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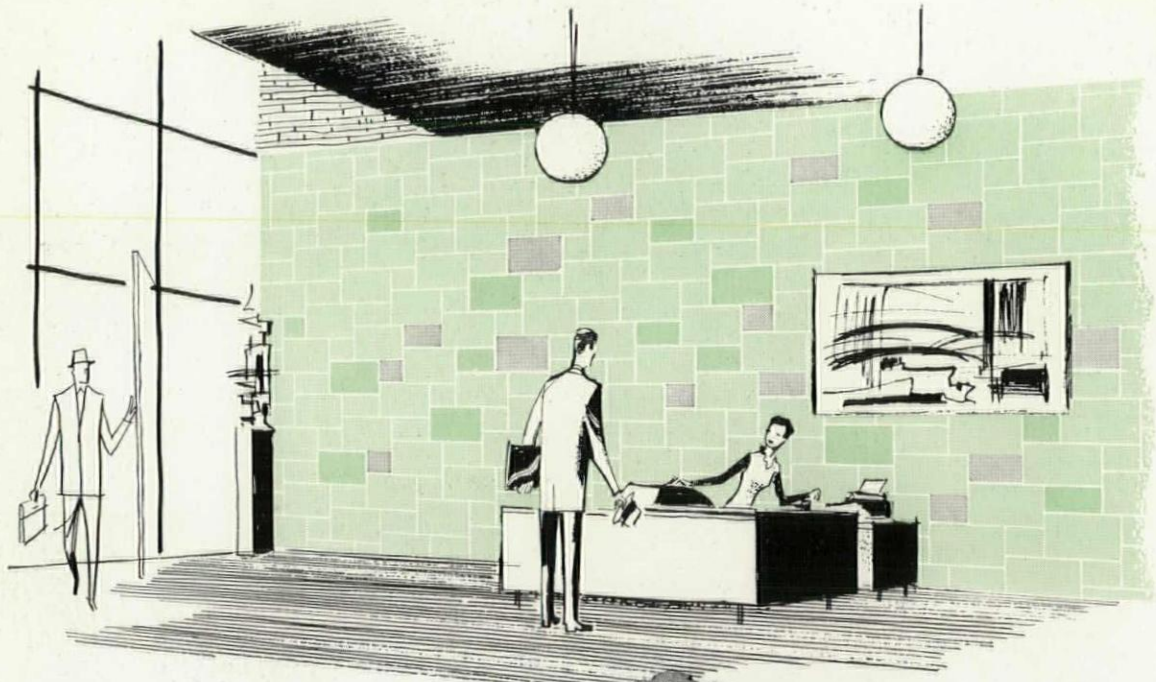

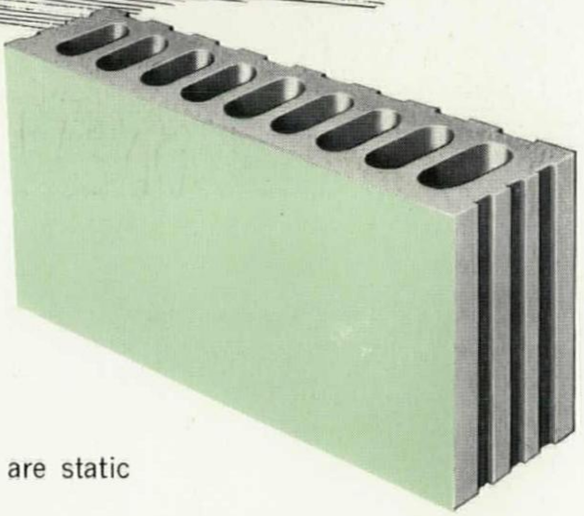

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Enjay Butyl window-sealing tape was employed throughout the newly-erected Industrial Reactor Laboratories in Plainsboro, N. J. Architect: Skidmore, Owings & Merrill.

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Here are some other important reasons why we believe you will, too: Granco Deck has flared ends for convenient nesting. Sheets are available in 18, 20 and 22 gage. With one-inch insulation board, twenty year roofing bonds are obtainable. Year-around construction. No weather problems! Like more information on Granco Roof Deck? Just mail the coupon at right.

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*Sub-contractor for Havens Structural Steel Co.

PROGRESSIVE ARCHITECTURE

November 1958

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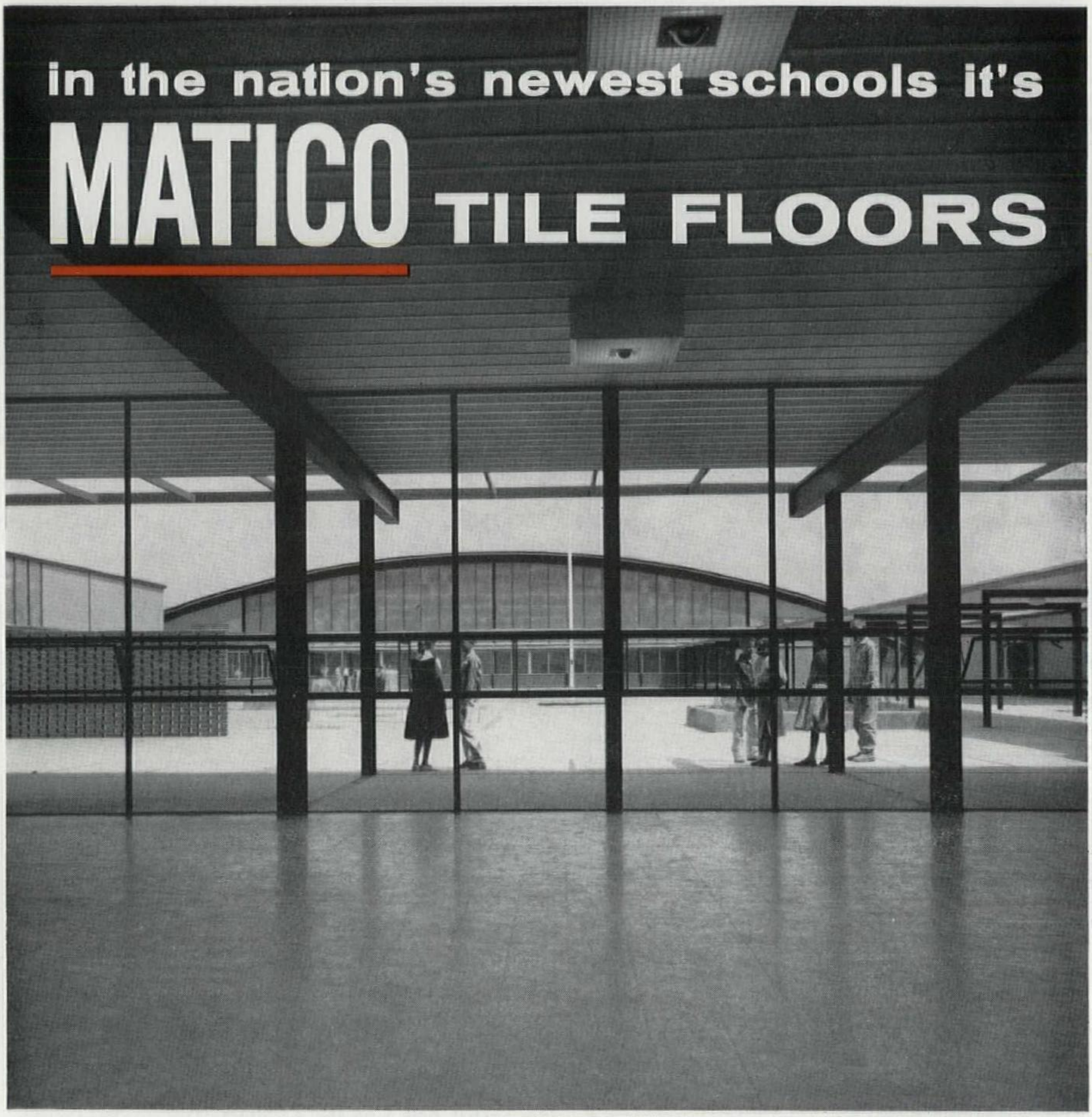

Architect: Robert Billingsbrough Price, A.I.A., Flooring Contractor: Selden's, Inc.

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Can The Neighbors Blackball A "New Look"?

It's The Law Column by Bernard Tomson

P/A Practice of Architecture *discussion of the legality of barring "Modern" from a community that boasts "Dutch Colonial," "Victorian," "Early and Farmhouse American" harmonies.*

May a community prohibit the erection of new homes having modern architectural design where the predominant architectural style of existing homes is traditional? This question was recently presented to a New Jersey court and answered in the negative (*Hankins* v. *Borough of Rockleigh*). However, the Court ruled that architectural standards can be validly regulated by the municipality if the general welfare is directly and clearly involved. The development of "esthetic zoning" has been slow and its validity often questioned (*See* IT'S THE LAW, NOVEMBER 1950, DECEMBER 1950, JUNE 1952, *and* JANUARY 1958 P/A). The Hankins case is illustrative of both the difficulties involved in establishment of "esthetic zoning" and the increasing acceptance of the concept.

Rockleigh, New Jersey, is a community with a population of approximately 150 people. There were 37 residences in the community, 80 percent of which were over 50 years of age. The architectural style of these homes was "Dutch Colonial," "Early American," "Victorian," and "Farmhouse American." The plaintiffs were owners of a tract of land in the community and filed plans for the construction of a home. Subsequent to the filing of such plans, an ordinance was adopted by the municipality providing as follows:

"The architectural design of all new houses and other buildings in the Borough of Rockleigh, or old houses or buildings that may be renovated or reconstructed, shall be subject to the approval of the Planning Board and of the Mayor and Council of the Borough of Rockleigh. Such design may be Early American, or of other architectural style conforming with the existing residential architecture and with the rural surroundings in the Borough, and acceptable to the Planning Board and to the Mayor and the Council of the Borough of Rockleigh."

This ordinance was amended in 1948 to prohibit flat roofs.

The plans filed by the plaintiffs called for a two-story home with extensive use of glass and with a flat roof. The location of the home was at least 4000 feet from the nearest neighboring home. These plans were rejected by the Mayor and Borough Council on the grounds they were violative of the zoning ordinances.

The plaintiffs contended that the ordinances under which the Mayor and Council acted were unconstitutional and were not based upon reasonable standards and specifications. The municipality, on the other hand, contended that the ordinances were a valid exercise of the police power relating to the general welfare of the community. In this connection, the Town asserted that a zoning ordinance whose purpose is to conserve the value of property is reasonable and not arbitrary. In describing the purpose of the ordinances the Court stated:

"It thus becomes very obvious that the ordinances in question are adopted for esthetic reasons and are an attempt to control the architectural style of homes in the community, despite the fact there have been more modern touches in the new buildings recently erected and a lack of strict application as to others in the community. The desire of the officials is an attempt to preserve in the community types of homes similar to their own and their neighbors."

The Court pointed out that under the earlier law of New Jersey no ordinance which attempted to regulate esthetics in construction was considered valid. The Court, however, emphasized that "esthetic zoning" has been more sympathetically treated in later years "but with the qualification that it has been approved on grounds other than esthetics alone." The Court gave as an example of this change in approach, the so-called "look alike" ordinances. These ordinances, the Court said, "have primarily dealt with minor changes in the façades of the building and have not required any great expense on the part of the builder *nor have they gone as far as our case where complete architectural standards come into question.*"

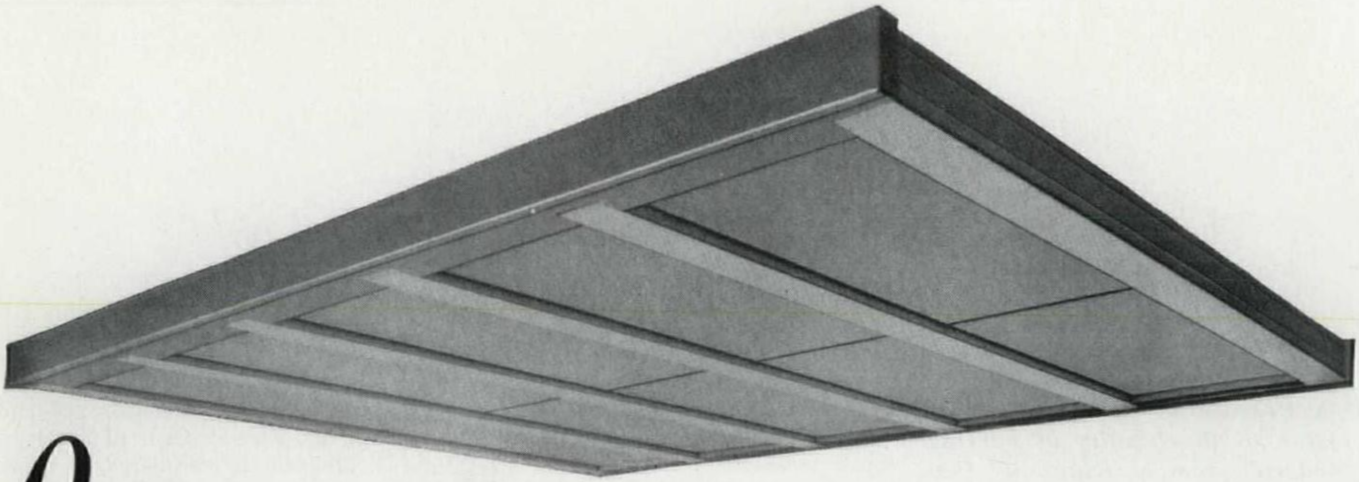
The Court, in its opinion, however, recognized that regulation limited merely to the question of uniformity and avoiding the over-all issue of architectural standards is considered, in many quarters, as superficial. In this respect a nationally known architect was quoted as follows:

"No - look - alike legislation fails to achieve proper results and is only superficial. The design of a residential neighborhood requires a much more positive attack going beyond the façade of a building; variety in building does play a part, but unless governed by significant underlying principles, little or nothing is achieved. . . . A competent board of people can do better than regulate uniformity if armed with legislation that goes to the heart of the matter, which is esthetics."

The Court concluded that the regulation of construction in the establishment of architectural standards is valid and legal provided there is a definite relationship to the general welfare. It further concluded, however, that such relationship did not exist in respect to the ordinance before it. The Court stated:

"While I am firmly of the opinion that the regulation of building by the setting up of architectural standards is valid and legal, yet under the present status of the law, we cannot say that it may be the regulation of esthetics alone but must be liberally construed on the basis of the general welfare and bear a relationship to the general welfare in some definite way. I have given a great deal of consideration to the ordinances in question and the testimony before me. I cannot support the contention of the municipality under the facts of the instant case. . . . There is no showing before me that earlier ordinance bears relation to the general welfare of the community . . . the only testimony before the Court was that the governing body wanted to keep the town as it was. This is not a proper relation to the general welfare nor do their past actions support their position."

As stated by United States Supreme Court (*Berman* v. *Parker*), "the concept of the public welfare is broad and inclusive. The values it represents are spiritual as well as physical, esthetic as well as monetary." The case discussed illustrates the dangers inherent in attempted regulation and on the plus side, the motivation, confused as it is, toward "esthetic zoning."



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OFFICE BROCHURES 3: planning to build

P/A Office Practice ***article continuing excerpts from the office brochure prepared for clients by the office of Nolen & Swinburne, Architects.***

As two previous articles on this subject have pointed out, office brochures do not need to be illustrated samplings of a firm's accomplished work. The booklet prepared by the Philadelphia firm of Nolen & Swinburne under the title of *Planning to Build* is a series of excellent, simply and clearly worded descriptions of the procedures an architect goes through for his clients—written at a level higher than most such booklets are, clarified by occasional tables and charts. On this page several quotes from the brochure will be made; on page 11 is illustrated the spread describing the purpose of Contract Documents.

"drawings

"Drawings are the bridge between conception and completion of a building project. Programming establishes the requirements of the problem . . . drawings develop the solution.

"There are three kinds:

Schematic Drawings
Preliminary Drawings
Working Drawings

"Nolen & Swinburne prepare schematic and preliminary drawings so that our clients readily understand them. Technical drawings are needed, certainly, but they can be confusing to those who can't read them. Accordingly, we select from the whole field of Graphic Arts those media which will effectively convey our ideas. We prepare: coded charts and diagrams to explain statistics; colored sequence drawings and overlays to explain systems or expansion programs; models, slides, full size mock-ups and other visual aids to explain what we are doing. We organize a system of reports, brochures, and other material that will help our clients conduct an effective Public Relations campaign.

"Nolen & Swinburne prepare working drawings, first as a Contract Document for the client that will give him full legal protection; second for the contractor as a Bidder who must quickly and accurately determine the cost of construction; and, third, for the contractor as a Constructor who must put the building together properly and on schedule.

"Drawings serve different purposes and are divided into three phases:

Schematic Drawings. These are diagrams of broad areas of possible solutions. Thinking is in general terms . . . basic policies are established. Decisions are made that set the course for all subsequent work.

"*Preliminary Drawings.* These drawings crystalize the solution. All program requirements are defined and criteria established which control final construction of the project.

"Schematic and Preliminary Drawings are prepared for the exclusive use of the client, not the contractor. Through them the architect interprets the program requirements and demonstrates his solution. During these exploratory and fluid phases the client can order changes in the plans or ask for new studies and arrangements until he is satisfied with the solution. Once he has approved them, however, only minor changes may be made, unless he chooses to pay the extra production costs caused by the change. The purpose of preliminary drawings is to establish agreement on the final solution and eliminate subsequent changes.

"*Working Drawings.* These technical detailed drawings show where space is to be enclosed and the methods of assembly and erection of materials and equipment. They establish the full scope of work, determine the contract price and are a directive to the contractor on precisely how to lay out the work. They become a part of the Contract Documents and are included in the construction agreement.

"The architect in conferences with the client, keeps him advised of the progress of work through each of these three phases. Before advancing from one phase to another, the architect receives the client's approval of that stage and authorization to proceed with the next.

"specifications

"Specifications complement the drawings. Each is useless without the other. Stated simply: the drawings say 'Where'; the specifications say 'How.'

"There are two kinds:

Preliminary Specifications
Final Specifications

"The office of Nolen & Swinburne, with the sureness and confidence of many years experience, will write a positive specification that will give the client precisely what he should have.

"We believe that firm specifications, carefully written and objectively enforced during construction, will insure:

Careful pricing during bidding stage.
Elimination of undesirable sub-contractors.
Proper materials and workmanship in the building.

"*Preliminary Specifications* are prepared for the client exclusively. They accompany the preliminary drawings and outline the materials to be selected for the work, the types of mechanical-electrical systems needed to operate it and the equipment required for special purposes. These specifications are short and as non-technical as possible. They are designed to give the client a clear picture of his building and establish selection of final material and equipment.

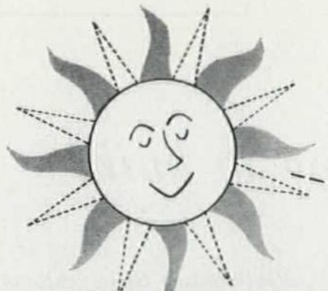
"*Final Specifications* complement the working drawings and become a part of the Contract Documents. They establish kinds of material and equipment and set up the standards of quality for material selection and workmanship.

"Final specifications must be clear, concise, realistic, informed, and authoritative. Nothing so demonstrates the professional and technical competency of the architect as this mastery . . . or lack of it.

"Construction in the field is a highly complex business operation with many problems in co-ordination, scheduling, and erection. From 30 to 50 or more sub-contracts will be involved, each requiring special knowledge and techniques . . . a weak, uninformed or ambiguous specification will produce nothing but trouble. If differences of opinion develop during construction, specifications, not the drawings are usually the basis of settlement.

"No pretty drawings or pictures here. Hard-headed business experience based on years of knowledge of trade practices and field supervision is required to write a good specification and later interpret it fairly and objectively."

(Continued on page 11)



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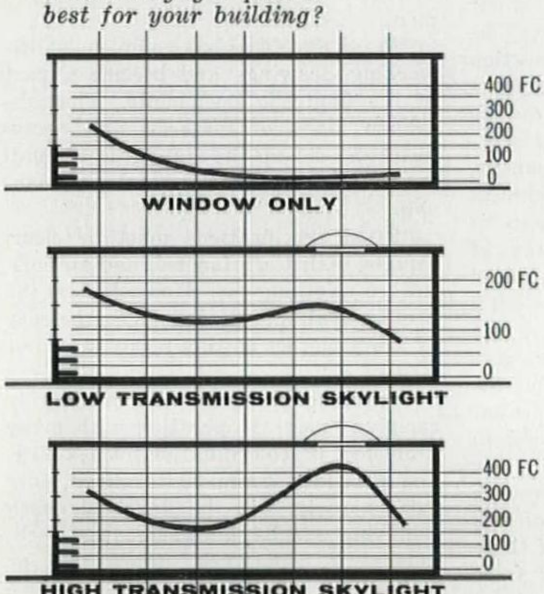

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OFFICE BROCHURES 3: planning to build

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Instructions to Bidders
Contractor's Proposal Form
Bid Bond *
Owner/Contractor Agreement
Performance Bond
Payment Bond *
General Conditions
Special Conditions
Working Drawings
Specifications
Addenda to Documents

* These items usually are required only when bidding on public work.

The office of Nolen and Swinburne takes particular care in the complete development of contract documents. The idea that architects simply make blue prints supplemented with a few outline specifications is a popular misconception.

We insist on absolute definition of all construction methods, materials and scope of work in the drawings and specifications. In addition, we set up the machinery for protecting the owner during and after construction operations.

We establish the methods of administration and financial status during progress of the work. We assist in maintaining proper legal procedure and determine that the owner's interests under the contract are safeguarded.

Stated simply, the contract documents mean: PROTECTION.

Explicit drawings and clear specifications protect the owner from inferior or improper construction and extra costs. But this is not the end - he must have many other forms of protection.

The owner needs: protection for his project; protection for his investment; protection for himself.

PROTECTION

FROM CONTRACTORS:

Agreement
Performance Bond
Payment Bond
Working Drawings
General Conditions
Special Conditions
Specifications

FROM HAZARDS

Public Liability Insurance
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Workmen's Compensation
Fire Insurance
Special Hazards Insurance

THROUGH LEGAL REQUIREMENTS

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Insurance
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Reactor Facilities Require Negative Air Pressure

Mechanical Engineering Critique by William J. McGuinness

P/A Practice of Architecture *column on mechanical and electrical design and equipment — devoted this month to control of ventilation for nuclear structures*·

Processes involving radioactive materials are carried out in a partial vacuum. The greatest suction or "negative pressure" is in the vicinity of the greatest potential source of contamination, such as a reactor. By this method, air, which could contain radioactive particles, is drawn to a terminal point where it can be monitored, filtered, and, if necessary, scrubbed before being discharged through a dispersal stack often several hundred feet in height. The rooms and buildings surrounding a reactor or other "hot" areas are visualized as an enormous chemical exhaust hood with a single battery of exhaust fans at the base of the dispersal stack. "Hot" refers to the possible presence of radioactivity rather than high temperature. The reactor shown (*below right*), for instance, is separately watercooled. The occasional opening of windows and doors in rooms along the line of air-flow preceding the reactor container will allow fresh air to join the air stream, and the slight suction prevents potentially dangerous air from leaving the buildings. Exterior wall openings in the reactor container are gasketed and always closed unless the reactor is down.

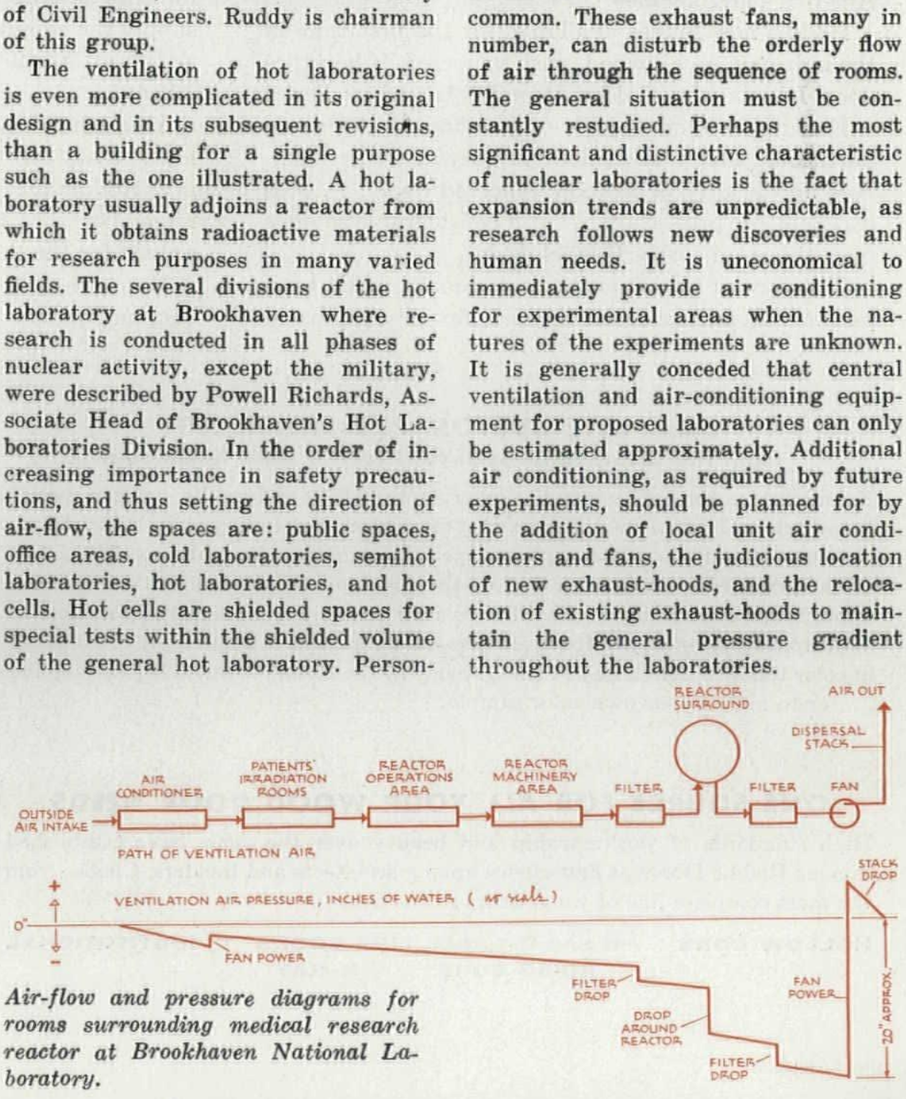
It must not be thought that personnel and equipment close to reactors, or other hot areas, are subject to contamination because they are at the tail-end of this air stream. The entire scheme of one-way air-flow, though in constant use, is an emergency precaution only, and is based upon the theory that it is safer to have a king-size vacuum cleaner to collect and control the products of an extremely rare accident, rather than to contaminate the countryside by the uncontrolled dispersion of polluted air. There are people who spend all of their working hours in the shadow of a reactor without the slightest ill effect.

John M. Ruddy, Chief Engineer, Architectural Planning Division, Brookhaven National Laboratory, has supplied us with an example of this kind of planning, illustrated in flow and pressure diagrams (*right*). They were part of the program given by the Laboratory to Architects Eggers & Higgins and Engineers Syska & Hennessy for the design of the ventilation system in the reactor container of the new Medical Research Center now under construction at Brookhaven. Syska & Hennessy then implemented this proposal by the selection of equipment, and a general study and design of areas where rooms and doorways were virtually part of a great duct system It will be noticed that a negative pressure exists in all rooms. Even the air conditioner at the intake of outside air does not pressurize the first room. The only positive pressure is in the stack after the air has been monitored and filtered.

For a while, nuclear experts will have to set the standards for each installation; gradually, however, design instructions will appear to aid the non-nuclear architect and engineer. In preparation now is a proposed *Manual of Hot Laboratory Design Criteria* by the Subcommittee on Hot Laboratories, of the Committee on Nuclear Structures and Materials, of the American Society of Civil Engineers. Ruddy is chairman of this group.

The ventilation of hot laboratories is even more complicated in its original design and in its subsequent revisions, than a building for a single purpose such as the one illustrated. A hot laboratory usually adjoins a reactor from which it obtains radioactive materials for research purposes in many varied fields. The several divisions of the hot laboratory at Brookhaven where research is conducted in all phases of nuclear activity, except the military, were described by Powell Richards, Associate Head of Brookhaven's Hot Laboratories Division. In the order of increasing importance in safety precautions, and thus setting the direction of air-flow, the spaces are: public spaces, office areas, cold laboratories, semihot laboratories, hot laboratories, and hot cells. Hot cells are shielded spaces for special tests within the shielded volume of the general hot laboratory. Personnel entering the hot laboratory section never leave by the same door, but are checked before leaving through the shower-toilet area. Similarly, air entering the hot area never returns to the colder sections, but leaves through the stack.

A number of special problems arise. These air systems, unlike those in most non-nuclear buildings are "once-through" installations using 100 percent outside air. This is very expensive, especially at Brookhaven where the reactors, all devoted to research only, cannot be tapped for power. Fossil fuels for heat and purchased electricity for cooling are costly when no recirculation is permitted. Exhaust fans in hoods for local research projects within the general hot area must be powerful, because they draw contaminated air from the radioactive material through filters which are fine enough to remove virtually all contamination. A pressure differential of three or four in. of water across an "absolute" filter is not uncommon. These exhaust fans, many in number, can disturb the orderly flow of air through the sequence of rooms. The general situation must be constantly restudied. Perhaps the most significant and distinctive characteristic of nuclear laboratories is the fact that expansion trends are unpredictable, as research follows new discoveries and human needs. It is uneconomical to immediately provide air conditioning for experimental areas when the natures of the experiments are unknown. It is generally conceded that central ventilation and air-conditioning equipment for proposed laboratories can only be estimated approximately. Additional air conditioning, as required by future experiments, should be planned for by the addition of local unit air conditioners and fans, the judicious location of new exhaust-hoods, and the relocation of existing exhaust-hoods to maintain the general pressure gradient throughout the laboratories.



Air-flow and pressure diagrams for rooms surrounding medical research reactor at Brookhaven National Laboratory.

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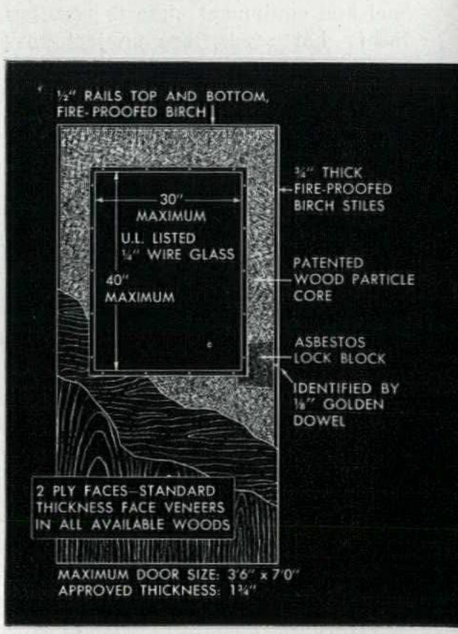

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For maximum factory-to-installation protection, finer end results, you can specify your Roddis Doors *primed and sealed* at our factory before shipment. Roddis' new, automated production line applies a special synthetic resin sealer to the double-sanded, dust-free doors. After drying, the doors are sanded again to emerge with a tough, smooth undercoat that assures a perfect on-the-job finish application.

Completely pre-finished doors are also available. You can specify doors finished in color tones to match any of the 9 woods in the Roddis Craftwall paneling line . . . or to match your own color sample.

ONE SOURCE FOR ALL YOUR WOOD DOOR NEEDS

High standards of workmanship and beauty over the years have established famous Roddis Doors as first choice among architects and builders. Choose from the most complete line of wood doors in the field . . .

HOLLOW CORE **B and C-LABEL FIRE DOORS** **INSTITUTIONAL**
SOLID CORE **X-RAY**

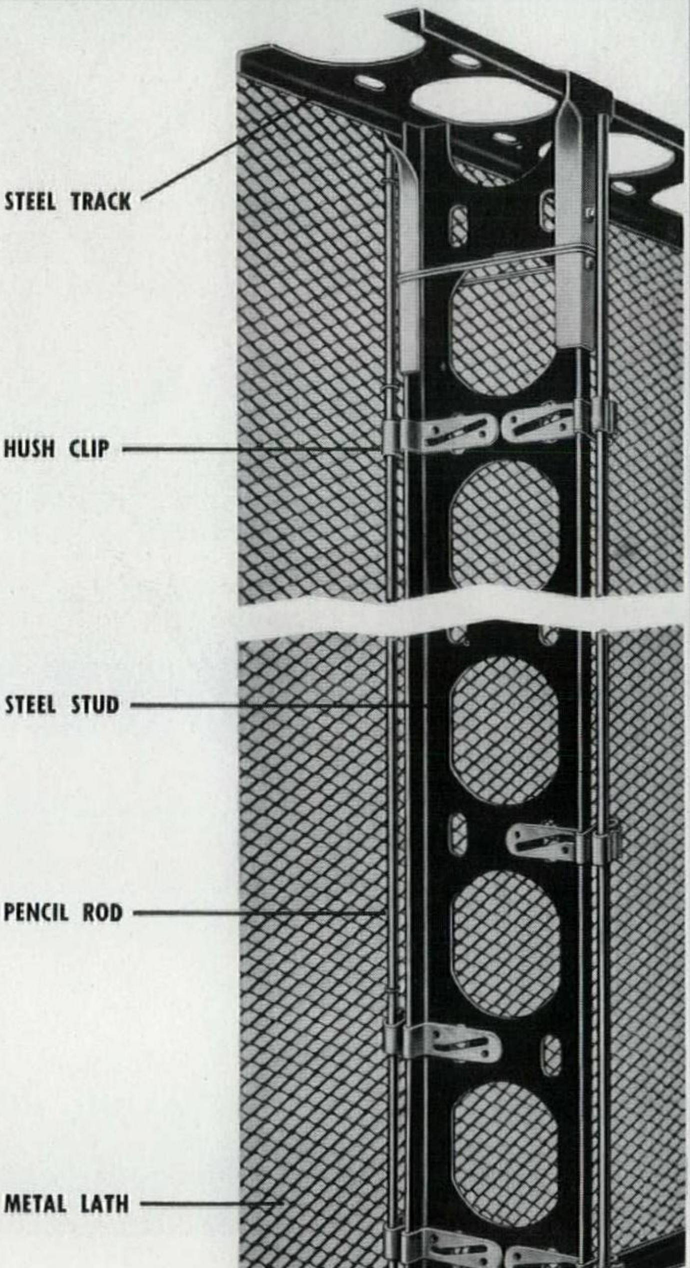
here's a partition that

STOPS SOUND AND FIRE

in their tracks!

FIRE-RESISTIVE RATING: 3½ hours. Test conducted with a partition of 4" studs and 1" perlite plaster on each face. An identical partition also met all ASTM Fire and Hose Stream Requirements for a 3½-hour partition.

SOUND-TRANSMISSION LOSS RATING: 56.4 decibels. This partition had 3¼" studs and ¾" sanded gypsum plaster on each face.



The above fire and sound ratings are the highest ever obtained by a metal lath and plaster partition. They were recorded by Penmetal's HUSH-CLIP* system, in tests conducted by a recognized Midwestern research laboratory.

For a better fire rating, you'd have to go to costly, heavy, solid masonry or reinforced-concrete construction. A comparable sound rating cannot be obtained with a conventional double partition, even when the assembly is 10" thick, and mounted on 1" cork strips. The HUSH-CLIP system does not require cork strips, and can be as thin as 5½".

Utilizing steel studs and track, and plaster over metal lath, the system features a unique clip used in combination with a pencil rod. Because direct wall-to-stud contact is limited to point of clip, the area over which sound is transmitted is greatly reduced. Since components are designed to fit together, assembly is easy and economical.

Another advantage of this system is resistance to plaster cracking. The wall proper is held away from the studs by the resilient clips which allow the panel to "float." Movement due to expansion and contraction is thus absorbed and possibility of cracking is greatly reduced.

Send for full details of this unique partition. Ask for a copy of folder 615-L.

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METAL MARK Penmetal 1869 OF QUALITY

a name to remember

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PM-173

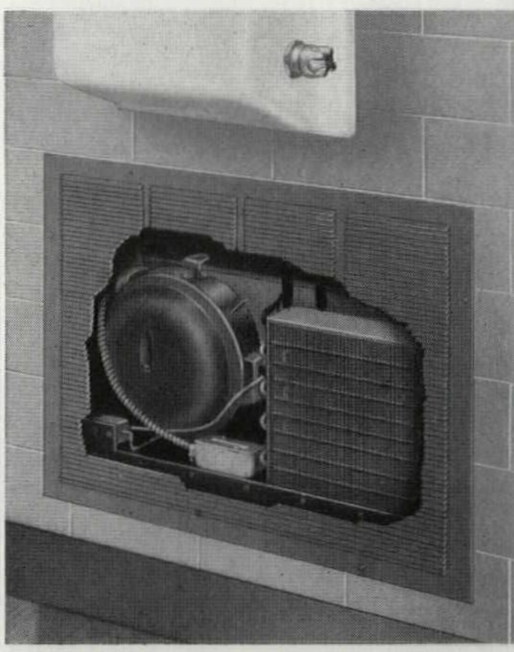
"Low cost **OASIS IN-A-WALLS** the complete solution to cooled water"

Ultra-modern new Howard Building in Providence, R. I., has built-in Oasis In-A-Wall Water Coolers. Architect—Albert Harkness & Peter Geddes, Providence.

The Howard Realty Company, of Providence, R. I., is unusually enthusiastic over the super-compact efficiency of the Oasis In-A-Wall Water Coolers in its new 10-story Howard Building. The owner says,

"We're greatly pleased with the low cost, the ease of installation, and the clean-cut modern look of our ten Oasis In-A-Wall Water Coolers. Everyone concerned feels that they are the complete solution to our problem of providing ample cooled water for each floor."

Versatile Oasis In-A-Wall Water Coolers are easy to mount on joists, in closets, or on a wall. They're built thin to build in —even in an 8-inch wall. In-A-Wall coolers can serve up to four remote fountains with cool, refreshing water.



Specify either of two models. IW-5 supplies 5 GPH for two remote fountains, serves 60 in offices, 35 in light industry. IW-10 has 10 GPH capacity for four remote fountains, serves 120 people in offices, 70 in light industry.

For every building need, there's an Oasis Water Cooler. Line includes models with capacities from 2 to 35 GPH, some with refrigerated compartments, and the famous Hot 'n Cold which also supplies piping hot water for coffee-breaks.

Send the coupon for complete specifications and roughing-in details

OASIS WATER COOLERS

The Ebco Manufacturing Company, Columbus 13, Ohio
Manufacturers of the most complete line of water coolers
Distributed in Canada by G. H. Wood & Co., Ltd.

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Send specifications and roughing-in details for Oasis In-A-Wall Water Coolers.

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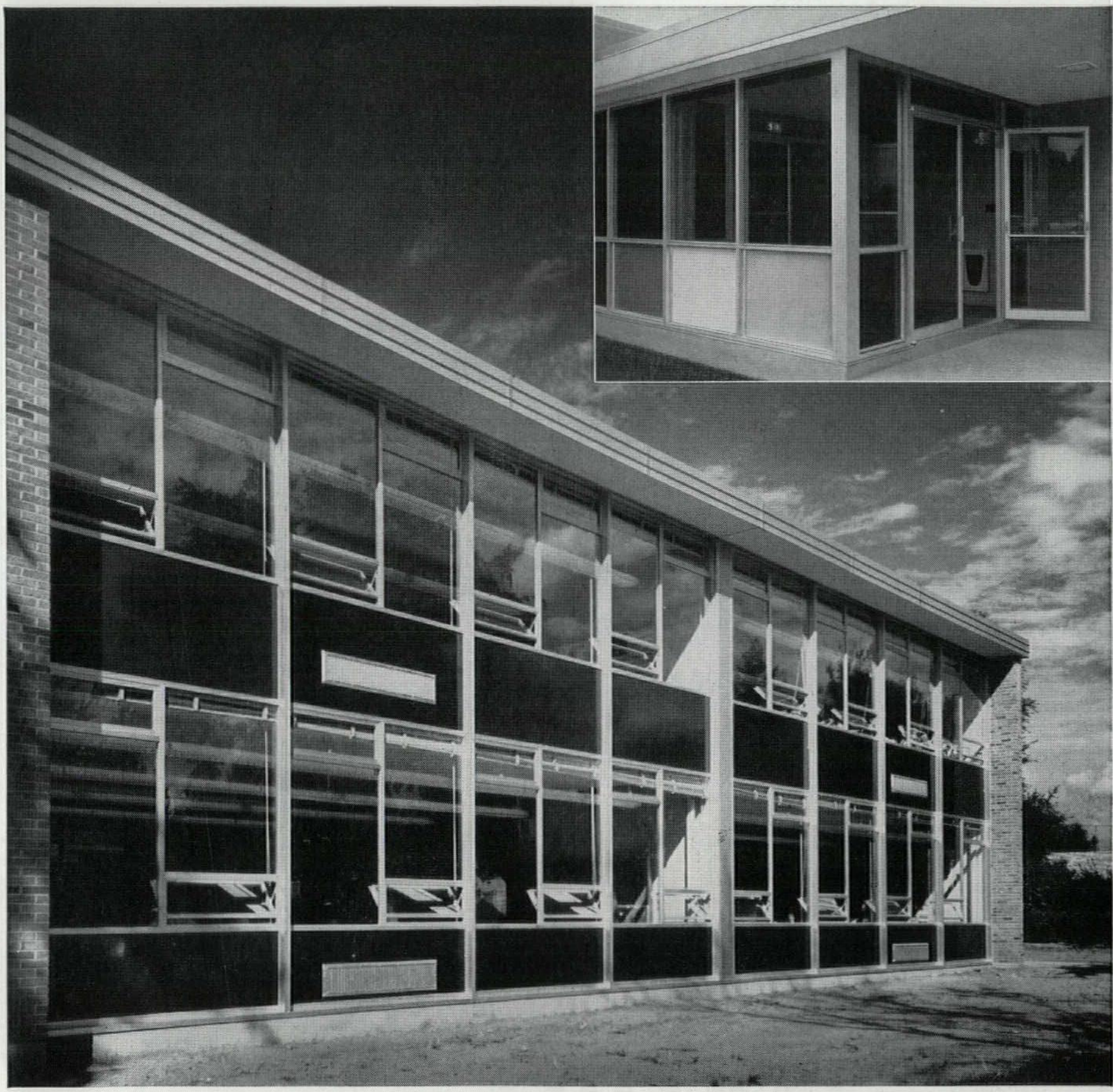
you can't look at, in, a school without



East Side School, Niles, Mich. Edward R. Duffield, A. I. A., Niles, Mich.

A CHOICE OF WALL SYSTEMS TO SUIT YOUR BUILDING AND YOUR BUDGET

Shown is a Kawneer Unit Wall, the pre-engineered, pre-fabricated wall system. It is only one of many Kawneer wall systems designed for schools. They range from the simple systems that are cut and fabricated for the job to precision-engineered, custom pre-fabricated systems. If insulated or facing panels are required, Kawneer can supply a wide range of colors. Each has its own particular advantages for certain types of buildings. That includes the price.

through or out of seeing applications for KAWNEER products!

the quality is artistocratic, and prices are now plebeian!

Look at the entrances . . . Here are doors that can withstand those repeated school's-out explosions longer than any other. It's either the Kawneer Wide Stile School Door—a rugged door with a clean, attractive design—or the durable Narrow Stile that's serving in many schools. Either can be equipped with a Kawneer Panic device. Kawneer has available the widest range of doors in the industry including type and color. Of course, frames are built of trim Kawneer Narrow Line members, whose lines harmonize with either door.

Look at the color trim . . . It may be Kawneer Zourite, a ribbed wall facing material that comes in a wide range of standard colors. Or it may be Kawneer Colorwall—panels faced with porcelainized steel or aluminum.

Look at the inner doors . . . The double doors inside the entrances and the office doors may be Kawneer Narrow Stile Doors. They combine sleek, slim lines with great strength. Spots of color may be added with Kawneer Color Glass Stops, with matching or contrasting Colorware Door Hardware. Kawneer Triple-Strength Flush Doors—plain or with single or multiple lights and louvers are available, too.

Look outdoors . . . Weather protection can be supplied by Kawneer Walk Covers. The sun control devices protecting the windows are Kawneer K-Louver sun shades.

Look in the laboratories, lavatories and shower rooms . . . There's Kawneer Colorwall again, doing the job that tile used to do, and at much less cost! Its myriad colors make the rooms bright and attractive, and it wipes clean with the whisk of a damp cloth.

Look down the halls . . . Where glazed areas separate rooms from the halls, Kawneer Division Bars or Narrow Line glazing members hold the lights of glass. Kawneer furnishes a complete line of doors, trophy and poster cases.

Everywhere in schools, there's a place for products with the "Kawneer Touch."

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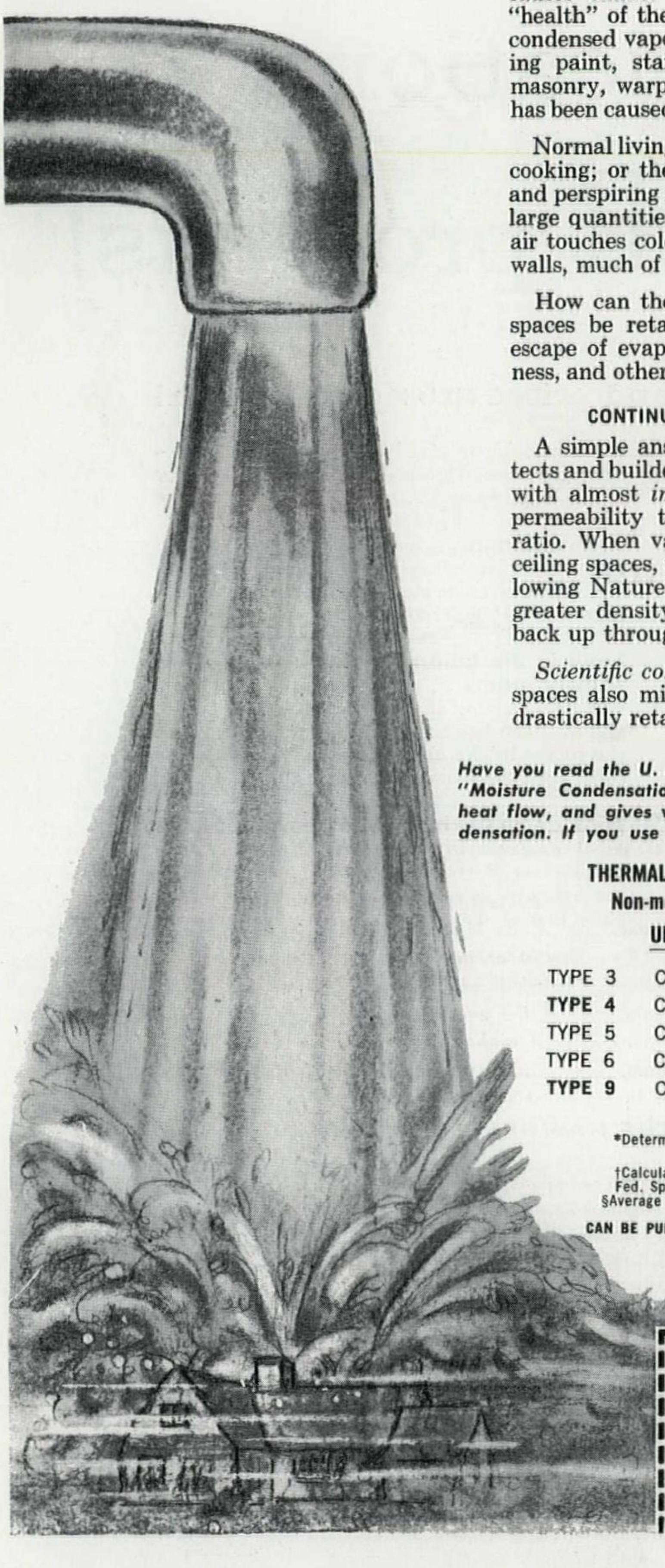
VAPOR HAS CAUSED MORE DAMAGE THAN FLOODS!



Like a cancer, the growth of the fungus which causes timber rot, *continuously* undermines the "health" of the house. This growth is promoted by condensed vapor. Condensation also promotes peeling paint, stained plaster, damaged mortar and masonry, warped flooring. More aggregate damage has been caused to buildings by vapor than by floods.

Normal living routines in a home; washing, drying, cooking; or the presence of many people breathing and perspiring in markets, churches, theatres, create large quantities of vapor. When warm, vapor-laden air touches cold inner surfaces of roofs and exterior walls, much of it condenses, and causes damage.

How can the flow of vapor into wall and ceiling spaces be retarded? How can one accelerate the escape of evaporation of driven rain, leaks, dampness, and other water from building spaces?

CONTINUOUS VAPOR BARRIER OF METAL

A simple answer has been found by many architects and builders. Exterior walls and roofs, compared with almost *impervious metal*, have greater vapor permeability than the required minimum 5 to 1 ratio. When vapor pressures build up in wall and ceiling spaces, the vapor flows out (harmlessly), following Nature's Law that gases flow from areas of greater density to those of less density. It cannot back up through *impervious, continuous* metal.

Scientific continuous, multiple aluminum and air spaces also minimize condensation formation; and drastically retard heat as well as vapor flow.

Have you read the U. S. NATIONAL BUREAU OF STANDARDS brochure: "Moisture Condensation in Building Walls"? It discusses vapor and heat flow, and gives vital facts on the causes and prevention of condensation. If you use the coupon, you'll get a copy at our expense.

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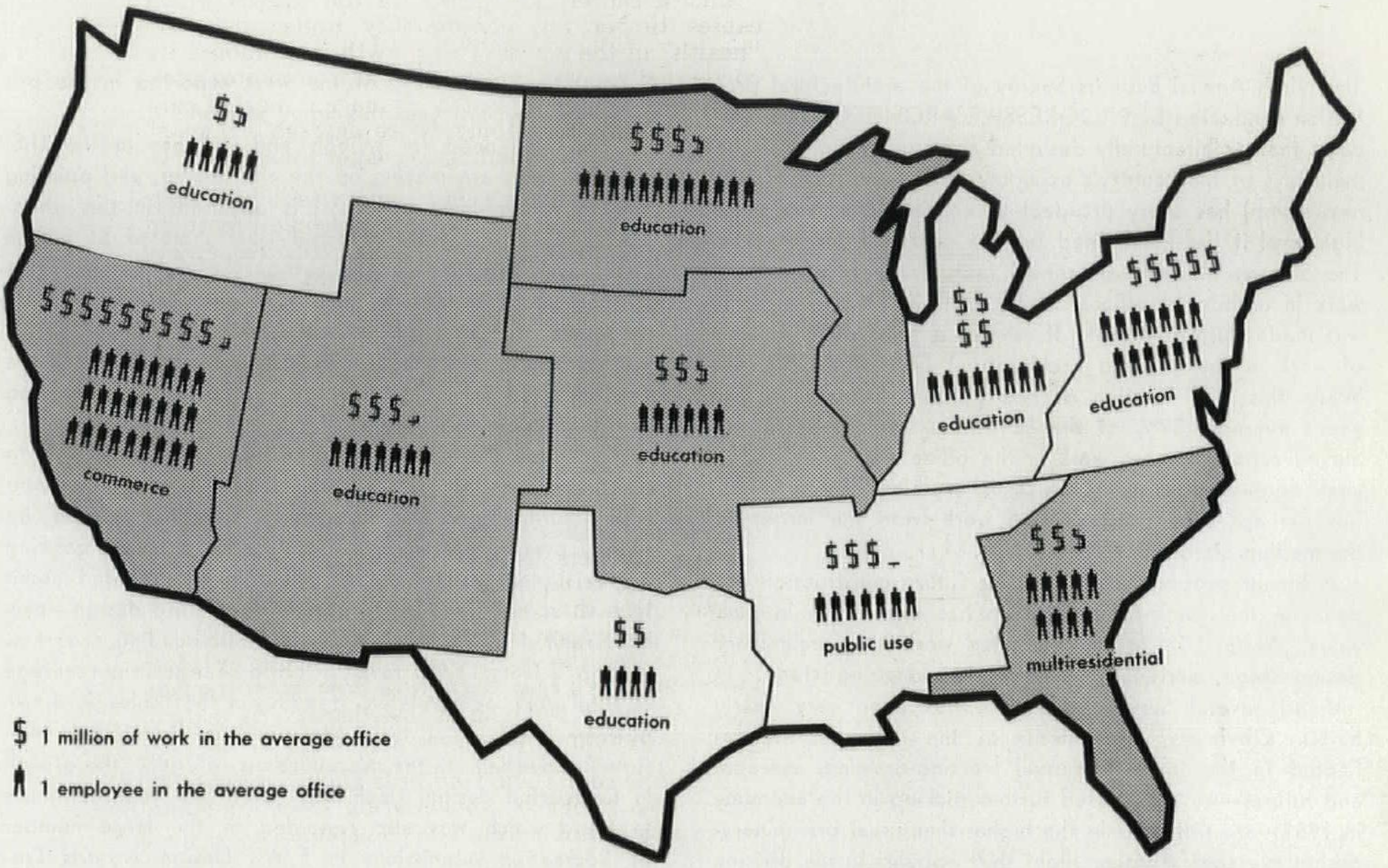
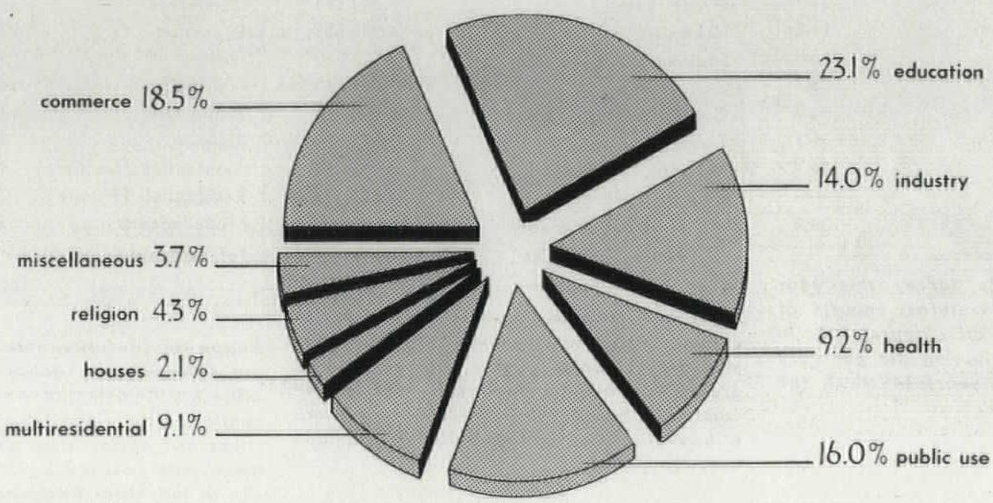


DESIGN FOR EDUCATION REGAINS LEAD IN ARCHITECTS' OFFICES

School design—nudged out of first place last year by Commercial design—has again taken the lead in dollar-volume activity in the average architect's office. In P/A's Ninth Annual Business Survey of the architectural profession, reported in detail on the following pages, the total, average, dollar volume remains gratifyingly high and there are few unexpected shifts in either regional or building-category distributions. The pie chart (below) illustrates the percentage of the average architect's work devoted to each building type. The map (above) shows the ten regions of the U.S. with each $ symbol indicating $1 million of work on the boards of the average architect in that region; each figure of a man representing the number of employes in the average office; and the building category showing the highest dollar-average in each region also indicated. Shaded regions report more work, on the average, than last year; unshaded regions report a decrease.

Map and Chart: Elmer A. Bennett



P/A BUSINESS FORECAST FOR 1959

The Ninth Annual Business Survey of the architectural profession conducted by PROGRESSIVE ARCHITECTURE indicates that architecturally designed construction (one of the mainstays of the country's economy during the recent business slump) has every prospect of continuing at the same high level it has maintained for the past half-dozen years. The Survey, which is an annual factual report of current work in architects' offices, to be built in coming months, was made during August. It reveals a total dollar-volume of work in the average architectural firm of $4,307,142. While this is a fraction of one percent lower than last year's average, 59% of the 809 firms taking part in the Survey reported more work in the office than they had a year ago—a divergence which is explained by a slight, but perhaps significant, shift in work from the larger to the medium-sized offices.

A higher proportion of work for future construction appears in the current Survey than has been seen in past years. About 55% of the reported work is in preliminary design stage, and 45% is in working-drawing stage. In the last several Surveys this ratio has been very nearly 50-50. Obviously, late effects of the recession are reflected in the lower-than-usual working-drawing average, and futures—an anticipated further pick-up in the economy in 1959—are reflected in the higher-than-usual preliminary-design average. Another slight shift appears in the division between design for public agencies and private clients. This Survey shows only 51% of the work reported in the private category; last year this figure was 54.4%.

Continuing need for schools and colleges in the U.S. (with the emphasis moving up the age ladder, and pointing now to college-level buildings) is apparent in the whopping 23% of the total reported—just short of $1 million in the average office—in the category of Education (Table 3). Last year, for the only time in recent years, Commerce exceeded Education solely on the basis of a huge dollar-volume figure, which has now declined (from 23% of the total reported to 18.5%) leaving the school/college-building category again the leader.

Commerce assumes a strong second place, testifying to the importance of private-business commissions in current architectural activity. Industrial design has picked up slightly over recent years. The signs of a slowly growing industrial-plant expansion are reflected in increased architectural commissions for this type. Public-use design—perhaps swelled by recession-inspired public-building programs —jumped from 11.6% to16%. Little change in percentage of total work, or in relative standing in the tables, is shown by remaining building types (Religion, and Private and Multiple Residential). In the miscellaneous category, the growth in Recreation design which was noted last year continues (a trend which was also reflected in the large number of Recreation submissions in P/A's Design Awards Program).

Table 1
Number of Firms Reporting and Regional Distribution

Region	% of Firms
Northwest	4.7
North Central	9.0
Great Lakes	11.4
Northeast	21.7
Southeast	11.8
Gulf States	5.8
Central States	8.3
Texas	6.7
Western Mountain	6.7
California-Nevada	13.9
	100.0

Valid returns in P/A's Survey this year (excluding incomplete returns, reports of death or retirement, etc.) were 809 in number. Regional distribution did not vary greatly from previous years in which the Survey has been made.

Table 2
Average Dollar Volume by Regions

Region	Average $ Volume
Northwest	1,717,211
North Central	3,666,165
Great Lakes	3,697,511
Northeast	4,986,527
Southeast	2,802,510
Gulf States	3,049,063
Central States	2,830,905
Texas	1,929,556
Western Mountain	3,297,241
California-Nevada	9,382,733
National Average	$4,307,142
National Median	$1,200,000

California is heavy leader this year in volumes reported by regions, with Northeast States second. Other regions seemed grouped in two volume-levels with Northwest and Texas (until the last few years a heavy-volume State) below $2-millions average.

Table 3
Dollar-Volume Averages and % Distribution of Work by Types of Buildings in All Regions

Type	% of Average Architect's Work	$ Volume Average Office
Commerce	18.5	794,653
Education	23.1	996,100
Health	9.2	396,942
Industry	14.0	601,521
Public Use	16.0	690,055
Religion	4.3	185,339
Residential (Multiple)	9.1	392,257
Residential (Private)	2.1	92,020
Miscellaneous	3.7	158,255
Total (average office — all regions)	100.0	$4,307,142

Design for Education once again leads building categories in dollar volume. Average office has Commercial work in second place, Public Use buildings (risen sharply) in third. Other categories stay about as they have been, with possible significance attaching to rise in industrial category.

Table 4
Activity of Architectural Firms in Types of Buildings

Types of Buildings	% of Architects Reporting Current Work
Commerce	54
Education	51
Health	26
Industry	26
Public Use	30
Religion	44
Residential (Multiple)	25
Residential (Private)	45

This table indicates the percentage of total firms reporting who are engaged in the various building-type categories listed. Despite a continuing high percentage of specialization (Table 5) the chart above would seem to show that the typical firm has a healthy distribution of work by types.

Table 5
Specialization of Architectural Firms

Types of Buildings	% of Firms doing only this type
Commerce	2.5
Education	4.2
Health	.1
Industry	.1
Public Use	1.1
Religion	1.2
Residential (Multiple)	.9
Residential (Private)	2.6
Total Specialists	12.7

The percentage of firms doing only one particular building type has not changed appreciably over the years. The total specialists are down one percentage point from last year's Survey.

Table 6
Sizes of Architectural Firms

Size of Firm by Number	% of National Total
Up to 4 employes	60.6
5 to 9 employes	19.0
10 to 19 employes	9.4
20 to 39 employes	6.2
40 to 99 employes	2.7
100 and more employes	2.1
	100.0

Average number of employes: 11.1
Median number of employes: 4

Size of Firm by $ Volume of Work on Boards	% of National Total
Under $1 million	43.4
$1 million to $10 millions	47.8
$10 millions to $50 millions	7.3
Over $50 millions	1.5
	100.0

Year by year, P/A's Survey has shown a percentage distribution—by dollar volume of work in the office, and by number of employes—that changes very little (that is still very close, as a matter of fact, to the percentages turned up in AIA's 1950 Survey for its Architect at Mid-Century report). As the averages and medians indicate, the great bulk of the architectural offices (roughly 80%) have less than $10 millions of work on the boards at a given time, and employ less than 10 people.

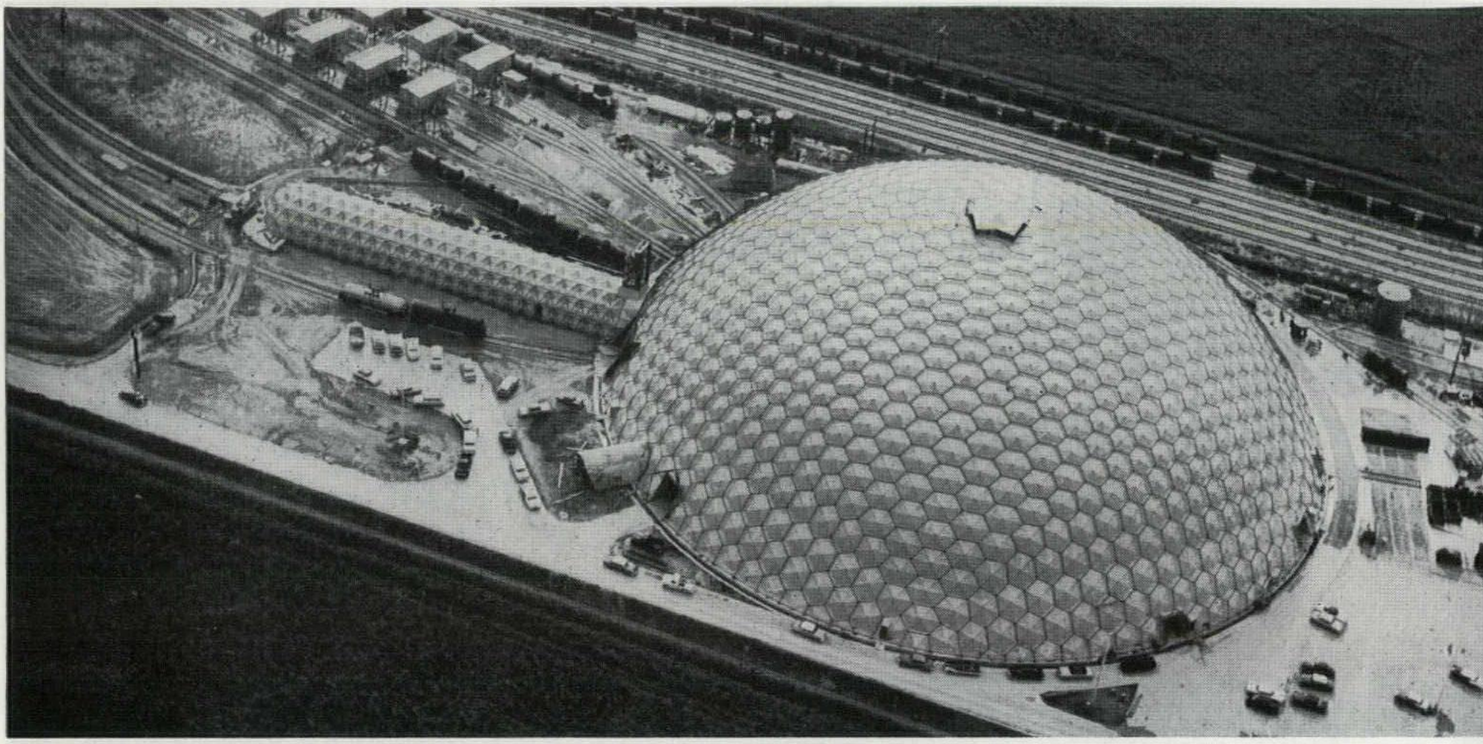
Regionally, California-Nevada is far out in front in the volume of work done by the average practitioner (Table 2). Last year, several of the very large firms active in this area indicated smaller than normal business, and the region dropped to third place. In the current Survey, the same firms report increased activity, and the region moves to the top again. The Northeast and Great Lakes regions follow, maintaining the hold on the first three places these industrial sections of the country have consistently had.

One interesting fact that the P/A Survey has demonstrated over the years is that the size of the average firm—by number of employes and by dollar volume of work done—does not vary much from year to year, but does show a gradual move toward a larger average office, with concurrent increases at both the top and bottom of the size scale. In the present Survey, for example, there are 11.1 employes in the average office (last year the figure was 10.5; it has increased gradually over the years from 10.0 in 1951) and the median is 4, as it has been consistently since the first P/A Business Survey.

Arguments advanced during the past year that a tiny fraction of the total of architectural firms does a great percentage of the total of work (a misinterpretation not very flattering to the great bulk of the hard-working practicing profession) are again put in proper perspective by the statistics in this Survey. The larger firms—those with over $50 millions of work on the boards at the time the Survey was made, and those with more than 100 employes—are a very small percentage of the profession (2.1%). Whatever percentage of the total construction volume these "giants" may account for, the great bulk of architecturally designed construction is still produced by thousands of small- and medium-sized firms throughout the country. The average firm has $4,307,142 of work on its board; the median volume at the time of the Survey was approximately $1,200,000.

The amount of specialization in particular building types has not changed significantly from previous Surveys (one percentage point drop since last year) nor have the areas of specialization (Table 5). Also, as in past years, activity in the various building types within the profession is widespread—more than half the firms reporting have commercial and educational work on the boards; nearly half have religious and private residential work; at least a fourth are designing health facilities, industrial plants and public-use structures.

By and large, a healthy, growing picture develops in P/A's Forecast for 1959. The spottiness turned up by the previous Survey (an early indication of the distress some parts of the field felt during the first half of 1958) seems to be replaced now by a widely documented front of optimism, busy drafting rooms, and appropriately diversified types of commissions.



BUCKY'S BIGGEST BY FAR AT BATON ROUGE

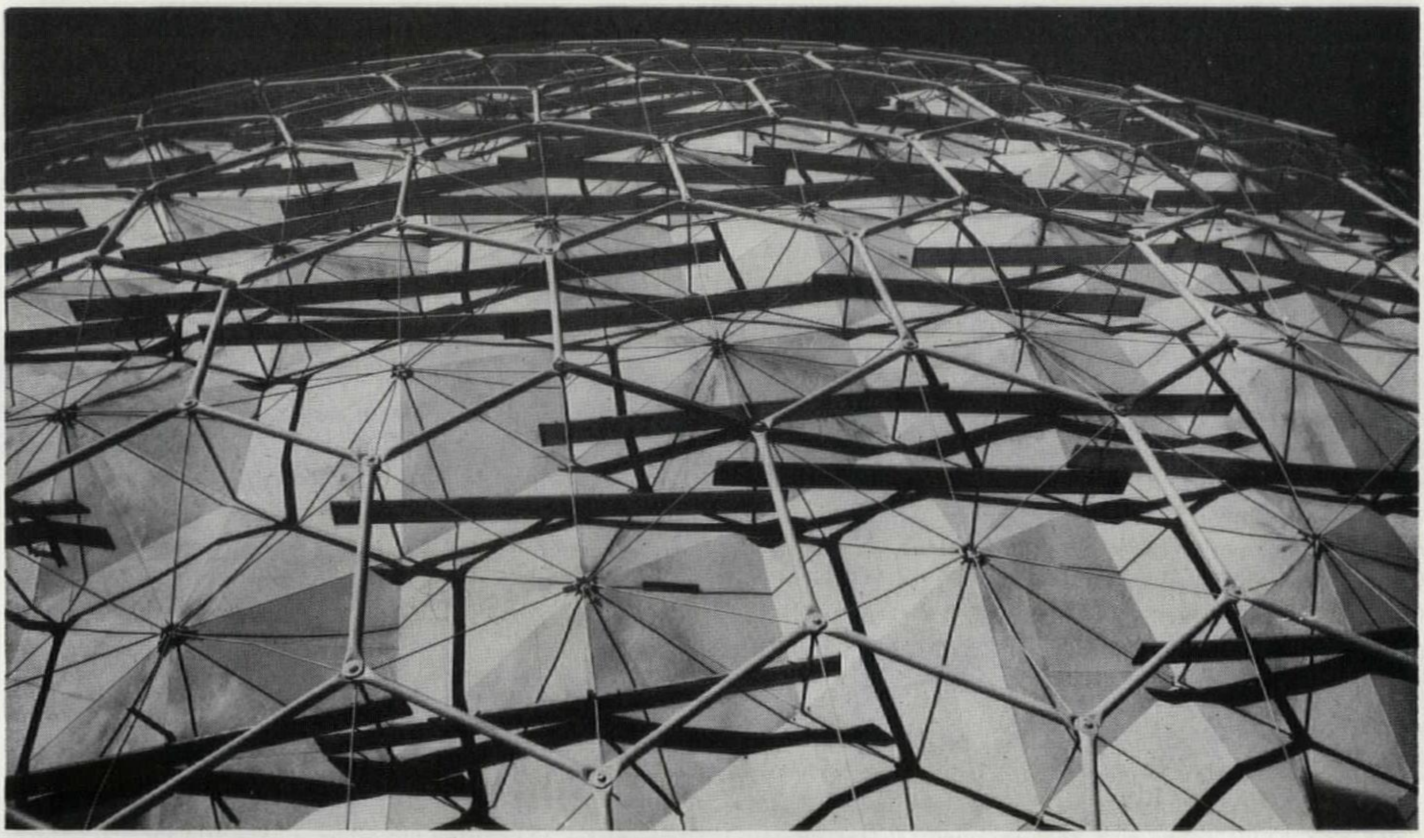
World's largest dome structure—384' diameter and 120' high—now shelters the 111,000-sq-ft Union Tank Car Company's regional tank-car repair and maintenance facility at Baton Rouge, La. Union Tank's wheel-like repair operation, far more efficient than a straight-line layout, and R. Buckminster Fuller's singularly applicable geodesic-dome principles have resulted in this highly economical building with a construction cost—for the dome itself—well under $10 per sq ft. Located in an off-center position, a control-tower/office structure was built on 18' high columns allowing space beneath for materials storage. Between the storage area and the peripheral radial work area, where 36 repair stations and accompanying track pairs are located, is a 50' wide annular space where a transfer table moves in a circular course around the interior structure to position in-coming and out-going tank cars.

Technically, the dome can be described as approximately a quarter sphere, designed and constructed of steel as a three-dimensional curved truss. The truss, about 4' deep, was designed as a unit-cell system of octahedra in which the involuted 11-gage, all-welded sheet-steel surface material is employed both as a weathering surface and as the inner-member tension system of the truss. Outer hexagonal webbing is composed of 4" steel-pipe sections, about 9' long, positioned with ¾" rods. Compression pipe elements and tension rods lie along the typical geodesic great-circle grid lines. The sheet-fold lines repeat the geometry of the pipes and roof system. Exterior surfaces of the dome panels are painted yellow to reflect the sun's heat and to accentuate their tendency to be in tension; outer framework is painted royal blue to absorb heat and to increase compression tendency of the framework.

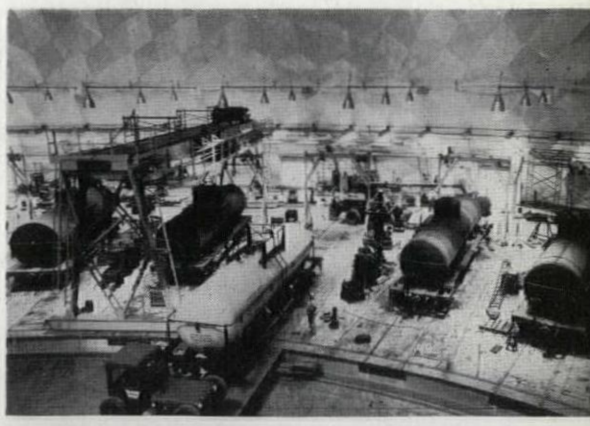
Complementing the structure by making its enclosed volume possible as a work area, is Abe Feder's brilliant lighting solution for the interior. To accomplish this, Feder created a new concept of lighting design as well as a new type of reflector lamp—said to be the brightest in existence and one which projects a more powerful beam than any other light source of equal wattage. (A new-type of reflector apparatus intensifies the beam.) Located 34' above the radial work area, 106 of these new luminaires are arranged in a tier of three concentric rings providing an illumination intensity of 70-90 ft-c at task. Beneath the control tower, mounted on the top deck of the inner building (containing offices, cafeteria, dressing/locker rooms, lounges, etc.), 60 additional luminaires with peach-colored filters are focused on the off-white dome above so that the total volume takes on a "mellow indirect radiance." One-half of the dome is floodlighted at night by similar luminaires, targeted 350' away, producing a wondrous look—the light causing variations in hue as the facets of the individual panels reflect their particular geometric positioning.

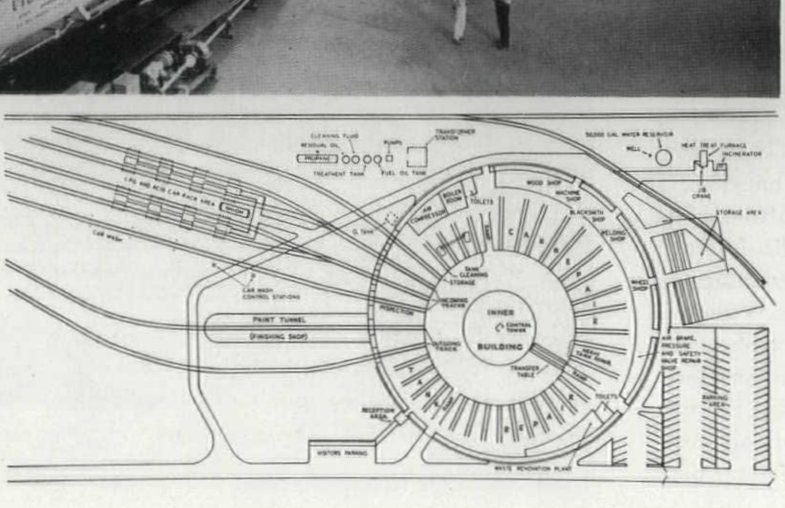
George S. Hunt, New York industrial designer, planned the color for the entire project, the layout of the office structure, and the landscaping for the 36-acre site. Battey & Childs, Chicago, performed the general engineering.

Photos: Ivan Massar from Black Star



Dome design: Union Tank's Department of New Plant Development & Operations, headed by Project Engineer R. A. Lehr, with Fuller's firm Synergetics, Inc., Raleigh, N. C. Nichols Construction Co., Baton Rouge, was the construction contactor. All panels were fabricated on the site.





Washington report

by Frederick Gutheim

The prospect of two years ahead with a far more predominantly Democratic Congress — and an increasingly weaker President who cannot run to succeed himself—is not calculated to provide a climate for positive action. Rather, it will lead not only to more checks and vetoes but also to a Congress divided among itself; and to a Democratic party divided into more sharply defined factions. The future for all measures that demand unity and strength for their execution strikes me as poor. It would be encouraging to think that the outstanding performance of Sen. Lyndon Johnson and the Democratic leadership in the House in the last Congress foreshadows its continuation; but the truth is that even in the past session it demanded extraordinary efforts and in the future it promises to become very much more difficult.

The incoming Congress will find a Capitol whose physical appearance reflects the enormous expansion and change which the legislative establishment is undergoing. Perhaps there is a closer connection than is generally recognized between these architectural and political happenings. About $125 millions of work is either now under way or about to start. The biggest single project is a third office building for the House of Representatives. Obviously, this is not required by the addition of new members to the existing 435 representatives: it is required by the increasing work load, staff, and services which Congressmen have today. The building (to be finished in 1962) will range itself alongside the two existing House office buildings on the south side of the Capitol. Its major accommodations will provide for 8 committtees, 15 subcommittees, 51 staff quarters, and 169 members who will be assigned there as the result of a redistribution of space in the two older buildings.

On the Senate side, a second office building is now being occupied by some 40 Senators and their office staffs, 12 committee rooms and 3 subcommittee rooms. The seven-story building cost $25.5 millions. Related to this project, and still a major construction project on Capitol Hill is a new subway, priced at $1.2 million, to provide equal advantages in transportation (and diversion for constituents) as the old Senate building.

• To the Capitol grounds themselves, nothing is yet proposed for the area between the Capitol and the Library of Congress and Supreme Court—long due for redesign. A substantial beginning is being made at the foot of "the Hill" in removing the existing greenhouses to another location in the city. This will not affect the conservatory of the Botanic Gardens (curiously, an agency of the legislative branch of the Government) which is, indeed, due for extensive repairs.

A foretaste of things to come and a token of the changing times is evident in the courtyards of the two existing House office buildings. In one is being built a three-level parking garage for 300 cars; in the other, a cafeteria for 550 people.

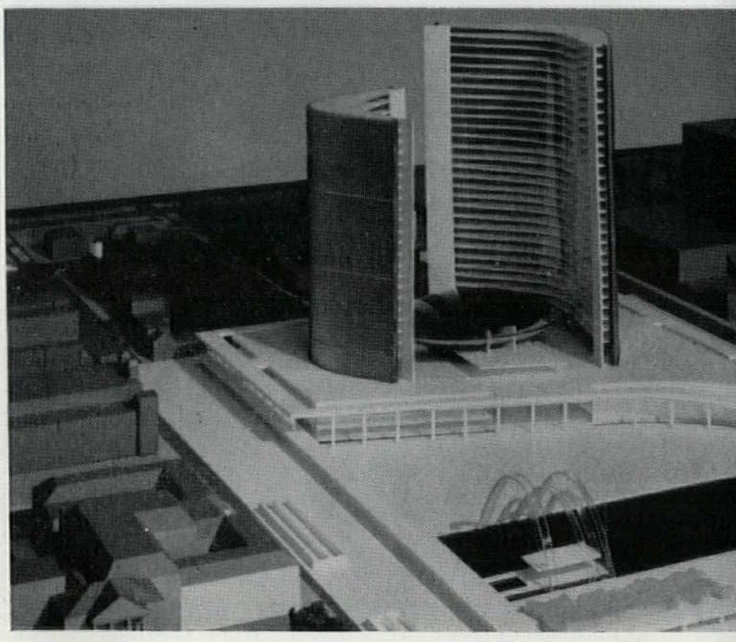
One of the most imposing, as well as the most recent addition to the Capitol, of course, is the $1-million Taft memorial.

• Finally, there is the extension of the East Front of the Capitol, itself, with an estimated cost of $17 millions. Scaffolding has been erected, the marble contract let, and construction will commence this winter. The promised completion date is December, 1960, in time for Inaugural ceremonies the following month.

FINN WINS TORONTO CITY HALL COMPETITION

Helsinki Architect Viljo Rewell has been named winner of the international competition for design of the $18-millions Toronto, Canada, City Hall. His design was chosen from among 520 entries by a Jury composed of Eero Saarinen (U. S.), Ernesto Rogers (Italy), Sir William Holford Graham (Britain), and C. E. Pratt and Gordon Stephenson (Canada). Eric R. Arthur (Canada) was Professional Advisor.

