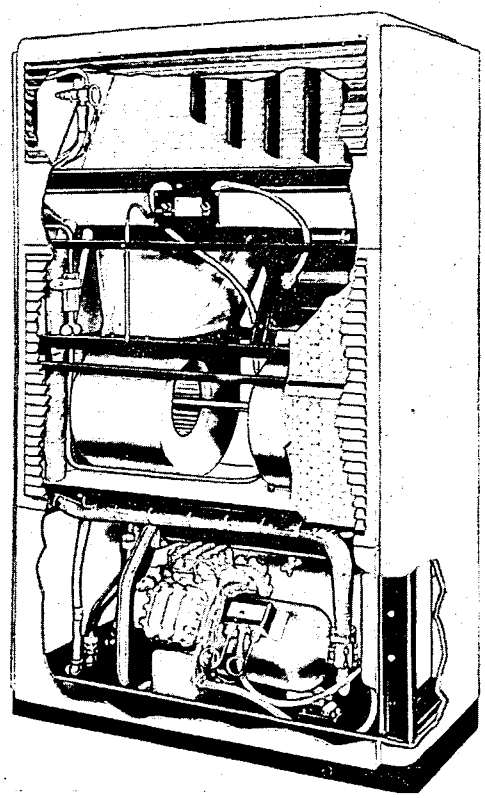
Two "auxiliaries"—if they may be so termed—are required for package units. First, means must be furnished for cooling the condenser coil of the refrigeration plant. This is accomplished in one of two ways, either by water, or by air. In the former case, the water may be supplied from domestic mains for small units and drain to sewer, or use may be made of a separate cooling tower. In the latter case, independent air-intake and discharge ducts must be furnished from those required for the conditioned air, outdoor air being used for the condenser cooling. A third method is to mount the condenser independently of the package unit in an evaporative cooler, in which case refrigeration-gas and liquid-pipework connection must be made between the two, and the evaporative cooler supplied with its own outdoor-air-intake and discharge ducts.

The second "auxiliary" is represented by the necessity for ventilation air. Thus, besides the air-conditioned supply—and return-duct connections, a connection for outdoor ventilation air must be furnished.

Both window and package units are mass-produced, shop-assembled equipment in standard sizes (*Figure 1*).

Central Station Plant. From the shop-built, standard-sized "package" type of unit, we proceed to the custom-built, central-station plant. Here, the major components are the fan, connected to a sheet-metal casing, heating and cooling coils, and filters—all housed in the casing. Provision is also made for return- and ventilation-air con-

Figure 1—typical, package-type, air-conditioning unit. Photo: Courtesy of Westinghouse



nections and, in addition, water sprays for positive humidification frequently may be incorporated. The conditioned air is discharged by the fan through sheet-metal ductwork to the spaces served.

The cooling coils may be served either by chilled water from a remote refrigeration plant, or may comprise the evaporator coil of an adjacent refrigeration plant, in which case they function as previously described. Cool, well water may be used, if available. The heating coils are supplied with either steam or hot water. This type of installation is custom-designed in capacity and characteristics to suit the individual requirements of the spaces it serves. The proportionate amount of ventilation and return air handled may be varied by automatic control to suit varying requirements. Additionally, bypasses may be furnished around the heating and cooling coils, again under automatic control, designed to deal with load variations of the system.

The need for individual space controls has already been mentioned. It will be seen that if the discharge from the fan in a central-station plant is fed into separate ducts serving individual spaces and is then further conditioned in these ducts, independent zones with varying requirements can be served.

The air in the zone ducts may be treated in various ways. Heating and/or cooling coils can be introduced into the duct, these being controlled to suit local requirements. A spray or other form of humidifier can also be installed, which again can be locally controlled. Finally, the volume of air handled by the duct can be varied by damper control (*Figure 2*).

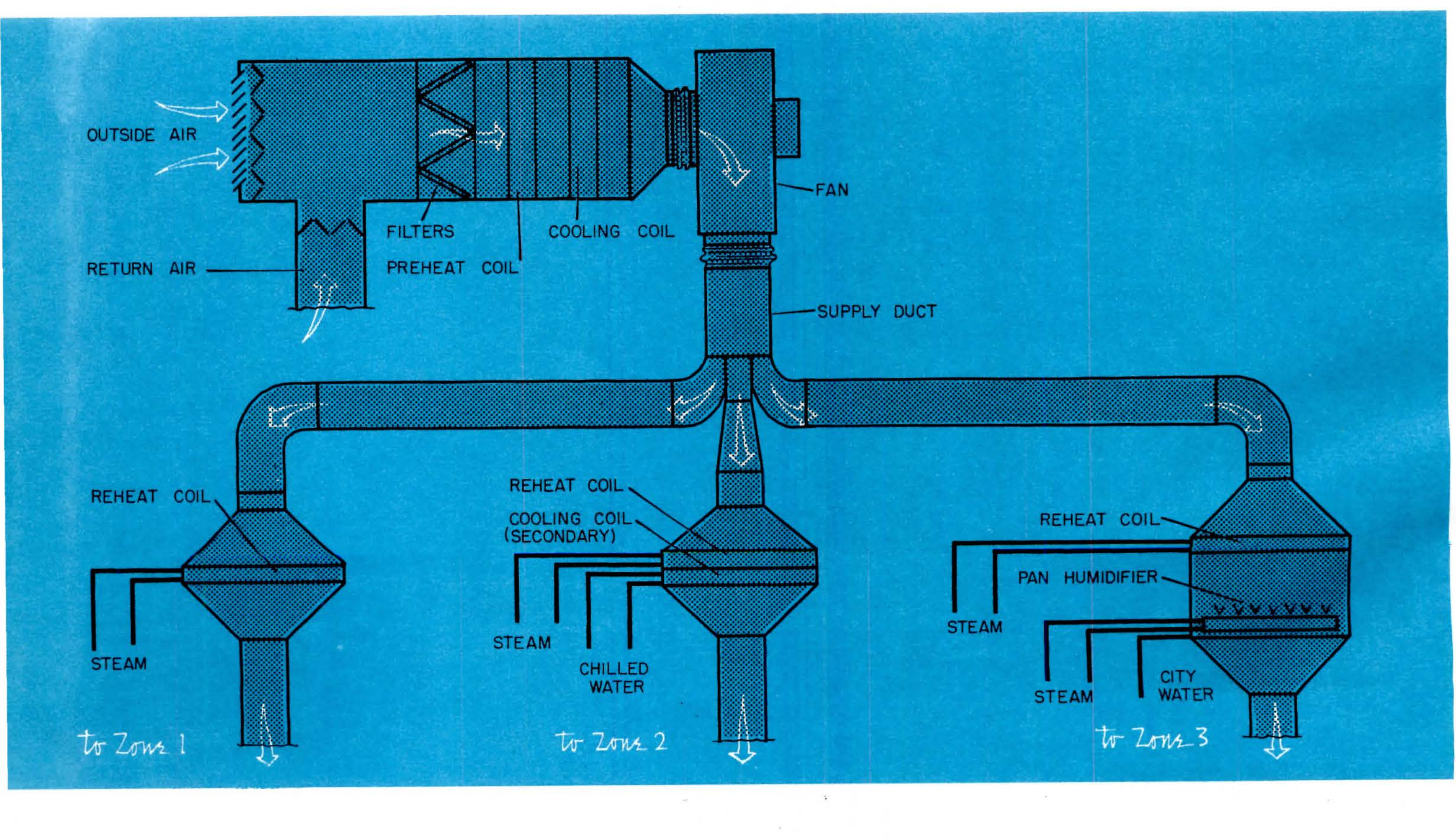
Primary and Secondary Systems. As a generality, the amount of ventilation air required to be handled by an air-conditioning plant is not more than 25 percent of the total volume dealt with; 75 percent of this volume being recirculated air. It is true that specialized systems must be designed to handle 100-percent-ventilation outdoor air during certain periods of the year. However, these do not represent the majority of design. Thus, if the movement of the recirculated air can be strictly localized to any particular area served, considerable advantages in space saving to a central plant will accrue. Furthermore, much greater controllability will result. When dealing with very large installations, these two factors become vital.

A logical extension of the central-station type of system with simple zones (*Figure 3*) then presents itself. The operation of such an installation is as indicated. It should be noted that the central-station plant now furnishes only the outside ventilation air needed, about 25 percent of the total air volume handled. The bulk of the air conveyed is handled locally by the secondary fans. As each handles only the volume for its own zone, it is relatively small. While the total space saving for the complete installation may not be considerable, the fact that the space can be broken up into a number of smaller spaces, whose individual sizes are not excessive, is of considerable advantage in larger buildings.

There is, however, a more important point, which is the fine individual-zone control which results. The system's flexibility may be seen by studying the diagram. It is not the purpose of this article to go into technical design, but it will be obvious that by the use of the local heaters, coolers, and mixing devices, etc., very complete individual zone control can be effected.

Fan-Coil Unit Systems. From what has been already described, it will be seen that the ultimate of decentralization and

Figure 2—central-station system; simple zones.



space saving is the package unit.

However, the disadvantages of this approach, due to the problems concerned with the required cooling of the refrigeration condenser, have also been touched upon. A middle approach as between the central-station plant and package equipment is one in which the actual air-conditioning operation may be dealt with locally, but the refrigeration plant may be installed as a single central unit. For local conditioning, fan, heating coil, cooling coil, and filters with ventilation-air connections are required. The cooling coil may be served by chilled water from a central-refrigeration plant and the heating coil by either hot water or steam from a central boiler plant. Further, the two coils may be combined and one coil only furnished, which acts as a cooling coil in summer, using chilled water, and a heating coil in winter, using hot water. Therefore, fan, coils, filters, and ventilation and return air mixing arrangements become the essential ingredients of the local unit conditioner.

The general arrangement of such a fan-coil system is shown (*Figure 4*). Fan-coil units, factory-built and assembled, are available in standard sizes and are of the under-window, floor-mounted, or ceiling-hung types. The service connections required are those for hot and cold water, which utilize only one set of piping, and ventilation air. The return air is drawn directly into the unit through a grill mounted on the casing. The units are placed in the actual spaces they serve and deliver their air directly through grills on their casings, or alternately they may feed the air through ductwork connections and standard-type diffusers and grills.

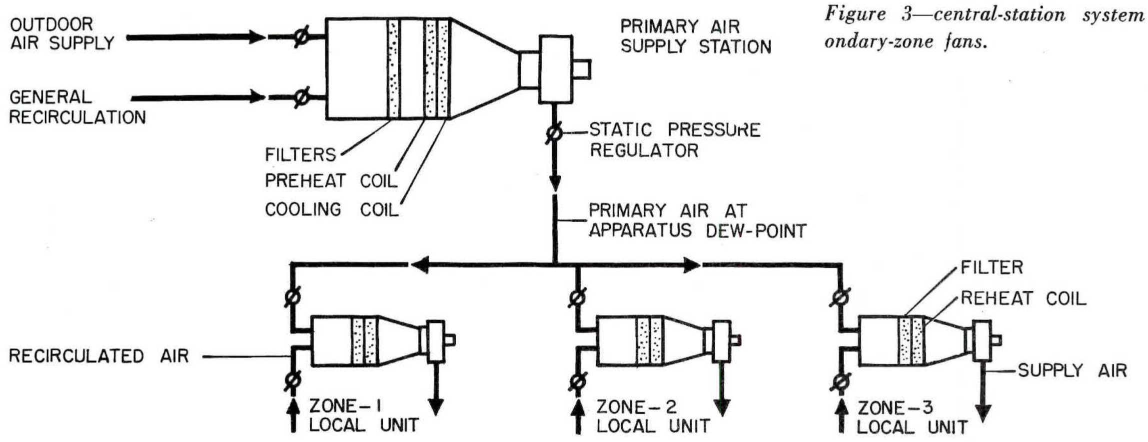
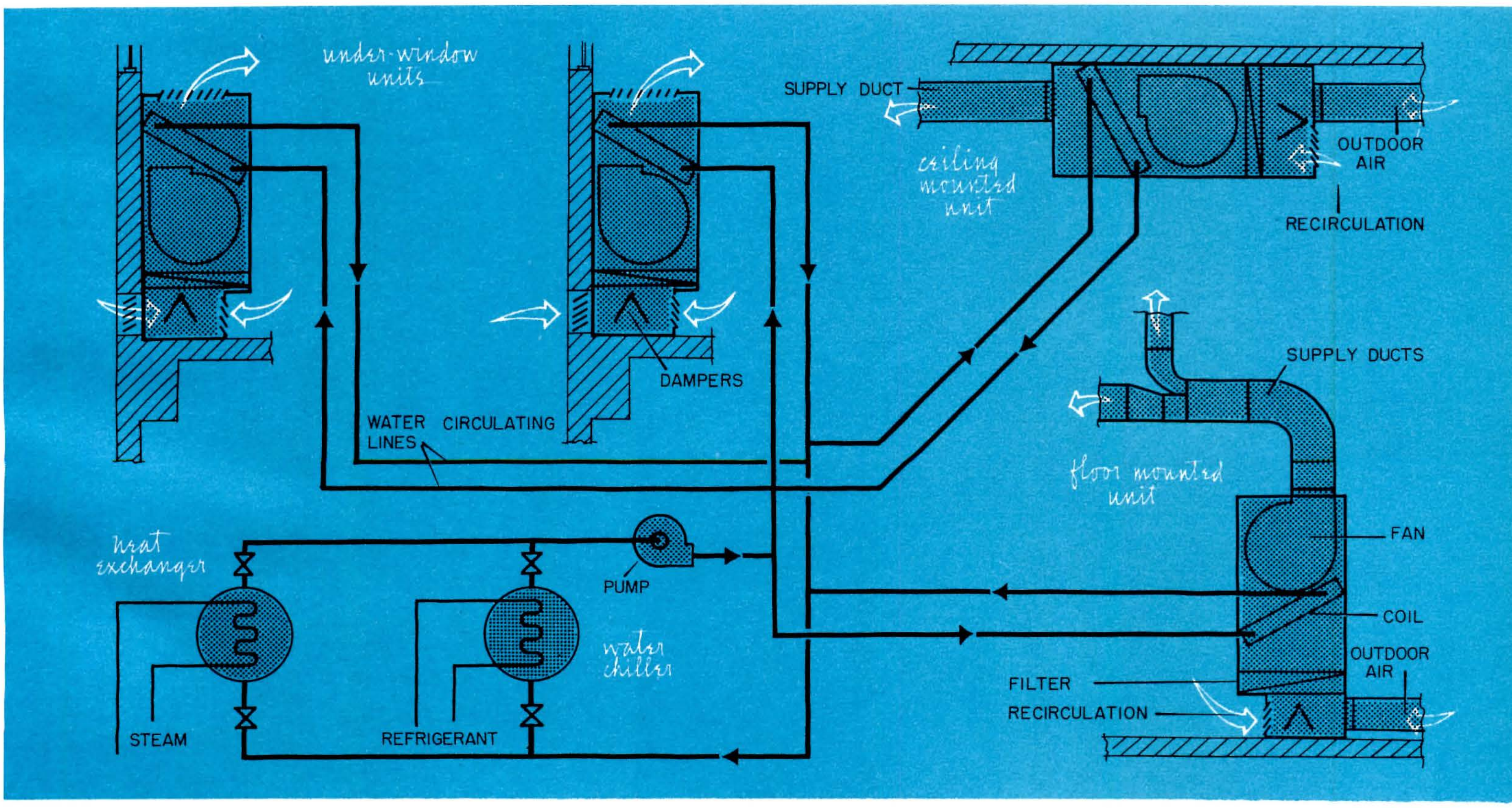


Figure 3—central-station system with secondary-zone fans.

Figure 4—fan-coil system (below).



Electricity must be furnished for the fan motor, and filter cleaning and maintenance must be considered. Further, if remotely located, return-air duct connections to the unit from the space served must be furnished.

This type of system, obviously, ideally meets the problem of individual space control as each unit can be controlled locally. In the standard, commercial unit, however, means for positive humidifying may be lacking as it is not usual to provide water sprays.

One further connection required is a drain to take away water condensed from the air during the conditioning process by the cooling coils.

Perimeter System. Hitherto, the only means of moving air considered has been that by use of fans. An alternate is the inducing of an air stream by means of high-pressure air jet. The operation is similar to that of an injector *(Figure 5)*.

The use of such a high-pressure jet introduces another relevant factor. If the induced air jet is conditioned before delivery to the injector nozzle, it can serve as the ventilation air from the space served. Furthering this approach, if the mixture of primary air and recirculated air is then passed over heating or cooling coils, it may be conditioned locally.

The practical application of this approach is met with in the high-pressure perimeter system *(Figure 6)*.

The various functions achieved by the primary air can be clearly seen. It is conditioned, but being only the ventilation air in volume, the space requirements for its central conditioning plant are modest. It is delivered under pressure and hence acts as the prime mover in the local unit. It furnishes the required ventilation air to each space and being filtered it eliminates local filtering at each unit.

The coils in each local unit are fed through one set of pipework with hot or cold water. Thus, they can both cool and dehumidify and also warm the air. Central boiler plant and refrigeration plant serve them. The variations which can be effected in the volume of primary air supplied, and hence the volume of recirculated air induced, gives full control to meet varying local conditions. The range of capacities of the shop-built units allows them to solve individual offices of average size.

This system requires central-plant space for the primary air equipment, which a fan-coil system does not. The average pressure in the induction nozzle of each unit is 1.5 to 2 in. of water. Allowing for friction in the supply ducts, this amounts to about 6 to 9 in. pressure at the primary fan discharge of the average system. Thus a high-pressure fan must be used. The velocities of the primary air in the supply ducts must be in keeping with these pressure characteristics and will range from 2000 to 4000 ft/min. For this type of operation circular ductwork must be used.

Such velocity range introduces another factor: namely, noise. The upper limit of ductwork air velocities which are not noisily offensive, ranges between 800 and 1000 ft/min. Therefore, for higher velocities, effective sound deadening will be required and sound attenuators must be used. The type of attenuators used is shown *(Figure 7)*, and these are incorporated into the discharge ductwork from the primary fan. Such attenuation is bulky and duct lengths so treated may range up to 20 ft and more.

With this type of system, recirculation of air back to the primary air-conditioning equipment is frequently adopted as an economy measure.

Double-Duct System. This system represents a reversal of the trend toward local, unitary, air-conditioning equipment.

Basically, it comprises the use of a central-station plant, but the heating and cooling coils, respectively, are placed in two different ducts on the discharge side of the supply fan. Thus, two independent air discharges are obtained, one hot and one cool. If branches are taken from each of these two main supplies and mixed locally, to serve any particular space, considerable variation in individual control can be obtained by varying the proportions of the two airs used. The mixing is controlled by local thermostat and it will be seen that an extremely flexible system results.

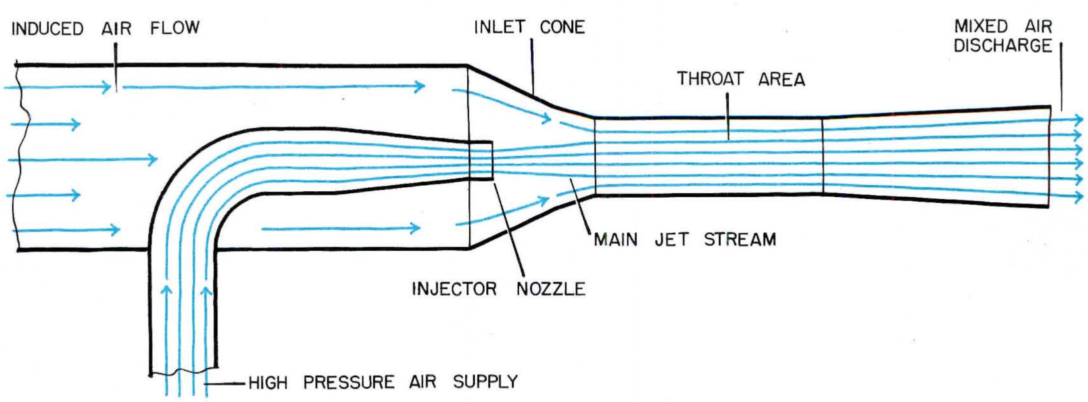
In its up-to-date form, the double duct system uses the high-velocity principle of air conveying already described, and the air-mixing device behind each air outlet also incorporates a sound-attenuating box. The mixing valves are controlled by a local thermostat. Recirculated air is drawn back from each space to the central conditioning plant.

This system attains the ideal, from the point of view of individual flexibility. However, since no local recirculation is provided, the hot- and cold-supply ducts have to convey the total air volume required and thus they become bulky and take up considerable space, in spite of the use of high air velocities.

The air-mixing boxes are of different types suitable for ceiling or underwindow mounting and feed the outlet grills or diffusers direct.

High-Pressure Interior-Zone System. The

Figure 5—injector.



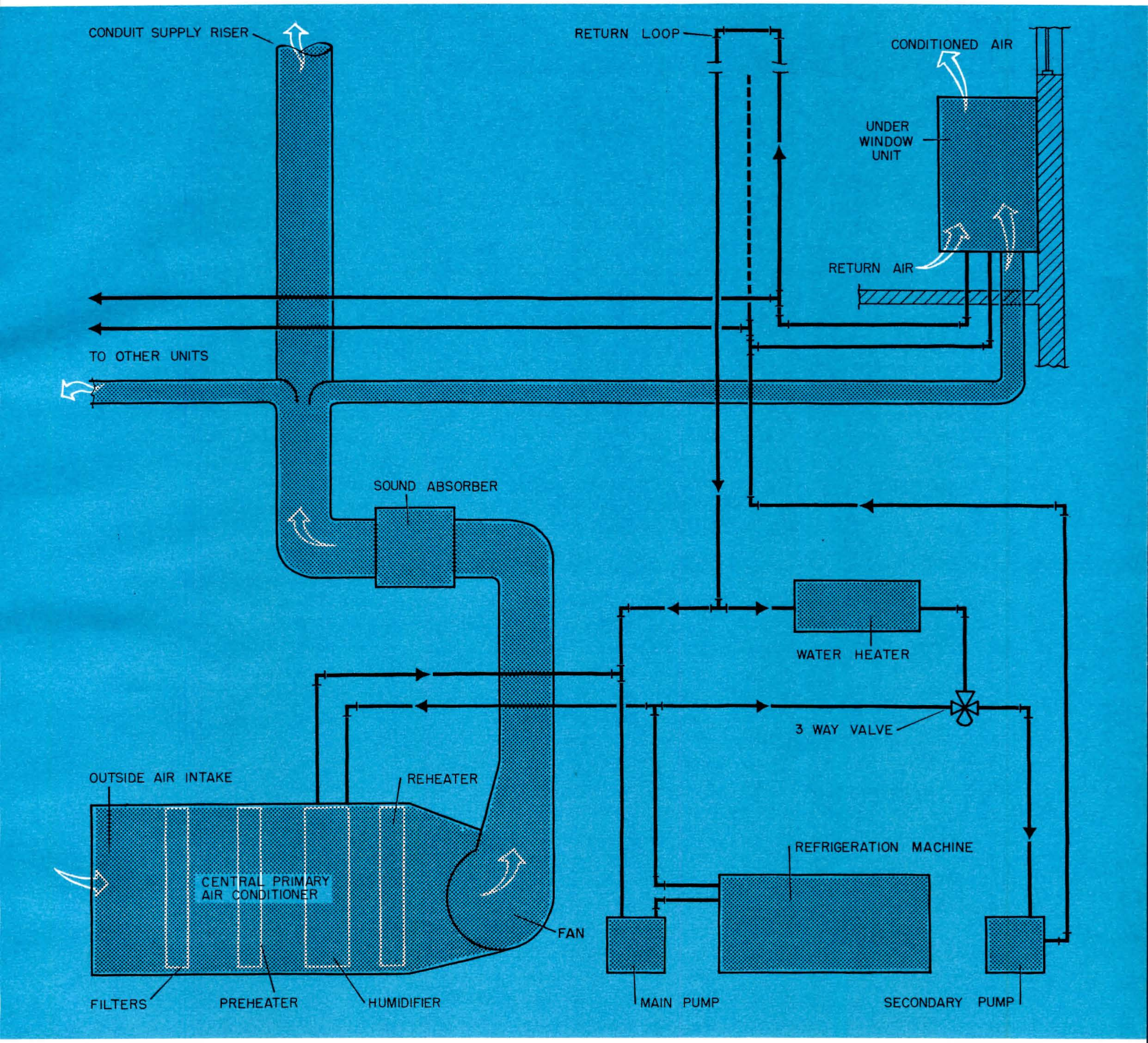


Figure 6 — high-velocity perimeter system (above).

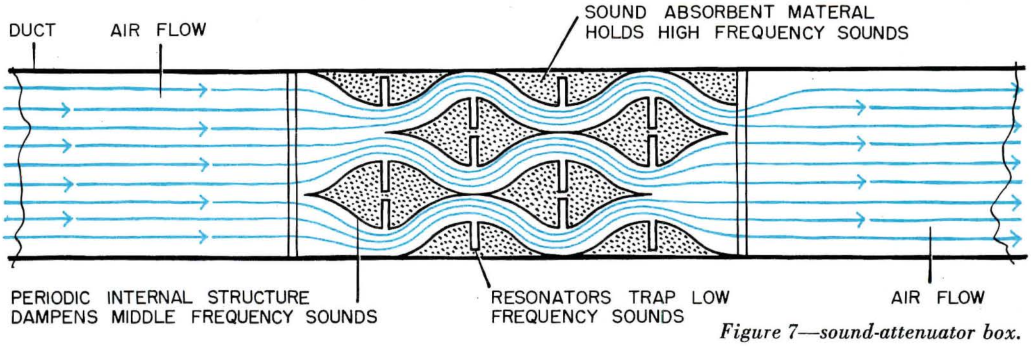


Figure 7—sound-attenuator box.

limitation in space size which can be served by perimeter systems has already been mentioned. In practice, this means that in a large "solid" building only the exterior rooms can be thus served. Furthermore, with this type of building the fluctuation in requirements of the exterior rooms is due principally to their being directly affected by the outdoor weather and varies tremendously from the fairly stable requirements of the interior areas. Thus, it is usually necessary to furnish an independent system for the interior zones of any large building.

Varying types of systems are used, but in general that using the principle of the central-station plant with simple zones is the most satisfactory. In the larger buildings it is usually necessary to adapt this to high-velocity air distribution and this entails the use of local sound-attenuating boxes to serve the outlets and diffusers on the system.

Miscellaneous Systems. The foregoing only attempts to describe briefly the standardized basic types of air-conditioning systems most commonly used. For unusual requirements many different types of special designs may be evolved to meet particular conditions. No attempt can be made here to describe these but the use of chemical dehumidification, and also, radiant cooling, may be mentioned in passing.

The former involves the use of a moisture absorbent chemical, such as lithium chloride or silica-gel, to dehumidify the air. Commercially manufactured plants of unitary type are available for such process. In general, however, their use is confined to industrial or other special applications where exceptionally low humidities are required.

Radiant cooling may be used as a heat-removal system in conjunction with an air-conditioning installation, and has the advantage of utilizing the same system components for radiant heating during the winter. Commercially manufactured radiant-cooling and heating hung ceilings are available. The combination of radiant cooling and air conditioning may have advantages over the usage of plain air conditioning where high intensity localized heating pertains, as from a heavy concentration of incandescent lighting.

Types of Refrigeration and Heating Plants. No attempt will be made to describe types of heating plants which are used to furnish steam or hot water for air-conditioning, as these are of entirely conventional pattern. However, one point worth mentioning is the use of hot water in winter and chilled water in summer, through the same service piping, to serve combination heating and cooling coils already described.

The basic elements of mechanical refrigeration are well known and the use of the evaporator coil as a direct air cooler has already been discussed. If, instead of air, water is circulated around the evaporator coils, this water will be chilled and can be circulated for summer cooling. The "pump" or compressor required to circulate the refrigerant takes various forms. Reciprocating compressors, multistage centrifugal compressors, and now high-speed, single-stage centrifugal compressors are all used.

The compressor drive varies and may be by various forms of prime mover such as electric motor, steam turbine, and even gas turbine, although this latter represents rather a future development.

An entirely different type of refrigeration plant is the absorption machine which is coming more into use. The component parts comprise a condenser, expansion valve, and evaporator as in the mechanical refrigeration machine. However, three other major components replace the mechanical compressor. These are the absorber, the pump, and the generator. A low-temperature, absorbent chemical is used in the cycle and evaporates in the evaporator in a similar operation to that effected in the mechanical compression cycle. By an absorption and concentration process, whereby the strength of the absorbent chemical is alternately diluted with water and then reconcentrated by heat, a proper heat transfer is maintained and a continuous cycle through the cooling evaporator is effected. The chilled water to be circulated through the air-conditioning coils is cooled by the evaporator in the same manner as in the mechanical compression machine. The regeneration of the circulating chemical is effected by a heat source, steam being the most commonly used for this purpose. It is not possible to use the evaporator for direct air cooling with this machine.

The advantages of this type of equipment are, of course, absence of moving parts, greater compactness, no vibration or noise, and the use of low-pressure steam as the heating medium. This latter means that there is no necessity for a large electrical supply or high-pressure steam source as is required to drive the compression type of refrigeration equipment.

Compression machines using reciprocating compressors are cheapest in first cost and operate satisfactorily up to capacities of about 150 tons. The centrifugal type of compressor in either single or multistage type is desirable for use at above the 150 ton range. The absorption equipment is best used in the range of 100 tons and above.

Most cities today impose severe limitations on the use of city water for condenser-cooling purposes. New York City's figure is a maximum of five tons refrigeration capacity. Above such limitations, therefore, it is necessary to use some form of recirculation system, which can cool the condenser cooling water externally to the refrigeration plant. The most common method is by the use of a cooling tower where the water is cooled by a forced draft of outdoor air as it drips over baffles in a specially constructed enclosure.

Another method of condenser cooling is by use of an evaporative condenser. In this application, the actual condenser coil of the refrigerating circuit is placed in an air stream and has water sprayed over it to increase the cooling effect. This type of equipment is satisfactory in the smaller ranges, but it should be borne in mind that it requires considerable volume of air to be passed over the condenser coils and that such air, when leaving the evaporative condenser, is hot and humid and therefore must be discharged well remote from any ventilating or air-conditioning air intakes. Evaporative condensers, therefore, require sizable air supply and discharge connections.

SELECTING THE BEST SYSTEM

The brief and simple description so far given of the fundamentals of air conditioning and the types of basic systems used have endeavored to illustrate the essential design thinking of the engineer when he tackles the practical approach to the essential question to be answered in all air-conditioning work, namely: "What will be the most satisfactory system for a particular building? What type will be the best?"

To help further in answering this sort of question, the following considerations must be weighed by the engineer: (1) Type and Character of Building; (2) Divisions and Space Factors Within Building; (3) Building Usage, Regarding Both Type and Time, and Its Operational Characteristics; (4) Building's Architectural Form and Treatment; (5) First Cost of Air-Conditioning Installation; (6) Operating and Maintenance Cost of Air-Conditioning Installation; (7) any Special Requirements by Building Owner; (8) Building Location, Utilities, and Availability of Utility Supplies; (9) other Special Considerations.

In dealing with the above considerations, it is assumed (A) that a new building is being planned, although most of them will apply also to the existing buildings; (B) that the engineer is given a free hand in his system design (this can be quite a factor in itself); and (C) that the architect is properly co-operative in giving the engineer the machine spaces needed. Further, (D) that the engineer is made part of the architect-engineer team at the earliest phase of design.

The first four considerations may be said to be technical, while the next two are strictly economic, and the remaining three involve specialized factors which may, or may not, have to be taken into consideration. Look at them in some detail:

(1) *Type and Character of Building.* This is related to the fact that different categories of buildings have different air-conditioning requirements. Divers extremes cover a modern office building, a laboratory building, and a church. Relatively, their requirements are indeed remote.

The office building, frequently of cubicle shape, multistory construction, and with a relatively great depth of structure, has an occupancy from 9:00 a.m. to 5:00 p.m. five days per week. In the case of a rental structure, there are also many different tenant considerations and satisfactions to be met.

The laboratory building, frequently of long narrow form, with little depth, usually has very specialized individual internal requirements. Its time usage varies tremendously.

The church, essentially an auditorium-type structure, has only occasional full occupancy and is frequently limited in construction funds for first cost.

As to building character, buildings of the same category vary enormously among themselves. Thus, an owner-occupancy office building may be expensive, with first cost of not too much consideration. Examples are found where such buildings exist as advertising for their owners. At the other end of the scale is the cheaply erected speculative office building designed for tenant occupancy at absolute minimum of first cost. Thus, it can be said that within one type of classified building, structures may well vary from the Cadillac type of approach to the Ford.

(2) *Divisions and Space Factors Within Building.* Detail design is directly affected here with the factors of individual space requirements and flexibility coming prominently into the picture. Thus, again, in the case of the tenant-occupied office building, the variation between the president's office suite and the typing-pool space must be taken into account. However, at the other end of the scale, consider the department store. This is essentially one large open space with very little need for individual control, except in small executive office locations. A hospital presents yet another problem, where extreme specialist requirements pertain in the operating suites, while the individual bedrooms present entirely different characteristics.

The provision of zoning, individual control, and independent systems must all be considered in dealing with this factor.

(3) *Building Usage — Time and Type Wise — and Operational Characteristics.* This presents the major consideration of time occupancy, whether daily, weekly, or seasonally. Some examples may be quoted as follows:

Department stores are most crowded during the Christmas shopping season and at January and Easter sales. During the summer months their population drops off. Office buildings operate primarily from 9:00 a.m. to 5:00 p.m. daily for five days a week and with some Saturday morning occupancy. Churches usually are occupied two or three evenings a week and Sundays—morning and evening. Social center buildings present wide variance in occupancy timing, both as regards space and season.

The above illustrates immediately the matter of variety. Directly following is the operating factor of equipment running unnecessarily. Obviously, it is wasteful to operate a plant serving empty spaces. Thus, the air-conditioning system of the average office building does not run all night. In proper relationship an air-conditioning system should have to operate only when the space it serves is occupied.

Further, the interrelation of time occupancy between individual spaces must be considered.

It is, therefore, wasteful to serve two spaces with different time usages from the same system and thus necessitate the running of the system to serve one space when the other may be closed down.

(4) *Building's Architectural Form and Treatment.* This consideration is concerned primarily with the building skin. Thus, we have on one side the modern, predominantly glass-enclosed structure and on the other side the conventional brick-faced building with relatively small windows. The sensitivity of the skin is a most important factor in air-conditioning design. Furthermore, the effect of this skin on the building's occupants must be taken into due account. The glass-skin buildings require a conditioning system which will handle adequately and with quick response varying outdoor weather conditions. However, the brick-faced building, with small windows, does not require such a sensitive system, nor one which must respond to perimeter variations so rapidly.

Now as to the building form. The solid "cube" building requires one treatment while the long, narrow building, quite another, and the flat, "doughnut" with central court or courts, yet another. The depth of the building also influences the design of the air-conditioning system. Thus, the solid-cube approach usually requires an independent interior system in addition to a perimeter system, as variation in load at the perimeter—primarily due to weather and sun effect—presents an entirely different problem to that encountered in the building interior where lights and human occupancy represent a fairly steady load. However, in the case of the long, thin building, which has a high perimeter proportion, need for an interior sytsem may be minor or may even be entirely eliminated. The flat, "doughnut" building, with its great roof area, must be again separately considered, as its interior courts may eliminate entirely the requirement for an interior system.

