ARCHITECTURAL RECORD

11 NOVEMBER 1962 • TWO DOLLARS PER COPY

BUILDING TYPES STUDY: INDUSTRIAL BUILDINGS

SIX NEW HOUSES BY PAUL RUDOLPH

"YESTERDAY'S CITY OF TOMORROW" BY LEWIS MUMFORD

FULL CONTENTS ON PAGES 4 & 5
Why Alden Dow chose Armstrong Ventilating Ceilings for Ann Arbor's new City Hall

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For buildings to seven stories, Rotary Oildraulic Elevators are the most practical choice on the basis of esthetics, performance and economy. Let our engineers assist you on plans and specifications.
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YESTERDAY’S CITY OF TOMORROW 139 In this second of five articles on “The Future of the City,” Lewis Mumford discusses the influence on urban design theory and practice over some 30 years of “the powerful propaganda and experimental achievement of this singular man of genius, Le Corbusier.”

HIGH-RISE DORMITORY 145 Philadelphia architects Nolen and Swinburne design a men’s residence hall at Temple University featuring a steel and glass sunshade and precast, exposed-aggregate curtain-wall panels.

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Coming in the Record

THE AIR FORCE ACADEMY CHAPEL—COMPLETED!

One of the most embattled designs in the history of modern architecture, the U. S. Air Force Academy Chapel at Colorado Springs, is now a completed building. Next month's feature will provide extensive photographic coverage of a spectacular architectural accomplishment.

SAARINEN'S "POLYGONAL MASONRY ARCHITECTURE" AT YALE

For Yale's two new residential colleges the late Eero Saarinen felt a new architectural vocabulary was needed to achieve the wanted feeling of diversity and individuality with proper respect for the spirit and scale of neighboring pseudo-Gothic structures. His solution was what he called "polygonal masonry architecture" and he thought it had potentials beyond this single project. Now the colleges are completed and occupied, and architects will be studying the results with more than ordinary interest.

BUILDING TYPES STUDY: BUILDINGS FOR THE AGING

It is now six years since the architectural competition sponsored by the National Committee on the Aging of the National Social Welfare Assembly in cooperation with Architectural Record and The Modern Hospital sought to stimulate more imaginative planning for a type of building then relatively new to architects and clearly destined to increase in volume. Hundreds of sponsors and architects have meanwhile been concerned with such projects; how have they been doing? Next month's study will offer some critical evaluations of progress in the field, and a review of current work.
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wherever concrete must be beautiful

The United States Science Pavilion is one of two principal theme buildings of the Seattle World's Fair. After the Fair it becomes the city's cultural center.

The load-bearing S-type stud wall panels are 32 and 52 feet long. They are faced with Trinity White portland cement and white quartzite aggregate. They are prestressed. The high strength of Trinity White and the high-early-strength gray cement back-up permitted the forms to be stripped in 12 to 14 hours with steam curing. Panels are secured in place by either welding or bolting.

Problems of repeated turning, handling and transporting these massive members were neatly and ingeniously solved with specially outfitted lift trucks.

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For more data, circle 5 on Inquiry Card
Claustrophobia for the Aged

One of the flurries of activity in our office of late has been the review of the plans of a considerable variety of homes for the aged (for a Building Types Study for December). It might seem that such a review would be one of the pleasurable prerogatives of an editor, particularly one who through the years has raised his small voice to urge more attention to homes for the "golden age" group. But this sensitive soul found himself becoming depressed.

We in this wealthy capitalist country are going to build thousands of units in great complexes of buildings, to give our elderly citizens a new way of life, a place of their own, a new dignity, and so on. But each one's place of his own is going to be a very small one. We are going to permit him the much-talked-about infirmities of old age; we will even allow him some psychological infirmities; but he had better not suffer from claustrophobia.

In the plans we saw there was an efficiency unit, or one-room apartment, measuring less than 14 by 14 ft. There was another unit 14 by 16 ft 6 in. In a public housing project there was a living room 12 ft square; though this one had a bedroom 10 by 12 ft.

Now you may join those who tell me that these sizes are not shockingly small. And I am well aware that you could show me plans of apartment houses with room sizes approaching these minimums. And I am not exactly unaware of building costs.

But I shall just set my feet and go right on sputtering. Those rooms are simply too small. Older people inevitably become continually more house-bound, physically or mentally or both. Their satisfactions increasingly come from the little things of life, the immediate associations of place and environment. The small living unit represents confinement, an obvious cutback.

The storage problem is not the least of the concerns for older people. By the time you are grandparents, we are told, you tend to shed possessions as you shed responsibilities. You give up that big house in the country; you move to the city and "take it easy." But this perpetual country boy remains unconvinced. Presumably there will come a day when I must junk the garden tools, but I shall not cheer about it. I shall become quite stubborn about giving up a great many possessions and mementos—records, books, family albums, collections, and so on ad infinitum.

There is an assumption, too, in all of those plans, that what activities remain available to me in later years are to be carried on in the craft shops or the communal lounge or the community center. A dismal prospect. Well, I suppose I cannot expect to tinker with a piano in my own room, or stuff birds, or raise African violets. But it doesn't seem like asking too much to have a desk of my own, or nine square feet for an easel and a stool. If you could see what happens when I attack something on a drawing board you would understand why privacy is a must.

Yes, you cannot plan anything in the institutional manner and give everybody a six-room house and basement.

But I don't think I am being unreasonable. I am merely asking for a few more square feet in the cell that represents one's private preserve. The square feet that would be added would be the cheapest square feet in the house. The expensive things are already included—the sanitary fixtures and piping, the heating and air conditioning, the kitchen and the dining rooms, the offices, the personnel, the medical equipment and care. By cutting the actual living space to the barest minimum you cut costs by niggardly amounts, but also you seriously cut into the living.

—Emerson Goble
LOUIS SKIDMORE DIES IN RETIREMENT AT 65

One of the founding partners of the internationally renowned architectural firm of Skidmore, Owings and Merrill, Louis Skidmore, died September 27 in Winter Haven, Fla., at the age of 65. Mr. Skidmore, whose death followed a long illness, has been living since 1955 in his retirement home on Lake Eloise in Winter Haven.

When, in 1936, Mr. Skidmore and his brother-in-law, Nathaniel Owings, founded the firm of Skidmore and Owings, they were laying the groundwork for an architectural organization which was to set a new pace for commercial architecture in this country and, by extension, throughout the world.

The firm opened new frontiers for modern architecture by convincing influential corporate clients that its highly skillful use of contemporary architecture constituted a profitable "image" for business. It and its work have been a pioneering force in developing the conviction in the business community that: (1) good architecture is good business, and (2) good architecture is contemporary architecture.

Further, SOM has developed into one of the largest architectural firms in the U.S. without losing its capacity for recognizing, developing, and effectively using individual design talents of the highest order.

Skidmore and Owings became Skidmore, Owings and Merrill in 1940, when John Merrill was made a partner. At Mr. Skidmore's death, SOM had 17 general partners, 18 associate partners, 48 participating associates and some 600 employees, with offices in New York, Chicago, San Francisco and Portland, Ore.

In his years as a practicing architect, Mr. Skidmore's firm was responsible for planning and building the whole town of Oak Ridge, Tenn., housing 75,000 people; the United States Air Force Academy at Colorado Springs; the Ford Administration Building in Dearborn, Mich.; many of the buildings for the H. J. Heinz Company; and such notable buildings in New York as Lever House, the Fifth Avenue branch of Manufacturers Trust Company and Union Carbide. Overseas the firm's buildings ranged from the Istanbul Hilton Hotel in Turkey to the postwar air bases in Okinawa, consular buildings in Germany and complete towns in Venezuela and Sumatra.

Mr. Skidmore received the 1957 Gold Medal of the American Institute of Architects, its highest honor, and was a Fellow of the A.I.A. He had also received the gold medals of the New York Chapter of the A.I.A. and the Architectural League of New York. He was a past president of the New York Building Congress and had been chairman of the Advisory Council to Princeton's School of Architecture and on the visiting committee of the School of Architecture and Planning at Massachusetts Institute of Technology.

Mr. Skidmore was born in Lawrenceburg, Ind., and educated at Bradley Polytechnic Institute (now Bradley University), Peoria, Ill., and at M.I.T. In 1926 he won the Rotch Traveling Fellowship for two years of travel and study in Europe. He began his architectural work in 1933 as director of design, assistant to the general manager, for the Century of Progress Exposition in Chicago.

Besides his widow, Mr. Skidmore leaves two sons, Louis Skidmore Jr., a graduate student in architecture at Yale University, and Philip Murray Skidmore, an undergraduate at Georgia Institute of Technology.

REPORT ON LONG-TERM CARE EXPECTED SOON

"Planning of Facilities for Long-term Treatment and Care," the report of a committee sponsored jointly by the American Hospital Association and the U.S. Public Health Service, is expected to be published before the end of this year.

The recent annual convention of the A.H.A. had a progress report on activities of the committee from Assistant Surgeon General Dr. Jack C. Haldeman, chief of the Division of Hospital and Medical Facilities of the USPHS Bureau of State Services.

Among the key "planning principles" developed by the committee and enumerated by Dr. Haldeman:

—Planning should include the entire complex of facilities and services for the long-term patient.

—The responsibility for planning for both short-term and long-term treatment and care facilities should be vested in the same areawide planning agency.

—Facilities should be organized to provide continuity of patient care and to minimize transfer of patients between institutions.

—The areawide planning agency should encourage the adoption and use of standards for construction, maintenance and operation, as advocated by recognized authorities.

—Planning should be based on patient needs rather than availability of funds.

—Planning should include provisions for research and evaluation.
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- Seattle, Wash., 3310 Wallingford Ave.
- Minneapolis, Minn., 2653 37th Ave. So.
- Hamilton, Ont., Canada, 789 Woodward Ave.

For more data, circle 6 on Inquiry Card
FIRST PHASE OF MARIN COUNTY CENTER IS COMPLETED

Five-foot balconies run the building's length on three floors. Third floor balcony has full-circle parapet openings.

First phase of the four-unit Marin County Civic Center, San Rafael, Calif., the Administration Building, was dedicated in mid-October. Last major work of Frank Lloyd Wright, the structure was designed "to make the landscape more beautiful than it was before that building was built."

The circle theme repeated through the center reflects the contours of Marin's hills. Wright liked to say that buildings should never be placed "on" hills, but rather "around" them. The Administration Building fuses two hills with a sweeping sky blue curve, supported by circles and earth-colored planes. Roof is a thin concrete shell covered by a sky blue sprayed plastic membrane and has a gold anodized aluminum facia. The 172-ft gold tower encloses the boiler stack and is surmounted by a 45-ft spire.

The 700-ft-long reinforced concrete structure, which cost $4,250,000, contains three floors with 160,000 sq ft of floor space. A central mall, lighted through a plastic skylight, runs the building's length. Rotunda space on the first floor is occupied by a cafeteria; on the second, by a room seating 204; on the third, by a circular library.

Construction on the remaining units of the four-part complex is not expected to begin for four years. The second unit for courts and law enforcement agencies will be identical and will join the Administration Building to share the rotunda and form an angled unit integrating a third hill. Third section will be located west of the main building and will house health and welfare agencies. An 80-acre fairgrounds to serve as a year-round cultural-recreational center will complete the plans. Included will be an outdoor amphitheater and a lagoon with an island.

Following Frank Lloyd Wright's death in 1959, a year after preliminary plans had been accepted by Marin County, his work was continued by Taliesin Associated Architects. William Wesley Peters, chief architect, supervised work on the drawing, assisted by Aaron Green, associate architect in San Francisco. Contractors are Rothschild, Raffin & Weirick Inc.
Health Center Planned for Kentucky

Kentuckiana Center of Education, Health and Research was designed for the Kentuckiana Children's Chiropractic Center, Louisville, Ky., by Taliesin Associated Architects; architect, William Wesley Peters. The four-part plan includes: children's out-patient wing, a circular group of buildings around a central court covered by a domed canopy; ring-shaped administration wing; children's in-patient wing, two parallel bands of rooms facing a court; and a 20-floor tower for education, training, emergency and operating rooms, maternity and nursery departments, laboratories, solaria.