The City Hall, to front a broad plaza, is composed of three main elements: a broad, low, horizontal building from which rises a pair of tall, curved towers, and, between, a "floating" round structure, curved top and bottom. The three-story base will contain all areas of public interest; civic offices will fill the towers; and the domed structure will house the Council Chamber and executive suites. Windows of the towers will face inwards to the Council Chamber; the convex sides will house mechanical, transportation, and service areas. An outside, glassed arcade will surround the gallery level of the Council Chamber element, affording wide-angle views of Toronto. The roof of the architectural base



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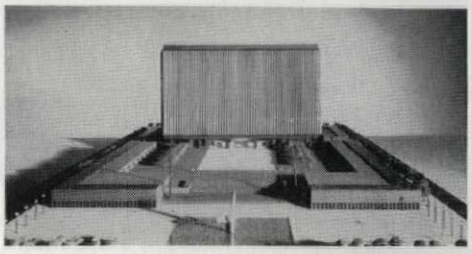

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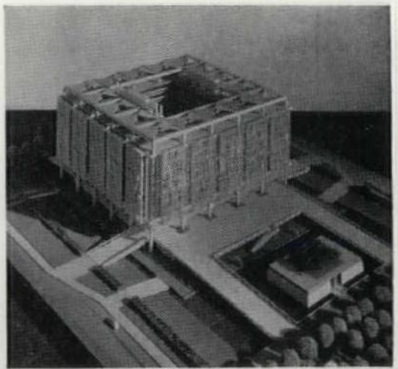

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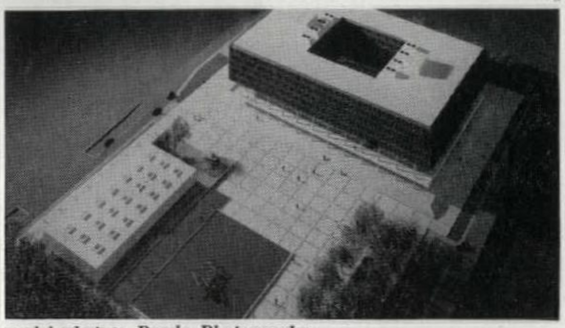

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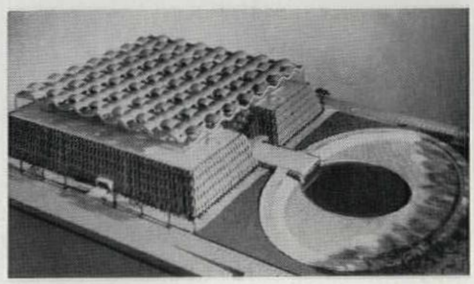

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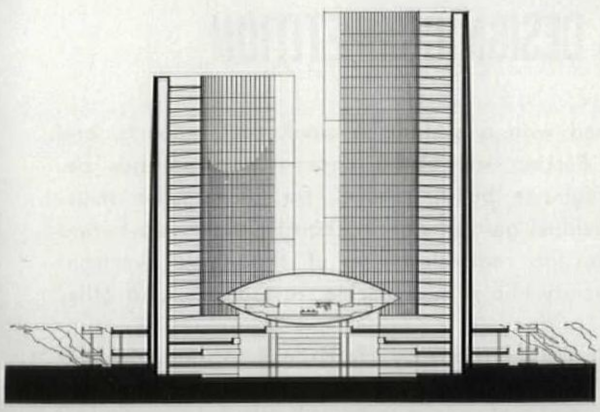
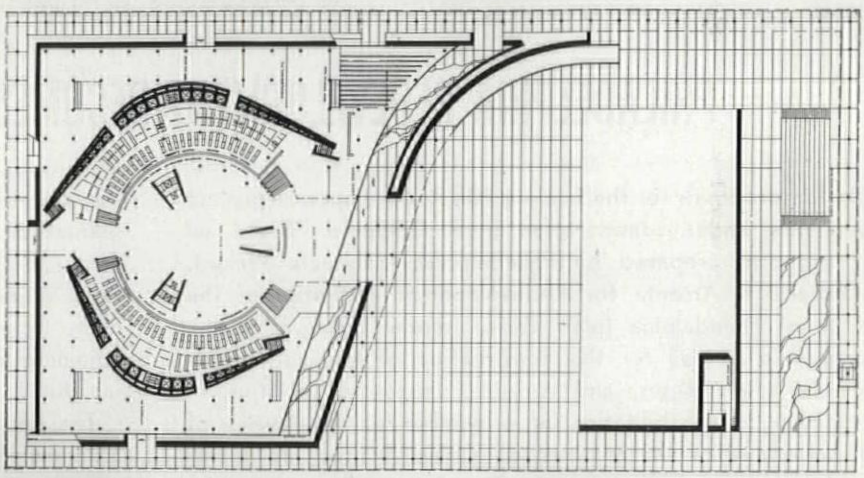
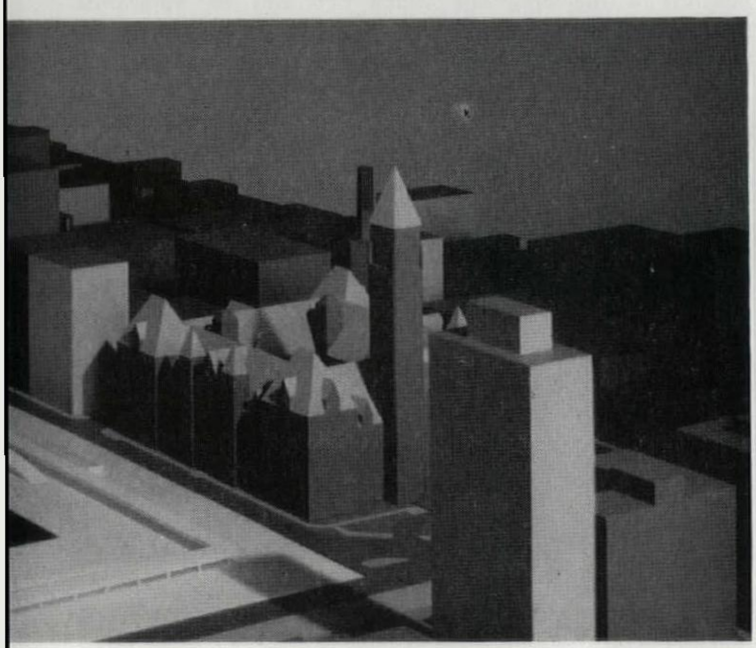
model photos: Panda Photography

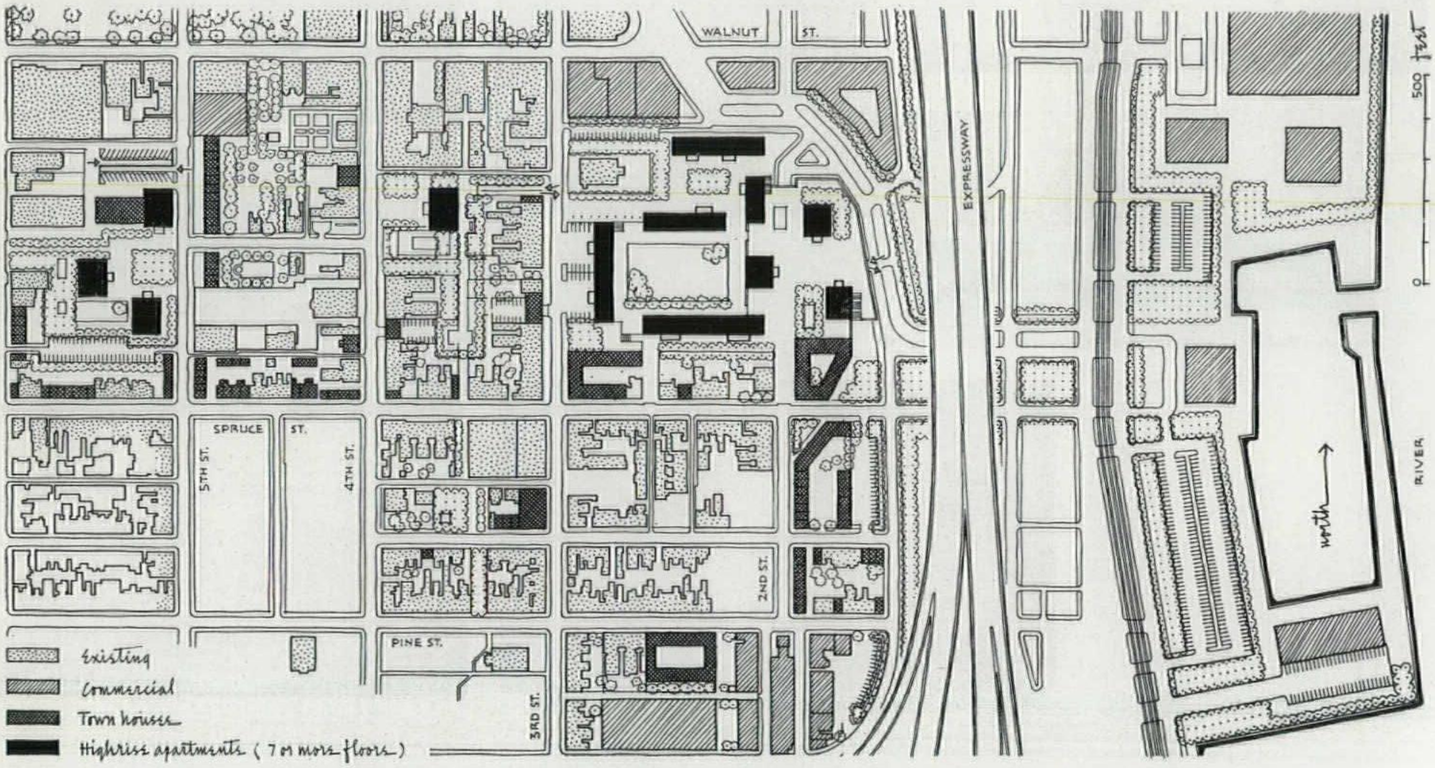






will be an upper plaza—the inner part within the curved towers and under the Council Chamber; the outer part overlooking the Square. The Square will feature a reflecting pool that will become an artificial ice-skating rink in winter. The western end of the Square faces the site of a proposed Court House, and at the eastern end is the old City Hall. City is committed to begin construction within three years; actual start expected next year.

There were seven other design proposals in the final stages of the competition, all based mainly on the concept of a relatively low, horizontal building in the Square, detached from surrounding buildings. The designs were by: (1) I. M. Pei & Associates, New York, N. Y.; (2) William B. Hayward, Philadelphia, Pa.; (3) Kikutowski, Rafferty, Rafferty, South St. Paul, Minn.; (4) David E. Horne, Toronto, Canada; (5) Halldor Gunnlogsson & Jorn Nielsen, Copenhagen, Denmark; (6) John H. Andrews & Associates, Cambridge, Mass. (Andrews is an Australian in the Graduate School of Design at Harvard); and (7) Perkins & Will, White Plains, N. Y.



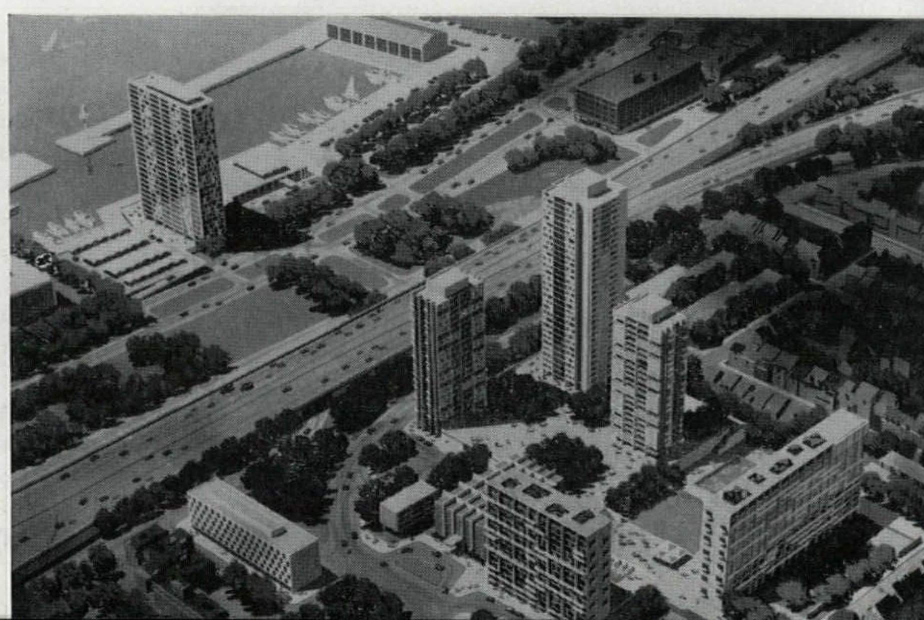
PHILADELPHIA REDEVELOPMENT BECOMES DESIGN COMPETITION

Design proposals for the Society Hill Redevelopment project are now under consideration in Philadelphia. Based on a proposal prepared by Philadelphia Architects Wright, Andrade & Amenta for Redevelopment Authority of the City of Philadelphia (plan above, model below left), the proposals all call for the construction of high-rise apartments, town houses, and various commercial facilities, in addition to rehabilitation of a number of old houses of historic and/or esthetic value. Other houses are being restored by private owners. The area, adjacent to the new Federal Mall development and to Washington Square, will be veined with a system of small parks, courts, and greenways. Parking will be in underground garages beneath the high-rise buildings and, for the smaller structures, in individual garges, parking courts, and lanes. Future plans include the redevelopment of the city's riverfront adjoining Society Hill with a marina, restaurants, and other facilities.

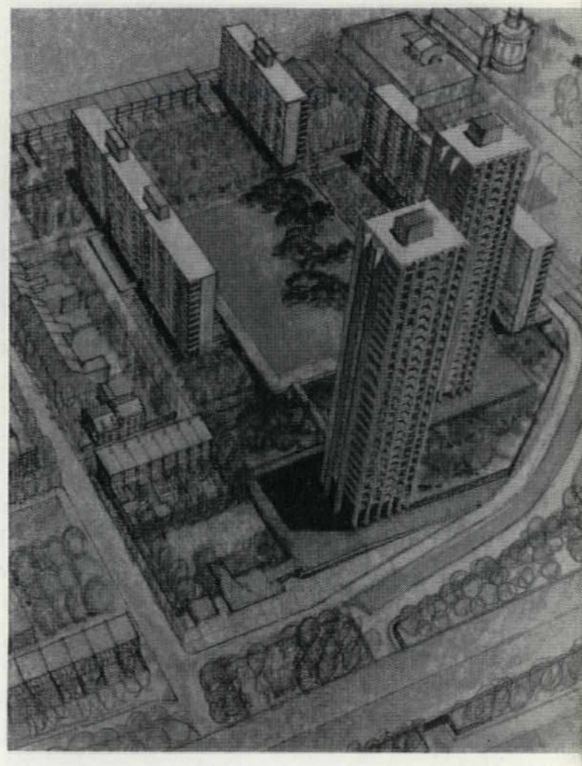
The design (below right) by Harrison & Abramovitz and Stonorov & Haws for The Thomas Jefferson Square Corporation is the only one which proposes an additional high-rise apartment in the riverfront area. Also included

Lawrence S. Williams

Schwartz



Lionel Freedman



are a concert hall and auditorium, a small market and commercial area, and a research laboratory building.

The proposal by Turner Construction Company and John W. Galbreath Company (above left) is in two parts: one by Vincent G. Kling (top) and another section by John Diehl Associates (bottom). The Kling design, for the area nearer the river, calls for six elevator apartments of 10 and 25 stories, rising from a landscaped "palette." Buildings are tower and slab, for variety in profile of the redevelopment. John Diehl Associates' design, for the area near Washington Square, has high-rise apartments enclosing a plaza on three sides. Situated in the plaza is a transparent, all-weather dome for sunning and recreation.

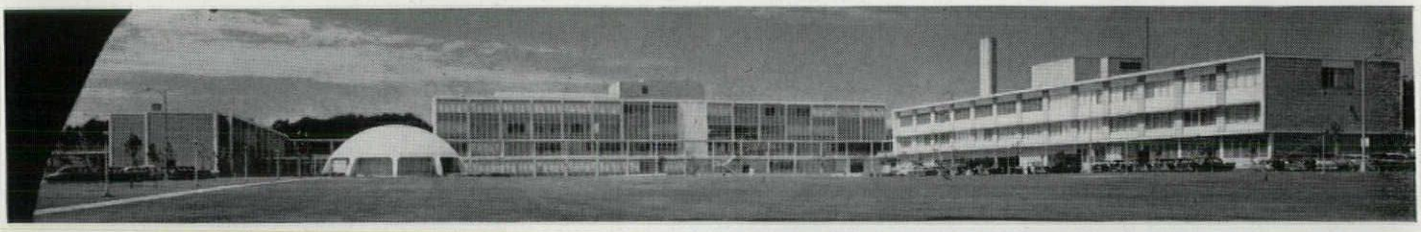
Architect Milton Schwartz's design for developers Harry K. Medway and Bernard Weinberg (above right) includes two 20-story towers and two 12- and one 11-story slab buildings. The large plaza area between the apartments is over the parking garage. A small inn and swimming club are also proposed.

Three reinforced-concrete apartment towers are the dominant elements in the design (below) by I. M. Pei & Associates for Webb & Knapp, Inc. A terraced restaurant and a private club top two of the structures. The tower area is landscaped as a park and bounded on two sides by new town houses. Two shopping facilities with barrel-vaulted roofs are situated nearby. The second element of this proposal (not shown) is by Vincent G. Kling for Roger L. Stevens and James H. Scheuer.

Under consideration is a competition for design of "fill-in" houses, to replace unwanted old blocks.

Oakes

p/a news bulletins



• Recently dedicated Flint, Mich., Municipal Center (above) comprises Public-Health Building, Public-Health Auditorium, City Hall, Police-Facilities Building, and (not shown) Courts Building. Auditorium, bounded on two sides by reflecting pools, seats 250. Architects: H. E. Beyster & Associates, Detroit and Grand Rapids.

• Proposal for $1-billion 564-acre redevelopment of Lower New York (Manhattan) has been given city officials by Downtown-Lower Manhattan Association. Plan calls for renewal and redevelopment of two areas, one on East River and one on Hudson River, which border main financial district. Residential, commercial, and light industrial sections are proposed. Also called for is a marina and heliport project on redeveloped East River waterfront. Report of Association was based on studies by Skidmore, Owings & Merrill.

• Renewed interest in gas lighting reported. At recent Atlantic City American Gas Association convention, one manufacturer (Arkla-Servel) reported sale of 25,000 units in first six months of 1958, mainly for gardens, pools, etc. Applications also being made in commercial projects. . . . BRI Conference on Noise Control In Buildings set for Jan. 14-15 in New York.

• Nuclear Science Center (below) announced for Texas A&M. Design by Bryan, Texas, firm of Caudill, Rowlett & Scott; program by architects in collaboration with Convair Nuclear Laboratories and Nuclear Research Division, Texas Engineering Experiment Station. Initial unit will be reactor (domed, truncated cone); to be followed by administration/laboratory building and other units. Reactor housing will sit in sub-level court, allowing outside view to scientists and students who must work below grade, where viewing and experiment facilities are.

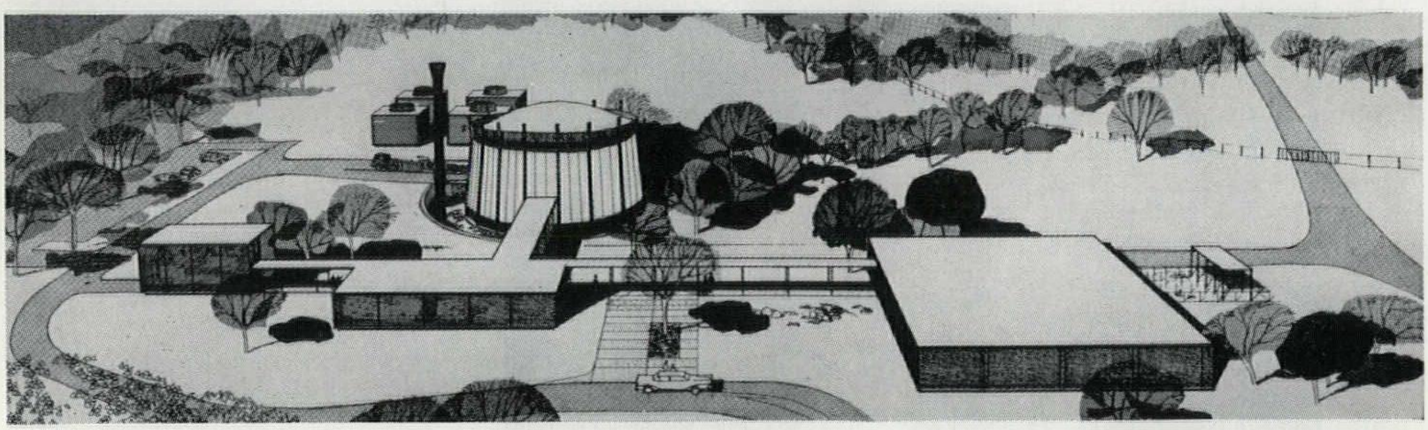
• Following retirement of L. Mies van der Rohe as Director of Department of Architecture, Illinois Institute of Technology, Reginald F. Malcolmson has been made Acting Director and Associate Professor. . . . Architect J. Rowland Snyder named head of Architectural and Structural Division of General Services Administration's Public Building Service. . . . Joseph L. Young, California mosaicist, elected to Lifetime Fellow, International Institute of Arts and Letters.

• Architects interested in designing proposed Haile Selassie Memorial Hospital in Ethiopia (first stage will be about $2 millions) should send professional references and examples of previous work in field to: The Duke of Harar Memorial Fund, P. O. Box 662, Addis Ababa, Ethiopia.

• Sum of $425 billions is needed over next 10 years for urban renewal, public and private housing throughout U.S. Forecast was made by Joseph P. McMurray, New York State Housing Commissioner, at 25th annual conference of National Association of Housing and Redevelopment Officials, San Francisco.

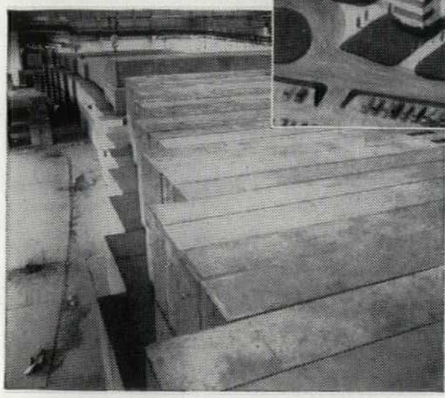
• Design Center for Interiors has opened on New York's East Side. It is a permanent exhibit hall for interior-design products, incorporating a reference department on all products shown. Robert Carson and George Nelson are architect-members of the advisory board, which is headed by Interior Designer Tom Lee.

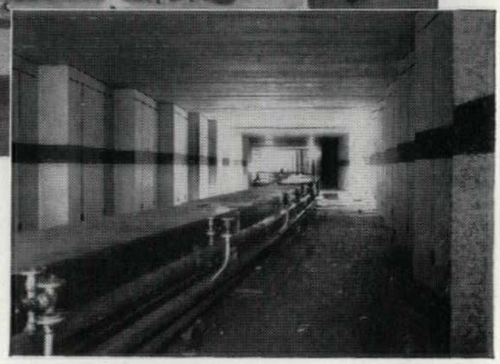
• Charles DuBose, New Jersey Architect, has been named to direct master planning and design of Front-Market Street redevelopment project, Hartford, Connecticut. . . . Byron C. Bloomfield, former secretary for professional development with AIA, has been made Executive Director of Modular Building Standards Association. He is succeeded at AIA by Eugene F. Magenau.



See page 48 for FINANCIAL NEWS

'Incor' Concrete Shield for Atomic Targets





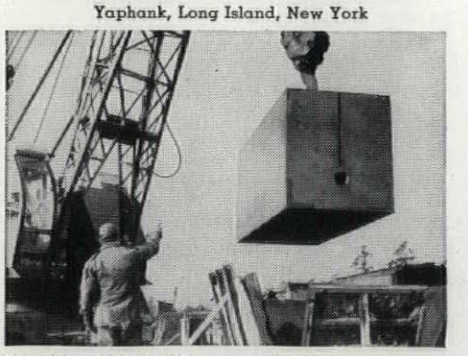
MASSIVE SHIELDING (left). Dense concrete blocks, weighing as much as 34 tons, enclose experimental area in Target Building.

(right) Speeding protons are guided in tight beam around synchrotron ring by a series of magnets.

ASSOCIATED UNIVERSITIES, INC.
BROOKHAVEN NATIONAL LABORATORY
Target Building, Upton, New York

High Density Concrete Shielding Blocks
PRECAST BUILDING SECTIONS, INC.
New Hyde Park, Long Island, New York
Main Office: New York City, N. Y.

'Incor' Concrete Supplied by
SUFFOLK SAND & STONE CORPORATION
Yaphank, Long Island, New York



HIGH-DENSITY CONCRETE (above). 'Incor' concrete, of over 246 pounds per cubic foot, was cast at contractor's batching plant in winter weather.

High-Density 'INCOR' Concrete Encloses Target Area in Brookhaven's Half-Mile Synchrotron

● To minimize the possibility of radiation, massive shielding blocks of extremely dense concrete enclose the target area of the Alternating Gradient Synchrotron at Brookhaven National Laboratory, Upton, New York.

The synchrotron will be the world's mightiest atom smasher. Speeding protons will circle the half-mile underground track 300,000 times per second. Accelerating to a top energy of 25 to 30 billion electron volts, they will smash into stationary target atoms.

Enclosing this target area is a total of 1,446 high-density 'Incor' concrete shielding blocks. These range in size from 1′ x 1′ x 4′ plug blocks to massive cover beams measuring 4′ x 2′ x 34′ and weighing up to 34 tons. In the shielding blocks, iron ore aggregate was used to produce concrete weighing over 246 pounds per cubic foot.

Produced by conventional mass-production methods, strict laboratory standards were maintained. Each shielding block was cast to strictest dimensional tolerances, with the maximum allowable deviation of only ⅛-inch between parallel faces.

Modern concrete know-how made it possible to cast the blocks at an off-site plant during winter months at temperatures as low as 20 degrees F.—with night temperatures often at zero. 'Incor',* America's FIRST high early strength portland cement, permitted forms to be stripped in 24 hours.

*Reg. U. S. Pat. Off.

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Now you can use FOAMGLAS® on roofs requiring less than 2″ of insulation. This unique, multi-benefit insulation is available in a thickness of 1¾″. And this new thickness makes possible a new 25% lower price.

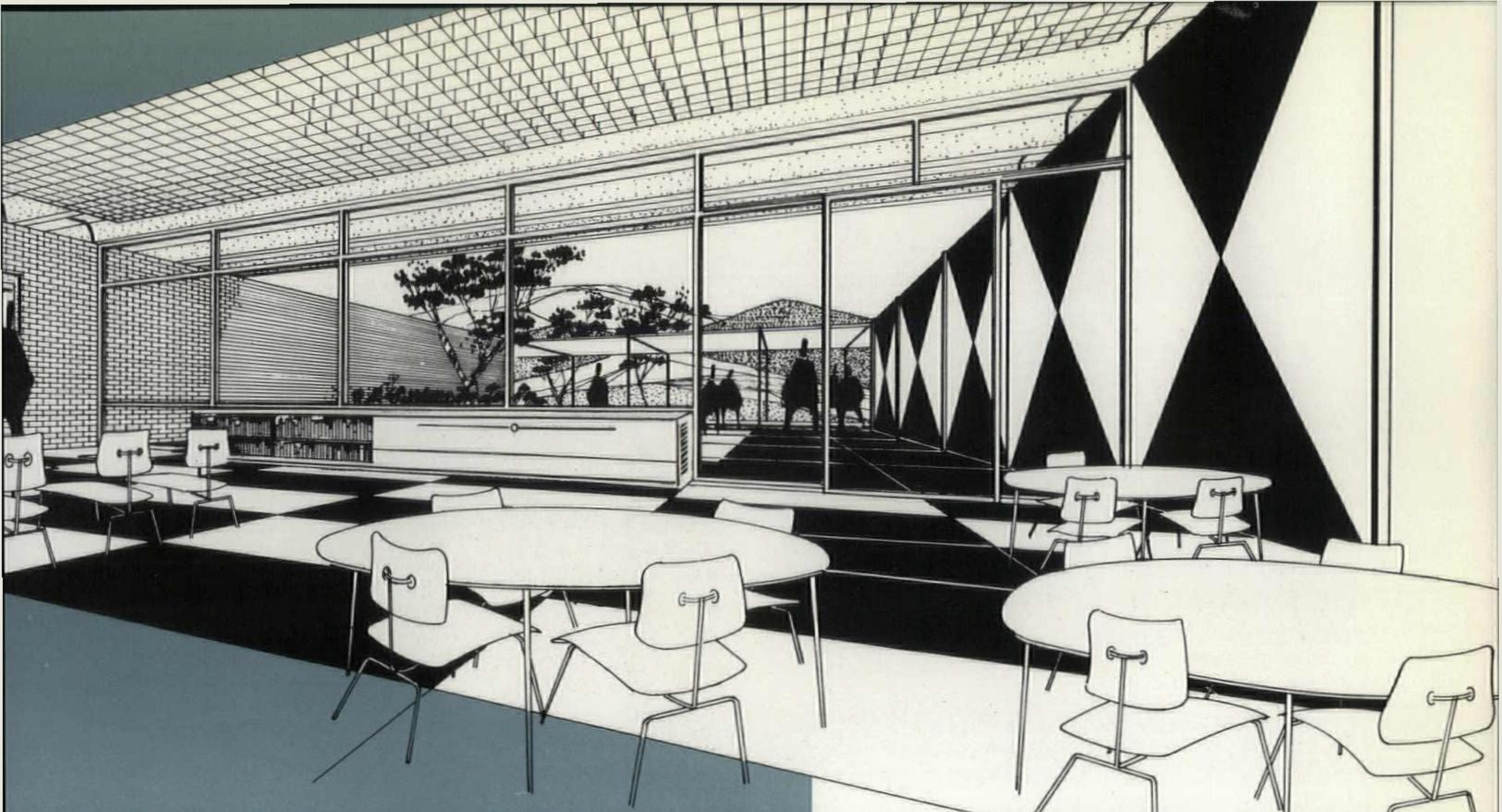
With the new 1¾″ FOAMGLAS, you enjoy the same insulating efficiency at the same cost per square foot installed as with any other insulation board, including wood fiber. One reason is the low cost of the new thickness. Another is that FOAMGLAS does not require the vapor barrier recommended with other insulating boards. The closed cells of FOAMGLAS form a natural vapor barrier which maintains original thermal efficiency.

And, the new 1¾″ thickness retains all of the many extra benefits of FOAMGLAS roof insulation. It is strong enough to take all roof and traffic loads during and after installation, but it is lightweight for easier handling. It can't burn. It is easy to cut and fit . . . and a new quick opening carton eliminates bothersome paper separators.

Write today for complete information on this new roof insulation development by Pittsburgh Corning Corporation, Dept. AB-118, One Gateway Center, Pittsburgh 22, Pennsylvania.

PC Glass Blocks are another outstanding building product of Pittsburgh Corning Corporation.

PITTSBURGH pc CORNING



Indoor-outdoor classrooms, low-cost air conditioning keynote this school design

Classroom view, looking out on exterior court. Exclusive DRAFT/STOP eliminates winter downdrafts from glass divider wall without using heat. For this reason, it is the only draft-elimination method compatible with year-round air conditioning.

This Washington State school design by Culler, Gale, Martell & Norrie, Spokane architects and engineers, combines a stimulating out-of-doors atmosphere with extremely low-cost air conditioning.

The design is based on completely air conditioned four-classroom "cluster" units—with each classroom opening to its

air conditioned school design

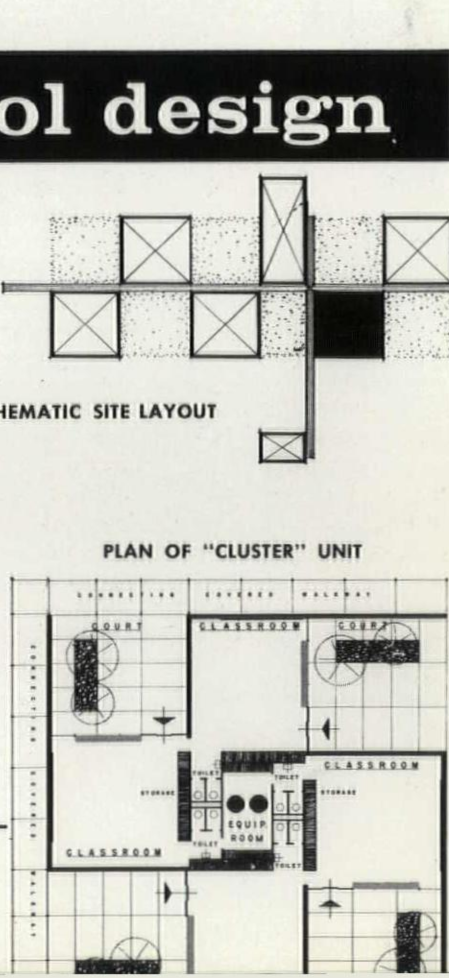
own private court. This provides immediately-accessible outdoor activity along with the ultimate in controlled indoor environment.

The "cluster" conception is also responsible for the extremely low installation and operating cost of the air conditioning. Four-way orientation makes sure that no two classrooms will require the peak air conditioning load at the same time. In addition, the deep overhang over the glass divider wall and the protection of the court's wing wall contributes to minimizing and dividing the solar load. As a result, *a 5-ton packaged chiller is all that's required to air condition the "cluster".*

Expanding on the original "cluster", other units and their group activity spaces are in a checkerboard arrangement connected by a covered walkway.

SCHEMATIC SITE LAYOUT

PLAN OF "CLUSTER" UNIT



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with optional air conditioning

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HerNel-Cool II is the first unit ventilator to offer optional air conditioning, as well as heating, ventilating and natural cooling (with outside air). Units can be installed so the school enjoys the usual benefits of Herman Nelson unit ventilation, including the famous DRAFT|STOP system—*the only type of draft control that is compatible with air conditioning.* Then at any time—immediately, or whenever the school budget will allow it—the mere addition of a chiller in the boiler room is all that is needed for complete hot weather air conditioning.

This can be accomplished without disruption of classroom activities . . . without expensive alteration and installation charges. The cost is far less than for separate heating and air conditioning systems—both for installation and operation.

Want information? Write today to Herman Nelson Unit Ventilator Products, **American Air Filter Company, Inc., 215 Central Ave., Louisville 8, Ky.**

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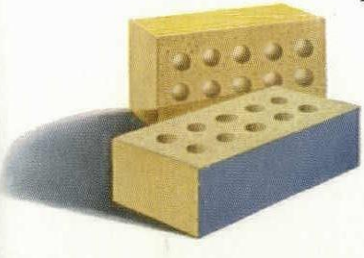
System of Classroom Cooling, Heating and Ventilating

Exterior Color That ***Cannot Fade...***

CERAMIC GLAZED BRICK



Why design an interesting colorful exterior only to have it lose the full beauty of its color within a few years? Ceramic Glazed Brick, with its burned-in color glaze gives you rich, permanent color that never, never fades . . . that retains its true, colorful beauty forever. Economical. Durable. Lasting. Initial costs are far less than for comparable metal and glass construction. What's more there's *no* expensive cleaning, *no* periodic recaulking or other costly maintenance. Glazed Brick, with the flexibility of many colors to choose from, enables the architect to give full expression to his creative talents.

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New Senior High School in Downey, Calif., Has a Norton Door Closer on Every Door

Ruggedness is a prime requisite for door closers in any school attended by over 2,000 students. This need has been satisfied in the distinctive new Senior High School at Downey, Calif. ...and also the new West Junior High School. All doors in both schools are equipped with Norton Door Closers. The choice was influenced by the fact that thousands of Norton Door Closers are still in daily use in some of America's best-known public buildings after serving continuously 30 years and longer. For fully illustrated data on these and other Norton Door Closers, including important new models, consult the current Norton catalog #57. Write for it today.

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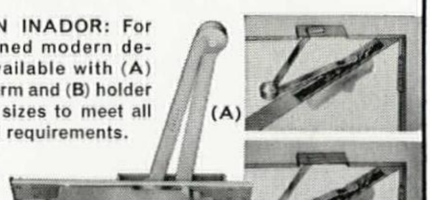
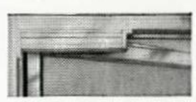
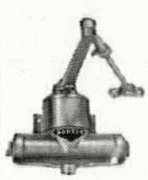
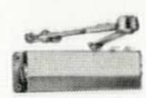




NORTON 750: New corner design with concealed arms, for all types of doors, particularly narrow-rail doors.



NORTON SURFACE-TYPE: For all installations where concealment is not essential.



NORTON 703E: Compact surface-mounted type ... first closer with extruded aluminum alloy shell.

magee commercial carpet

(OVER)

The Museum of Modern Art chose AETNA & AETNAPAK hollow metal doors and frames

Four short months were allotted to repair damage done by fire to New York's Museum of Modern Art and to carry out extensive renovations. To avoid unnecessary hollow metal custom engineering delay, Aetna worked out a plan with the architect and contractor according to which openings requiring almost immediate delivery were supplied from stock AETNAPAK inventoried components; special frames and doors for later erection were AETNA custom engineered.

Architect: Philip Johnson.
Contractor: George A. Fuller Company.

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730 Fifth Avenue, New York 19, N.Y.

p/a financial news

by William Hurd Hillyer

"We're going to have inflation in this country because Americans like to feel more money in their pockets, regardless of whether they can buy more with it," the president of the top-rank Timken Roller Bearing Co. is quoted as saying. A Wall Street Journal nationwide cross-section survey confirms this opinion, which can be summarized: "Inflation is inevitable; the individual can only try to protect himself; and if prices show signs of getting out of hand, the Government should impose price controls." By way of contrast it is the position of New York's Guaranty Trust Company that among businessmen and economists, at least, a large majority regards inflation as a more serious threat than recession. As long as the more popular laissez-faire sentiment prevails, regardless of sober counsel (such as that offered by Baxter Research with its prophecies of another great Depression) the architect need not fear a slack professional season ushered in by real estate and construction doldrums.

• The increasing tempo of business recovery has generated excessive optimism in many quarters. "A new boom is upon us!" rises the theme song. New York's largest bank regards such expectations as envisioning too rapid a return to capacity production, high-level employment, and inflationary pressures. What Chase Manhattan does concede is a two-fold development: Easing of downward pressures imposed by business decline plus inventory liquidation; increasing expenditures by Government as well as consumer. These things will produce a demand for goods and services. Industrial production has staged a 9% comeback in four months, regaining more than half its previous eight-month decline. Nevertheless, the bank believes a strong upturn in fixed investment (nonresidential) is most needed and could come next year. Hopefully, but cautiously, First National City Bank of New York shifts from present participle to perfect tense and announces that the decline in capital outlay has "bottomed out." Less encouraging is the announcement of National Machine Tool Association that tool orders have dropped to a near-record low of $20 millions monthly —about half the comparable pace of last year.

• Lending-money is in a turmoil. Interest rates, after the quickest steam-up in recent history, are still boiling, as witness the sharp rise from less than 1% to around 2¾% in the per-annum price Uncle Sam has to pay for his short-term Treasury Bills. Bankers' acceptances demand a higher yield; the largest sales finance company advances the rates on its own paper by nearly 1 percentage point. Federal Reserve Board, in one of those sudden reversals of policy for which it is noted, called the tune in a higher key several weeks ago and caused a similarly violent reversal in bond-market expectations. Government bonds, particularly the longer maturities, took a tumble and even municipal bonds became less appetizing to investors. At this writing, bonds in general have tended to stabilize, but the end product of the unrest remains. Construction-loan money is getting scarce. Architects need not show worry lines yet, but when Fanny May (Federal National Mortgage Association) goes in for second mortgages—as she did last month—somebody is scraping the bottom of a barrel.

A confidence-breeding move is announced by Federal Housing Administration, which will pay off some $25 millions of its outstanding debentures. This is in accord with a "housecleaning" policy announced by the FHA, which has been conducting "liquidation operations."

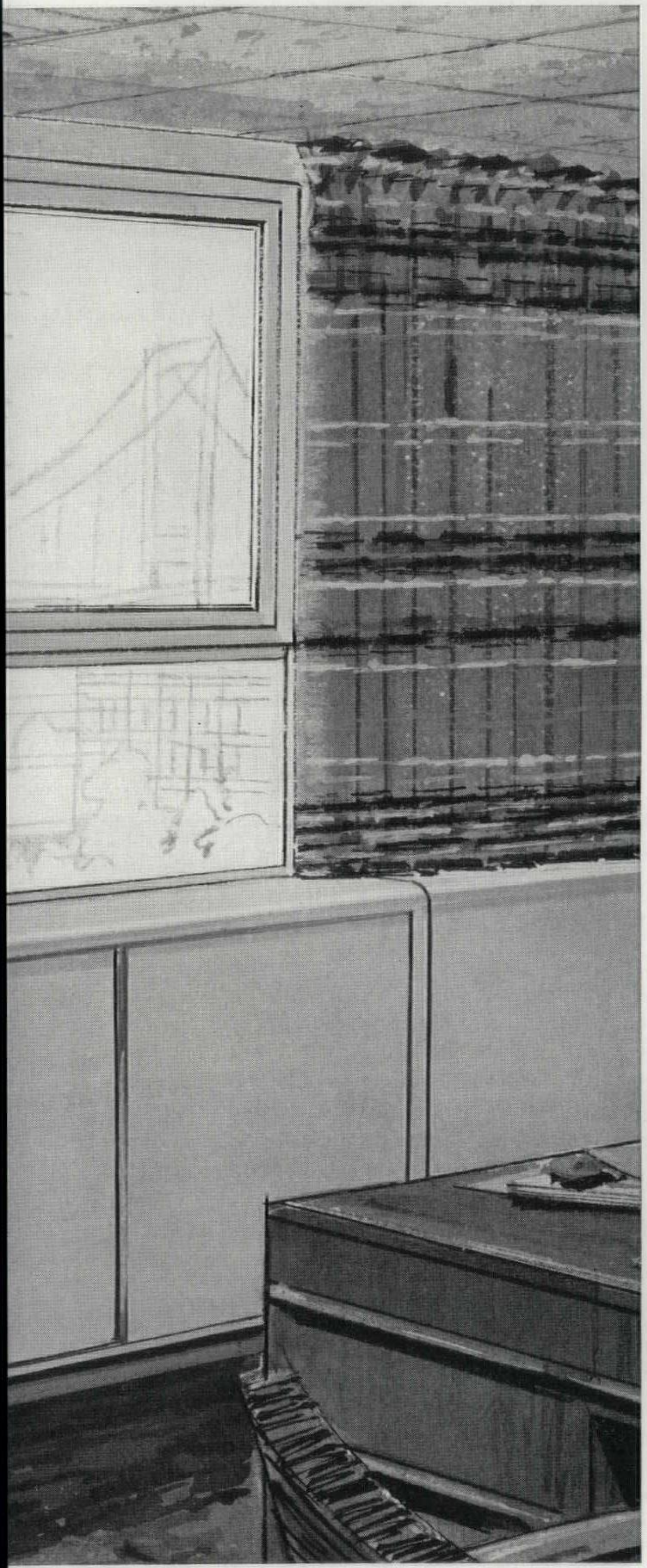
• The aluminum dwelling (prefabricated of course) has presumably "arrived," but not to the near-future profit of its stockholding proponents. Merrill Lynch, Pierce, Fenner & Smith, giant stockbrokers, quote Pres. Jim Pierce of National Homes Company as saying: "I can't foresee cash dividends." National, which is pushing an aluminum house at $8750 and up, now builds 43% of prefabricated homes, comprising 3% of all houses. Sales fell off from $62 millions to $47 millions between '55 and '58, with aluminum houses negligible so far.

• Real-estate loans at insured banks are increasing steadily and were touching $24 billions at last reports. By contrast, commercial and industrial loans "edged off fractionally" to less than $39 billions, the FDIC reports. These contrary trends indicate that real-estate improvement is recovering at a faster pace than general business. Savings deposits, prime banking source of mortgage money, are mounting at reported rates of around 13% annually for commercial banks at 11% at insured mutual savings banks where mortgage holdings total more than $18 billions.

• "Renewed confidence in prosperity" is what the Federal Reserve Bank of Chicago sees as "spreading over the nation." At the same time, that institution declares, "perhaps never before has the inflation issue been raised so early in the recovery phase of a business readjustment." According to the bank, the "inflationary psychology" which was promoted by the 1955-58 peacetime upsurge in consumer and wholesale prices, is now being reawakened—but without the former stimulus of "capital spending." Construction activity, however, "is picking up sharply."

• It may be a trifle early to join the already rising paean of 1959 prophecy, but a few pre-echoes may not be amiss. American Iron & Steel Institute looks for a record year of dollar-volume construction activity, particularly in office buildings and other steel-using erections; banks must seek new credit sources to finance the imminent housing boom, Senator Sparkman tells savings bankers; "two-home family" idea is replacing two-car concept in New England and elsewhere; business in general will "pick up steam" thinks American Banker. Barring accident, the '59 outlook, buildingwise, tends toward cheerful regions of the spectrum.


SOON



...Comfort conditioning will become an integral part of a Lupton curtain wall!

New LUPTON Aluminum Curtain Wall adds cooling and humidity controls...with individual regulation.

LUPTON's brand-new concept in curtain wall function will simplify your design problems . . . provide more income-producing space . . . for all true perimeter buildings.

It will reduce installation costs to 40-60% of those for a central system. You'll no longer need unsightly, expensive cooling towers or bulky, space-eating ductwork and plumbing connections . . . *only electrical connections.* Skilled LUPTON crews will assemble the units . . . giving you one-source responsibility.

Advance planning will permit greater flexibility. You'll install as many LUPTON Comfort Conditioning Aluminum Curtain Wall Units as you need at first. In each office, you can combine the unit with shelving, bookcases, or storage cabinets. You can replace these latter units with additional LUPTON units if required. LUPTON offers two units . . . *heavy-duty* for areas where a number of people work, and *lighter-duty* for offices containing only a few persons. You can interchange these units as loads decrease or increase.

Air conditioning costs go down. LUPTON's personalized controls eliminate costly over-air-conditioning. Give each occupant the exact amount of comfort conditioning he desires. Allow complete variations from office to office.

Your clients will get a major rental feature: personalized comfort conditioning. The LUPTON Comfort Conditioning will remove smoke and odors through its exhaust . . . as well as providing ventilation and other comfort conditioning features.

Write today for more information about this revolutionary new advance in aluminum curtain wall design and function.

LUPTON

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MICHAEL FLYNN MANUFACTURING COMPANY

Main Office and Plant: 700 E. Godfrey Ave., Philadelphia, Pa. New York, N.Y., Chicago, Ill., Cincinnati, Ohio; Cleveland, Ohio; Los Angeles, Calif.; Stockton, Calif.; Dallas, Texas. Representatives in other principal cities.

THE VAST MAJORITY OF THE NATION'S FINE BUILDINGS ARE SLOAN EQUIPPED

ROBERT AND COMPANY ASSOCIATES, *architects and engineers*
ROBERT E. McKEE GENERAL CONTRACTOR, INC., *general contractor*
J. S. BROWN—E. F. OLDS PLUMBING & HEATING CORP., *plumbing contractor*
NOLAND COMPANY, INC., *plumbing wholesaler*
AMERICAN RADIATOR & STANDARD SANITARY CORP., *fixture manufacturer*

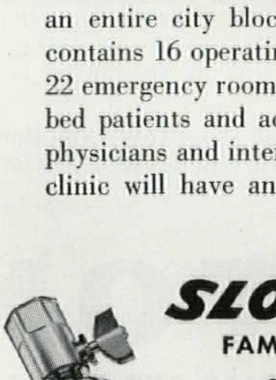
NEW FAME FOR 66-YEAR-OLD NAME

• A few months ago this new $25-million hospital was opened and assigned the honor of carrying forward the proud name, GRADY, its predecessor founded in 1892. This 21-story structure occupies an entire city block in downtown Atlanta, Ga. It contains 16 operating rooms, 10 delivery rooms and 22 emergency rooms. Facilities for more than 1,000 bed patients and accommodations for 150 resident physicians and interns are provided. Its out-patient clinic will have an ultimate capacity of 4,000 patients per day. Food service is provided by three cafeterias, and a kitchen capable of preparing 6,000 meals per day. In addition to instruction conducted by the Emory University School of Medicine, the Grady contains a School of Nursing, and the largest schools of Medical Technology and X-ray Technology in the Southeast. As are thousands of other expertly planned and skillfully erected buildings, the new Grady Memorial Hospital is equipped with SLOAN *Flush* VALVES, most favored of all for more than a half century.

SLOAN *Flush* VALVES

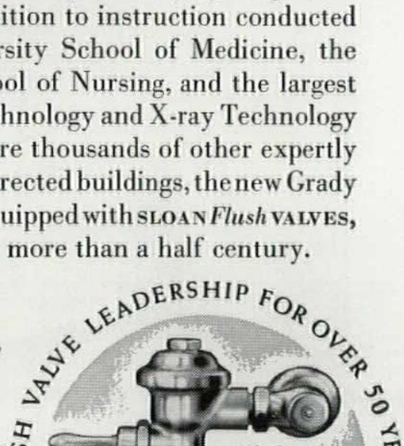
FAMOUS FOR EFFICIENCY, DURABILITY, ECONOMY

SLOAN VALVE COMPANY • CHICAGO • ILLINOIS

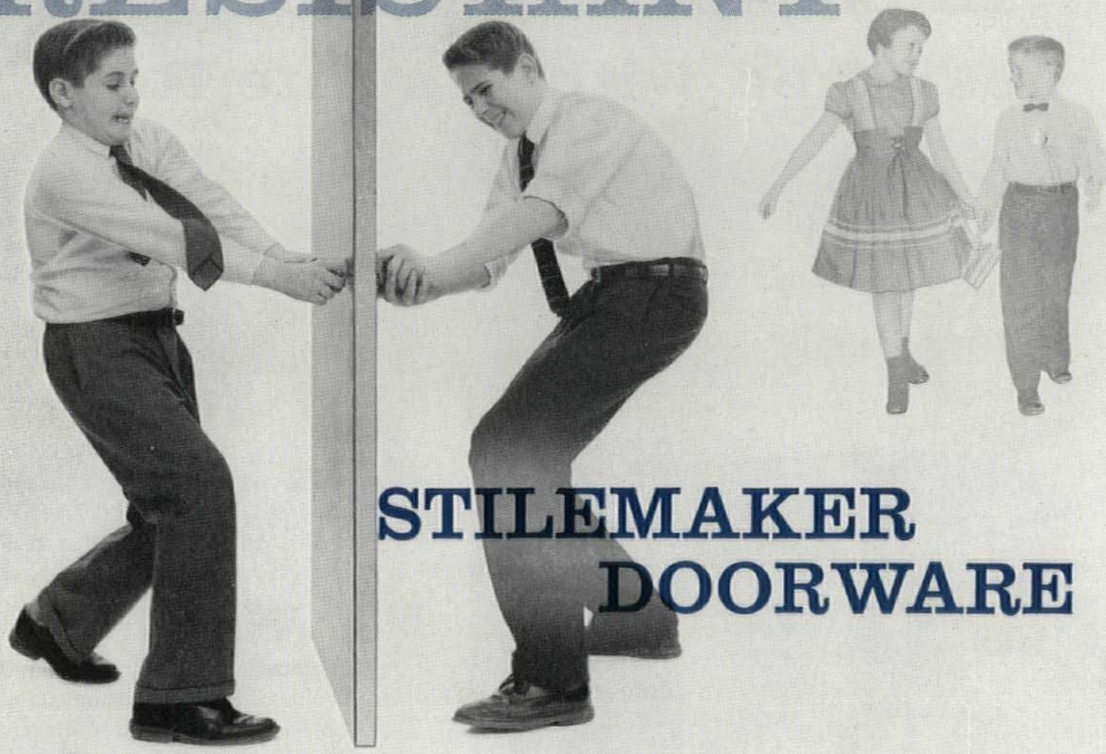


Another achievement in efficiency, endurance and economy is the SLOAN *Act-O-Matic* SHOWER HEAD, which is automatically self-cleaning each time it is used! No clogging. No dripping. Architects and Engineers specify, and Wholesalers and Master Plumbers recommend the *Act-O-Matic*—the better shower head for better bathing.

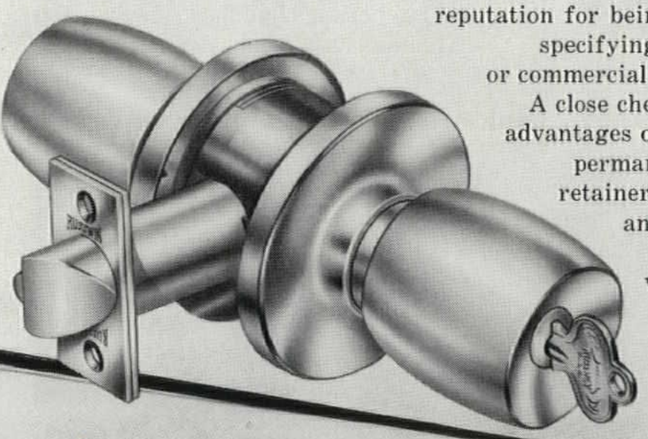
Write for completely descriptive catalog



ROUGH RESISTANT



STILEMAKER DOORWARE

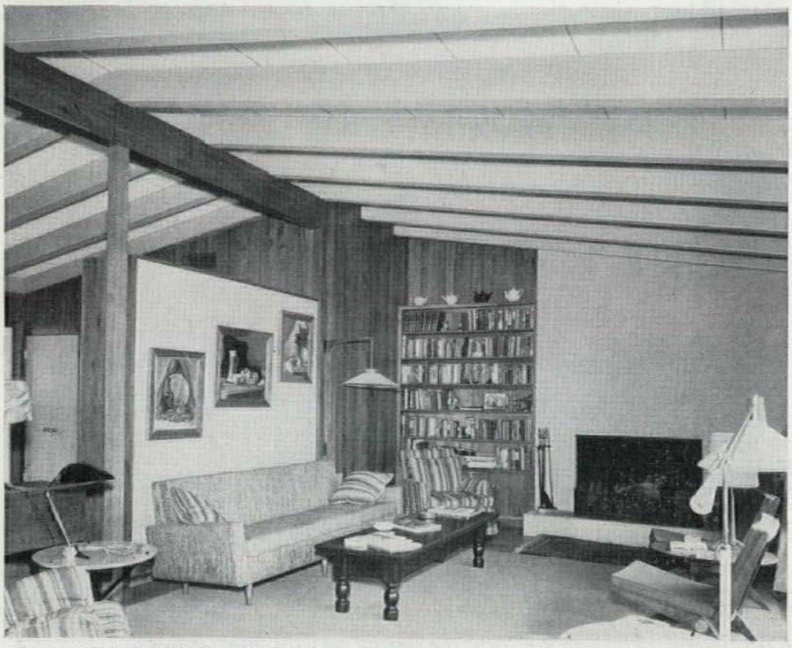


This heavy-duty cylindrical lock line has earned a schoolwide reputation for being *rough-resistant*...a point to consider when specifying doorware for any type of institutional or commercial building.

A close check of Stilemaker construction will reveal the advantages of such features as...a full ⅝" throw permanently lubricated latch bolt; concealed knob retainers; long knob shank bearing for knob rigidity and many others. All the facts are available in concise form. Consult your Russwin Specialist or write Russell & Erwin Division, The American Hardware Corporation, New Britain, Conn.

RUSSWIN®
distinctive doorware

Homes of American architects designed with Insulite Roof Deck



Home of Herbert L. Smith III, A.I.A., Norfolk, Va.

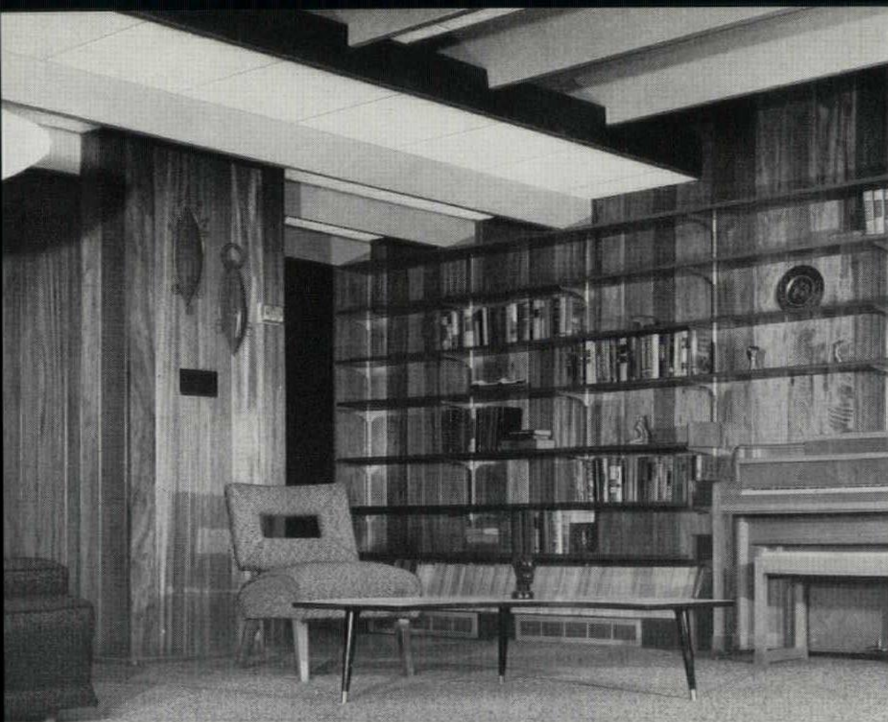
4-in-1 Roof Deck panels contribute to strength, beauty and comfort of these distinguished open-beam designs

Here you see some notable examples of happy freedom in home design—because, in each case, the designer was his own client. And isn't it interesting that these six architects, plus so many others throughout the U.S., have designed their own homes with Insulite Roof Deck?

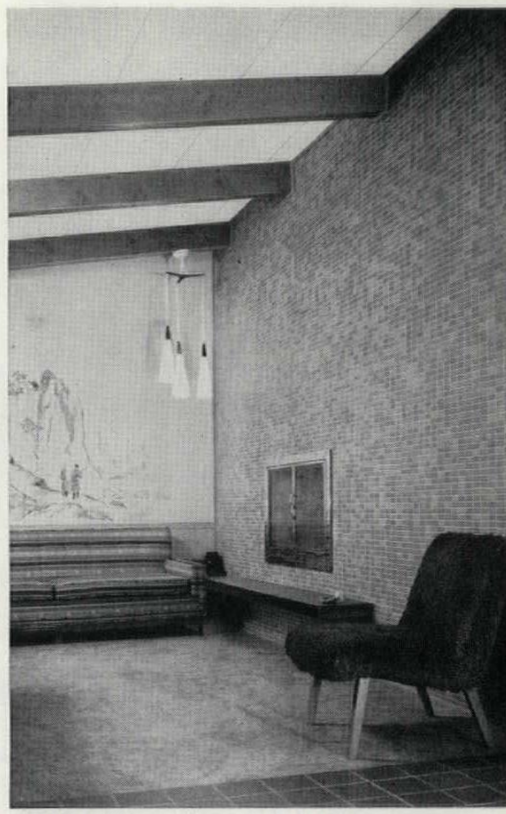
The excellent quality of design in these homes is self-evident. But in addition to that, Insulite Roof Deck adds a 4-in-1 functional advantage: It's decking . . . insulation . . . vapor barrier . . . and prefinished ceiling . . . all in one.

Want technical data, and literature showing the growing use of Insulite Roof Deck in fine homes and commercial buildings? Just write us—Insulite, Minneapolis 2, Minnesota.

Home of Reginald Roberts, A.I.A., San Antonio, Texas

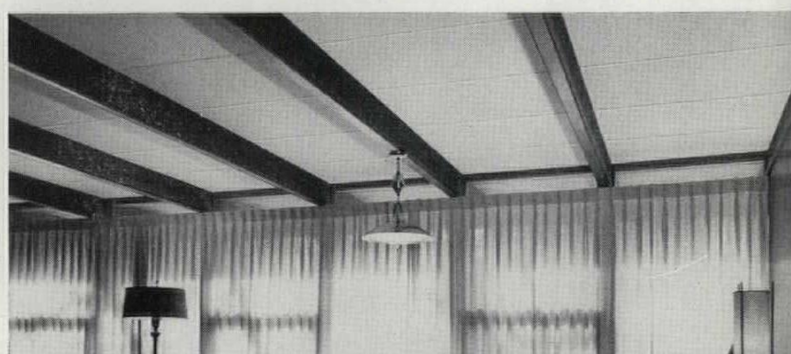


Home of John Brenneman, Manhattan, Kansas



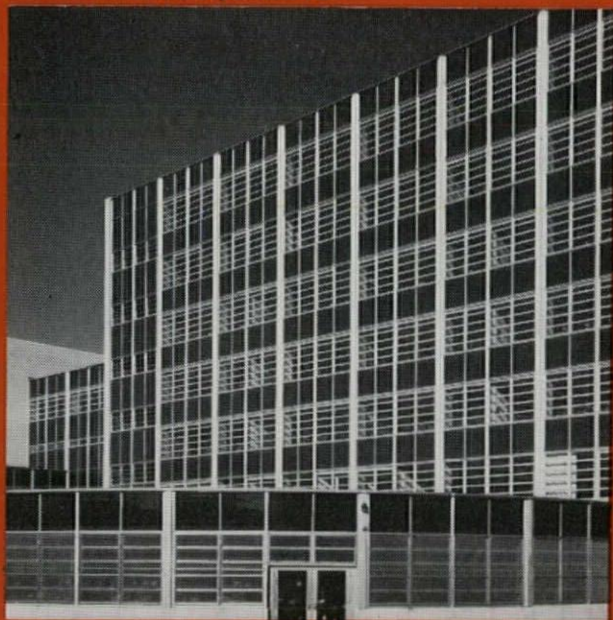
Home of Paul F. Lewis, A.I.A., Overland Park, Kansas

Home of Robert Arthur Jones, Canandaigua, New York



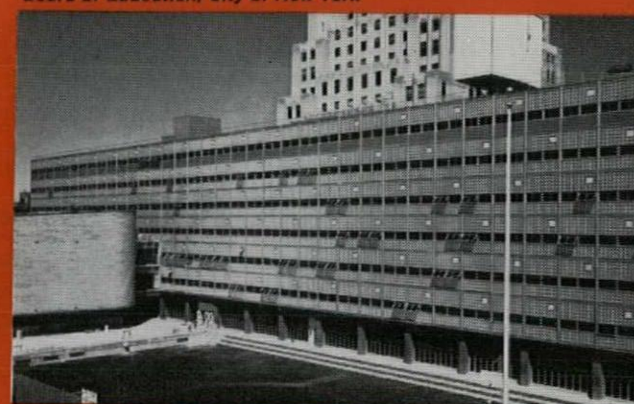
Home of Richard C. Hafner, Arch. Eng., St. Louis County, Missouri

AVIATION TRADES HIGH SCHOOL
Board of Education, City of New York



architect: Chapman Evans & Delehanty
contractor: Caristo Construction Corp.

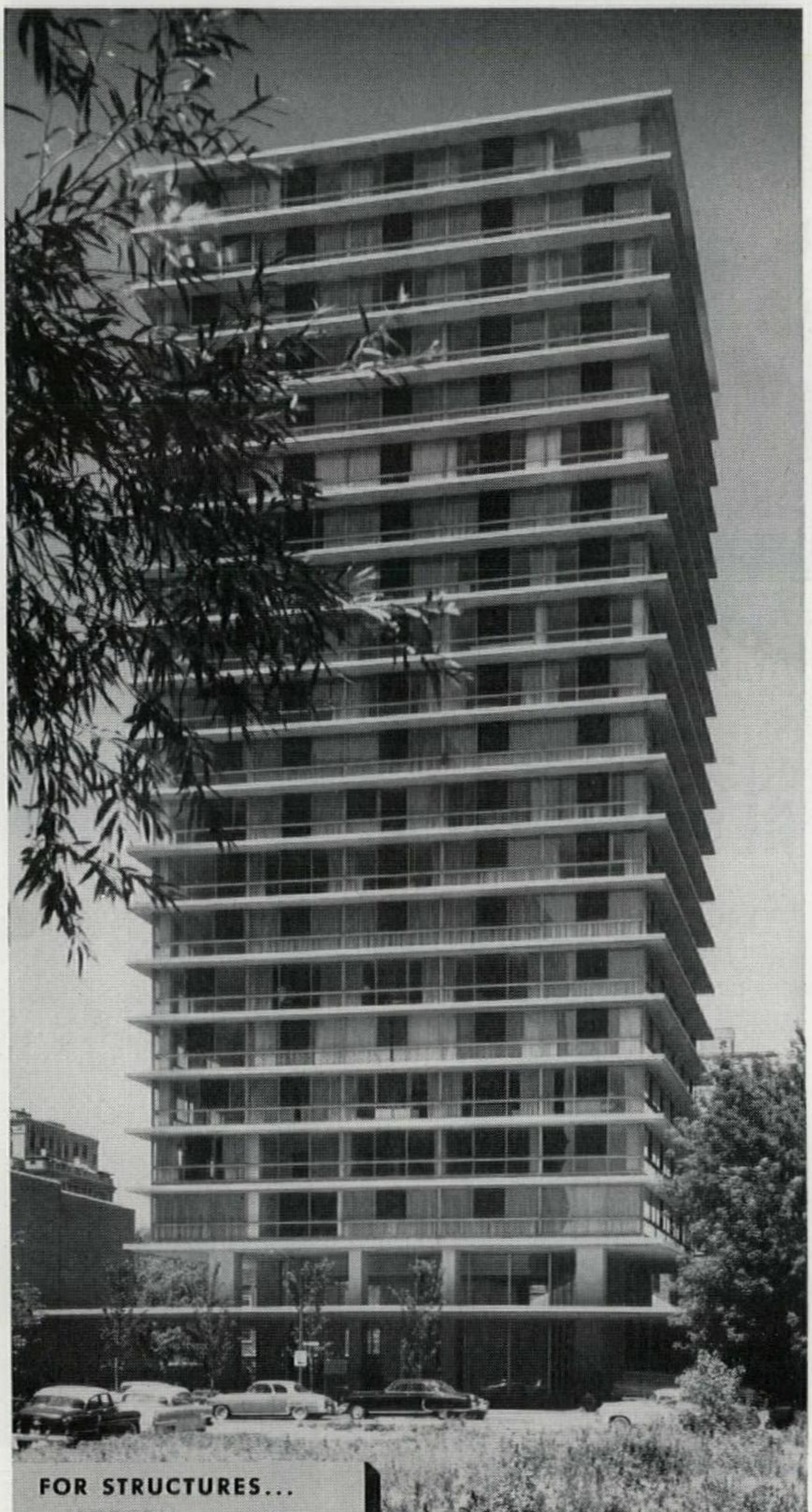
NEW YORK SCHOOL OF PRINTING
Board of Education, City of New York



architect: Kelly & Gruzen
contractor: Caristo Construction Corp.

Curtained with an acre of glass...this Chicago building is 100% reinforced concrete!

WHEN AMERICA BUILDS FOR DURABILITY . . . IT BUILDS WITH CONCRETE

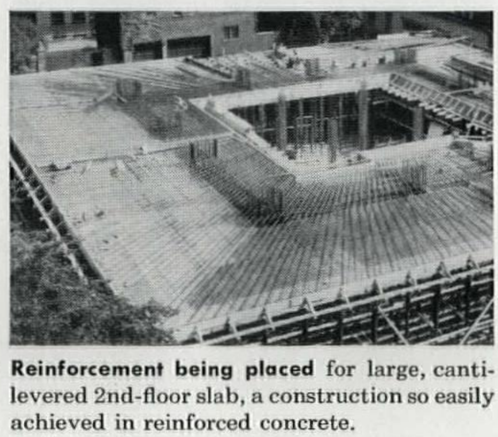


It's one of Chicago's finest luxury apartment buildings, 21 stories overlooking Lake Michigan at 320 Oakdale. Beneath its attractive exterior, 12,000 cu. yds. of concrete form a frame and floor skeleton of outstanding strength.

Architect Milton M. Schwartz of Chicago and structural engineers from Miller Engineering Co. chose reinforced concrete for its rigidity and durability—and passed along big bonuses in economy to their client, too.

Concrete saved an estimated $200,000 through reduced materials cost, easier construction scheduling. It made a simple job of the cantilevered overhangs. And because floors are flat slabs, it saved a full story in total height.

Concrete needs no special fireproofing. It can't rust or rot. No other material offers such low maintenance cost. More and more architects and engineers are specifying concrete frame and floor construction today. They're finding the same kind of economies for all structures, of both conventional and modern design.



Reinforcement being placed for large, cantilevered 2nd-floor slab, a construction so easily achieved in reinforced concrete.

FOR STRUCTURES...
MODERN
concrete

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete

There is no substitute for safety, and Polished Misco (wired) affords proven protection for youngsters in the new Walt Disney Elementary School, at Tullytown, Pennsylvania.

Architect: John Carver,
2112 Spruce St., Philadelphia, Pennsylvania

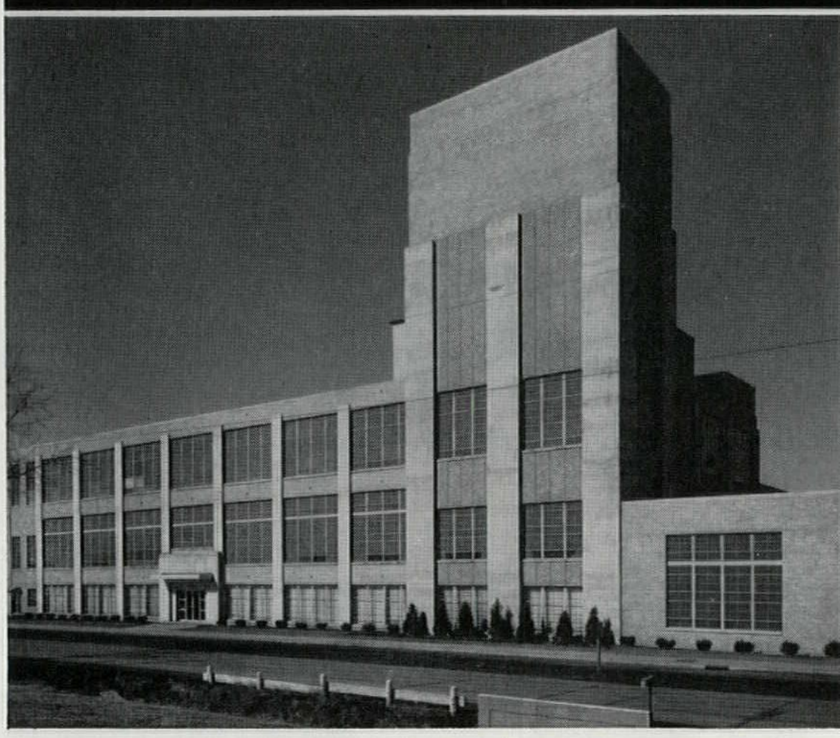
Heat absorption provided by 38,750 sq. of Mississippi Coolite glass make patients more comfortable in the John J. Kane, Allegheny County Institution District (Hospital for the Indigent Sick).

Associate Architects: Button & McLean—Mitchell & Ritchey, Pittsburgh, Pennsylvania
General Contractor: Sherry Richards Company, Chicago, Illinois
Glazing: United Plate Glass Company, Pittsburgh, Pennsylvania

At the Philadelphia International Airport, modern vistas are created by 10,000 sq. ft. of 60" wide lights of Polished Misco (wired glass).

Architect: Carrol, Grisdale and Van Allen, Philadelphia, Pennsylvania
Glazing: Pittsburgh Plate Glass Company

ROLLED GLASS . . .



New factory of American Chicle Company, Rockford, Ill. where 14,000 sq. ft. of Coolite Wire glass, Glare Reduced, combines heat absorption with protection.

Architect: William Higginson & Sons, New York, N. Y.
General Contractor: Sjostrom & Sons, Inc., Rockford, Illinois
Glazing: National Mirror Works, Rockford, Illinois

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MISSISSIPPI GLASS

Sections Give You a More Practical and a More Efficient Structural Unit!

6″ Wide Cel-Beams Provide Adequate Raceway Capacity . . . Permit Greater Latitude in Location and Installation of Floor Service Fittings

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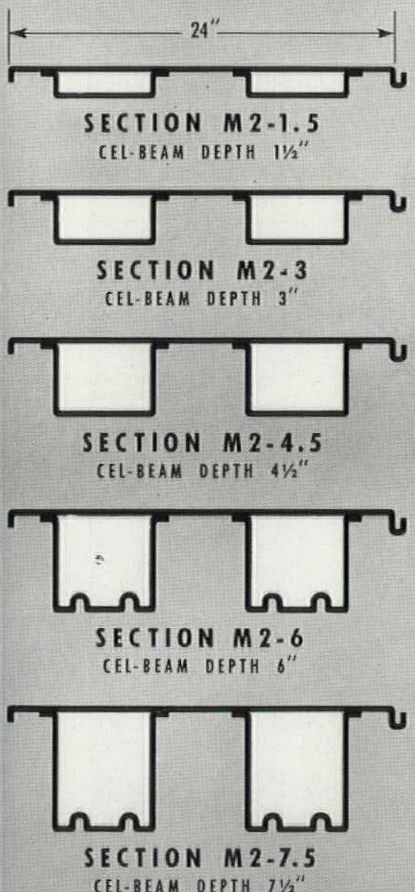

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- Underwriters' Rated Metalclad Fire Walls
- Rolling Steel Doors (Standard or Underwriters' Labeled)
- Steel Roof Deck
- Long Span M-Decks (Cellular or Open Beam)
- Permanent Concrete Floor Forms
- Acoustical and Troffer Forms
- Acoustical Metal Walls and Partitions
- Acoustical Metal Ceilings
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☆ *For INFORMATION See SWEET'S FILES or Write for Catalogues*

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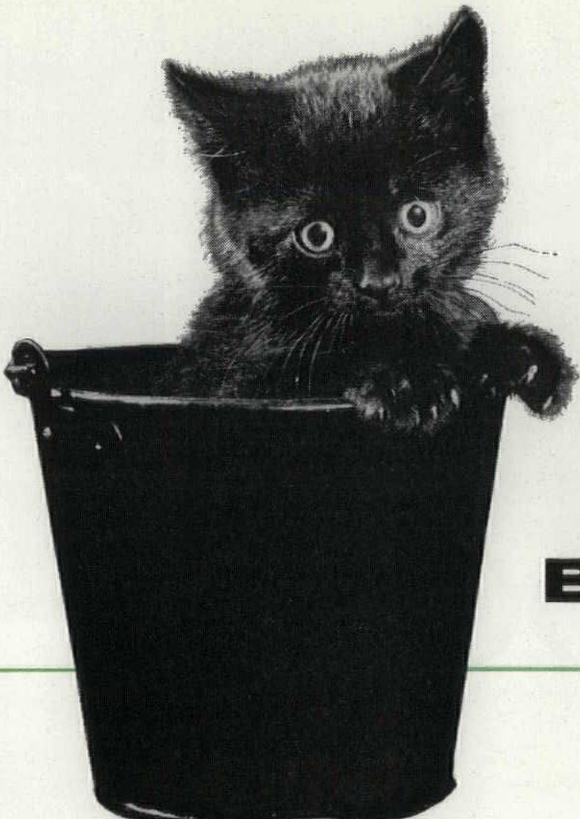

Black

that's

born

BLACK...

Imported CASTELL is saturated with "black gold" — the best natural graphite of more than 99% pure carbon

Only the best natural "black gold" graphite — mined out of the earth just as gold and silver is mined — goes into imported CASTELL. Because it assays at more than 99% pure carbon, we are not obliged to add foreign oily substances to create the *illusion* of black. CASTELL is *born* black.

That's why it gives you clean, crisp, extremely opaque lines that do not feather or crumble — why you do not have to pause frequently to brush away graphite dust.

Microlet-milling, our own exclusive process, reduces the granules to perfect shape and cohesion, giving you *light-proof* lines of unvarying density for the maximum of cleaner, sharper blueprints . . . lines with remarkable *erasability* that leave no ghosts. The close-textured lead sharpens to a needlepoint and resists breakage even under extra heavy pressure. 20 scientifically-uniform degrees, 8B to 10H.

You owe it to your career to use CASTELL, the Drawing Pencil of the Masters. All good dealers carry CASTELL. Why not call *yours* today.

CASTELL LOCKTITE (with Tel-A-Grade Indicator) for those who prefer a feather-weight holder with degree indicating device. Grips the lead like the jaws of a bulldog to prevent slipping or turning. One hand push-button control reduces graphite stains.

Imported CASTELL 9030 Lead — with the identical graphite that made Castell wood pencil world famous. Usable in all standard holders, but a perfect mate with LOCKTITE. Also available in a kaleidoscope of colors. Packed in plastic tube, 12 leads each.

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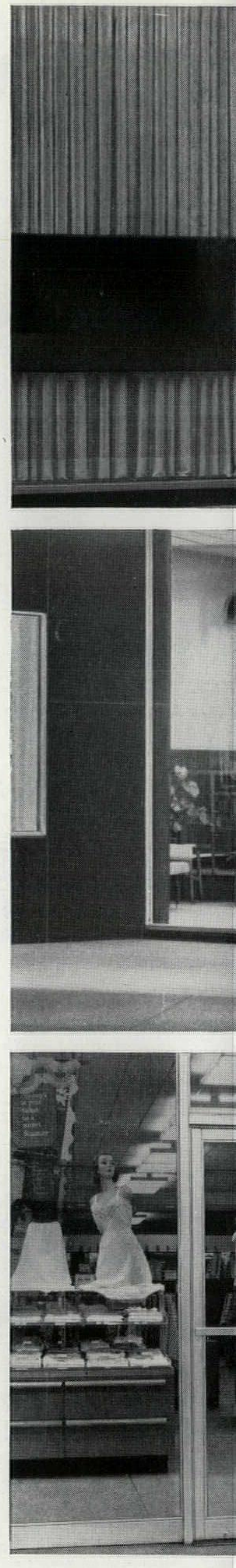
PREFERRED BY PROFESSIONALS IN EVERY CIVILIZED COUNTRY ON EARTH.



When it comes to doors —come to PITTSBURGH

Architects and building owners turn to *Pittsburgh* for all their doorway requirements. For only *Pittsburgh* offers three distinct types of doors which offer extreme architectural adaptability and real value. What's more, Pittsburgh's HERCULITE, WEST and TUBELITE Doors are without equal in handsome appearance and long, dependable, trouble-free operation.

For complete information on Pittsburgh Doors, see Sweet's Architectural File, sections 16a and 16d. For specific details, write direct to Pittsburgh Plate Glass Company, Room 8288, 632 Fort Duquesne Blvd., Pittsburgh 22, Pennsylvania.

PITTCOMATIC® . . . the nation's finest automatic door opener. HERCULITE, WEST and TUBELITE Doors may be equipped with this outstanding automatic door opener. Operated by a simple, hydraulic, motor-driven unit, it is easily installed and maintained. It is available for *handle* or *mat* control.

PITTSBURGH DOORS

. . . for entrances of enduring distinction

75th ANNIVERSARY 1883–1958

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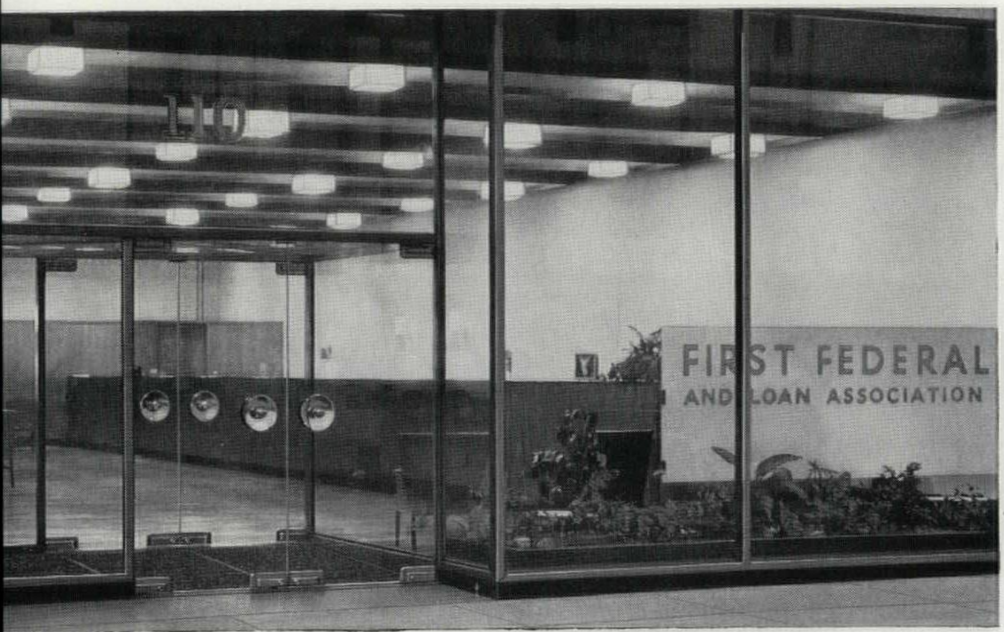
PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED



HERCULITE® DOORS

This installation of HERCULITE Doors at the First Federal Savings & Loan Association of Providence, Providence, Rhode Island, is a splendid example of the architectural flexibility of these doors. Here they complement a complete, new two-story facade of an old building in which Pittsburgh Polished Plate Glass and CARRARA® Tranquil Green spandrels also are utilized. Design possibilities with both ½" and ¼" HERCULITE Doors are practically unlimited. These doors are noted for their sturdiness, strength and endurance. Their uninterrupted transparence assures effective daylighting and illumination. Architects: Cull, Robinson & Green, Providence, Rhode Island.

WEST TENSION DOORS

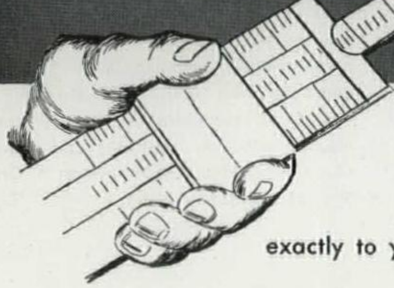
Narrow stiles and rugged strength make West Tension Doors the *quality* metal-framed doors. ½" thick glass, held under compression by a thin metal frame, provides strength. This new patented door is a solid unit with increased glass area which can never sag, rack or get out of alignment. Its simplicity affords unlimited variations in design. Standard or specially designed handles can be applied direct to the glass for complete open vision. These doors are suitable for operation with any type of automatic opening device. They are moderately priced and completely dependable in operation. Cumberland Savings and Loan Association, Portland, Maine; Architects: Wadsworth & Boston, Portland, Maine.

TUBELITE® DOORS

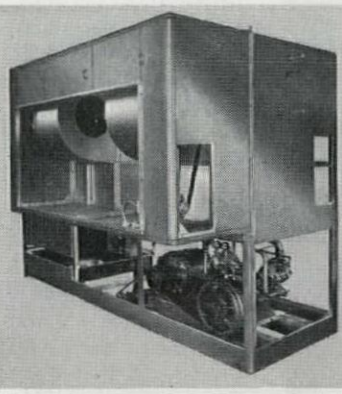
In this new building of the J. C. Penny Company, Longview, Texas, *Pittsburgh* TUBELITE Doors were effectively utilized by architects Wilson, Morris & Crain of that city. These doors and frames are a major advance in hollow metal entrance design. Their lines are clean and simple. They are fabricated of heavy extruded, hollow aluminum tubes, with no exposed seams. Their excellent quality, superb aluminum finish and simplicity of design make them ideal for new buildings and the modernization of old ones. They have a unique interlocking feature which assures that their true shape will be held through long and continued use. Here are doors which offer the greatest value at the lowest possible cost.

Unusual air-conditioning needs? . . .

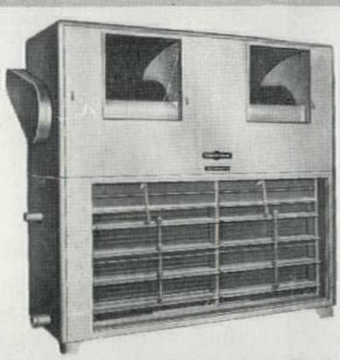
YOU CAN "DESIGN" YOUR OWN ©*Satisfabricated* PACKAGE . . . AT GOVERNAIR!



Yes, working with numerous basic models, Governair will incorporate your specifications and modifications to SATISFABRICATE the package exactly to your needs. You can be sure of its quality, too . . . for every Governair unit is constructed by expert craftsmen. This is your assurance of dependable performance and exact fit. Why not consult us on your next air conditioning project . . . from 3 to 100 ton units.



SELF-CONTAINED MULTI-ZONE AIR CONDITIONERS—with evaporative condenser. Zoned conditioner section — hot and cold deck, with mixing dampers for each zone. Sizes 7½ to 80 ton — single or dual refrigeration circuit. Ready for simple connection to duct system.



FAN AND COIL CABINETS — cooling, heating, humidifying, dehumidifying, ventilating, 1 to 100 ton, 500 to 30,000 cfm, vertical or horizontal types. Governair multi-zone fan and coil units are available in sizes ranging from 5 to 80 ton capacities, suitable for individual zoning.

Also: Blast Coils, Cooling Towers, Packaged Water Chillers, Low Temperature Coolers.

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Originators of Completely Packaged Air Conditioners

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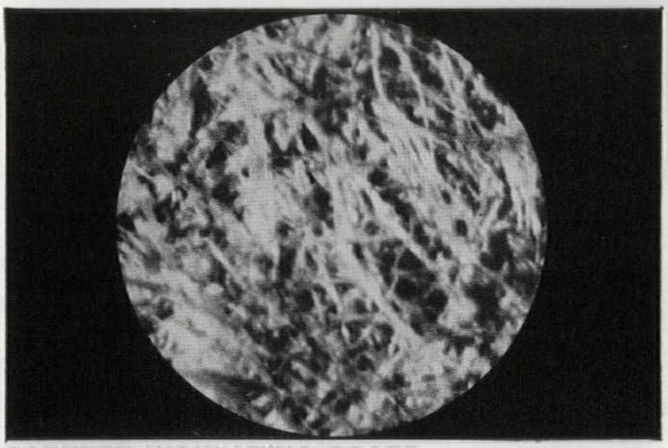
Barrett®

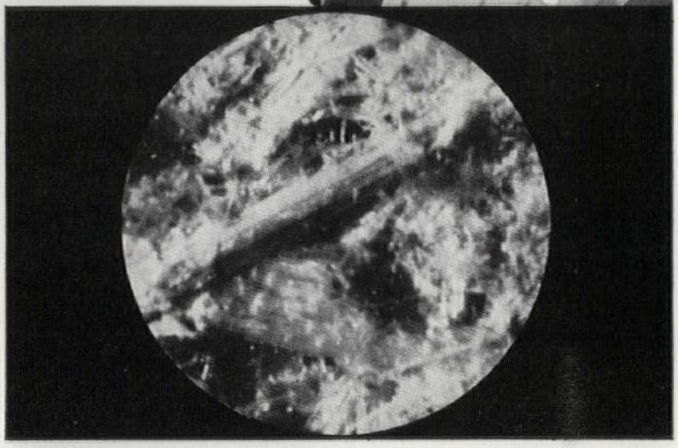
THE MICROSCOPE PROVES THE DIFFERENCE

New CHEM-FI manufacturing process preserves the fiber strength of natural wood . . . makes Barrett board stronger, more uniform.