Another consideration directly affected by the building form is the first cost of the installation. Thus, the air-conditioning system in a long, flat, extended building may run as much as 10 percent higher than that for a cubical building having the same total floor area. This is due to the extended runs of piping and ductwork, the much greater perimeter and roof area, and the consequently greater exposure, heat, and sun gains.

(5) *First Cost of Air-Conditioning Installation.* Naturally this is one of the most important considerations. The search for cheaper first cost goes on constantly and any good air-conditioning system, besides being well engineered, must be properly and economically designed.

"Where and how can I save money" should be the engineer's watchword. However, he must also evaluate this properly against the next consideration. It is obviously unwise to fall into the trap of using "first cost only" as a complete yardstick.

Therefore, balancing of first cost against operating cost and against good engineering design is of paramount importance, and the proper balance of the three criteria must be maintained.

A sample of "first-cost consideration only" may be cited by the fact that a simple window-unit installation may only cost $400 per ton installed, whereas a multizone high-pressure perimeter system with a heavy proportion of automatic controls may cost as much as $2000 per ton. If only first cost were to be considered, the former type would be the obvious one to use. However, if other relevant factors are considered, it is seen that each installation will have its own proper application.

A further word of warning. There is a tendency to use unit costs for detailed estimating. No one should be fooled by these. They are a good yardstick, but the variation in local factors is such that they should be used as a yardstick only.

(6) *Operating and Maintenance Cost of Installation.* An engineer's assistant's salary is now in the region of $2.00 to $3.00 per hour. At an annual salary of approximately $4000 to $6000, a mechanic's cost can be an important factor in the evaluation of annual operating costs. Amortized over a period of say 10 years, such labor costs represent an appreciable factor in operating cost of equipment. This may apply for even a small job.

Certain states have rulings requiring the employment of licensed engineers. Thus, in New York such employment is required on steam-boiler plants with a pressure over 15 psi. The salary scale involved averages $9000 per annum. On refrigeration plants similar rulings apply and thus in New York, for example, a plant having a capacity of over 50 lb of refrigerant, i.e., 20 tons, also requires the employment of a licensed engineer.

The above indicates the importance of operating-labor consideration in the design of a system. The savings in the employment of one operator alone is a vital factor. It is often possible, by the use of ingenuity, to arrange design in such a way that this labor saving can be effected. It must certainly always be a major consideration.

Now, as to utility costs. The evaluation of these is vital. In many instances alternate drives for refrigeration machinery, by steam or by electricity, must be considered, in as much as steam turbines or electric motors can both be used for compression refrigerating machines. The cost per ton of refrigeration produced should be worked out where both steam and electricity are available. While generalized figures are often inaccurate, the following comparisons may be considered: 1 kw of electricity equals 3.412 Btu heat output; average price per kw is 3¢; 1 lb of steam equals 960 Btu heat output; so, 3.57 lb of steam equals 1 kw of electricity (efficiencies and other factors being equal). Therefore, to break even, one pound of steam should cost not more than 84¢. These figures are, of course, merely illustrative.

The next consideration is the question of equipment life, i.e., amortization rate. It is fairly common practice to use a factor of 8 to 12 percent for amortization for a good central plant. However, if localized equipment, which cannot always be well maintained, is used, this factor may be increased heavily, i.e., a reduction to a five-year life gives a 20 percent amortization figure.

Certain equipment wears very rapidly; the average life of a window unit is about five years. There is also the question of chemical corrosion, particularly in a weather-exposed plant. It is certainly bad practice to cut first cost on such equipment. The example of the importance of boiler-feed water may be cited. Its effect on tube scaling is well known and lack of treatment seriously curtails boiler life with consequent heavy replacement costs.

The final consideration, but one of the most important, is that of plant efficiency. As an illustration, the air conditioning of department stores may be quoted. Here a high interior-population heat load is encountered during the Christmas shopping rush. During this same period, outdoor-air temperatures may usually be expected not to exceed 50 F. It is therefore quite practical to satisfy a proportion of the internal cooling requirement using outdoor air only, without resource to running the refrigeration plant for cooling at all. Thus, a department store's air-conditioning plant should be capable of handling 100 percent outdoor air and should not be designed for recirculation at a constant rate. The additional cost of such design is negligible, but its saving in annual cost of refrigeration plant operation is appreciable.

(7) *Special Requirements by the Building Owners.* This is a "personality" factor. Take two opposite illustrative extremes: Compare the approach to a new "glass palace" on Park Avenue in New York to that of a strictly utilitarian office building in Newark, New Jersey. The engineer may be faced with the fact that the building owner deliberately wishes to spend money on his building for the purpose of publicity as well as for employe relations. The design of the mechanical systems plays its part in such an approach. On the other hand, the plant may be tucked away in the basement plant room and completely forgotten.

Individual space treatment within any particular building must also be taken into account. The executive suite in an office building must be handled differently from the typing-pool area.

No further comment is needed on this matter, since many instances of special owner's requirements come easily to mind.

(8) *Building Location, Utilities, and Availability of Utility Supplies.* The major technical consideration here is in the matter of supplies. A building out in the countryside, as many office buildings are today, and a similar building built in the heart of a downtown area pose vastly different problems which may directly affect air-conditioning design. Such items as standby equipment, prime movers, and the labor situation too are affected. The use of automation comes into this consideration as well.

The physical placement of the building —its orientation, proximity to other buildings, and hence the shadowing effect they have on it—must also be considered. So far as utilities are concerned, the availability of electricity or street steam, voltages, pressures, and first costs must all be considered. The matter of city water or well water for condenser cooling is also pertinent. Some of these factors are also bound up with consideration (6) above. All are important. Thus, with isolated buildings a self-contained plant—i.e., use of the boiler plant to furnish steam for summer air conditioning, as well as winter heating—may have to be considered. On the other hand, in a city where street steam is available at cheap rates, boiler plants become uneconomical.

Electrical rates are a study in themselves. They are usually incremental in structure and fall into the classifications of domestic, commercial, industrial, etc. In general, naturally, greater demand produces better rates. However, the change-over point from one rate to another must be watched.

Lastly, the question of the load imposed by the new buildings on the utility mains themselves in a small community must be considered.

(9) *Other Special Considerations.* Naturally, it is impossible to generalize on this particular consideration, but such questions as the requirements of particular spaces in buildings having special equipment in them, etc., come readily to mind. The consideration is self-evident and need not be discussed further.

Having thus outlined the relevant design considerations, it is appropriate next to make an evaluation of the character of the various systems which have already been briefly described, and to see how they fit against these considerations.

"window units" and "packaging units"

Let us consider window units first. Their physical characteristics indicate their installation in the bottom quarter of sash windows, they are styled for the neat internal appearance in a room, and are easy to install in existing buildings. They obstruct window openings and raise problems with window cleaning and union requirements. Their external exposed portion houses in general the refrigeration equipment; the condenser cooling fan is often noisy and the protrusion does not present a pleasing appearance on a building facade.

They are, of course, ideal for individual space control with their own switch and thermostat and, thus, represent great flexibility in approach. They are limited in size, however. General availability is not more than two tons capacity, although a one and one-half ton unit seems to represent the maximum size for really satisfactory operation. Air distribution is necessarily not ideal, and they can, of course, only handle perimeter rooms, due to their condenser cooling air requirements. First cost is low, averaging for the unit only about $330 per ton. Electrical connections, usually of the independent-circuit type, under code requirements average about $50 per unit cost, so that as a generalized figure $380 to $400 per ton installed complete represents final first cost. Operating costs average $18 per ton per year, assuming a base electrical cost of about 6¢ per kwhr. This rate is used as these units usually operate on domestic rates.

Maintenance presents problems because the units are relatively cheaply mass produced, and weather exposed. About five years average life may be expected. In general, they are suitable for summer cooling only and do not furnish positive humidification. Some are arranged for winter warming, but this is mainly "top-up" heat only. The outdoor air ventilation furnished is not of a very positive character, due to dampering arrangements.

Variations of the window installed type of unit are now coming into use, particularly for apartment houses. One form is installed under the window, partly recessed, and has an appearance equivalent to that of a cased radiator, convector, or fan-coil unit. So much for window units as such.

Now as to package units. A wide variety and range of sizes are available in capacities from 3 to 25 tons. The smaller sizes, usually below 5 tons capacity, have water-cooled condensers, while those in higher ranges require cooling towers or evaporating condensers.

Package units may be of the floor-mounted or ceiling-hung types and can be used with or without ducting up to about the 5 ton size, and then ducting for distribution of supply must be furnished, recirculation being usually effected directly through a grill in the casing of the unit itself. Many of these units are styled so as to be free standing, and present a reasonably pleasing appearance, and the amount of ventilation air handled can be varied fairly easily by damper control.

The first cost per ton varies, dependent upon the ductwork used, but an average figure of $420 per ton applies. This is for sizes up to 5 tons capacity, with condenser water cooling from city mains. In the 7½ ton and above sizes, assuming an average amount of supply ducting and condenser cooling equipment, the first cost will be about $650 per ton. Their operating costs may vary between $45 per ton/per year for the smaller water-cooled sizes up to $50 per ton/per year for the larger sizes with separate condenser cooling equipment.

The units can be adapted to some degree for special requirements and may have positive humidification, zoning, and special coils added if necessary. Their usage naturally represents greater flexibility in operation, as individual units to serve individual spaces, or two or three similar spaces, can easily be installed. However, the question of maintenance must be watched as this may become serious where a great many units are installed in a large building. Filter cleaning under these conditions can become a major operation. It cannot be said that the provision of a large number of package air-conditioning units in a big building represents good practice.

central station plant

As already mentioned, this type of installation is "built in" and requires sizable space for accommodation. A rule of thumb will be .3 cu ft of space per cfm delivered, and using an average of 350 cfm per ton of refrigeration we get a resulting approximation of 100 cu ft of space required per ton. The head room factor is important, too, and for large installations this may range up to 17 to 18 ft.

As this installation uses distribution ducts from the central plant, space consideration for such ductwork becomes important as well. Furthermore, the architectural treatment and casing of these ducts must be worked out in considerable detail. The central station plant will also require fresh air and recirculation air duct connections.

As previously mentioned, these are custom-designed systems and therefore vary enormously in size and in individual component arrangement. One of their major advantages is the fact that they have one central location for plant, and thus have reasonable maintenance characteristics. Their appearance is strictly utilitarian and they are not, in general, adaptable to installation in areas other than machine rooms.

On the score of flexibility, this type of installation best serves fairly evenly heat-loaded spaces, or may be even designed to serve one space only. It can be adapted to zoning, as already described, in which case flexibility is considerably improved. However, the individual zone reheaters or cooling coils are bulky, and require space and access for their accommodations, and also that of their piping connections.

The central-station plant may be used with either chilled water, or direct expansion, coils as cooling media. In the latter case, the plant room may accommodate the refrigeration equipment too. So far as capacity and usage is concerned, the range is great. The matter of secondary zoning has been briefly described and, using this approach, the system is adaptable to handling the larger type of installation. However, in these cases, provision for the secondary fan rooms must be made, and, again as a rule of thumb, an approximate space allocation for these will be .25 cu ft of space per cfm of air handled.

Due to the custom-built nature of these plants, it is hard to give an exact determination of their first cost on a unitary basis. However, for a simple central-station plant, without secondary zoning, a price range of $800 to $1000 per ton of refrigeration would be reasonable. With secondary zoning no accurate estimation of costs can be given, due to the very broad arrangement variety, but it may be said that such installation will run well over $1000 per ton first cost. These figures include the cost of the refrigeration plant for cooling, but assume a separate steam supply, i.e., *do not include* boiler-plant costs. Required auxiliary services such as electricity, etc., are compact, as they are confined to the central-plant room so that the "load" is well centralized.

The operating costs for a simple, central-station system will be comparable with those given for a self-contained package installation. However, with secondary-zone fans, operating costs will rise and as an example the cost of a large laboratory building installation may be considered.

The building cube is approximately 1,800,000 cu ft. Air volume handled by the primary fan is 60,000 cfm. The total volume handled by the secondary fans is 129,000 cfm. The tonnage of refrigeration is 750.

The estimate cost of operation per annum, using electric drive for the compressors and with the electricity at 2½¢ per kwhr, is $54,000. This includes labor charges of $18,000 per annum.

The above figures are based on conventional low-velocity air-conditioning plant. As mentioned, the principle of the central-station system may be applied to high-pressure systems and under these conditions, operating costs will be considerably increased due to the greatly increased horsepower of the fans. Such additional cost may represent up to 23 percent over-all increase.

fan-coil unit systems

This represents, as indicated, a complete decentralization type of approach, and therefore has considerable advantage where space conditions in a large building are tight. The units are factory manufactured and mass produced. As already noted, they vary from the underwindow type, to the floor mounted, to the suspended type. Their architectural treatment can be most flexible. All types require chilled water, or hotwater piping or steam connections, and distribution ductwork will be comparative to that from self-contained package units of comparative size.

So far as size and capacity is concerned, the under-window models range up to one ton. Physical sizing and appearance is so well known as to require no description. The floor-mounted and suspended types range from 3 to 70 tons capacity. All require a central refrigeration plant, which can be any one of the types described, with chilled-water circulation to the units for summer cooling and either hot-water or steam circulation to the units for the winter.

An entire installation may range up to 1500 tons capacity with well over 1000 individual units being used, each serving a single room. Basically, the system is suitable for comfort cooling and warming only, as it does not provide enough control for specialized industrial service. Varying unit types may be used on the same system; some of the larger applications have been in hotels where bedrooms — all outside rooms — contain underwindow type units and where larger suspended or floor-mounted units serve public spaces. So far as first cost is concerned, this may run as low as a unit price of $1000 per ton.

Maintenance on large installations presents problems, due to the multiplicity of individual filters requiring cleaning, and the risk of dirt clogging fresh-air intakes. The electrical distribution requirement is heavy also.

Operating cost may be figured at about $55 per ton per year, using a price for electricity of 2½¢ per kwhr.

perimeter system

The physical arrangements of perimeter units is well known. The central high-pressure primary air-supply plant is, in general form, similar to the central-station plant, with the exception of its noise characteristics. It is usual to accommodate the primary air supply, carried by its circular ductwork, and the water supply and return mains, in vertical furring inside the outer wall of the building. The room units are flexible and their accommodation in a variety of ways is well known. Furthermore, they can be obtained suitable for ceiling mounting, so that they do not necessarily have to be accommodated under windows.

For the primary-air plant, the high-pressure discharge ducting must be accommodated, and in addition sound attenuation arranged for in the ducting. It should not be forgotten that the ducting, being circular in shape, may not be as flexible in installation as is low-pressure rectangular-section ductwork. The space required by the plant may average about .44 cu ft per cfm of air handled. Headroom is important due to the accommodation of the circular ducts and for any sizeable installation a minimum of 17 ft will be required.

The great flexibility of this system has already been mentioned. Also, the fact that it can be used to produce finely controlled individual conditions—i.e., industrial applications are possible with it—should be stressed. It is extremely sensitive and is thus ideal for use with the modern type of thin-skin-clad buildings.

So far as first cost of installation is concerned, the system falls into the higher brackets and will average between $1500 and $1800 per ton. This is an all-inclusive cost, although it does not include the steam source. Operating costs run about $65 per ton of refrigeration per year with electricity at about 2.5¢ per kwhr. This includes labor charges that are commensurate with the size of the system. Maintenance is reasonable since the individual induction units do not require filter cleaning and are capable of operating for long periods without attention. Filter cleaning is centralized at the primary supply plant and, because there are no local ventilation air inlets from outdoors, there is no particular dirt clogging problem.

double-duct system

Since this is primarily an adaptation of the central-station system, it does not need much additional comment. As has been pointed out, its great advantage is its extreme sensitivity to varying local conditions and the excellent control it can provide. However, since it has to handle the total air volume required, the distribution ductwork, even if operated at high pressure, becomes bulky. This, for large installations, is a serious handicap. The result is expensive first cost and considerable space requirements for accommodation. First cost averages between $1500 and $2000 per ton of refrigeration.

The mixing devices for the warm and

cold air used are illustrated *(Figure 8)*. These are usually automatic in operation, controlled by local thermostats. Operating costs are in line with those of central-station systems, whether low-pressure or high-pressure distribution is used.

Having now laid the groundwork for the approach to the considerations influencing design, and having also evaluated the basic system types, it will be in order to finalize the thinking on the "best" or more properly "most suitable" system selection.

There is, of course, no simple obvious solution to this. There is no "best" building to meet an owner's requirements, but there is a most suitable building which gives the owner what he basically requires. Good architecture strives to provide this most suitable building. So, in evolving an air-conditioning design, the correct solution lies in finding the "most suitable"—a system tailored properly to the owner's and the building's unique requirements.

To demonstrate this, it is proposed to take two or three examples of design approach for different types of buildings and work them through.

Example One: A department store. Take the considerations already outlined:

(1) *Type and character.* Store about 400,000 sq ft floor area, rather well architecturally treated with good interior decoration; shopping center location.

(2) *Divisions and space factors.* Large, open, interior spaces for general selling; some stock and service area; some subdivision into small areas in a few locations; moving stairways, therefore considerable openings between floors.

(3) *Building usage* 9:30 a.m. to 5:00 p.m., six days per week; some evening openings; during sales may be open late six nights per week; peak loading by people at sales time may quadruple normal occupancy; such loading may occur out of the normal air-conditioning season; also loading peaks in various departments vary relatively.

(4) *Architectural treatment and form.* Windowless, rather solid cubicle building; interior arrangements must be very flexible, i.e., capable of extensive change and redecoration at minimum cost.

(5) *First cost.* Maintain minimum due to economics of department store operations; simple utilitarian system required with no frills.

(6) *Operating and maintenance costs.* Maintain a reasonable minimum to keep down overhead; maintenance will be haphazard, due to lack of skilled personnel.

(7) *Owner's special requirements.* Absolute minimum of space to be used by plant, since all available space is required for sales area; considerable flexibility in distribution arrangements requires *(see* (4) *above)*; system to be kept essentially simple in design, due to lack of skilled operating personnel; good air filtering required due to risk of dirt on sales goods; exactly controlled conditions not required, object being to provide comfort cooling rather than pin-pointed temperature and humidity control; additional cooling adjacent entrances required to give "quick cooling" effect; owner has certain standards in equipment, etc., as this is a chain-store building.

(8) *Building location and utility supplies.* Building located remote from adequate utilities, except for electricity; abundant well water in vicinity at 50 F; no steam available except that purchased at low pressure from the shopping-center boiler plant.

(9) *Special conditions.* Care required with air distribution due to high incident of salesgirls complaints; some specialist requirements in some departments; owner will furnish certain equipment direct, as he enjoys mass-purchase agreements with various suppliers.

Considering all of the above factors, what is the "most suitable system"? Begin with the process of elimination. Obviously, a central-plant system is out of the picture, due to space considerations. First cost will probably rule out the use of a high-pressure system, although this would effect space saving. A perimeter-type system is obviously not required, since there are no windows in the building and the perimeter area is not the sensitive one. This leaves the "unit" system type of approach. Either self-contained package units, or a fancoil system, using ceiling- or floor-mounted equipment—i.e., not using under-window units—may be used. Either system will, incidentally, provide the required flexibility between department and space requirements. The first cost will also be in line. However, well water, which can be used directly for cooling, is available. Mechanical refrigeration, therefore, does not appear to be necessary. This rules out self-contained package units and, in addition, their maximum size limitation of about 25 tons each makes them unsuitable. Furthermore, their maintenance problems are not suitable for this type of building.

Thus, the fan-coil units served by well water seem to be the most satisfactory. They can be arranged to serve individual departments and spaces. They can also be used for winter warming with independent steam coils in them, and for department stores this type of heating is usually sufficient.

Example Two: A medium-sized bank building. Considerations are:

(1) *Type and character.* Building comprises two floors and basement, about 20,000 sq ft total; good architectural treatment and interior decoration.

(2) *Divisions and space factors.* Banking hall, main floor; offices and conference rooms, second floor; vault, coupon booths, storage rooms, and service areas, basement.

(3) *Building usage* 9:00 a.m. to 5:00 p.m. daily, five days per week; occasional evening work by staff. The personnel load is relatively constant, except that the banking hall's population may vary, but not excessively so. In any case, this variation follows a fairly regular pattern, peaking usually about midday. Not too much interdepartment flexibility required; however, the second-floor conference rooms

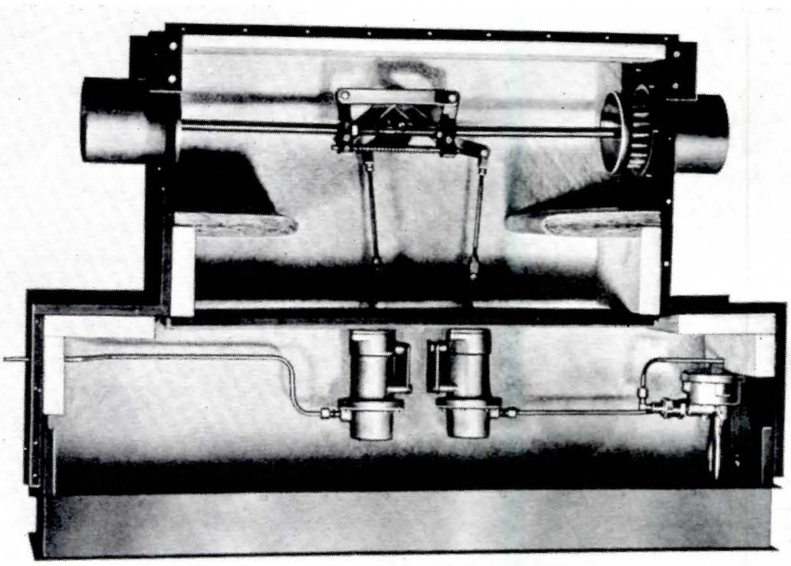


Figure 8—double-duct outlet boxes.
Photo: Courtesy of Anemostat

may not be used simultaneously and will be subject to a fluctuation in personnel load.

(4) *Architectural treatment and form.* Rather monumental-type building without excessive fenestration; cubicle in form and will be an important building in the community where it is located.

(5) *First cost.* A good efficient operating system required; owner is prepared to pay for good quality design and equipment; operating characteristics should give a minimum of trouble.

(6) *Operating and maintenance costs.* A full-time janitor-mechanic who can be trained to operate the plant efficiently will be available; operating cost is not a major factor.

(7) *Owner's special requirements.* The executive offices and conference rooms on the second floor will have expensive interior treatment; space arrangements within the building are of a permanent nature.

(8) *Building location and utility supplies.* In the suburban area of a large city with utilities readily available; no street steam.

(9) *Special conditions.* The plant will be styled to the type of building—which is going to be an important one—in this local community. The bank president is a prominent citizen and fussy in his requirements.

Let us evaluate the above considerations. First, this is a relatively small building, its interior is stable, and its individual load requirements, by spaces, are not subject to too much variation. It is a "solid" job and has got to be a good one. Very reasonable plant space in the basement is available and economically the bank can afford a first-class installation.

Everything therefore points to a central-station type of job with some zoning. For instance, the banking hall should be on one zone, while the subdivisions of the second floor must be on individually separate zones. Finally, the basement should be on another zone, since its characteristics vary from the upper floors. However, a central-station plant located in the basement plant room and serving the various zoning with individual supply duct work, will do the job well. In addition, the maintenance required for this type of equipment will accommodate the janitor's operating schedule.

An efficient system of automatic controls for the individual zones is indicated, and distribution ductwork from the central plant room can be cased in and treated architecturally without too much problem. A simple heating boiler plant will effectively serve the conditioning equipment for winter use.

Example Three: A large multistory office building. Considerations are:

(1) *Type and character.* This is the head office of a major national organization; it is to be a showplace type of building; about 300,000 sq ft.

(2) *Division and space factors.* The building is divided into many private offices, has an extensive executive suite, some large open offices for typing pool, etc., an auditorium, and a small amount of display and showroom area.

(3) *Building usage* 9:00 a.m. to 5:00 p.m. daily, although some offices work late occasionally; the internal population of the building is constant. There is no particular variation in personnel load during the course of an average working day; however, some flexibility in partition arrangements between individual spaces must be allowed for future rearrangement of offices.

(4) *Architectural treatment and form.* This building will be a skyscraper-type of structure and its skin will have an extensive glass area. The building has depth, since it occupies most of a city block; it is to be an outstanding building and in effect a showcase for its owners; its whole treatment is to reflect the standing of the firm occupying it.

(5) *First cost.* The entire plant installation is to be in keeping with the concept of the building; a first-class job is required, every individual component being of the best quality and the over-all design excellent.

(6) *Operating and maintenance costs.* A complete engineering staff will be employed to operate the plant; the plant must be economically efficient in operation.

(7) *Owner's special requirements.* The internal treatment of the building is to be the finest, in order to provide ideal working conditions for the staff; a public relations approach is inherent is the concept; the internal treatment of the executive suite will be the most expensive; the owner would like to consider the mechanical plant as an inherent part of the "showplace" approach; it is envisaged that guided tours for the general public will be made through the building, and these will include the plant location; the owner requires the latest and most modern machinery and equipment.

(8) *Building location and utility supplies.* On one of the most important thoroughfares in New York, centrally located; all street utilities are available, including high-pressure street steam.

(9) *Special conditions.* This building can be rated as part of the owner's public relations and publicity operations; it will be extensively publicized when completed; the owner is prepared to pay accordingly.

A major consideration here will be "size." This is a large project and one with many subdivisions. There will be numerous weather problems as it is a tall glass-skinned building. It also has some depth and its internal areas will be extensive. The requirements of these interior areas will vary considerably from those of the perimeter area. This latter will house the most important offices.

The type of equipment chosen must be the best and design of the system should not spare cost to obtain efficiency.

It automatically appears that the unitary type of approach is desirable—i.e., either the fan-coil or perimeter type of system should be used. Fan coils, however, will result in a major maintenance problem and, in addition, provision of the numerous fresh-air intakes required for them is not desirable from the architectural point of view. These considerations therefore, indicate the use of a perimeter system for the circumferential areas of the building. This should be of the high-pressure type, to keep the size of ductwork within reason. For the interior, a separate system must be furnished, as the requirements in this area will be quite different from those of the perimeter. Conference rooms, lesser offices, pool spaces, service areas, etc., will vary greatly in their requirements from those of the individual, perimeter, executive offices. As to the type of the interior system, local space factors will largely determine this. However, it is probable that space considerations will be over-riding and that some sort of high-pressure system must be used, a double-duct system might be ideal.

Another important consideration in a project of this size will be the arrangement and central grouping of the plant. To scatter individual equipment does not represent good engineering practice. A relatively few "plant centers" should be planned, perhaps only four in number. Individual space control will be important and therefore extensive use of automatic controls and zoning is indicated. A double-duct system might well be considered.

The architectural treatment of the building, both internal and external, must be taken into due account and the installation integrated with this design. Special arrangements of the perimeter units and interior system air diffusers and outlets should be considered where required. Such attention must also be applied to the machine rooms, as they too will be showplaces. Since a full time operating engineer and staff will be available; complexities in first design, which may make for operating efficiency, must be duly considered. High-pressure steam is available, and this will give a choice of prime mover for the refrigeration equipment. Operating cost estimates, using either steam or electricity, should be made in detail to determine the best plant to be used. Considerably detailed research is justified for a project of this type for best results.

The foregoing illustrations should indicate adequately the use of design considerations and system-evaluating factors, and show the consequent evaluation of the "most suitable" system. It is important to remember always that the air-conditioning installation for any sizable building must have a "tailored" approach in the same way that its architecture does. Thus, summing up, the correct approach should be to consider, to evaluate, and then to custom design.

TRENDS AND TROUBLES

Now, what of the future? The day when a building owner had to be sold on the necessity of installing air conditioning has gone. This means that our concentration is now more toward improving efficiency plus increasing economy in space. In addition, there is some movement toward increased automation, although as yet this is only faintly discernible.

Dealing first with *improved efficiency*, there is no doubt that in the last few years there has been a steady movement toward factory-manufactured, self-contained components for even the largest systems. This movement is best represented by the increasing number of "package" jobs. The completely self-contained air conditioner is steadily coming more and more into its own. Mass production, on a similar basis to that used for automobiles, is becoming evident. The under-window, in-the-wall mounted, self-contained units being used for apartment houses today give the best illustration of this trend. Naturally, a strong incentive to this movement to factory manufacturing and mass production is the question of first cost. This is merely a reflection of the whole economic tendency in the country.

Concerning the *economy-in-space factor*, as air-conditioning systems become more complex, they take up more space. Thus, in a large multistory building the air-conditioning installation alone may take up as much as four percent of the building gross area in plant-room space requirements only. This is a serious inroad into the usable area of the building. It is becoming more and more evident that bulky, low-velocity, sheet metal ducts must be reduced in size. After all, air is a fluid and normally fluids are conveyed through pipes under pressure. Certain technical problems have to be overcome before air can be thus handled, but they are by no means insurmountable. Already high-pressure systems are in extensive use and even at this stage of development, using velocities of 3000 ft per minute, the same volume of air can be conveyed through a duct one-third the size of that required for conventional low-velocity operation. Certainly more and more "pipe" conveying of air will be used.

Another interesting development in connection with the question of space economy has been the use of radiant cooling to offset the heat gains in a building at the point at which they occur. The best known example is the cooled-metal pan ceiling which performs a two-fold function—namely, the removal of the heat from the lighting fixtures at the point at which this heat is generated, and secondly, the offsetting of a certain proportion of the outdoor heat gain into the building. This second function also results in decreased size of the conditioned air-handling equipment and, hence, a decrease in size of space which this equipment must occupy. The first cost problems, though, have not yet been fully overcome.

As for *automation*, progress has been relatively small to date as far as over-all master control is concerned. This, of course, does not apply to the individual space or area automatic controls of a system, because these are already well advanced in design and in common usage. Also the automatic control of air quality is common practice. What, however, is not so advanced is the matter of over-all plant control—i.e., starting and stopping plant and running its daily operation. This aspect of automation in operation is particularly pointed up by the severe shortage of good operating engineers and maintenance personnel. Too frequently an expensive installation of air-conditioning equipment is made and the design engineer receives trouble calls as soon as two or three years after installation. It is often found in such cases that either the system is not being run at all, or it is being operated entirely incorrectly, with no understanding of what it is meant to do. It almost seems that under present conditions the ideal installation would be one which could be locked up and allowed to run itself completely automatically. All that would then be required would be periodic maintenance by a specialty firm operating on a yearly contract basis, as is done with elevators.

So much for over-all trends. Now as to *specific equipment*. In the refrigeration-plant field the absorption machine is here to stay. Its advantages have already been mentioned and its operation described. The other trend is toward the use of high-speed, single-stage, hermetically sealed, refrigeration compressors in the larger sizes. The 300 to 500 ton class of equipment is using this type of machinery more and more. Again, absence of heavy maintenance and savings in space are the major forces behind the movement.

Two other developments should be mentioned in conclusion. One is the question of the heat pump and the other is the increasing use of high-temperature hot water. Neither of these are strictly new air-conditioning developments as such. But they do affect air-conditioning design very directly. The heat pump works in a manner similar to a mechanical refrigeration plant, except that in the winter the heat extracted from the condenser is used for warming, while in the summer the heat absorbed by the evaporator is used for cooling. So far as high-temperature hot water is concerned, the usage of this is similar to that of steam.

Now as to *troubles*. Many architects are aware of the fact that when a building is completed and in the settling down process, the air conditioning gives more trouble than anything else. Why is this? It is not a matter automatically of bad design, but it is because the air-conditioning installation is the most sensitive of all the various building equipment components. Further, the unfortunate fact is that it is becoming increasingly difficult to get a new system properly set and adjusted. Additionally, as already mentioned, lack of proper operation also enters into the picture. Thus, there is a compounding of felonies. Even the finest type of system installed, if not adjusted correctly and operated properly, will not give satisfactory results.

Concrete Floor Finishes *by Harold J. Rosen*

Concrete floors can be constructed that will take wear and grind and resist extremely severe conditions, indefinitely. This can be achieved through understanding certain basic principles of concrete making. Concrete can be made to have a wide range of qualities. Thus the strength, resistance to wear, watertightness, and other characteristics may be varied by changes in the materials or the proportions of the ingredients used and by differences in the manipulation of the concrete.

Important considerations to be taken into account in constructing good concrete floors are the following:

a. The less water used in mixing concrete, the stronger, more wear-resistant, and more watertight it will be, provided the concrete can be placed properly.
b. Clean, hard, tough, suitably graded aggregates give more wear-resistant concrete than materials which are inferior in these respects.
c. For uniform concrete, a mixture that does not permit segregation of the ingredients must be used.
d. The chemical combination of cement and water to produce hard, strong concrete requires time. During this period, water must be available, either by preventing evaporation of the water used in the mix or by replacing the water which does evaporate.

Applying the above basic principles to concrete floor finishes, the following requirements should be observed:

a. Use only suitable materials.
b. Use not more than 3½ to 4 gallons of mixing water per sack of cement when machine floating is used and 4½ to 5 gallons of water when hand floating is used.
c. Use mixtures and construction methods which will not permit segregation resulting in free water and fine material on the top surface.
d. Prevent early evaporation of water by keeping the concrete wet as long as possible.

Aggregates for floor finish in the wearing course are subject to abrasion and they should be of sufficient toughness and hardness to resist that abrasion. For unusually severe conditions, traprock, granites, and quartzites are excellent aggregates. Where the floors are not subjected to severe conditions of traffic, aggregates may be either gravel or crushed stone. Materials containing a large proportion of elongated or thin fragments should never be used.

New and untried aggregates should be tested and studied before they are used in finishes intended for severe service. Fine aggregate should consist chiefly of coarser grains ranging from 1/16" to ¼" in size and should be graded as follows:

Sieve Size	*% Passing*
⅜"	100
No. 4	95-100
No. 16	45-65
No. 50	5-15
No. 100	0-5

Coarse aggregate should be well graded pea gravel or crushed stone ranging between ⅛" and ⅜" in size and graded as follows:

Sieve Size	*% Passing*
½"	100
⅜"	95-100
No. 4	40-60
No. 8	0-5

Proportioning concrete mixes for floor finishes is very important. Job experience has proved that a good mix is 1 part portland cement, 1 part sand, and approximately 2 parts coarse aggregate. Not more than 4 gallons of water per sack of cement, for machine floating, and 5 gallons, for hand floating, should be used in the mixture. A large percentage of sand as compared with the quantity of coarse aggregate may work easily under the trowel, but it will not be durable. Coarse aggregate is required to resist wear, and sand-cement mortars should never be used even for light traffic. A correctly proportioned wearing course will have uniform distribution of coarse aggregate through the entire depth of finish and right up to the wearing surface. Crazing of the surface of the concrete floor is evidence of excessive shrinkage. It frequently results from over-sanding the concrete mix. It is desirable to have as much as possible of the coarse aggregate near the surface of the floor to take the abrasion and wear of service. An excess of fine aggregate should therefore be avoided, as it tends to work to the surface during compaction, thus defeating the purpose of the coarse aggregate.

The importance of proper curing cannot be overstated. The chemical reactions between cement and water which cause hardening continue indefinitely if moisture is present and temperature is favorable. Through this curing process, the internal structure of the concrete is built up to provide strength, resistance to wear, and watertightness. Floor finishes present such a large surface area that loss of moisture through evaporation takes place rapidly unless measures are taken to prevent it. Rapid drying not only stops the chemical reactions, but may cause dusting and also cracking of the surface due to shrinkage taking place at a time when the concrete has little strength. To prevent drying out, water for curing should be applied to the new concrete as soon as this can be done without marring the surface. It should then be kept wet, or moisture should be sealed in by covering the floor with waterproof paper or a membrane curing compound. The curing period should be at least a week when using normal portland cement, and 3 days when using high-early-strength portland cement.