Concordia College
To Be Built
At Ann Arbor

Construction of the new, 23-building Concordia Lutheran Junior College along the Huron River in Ann Arbor, Mich., was begun in September and is scheduled to be completed next summer. Designed by Vincent G. Kling, F.A.I.A., the $6 million campus revolves about a triangular-shaped 116-ft-high chapel, tallest building on the campus. Academic buildings cluster about the chapel while dormitory communities, one for girls and one for boys, are to the east and west. All buildings except chapel are one- and two-story rectangular structures of residential scale and character. The chapel has a single space interior, the congregation area, an 800-seat capacity. Mechanical and electrical engineers are Pennell & Wiltberger Inc.; structural engineers, Severud-Elstad-Krueger Associates. Contractors are Huber, Hunt & Nichols Inc.
NEW YORK'S MUSEUM OF MODERN ART EXPANDS

Three new wings and an enlarged Sculpture Garden are to be added to the Museum of Modern Art, New York. Ground is to be broken this month, and the first phase of the building program—a Garden Wing on 54th Street and an East Wing on 53rd Street—is scheduled for completion by spring, 1964, when the New York World's Fair opens. Philip C. Johnson Associates are the architects.

Together the new wings and enlarged garden give the museum collections four times their present exhibition space, increase space for temporary exhibits by more than 30 per cent, almost triple space for library and other research facilities, increase office space by over 50 per cent and member services areas by 65 per cent.

The two-story Garden Wing will provide a ground level a 60- by 75-ft exhibit hall; and underground, space for the Art Center of the Institute of Modern Art. The roof will serve as a connecting garden to the existing garden. A 50-ft-wide East Wing will replace the brownstone houses between the museum and St. Thomas Church. These additions will be built first because their construction does not involve demolition of buildings now in use by the museum.

Phase two will see a new 100-ft-wide West Wing replace three other buildings on 53rd Street owned by the museum: Grace Rainey Rogers annex, former Theater Guild Building and a remodeled brownstone.
A Church for St. Louis

St. Louis Priory Church, St. Louis, was recently completed and dedicated. It combines two basic building materials—concrete and a sandwich structure made with two sheets of fiberglass reinforced polyester bonded to both sides of an aluminum grid core. This latter light-transmitting material, used for both walls and roof, provides thermal insulation, is shatter-proof, lightweight, structurally strong. Architects were Hellmuth, Obata and Kassabaum.

An Office Building for Washington

Reporters Building, Washington, D.C., an 8-story reinforced concrete structure, will house firms related to shorthand reporting. Architects for the southwest renewal area project are Vosbeck-Ward & Associates. A unique feature of the $2.8 million two unit central core building is a perimeter façade of tilted exposed aggregate concrete panels extending one foot over and shading window glass areas. Two basement levels provide parking for 150 cars. Construction is expected to begin early next year.

Two New Hotels

Americana Hotel, New York (right), designed by Morris Lapidus, Harle & Liebman, provides 1,100,000 sq ft of guest accommodations, 2,000 rooms and suites, 8 ballrooms, 30,000-sq-ft convention hall, shopping promenade and garage for 350 cars. The $50 million structure uses three reinforced concrete framing systems: from top floor to 29th, slabs are supported on columns; from 29th floor to fifth, reinforced concrete shear walls provide vertical support for slabs as well as wind resistance; from fifth floor down, wall load is transferred to composite steel core columns. Structural engineers were Farkas & Barron; contractor, Diesel Construction Company. Concrete work was by Dic Concrete Corporation.

Hotel Indonesia, Djakarta, Indonesia (far right), has 400 rooms, 14 stories. Designed by architect Abel Sorenson and constructed by Indonesians with the help of the Taisei Company of Tokyo, the building’s two wings form a “T” shape. The hotel has three restaurants, a tropical garden, two swimming pools, a gallery of shops. Sculpture and mosaic murals are placed about the grounds, which were landscaped by architects from the National Botanical Gardens at Bogor.
the most exciting ideas take shape in fir plywood
NINE PLYWOOD VAULTS, seeming to float on panels of light, give this church its simple grace and elegance. They provide the additional, practical advantages of construction economy and a 51x135 ft. support-free interior.

Each vault rises to an apex of 27 feet and spans an area 15x51 ft.—longest span on record for an unsupported plywood vaulted roof system. The roof components were prefabricated, and were so carefully engineered that installation took only seven hours.

This church is one more example of the striking new architectural forms that are becoming a practical possibility with plywood: high in structural strength and integrity, economical of labor and materials, and offering superior design flexibility. For more information on plywood structural systems, write (USA only) Douglas Fir Plywood Association, Tacoma 2, Washington.

For more data, circle 7 on Inquiry Card
INDUSTRIAL BUILDING LAG IS EXPECTED TO END NEXT YEAR

The developments over the past half-dozen years in industrial construction (the subject of this month's Building Types Study) reflect a broader problem which is basic to our national rate of economic growth. Investment expenditures by business firms in new and more productive plant and equipment provide the means for increasing our future output of goods. Yet, in recent years there has been a decided slowdown in the volume of business capital spending in general, and in industrial construction in particular.

The postwar pattern of plant and equipment outlays shows vigorous expansion for more than a decade (interrupted briefly by two recessions), and then, since 1957, no further growth. And in this latter period the trend of manufacturing construction contract awards has been downward. As a consequence, our rate of total economic output (Gross National Product) has fallen below its average historical performance. Recoveries following recessions have been less vigorous and of shorter duration, and with the exception of a single month, unemployment has persistently remained above five per cent of the labor force for the last five years.

Many factors enter into the decision to expand manufacturing capacity. Chief among them are anticipated profits, the availability of capital funds, and the extent to which existing facilities are being put to use. Recent developments in these critical areas explain much of the sluggishness in business capital spending.

The steady decline of corporate profit rates over the last 15 years is one of the better known facts of economic life. From a level of 5 per cent in sales prior to 1950, after-tax profits have dwindled to below 3 per cent in the early sixties.

The existence of excess manufacturing capacity in many industries is a further deterrent to investment in new plant facilities. It is well to remember, though, that not all surplus facilities are modern and efficient, and some extra margin is always required to give our productive process the flexibility it must have.

One factor which is less likely to pose a problem in the years immediately ahead is the availability of investment funds. Depreciation allowances have risen steadily, and in combination with retained earnings stand at an all-time high. What is more, the July 1962 reduction (for tax purposes) of the allowable useful life of plant and equipment will serve to speed up the generation of internal funds. External financing, on the other hand, should continue to be in plentiful supply at stable, though not exactly bargain rates.

Much of the current outlay for plant and equipment has been devoted to replacement and cost-cutting modernization rather than primarily to expansion of output. This situation is not likely to change without a decided improvement in the profitability of new investment ventures. An across-the-board tax cut early next year (a strong possibility) would provide just that improvement. By adding to consumers' spendable income, it would boost total sales volume as well. Thus it is likely that the latter half of 1963 will bring a much-needed reversal to the sagging trend of industrial building.

GEORGE A. CHRISTIE, Economist
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Construction Cost Indexes
Presented by Clyde Stute, Director of Statistical Policy, Construction News Div., F. W. Dodge Corp., from data compiled by E. H. Boeckh & Assoc. Inc.

Labor and Materials: U.S. average 1926-1929=100

NEW YORK

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<td>August 1962</td>
<td>379.2</td>
<td>356.6</td>
<td>422.2</td>
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August 1962: 207.0% increase over 1939

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SAN FRANCISCO

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Cost comparisons, as percentage differences, for any particular type of construction, are possible between localities, or periods of time within the same city, by dividing the difference between the two index numbers by one of them; i.e.,

index for city A = 110

Then: costs in A are approximately 16 per cent higher than in B.

\[
\frac{110 - 95}{95} = 0.158
\]

Conversely: costs in B are approximately 14 per cent lower than in A.

\[
\frac{110 - 95}{110} = 0.136
\]

Cost comparisons cannot be made between different types of construction because the index numbers for each type relate to a different U. S. average for 1926-29.

Material prices and wage rates used in the current indexes make no allowance for payments in excess of published list prices, thus indexes reflect minimum costs and not necessarily actual costs.
Borden Architectural Decor Panels are finding preference as the modern medium of architectural expression. The decorative, sturdy, lightweight aluminum panels are used for facades, grilles, dividers and many like applications. They are available in several types and innumerable variations of the types.

Shown above is Borden Deca-Ring panel on a multi-level parking facility in downtown Miami. Here Deca-Ring provides safety, ventilation, and a touch of luxury in combination with efficient use of materials. The Deca-Ring screens are the only siding used on an otherwise stark concrete slab building. Individual panels of Deca-Ring are outlined with Decor-Plank to give added design emphasis.

The circular Deca-Ring pattern is currently produced with 3½" O.D. rings assembled at 4½" centers. Depths of ⅛" and 1" are available. For more detailed information on Deca-Ring and other Borden Architectural Decor Panels, including Deco-Gril, Deca-Grid, Decor Plank and their many variations and subtypes, write for our new eight-page catalog on Borden Architectural Decor Panels.

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For more data, circle 9 on Inquiry Card • For more data, circle 10 on Inquiry Card
Moisture constantly seeks a point of access into every type of construction. It will never find weak spots if you have the right flashing in all the right places. • WASCO flashing, properly installed, is permanent insurance against water damage in all types of building design including curtain wall and pre-cast concrete construction.

Yet the cost of this complete WASCO protection is generally less than 1/20 of 1% of total construction investment. • Only Cyanamid offers every kind of thru-wall and spandrel flashing you need to keep water out — from parapet to foundation. You can specify 14 types of flashings including copper-fabric, copper-asphalt, copper-lead, fabric, plastic and aluminum.

For exceptional flashing problems, you are invited to consult the Cyanamid Engineering staff. For full details, see Sweet's Architectural File 8g/Wa.
WORLD CONFERENCE ON SHELL STRUCTURES
DRAWS INTERNATIONAL ATTENDANCE OF 700

The plastic forms and unobstructed space obtainable with shell structures proved an irresistible attraction to well over 700 engineers and architects who came from all over the world to attend the World Conference on Shell Structures held last month in San Francisco. That one in 10 conferees was an architect—despite the preponderantly technical character of the program—evidences the great increase in interest in these structures predicted by the late engineering genius Eduardo Torroja on his last visit to the United States two years ago.

Four days of meetings, with 67 presentations of papers, were well interspersed with social occasions and opportunities for the visiting experts to get to know each other personally (most had previously known each other by reputation only) and to visit some of the San Francisco Bay Area's shell structures and to enjoy its famous natural beauty.

The program progressed from general architectural considerations ("structure, shells, architecture, form, environment, materials") through discussion of construction methods, economies of shells, computers and numerical methods of analysis, models, experiments and tests to the final two days which were given over to papers on highly theoretical aspects of shell analysis and general theory.

Particularly on these last two days, the program showed the names of men doing important work in the field of shells: A. L. Bauma of Delft, The Netherlands, on "Approximate Methods of Shell Analysis," Konrad and Ivo Hruban of Prague on "Effect of Volume Variations and Prestressing on a Surface of Translation," W. Zerna of Hannover on the "Exact Theory of Elastic Shells," Ronald Jenkins of London (whose firm is doing the engineering design for the Sydney Opera House) on "Shell Problem Solution by the Matrix Progression Method" and Wacław Olaszak and A. Sawczuk of Warsaw on "Inelastic Shell Problems."

Work in these fields, although out of the architect's world in its present state, will inevitably—if much later on—influence the potentials of design.

Architects, however, found much of interest in Frei Otto's description and slides of his imaginative and inventive tensile structures (tents and cables); in Joseph Allen Stein's thoughtful discussion of shells and their potential ("lively yet ordered variety in an otherwise monotonous aspect," with "special advantages when seen from the air, but in a hot and humid country like India the economics of enclosed space is greatly influenced by air conditioning"); Felix Candela ("with shells you must take the 'formalist' approach, you cannot follow the 'functional' approach: maybe this is why architects are so interested in shell structures"), who said he preferred moving formwork and pouring concrete to precasting and lifting and that he believed the practical span limit to be around 400 ft.
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We are installing the same efficiency, speed, and smooth ride in as many modernized buildings as new.

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Elevators by Westinghouse

For more data, circle 11 on Inquiry Card
DESIGN IN URBAN RENEWAL: NOW IT’S OFFICIAL

The continuing concern with design as a controlling factor in urban renewal so often expressed by Commissioner William L. Slayton of the Urban Renewal Administration has now been formalized in an official statement of policy sent to all local public agencies concerned with urban renewal throughout the country.