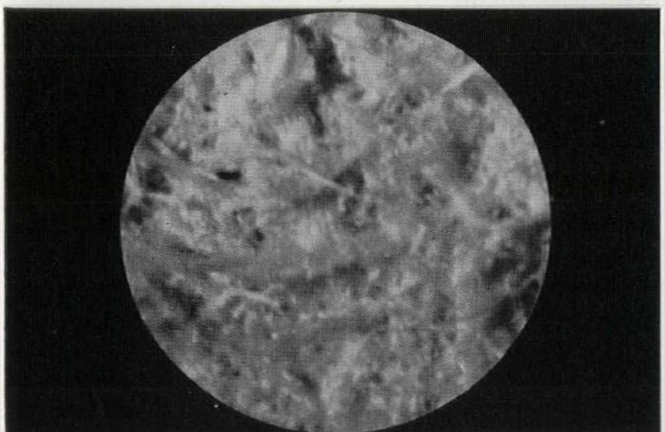
BARRETT INSULATING BOARD (magnified 20 times)

This microphotograph shows the long, interlocking wood fibers that reinforce Barrett Insulating Board . . . give it superior strength, uniformity and uniform thermal resistance. Barrett's CHEM-FI process separates the wood fibers by chemical means, retaining the strength of the natural wood from which it's made.

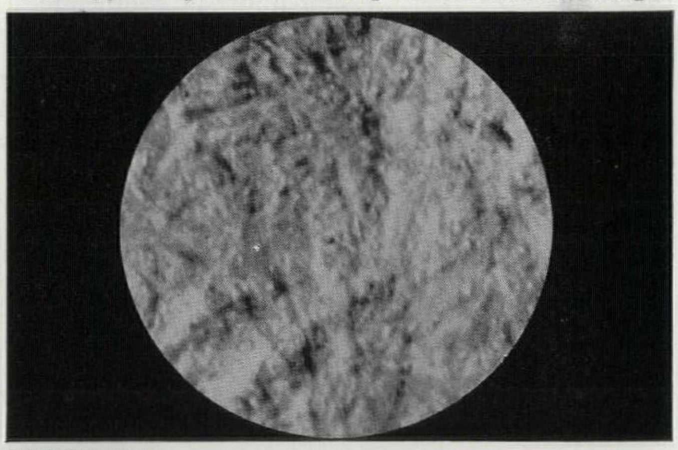


PROCESS B (magnified 20 times)

Notice that insulating board made by Process "B" has little uniformity in its fiber lengths. Some fibers are long, others are powder-like, providing no reinforcement. For a given board density (and thus a given K factor), Barrett's CHEM-FI manufacturing process produces insulating board of maximum strength.



PROCESS C (magnified 20 times)



PROCESS D (magnified 20 times)

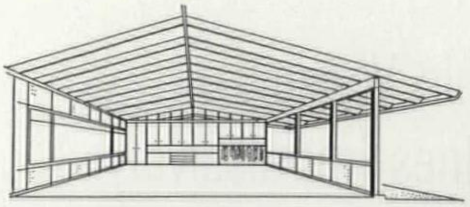
Insulating board made by these processes shows same preponderance of short fibers. Barrett Insulating Board using the CHEM-FI process, is made with longer, more uniform fibers, which have a reinforcing effect and substantially improve strength.

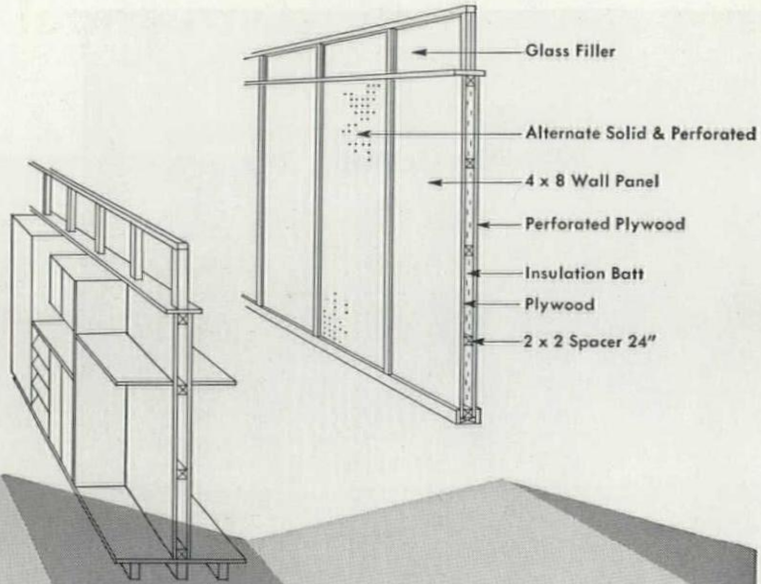
Architects—these microphotographs carry an important message for you!

Compare Barrett Insulating Board with that made by three other processes. There you'll find conclusive proof of the greater strength and more uniform insulating power of Barrett Insulating Sheathing and Barrett Roof Insulation. To insulating sheathing, Barrett's CHEM-FI Process brings superior strength for increased resistance to stress, and greater wall rigidity. To Barrett Roof Insulation, it brings uniformly high insulating value and light weight. Specify Barrett Insulating Sheathing and Roof Insulation made by the CHEM-FI Process—the biggest improvement in insulating board since its introduction.

Allied Chemical

BARRETT DIVISION
40 Rector St., New York 6, N.Y.

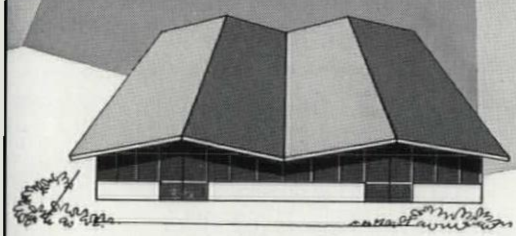




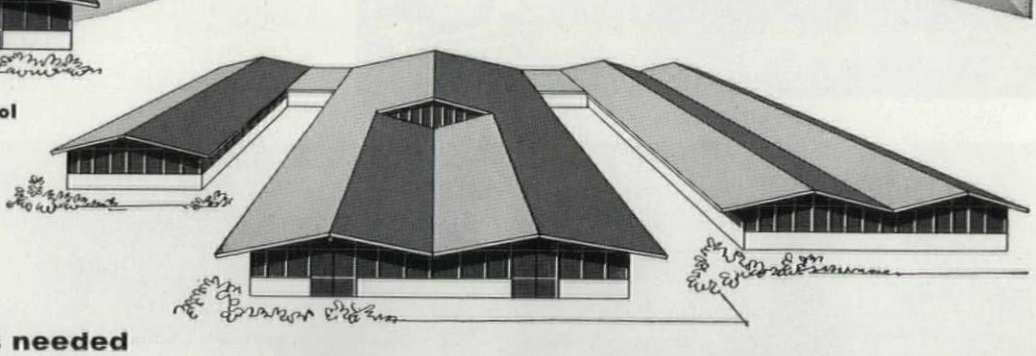
The interior may be left open for classroom uses
... or divided into smaller areas by movable partitions

FOLDED PLATE ROOF

PROVIDE MAXIMUM FLEXIBILITY FOR AN EXPANDABLE SCHOOL



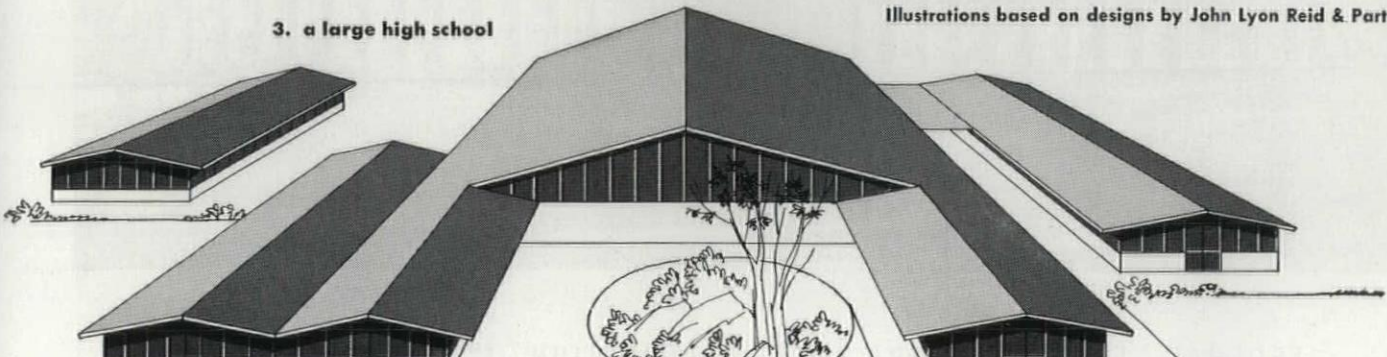
1. a small elementary school

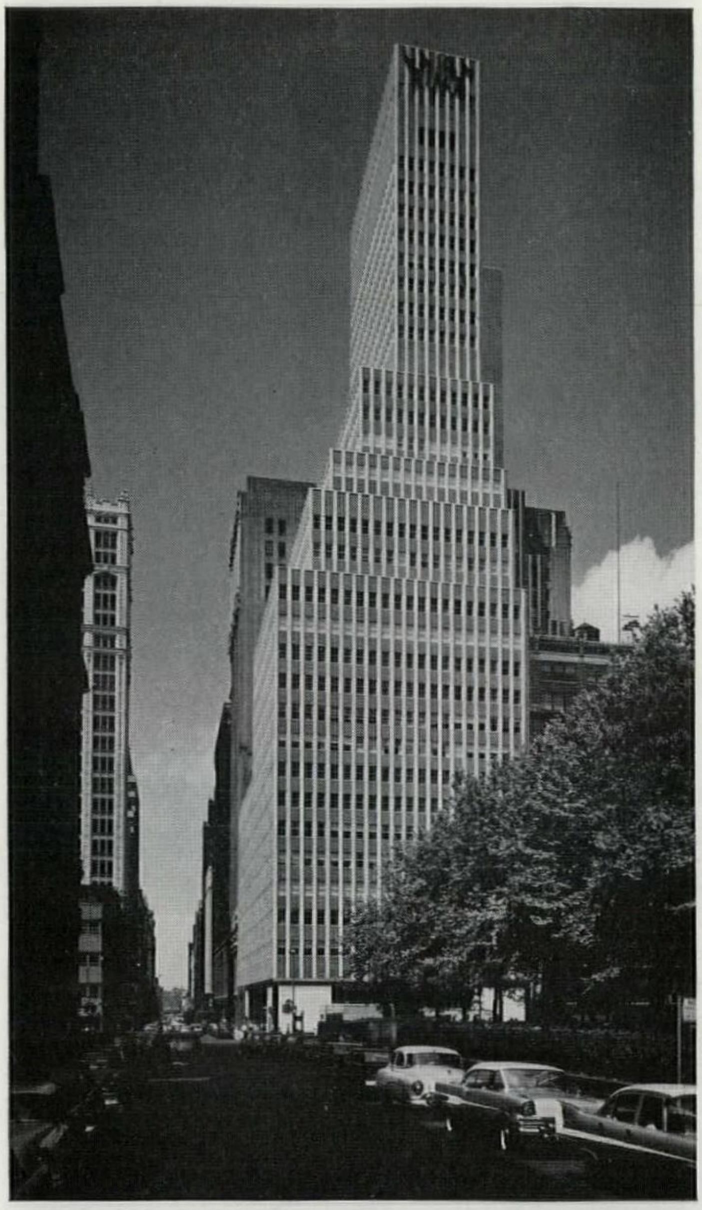


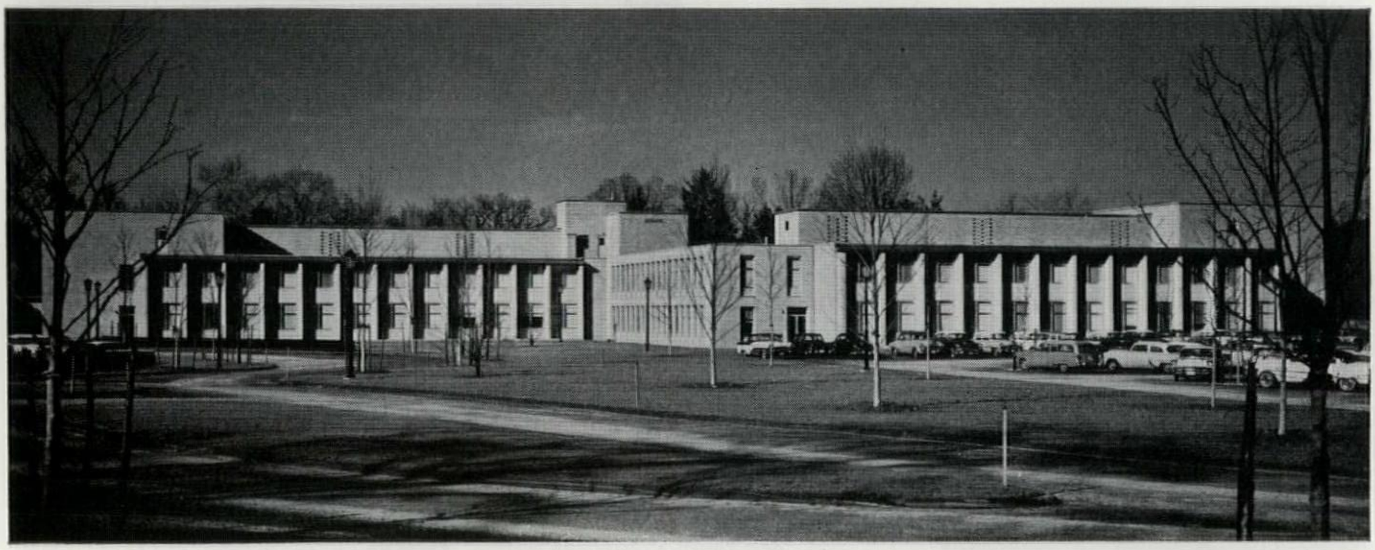
Units can be added as needed

3. a large high school

Illustrations based on designs by John Lyon Reid & Partners







Mosaic Ceramic Tile

TERRACES AND WALKS

AMERICA IS ENTERING THE CERAMIC TILE AGE

MOSAIC®

Designer: Wm. Pahlmann Assoc., Inc. Tile Contractor: N. Pietrangelo, Inc. Plate No. 595

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CERAMIC TILE TERRACES AND WALKS

THE MOSAIC TILE COMPANY

Mosaic Ceramic Tile

TERRACES AND WALKS

Expanded design frontier

Bringing the outdoors in is an accomplished fact in today's architecture. Now, the frontier is to accomplish the reverse—take the indoors outside!

The problem is not just to build a terrace, porch or walk. It is to create living comfort in the out-of-doors, to design a setting that invites use, pleases the senses, and relates well with the adjacent interior.

The thing to do is to "decorate" these exterior planes with rich, integral pattern and color. Naturally, color must be permanent and must totally resist weather and wear.

Ceramic tile provides the designer with all these qualities in a basic material. And Mosaic's complete selection of tile types, patterns and colors (many exclusively Mosaic) enables the designer to suit the tile treatment individually to the personality and purpose of the structure and its surroundings.

The designer derives another benefit from a Mosaic ceramic tile specification. He knows that the architectural spirit he creates will remain faithfully unchanged.

Good Ceramic Tile Service—A broad selection of tile is carried in stock locally in the Mosaic Warehouses listed below. You, your clients and your tile contractors are welcome to make full use of our Showrooms.

The complete Mosaic ceramic tile line offers: wall tile in Harmonitone, Bright Glaze and Everglaze; ceramic mosaics in Harmonitone, Velvetex, Granitex, Conductive, Undulatile, Everglaze, Faience, Formfree, Medley and Byzantile patterns; Carlyle quarry tile; Decorated glazed tile; Faience; All-Tile Accessories.

The Mosaic Tile Workbook for Architects, Form No. 226, is in Sweet's. For additional data, write The Mosaic Tile Company, Dept. A, Zanesville, Ohio, or The Mosaic Tile Company, Dept. A, 829 N. Highland Ave., Hollywood 38, California.

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America's largest ceramic tile manufacturer

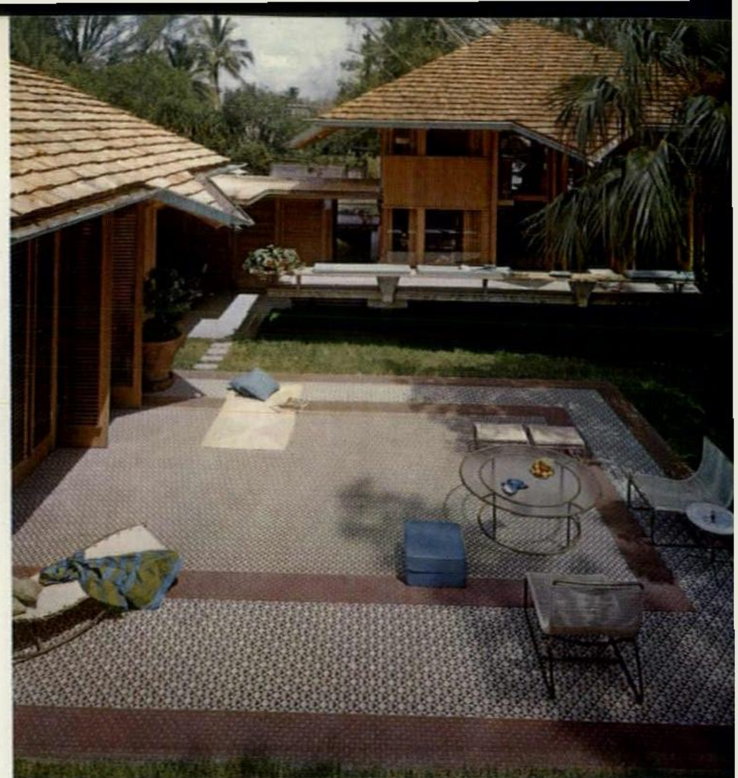
Member—Tile Council of America, Inc. and The Producers' Council, Inc.

Showroom-Warehouses: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Corona, Cal., Dallas, Denver, Detroit, El Segundo, Cal., Fresno, Ft. Lauderdale, Greensboro, E. Hartford, Hempstead, L.I., N.Y., Hollywood, Ironton, Ohio, Jackson, Miss., Little Rock, Matawan, N.J., Miami, Milford, Conn., Milwaukee, Minneapolis, New Orleans, New York (Showroom only), Philadelphia, Portland, Rosemead, Cal., Salt Lake City, San Antonio, San Diego, San Francisco, Santa Clara, Cal., Seattle, Tampa, Washington, D.C., Zanesville, Ohio.

Representatives: Memphis, Oklahoma City, Pittsburgh, St. Louis.

Factories: Zanesville and Ironton, Ohio; Matawan, N.J.; Little Rock, Ark.; Jackson, Miss.; Corona and El Segundo, Cal.

Architect: Thomas, Harris, Calvin & Assoc. Tile Contractor: Fortney Tile & Flooring Co.

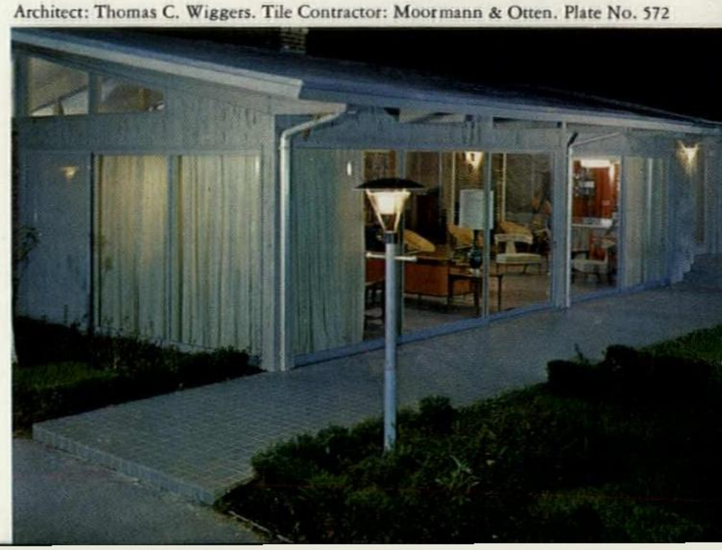


Architect: Alfred Browning Parker. Tile Contractor: Mariutto & Sons, Inc. No. Plate 621

Architect: Smith & Mills. Tile Contractor: Ellis Skinner Tile Co. Plate No. 419

For free estimates on Mosaic Tile, see the yellow pages for your Tile Contractor, Ceramic

Architect: Thomas C. Wiggers. Tile Contractor: Moormann & Otten. Plate No. 572



(Continued from page 77)

worthwhile reading

Dear Editor: I wish to thank you for jolting one nonreading reader into, at least, a nonreading thinker—with your P.S., "nonreading" (SEPTEMBER 1958 P/A).

The questions which you suggest we ask ourselves are pertinent, and I am sure will be remembered by many.

Perhaps a comprehensive book review with praise for only the best would encourage more of us to turn loose of the purse strings, for worthwhile additional reading.

ROBERT V. FLANAGAN
Houston, Tex.

anyway — interesting

Dear Editor: I have just finished reading, with great interest, McLaughlin's article on the three "styles" he has observed at Yale during the period between 1945 and now (*page 11,* JULY 1958 P/A). Historical styles used to cover centuries—now we have three within fifteen years!

I do not doubt that these differences in student work are discernible, but the fact that they exist is a sad commentary on the state of architectural design if these three periods he speaks about are applicable to work done beyond the school during the same period.

I think too many people who are talking and writing about architecture today are outdoing themselves to try to pin down work they observe as being done in the "Mies idiom" —or "after Wright"—or "according to the Gropius vocabulary"—and so on. It is just this sort of philosophy which rubs off on us and is making of us a bunch of stumbling imitators: a bunch of conformists who are afraid of originality in the field of architecture as much as we are afraid to be individuals in our daily lives.

Convention and the fear to be different are two factors which tend to reduce the frequency of original work. Then, too, there are architectural commentators who feel that they must draw comparisons between the work they observe and that done by recognized big names such as Gropius, Mies, Breuer, and Wright —to name a few. In other words, so-and-so's work shows the influence of such-and-such, hence it is inconceivable that so-and-so can lay much claim to what he has done, being a follower of this-and-that school.

Imitation is the forte of the very young. Unless leaders, and teachers, go out of the way to try to inculcate creative originality in the associates ard students, these people are going to be imitators the rest of their lives. Look what happens to those who fly off on a tangent. *They* become the Wrights, the Gropiuses, the Breuers, and the Kahns!

I think it is time we stopped this silly practice of culling, sorting, and tagging architectural design as being done in this idiom or that vocab-

(Continued on page 90)

p/a views

(Continued from page 88)

ulary. This is unnecessarily rough on the poor designer. He tightens up—not knowing whether to do his next job a la Corbusier in which everything is covered up, or as per Mies where a lot of it sticks out. Or do it his way and be doomed to mediocrity.

We ought to spend more time studying and analyzing how the architect of a successful building met the requirements of his program—and how he used those age-old tools of design which are universal and which are found in all periods of architecture—unity, balance, rhythm, scale, proportion, and so on.

Anyway, McLaughlin's article was interesting, whether it proves anything or not.

CORMAC C. THOMPSON
Prosser, Wash.

notices

new addresses

WITTENBERG, DELONY & DAVIDSON, Architects-Engineers, 510 Center St., Little Rock, Ark.

KELLY & GRUZEN, Architects-Engineers, 10 Columbus Circle, New York 19, N. Y.

new partners, associates

N. JACK HUDDLE, Associate in the firm of ROBERT A. LITTLE & ASSOCIATES, Architects, Cleveland, Ohio.

MORRIS SCHUPACK and CHARLES C. ZOLLMAN, Partners in the firm of SCHUPACK & ZOLLMAN, Consulting Engineers specializing in precast and prestressed concrete, 211 E. 37 St., New York, N. Y. and 3605 Chapel Rd., Newtown Square, Pa.

new firm

The ANACONDA COMPANY announces formation of a subsidiary, ANACONDA-JURDEN ASSOCIATES, INC., offering services in planning, designing, engineering, and construction of industrial plants.

p/a congratulates . . .

GENE C. BREWER, new president of United States Plywood Corporation who succeeds S. V. ANTOVILLE, elected chairman of the board.

JOHN W. BAMERT, new General Sales Manager of STANLEY HARDWARE DIVISION, THE STANLEY WORKS, New Britain, Conn.

PAUL D. JAPP, Vice-President of THE PHILIP CAREY MFG. COMPANY, Cincinnati, Ohio.

New Sub-Committee Chairmen of the Research & Development Committee, of the METAL CURTAIN WALL DIVISION, NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS, announced by Chairman JACK M. ROEHM: J. A. MOZUR, Benson Manufacturing Company, Sub-Committee On Technical Literature; CHARLES HUFFMAN, The Flour City Ornamental Iron Co., Sub-Committee

(Continued on page 93)

notices

(Continued from page 90)

on Engineering Design Standards and Specifications; PAUL FREEMAN, Aluminum Company of America, Sub-Committee on Material Specifications, Metallic; T. J. LEVAKE, Tremco Manufacturing Co., Sub-Committee on Material Specifications, Non-Metallic; K. V. ALEXANDER, Kawneer Company, Sub-Committee on Component Specifications; E. F. COFFMAN, Benson Manufacturing Co., Sub-Committee on Testing Procedures; PAUL FREEMAN, Aluminum Company of America, Sub-Committee on Building Codes; W. S. KINNE, Kawneer Company, Sub-Committee on Engineering Economics. WAYNE F. KOPPES has been retained as architectural consultant for the Metal Curtain Wall Division.

ATOMIC ARCHITECTURE

photo credits

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Ben Schnall.

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American Machine & Foundry.

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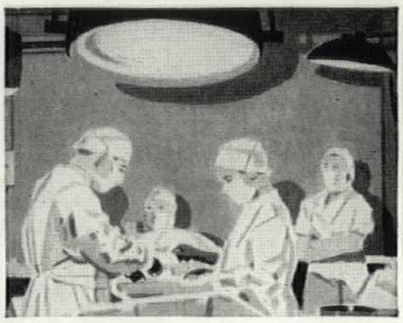
Now a hospital's mechanical systems

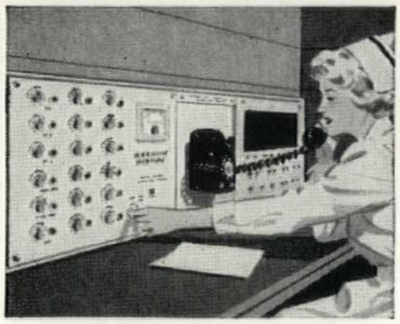
Supervisory DataCenter. More than 350 control centers using the basic principles outlined here have been sold by Honeywell for all types of buildings—including hospitals, schools, hotels, office and industrial buildings, banks, shopping centers and churches. They range from one square foot to many times larger than panel shown. List of installations furnished on request.

can practically manage themselves!

Honeywell now centralizes supervision of building functions—replaces legwork with cheaper, faster electrical signals.

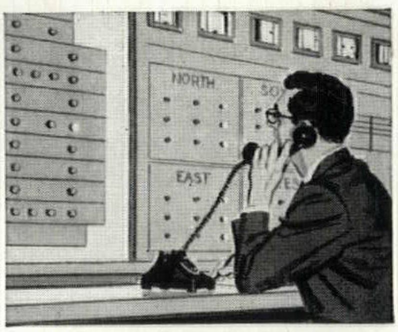


Air cleaner supervision
Panel supervises operation of electronic air cleaners to protect hospital cleanliness, trap microscopic particles. Gives bacterial and viral arrestance of 90% or more.

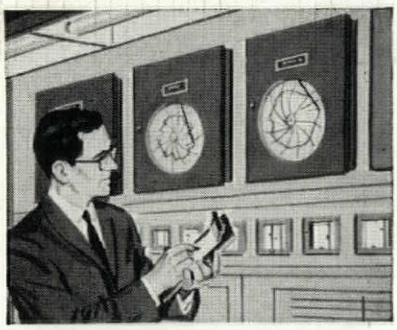


Remote control and communication
Lets nurse control temperatures in sterile areas and in areas where control by occupants is undesirable. She can also communicate with these same areas.

Bedside self-service center
A mobile bedside table which can incorporate: room temperature control, nurse intercom, clock, telephone outlet, light dimmer and control, other functions.



Fire detection and alarm
Sounds alarm and flashes light showing fire's exact location. Supervisor can direct quick action. Fire-sprinkler system, if used, can be tied in to same panel.



Utilities consumption records
Gives daily departmental metered record of power, steam and chilled water used. Connected to high speed typewriter, will fill in regular accounting forms.

Mechanical failure detection
From panel, supervisor can spot trouble at any point in air conditioning, plumbing or other mechanical system, send crews to remedy before breakdowns occur.

This new control concept from Honeywell enables a building to almost take care of itself—automatically.

Called a Supervisory DataCenter*, it lets one man do the work of crews. For it places all the functions shown above—and any others that benefit from centralized control—under the supervision of a single control center.

It's easy to operate, requires no special training. And its maintenance can be handled through a low cost service agreement. Each control center is custom designed. Even before blueprints are started, a Honeywell specialist will work with you and your engineer to allow free expression of your ideas, as they apply to both design and function.

It's at this original planning stage that his specialized control knowledge can be useful in developing a system that will save the most money for your client. For more information about this new concept, call your local Honeywell office or write Minneapolis-Honeywell, Department PA-11-147, Minneapolis 8, Minnesota.

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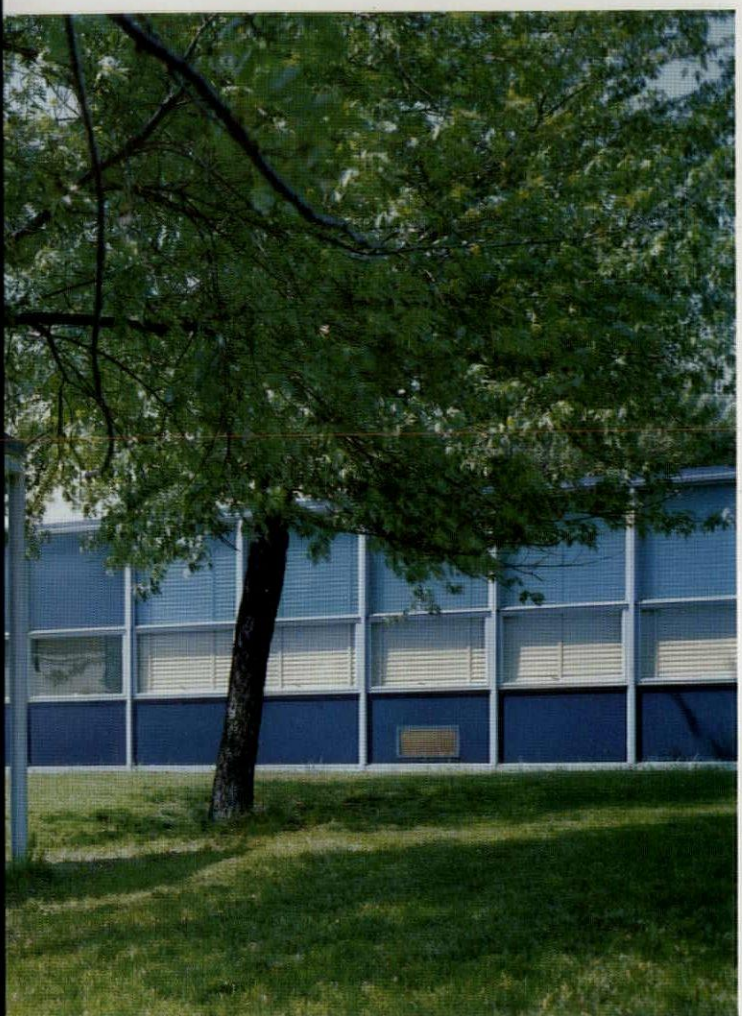
Honeywell

H HONEYWELL *First in Control*

Fresh as clover—

Drive out along Given Road in the town of Indian Hill, Ohio, and you'll come to a school that's as striking as its address, and as clean and fresh as the fields around it. It's the Cincinnati Country Day School—built with steel window walls because the architect wanted beauty and economy.

and the cost is down-to-earth



The porcelain-enameled steel panels, window sash and mullions are factory-assembled into complete floor-to-ceiling wall units and delivered ready to install. A small crew can erect an entire wall in only a few days. Labor and equipment costs are trimmed to the bone.

You can use lighter, simpler foundations because steel window walls are light . . . less than ¼ the weight of a conventional wall.

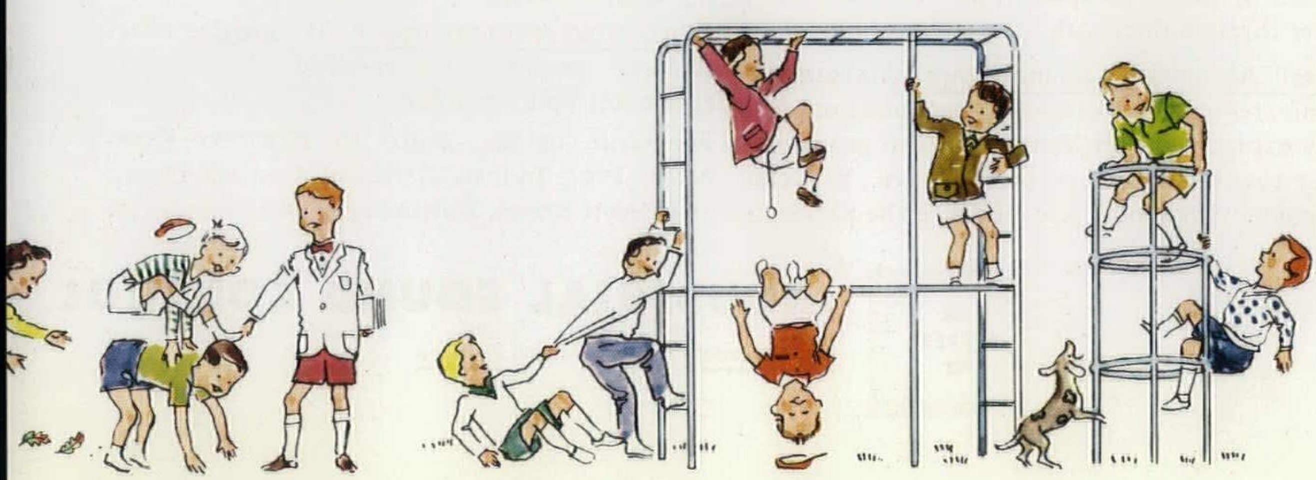
Porcelain-enameled steel panels *continue* to save money because they never have to be painted, scraped, pointed or resurfaced. The color will not fade. The walls will always look bright and new with just an occasional wash—often, rainfall alone can do the job.

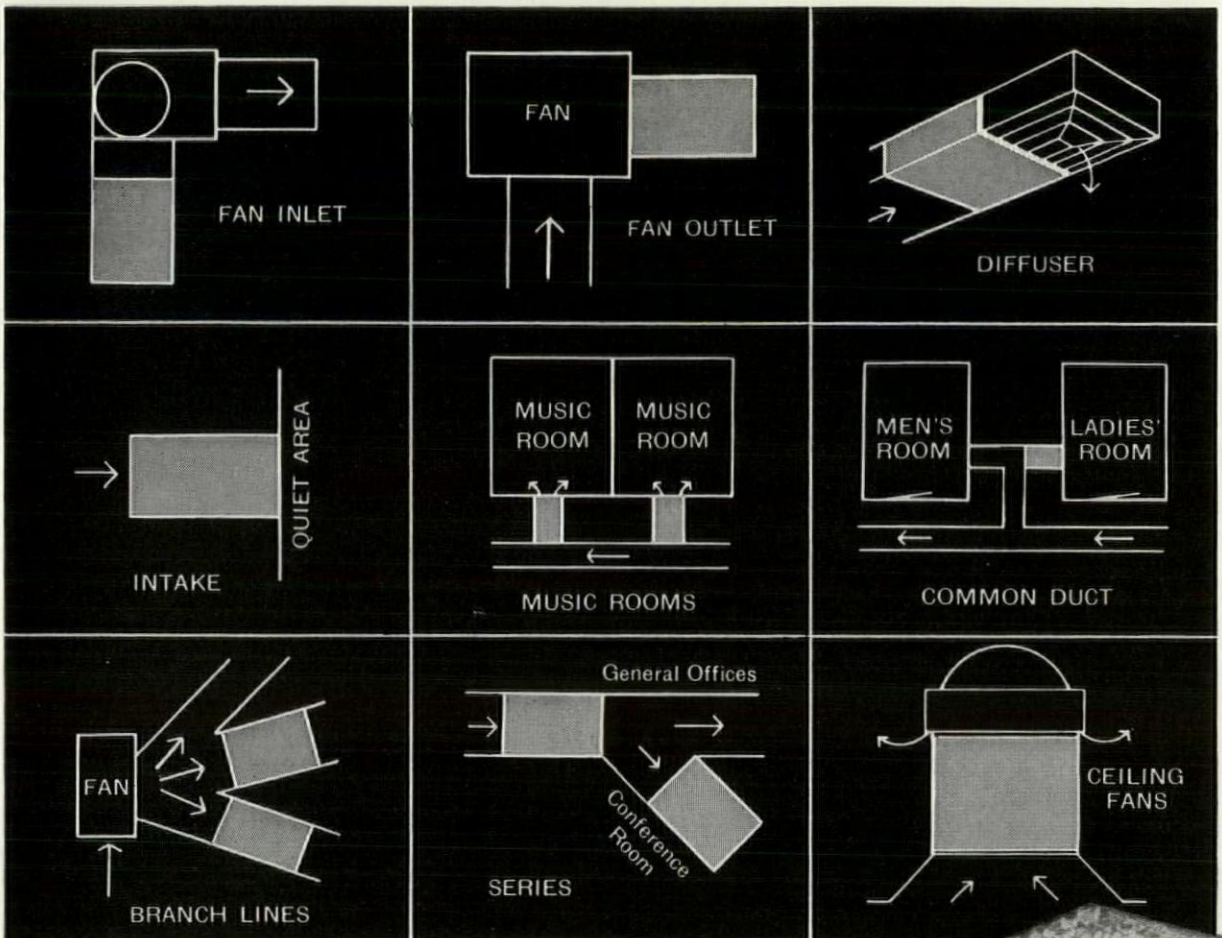
Beauty. Low cost. Low maintenance. Want more information? Write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS is a registered trademark

Cincinnati Country Day School, Indian Hill, Ohio
Architect: Carl A. Strauss, Cincinnati, Ohio
General Contractor: Chas. V. Maescher & Co., Inc., Cincinnati, Ohio
Curtain Wall Contractor: Fabricated and erected by Knapp Bros. Mfg. Co., Cincinnati, Ohio
Panel Fabricator: Porcelain Steel Corporation, Subsidiary of H. H. Robertson Co., Connersville, Indiana

USS United States Steel





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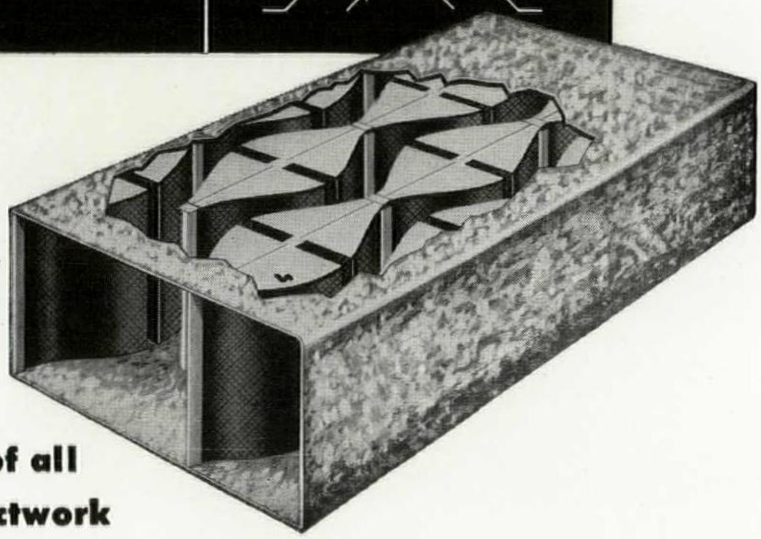

AIRCOUSTAT silences all noise of all frequencies traveling through ductwork

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preview

for december

PROGRESSIVE ARCHITECTURE

SEARCH FOR FORM

In examination of the work of Eero Saarinen and of Carl Koch and in a special article questioning current design trends and experimentation, DECEMBER P/A will take a look at the "Search for Form" in today's architecture.

The 14-page presentation of Saarinen's *Concordia Senior College* for the Lutheran Church, in Fort Wayne, Indiana, will be prefaced by a display of other Saarinen designs in which he has utilized a wide variety of forms.

Progress Report III in December will be devoted to the work of Carl Koch & Associates. A range of building types representing Koch's practice will be covered: housing and town planning, religious buildings, schools, commercial buildings. Particular emphasis will be given to Koch's interest in greater architectural control over the design of standardized building products.

Classicism in Architecture, by Stephen Kliment, young New York architect, illustrated with his own sketches, advocates less searching in varying forms and calls for the adoption of a Style Approach which can become "classicism" in our own time.

PROGRESSIVE ARCHITECTURE

means

ARCHITECTURAL PROGRESS

ATOMIC ARCHITECTURE

No architectural-engineering challenge is newer than that of the design of buildings to house nuclear reactors and their auxiliary facilities. It is so new, in fact, that no more than a handful of architects has even a nodding acquaintance with the design problems involved. Yet it is clearly an architectural problem—these awesome new scientific tools require shelter—and the architect and engineer have important roles to play in providing that shelter. It is also a fast-growing field; the research reactors now forming the bulk of construction in this new type will soon be supplemented by a rapid development in power reactors—an activity estimated to reach a volume in the billions of dollars within a few years. Hence, this special issue of P/A.

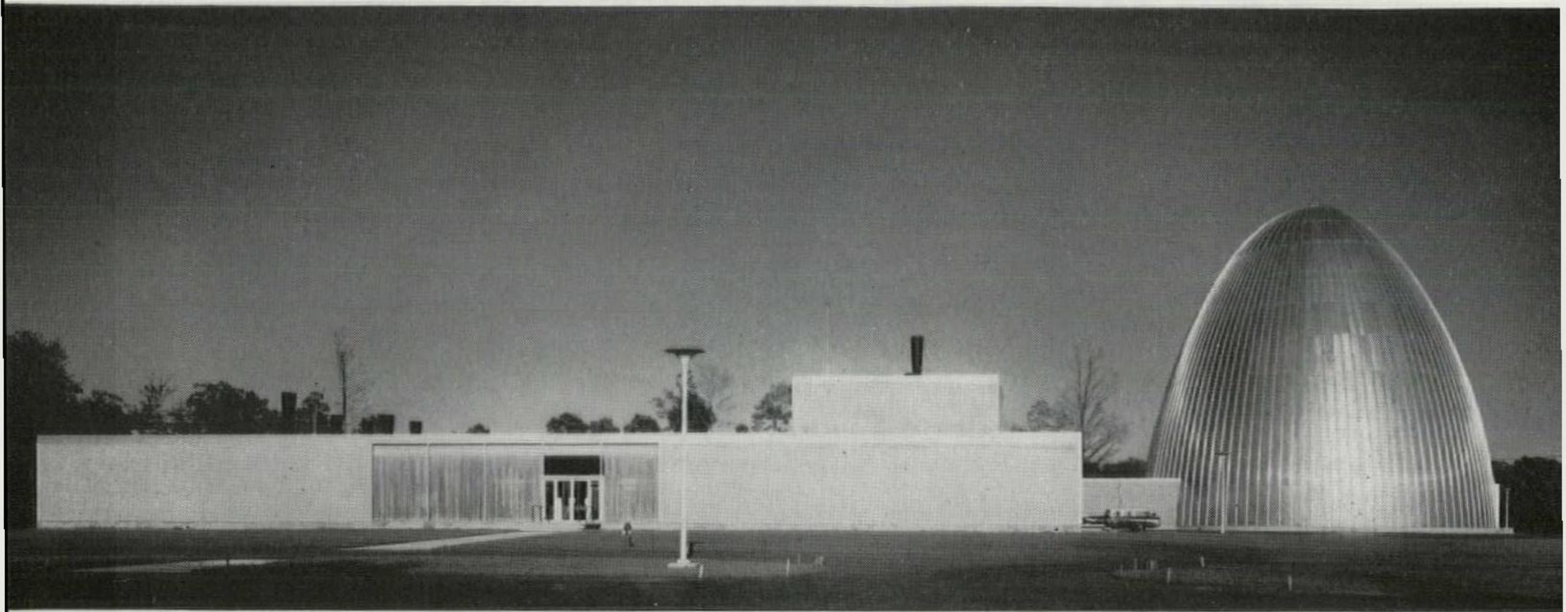
We have neither the intention nor the knowledge to explore the highly complex business of nuclear fission or the varying qualities and characteristics of fuels employed in the operation of nuclear reactors. These are matters for the physicists and technicians. Our attempt here is merely to provide sufficient a-b-c information on reactors, so that the designer of the enclosing structure and ancillary elements will have at least a general idea of what it is that he may be called on to house.

The architect will not design the reactor, proper; this comes under the heading of a design requirement, a given factor usually provided by the reactor manufacturer. But he must devise a roof and enclosing walls for it, and he must understand the nature of the reactor and reactor activity sufficiently to understand how strong, shielded, high, or wide this enclosure should be.

To guide us in the preparation of this issue—indeed, the issue would not have been possible without their help—we have had the able assistance of two nucleonics experts who work with AMF Atomics, a Division of American Machine & Foundry Company—Hugh Neale, Deputy Manager, Engineering Department; and Lars G. Stenberg, Architect. Articles by each of them appear on subsequent pages, one defining the various types of reactors and isolating those in which architecture is involved; the other, explaining where the architect fits into the picture and the procedures through which he must go in developing the design of a nuclear-reactor structure. A technical article by Consulting Engineer J. Fruchtbaum, who worked on design of reactor structures at both MIT and the University of Buffalo, discusses basic engineering considerations involved.

In a special section, we present a number of completed, or under-construction, reactors of different types that indicate some of the workable schemes that have been developed, to date, and illustrate the variety of results growing out of the search for an appropriate design expression.* Then, we show several school projects from Pratt Institute, where the students, unhampered by budgets or technical involvements, were free to "dream up" whatever they wished—subject, of course, to the schemes being basically (or conceivably) workable, a requirement that was protected by the fact that our AMF collaborators wrote the program for the problem; served as critics; and sat on the jury for the final designs.

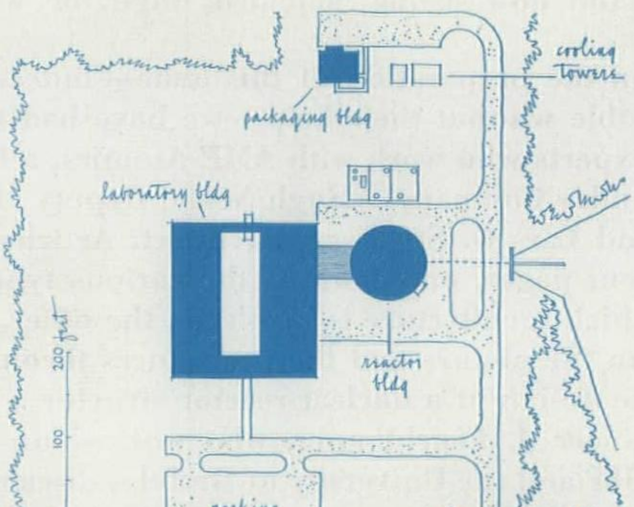
** Except for those projects that are shown in some detail, all photo credits for this issue appear on page 93.*



research reactor: IRL

data

location: Plainsboro, New Jersey
owner: Industrial Reactor Laboratories, Inc
reactor design: AMF Atomics
architects: Skidmore, Owings & Merrill
partner-in-charge: Robert W. Cutler
project manager: Frederick C. Gans
operating power: 5000 kw
reactor type: pool

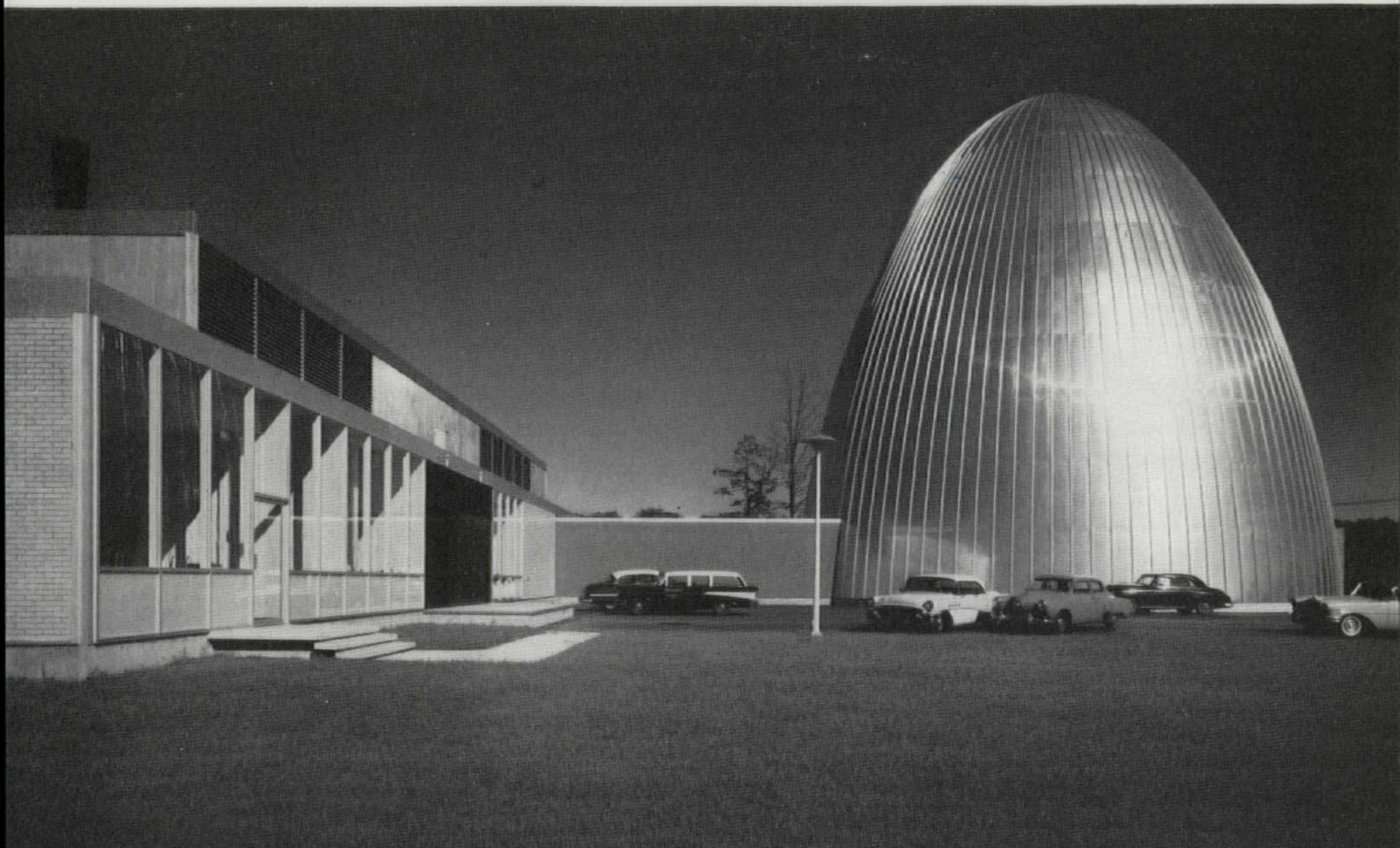


This outstanding nuclear facility is unique in several ways—in its joint sponsorship; in its intended use; and in its distinguished architectural design. Probably no other reactor installation yet built has enjoyed such close co-operation between owner, reactor designer/fabricator, and architect. Associated in its accomplishment were Severud-Elstad-Krueger Structural Engineers; Guy B. Panero, Mechanical Engineer; and Turner Construction Company, General Contractor.

Ten major U.S. companies constitute the member-owners who will use the building's facilities, with the reactor and hot-cell labs to be jointly shared and with separate office and lab spaces for each of the ten participants: National Lead Company; American Tobacco Company; Continental Can Company; Corning Glass Works; Socony Mobil Oil Company; United States Rubber Company; American Machine & Foundry Company; Atlas Powder Company; Radio Corporation of America; and National Distillers & Chemical Corporation. The eleventh lab-office unit is for the use of the IRL staff that will operate and control the use of the common facilities. AMF Atomics, a Division of American Machine & Foundry

Over the concrete shell of the beehive dome, a layer of 30 # roofing felt was applied to seal off the concrete and to prevent acids or vapors from reaching the insulation or aluminum surface. Over this felt layer is 1" of glass-fiber insulation board set between 1"x3" treated wood sleepers, 30" o.c. Above this is another layer of 30 # felt, and covering all is the skin of 16-gage mill-finish aluminum with trim caps over vertical joints. The whole is capped with a stainless-steel grill which is part of the emergency exhaust system. Approximately 20,000 lb of aluminum were used for the gleaming surfacing.

Photos: Alexandre Georges



Co., both designed and fabricated the nuclear elements and served as agent for the operating group in the development of the project.

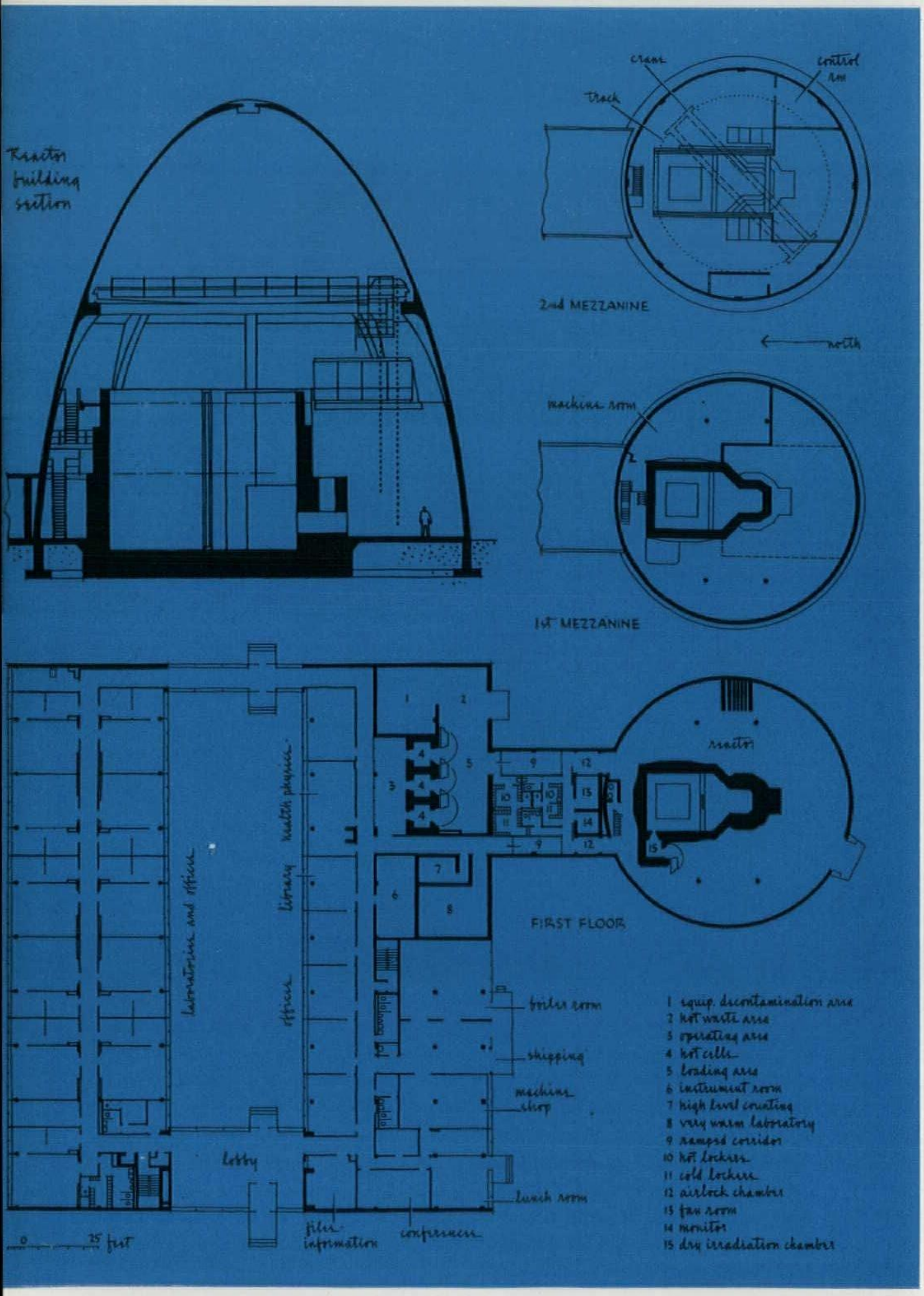
The facility is located approximately in the center of a 300-acre tract that the group has leased from the Walker Gordon Dairy, with the possibility in mind that at some future date related nuclear enterprises may occupy other areas of the site. The particular site was selected in preference to others considered, when investigation showed that it did not present downdraft conditions that might conceivably prove hazardous. Surrounding trees afford additional protection from the generally prevailing westerly winds.

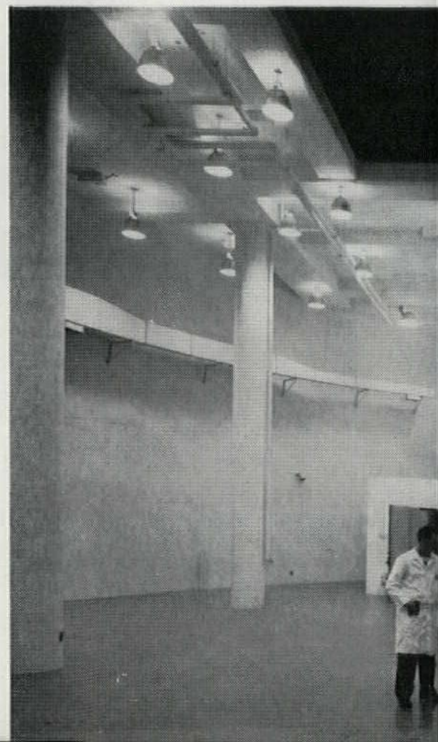
Common-use elements, in addition to the reactor and hot-cell labs, include a counting room, monitoring room, dark room, reception room, lunch room, library, conference room, shipping and receiving room, decontamination rooms, dressing rooms, and shops. The courtyard scheme gives full outside light to lab-office units.

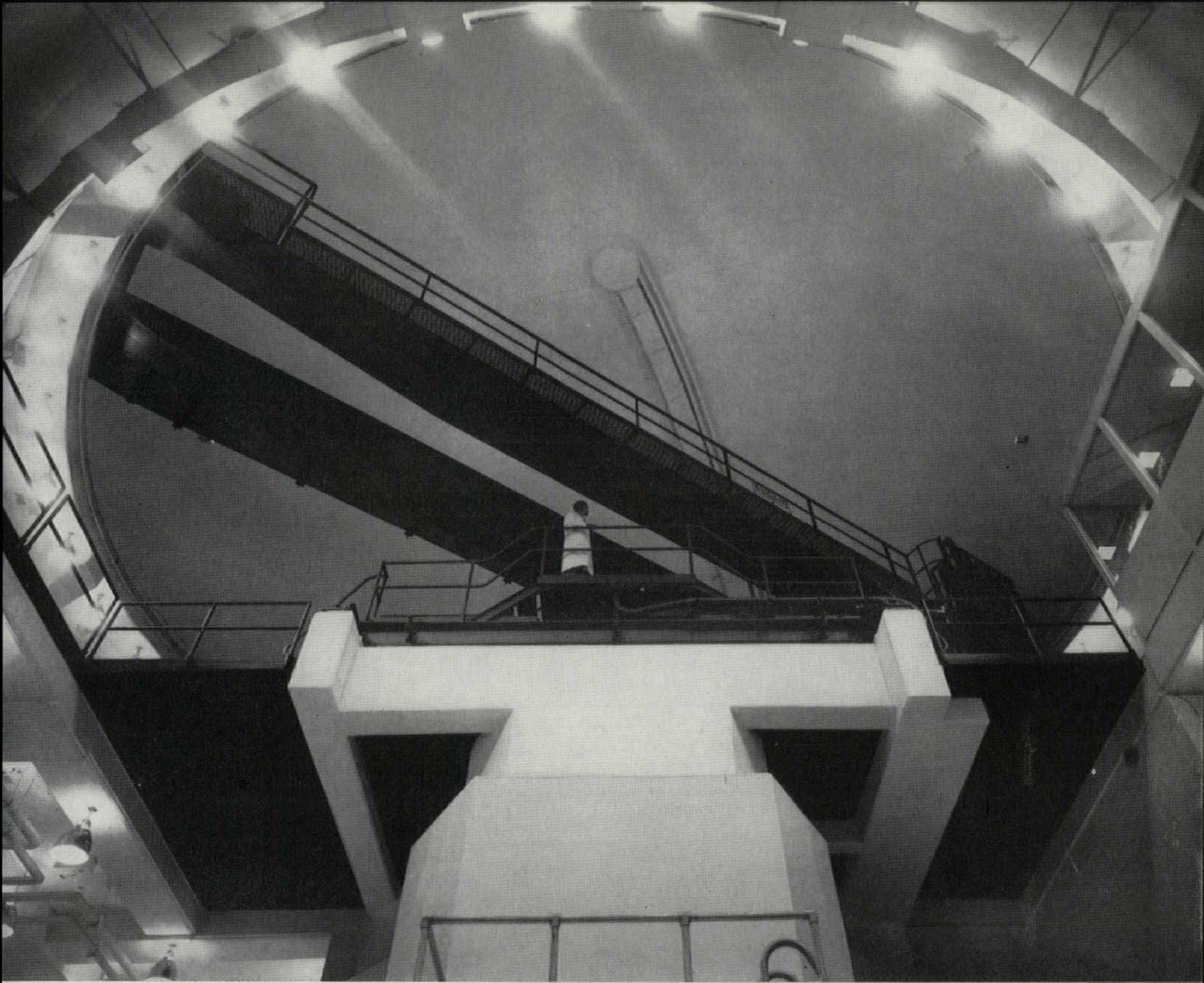
The beehive shape of the aluminum-surfaced, concrete dome housing the reactor was selected to provide a continuous surface that reduces gas-leakage possibilities to a minimum. The 87-ft-high dome has 12-in. and 8-in.-concrete walls for its lower half and 3-in. sprayed-on concrete for the upper portion. The 30-ft-deep reactor pool has walls $1\frac{1}{2}$ ft to 4 ft thick (depending on nearness to source of radiation) for maximum shielding. The lower 15 ft is built of magnetite concrete weighing 235 lb per cu ft; upper walls use regular concrete aggregates.

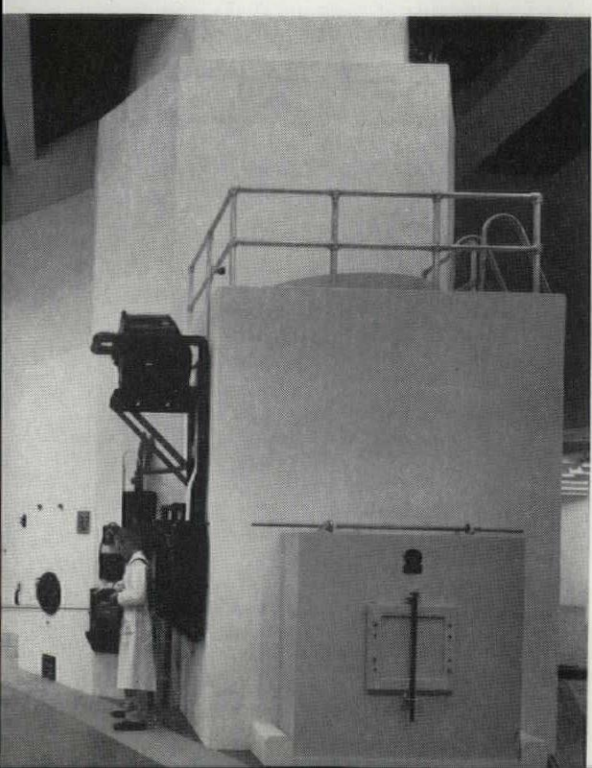
Thirty feet above the ground floor is the second-mezzanine level where the control room is located and from which the reactor pool is serviced. Thirty feet above this level is a traveling, 12-ton-capacity circular crane that spans the full 64-ft diameter at this level.

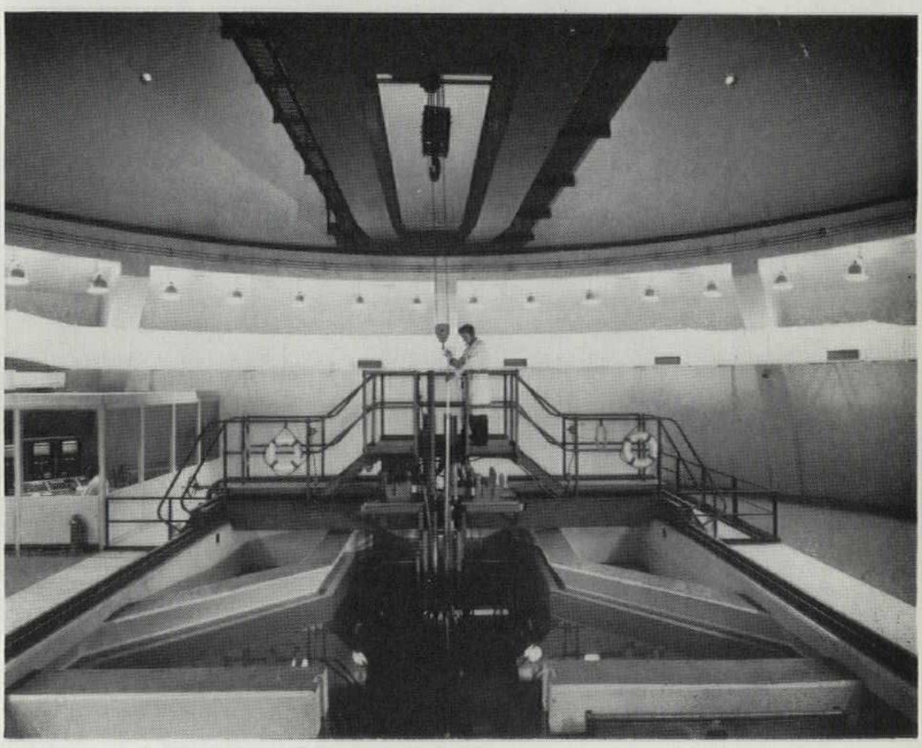
The hot-cells have steel-surfaced 3-ft-thick heavy concrete walls and doors. Experimental materials are handled from the operating side of the hot-cell area by mechanical manipulators and are viewed from this side through 3-ft-thick high-density glass windows. Between these labs and the reactor dome are toilets, showers, and lockers that are divided into hot and cold areas (from the standpoint of contamination).

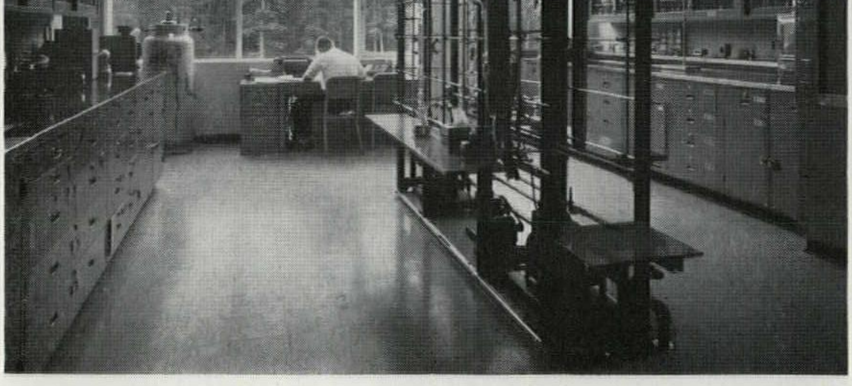










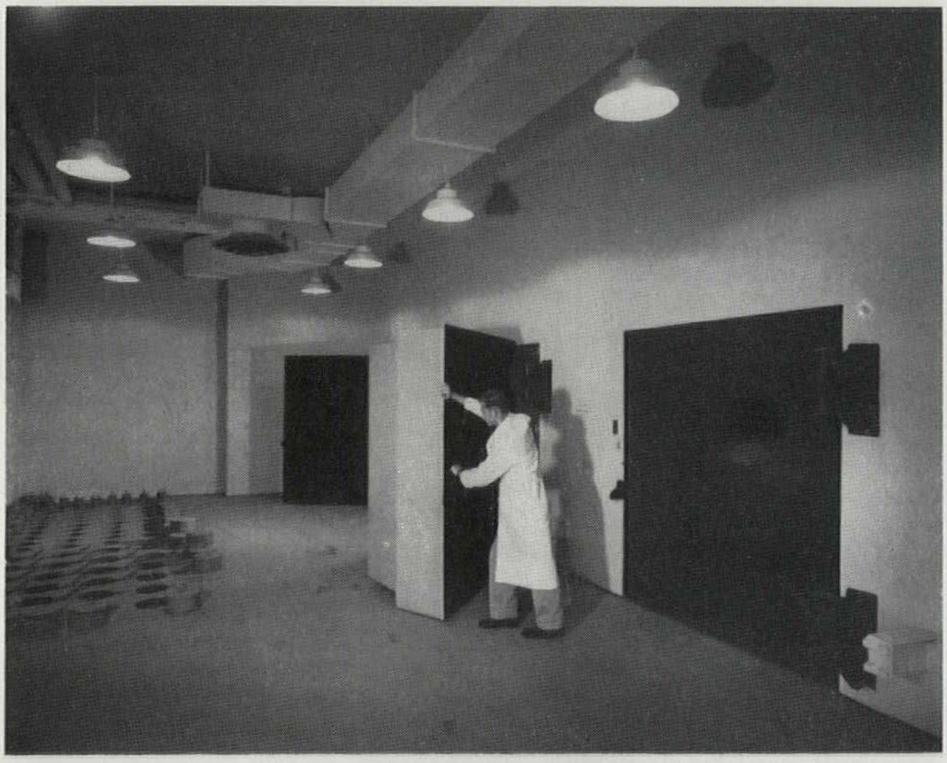


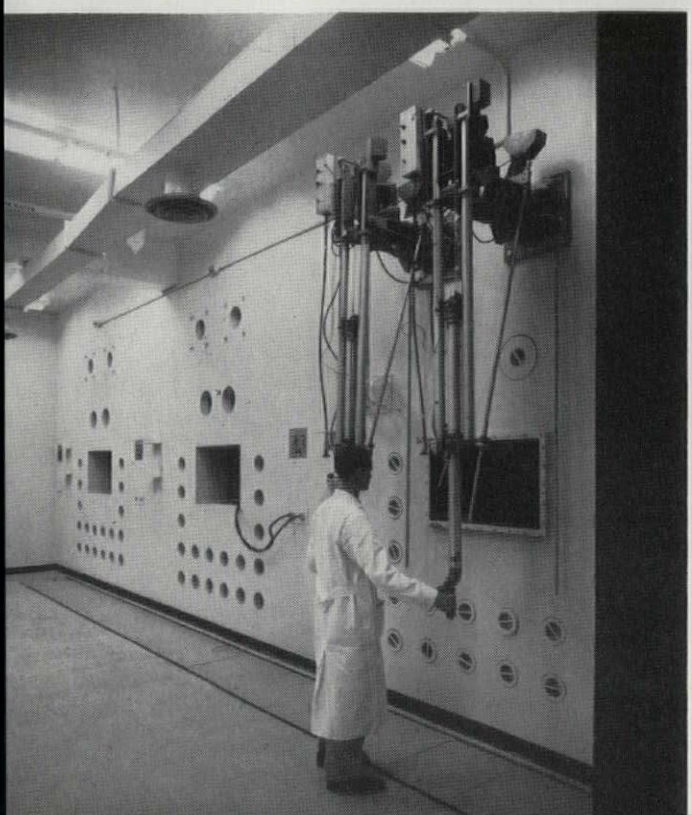
North of the central courtyard is the office and lab wing in which each of the ten participating companies, as well as the IRL staff itself, has its private facilities similar to those shown here (left) *for the Atlas Powder Company.*

Walls and doors of the hot cells (acrosspage) *are of heavy concrete, 3 ft thick, surfaced on both sides with 12-gage steel. Operators, protected by 3-ft-thick viewing windows, conduct experiments with mechanical manipulators.*

construction

Structure: foundation, frame, floors, roof: reinforced concrete: reinforcement—Bethlehem Steel Company; reactor, hot cells: heavy-aggregate concrete: aggregate—Shahmoon Industries, Incorporated. **Wall Surfacing:** outside: aluminum curtain wall—Allied Bronze Company; glass spandrel panels with ceramic color fused on back—Pittsburgh Plate Glass Company; brick—Hanley Brick Company; aluminum panels—H. H. Robertson Company; inside: exposed-concrete block, plaster, laminated-plastic panels—Formica Company; rest rooms, toilets: tile and plaster: lining for reactor pool: ceramic tile. **Floor Surfacing:** treatment: asphalt tile and vinyl asbestos—Mastic Tile Corporation of America. **Ceiling Surfacing:** treatment: exposed concrete, plaster, aluminum acoustical pans, cemented acoustical tiles—Johns Manville Corporation. **Roof Surfacing:** built-up roof over insulation—Barrett Division, Allied Chemical Corporation; aluminum covering on dome—Overly Manufacturing Company. **Waterproofing & Dampproofing:** integral and applied—Anti-Hydro Waterproofing Company. **Insulation:** acoustical plaster—National Gypsum Company; thermal: roof—Barrett Division, Allied Chemical Corporation. **Roof Drainage:** floor and roof—Josam Manufacturing Company. **Partitions:** interior: exposed block, metal—Aetna Steel Products Corporation. **Windows:** sash: pivoted—The Adams and Westlake Company; glass—Pittsburgh Plate Glass Company; viewing window, hot cell: special-density glass— Corning Glass Works. **Doors:** interior: steel—Atlantic Metal Products Company; overhead—J. G. Wilson Corporation; hot-cell and automatic air-lock doors—The Peelle Company; entrance—Allied Bronze Company. **Hardware:** lock sets, door closers—The Yale & Towne Manufacturing Company, LCN Closers, Incorporated; hinges—The Stanley Works. **Paint & Stain:** outside and inside: masonry paints—National Lead Company; reactor and hot-cell interiors: strippable paint—Amercoat Corporation.





equipment

Specialized Equipment: laboratory—S. Blickman Incorporated. **Crane:** circular—The Euclid Crane and Hoist Company. **Lighting Fixtures:** office areas: fluorescent luminaires—Westinghouse Electric Corporation; lobby area: downlight—Century Lighting, Incorporated: reactor room: mercury-vapor lamps—Holophane Company, Incorporated; area lighting—William A. Daunt. **Electric Distribution:** duct system: cable—Gavin-Graham Electrical Products Company; panelboards—Federal Pacific Electric Company; laboratories: fire-detection system—Acme Fire Alarm Company, Incorporated; generating plant—D. W. Onan & Sons, Incorporated. **Plumbing & Sanitary:** water closets: wall hung—American Radiator & Standard Sanitary Corporation: lavatories—toilet seats: solid molded plastic—Swedish Crucible Steel Company; flush valves—Sloan Valve Company; incinerator: package unit—Morse Boulger Destructor Company; pipe: copper, iron, polyvinyl chloride; water-supply system: wells—C. W. Lauman & Company, Incorporated; tanks: stainless steel, steel and glass-lined—Buffalo Tank Company; elevated water tank—W. E. Caldwell Company, Incorporated; water softener, demineralizers—Hungerford & Terry, Incorporated. **Heating:** hot water; package unit—Orr & Sembower, Incorporated; fuel: gas; convector covers: fin type—Vulcan Radiator Company; unit heaters—The Trane Company; controls—The Powers Regulator Company. **Air Conditioning:** type of unit: heat absorption—Carrier Corporation; cooling tower—The Marley Company, Incorporated; grills and diffusers—Tuttle & Bailey, Incorporated, Titus Manufacturing Company; blowers—Claridge Fan Company; filters—Cambridge Filter Corporation; ventilators—Penn Ventilator Company; controls—The Powers Regulator Company; air monitoring system—Brook Company.

nuclear reactors defined

by Hugh C. Neale*

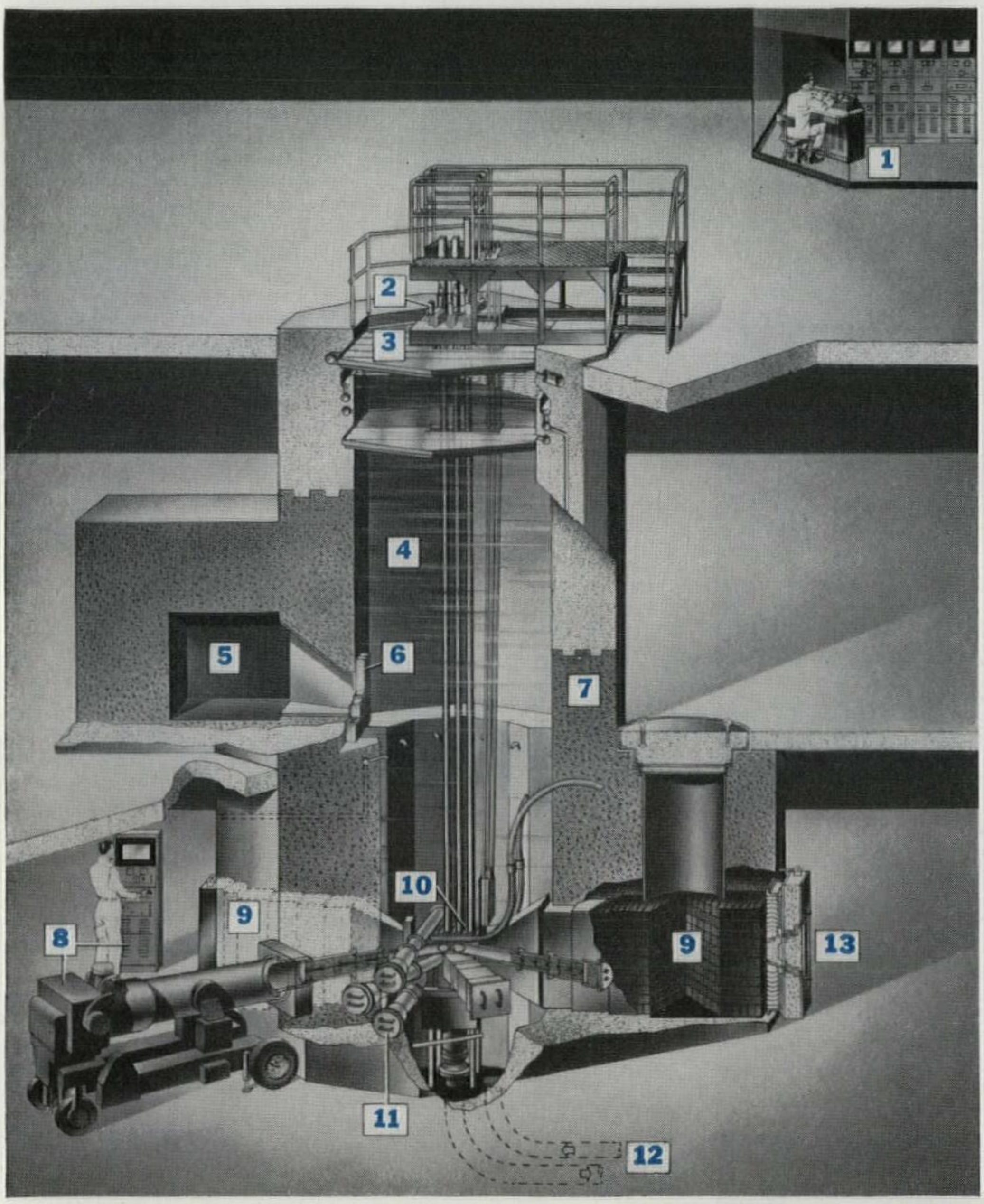
In the United States, alone, there are 149 reactors in operation, 89 reactors under construction, and 67 reactors in the planning stage.[1] Many others are in the earliest-thinking stages and no public announcements have been made. These figures clearly make the construction of nuclear reactors and their supporting facilities a significant enterprise.

In this article, the basic building blocks of nuclear reactors are described and their present-day uses reviewed. A short report on the principal types of reactors is included. Although the first nuclear reactor was operating 16 years ago, to cover adequately all of the reactors developed today, even rather briefly, would require several volumes.

To achieve an actual working reactor, many technical experts and specialists have worked together applying their specialties to nuclear-reactor systems. Top-notch personnel in the fields of reactor physics, heat transfer, hydro-dynamics, reactor shielding, reactor control, metallurgy, machine development, power-plant engineering, and architecture have all been necessary to bring reactor science and engineering to its present level.

* *Deputy Manager, Engineering Department, AMF Atomics.*

[1] *December 31, 1957 figures,* Progress in Peaceful Uses of Atomic Energy, *July-December 1957, USAEC.*



1 *Cut-away view of a Tank-Type Light-Water Research Reactor, showing control console, shielding, control rod drives, irradiation facilities, and experimental apparatus.*

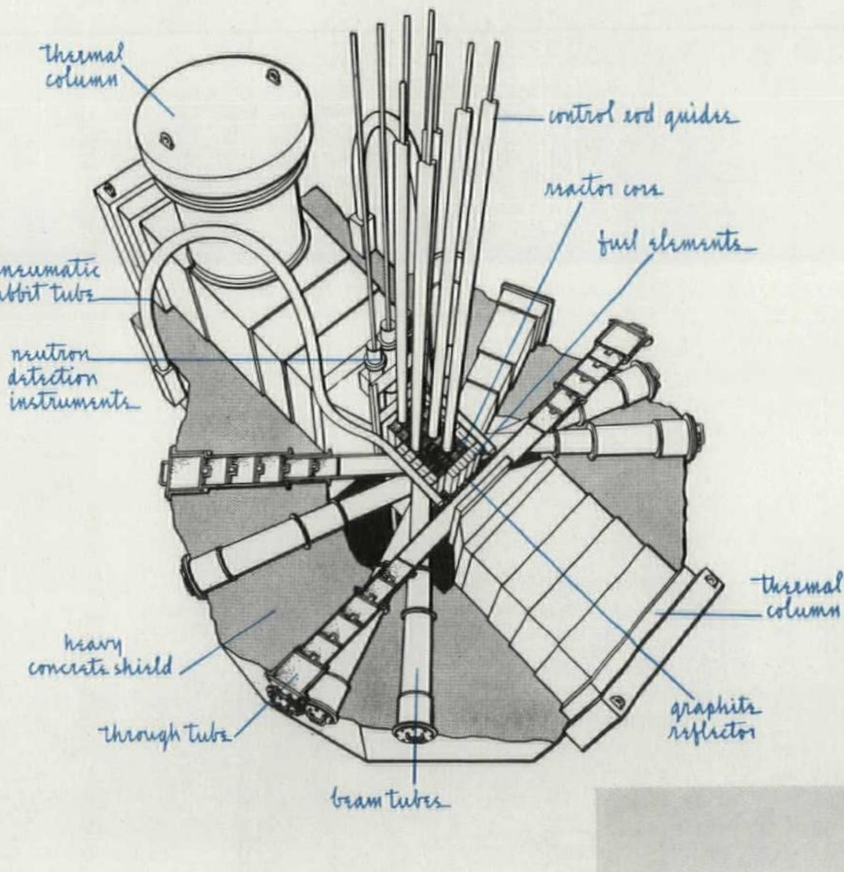
NUCLEAR REACTOR ELEMENTS

Basically, a nuclear reactor is a device in which nuclear fission occurs in a self-supporting, controlled chain reaction. Nuclear fission consists of the division of a heavy nucleus of uranium or plutonium into two parts, and is accompanied by release of neutrons, gamma rays, and heat. The nuclear reactors which are designed to use the neutrons and gamma rays for experimental purposes are called Research Reactors. Those which utilize the heat generated to produce mechanical work or electric power are called Power Reactors.