Troweling is an extremely important operation and one which requires experience and skill for the best results. The once common practice of striking off a wet mixture of mortar and then troweling it while still plastic until there was a layer of fine material at the surface was largely responsible for crazing, dusting, and poor wear resistance. Do not steel trowel until absolutely necessary, generally 30 to 45 minutes after placing. By delaying troweling as recommended, the concrete will have hardened sufficiently so that all the materials will remain where deposited. Objectionable fine material and water will not be brought to the top and the coarse aggregate will remain at the surface. An impervious wear-resistant floor will result from following this troweling procedure.

Cement toppings should not be less than 1" thick whether they are placed at the same time as the structural slab (integral finish) or after the concrete in the structural slab has hardened (bonded finish). The thickness of the structural slab will of course depend on design requirements. When floors are placed over a membrane waterproofing or over insulation, a reinforced slab at least 3 inches thick should be placed over the membrane or insulation.

In many instances, especially when economy is required, the structural slab is usually the finished concrete floor. This

(Continued on page 274)

Louise Sloane

air-conditioned retail stores

In no other area of interior design must virtually every component be evaluated so sharply for its actual dollars-and-cents productivity as in the design of the retail store. The two examples we show, both by the office of Ketchum, Giná & Sharp, reveal at every point the merchandising *expertise* that has gone into their planning.

The importance of air conditioning as a service factor in the retail store is emphasized by Morris Ketchum, Jr., in his book, *Shops & Stores* (Reinhold, 1957), as follows: "Heating and ventilation are essential to the day-to-day operation of any store building. Public demand has made air conditioning, as well, one of the most important factors in store planning. Without air conditioning, store business languishes during the summer months. Not only customer comfort but the important operational savings effected by air conditioning add immeasurably to its over-all value.

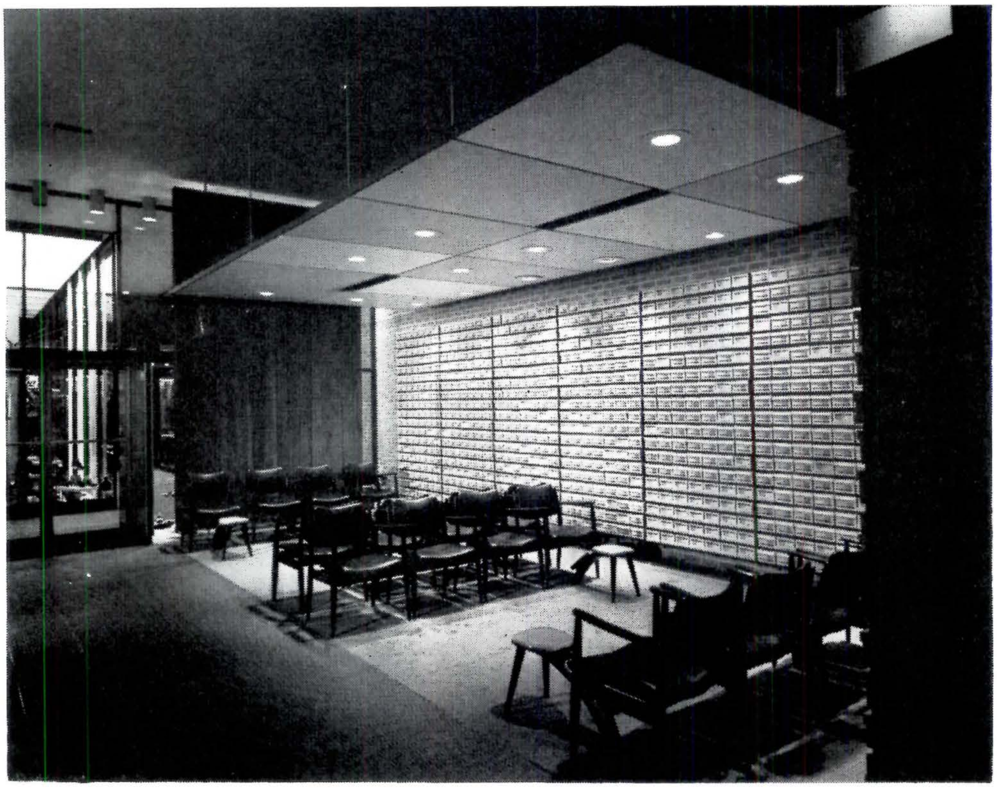
"In addition to summer-comfort cooling, well-balanced air conditioning can provide both year-round humidity control and a continuous supply of clean air. Where the air-conditioning supply and exhaust duct system is also used for heating, initial, and maintenance costs can be minimized. Air conditioning helps to prevent merchandise spoilage, reduces cleaning bills, and increases personnel efficiency. Almost every small shop and store must be air conditioned to meet progressive competition; larger stores cannot operate efficiently without it.

"Any air-conditioning cooling system should be planned to counteract the heat loads produced by electric lights, people, and machinery within the store, and the outside heat produced by the effect of the sun on the building. . . ."

Harwyn Shoes store at Roosevelt Field Shopping Center fronts on the Garden Mall (left) *and also on the parking area. Women's accessories are displayed, as well as shoes. Ketchum, Giná & Sharp were the architects.*

Photos: Alexandre Georges

retail stores



Men's Shoes

Women's Accessories

data

Design Theory: The Harwyn Shoes store at Roosevelt Field Shopping Center is a small shop, competitively located. It sells men's, women's, and children's accessories. Its interior plan and architecture were devised to express this merchandising program, with separate but interlocking sales departments for each category, each with a distinctive character of its own. This "design departmentalizing" also accomplished an agreeable visual solution for the problem of a narrow, corridorlike space. The store has two fronts; one on the "Garden Mall," a location attracting more shopping traffic, and therefore containing the main display lobby; the other on the outside parking area, where an overdoor sign panel and patterned awnings are used to attract customer attention.

doors, partitions

All: U. S. Plywood Corp., 55 W. 44 St., New York 36, N. Y.

furniture, fabrics

Shoe Chairs: American Chair Co., Sheboygan, Wis.
Sofa, Occasional Chairs: Jens Risom Design, Inc., 49 E. 53 St., New York 22, N. Y.
Draperies: Laverne, Inc., 160 E. 57 St., New York 22, N. Y.

lighting

Over-all: General Lighting Co., Inc., 248 McKibbin St., Brooklyn 6, N. Y.

Special Fixtures: George Tanier, Inc., 521 Madison Ave., New York, N. Y.

walls, flooring, ceiling

Wall Fabric: "Strawtex"/Guilford Leather Co., 515 Madison Ave., New York, N. Y.

Wallpaper: Katzenbach & Warren, Inc., 575 Madison Ave., New York, N. Y.; Laverne, Inc.

Carpet: Bigelow Rugs and Carpets, 140 Madison Ave., New York 16, N. Y.

Linoleum: Anchor Carpet & Linoleum Co., Inc., 149 E. 34 St., New York N. Y.

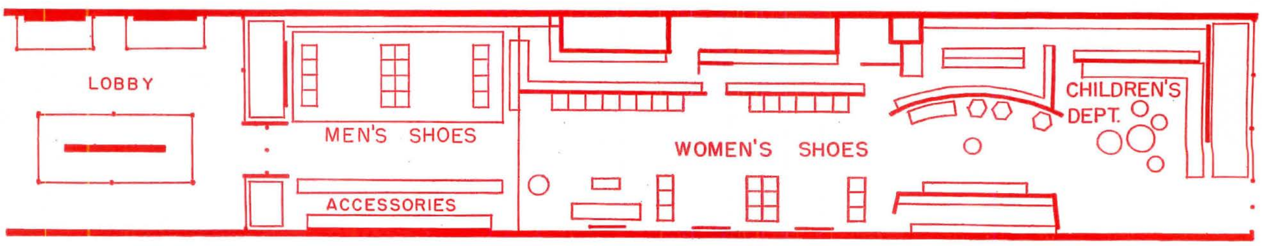
Ceiling: acoustical tile/U. S. Gypsum Co., 300 W. Adams St., Chicago 6, Ill.

Children's Shoes (acrosspage)

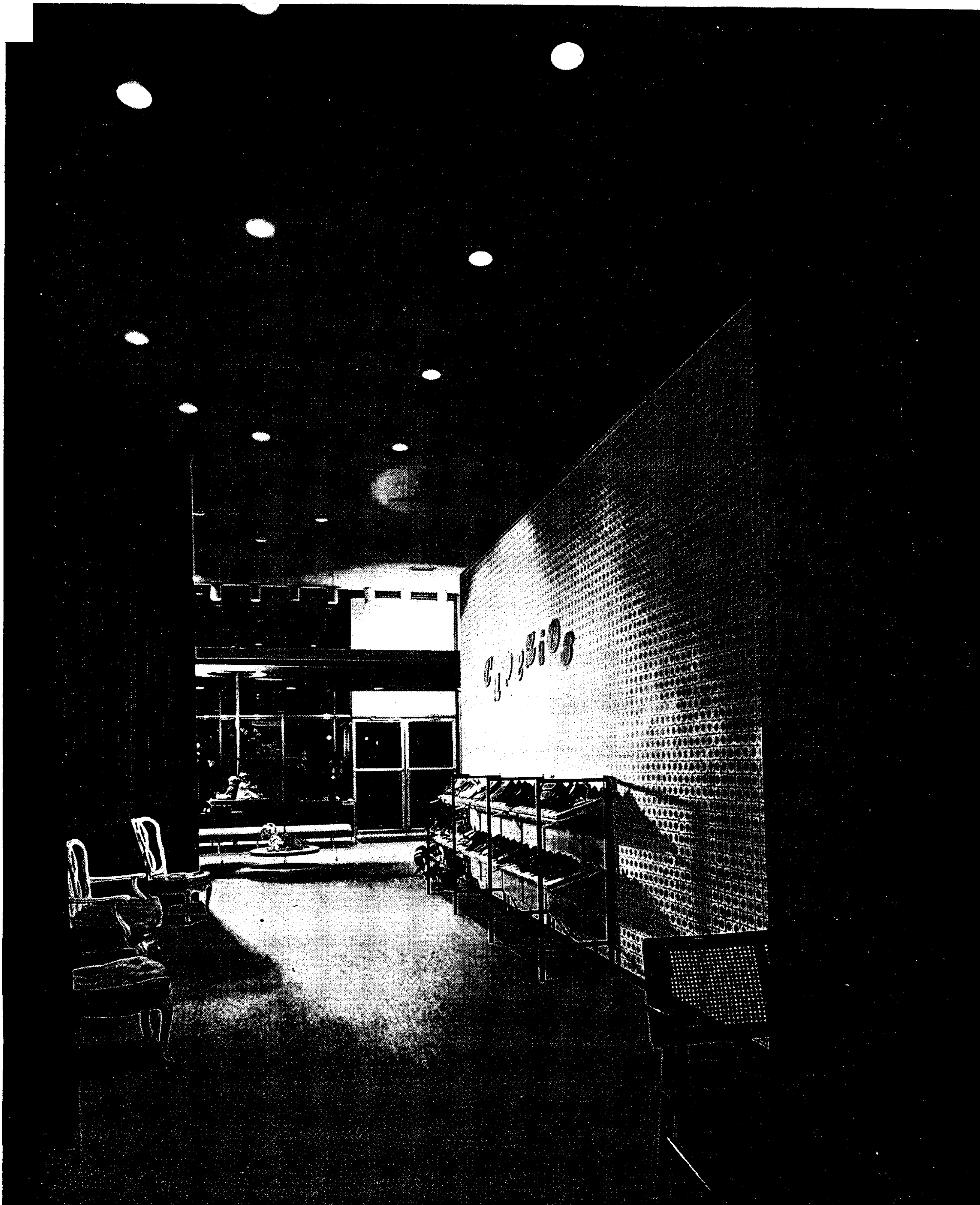
client	Harwyn Shoes
location	Roosevelt Field Shopping Center, Hempstead, New York
architects	Ketchum, Giná & Sharp
partner-in-charge	Morris Ketchum, Jr.
staff architect	Helmut Jacoby

retail stores

Harwyn Shoes *(continued)*



Women's Shoes (below and acrosspage)



retail stores

client	Alexander's Department Store
location	White Plains, New York
architects	Ketchum, Giná & Sharp
partners-in-charge	Francis X. Giná, Building Design Morris Ketchum, Jr., Interior Design
staff architects	Fred Treffeisen, Building Design Elford King, Interior Design

Boutique

Better Millinery

data

Design Theory: Alexander's, a volume department store with heavy customer traffic on all three of its sales floors, posed the challenge of "glamourizing" a cash-only, low-priced sales operation of the kind that normally offers the customer minimum service facilities. This was achieved through the use of fixtures, lighting, and materials that, while serving their practical purposes, at the same time provide a "high-style" atmosphere. Flexibility, to accommodate changes in the merchandising program, is a key factor in the design of the sales fixtures, as well as in the perimeter and free-standing walls, the former interchangeable, the latter easily reassembled.

cabinetwork

Sales Fixtures, Storage Elements: Hinzmann & Welmann, Inc., 80 Third St., Brooklyn, N. Y.

furniture

Furniture: American Chair Co., Sheboygan, Wis.; J. G. Furniture Co., 543 Madison Ave., New York, N. Y.; Herman Miller Furniture Co., Zeeland, Mich.; Janet Rosenblum, Inc., 602 Madison Ave., New York, N. Y.

walls, flooring

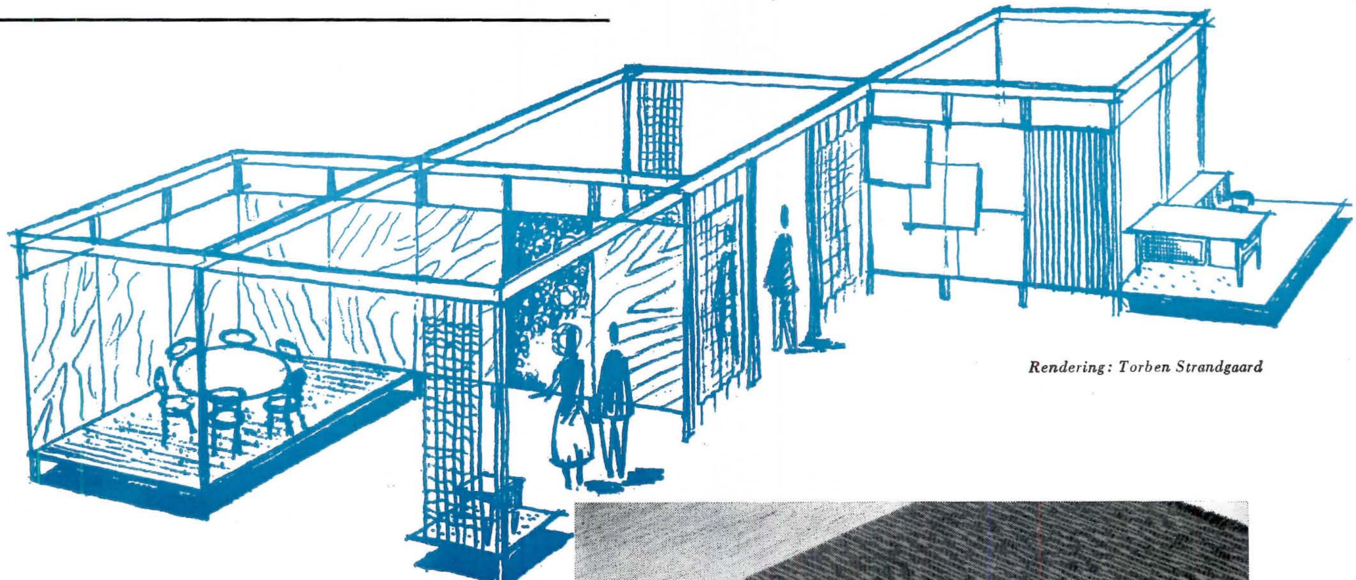
Wall Fabric: "Strawtex"/Guilford Leather Co.

Perimeter Walls: painted or natural wood/Hinzmann & Waldmann, Inc.

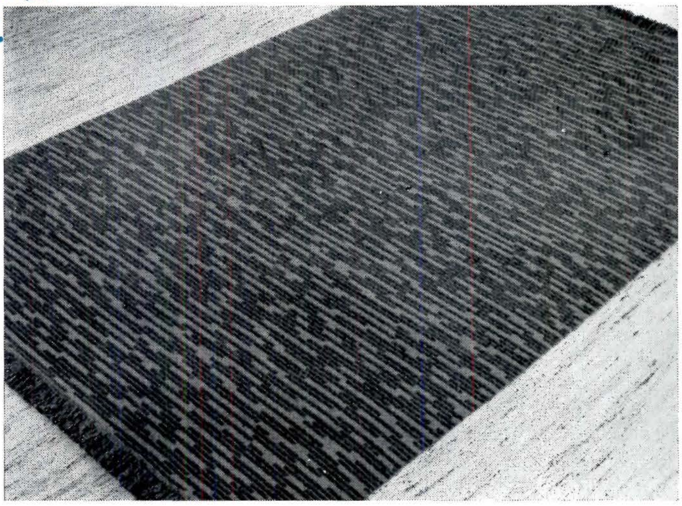
Wallpaper: Katzenbach & Warren, Inc., 575 Madison Ave., New York, N. Y.

Carpet: Bigelow Rugs and Carpets, 140 Madison Ave., New York 16, N. Y.

Children's Shoes (acrosspage)

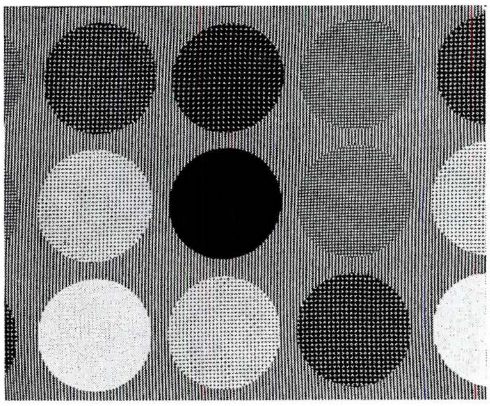


Rendering: Torben Strandgaard



1

In an architectural setting of exposed redwood, Philippine mahogany, and concrete block, designed by Architect Torben Strandgaard to show how well the newest in Danish design harmonizes with materials and colors used in contemporary American homes, M. H. de Young Memorial Museum in San Francisco presented its exhibition, "Contemporary Danish Design in Textiles and Furniture." One hundred textiles offered a generous cross-section of machine- and hand-woven fabrics and rugs by leading Danish textile designers; and the furniture included examples of work by ten notable furniture designers. A handsome, illustrated catalog, listing both Danish and American importer resources, is available from the Museum.



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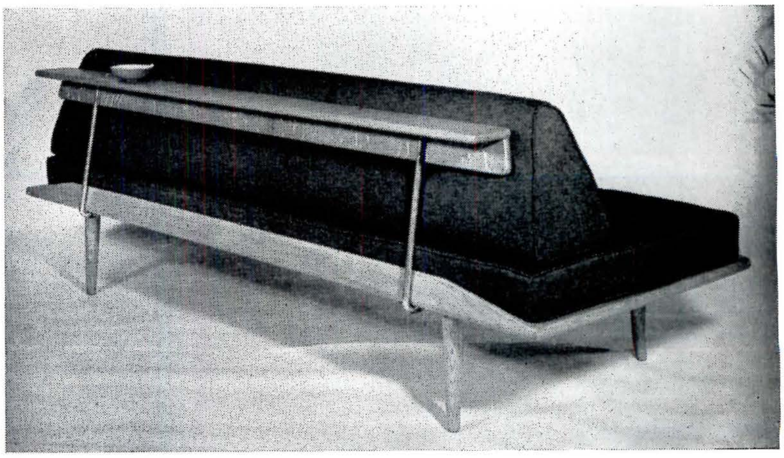


3

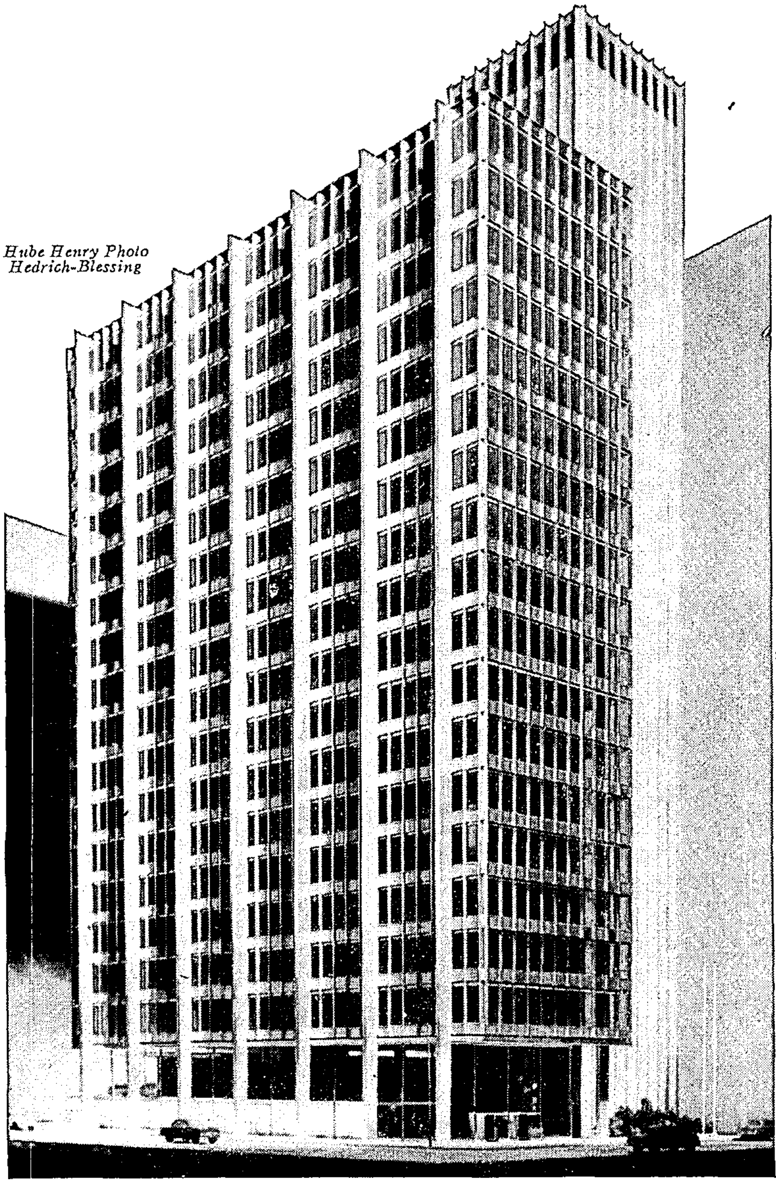
1 "Linier" carpet/black and gray wool/reversible/79" x 118"/Designer Arne Jacobsen/Wessel & Vett, Ltd., Copenhagen.

2 "Circles" cotton fabric/51" wide/Designer Diter Rot/Unika-Vaev, Copenhagen.

3 Oak sofa-bed with back shelf/Designer Torben Strandgaard/Hagen-Strandgaard, Inc., San Francisco, Calif.

4 Teak desk/Designer Svend Madsen/Hagen-Strandgaard, Inc., San Francisco, Calif.

Hube Henry Photo
Hedrich-Blessing



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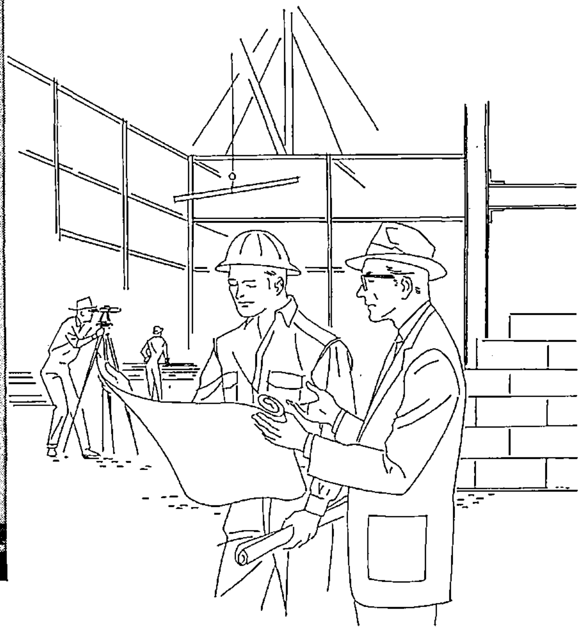

The Inland Steel Company's new headquarters in Chicago numbers some important firsts among its outstanding features. It is the first large office building to be built in Chicago's loop in 20 years. It is also Chicago's first stainless curtain wall building, and the first building anywhere to use the low-nickel stainless grades pioneered by Allegheny Ludlum.

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In most applications the 200-series perform as well as the 300-series of stainless steels, and they offer unique advantages of their own. There is some advantage in price, strength is slightly higher and availability is much greater in times of nickel shortage. Weldability, forming and finishing characteristics are virtually the same as with the 300-series.

If these new steels sound interesting to you, let us supply printed information and engineering assistance. • Write for a copy of *Technical Horizons No. TH2*, containing essential data on the properties and characteristics of Allegheny 200-series low nickel stainless steels. *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*

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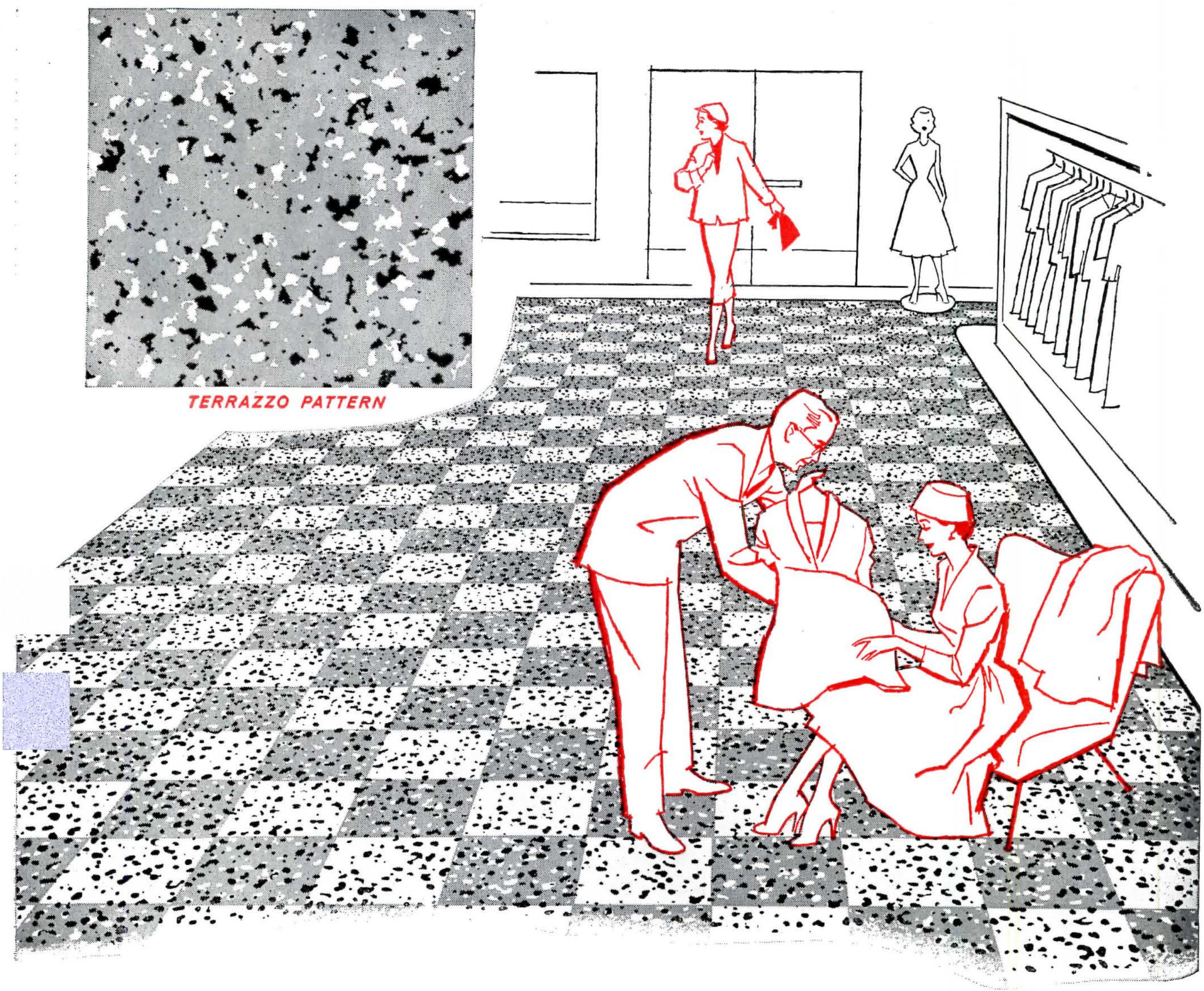

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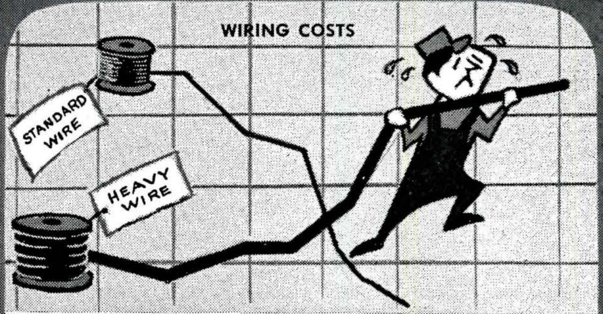

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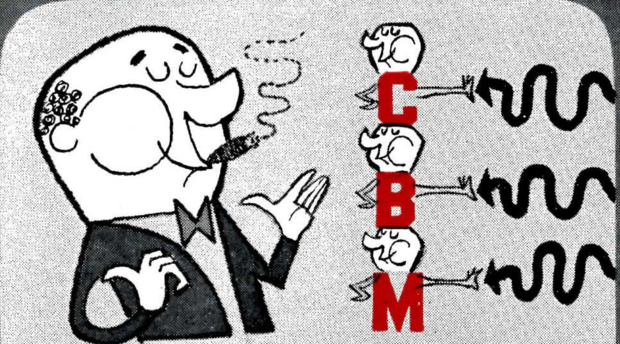

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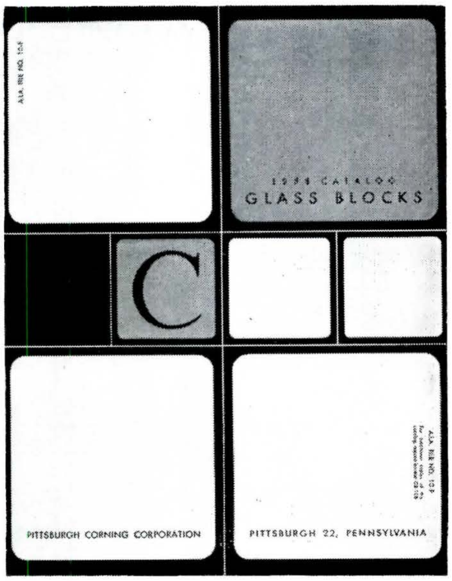

Curtain-wall construction continues to offer design advantages to architects and designers. The Pittsburgh Corning Corporation has just published its 1958 catalog showing the possibilities for this type of construction by using PC Glass Block. The glass block is fabricated by fusing two sections of clear, pressed glass together at elevated temperatures, creating a hollow, partly evacuated unit with properties of both glass and masonry.

PC Glass Blocks are available in two types: functional and decorative. Various textures and colors are available—booklet stresses effects created by new color glass block line. Thermal insulating value of block gives added protection against heat loss; advantages include diffusion and better use of light. Characteristics are given, as well as selection tables, performance data for both types. Details for both exterior and interior installation of curtain walls, windows; specifications given.

291. PC Glass Blocks, *AIA 10-F, 32-p. Pittsburgh Corning Corporation.* E.C.D.

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

air and temperature control

150. Residential Cooling Exhaust Fans, 12-p. booklet describes Niteair fan line. Instructions for selecting size, style, location, given. Provision for exhaust openings, typical installations shown by drawing. Installation method described by step-by-step illustrations. Two main styles—Rancher, for low-pitched roof structures; panel unit, for large attic buildings. Wall shutters described by photos, data. Wiring instructions given for all units, as well as operation and maintenance information. The Lau Blower Co.

151. Remote Packaged Air Conditioners, (C-1100-S104A P), 4-p. folder describes line of year-round air conditioners. Features include flexibility of arrangement and interchange of components, savings in floor space, good service, economy, removable exterior panels. Dimensions and detail drawings illustrate vertical and horizontal arrangements obtainable. Specifications, physical data, motor characteristics included. Air Conditioning & Refrigeration Div., Worthington Corp.

152. The Care and Maintenance of Steam and Hot Water Unit Heaters, 4-p. booklet shows drawings of various operations in the maintenance of hot-water, steam heaters. Special points to consider in installation are mentioned, including branches from steam supply main, low-pressure gravity systems, vacuum systems, high-pressure systems, strainers. Maintenance suggestions include regular inspection, care of motors, heating elements, fan, case, traps. Forced hot-water units, blower types given special attention. Prevention of internal corrosion discussed. Air Moving and Conditioning Association, Inc.

153. Schoolmaster Unit Ventilators, AIA 30-F-1, 12-p. catalog contains data for line of classroom heating and cooling ventilators. Sectional design gives saving in installation costs—unit available in five sizes. Heating elements: copper tubes with aluminum fins for high heat transfer. Cabinets: 14-gage steel bonderized, finished with enamel. Features include air blending dampers for controlled ventilation, adjustable outlet louvers, quiet operation, motor and blower assembly below heating element, formica top with rolled front. Detail drawings, steam ratings, hot water ratings, dimensions, colors given. The Rittling Corp.

154. LoLine Cooling Towers, 16-p. file shows water-cooling tower for industrial processes and air conditioning. Structural framework is designed to withstand wind loads of 100 mph, has cast-iron connections. Casing is of corrugated asbestos-cement board; open distribution system gives low pumping head requirements—removable ceramic orifices distribute water evenly. Clear all-heart grade redwood used as filling—drift eliminators give water removal from discharge air. Two series—"BW" has aluminum fan, galvanized fan drive supports, multi v-belt drive, oversized bearings, stainless-steel fan shaft, external grease fittings; "R" series features fan, galvanized fan stack, enclosed fan-cooled motor, speed reducer fan drive, nonlubricated drive shaft. Cross-sectional drawings of each series shown. Engineering data, tower dimensions, general arrangement, supporting-steel arrangements and foundations for concrete basins, specifications outlined. J. F. Pritchard & Co. of California.

155. Wiremold Flexible Air Duct, 22-p. folder concerning flexible, versatile duct usable for a variety of applications. Fabric component and supporting metal spiral are mechanically interlocked—duct has good air flow, wide temperature range. Friction loss characteristics table, data. Specific use in air-conditioning systems: to connect perimeter underwindow units with vertical risers, branch to ceiling outlets, from branch duct to attenuation box, vertical take-off. Specifications tables, installation photos. Industrial uses also given. The Wiremold Co.