The statement, entitled “Design in Urban Renewal,” is contained in Local Public Agency Letter No. 249; copies are available from the URA, Washington 25, D.C.

An introductory note by Mr. Slayton says the statement “sets forth the URA position that high-quality design is a basic objective of the urban renewal program, and outlines the actions which LPA’s can take to achieve quality design in urban renewal.”

Content of the six-page statement itself follows very closely the ideas outlined by Mr. Slayton in his major address at last summer’s annual Conference on Urban Renewal of the National Association of Housing and Redevelopment Officials (August, pages 23 and 26). Emphasis is on the need for attention to the role of design at every stage of the urban renewal process and for utilization in this process of the services of “skilled design professionals.”

Another important development in URA’s campaign for good design is the appointment of Roger Montgomer, a St. Louis architect and associate professor of architecture at Washington University, as “urban design specialist” for URA. This new staff position in the Project Planning and Engineering Branch of the URA Division of Technical Standards was established “to develop and implement policies for well-designed urban renewal projects.”

—Elisabeth Kendall Thompson
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A House of Worship
in Michigan

by Albert Kahn Associated
Architects and Engineers,
and Percival Goodman, F.A.I.A.,
Associate Architect

Synagogue of the Shaarey Zedek Congregation, Southfield, Michigan. This 100,000-sq-ft sanctuary seats 3,600 people—all within 120 ft of the Bema. 80 ft above grade at its highest point, the sanctuary is walled with precast concrete, and glass. Concrete was also considered for the structural frame, but steel was chosen, according to the designer, for its economy and because it was best suited to the general configuration.

Architects and Engineers: Albert Kahn Associated Architects and Engineers.
Associate Architect: Percival Goodman, F.A.I.A.
General Contractor: O. W. Burke Co.
Steel Fabricator and Erector: Whitehead & Kales Company.
Steel for the 602-ton frame was supplied by Bethlehem (shapes and plates).
The Austin National Bank Building, Austin, Texas, is scheduled for completion in early 1963. This five-story structure will be sheathed with natural color aggregate sections and vertical metal sun shields.

It's the first multi-story structure in Austin in 20 years to be built on a steel frame, rather than on a reinforced concrete skeleton. Reasons for return to steel: (1) economy, thanks to higher-strength A36 steel, Bethlehem lightweight shapes, and a continuous, welded frame, (2) "thinner" steel columns, needed for maximum usable floor area in the future multi-story portion (three-column two-bay framing system), (3) the ease and economy of adding on to a steel structure in the future (in this case adding on 17 stories to 5).

Architects: Page, Southerland & Page.
Associate Architects: Fehr and Granger.
General Contractor: Rex D. Kitchens Construction Co.
Fabricator: Tips Iron & Steel Co. (1,035 tons).
Erector: F. B. McIntire Erection Co., Inc.
El Patio Cabana Club, Atlantic Beach, L.I., N.Y. Circular restaurant on second floor (22,000 sq ft per floor) can seat over 1,500 diners. Walled in tinted glass, except for a 200 x 20 ft mosaic-tile mural, it’s cantilevered 20 ft in the front of the building and 10 ft in the back on steel beams. Central core, built around the four interior steel columns, contains the kitchen and all utilities. All dining rooms, readily accessible to the kitchen, are free of cluttering columns.

Consulting Engineer: Richard I. Pezenik.
General Contractor: Royal Land & Development Corp.
250 tons of Bethlehem structural steel were quickly fabricated and erected by Standard Structural Steel to help speed completion of this building needed to replace the previous building which burned down.
A Field House in Maryland

by McLeod and Ferrara

Field House, Walt Whitman High School, Bethesda, Md. Geodesic-dome design chosen by Montgomery County Board of Education when several advantages over alternate designs were noted in preliminary research studies conducted by Educational Facilities Laboratories, Inc., an agency of the Ford Foundation. Compared to a conventional box-shaped gymnasium, the dome provides (1) about 4,200 more sq ft of free interior, (2) no interior columns to block spectators' vision, (3) seating space for 1,200 more spectators, (4) a slightly lower cost.

From the many design studies and cost analyses made by Synergetics, Inc., consultants for the design of the structural characteristics of the dome, the most practical and economical type of superstructure proved to be the combination of a structural steel framing system, covered with a gypsum roof deck and composition roof covering. The structural steel framing was left exposed on the underside of the roof, thus giving a honeycomb effect to the domed ceiling.

The slender steel frame rests on five concrete pylons around the base of the 157-ft-diam dome. Steel members were curved in the fabricating shops to speed erection, which took less than five weeks.
Architects: McLeod and Ferrara.
Consulting Engineers: Synergetics, Inc.
General Contractor: Merando Inc.
150 tons of structural steel supplied by Bethlehem.
Two entry courts (small bridge crossing retaining wall, and circular stairway from carport), along with enclosed entry hall, divide the plan into two distinct parts—living areas to the east, bedrooms to the west.

Philip Drill house, West Orange, N.J., winner of a 1962 architectural award of excellence from the American Institute of Steel Construction.

Award jury praised the house for combining steel framing with other materials: glass window-walls; pivoted redwood grilles; exterior wall surfaces of oriental stucco; structural decking fabricated of alternate 1 x 4's and 2 x 5's, glued together; and interior panels of smooth plaster.

Bethlehem steel frame is composed of star columns, made up of four steel angles spaced two inches apart. Beams are built-up tubes of steel plates with continuous bar separators.

Architects: Davis, Brody & Wisniewski.
Structural Engineers: Wiesenfeld & Leon.
General Contractor: Max Drill, Inc.
Fabricator and Erector: Interstate Iron Works.
A Motor Hotel in Massachusetts

by Bedar & Alpers

Dolphin Motor Hotel, Quincy, Mass. This 120-ton steel tent frames a restaurant, cocktail lounge, and three multi-purpose rooms. It took just 3½ days to erect the steel A-frame, which is 37 ft high, 125 ft long, and 142 ft wide. Bethlehem supplied all the structural steel used in this and the second phase of the 104-unit motel’s construction.

Architects: Bedar & Alpers.
General Contractor: Oxford Construction Corp.
Steel Fabricator: Antonelli Iron Works, Inc.
Steel Erector: Daniel Marr & Son Co.

Bethlehem Steel
Isn’t it wonderful what you can do with Steel for Strength ... Economy ... Versatility
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Throughout the centuries of Christendom, the church spire and the cross have served as an inspiration and an invitation to worship. Modern forms of architectural design, however, invite religious symbolism to adopt new shapes and still retain its traditional spiritual meaning. Overly has pioneered new fabrication techniques for spires and crosses, artfully combining the symbolic "welcome to worship" with the church's architecture—in effect, crafting an inspiration.

**How to craft an inspiration**

Creative craftmanship has been the basis of Overly's 70 years of cooperation with the architect. Overly has pre-fabricated and erected spires and crosses in every State of the Union, each built to precise architectural specifications in order to harmonize with the church architecture. For assistance with your next church or church-related structure, you'll want to talk to Overly—*The Architect's Craftsman.*

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Only vertical blinds make large windows so exciting

In this new publications building for Wesleyan University, Thru-Vu Vertical Blinds of Du Pont Triglas add sharp, clean vertical lines to the horizontal design of the building. They give it a modern feeling other window coverings cannot match.

For the natural light control so important to the editors and artists who work in this building, these Thru-Vu Vertical Blinds rotate with a touch of the finger and traverse as easily as drapery.

When closed, they reflect up to 65% of the sun's heat, contributing substantial comfort conditioning of the building and low air conditioning loads and costs, especially important in a building with this much glass area.

Vertical blinds made of Du Pont Triglas washable window shade cloth have a fabric base of glass. They won't shrink, twist, bow, or curl. They require little maintenance, catch little dust and are easy to wash. They complement your design, make almost any window look better.

Du Pont makes only the fabric. The mechanisms used in this installation are manufactured by Thru-Vu Vertical Blind Corp. For sample swatches and information, write Thru-Vu Vertical Blind Corp., 805 Mamaroneck Avenue, Mamaroneck, N. Y., or E. I. du Pont de Nemours & Co. (Inc.), Fabrics Sales, N-2496, Wilmington 98, Del. Or consult Sweet's Catalog on Better Things for Better Living...through Chemistry.
Competitive bidding among six contractors for the Borgia Butler Housing Project proved the lower cost of monolithic reinforced concrete for this development type of construction. An estimated savings of $737,500 was realized over structural steel. In most types of construction, a reasonable cost-savings can be obtained through the use of monolithic reinforced concrete. Before YOU build, be sure to compare costs—also the many timesaving and design advantages of this superior structural method. Write for the new booklet entitled “The Economic Advantages of Reinforced Concrete Building Construction.”
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PCP ceiling installations are now replacing mineral tiles that cost up to 50% more. Simpson PCP costs only a few cents more than ordinary woodfiber acoustical tile.

Pyro-Chem Protection is an exclusive Simpson process. Not just a surface treatment, every fiber throughout the tile is impregnated with special PCP fire-proofing chemicals.

Simpson PCP acoustical tiles are not only safe and economical, they are acoustically efficient; NRC ratings up to about 70. Room-to-room attenuation factors average 37.6-41.5 db. Available in 4 beautiful Forestone® sculptured textures and 2 perforated designs.

SIMPSON TIMBER COMPANY
2086-6 Washington Building, Seattle 1, Washington
Robert Keith Adams, 28-year-old graduate student in architecture at the Illinois Institute of Technology, has been presented the Third Annual Material Service Foundation Fellowship, sponsored by Material Service Division of General Dynamics Corp., Chicago. The $2,500 scholarship award was based on high scholastic achievements, excellence of character and Mr. Adams’ proposed plan of research in the development of a prestressed precast concrete building of long span and constructed of modular elements.

Armstead Fitzhugh, site planning landscape architect, Jamaica, N.Y., has been awarded a citation for “outstanding performance,” a Superior Service Certificate and a cash award of $300 by the New York Regional Office of the Public Housing Administration. The awards recognize Mr. Fitzhugh’s contributions both to aesthetics and economy in low cost housing projects.

Frank Hope of San Diego and Charles Luckman of Los Angeles have received the Distinguished Service Citation of the California Council, The American Institute of Architects, at the 17th annual convention of the California Council, A.I.A. held early last month in Monterey. Also receiving the citation, which recognizes outstanding service to the architectural profession in the state, was John Hirten, San Francisco, executive director of SPUR, San Francisco planning and urban renewal association.

Thomas W. Williamson, 74, senior partner with Williamson, Loebshack and Associates, Architects, Topeka, Kans., recently observed an annversary marking 50 years in the private practice of architecture. President and still fully active in the operation and management of his firm, Mr. Williamson first opened his own firm, then known as Thos. W. Williamson and Company, Architects, in April, 1912. The firm has designed hundreds of schools through the years in Kansas and other midwest states, and in Topeka alone, 31 schools, 12 churches, 31 office buildings, some 20 other various buildings plus many residences.

John Noble Richards, F.A.I.A., of Richards, Bauer & Moorhead, Toledo, was general chairman on the Toledo Committee which made arrangements for the 1962 Amateur Wrestling World’s Championships held in Toledo (celebrating its 125th birthday) in late June. This was the first time the championships were held in the Western Hemisphere.
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It enables concrete to retain over 95% of its moisture. Permits a gradual and even release of moisture so that the curing, hardening and sealing processes occur simultaneously.

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demountable classroom
a.i.a. file: 4-a

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Entire classrooms precast in concrete make up the new addition to the Homewood Elementary School, Pittsburgh, Pa. The design brings beauty, extra utility and easy upkeep to what is usually a "temporary" type of construction. Moreover, a degree of portability is achieved which allows future transportation to another site at very nominal cost.

The concrete segments—each 8' wide by 28' long—include a roof or floor section combined with half of each side wall. The precast units were designed for mass production and contain all the essentials of classroom planning. Air ducts, concealed conduits and pipe chases provide a finished room without unsightly exposed utilities.

Oriented to enclosed, planted playgrounds, the structure is completed by a street facade of integrally cast exposed aggregate panels that enhance aesthetic values... keep out dust and noise... discourage vandalism.

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Carpeting is your finishing touch. Your pièce de résistance. It is an acoustical blessing, a built-in noise-killer. For tenants, it has proved itself one of the biggest renting inducements since drop-in ovens, plastic wall paneling, tenant-controlled air conditioners and on-site parking.