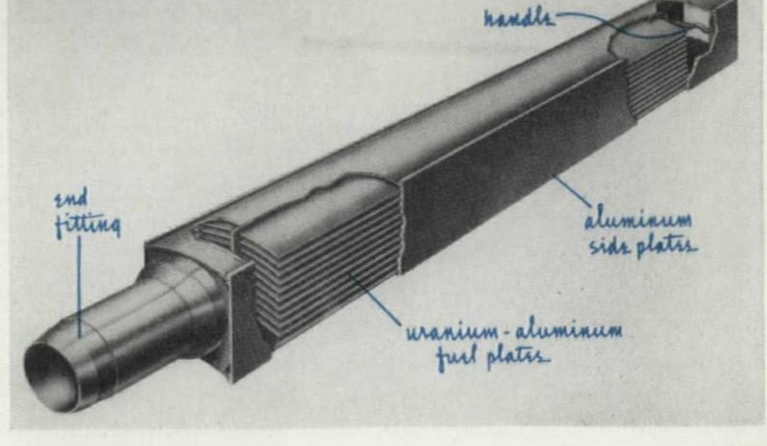
Many different concepts for nuclear reactor designs exist. Two typical reactors, one research, **1**, and one power, **6**, give a general idea of the shape and size and features of nuclear reactors. While reactors for other purposes may emphasize one part of the system more than others, these examples cover all of the important functions of any reactor.

research reactor elements

The reactor core is the heart of the system **2**. A support structure with a grid plate holds the individual reactor fuel elments in a fixed position. The fuel elements shown, **3**, are assembled from curved plates which are a sandwich of uranium-aluminum alloy with an outer



2 *Close-up of Research-Reactor Core and Irradiation Facilities, showing fuel elements, reflector elements, neutron-detection instruments, and irradiation facilities.*



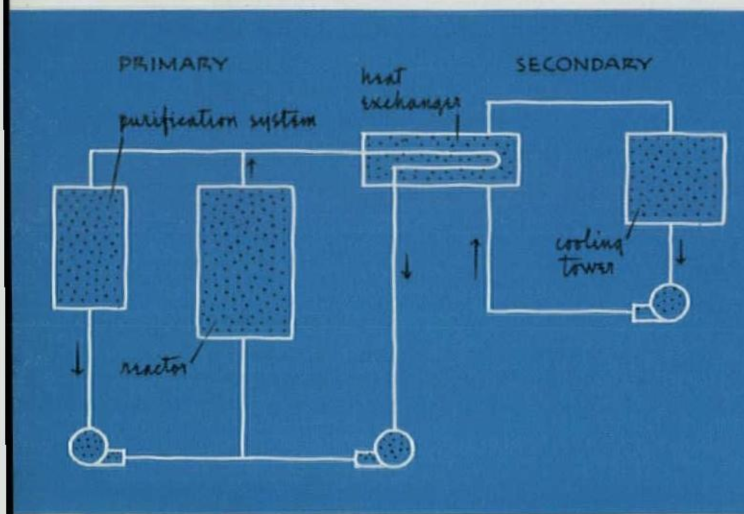
3 *Cut-away to show fuel plates inside Research-Reactor Fuel Element.*

covering of aluminum to prevent corrosion and contain the uranium fuel and fission products (various materials gradually created in the uranium as a result of the fission process). The end fittings of the fuel elements are inserted into the grid plate. Fuel elements can be arranged in any configuration demanded by operational requirements.

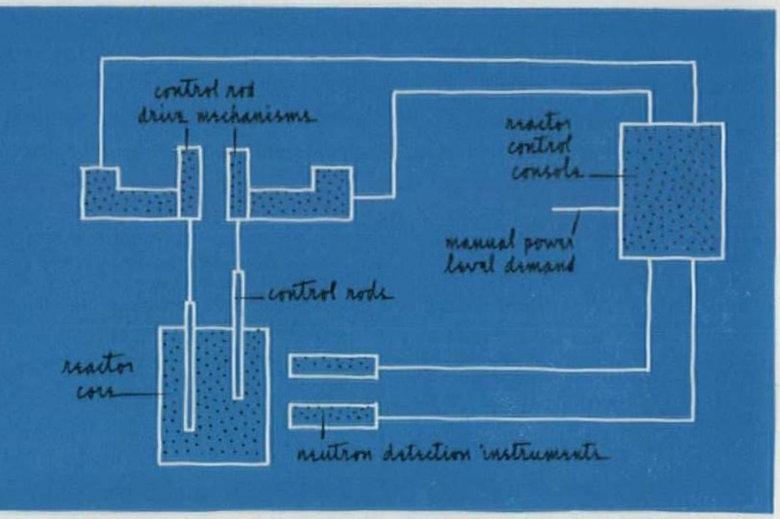
A reactor core also has a moderator; in the case illustrated, ordinary water flowing through the fuel elements moderates or slows down fast neutrons released in the fission process to create thermal or slow neutrons required to continue the fission process. Around the reactor fuel is a graphite reflector which conserves neutrons by preventing their escape from the reactor core. Also used for moderators and reflectors are beryllium, heavy water, and other materials.

The heat generated by the fission process in the reactor core is carried away by the water moderator and, in the case of a research reactor where heat is an unwanted by-product, is removed by conventional cooling methods such as cooling towers, rivers, air coolers, and spray ponds. A typical cooling system is illustrated **4**. The primary system is isolated from the secondary system in order to maintain a high standard of purity for water circulating through the reactor. This minimizes activation of impurities in the water which would create a high level of radiation in the area. All primary system components are stainless steel or aluminum. The purification system continuously cleans up a portion of the circulating water. Because of the isolation of the two systems, the secondary one can be designed with normal commercial equipment.

Control of the amount of heat produced by the reactor is usually achieved by



4 *Typical Research-Reactor flow diagram.*



5 *Simplified Research-Reactor control system.*

Control console.

inserting material into the core, **5**, which "poisons" or stops the reaction. The materials used are boron carbide, stainless steel, hafnium, cadmium, and others. These materials are made up into control rods which can be automatically driven in and out of the reactor core. Neutron-detection instruments are located near the reactor core to determine neutron intensity. The neutron intensity or neutron-flux level is proportional to the reactor power output. Several instruments are used to provide coverage over a broad range of power levels and to give added safety in case of failure of any one. By use of information displayed on the control console, the reactor can be started up, brought to the desired power level, and maintained at a given power level by manipulation of the control-rod positions with the drive mechanisms. In addition, the control console incorporates many circuits which cause the control rods to "scram" or rapidly enter the reactor to shut it down. These scrams occur automatically if critical equipment failures occur or too high a power level or rate of rise of power level occur.

The reactor core, the cooling system, and the control system are the basic compononets of a reactor. However, because of the high levels of radiation created by the reactor, personnel must be shielded to prevent biological damage. Shield materials are water, concrete (often with special heavy aggregates such as magnitite or barytes), lead, steel, boron, and others. The shield absorbs enough of the neutrons and gamma radiation streaming from the reactor core so that radiation levels in the areas where people are working are at or lower than tolerance levels specified by the U. S. Atomic Energy Commission.

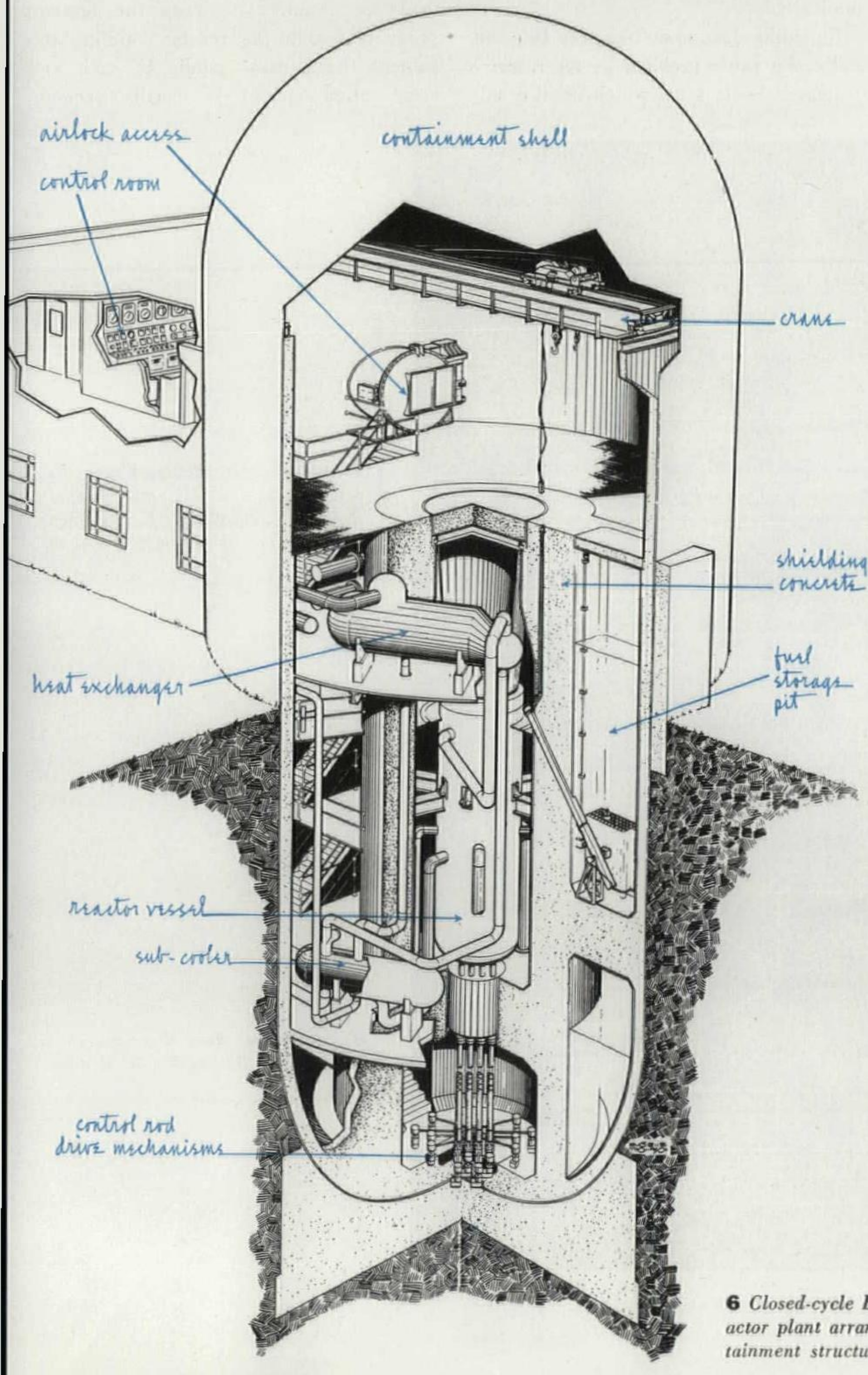
Each reactor will use combinations of shielding materials dictated by design conditions and economy. The reactor illustrated, **1**, uses water as a shield in the vertical direction and water, lead and heavy concrete in the horizontal directions. The importance of protection of personnel from harmful radiation has led to the development of extensive monitoring equipment. Instruments which detect direct radiation of many kinds, air-borne radioactivity, solid contaminants, and water activity are a basic part of any reactor facility. Portable equipment and continuously recording apparatus which can alert operators to dangerous conditions or shut down the reactor are necessary.

The irradiation facilities which are built into a reactor are highly dependent on the particular plans of the user. No two research reactors are alike and probably never will be. Typical irradiation facilities are discussed in the section on Nuclear Reactor Uses. The elements of a research reactor are found also in training reactors and test reactors, which are discussed in that section.

power reactor elements

Power reactors are similar in concept to research reactors; they have a reactor core, a means for heat removal, a control system, and a shield. They are simplified by omission of irradiation facilities, but the design problem is made more complex due to the need for maximum temperatures and pressures to achieve high cycle efficiencies.

A closed-cycle boiling-water reactor, **6**, illustrates some typical power-reactor components. "Closed Cycle" means that the primary water is separated from the secondary system by a heat exchanger. Water is boiled in the reactor to remove heat which is then transferred to the secondary system.



6 *Closed-cycle Boiling-Water Reactor plant arrangement and containment structure.*

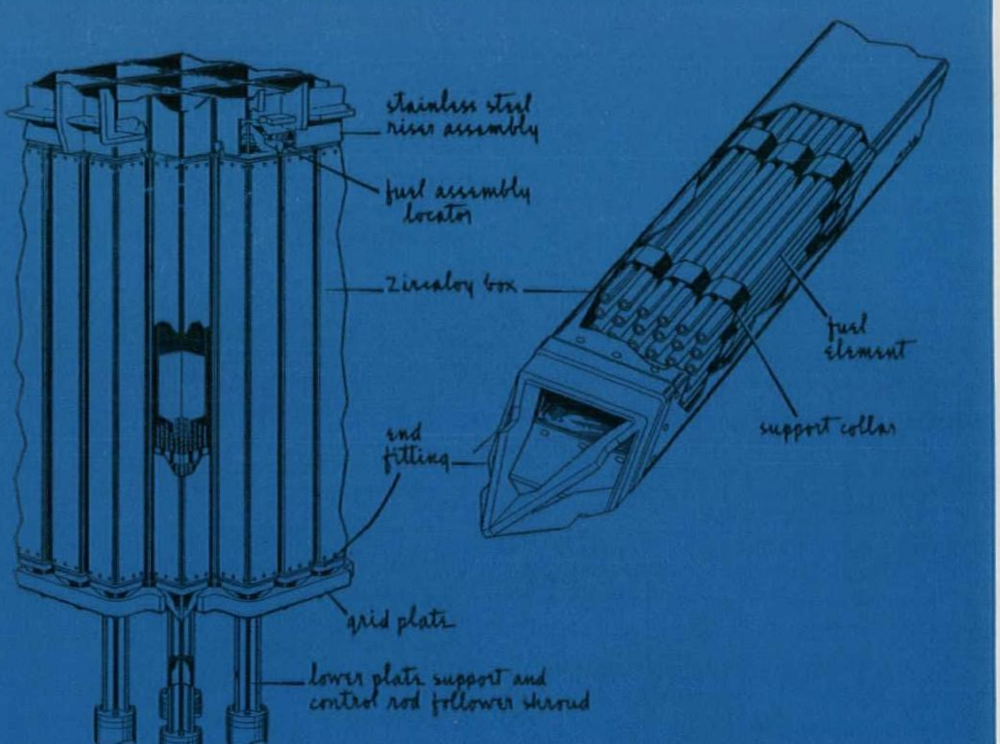
nuclear reactors defined

The reactor core is composed of fuel elements assembled on a grid plate **7**. Here the similarity to a research reactor ends. Materials are Zircaloy (a zirconium alloy) and stainless steels to withstand higher temperatures. Uranium oxide and thorium oxide, which are ceramic materials, are used for the fuel itself because of resistance to radiation damage and corrosion. The illustration shows some of the control rod guides entering from the bottom.

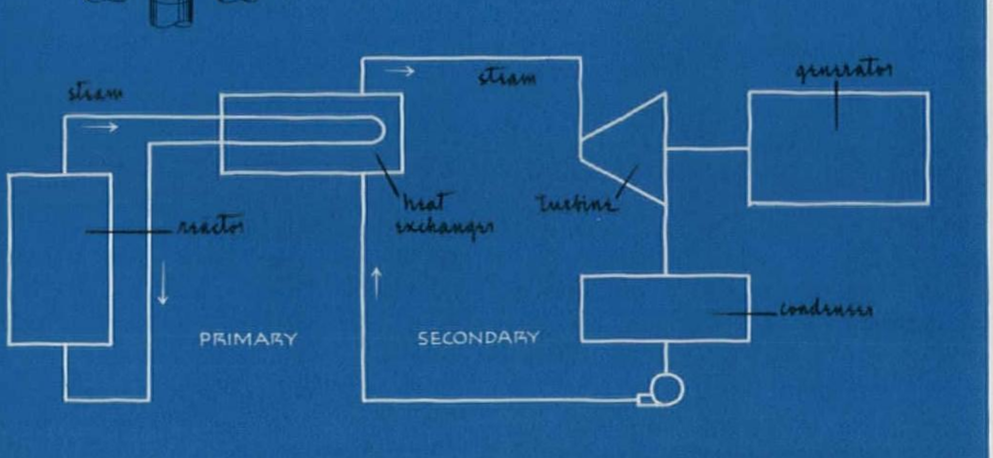
In operation, **8**, the water passing through the reactor core is allowed to boil. The steam passes through a heat exchanger and returns to the reactor by natural circulation. Steam formed in the secondary system is utilized in a conventional fashion in the turbine and condenser. A purification system is required which is similar to that discussed earlier with the addition of coolers to keep the water entering the demineralizer at a low temperature.

Control of a power reactor requires control rods, drive mechanisms, and nuclear instrumentation. In addition, a variety of pressure, temperature, flow, and water-level information must be obtained. The basic control problem is to maintain reactor output in accordance with the power demand within the limits of the equipment and to do this automatically.

Shielding for power reactors is essentially the same problem as for research reactors. Some areas which require only limited access can be designed for higher radiation levels to reduce concrete costs. An additional expense, required of almost all power reactors and for many research reactors is a method of containing the radioactive materials generated in the reactor within the reactor building under all conceivable conditions of equipment malfunction and misoperation. There exists the very remote possibility that power excursions can occur in reactors which would be of sufficient severity to cause damage to the reactor core and release some of the radioactive fission products from the fuel elements and considerable heat. Containment measures are required to keep the fission products within the reactor building to protect the general public in such an event. Containment is usually accom-



7 *Closed-cycle Boiling-Water Reactor fuel assembly and support structure; individual fuel element and portion of assembled reactor core.*



8 *Simplified flow diagram of a closed-cycle Boiling-Water Reactor.*

plished by designing the reactor building as a huge pressure vessel to withstand the pressures created by the power excursion without leaking. As shown, **6**, the containment structure is lined with concrete to protect the outer shell from flying fragments of the reactor core and to provide additional shielding during normal operation.

Elaborate meteorological, hydrological, and seismological surveys are usually made at reactor sites to insure that the containment measures are effective and to establish a basis for release of radioactive gases, liquids, and solids created in normal operation.

For both research and power reactors, this information together with a description of the reactor and building design, data on administrative procedures and personnel, and how the reactor will be used is assembled into a Hazards Report which is submitted to the USAEC. This material is reviewed and construction permits and operating licenses are granted when AEC findings show that adequate plant and personnel have been provided.

NUCLEAR REACTOR USES

Reactors are used in many different ways and new uses are being proposed regularly. The design of a reactor, its shape, the supporting facilities, architectural problems, location, and financing vary considerably with the use of a reactor. These uses are an excellent way to classify reactors into broad categories.

training reactors

These reactors have power outputs in the range of 0 to 10 kilowatts (heat). Most are built for colleges and universities to use in training of students in engineering and physics. Both graduate and undergraduate courses in nuclear science and engineering are being offered. A limited amount of research can be accomplished with training reactors.

The nuclear-engineering students can learn the principles of reactor physics, reactor operation, shielding, the handling of large-scale radioactivity, and reactor technology in general, by actual operation and measurement. The students who will become scientists in the fields of neutron research, radiochemistry, radiobiology, and solid-state physics can demonstrate most of the classic experiments in neutron physics with a training reactor.

Training reactors usually have limited experimental facilities for use of the neutron flux and gamma radiation. They are often installed in existing buildings with small laboratories for nuclear work nearby. One may expect that all of the prominent engineering and scientific schools will eventually have training or research reactors.

research reactors

Research-reactor power levels are from 0-10,000 kilowatts (heat). They take on many forms for special purposes and are used by schools, government research establishments, private industry, research institutes, and hospitals. In all cases except for pilot models of other types of reactors, these reactors are tools and sources of radiations for a wide range of research work.

A typical list of research subjects includes:

1 *Reactor Engineering*
   a Determination of the behavior of the reactor itself by study of the control system; shielding; neutron densities; effects of control rods temperature and the experimental facilities on reactor performance; and other aspects of the reactor.
   b Study of nuclear properties of materials and the effects of radiation on reactor materials.
   c Shielding materials and shapes experiments.
   d Test of complete components including fuel elements for proposed reactors.

2 *Physics*
   a Study of the fission process.
   b Study of neutron, gamma-ray, beta-ray, and neutrino phenomena.
   c Radiation-damage studies.
   d Standardization and calibration of reactor radiations.
   e Study of transmutation products.

3 *Chemistry*
   a Effects of radiation on chemical properties.
   b Analysis of substances by tracer techniques or activation analysis.
   c Promotion of chemical processes by radiation.
   d Determination of molecular structures by neutron diffraction.

4 *Biology and Medicine*
   a Probable long-term effects of radiation on humans.
   b Acceleration of genetic mutations in plants.
   c Sterilization and pasteurization of foods and medicines.
   d Cancer treatment.
   e Biological and physiological research using radioactive tracers.

In addition, a research reactor produces radioisotopes which are used for research in almost all branches of science and engineering. Also, many research reactors are used for training of reactor operators and graduate students.

To accomplish these research tasks, various experimental facilities are necessary:

Beam Tubes are used to guide a thin beam of neutrons out of the reactor core to experimental apparatus outside of the biological shield. They are also used to insert samples in an area of high radiation near the core.

Rabbits are pneumatic systems which "shoot" a sample in a small container to the reactor core and back out in seconds.

Thermal Columns are large graphite-filled spaces which provide a source of thermal neutrons relatively free of gamma radiation.

Converter Plates made of natural uranium absorb thermal neutrons and produce fast neutrons.

Fuel Elements after they have been used in the reactor are an intense source of gamma radiation.

Supporting laboratories, shops, hot cells (heavily shielded rooms for remote handling of radioactive materials, **9**), special scientific apparatus, and facilities common to any general research center are needed for preparation of experiments and post-irradiation analyses.

There are more than 30 research reactors in operation or under construction in the United States alone. The Atomic Industrial Forum[2] has estimated that 80 to 195 additional U. S.-built research and test reactors will be put into operation by 1967 including those for foreign installation.

test reactors

Test Reactors are quite similar to research reactors but produce higher neutron fluxes. The largest is the Engineering Test Reactor (ETR) which produces an average flux of 4×10^{14} neutrons/cm^2-sec. at an output of 175,000 kilowatts (heat).

The principal use of high-flux test reactors is to explore the effects of radiation damage experienced by materials and components. Higher fluxes shorten the irradiation time required so that it is possible, for example, to test in a few weeks the effects of exposure on metals, components, gaskets, and fuel elements which might correspond to several years' operation in a power reactor.

Also included in the category of test reactors are units designed for one special purpose as opposed to general testing. A good example is the SPERT

[2] A Growth Survey of the Atomic Industry 1958-1968, *Atomic Industrial Forum, Inc., 1958.*

nuclear reactors defined

(Special Power Excursion Reactor Test) series of reactors which have been installed at the National Reactor Testing Station in Idaho. These reactors are used to establish the dynamic behavior of several classes of reactors when subjected to sudden and slow changes in reactivity. Such tests provide invaluable information on reactor safety and control.

power and process steam reactors

The worldwide application that nuclear power promises is the major effort in the atomic-energy field. Proved uranium reserves are sufficient to permit nuclear power to become a significant percentage of new installed electrical energy. In areas where fossil-fuel costs are high, nuclear-power plants are already economically attractive. Even though nuclear-reactor technology is still in a state of development and large central-station reactors are not yet economic in the United States, by 1968 the Atomic Industrial Forum predicts 2350 to 6470 megawatts of electrical capacity may be installed. In the rest of the free world, 16,500 to 24,200 megawatts (electric) are forecast.

Nuclear power plants to fill this need will come in all sizes, from 1 or 2 megawatts for small plants operating in remote areas to several hundred megawatts (electric) for central stations.

Basically, nuclear reactors are a substitute for the oil-fired or coal-fired boilers of today. Essentially, no changes are required in turbine and electrical generation equipment design. Time and experience are necessary, however, before this substitution can become economic. Some of the problems now being explored and resolved are:

a Obtaining higher operating temperatures, higher specific power, higher efficiencies to reduce the capital cost per kilowatt.

b Building larger plants up to sizes common for conventional power plants to reduce capital cost per kilowatt.

c Making design simplifications based on operating experience to eliminate unnecessary design conservation.

d Increasing the use of commercial components, commercial specifications, and standard fabrication techniques as experience permits greater confidence in reactor performance.

e Increasing reactor fuel life and reducing fabrication costs to lower operating costs.

f Reducing operation and maintenance costs based on further operating experience.

Solving these problems to create economic nuclear-power plants requires the continued co-operation of Government and industry in research and development, and construction of small pilot plants, fuel fabrication and reprocessing plants, and full-scale power plants.

propulsion reactors

The submarine Nautilus is the first of some thirty nuclear-powered submarines and surface ships of which several are now operating and the remainder are either authorized or under consideration by the Congress. Nuclear power for naval vessels and the merchant marine is especially attractive because of the extended cruising radius of a nuclear ship.

Propulsion reactors are similar to land-based power reactors but have additional design problems created by a need for the utmost reliability under tactical conditions. Quality requirements are significantly more stringent than for other applications.

The Aircraft Nuclear Propulsion program of the USAEC and U.S. Air Force is a research and development program leading to the application of nuclear reactors to propulsion of aircraft and missiles. Work in this area is largely classified and it is difficult to judge the extent of this nuclear reactor use.

production reactors

Plutonium production is another major use of nuclear reactors. Plutonium is used for atomic bombs and also may be used in power reactors as a fuel. The U. S. facilities for producing plutonium are the Hanford and Savannah River plants.

special process reactors

To date, research utilizing neutrons and gamma radiation from nuclear reactors is in its infancy. New ideas are being discovered daily. Food preservation, improvement of physical properties of plastics, and other radiation-induced processes lead to use of nuclear reactors as an integral part of an industrial process. The research and developement being done today may lead to specialized applications of reactors as radiation sources in the future.

NUCLEAR REACTOR TYPES

An almost infinite number of reactor types can be conceived by varying the configuration of the fuel, moderator, and coolant and by varying the intended use. New ideas for reactor designs are being proposed all over the world. Old ideas are being reviewed with new interest as improved materials and components become available. The more advanced and generally promising nuclear-reactor types are briefly described below.

low-pressure water-cooled research reactors

Most of the research, test, and training reactors built here and abroad are water-moderated and cooled — graphite, water, or beryllium reflectors are used. For a particular power output, water pressures and flows are established to prevent boiling in the reactor core.

At very low powers, atmospheric pressure and natural convection cooling are adequate. Forced cooling and pressures up to 150 psi are specified as power outputs increase. Two broad classifications can be made: the *tank type* which was illustrated earlier; and the *swimming-pool type*, **10**, which is limited to unpressurized reactors and has large water-filled areas for experimental work, not unlike a very deep swimming pool.

The MTR (Materials Testing Reactor) built by the AEC in Idaho is a tank-type reactor, pressurized, with a power level of 40,000 kilowatts (heat). The BSR (Bulk Shielding Reactor) at Oak Ridge National Laboratory was the first swimming pool to be built and has no external cooling provisions. It can be operated at 1000 kilowatts (heat) for short periods.

pressurized-water reactors

This is the type which has had the most development in the United States. Submarines and a number of central station power plants use this design. Fuel elements are surrounded by high-pressure water which acts as a moderator and coolant. The water is circulated through a heat exchanger and back to the reactor core. High pressure is required to prevent boiling. The secondary side of the heat exchanger generates steam at a lower pressure, which operates a turbine.

Reliability of this approach is well established but costs are high. Operating experience with the PWR (Pressurized-Water Reactor) at Shippingport may show ways to reduce costs. Use in naval propulsion, where cost per kilowatt is less important than reliability and freedom from fueling bases, is typified by the submarine Nautilus. Many additional propulsion reactors can be expected.

boiling-water reactors

Boiling-water reactors are similar to pressurized-water reactors, except that the water coolant is permitted to boil in the reactor and can pass directly to the turbine or through an intermediate heat exchanger.

Much concern over the stability of such reactors was removed after a successful series of BORAX (Boiling-Reactor Experiment) tests were conducted by the AEC and construction of the EBWR (Experimental Boiling-Water Reactor) at Argonne National Laboratory. The EBWR proved to be operable at greater than three times its design power level, thus indicating hope for achievement of economic nuclear power. An example of a full-scale commercial plant of this type is Commonwealth Edison's Dresden Station designed for 180,000 kilowatts (electric).

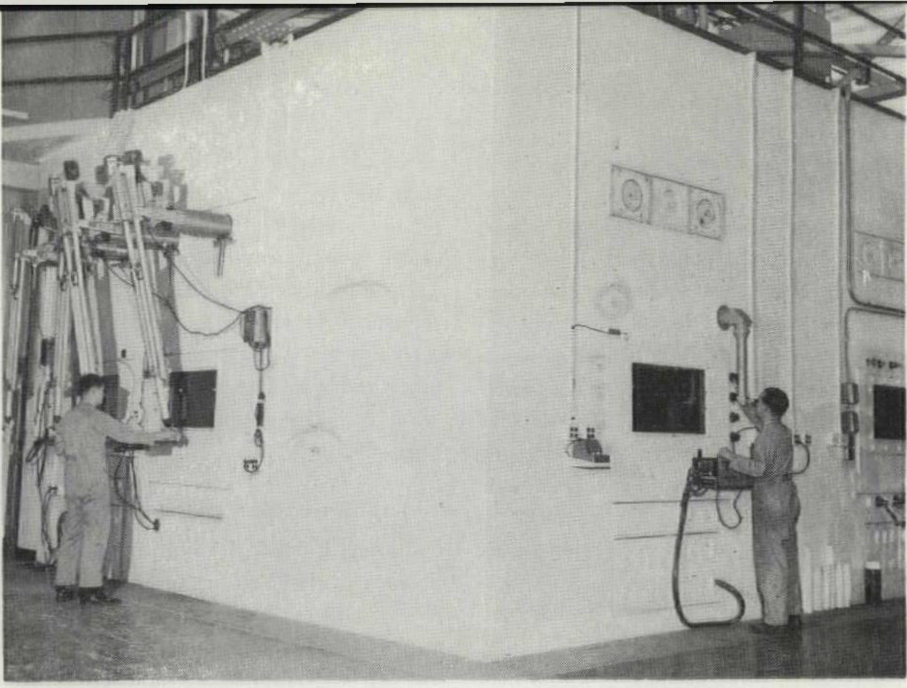
heavy-water reactors

These reactors use heavy water (D_2O) for the moderator and primary coolant. Graphite and heavy water are used as reflectors. As research reactors they are operated at low temperatures and pressures. Their primary advantages are good thermal neutron flux and a very large experimental area compared to light water (H_2O) moderated reactors.

The production reactors at the Savannah River plant are moderated and cooled by heavy water. For power generation, pressurized heavy-water reactors are being considered. The Canadian Nuclear Power Demonstration Reactor (NPD) now under construction is of this type.

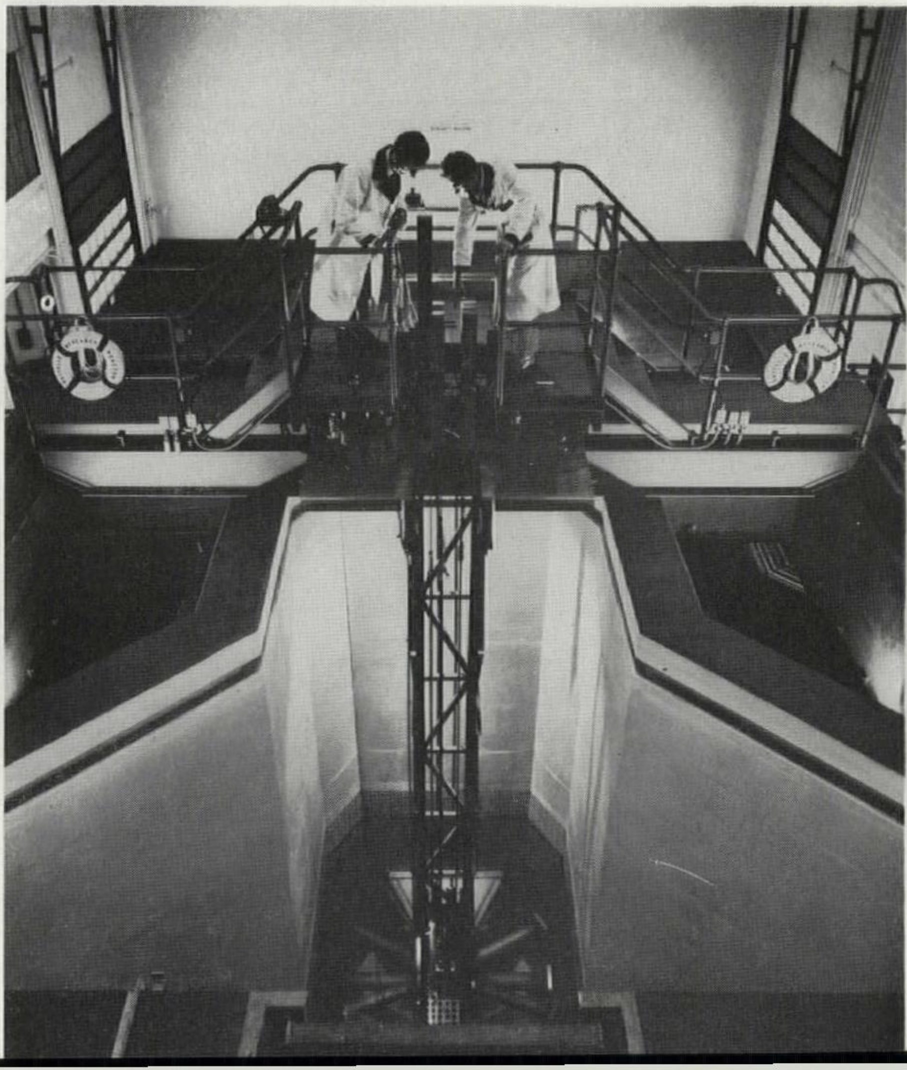
graphite reactors

Graphite-moderated reactors are cooled by air or carbon dioxide or other gases. Nuclear characteristics make such reac-



At Battelle Memorial Institute, West Jefferson, Ohio, operations inside the hot cells, **9**, *are carried out by remotely controlled equipment and master-slave manipulator arms. In this photo, operator at left observes his experiment through special radiation-shielding window. Technologist at right observes with a periscope.*

Battelle is a "swimming pool" type reactor **10**. *Reactor design: AMF Atomics; architectural design: Dan A. Carmichael, Jr.; operating power: 1000 kw.*



nuclear reactors defined

tors considerably larger than the others discussed. The world's first reactor was graphite moderated and the plutonium production reactors at Hanford are of this type. The most widely known power reactors are the British "Calder Hall" type which produce about 40,000 kilowatts (electric). "Calder Hall" type reactors use the hot gases to generate steam in a secondary loop. Development of materials with better high-temperature properties makes direct operation of a gas turbine with the reactor coolant attractive.

aqueous-homogeneous reactors

Up to this point discussion has centered around reactors which have had uranium or other fuel in solid form usually sheathed in a corrosion-resistant material. Aqueous-homogeneous reactors have solutions or suspensions of fuel in light or heavy water which combines the fuel moderator and coolant all in one fluid. The savings by elimination of fuel fabrication and by general simpilicity of the system seem obvious.

Several reactors of this type have been built and operated. However, several major development problems must be solved before power reactors will be commercially desirable. Most serious is the development of materials to withstand the corrosive fluids and development of equipment and handling techniques for purifying and recombining the fuel solution remotely.

sodium-cooled reactors

Sodium is a desirable coolant for reactors because it remains a liquid at normal power-plant temperatures. It has good heat-transfer characteristics and permits use of low pressures without boiling. Since sodium reacts violently with oxygen and water, special designs are necessary for safety. A 6500 kilowatt (electric) sodium-cooled reactor with graphite as a moderator has been built as a prototype, **11**. A full-scale reactor of 75,000 kilowatts (electric) patterned after the design of the prototype is being constructed for the Consumers Public Power District, Columbus, Nebraska. A heavy-water moderated unit is also in design.

The fast-breeder reactor is sodium cooled and does not use a moderator to slow down the neutrons. A breeder reactor is a reactor that uses one kind of fuel and produces another which it can also consume. Experimental units have been built and tested. A full-scale power reactor is being constructed which will produce power for the Detroit Edison system. Since more fuel is created than used, fuel costs may be very low, providing chemical processing and fabrication costs can be held down.

11 *Technician at work in the core of reactor for Sodium Reactor Experiment, a nuclear-power project at Canoga Park, California, conducted by Atomics International, division of North American Aviation, Inc., as part of AEC's program to develop economical power from atomic energy.*

other reactor types

Beyond the nuclear-reactor types described are many others in various stages of advancement. Some fall within one or more of these classifications. Two interesting possibilities are organic-moderated reactors and liquid-metal fueled reactors. Industry and Government are constantly searching for concepts which will prove to be another step toward economic nuclear power.

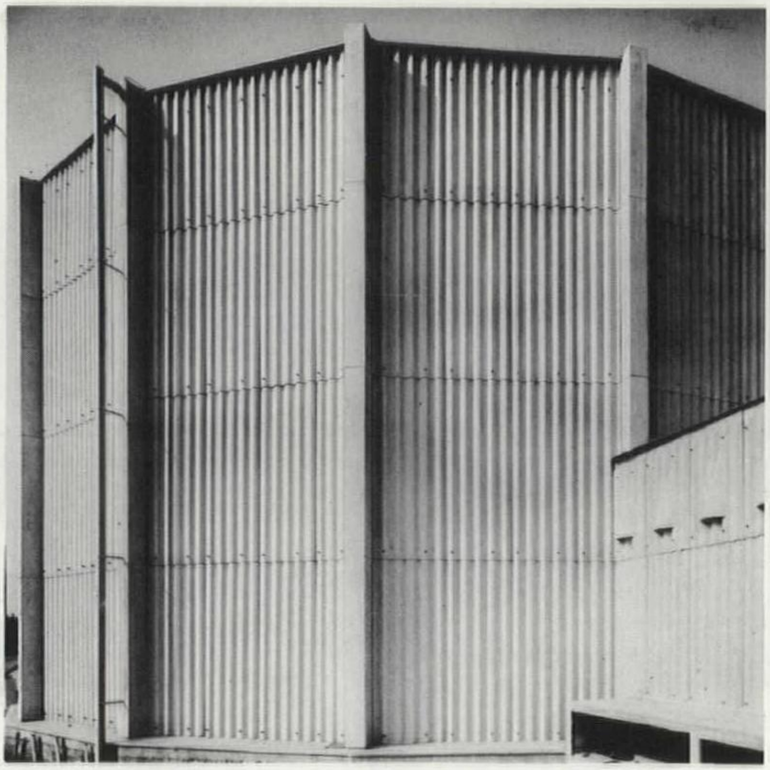
CONCLUSION

Until now, the main problem in nuclear energy has been the sheer technological problem of making reactors work. New arts and new techniques have been evolved to apply existing engineering and scientific knowledge to nuclear-energy subjects. Many types of reactors have been built and are operating successfully. Second-generation plants following the basic design of the first unit, but with changes prompted by actual operating experience, are under construction. Techniques for more effective use of research reactors are developing. With the benefit of these pioneering efforts much can be done by all who work in the field of nuclear energy to create new and improved nuclear-reactor facilities.

The coming years are crucial ones for the nuclear-energy field. There are many obstacles which must be overcome before nuclear reactors can be manufactured, installed, and operated as a commercial, profit-making business. High costs created by unusual environmental conditions and overly conservative designs due to lack of experience are discouraging impediments to economic power. Yet, one looking back at the tremendous progress made in the last ten years is encouraged to believe that these problems which now loom so large can and will be successfully surmounted.

experimental research reactor/data

location: Frankfurt, Germany
owner: Frankfurt University
reactor design: Atomics International, a Division of North American Aviation, Inc.
architectural design: Ferdinand Kramer
operating power: 50 kw
reactor type: aqueous homogeneous



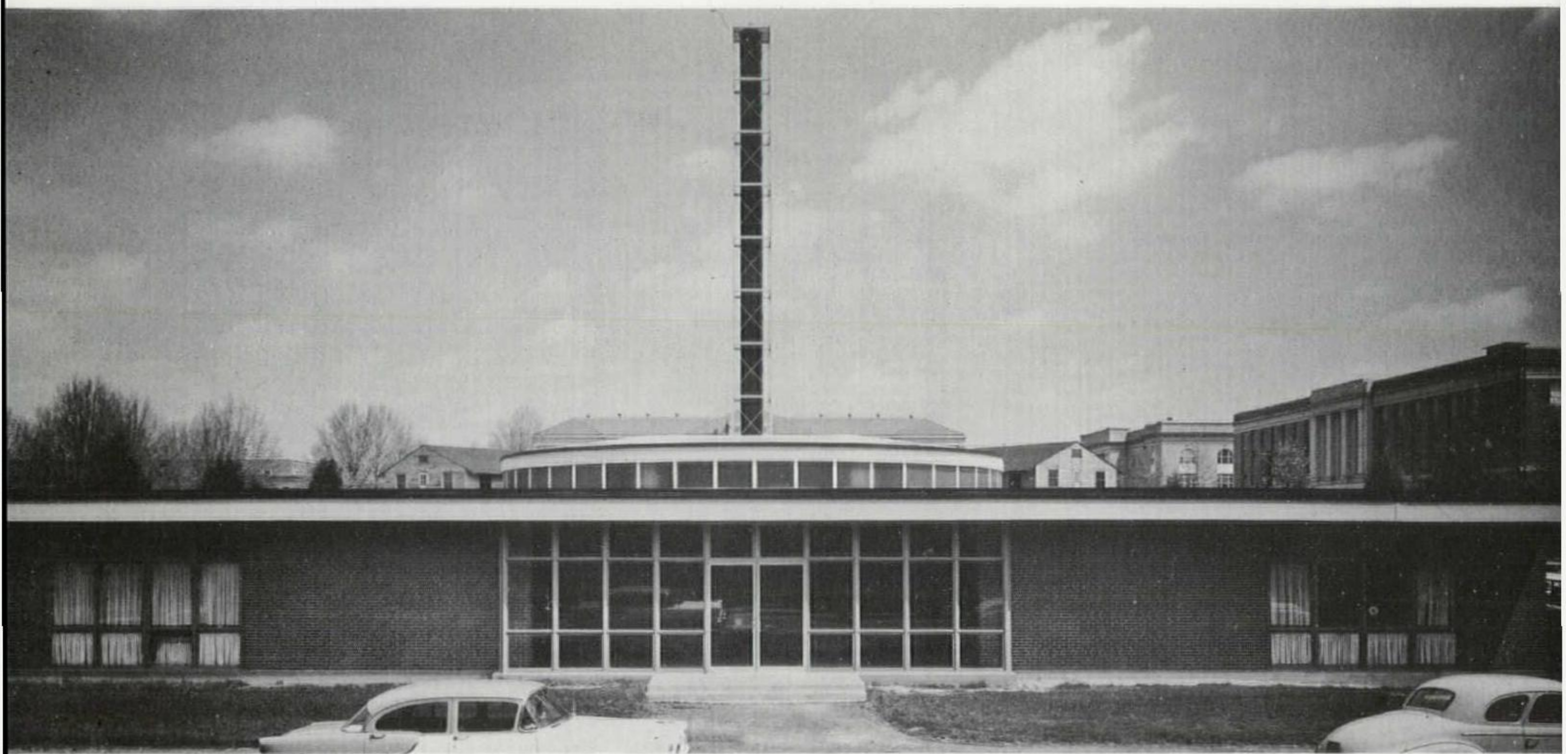
REACTORS

the search for appropriate form

The following section of this special issue of P/A is a gallery of some of the better known nuclear reactors in this country and abroad, with comparative data given about each. There are Research Reactors of many types—one in Germany that is used for student training and production of radioisotopes as well as research; the first postwar large-scale research reactor; the first privately owned reactor in this country; facilities for college campuses; reactors that are operated jointly by AEC and private industry.

Following this survey of Research Reactors, there are pages that illustrate the increasingly important category of Power Reactors, ranging from the first atomic-electric-power plant devoted exclusively to civilian needs to the world's largest scheduled power reactor, with an output of 500,000 kw, now going forward in England. The Soviet Union is reported to have put in operation a 100,000-kw atomic power plant, the first unit of an eventual installation of 600,000 kw capacity. The entire group gives a comprehensive cross-section of the several approaches to reactor design that have been explored up to now—relatively conventional buildings to house reactors of modest rating; tall, domed cylinders; housings with parabolic section; spheres.

Then, as a fillip, and a possible look into the future, we show several reactor designs that were developed by students at the architectural school of Pratt Institute. The program was very similar to data that would be given to a practicing architect who received a nuclear-reactor commission. But the students did not have to worry about costs or clients. As might have been expected, a number of novel forms and structural proposals emerged from this exercise.



research reactor: NCSC-2

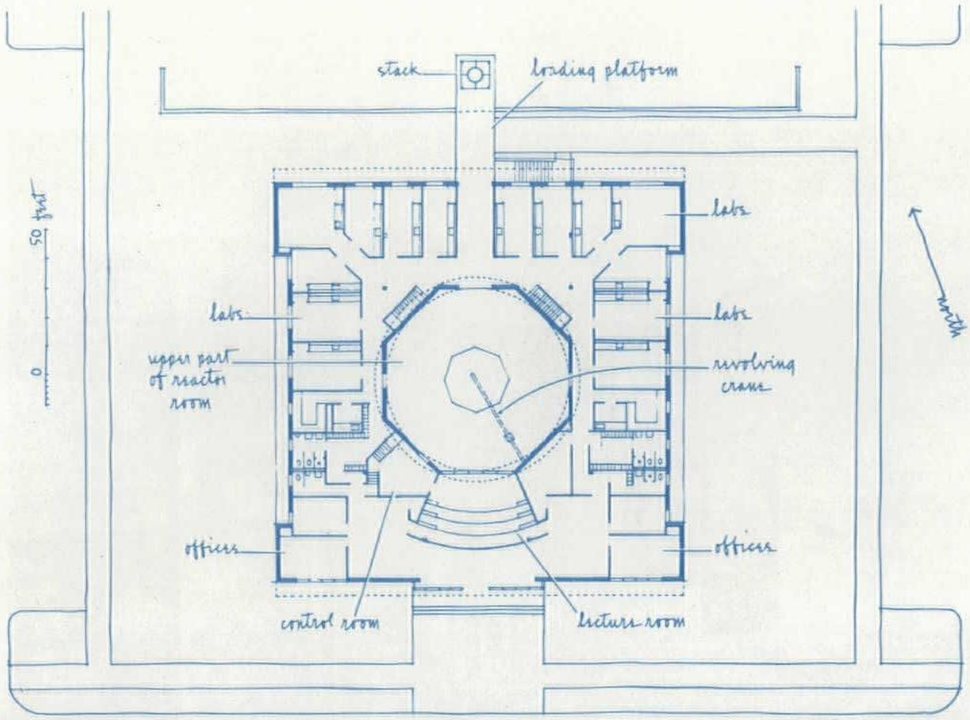
data

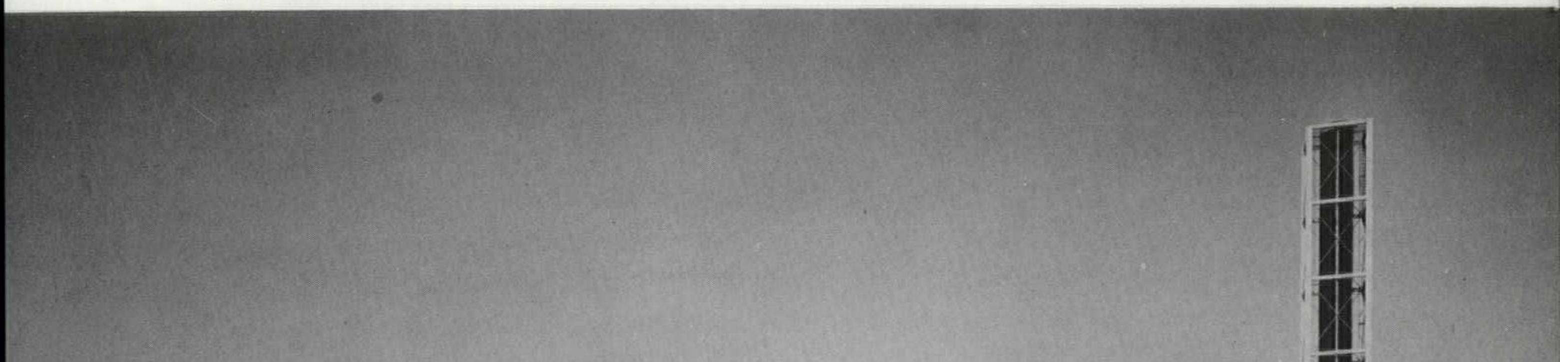
location: Raleigh, North Carolina
owner: North Carolina State College
reactor design: Physics Department, NCSC
architectural design: G. Milton Small
operating power: 500 watts
reactor type: aqueous homogeneous

The Burlington Nuclear Laboratories, located in the heart of North Carolina State College campus, were designed to house the first privately owned nuclear reactor in the world, with its related control rooms, labs, radioactive waste-removal systems, offices, storage areas, and other spaces required for the teaching of nuclear physics. Special requirements were the octagonal shape of the central reactor room; 12-in.-thick concrete walls for this room; placement of the reactor, itself, not less than 8 ft below finish grade; a stack not less than 100 ft high for the expelling of gases; and a lecture room from which activity in the reactor room could be viewed. To service the reactor itself, a special revolving crane without center support was required, and this was accomplished by a roof-supported pin anchor at the center with enough over-run for the crane boom to allow the hoist to reach the exact center over the reactor. For the sake of appearance, the college authorities ruled out a forest of rooftop metal exhaust stacks; therefore, special, reverse-flow, fume-hood exhaust systems were employed which are fed back below the floor slab to a central filter room and monitoring station below the tall, structural steel and plate exhaust stack at the rear of the building. Opening off the below-grade level of the reactor room (accessible to qualified personnel only) are mechanical-equipment rooms, storage room, filter room, and work room.

Structurally, the building combines fireproofed structural steel and masonry bearing walls; roof joists are steel. Below the main-floor line, structure is of reinforced concrete.

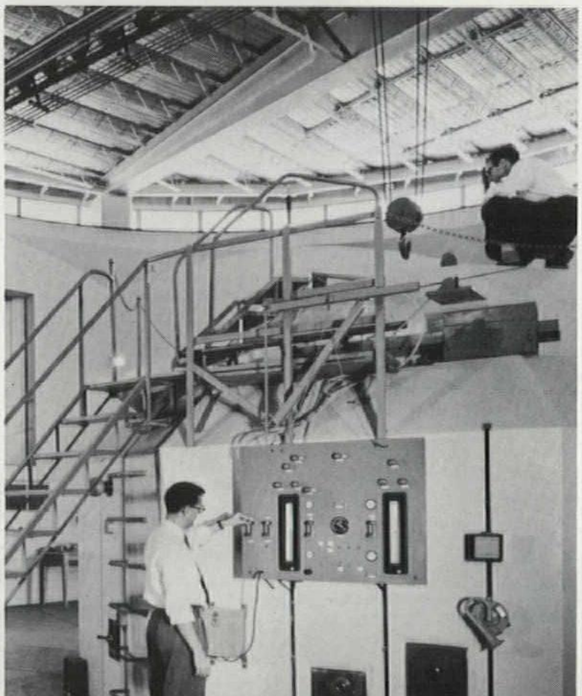
Browning & Landstreet were Consulting Engineers for the building. Wrenn-Wilson Construction Company were General Contractors.

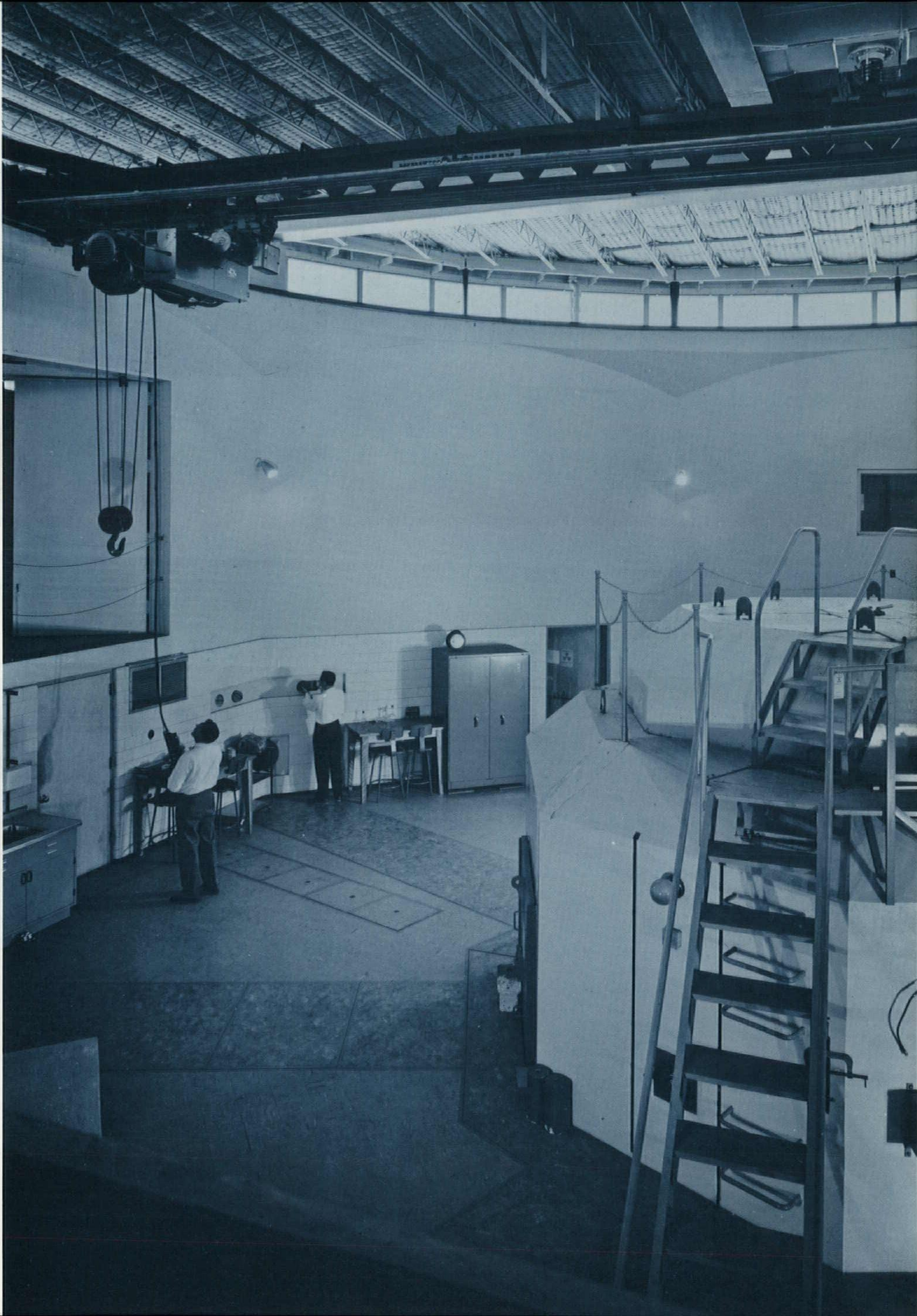

stack
loading platform
labs
labs
labs
upper part of reactor room
revolving crane
offices
offices
control room
lecture room
50 feet
0
north

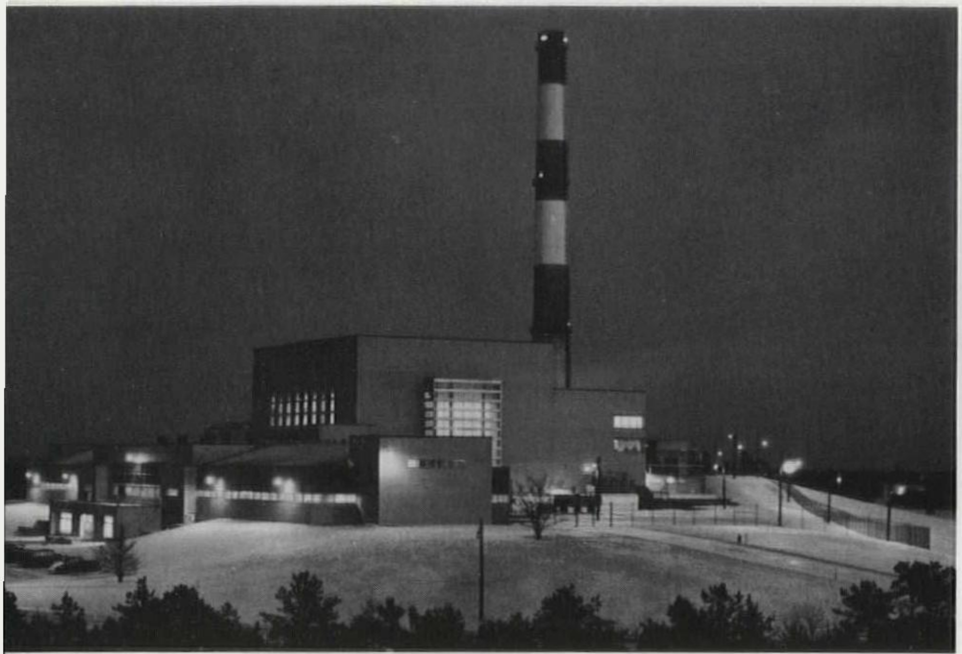


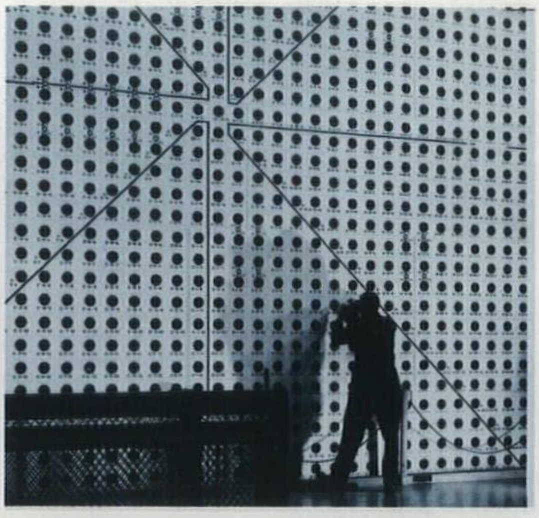
Adjacent to the upper portion of the reactor room are the control room (below) *and lecture room* (above), *which have a view of the reactor through two plates of heavy glass, set 12" apart. This space can be filled with water when there is radioactivity in the reactor room. At clerestory level of reactor room is the floor-controlled, center-pivoted revolving, traveling crane used for dismantling the reactor, setting up of experiments, etc.*

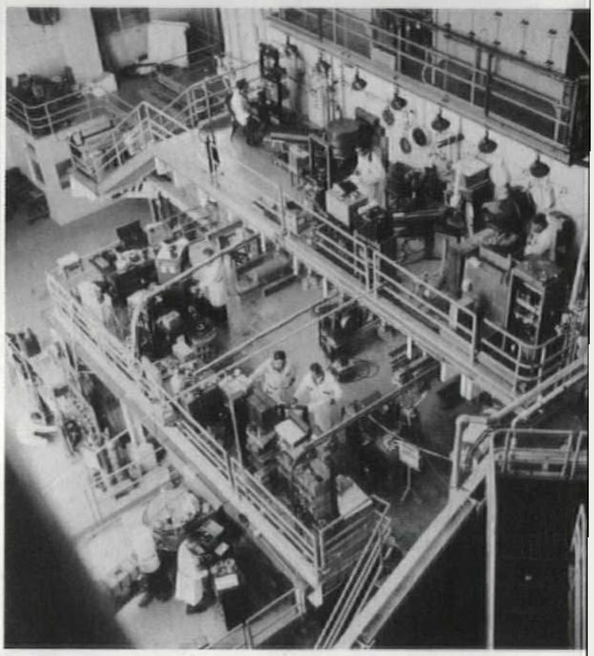
Photos: Joseph W. Molitor





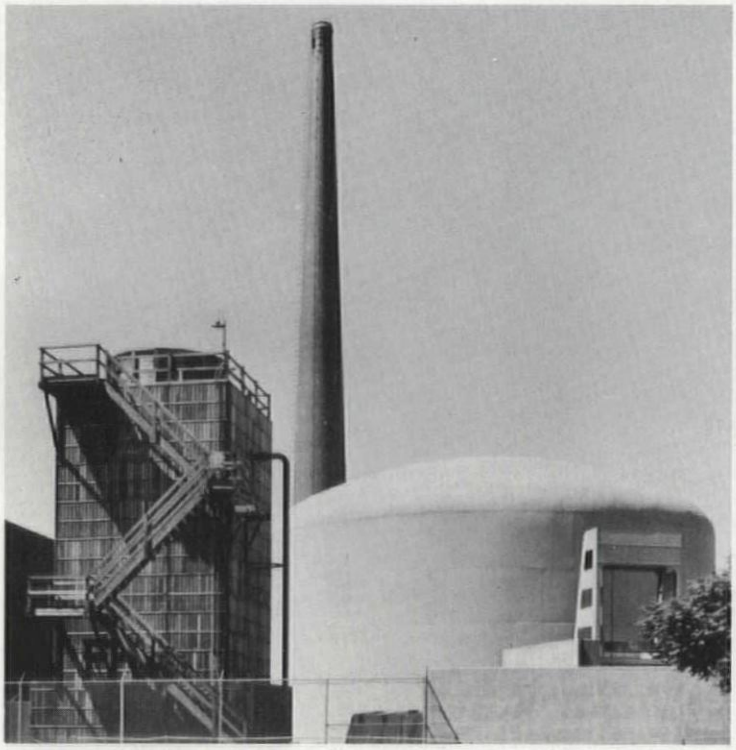






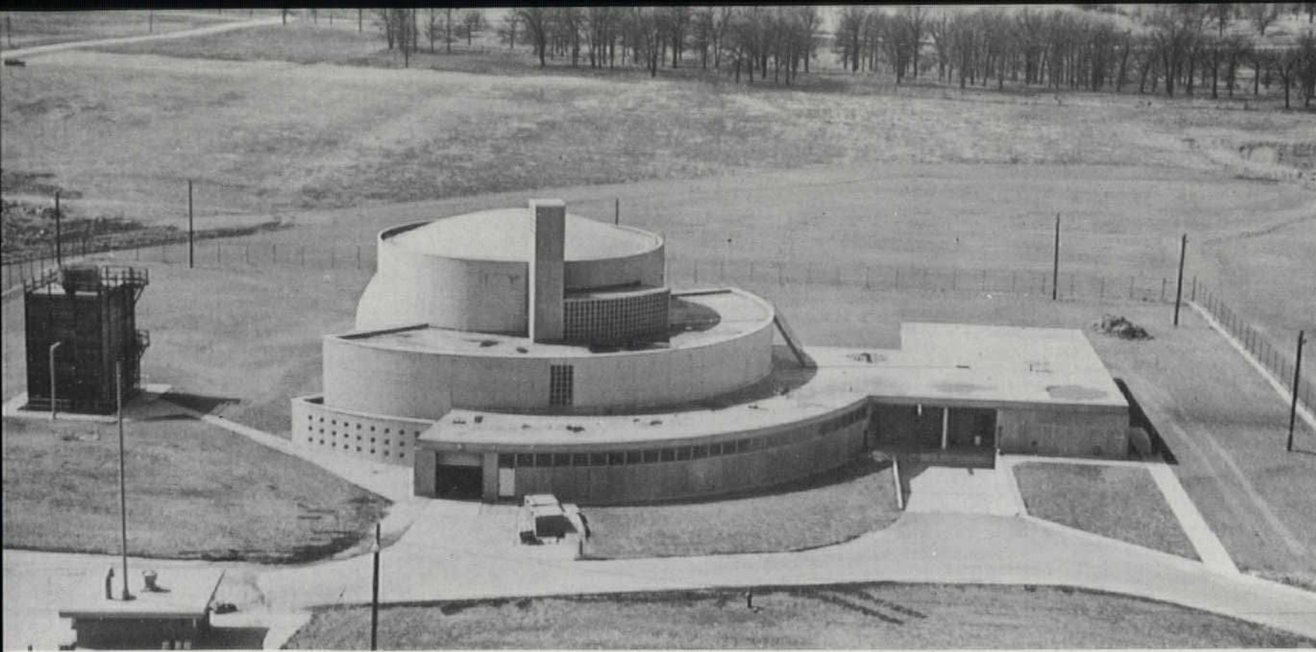
BNL/data

location: Upton, Long Island, New York
owner: AEC-Brookhaven National Laboratory
reactor design: Brookhaven National Laboratory
architectural design: H. K. Ferguson Co.
operating power: 30,000 kw
reactor type: graphite
remarks: large-scale reactor in operation since 1950



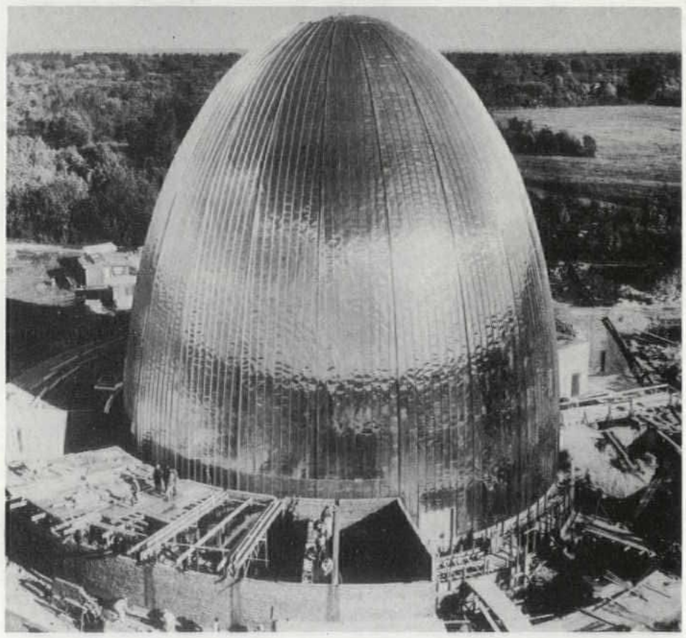
MITR/data

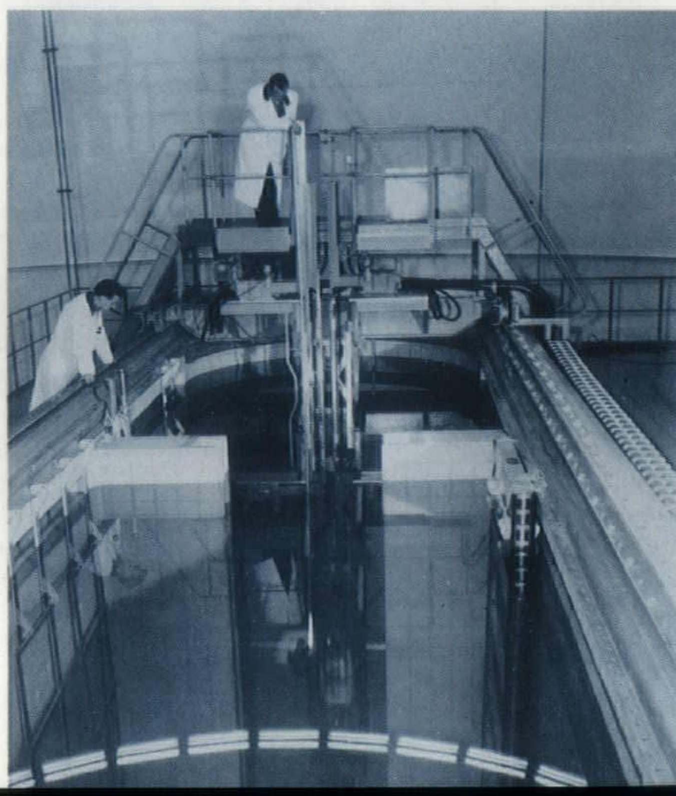
location: Cambridge, Massachusetts
owner: Massachusetts Institute of Technology
reactor design: MIT, under direction of Dr. Theos J. Thompson
architectural design: J. Fruchtbaum
reactor fabricator: ACF Industries, Inc.
steel shell design: Chicago Bridge & Iron Company
operating power: 1000 kw
reactor type: tank; heavy water
use: medical therapy; training of nuclear engineers



CP-5/data

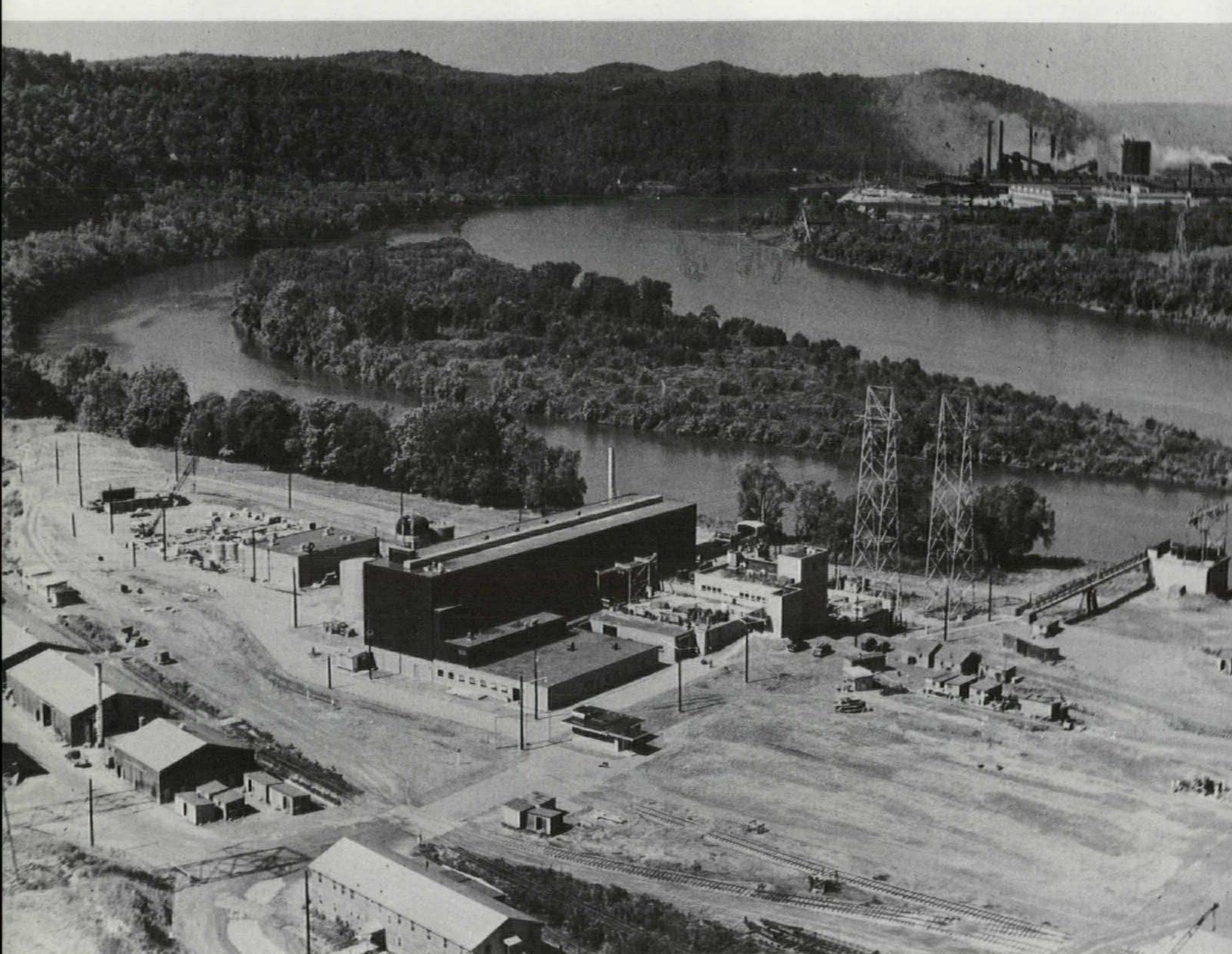
location: Lemont, Illinois
owner: AEC-Argonne National Laboratory
reactor design: Argonne National Laboratory
architectural design: Shaw, Metz & Dolio
operating power: 2000 kw
reactor type: tank; heavy water





FRM/data

location: Munich, Germany
owner: University of Munich
reactor design: AMF Atomics
architectural design: Technische Hochschule
operating power: 1000 kw
reactor type: pool
use: student training; production of radioisotopes



power reactor: Shippingport, Pennsylvania

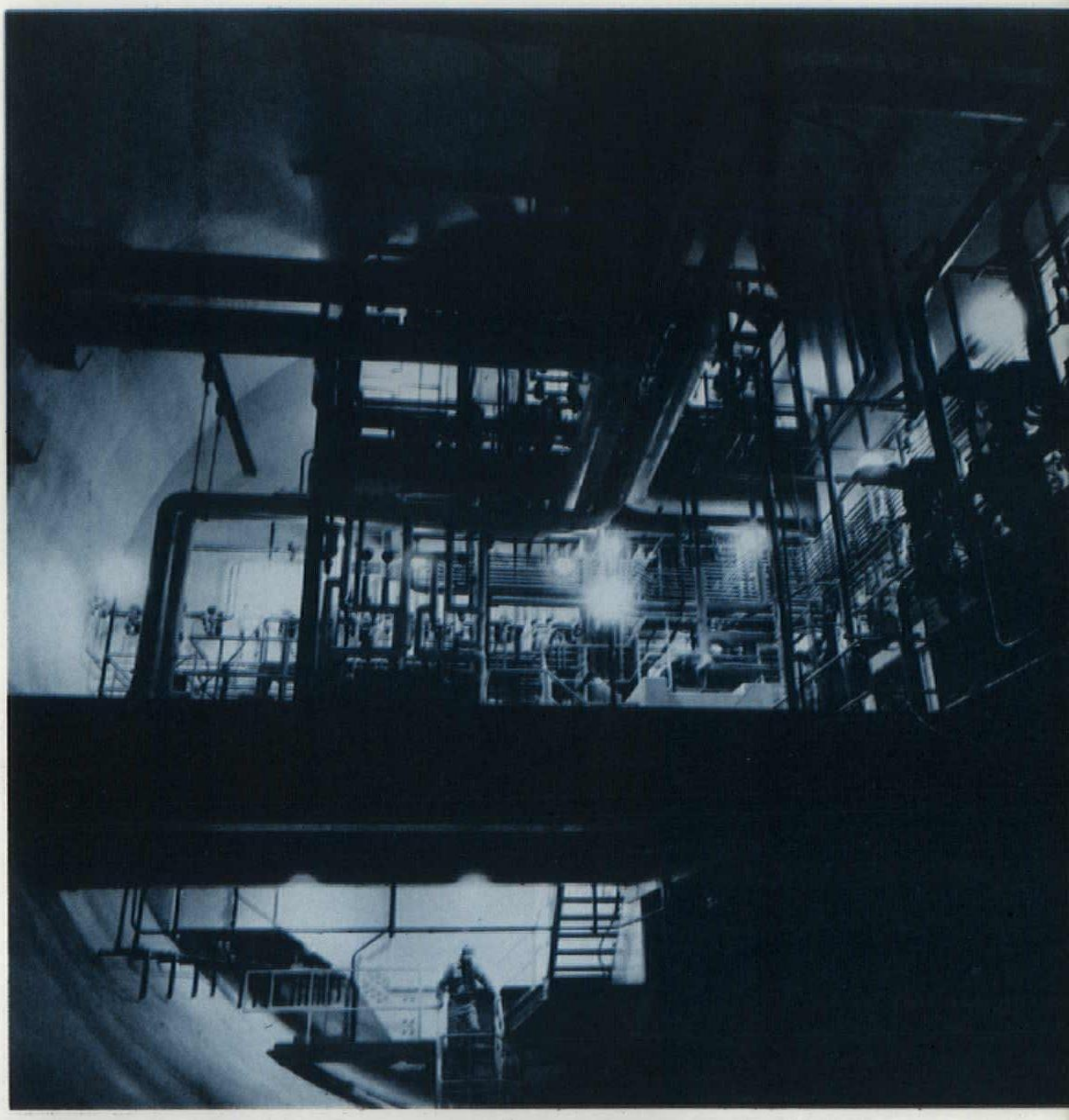
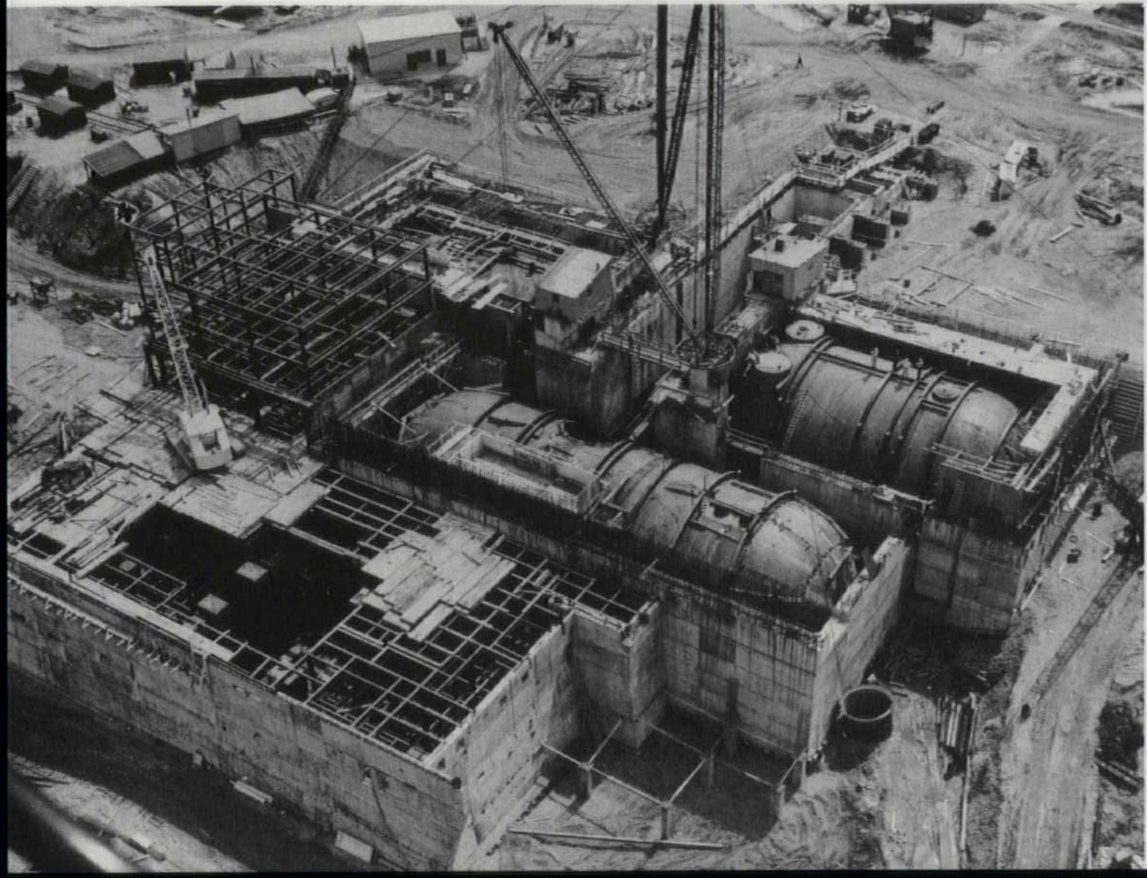
data

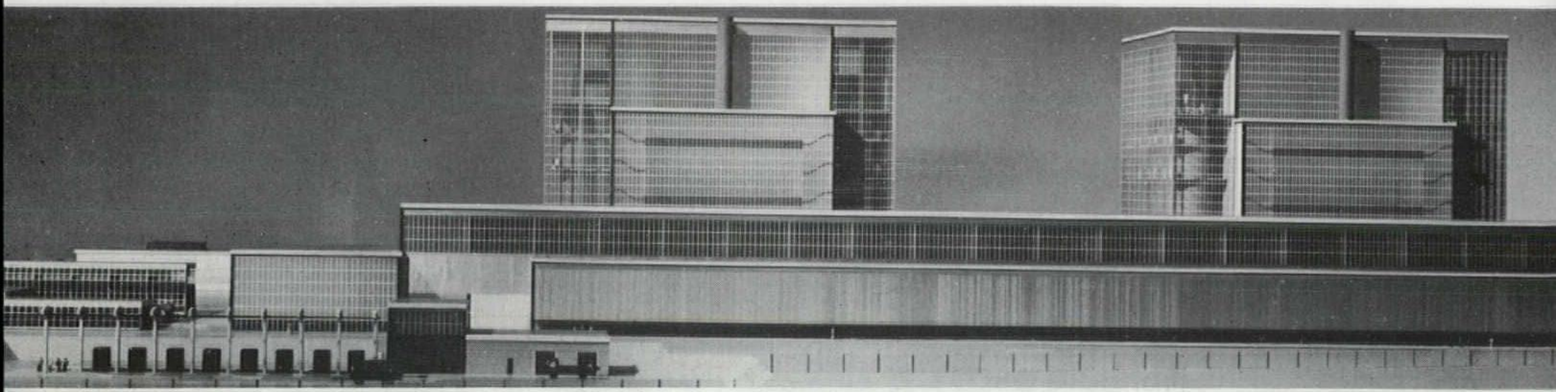
owner: AEC-Duquesne Light Company
reactor design: Westinghouse Bettis
architectural design: Stone & Webster (reactor plant)
Burns & Roe (turbine plant)
electric output: 60,000 kw initially
reactor type: pressurized water

America's first full-scale atomic energy electric power plant, this giant installation is also the world's first full-scale nuclear-power plant devoted exclusively to civilian needs. With three of the four steam generators in operation, the electric output is 60,000 kw; ultimate generating capacity is 100,000 kw.

Four huge pressure-vessel containers constitute the nuclear portion of the plant (*acrosspage bottom*). A central one houses the reactor proper; two that flank the reactor core contain 2 boilers each; and the fourth is for plant auxiliary equipment. The latter (*acrosspage top*) has a diameter of 50 ft and is 147 ft long. All four of the huge vessels are constructed of steel 1½" thick and are enclosed in reinforced-concrete boxes with walls 5 ft in thickness.