156. Clean Air Helps Every Business, 4-p. catalog concerns electronic air cleaner specially suitable for small commercial buildings. Dust and dirt are drawn into return air duct, magnetized onto aluminum plates. Water spray periodically washes plates—air recirculated is clean. Advantages of system include economy, better health, less soiling of merchandise. Photos depict uses. Eight sizes with specifications given. Trion, Inc.

157. High-Capacity-Cell Electronic Air Cleaners, 4-p. brochure gives engineering data—dimensions, capacity, model information—for high-capacity units. Field-assembled, factory-built enclosure, packaged units discussed. General specification guide. Trion, Inc.

construction

281. Panelbild, AIA 17A, 8-p. booklet illustrating plywood stressed skin panels for floor, roof or wall. Panelbild system components are laminated under pressure and controlled conditions, providing strength, minimum bulk. Components may be specified for part or whole of structure. Details, drawings, data given for roof and floor panels, including available sizes.

Wall panel described by section drawings, specifications. Details of panel construction and installation included. General specifications, building code acceptance, materials (plywood and casein glue), fire resistance listed. Panelbild Systems, Inc.

282. Specification for Asphalt Floor Tile, 10-p.

283. Specification for Grease Resistant Asphalt Tile, 3-p.
Two revised specification sheets cover necessary physical characteristics for asphalt tile—regular and grease resistant types. Requirements are outlined in detail. Test methods given, as well as pertinent notes. Tests illustrated by photos. Asphalt Tile Institute.

284. Thermo-Wall Construction, AIA 19-D, 4-p. folder describes panel construction method for covering industrial, commercial buildings. Corrugated asbestos-cement board with structural insulating unit is basis of panel—claims insulating value of 14-in. brick wall—weighs little. Table lists coefficients of thermal transmission. Advantages of method include insulating value, resistance to fire, light weight, rigid construction for easy maintenance. Detail drawings show three methods of erection, fastening. The Philip Carey Mfg. Co.

★ **285. Design and Use of TECO Trussed Rafters,** AIA 19-B, 24-p. booklet illustrates advantages, economies, of light wood roof trusses. Twelve rafter designs shown, with specification, material tables. Data for fabrication, assembly, erection also given. System especially adaptable to homes, industrial structures, other buildings requiring clear-span constuction. Timber Engineering Co.

286. Products for Construction, 8-p. booklet contains descriptive data on 50 products useful in construction. Types of products include abrasives, adhesives, electrical products, roofing granules, sealers and coatings, signs and markings, tapes. Most products pictured. Brochure is divided into type of usage—architectural, electrical, mechanical—for ease in specification. Minnesota Mining & Mfg. Co.

287. Lupton Aluminum Curtain Walls, AIA 16-E, 14-p. booklet features two types of aluminum curtain-wall panels. Type H is limited to 5′ spacing of vertical mullions; type G has deep frame, mullions can be spaced up to 8′. Fabrication and installation done by company. Design data given for both types. Construction details show design; types of insulated panels also depicted. Mullion, sill, head details; specifications. Systems especially adaptable to schools, hospitals, office buildings. Michael Flynn Manufacturing Co.

★ **288. VMP Mobilwalls,** AIA 35-H-6, 60-p. catalog describes line of movable metal partitions for office, school, laboratory. Five distinct types—flush, semi-flush, eye level, low-rail, partial partitions—offered, as well as numerous accessories, including doors, top filler, hardware, wickets, and grills, etc. Features claimed: surface flatness, range of color finishes, assembly lock, functional appearance, adjustable base, universal floor fastening, insulation, wiring facilities, adjustable frames, reduced installation, maintenance costs. Cutaway drawings, construction details, elevations given. Typical plans offered. Specifications, photos of installations. Virginia Metal Products, Inc.

289. Fulget, 8-p. folder contains information on new process for producing marble floor and wall tiles. Developed in Italy by Fratelli Capoferri, process is in two parts: raw marble is first artificially shaped into spheroids of several uniform sizes; spheres are then hand-set in steel molds, machine vibrated and pressed into grooved and channeled cement units. Tiles can be applied to walls with cement mortar as a veneer. Protruding pieces can be smoothed or polished. Color photos of actual patterns and installations show quality. Directions for installation—stressing that unit be set tight, joining without grouting or filling—and specifications included. National representative: The Fred Dean Co.

290. Glass-clad Buildings, AIA 17-A, 16-p. booklet outlining completely integrated curtain-wall system of steel and aluminum supporting members coupled with structural-glass panels for vision and spandrel areas. Four-color renderings and photos show esthetic possibilities in design of façades for industrial and school buildings, shopping centers, and multi-story structures. Perspective section drawing, details, structural-glass color charts. Specifications and large detail sheet are inserted in brochure pocket. Pittsburgh Plate Glass Co.

doors and windows

331. Aluminum Entrances, 4-p. brochure features entrances with polished alumilite or plain color finishes. Sectional drawings of standard entrance—narrow stile—and sidelight units given. Table gives stock shapes available—37 shapes shown. Features include weatherstrip molding, butt hinges, tie rods for rigidity and strength, security lock, flush bolts. Wide stile entrances also described. Specifications and photos. Hankins & Johann, Inc.

332. Aluminum Windows, AIA 16-E, 56-p. book gives complete line of all types of aluminum windows for various uses. Specifications, sizes outlined for each type, as well as detail drawings of component parts. Various combination types. Recommended glass sizes given. Typical details, bar sections. Special types of windows, for churches, etc., available. Some photos, description. Valley Metal Products Co.

★ **333. All-Aluminum Sliding Glass Doors,** AIA 16-E, 16-p. 1958 catalog gives drawings, technical details of all sliding glass doors in line. Types featured are standard door, dual glazing adaptor door for 1″ dual glazing, lower priced aluminum door. Features of each series pictured, described. Sizes, specifications included as well as application photos. Ador Sales, Inc.

334. New Modernaire Wood Windows, AIA 16-L, 6-p. brochure gives installation and frame details for series "D" window—awning, casement, hopper applications. Accessories, four types of operating mechanisms are illustrated. Various combinations of units shown; dimensioned drawings for awning, hopper, fixed casement windows given. Specifications, features such as narrow sightline, shadow box frame, prepitched subsill surfaces listed. Modernaire Corp.

electrical equipment, lighting

442. New Light Control With Sylvania Reflector Fluorescent Lamps, 4-p. folder describing reflector fluorescent lamp line. Brochure features use of lamps in direct, indirect, directional installations. Inner white reflector coating of lamps said to increase light output 60%. Special applications discussed. Various models—sizes and colors—listed. Sylvania Electric Products Inc.

443. Crouse-Hinds Lighting Equipment, 52-p. catalog of line—floodlights, searchlights, products for aviation and industrial

(Continued on page 200)

PROGRESSIVE ARCHITECTURE, 430 Park Avenue, New York 22, N. Y. I should like a copy of each piece of Manufacturers' Literature circled. Coupon must be used by 5/1/58

150	281	289	443	813
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152	283	291	445	815
153	284	331	446	974
154	285	332	547	975
155	286	333	654	
156	287	334	811	
157	288	442	812	

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We request students to send their inquiries directly to the manufacturers.

SECTION OF LOBBY, DISTRICT OF COLUMBIA RED CROSS BUILDING. ARCHITECTS: EGGERS & HIGGINS, NEW YORK, N.Y.

Serves every need beautifully:

Ageless, Versatile Terrazzo

Centered in a vast area of gleaming Terrazzo in a busy lobby, this Mosaic insignia turns a meaningful symbol into a handsome focal point—evidence again of the versatility of Terrazzo and Mosaic. No design is too difficult. The range of colors is virtually unlimited. And regardless of the amount of traffic, any design makes a lasting, shining example of ageless material at work in modern times.

Because of this durability, Terrazzo is specified time and again by architects who build for permanence. The smooth jointless surface is inexpensive to maintain, easy to clean, hard to stain. It requires no refinishing, no painting. Terrazzo is also less slippery than waxed surfaces, easier to walk on.

Important too, is Terrazzo's economy in the long run. Initial cost is more than offset by absence of repair or replacement costs, because Terrazzo is marble hard, concrete durable.

For detailed information, write the Association in Washington, D. C. Free AIA Kit upon request. Catalogued in Sweet's.

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Weldwood birch paneling for walls and built-ins and Weldwood Chalkboard. Westover Elementary School, Stamford, Conn. Arch: William F. R. Ballard.

How wood paneling makes schools brighter —keeps the tax load lighter

In schools like Stamford's Westover Elementary (above) learning comes a little more pleasantly for the youngsters these days. Yet the taxpayers will save money. Here's why:

The school's planners used Weldwood real wood paneling on walls and built-ins. The reasons: 1. Weldwood Paneling cheers up any room. 2. It keeps maintenance costs low. Smudges and stains are easily removed and there's no need for periodic repainting and repapering.

Weldwood Paneling, in types and finishes to meet virtually every decorating plan, is guaranteed for the life of the building. Like Weldwood Fire Doors and Kalistron wall covering (below) it can help you include long-range savings as an important feature of your school building or remodeling designs.

FREE WELDWOOD SCHOOL PLANNING BOOKLET. "Weldwood Products for School Construction and Remodeling," has 16 pages of photographs showing low-maintenance Weldwood Products installations in schools. Write for your copy and see Weldwood Products at any of our 111 branches. We will be glad to have a Weldwood Architects' Service Representative consult with you—no obligation. United States Plywood Corporation, Dept. PA 3-58, 55 W. 44th St., N. Y. 36, N. Y.

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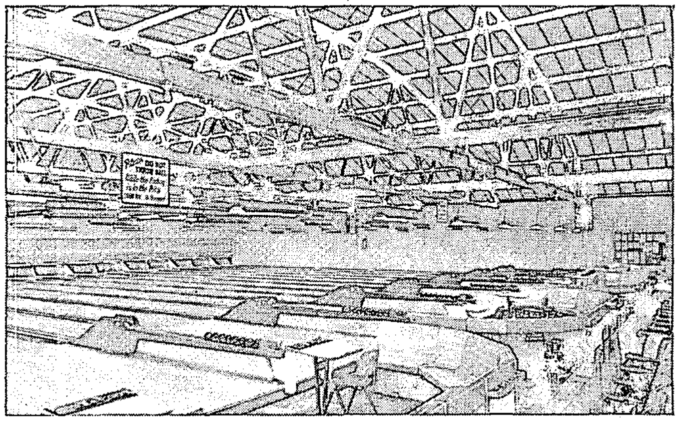
In Canada: Weldwood Plywood, Ltd.

Weldwood Fire Doors with African mahogany faces in the Slosberg Music Center, *Brandeis University, Waltham,* Mass., stop transmission of destructive, suffocating heat as well as fire itself. Doors are guaranteed never to warp, twist, or get out of line, thanks to inert, incombustible Weldrok® mineral core. Architects: Harrison & Abramovitz.

These Colorful walls of scuffproof Weldwood Kalistron® in the Central School, Hudson Falls, N. Y., never need painting. Color fused to the *underside* of a transparent vinyl sheet is protected from scratches and smudges. Cleans easily. Comes in 35 colors and different textures. Architects: Sargent, Webster, Crenshaw & Folley, Syracuse, N. Y.

3 Buildings—3 Specifications

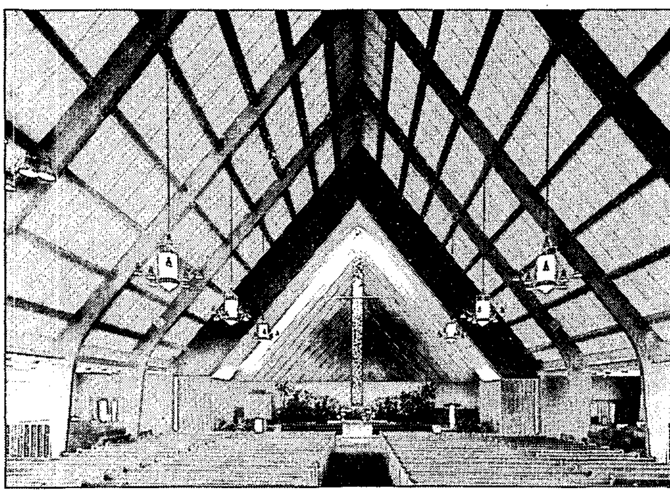
ALL USE TECTUM ROOF DECKS



BILL ADOLPHSON'S BOWLING CENTER, GREENSBURG, PENNSYLVANIA

Architect: Gordon C. Pierce, Greensburg, Pennsylvania
General Contractor: L. P. Wineman, Greensburg, Pennsylvania

The roof deck of this bowling alley—as well as the sidewall material—become important assets to the success of this new building. The continual thunder of rolling balls and flying pins is considerably lessened with Tectum sound-absorbing roof decks and sidewall material. Tectum insulates, too, and is noncombustible, termite proof and workable as wood. Here's functional good looks at work—a single material responsibility for good construction, durability, appearance and effective noise reduction.



BEULAH PRESBYTERIAN CHURCH, PITTSBURGH, PENNSYLVANIA

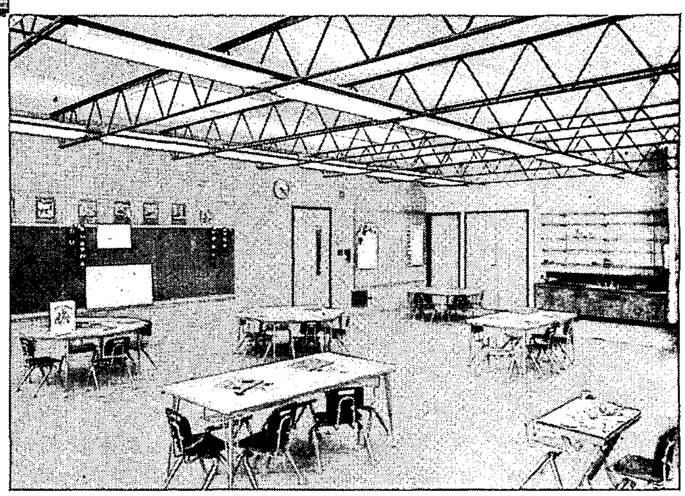
Architects: Hoffman & Crumpton, Pittsburgh, Pa.
General Contractor: Ferraro Construction Co., Pittsburgh, Pa.

Good acoustics go hand in hand with good appearance in this modern house of worship. Tectum decks play an important part in holding costs to appropriated funds, as these economical panels are laid directly over secondary framing members without need for further insulation, acoustical treatment or sheathing. Textured Tectum decks are warm and inviting, and audience appreciation of the services is greatly improved.

FURNACE BROOK SCHOOL, QUINCY, MASS.

Engineers: Anderson-Nichols & Company, Boston, Mass.
Architect: Earl M. Harvey, A.I.A., Boston, Mass.
General Contractor: L. C. Blake Construction Co., Boston, Mass.

Keeping costs in line to meet the needs of a growing school age population is a challenge met perfectly when Tectum decks are installed. Structural, noncombustible, insulating and acoustical panels go down fast. Deck and interior ceiling are completed in one operation. Costs are reduced when Tectum is laid over joist or beam. Hundreds of schools in all climates are utilizing this new concept with marked success. Write for complete information.



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Tectum CORPORATION
Newark, Ohio

Branch Offices in Philadelphia, Columbus, Atlanta, Dallas, Chicago, Beverly Hills, Seattle and Toronto, with distributors in all leading areas. Factories in Newark, Ohio, and Arkadelphia, Arkansas.

(Continued from page 195)

lighting. Data, photos shown for all types, including specific applications. Brackets and accessories recommended, prices given. Crouse-Hinds Co.

444. Architectural Lighting, 32-p. booklet covers architectural lighting line. General data given for series adaptable to banks, lobbies, offices, stores, restaurants, hotels, public and commercial buildings. Both incandescent and fluorescent designs shown. Photos, sketches illustrate possible effective usage. Lightolier.

445. Panelescent Lamp, 4-p. brochure details construction and characteristics of new ceramic-on-metal panel lamp using electroluminescence principle — for low brightness surface lighting. Among applications suggested in photos are: radio-clock face, radio dial, thermometer, luminous house numbers, glowing switch plate, self-illuminating sign. Also illustrates ceiling panel for soft-interior lighting. Sylvania Electric Products Inc.

446. Flexicore Electrified Floors, 36-p. guide to installation of complete electrified-cellular concrete-floor system for office buildings. Describes how use of system facilitates office-building design. Gives sample structural design problem with drawings of typical floor, sections, and structural details; photos show full installation procedure. Also section on design of underfloor electrical distribution system: step-by-step procedure; typical distribution layouts; isometric wiring diagram. Additional data on floor openings, fireproofing, suspended ceilings, floor finishing. Structural and electrical specifications. The Flexicore Co., Inc.

finishers and protectors

547. Mono-Seal, The Scientific Protective Coating, 14-p. brochure describes characteristics of balanced chemo-setting synthetic resin coating. Material has no plasticizers or oils to increase surface breakdown—cures by solvent evaporation, internal polymerization. Finished coating is elastic, durable, resistant to corrosion, chemical deterioration. Information on application, drying time, coverage, surface preparation given. Photos of typical applications. Graphs show comparative drying times, initial hardness. Available in 22 colors. Mono-Seal Products.

insulation

654. Ultracoustic Ceiling Board, AIA 17-A, 4-p. folder introduces new type incombustible glass-fiber acoustic ceiling board, adaptable to suspended ceiling systems. Material has off-white travertine textured finish, reflects light, is sound absorbent, decorative. High degree of fire resistance, low thermal conductivity claimed. Board may be painted up to six times without losing efficiency; may be bent; light weight. Gustin-Bacon Mfg. Co.

sanitation, plumbing, water supply

What You Should Know About Plumbing, 16-p. $.10
Plumbing Care and Repair, 22-p. $.10
Two booklets published by Plumbing and Heating Industries Bureau give timely facts about initial installation and upkeep of plumbing facilities in the home. First booklet details planning of bathrooms, kitchens, and necessary considerations for particular needs. Second publication explains maintenance of plumbing, gives suggestions on how to make minor repairs. Both illustrated by drawings, sketches. Write direct: Plumbing and Heating Industries Bureau, 35 E. Wacker Dr., Chicago 1, Ill.

specialized equipment

811. Viz-U-Bilt, 38-p. book is devoted to line of all-metal merchandisers. Cream, gray are standard finish colors—others available. Pyramid, multilevel type displays large amount of merchandise; flexibility of design stressed. Advantages claimed: bracket adjustability and

(Continued on page 204)

(Continued from page 200)

strength, perforated metal shelves, various units, easy assembly, appearance, economy —many attachments, accessories available. Versatility stressed—units for all kinds of merchandising applications described and pictured. Sections devoted to accessories, attachments. L. A. Darling Co.

812. Inventive Designs, 20-p. brochure containing eight design projects by outstanding architects. Designs include bathrooms, bathroom-sun patio, home entrance, modern kitchens and kitchen areas. Use of ceramic tile is featured. Complete photographs of each area, including color and detail shots. Editorial comment of each design. The Tile Council of America, Inc.

813. Flutocall Fire-Alarm Systems, 46-p. catalog gives data for selective code, general alarm, combination fire alarm and paging, remote station, pull lever, other fire-alarm systems for installation in all types of buildings from schools to large industrial structures. Planning designs shown as well as photos of actual controls. Accessories, complete arrangements, power information included. The Autocall Co.

814. Shampaine Hospital & Laboratory Casework, AIA 35-K, 100-p. catalog contains complete specifications for casework, construction data. Complete section devoted to hospital cabinets includes illustrations, description, size tables. Suggested floor plans given for various sizes, types of hospitals. Laboratory casework available included, with similar data given. Accessory fittings, etc. Shampaine Co.

815. Parkmaster, 24-p. brochure contains description of automated mechanical parking system. Structural-steel elevator platform and turntable is lifted by precision roller chains, hydraulic jacks. Double-gear pump driven by electric motor; feature of lifting mechanism is cross-chain equalizing system, tied by torque tubes from corner to corner for horizontal stability. Two shuttles on elevator platform receive, store cars — are self-propelling. Cars can be parked two deep by turning platform a half revolution—speed can be varied to meet operating time requirements. Safety tested, system can be installed for above- or below-ground operation. Photos of systems, safety features given; several layouts for possible installation. Parkmaster Systems, Inc.

Unit-Lab Educational Science Equipment, 16-p. two-color catalog is guide to school laboratory furniture. Units are designed for single- or multiple-unit purposes; variations obtainable by use of different tops, fittings, sinks, storage facilities. Student and instructor tables, work tables, storage units, fume heads, sink units, fixtures and accessories available are pictured. Planning, engineering services also obtainable. Write direct on letterhead: Laboratory Furniture Co., Inc., Old Country Rd., Mineola, L. I., N. Y.

surfacing material

974. Ceramic Veneer, AIA 9a (CV-★ 57), 8-p. booklet concerning high-fired glazed clay facing material. Three main types — adhesion, anchored, mold-pressed — offer various effects. Drawings show applications of concrete, metal, or wood. Several colors and textures available. Panel wall construction shown by photos, construction drawings. Sectional drawings illustrate anchored type. Special decorative types depicted. Gladding, McBean & Co.

975. Monorock — Monolithic Concrete Floor Surfacing, 4-p. brochure describes surfacing for industrial, commercial, institutional floors. Consisting of surface mixture of aggregate, with controlled water content, material strengthens base concrete. Low water-cement ratio gives smooth, long-wearing finish. Surfacing becomes integral part of slab. Aggregate is graded, tested by rigid standards; emery, aluminum oxide, other abrasives added for nonskid flooring. Application process—including spreading, screeding, surfacing, leveling, troweling, finishing—illustrated by photos. Detailed specifications, application data given. Kalman Floor Company, Inc.

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CELOTEX
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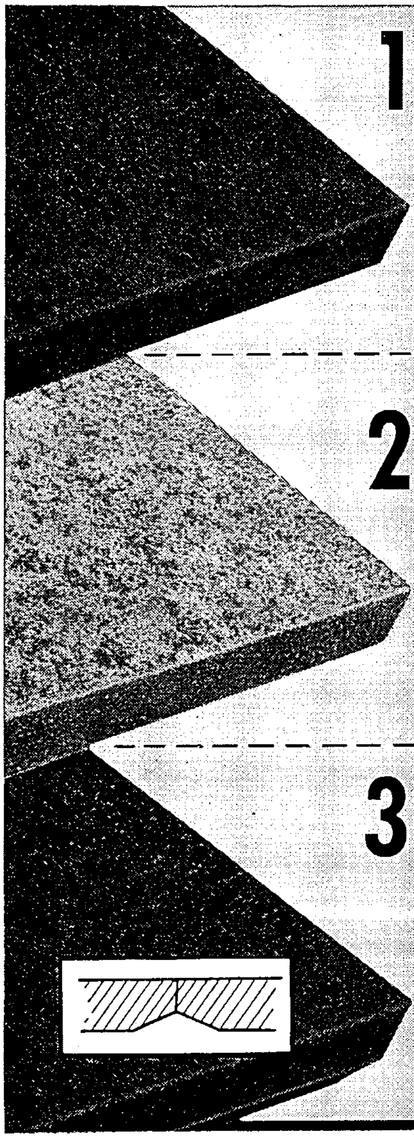
Big 3

Roof Insulation Products

with all these Performance Advantages



1 PRESEAL

Asphalt coating on sides and edges protects against moisture pickup at job site; also provides excellent surface for mopping and bonding to deck or felt with either asphalt or pitch.

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For 35 years the recognized standard in roof insulation where lowest cost is important. Meets or exceeds all applicable Specification Standards. Natural, textured surface makes strong bond with pitch or asphalt.

3 CHANNEL-SEAL

Asphalt-coated board featuring bevels on deck-side edges, forming a network of connecting channels across the entire roof area. Channels are means of equalizing air pressure between roofing and deck, thus minimizing any pressure build-up and hazard of roofing blisters.

- ✓ Rugged—hard to damage
- ✓ Clean-cut snug-fitting edges
- ✓ Smooth solid base for felts
- ✓ No worry about punctures or depressions that become weak spots under felt
- ✓ Withstands heavy traffic
- ✓ Strong, rigid, crush-resistant
- ✓ Uniform density and thickness
- ✓ Permanent, efficient insulation
- ✓ Over 30 years job-proved service
- ✓ Billions of feet in use

All three products available in a complete range of Conductances (C-values).

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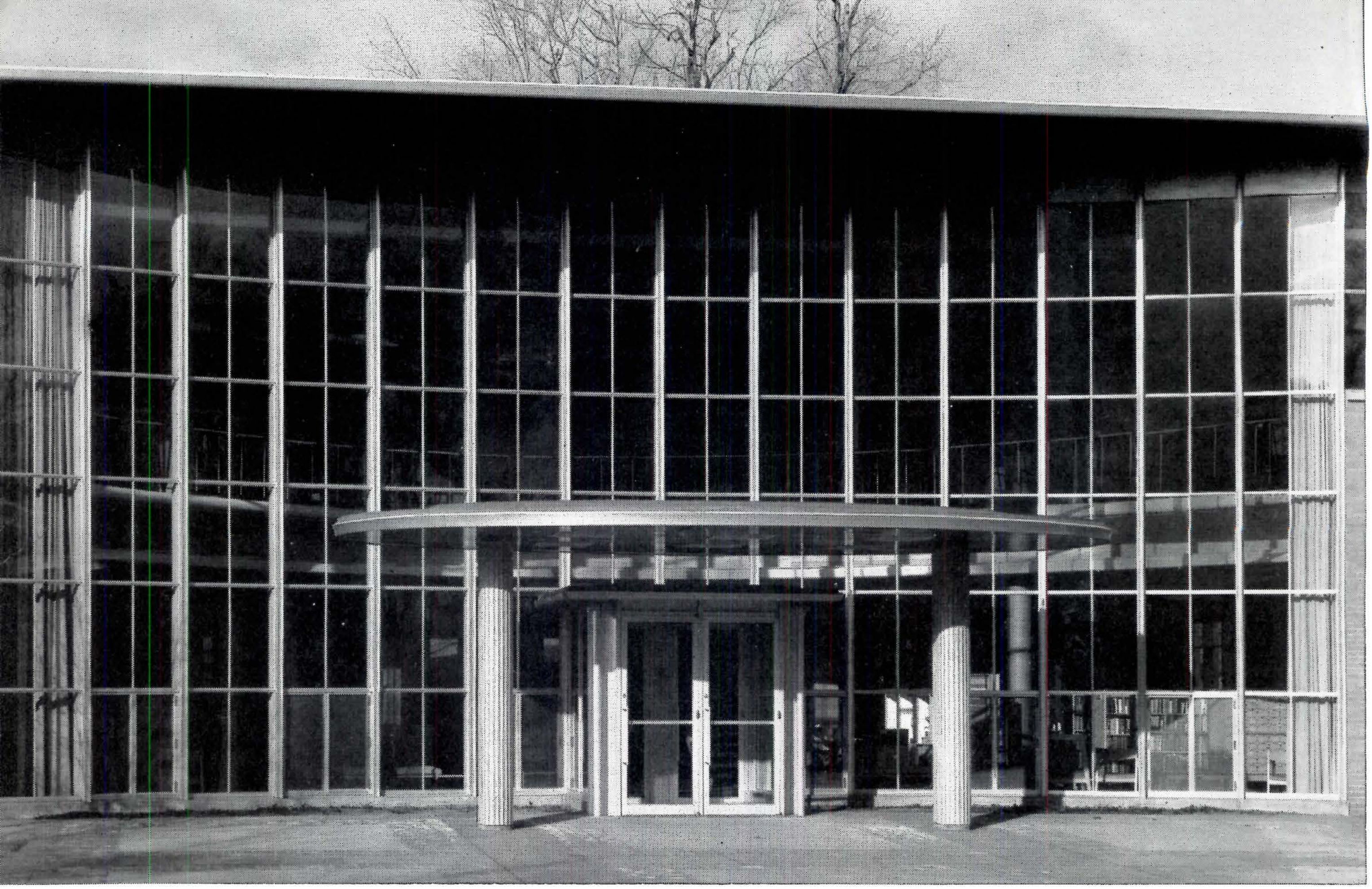
See 1958 Sweet's Architectural File, Catalog 10a-Ce. Write for Specifications, Samples, Information Manual.

CELOTEX ROOF INSULATION

REG. U.S. PAT. OFF.

THE CELOTEX CORPORATION, 120 SOUTH LA SALLE STREET, CHICAGO 3, ILLINOIS



Close-up photo of front, curved glass wall which gives excellent light to interior—helped by the trim aluminum structural mullions which also contribute to the clean-lined design. Elliptical canopy is free standing . . . supporting columns are encased by aluminum extrusions.

MONTCLAIR LIBRARY GOES ALUMINUM

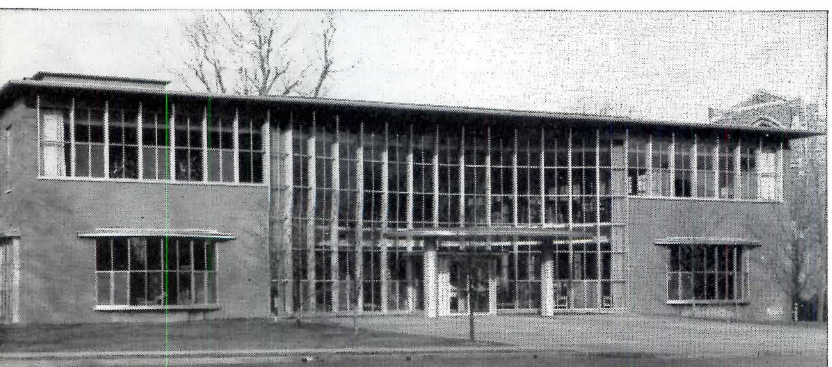
to meet budget and lower upkeep

In building a library that is friendly, functional and contemporary, Montclair turned to practical aluminum. Two-story structural mullions, window frames and an interesting entrance canopy make this an unusually attractive building. The aluminum decision helped keep costs within the budget and eliminated maintenance problems for the future.

An actual-size detail of the aluminum extrusions which form the structural mullions is shown on the next page.

Aluminum offers architects flexibility in design and exceptional practicality. Your nearest Alcoa sales office will gladly show you how and why. Or write: Aluminum Company of America, 1890-C Alcoa Building, Pittsburgh 19, Pa.

Over-all view shows contemporary harmony of aluminum when used with other materials. Carefully planned for future needs of the community, this library has three floors which serve children, teen-age and adult groups.



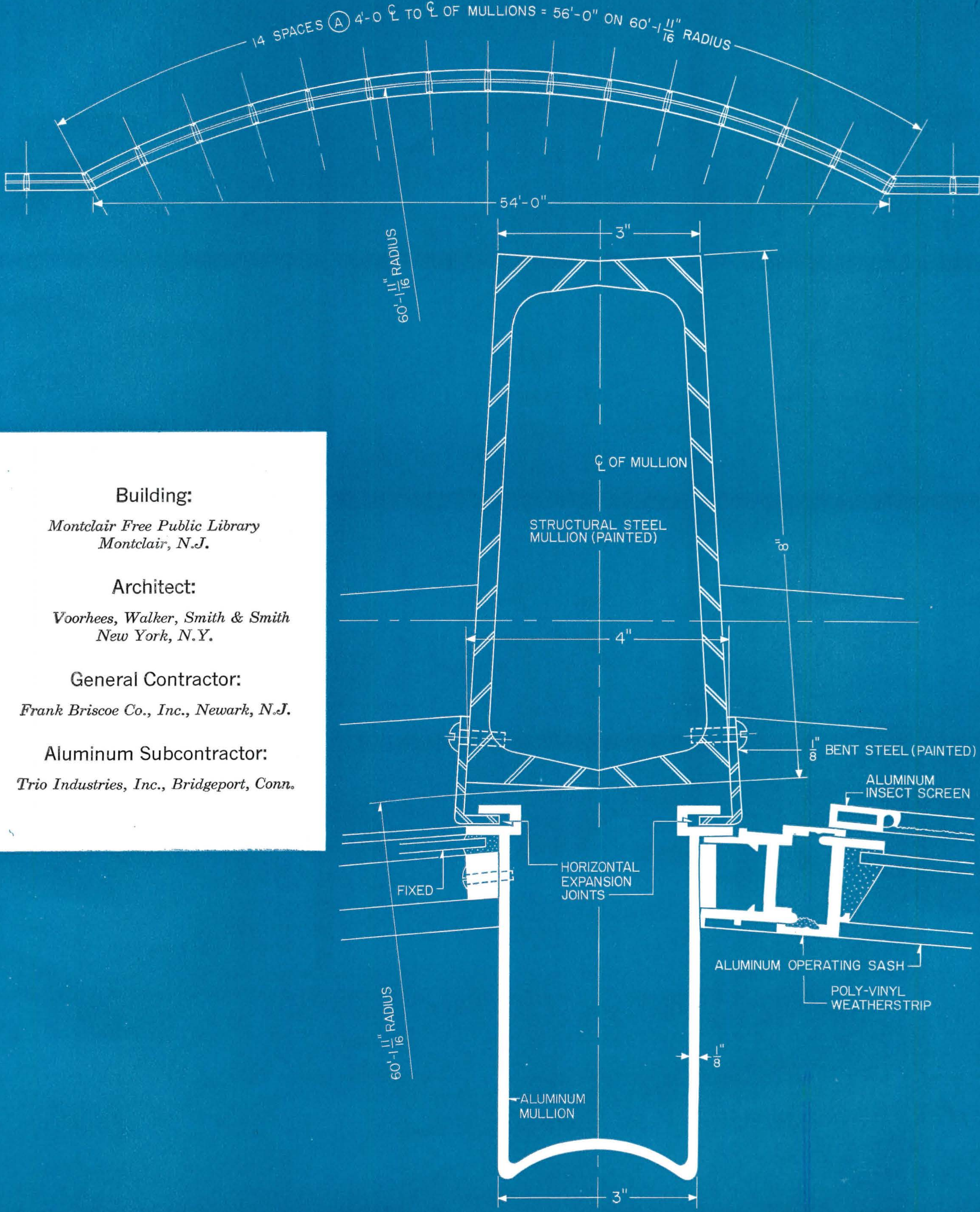
WE CHOSE ALCOA ALUMINUM MILL PRODUCTS
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

M NTCLAIR LIBRARY

Detail Aluminum Vertical Mullions, Main Entrance



Building:

Montclair Free Public Library
Montclair, N.J.

Architect:

Voorhees, Walker, Smith & Smith
New York, N.Y.

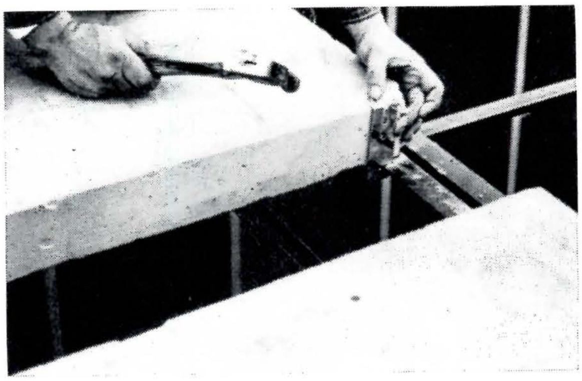
General Contractor:

Frank Briscoe Co., Inc., Newark, N.J.