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Carpet mills are so sold on the virtues and beauties of Acrilan, they are going all out on colors, designs, weaves, patterns, textures, tone-on-tones. Your choice is getting practically unlimited.

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Sealant Applicator: F. H. Sparks Co., Inc.
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- Static Control
- Steel Mill Control
- Switchgear & Unit Substations
- Synchronous Motor Control
- Terminal Blocks
- Textile Machine Control
- Timers
- Underfloor Duct
- Voltage Testers
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New Gold Bond Corrugated “400” costs much less than comparable competitive materials. Yet it carries a 10-year written guarantee against peeling, blistering or crazing.

“400” is the first corrugated asbestos-cement product with a durable predecorated finish. The Plasti-Clad finish is a heavy polyvinyl chloride coating that gives maximum resistance to weathering. It is virtually inert, so airborne dust, acid and alkaline fumes will not affect the appearance. And the glossy, pebbled surface is impervious to water, so it tends to be self-cleansing...resists dirt accumulation.

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Corrugated 400
Jamison See-Thru Acrylic Plastic Doors add efficiency and convenience in large motor hotel kitchens

The need for rapid access, supervision of personnel and maintenance of sanitation in the busy kitchens of the new Marriott Motor Hotel in Philadelphia made desirable the use of five Jamison See-Thru acrylic plastic cold storage doors. Jamison See-Thru doors can be opened as easily as insulated doors and give the additional advantages of improved employee supervision, convenience in identifying stored materials, elimination of accidental lock-in. The See-Thru door is just one of many Jamison doors developed to help cut costs and save time in the food service industry. For additional information write to Jamison Cold Storage Door Company, Hagerstown, Maryland.

See-Thru acrylic cold storage doors are sturdy, rigid doors which provide attractive, sanitary appearance.

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In his Arena Stage, as one critic commented, Harry Weese “has produced a handsome structure, both simple and spare, creating an ambiance which suggests . . . that magic is made, after all, in a working place.” We wholeheartedly agree, and are indeed proud that this distinguished architect should have chosen terne roofing for so notably distinguished a building, merely adding (however diffidently) our not unselfish belief that there is also some slight element of magic in a material which can provide so much—form, color, function—at such relatively modest cost. Whether architect or prospective builder, we will be very happy to send you detailed information on Terne.

FOLLANSBEE STEEL CORPORATION
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Arena Stage, Washington, D.C.
Follansbee is the world's pioneer producer of seamless terne roofing
And there's more to be saved than manpower alone. Take the case of the Henrico County, Virginia Schools. This 688-classroom system saves $37,165 per year on manpower plus materials for floor cleaning and maintenance (repairs and replacement are not included). These figures are the result of a study completed by the Henrico County school system. After a close hard look at initial dollars and ultimate costs, Mr. George H. Moody, superintendent of schools, decided to use Monolithic Terrazzo floors throughout all 14 campus-planned schools. That's approximately 834,000 square feet of beautiful, durable, ageless Terrazzo. At this rate, declares Mr. George Eitel, Director of Construction & Maintenance, the higher original installation cost of Terrazzo (30¢ per sq. ft. more than the next best floor) will be justified in just a few years. These savings are based on cleaning and routine maintenance only. County officials state that in 8 or 10 years, when asphalt tile would have to be replaced, savings with Terrazzo will be sharply increased.


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1 man cleans only 15 classrooms
with composition floors

The same man cleans 20 classrooms
with Terrazzo floors*

Henrico Study Proves $37,165 Savings in Manpower, Materials and Maintenance

<table>
<thead>
<tr>
<th>Typical 30-classroom elementary school</th>
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<tbody>
<tr>
<td>Asphalt tile—annual cost of cleaning and maintenance</td>
<td>$6,505.00</td>
</tr>
<tr>
<td>Terrazzo—annual cost of cleaning and maintenance</td>
<td>$2,880.00</td>
</tr>
<tr>
<td>Annual savings with Terrazzo:</td>
<td>$1,625.00 per school or $4.16 per classroom</td>
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</table>
They want it to last, so they use glass

What's more disheartening than taking a prospect out to a building you've worked on only to find that the lighting has dimmed and the panels have yellowed and warped with age?

It's because your installations last only as long as the materials you use that we suggest you use glass for lighting. Glass never discolors. It cannot warp or wear away. In short, glass lasts.

Five, ten, even twenty years from now, there will still be 75 foot-candles cascading from every one of the 4,500 troffers used in this bank building.

The glass used is our Pattern 70, a crystal glass with a hex pattern that spreads light evenly, bends glare-producing wayward waves down onto work areas.

By the way, you can get this same Pattern 70 in a special panel that grounds out radio interference from fluorescent lamps—a real benefit for any of your customers using sensitive electronic equipment.

You can get complete specifications on both panels by writing to our Lighting Glassware Department, Corning Glass Works, 8511 Crystal Street, Corning, New York.

CORNING
A typical laboratory in the Center with its Ruberoid/Matico floor

The door tile in corridors and offices is Ruberoid/Matico Vinyl Asbestos. Over 300,000 sq. feet were installed.

The resilient flooring in IBM's Thomas J. Watson Research Center at Yorktown, New York, is Ruberoid/Matico Vinyl Asbestos Floor Tile

International Business Machines Corporation's Thomas J. Watson Research Center at Yorktown is one of the most advanced laboratories in the world for the study of computer science. Its design has evoked wide interest. The floor tile is beautiful practical Ruberoid/Matico Vinyl Asbestos. Have you seen the entire new line of Vinyl Asbestos by Ruberoid/Matico? For samples call your Ruberoid Architectural representative.

Architect: Eero Saarinen Associates
Flooring Contractor: Circle Floor Co.

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A house for Palm Beach
Upper level

SIX NEW HOUSES BY PAUL RUDOLPH
BOLD GEOMETRY FOR A MANSION IN PALM BEACH

Project for a residence,
Palm Beach, Florida
ARCHITECT: Paul Rudolph
RENDERING: Der Scutt
This project is Rudolph's largest and most dramatic house to date. An elaborate variant of his completed Milam house (next page), it was planned for a very special and informally grand way of life in a still rather special community. A local “white with greenery” quality is echoed in continuous concrete surfaces and lush landscape. The design emphasizes the big rooms and volumes of the house, with great sculptural sunshades forming a counterpoint to the basic structure. The six houses shown in this portfolio have a strong underlying theme, however superficially different they may seem, a theme whose developments started with Rudolph's Applebee and even earlier houses: the investigation of varied methods of disposing and showing volume, resulting in an interplay of geometric forms within and without a structure. As can be noted, the relative smallness of houses has allowed Rudolph scope for enthusiastic realization of his ideas.
THE "HOUSE OF SEVEN LEVELS" IS COMPLETED

The Arthur W. Milam House
St. John's County, Florida

ARCHITECT: Paul Rudolph
SUPERVISING ARCHITECT: Robert Ernest
STRUCTURAL ENGINEER: Herman D. J. Spiegel
MECHANICAL ENGINEER: Frank B. Wilder & Associates
CONTRACTOR: William E. Arnold Co.

Amazingly faithful to its preliminary design (see ARCHITECTURAL RECORD, March 1961), Rudolph's much-discussed Milam house turns out to be a powerful distinctive, and according to the owners, a very successful structure. Besides expressing pleasure in its functional qualities, Mr. Milam states that the house "can, to a certain extent, dictate one's moods. Ill-humor, irascibility, gloom, little irritations, etc., never seem quite so long-lasting or so unbearable when, as here, the surroundings are so esthetically pleasing." The interiors certainly do have a spatially-varied and tranquil quality (note next page), with cube volumes defined and emphasized by the attenuated forms of the sun screen. The big-scale sculptural quality of the screen seems equally as valid (where, as here, privacy is not required) as popular more intricate ones.
New Houses by Paul Rudolph

SECOND FLOOR

HALL

UPPER LIVING

BR.

BR.

FIRST FLOOR

KITCHEN

ENTRY

DINING

FAMILY

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The Milam house is constructed throughout of beige concrete block, with exposed natural finish. Floors are terrazzo and ceilings are acoustical plaster. These simple, monochromatic interiors require little upkeep, and lend themselves to furnishings of any age. In the dining area is a sixteenth century refectory table; the living room is furnished entirely with built-in furniture designed by the architect; medieval rubbings are hung on the downstairs walls. The house is air conditioned, and daylighting is carefully controlled by sun shades. The baths have skylights.
UNDULATING ROOF PLANES SET THEME

The R. H. Daisley House
Inlet Cay, Florida
ARCHITECT: Paul Rudolph
SUPERVISING ARCHITECT: Richard T. Hanna
LANDSCAPE ARCHITECT: Boynton Landscape Co.
AIR CONDITIONING AND HEATING: Air Conditioning Designers
CONTRACTOR: Warren D. Reiff
RENDERING: Bryant L. Conant

Joseph W. Molitor photos
The Daisley house was planned for a subdivision requiring all roofs to be pitched. This “restriction” was turned into a prime design feature of the house: the shed roofed units of the house were, in effect, pulled apart, and re-combined in a way that gives a forceful counterplay of the sloping planes. All the structural bearing walls, built of sand-colored concrete brick, run in the same direction, and are offset from each other. The dominant roofs are surfaced with off-white enameled aluminum. In keeping with his theory of keeping all materials in a house as unified as possible, Rudolph has finished the interiors with cement-like materials: terrazzo for floors, acoustic plaster for ceilings. Spaces are clearly delineated, but varied.
As avid an explorer of regional qualities as he is of spatial ones, Rudolph has redeveloped a neoclassic scheme highly appropriate (and perhaps a bit whimsical) for an Alabama town named Athens. In this case the originating device in the design was structural rather than spatial white-painted brick columns and wood joists. Even so, a certain by-play of forms is introduced by repeating the curved shape wherever reasonable in the brick veneer curtain walls, and in the stairs. The house has an extremely imposing character, added to by the use of a raised base; the garage is countersunk in this podium on one side. The entrance façade is shown in the elevation at right, and is approached by a long curving drive. The main entrance is to the left of the sketch, the service entrance by the little stairs to the right. At the rear, the plan centers on a great open court.
A SPIRAL OF NINE STEPPED-UP ROOF PLANES

The latest in design of the houses shown here, this one was planned with "much more freedom provided by eight acres of rolling land." Each area or room has its own level, arranged in a spiral step-up around the chimney. The difference in levels was fixed by the use of 2-ft beams. Plaster will be sprayed over the light wood structure to provide a continuous surface. This will give a quiet foil to the play of the shades and shadows from the many cantilevered overhangs. Interiors will also be finished in plaster; floors will be hardwood in living areas, vinyl asbestos tile in the kitchen, ceramic tile in the baths. Skylights will be used to give added light to the inner part of the living areas. The house will be air conditioned.
Although the earliest in design of this group of six houses, Rudolph's concern with forms, materials and regional qualities is still quite evident. It seems, at first glance, a more conservative scheme, but the house is planned as a “pinwheel which turns.” The foundation walls are arranged in a pinwheel shape, with walls extended for emphasis; the upper floor has a similar shape, turned 90 degrees from the foundation, and accented by an extended roof trellis. As the house is first seen from above on approaching, the trellis (to be covered with vines) was further intended to relieve the bareness of the roof planes. The house is totally of wood construction above the foundations, and planned by Rudolph to reflect “the spareness of New England.” The living area, however, has its share of drama: one screen-wall is gold to augment the glow from the skylight.
The Yanofsky house is entered (top photo) through an open gallery flanking the carport. The exterior is textured plywood, painted white, with black trim. This scheme continues into the interiors, as in the living area (center) which has white plaster walls, and adds the gold screen noted before, as a backdrop for fireplace and stairway. The roof is tar and white marble chips. Floors are carpet over plywood in the living areas, linoleum in the kitchen, and ceramic tile in the baths. The integration of the series of trellises with the clerestory above the living room can be noted in the section.
The Future of the City: a five-part series

By LEWIS MUMFORD

2. YESTERDAY'S CITY OF TOMORROW

In a previous article I dealt with the continued dissolution of the city into an amorphous, over-mechanized urbanoid mass, lacking both esthetic identity and social character. Even the biggest metropolises seem fatally doomed by this process, if we allow it to continue. Private transportation by motorways, during the last two decades, instead of assisting the reorganization and reintegration of urban life on a regional scale, has only lengthened distances, slowed down transportation within the city, and dispersed useful facilities that were once close at hand and constantly available. Therewith the city and all its organs have been dissolving into the formless non-entity miscalled Megalopolis.