Fuel for the plant consists of a combination of natural and enriched uranium, which is contained in the reactor pressure vessel located between the two boiler containers. Water at 2000 pounds per sq. in. is heated to 545 degrees F and is then pumped through heat exchangers which use the heat to boil condensate and generate steam at 600 pounds per sq. in. which drives the turbine.



power reactor: Hinkley Point, England

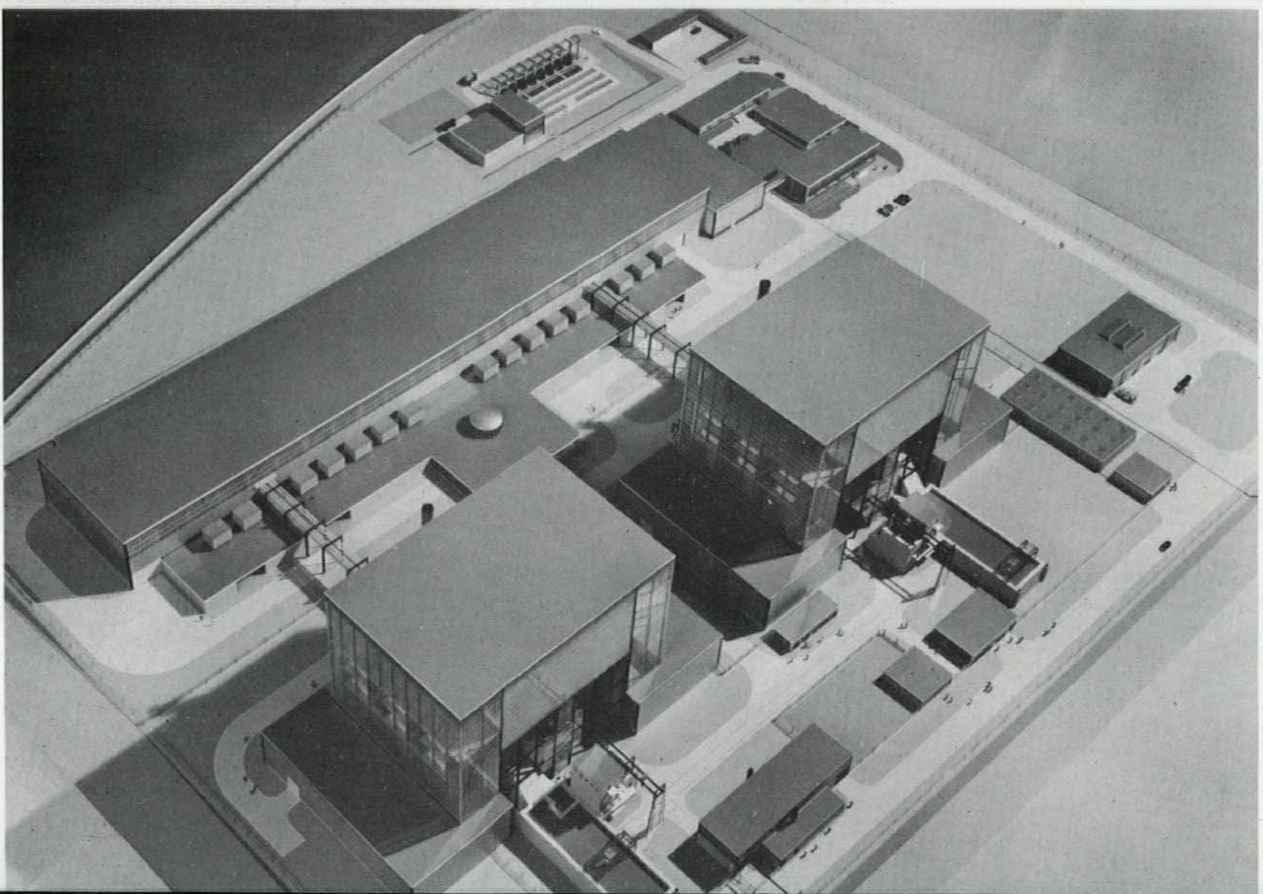
data

owner: Central Electricity Generating Board
reactor design: English Electric and Babcock & Wilcox, Ltd.
architectural design: Frederick Gibberd
electric output: 500,000 kw
reactor type: thermal heterogeneous

The world's first 500,000 kw atomic power plant is now under construction in Somerset, England, with the expectation that the first of the two reactors will be in operation by mid-1961. General Contractor for the vast project is Taylor Woodrow.

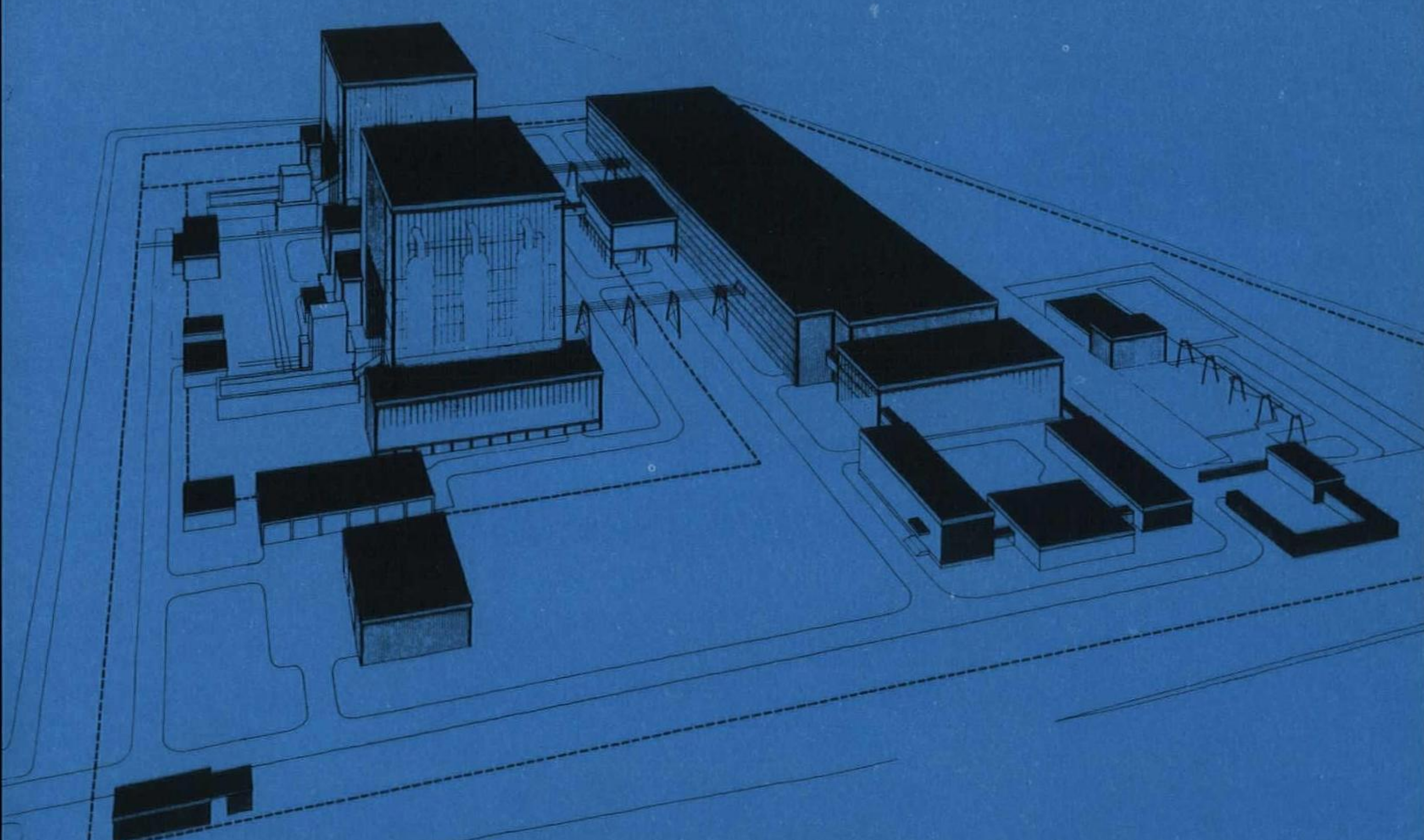
Basic scheme for the installation consists of a series of related, rectangular structures. Paired, lofty enclosures on the south side of the site house the two graphite-moderated, gas-cooled reactors and their 12 heat exchangers in spherical pressure vessels. To the north is the long, low turbine house, including a workshop and control building. At the northeast corner of the complex are administrative offices, canteen, and welfare services. According to the October, 1957, issue of the British publication, *Nuclear Engineering*, "the reactor blocks are located side by side, parallel to the turbine house so that the heat exchangers face the turbine house in four rows of three, to facilitate steam piping. The charge faces of the reactors are on the side adjacent to the turbine house, the cooling ponds for discharged elements being at the rear of the buildings.

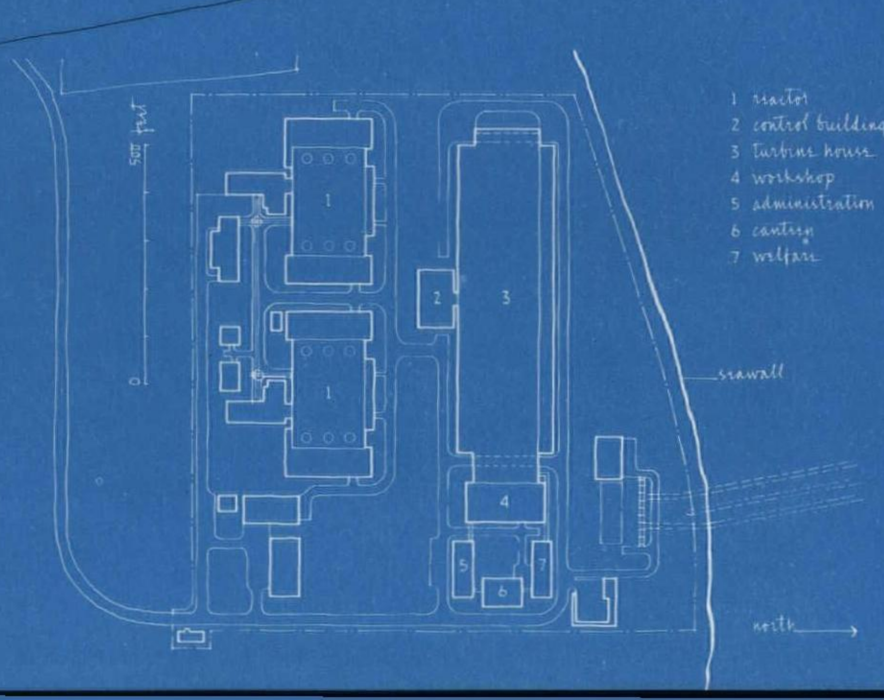
Model photos: Alfred Cracknell

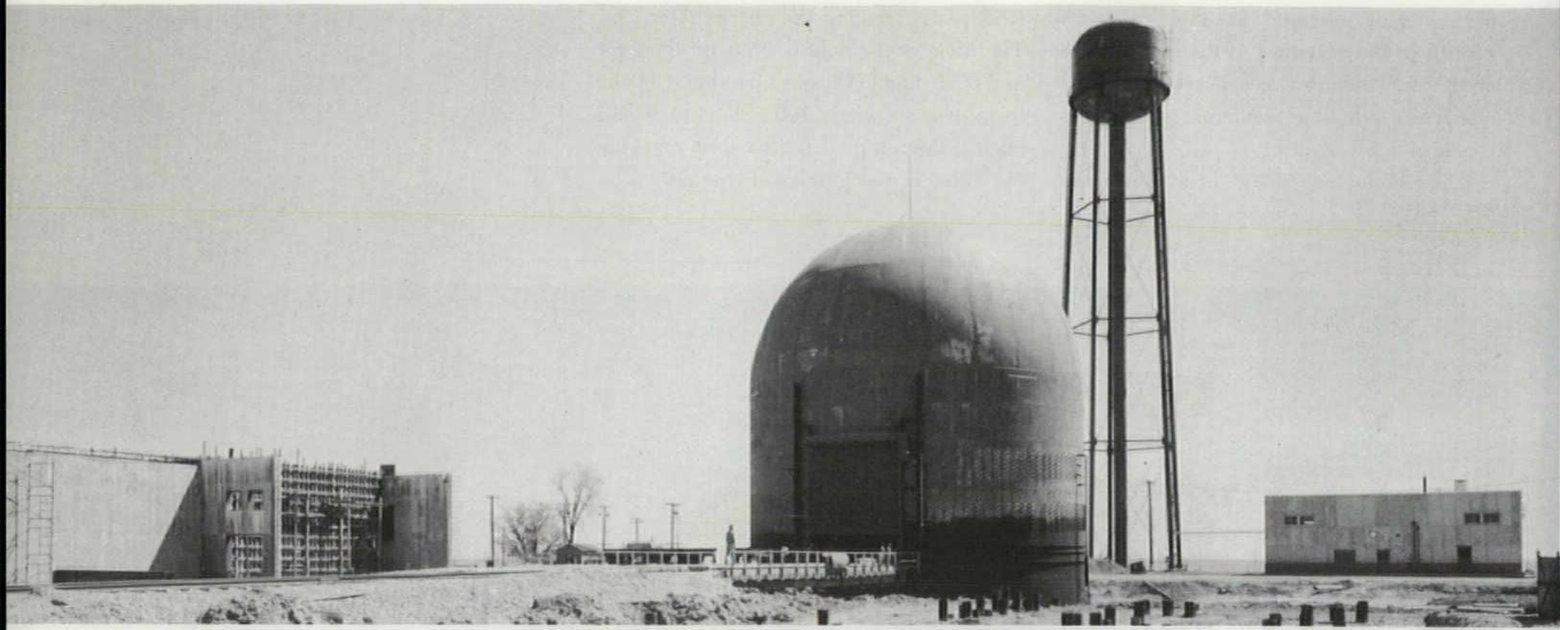


Cooling water for the turbines will be taken from the Bristol Channel, from a point about 2200 ft offshore and returned to the main channel at a point some 2300 ft to the eastward of the intake. The civil work includes a concrete sea wall nearly 3000 ft long, wharves, and access roads. . . .

"The biological shield is of dense reinforced concrete in the form of a duodecagon, with walls 7 ft thick, surmounted by an 11-ft-thick slab, covered by a thick steel plate, forming the charge floor. . . . The biological shield is 75 ft in diameter and 90 ft high. A secondary shield in the form of a rectangle 100 ft by 140 ft will enclose the complete reactor unit, masking the holes in the biological shield."





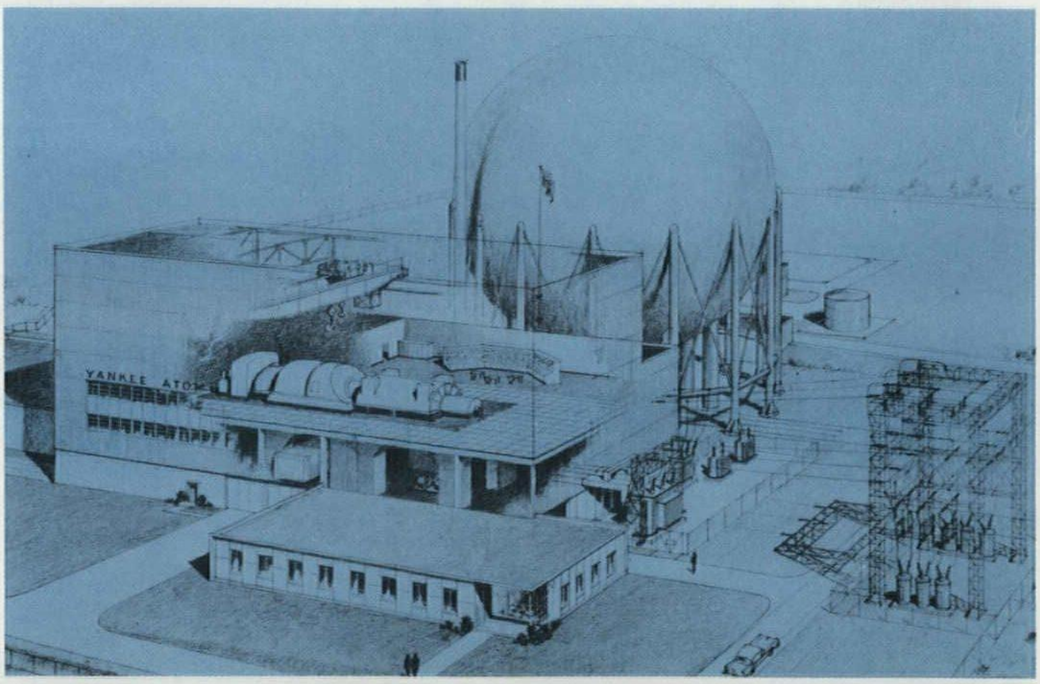


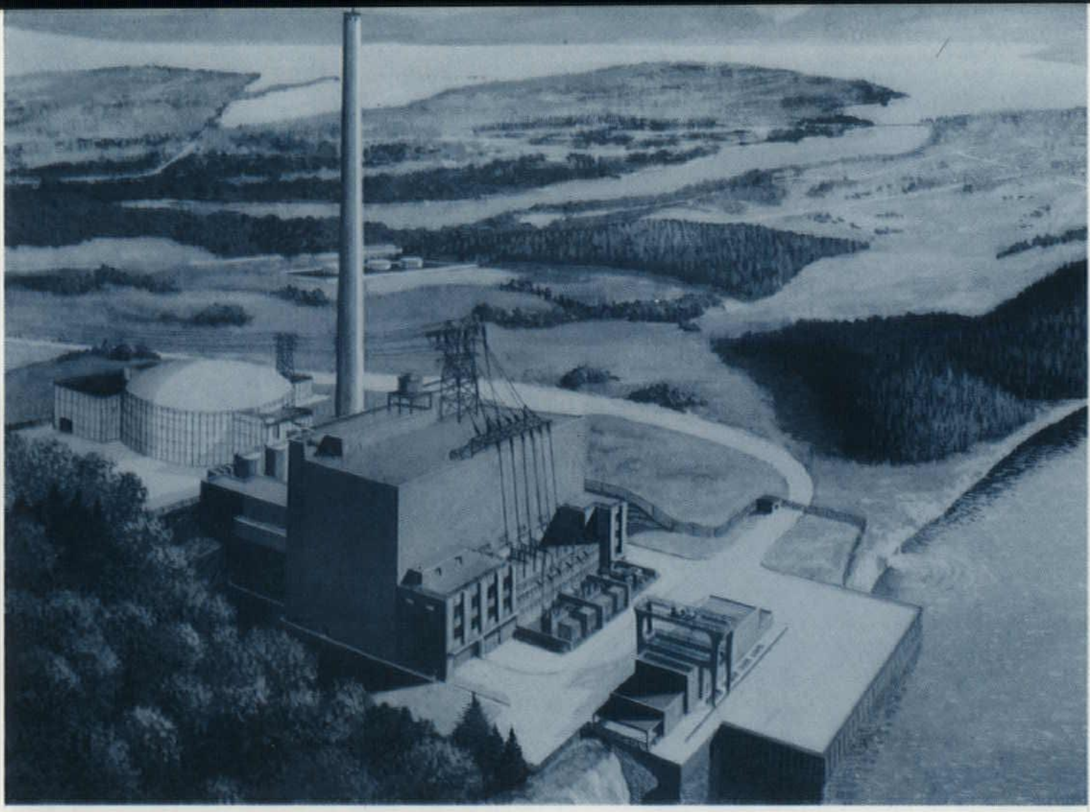
data

name: Enrico Fermi Atomic Power Plant
location: Monroe, Michigan
owner: Reactor Development Co.
reactor design: Atomic Power Development Associates, Inc.
architectural design: Commonwealth Associates, Inc.
electric output: 100,000 kw
reactor type: fast breeder
remarks: scheduled for completion in 1960

data

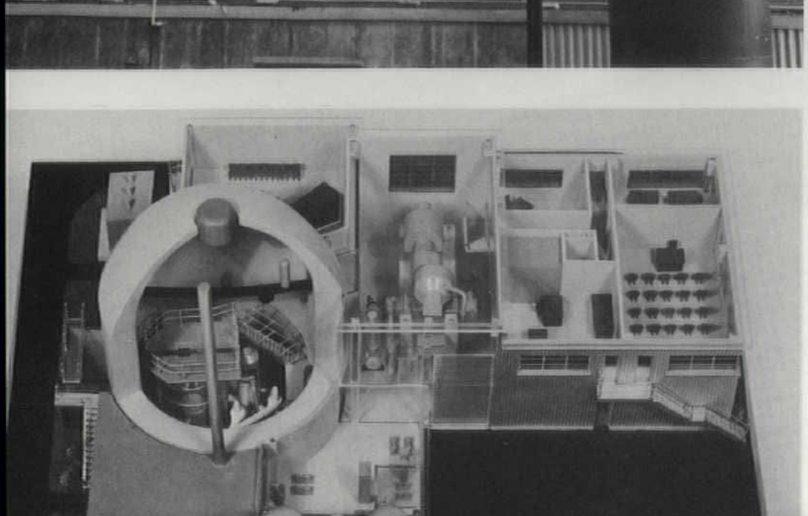
name: Yankee Atomic Power Project
location: Rowe, Massachusetts
owner: Yankee Atomic Electric Company
reactor design: Westinghouse CAPA
architectural design: Stone & Webster
electric output: 134,000 kw
reactor type: pressurized water
remarks: scheduled for completion in 1960





data

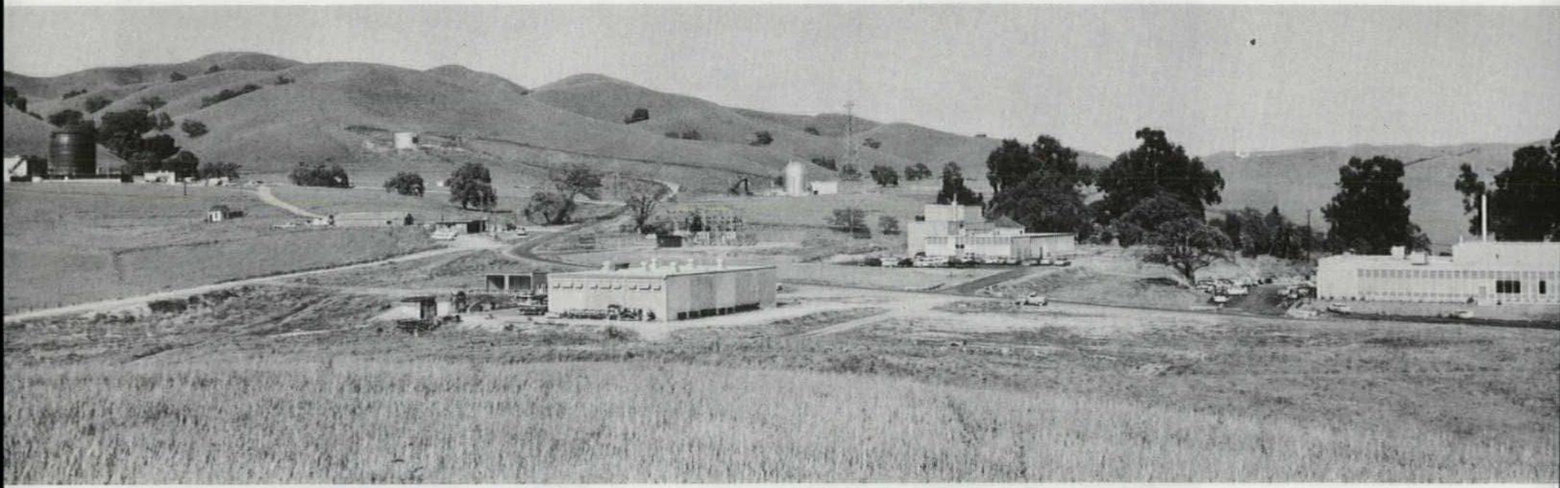
name: Indian Point
location: Buchanan, New York
owner: Consolidated Edison Company of New York, Inc.
reactor type: pressurized water
architectural design: Consolidated Edison and Vitro Corporation of America
reactor design: Babcock & Wilcox Company
electric output: 275,000 kw
remarks: involves both nuclear and fossil-fuel energy sources



data

name: Army Package Power Reactor
location: Fort Belvoir, Virginia
owner: AEC
reactor design: Alco Products, Inc.
architectural design: Stone & Webster
electric output: 2000 kw
reactor type: pressurized water
remarks: component parts can be transported by air and erected in the field within a six-month construction period

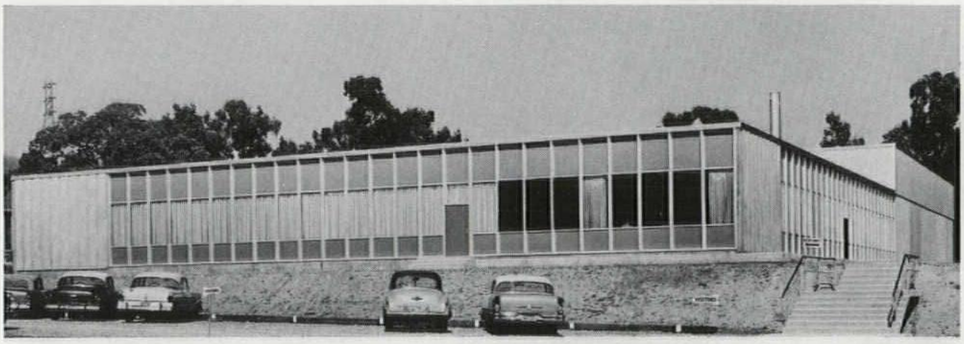
special reactors: Pleasanton, California

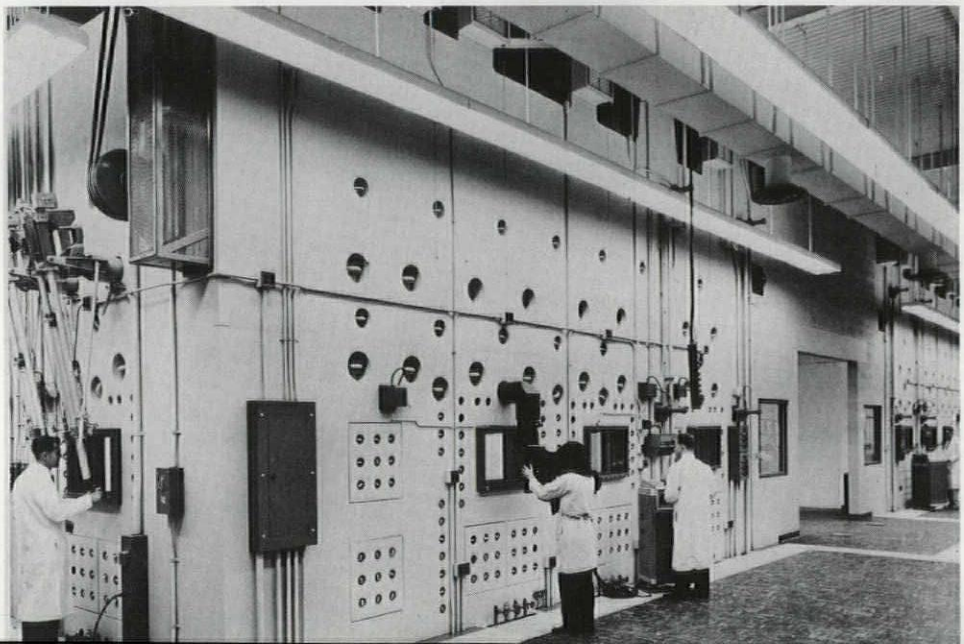


The General Electric Company's Vallecitos Atomic Laboratory, not far from San Jose, California, is this country's largest, privately financed, atomic-research facility. A component of the Company's Atomic Power Equipment Department, the laboratory is a veritable campus of atomic-energy facilities.

The four major research facilities are (1) a radioactive materials laboratory (*below*); (2) an experimental physics laboratory (*acrosspage top*); a developmental boiling-water power reactor (*acrosspage center*); and, under construction, a materials-testing reactor (*acrosspage bottom*). All reactors were designed by GE's Atomic Power Equipment Department; Bechtel Corporation handled the architectural design of the radioactive materials lab, experimental physics lab, and boiling-water reactor. The Ralph M. Parsons Company designed the new test reactor building.

The radioactive-materials lab carries out studies of materials that have undergone nuclear irradiation. Among its facilities are four test cells (*bottom*), each with three work stations provided with shielding windows, master-slave manipulators, and numerous access ports.

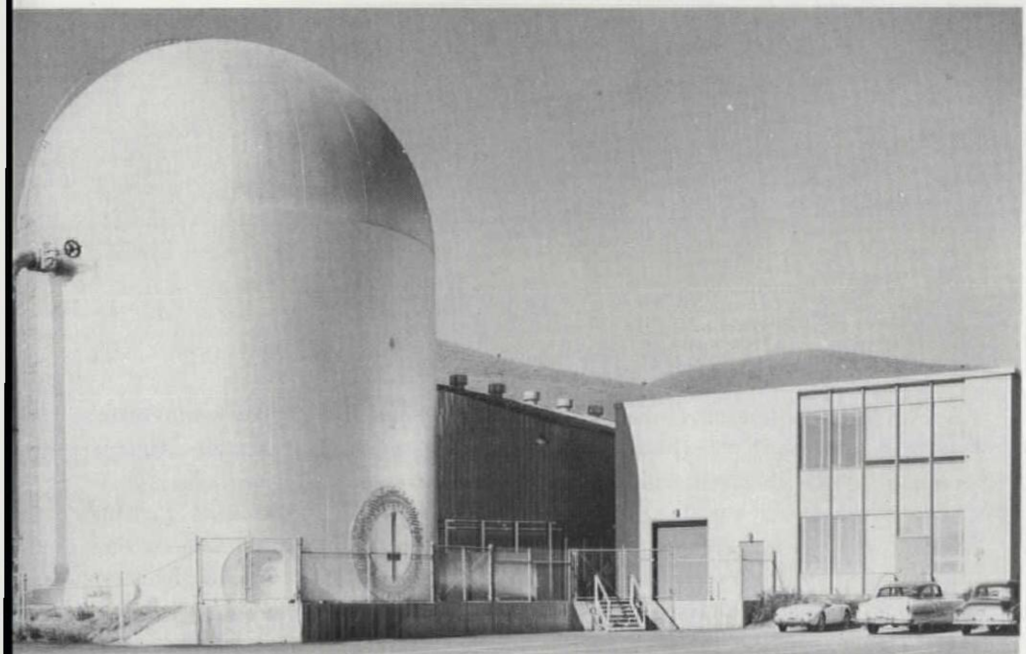


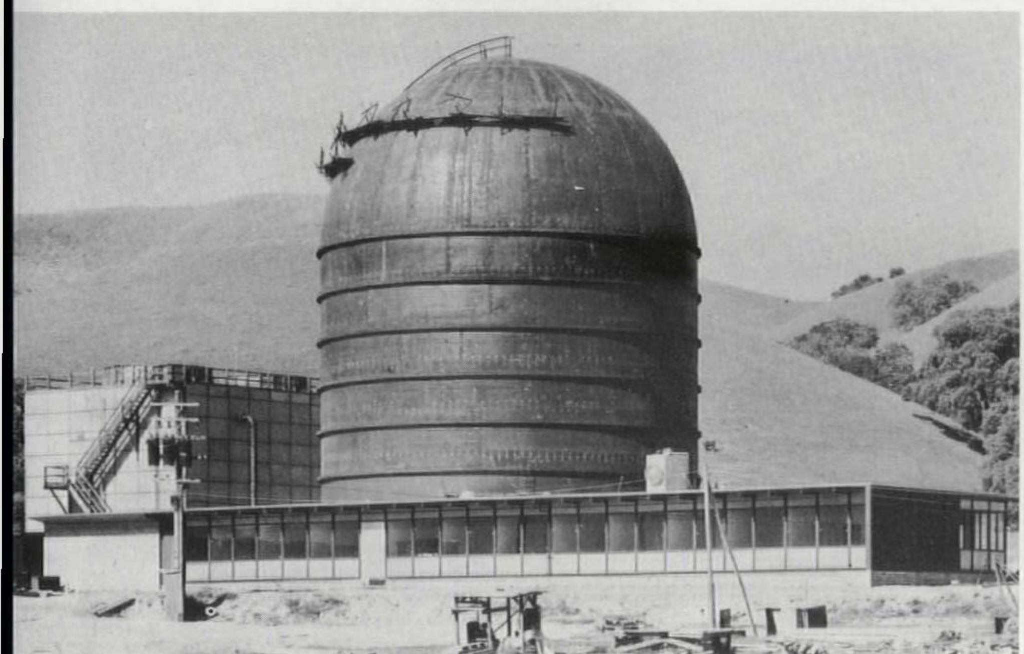


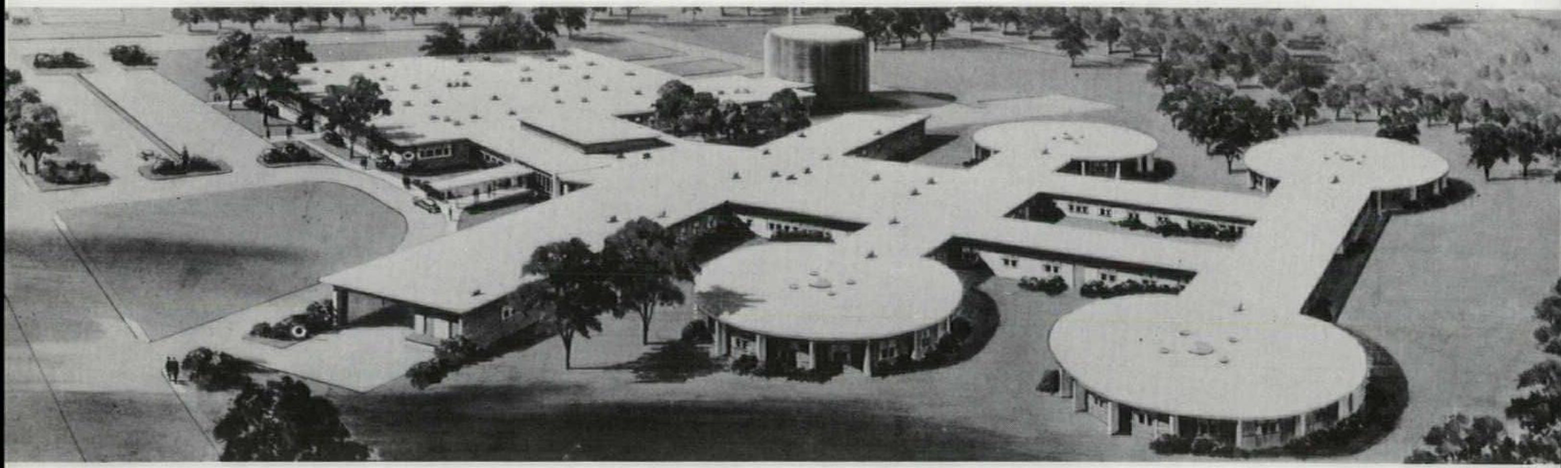
The experimental physics lab (above) *makes explorations and measurements of the degree of criticality, length of fuel life, distribution of temperatures and power, and control of various reactor-core designs.*

The boiling-water power reactor (center) *is currently used to obtain operational data for application to design of the Dresden Nuclear Power Station reactor. It also furnishes steam to a turbine generator owned and operated by the Pacific Gas & Electric Company.*

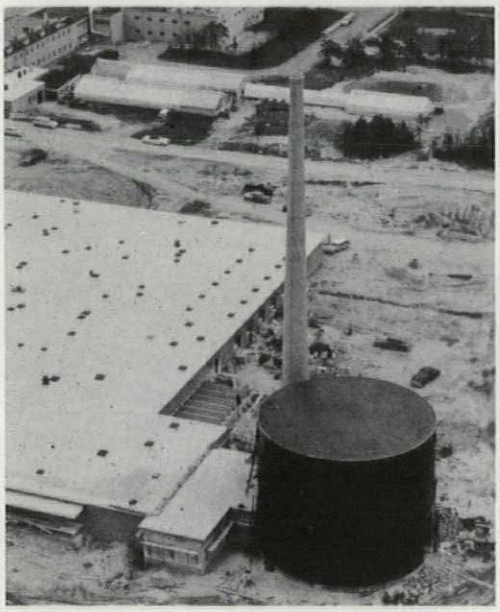
The new materials-testing reactor (bottom) *will be used mainly for development studies of nuclear fuels.*







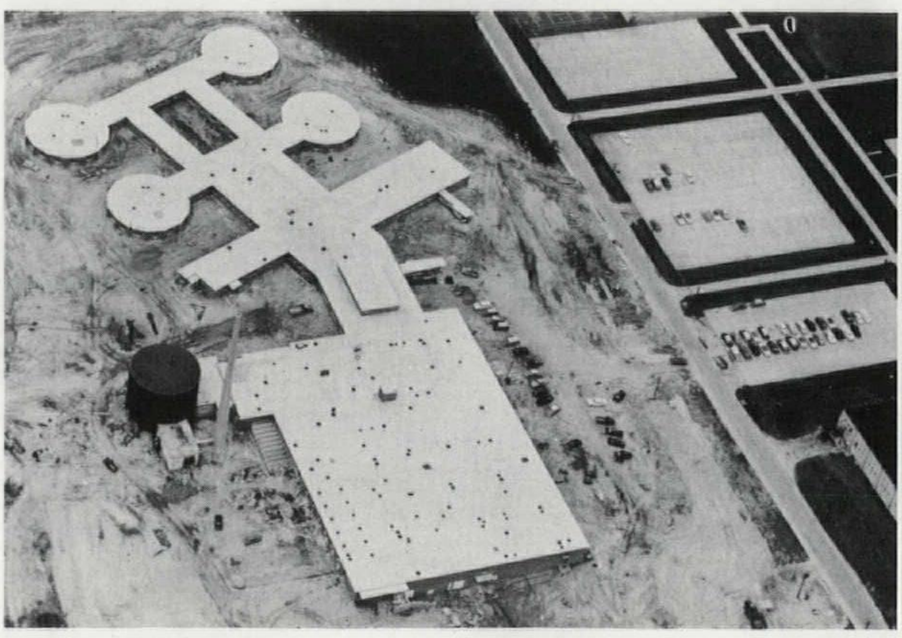
special reactors: Upton, New York



data

owner: AEC-Brookhaven National Laboratory
reactor design: Daystrom Instrument Company
architectural design: Eggers & Higgins
operating power: 1000 kw
reactor type: tank

Part of a Medical Research Center being built at Brookhaven National Laboratory on Long Island, this will be the first nuclear reactor that was designed specifically and exclusively for medical research and treatment. In the large rectangular element adjacent to the reactor tower are literally dozens of research laboratories in medical physics, biochemistry, pathology, microbiology, physiology, and clinical chemistry. Patients' rooms occur in circular pavilions on wings at the opposite end. Syska & Hennessey were Mechanical Engineers.



tomorrow's reactors

the student lets his imagination roam

To spur design thinking about design expression for a reactor structure, P/A went to Olindo Grossi, Dean of School of Architecture at Pratt Institute, and suggested a student problem (with prize money) on the subject. Grossi concurred at once; our AMF collaborators, Hugh Neale and Lars G. Stenberg, prepared a program for "A Nuclear Science Building." On these pages we report some of the results.

The program (*page 208*) outlined a complex for a major university that would integrate facilities for nuclear research and education—the reactor and its essential ancillary services; laboratories of various types; and office areas, including a lunchroom. To assist the students in their analysis of the program, schematic flow diagrams (simplified below) were developed by Prof. William N. Breger, who conducted the design problem at Pratt—diagrams to which he refers as "simply workable hypotheses at best."

Actually, the problem was given twice at Pratt—in both instances under Breger's supervision. First, a single graduate student, Robert Napier, undertook the problem as his graduate study. His solution is shown in model form (*overpage*). Then, an entire summer class of 25 took the problem, with Napier assisting Breger as critic. Finally, these designs were judged by a Jury consisting of Pratt representatives (Grossi, Breger, Napier); Architects (Fred Gans, Philip Johnson); AMF Atomics experts (Neale, Stenberg); and P/A Editors (Creighton, Holmes). The first-prize solution and excerpts from others are shown on subsequent pages. Following the draft of the program (*page 228*), Breger describes the school's approach to the problem and gives his view of the results.

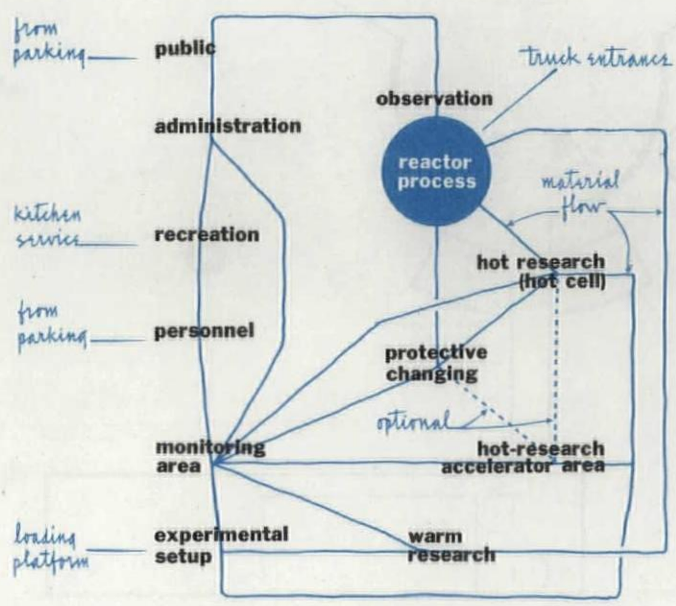
Commenting on the performance at Pratt and especially on Napier's solution, Neale & Stenberg say: "Making a complete design of a Nuclear Science Building in a week or two is an awesome task for anyone. Such buildings present a genuinely new problem. Only a few examples exist today. There are many technical features which are not found in any other building, and these features are in a state of rapid change. Serious attention to architectural aspects of nuclear-science centers has just begun.

"These circumstances made the statement of the design problem somewhat difficult and presented a real challenge to Napier. Looking back, we believe that we made the design problem more complex than it should have been for the time available to complete the problem. Napier's design clearly gets at the essence of the problem, and the general arrangement of spaces and functions shows that he has a good grasp of the problems involved. There are, however, certain features of the design that call for criticism from a nuclear engineering point of view:

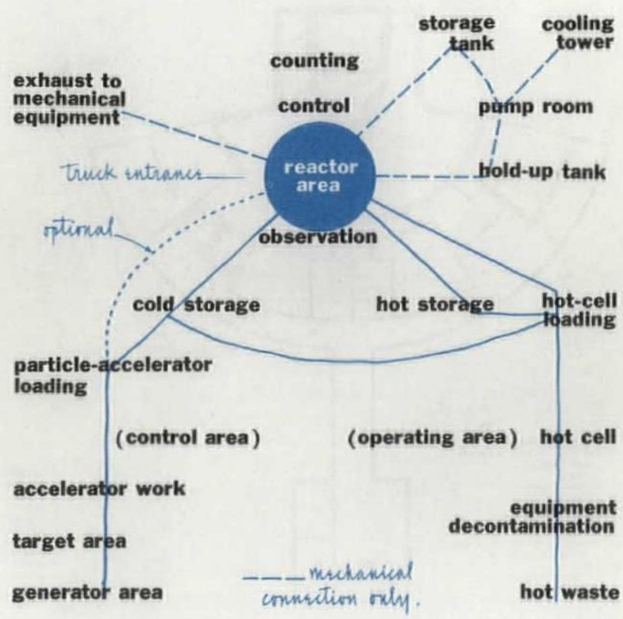
"The shape of the reactor building, while interesting, has a practical disadvantage. The inward taper of exterior walls necessitates a smaller crane with less coverage than vertical walls would allow. There appears to be no functional reason for this shape. The flat-glass roof not only requires many linear feet of joints but will certainly add to the problem of maintaining air leakage from the building, under hazardous conditions.

"From the section, one finds that the design omits a floor or a partial floor at the reactor-pool surface, for access to the reactor bridge and for experimental work around the pool. Some sort of floor is absolutely necessary. The cooling tower for dissipation of heat generated in the reactor has been placed mostly underground. Air flow is severely limited, and cooling-tower manufacturers are presented with an unusual and unnecessary problem. The ground-floor plan shows the

Interrelationship of elements



Intrarelationship of reactor and hot labs

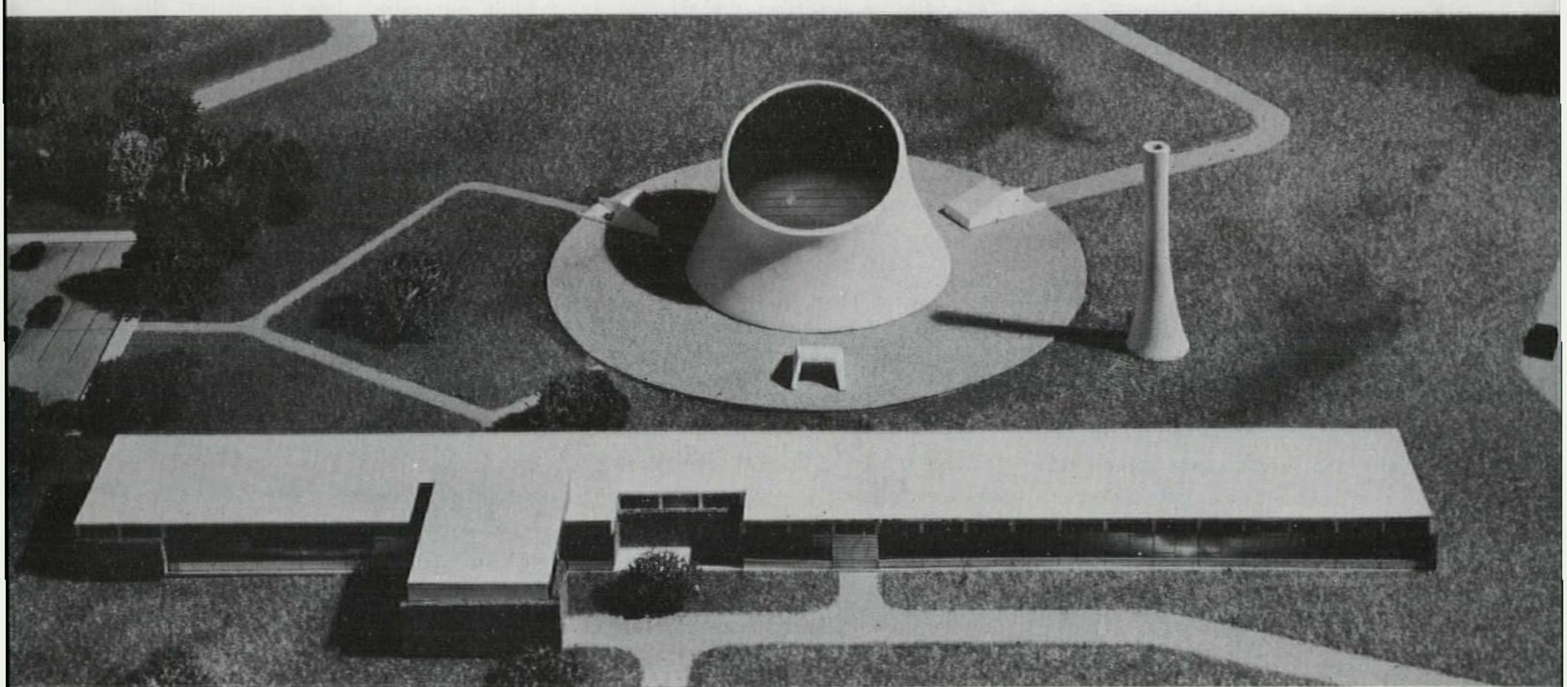


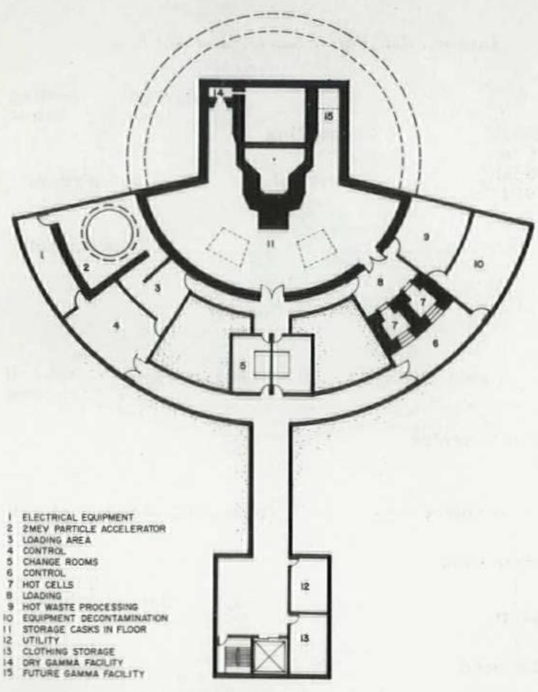
tomorrow's reactors

limited area serviced by the crane. Access to the particle-accelerator room at grade, for installation and maintenance, seems desirable.

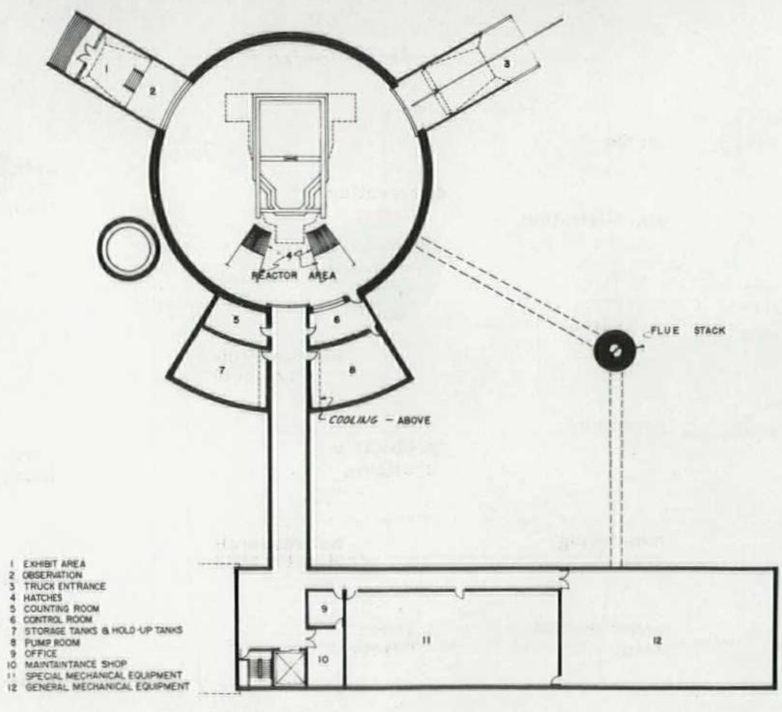
"In the basement plan, the observation area occurs in the one place where it is least likely that there will be anything to observe. The remote entrance makes visitor control difficult, and one must walk outdoors to reach it. For a building requiring very low air leakage, ordinary doors are not adequate. Each access to the reactor building should be an air lock or opened only during reactor shut-down. As the design now stands, simply opening one door voids the 'containment' design requirement. The pump room for the reactor should be in the sub-basement to provide adequate pump suction and gravity head for coolant flow through the reactor. The ordinary door used for access to the storage tank is not customary; a pressurized manhole preferably at the top of the tank is recommended. In the sub-basement, also, air-lock access to the reactor building is suggested. The walls of the reactor building have been brought in close to the pool, over more than half the area. This arrangement is not required by the fundamental building design, and the restricted space will seriously impair the use of four of the six beam tubes.

"While the design is not wholly satisfactory, the important fact is that all of the deficiencies noted can be removed by relatively simple changes—changes which are the normal development of a new idea and should be expected. Napier has tackled a new and difficult problem with intelligence and capability."

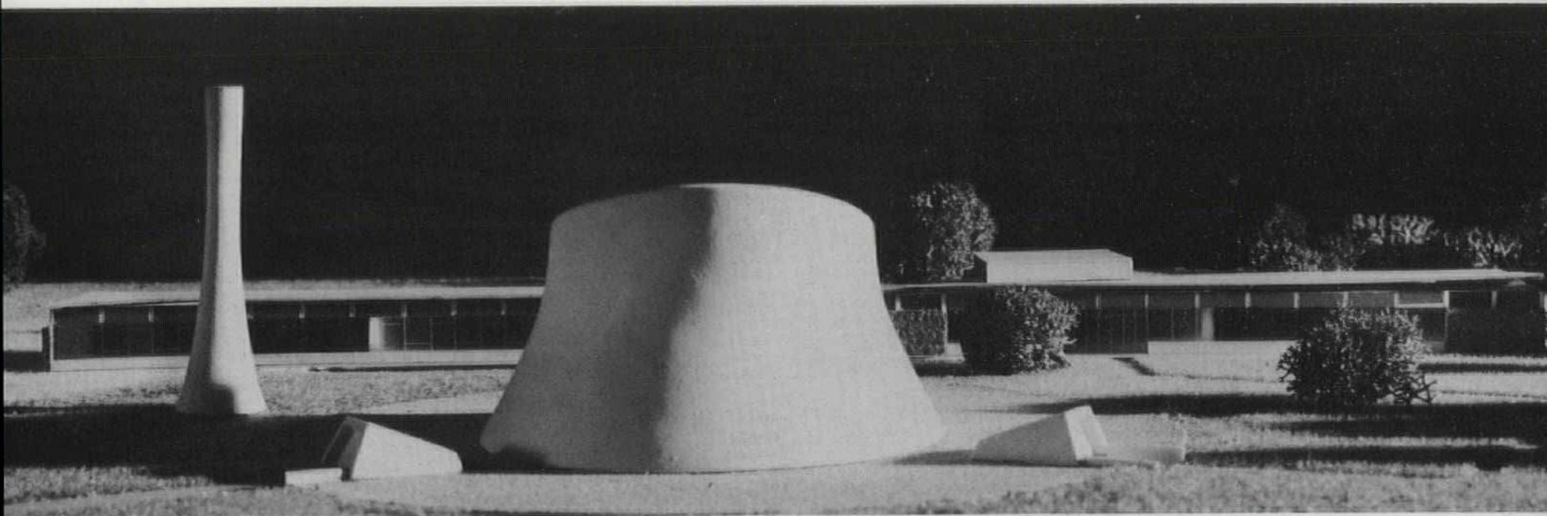


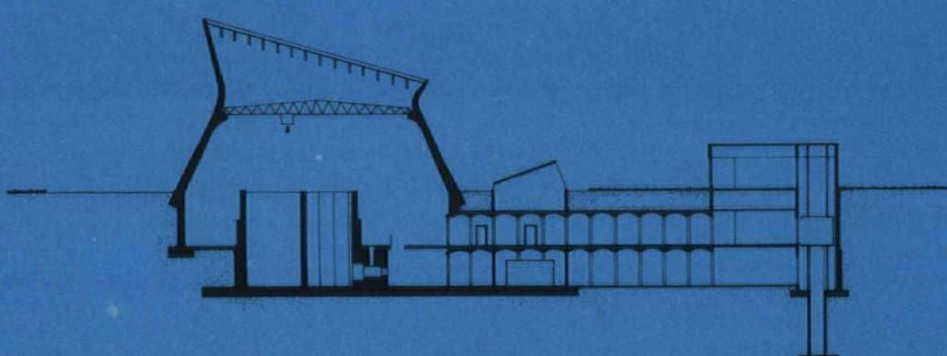


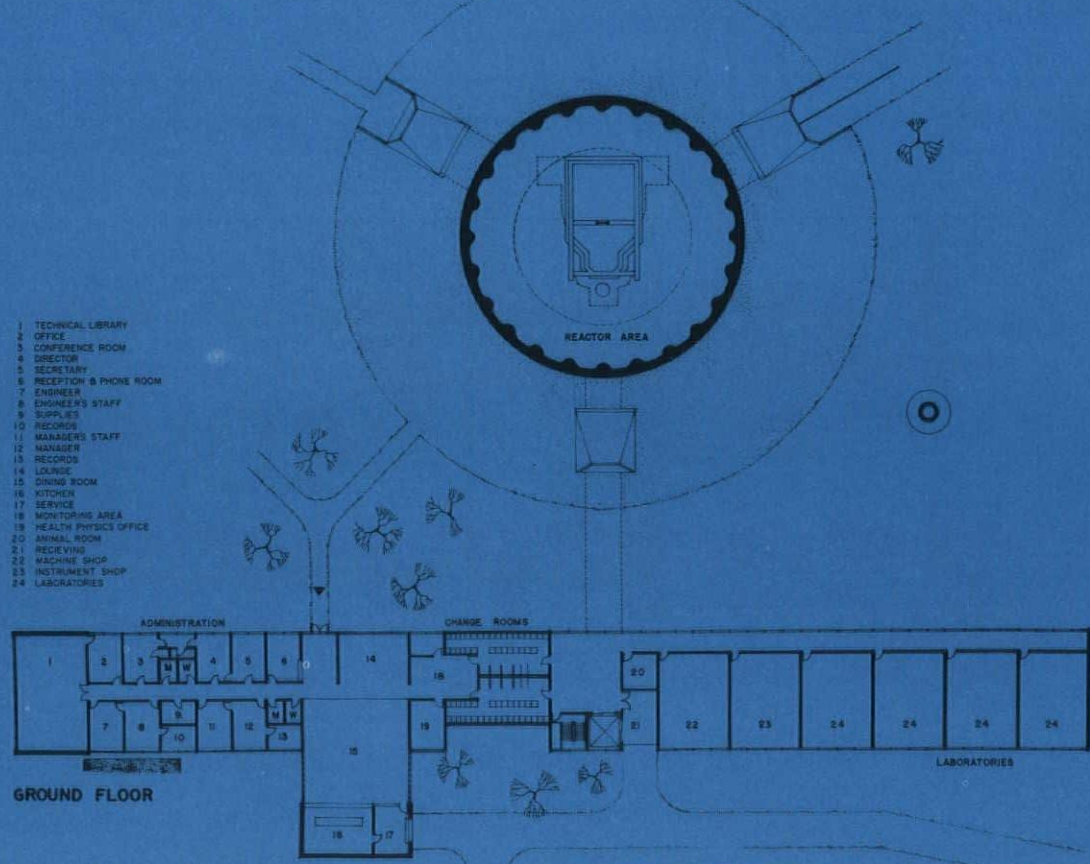
SUB-BASEMENT

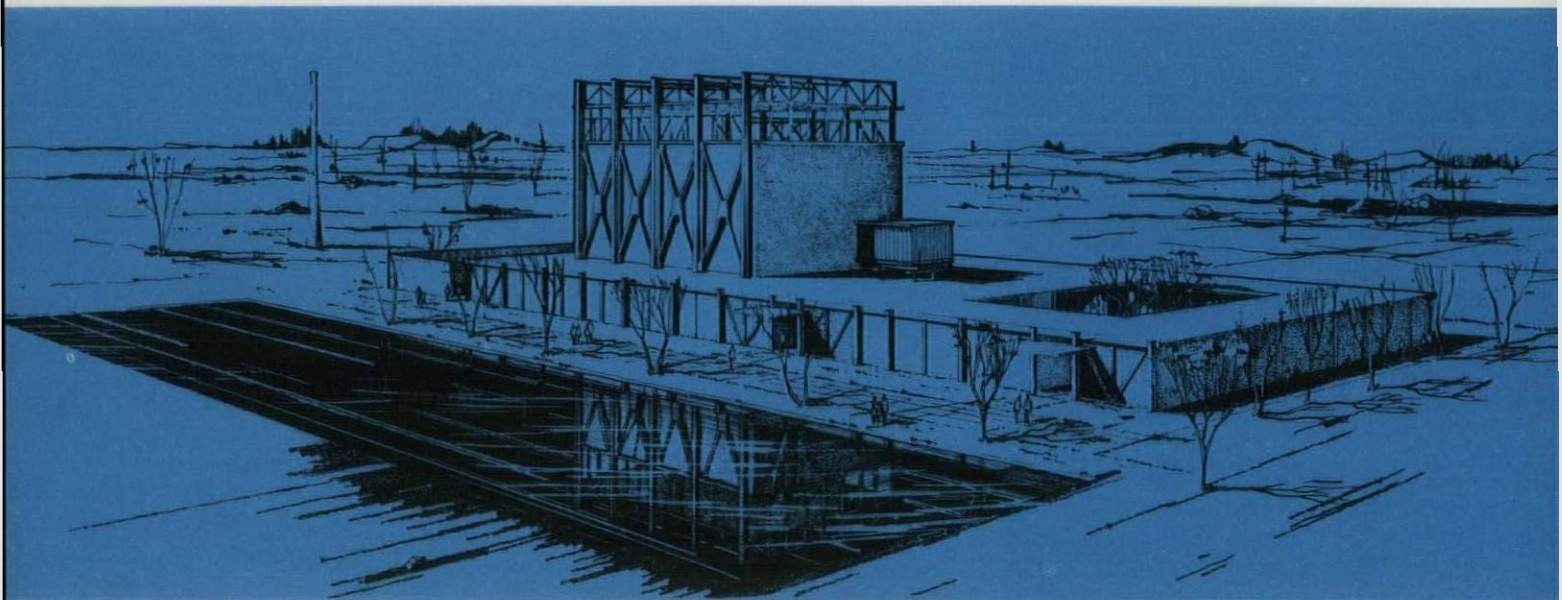


BASEMENT





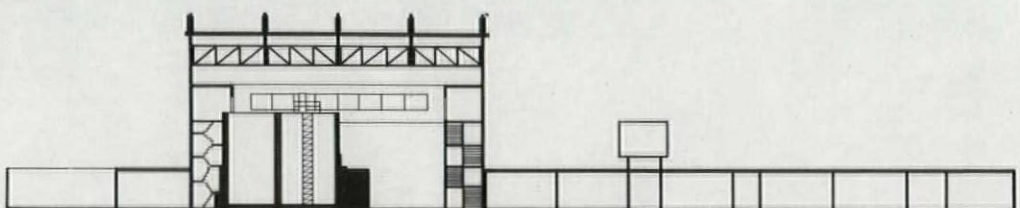

1 TECHNICAL LIBRARY
2 OFFICE
3 CONFERENCE ROOM
4 DIRECTOR
5 SECRETARY
6 RECEPTION & PHONE ROOM
7 ENGINEER
8 ENGINEER'S STAFF
9 SUPPLIES
10 RECORDS
11 MANAGER'S STAFF
12 MANAGER
13 RECORDS
14 LOUNGE
15 DINING ROOM
16 KITCHEN
17 SERVICE
18 MONITORING AREA
19 HEALTH PHYSICS OFFICE
20 ANIMAL ROOM
21 RECIEVING
22 MACHINE SHOP
23 INSTRUMENT SHOP
24 LABORATORIES
REACTOR AREA
ADMINISTRATION
CHANGE ROOMS
LABORATORIES
GROUND FLOOR

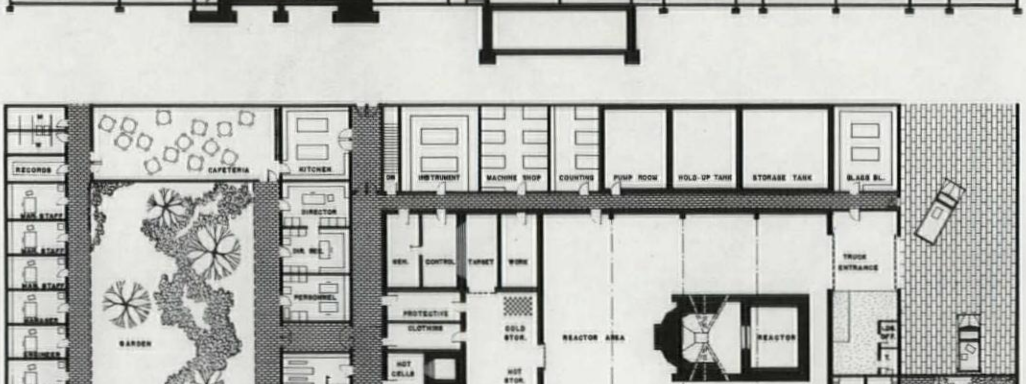


In the summer-school class of 25 at Pratt Institute that took the nuclear-science-building problem, First Prize went to Charles Coiro for the design shown on this page.

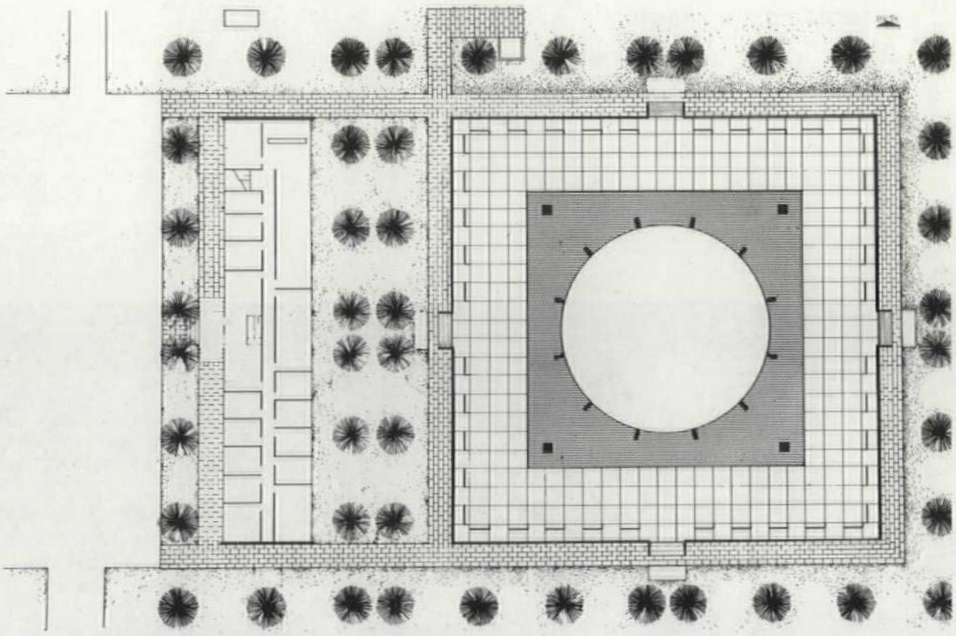
Professor Breger commented that "it has a lot of TVA quality, and certainly it has a strength and dynamic aspect to it." The Jury found the plan developed on one level—one of the few that attempted this solution—commendable. Also applauded was the unified entrance for all trucks serving the complex, though one Juror felt that the machine shops should have been placed nearer this entrance. Another criticized the number of doors into the reactor area.

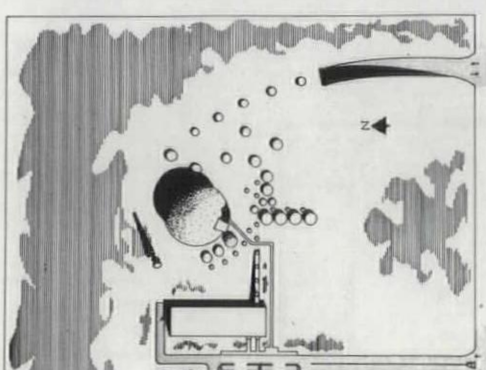
While all wished that there might have been some form developed that would have been more "nuclear-reactor-expressive," they concurred that the disciplined, modular approach to the design was quite acceptable. Following pages show most admired aspects of other solutions.



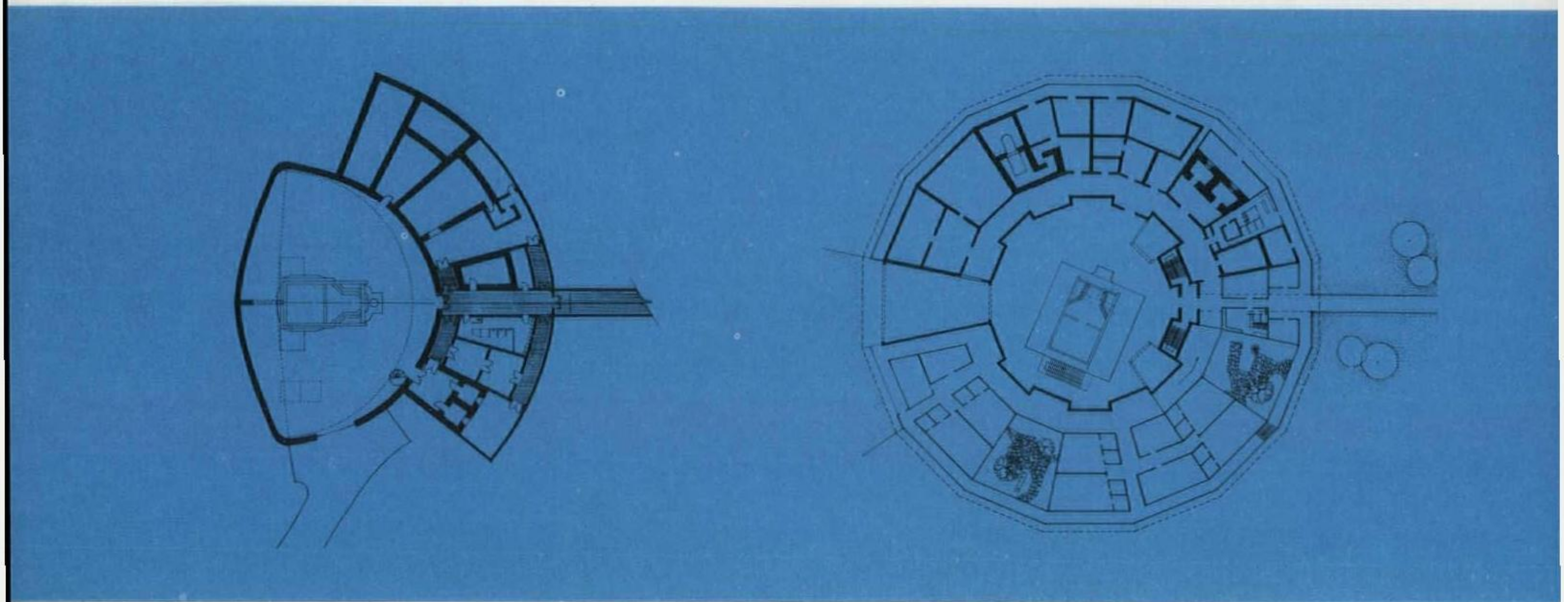


In the design by Philip Minervino (right *and* top below), *a severely formal, monumental scheme appeared, with the reactor area centered in a reflecting pool. A criticism was that it would be difficult to connect the reactor with the auxiliary services.*





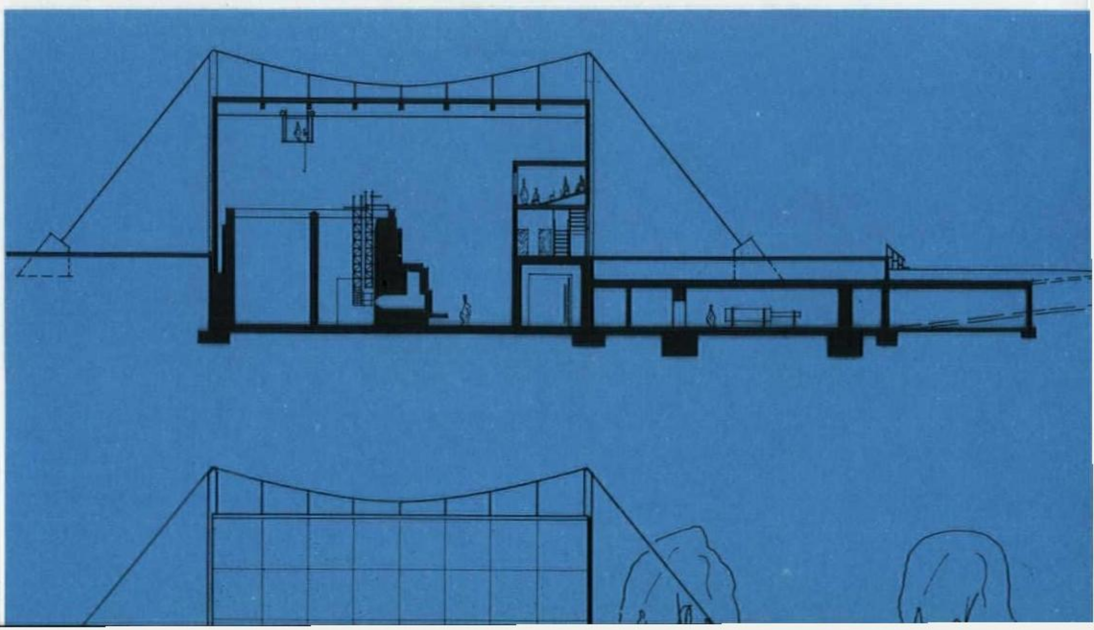
This solution by Dennis Jurow (above *and* left) *places most reactor-related functions underground, and these spaces are lighted by a forest of bubble skylights. While nothing in the program ruled out underground location of functions, some on the Jury felt that the bubbles would be rather meaningless to the average viewer.*



The plan of the reactor area (above left) *of the design by Marilyn Cosgrove Horn was admired by the Jury for its ingenuity in developing the plan shape around the actual path of travel of the overhead crane.*

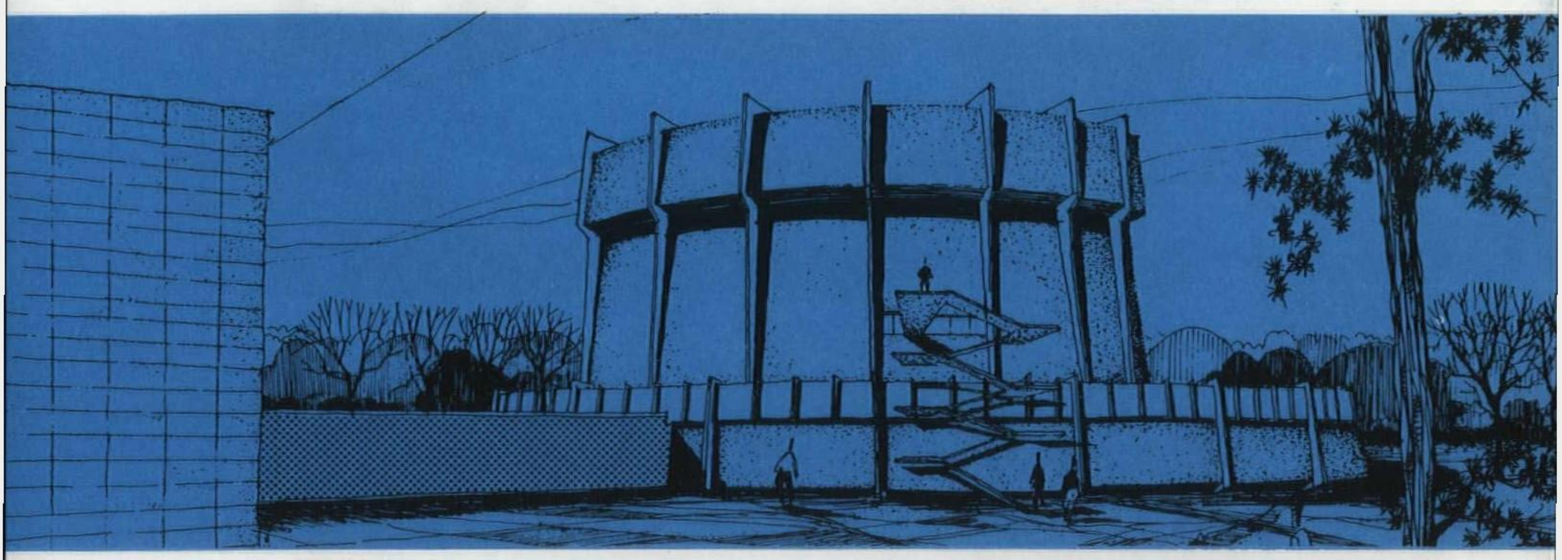
In the scheme by Elizer Frenkel (above right), *the plan was applauded for having provided two means of circulation.*

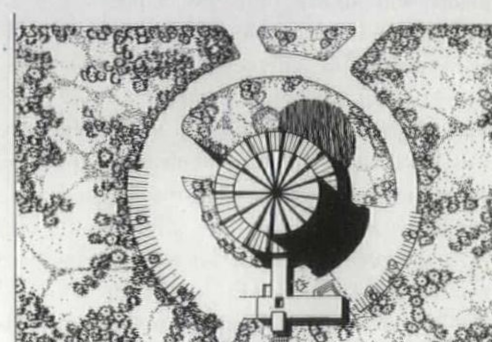
The Jury was looking for several results—expressive form; efficient planning; structural adventure. This design by Frederick Foord was the only solution that employed a cable-suspended ceiling.



Ernest Daeschler was one of the few in the class to attempt a molded or sculptural solution. While the Jurors did not feel that this was wholly successful, they applauded the experiment.

In the shaping of the rigid-bent concrete framing in the design by William Godsall, the Jury felt a serious effort had been made in the direction of expressive structure—the out-thrust near the top actually echoing the crane track within the reactor area.





THE PROFESSIONAL'S ROLE

basic engineering considerations

by J. Fruchtbaum*

In general, the design of nuclear facilities is comparable to that of chemical plants, with similar problems of pressure vessels, ventilation, power distribution, and controls. The differences relate mainly to the special safeguards required. To stay within space limitations, this discussion will be limited to those items that are different from customary architectural and engineering practice.

At the present, except for a few independent groups and AEC staffs, the design of the atomic reactor, proper, is handled by the manufacturer. These fabricators have expended tremendous amounts of money and time on the design, detail, and fabrication of components with some effort toward standardizing them. While this practice tends to reduce costs, it poses the threat of perpetuating existing designs by discouraging new ideas involving changes of parts or assemblies. The role of the architect-engineer is that of a designer of supporting facilities, including the housing.

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structure

Reactors are designed with many safety devices that control their operation and shut them down automatically in an emergency. Fission products are generated at all times during reactor operation, but in a heterogeneous reactor they are released from the fuel element only during a failure of the cladding, by corrosion, mechanical damage, melt down, or other circumstances. Only a small portion of the reactor solids and the moderator are likely to be vaporized, even under extreme circumstances. As a final precaution, most reactors, other than small ones, are placed in structures that will contain the radioactive gases generated by a reactor out of control. Such containment structures are built of concrete and steel. Low-power research reactors, especially if located in remote areas, can be housed in ordinary rectangular structures. Large reactors and their industrial counterparts, however, must be housed in a containment structure able to withstand pressures ranging from ½ to 2 psi for research reactors, and from 15 to 30 psi and considerably more for power reactors. These are the pressures that would be created if the reactor solids and the liquid moderator and coolant suddenly vaporized. The larger the total power developed, the larger the volume of radioactive clouds that would push outward on the housing walls. Unless the walls are strong and gas-tight, the dangerous vapor will escape and contaminate the atmosphere.

These gas-tight shells are also designed to withstand internal vacuum pressures of ½ to 2 psi that may be caused by changes in atmospheric temperatures and pressure outside the building and/or malfunction of the ventilating system. Some special units have been designed for much greater vacuum. The internal pressure in the housing is usually kept at a slight vacuum to prevent leakage from the building.

While all precautions are being taken in the designs to protect personnel, it should be stressed that the normal operating conditions around the reactor are at low-radiation levels and can create no harmful effects. There is very little chance that fission products will escape from fuel elements and cause a radiation hazard.

Since with steel-plate structures, design for vacuum might prove expensive and objectionable, because of necessary stiffeners, vacuum-relief valves can be used to reduce strength requirements. In such cases, however, the structures should still be designed for a minimum of two in. of water, and controls provided on the exhaust fans so as not to exceed the design limitations.

Shielding is provided against gamma radiation and/or stray neutrons to an extent governed by AEC regulations. Formulas for calculations for shielding are available, but up to now most of this work has been done by physicists. In general, when it is considered necessary to design structural walls to provide shielding—from direct radiation due to fission products released into the reactor building during a nuclear incident—they should also be designed for minimum permeability to provide containment. This will require all breaches in the walls (conduits, ducts, etc.) to be in the form of a maze to eliminate radiation penetration and to seal against air leakage. Based upon Bureau of Standards tests by Hornibrook, Freiberger, and Litvin,[1] the air permeability per day for a 24-in.-thick structural-concrete wall, subject to 2 psi pressure differential, will vary between .065 to .39 cu ft per sq ft of wall.

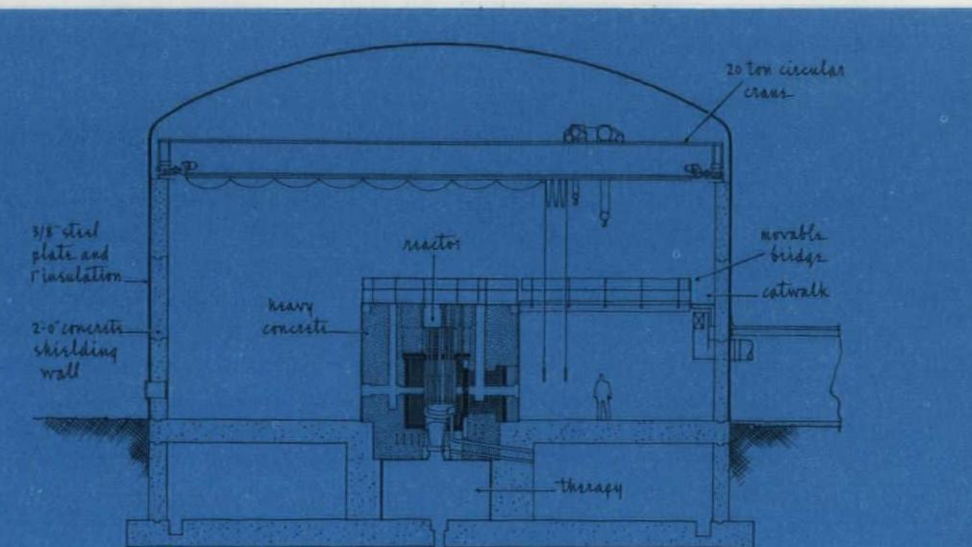
The most economical shape of structure to withstand pressure or vacuum is a sphere; with a cylinder having hemispherical domes, at top and bottom, next in cost. However, site conditions and space requirements will dictate the type of structure more than the cost per cu ft of space. In general, the cylindrical sections will be preferred for pressures say 15 psi or less, and the spherical units for greater pressures. In both types, the bottom sections are supported on steel columns placed along the periphery, and in turn supported on individual footings. An excavation about four ft below the bottom of the shell permits full inspection, leak-testing, and repairs of the structure. A hole in the bottom of the shell and the open sides of the excavation are used to fill the underneath space with concrete and thus bring the load to the soil, after testing and repairs. Where no containment of pressure is required, a rectangular or square building may be more economical than other types, and will often prove more advantageous from a layout viewpoint. The thickness of concrete walls can then be limited to structural requirements.

[1] *Proceedings of ASTM for 1946.*

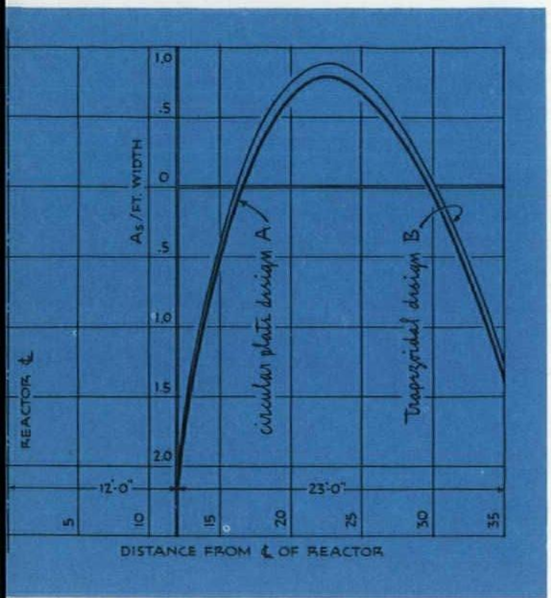
Concrete structures requiring containment may have walls two or more ft thick, which should be designed to withstand all pressures. The AEC Safeguards Committee has approved containment structures without steel-plate lining in urban areas for powers up to one megawatt and in suburban areas for somewhat greater power. For the housing of the nuclear reactor at Massachusetts Institute of Technology, **1**, where the bottom of the concrete mat was 16 ft below grade, and the ground-water provided a seal against air leakage, the steel plate was omitted underneath.

Use of a gas-tight shell, however, introduces various structural problems for which little data is available. The steel shell is used as one side of the form for the poured-concrete walls, but as the concrete sets, shrinkage will distort the shell unless allowances are made. For the MIT reactor, more form ties than normally required were tack-welded to the steel plate. This procedure and the insertion of insulation between the steel shell and the concrete prevented shell distortion. The shell is designed to prevent gas leakage through any cracks that might develop in the concrete. It may or may not carry structural loads.