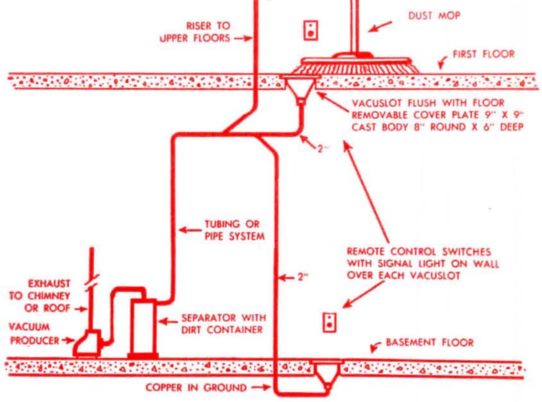
Aluminum Subcontractor:

Trio Industries, Inc., Bridgeport, Conn.

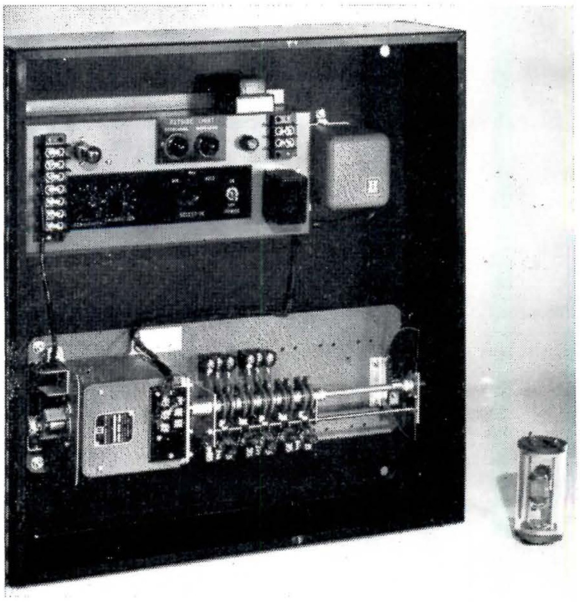
New application for mirrors is Signet Mobile Mirror—floor-to-ceiling sliding mirror door for closet and storage areas (above). *Mirror operates on nylon-tired ball-bearing hangars, is a complete-package product which can be easily installed. Additional storage space and interior design possibilities are features of this new product. Carolina Mirror Corp., North Wilkesboro, N. C.*



Centrally located vacuum producer and dirt separator combine to form sanitary cleaning system. Flush-mounted inlet valves receive dirt and dust from dry mops, erasers, cleaning cloths, and transport it through the system (below). *Vacuum hose up to 100′ allows cleaning of walls and floors* (left). *System is especially suited for schools, hospitals, office buildings. The Spencer Turbine Co., Hartford 6, Conn.*



Nails can be driven easily into new, lightweight, cellular building material fabricated by preformed foam process (above). *Primarily designed for use as roof decking, Calsi-Crete claims fire resistance, insulation, acoustical properties. Initial form will be planks—3″x20″x80″: weight 10.5 lb/sq ft. Versatility of material is demonstrated by its ability to be sawed, nailed, cut while remaining stable. Pacific Materials Corp., Div. of Continental Materials Corp., 4401 W. North Ave., Chicago, Ill.*



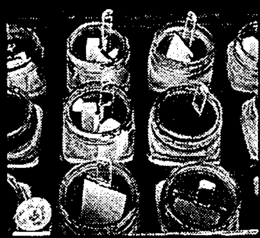
Automatic indoor lighting can now be obtained by use of control panel and phototube system (right). *Considerable saving of electricity is acquired by zone-control system—phototubes measure amount of daylight in each zone and signal switching motor, which decreases or increases amount of artificial lighting necessary in three or more stages. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.*

TRUSCON STEEL WINDOWS WITH

7 TOUGH TESTS PROVE SUPERCOAT PERFORMANCE

1. SOAK TEST simulates field condition of windows standing overnight in a pool of water before installation.
2. SALT SPRAY TEST parallels coastal area atmospheric conditions.
3. WEATHEROMETER TEST duplicates the field condition of exposure to strong sunlight.
4. ABRASION TEST simulates abrasive materials rubbing against frames during installation, and abrasives windblown after installation.
5. HUMIDITY TEST parallels field conditions of humidity inside and outside.
6. ALKALI TEST duplicates field conditions of washing windows with ammonia, rain dripping off mortar, plaster, etc.
7. MAR PROOFNESS TEST simulates field condition of sliding frames across one another in handling.

SUPERCOAT PASSED THEM ALL!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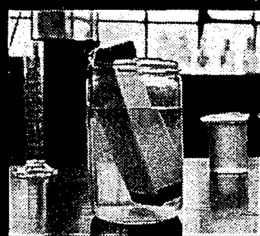
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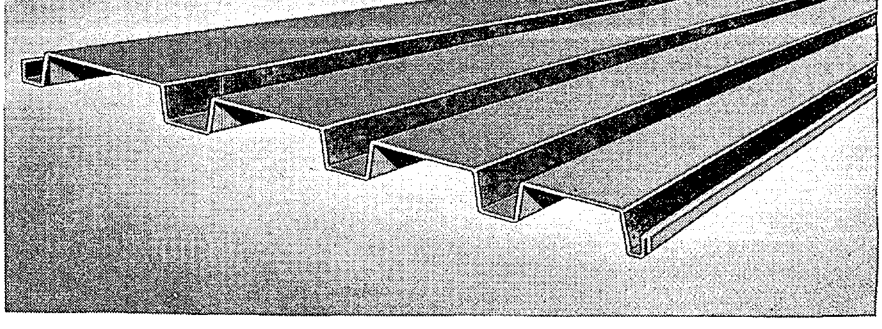
7.

NOW! Truscon Ferrobored® Steel Roofdeck is a full two feet wide. New, wider Ferrobord available in lengths up to 32 feet, 6 inches. It roofs large areas quickly. Straight lay means that several crews can roof without delay. All work is done from above—Ferrobord is quickly welded to top chords of joists or purlins. It is light, strong. Fire-resistant. Available now. Send coupons for specs.

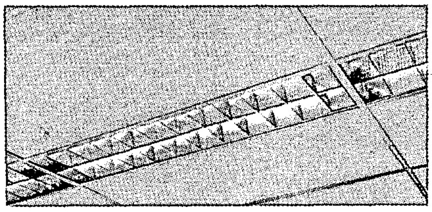


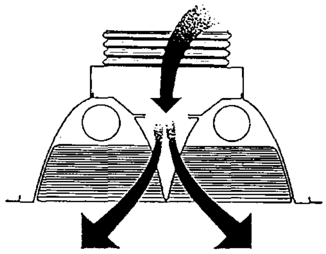
(Continued from page 211)

air and temperature control

R-316 Air-Flow Controller: device for controlling volume of air for high-velocity, double-duct air-conditioning systems allows individual room control. Change in hot, cold air in one room does not affect volume to other rooms. Minimum duct air pressure necessary. Johnson Service Co., 507 E. Michigan St., Milwaukee 1, Wis.

"Paraflo" Troffer: new troffer combines air diffusion and fluorescent illumination. Designed for installation in any suspended ceiling, unit (*below*) diffuses conditioned air through length of center parabolic louver of perforated metal. Low pressure





drop and low noise level are advantages of this type of diffusion. Center V (*above*) gives lateral deflection to air stream. Units can deliver up to 150 cfm at normal temperature differentials. Air stream does not contact ceiling. Volume control valve adjusts without removing louver assembly. Available in aluminum or white-enameled steel, 1'x4' and 1'x8' models for Rapid-start and Slimline lamps. Developed by Air Distribution Div., Barber-Colman Co., and Day-Brite Lighting Inc., 16 N. Ninth St., St. Louis, Mo.

Activated Charcoal: activated charcoal aids purification of air by absorbing gases, vapors, odors. Three distinct uses: purifying outside air for inside use, purifying inside air for reuse, eliminating atmospheric pollution. Most important use is purification of inside air for recirculation—aids heating and cooling costs. Use reduces ductwork necessary for air-conditioning systems, provides clean air particularly necessary in hospitals and industrial plants. Odor control is handled independently of heating and cooling. Barnebey-Cheney Co., Cassady at Eighth, Columbus 19, Ohio.

construction

ARC-Kleer: recently developed compound may be used as an adhesive for marble and stone. Material can be colored with mineral or paint pigment, making any mend invisible. Strength of bond is comparable to a weld—reinforcing rods not necessary to strengthen the joint. When used as filler, adhesive can be polished to slab finish. American Resin Corp., 3215 N. Sheffield Ave., Chicago 13, Ill.

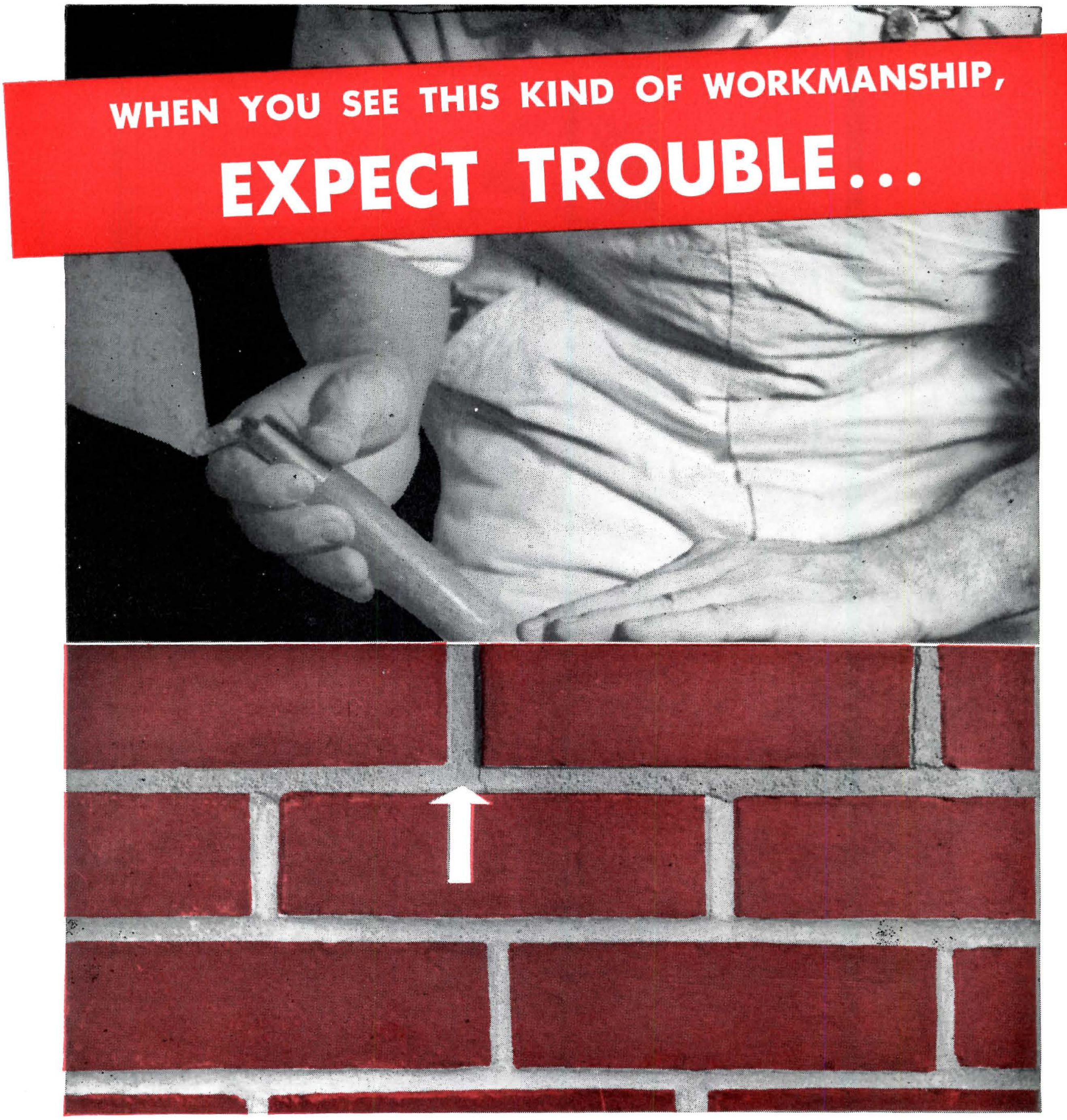
doors and windows

Aluminum Window: single-hung window is addition to general line—upper pane is permanetly sealed, no center lock is necessary. Tamperproof, permanent latch at bottom of lower sash automatically locks window when closed. Screens can be placed from inside house or building. Vinyl weatherstripping gives increased protection; adjustable spiral balances make operation simple. Capitol Products Corp., Mechanicsburg, Pa.

finishers and protectors

Aqua-Tyte: waterproofing agent claims complete stoppage of water flow through brickwork, concrete, stonework. Applied on masonry wall, material stops capillary action—application consists of mixing with cement, sand, water, and troweling onto

(Continued on page 216)



GOOD workmanship is one of the most important factors in preventing leaky brick walls.

Good workmanship includes wetting the brick, securing full head and bed joints, backplastering the face brick—*and laying the brick carefully to keep the bond. The position of the brick should never be shifted after the mortar has stiffened.*

Expect trouble when brick are shifted or tapped into place after the mortar has stiffened. Cracks will result and the wall may leak.

Brixment mortar has high water-retaining capacity. It resists the sucking action of the brick. It stays plastic and workable longer. Brixment mortar therefore makes it easy for the bricklayer to lay the brick accurately, before the mortar has stiffened.

Brixment mortar has great plasticity, high water-retaining capacity and bonding quality, great resistance to freezing and thawing, and freedom from efflorescence. Because of this *combination* of advantages, Brixment is the leading masonry cement on the market.

BRIXMENT

LOUISVILLE CEMENT COMPANY, Incorporated, LOUISVILLE, KENTUCKY

p/a products

(Continued from page 214)

wall. Material is composed of inorganic compounds, bonds easily to masonry; finish has color of portland cement. Particularly useful in slab construction. Dakota Engineering, Inc. Chemical Div., 6641 Crenshaw Blvd., Los Angeles 43, Calif.

Supercoat: new finish coat especially developed for protecting steel windows. Finish—applied over epoxy resin base coat—gives smooth, hard, glossy appearance; paint is oven-baked type enamel, modified for exterior exposure. Paint is similar to that used for appliances—has good adhesion, resistance to elements, durability. Truscon Steel Div., Republic Steel Corp., Youngstown 1, Ohio.

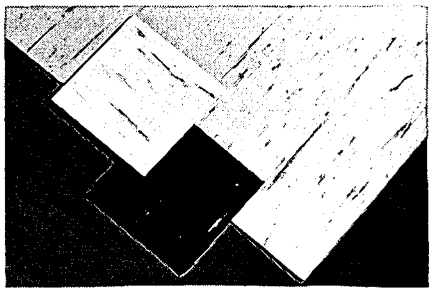
White Rustrem: anti-rust paint claims resistance to moisture, corrosion, as well as giving high light reflectivity. Useful for finished interior metalwork in areas of high humidity and production fumes. Finish also reduces maintenance problems when used for ventilator grills, radiators, oil and compressed air pipe lines. Speco, Inc., 7308 Associate Ave., Cleveland 9, Ohio.

insulation

Reflecto-Batt: double-foil batt has foil on both vapor barrier, breather surfaces, plain kraft paper on sides. Foil surfaces diminish entrance of heat into building frame; batt handles easily. Batt will come back to specified thickness after compression. Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

surfacing materials

Vynl-Flor: new vinyl flooring material is available in 12 colors, both tile and rolls. Gage: .08; thickness: ⅛". Properties claimed include dimensional stability, re-



silience, decoration. Photo (*above*) shows design pattern. The R.C.A. Rubber Co., 1833 E. Market St., Akron 5, Ohio.

Crystal-Glazed Tile: ceramic floor tile is now available in 12"x12" sizes. Body is frost proof, permanent—can be used outdoors as well as in lobbies, schools, patios. Line has 15 colors, 7 shapes, including hexagonal and octagonal. Stylon Corp., P. O. Box 341, Milford, Mass.

books received

Air Conditioning. Willis R. Goodrich, Willis R. Goodrich, Jr. The Ronald Press, 15 E. 26 St., New York, N. Y., 1957. 384 pp. $7.50

American Civil Engineering Practice. Vol. III. Robert W. Abbett. John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y., 1957. Illus. $25

Buildings for Industry. F. W. Dodge Corp., 119 W. 40 St., New York, N. Y., 1957. 309 pp., illus. $9.75

Origins of Functionalist Theory. Edward De Zurko. Columbia University Press, 2960 Broadway, New York, N. Y., 1957. 265 pp. $5

Perspective. Jay Doblin, Whitney Publications, Inc., 18 E. 50 St., New York, N. Y., 1956. 67 pp., illus. $5

The Art of Painting. Leonardo da Vinci. Philosophical Library, Inc., 15 E. 40 St., New York, N. Y., 1957. 224 pp., illus. $4.75

a new vision

The New Landscape in Art and Science. *Gyorgy Kepes. Paul Theobald & Co., 5 N. Wabash Ave., Chicago 2, Ill., 1956. 383 pp., illus. $15.50*

This is the most fascinating and stimulating book. If one may use a psychoanalytic analogy, its manifest content is a remarkable combination of text material and illustrations while its latent content is a flag of truce. The war (perhaps I should say cold war) that this book tries to end is the war between those two large abstractions of contemporary society; *art* and *science*. Let me hasten to add that my view of this book as a peacemaker is not based on the fact that both artists and scientists contributed to it. If that were the basis for decision almost half the books published today would deserve the appellation.

Let us say something more about the manifest content before returning to the somewhat more enticing task of the underlying "message" and its implications. The book is divided into ten major sections with such intriguing titles as: *Image, Form, Symbol; Analogue, Metaphor; Symetry, Proportion, Module.* Each of these sections is introduced by a discussion by Kepes. All but one are acompanied by a considerable number of exceedingly effective illustrations. Kepes' imaginative hand is ever present in the selection of these illustrations. His introductory discussions provide any sense of order that the book has. His writing has an attractive sense of urgency.

The contributions of the "guests" are charming, stimulating and, on the whole, quite unrelated to each other. What else can one expect when a book includes contributions by people of such varied interests as Semanticist S. I. Hayakawa, Physiologist Ralph Gerard, Architects Gropius and Neutra, Psychologist Heinz Werner, and Poet Richard Wilbur? Let me hasten to add that all these people are both creative and communicative. Many of them have

(Continued on page 224)

The RUSSWIN
UNILOC...UNITY DESIGN

INDESTRUCTIBLE

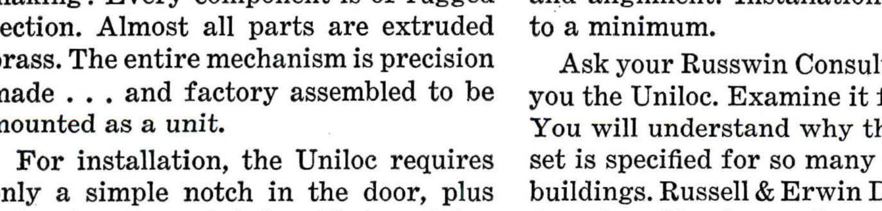
as a lock can be!

You get a lot of lock with this handsome heavyweight . . . a Masterpiece of Lockmaking! Every component is of rugged section. Almost all parts are extruded brass. The entire mechanism is precision made . . . and factory assembled to be mounted as a unit.

For installation, the Uniloc requires only a simple notch in the door, plus holes for through-bolts. No mortising . . . nothing to take apart or put together . . . virtually no chance of misapplication. Parts remain in factory-perfect fit and alignment. Installation time is cut to a minimum.

Ask your Russwin Consultant to show you the Uniloc. Examine it for yourself. You will understand why this fine lockset is specified for so many outstanding buildings. Russell & Erwin Division, The American Hardware Corporation, New Britain, Connecticut.

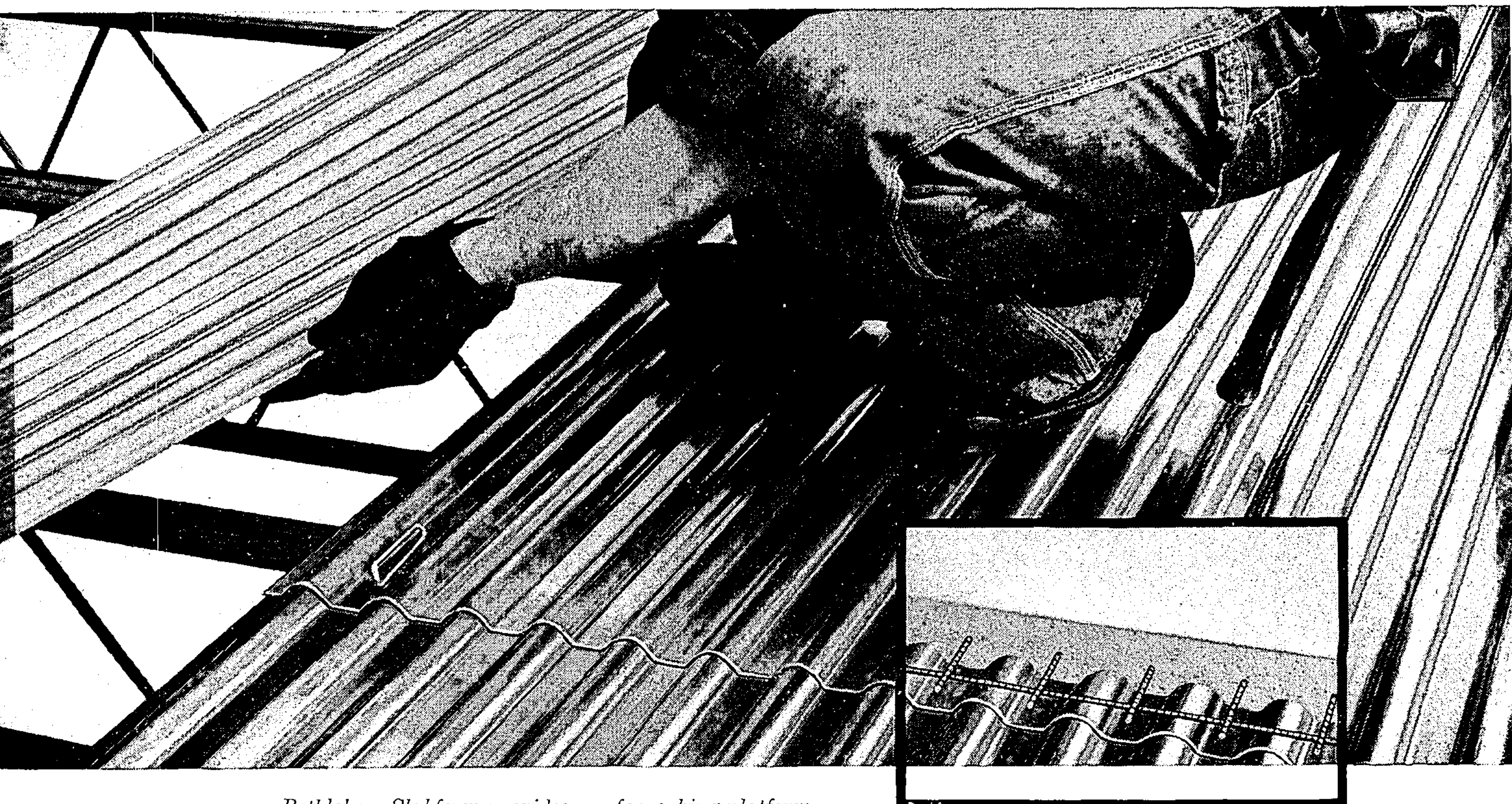
the new
UNILOC STRIKE
with Nylon
Screw Adjustment



"400" Closers | Overhead Door Holders | Stilemaker Locksets | "Ten Strike" Cylinder Locks | Surface Door Closers | Fire Exit Bolts

RUSSWIN
distinctive doorware

WHY BETHLEHEM SLABFOR
Saves You Time and Money



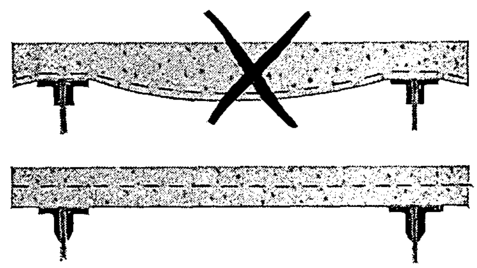
Bethlehem Slabform provides a safe working platform

Finishing operations start sooner

Here are seven reasons why you can save both time and money by by using Bethlehem Slabform, the steel form for concrete floors and roofs over steel joists:

- 1. The solid Slabform permits concrete finishing to start much sooner than is possible with "flexible" centering. You can pour, level, screed, and finish without time lag, saving considerable time and labor.
- 2. Eliminating the sag that occurs with "flexible type" centering saves ½ in. or more of concrete. For a 2½-in. slab this represents a concrete saving of approximately 20 per cent.
- 3. Slabform prevents concrete leakage and greatly reduces clean-up costs.
- 4. Slabform prevents rapid run-off of water, permitting proper "hydration" during curing period, resulting in stronger concrete.
- 5. Slabform prevents formation of "incipient cracking" which often occurs with "flexible type" centering in poured areas adjacent to those being concreted.
- 6. Just an ordinary pair of tin shears is all that's needed to cut and fit Slabform around special openings.
- 7. Slabform can easily be installed with clips (illustrated) or by welding through wing washers or by means of self-tapping screws.

Bethlehem Slabform makes the pouring of floors and roofs simple and rapid. Made from steel having a yield point of approximately 90,000 psi, Slabform provides a strong, stiff formwork. Slabform comes in laying widths of 24 in. and in lengths of 6 ft 3 in., 8 ft 3 in. and 10 ft 3 in., including 3 in. for end laps. Gage is 0.0156 in.



Eliminates sag, saves concrete

No leakage, reduces clean-up costs

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Adjustable header duct junction units move up or down to screed level ...cut installation time, assure a level finished floor

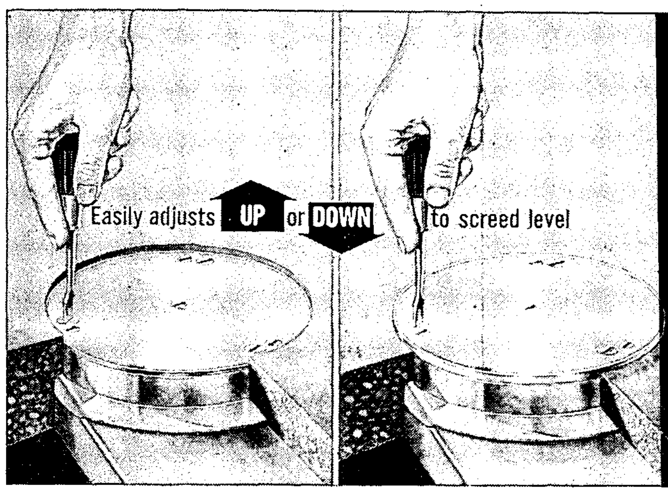
National Electric has developed an easily adjustable junction unit ring for its Header Duct Steel Underfloor Raceways.

The new Header Duct junction unit ring is designed to eliminate the raised spots and depressions that occur when underfloor raceway junction boxes protrude above or become recessed in the floor due to minor variations in the level of the concrete. Adjustment of three easily accessible flush screws in the cover of the unit is all that's required to level the ring with the concrete surface . . . assures a smooth, level, attractive finished floor.

National Electric junction unit rings can be moved down as well as up after the concrete has set. A galvanized steel collar around the junction unit ring keeps concrete from bonding to the ring and preventing a downward adjustment.

The newest Header Duct improvement is typical of how every detail in NE Header Duct is engineered to help you give the owners and tenants complete flexible electrical distribution for power, light, communication or telephone—where and when it's needed.

When the plans call for cellular steel floors with feeder raceways from distribution panels make sure NE Header Duct, with adjustable junction units, are specified.



Where you plan cellular steel floors with underfloor electrical distribution always specify

NE HEADER DUCT

National Electric Products

PITTSBURGH, PA.

2 Plants ∘ 12 Warehouses ∘ 41 Sales Offices

reviews

(Continued from page 218)

something to say and I defy any person to read through their contributions and not come out with some fresh ideas about problems of design. But they have not set the central theme of this book; for that we must look to Kepes. This brings us back to the latent content.

Having already said that the central theme of this book was some sort of mutual security pact between *art* and *science*, one feels some need to defend it and in the process say a little more about the book. Let us begin with the fact that *science* has changed the world in which we live and in the process changed us. What can the artist or the designer do? He can, for one thing, attempt to hang on to the abstractions he has used in the past and reject the ugliness of the "new landscape." Or, as I think Kepes suggests, he can face up to the new world and attempt to build his creativity on and around it. Our perceptions are constantly being expanded and changed by advances in science such as our techniques for increasing our sensory capacities, for example, the electron microscope. Our industrial advances are changing the shape of our world.

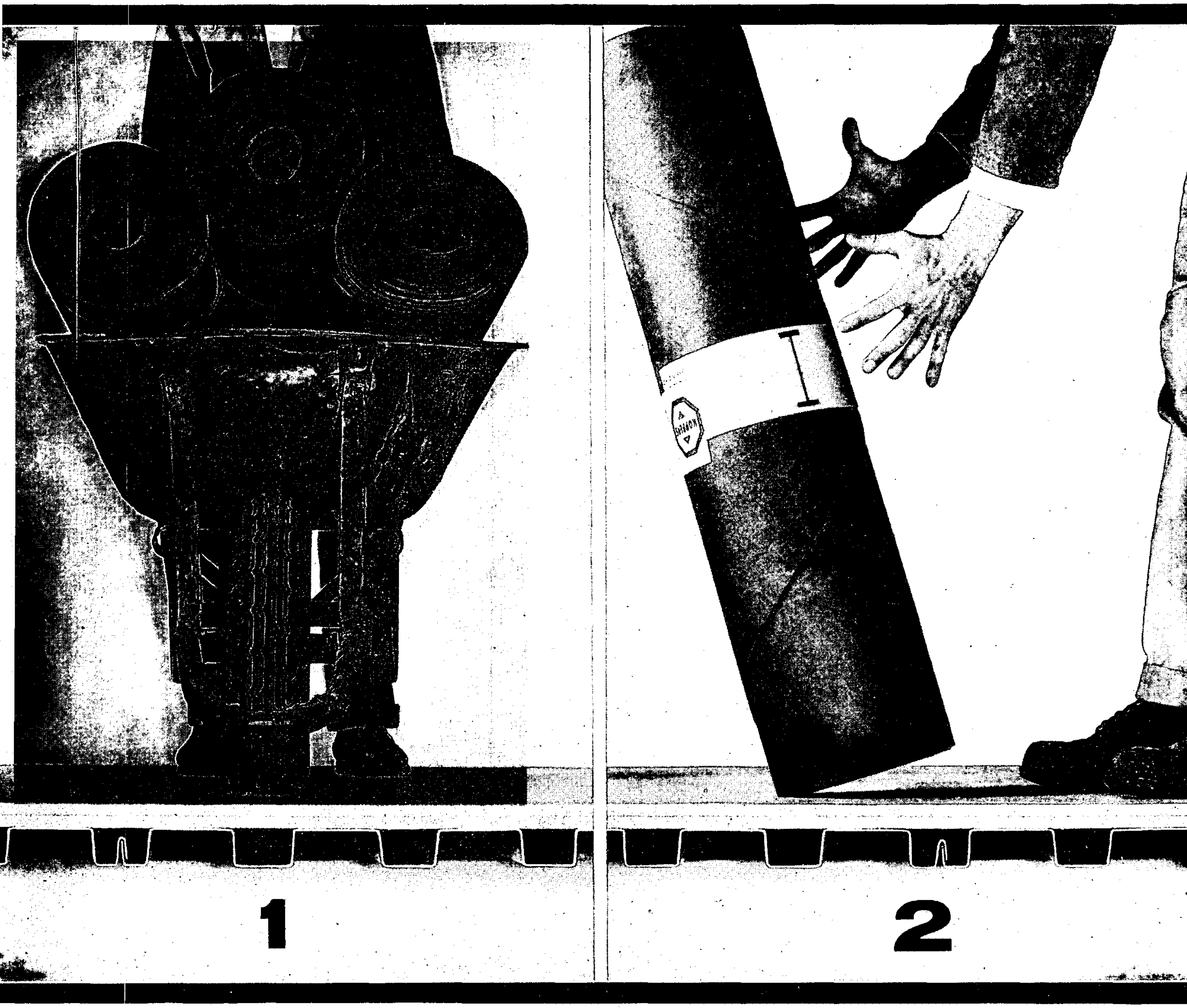
Artistic activity is a necessary aspect of a productive civilization, but the artist must change with the times. How must he change? According to Kepes, the change must occur at the level of his perception of the world. This entails a psychological assumption (one that your reviewer happens to agree with). Namely, that our view of the world, how it looks to us, what is beautiful and what is ugly, is a function of the assumptions we have learned to make about the world. The world is not given to us perceptually, we must learn to see it. *Art* and *Science* are similar in that both entail the process of abstracting significant parts of our environment— focusing our attention on them. Thus they are not in conflict but are engaging in similar acts using different methods and with somewhat different purposes. However, science is creating new abstractions and the artist can use them. Kepes sums this up in the preface when he says, "science has opened up resources for new sights and sounds, new tastes and textures. If we are to understand the new landscape, we need to touch it with our senses and build the images that will make it ours. For this we must remake our vision."

So, the central thesis makes the contributions by the scientists to this book somewhat more meaningful. They now stand as examples of the new worlds of perception that science is opening up. New abstractions, new forms are available to us. The wonderful microphotographs of cell structures, the technique of photographing heated air around a Bunsen burner; all these things pre-

(Continued on page 228)


Neville, Sharp & Simon, Architects
MODERN DOOR CONTROL BY LCN · CLOSER CONCEALED IN HEAD FRAME
JANE G. PHILLIPS MEMORIAL HOSPITAL, BARTLESVILLE, OKLAHOMA
LCN CLOSERS, INC., PRINCETON, ILLINOIS
Construction Details on Opposite Page

3 tests of strength



These tests can be made at any roof job: **1.** BARROW TEST. Run heavily loaded barrow on line between support surfaces. **2.** DROP TEST. From height of 12 inches, drop wrapped roll of roofing felt, letting edge strike insulation. **3.** HEEL TEST. Kick the insulation sharply, at any point between flat support surfaces. In these tests, Insulite Roof Insulation will not crack, crush or break through. 1-inch Insulite Roof Insulation was used in tests illustrated.

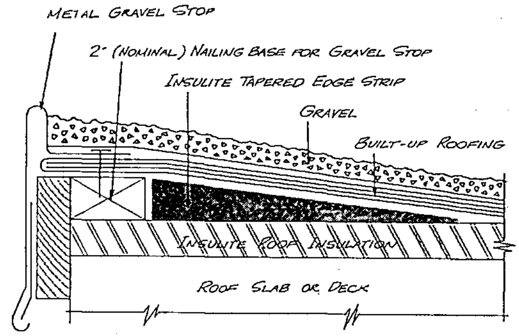
build better and save with

INSULITE®

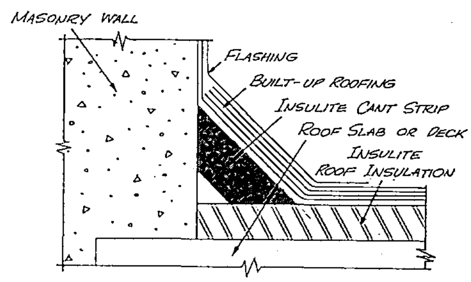
INSULITE, *made of hardy Northern wood,* Insulite Division of Minnesota and Ontario Paper Company, Minneapolis 2, Minn.

roof insu.a.ion

For better roofs, specify these accessories



Announcing . . . Insulite Tapered Edge Strip! Here is a valuable new product—an important "finishing touch" to make roofs more perfect than ever before. Insulite Tapered Edge Strip is bevel-cut from Graylite Roof Insulation. Used at outer edges of flat roofs, it underlies felt layers, eliminates sharp angles where cracks often develop, carries felt smoothly over edge nailing member. May also be used at any point on flat roof area to channel drainage. Tapered Edge Strip measures 1⅝" at thick edge, tapering to ⅛". Width is 12". Strips are delivered in 4' lengths.