THE INFLUENCE OF THE SUBURB

Meanwhile the major reaction against the misdemeanors of the city has been the escape to Suburbia. For more than a century, families that were content to do without the social advantages of the city profited by the cheap land and the natural landscape to create a biologically more adequate environment, with full access to all the things now missing from the city: sunlight, untainted air, freedom from mechanical noises, ample lawns and gardens, accessible open country for walks and picnics; finally, individual houses, specially designed for family comfort, expressive of personal taste. This impulse to have closer contact with the rural scene was fed by the literature of the Romantic movement, from Rousseau on to Thoreau; but it did not originate there. For the rich families of Florence, Rome and Venice, in the fifteenth and sixteenth centuries, did not wait for either romanticism or the railroad age to build their country villas in Fiesole, in Frascati, or on the Brenta. What marks the modern age is that both the impulse and the means of achieving it have become universal.

Though the ultimate outcome of this suburban retreat on a large scale has proved to be a non-city, if not an anti-city, just because of the very isolation and separation it proudly boasted, one must not under estimate its architectural results or its great human attraction; in fact, no adequate image of the emerging city will arise until these are both fully reckoned with. From William Morris's Red House to the shingle-houses of H. H. Richardson, W. R. Emerson, and their colleagues, from Frank Lloyd Wright's prairie houses on to the work of Voysey, Parker, and Baillie-Scott, from Olmsted's Riverside and Roland Park to Unwin's Hampstead Garden Suburb, most of the fresh forms of domestic architecture and planning grew out of the suburb. This still holds true today: not merely in houses, but in shopping centers, school complexes, industrial parks. Apart from purely industrial architecture, like the cotton mills of Manchester or the early skyscrapers of Chicago, no other environment has proved so encouraging to positive architectural expression as the suburb.

Though the original values of the suburb have been fast disappearing in the welter of the ever-spreading conurbation, the image that was left behind has had an influence upon urban planning. This is the image of a new kind of city, the “City in a Park”; more open in texture than the more crowded cities of the past, with permanent access to gardens and parks for all the inhabitants of the city, not just for the dominant minority. That influence has expressed itself in three different conceptions of the contemporary city, advanced by three distinguished architects and planners, Raymond Unwin, Frank Lloyd Wright, and Le Corbusier. Though radically different in their human background and purpose, all three conceptions have a common denominator: an unqualified demand for more space. In this article I shall confine myself to the work of Le Corbusier. If space and speed, mass production and bureaucratic regimentation were all that were necessary to form a new image of the modern metropolis, Le Corbusier would already have provided an adequate solution.

LE CORBUSIER:
DESTROYER AND INNOVATOR

Most architects, during the last thirty years, and certainly most architectural and planning schools, have been dominated by the powerful propaganda and experimental achievement of this singular man of genius, Le Corbusier. If anyone put forward what seemed a fresh and original conception of the City of Tomorrow, it was this redoubtable leader. Though that conception has gone through a series

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"While Le Corbusier's image of the city is still often regarded as the last word in modern design, it combines, in fact, the three chief mistakes of the nineteenth century"
of changes, corresponding to changes that have taken place likewise in his architecture, certain main features stand out, and will probably for a while continue to have influence, even if the master should abandon them. And though no one city, except Chandigarh, shows the full range of his influence, his thought has run so closely along the grain of our age that fragments of it are scattered everywhere.

The chief reason for Le Corbusier's immediate impact lies in the fact that he brought together the two architectural conceptions that separately have dominated the modern movement in architecture and city planning: the machine-made environment, standardized, bureaucratized, "processed," technically perfected to the last degree; and to offset this the natural environment, treated as so much visual open space, providing sunlight, pure air, green foliage, and views.

Not the least attraction of Le Corbusier's thought to his contemporaries was that in bringing these two together, he paid no more attention to the nature of the city and to the orderly arrangements of its constantly proliferating groups, societies, clubs, organizations, institutions, than did the real estate broker or the municipal engineer. In short, he embraced every feature of the contemporary city except its essential social and civic character. This failure to understand the function of the city as a focal meeting place extended to the C.I.A.M., which commissioned a book on the city in which the functions of the city that concerned the planner were reduced to Housing, Work, Recreation and Industry; and it was not until this group produced its symposium on the Heart of the City that the city's special social attributes, as a meeting place, were at last recognized.

In his first presentation of the City of the Future, Le Corbusier over-emphasized its new mechanical facilities, and equated urban progress with geometrical order, rectilinear planning, and mechanized bureaucratic organization. Enchanted by the possibilities of modern steel and concrete construction, Le Corbusier first presented a picture of a modern city like Paris, transformed into his new image: an image of free-standing, 60-story office buildings, set in open spaces, as the central feature, with multiple high speed transportation routes at many levels, feeding into this center, and long series of apartment houses, uniform in height, forming an undifferentiated residential district outside the bureaucratic core. This new unit would hold three million inhabitants, the equivalent of Paris. Le Corbusier's "Voisin" plan (1922-1925) was superimposed on the center of Paris: he proposed to tear down the historic core of Paris, as confused, unsanitary, pestilent, preserving only a few ancient monuments, and packing all its multifarious activities into uniform structures.

In his readiness to demolish the historic quarter of Paris and replace it with these towering isolated buildings, Le Corbusier's imagination worked like a bulldozer on an urban renewal project. In the name of efficiency, he paid no attention to the actual functions and purposes of the structures he proposed to re-house, or to historic buildings that by their individual character give form and continuity to the life that goes on within them. In short, he ignored the main office of the city, which is to enrich the future by maintaining in the midst of change visible structural links with the past in all its cultural richness and variety. In proposing prudently to preserve a handful of historic buildings as isolated monuments, Le Corbusier overlooked the fact that no small part of their value and meaning would disappear, once they were cut off from the multitudinous activities and associations that surrounded them; that in fact it was people, not space, that they needed if they were even properly to be seen.

In placing his emphasis on the vertical, rather than the horizontal elements of city design, Le Corbusier was fascinated, not only by the general possibilities of technology, but by the desire to give a more rigorous Cartesian expression to the American skyscraper. He had returned, most probably without any consciousness of it, to the form of the early Chicago skyscrapers, and had removed, not merely the romantic pinnacles and setback towers that had followed, but the visual jumble and congestion. His novel proposal was to combine the new order of height with something that had never been seriously suggested before, a palatial increase of open space, in the form of a park, between the buildings.

In that simple act, Le Corbusier wiped out the complex tissue of a thousand little and not so little urban activities that cannot be economically placed in tall structures or function efficiently except at points where they are encountered at street level and utilized by a multitude of people going about their business at all times of the day.

The extravagant heights of Le Corbusier's skyscraper had no reason for existence apart from the fact that they had become technological possibilities; the open spaces in his central areas had no reason for existence either, since on the scale he imagined there was no motive during the business day for pedestrian circulation in the office quarter. By mating the utilitarian and financial image of the skyscraper city to the romantic image of the organic environment, Le Corbusier had in fact produced a sterile hybrid.

But perhaps the very sterility of Le Corbusier's conception was what has made it so attractive to our age. In American cities tall buildings came into existence not simply as a convenience for business enterprise, but as a mode of increasing land values and the opportunities for highly profitable large-scale building and speculation; and even when the business towers provided too little floor space in proportion to elevator space to be profitable, they
"Most architects, during the last thirty years, certainly most architectural and planning schools, have been dominated by the powerful propaganda and experimental achievement of this singular man of genius, Le Corbusier."
served by their very extravagance as a form of commercially valuable advertisement. The tall building was accepted in America as a standardized substitute, with convertible units of space, for more functional plans and elevations that might require a more generous—that is expensive—allotment of land along with a more exacting design.

By stressing the visual openness between tall buildings, offsetting the low coverage with ever higher structures, Le Corbusier seemed to have satisfied two hitherto irreconcilable conditions: higher densities with higher rents on one hand, and greater exposure to light and air, along with a greater sense of open space, however unusable except to the eye. This pattern could be reduced to a mechanical formula and repeated anywhere precisely because it paid so little attention to the variety of human needs and the complexities of human association. That failing largely accounts for the present success of Le Corbusier’s formula. But applied to urban renewal projects it has proved a disastrous success, on which Jane Jacobs has said almost the last word, though her own counter proposals, to increase densities and encourage haphazardness, are equally unsound, and quite as willfully negligent of urban realities.

MISPLACED OPENNESS

Le Corbusier’s early images of the city were supplemented by later designs that could be carried out on a more modest scale: his plan in the Nineteen Thirties for the little town of Nemours in North Africa, with its geometric grouping of domino structures, set the fashion for high-rise slabs. Both images in turn have had a massive impact upon the minds of today’s architect-city planners. The post-war housing estates of the London County Council record that influence at its best, sometimes in more ingratiating forms than he had pictured,—as in the Alton estate at Roehampton, on land already richly landscaped by the original suburban owners—but also at its worst, as in their over-emphatic repetitions of his Unity House slab in another area.

In the United States the standard urban renewal projects fostered by the Federal government have been designed in a similar socially heedless fashion. Le Corbusier meanwhile has kept on modifying his original proposals, which were exclusively metropolitan and bureaucratic. In more recent statements since 1945 he has envisaged small, better balanced, more self-contained communities, as complementary members of the metropolis; and in Chandigarh he even took over from Albert Mayer and Matthew Nowicki, the first planners, the outlines of the Radburn plan, with its series of neighborhood superblocks and its inner green walkways.

But the gigantic scale of that city demands a completely motorized population: that is the chief of excessive openness. Though Le Corbusier’s buildings are low, his walks are long, and the central public buildings swim in space under a torrid summer sun whose heat further penalizes pedestrian circulation. The misplaced openness of Le Corbusier’s new capital turns the great buildings and monuments into isolated works of sculpture, exhibited as in a high outdoor museum. They are meant to be visited piously or admired occasionally at a distance; not to serve as intimate architectural companions in the daily traffic of the city, visible at all times, with sufficient detail to hold the eye and refresh the spirit even under intimate inspection. In its excessive, official openness this plan vies with Walter Burley Griffin’s purely suburban conception of the Australian capital of Canberra.

Le Corbusier was of course right in thinking that the functions of business and transportation could be better handled in structures especially designed to fit modern needs; he was right, too, in thinking that a basic pattern of order is essential to the full enjoyment of the city, particularly in our own age, in which a multitude of sensual and symbolic stimuli—print, sound, images—at every hour of the day, would produce overwhelming confusion if the general background were equally confused. So, too, he was correct in thinking that the skyscrapers of New York or Chicago should be thinned out, if they were to be visible from street level, or the traffic avenues were to remain usable; and further, that sunlight, pure air, vegetation, along with order and measure, were essential components of any sound environment, whether urban or rural.

But in his contempt for historic and traditional forms, Le Corbusier not merely lost continuity with the past but likewise any sense of how much of the present he was also losing. His new conception of the City in a Park misconceived the nature and functions of both city and park.

The monotony of Le Corbusier’s favored forms has expressed the dominant forces of our ages, the facts of bureaucratic control and mechanical organization, equally visible in business, in industry, in government, in education. That fact itself constituted one of its attractions. But until Le Corbusier theoretically destroyed the historic tissue of the city, with its great complexity of form and its innumerable variations even within the fixed geometry of the gridiron plan, the prevailing bureaucratic pattern had been modified by many human, sometimes all-too-human, departures. The old skyscrapers of Wall Street or the Loop may have been anarchic in their efforts to pre-empt space or claim attention, but they did not present the faceless conformist image of present-day Park Avenue. As for urban compositions that have been more directly influenced by Le Corbusier’s idea of the City in a Park—the collection of office buildings in the Pittsburgh Triangle, for example—they might as well be in a suburb as in the city itself. Even the open space

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around these buildings has become meaningless in terms of light and air, for all-day fluorescent lighting and air conditioning flout the one benefit that would justify this type of plan.

THE SUB-URBAN METROPOLIS

Unmodified by any realistic conception of urban functions and urban purposes, apart from the bureaucratic process itself, Le Corbusier’s City in a Park turns out in fact to be a sub-urban conception. By its very isolation of functions that should be closely connected to every other aspect of city life, and by its magnification of the forces that govern metropolitan life today, it can be detached from the organic structure of the city and planted anywhere. Even the space around Le Corbusier’s skyscrapers has an ambivalent function, for the City in a Park has now taken a more acceptable, commercially attractive form, and has become a City in a Parking Lot.