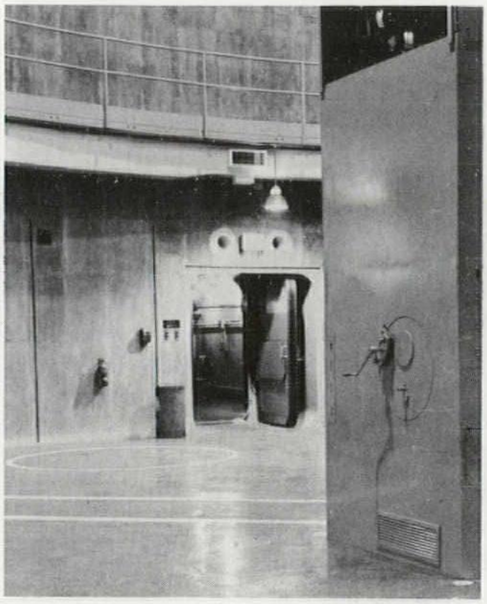
The location of the reactor with refer-



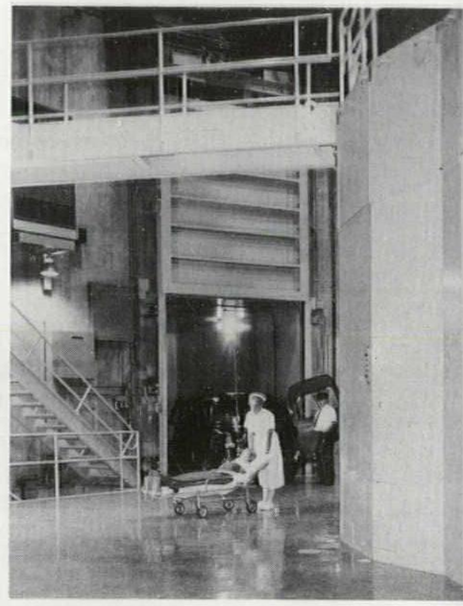
1 *The Massachusetts Institute of Technology Nuclear Reactor* (acrosspage *and* right): *other illustrations in this article are also from the same installation. The MIT reactor was designed under direction of Dr. Theos J. Thompson. ACF Industries executed detail engineering design and were general contractors for the project. The Office of J. Fruchtbaum acted as architects-engineers for the project; J. W. Cowper Company performed actual construction.*



2 *Comparison of values A_s*



3 *Personnel air lock*



4 *Truck air lock*

Table I: Coefficients for M and T

Point		0.0H	.1H	.2H	.3H	.4H	.5H	.6H	.7H	.8H	.9H	1.0H
Coef A	a	0.0	− .0004	− .0018	− .0025	− .0048	− .0242	− .0451	− .0708	− .1280	− .1483	− .2440
	b	− .0749	− .0330	− .002	.020	.0337	.0367	.0337	.020	− .002	− .0330	− .0749
Coef B	a	0.0	.010	.042	.094	.168	.262	.385	.533	.666	.828	1.00
	b	− .353	− .266	− .171	− .071	.037	.156	.290	.442	.614	.801	1.00
Coef C	a	2.16	2.15	2.14	2.14	2.05	1.94	1.82	1.61	1.26	.72	0.0
	b	0.0	.098	.354	.727	1.134	1.513	1.791	1.879	1.424	1.097	0.0
Coef D	a	.983	.862	.741	.621	.504	.382	.262	.163	.080	.024	0.0
	b	0.0	.021	.063	.110	.138	.149	.138	.110	.063	.021	0.0

ence to the surrounding neighborhood, direction of prevailing winds, and other aspects of weather will determine the design of the roof. Obviously, radiation passing through the relatively light roof construction must not strike any inhabited structure. Either parapet walls or roof contours will have to be altered to suit conditions While the total weight of steel required for a container to handle a given surge will not be affected by its volume, a balance must be struck between architectural, structural, and ventilating system requirements. Where radiation upward is not a problem, steel domes can be used at a saving in cost. They should, however, be protected against uplift by anchorage to the base and/or shielding walls.

The Portland Cement Association has published Bulletin ST-57, in which coefficients are given for stresses in circular walls fixed at the base only. While the value of ν for Poisson's ratio is given as .8, the correct value of .2 was used in the calculations for that bulletin. To compare the values for moment, M, per ft of width, and ring tension, T, per ft of height obtained by using that method, and the values obtained using Equations 229 and 231 from Timoshenko's *Theory of Plates and Shells* direct, the results are tabulated (*Table I*) for the wall below the reactor floor on the MIT reactor housing. The values a are from the PCA Bulletin, and the b values are derived from Timoshenko's formula. The values were obtained by differentiating Equation 231 and equating to zero deflections at rigid points.

Assume 0.0 H is used to denote the top of the wall (at reactor floor), and 1.0 H the base at the foundation mat. The coefficients will have to be reversed when considering the effects of induced moments at the top. The final values are obtained by adding the effects of induced moments at top and bottom.

With p = uniform horizontal pressure
H = height of wall
M_i = induced moment
R = radius of structure

Taking into account only the effect of induced moments, and uniform horizontal pressure,

$$M = \text{Coef. } A \times pH^2 + \text{Coef. } B \times M_1$$

$$T = \text{Coef. } C \times pR + \text{Coef. } D \times \frac{M_1 R}{H^2}$$

When the values, assuming the base fixed, were added to the values obtained by assuming the wall fixed at the reactor floor (in each case, the opposite end of the wall was assumed free), the vertical steel required by the induced moments, through the use of the PCA tables, was on the side of safety, except for say the top 30 in. of wall.

The moment due to uniform horizontal pressure was not a large factor, with the walls fixed at top and bottom, requiring only a negligible amount of steel. The PCA method, however, showed a substantial requirement as the free end is approached. It amounted to over one-half that caused by the induced moment, and was of the opposite sign. The ring tension due to induced moments and uniform load was considerably less when the walls were figured fixed at both ends.

Again, referring to the MIT project, the loading on the reactor floor was varied because of the thermal column, lead-brick or heavy-concrete partitions and other loads, so that some short system of calculations of radial moments had to be devised for the circular floor, with its central support. A comparison was made between the results obtained by the use of Equation 58 in Timoshenko's *Theory of Plates and Shells (Circular-plate Design A,* **2***)*, and a design assuming the floor to be made up of trapezoids 1′-0″ wide at the inner support, and its nonparallel sides to be radii *(Trapezoidal Design B,* **2***)*. In this latter case, the trapezoids were further divided into rectangles 1′-0″ wide, fixed at both ends, and triangles fixed at the base with moments equal to the average obtained by assuming the vertex fixed and freely supported. The trapezoidal method gave only slightly larger positive moments and almost identical negative moments.

However, the amount of steel used in particular locations will be determined to a large degree by steel required in other areas, in order to obtain a good uniform spacing-pattern of steel for the design as a whole.

The weight of the reactor will generally be sufficient to provide a center support for the upward foundation and for the floor loads. Since the total load on the base will seldom exceed 3000 psf, making due allowance for the weight of the excavation, the net increase in soil pressure can be supported by a relatively poor soil through the use of a mat or floating foundation. The foundation may have to be stabilized by cement or strengthened by a compacted-gravel fill. In such cases, connections to adjoining structures will have to provide for unequal settlement.

Where concrete domes are used, they may be separated from the walls to reduce costs and to simplify design. A check should be made in all such cases to be certain that the weight of the roof exceeds the total upward design pressure. Otherwise, in case of an incident, the roof may lift and discharge radioactive material to the atmosphere.

No special code has been adopted yet for the design of nuclear housing. It is standard practice to use ordinary concrete stresses, with due allowance for leak tightness. For steel, the specification of American Petroleum Institute, American Society of Testing Materials, and American Institute of Steel Construction govern at present. Welding of containment structures for power reactors should be checked with X-rays.

The control room should be located and designed so as to provide for both the safety and convenience of the operating personnel. It is not necessary, nor is it possible, to provide a complete view of all equipment at all locations. However, the operator, aided by two or three remote-control television cameras, can obtain from the instruments all the information required. Operator's quarters should be shielded from primary cooling and other equipment that is liable to be contaminated. The control room should be well lighted and ventilated with direct outside air, say six to eight changes per hr, and be made pleasant for operating personnel. Decibel rating should not exceed 70.

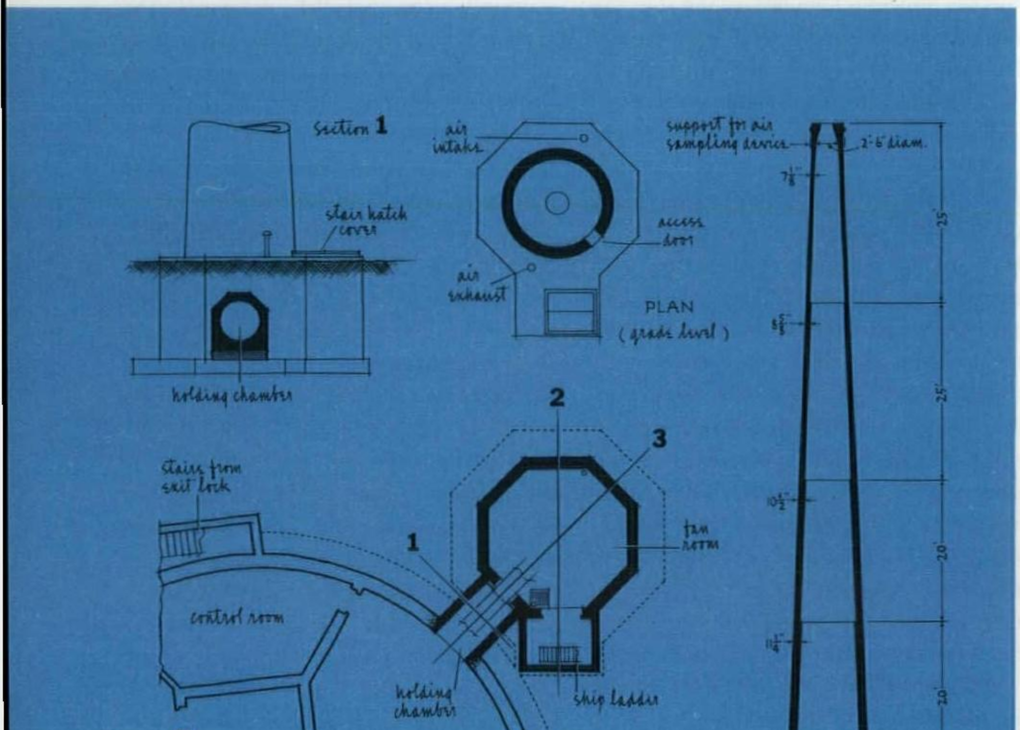
Circular structures lend themselves to the use of rotating cranes. While this type of crane is more expensive, it allows savings in height of the building over those having parallel runways, and also makes the entire area accessible. The clearance for the crane hook should be checked especially for parallel runways. The cranes should be low-speed type. It is advisable to have an auxiliary hoist, with the main hoist designed to take the maximum load it has to handle, not forgetting the weight of the shielded cask used to remove or replace fuel elements.

In order to maintain a pressure differential between the interior and exterior of the containment structure, and still allow ingress and egress of personnel and equipment, the exits must be of an air-lock type. The dimensions of the doors and air locks should be large enough to accommodate a lift truck of the size required to service the installed equipment. The doors should be power-operated type, but also capable of manual operation by pressing a lever or handle downward, in case of power failure. The truck doors required for the passage of large equipment, such as the casket for handling fuel elements, should, because of their weight, be power operated. For shielding, they can be bricked-in with lead or heavy-concrete bricks. If, however, the truck door is to be used frequently, a regular air lock should be installed. Walls of the air-lock structure should be designed to give the required shielding, even with one door open. Valves for the air locks should be capable of balancing the pressure as quickly as possible without causing discomfort to personnel. The doors must be strong enough to withstand the unbalanced pressure, and be provided with good gaskets for sealing against air leakage.

It is both expensive and difficult to provide air locks. A personnel air lock costs about $25,000, **3**, an air lock for trucks will cost about three times as much, **4**. While no special codes for this type of structure have been developed, most states will require two personnel air locks. They should be located for maximum safety and convenience. Passage from the control room should lead as directly as possible to an air lock. A manhole may be provided through the wall. This can be protected by either lead or heavy-concrete bricks, in addition to the necessary gasketted doors.

mechanical

Heat generated in the reactor must be removed through heat exchangers and



5 *Stack/Reactor Container Relationship*

circulating cooling water. Solid or dissolved material in the water becomes activated as the water is circulated through the reactor. This activation would create an additional shielding problem, particularly in the case of a pool reactor. Cooling is therefore generally done in two closed circuits. The primary circuit must have demineralized water. Some reactors use heavy water, which has advantages from a nucleonic point of view, but is very expensive. If used, separate tanks for draining and storage, devices for catching drippings at valves, and all possible leak locations along with leak detectors, should be provided. All piping used for heavy-water circulation should be X-rayed and penetrant tested. Careful and complete testing of pipe lines, pump, and heat exchangers after fabrication and assembly, is most important for the primary circuit. The secondary circuit when more than one is used is not critical.

Ductwork passing through radiation-shield walls presents some problems requiring co-ordination with structural design to provide proper wall thickness. Where design does not permit the routing of ducts so that wall shielding is adequate, then lead shielding should be used. Exposed surfaces should insofar as possible be finished to prevent dusting.

Contaminated gas removal, air-tight seals, micron filtering, and dilution of exhaust gases are beyond the ordinary problems of air conditioning and ventilating. Incoming air should be drawn through a filter bank with an efficiency of 85 percent down to a particle size of five microns. Exhaust air should be filtered but to a greater degree, by passing it first through a bank of filters as above and then a second bank of filters having an efficiency of more than 99 percent down to a particle size of one micron. This is to avoid exhausting contaminated air-borne dust.

A stack should be used for exhaust ventilation from the reactor structure, so as to avoid the effect of downdrafts, **5**. The stack design presents a special problem in areas subjected to cold weather. Since there is not much heat coming up the stack, lower stresses than those permitted for heated stacks should be used in its design, and the contour of the stack wall should be such as to prevent moisture running down the walls and freezing. Devices should be installed at the top of the stack to monitor the discharges, with warning signals at the control board. The monitors should be set at levels low enough to sound alarms long before any serious radiation dosages are released to the atmosphere. Many sources of air-borne radioactivity will not be decreased by shutting down the reactor. The height of stack should be such that all air will be discharged well above surrounding buildings and stacks. Its location and design will be determined by the prevailing winds and weather. Since it is difficult to build a stack less than 2′-6″ inside diameter, it is advisable to use that as a minimum dimension, and, if need be, corbel the walls inside to obtain the necessary air velocity.

The plumbing system should be designed to prevent contaminated radioactive wastes from being discharged to the city water or sewer system. This is accomplished by providing hold-up tanks to which all wastes are pumped. The contents of these tanks are sampled at intervals for radioactivity and, if found safe, are then pumped to the sewer. If the wastes exceed the safe limits, they are treated and diluted before being discharged to the sewer. In the event that treatment does not suffice, the wastes are removed from the tanks, concentrated, and dumped in safe areas. Sufficient water seals must be provided to maintain the gas-tightness of the building in the event of a build-up to the internal pressure for which the housing is designed.[2] Float-operated mechanical traps are indicated where pressures exceed a few inches of water.

Radiation monitors should be located in the exhaust ductwork ahead of the exhaust valve, so that if the exhaust air becomes overly radioactive, the controls will close the supply and exhaust valves. A hold-up chamber of sufficient volume should be provided between the radiation monitor and the exhaust valve so that this valve closes before any of the overly contaminated air reaches the valve.

In the event of an emergency, or on signal, the building must be sealed tight to prevent contaminated dusts or gases from escaping to the outside. The air supply and exhaust openings can be sealed automatically by quick-closing air-tight butterfly valves in ducts on a signal from the control panel. They should be designed so that in the event of power failure, the system will fail "safe."

electrical

A novel application of standard products in the solution of out-of-the-ordinary problems in electrical construction was used at the MIT reactor, to prevent leakage of air from the building at points where the electrical conductors penetrated the steel containment shell. At one location it was necessary to run 21 power, 30 control, and 12 telephone conductors through the shell. The required method of sealing had to prevent positively the passage of air around the insulation, between the insulation and the conductors, and between the individual strands of the conductors. A standard pothead of the cap-nut type satisfied the requirements for the power conductors. A conax thermocouple sealing-gland provided an effective seal for the control and telephone conductors. As far as is known, this is the first application of these products as seals for electrical conductors in a nuclear reactor.

The construction of the pothead makes it a virtual cap on the end of the conduit. The conductors are terminated in connectors which screw into the cap-nuts inside the pothead. The circuit is continued through the cap-nuts and the conductors clamped to the outside end of the cap-nuts. In the thermocouple sealing gland, the usual teflon-insulated thermocouple leads are replaced by solid #14 teflon-insulated conductor leads. Effective sealing is secured by passing the conductors through a teflon sealant disk and porcelain insulators, between which the disk is placed in a body, and compressing the disk with a threaded cap. The sealant disk is compressed around the insulation on the conductors, and the insulation itself around the conductors.

All parts, especially those subject to corrosion, must be made accessible for inspection and maintenance, the provision depending on expected rate of disintegration.

Emergency-lighting circuits operated by batteries or diesel generators should be provided for exit lighting and other critical items in case of power failure.

Air-lock equipment and controls must be easy to repair or replace.

Cables should be carried in open troughs, and all valves, pumps, heat exchangers, and tanks placed so as to provide for easy access to manhole or exit.

medical accessories

As accessories to reactors, medical facilities, hot cells (where the source of radiation is completely internal to the cell), and gamma cells (where the source of radiation generally consists of spent fuel elements) can readily be provided. The nearness of the irradiation source gives access to high flux of neutrons, and/or gamma rays.

In the MIT reactor, a therapy room is provided at the base of the reactor, **1**, **5**. Because of the amount of equipment, the thermal column, and the space provided for handling piping, the framing was rather complicated. Deflection was the design criterion, in order not to interfere with the proper operation of the shield. In the proposed University of Buffalo Nuclear Center, the therapy room is along one side, and the gamma cell is reached through a canal from the pool-type reactor. The doors to these facilities are made of steel frames enclosing lead, or vault doors filled with heavy concrete, depending upon radiation and space available. These rooms should be provided with shielded observation windows made of either leaded glass or plate-glass containers filled with a zinc-bromide solution, or similar shielding transparent material. The cost of one of these windows is in the neighborhood of $15,000 to $20,000, depending on the type. Decibel rating for medical-therapy rooms should not exceed 55.

Hot and gamma cells must be provided with sleeves for manipulators, measuring devices, power lines, etc., all to be operated from outside.

The walls, floors, and ceilings must be surfaced for ease in decontamination. Decontamination areas should be provided for cleaning equipment. In addition, showers and clothes changes should be provided in personnel-decontamination areas.

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[2] *One psi variation in pressure requires 2.31 ft of water seal.*

what role can the architect play?

by Lars G. Stenberg*

The role of the architect in the design and construction of buildings for nuclear-reactor projects is especially challenging because of its kinship to a young, dynamic science—nuclear energy.

The principal participants in the development of a nuclear-reactor project are the owner, United States Atomic Energy Commission, reactor supplier, architect, fuel fabricator, consultants, and the general contractor.

A typical nuclear-reactor project develops in certain phases from initial planning through to completion. These phases, described below, are typical and are based on knowledge gained while associated with the design and construction of twelve nuclear-research-reactor facilities. The scope of each phase is subject to variation based on special requirements.

Phase I—Analysis and Planning. The owner and architect analyze and plan a complete reactor facility specifically designed to the owner's broad objectives in the nuclear field, with the aid of consultants, such as reactor suppliers, government and local agencies, and AEC. Possible sites for location of the facility, contractual problems, estimated costs, scientific requirements, fuel requirements, etc., are evaluated during this stage.

Phase II—Preliminary Design. The site is selected; and preliminary designs and specifications for the reactor, facilities, and building (or buildings) are developed. Consultants in various fields are contacted to crystallize and complete the preliminary design in all phases. A reactor supplier is selected. Scheduling of all phases is co-ordinated and established. Cost estimates are reviewed.

Phase III—Construction Permit. The owner and architect work with a consultant to prepare a preliminary-hazards report. This report substantiates the safe operation of the facility based upon an evaluation of the hazards involved.

The hazards analysis and evaluation consider the preliminary building plans and reactor design in relation to the site topography, geology, hydrology, meteorology population density, and other pertinent site data and show that all necessary safety precautions have been considered. This report is then submitted to AEC, which, upon approval, issues a construction permit.

Phase IV—Detail Design. Upon issuance of the construction permit, the architect and reactor supplier prepare construction and installation drawings and specifications. All work is co-ordinated with requirements of local authorities having jurisdiction over the work.

Phase V—Bids and Award. The architect obtains bids from general-construction contractors and fuel fabricators (fuel is a fissionable material used in nuclear reactors for the production of energy). The bids are evaluated, owner approvals obtained, and awards made.

Phase VI—Construction. The general-construction contractor, reactor supplier, and fuel fabricator proceed to construct the facility; manufacture and deliver reactor equipment; and install equipment. The architect supervises and administers the detailed problems of co-ordinating the schedules of the various contractors in close alliance with local authorities. A final hazards report is submitted to AEC.

Phase VII—Start-up and Initial Operation. Upon approval of the final hazards report, AEC issues a license to operate the facility. The reactor operators test the reactor-system components and load the reactor for start-up under the guidance and assistance of the reactor supplier. Upon satisfactory completion of tests and loading, the reactor is then operated in successive steps until full power is obtained. The owner accepts the reactor facility at this time.

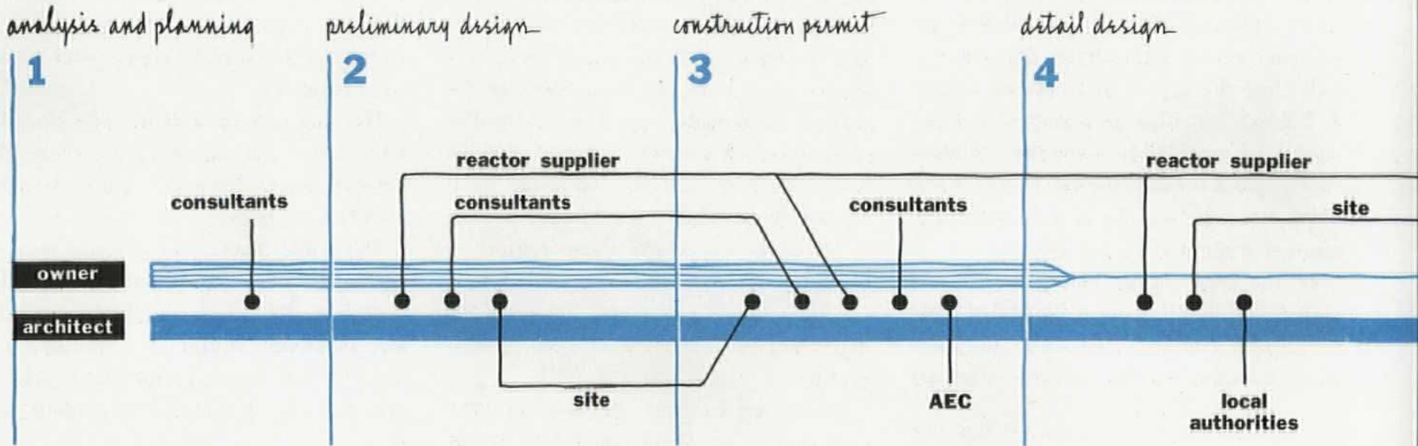
Phase VIII—Operation. The owner operates the reactor facility and experimental work is begun.

building design

The interrelationships of the various elements of planning in a nuclear-research-reactor facility are extremely complex. The traffic flow of operating personnel involves the reactor area, "Hot Areas," "Warm Areas," and "Clean Areas." The control of visitors to each of these areas is restricted, limited, or nonexistent—depending on the day-to-day work schedule within the building. Adding to complexity within each of the areas, and between areas, are the required health controls for personnel and the movement of materials.

In addition to the usual design require-

* *Architect, Engineering Department, AMF Atomics.*



ments in which highly irradiated materials are handled, flexibility of arrangement, and future expansion, there are areas of special design for the architect in nuclear-research facilities. The following descriptions of these areas are not intended to be complete; but merely introductory.

Containment. AEC requires assurance that the surrounding population will not be jeopardized by the release of radioactive products to the atmosphere. This depends upon the type of reactor, power level, exclusion area, and local site conditions. Generally speaking, the building is designed with a minimum of doors and other openings. The design, approached in this manner, will minimize possible leakage of air from the building to the outside in the event of a nuclear incident.

The "Hot Area" is, as the name implies, the principal location where highly radioactive material is handled.

The "Warm Area" includes the various facilities required to support the "Hot Area" such as laboratories, machine shop, instrument shop, counting room, health physics office, mechanical equipment room, changing room and shipping, receiving, and storage areas.

The "Clean Area" is isolated from the other areas and includes rooms normally required for administering a facility of this type such as offices, reception room, conference room, library, telephone room, lunch room, etc.

The reactor area includes the reactor, ample operating space adjacent to the reactor as well as above the reactor, a truck entrance, and an overhead crane. The overhead crane is required to service the areas around and above the reactor, as well as incoming trucking. An auxiliary hoist is useful for handling light equipment.

A hot laboratory area is a section of the building wherein experiments are performed with extremely radioactive material.

The various areas within a hot laboratory area are dependent on each other. The center of the area is a *hot cell*, or cells, containing experimental set-ups. Generally, the loading of the hot cell is done from one face, and operation or observation is done from one of the other faces of the hot cell. Conversely, unloading of the hot cell is also done from the loading face. Therefore, it is desirable to have the hot-storage area, equipment-decontamination room, and hot-waste-processing area readily accessible to the loading area.

A hot cell is designed so that its biological shielding walls will reduce the intensity of its contents, so that the background radiation level outside the cell is well within the maximum possible tolerance for the operating personnel. Also, a hot cell generally includes a shielded door, shielded viewing window, master-slave manipulators, remotely controlled monorail hoist, access holes, plugs for transferring samples or supplying standard services and optical devices.

The operating area extends along the full length of the front face of a hot cell, and the loading area extends along the full length of the rear face. Access is required from the loading area to the hot-storage area, hot-waste-processing area, and equipment-decontamination room. Hot-storage area consists of storage tubes encased in concrete and covered with plugs. Storage tubes have the same shielding requirements as hot-cell walls. The equipment-decontamination room contains acid-resistant sinks and a floor drain to the contaminated-waste system.

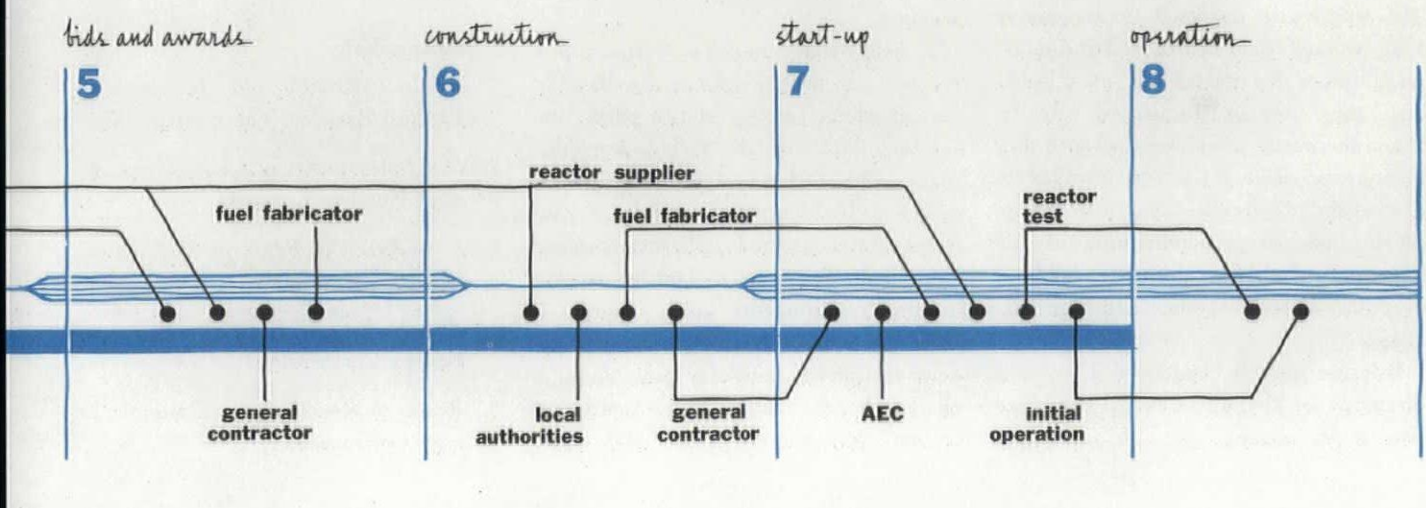
Warm laboratories are used for chemically analyzing radioactive materials, developing the processes that are used on a larger scale in the Hot Area, and executing a variety of general chemical experiments using small amounts of radioactive materials as tracers (isotopes used in small quantities to follow chemical, metallurgical, or biological processes, tracing their movements by means of their continuous emission of nuclear radiation). The use of movable partitions is desirable, so that the laboratory areas may be rearranged at the convenience of the occupants. However, equipment such as hoods, sinks, work tables, etc., are permanently installed. Services for each laboratory include compressed air, gas, steam, vacuum, hot and cold water, electric power, etc., as required.

The machine shop is used for maintenance purposes and for preparing experimental set-ups. Generally, an outside machine shop is available to handle any large work. Typical equipment required for a machine shop includes lathes, drill press, grinder, cut-off saw, milling machine, pipe-fabrication equipment, welding equipment (Heliarc), miscellaneous tools, benches and furniture, and raw materials and stores.

The instrument shop is used for maintenance, repair, and calibration of the reactor-control system, the monitoring system, and the electronic experimental equipment.

The counting room is used for radiation measurements and is completely shielded. Ample counter space is required for counting equipment and devices. Space is also required for desks and filing cabinets.

The health physics office is used by the Health Physics staff, which supervises protection of all personnel. Space is re-



quired for desks, filing cabinets, etc.

The mechanical-equipment room contains heating, ventilating, air-conditioning, electrical, and telephone equipment required for a facility of this type.

The changing room contains showers, "cold" clothing storage, "hot" clothing storage, sink, toilets, and lockers.

The control room contains controls for operating the reactor and is located in an advantageous position for viewing reactor operation. The room is sized for control-equipment racks, operating console, and normal operating requirements.

The observation room provides for visitor control and may also be used as a classroom. Experience has shown that lecturing to visitors in the reactor area is difficult due to acoustical problems; and visitors in the control room make normal operation of the reactor and experimental work difficult.

Toilet and lavatory facilities are provided for both men and women in all areas. Emergency safety showers and eye-baths are provided in "hot" and "warm" areas.

Storage areas consist of general storage space, shielded storage for radioactive test assemblies, and a storage vault for storage of unused fuel or test assemblies.

Special requirements. In addition to the general elements of planning mentioned above, the "swimming pool" type of research reactor requires a pump room, and a storage and/or hold-up tank (to provide hold-up of the circulating demineralized water used for cooling the reactor).

The radioactive-waste-disposal system collects all wastes capable of containing radioactivity. Radioactive wastes originate in hot cells, hot laboratories, warm laboratories, decontamination areas, etc. The wastes are collected in a common sump or tank, then neutralized and monitored. When the wastes are below tolerance they may be discharged directly. When the wastes are above tolerance they must be reduced to a tolerable level before discharging. Generally, this is done by employing one or a combination of the following methods: dilution, hold-up, evaporation-condensation, and ion exchange.

Dilution may be employed to permit discharge of the waste below tolerance level if the waste is not too active and a large volume of water is available.

A series of hold-up tanks may be provided to contain the waste for a sufficient decay period. When the waste reaches a tolerable level, it is discharged.

In an evaporation-condensation system, the waste is collected, evaporated, and the decontaminated condensate routed through an activity monitoring station to discharge. The concentrated residues from the evaporator are collected and transferred to shielded casks for shipment to disposal. This method involves a rather expensive installation where semi-remote operations are involved.

Ion exchange is often employed to reduce nonvolatile water activity due to various isotopes. This is an attractive method of handling wastes. However, further consideration must be given to the disposal of radioactive wash liquids used in regenerating the resins. If a cartridge-type demineralizer is used, plans for handling and disposal of the hot cartridge must be made.

Design of the radioactive-waste-disposal system requires careful analysis of the operations to be performed in order to determine the types and volumes of waste to be handled. In addition, local conditions, and Federal, local, and state regulations must be determined before the most economical system is selected.

Strict regulations are imposed on radiation levels of ventilating air to remove possible airborne contamination. Thus, the development of a high-efficiency filtering system with control and safety devices is required.

Power Reactors. Building design described thus far, in this section, is applicable mainly to research reactors. There are additional areas of design—of special interest to the architect—in building design and construction for power reactors.

A heavy-water moderated-type power reactor is an integral part of a generating station which consists of two parts—the reactor plant and the turbine-generator plant. The turbine-generator plant requires a building of conventional construction to house and support the process equipment. The reactor plant has certain housing requirements which separate it from the turbine plant: shielding of reactor equipment, control of contamination carried by personnel or by the ventilating system. Maintenance space and crane service for handling heavy equipment are required for both the reactor plant and the turbine generator plant.

A service area or wing is required to house facilities for equipment maintenance, storage of spare parts, and the ventilation ducts, fans, and filters.

A control area or wing is required for the control room, control laboratory, heating plant, instrument service shop, changing rooms, laundry, electrical service rooms, and inactive-reactor auxiliary cooling system, offices, lunchroom, and first-aid room. Regulations for waste disposal and ventilation of air apply to power reactors as well as research and/or training reactors. The fuel in a reactor generates heat in the process of radioactive decay of the fission products. This heat must be removed to avoid damage to the reactor-core components. As a result, the reactor must have highly reliable sources of electrical power for station services, including the reactor-cooling equipment. A generator for essential auxiliaries is desirable, as well as batteries to supply power for controls and emergency lighting.

conclusions

Architects are, and will continue to be, involved in nuclear-reactor projects, because the complex functional requirements of these buildings demand architectural planning and architectural expression. It is impossible to forecast the amount of nuclear-reactor work requiring architectural consideration during the next decade. However, the need is present and the assumption can be made that as nuclear research, nuclear power, and the application of nuclear energy to our daily lives increase, it behooves the architect to be well informed, and on the alert for new developments in this young, dynamic science.

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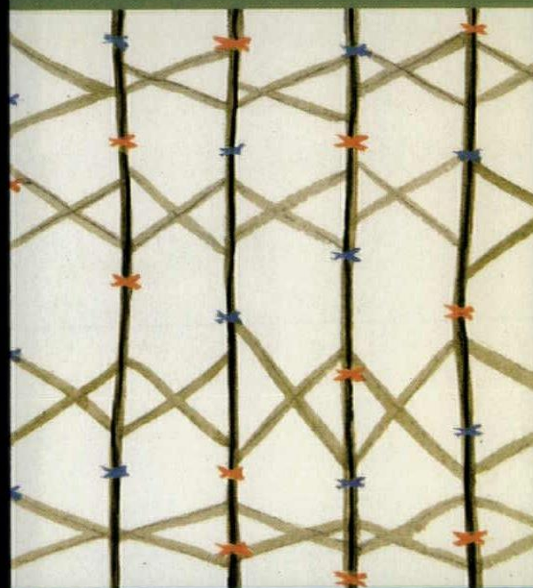
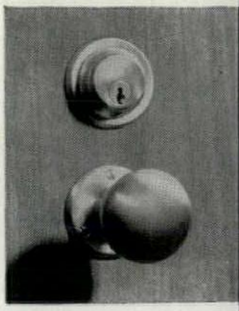
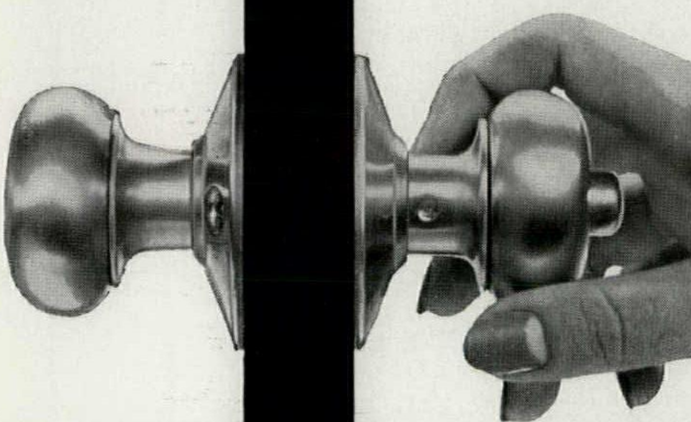
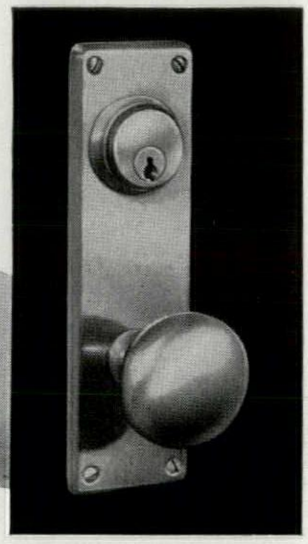


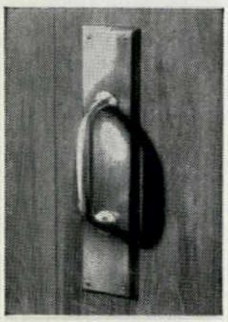
New steels are born at Armco

Now...The Timeless Beauty and Durability of Armco Stainless Steel in Locksets and Hardware









Typical of the rapidly expanding use of this hard, strong, corrosion resistant and economical metal in contemporary architecture, standard locksets and door hardware are now available in stainless steel.

These small but important and much-noticed building components get rough service. Exposed to a combination of weather, dirt, perspiration, abrasion and severe knocks, hardware can quickly get a run-down look that detracts from a building's appearance . . . just as a frayed collar or scuffed shoes can spoil personal appearance.

But when you use hardware made of Armco Stainless Steel, you are assured that it will remain attractive for years with little or no maintenance. That's because stainless steel is solid metal all the way through. There's no coating or plating to chip or wear off. It won't tarnish and resists scratching and denting.

Protect the beauty of *your* designs and give your clients the economy of low-maintenance, replacement-free service by specifying stainless steel hardware for both interior and exterior doors. For additional information on the use of stainless in architecture and the names of manufacturers of stainless steel door hardware as well as other building products, write Armco Steel Corporation, 3048 Curtis Street, Middletown, Ohio.

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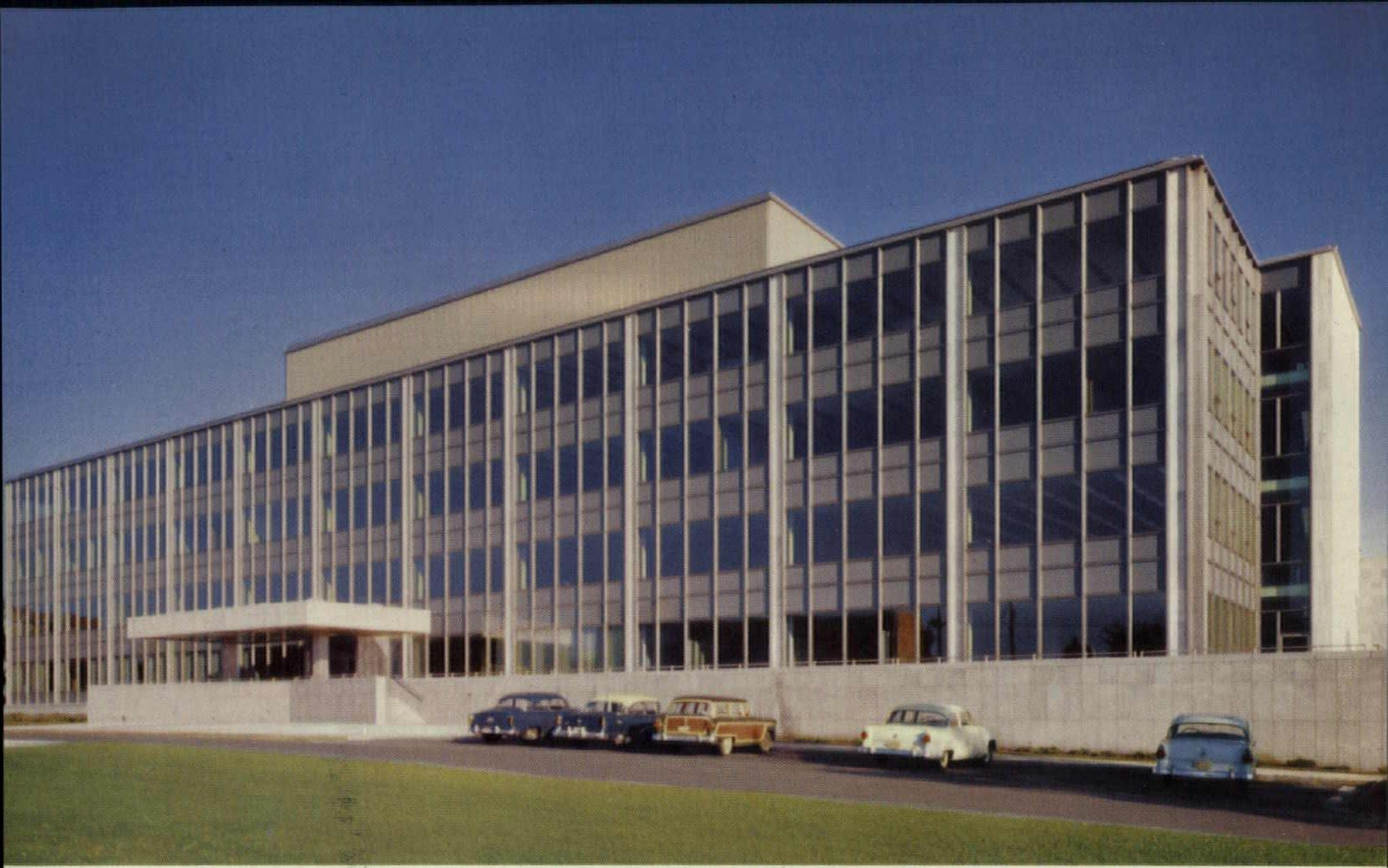
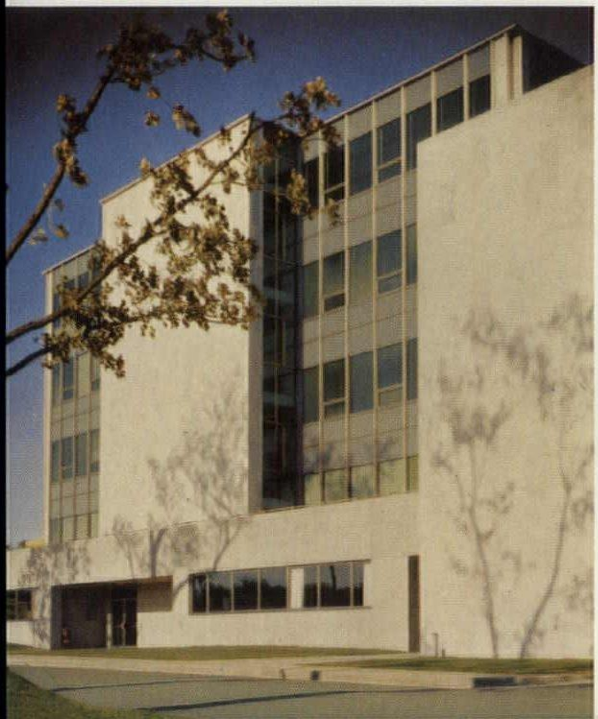


Curtis Recessed Alzak Aluminum Troffers provide high level general illumination, low-brightness quality, in the American Hardware Mutual Insurance Company building, Minneapolis, Minn. Architects: Thorshov & Cerny. Engineer: Leonard Johnson.

Curtis Visioneers introduce

new horizons in illumination . . .

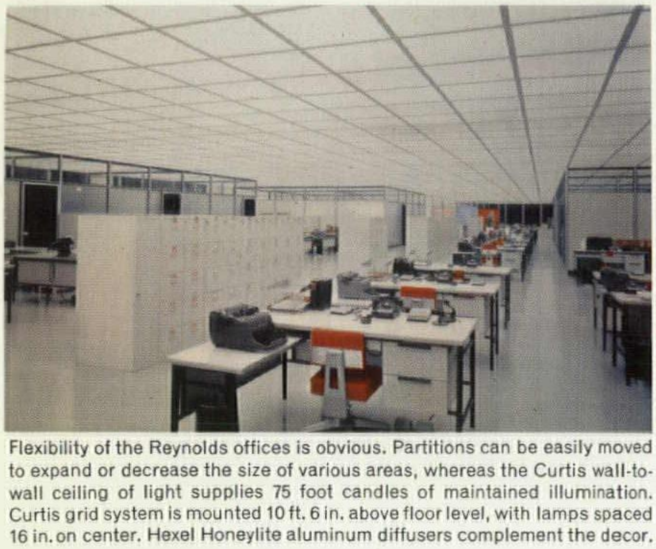
A touch of tomorrow today



The fast tempo of modern life is characterized by efforts to grasp the future and make it live now. The development and design of advanced lighting equipment to fulfill this goal is a prime Curtis purpose. To serve you better, with products of the future, Curtis is staffed with a group of highly trained and skilled Visioneers (Vision Engineers). These men are constantly looking beyond horizons, adapting new concepts that make for improved lighting. Curtis has over 50 important "firsts" in the science of illumination. Two very significant ones are: (a) development of the concept of lighting from concealed sources, helping end the era of the bare lamp on a drop cord; (b) the pioneering of the Alzak process for permanently finishing aluminum reflectors. If you want lighting today with a touch of tomorrow . . . look to Curtis.

On the following pages see how Curtis Visioneers have given the modern feel in lighting to industry . . .

Reynolds Metals Company, Richmond, Va. Modular design of second and third floors severely tested Curtis ingenuity. To appreciate the enormity of this Curtis Visioneered project—one thousand 10 ft. by 10 ft. grids were used. Architect: Skidmore, Owings & Merrill. Consulting Engineer: Ebasco Services.



Flexibility of the Reynolds offices is obvious. Partitions can be easily moved to expand or decrease the size of various areas, whereas the Curtis wall-to-wall ceiling of light supplies 75 foot candles of maintained illumination. Curtis grid system is mounted 10 ft. 6 in. above floor level, with lamps spaced 16 in. on center. Hexel Honeylite aluminum diffusers complement the decor.

The look of the future in lighting for Reynolds

To cope with things to come and anticipate the demands of to-morrow, those who mold our nation's products should have a talent that combines ability with versatility. Curtis Visioneers met one of the greatest challenges to their originality and inventiveness in designing a lighting system for the Reynolds Metals Company building in Richmond, Va. Objective was to provide a 100,000 sq. ft. area with illumination that would be permanent yet allow for future changes in the floor plans in keeping with modular concept. Another stipulation was that the installation must coordinate with the air conditioning and sound proofing. Curtis Visioneers solved this multiple problem by forming a completely custom-engineered special aluminum folding grid system . . . a wall-to-wall ceiling of light. No matter how floor arrangements are changed, uniform low brightness will be retained throughout. Through special folding "packages", which permitted 100 sq. ft. of lighting to be installed at one time, an estimated 8,000 man hours were saved, or approximately $50,000.00.

Vast expanse of office areas can be altered to any size or shape without destroying ceiling pattern or lowering lighting standards. In this special Curtis grid installation, aluminum materials were used throughout. Maintenance advantages are: ease of relamping, ready access to wiring, and simple replacement of the ballasts.

Hallmark Cards, Kansas City, Mo., where Curtis Visioneers "personalized" the illumination system to harmonize with company qualities. Architect & Consulting Engineer: Welton Beckett.

Illumination in the modern mood . . . for Hallmark Cards

As the present catches up with the future, buildings must be more than mere places of work for people who breathe life into industry. To capture the feeling of its product, Hallmark Cards adapted the warm spirit of greeting to its new building in Kansas City, Mo. The exterior countenance reflects a buoyant personality one would naturally associate with a greeting card company. The same sparkling atmosphere permeates the office interiors, where all the furnishings have been selected with an eye to comfort and creative inspiration. In keeping with this setting, Curtis Visioneers provided a lighting system which would complete the theme of visual charm and visual well-being. They accomplished this through the use of Curtis Alzak aluminum low-brightness troffers and Curtis Vari-Spot recessed incandescent units. The careful application of these quality products assured glare-free illumination and accentuated the esthetic characteristics of the Hallmark Cards building.

Curtis Vari-Spots produce attractive lighting patterns in various lobbies of the Hallmark Cards building. Reception room shown is approximately 45 ft. by 45 ft. Vari-Spots are used here to accent two areas. Each is effectively dramatized.

Louise Sloane showrooms

Manufacturers' showrooms have a mighty merchandising function to perform: they must be forceful sales aids, both for the firm's products and for the firm's corporate image. The designers of the three showrooms we present this month have accomplished their task well, for in each case the showroom bespeaks the client-character to be projected.

The point of view may have been easiest for Estelle and Erwine Laverne, since it is their own showroom, where architectural and decorative merchandise of their own design or selection is sold. The total plan effectively expresses the couple's individual and distinctive design approach, and results in an impressive integration of display background with the objects on display. In opening two new floors above their former space, the Lavernes turned architectural handicaps of an old building into assets, camouflaged unsightly air-conditioning ducts by introducing an indoor garden area below, a mural court above.

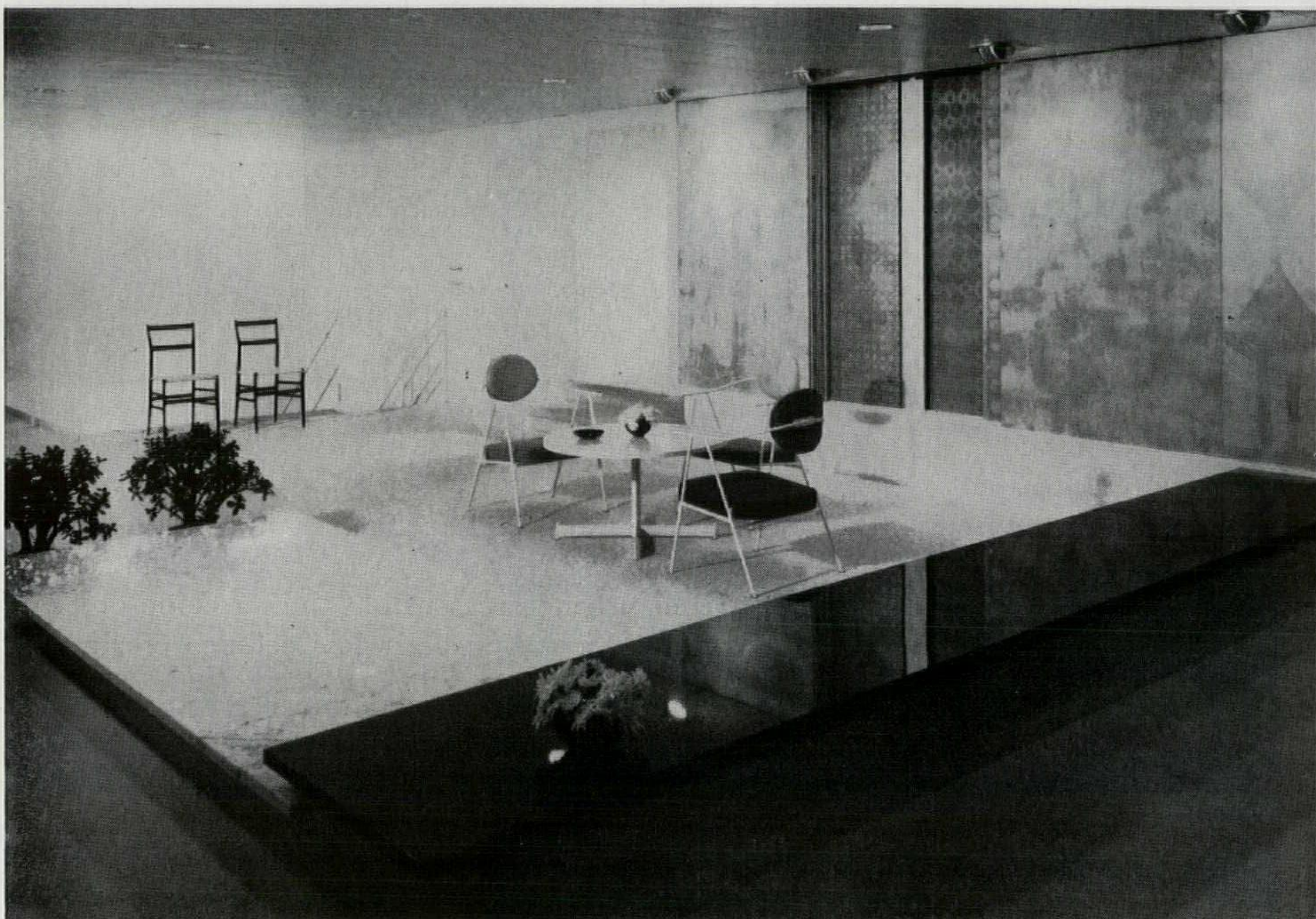
For the New York office-showrooms of Shulton, Inc., manufacturers of men's and women's toiletries, Designers Williams & Wells were required to provide a complex of public and private areas within the envelope of a somewhat less-than-contemporary building. Unusually low ceilings created a design obstacle, and a carefully watched budget demanded that effects be achieved by simple means. We show the foyer with adjacent lounge area, and the display showrooms, where the designers are to be commended for their discretion. Bypassing the aura of chi-chi commonly associated with cosmetics, they chose clean lines, sparkling colors, textural planes to accomplish a serene, yet warmly cheerful atmosphere.

Through a masterly handling of lighting and color, Designer Ward Bennett converted a featureless space into an intimate and inviting showcase for the furniture collection he designs for Lehigh Furniture Corporation. Bennett ingeniously used the simplest tools for his effects—paint, felt, expanded metal. The atmosphere is that of a dark, sheltering cave, with pools of light spilling from concealed sources to bring the furniture on display into brilliant and unmistakable view.

Penthouse floor in Laverne showroom, devoted to Piranesi imports, displays both contemporary and traditional furniture from Italy. Note lighted Fiberglas print of Matisse painting, from which the setting takes its brilliant colors—yellow rug, blue vitrine against blue wall, red and green side chairs, white background.

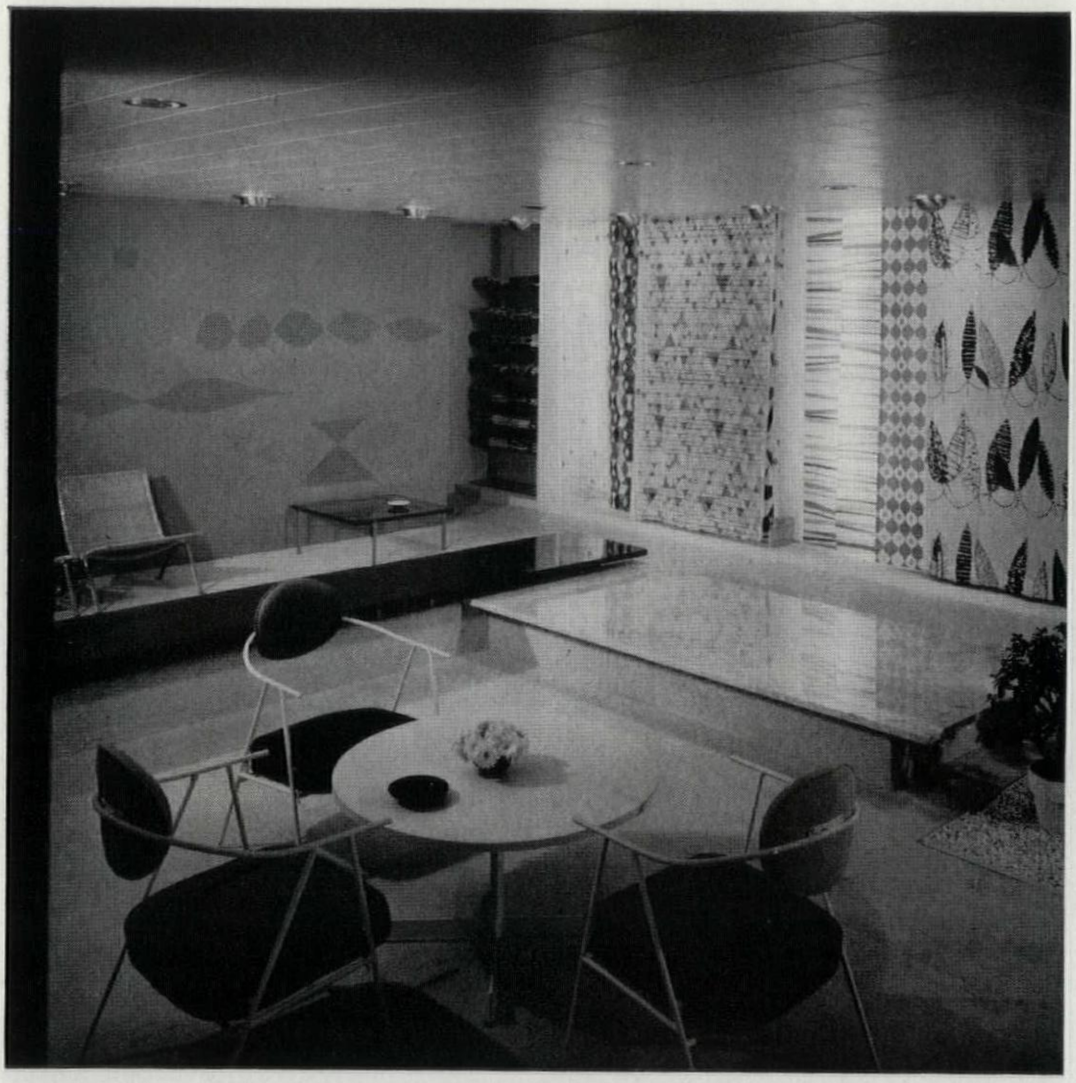
showrooms

client	Laverne, Inc.
location	New York, New York
designers	Estelle and Erwine Laverne



Photos: Alexandre Georges

indoor garden area



data

Color Plan: Background is dominantly white, with the display of wall coverings, drapery fabrics, and furniture upholstery providing all color contrasts. Brilliant orange, with a surprising dash of neon purple, is introduced in furniture display area.

windows

At Stairway: floor-to-ceiling opaque glass unifies a group of odd-shaped windows.

Drapery: two-floor-high fall of white plastic-bead drapery/Laverne, Inc., 160 E. 57 St., New York 22, N. Y.

furniture

All: low marble built-in benches in Mural Court, mobile chairs and tables, Danish and Italian imports/ Laverne, Inc.

lighting

All: designed by the Lavernes.

walls, ceiling, flooring

Mural Court Walls: one has sliding mural display; opposite wall, sliding panels of fabric prints lighted from behind; stairwell wall is covered in "Patina," white tone-on-tone textured canvas; wall opposite stairway holds textured mural, an abstract design in taupe tones, designed by the Lavernes/Laverne, Inc.

Ceiling: sound-proofed/National Acoustics, 514 W. 36 St., New York, N. Y.

Flooring: wall-to-wall carpet/all wool/ white.

accessories

Garden Planters: metal/Laverne, Inc.
Sculpture: metal/Herbert Kallem.

showrooms

client	Shulton, Inc.
location	New York, New York
design consultants	Williams & Wells
architects	Architectural Office, Rockefeller Center, Inc.

Photos: Alexandre Georges

pendant display for new products

data

Color Plan: In the public areas, off-white or champagne walls rise above gold or beige carpet, or honey-toned vinyl-plastic tile, inset with diamond-shaped brass studs. Curtains are neutral; a jewel sparkle of color is obtained through acid green, turquoise, and orange upholstery fabrics. Along the perimeter of the showrooms, the colors of the products displayed seem to be multiplied prismatic reflections of the larger color areas.

cabinetwork, partitions

Lounge Partitions: metal-and-glass partitions/alumilited black aluminum/turquoise doors/Northern Studios, Inc., **25-52 Crescent St., Long Island City 1, N. Y.**

Lounge Screen: wood panels/off-white/brass screws/Atlas Woodwork Corp., 4077 Park Ave., Bronx, N. Y.

Showroom Display Console: teak/white Micarta inlay/Atlas Woodwork Corp.

Showroom Pendant Display: gold mesh/white Carrara glass/white painted steel/Hudson Fixtures, Inc., 213 E. 38 St., New York, N. Y.

doors, windows

Entrance Door: "Herculite"/Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa.

Lounge Doors: Weldwood "Staystrate"/flush panel/United States Plywood Corp., 55 W. 44th St., New York 36, N. Y.

Showroom Draperies: Fiberglas vertical lace/sand color/Ben Rose, Inc., 1129 W. Sheridan Rd., Chicago 40. Ill.

Showroom Blinds: "Bambino" reed/Holland Shade Co., 999 Third Ave., New York, N. Y.

furniture, fabrics

Entrance/Reception Area

Desk, Planter: teak Parkwood top/gold-anodized wire mesh/custom-made/Atlas Woodwork Corp.

Chairs, Sofa: Edward A. Roffman Associates, 17 E. 48th St., New York, N. Y.; acid-green chair upholstery/Henrose Co., Inc., 19 E. 53rd St., New York, N. Y.; black-and-brown sofa upholstery/Boris Kroll Fabrics, Inc., 220 E. 51st St., New York 22, N. Y.

Coffee Table: teak Parkwood/Janet Rosenblum, Inc., 602 Madison Ave., New York 22, N. Y.

Lounge/Foyer

Chairs: armless/upholstered/Edward A. Roffman Associates.

Sofa: custom-made/Edward A. Roffman Associates.

Tables: Vermont marble/black iron/Lehigh Furniture Corp., 16 E. 53rd St., New York 22, N. Y.

Coffee Table: teak/black iron/Janet Rosenblum, Inc.

Showroom

Sofa, Chairs: Edward A. Roffman Associates; blue-green stripe sofa upholstery/Jack Lenor Larsen, Inc., 16 E. 55th St., New York 22, N. Y.; turquoise chair upholstery/Jofa, Inc., 45 E. 53rd St., New York, N. Y.

Wood Chairs: Janet Rosenblum, Inc.; light orange upholstery/Stroheim & Romann, 35 E. 53rd St., New York, N. Y.

Small Tables: brass/white marble/Janet Rosenblum, Inc.

lighting

Pendant Fixture: brass/Finnish-American Trading Corp., 41 E. 50th St., New York 22, N. Y.

Field Lights, Incandescent Downlights: The Frink Corp., 27-01 Bridge Plaza N., Long Island City 1, N. Y.; Geo. Kleinknecht Co., 140 W. 19th St., New York, N. Y.

Custom Lamp: brass/white shade/Tasson, 556 Madison Ave., New York, N. Y.

walls, ceiling, flooring

Walls: plaster/painted.

Wallpaper: "Yen"/Albert Van Luit & Co., 515 Madison Ave., New York, N. Y.

Ceilings: "Acoustone"/off-white/United States Gypsum Co., 300 W. Adams St., Chicago 6. Ill.

Entrance Flooring: custom "Corlon" tile/antique ivory/brass diamond-shaped inserts/Armstrong Cork Co., Lancaster, Pa.

Lounge Area Rug: wool/beige with orange stripe/custom-woven in Puerto Rico.

Showroom Carpet: "Gulistan"/gold/A. & M. Karagheusian, Inc., 295 Fifth Ave., New York, N. Y.

accessories

Planting: at entrance/Trepel Florist, 1 Rockefeller Plaza, New York, N. Y.; showroom/Plants from the Tropics, 161 E. 53rd St., New York, N. Y.

showrooms

client | Lehigh Furniture Corporation
location | New York, New York
designer | Ward Bennett

Photos: Hans Van Nes

green-felt wall, modular screens

data

Color Plan: Predominant color is black, to lower ceiling and give walls a feeling of enclosure. Combined with the black are white curtains, pearl gray flooring, and dramatic accents of brilliant green and mustard yellow in felt-covered walls.

furniture

All: Lehigh Furniture Corp., 16 E. 53rd St., New York 22, N. Y.

lighting

Lamps: designed by Ward Bennett/ Harry Gitlin, 917 Third Ave., New York 22, N. Y.

Darklights: Edison Price, Inc., 238 E. 44th St., New York 17, N. Y.

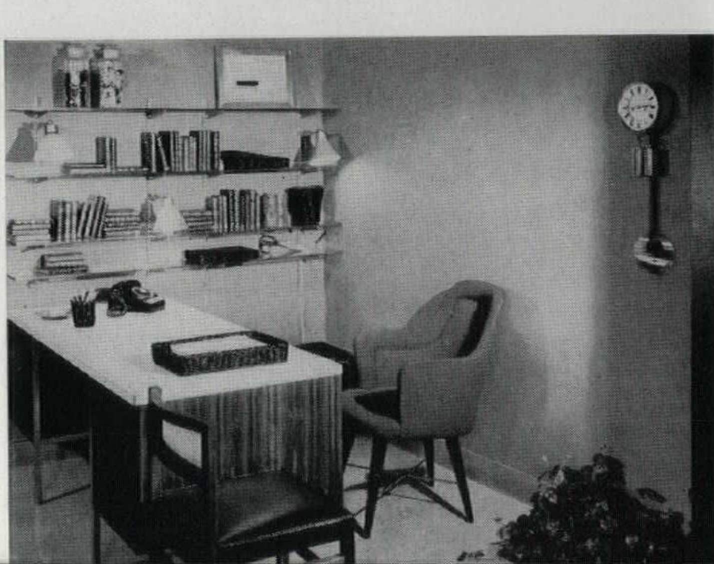
walls, flooring

Felt-Covered Walls: American Felt Co, Glenville, Conn.

Screens: "Arma-Weave" aluminum panels/walnut frame/Expanded Metal Engineering Co., 2-01 50th Ave., Long Island City, N. Y.

Entrance Flooring: rubber tile/studded with stainless steel/custom/Gotham Carpet Associates, Inc., 515 Madison Ave., New York, N. Y.

Display Area Flooring: Matico rubber tile/pearl gray/Mastic Tile Corp. of America, P. O. Box 1151, Newburgh, N. Y.



Accent on Excellence

Youngstown "Buckeye" steel conduit

At Carling's ultra-modern $10 million plant recently erected at Atlanta, Georgia, Youngstown "Buckeye" Full Weight Rigid Steel Conduit was installed for lifetime protection of the brewery's all important electrical wiring system. That's because steel conduit is today's *only* method of wiring protection approved by the National Electrical Code.

When you specify "Buckeye" Conduit, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create electrical wiring systems with an "accent on excellence".

QUALITY YOUNGSTOWN SERVICE

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY
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Manufacturers of Carbon, Alloy and Yoloy Steel

Carling Brewing Co.,
Atlanta, Georgia

ARCHITECTS:
Designed by Carling Brewing Company
GENERAL CONTRACTORS:
Beers Construction Co., Atlanta, Georgia
ELECTRICAL CONTRACTOR:
White Electrical Construction Co., Atlanta, Ga.
"BUCKEYE" CONDUIT SUPPLIED BY:
Electrical Wholesalers, Inc., Atlanta, Georgia

Carefully selected
Continuous Weld pipe

is first accurately threaded. Next, the pipe is thoroughly cleaned by pickling. Then it is immersed in a bath of molten pure zinc. A special process is used to remove it from this bath so that a clean, smooth zinc coating remains on both inside and outside. Then a coating of tough, transparent lacquer is baked on both inside and outside surfaces, providing a smooth raceway through which wires may be easily fished. This is Youngstown's long-lasting, trouble-free, easy-bending hot galvanized Buckeye Conduit.

PLANNING INSTALLATIONS Nick Stivaletta (left) and his brother Mike (standing) plan locations for telephone outlets in a new home with Don Cotter of the telephone company.

"A popular feature that pays off– that's concealed telephone wiring"

—say Mike and Nick Stivaletta, Builders, of Randolph, Mass.

"Concealed telephone wiring is a 'must'," say Mike and Nick Stivaletta. "People know about it and demand it. In our new Deer Park Development, for example, all 250 homes will have it.

"For such a small outlay, it sure pays off. Easy to put in, neat, attractive, it tells our prospects that we're giving them value. We mention in our newspaper advertising that our homes are telephone planned. In today's competitive market we wouldn't offer a home that wasn't."

• • •

Your local Bell Telephone business office will be glad to help you with concealed wiring plans. For details on home telephone wiring, see Sweet's Light Construction File, 8i/Be. For commercial installations, Sweet's Architectural File, 32a/Be.

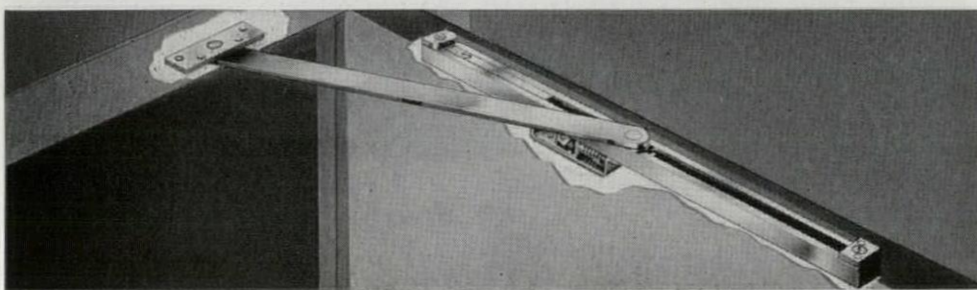
BELL TELEPHONE SYSTEM

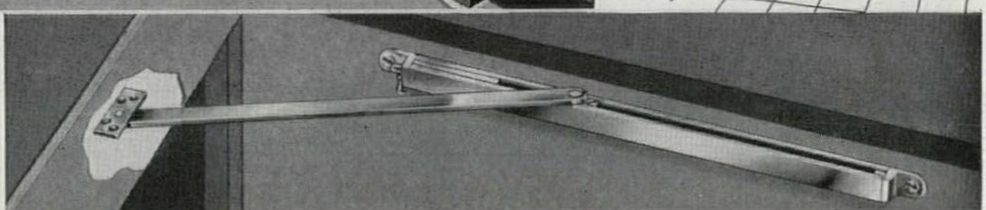
GLYNN·JOHNSON

the complete line of OVERHEAD *
DOOR HOLDERS

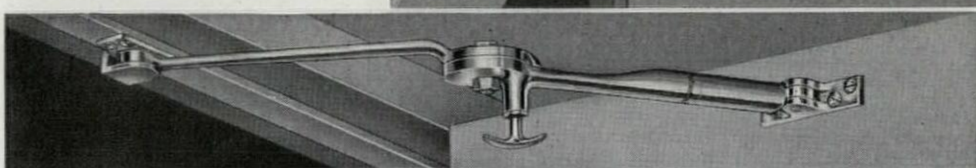
**overhead means out-of-the-way...*

no stumbling hazards—no interference with cleaning

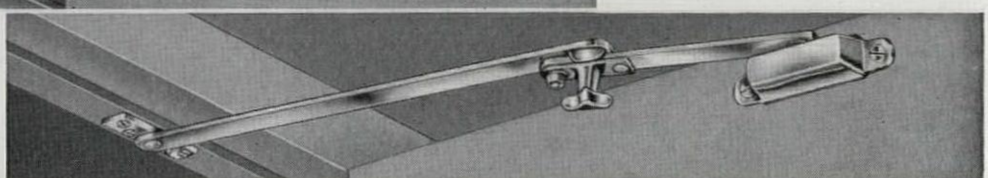




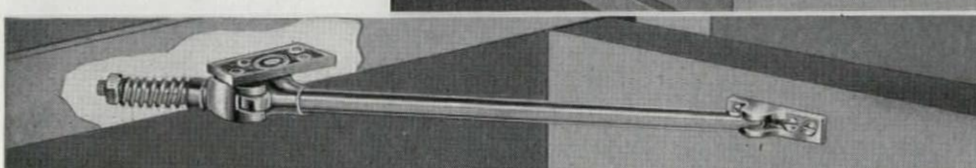
▲GJ 100 **concealed** **(non-handed)** **GJ 90▶** **surface type** **(handed)** **for single and double acting doors.** The finest in appearance and long, trouble-free wear.



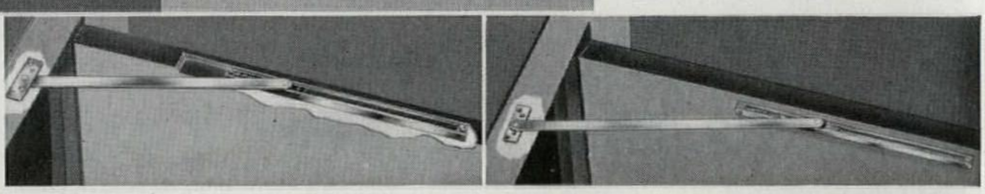
◀GJ ARISTOCRAT (non-handed) for single acting doors. Ruggedly built for hard, practical usage.



GJ 80▶ (handed) for single acting doors. For moderate cost installations.



◀ GJ 70 (non-handed) for single acting doors. Inexpensive for low-cost installations.



GJ 300 and GJ 500 series▶ **(non-handed)** concealed for single and double acting interior doors. Surface type for single acting doors. Spring cushion types and friction holder type.

CUSHION THE STOP... silently absorbing the shock of violent openings.

HOLD THE DOOR... hold-open engages silently . . . holds firmly . . . releases easily.

"*Life of the building*" GJ Overhead Door Holders are made of highest tensile strength alloys requiring minimum maintenance or replacements. They have built-in shock absorbers to cushion the stop and are made in various sizes for any width door.

Write for complete details and templates.

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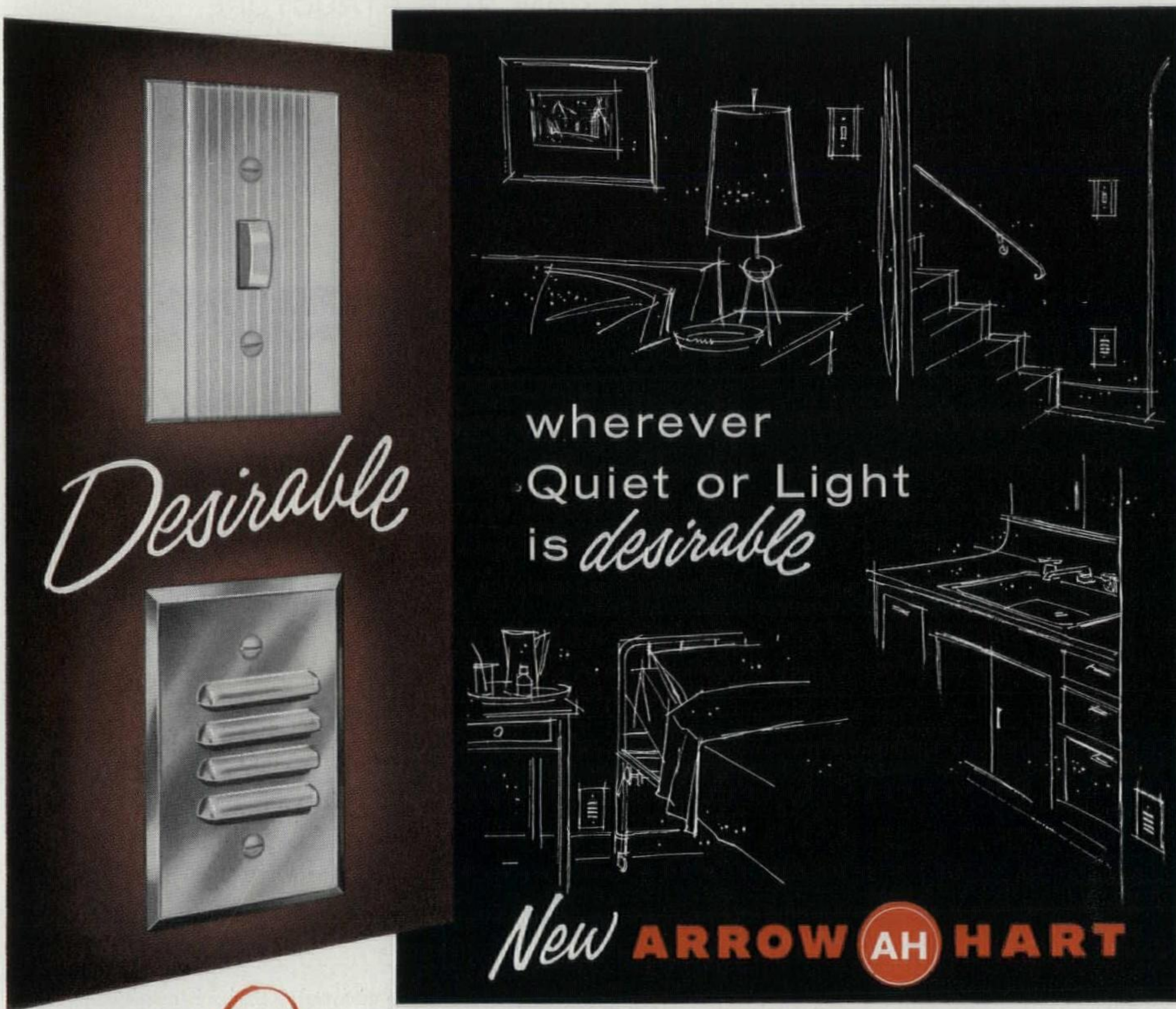
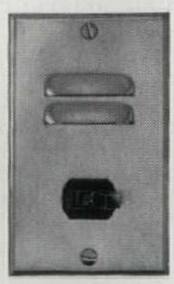


Quiette TAP ACTION SWITCHES and LOUVRE-PILOT LIGHT COMBINATIONS

No. 2891-I
Quiette Tap Action Switch

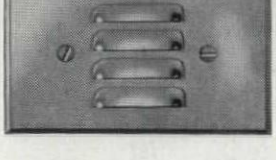


No. 6416
Louvre Combination with Quiette Switch and Pilot Light

For any location requiring both light and quiet. A touch of finger-tip, hand or elbow on button turns incandescent or fluorescent lights and appliances on *or* off. Costs no more than toggle-type switches. Lifetime service. In attractive brown or ivory. *Fits any standard toggle wall plate.* H&H Specification Grade. 15 and 20 amps., 120-277 volts, ac only.

For subdued illumination that will bring peace of mind by lighting the way to safety wherever darkness is dangerous. Each combination supplied with own switch or controlled from wall switch. Fits any standard wall box . . . ideal for re-modernizing. Line includes models available with attractive brush brass, stainless steel, brown or ivory plates, brown or ivory handles.

Write for free H&H Specification Grade, Architect's Specification Index to The Arrow-Hart & Hegeman Electric Company, Dept. PA, 103 Hawthorn Street, Hartford 6, Connecticut.

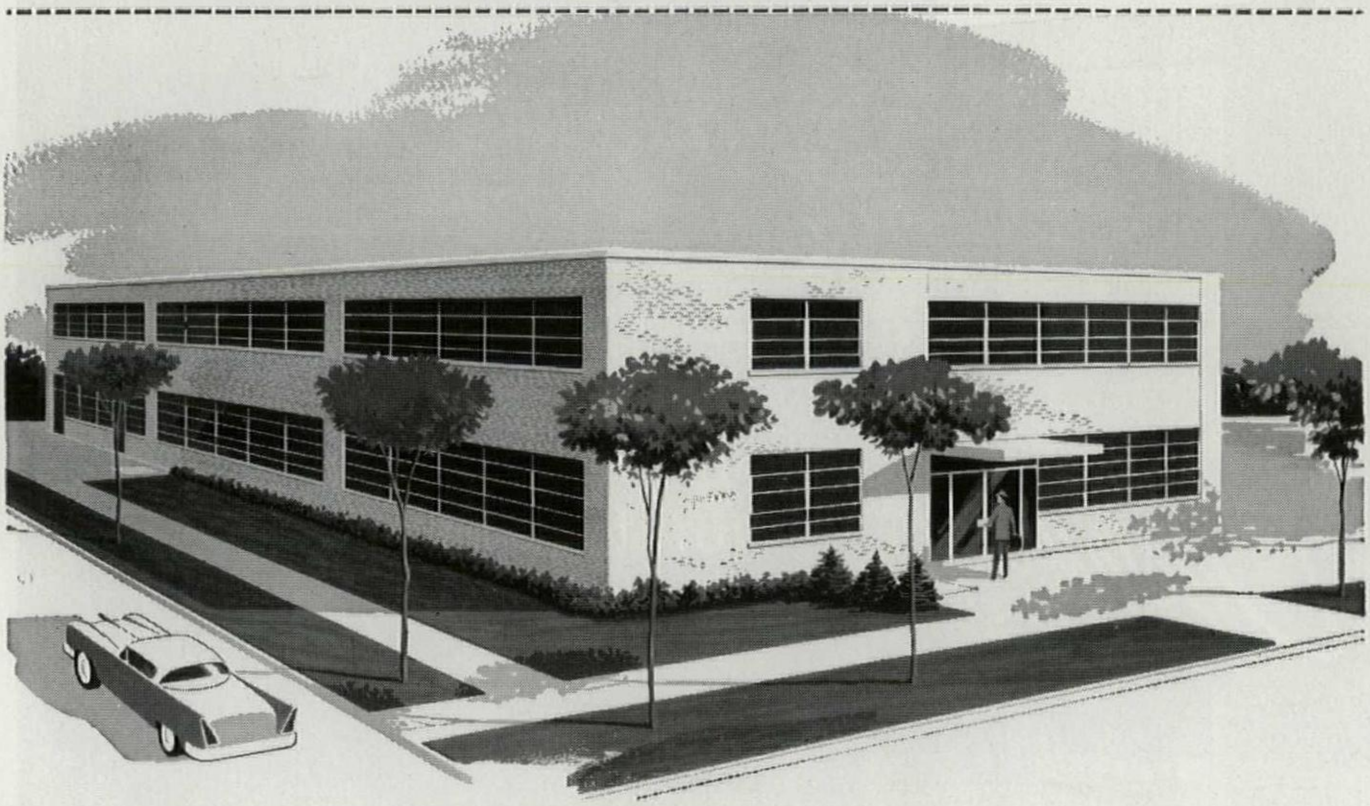


No. 6413
horizontal Louvre Combination with Pilot Light

ARROW AH HART
Quality since 1890

WIRING DEVICES • MOTOR CONTROLS • ENCLOSED SWITCHES • APPLIANCE SWITCHES

ANOTHER PRESTRESSED CONCRETE STRUCTURE

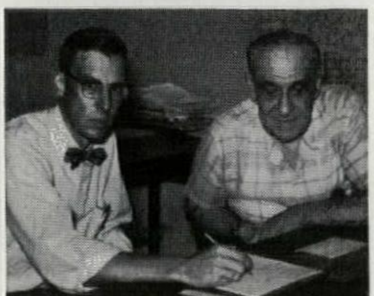


A. Epstein and Sons, Inc. sums up the reasons why PRESTRESSED CONCRETE was chosen for University of Illinois' new digital computer laboratory

Architect's rendering of Digital Computer Laboratory, University of Illinois.

Designers: A. Epstein and Sons, Inc., Engineers, Chicago, Illinois.

All prestressed concrete members by Crest Concrete Systems, Inc., Lemont, Illinois.



Shown here are Arthur Hauswald, Design Engineer, and Joseph M. Brandstetter, Chief Structural Engineer of A. Epstein and Sons, Inc., checking plans for this building.

Designed and made by university personnel, this new digital computer will be used by engineers and industrial concerns on a rental basis.

The firm of A. Epstein and Sons, Inc., Chicago, stated as some of the reasons for choosing prestressed concrete for the laboratory structure . . . "we selected the material for its ease and rapidity of construction, for the all-weather aspects of installation, for the smooth surface on the underside where it formed a ceiling for a semifinished room, and because we thought it particularly applicable to a building housing as modern an instrument as a digital computer."

Whenever and wherever prestressed concrete structures are being designed and erected, there are, as in this instance, a list of *particular* reasons for choosing this material and method. When prestressed concrete is dealt with in the broad sense, there are many *general* reasons that recommend its choice for virtually any kind of structure.

Architects, engineers and contractors are discovering that prestressed concrete's low initial cost, construction speed, structural strength, aesthetic values, low maintenance, as well as the reasons given above, are as readily applied to schools, motels, plants, office buildings, warehouses, parking garages, etc., as they are to a digital computer building.