Insulite Cant Strips have long been accepted as the ideal angle-breakers at points where roof surface meets any vertical surface. Made in two sizes, 3"x3" and 4"x4".

Here is practical proof of Insulite's superior strength . . . and the news about Insulite Tapered Edge Strip

For the architect who does not have time to study newest detailed technical data on built-up roofing, one simple fact may be most helpful: *today, more than ever before, a sound, trouble-free roof demands insulation with high transverse and compressive strengths.*

These strength properties are needed to resist cracking, crushing, flexing—especially with heavy rooftop equipment now in use.

To demonstrate, in the simplest possible way, the high strength of Insulite Roof Insulation, we suggest the three simple tests illustrated in the photos above. Obviously, any material that can withstand such punishment can be trusted to handle severe blows and heavy loads.

With Insulite on the deck . . . and Insulite's new Tapered Edge Strips and cant strips in place . . . a fine, long-lasting roof is well begun. Want information? Write us—Insulite, Minneapolis 2, Minnesota.

(Continued from page 224)

sent a new stimulus to the designer. Sculptor Naum Gabo states the goal of the artist very well when he concludes his excellent discussion of *art* and *science* with the following:

"On the other hand, it would be a relapse into the old naive naturalism if the contemporary artist should start to reproduce the new forms of nature which the scientist is unfolding, taking for granted the scientist's vision as he, the scientist, is representing them. That would amount to nothing more than a waste of energy and be of no account since it would only repeat what the scientists have already done. The artist's task consists in bringing forth an image which is in a language of its own, acceptable to all men, and is imparting his message without the help of anything other than his own pictorial and plastic means. It is in this way that art always acted on the psychology of man and it is in this way it can and shall still act in our time of ever widening and ever more inspiring horizons."

Note that he has not given the scientist and the artist identical tasks. On this point, I leave to the reader the delightful story by Richard Wilbur as to how science and art may deal with the same phenomenon with somewhat different abstractions and, thus, somewhat different language. Good, but let him not forget that they have great capacity for mutual stimulation.

This is an important book. It has some ideas in it and various people will see different ideas because there are many there. One thesis is inescapable, *art* and *science* must interact. The days are gone when the artist, the designer, and (most important) the architect can escape from the world of science. The retreat into intuition is no longer possible. The creative artist must create in the world that science is constantly altering and expanding.

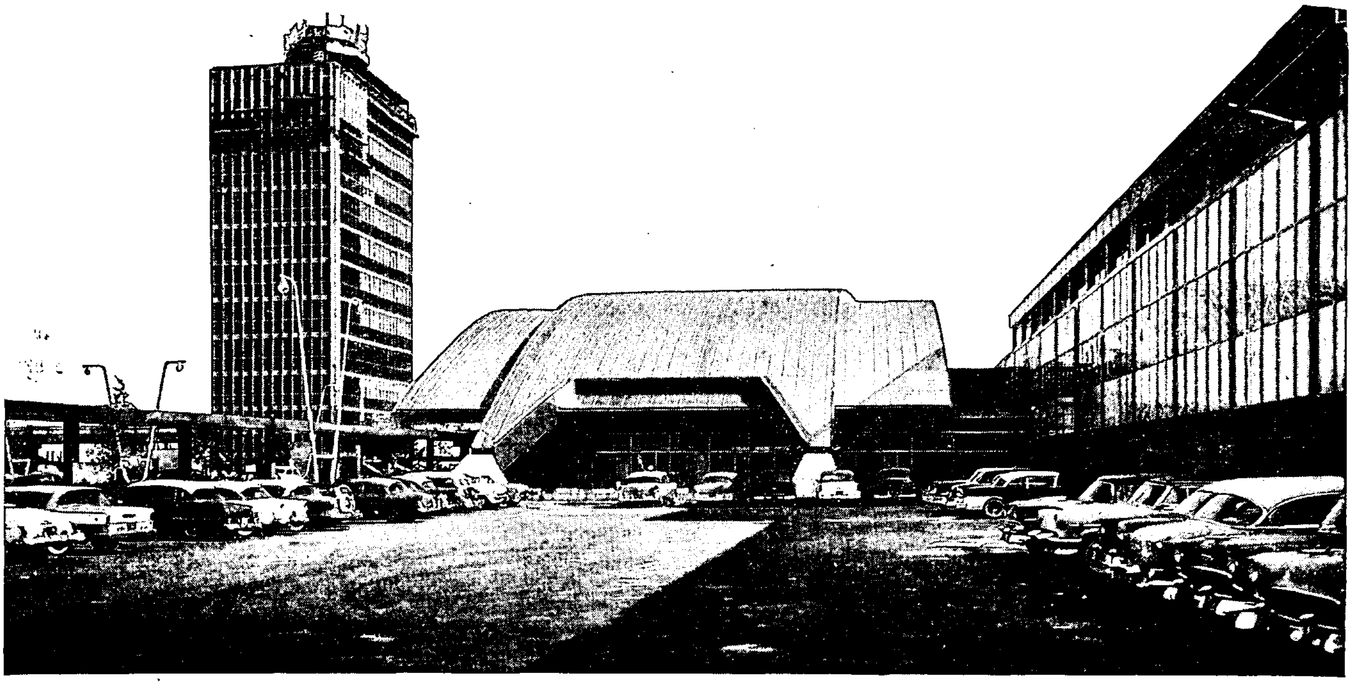
PROF. ALBERT H. HASTORF
Department of Psychology
Dartmouth College
Hanover, N. H.

•

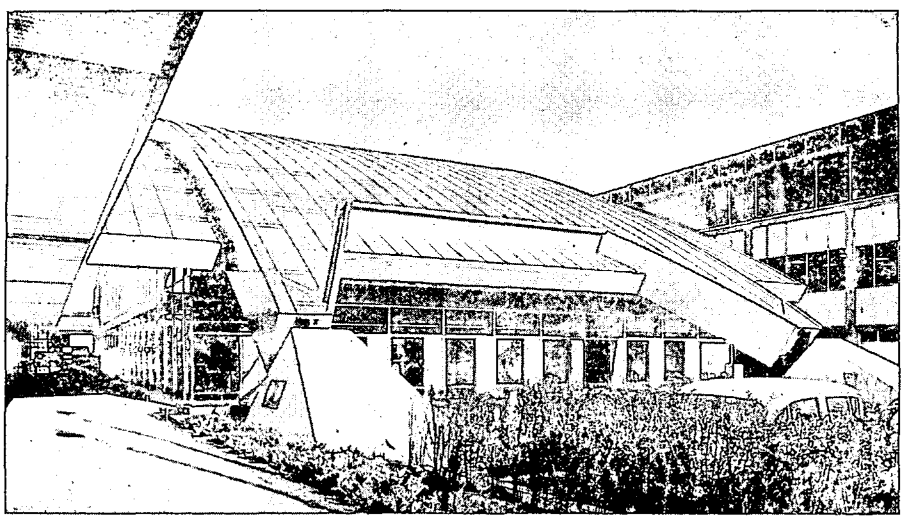
The 20th Century has been searching for a valid and generally acceptable esthetic; and it does *not* see as a possibility for artistic creation the direct employment of historical precedent. But this has almost always been true; every age, every great period in the course of civilized history had acknowledged its own relation with Nature, its own peculiarly unique set of intellectual precepts and artistic ideals. The 16th Century in Italy is as different from the Golden Age of Augustus as the Fables of James Thurber are from those of Aesop.

To be sure, the present century has been heir to a long past; but unlike preceding times, it is *now* the heir to an open and seemingly limitless future; it is rare today (and

(Continued on page 232)



Main concourse roof and 11-story control tower viewed from one of the two adjacent inside-court parking lots. The stainless sheathed arch spans 238', is 107' deep and 48' high.



Close-up of the two triple-hinged, 6' deep plate girders which span 238'. Girders act like bridge trusses . . . make the roof self-supporting yet flexible. Girder fascia is $\frac{3}{16}''$ aluminum anodized gray, also erected by Overly.

(Continued from page 228)

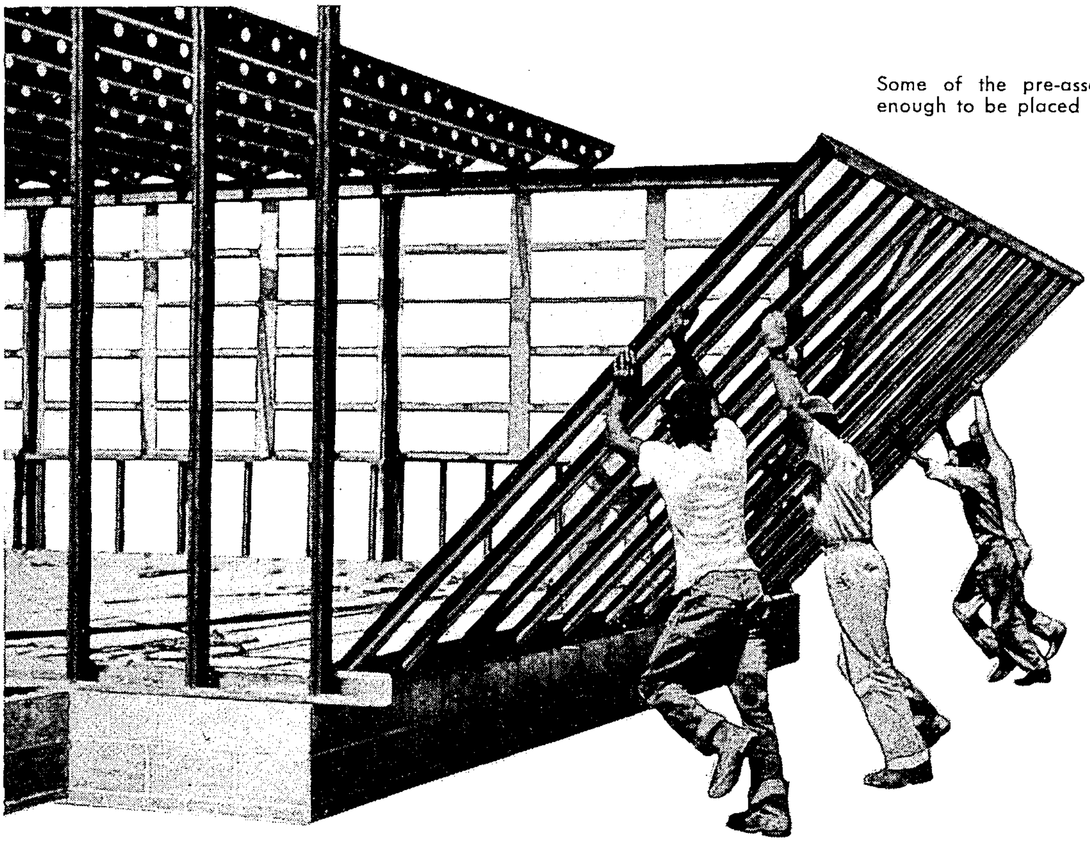
outmoded, though charming at times) that one can look back romantically to the past and be inspired by it to create something of value. Science has advanced the thinking of the age to a point where Henry Ford's motor car and the era that produced it seem remote indeed. We are living our present in the future—*the future has become our present.*

What has brought about this startling idea is the unbelievable acceleration in the advancement of science and technology. This advancement has brought about new means of doing practically everything, even dying. And a familiar problem poses itself: how is art to reconcile itself to the new technology. Most architects, artists, and sculptors have arrived at some solution to the problem; they use the materials and methods, even the ideas, that technology has invented, to meet the demands of art. But the fusion of art and science has never, up to the present, been absolutely complete.

Gyorgy Kepes in his extraordinary volume, *The New Landscape*, has attempted to bridge this difference between art and science. He has attempted to show that the visions of art and science are one and the same thing, that the natural world which we all inhabit and perceive is very large indeed, and that our perception — scientific and esthetic— must comprehend that vast panorama, sometimes ugly and often beautiful, which appears before us.

Our senses, dull as they are (it has been said that certain angels have as many as ten senses of perception), cannot keep pace with scientific *discovery* but yet how wondrous it is: the possibility of new forms, new ideas, a new vision. Kepes has suggested the symbols, images, even the methods by which we can make the expanding vision of the universe completely our own. What would a new vision mean for

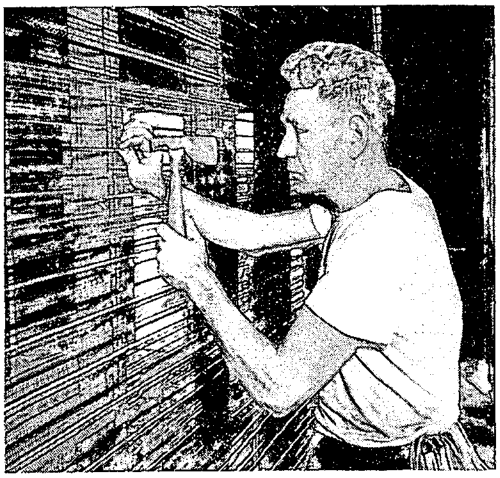
(Continued on page 238)



Some of the pre-assembled panels were light enough to be placed by 3 or 4 men.

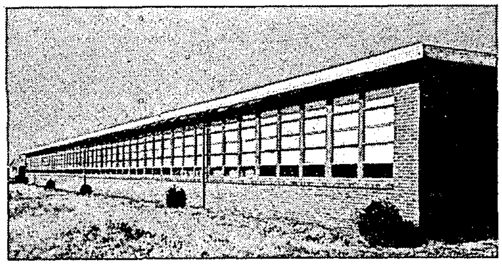
Framed with LIGHTSTEEL

Virginia Schools go up in record time



ABOVE: LIGHTSTEEL nailing feature speeded metal lath attachment.

BELOW: Camellia Elementary School, Princess Anne County, Va.



Facilities including eight to twenty-eight classrooms *completed in one-half normal time* — that's the speed record set in Virginia during the erection of eleven modern schools.

All were built to high standards, using Penmetal LIGHTSTEEL structural sections, metal lath and plaster. The LIGHTSTEEL was assembled into wall panels and welded at the plant of J. K. Parker, Inc., London Bridge, Virginia, then trucked to the job site and quickly placed. Mr. Parker says, "The steel framework for an 8-classroom building can be completely erected and the building 'closed in' in about 15 days."

A number of factors account for the low cost, high-speed erection of the schools. LIGHTSTEEL is inexpensive, light in weight, has a nailing feature. What's more, ease of fabrication enabled J. K. Parker and architect A. Ray Pentecost, Jr., to develop the pre-assembly system which contributed many time-saving features.

Send for further details of these schools. Also ask for a copy of catalog SS-22.

PENN METAL COMPANY, INC.

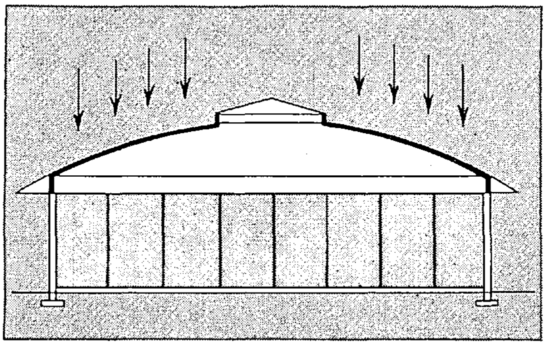
General Sales Office: 40 Central Street, Boston 9, Mass.
Plant: Parkersburg, W. Va.
District Sales Offices: Boston, New York, Philadelphia, Pittsburgh, Chicago, Detroit, St. Louis, Dallas, Little Rock, Seattle, San Francisco, Los Angeles, Parkersburg

METAL MARK
Penmetal
1869
OF QUALITY

a name to remember

PM-163

new approaches to structural design with fir plywood



Engineering tests by Douglas Fir Plywood Association showed vault resists three-times-normal roof load. Deflection at midspan was negligible. Note how door-high roof line saves wall area.

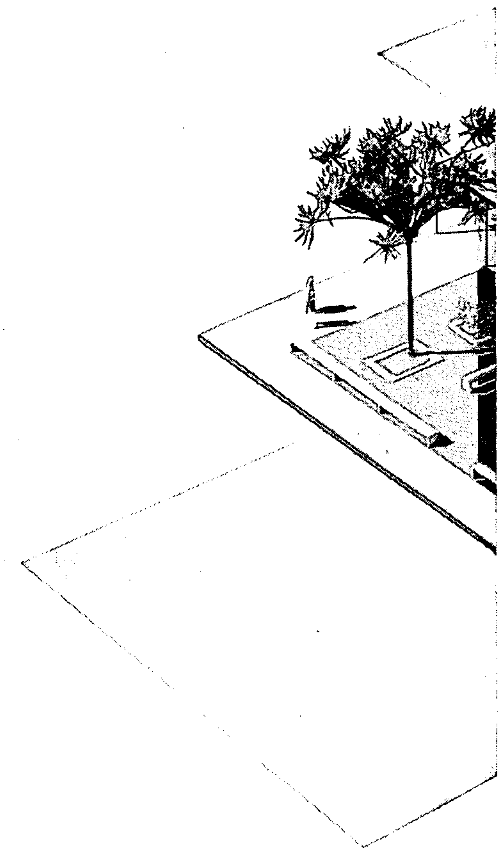
FIR PLYWOOD

ARCHITECT: Robert B. Price, A. I. A., Tacoma, Wash.
Robert C. Wing, Consulting Engineer

IN THIS graceful stressed-skin fir plywood domical roof, Architect Price has developed a simple and precisely engineered unit that combines beams, purlins and roof sheathing.

The first application of this new semi-spherical roof system is in the four-room satellite school shown at right. In its design, Price sought to create "an exciting and stimulating space with a high degree of flexibility and substantial construction economies."

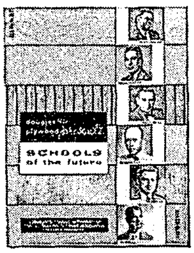
Adaptable to other types of buildings, the Price roof system is a logical design evolution in which lightweight fir plywood replaces heavier and costlier materials. It provides a long, post-free span, pleasing mass and profile, has excellent lighting, insulation and acoustical properties.

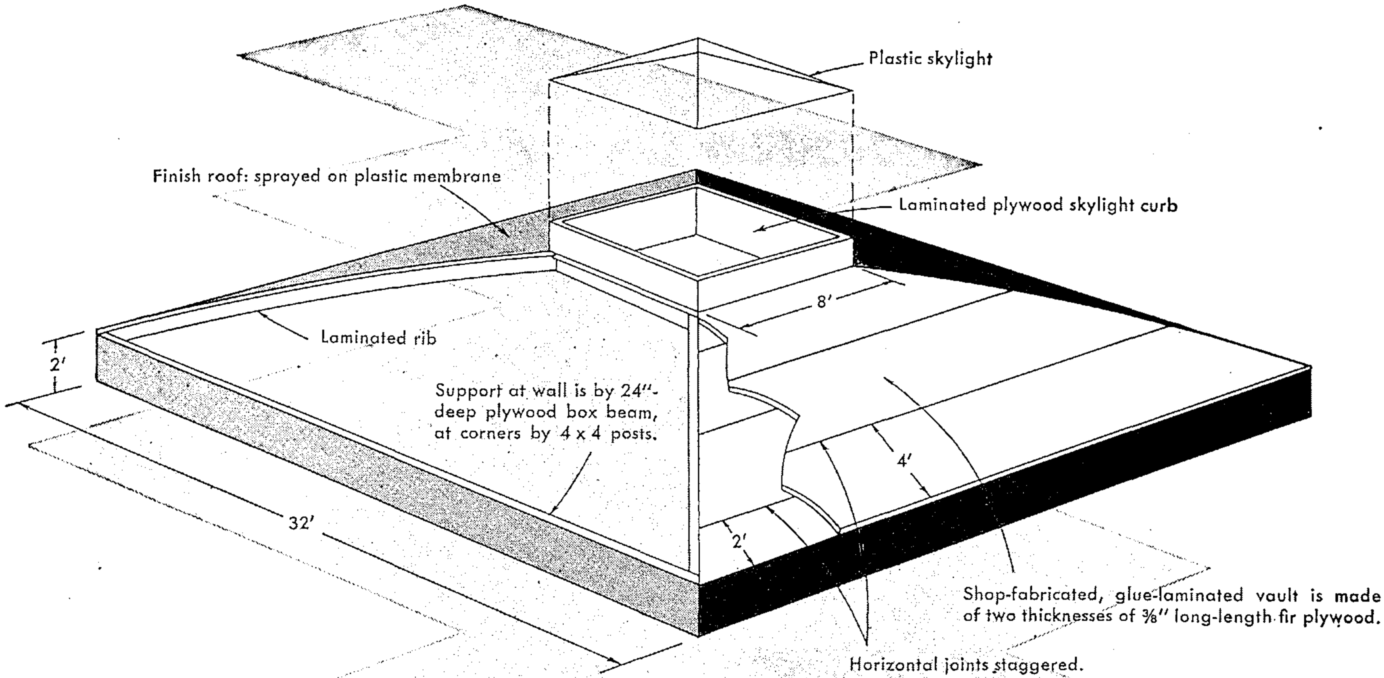


ONE OF A SERIES FROM "SCHOOLS OF THE FUTURE"

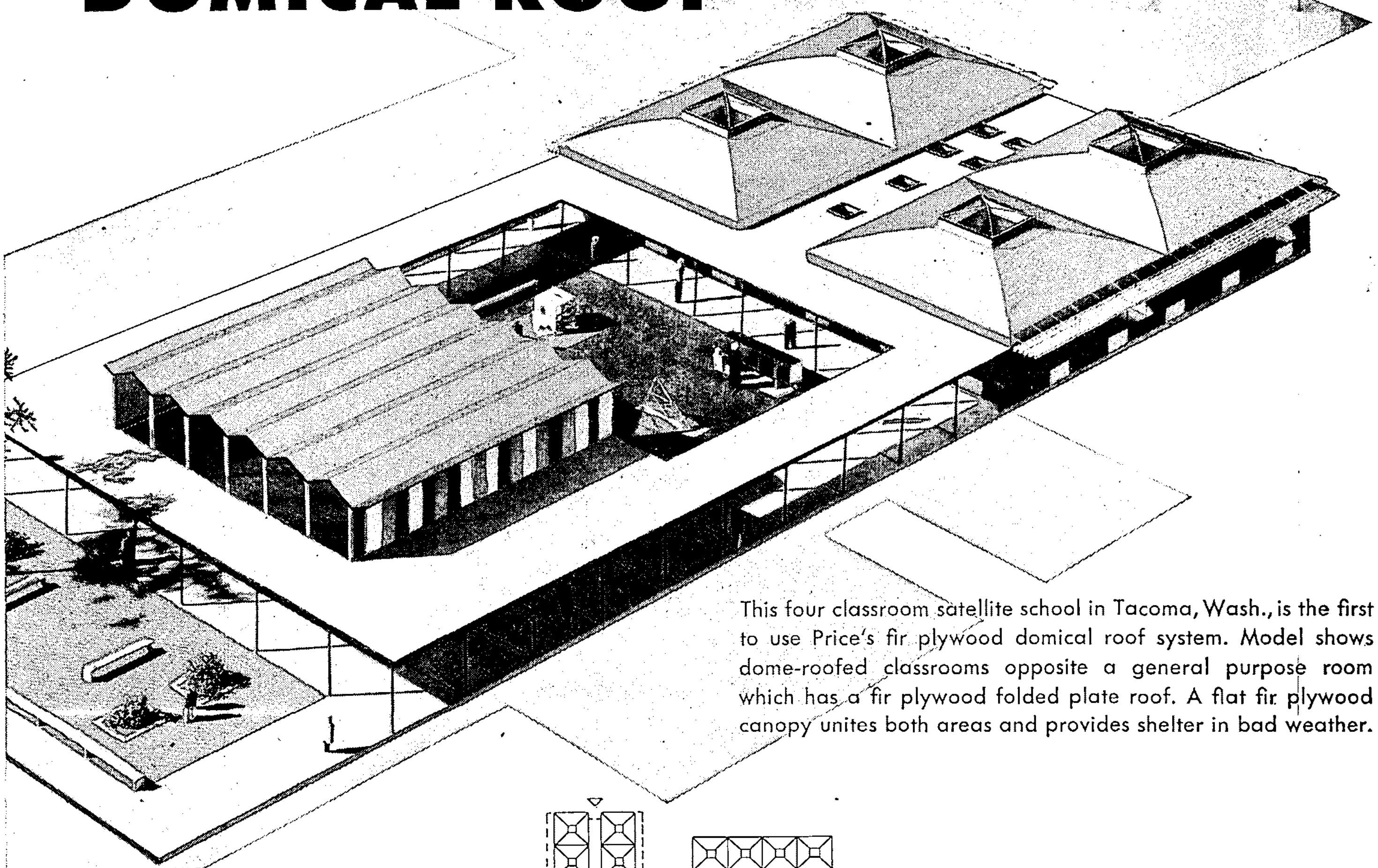
. . . a portfolio collection of outstanding designs by six leading architectural firms. Includes details on domical roof shown above. For your free copy, write (USA only) Douglas Fir Plywood Association, Tacoma, Wn.

Also write for information about fir plywood design and engineering consulation services.

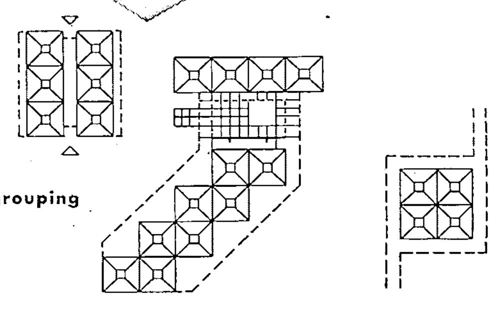




DOMICAL ROOF



This four classroom satellite school in Tacoma, Wash., is the first to use Price's fir plywood domical roof system. Model shows dome-roofed classrooms opposite a general purpose room which has a fir plywood folded plate roof. A flat fir plywood canopy unites both areas and provides shelter in bad weather.



Units can be placed in any grouping

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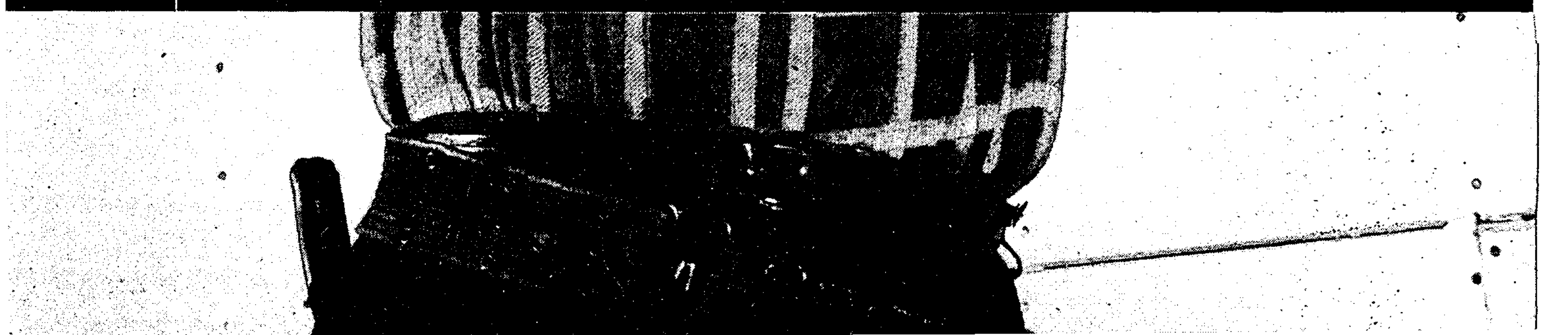
THE EBY SYSTEM OF LATHING. Instead of staggering end joints of gypsum lath, longitudinal joints are staggered. Keycorner lath is applied to the continuous joints at 4 ft. intervals. Then, through the center of the room, one strip of 1″ x 20 ga. Keymesh, 36″ wide, is applied. This adds extra reinforcement where it's needed and assures full thickness of plaster.



reviews

(Continued from page 232)

art, for design, for beauty? The question is almost as exciting as an answer.

Kepes has given many answers in a collection of essays by himself and by many whose work and integrity, artistic and scientific, have gained both respect and confidence. *Richard Neutra* contributes "The Inner and Outer Landscape." In "The New Landscape," *Fernand Leger* states: ". . . My work in its development is, I believe, marked by this instinctive need to be based upon the new vision and in the spirit of my time."

Sigfried Giedion writes in his essay, "Universalism and the Enlargement of Our Outlook": "The desire to unveil the secrets of the phenomenon of growth; to find an answer to the riddle of form and Gestalt; to discover more about relationships within a limited whole; and also to understand the relationship of this with other wholes: all this is part of the inner will of our civilization."

Walter Gropius states in "Orientation": "Design is becoming again an integral part of our life—a thing dynamic, not static. It lives, it changes, it expresses the intangible through the tangible. It brings inert materials to life by relating them to the human being. Thus conceived, its creation is an act of love."

Jean Arp has written "Transformation"; *Bruno Rossi*, "The Esthetic Motivation of Science"; *Richard Wilbur*, "Poetry and Landscape." In short, Kepes' work presents a sum of the modern movement in many of its most advanced and brilliant facets.

That Kepes has organized his work in the way he has is a miracle of synthesis. In addition to the essays, Kepes has included a truly startling set of some 450 photos, which demonstrate the possibilities of a new vision. The formerly invisible is now capable of being seen. The spectrum of nature and art becomes one.

(Continued on page 246)

GLARE REDUCING SHEET GLASS

Architects specify american LUSTRAGRAY

for efficiency, comfort, appearance, economy

Photo from interior. LUSTRAGRAY glazing reduces sun glare.

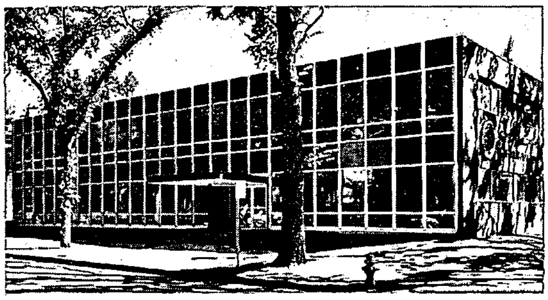


Photo from exterior. LUSTRAGRAY glazing enhances appearance of new office building of Aetna Life Insurance Co., Denver, Colo. Architect: *Thomas J. Moore.* Glazier: *Gump Glass Co.*

With AMERICAN LUSTRAGRAY, large window areas, which increase occupants' efficiency by creating a feeling of space and freedom from confinement, can be designed without detrimental effects. This neutral gray glass:

- Reduces sun glare 50%, minimizing eyestrain and fatigue
- Reduces heat transmission
- Provides exterior skin wall effect and interior "clear glass" vision
- Makes permanently attractive appearance
- Assures maximum economy

AMERICAN LUSTRAGRAY is available through more than 500 glass jobbers. Thicknesses: 3/16″, 7/32″, ¼″. Maximum size: 6′ x 10′. Check your classified telephone directory for listing. For literature, write our Architectural Promotion Department.

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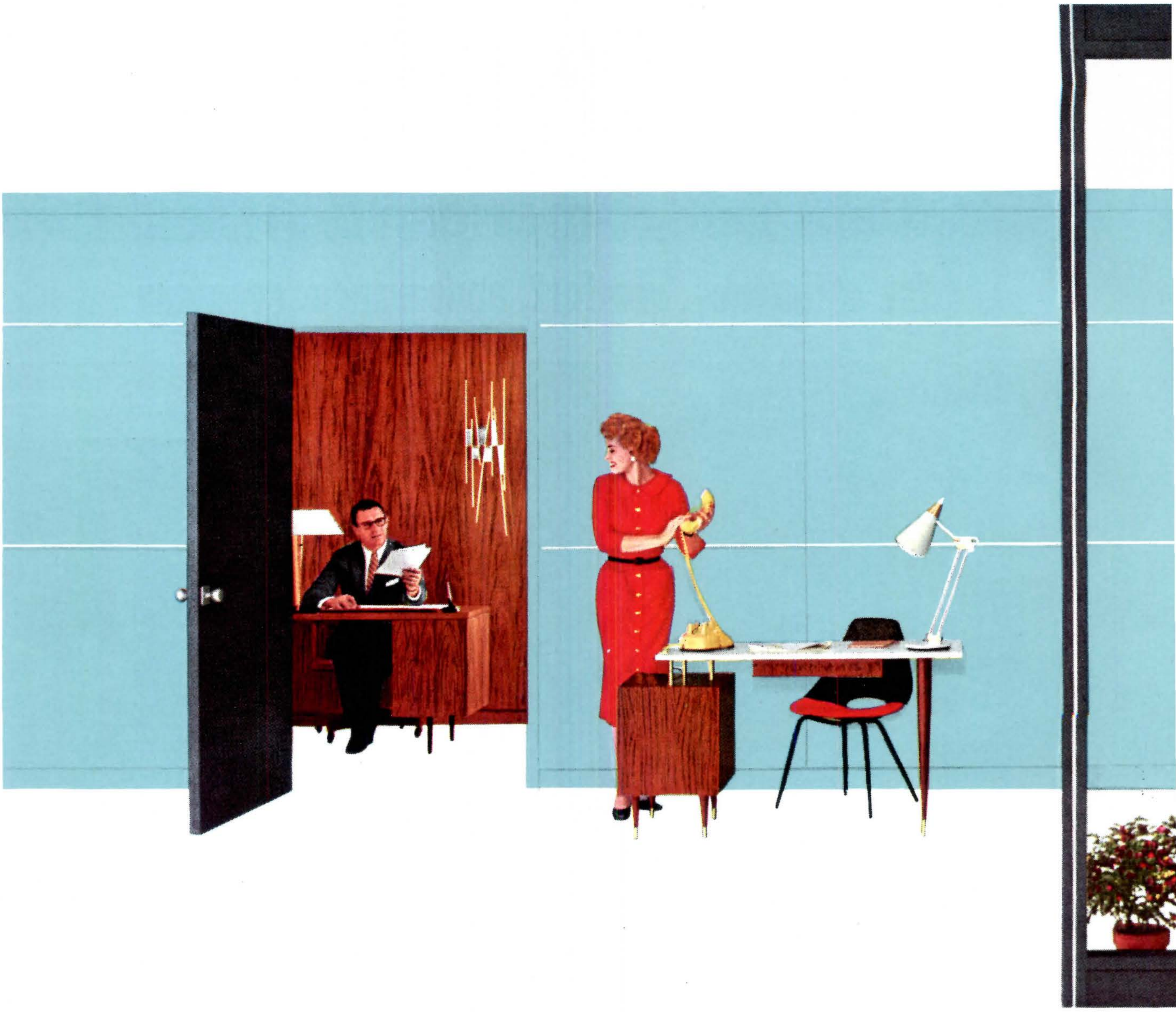

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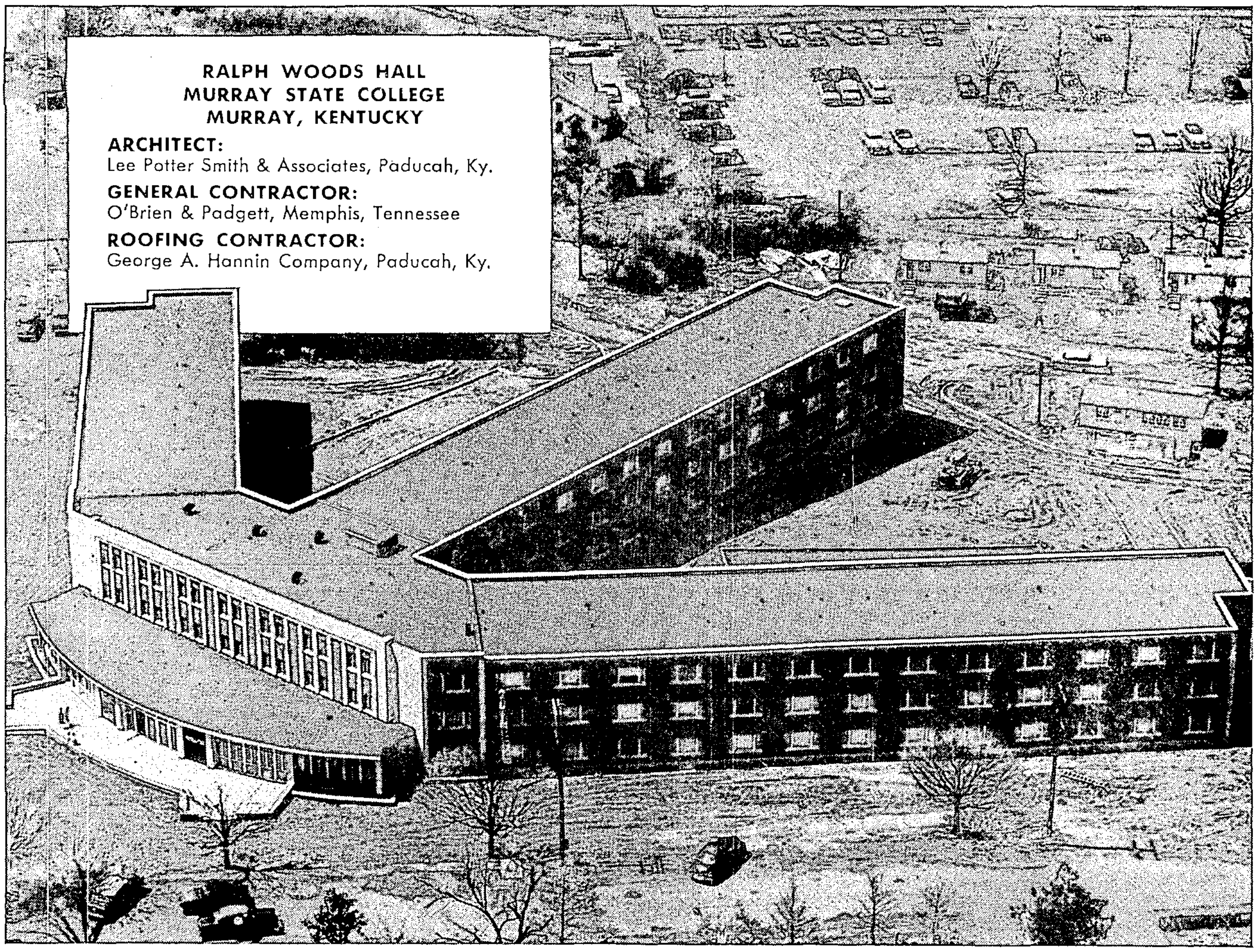

On Murray State College's new dormitory . . .