When we follow this whole process through, we discover that the freedom of movement, the change of pace, the choice of alternative destinations, the spontaneous encounters, the range of social choices and the proliferation of marketing opportunities, in fact, the multifarious life of a city has been traded away for expressways, parking space, and vertical circulation. It is not for nothing that so many of the new urban housing projects, filled with 20-story skyscrapers, are called villages: the conformities they demand, the social opportunities they offer, are as limited as those of a village. These islands of habitation in the midst of a sea of parking lots may have densities of 500 inhabitants a residential acre, and be part of a megalopolitan complex holding tens of millions of inhabitants, but the total mass still lacks the complex character of a city.

In short, the City in a Park does nothing to foster the constant give and take, the interchange of goods and ideas, the expression of life as a constant dialogue with other men in the midst of a collective setting that itself contributes to the animation and intensity of that dialogue. The architectural blankness of such a city mirrors the only kind of life possible under it: over-all control at the top, docile conformity at the bottom.

BASIC URBAN FALLACIES

While Le Corbusier’s image of the city is still often regarded as the last word in modern design, it combines, in fact, the three chief mistakes of the nineteenth century. These misconceptions destroyed the classic form of the city, as it had existed almost from the beginning, and replaced it with a succession of urban and suburban wastelands: anti-cities.

The first mistake was the over-valuation of mechanization and standardization as ends in themselves, without respect to the human purpose to be served. The second was the theoretic destruction of every vestige of the past, without preserving any links in form or visible structure between past and future, thereby over-magnifying the importance of the present and at the same time threatening with destruction whatever permanent values the present might in turn create, and nullifying any lessons that might be learned from its errors. This is the error of the “disposable urban container.” Finally, Le Corbusier’s concept carried to its extreme the necessary reaction against urban overcrowding: the mistake of separating and extravagantly overspacing facilities whose topographic concentration is essential for their daily use.

Now that a sufficient number of adaptations of Le Corbusier’s leading concepts are in existence, we begin to have an insight into both their social and their esthetic limitations; for the two are in fact closely connected. The visual open space that this planning produces has no relation to the functional open space, space as used for non-visual purposes, for meeting and conversation, for the play of children, for gardening, for games, for promenades, for the courting of lovers, for outdoor relaxation. At the high density of 250-500 people per acre, what seems by the trick of low coverage an ample provision of open space turns out to be miserly.

The esthetic monotony of these high-rise dominoes is in fact a reflection of their social regimentation: they do not represent, in architectural form, the variety that actually exists in a mixed human community; uniformity and conformity is written all over them. Such freedom, such family intimacy, such spontaneous utilization of the natural environment, and such architectural identity as even the old-fashioned railroad suburb offered has been forfeited without any equivalent return.

The City in a Park, as so far conceived by Le Corbusier and his followers, is a blind alley. Yet its basic ingredients, the more adroit use of present-day mechanical facilities and the constant respect for the natural conditions for health and child nurture, must play a part in any better image of the future city. Neither high-rise structures, vertical transportation, spatial separation, multiple expressways and subways, or wholesale parking space will serve to produce a community that can take advantage of all the facilities modern civilization offers and work them into an integrated urban form. Even when assembled together in orderly fashion they still do not constitute a city. Before the architect can make his contribution to this new form, his private services to his client must be combined with a better understanding of the nature and functions of the city as a device for achieving the maximum amount of human cooperation and crystallizing in more durable and visible form the whole creative process.
HIGH-RISE DORMITORY

Philadelphia architects Nolen and Swinburne design a men's residence hall at Temple University featuring a steel and glass sunshade and precast, exposed-aggregate curtain-wall panels
Located in an urban area characterized by heavy traffic and dense population, this new 11-story men's dormitory at Temple University—which features a curtain wall of precast panels and a 10-story-high steel and glass sunscreen—is set in an informal garden arrangement to provide for outdoor recreation and ameliorate, as much as possible, the busy character of the setting.

The colors of the building range from the beige exposed aggregate of the precast panels and tan brick to the darker brown of the interior finished wood to the gray and black of the sunscreen; this dark tonal range calculated to create a masculine character.

The building will house 450 men and 10 proctors, arranged in five two-floor units. Each unit accommodates 90 students and includes its own lounge, study and typing area, as well as complete laundry facilities. A large lounge and a dining room for 300 occupy a large part of the ground floor, the remainder of which is given over to kitchen and services. This building is the first of two which will eventually occupy the block; a common kitchen will link the two. The architects were awarded a "Citation for Excellence" by the Philadelphia Chapter of the A.I.A. for the design of the dormitory.
The 10-story-high sunscreen of gray glass and metal stands free of the building mass so its absorbed heat may be dissipated into the air before reaching the façade. The glass panels do not form a single large, unbroken expanse, but are articulated with the floor heights by means of gaps at each level, giving the whole a better scale and lowering wind resistance. In keeping with the masculine character of the building, the metal work is painted black—except for the small glass beads, which are of natural aluminum and create a pleasantly contrasting pattern of fine lines. The screen was designed to withstand 120 mph winds, since the building may conceivably be exposed to hurricanes.

The sunscreen is designed to protect the two-story-high, glass-walled lounges that occupy alternate upper floors. The lounges are oriented to the west and serve 90 students each.
A typical room—shown above in a sketch by the architect—is designed for two students, and includes a prefabricated, built-in double wardrobe and dressing unit with mirrors and drawers. These units are of natural oak, stained dark. Floors are vinyl-asbestos tile in a color to correspond with the color scheme of the room. Rooms are painted in a variety of colors ranging from warm to cool in tone as one moves around the plan in order. The hangings at the windows—furnished by the university—are of a natural colored fabric throughout the building.

The ground floor lounge is shown below at left, and a typical upper floor, two-story lounge at right. All finished woodwork is of oak, stained dark.
Since most congregations can no longer afford to spend $1,500,000 for a church and school, St. Mark’s Episcopal Church in New Canaan, Connecticut is in a class by itself. The architects, Sherwood, Mills and Smith, have taken brilliant advantage of the opportunity to design within a generous allowance.
St. Mark's Church, New Canaan, Connecticut
ARCHITECTS: Sherwood, Mills and Smith
STRUCTURAL ENGINEERS: Werner-Jensen and Korst
MECHANICAL ENGINEERS: B. F. Greene
LANDSCAPE ARCHITECT: V. Cerosi
GENERAL CONTRACTOR: Frank Mercede and Sons
CABINET MAKER: Joseph E. Rhodes
SCULPTOR: Clark B. Fitzgerald
STAINED GLASS WINDOWS: The Willet Stained Glass Studio
CARILLON CONSULTANT: Arthur L. Bigelow

St. Mark's may become a place of pilgrimage, where cost paring architects are briefly consoled in the contemplation of the sources of architectural enrichment available to a prosperous congregation.

The church is placed toward the north of the site, well back from the sidewalk to the south in a nicely landscaped park of its own. It is a big building by present day standards, properly scaled for its size. It seats 700 people. The church proper is 169 ft long and 52 ft wide, with a side chapel 80 ft long and 24 ft wide. The nave is 56 ft high and is formed by triangular vaults supported by 13 precast reinforced concrete columns. The columns are tapered to be wide at the top where they join the vaults and where the stress is greatest. The columns are 40 ft high and weigh 16 tons each. Between each pair of columns are infill walls of patterned buff colored brick 18 in. thick. A negative joint where column and wall connect expresses the fact that the column, not the wall, is the supporting member.

To the west of the narthex is a bell tower, topped by a bronze cross. It houses a carillon made in France. The tower is constructed of four tapered reinforced concrete columns, each 117 ft high, which form a double-crossed arch at the pinnacle. The carillon consists of 20 bronze bells varying in weight from 110 pounds to 3,100 pounds, which are operated manually by a bell master from a keyboard in the tower. Two bells hung to swing in a peal as well as to be played by the keyboard can be rung by hand by means of rope pulls, extending to the base of the tower.

The parish hall lies to the east of the church and chapel, and is connected to them by the church school which consists of a bank of nine classrooms, each measuring 15½ ft by 25 ft. These elements are grouped around a central landscaped court.
Above: behind the altar is a free standing reredos made of dark-stained Philippine mahogany, ornamented with copper and brass sculpture. It separates the 50-seat choir from the sanctuary and nave, permitting the singers to see but not to be seen, and concealing the organ and pipes from the congregation. Screen and altar are illuminated by skylight above.

Detail of reredos. Sculptures by Clark Fitzgerald illustrate the story of creation and the drama of redemption.

Left: view toward narthex. Chapel is to left of picture. Window over the entrance is known to the congregation as the "Resurrection Window." In its design, a mixture of somber blues and greens at the bottom of the window are transformed gradually to brilliant yellows and gold at the top.
Side chapel as seen from center aisle of nave. Three floor-to-ceiling panels of stained glass illustrate five episodes in the life of Christ. The stained glass for St. Mark's was designed by Odell Prather.
Parish hall has a pyramidal roof of reinforced concrete with central skylight. The structure is 72-ft square and seats 400
Japan's traditional Kabuki theater requires a close relationship between the audience and the actors, while at the same time the sheer number of its performers calls for a huge stage. In a full Kabuki performance, action and sets are designed for proscenium openings of 100 ft. A shallow and wide seating arrangement is customary, as is the use of the hanamichi or runway which brings the actor from the front of the stage directly into the audience. The requirements for a Kabuki stage dominate the plan for the Gunma Music Center, and the essentials for the symphony orchestra are fitted within this framework.

A strict budget called for a simple structure. Raymond decided to eliminate the standard fly gallery into which flats are hoisted, and to provide horizontal space in the wings instead. It was possible, therefore, to make the ceiling of the stage the same height as the auditorium and lobby and to enclose the total space (455,000 cu ft) in one structure.

To span the wide spaces required by the Kabuki plan, Raymond devised a continuously shaped folded slab. Walls and roof are one. They are built as a thin folded sheet of concrete which acts as a single shell covering the lobby, auditorium and stage. Similar to the structural form used by Nervi to enclose the UNESCO Conference Hall in Paris, and to Breuer's design for the church at St. John's Abbey in Minnesota, this building can also be compared with Raymond's design for St. Anselm's Church in Tokyo built in 1955. (See Architectural Record, November 1956.)

The fan shaped auditorium was carefully designed to seat 2,000 people all on one floor. Eliminating a balcony not only decreased construction costs but it had another salutary effect in the view of the architect. Said Raymond: "There are no balconies, and I believe the vision and the hearing are equally good and equally comfortable from every one of the 2,000 seats, which makes this theater democratic in the real sense of the word."
The designer specified perforated plywood panels on the walls and ceiling. At the wall they conceal air handling equipment, note portholes in photographs above and at left; and on the ceiling they conceal catwalks, spot lights and indirect fixtures as well. Akira Miki, the acoustical engineer, describes his devices as follows: "The folded plate sidewalls are covered with curved wood panels to obtain even sound distribution. The ceiling is similarly treated and each panel is hung at a different angle to direct the sound properly. The concrete surfaces behind these perforated walls and ceiling panels are treated with sound absorbent material for the purpose of absorbing noises originating in the audience. To solve the problem of the different acoustic requirements of Kabuki and a symphony orchestra, a special retractable proscenium mask was designed and this can be arranged to provide four different proscenium widths for various types of performance. The symphony orchestra acoustics were improved by designing a sound projection board which, when put in place, completes the auditorium space and encloses the orchestra and audience in one space. This sound panel is retractable." See section at left.
Tensile beams connect all unit arches together, pulling them toward the rear of the building.
Takeishi Okamoto, structural engineer for the Gunma Music Center, here describes the structural system: "The main portion of this building has a fan-shaped plan, 197 ft wide along the facade. The structure of this portion consists of walls of folded plates on both sides and a roof of folded plates jointed thereto. The walls are inclined 12 deg and 16 sec toward the inside.