Since the introduction of this construction method into the United States, John A. Roebling's Sons Corporation has taken an active position on all phases; design elements, prestressing materials and methods, and the constant championing of prestressed concrete as a wholly new and highly important means of building virtually any type of structure.

We have at hand literature, examples and the experience that cover every aspect of prestressed concrete. We will be pleased to share this with you. Any means of communication to Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey, will bring a prompt reply.

CONSULT ROEBLING...*First* in the U. S. with prestressing and tensioning elements

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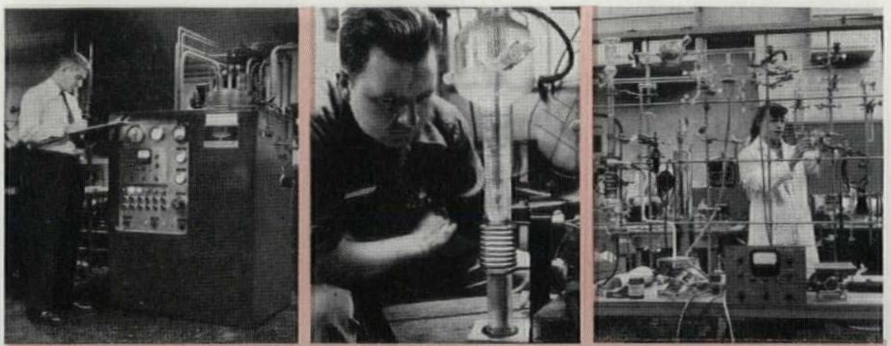
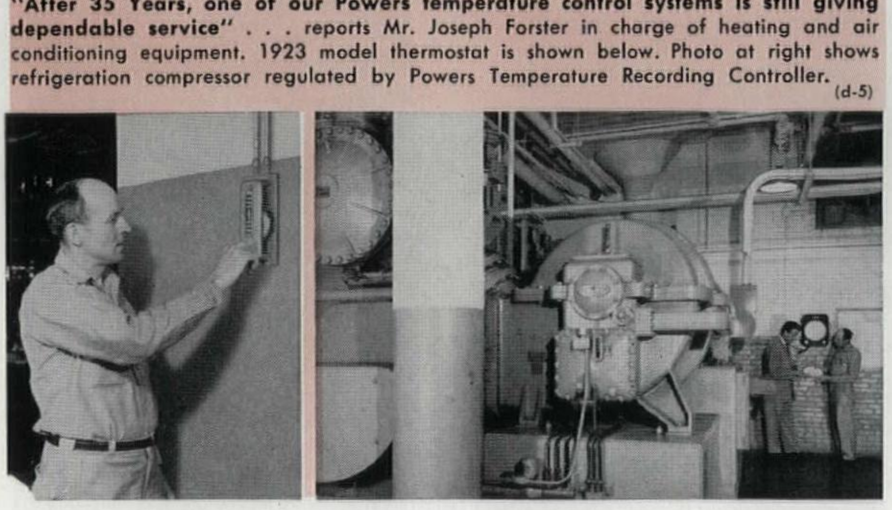
Subsidiary of The Colorado Fuel and Iron Corporation



Research and engineering are important factors in ZENITH'S growth and industry leadership.

One of many assembly lines at Zenith Radio Corporation

"After 35 Years, one of our Powers temperature control systems is still giving dependable service" . . . reports Mr. Joseph Forster in charge of heating and air conditioning equipment. 1923 model thermostat is shown below. Photo at right shows refrigeration compressor regulated by Powers Temperature Recording Controller. (d-5)



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Control for Heating and Air Conditioning helps

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Since 1923—Powers temperature control systems have been used in ZENITH'S six block long plant No. 1 in Chicago. Located here are executive offices, research, engineering and manufacturing facilities producing Zenith's famous line of Television, Radios, High Fidelity instruments and Hearing Aids.

By preventing overheating Powers temperature control reduces heating costs. Office and factory workers accomplish more and make fewer mistakes. Its many years of dependable operation makes Powers control a highly profitable investment.

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How Ceco teamwork helps architects shape the skyline of America

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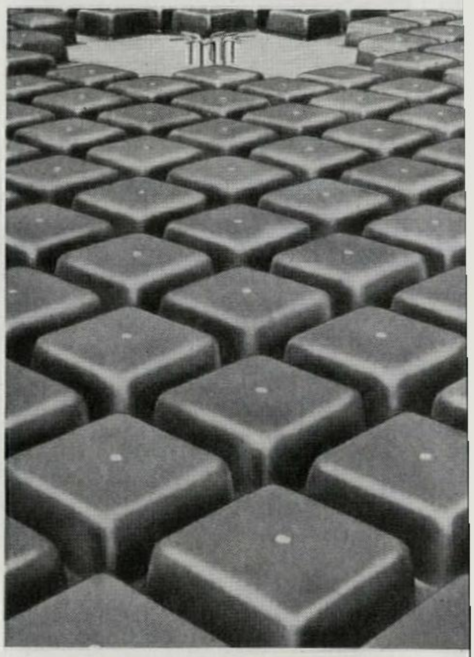
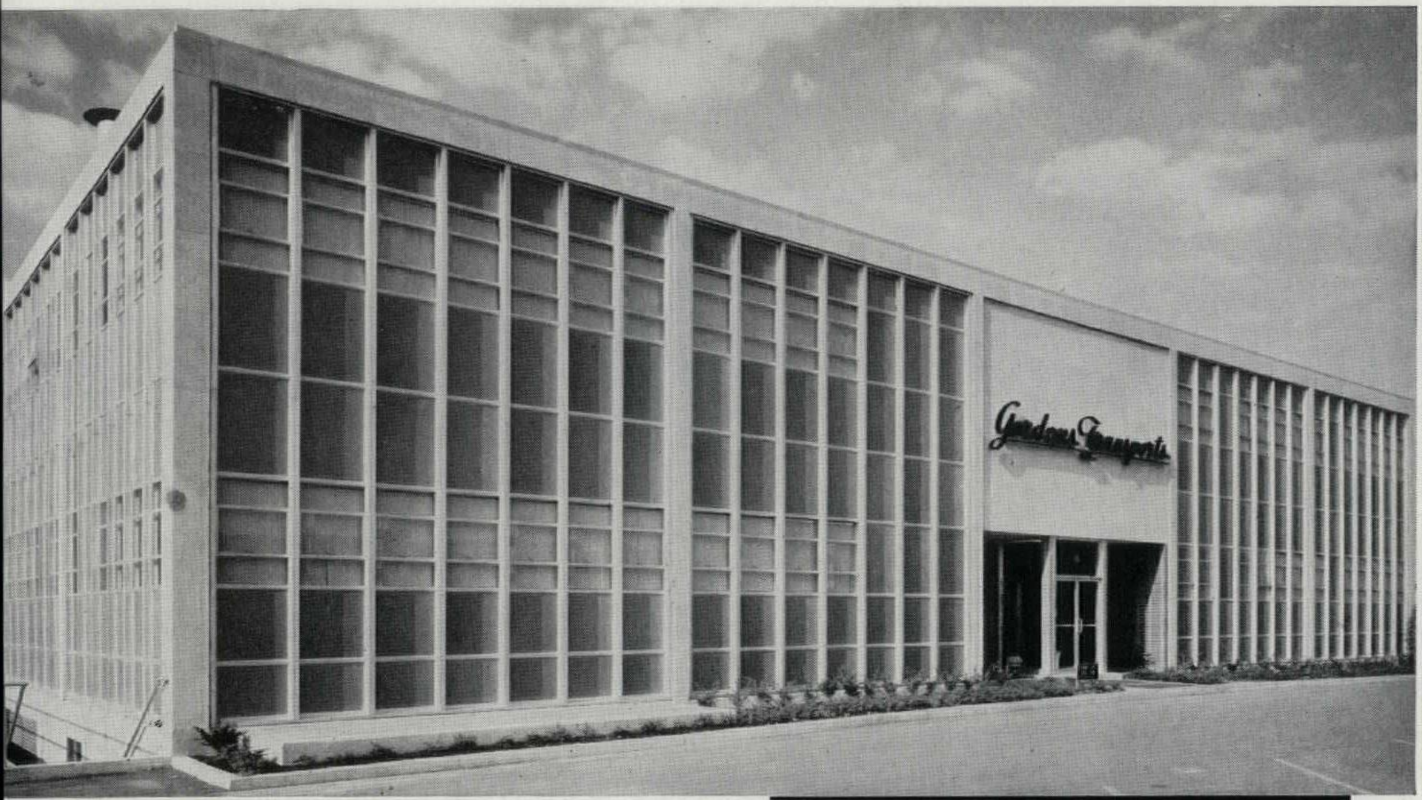
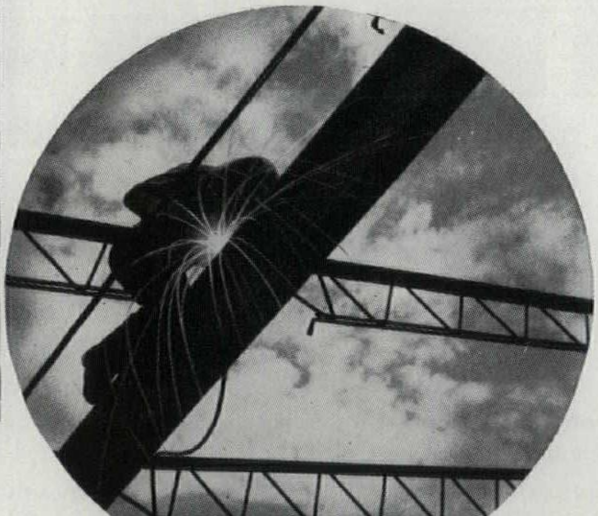
Every architect should have freedom in design—freedom to make best use of knowledge and imagination. He needs building materials which will give him that freedom. And here is where Ceco provides welcome assistance, especially when called in before plans are drawn. Result: almost every skyline in the U.S.A. reflects Ceco teamwork with architects. Yes, from Littletown to Middletown to Metropolis, Ceco products are specified by architects in creating the building face of the nation. Ceco Steel Products Corporation. General offices: 5601 West 26th Street, Chicago 50, Illinois. Offices, warehouses and fabricating plants in principal cities.

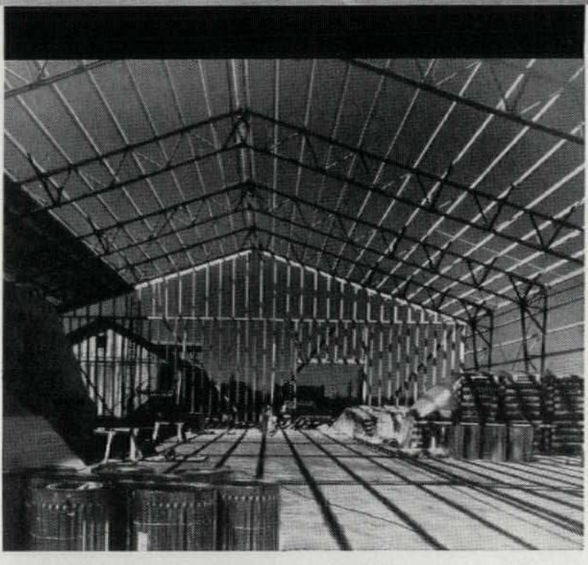
Consider these 4 engineering concepts:

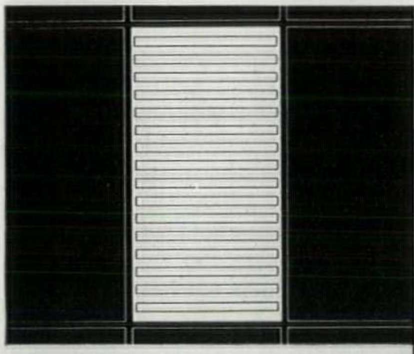


■ If open floor area is wanted in reinforced concrete, the answer is waffle-type flat slab construction formed with Ceco Steeldomes. Wide column spacings are easily achieved with Steeldomes, because of (a) the basic economy of two-way construction, and (b) the savings of dead-load through use of a joist framing system. Projecting beams are eliminated—story heights kept to the minimum. Splayed heads and drop panels can be eliminated, too. Your client saves on concrete, steel and labor... gets, in return, wide open spaces he can convert to profit. R/C duct underfloor electrification is readily installed, allowing electrical and telephone outlet flexibility for the life of the building.

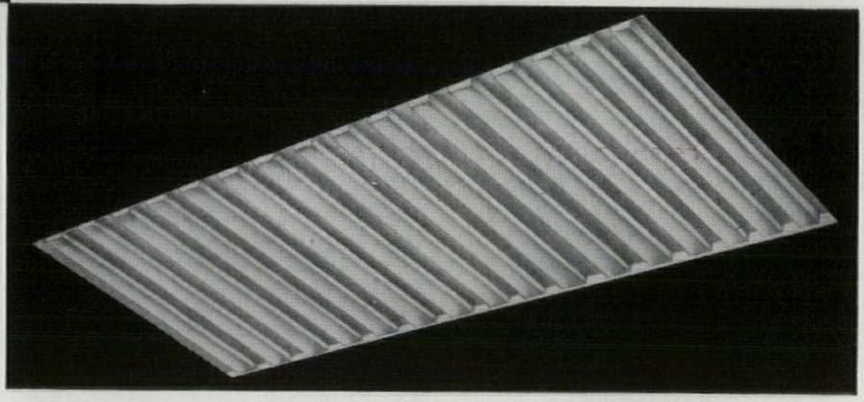




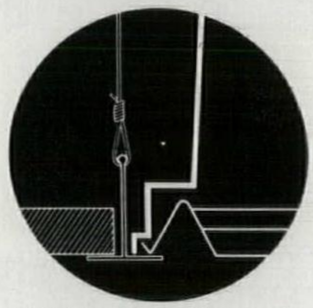




nothing but pure light!



There are good reasons why so many lighting specs hold firm for Lightolier recessed troffers: ARCHITECTS like the clean panel of light...no bulky frames or exposed screws...the neat joints and hidden hinges...the Optiplex, Domex and Strialux diffusers that meet nearly any requirement. OWNERS like the easier cleaning...no frames to handle, no broken diffusers...the finished appearance... the efficient, dependable performance. CONTRACTORS like the way one man uses detachable grab handles to lift fixtures easily...the rugged construction, trouble-free installation...the sound profits. Doesn't it make good sense to recommend and install commercial lighting by Lightolier? For a 120-PAGE CATALOG-BINDER detailing the complete architectural collection, write today to Dept. PA-118



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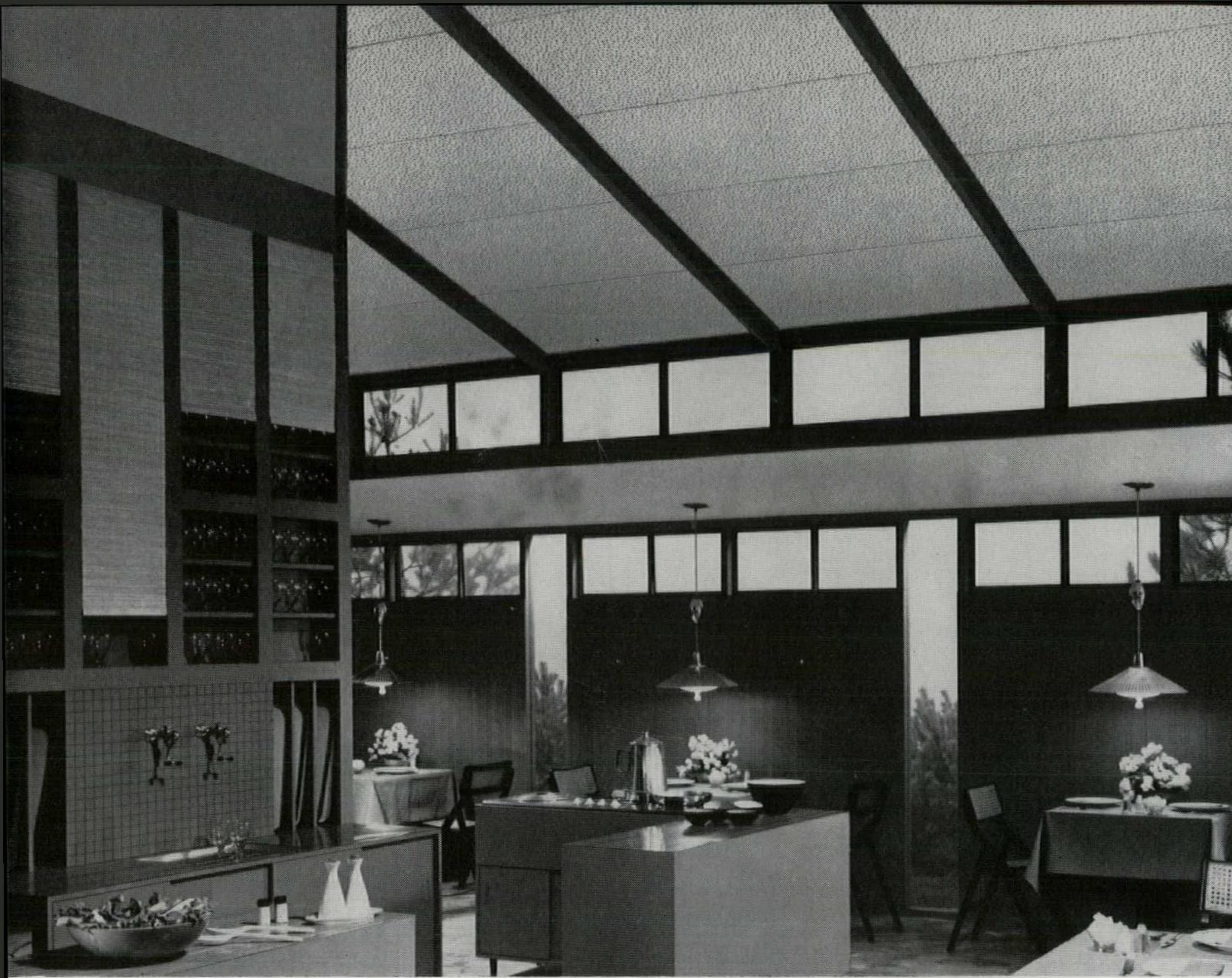


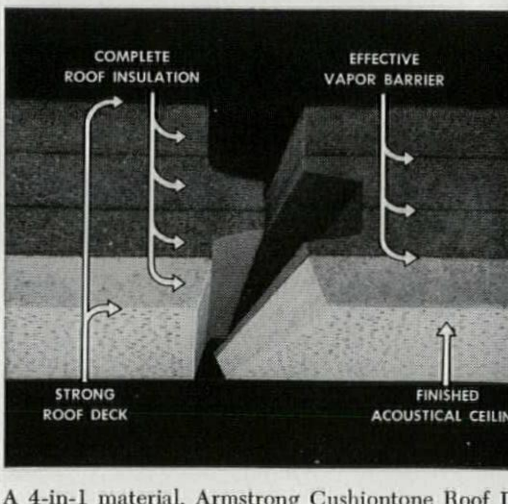
Here's a new, low-cost way to sound-condition light commercial structures. No suspended ceiling is required. No further acoustical installation is ne

This new Armstrong Cushiontone Roof Deck sound-conditions open beam interiors

New Armstrong Cushiontone Roof Deck is a 4-in-1 material that provides roof deck, insulation, multiple vapor barriers, and finished acoustical ceiling in one fast, simple application. It needs only beams to support it and built-up roofing to weatherproof it.

New Armstrong Cushiontone Roof Deck is made up of ½" layers of asphalt-impregnated fiberboard. The interior surface is prefinished with two coats of washable white paint. Perforated in the popular Full Random design, it absorbs more than half the noise that strikes the ceiling surface. Cushiontone Roof Deck is available in easy-to-handle 2′ x 8′ panels, 2″ or 3″ thick, with sturdy T & G joints on all four sides.

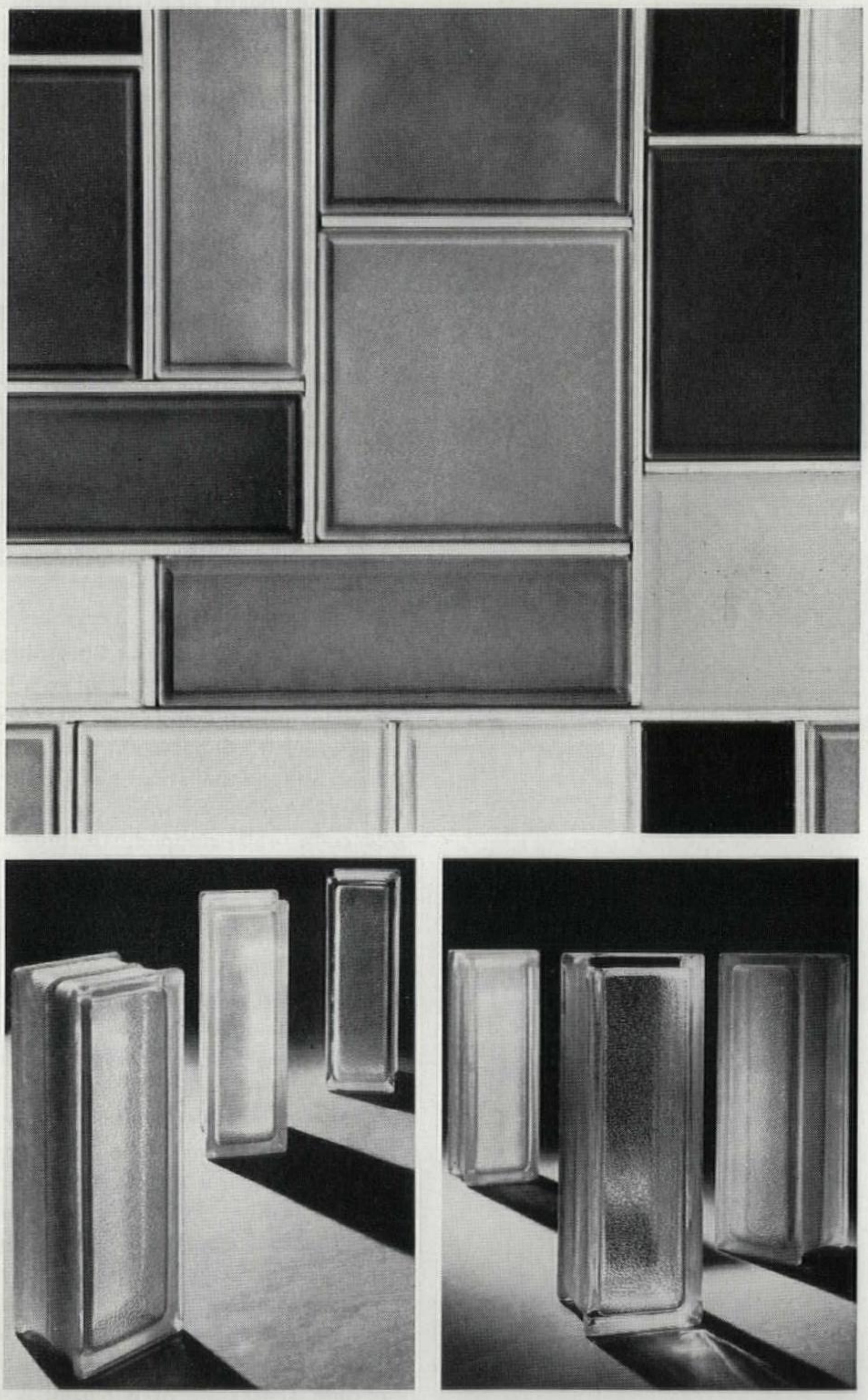
Send for free twenty-four-page booklet, "How to build with Temlok Roof Deck." It shows you how you can add the beauty of open beam interiors to motels, gift shops, restaurants, and other types of light commercial buildings. Write to Armstrong Cork Company, 3511 Watson Street, Lancaster, Pennsylvania.



A 4-in-1 material, Armstrong Cushiontone Roof D provides a sturdy roof deck, multiple vapor barri roof insulation, and a prefinished acoustical ceil

Armstrong BUILDING MATERIALS

•TEMLOK® ROOF DECK • TEMLOK SHEATHING • TEMLOK TILE • CUSHIONTONE® CEILINGS

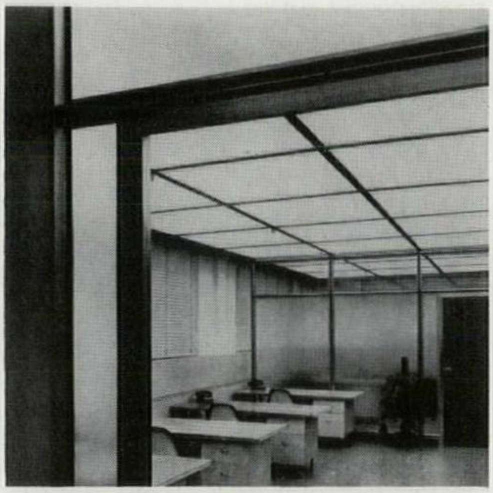


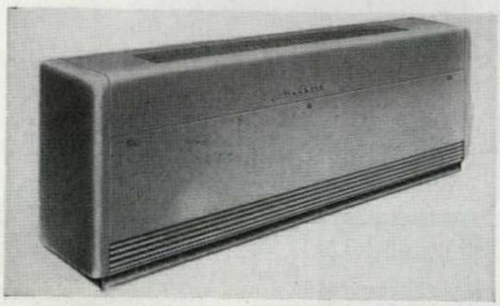
New Shape, Wider Color Range Announced for Glass Blocks

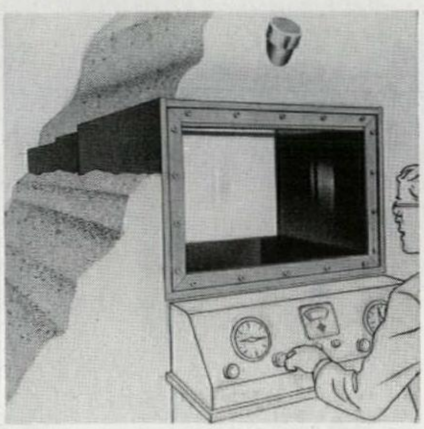
Fanning the flame of renewed interest in use of glass blocks, Pittsburgh Corning has just announced two major steps in the revitalization of this line of products. The traditional square shape of the block has undergone its first change in two decades with the availability of a new rectangular block, 4" wide and 12" long. Developed in response to suggestions made by architects in recent surveys, the new shape adds innumerable design possibilities when combined with already familiar 6", 8", and 12" blocks. Besides the new shape, the blocks have an etched pattern on the interior surface. They are also available with a white fibrous-glass divider screen or with a blue-green "Suntrol" screen. Second major advantage is that the new block can be had in all of the following colors (said to be richer than currently available pastel colors): blue, green, red, yellow, and orange, as well as jet black and pure white. The four pastels currently available are blue, green, coral, and yellow. The 6" block also comes with these same colors. Two more-restrained colors obtainable only with the 8" squares are walnut and charcoal gray.

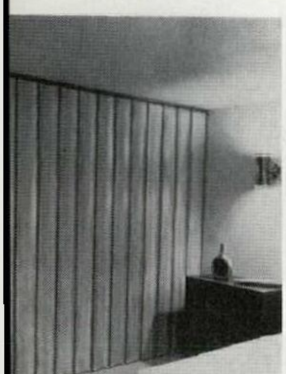
Pittsburgh Corning Corp., One Gateway Center, Pittsburgh 22, Pa.

p/a products









Translucent Acoustical Element

Soundsheet provides shielding media in wall-to-wall area lighting—combines acoustical and light-diffusing properties, with noise-reduction coefficient of .70. Available in two types: corrugated, supported on T-bars, with hold-downs; flat, stretched in frames for drumhead tightness. Can be ordered either translucent or opaque, in white, or color.
Contrex Co., Chelsea 50, Mass.

Classroom Year-Round Air-Conditioning

"Syncretizer" combines winter functions (heating, ventilating, natural cooling) and summer functions (ventilating, mechanical cooling, dehumidifying)—for classroom, other assembly-area installations. Suitable for use with pneumatic, electric, or electronic temperature-control systems. Available in five sizes, from 500 to 1500 cfm standard air; may be integrated with matching open and closed Nesbitt storage cabinets.
John J. Nesbitt, Inc., State Rd. & Rhawn St., Philadelphia 36, Pa.

Packaged Radiation-Shielding Window

Pre-engineered, copper-lined window, using zinc-bromide solution, effects substantial cost reductions compared to all-glass unit. Suitable for laboratory, hospital, processing plant, other installations, and built to Argonne specifications. "Aquarium" window comes ready for mounting in concrete wall—stepped, to prevent radiation rays from leaving room if concrete shrinkage develops during aging. Available in four sizes, and special order sizes.
Research Equipment Co., 1032 College Ave., Wheaton, Ill.

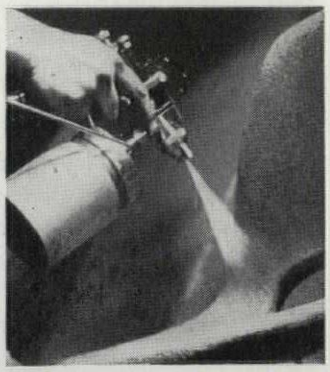
Folding Door Controls View, Light, Ventilation

Wood-paneled Louver-Fold door forms a handsome, sound resistant wall when closed for privacy between rooms. Opened, it is a louvered partition that controls the flow of light and air, acting as a room divider or movable screen. Since partially opened louvers allow visibility in only one direction, either a left or right louver view may be specified for installation. Hollow, $8\frac{3}{8}$"-wide, wood panels overlap when closed; are lightweight; glide on a single, overhead steel track. Stock doors are Philippine mahogany, satin-finished with clear lacquer; height is 6'8"; widths from 2' to 4'. Custom doors—to 24' width, 10' height—are supplied finished or unfinished in Philippine mahogany, birch, or ash; or with alternating or duplexed wood panels. Stock doors retail from about $45-$65.
Consolidated General Products, Inc., P.O. Box 7425, Houston 8, Tex.

Glass Felt for Built-up Roofing

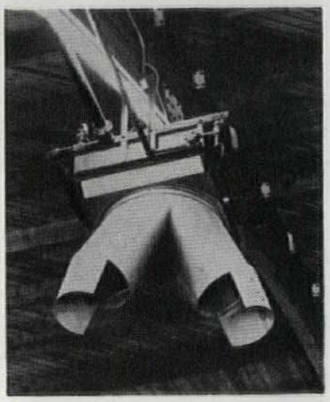
Glass felt and asphalt make strong, nonrotting, monolithic roofing. Moppings of bitumen soaked through porous Perma Ply fibrous-glass sheet produce single-layer roof—crack and blister resistant—long lasting, low maintenance. Rolls are 180' long, 3' wide. (Not illustrated.)
Owens-Corning Fiberglas Corp., National Bank Bldg., Toledo 1, Ohio.

Upholstery Sprayed on Plastic Chair



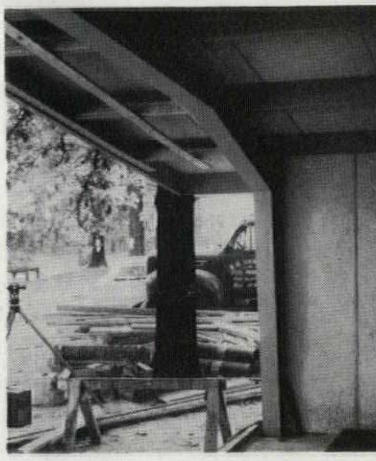
Vinyl upholstery is sprayed on chair to form a washable, weatherproof, seamless skin without joints or overlaps. It is bonded to 1/2"-thick foam cushion molded to conform to shape of chair's glass fiber plastic shell; skin also covers back, underside of chair. Available with regular, swivel, or stacking legs which may be painted, plated, or plastic covered, chair is produced in 12 primary and decorator colors. Designer: Guy G. Rothenstein. Retail: $45 to $60.
Aeon Industries, Inc., P.O. Box 208, Gracie Station, New York 28, N. Y.

Revolving Heater Recirculates Air



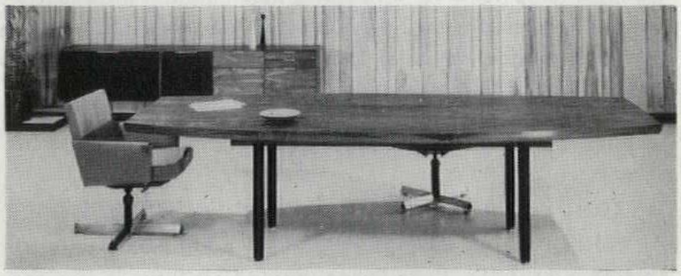
Suspended revolving heater has 2-speed motor-driven fan which blows air from above unit down through heating element, and through two discharge outlets. Delivers about 19,500 cfm. Steam at 5 psi is piped to heating element in 4" diameter lines. Movement of air eliminates concentration of hot air on any section of floor. Eliminates stagnation of air under roof—economical because heater recirculates air through itself—operates at half speed for comfortable temperature. Speeds are manually controlled from floor. Unit comes equipped with stop valves, trap, dirt pocket, thermostat. In warm weather, acts as ventilator.
L. J. Wing Mfg. Co., Linden, N. J.

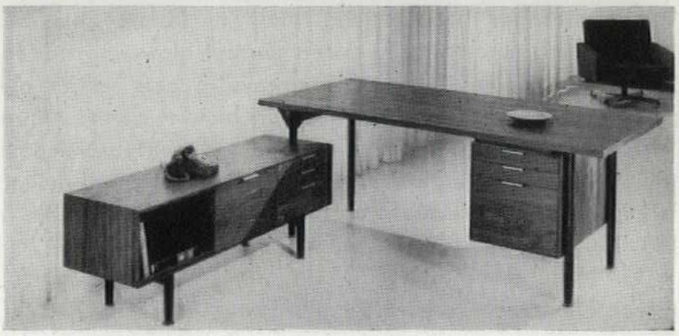
Rapid Construction Possible With Wood-Fiber Paneling And Prefab-Steel Framing



Paneling in conjunction with steel framing create practical technique for speedy construction in residential building. Wood fiber roof deck and sidewalls are formed over steel structural members—fastened by special clips welded to the framing. Wall and deck of Tectum, and prefinished partitioning throughout structure, result in one material cost for structural, insulating, and acoustical benefits. Cavity construction forming air gap between firesafe fiber wall and exterior heightens insulating factor and produces a practically incombustible building.
Tectum Corp., 105 S. Sixth, Newark, Ohio.

New Furniture Suits Many Uses





Simplicity of line distinguishes desks, cabinets, tables, seating in this Architective furniture. Conference tables—rectangular, round, square, or boat-shaped—with a substantial overhang and without leg stretchers provide comfortable all-around seating. Bases are walnut or ebonized; tops are walnut, teak, rosewood, or plastic laminate with a 2 1/4" shaped solid-wood edge; legs rest on adjustable nylon cushioned domes. Tables are from 8' to 24' long. Upholstered seating group has pedestal base sheathed in walnut or stainless steel. Natural walnut desks and cabinets are finished in clear lacquer, linseed oil, ebony, or a special open-pore mat lacquer. Desks may have outside or under-mounted legs, flush or overhanging tops, and pedestals 12" or 18" high; 1 1/4"-thick desk tops are walnut veneer or plastic with wood edge. Cabinets, without bases, 12" or 18" high and 38" or 56" long, may be wall-hung or bench-mounted.
John Stuart, Inc., 470 Fourth Ave., New York 6, N. Y.

Two Window Functions in One Unit

Rusco window is louvered, jalousie window on the inside, adjustable awning window for light and weather control on the outside. Engineered to work in unison to subdue weather in any region. Reduces building and maintenance costs by eliminating need for indoor-outdoor sills, awnings, storm shutters, shades, or blinds. Aluminum flush-fit construction, with concealed hardware. Can be glazed with glass or glass fiber in standard colors: pale yellow, aquamarine, off-white, or special colors.
F. C. Russell Co., Columbiana, Ohio.

Horizontal Shoring Beam Cuts Costs

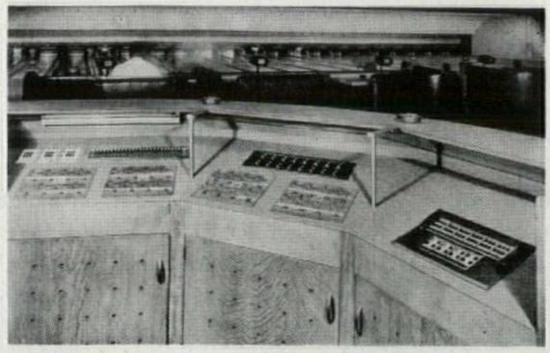
Telescopic Pecco-Beam used to support concrete-slab forms for all types of concrete-slab construction, cuts erection costs by as much as 40%. "Wedge lock" design permits adjustment and locking in a matter of seconds with a carpenter's hammer. Allows large working, storing, carting, floor-space areas under shored slab. Weighs 8 lb—easy to move from job to job. Available in 3 basic units adjustable to spans from 8'6" to 27'7". Carries uniform distributed weights up to 6600 lb.
American Pecco Corp., 188 E. Post Rd., White Plains, N. Y.

System Increases Lighting Efficiency

Color-Ceil provides comfortable high-level illumination without distortion, while permitting luminous color design. Any level of lighting between 100 and 250 ft-c is achieved by arrangement of two-lamp units and three types of high-intensity fluorescent tubes, including GE's new Power Groove lamp. Lamps may be used individually, or in combination. Color designs are effected by dropping in "floating" translucent-plastic eggcrate panels between lamp units, spaced 2' apart. Light passes downward to work surface and upward where it is diffused through plastic panels. Has efficiency of 82% although achieving greater shielding than previous fixture types. Adaptable to considerable range of room dimensions and limitations. Components of basic module: two lamp fixtures, wired and assembled, with ballasts—over-all dimensions of 2'4 5/16"x8'2 1/2", with twin stem hangers; end section spacers; louver flanges; pieces of plastic louver, each 18 1/2"x44". Easy to install.
Silvray, Inc., Bound Brook, N. J.

Heat and Air-conditioning in Compact Unit

Airtrol line claims savings in cost of equipment, time and cost of installation, floor space. Forced-air furnace is a complete packaged unit, tested, ready to install. Relay-box jumper plug automatically selects correct blower speeds for heating or cooler—"Dual-Air Freeways" bypass heating elements to deliver extra air. Larger blower permits unrestricted, even air-flow over cooling and heat exchangers. Blower wheel and motor, accessible to servicing, are mounted in rubber to eliminate noise and vibration. Available in 80, 100, 120 and 140 thousand BTU sizes for use with 2 to 5 ton Holly air-conditioning.
Holly-General Co., 875 S. Arroyo Pkwy., Pasadena 2, Calif.



Electronic Switch System Cuts Operational Costs

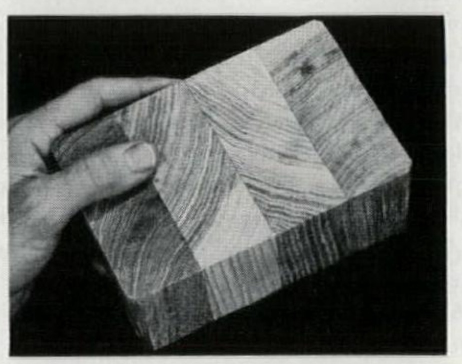
Time-saving low-voltage electronic system for bowling alley and restaurant—applicable to other commercial installation—increases profits through touch-button control of all lighting and servicing of guests, throughout building. One-man-operated control center "master controls" all lanes. Trouble-light master panel and time-delay panel indicate malfunctioning of alleys, recycle automatic pin-setting machines. Space-saving equipment and nonconduit installation reduce building costs.
Touch-Plate Mfg. Corp., P. O. 1970, Long Beach, Calif.

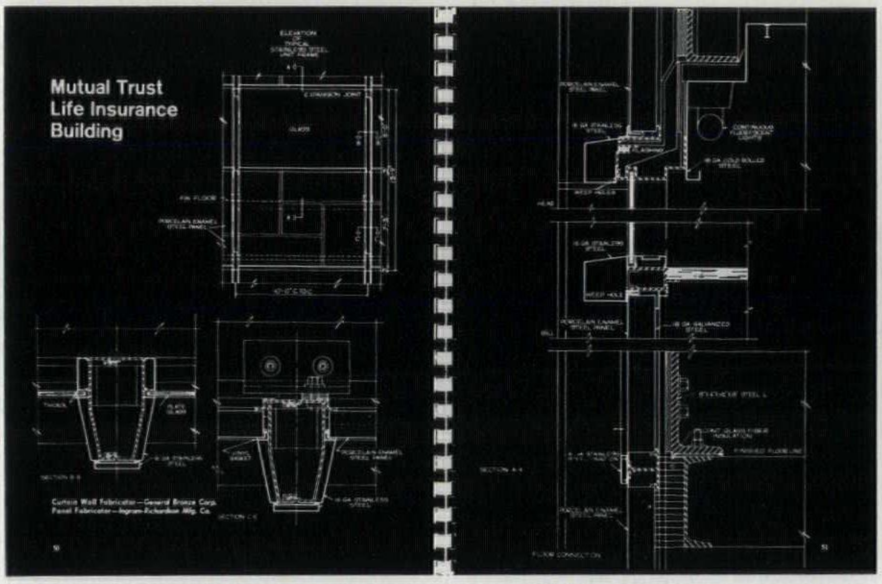
Mosaic Appearance in Plastic-Sheet Flooring

Tessera series in Vinyl Corlon—imbedded-vinyl-chip formulation floor surfacing of mosaic appearance—small, square-faced cubes stand out individually in the design. Nubbly wearing surface and slight emboss help conceal imperfections in subfloor, minimize scratch damage. Made with Hydrocord moisture-resistant backing—suitable for below-grade as well as suspended, and on-grade subfloors. Heavy-duty flooring is applicable to hospital, laboratory, as well as commercial and residential uses. Not affected by mold growth, salt, or alkaline moisture. Almost unlimited number of custom-design treatments is possible by intermixing colors in the series. Available in 7 tone-on-tone colors: sage green, warm beige, medium gray, gray beige, putty, ivory, and suede brown. Sheets (.090" gage) are flexible, come in 6' widths. Falls in linotile and 1/8" rubber-tile price range.
Armstrong Cork Co., Lancaster, Pa.

Flooring Withstands Over 100,000 lb

Engineered end-grain hickory flooring for heavy-duty areas in industrial plant floors—aisleways, intersections, loading docks, etc.—claims longer wear up to 10 times compared with other flooring. Nonskidding, easy to install, available in any thickness from 1" to 3".
Gamble Bros., Inc., 4601 Allmond Ave., Louisville, Ky.





Brochure, Chicago Dynamic: Architectural Workshop, presents discussion of conception, design, fabrication of six steel curtain walls recently erected in Chicago, based on tape of conference held in connection with Chicago Dynamic Program last winter, in which respective architects participated. Book, 9"x11", contains full-color renderings, photographs, and blueprints showing construction. Curtain-wall details (left) from Mutual Trust Life Insurance Building. Perkins & Will, Architects.
United States Steel (61-p.) **269**

★ ***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

Electric Heaters and Heating Devices
Catalog provides complete data, specifications, operating information, power requirements, new ratings and configurations, and manufacturer's recommended list prices of standard General Electric heaters and heating devices—including immersion, strip, cartridge, tubular, railroad switch, etc.
General Electric (GEC-1005I, 52-p.) **198**

High-Velocity Filter
Folder explains new high-velocity Aerosolve filter with 80% more air volume per sq ft of face area, 45% less face area per given cfm. Filter depth of 24" makes possible lower installation, maintenance, and operating costs—can be installed in straight banks. Consists of permanent cadmium-plated frame and one of three interchangeable and replaceable cartridges providing efficiencies of approximately 95%, 85%, and 35%. Available in 12"x24"x12", 24"x24"x24", 24"x12½"x12", sizes.
Cambridge Filter Corp. (2-p.) **199**

Explosion-Release Unit
"Pyrojector" roof ventilator for automatic release of heat, smoke, and explosion described in catalog containing engineering drawings, performance data, capacities, accessories, etc. Lists direct-driven and belt-driven centrifugal fans, AX propeller direct-drive, and IR fresh-air intake. Associated literature includes 13 new submittal drawings and 14 sets of performance graphs.
The Swartout Co. (Catalog V-58, 34-p.) **101**

CONSTRUCTION

★ Aluminum-Strut Dome
Fabrication and erection of aluminum-strut dome serving as economical temporary showroom or storage shelter for commercial, industrial, and agricultural use. Features are ease and speed of erection and disassembly at low cost, transportability to selected location, and relocation. Height 16' at center; diameter 57'; covers 2500 sq ft floor space. Structure weighs 850 lb—translucent sealed vinyl-clad nylon envelope weighs 450 lb—withstands winds of hurricane velocity when properly anchored. Packaged in cartons for easy handling.
Capitol Products Corp. (4 p.) **268**

Glued-Laminated Wood Structural Members
Catalog on glued-laminated, wood structural members gives complete technical data, connection details, and specifications. Illustrations show how laminated-wood arches, beams, and trusses may be used in church, school, residential, commercial, and industrial building.
Rilco Laminated Products, Inc. (24-p.) **270**

Underfloor Duct-Distribution
Simplicity in underfloor duct-distribution systems for electric power, telephone, and intercom, featured in illustrated bulletin. Catalog section includes detailed dimensions, types and sizes of junction boxes, ducts, all accessories, and service fittings.
Spang-Chalfant Div., The National Supply Co. (Bulletin 484, AIA 31C62, 8-p.) **271**

★ Elastic Sheet Flashing
Quick and easy installation of Salaroy 400 elastic flashing material is described in a bulletin giving complete application information. For every type of industrial and residental application. Conforms to nearly any contour. Adhesive system bonds it to (1) common building materials, (2) hot-melt roofing bitumens, (3) itself by solvent activation. Flex-

p/a manufacturers' literature

ible sheets are available in 36" wide rolls containing 100 sq ft, weighing approximately 50 lb. In black only, but can be painted with ordinary paint.
The Dow Chemical Co. (AIA 12-H, 14-p.) **272**

Double-Tee Roof Member
Volume 9, in series of illustrated handbooks, covers applications of 5' wide by 18" deep Double-Tee roof members. Complete technical information on 116 combinations provides estimating tool for speedy selection of correct member to use under any given condition. Data sheet gives spans, loadings, stresses, etc. Also included is a section on basic design of prestressed concrete and a table of loadings for 9 other prestressed structural members.
Leap Concrete, Inc., P.O. 1053, Lakeland, Fla. (34-p.) $2.00

Tile and Brick
Brochure presents full-color illustrations of interior and exterior architectural treatments in wall and floor assemblies to show variety of patterns and uses for facing tile and glazed brick.
Structural Clay Products Institute (8-p.) **273**

Modern, Versatile Building Material
Translucent glass-fiber panels with chemically glazed surface offer design advantages. Complete specifications given for low heat- and light-transmission panels, high light-transmission panels, and flat panels for industrial-window glazing. Technical data on flammability, load strength, chemical resistance, insulation value, etc., listed.
Alsynite Co. of America. (AIA 26-A-9. 4-p.) **274**

Translucent and Opaque Building Panels
Building panels for use in spandrels, curtain, window, or interior walls are discussed in this bulletin. Core of translucent or opaque panels is an aluminum grid. Fastened to core by means of synthetic resin is glass-fiber reinforced sheet. Test results support claims of good light transmission, resistance to fire and acids, shatterproof qualities. Suggested installation drawings, plus individual details for many panel systems are included.
Kalwall Corp. (4-p.) **275**

DOORS AND WINDOWS

Double-Weatherstripped Awning Windows
Folder describes E-Zee Loc double-weatherstripped awning windows with extra-heavy sash and frames made of Ponderosa pine—toxic and water repellent treated. Features are: extra rain protection; draft-free ventilation; concealed hardware; easy operation, cleaning; removable inside screens and storm sash. Available in traditional colonial and divided light sash styles, in singles, mullions, triples, center vent types—to 5' heights. Illustrations accompanied by specifications and construction details. Though optional, Thermopane insulating glass is recommended to eliminate need for storm sash, and to reduce cleaning surface.
Woodco Corp. (6-p.) **370**

Aluminum, Steel Windows and Screens
Catalog shows aluminum, steel windows and screens for residential, commercial, and institutional buildings. Data includes specifications, construction and installation details for casement, double-hung, single-hung, window-wall, awning, sliding, projected windows—also security, basement, and utility styles.
Ceco Steel Products Corp. (Catalog 1049-D, AIA 16-E, 39-p.) **371**

Sliding-Glass Door Allows Custom Glazing
Custom G Sliding Door which allows either single or double custom glazing will adapt to single 3/16", 7/32", or 1/4" glass or to 5/8" insulating glass. Other factors are interlocking door sections for fast easy assembly, double-pile weathering, trip-proof glide rail for smooth operation. Furnished in standard clear Alumilite or gold-anodized finish. Half-size details show construction.
The Alumiline Corp. (4-p.) **372**

Door Hardware
"Quick-Spec" series of 8 1/2"x11" reference cards in four-color process illustrate door hardware designs suited to a variety of architectural settings—industrial, school, institutional. Reverse side gives specifications, construction, available finishes, and line drawings of installation process.
P. & F. Corbin (AIA 27-B) **373**

Door Hardware: Advanced Collection
Advanced collection includes complete line of hardware for all types of doors—stock and custom. Section 1 is devoted to handles for wood, metal, metal-framed, and custom-tempered glass doors; Section 2 concerns handles for same types; Section 3 describes lever handles, rosettes, escutcheons. Wide choice of finishes available. Photos, drawings, dimensions for each model.
House & Co. (AIA 27, 21-p.) **374**

ELECTRICAL EQUIPMENT, LIGHTING

Commercial and Church Lighting
Catalog shows types and variants of lighting fixtures for diversified applications in commercial and church building. Detailed drawings accompany complete specifications for comprehensive line of lighting equipment.
Rambusch (8-p.) **482**

Surface-Mounted Power and Light Wiring
Booklet describes installation of surface-mounted wiring consisting of two parallel runs of raceways: Wiremold 3000, and Plugmold 2100—one for telephone and other communication wiring; the other a multi-outlet system for power and light. Mounted with available standard fittings. Photos and specifications included.
The Wiremold Co. (AIA 31C-62, 4-p.) **483**

Metal-Clad Switchgear
Bulletin explains complete line of indoor and outdoor Metal-Clad Switchgear: margin of versatility, system protection, safety, compactness, maintenance, and ordering ease. Includes equipment and application photos, dimensional drawings and lists of basic and optional equipment, rating, dimension and weight tables, equipment diagrams. Rated 2.4 to 13.8 kv with interrupting capacities of 75 to 1000 MVA.
General Electric (Bulletin GEA-5664E, 40-p.) **484**

Anodized Cast-Aluminum Wall and Ceiling Fixtures
Folio shows wide range of anodized cast-aluminum fixtures completely "enclosed and gasketed" for weathertight, vaportight, and bugtight operation in industrial, institutional, and public buildings. With specifications, photos, line drawings and accessories, including selection of junction boxes and finishing collars for conduit installations.
McPhilben Lighting, Inc. (Folio 58-7, 4-p.) **485**

FINISHERS AND PROTECTORS

Tape Sealing and Glazing Compound
Bulletins on #1072 Duribbon Butene Tape sealing and glazing compound provide specification of properties, instruction for glaziers, and general information. Tape has butyl base and is formulated with a controlled, yet complete, vulcanization, by which elastic and resilient properties are imparted to the sealer with resultant good performance in absorption of expansion, contraction, vibration, wind load —reliable adhesive properties are retained—butyl base insures durability to weathering agents. Ease of application reduces costs. Packaged in rolls sized for convenient field use.
Suydham Div., Pittsburgh Plate Glass Co. (14-p.) **568**

Comprehensive Line of Coatings
Construction Data Handbook contains comprehensive information on chemical, heat, corrosion-resistant coatings for interior and exterior application. Specifications furnished for sealers, dressing, glazing, etc.—also removers and thinners. Estimating tables and charts, weights and measures, mixing and application instructions, color, coverage, packaging, freight classification, shipping weights, included.
A. C. Horn Companies (152-p.) **569**

Cortland Emery Aggregate for Floors
How heavy-duty industrial floors are finished or resurfaced with Cortland emery aggregate is told in this bulletin. Explains composition of Emeri-Crete mix, its preparation and application for monolithic and granolithic finishes—preparation of surfaces before application, information on curing and protecting new or refinished surfaces. Flooring is described as smooth, hard, nonskid, resistant to heat, moisture, steam, processing materials—nonporous and nonabsorbent. Complete specifications, tool and material requirements provided.
Walter Maguire Co. (8-p.) **570**

INSULATION

Non-Combustible Building Slab
Catalog describes multipurpose roof decks for all types of building. Slabs, 32"x96", 2" or 3" thick, for short span over steel joists or wood framing, are composed of long, tough, chemically treated wood fibers coated with fire-and-water-resistant portland cement bonded together into durable, incombustible slabs—are sound-absorbing and lightweight. Complete construction and installation specifications given. Available with factory applied primed white surface suitable for field painting.
Insulrock Co. (AIA 37-B-1, 11-p.) **671**

Foamglas, The Cellular-Glass Insulation for Curtain-Wall Construction
Thermal-glass insulation is said to possess both rigidity and compressive strength in a lightweight, rigid-block form. Inorganic material is rot and vermin proof and a constant insulating value. Booklet lists properties and shows applications of finished installation where porcelain and other curtain-wall materials have been laminated to Foamglas —panel details shown.
Pittsburgh Corning Corp. (AIA 37-B, 12-p.) **672**

Cafco Spray
Blend of mineral and asbestos fibers, mineral binders is sprayed on to give effective acoustical and thermal insulation. Spray is permanent, inorganic, lightweight, incombustible, rust and rot proof, sound absorbent. Characteristics; light reflection, U-factor, sound absorption figures given. Material should be sprayed over special adhesive.
Columbia Acoustics and Fireproofing Co. (AIA 39-B-1, 37-C-2, 4-p.) **673**

SANITATION, PLUMBING, WATER SUPPLY

All-Brass Faucet Fittings
Kohler introduces Galaxy and Constellation series of all-brass faucet fittings—Galaxy comes in either brushed or polished chrome finish; Constellation in polished chrome. Both individually styled to blend with contemporary designs of Kohler fixtures. Complete illustrated information.
Kohler Co. (25-p.) **766**

Hot-Water Systems
Bulletin supplies specialized application information on

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 1/1/59

198	273	482	672	853
199	274	483	673	854
101	275	484	766	855
268	370	485	767	989
269	371	568	768	990
270	372	569	769	991
271	373	570	851	992
272	374	671	852	

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heating equipment for high-temperature high-pressure, hot-water systems: complete capacity tables, charts, conversion factors, etc., for HS Horizontal, PS Projection, and Torrivent Coil Model Heaters—especially suited to large, high-heat load applications where heat must be moved over broad distances from a central plant. (Please write on letterhead.)
The Trane Co. (Bulletin D-327-2, 19-p.) **767**

Engineered Sterilization Service

Booklet lists sterilizing equipment for industrial and other applications, explains Castle Engineered Sterilization Service which includes determination of process; bacteriological research; package analysis; layout and installation. Special section is devoted to newly developed automatic gas sterilization. Illustrated.
Wilmot Castle Co. (11-p.) **768**

Plumbing Layouts that Save Materials, Time, and Money

Featuring two-bathroom layout used in 1957 NAHB Research Institute "Home of the Year," booklet shows how end outlet bathtub and wall-hung closet combinations can be utilized with built-in lavatory. Dozen layout suggestions are detailed—for single, one-and-a-half, double baths in conventional and slab construction. Units are fabricated from enameled cast-iron, porcelain on steel, vitreous china.
Ingersoll-Humphreys Div., Borg-Warner Corp. (8-p.) **769**

SPECIALIZED EQUIPMENT

Laboratory Furniture

Wood Educational Laboratory Furniture catalog serves as planning aid for typical installations of laboratory equipment in secondary schools and junior colleges. Complete line of furniture, cabinets, sinks, fume hoods, service fixtures, etc., is illustrated, and described in detail. Dimension drawings and specifications included.
Kewaunee Mfg. Co. (AIA 35E, 68-p.) **851**

Kitchen-Design Aid

Caloric offers 8½"x11" kitchen design brochure which discusses and illustrates 10 basic house plans with kitchen arrangements featuring color-co-ordinated sinks and built-in or free-standing ranges, automatic equipment, cabinet arrangement, etc.
Caloric Appliance Corp. (14-p.) **852**

Aluminum Screens and Grilles

Folder illustrates varied styles of "carved" color-anodized aluminum screens and grills used for sun, traffic control, interior area dividers, courtyard walls, and other applications. Easy installation—low maintenance. Thicknesses range from ¼" to ¾" in sizes from 2'x2' to 4'x12'. Finished in red, blue, gold, bronze, and other colors as well as natural aluminum.
Morris Kurtzon, Inc. (AIA 14-B-6, 3-p.) **853**

New Catalog of Drafting Templates

Describes full line of symbol, circle, ellipse, alphabet templates, etc., including 6 recent additions to the line. Shows size, scale, uses, prices.
Timely Products Co. (7-p.) **854**

Swedish Design in Prefab Shelving

Brochure describing Lundia prefab adjustable wood storage shelving for commercial and industrial use stresses speed, simplicity, strength, and unusual versatility of Lundia installations. Sectional shelving with accessory units accommodates merchandise of all types and sizes—can be dismantled, extended, or rearranged at will with ordinary tools. Will not rust or store static electricity—resists temperature changes. Fact sheet on a second Lundia utility shelving line is also included. Complete line of accessories, specifications, and prices for both the industrial and commercial and utility lines listed. Photographs.
Lundia Div., Swain & Myers, Inc. (10-p.) **855**

SURFACING MATERIALS

Mosaic Ceramic Tile

Booklet explains in easy-to-read terms the various kinds of ceramic tile and their uses throughout the home. Contains section on installed tile prices. Full-color views of installations illustrate the appearance of types of tile on walls, floors, countertops, and other surfaces.
The Mosaic Tile Co. (12-p.) **989**

Versatile Planking

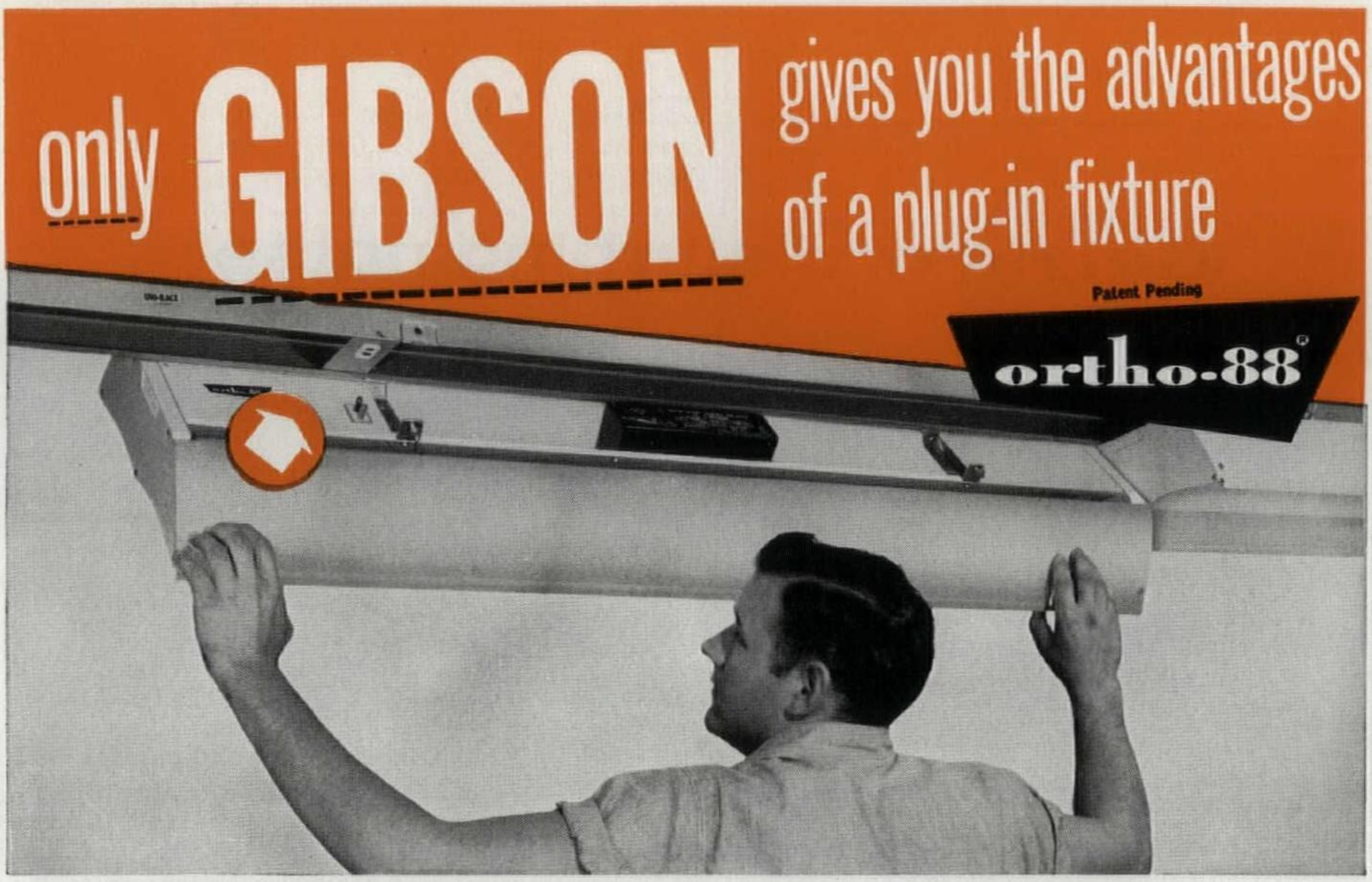
Lamidall tongue-and-groove random width plastic laminated planking for versatile application: new walls, partitions, wainscoating, refacing, remodeling, etc. Special clips included with planking make application simple, reduce molding use to minimum. Furring strips attached horizontally serve as nailing base—or direct attachment to wall is possible if wall material will firmly hold nailed clips. Athough primarily designed for permanent installation, walls are easily taken down for reuse. Planks, ¼" thick, come in standard widths 6", 8", or 10"—standard lengths 8' or 10'. Other widths and lengths available on special quantity order.
Woodall Industries Inc. (4-p.) **990**

Technical Notes, Harris BondWood Flooring and Harris Adhesive Mark 10

Concentrating on the features and properties of BondWood flooring and Adhesive Mark 10 in numerous installations, booklet gives technical data on application of flooring material. Dryness of building interior, subfloor, and testing of concrete dryness discussed, as well as installation over concrete subfloors, resilient tile, and wood subfloors.
Harris Manufacturing Co. (AIA 19-E-9, 18-p.) **991**

Surfacing Works Like Wood, Wears Like Iron

Folder illustrates multiple uses of temper-treated sealed hardboard with baked-in blond colored surface. Stresses toughness and paint-taking character of smooth nonporous finish—for installation with woodworking tools. Available in 1/8", 3/16", 1/4", and 3/8" thicknesses with standard lengths to 16'—other dimensions on special order.
Forest Fiber Products Co. (4-p) **992**



Incomparable Flexibility • Ortho fixtures can be mounted in continuous rows or at intervals. Can be re-spaced any time by one man without tools.

Ease of Maintenance • Ortho fixtures can be removed for cleaning or repairs without cutting off other fixtures in row.

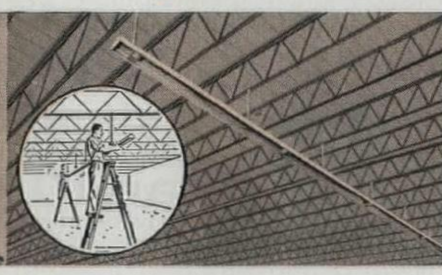
Low-Cost Installation • Ortho fixtures can be installed in a mere fraction of the time it takes to install conventional fixtures. Contractors report up to 75 percent savings in labor.

Made for All Standard and High Output Lamps

The Ortho 88 is made in 48″ and 96″ lengths for the following lamps: Rapid Start; Slimline; 800 ma R. S.; Power Groove; VHO and SHO. All fixtures, except the 40 w. Rapid Start with all other fixtures of the same length.

installation quick and simple

1 Uni-Race, U.L. approved raceway of 225-amp capacity, is assembled and wired on floor.



2 Light, rigid Uni-Race assembly up to 48′ easily lifted and hung.

3 Fixtures simply snap into place. Plug-in fixture engages receptacle in Uni-Race.

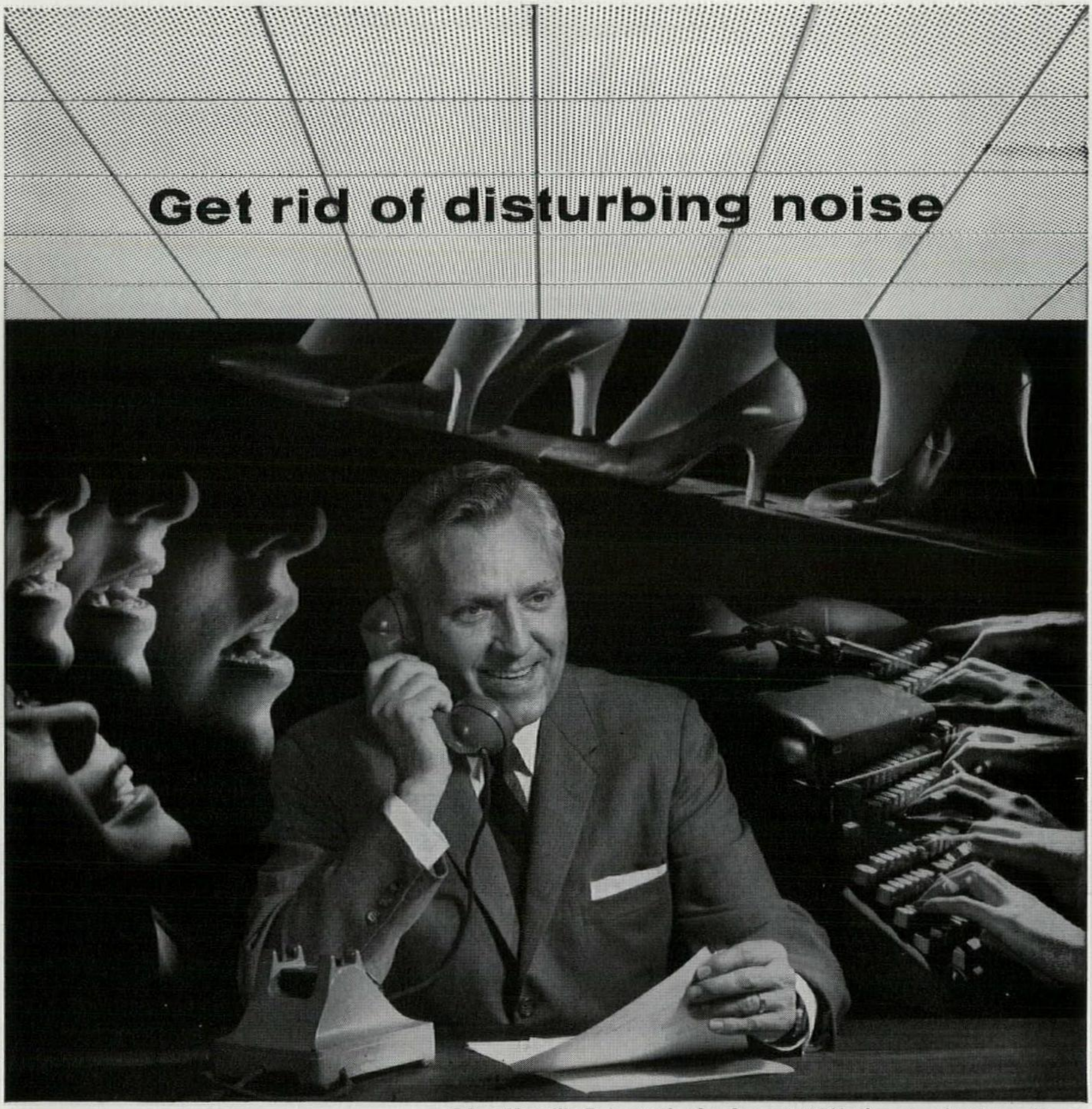
WRITE FOR COMPLETE INFORMATION ABOUT THE GIBSON ORTHO PLUG-IN FIXTURES

Gibson LIGHTING

GIBSON MANUFACTURING COMPANY

1919 PIEDMONT CIRCLE, N. E. ATLANTA 9, GEORGIA

Manufactured in Canada under franchise by Electrolier Manufacturing Co., Ltd., Montreal



Johns-Manville Sanacoustic absorbs up to 90% of room noise that strikes it.

the children/school puzzlement—magnificently illustrated

*by Frank G. Lopez**

Schoolhouse. *Joint School Research Project: Aluminum Company of America, Eggers & Higgins, and Walter McQuade. Simon and Schuster, 650 Fifth Ave., New York, N. Y., 1958. 272 pp., illus. $10*

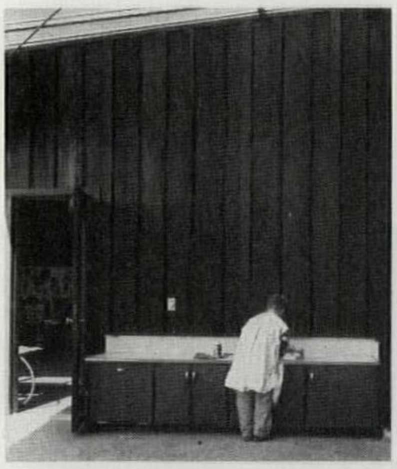
There is much good, solid meat in this book. It is not very thick—only 272 pages, well over half of them illustrations—and the few essential charts in which technicalities of construction are compared, are easily understandable. The text is as non-technical as a discussion relating to two professions, education and architecture (each with its own esoteric jargon), can be. The intended audience is the general public, or that part of it concerned with building new schools, and as a translation of these professional points of view for the layman it has an important function.

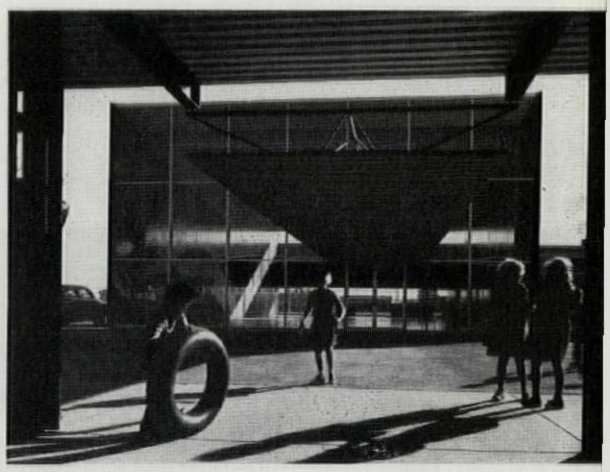
How well is the function fulfilled? As we have said, *Schoolhouse* contains a lot of simple, healthful nourishment, in the portions dealing with factual matters: construction, equipment, costs, financing, and so on. These are excellent chapters, as far as they go. The reportage here is relatively unbiased, though unfortunately incomplete in a few essential respects which will be discussed later.

Preceding the meaty portions are three introductory chapters intended to set the tone of the entire volume. It would appear that these were a last-minute addition to the text, because a duality of viewpoint appears not only between these and the remaining chapters, but also within the introductory three themselves. The attempt has been to relate the entire work to the children for whom our schools are primarily intended. Pictorially this is exceedingly well done; there is hardly a page, even in the technical sections and the superb presentations of contemporary schools, where children doing things — talking, eating, singing, playing, sleeping, acting, doodling, idling, waiting, and sometimes paying attention to their learning chores —are not pictured. Most of these need no captions and have none. This facet of the book is like a family album, but only occasionally does one wonder at the emphasis on cute behavior or wish that picture editing had been more selective. The temptation to include more must have been very great; kids are fascinating.

The duality begins to show itself in the childlike cartoons which are also liberally sprinkled through the center pages. Some of these explain technicalities; some are exceedingly funny and characteristic of children (for instance the small boy at the bottom of page 173 who chooses to sit *under* his chair and so attracts the undivided attention of the class); and some confusingly betray the fact that an adult intellectual really drew them. It takes quite a while

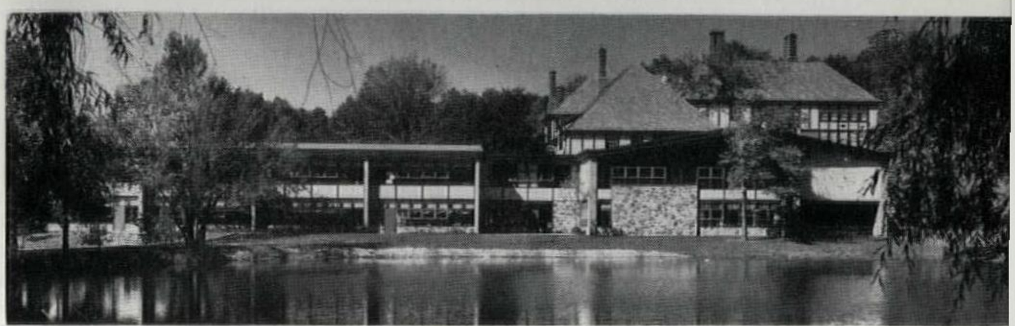
(Continued on page 196)





". . . neatness and trimness . . . need not eliminate visual excitement."

"The personality of a building springs from the mind of its architect . . ."



**With Englehardt, Englehardt, Leggett & Cornell, Educational Consultants, New York, New York.*

(Continued from page 193)

to appreciate all the subtleties, for example, of a cartoon of a crocodile biting a bearded man who is simultaneously pulling the tail of a hippopotamus—this in a section on acoustics and decibles—for which the label is: "Hippopotamus = 100 decibels; Hemingway = 10,000 decibels."

The first chapter, "Thinking It Over," a page or so of text, tells the reader it is important to think things through. Educational philosophies are here touched upon briefly; the current public controversy over their nature is mentioned as a "swing toward more intellectual and scientific subjects. . . . " Immediately, however, the author-editor hastens to say that "America may be headed back to a stricter curriculum, but more liberal methods of teaching it are here to stay." The next paragraph begins: "There is also the feeling in America that education should aim at *wholeness*—at developing all of a child's potentialities. . . . This has always been true in a way. . . ." And later: "Even a latent feeling for art, or music, or any of the other enriching aspects of living, does not simply assert itself instinctively . . . it must be found and fed. By adulthood it is usually too late."

How can the incongruities in such a catch-all presentation of educational fundamentals be reconciled? How can the misread history be justified? Should one accept bald assertation? Not only does the semi-popularized text contain solecisms. Educational philosophy, on which design of good school plants is necessarily based, is presented from the viewpoint of the entrenched liberal; he may be right, but is not a lay reader entitled to fair exposition of other points of view? If the evidently considerable research had been more objective, the dubious statements might have been fewer. Some of these statements may be half true, but education of the whole child has *not* always been the American aim; and if adults are too old for cultivation, the entire field of adult education is a boondoggle.

In such a literary environment, it is not suprising to find the children for whom our schools are presumably intended called "tenants," when the adults, who by implication are the owners and landlords (although as school-board members they pay only part of the school construction bills they incur) are in reality merely trustees. Actually, today's children will eventually pay a good share of the taxes that amortize construction costs, if not for the school they now attend, then for another, more or less equal, facility. No, the subject of the first chapter is too complex for such summary treatment.

Chapter 2 is considerably longer. About 12 of its pages are textual. Here the author attempts to counter the blunder of calling the children in a school its tenants (a hurtful blunder which only an adult could make) by focussing on children. This is fine. But again loose think-

(Continued on page 198)

reviews

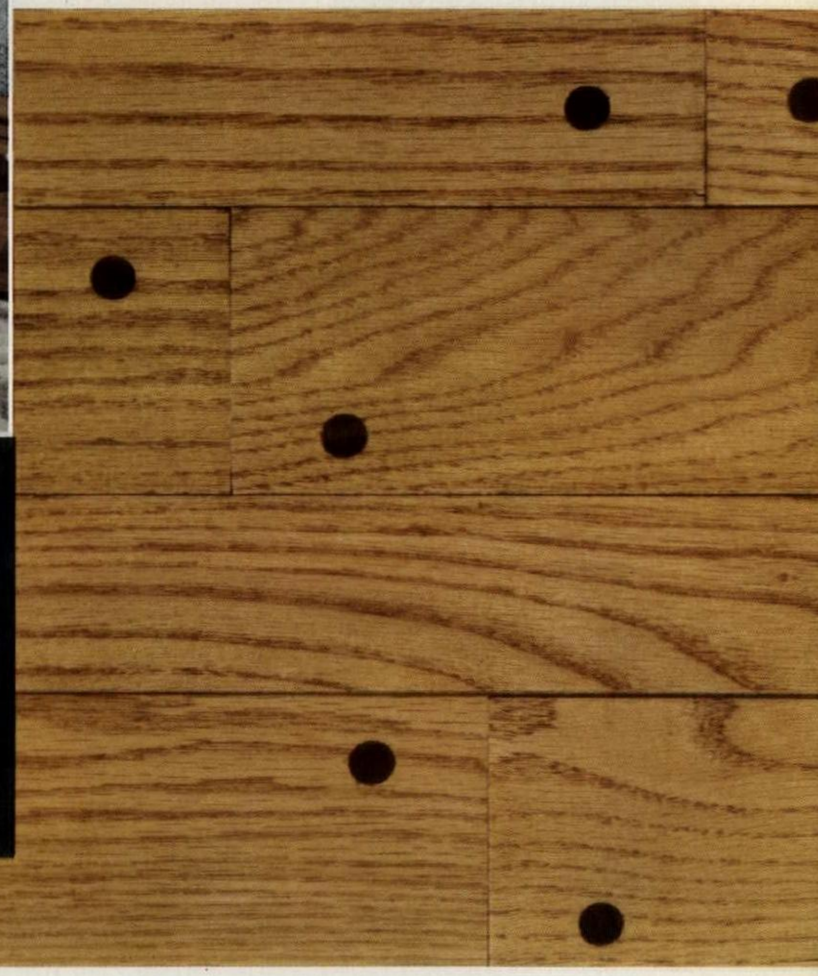
(Continued from page 196)

ing and writing betray the author: the chapter title is, "What Do Children Like About Schools?" Children's preferences do have importance; but is not the real question, "What do children *need* in schools?" Instance after instance of the flat assertation, not always substantiated or widely subscribed to, can be found here; it is sufficient to say that the name of Dr. Frances Ilg of the Gesell Institute of Child Development appears on the book's title page as an "adviser" (*sic*), and that this chapter reads like a layman's selective interpretation of the Ilg point of view. Other schools of child psychology are never mentioned. Much lifelike reporting of the ways children act is to be found here. Yet this reviewer found in it the confusing duality previously mentioned: the adult attempting, at times with success, to write about children so that other adults will understand them, but never quite going all the way in identifying himself with his subjects, often falling into that slight condescension that is expressed in occasional didacticisms, resulting in a feeling conveyed (to this reader) that problems *en masse* are more important than those of the individual child. Love and perception are better guides to understanding children than a view through a microscope or a kaleidoscope!

Farther on, the book, as we have said, takes a different tone. In the chapter on the future, "aloneness" is cited as a probable need in the increasingly populous years to come. The problems of size; of adult use of schoolhouses; of the special needs of gifted and retarded children, of the superficially quick and the slow; of the evolution of building needs as educational programs develop; and of rapid technological progress which often, in satisfying immediate needs, entrains fresh difficulties—these are briefly listed without many categorical postulations. In some

(Continued on page 204)

Pegged to today's home styles



Bruce Ranch Plank FLOOR

Naturally Beautiful

Furniture by M. Singer and Sons. Photo by Hedrich-Blessing

Inlaid walnut pegs, inserted at the factory, give Bruce Ranch Plank the casual charm of an expensive random-width floor. Appeal is enhanced by the plank effect of alternating 2¼″ and 3¼″ width strips with beveled edges. The finish is rich medium dark, factory-applied for beauty, durability and economy. Bruce Ranch Plank is installed like any strip flooring, but there's no expense of on-the-job sanding and finishing.

Write for color booklet. See our catalog in Sweet's Files.

E. L. BRUCE CO. BRUCE Memphis 1, Tenn.

The Great Southern Shoppers Mart
Columbus, Ohio
C. Melvin Frank, A.I.A. Architect

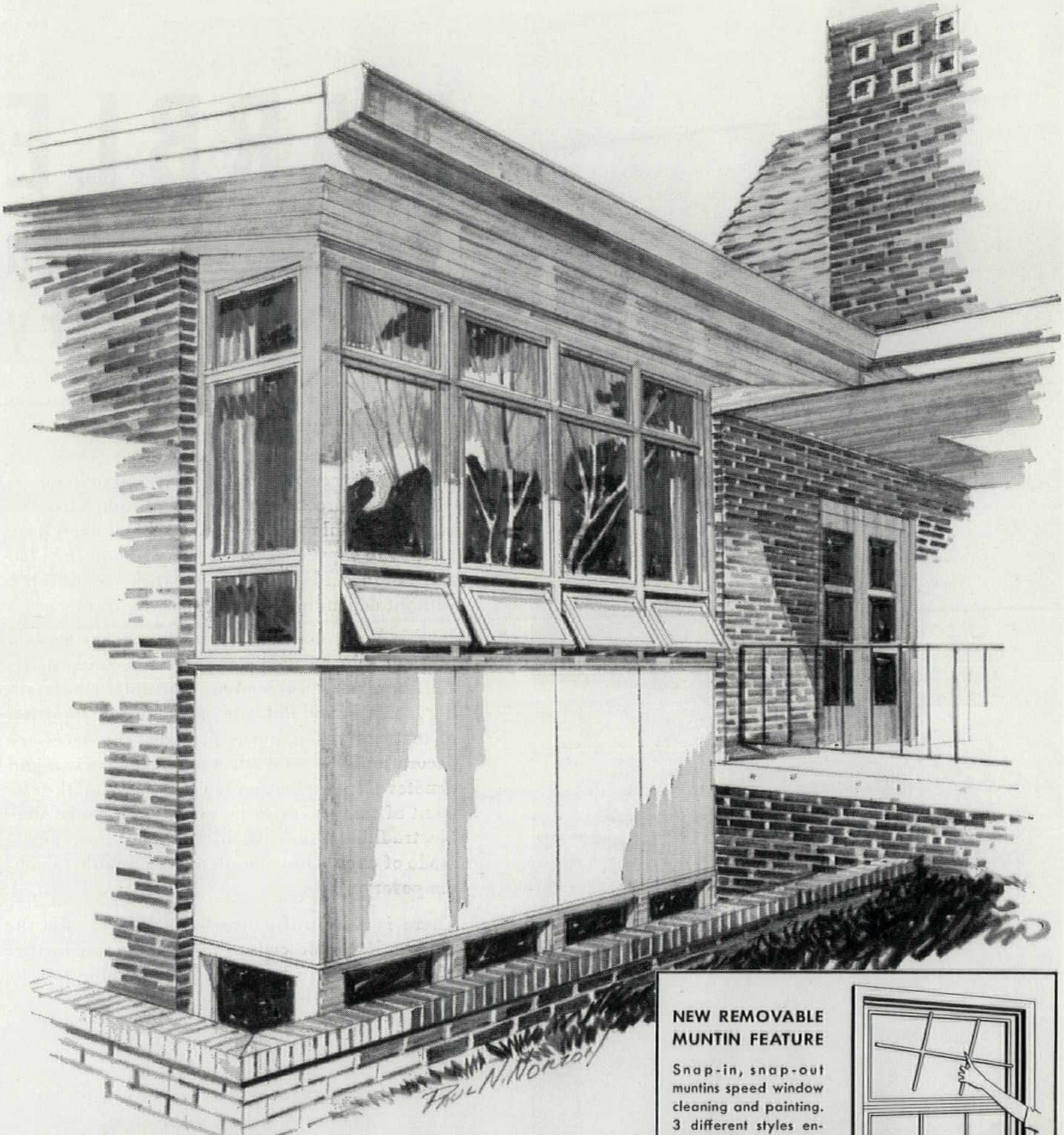
For Structural Strength One Shape Stands Out!