A RUBEROID BUILT-UP ROOF

Was engineered to fit the job

Ralph Woods Hall, the new dormitory for women at Murray State College, has a unique design feature. Three dormitories are joined into one by connecting three wings with a large circular lobby.

But there is nothing unique in the use of Ruberoid Built-Up Roof specifications. The fact that Ruberoid Built-Up Roofs are the answer to many roofing problems has long been known to progressive architects and builders everywhere.

In engineering the roof construction to fit the needs of the building, three different Ruberoid specifications were used. The largest portion of the roof—398 squares —is Coal Tar Pitch and Tarred Felt with a Gravel Finish (Specification #202). A second section is a Dubl-Coverage Mineral Surface Roof (Specification #159). In still another area, Asbestos Felt and Asphalt Felt with a Smooth Finish (Ruberoid Specification #208) was used.

As with all Ruberoid Built-Up Roofs, rigid standards of manufacture will assure Murray State College of many more years of trouble-free service for their roofing dollar.

Ask your Ruberoid Approved Roofer to demonstrate the advantages of Ruberoid products when next you are faced with a built-up roofing job. You will find that there is a Ruberoid specification to fit whatever requirements you may have.

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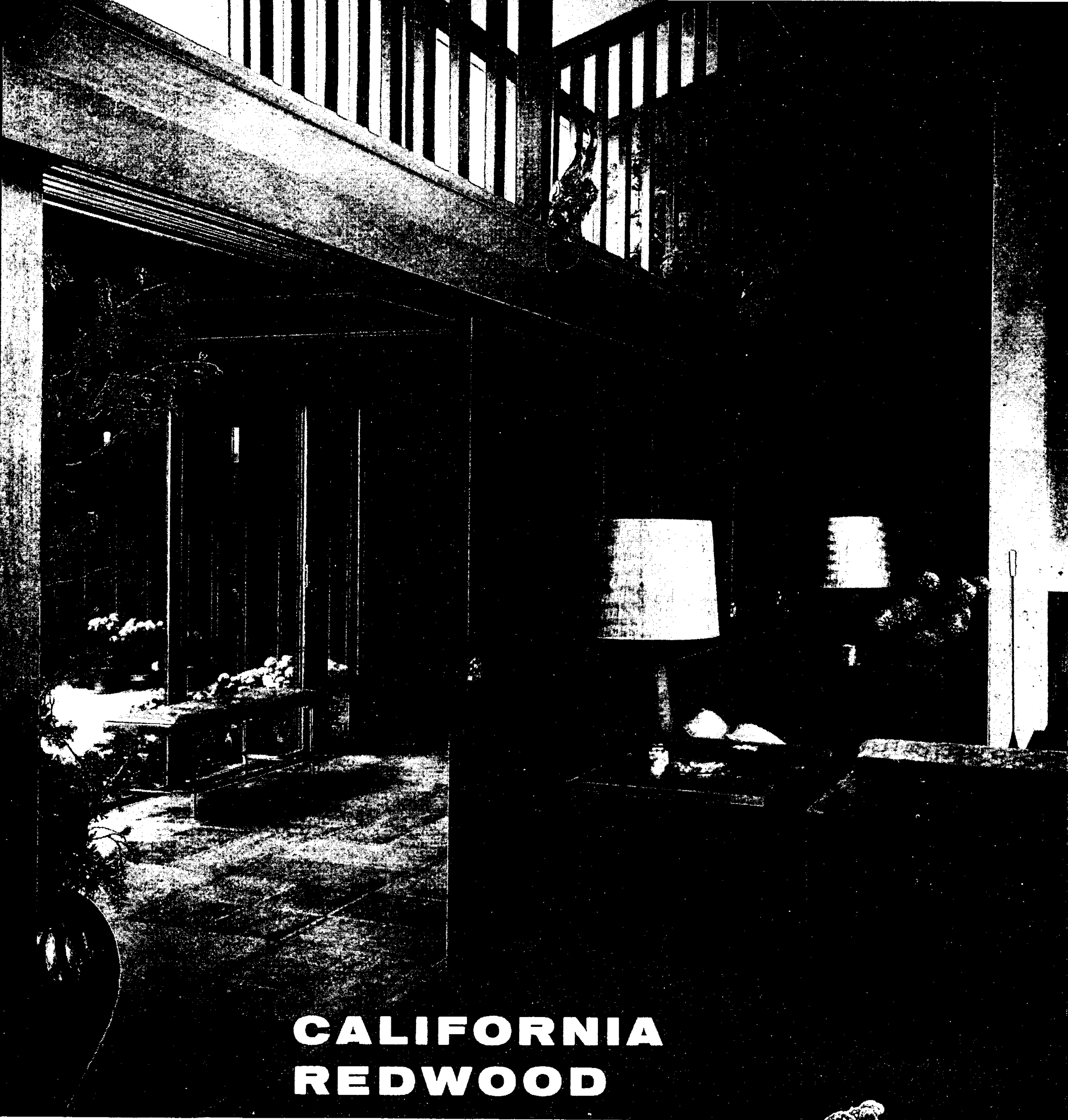

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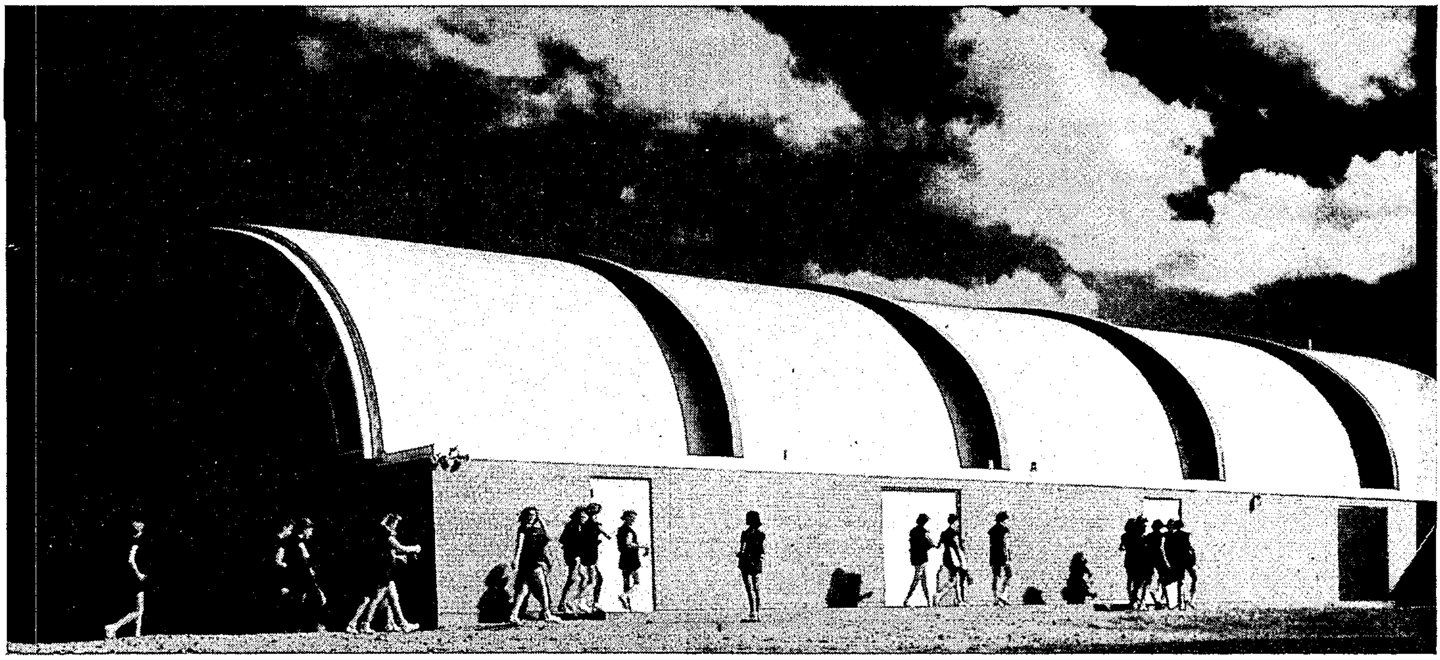
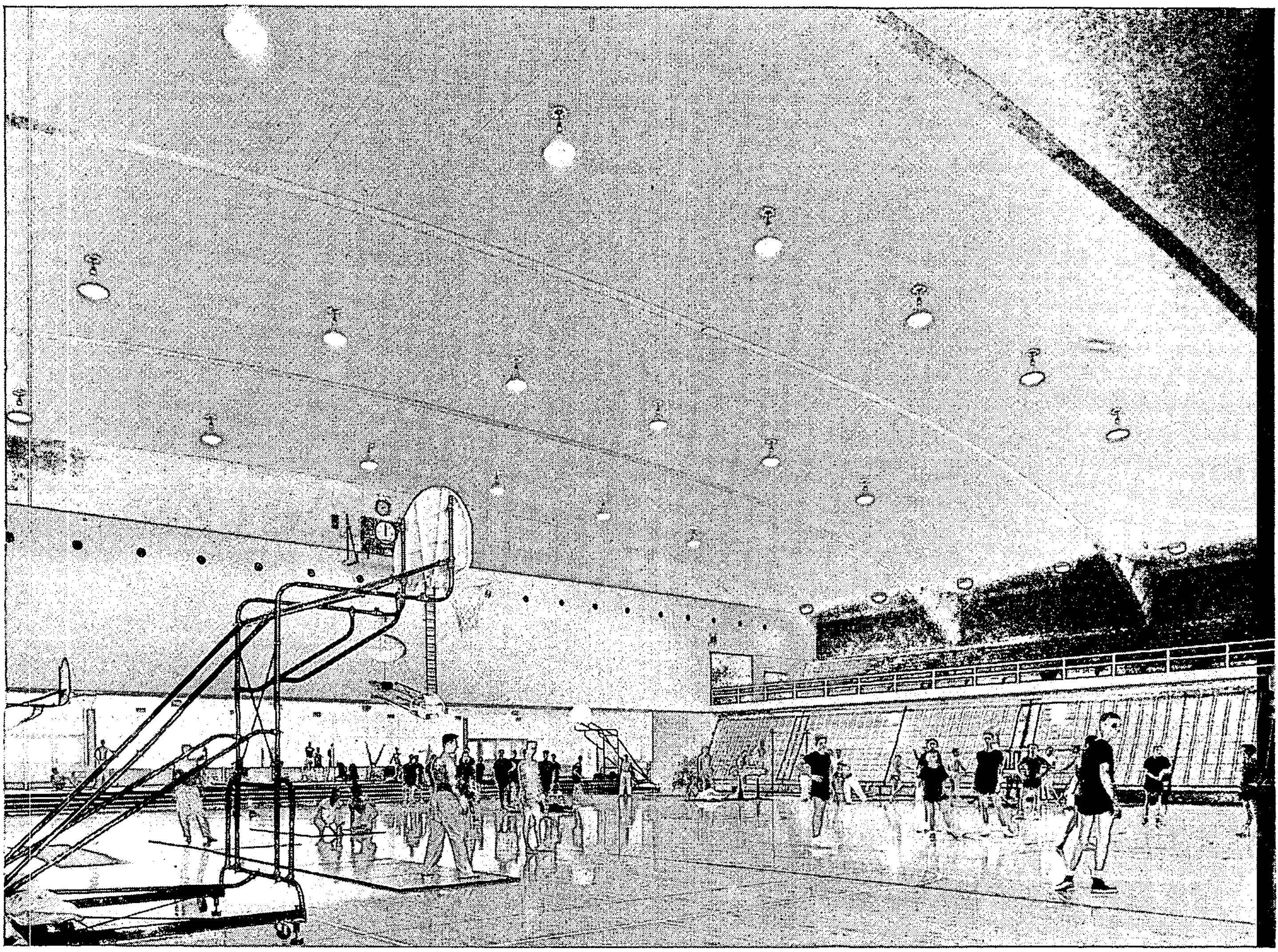
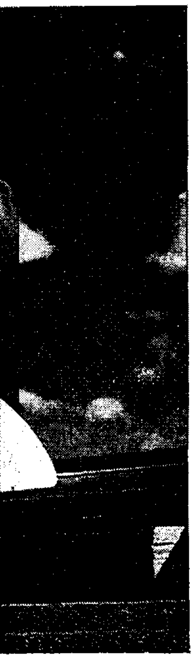
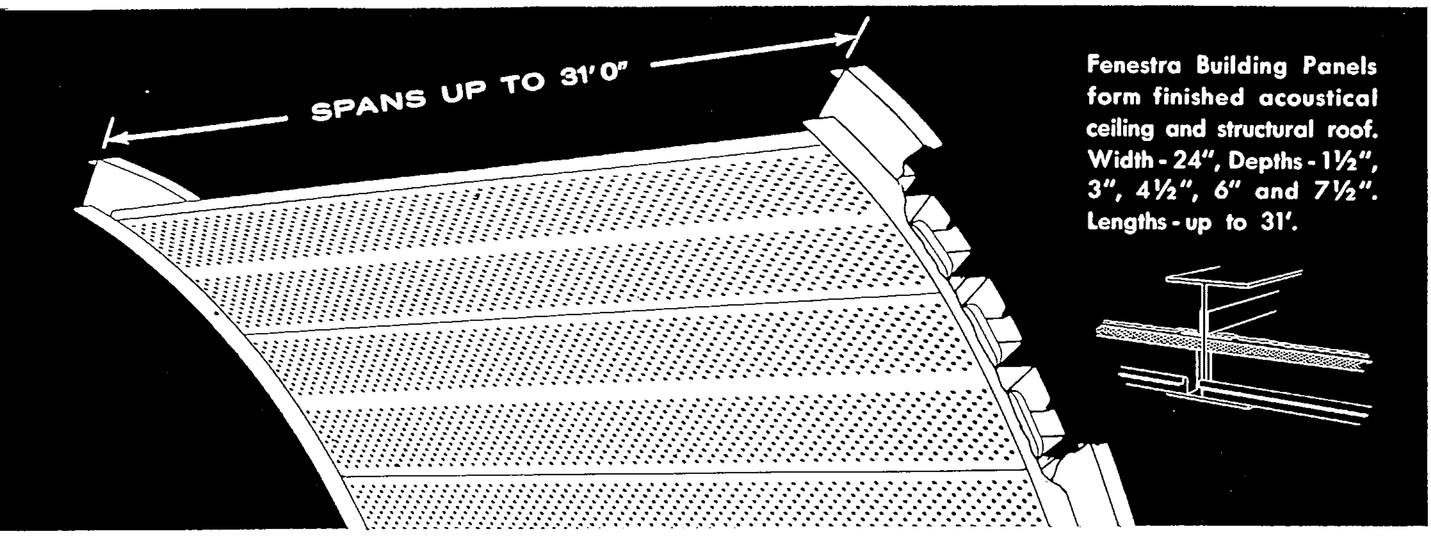


Catalina High School, Tucson, Arizona
Architects: Scholer, Sakellar & Fuller, Tucson, Arizona
Contractors: L. C. Anderson & J. J. Craviolini, Tucson, Arizona







SPANS UP TO 31'0"
Fenestra Building Panels form finished acoustical ceiling and structural roof. Width - 24", Depths - 1½", 3", 4½", 6" and 7½". Lengths - up to 31'.

reviews

(Continued from page 238)

Examples of vision in the 16th Century are compared with the vision of a 20th Century sculptor, with the vision of a highly sensitive camera, with the vision of a telescope. The results of these comparisons are unique in photographic achievement as well as in esthetic theory and scientific research.

The architect and artist will be intrigued by Kepes' approach to symmetry and proportion, to his suggestions for new symbols for order, permanence, and change. And the general public will be equally fascinated. Gyorgy Kepes' book is an important one—it has helped to define our *present* in the *future* and a 20th Century esthetic; and it will awaken at least the enthusiasm of even the most confirmed skeptics.

F.J.S.H.

constructive vision

A Testament. *Frank Lloyd Wright. Horizon Press, 220 W. 42 St., New York, N. Y., 1957. 250 pp., illus. $12.50*

A dozen buildings never before between boards, some inspired pages such as only the maturity of genius can pen unabashed, make this book a prize. An ample, nicely presented body of illustrations goes far to balance those passages of text where Wright seems intent upon pushing Polonius. But by now Frank Lloyd Wright has earned the right to be dull occasionally in his cause of "Truth Against the World." Those who agree with him that his principles are great and much needed, will wonder how many readers, often removed from the direct experience of his buildings, will be able to extract from his often cryptic, freighted prose those nourishing insights which give him his extraordinary stature. As castigator, Wright writes in an honorable but decayed tradition. As genius, who has experienced creativity beyond the understanding

(Continued on page 248)

reviews

(Continued from page 246)

of most mortals, he can and occasionally does provide pure manna. Those who wander in the desert had better read his new book; and so had those who are interested in a full view of the master architect, and in *his* full view of the world in which he labors. He seems to labor richly, but from his own vantage much of his own power is frustrated. No one will deny his right to protest.

More important, Frank Lloyd Wright's *Testament* also reveals his constructive vision of human society, a vision rooted in the original tenets of Christianity and American democracy. Agrarian and individualist, and hence out of phase with our own rather distraught times, he may prove in the long run to have kept his eyes firmly fixed on the fundamental facts.

EDGAR KAUFMANN, Jr.
Author, Critic

only representative type

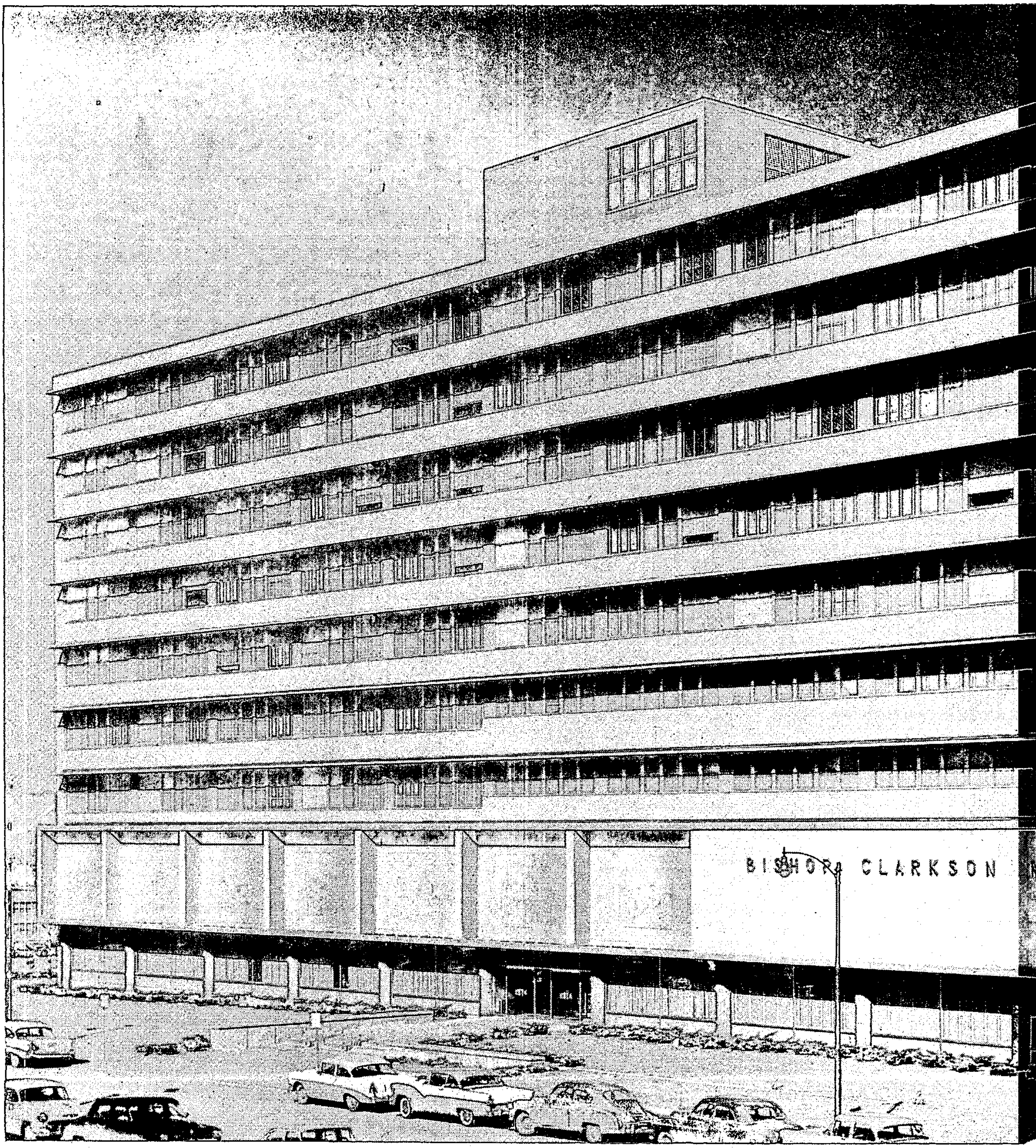
The Railroad Station. *Carroll L. V. Meeks. Yale University Press, New Haven, Conn., 1956. 203 pp., illus. $7.50*

It is difficult to conceive of a more thorough or personal study of a specialized building category, than *The Railroad Station*, by Carroll L. V. Meeks. For the author, the passenger railroad station is a symbol, the significance of which is summarized in a quotation from *Building News* (1875): "Railway termini and hotels are to the 19th Century what monasteries and cathedrals were to the 13th Century. They are truly the only real representative building we possess."

Fundamentally, this is a meticulous, academic documentation of the evolving railroad station—from its inception (1830) at Liverpool, England, to the present—touching upon problems of specialization, mass-production, and functional design, generated by the Industrial Revolu-

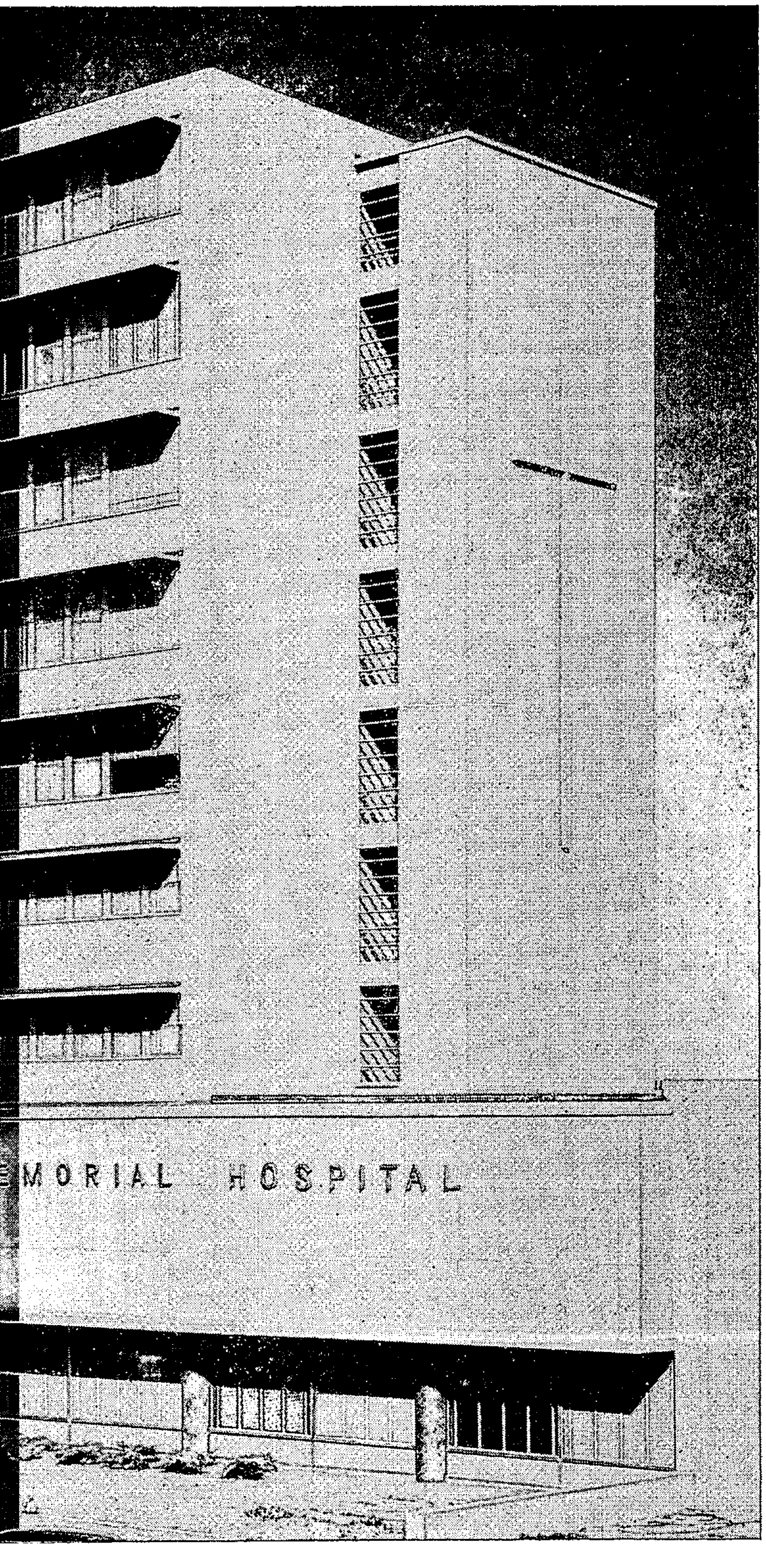
(Continued on page 252)

The enduring beauty of GLASS enhances
of the new BISHOP CLARKS



Architect: Leo A. Daly, Co., Omaha, Nebraska the architectural appeal

EMORIAL HOSPITAL



THE BISHOP CLARKSON MEMORIAL HOSPITAL at Omaha, Nebraska, is an excellent example of the part Pittsburgh Glass plays as a basic material in architectural plans.

In creating this impressive structure, Architect Leo A. Daly selected Pittsburgh Polished Plate Glass for the front of the building. At the back, many openings are equipped with TWINDOW® . . . the windowpane with insulation built in. Through its exceptional insulating properties, TWINDOW keeps interiors cooler in summer, warmer in winter. Patients and staff are thus placed in a more comfortable environment. And, through the use of this insulating glass, other collateral advantages accrue, such as less cold air drafts at windows, reduction of outside noises, elimination of the need for storm windows, and actual savings in heating and air-conditioning costs, as well as in the initial cost of the equipment.

Among the many other Pittsburgh products found in this beautifully designed hospital are TUBELITE® Sliding Doors in the newborn nursery where the entire wall slides. In addition, the coffee shop is equipped with a bay of glass, consisting of PITTCO® Premier Metal Frames with HERCULITE® Tempered Plate Glass Doors. And two banks of HERCULITE Doors form the entrance to the hospital.

May we suggest that, in *your* designs, you give first consideration to *Pittsburgh Glass* . . . the *basic* architectural material?

PITTSBURGH GLASS

...the basic architectural material

75th ANNIVERSARY 1883—1958

SYMBOL OF SERVICE FOR SEVENTY-FIVE YEARS

PITTSBURGH PLATE GLASS COMPANY

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reviews

(Continued from page 248)

tion, in which the railroad station played an integral part.

There was the period of *experimentation,* 1830-45, during which the trainshed was born; roof spans grew more and more daring; metal trusses and structural systems replaced wooden construction; practical considerations over-ruled design and the latent schism between architecture and engineering grew apparent. There was the period of *standardization* in the 1850's—mechanical equipment was improved; comforts and luxuries were added; waiting rooms grew more monumental. There was the period of *sophistication,* 1860-90, a time for richness and display—stations were grander and more ornate; the Victorian Gothic style gave way to Richardsonian Romanesque; Pullman cars were introduced and railroad operations refined.

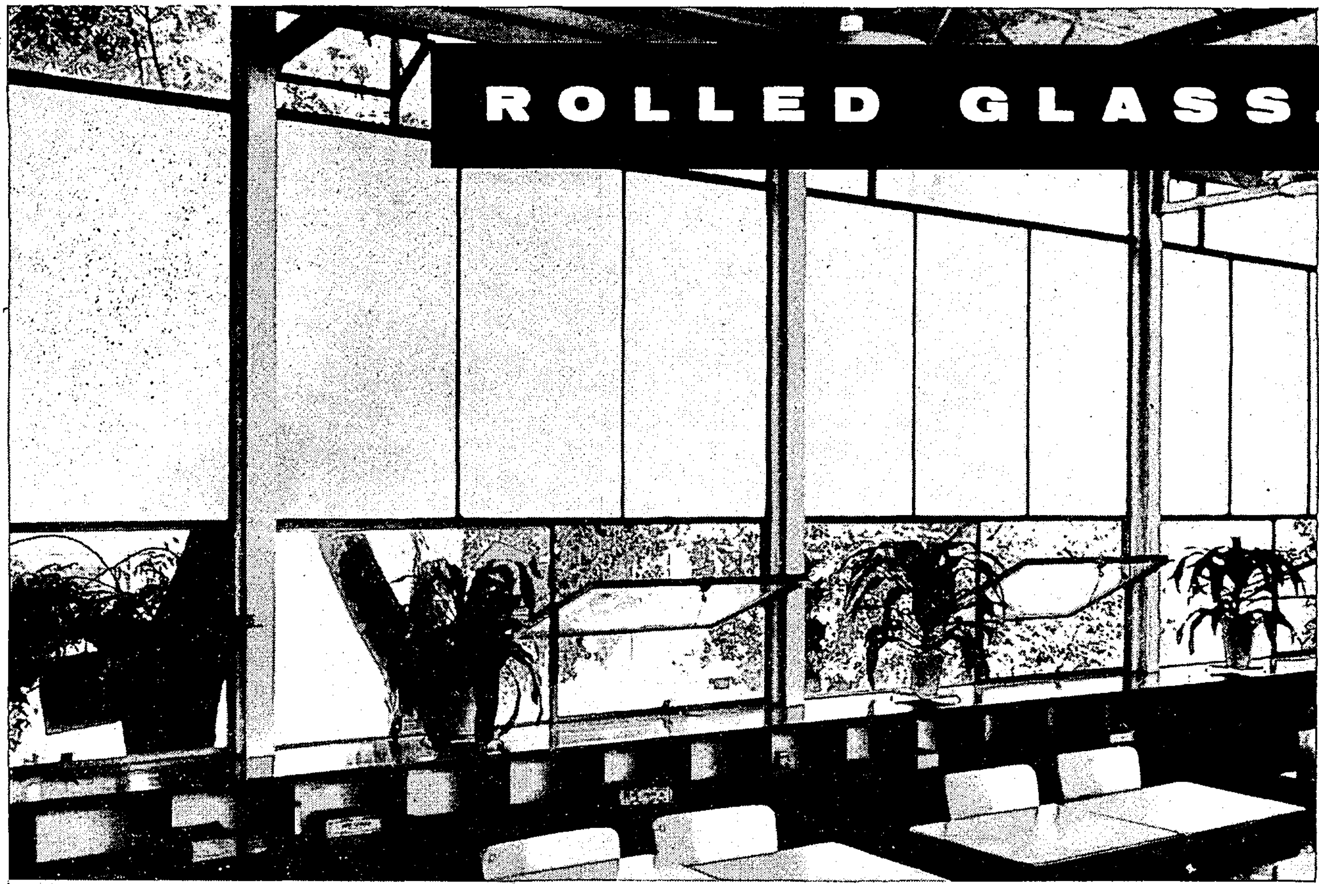
From 1890 to 1914—station and trainshed schemes of unprecedented size were realized; the use of steel and glass created new design idioms; the love of gigantism over-ruled practical considerations.

After World War I, colossal terminals were no longer practical. The transition from trainsheds to multi-level stations was complete; telephones, telegraphs, electrified rails, air conditioning, and elevators became standard equipment. Finally, the "rational" approach to design, with its emphasis on structural clarity, produced an architecture of roofing systems and space-frames, exemplified by Nowicki's project for a station to be built at Chandigarh.