"Loads are carried by each two-hinged arch, shown in Fig. 1(C) as D, D', G, K, N' and N, which is formed by continuous folded plates having a V-shaped section and comprising a unit combination of roof and walls. Each arch does not stand along a vertical plane, but inclines toward the front of the building along an arch formed by the rows of audience seats. See Fig. 1(A). This subjects each unit arch of folded plates to the forces that work to capsize it in the direction of the front of the building. To resist these forces and keep the arches in position, tensile beams RG, and RG, in Fig. 1(C) are provided connecting all unit arches together at the corners shown as D', G, K and N' in Fig. 1(C) and pulling them toward the rear of the building. These tensile beams are anchored at the end in the large buttresses which are rigidly connected to the basement wall. Refer to Fig. 1(B). The tensile beams serve also as stiffeners for each folded plate."

At rear of building tensile beams are anchored in large buttresses
Upper lobby fresco designed by Raymond and executed by local artists

Lower lobby
Planning Industrial Research Facilities

Correlating the major factors that influence planning, location, design and construction of industrial research facilities with industry’s new concern for the researcher’s working climate and the vital need for flexibility

By Frank L. Whitney,
President, Walter Kidde Constructors, Inc.

Today’s research facilities are gravitating to suburbs that have high educational standards. This is a direct attempt to attract and stimulate researchers, who are hard to find and even harder to hold.

Obtaining the best site involves much more than finding a large plot somewhere in the suburbs. Evaluation of both living area and building site must be made in detail, item by item. For example, researchers consider the caliber of local education the most important factor in picking a laboratory site; not only for education of their children, but as an index of the community’s cultural level.

Another important community factor is access to a university to permit researchers to take graduate courses and rub elbows with fellow scientists. Other factors of community evaluation are the obvious ones: available housing, taxes, recreational and cultural activities, churches, medical facilities, distance to a metropolitan center and the quality of local government. (With experience, architects can assign weighting values to the various factors and develop a kind of scoring system for comparing sites.)

In building site evaluation, the most weighty factor is the combined cost of land and construction. Others are site acquisition costs, utilities, taxes and proximity to corporate headquarters. Advancements in soil technology and land reclamation make possible the salvaging of sites that might have been abandoned only a few years ago.

Text is condensed from a report based on a nationwide survey of laboratory design practice.
The single structure laboratory and office unit is well adapted to research programs of definite or limited objective and to a restricted site. It provides internal flexibility, but expansion may be costly or disruptive.

The campus plan permits separation of projects in a varied research program and easy expansion on a generous site, but it is costly to build and poses some problems in service distribution and inter-unit communications.

The articulated plan is a reasonable compromise between the single building and campus plans, permits isolation of hazardous operation, but may develop problems in service distribution and communication between add-on related units.

**MASTER PLAN**

The master plan begins with a prediction of the ultimate research program, the number and size of laboratories and offices in terms of the number of researchers per unit. Although the facility's overall area can be related directly to its population, the shape and dimensions of the research complex depend more on the pattern of expansion. For example, a highly diversified company might consider it necessary to segregate projects in separate structures, whereas a more specialized company might prefer to handle research as a tightly knit operation under one roof.

In any case, the master plan should accommodate independent expansion of all facilities—laboratories, administrative offices, amenities and service structures—and without sacrificing a high degree of insulation from site surroundings. Ideally a site should be at least four times the area covered by the buildings. Some zoning regulations permit only five per cent maximum coverage. Once the basic objectives of the research program are defined, it is better to design to a specific site rather than to an ideal site and later attempt to adapt to actuality. Regulatory bodies, state and local, vary greatly from area to area in their building and site restrictions and code requirements.

Obvious influences of site on design are topography, utilities, views, and appearance to the public. Less obvious ones are underground conditions, solar heat loads, and approaches. Then too, there may be special requirements of the operation, such as hazards, security, unobstructed ranges for testing, equipment, etc.

Regardless of the size of the facility—whether it's a single building or a complex—the following four distinct building areas are usually necessary:

1. Laboratory (experimental areas, researchers' offices, conference rooms, mechanical and storage rooms)
2. Administrative (executive, administrative staff and clerical office space)
3. Amenities (library, auditorium, cafeteria)
4. Services (boiler plant, cooling equipment, substation, water supply and storage, sewage disposal, warehouse, shops, pilot plants or any other support services, parking lots and roads)

The arrangement of these four basic building areas depends largely on two factors: (1) the ability of all areas to expand independently, and (2) the need for maintaining good circulation between laboratory and all other services.

Too often, to save a few dollars on piping, a boiler plant, for example, is located where it not only gets in its own way, but strangles expansion of other areas. For ease of personnel circulation, centralized lab facilities such as computer or distillation rooms...
(technical staff services) should be near adminis­
trative areas, but a definite amount of isolation is
often desired to maintain security and to prevent
excessive traffic. Thus, it is wise to provide cafe­
teria, meeting rooms and auditorium with conven­
ient access from the main lobby. This permits free
access without disturbing lab personnel. Separating
service areas from the lab also has the same advan­
tage of reducing noise and disturbance. Placing ad­
ministrative and reception areas on the front of the
building complex is also desirable because they lend
favorable “corporate face.”

BUILDING ARRANGEMENTS
Research facilities generally fall into one of three
basic physical arrangements of structures:

1. Single building
2. Campus plan
3. Articulated building

Single structure, while most economical, has min­
imum flexibility and is best suited for a restricted
research program. Advantages are building econ­
omy and easy internal rearrangement. Disadvan­
tages lie in problems of isolating operations, limited
expansion, disruption of work when expansion is
required and difficulty in adapting to an irregular
site. The single building may be practical only when
a company can predict positively the exact nature
and size of its research program.

When a single research building requires a floor
area of about 50,000 sq ft or more, it probably should
be constructed as a multi-story facility. Beyond this
point, communications and circulation in the one-
story plant become difficult and inefficient. Person­
nel prefer to climb a flight of stairs rather than
walk what may often be the length of a football
field on one level.

The campus plan is well suited to an organization
of essentially non-related functions. Advantages are
the ability to separate operations, easy expansion of
units and pleasant atmosphere. Disadvantages lie in increased cost of both structure and service
distribution and difficulties of communication.

The articulated plan, an effort to combine most
of the advantages of the first two, is a series of in­
terconnected smaller building units. These units
may be single or multi-story or a mixture of both.
This concept retains most of the expansion poten­
tial of the campus plan, but has better supervision
and communications. Disadvantages are in the mod­
erately high cost of service distribution and com­
munications between interrelated subjects. More
expensive site development plus extended services
gives the articulated facility a higher price tag
than the single structure, but if a company can rea­
sonably predict growth in substantial increments,
the articulated plan is ideal.

LABORATORY LAYOUT
The laboratory building consists of four basic ele­
ments: experimental rooms, office areas, pipe chases
and corridors. A variety of floor plans incorporating
these elements is possible, depending upon the na­
ture of research and the degree of privacy desired.
Development of the most suitable design demands
careful integration of architectural layout with
mechanical and electrical installations. It is poor
policy to adopt a layout first and then try to make
mechanicals conform to it.

Broadly speaking, there are two classes of labora­
tories—the dry type for physical research; the wet
type for chemical and biochemical work.

Regardless of the type, the optimum number of
researchers per experimental area ranges from one
to four, with two the most common. A larger num­
ber usually has an adverse effect on privacy and
working conditions.

Other design criteria depend largely on the na­
ture of research. In dry labs, for example, flexiblity
in terms of movable partitions is most important to
permit changes, expansions or introduction of new
research projects. Also, the nature of physical re­
search is such that constant attention to apparatus
is not usually essential, but the researcher should
have a separate private office where he can carry on
theoretical work. In wet labs, scientists prefer to
stay close to their experiments, so there is a trend
in wet labs to incorporate the office into the experi­
mental area.

Physical research usually involves a larger num­
ber of theoretical scientists than does chemical re­
search. Hence, dry laboratories generally have a
higher ratio of office to laboratory space than do
chemical labs. At times offices for physical scien­
tists may be separated from the laboratory wing,
as in the case of mathematicians using computers.

MODULAR DESIGN
A laboratory designed on a modular plan permits
maximum flexibility. Once the module is created, a
variety of floor layouts can be worked out or altered
during the design stage. The modules can be shifted
about somewhat like building blocks until a satis­
factory arrangement is obtained. Designing with­
out a module makes changes costly and difficult.

Surveys of various organizations have failed to
provide any hard and fast rules for determining
optimum size or population of modules. The depth of
the module depends upon the linear feet of bench
per researcher. The width is governed by whether
the lab is wet or dry, the number of people who will
occupy the unit, portable equipment, size of pipe
chases, fume hoods and the need for internal parti­
tioning. Experience indicates that the optimum
width in dry laboratories is 5 to 6 ft and in wet
labs, 10 to 11 ft.

ARCHITECTURAL RECORD November 1962 165
Typical layout for center corridor with labs on each side can provide office cubicle or desk space in laboratory area or adjacent wing depending on whether proximity to work or isolation for study is predominant factor. Mechanical services shown in section at top are similar on each side of corridor. Details suggested may vary.

Off-center corridor with offices on one side and labs on the other provides extra office space for theoretical physical research. Hood exhaust for contaminated work would be vented far from any intake. Narrow doors between labs might be provided at outside wall. Electrical requirements may be extensive and cooling loads may be high.
In planning the module, mechanical and electrical considerations are far more critical than architectural elements—such as window mullions or ceiling panels—which are available in virtually any measure. But mechanical and electrical services are far less flexible. They are costly to redesign or alter.

In addition human considerations must be taken into account. Foremost among these are safety factors: multiple exits from all laboratory units, elimination of dead-end aisles, properly located safety showers and eye wash fountains. Also, the psychological value of proper window treatment should not be overlooked. Outside orientation—an occasional glimpse of blue sky from either the office or the laboratory—can contribute to a pleasant and creative working environment.

The examples which follow show the general arrangement of four typical laboratory units and associated services. The drawings do not apply to specific laboratories, although with some modifications they may serve as a guide to designs for special requirements.

1. CENTER CORRIDOR WITH OFFICE CUBICLE IN LABORATORY AREA. **Assumed occupancy: pharmaceutical or chemical research**

This layout, with an office enclosure in each lab, is popular where the scientist prefers to be as close as possible to his experiments. Chief disadvantage is the elimination of every other pipe chase to make room for office enclosures.

It is possible, of course, to remove the office space from the labs to a separate wing, thus concentrating service distribution, but this is usually unpopular because of distance and lack of privacy.

**Heating, ventilation and air conditioning.** This project requires extensive fume hoods. To minimize conditioning loads for make-up air, outside air is supplied to the ceiling plenum, heated in winter, and directed by fans to the top of the fume hoods. This system reduces by two-thirds the amount of conditioned room air required to make up for fume-hood exhaust.

Where heat gains are large and variable, a high velocity, dual duct system can provide means for automatic individual room control. Air distribution shown is through combination air-light troffers. Other diffusers or perforated ceiling would also be feasible. Typical design air conditioning load per 1,000 sq ft would be about 6.8 tons, with make-up air (0.6 cfm per sq ft) and lights comprising about half the load.

Laboratory services are distributed vertically through chases with access from the corridor.

Electrical service at fume hoods consists of duplex plug receptacles for single phase, 120-volt, 60-cycle, AC power. Power stats for variable voltage at 60 cycles AC are mounted on the apron of the hood. Laboratory benches are provided with plug-mold having 120-volt AC receptacles, spaced 18 in. on centers and 208-volt receptacles limited to two to each 21-ft laboratory module.

**2. OFF-CENTER CORRIDOR, OFFICES ONE SIDE, LABORATORIES OPPOSITE. Assumed occupancy: electrical and physical research, including radioactive and contaminated materials**

Because offices are narrower than labs, this layout produces more offices than labs—a desirable condition for handling the high ratio of theoretical work in physical and electronic research. It is particularly economical in a multi-story structure, because runs of utilities are not lengthened by introduction of office space between or within labs. Because of the tendency of this layout to develop along fingers of circulation, it is most practical in a fairly small plan.

**Heating, ventilating and air conditioning.** Outside air loads are high because of exhaust through hoods by constantly operating fans. Thus laboratories are maintained under negative pressure and are provided with 100 per cent fresh air. Internal heat gain is relatively high and variable. The dual duct system provides excellent automatic individual room temperature control for laboratories under variable load conditions. The use of the ceiling as a supply plenum effects uniform air distribution at low velocities. The office areas are separately zoned for smaller quantities of outside air with substantial recirculation.

Design air conditioning load averages about 8.5 tons per 1,000 sq ft, of which about 4.7 tons is imposed by outside air supplied at 1.8 cfm per sq ft.