The Macomber V-Section chord in steel structurals has established a new concept in steel framing. Increased load-bearing strength and rigidity gained by cold-rollforming means that Macomber open-web structurals surpass the performance requirements of all national steel framing specifications. Macomber V-Beams, V-Girders and V-Trusses have universal acceptance as the framing members that give you the greatest strength per pound of steel.

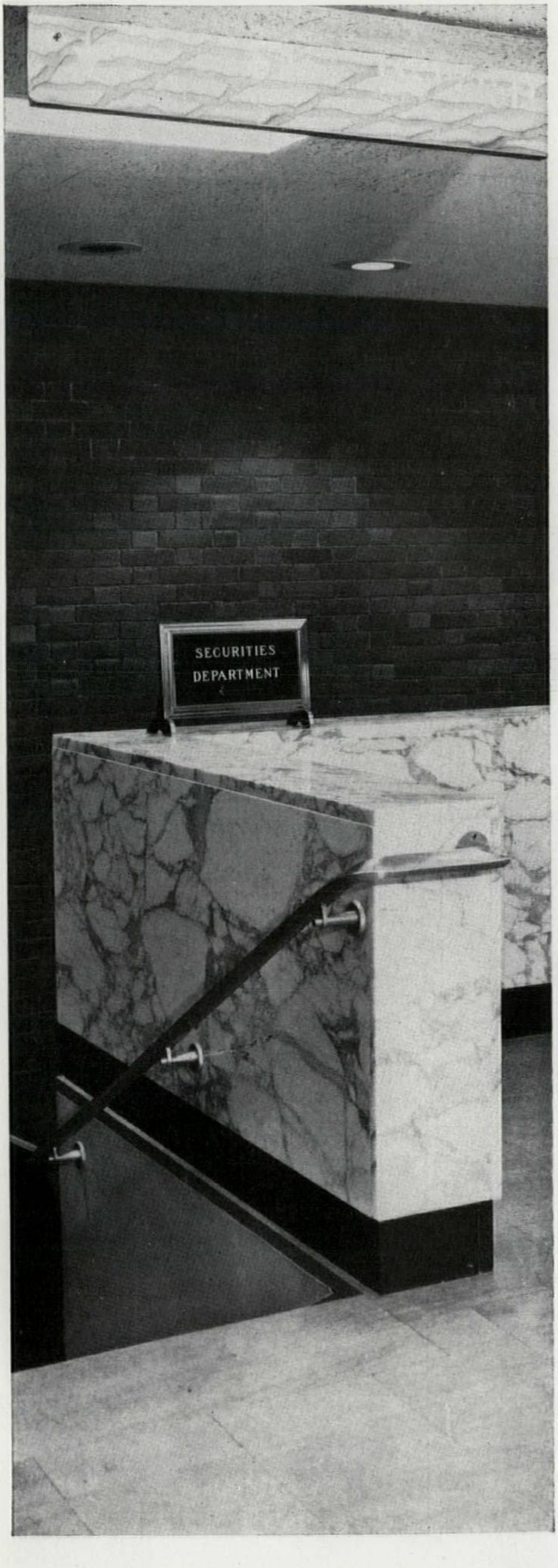
Specific bulletins on all Macomber products are available.

MACOMBER

CANTON 1, OHIO



SAVAGE AND VER PLOEG, DES MOINES, IOWA, ARCHITECTS



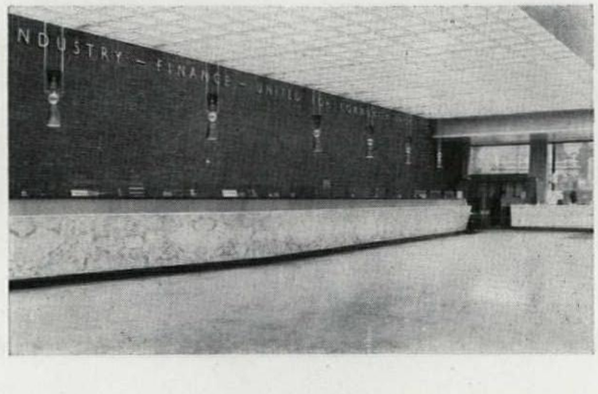
MARBLE
a vital need in contemporary design

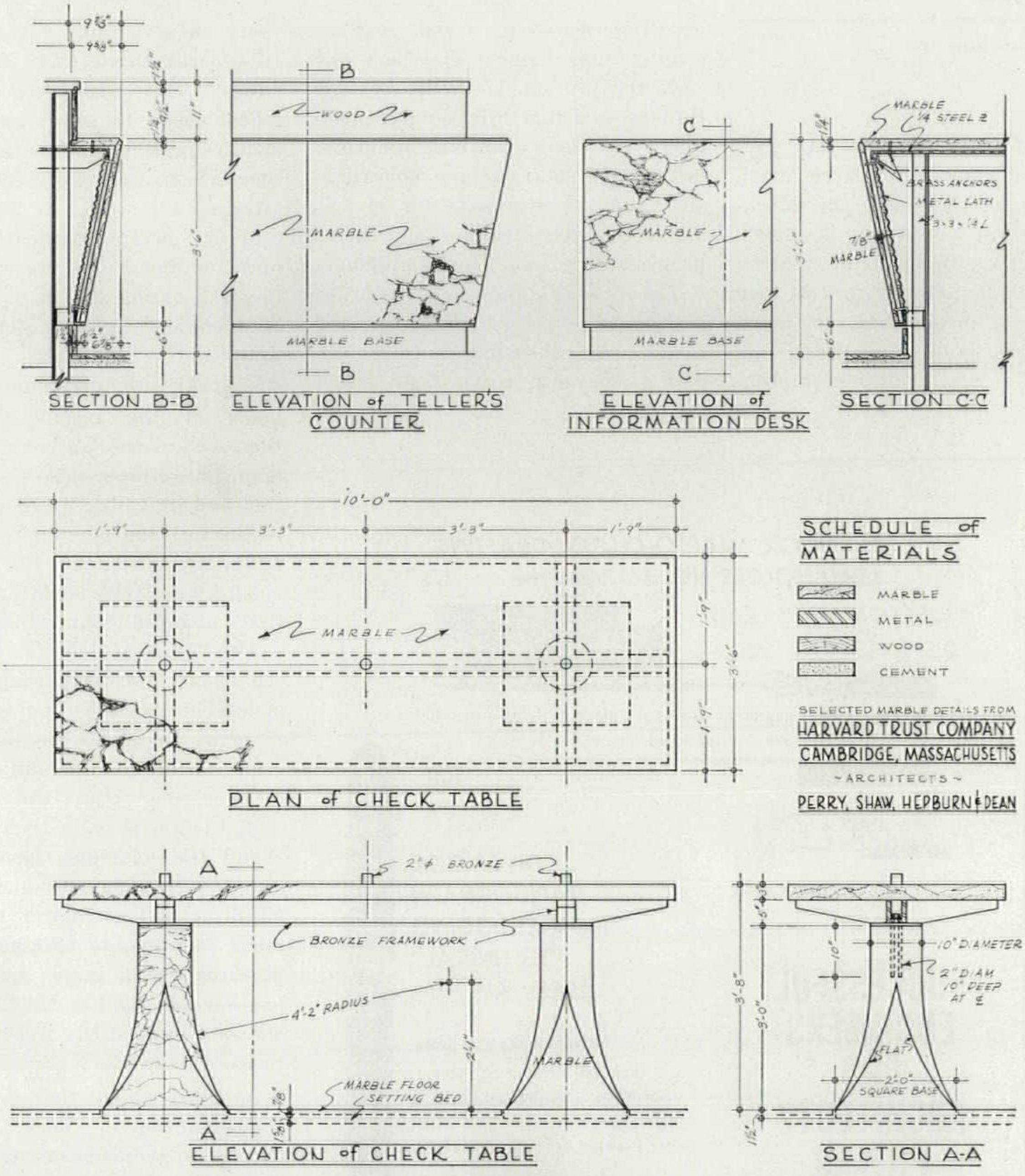
The significance of contemporary design lies in its simplicity, directness and exploitation of essentially beautiful materials. Modern architects have learned to express order and function in the plan and attain occasional moments of magnificence without depending upon extraneous elements.

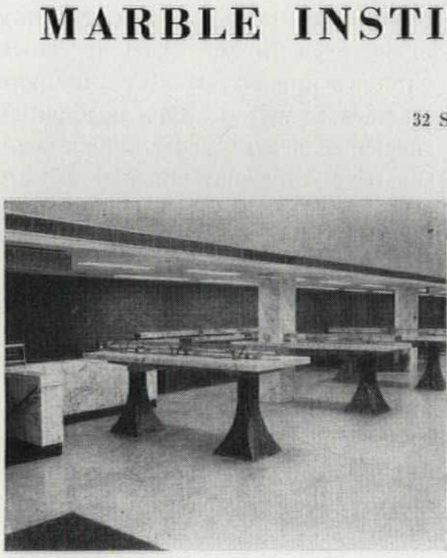
In this beautiful bank interior, marble lends a note of freshness and clarity which no other material would have provided so admirably. The detailing is simple and delicate; and the juxtaposition of textures and patterns provides the necessary decoration. The total effect is extremely clear and denotes efficiency without detracting from the element of refinement so necessary in a bank. Marble, traditional in bank interiors, enhances a new mode of expression completely adaptable to contemporary needs.

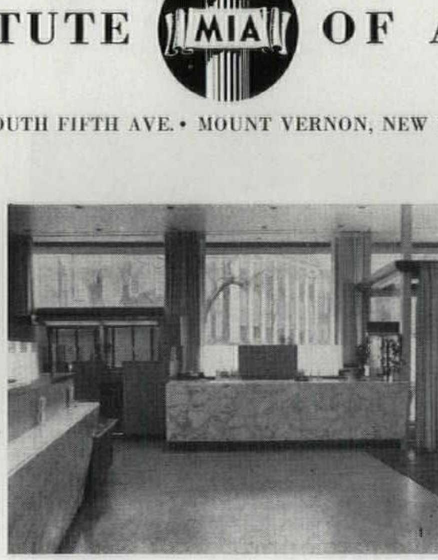
There is a beautiful brochure "Marble for the Modern Bank," describing and illustrating further uses of marble in bank design, available free by writing the Marble Institute of America.

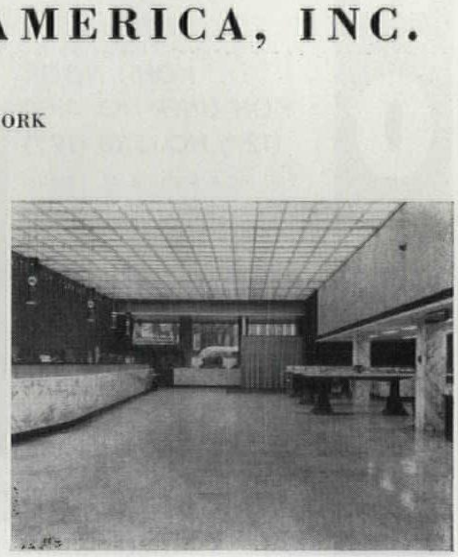
HARVARD TRUST COMPANY, CAMBRIDGE, MASS.
Architects: Perry, Shaw, Hepburn & Dean




SECTION B-B
ELEVATION of TELLER'S COUNTER
ELEVATION of INFORMATION DESK
SECTION C-C
WOOD
MARBLE
MARBLE BASE
BRASS ANCHORS
METAL LATH
PLAN of CHECK TABLE
10'-0"
SCHEDULE of MATERIALS
MARBLE
METAL
WOOD
CEMENT
SELECTED MARBLE DETAILS FROM
HARVARD TRUST COMPANY
CAMBRIDGE, MASSACHUSETTS
~ARCHITECTS~
PERRY, SHAW, HEPBURN & DEAN
2"ϕ BRONZE
BRONZE FRAMEWORK
4'-2" RADIUS
MARBLE FLOOR
SETTING BED
10" DIAMETER
2" DIAM. 10" DEEP AT ℄
FLAT
2'-0" SQUARE BASE
ELEVATION of CHECK TABLE
SECTION A-A







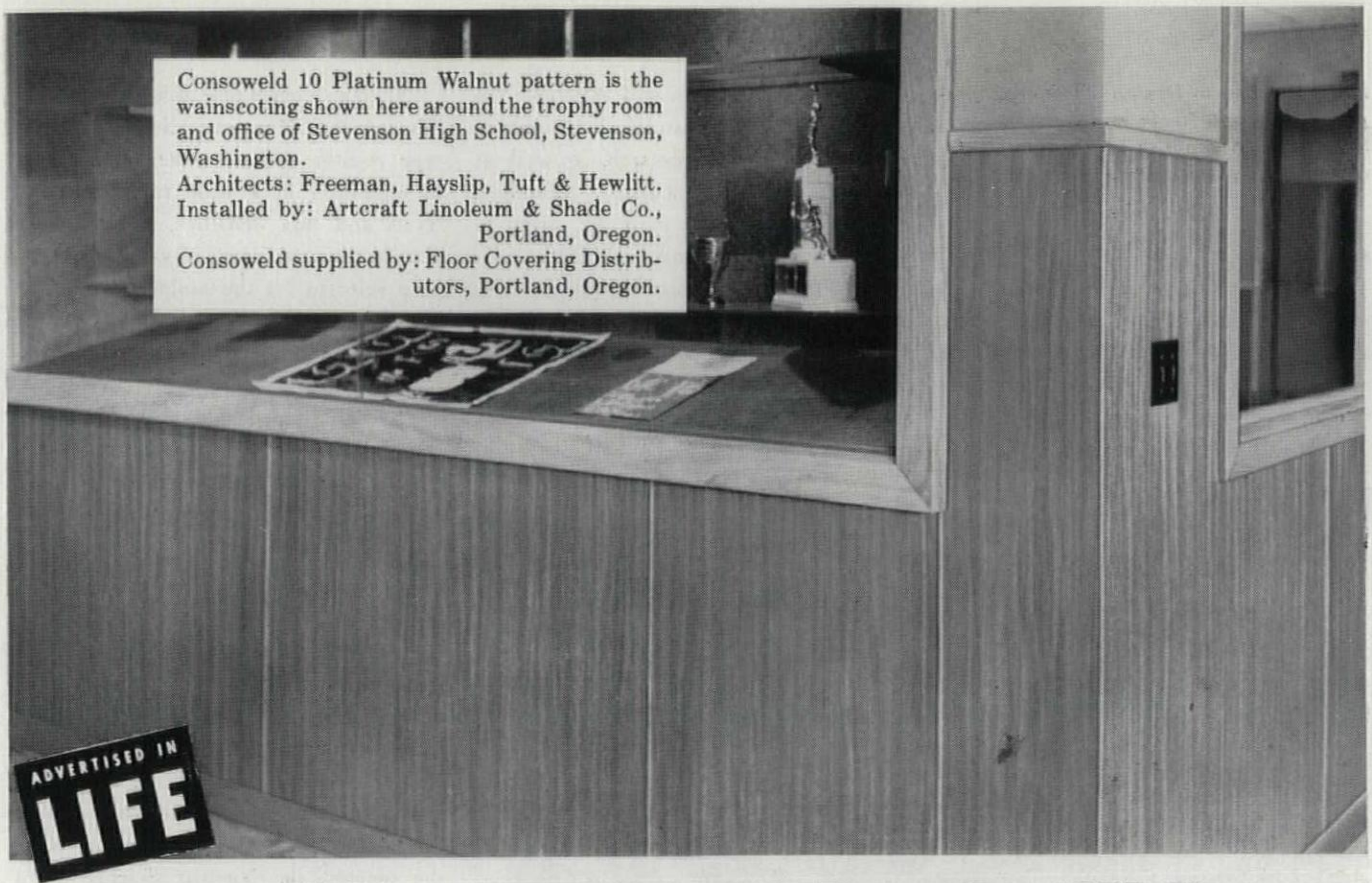
(Continued from page 198)

cases they are informatively presented, but rarely is there much speculation on the ways the educational fraternity even now is exploring to meet the problems of treating children as individuals in the face of ballooning enrollments; nor much that is explicitly directed at satisfactory architectural solutions of problems imposed by the trends that are coming into being. The past and even the present are well explored. But the exciting thing about schools today is their constant improvement architecturally and educationally, and the signposts for laymen sincerely interested in educational progress are too often ambiguous.

The five chapters on "action"—getting a school building project under way, choosing an architect, public relations, costs, bond issues—are safer ground for a reporter. In general, this section offers sound advice. The pages on comparing school costs, to select one example, lucidly present the bases for fair comparisons and expose many of the pitfalls. Likewise, so are the six chapters on environment—the technical, engineering, and architectural factors—excellent. The simplification of technical matters for lay consumption is admirable. One could wish that full advantage had been taken of the recent research of Blackwell at the University of Michigan, and others, into visual perception and lighting; what is contained in the lighting chapter may soon be somewhat outdated. But that is a hazard which any book faces in these times of rapid technical development.

The "Tour of Schools" with which the book closes is perhaps its peak of excellence. The photographs are in many instances magnificent; the organization of the subject matter is clear and fresh; the appearance of the pages is more than satisfying—and the examples have been selected with judgment and taste. It might have been better here, as in other sections, to eliminate the explanatory text, since many of the photographs explain themselves. But one may ignore the words; the pictures tell the story.

A word about the sponsor who commissioned the book: until now we have avoided saying that the Aluminum Company of America is responsible for this project. This has been done because the book deserves to stand on its own merits. Nothing in it, even in the chart in which windows appear, stresses aluminum or tries to sell it. This is a public service of a high order, which some sensitive souls may consider a "soft sell," but a sincere public service nevertheless. Alcoa is mentioned once in the text, in the brief foreword by the Company's president, Frank L. Magee. These few paragraphs are worth reading, particularly the last two sentences: " . . . in the end quality is the dominantly important thing in school building, and is the reason for this book. Children are more than statistics."



Consoweld 10 Platinum Walnut pattern is the wainscoting shown here around the trophy room and office of Stevenson High School, Stevenson, Washington.
Architects: Freeman, Hayslip, Tuft & Hewlitt.
Installed by: Artcraft Linoleum & Shade Co., Portland, Oregon.
Consoweld supplied by: Floor Covering Distributors, Portland, Oregon.

Consoweld 10 on School Corridor Walls Will Save $200 A Year, Says Architect

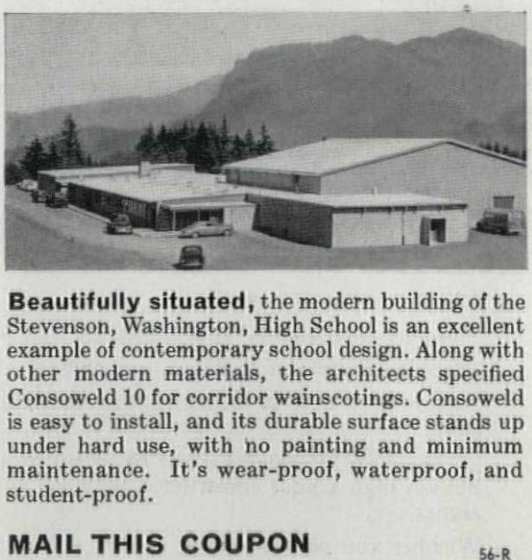
In addition to the color, beauty, and durability that Consoweld wainscoting provides, the saving on maintenance alone will be around $200 a year, based on elimination of painting every three years, according to P. A. Hewlitt, the architect.

At Stevenson (Wash.) High School, the architects used about 7600 square feet of Consoweld 10, the extra-thick (1/10-inch) laminated plastic panels. This was installed directly over gypsum lath, with Consoweld's Twin-Trim matching mouldings at seams. A two-man team installed about 700 square feet per day. Men who installed the panels said that even though this was their first experience with it, they had no trouble whatever installing Consoweld—in fact, said "it was fun to install," and it required no bracing or shoring.

Consoweld 10 is a heavier grade of the same durable, easy-to-clean laminated plastic seen everywhere on quality dinette tables, countertops, and fine furniture.

Consoweld's exclusive new 5-foot-wide, 10-foot-long panel is ideal for wainscoting. Consoweld is available in a wide variety of color-tuned patterns and panel sizes, in both Consoweld 10 for vertical applications, and the standard 1/16-inch Consoweld 6 for desks, lunch counters, tables, and other applications. Get complete information—mail the coupon for details and name of nearest distributor.

CONSOWELD®
LAMINATED PLASTIC



Beautifully situated, the modern building of the Stevenson, Washington, High School is an excellent example of contemporary school design. Along with other modern materials, the architects specified Consoweld 10 for corridor wainscotings. Consoweld is easy to install, and its durable surface stands up under hard use, with no painting and minimum maintenance. It's wear-proof, waterproof, and student-proof.

MAIL THIS COUPON 56-R

Consoweld Corp., Wisconsin Rapids, Wisconsin PA-118

Please send me details on Consoweld 10 for school and other wall use, and name of nearest distributor.

Name____________________

Firm____________________

Address____________________

City____________ State________

Please check type of business

Architect ☐ Builder ☐ School ☐ Other________

A Nuclear Science Building

***Program for a Design Problem, prepared by Hugh Neale and Lars G. Stenberg of AMF Atomics for School of Architecture, Pratt Institute* (see page 133.)**

PROBLEM

The trustees of one of our large midwestern universities have decided to erect a Nuclear Science Building to integrate nuclear science research and education into one building.

The building design will anticipate the exploration of many and varied problems in nuclear science research, as well as nuclear science education. Therefore, major consideration must be given to *flexibility of arrangement* within the normal criteria for design of laboratories for the study of highly irradiated materials. *Future expansion, without complex alterations to original space, must also be considered.*

Nuclear science research centers around reactors. A 5 Megawatt "Swimming Pool" type reactor with its inherent flexibility of operation in a wide range of power levels and flux densities, and ability to receive test specimens of varied sizes, has been selected for the building. A "Swimming Pool" reactor is the most versatile type known for combined education and research.

The building design will incorporate the research reactor facility and operational requirements, auxiliary facilities, and administration requirements.

SITE

The site selected for the building is a level piece of land, approximately 800′ x 800′, located on the north side of a minor state highway. Other university buildings are adjacent to the site. To minimize hazards from radioactive effluent from the reactor and hot laboratories, and direct radiation from the reactor hall in the event of release of fission products from the reactor, the Nuclear Science Building must be generally centralized on the site.

REQUIREMENTS

building

Recent practice by the Atomic Energy Commission and reactor builders has dictated the use of a "containment" structure for the area housing the reactor when the reactor is located in a populated area such as this. The "containment" structure is one which limits the leakage of air from the structure to values on the order of 1-5% of the volume of air in the building per day. Such low leakage values need be maintained only when the air has become contaminated with radioactive material to a dangerous degree. This requirement can be relaxed when the reactor is made totally inoperative.

In addition to barometric pressure effects created by a low leakage structure large power excursions in the reactor may release sufficient heat to create a temporary internal pressure. For design purposes, this pressure is:

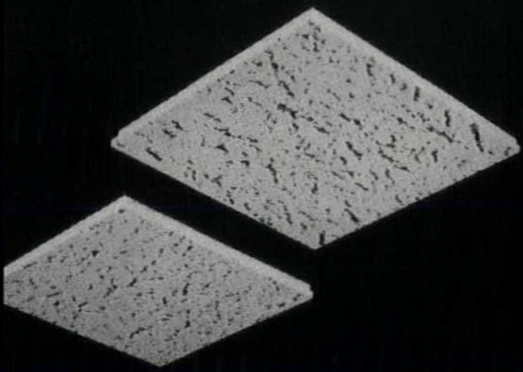
$$P_{psi} = \frac{V\ cu\ ft}{600{,}000}$$

reactor

The reactor pool is a reinforced concrete structure designed to provide adequate

(Continued on page 212)

NO TWO TILES ALIKE



that's the beauty of

BALDWIN-HILL **STYLTONE**

Illustration, courtesy UNION DIME SAVINGS BANK, New York, N. Y.
ARCHITECTS: Kahn & Jacobs, New York, N. Y.

Office of Woodward, Baldwin & Co., Inc. in the Union Dime Savings Bank building
DESIGNERS: Beeston & Patterson, New York, N.Y.

Non-Combustible Fissured Mineral Tile

As you see above, B-H STYLTONE gives the ceilings of Woodward, Baldwin & Co. offices a beautifully textured finish. It will do the same for your interiors. By specifying STYLTONE, with a look of luxury — and effective sound absorption — you will contribute much to your clients' desire for quiet elegance as well as office harmony and efficiency. Its smooth, matte-white surface diffuses light without glare and has an "a" value light reflectance.

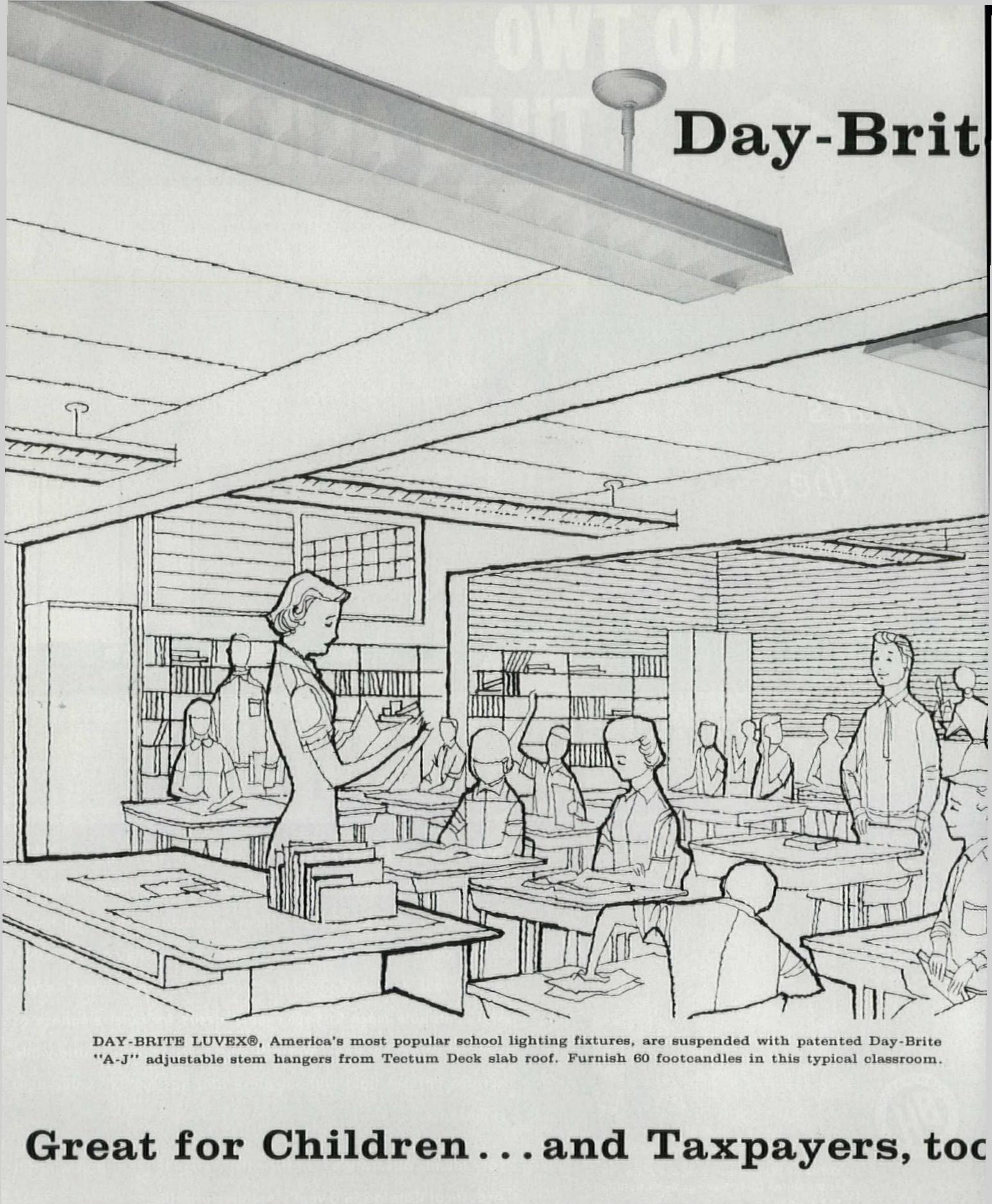
For sound absorption coefficients, refer to the Baldwin-Hill Acoustical Catalog in Sweet's Architectural file.

BALDWIN-HILL COMPANY

Acoustical Products and Building Insulations

1811 Breunig Ave., Trenton 2, N. J.

Member Acoustical Materials Association



DAY-BRITE LUVEX®, America's most popular school lighting fixtures, are suspended with patented Day-Brite "A-J" adjustable stem hangers from Tectum Deck slab roof. Furnish 60 footcandles in this typical classroom.

Great for Children . . . and Taxpayers, toc

Today there is no reason for compromising on school lighting, regardless of budget limitations.

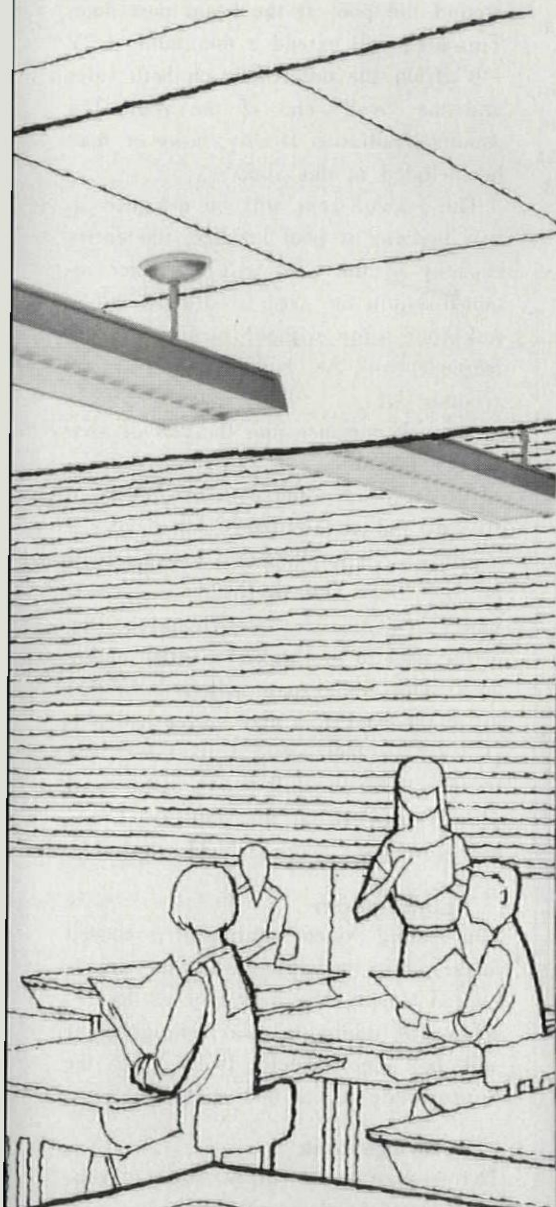
In the school shown here, for example, construction costs were *only $10.59* per square foot, with *Day-Brite* lighting used throughout!

Factory pre-assembly and simplified installation make Day-Brite fixtures competitive with lighting equipment that only attempts to imitate Day-Brite in name or appearance, but never in performance or quality.

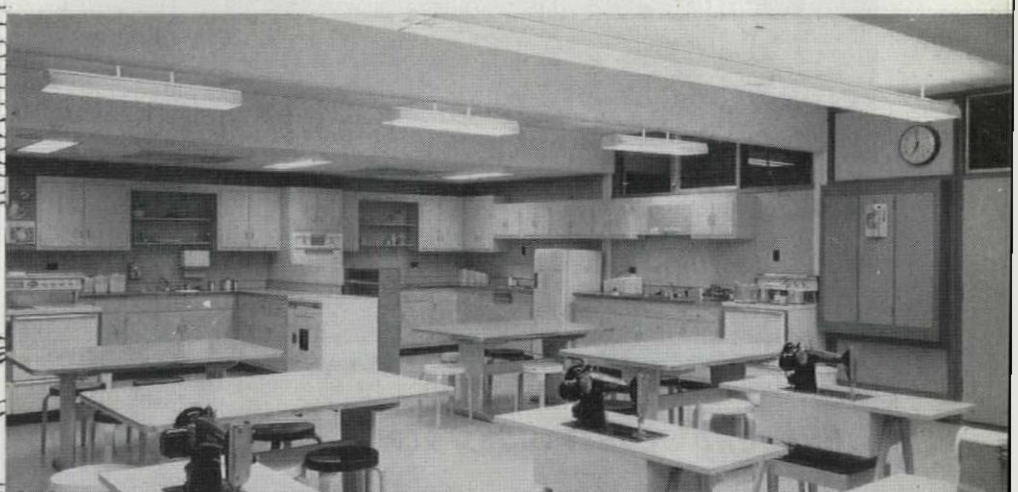
And because Day-Brite fixtures are designed for ease cleaning and relamping, they keep on saving the t payers money throughout the long life of the fixtu

Call your Day-Brite representative, listed in the Yel Pages, for the *facts* and the *fixtures*. Compare *insta* costs and maintenance economies. Then you will kn why there is no legitimate reason for accepting an equal" substitute for Day-Brite lighting.

ighting for Schools...



Herbert Spaugh Junior High School at Charlotte, North Carolina.
J. A. MALCOLM, A.I.A., *Architect;* ALEXANDER SPRINGS, *Engineer;*
F. E. ROBINSON CO., INC., *Electrical Contractor.*



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A Nuclear Science Building

(Continued from page 208)

shielding for the core. The pool is divided by a concrete wall into two sections, a "stall" end and an "open" end. An aluminum gate is provided for access between the two sections. A dry gamma irradiation facility will be located adjacent to one wall of the "open" end of the pool. A fixed aluminum window in the wall of the pool will allow irradiation of objects in the gamma irradiation facility by fuel elements within the pool. A door will be provided for access into this facility from the beam port floor of the reactor area. The shielding may be increased for ease of construction except at embedment locations.

The reactor will be cooled by demineralized water which will circulate from the reactor through a hold-up tank, heat exchangers in the pump room, and back into the pool. A portion of the water will be continuously retreated by a demineralizer.

reactor area

A clear working area will be provided around the pool at the beam port floor. This area will extend a minimum of 25'—0" from the outer face on both sides and the "stall" end of the pool. The gamma irradiation facility, however, may be included in this area.

The reactor area will be designed so that in case of pool leakage, the entire capacity of the pool will be either retained within the area, or drained into a leakproof sump without escape into the remainder of the building or into the ground.

A truck entrance into the reactor area will be required.

An overhead crane with a capacity of 10 tons and an auxiliary hook having a capacity of approximately one ton will be required. The overhead crane will have a 20'-0" clearance from the top of the pool to the highest position of the hook. The crane span will be such that all of the pool area may be reached plus at least 15 feet along both sides. The travel will be the full length of the pool plus at least 15' at the stall end. Crane access to lower floors is highly desirable.

pump room

The cooling system equipment is housed in the pump room. Access to this room is limited during the operation of the reactor. The minimum clear ceiling height will be approximately 16'-0", and the approximate area is 600 sq ft.

storage tank

The storage tank will be sized to contain all of the demineralized water normally held in one section of the reactor pool, and will be located adjacent to the pump room. The storage tank will be located so that misoperation of the valves will not cause the water in the pool to drain below the reactor core. An access manhole is required and the tank should be vented to an elevation above the pool water level. 87,000 gals, cap equals—12,800 cu ft.

hold-up tank

The hold-up tank will provide hold-up of the circulating water and will be sized for approximately 33,000 gal or 4,900 cu ft.

(Continued on page 216)

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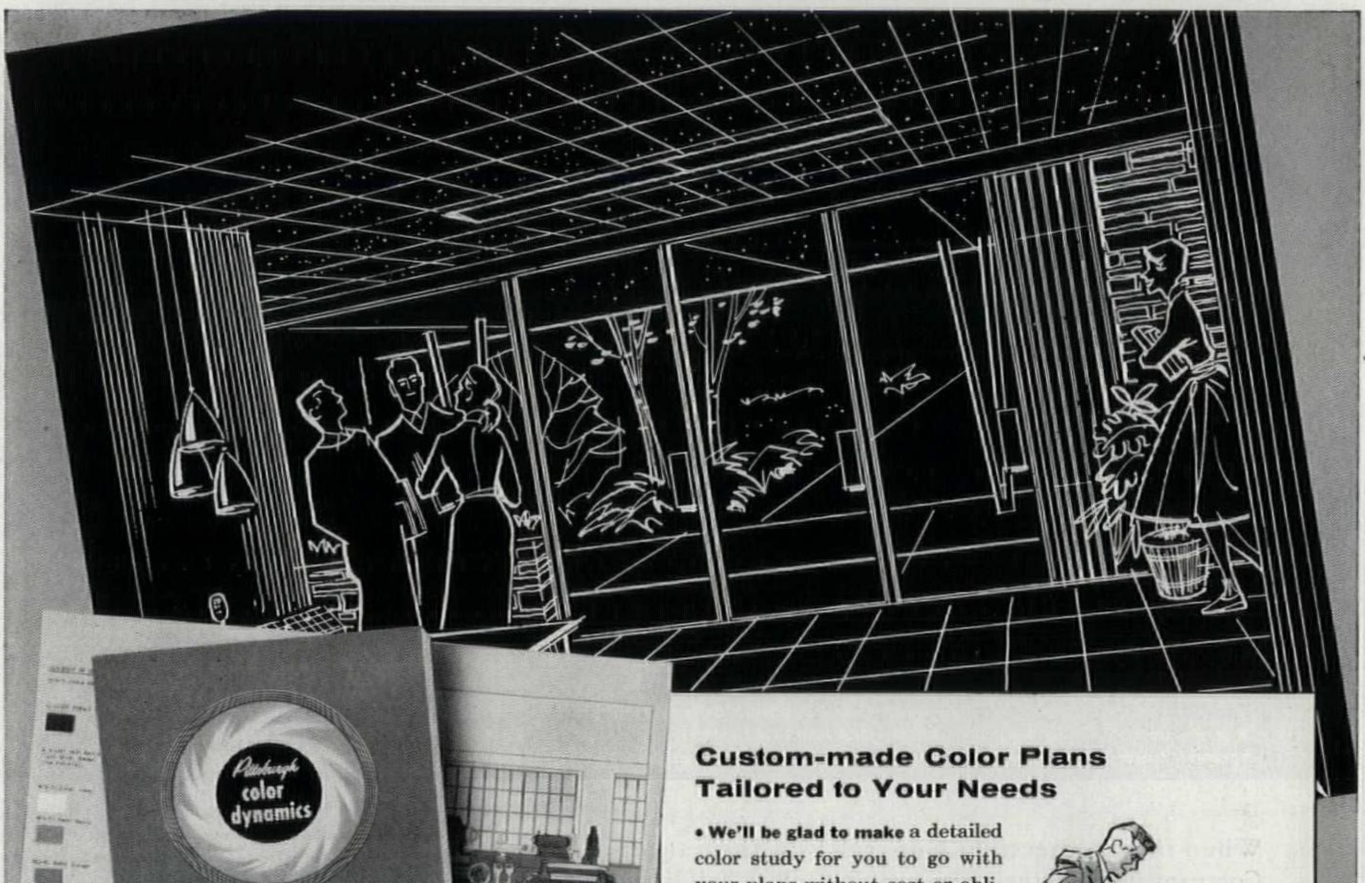

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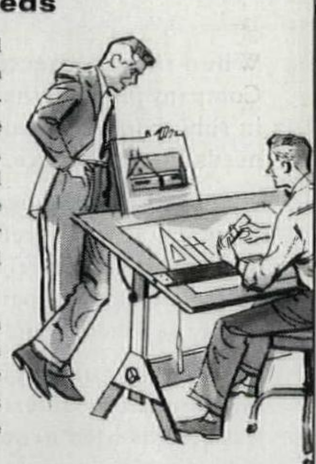

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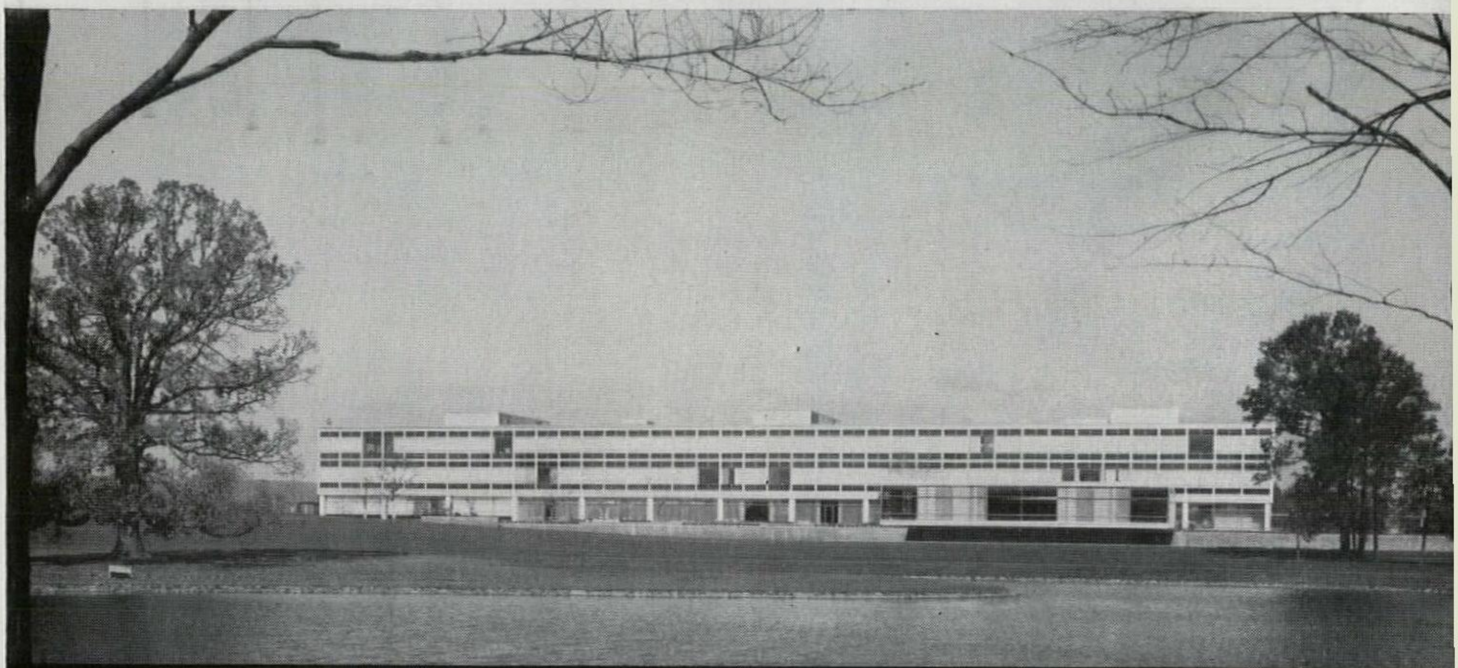


Home Office Building: Connecticut General Life Insurance Co., Bloomfield, Conn.
Architects: Skidmore, Owings & Merrill   Architectural Metal Fabricator: General Bronze Corporation   General Contractor: Turner Construction Co.
Engineers: Weiskopf & Pickworth (Structural); Syska & Hennessy, Inc. (Mechanical & Electrical)   Consultant: Building Methods & Materials: Walter C. Voss

When the Connecticut General Life Insurance Company planned their ultra-modern office building in suburban Hartford, they carefully projected their needs into the future.

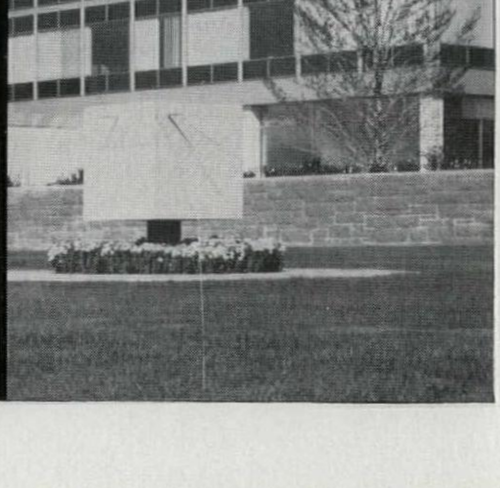
They wanted the nearest thing to "no maintenance" costs for 50 and preferably 75 years. Where initial investment in materials could cut down the yearly costs of cleaning, painting, and repairs they would make the investment.

That's why, throughout the building—both on the exterior and the interior—Republic's ENDURO Stainless Steel is used generously to protect, beautify, and reduce maintenance costs.

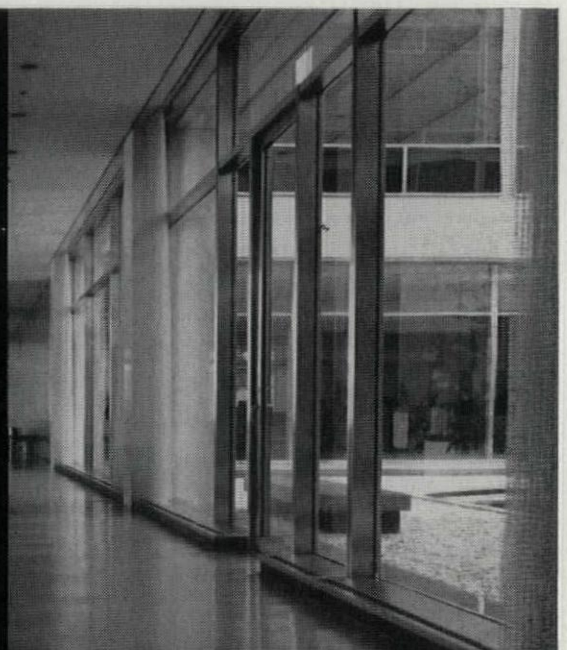
The main building—which contains some 400,000 square feet of floor space unbroken by a structural column—is penetrated by four garden courts, 72 feet square, making it possible for nearly all employees to be within 35 feet of a window. The cafeteria juts out from one end of the main building, cantilevered 15 feet over a pool. At the other end of the building, across a glass bridge, is a special department wing.

Once inside the metal and glass walls the stylish gleam of gracious architecture comes alive.

STAINLESS STEEL WINDOW FRAMES on all levels provide permanent beauty and low maintenance. ENDURO Stainless Steel was selected for the frames because of its high resistance to corrosion. It will not discolor with age. Will never need painting. The building's large window walls admit the outdoors and command scenic views of wide lawns, pools, and trees. Complete details and specifications on Republic ENDURO Stainless Steel for architectural applications are contained in Sweet's File, or can be obtained by sending the coupon below.



DOORS FRAMED IN STAINLESS STEEL open onto one of the four garden courts that penetrate the main building. Although receiving heavy use, the doors resist scuff, scratches, and dents—thanks to the metal's strength and toughness. Like all the entrance doors, the first level and upper level fixed glass windows are framed in stainless steel to resist corrosion and weathering.



STAINLESS STEEL ADDS STYLE AND CHEER to the 800-seat dining room. Table and chair supports, column covers, and food-handling equipment of stainless steel assure attractive clean surroundings. All food-preparation and food-service equipment in the kitchen and counter pick-up areas are fabricated of stainless steel for peak sanitation and attractiveness. Dishwashing facilities are stainless steel, too, to resist corrosion and abrasion.

STAINLESS STEEL FOOD-SERVING COUNTER accommodates some 2,000 employees each day. The cafeteria is completely equipped with stainless steel—from refrigerator doors and back walls to steam tables, display cases, and working areas up forward. In the working areas, cleanliness is easy to maintain since everything with which food and dishes come in contact is made of easy-to-clean and keep-clean stainless steel. Republic offers architects competent metallurgical and engineering help in obtaining the best possible results with ENDURO Stainless Steel.

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(Continued from page 212)

cooling tower

The cooling tower will dissipate heat of the circulating demineralized water system. The cooling tower will require an area of approximately 400 sq ft.

control room

The control room with an area of approximately 400 sq ft contains the control console for the reactor and cooling system, and will be located so as to permit a maximum view of the top of the pool and all reactor operations through glass partitions. The control room will be completely enclosed, however, it will have access to the reactor area.

observation room

The observation room will be similar in size and design to the control room. The room will provide for visitor control and may also be used as a classroom. Experience has shown that lecturing to visitors or students in the main reactor area is difficult due to acoustical problems, and visitors in the control room make normal operation of the reactor and experimental work difficult.

instrument shop

The instrument shop with an area of approximately 600 sq ft is used for maintenance, repair and calibration of the reactor control system, the monitoring system, and the experimental electronic equipment. It will not be used for the fabrication of special experimental gear.

machine shop

The machine shop with an area of approximately 600 sq ft will be used for maintenance purposes and for preparing experimental set-ups. It is anticipated that an outside machine shop will be available to handle any large work. A list of typical equipment for the shop is:

Lathe
Drill Press
Grinder
Cut-Off Saw
Milling Machine
Pipe-Fabrication Equipment
Welding Equipment (Heliarc)
Miscellaneous Tools
Benches and Furniture
Raw Materials and Stores

equipment room

An equipment room or rooms will be required for the heating, ventilating, air conditioning, and electrical equipment required for a building of this type.

counting room

The counting room with an approximate area of 400 sq ft will be used for radiation measurements and will be located near the experiment area in the reactor area.

health physics office monitoring room

A health physics office and a monitoring room will be required with a total area of 300 sq ft. These rooms may be adjoining each other, or combined as one room.

animal room

An animal room, approximately 200 sq ft in area, will be required. This room will be air-conditioned and temperature controlled in accordance with normal requirements for an animal laboratory.

change rooms, toilets, etc.

Change rooms, toilets, and lavatory facilities will be required for both men and women in the hot and cold areas.

(Continued on page 222)


MODERN DOOR CONTROL BY LCN · CLOSERS CONCEALED IN HEAD FRAME
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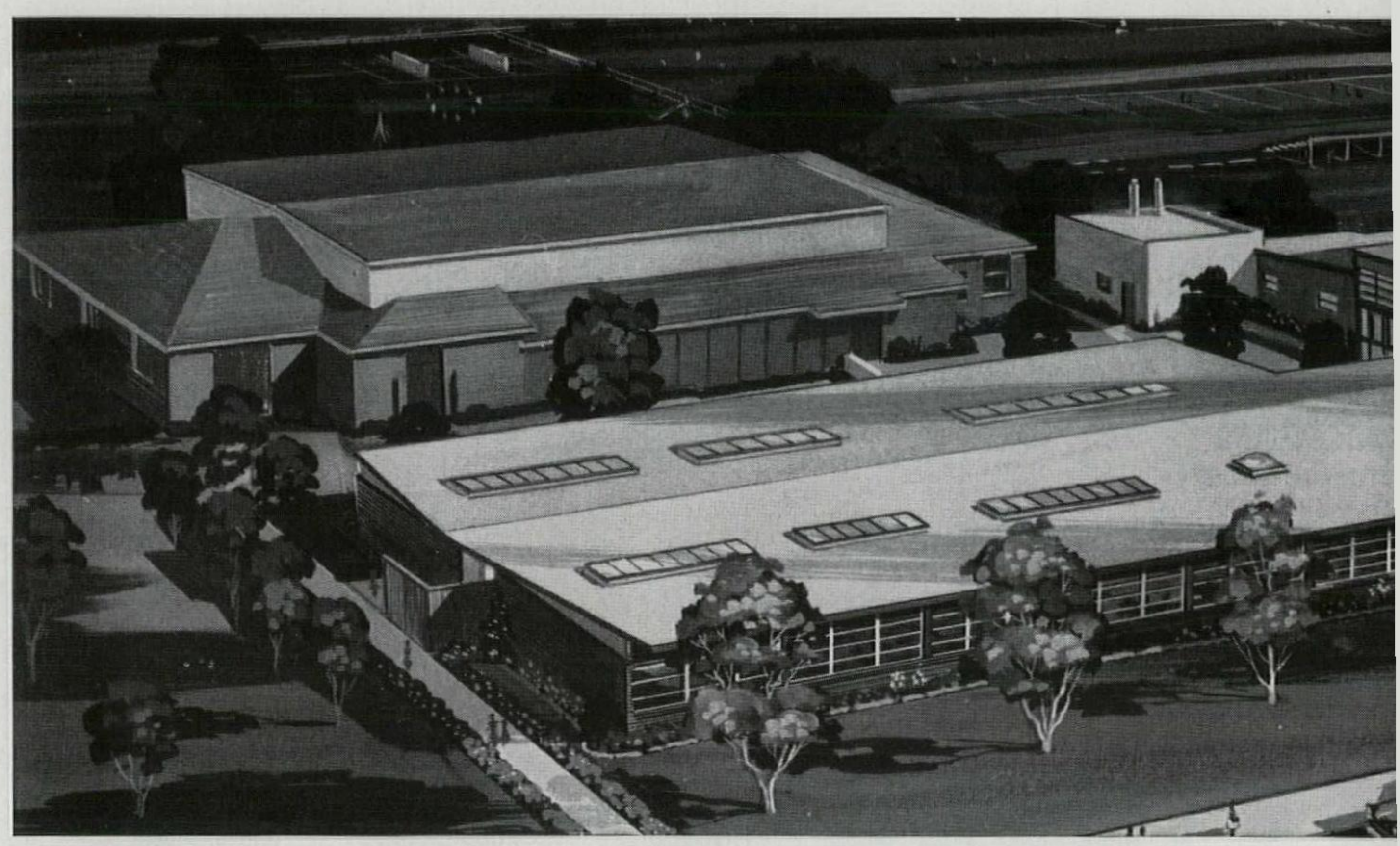
August Perez & Associates
Associated Architects



How to Assure Flexible, Low-Cost Operation in a Multi-Use

It's an elementary school, a high school, a civic center! Resourceful planning combined these much needed community facilities into a single project!

Even a sloping site became an asset in designing this modern building to meet the diversified needs of the small town of Washtucna, Washington.

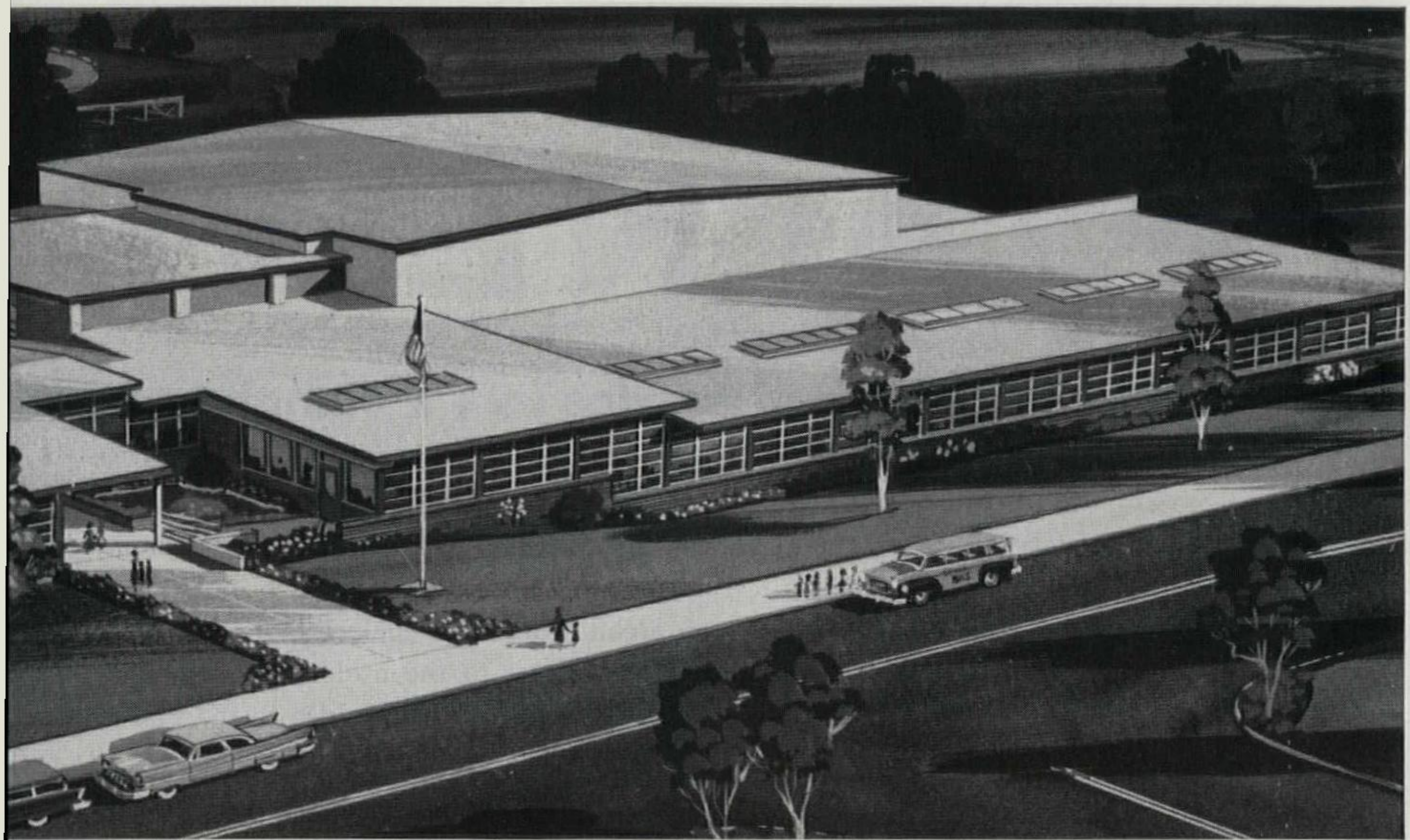
On the lowest level are the elementary school rooms and a 100′ x 75′ gymnasium that doubles as a community auditorium. A portion of the former school on the site was left standing and repaired to provide shop facilities.

On the intermediate level are a multipurpose room and the library. The latter serves both the school and the community, while the former is used as the school cafeteria, as a band and music room and as a civic and social meeting place. The room is also equipped for use by physical education classes. And, thanks to the sloping site, a proscenium opening converts one end of the room to a stage, complete with curtains and lights, three feet above the gymnasium where the audience is seated.

The upper level houses the high school classrooms and administrative offices.

Such multiplicity of use often requires "after-hours" heating and ventilating in one or more rooms of the building. To meet this usage pattern, the specialist Johnson organization installed a pneumatic temperature control system that makes it possible to heat and ventilate *only the room or rooms in use, while maintaining the unoccupied rooms at reduced economy temperatures.*

The Johnson System allows complete flexibility of control to meet each of the varied comfort requirements in the building. It assures



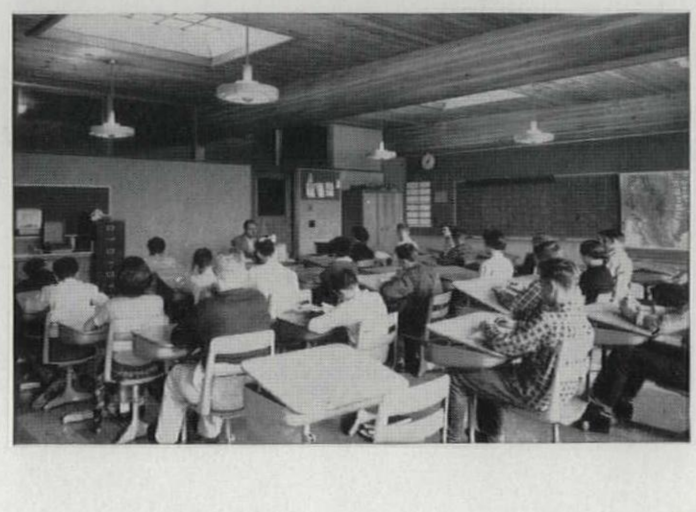
Elementary and High School Building, Washtucna, Washington. Victor Louis Wulff, AIA, architect, Spokane; Lyle Marque & Associates, mechanical engineers, Spokane; Peter J. Young & Son, general contractors, Spokane; W. R. O'Rourke Co., mechanical contractor, Walla Walla.

Heating Building

the best possible thermal environment for the youngsters in school and provides equally ideal conditions for other purposes. Yet it eliminates all needless heat waste, overlooks no opportunity to save fuel. The savings are large.

Similar temperature control arrangements and large fuel savings are possible in any building with "after-hours" heating problems. A nearby Johnson engineer will welcome the opportunity to give you complete facts about the superior comfort and fuel-saving advantages of a Johnson Pneumatic Control System. There is no obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

During school hours, a Johnson *Dual* Thermostat on the wall of each room assures ideal temperatures and proper ventilation throughout the building. For "after-hours" comfort, occupants simply press the thermostat button for normal heat and ventilation, while low, nighttime economy temperatures are maintained in all unoccupied rooms.



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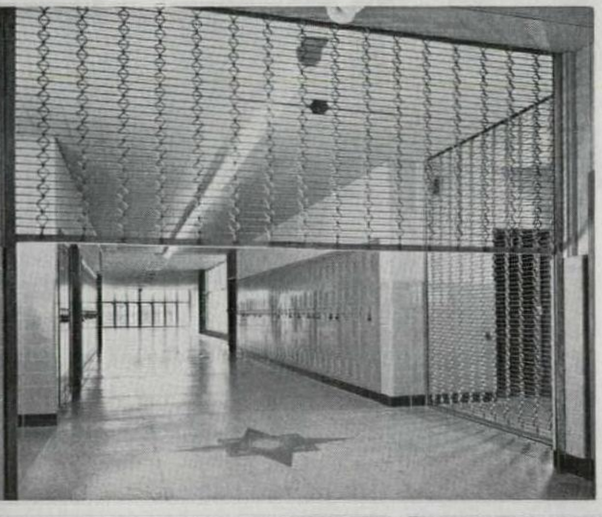
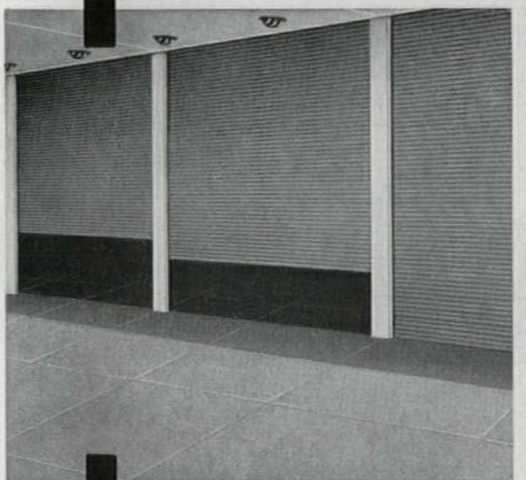
P/A News Report will carry on the PROGRESSIVE ARCHITECTURE tradition of top quality in appearance and content. Presentation of newsworthy buildings, significant technical developments and news about firms, people and architectural organizations—all will receive the same expert treatment as the rest of the magazine. But in effect, because of the scope and timeliness of its coverage, this section will comprise *a new and vital magazine* within the magazine—a complete newsmonthly for the profession, unparalleled in any other publication.

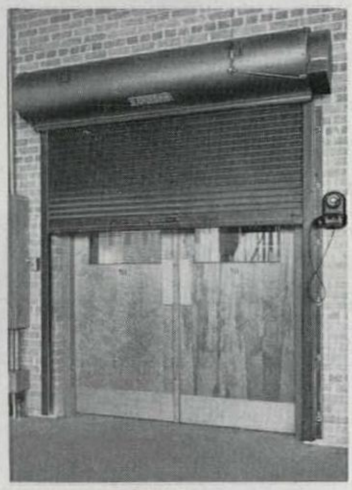
Result of P/A Leadership—and Reader Requirements

For several years, PROGRESSIVE ARCHITECTURE has studied the growing interest of its readers in news of design, technical and product developments. The culmination of plans resulting from this examination is the *P/A News Report,* another in the ever-growing list of editorial firsts in PROGRESSIVE ARCHITECTURE. It demonstrates once more a deep sense of responsibility felt by P/A's editors: to keep you, its readers, abreast of significant changes in a swiftly changing field.

See it in January . . . P/A News Report
Another *first* from Progressive Architecture







A Nuclear Science Building

(Continued from page 216)

hot-laboratory area

The hot laboratory area will consist of one hot cell, an operating area, a loading area, a hot storage area, a hot waste processing area, and an equipment decontamination room.

The inside dimensions of the hot cell will be 8'-0" x 8'-0" with a clear ceiling height for manipulator operation of 12'-0". The walls will require an equivalent thickness of 3'-0" of "heavy" concrete. The ceiling will require an equivalent thickness of 2'-6" of conventional concrete. Access to the hot cell will be through a 4'-0" wide x 6'-6" high door in the rear wall of the cell. A one ton monorail crane will be required in the hot cell, with remote controls on the front wall of the hot cell. One viewing window will be installed in the front wall of the hot cell. Two manipulators will be installed above and centered on the viewing window. They will be 28" apart at a height of 10'-0" above floor. Sample transfer and storage plugs will be required in the front wall of the hot cell located so that they can be reached by the manipulators.

The operating area will be a 15-ft wide area extending along the full length of the front wall of the hot cell. A clear ceiling height of approximately 13'-0" is required to insert or remove the manipulators.

The loading area will be a 15-ft area extending along the full length of the rear wall of the hot cell. A fork-lift truck will be used to transfer materials between this area and the reactor area. Access will also be required from this area to the hot storage area, the hot waste processing area, and the equipment decontamination room.

The hot storage area will consist of 66 storage tubes approximately 7'-0" long (22 each 4", 6" and 8" dia.) Storage of these tubes will have the same shielding requirements as the hot cell walls. These tubes may be stored vertically in the floor.

The hot-waste processing area will be an open area of approximately 300 sq ft and should be accessible to the loading area and the equipment decontamination room.

(Continued on page 224)

A Nuclear Science Building

(Continued from page 222)

The equipment decontamination room will be about 300 sq ft in area.

particle-accelerator area

An area will be provided for installation of a 2 MEV particle accelerator. A basement will be required to permit vertical mounting of the accelerator as well as to reduce the shielding requirement.

warm laboratories

Four separate areas will be required for the performance of experimental work. Each of these areas will contain approximately 650 sq ft of floor space and will contain a warm laboratory, office and storage space. Partitions within each area will be of the movable type so that the areas may be rearranged at the convenience of the occupants.

administration

Offices will be provided for the Director, Chief Engineer and his staff, the Office Manager and his staff.

Other rooms normally required for a building of this type, such as a reception room, conference room, library, telephone room, shipping room, and receiving room will be provided.

A lunch room, isolated from the laboratories and hot areas, with seating capacity for approximately 50 people will be required.

lighting

Appropriate lighting should be provided for all important areas.

finishes

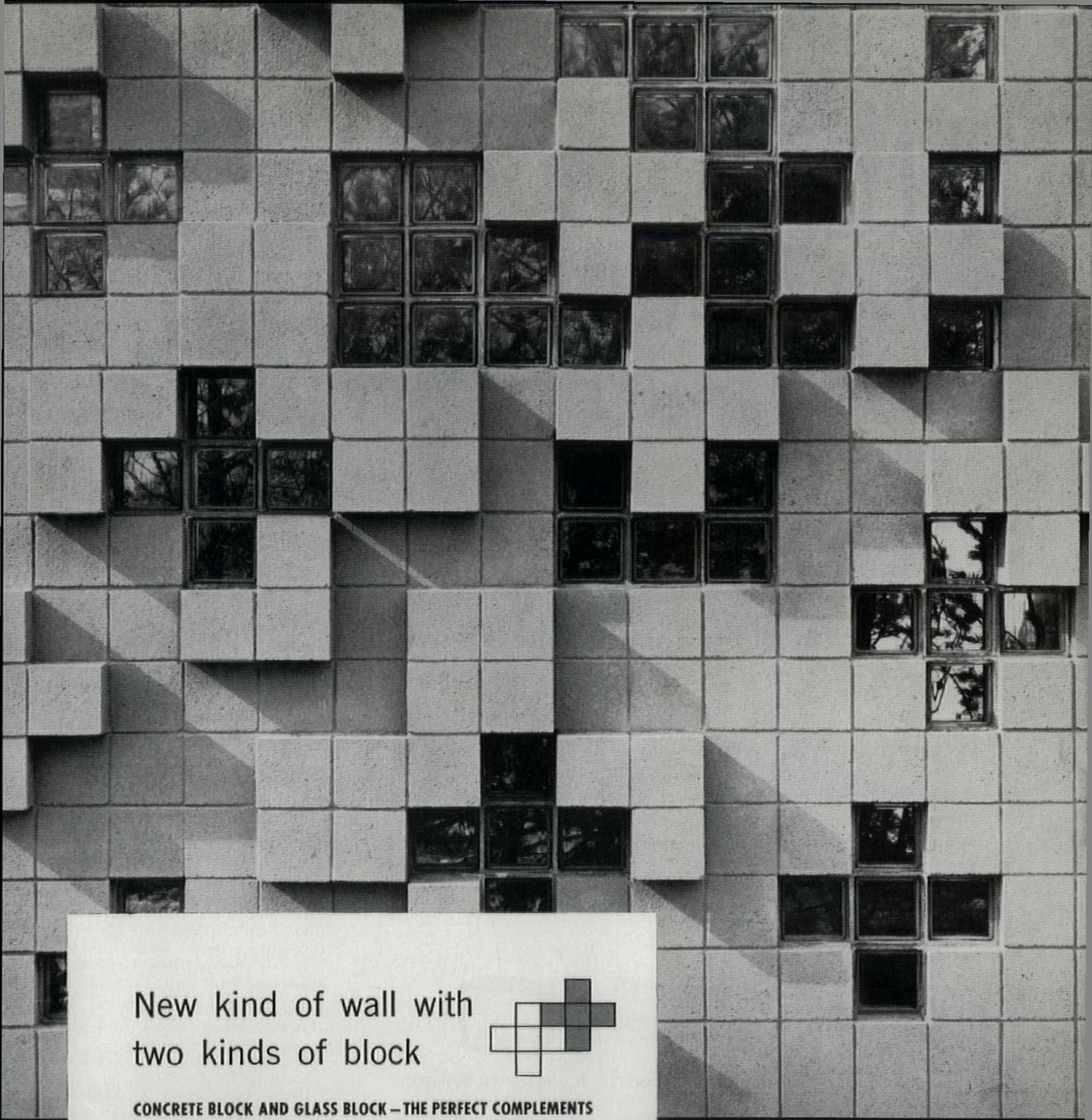
Due consideration should be given to finishes in "hot" and "warm" areas for ease of decontamination and to reactor pool and tank interiors for minimizing radiation damage and maintaining pool-water purity.

RESEARCH

Research in all architectural problems is of the utmost necessity to the student so that he may really know what kind of functions his building will house and may begin to study what kind of a building will best answer the functional needs of the problem. This is particularly true in the case of a new building type such as a Nuclear Science Building.

After investigating the carefully outlined research material, the student will

(Continued on page 226)



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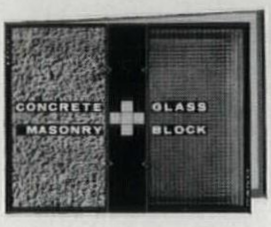

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A Nuclear Science Building

(Continued from page 224)

become aware of how little architectural consideration (used in its finest sense) has been given to this building type both in the past and in the present. It will reveal to him (1) what has been done to date with this type of building and (2) serve to acquaint him with the technical operations and the host of complex functions that occur in a building of this type.

Once this material has been *carefully studied* and *assimilated* by the student he may begin to study how the complex functional needs of a building of this type might be more efficiently planned than they have in the past and to find an individual architectural expression for this building, the question to be answered here is: *What should a Nuclear Science Building look like?*

SUMMARY OF SIZES

public

a Lobby—20x50 max. or 1000 sq ft
b Observation and classroom—20x20 or 400 sq ft
c Receptionist & Switchboard 10x15
d Cleaner's closet 5x5
e Toilets—men & women 20x15

administration

a Director 10x15
b Directors Secretary and Reception Room 10x15
c Manager 10x15
d Managers Staff (3) 10x15
e Managerial Records 10x7½
f Engineering Records 10x7½
g Engineering Staff (3) 10x15
h Engineer 10x15
i Conference Room 10x15
j Library office and Records—10x15
k Library 20x30

personnel

a Men's changing—lockers, showers, toilets for 25
b Women's changing—lockers, showers, toilets for 25
c Health office 10x15 & monitoring area 10x15
d Personnel office 10x15
e Entrance 20x20

recreation

a Dining room for 50 (may be used as a lounge)
b Kitchen (for minimum food prep. and storage) to be served daily
c Loading area

experimental set-up

a Machine shop 20x30
b Instrument shop 20x30
c Glass blowing 15x20
d Loading platform 10′ deep 30′ wide, (3) trucks
e Loading office

(Continued on page 228)

A Nuclear Science Building

(Continued from page 226)

warm research

a 4 laboratories with office and storage space 650 sq ft ea
b Animal room 20x15
c Utility space 20x15

hot research

a One hot cell & space for at least one more 15x15 each
b Hot-cell operating area 15x15
c Hot-cell loading area 15x15
d Hot-waste processing 300 sq ft
e Equipment decontamination 300 sq ft
f Hot storage 100 sq ft
g Cold storage 100 sq ft
h Particle accelerator control 20x20
i Particle accelerator target area 20x20
j Particle accelerator loading 20x20
k Particle accelerator work 15x20
l Particle accelerator generator & equip. 15x20

reactor processing

a Reactor 29x52
b Reactor area 8000 sq ft
c Control 400 sq ft
d Counting 400 sq ft
e Pump room 600 sq ft
f Cooling tower 400 sq ft
g Hold-up tank 4,900 cu ft
h Storage tanks 12,800 cu ft
i Truck entrance

protective changing

a 3 gang showers
b Cold clothing storage
c Hot clothing storage
d Scrub up sink
e Hot toilet
f Cold toilet
g Lockers for ten

mechanical equipment

a Gen. heating 500 sq ft
b Gen. A/C 500 sq ft
c Gen. water supply and drainage 200 sq ft
d Special heating 500 sq ft
e Special A/C 500 sq ft
f Special water supply and waste processing 300 sq ft

parking

a Space for 50 cars
b Control shack
c Access roads

•

Professor Breger, who conducted the problem outlined above, gives us the following comments:

"The Nuclear Science Building problem allowed us to examine the form and function in an almost completely experimental and empirical manner. As the general analysis of the functional aspects of this building are not clearly resolved, the possibilities of variations in the planning were many. Thus, our flow diagrams (translated on page 133) are simply workable hypotheses. Certainly, the ex-

(Continued on page 230)

SEAGRAM'S SELECTS GRANT 2200 DRAPERY HARDWARE

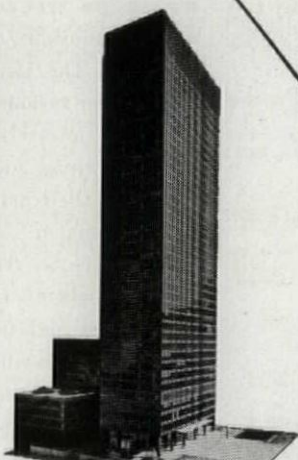

Photo by Ezra Stoller

Building Name:	SEAGRAM'S BUILDING
Architects:	MIES VAN DER ROHE & PHILIP JOHNSON
Associate Architects:	KAHN & JACOBS
General Contractor:	GEORGE A. FULLER CO.
Office Layout and Furnishings:	PHILIP JOHNSON ASSOCIATES, J. GORDON CARR AND KNOLL ASSOCIATES
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A Nuclear Science Building

(Continued from page 228)

pressive quality of such a new building type with all the concomitant symbols of the atomic age presented a magnificent challenge. The method adopted in resolving this problem after research and study was to translate requirements into flow diagrams. The first was the interrelationship of the various elements and the second, the intrarelationship of the more complex areas such as the hot laboratories and the reactor proper.

"In terms of the flow, the particular problems to be resolved were the movement of personnel in cold (safe), warm (medium), and hot (somewhat dangerous) areas, the different health controls involved in each area, and the movement of materials between these spaces. It should also be noted that some spaces could be hot on one level but warm at another level; also spaces might be hot for only a short period of time during the operation and cold for most of the time. Yet, despite these rigid requirements of movements, expansion and flexibility were desirable since the obsolescence rate of Nuclear Science Buildings is quite rapid.

"Problems of structure were twofold. First, there was the enclosing of space for the required areas with spans ranging from 60 ft to 100 ft and provisions for a 10-ton crane in the reactor space to comparatively small bay sizes for the adjacent and related functions. However, the heights of space varied—30-ft heights were required for the particle accelerator; 40- to 90-ft heights might be used for the reactor (depending on one's interpretation of what happens when an excursion occurs); 15-ft heights for operating area and experimental setup; and normal ceiling heights for warm laboratories and administrative areas. Secondly, the construction of some elements required thick concrete protective covers, *e.g.*, the hot cell and hot storage elements, while other areas, such as the reactor, were to be as sealed as possible to prevent leakage. It should also be noted that the structural enclosing of the areas was only a small percentage of the ultimate cubic cost of the building; thus including the area for expansion in the initial stage

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A Nuclear Science Building

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—without building for the ultimate requirements—was feasible. Indeed, this was the way most students solved the problem in the expansion of the hot laboratories.

"The biggest problem was the conceptual one. Namely, what kind of form is indicative, expressive, or symbolic of this special function? Form-wise, most of the problems were resolved in terms of two distinct shapes. A complex, large, cylindrical or elliptical or truss-enclosed shape for the reactor and a somewhat simple, trabeated, cubistic form for the related functions. Most solutions placed the hot laboratory functions underground. This was felt justified in terms of protection, and was also desirable in terms of form, because of the variety of heights that occur in this function. The reactor area was interpreted in two ways. In one, the structural elements, such as the ribs, trusses, or columns, emphasized the large span and crane supports. The other interpretation was simply carrying a continuous shell or modeled form over the entire area and placing the crane supports within the shell so that they were not experienced from the exterior. A variation of this was seen in the few molded forms that were presented, but treating the nuclear form as sculpture seemed to be beyond the abilities of most students. The problem of using glass both formally and functionally was not resolved. On one hand, it was felt that it might lighten up the space, but on the other hand, there is no question that leakage would be increased. Summarizing the form problem, I cannot really say that a new symbolism was presented. Perhaps, as more and more people work on this we might come closer to it."

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P.S.

why don't people see architecture?

Architects are very conscious of the fact that people don't really see architecture, although they live with it and make use of it every day. It has become almost a cliché within the profession to say so. Bruno Zevi, Italian critic, begins his book, *Architecture as Space,* with a series of quotes from other writers, all to the effect that:

"The public is interested in painting and music, in sculpture and literature, but not in architecture. . . ."

I have commented many times, from my own experience, on precisely this distressing situation. I often spend evenings in the company of people who are able to bounce back and forth in conversational badminton bright-feathered shuttlecocks of information about abstract-expressionist painting, about the latest sculpture of David Smith or Reg Butler, the new dance series of José Limon, the most recent off-Broadway as well as on-Broadway theater, the current Henry Miller book, and so on. But when the subject turns to architecture (TIME may have had Eero Saarinen or Richard Neutra on its last week's cover, and intellectuals see at least the cover of TIME) the ball falls to the floor—there is not even a knowledge of *names,* to say nothing of a basis for casually critical evaluation, as in the other arts.

If this is true among "sophisticated" people, how much more true it is among business people, middle-class solid citizens, and ordinary, reasonably perceptive white- and blue-collar workers.

It would seem that understanding of today's architecture is limited to something like this:

1. An architect is a man who draws blueprints. (It is shocking, but true, that few laypeople even know what an architect does. A painter paints; a writer writes; a dancer obviously practices and performs in choreographic routines; but what is the creative process, artistically and technically, of an architect—and what are his business and professional duties? Ask any ten people you know, and eight of them will be vague or misinformed.)

2. Architecture is something of the past, which included the Parthenon, Gothic Cathedrals, and certain Monuments.

3. Architecture also might be extended to include some churches, in imitation Gothic; the Town Hall, in imitation Georgian; and the recently built East Side Bank, in imitation Roman. These are known as "styles" in architecture, and the well informed middle-class college graduate is rather proud of being able to distinguish among them.

4. There has been a new "style" known as "modern architecture" developed in recent years. It has several manifestations: a type of residential design from California known as "ranch house"; the downtown, curtain-walled office building; the local high school, which makes more sense as a school than the columns and pediments we grew up with; the new regional shopping center and the stores that constitute it. The fact that by listing all these acceptable "modern" architectural types we have covered the great bulk of modern building is apt to escape us. The public still isn't sure that this is "architecture."

5. And Aunt Sue's boy Harry has gone into architecture. He studied at State University, and now he's working for a large New York firm of architects, and Sue says he is principally making detailed drawings of stairways and things like that. Work of that sort also, presumably, is architecture.

And that, unhappily, is the extent of the understanding, by the average American, of architecture in America in 1958. Why is this?

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One reason, undoubtedly, is that the change from a traditional approach to architecture was so rapid during the second decade of our century as to confuse even the architects themselves, and obviously could not have been followed carefully by the general public.

Another is that "architecture" for so long was, as an art, directed toward monumental buildings and the homes and institutions of the wealthy. A democratic architecture which should—and therefore could—be understood by *all* people is a recent concept, which *all people* do not yet appreciate.

A third possible reason is that architects themselves have not, until very recently, attempted to explain what they were doing, and why, to the public. The creative segment of the profession has very recently emerged from a withdrawn, introspective, avant-garde, you-won't-understand-me-so-I-won't-attempt-to-explain-myself attitude.

Another very possible reason for the public lack of concern or outright misunderstanding of architecture is the preponderantly large amount of bad architecture that surrounds us—some from previous generations, much going up today. Not only do badly designed buildings by architects get built by the score, even amateurs have great volumes of badly designed architecture actually accomplished and built in conspicuous places; home builders are designing, as well as building, millions of houses; engineers design and build industrial and institutional buildings; interior decorators, who are likely to be amateurs with an "educated taste," design the "interiors" of all sorts of buildings, with no relation to the "exteriors."

But finally, and probably most important of all the reasons people don't really critically see the architecture around them is that this is the most complicated of all the arts and the most *difficult to evaluate.* When I realize that I am over my head in a discussion of philosophy of higher mathematics, I am inclined to quit and turn to something more within my ken and intellectual reach. In the same way, I believe, the average, well intentioned, well informed (on other subjects) layman is understandably inclined to give up on architecture.

There is, for instance, the characteristic of architecture which concerns the handling of *space.* This is the subject of Bruno Zevi's very excellent book which I mentioned earlier. Whether or not one agrees fully that this is the *only* approach to the understanding of architecture, there can be no doubt that the quality of space *is* basically important. To the untrained critic this is a subtle thing. It is also often an *unseen* and therefore unexperienced sensation. The typical man-in-the-street who *sees* Seagram House literally remains in the street; he never senses it as architecture, if architecture is space, but purely as a block on Park Avenue, seen from outside; he never goes in it to experience the space as such.

Then there are the equally subtle architectonic responses that come from the use of color, texture, ornament of various kinds (today, usually extremely subtle and difficult-to-evaluate ornament, such as the polish of a metal, the play of a fountain, the contrast of a curved and a flat plane) and the sciences or quasi-sciences that derive from sensory perceptions and reactions such as sound (acoustics), lighting (illumination), and air conditioning (climate control).

Other arts also have technical considerations and sensory subtleties, which the intelligent-viewer public can learn to evaluate (perhaps, after enough experience of the art form, unconsciously). Could not this happen also in architecture? I am sure that it could, but my point here is simply that it has not, and it probably will not for some time to come. It is difficult enough for the constant, critically orientated professional viewer to be sure that his subconscious, quick, innate reactions to architecture are also reasonable ones and reasonably correct ones. Since the available literature on the subject is published almost entirely for the profession itself, there is little likelihood that this "how to look at architecture" faculty will develop of is own accord. If we *want* it to develop, we must find ways to promote its development.

Thomas H. Creighton