The Railroad Station is, however, more than a chronicle of railroading in the Western World, more than a history of changing taste and growing technology; it is an attempt to synthesize the many streams of thought in 19th Century architecture. It is an attempt to formulate a single 19th Century style "dominated and unified by the esthetic doctrine of picturesque eclecticism."

(Continued on page 256)

ROLLED GLASS.



MODERN DESIGN CALLS FOR COOLITE

Extensive use of Coolite glass in sidewall sash in the Thomy Lafon Elementary School, New Orleans, fits the aims of architects, Curtis & Davis, to obtain "the ultimate in scientific achievement for natural lighting . . . a truly functional architecture adapted to human values and physical needs." Coolite, glare reduced, floods classrooms with softened, glare-free light . . . absorbs up to 50% of solar heat . . . makes rooms appear larger, friendlier.

GLASS MAKES A GRACEFUL ENTRANCE

In a distinctively different doorway, made possible by the handsome Broadlite pattern, the reception hall is flooded with flattering, diffused daylighting. A rythmic pattern, translucent Broadlite glass offers a new, dramatic decorating texture that creates a feeling of leisurely living and gracious hospitality, in either modern or traditional settings.

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reviews

(Continued from page 252)

It is an attempt to remove the stigma of "romanticism" and "eclecticism"—terms which have long obscured the value of academic discipline in art education. It is an attempt to clarify the distinction between *functional* and *esthetic* aspects of architecture and to define the esthetic qualities peculiar to 19th Century buildings—among which are named the following: variety, movement, irregularity, intricacy, and roughness—as opposed to characteristics of Classic, Baroque, and contemporary buildings. The ultimate value of such an analysis is debatable; but it does serve the author's present purpose, which is to study 19th Century architecture in its proper relationship to past and contemporary styles.

The choice of the railroad station as the representative building type of this period was not whimsical, for its arched and vaulted forms—derived from the Roman, Gothic, and Byzantine traditions of grand and spacious architecture—have survived unto the present day, in the dirigible sheds of Freyssinet and the airplane hangars of Nervi.

Nevertheless, the analogy between our modern terminal temples and the cathedrals of the 13th Century cannot be drawn too closely: for the one aspires toward a richer, fuller, and better way of life; while the other aspires toward an easier, more comfortable, and mobile life. Any resemblance between the two is purely superficial.

Theological speculations aside, *The Railroad Station* will serve as a valuable reference book for years to come. The 166-page text is supplemented with complete biographical data, footnotes, and index as well as a rare collection of 231 illustrations, including photographs, drawings, engravings, plans, and sections.

ROSALIND COHEN
Museum of Modern Art

(Continued on page 260)

NEW!

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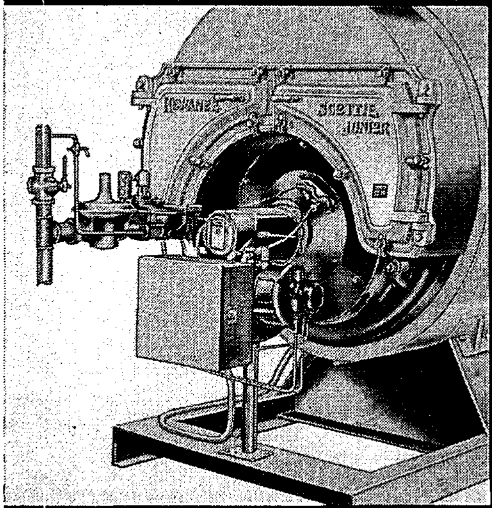

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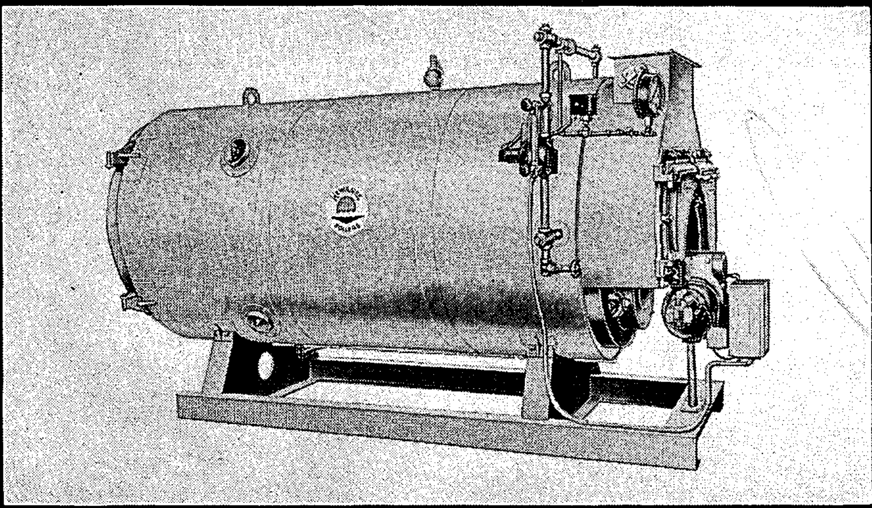

NEW 606,000 TO 3,060,000 Btuh CAPACITIES: Kewanee Scottie Jr. low pressure boiler with Kewanee burner. Firing rate is balanced with boiler capacity. Oil burner (shown) is high pressure, twin nozzle type. Gas burner is equipped for either natural or LP gas.

another KEWANEE® quality product . . . proven in the field

Now . . . Kewanee provides 8 popular high pressure packages, 18 to 92 horsepower . . . 8 low pressure packages, 606,000 to 3,060,000 Btuh.

Forced-draft firing keeps combustion air supply constant, regardless of location or atmospheric conditions. Only a vent pipe is needed. The long, low lines of today's buildings are not violated by a costly, unsightly stack. Nor does the boiler room ceiling need to be higher than a standard 8 feet.

Fuel flexibility is provided by Kewanee burners for oil, gas or gas-oil combination firing. On combination units, fuel changeover is simple and fast . . . can be handled by automatic controls if desired.

Traditional Kewanee quality is engineered into the complete unit. Reserve strength is built into

18 TO 92 HORSEPOWER

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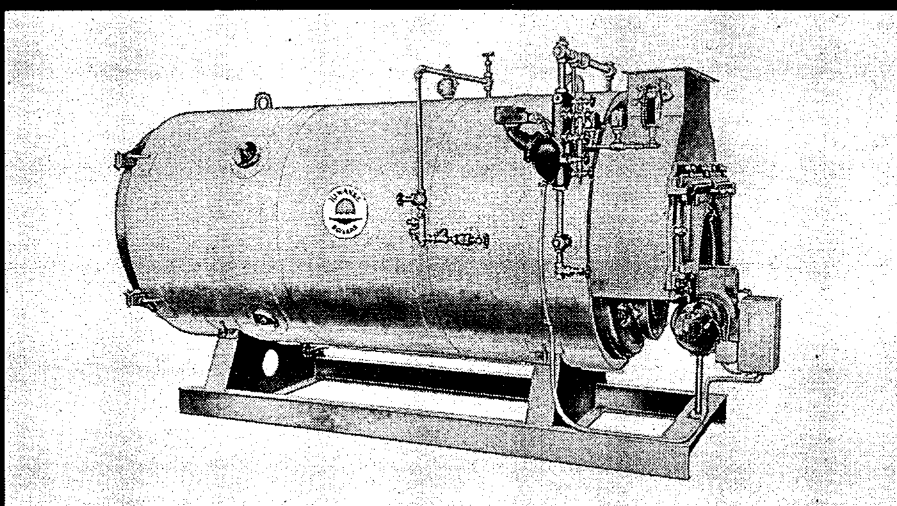

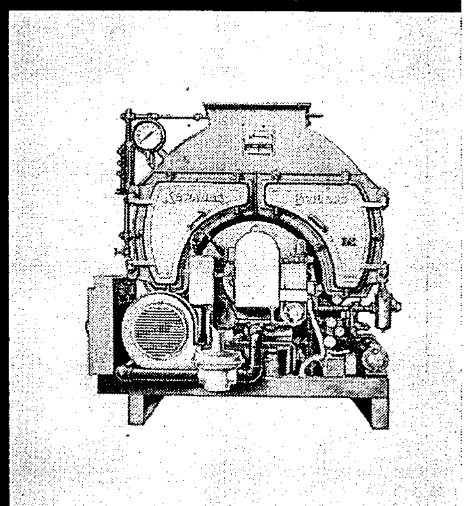

NEW 18 TO 92 HP CAPACITIES: For 125-150 swp or high temperature water above 250° F. Kewanee Scottie Jr. high pressure boiler with a Kewanee burner for oil (shown) or gas. Features include long gas travel, ample steam space, x-rayed and stress relieved welds.

OTHER LARGER KEWANEE BOILERS range up to 651 hp for high pressure . . . 21,855,000 Btuh for low pressure. Matching forced-draft burners are available for oil, gas and gas-oil combination firing.

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reviews

(Continued from page 256)

paint? sketch? (anyone)

Watercolor Painting Step by Step. *Arthur L. Guptill. Watson-Guptill. Publications, Inc., 24 W. 40 St., New York, N. Y., 1956. 127 pp., illus. $5.75*

Watercolor . . . A Challenge. *Leonard Brooks. Reinhold Publishing Corp., 430 Park Ave., New York, N. Y., 1957. 160 pp., illus. $12.50*

Course in Beginning Watercolor. *John B. Musacchia, Henri A. Fluchere, Melvin J. Grainger. Reinhold Publishing Corp., 430 Park Ave., New York, N. Y., 1956. 75 pp., illus. $3.50*

Course in Pencil Sketching. *Ernest W. Watson. Reinhold Publishing Corp., 430 Park Ave., New York, N. Y., 1956. 63 pp., illus. $2.50*

The Landscape Painter's Manual. *Harry Leith-Ross. Watson-Guptill Publications, Inc., 24 W. 40 St., New York, N. Y., 1956. 64 pp., illus. $3.95*

Figure Drawing Comes to Life. *Calvin Albert and Dorothy Gees Seckler. Reinhold Publishing Corp., 430 Park Ave., New York, N. Y., 1957. 160 pp., illus. $7.50*

With the possible exception of *Figure Drawing Comes to Life,* none of these books can be considered controversial. Each is directed toward a certain use, a certain reader.

Watercolor Painting Step by Step, Course in Beginning Watercolor, The Landscape Painter's Manual, and *Course in Pencil Sketching* are primarily guides for beginners. *Watercolor . . . A Challenge* emphasizes the esthetic aspect of that medium. *Figure Drawing Comes to Life* can be of inestimable value to the teacher of life drawing who desires to stimulate his class, to clear the cobwebs from the traditional approach to the subject.

The two watercolor books for beginners are of particular significance for many art students. For some peculiar reason, watercolor has always taken second place to oils; watercolor is sometimes taught for a specific purpose, often as a rendering medium for architects, but is usually omitted from the curriculum as an art or painting course. Many students who want to use watercolor as a medium for the expression of "fine art" must necessarily seek recourse to printed material for instruction. These books are therefore useful as supplemental material for those students.

Arthur L. Guptill's book is perhaps the better of these. It is more than a cursory "do-it-yourself" book for Sunday painters. Highly readable, thoroughly and logically organized, it is a text that offers instruction, as the title indicates, step-by-step. Although the material is methodically presented, it escapes stodginess because of Guptill's informality and the obvious enthusiasm with which he writes.

John Rogers adds his careful description for stretching watercolor paper to Guptill's equally careful description of a different method. In brief chapters, Norman Kent, Ted Kautzky, Herb Olsen, Ralph Avery, and Samuel Kamen discuss different aspects and problems of watercolor.

The book contains sufficient diagrams and illustrations that serve as graphic aids to statements and problems. A good thing, too, for a plethora of pictures can never substitute for a carefully detailed text. Contemporary emphasis on graphic qualities, while enhancing physical and visual appeal, may not always avoid the pitfall of skimping information as the result of a shrunken and cursory text.

Too often the graphic approach offers the "easy" method, and there is none. For instance, a "three-stroke" figure (*Watercolor Made Easy,* Olsen) or a similarly simply rendered figure (page 70 upper left, *Course In Beginning Watercolor*) looks easy when presented by a series of attractive illustrations, but it is almost impossible for the amateur to emulate as a method, for its success depends on many factors, the sum total of which enables the artist through accumulated knowledge and

(Continued on page 262)

THE VAST MAJORITY OF THE NATION'S FINE BUILDINGS ARE SLOAN EQUIPPED

CARSON & LUNDIN
architects

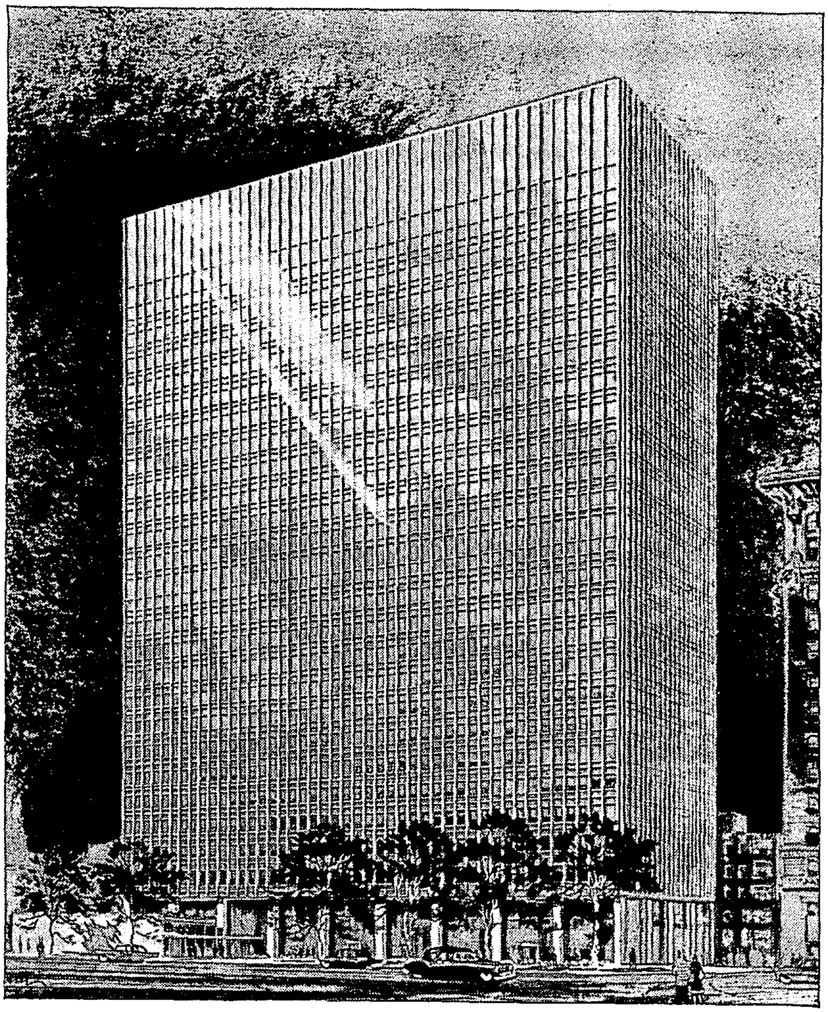
McGEORGE & HARGER
mechanical engineers

GEORGE A. FULLER COMPANY
general contractor

GORMAN LAVELLE COMPANY
plumbing contractor

AMSTAN DIVISION,
AMERICAN RADIATOR
& STANDARD SANITARY CORP.
plumbing wholesaler

AMERICAN RADIATOR
& STANDARD SANITARY CORP.
fixture manufacturer



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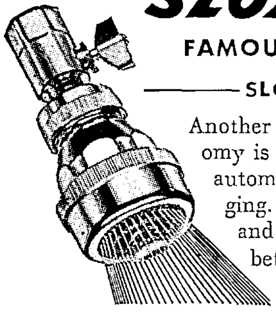

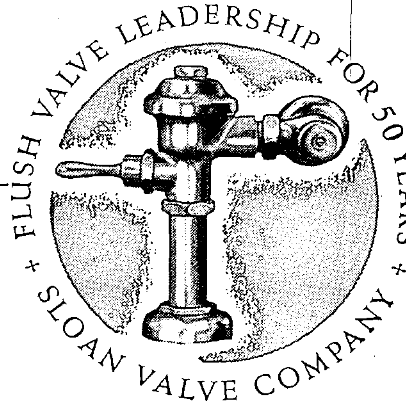

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reviews

(Continued from page 260)

experience to employ a convincing kind of shorthand, purely the result of his skill.

Course in Beginning Watercolor, by John B. Musacchia, Henri A. Fluchère, and Melvin J. Grainger, is a good book, but does not entirely avoid these pitfalls. Its information is accurate, but a bit meager when compared with the Guptill book. The chapters on pictorial analysis and composition are represented by illustrations, but the whys and wherefores are not thoroughly amplified by the text and leave the beginner depending too much on his own intuition.

Instruction in color and value, all-important to form description and fundamental to the beginner, is omitted. It is included in the Guptill book along with interesting suggestions for experimentation.

The chapters on equipment and borrowed technique are competently presented. Photographs showing stroking, detailing, and textured effects are pertinently used as visual aids.

Watercolor . . . A Challenge, by Leonard Brooks and illustrated with Brooks' own work, is not, like the Guptill book, a well organized book of instruction. It does offer technical hints and good advice, but its function is to " . . . help the amateur and student to move ahead to a higher creative level than aimed for in most 'how-to-do-it' manuals . . . " Brooks succeeds admirably in his endeavor.

Writing with force and warmth, he discusses various problems the painter faces: quality of line, choice of subject matter, use of symbols and creative elements, movement in depth, and many others. Basically, *Watercolor . . . A Challenge* is concerned with the esthetics of the medium and with pictorial concept. Brooks' attitude toward his work, his philosophy as it were, enriches his text and offers a convincing reason—particularly for amateurs—for a departure, when it is desired, from literal representation.

Quite a few illustrations are explained in some detail in terms of color but, unfortunately, some of these are printed in black and white. Perhaps greater clarity could have been employed in describing form or in differentiating between shape and form.

The proofreader fell asleep when he reached pages 86 and 87. The first four paragraphs on page 87 are identical with the last four on page 86. This is the only jarring note in an otherwise handsomely prepared and thoughtful book.

The Landscape Painter's Manual by Harry Leith-Ross, is another competent book for beginners and is on a par with *Course in Beginning Watercolor.* Like the latter, it is brief, perhaps cursory, but doubtless satisfactory enough as a beginner's guide. The opening chapters on preparation, finding a subject, and preliminary lay-in are thorough and well detailed. Also included are helpful instructions on stretching canvas and transferring it to the preliminary sketch. Explanations of color and value are lucid but might have been amplified with illustrations so important to those two subjects. In a book so profusely illustrated, it is a shame that a graphic demonstration so pertinent to an explanation of color and value has been omitted. In this instance, the graphic approach would have been important without being mere trimming.

Ernest W. Watson's *Course in Pencil Sketching, Book 1, Streets and Buildings*, thoroughly discusses necessary materials and pencil techniques as applied to the purposely limited subject matter. A particularly interesting chapter on legibility demonstrates how a rearrangement of value patterns can make a composition more readable and intelligible.

Compounded of experience and an ability to express himself entertain-

(Continued on page 266)

reviews

(Continued from page 263)

ingly, Watson's book is instructive. It provides a series of exercises related to particular problems of rendering which, practiced in sequence, should contribute to the development of the would-be pencil artist.

In *Figure Drawing Comes To Life*, Dorothy Gees Seckler provides a penetrating commentary on methods of teaching figure drawing as developed and used in the classroom by Calvin Albert.

Devised over a period of time as a means of stimulating student interest and of freeing self-conscious inhibitions, these techniques, illustrated by student work and supplemented by analogous reproduction of masters old and new, stress the objective approach as a primary aim.

This book can be of value to the teacher who is seeking new ways of presenting a subject that is usually cut and dried. Because it stresses the subjective approach first and the objective approach later, it may be considered controversial by some. However that may be, the authors do not deny the value of the objective approach; they think it eventually necessary. They do feel that too much emphasis on literal recording to begin with often stifles talent and prevents development until it can later cope with the objective approach and learn from it.

Figure Drawing Comes To Life is well worth reading not only for its provocative ideas, but for its handsome presentation. The drawings and the contrasts made apparent by the different techniques are fascinating.

WILLIAM C. HOLDSWORTH
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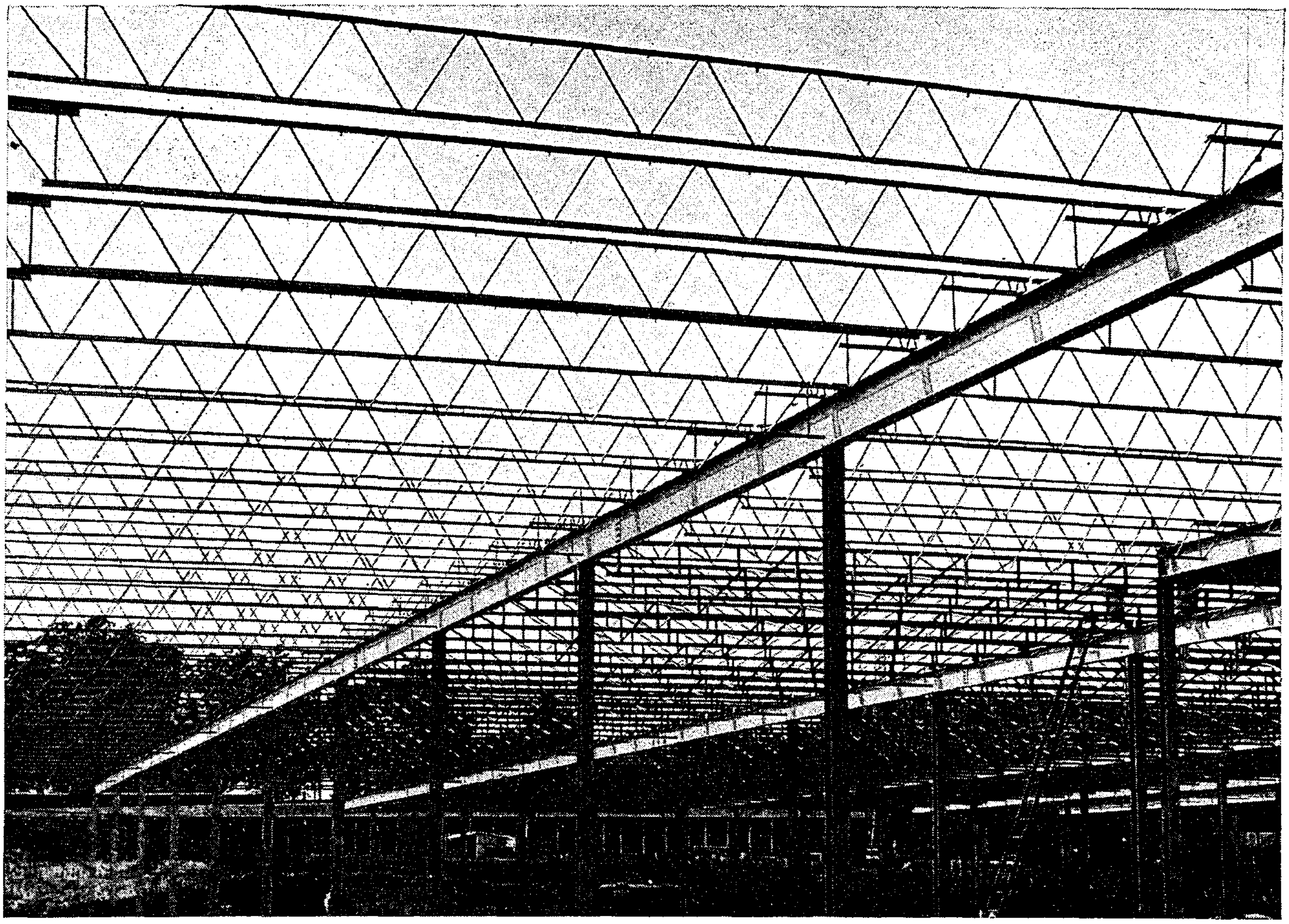

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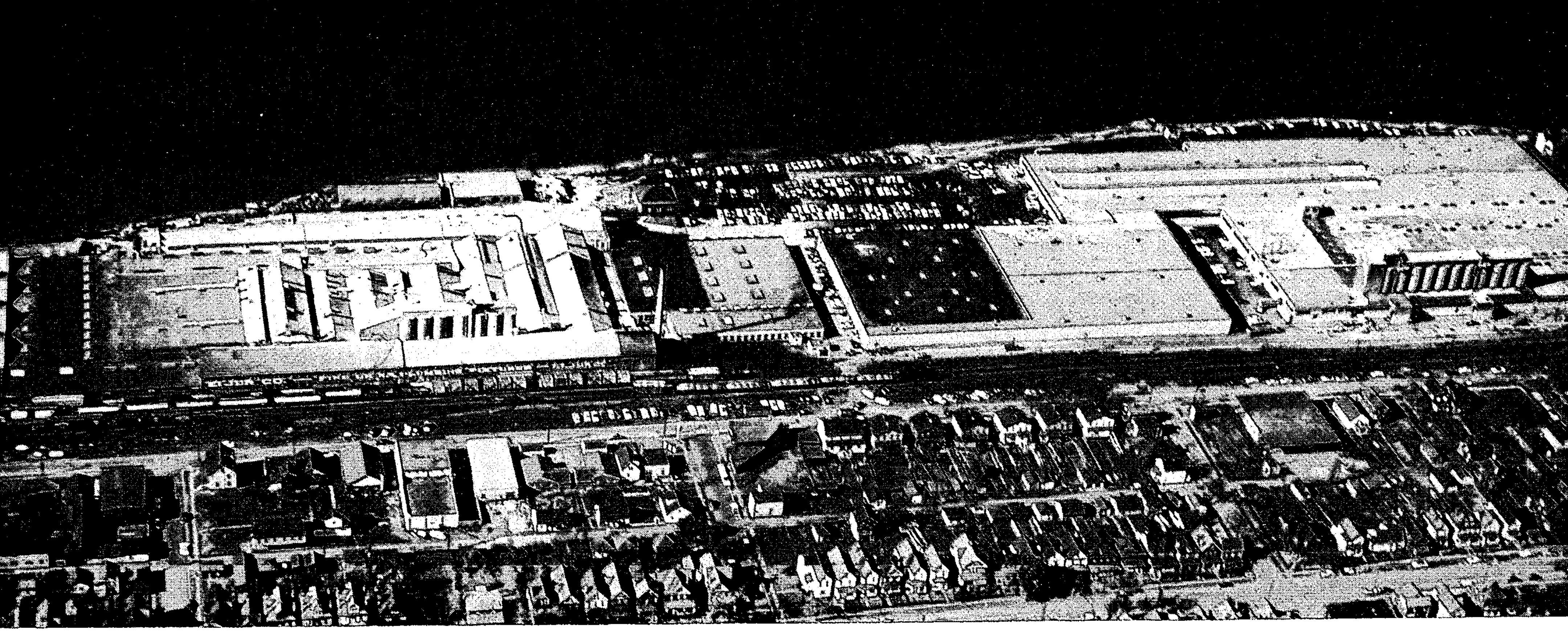

specifications clinic

(Continued from page 178)

finish known as *monolithic* finish is specified as follows:

"*Monolithic Finish:* Shall be produced without a separate topping by striking off and screeding the concrete to a true surface at the required elevation. The concrete shall be tamped with special tools to force the aggregate away from the surface. While the concrete is still green but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood floated to a true, even plane with no coarse aggregate visible. The concrete shall then be troweled to produce a smooth impervious surface free from trowel marks."

Separate applied toppings may be placed on the structural slab after it has hardened (bonded finish) or while it is still plastic (integral finish). The first method is preferable since the finish is then put on after other building operations have been completed and therefore is less likely to be damaged. Bonded and integral finishes may be specified as follows:

"*Bonded Finish:* The surface of the structural base slab shall be finished reasonably true and struck off at a level not less than 1" below the required finish grade. As soon as the condition of the concrete base permits and before it has fully hardened, all dirt, laitance, and loose aggregate shall be removed from the surface by means of a wire broom, which shall leave the coarse aggregate slightly exposed, or the surface otherwise roughened to improve bond with the topping. Base surfaces which have not been sufficiently roughened shall be further prepared for bond by mechanically chipping. Base slabs shall then be thoroughly wetted just prior to the placing of the finish. A thin coat of neat cement grout shall be broomed into the surface of the slab. The topping shall be applied before the grout has hardened and brought to the established grade with a straight edge."

"*Integral Finish:* The surface of the structural slab shall be finished reasonably true and struck off at a level not less than 1" below the required finish grade. Water and laitance which rise to the surface of the base slab shall be removed before applying the wearing course. After concrete in the base slab has settled sufficiently so that the water does not rise to the surface but within 2 hours after placing the base slab, the topping shall be applied and brought to the established grade with a straight edge."

Troweling shall be specified as follows:

"After surface water has disappeared and the concrete is sufficiently firm to hold a man's weight, generally 30 to 45 minutes after placing, the floor shall be troweled to a true, even, smooth surface. No dry cement nor mixture of dry cement and sand shall be sprinkled directly on the surface of the wearing course to absorb moisture or to stiffen the mix."

Additional information on concrete floors, surface treatments, and floors subject to special conditions may be obtained from a pamphlet, *Concrete Floor Finishes*, published by Portland Cement Association.

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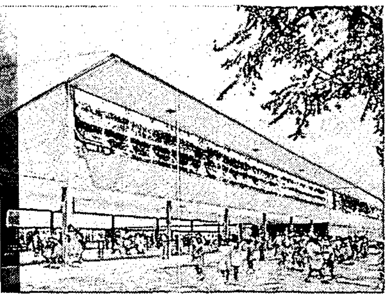
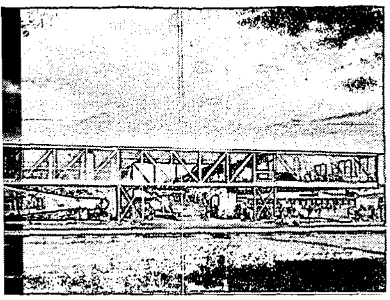


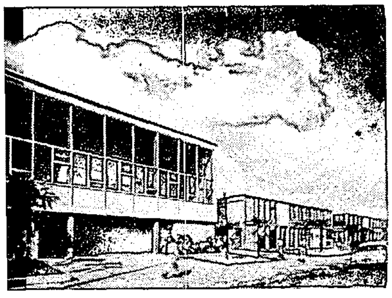
2

Bienville Elementary School: Burk, Le Breton & Lamantia, Architects. See DECEMBER 1955 P/A.
New Hoffman Elementary School: Sol Rosenthal, Architect; Charles R. Colbert, Jr., Associate. See MARCH 1956 P/A.



3

Phyllis Wheatley Elementary School: Charles R. Colbert, Jr., Architect. See JANUARY 1955 P/A; July 1956 Architectural Forum.
Carter F. Woodson Jr. High School. Favrot, Reed, Mathes & Bergman, Architects. See February 1955 Architectural Record.
Photos: Frank Lotz Miller



4

The headline on this page is the title used by the Orleans Parish School Board, New Orleans, La., for a little brochure which describes and analyzes results of a survey of *school teachers* in recently completed New Orleans schools. Since some of these school buildings have been published and several have won awards of one sort or another (including P/A Design Awards Citations) it seemed to me that a few excerpts from the study might be interesting. If any readers would like to see the entire analysis, I believe that the office of Mrs. Patricia Bornemann, Assistant to Superintendent, New Orleans Public School, 703 Carondelet Street, New Orleans 12, has copies available.

Fifteen schools, in all, were studied (detailed results for only four of these new schools are reported here). In the total study, 79% of the teachers said that they preferred the new school in which they presently taught to "traditional" schools; 8% disagreed; 13% had no strong opinions.

However—and this would indicate that the study was not a "whitewash"—only 41% had no complaints about their new setup; 56% felt that there were "serious drawbacks"; (3% had no opinions on this question).

These "drawbacks" which teachers found (some probably based on prejudice or "opinion"; but most of them serious worries about functional problems) included, for all schools, the following important factors: inadequate recreational facilities for inclement weather, a problem for 65% of the teachers; classroom glare, a new "drawback" for 60%; outside noise, worrying 39%; breezeways and open corridors, bothersome to 33%; visual distractions from activities outside classrooms, serious for 33%. In addition, nearly half the teachers, the report states, were dissatisfied with space given to chalkboards and tackboards.

"Of course," the brochure points out, "these features were not uniformly criticized in all of the new schools. Differences in design from building to building caused certain features to meet with a high degree of acceptance in one school and considerable dissatisfaction in another." For the four schools illustrated, here are some of the statistical results; figures given indicate percentages, not totaling 100% because there were always some "no opinion" or "no comment" responses.

• Taking everything into consideration, how well do you like your present (new) school building?

	All Schools	School 1	School 2	School 3	School 4
Very much	41	20	58	72	39
Some faults	55	75	38	28	60

• In your own classroom, do you have a problem with regard to ventilation in warm weather?

	All Schools	School 1	School 2	School 3	School 4
No	49	80	84	22	48
Some	35	10	16	67	34
Major	11	10	0	11	9

Ventilation in cold weather?

	All Schools	School 1	School 2	School 3	School 4
No	57	30	96	83	60
Some	28	55	4	6	24
Major	7	10	0	0	4

Lighting system?

	All Schools	School 1	School 2	School 3	School 4
No	81	95	88	28	86
Some	11	5	4	61	8
Major	4	0	0	11	1

Heating system?

	All Schools	School 1	School 2	School 3	School 4
No	72	55	96	100	77
Some	20	35	0	0	12
Major	4	10	0	0	5

• To what extent is there a problem in your classroom of distraction from outside noise?

	All Schools	School 1	School 2	School 3	School 4
None	58	90	46	94	35
Some	26	10	21	6	41
Major	13	0	33	0	16

Inside noise: poor acoustics?

	All Schools	School 1	School 2	School 3	School 4
None	76	95	79	94	69
Some	12	5	8	0	15
Major	2	0	0	0	1

Glare from outside?

	All Schools	School 1	School 2	School 3	School 4
None	36	15	71	46	55
Some	29	60	21	39	23
Major	31	25	0	17	13

Activities outside classroom?

	All Schools	School 1	School 2	School 3	School 4
None	62	70	67	61	51
Some	25	30	29	28	27
Major	8	0	4	5	16

• Switching from the teacher's own classroom to the school in general, the survey asked: How do you like the over-all appearance?

	All Schools	School 1	School 2	School 3	School 4
Like very much	78	90	100	83	65
Dislike very much	0	0	0	0	0
Inconclusive	12	10	0	17	35

• Floor plans—particularly the openness of the new schools, with "open corridors and breezeways"—caused some adverse comment. Teachers rated as "very satisfactory" these elements by the following percentages:

	All Schools	School 1	School 2	School 3	School 4
Gen'l floor plan	57	40	79	89	49
Open corridors	32	0	62	66	19

Finally, probably the most important criterion by which a school can be judged was covered by a question which asked whether there had been improvement in student attitude in the new building.

	All Schools	School 1	School 2	School 3	School 4
Considerable	63	50	96	66	71
Some	24	10	4	34	23

All in all, it seems to me, this is a most healthy and constructive study of the results of architecture, using the most directly measurable standards.

Thomas H. Creighton