Services are extensive and subject to frequent change. They are therefore distributed vertically through pipe chases with access from corridors. Special waste lines, often stainless steel, are used for contaminated materials.

Electrical requirements for both AC and DC power vary considerably and cannot readily be determined except by understanding the operations of the specific application. Electrical ratings and load factors should be thoroughly evaluated to arrive at the maximum system demand.

The cost of mechanical and electrical work for this type of floor plan is relatively high because of the length of service distribution lines, extensive plumbing services, and the amount of air conditioning capacity required.

**3. CORE LABORATORIES AND PERIMETER OFFICES WITH DOUBLE CORRIDORS. Assumed occupancy: electrical and electronic research**

A layout of this type is practical only with a fairly large facility—at least 30,000 sq ft. It is well suited for dry research, because it has flexibility in the core labs and a large number of offices. Concentration of labs simplifies service distribution, and
Core laboratories with perimeter offices make a layout suitable for large establishments, especially in "dry" research, where flexibility in lab areas is required. Service distribution to labs is relatively simple near center wall. Zoning of air handling systems is also fairly simple. Details are optional.

Perimeter corridor with interior laboratories separated by mechanical service passageway provides easy access and flexibility for changing service requirements. Traffic and communications may be cumbersome, and workers' views of outside are limited unless privacy is sacrificed by interior window wall.
Heat sources are a principal cooling load component. The example laboratory uses a simple, low velocity, zoned system, with return air discharged to corridors. The office area is similar, but is given modular flexibility and acoustical control in this example by use of air-light troffer diffusers and acoustically treated relief ducts which make the ceiling a return plenum.

Design air conditioning load averages about 4.6 tons per 1,000 sq ft of which about 1.25 tons is for outside air supplied at about 0.5 cfm per sq ft.

Electrical services are provided by power receptacles mounted on walls adjacent to laboratory benches. The benches are equipped with flexible power receptacles. Each laboratory module is equipped similarly and with rectifiers to furnish direct current. A central high frequency plug board provides variable frequency power for any location when required.

Cost of the simple mechanical systems for this plan is very low. Plan can be improved by construction of an enclosure for the horizontal run of service mains on the lower floor so that alterations can be made without disruption of laboratory work.

4. PERIMETER CORRIDOR, INTERIOR LABORATORIES WITH CENTRAL SERVICE CORRIDOR AND PLENUM. ASSUMED OCCUPANCY: PHARMACEUTICAL OR CHEMICAL RESEARCH.

This layout is best suited to wet laboratories where offices are within the lab space. But the plan is adaptable and has served where both wet and dry experiments occur in the same building. The gallery provides good service distribution. The perimeter corridor permits striking window treatment, but it is inefficient because there is simply too much hall.

Heating, ventilation and air conditioning. Mechanical distribution is solved here with a central service core. Tempered fresh air is supplied to aero-balanced fume hoods by a duct system. A high velocity, dual duct system is used for air conditioning, with distribution to the room through the ceiling as a supply plenum.

Design air conditioning load averages about 6.0 tons per 1,000 sq ft, 1.2 tons of which is for outside air supplied at about 0.45 cfm per sq ft.

Service problems are similar to those in example 1, but the number of risers and maintenance problems is reduced by use of the service core.

The drawing shows an electrical layout for a pharmaceutical as well as a chemical laboratory. Location of the panelboard may be inside the laboratory along the corridor wall instead of the location shown. The center laboratory bench is equipped with pedestal type power receptacles.

COST CONSIDERATIONS

Although each facility must be master planned to fit the needs of each research program, the following yardsticks are recommended to check planning efficiency:

1. Ratio of assignable area to gross area
2. Ratio of support personnel to researchers
3. Assignable area per worker

Ratio of assignable area to gross. Assignable space is that portion of the structure in which people work; gross space is the total area of all buildings. Assignable space excludes all service areas such as corridors, washrooms, stair wells, store-rooms, lobby, cafeteria and auditorium.

Although there are exceptions for special conditions, about half of a facility's gross area is assignable, at least in labs of 100 or more researchers. If the percentage of assignable area is 60 or more, it's likely there is inadequate provision for services, inefficient corridors and unsuitable amenities. The reverse is true if the percentage falls much under 50. Here, it's probable that the utility of unassignable space is questionable. The facility may simply be too luxurious.

Ratio of support personnel to researchers. Researchers are defined here as professional scientists; support personnel consists of clerks, technicians, secretaries, maintenance workers, cafeteria attendants, etc.

Although this ratio varies considerably according to the nature of the program, common ratios of support personnel to researchers range from 1:1 to 3:1. Lower ratios are more common in basic research, where work is highly theoretical, requiring less need for technicians and other support. Applied research and development, on the other hand, depends to a much greater extent on technicians, administrators and others. Highest ratios are found in laboratories engaged in government work where, in addition to research activities, a large amount of contract administration is required.

An unusually low ratio may not indicate inefficiency if there is heavy use of outside services. Otherwise it might be a sign that scientists are overloaded with non-research work. A high ratio might mean the research program is top-heavy with administration and services.

Assignable area per worker. The amount of space required per person runs from 200 sq ft to 400 sq ft, including all personnel and all space. Much more than the maximum is usually inefficient; much less makes for cramped conditions.

Often overlooked is the dramatic effect that people
have on industrial building costs. The higher the personnel density—that is, the more people per square foot of building—the greater the requirements for increased mechanical and electrical facilities to maintain worker efficiency and productivity.

SINGLE VS. MULTI-STORY BUILDINGS

Another facet of cost determination relates to the height and number of stories. One-story structures require maximum ground area, but are most economical for building construction. Mechanical and electrical service distribution, however, is extended and expensive. Circulation and communication become difficult somewhere between 30,000 and 50,000 sq ft—depending on the organization of the laboratories and need for physical interchange.

Two-story structures increase the cost of building construction. In addition to heavier footings and framing to carry floor loads, they require elevators to move supplies and stairs to move people. But there comes a point where a two-story building may be more economical. This depends upon savings in the distribution of mechanical and electrical services, land costs, and site configurations.

Multi-story buildings are most satisfactory for extremely large installations. However, expansion of multi-story buildings is difficult except in large increments.

TABLE 1—COST RANGES FOR LABORATORIES

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Dollars per sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural and Structural</td>
<td></td>
</tr>
<tr>
<td>Foundations and first floor slab</td>
<td>1.00 to 3.00</td>
</tr>
<tr>
<td>Second floor slab and its structural frame</td>
<td>2.50 to 3.50</td>
</tr>
<tr>
<td>Roof decks, roofing and roof framing</td>
<td>1.40 to 3.00</td>
</tr>
<tr>
<td>Exterior walls</td>
<td>.25 to 2.50</td>
</tr>
<tr>
<td>Interior partitions</td>
<td>.40 to 3.00</td>
</tr>
<tr>
<td>Finishes</td>
<td>.25 to 3.00</td>
</tr>
<tr>
<td>Mechanical and Electrical</td>
<td></td>
</tr>
<tr>
<td>Fire protection</td>
<td>.50 to .75</td>
</tr>
<tr>
<td>Building plumbing and piping</td>
<td>.50 to 2.50</td>
</tr>
<tr>
<td>Heating plant</td>
<td>1.00 to 2.00</td>
</tr>
<tr>
<td>Refrigeration plant</td>
<td>1.00 to 1.50</td>
</tr>
<tr>
<td>Air conditioning, ventilation, etc.</td>
<td>2.50 to 4.00</td>
</tr>
<tr>
<td>Incoming power</td>
<td>.80 to 2.50</td>
</tr>
<tr>
<td>Power distribution</td>
<td>1.50 to 3.00</td>
</tr>
<tr>
<td>Lighting system</td>
<td>1.50 to 3.00</td>
</tr>
<tr>
<td>Telephone and signal system</td>
<td>.25 to 1.00</td>
</tr>
</tbody>
</table>

**TABLE 2—PERCENTAGE BREAKDOWN OF COSTS FOR THREE SPECIFIC LABORATORY BUILDINGS**

<table>
<thead>
<tr>
<th></th>
<th>Pharmaceutical</th>
<th>Industrial Chemical</th>
<th>Electronics</th>
<th>Average</th>
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</thead>
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<tr>
<td>Architectural</td>
<td>31.0</td>
<td>39.6</td>
<td>28.2</td>
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<tr>
<td>Structural</td>
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<td>16.8</td>
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<td>34.7</td>
<td>26.8</td>
<td>35.7</td>
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<tr>
<td>Electrical</td>
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<td>11.7</td>
<td>21.6</td>
<td>16.6</td>
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<td><strong>Total</strong></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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</tr>
</tbody>
</table>

Figures do not include laboratory furniture or yard work.

**COST ANALYSIS**

The cost of constructing a laboratory, including engineering, ordinarily ranges from $20 to $40 per sq ft, including land, site development, equipment and furnishings. This wide variation illustrates the difficulty of discussing laboratory costs except in very specific terms. For instance, the cost of foundations and first floor slabs usually ranges from $1 to $1.25 per sq ft. But if subsoil conditions require the driving of piles, these costs can soar to $3 per sq ft.

Much the same thing holds true for the cost of the second floor slab and its structural frame. Here, the cost can vary from $2.50 to $3.50 per sq ft. The difference lies in whether the slab requires underfloor ductwork. If it does, the floor must be poured in two lifts rather than one.

Roofing, exterior walls, interior partitions and finishes are all subject to wide variations. The difference, for instance, between a painted cement block and a window wall exterior can be quite considerable in cost as well as appearance.

An equally wide range of options pertains to the mechanical and electrical aspects of the laboratory. Partly because of this, air conditioning and ventilating costs can vary $2.50 to $4.00 per sq ft. Or the type of fire protection system and number of piped services will affect plumbing and piping costs which range from $.50 to $2.50 per sq ft. Table 1 translates the possible cost ranges for a two-story, 50,000 sq ft building.

**PERCENTAGE BREAKDOWNS**

Frequently, and unfortunately, corporate managers have a tendency to wield the cost-cutting axe in the wrong direction. Ask any ten owners of industrial facilities how to cut building costs five per cent, and nine of them will undoubtedly suggest the removal of the fancy front entrance, plush lobby and the substitution of cheaper wall materials. Not enough managers would believe, for example, that a re-examination of air conditioning or heating or ventilating requirements might save twice as much as glamorizing the walls. In considering building costs, it is an almost universal failing to overemphasize the architectural aspects and underemphasize mechanical and electrical installations. Table 2, which gives percentage breakdowns of costs for a pharmaceutical laboratory, an industrial chemical laboratory, and an electronics laboratory, underscores this very important point.

These figures illustrate a typical pattern in construction costs. They show that mechanical and electrical costs combined represent one-half of the total costs of the building—a frequently overlooked fact that should affect early planning.

This discussion has been oriented toward initial building costs. At least two other factors that bear on costs—site improvement and maintenance—should be taken into consideration. Careful design can minimize these problems.
LABORATORY FOR SPACE SCIENCES

Vincent Kling brings discipline, repose and order to an articulated plan for the fantastic diversity of a space technology center

The Valley Forge Space Technology Center tops a partially wooded knoll on an irregularly shaped, 131-acre site in the rolling suburbs of Philadelphia. To serve the diverse functions of a rapidly changing technology, design emphasis was on expansibility and potential requirements in terms of bay sizes, ceiling heights and internal flexibility rather than on specific initial functions. Primary, too, was disciplined organization of inherent diversity into a unified architectural statement befitting both the company headquarters for its Missile and Space Vehicle Department and the individuality of highly skilled employees.

These design objectives are accomplished by separating the various functions into identifiable units of a single main structure and subdividing each unit into working segments. Varied and unusual facilities demonstrate scope of the design: a controlled environment “clean room” of 10,000 sq ft where super-critical assemblies are made in super-clean air; shock tunnels—one almost 140 ft long—where models are tested in air streams up to 34 times the speed of sound; an inertial guidance lab with a fully isolated slab for testing systems completely free from outside vibration; three separate data processing centers; a 25,000-sq-ft high-bay area with 46-ft clear height and 48-ft column spacing; a convertible one- or two-story lab area with removable median floor for creating high-clearance space when required. And in a separate building is a giant space simulator, a vacuum vessel 54 ft high for testing full sized space vehicles.
Industrial Buildings: Valley Forge Space Center

Floor Plan of Main Building at Hillcrest Ground Level

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MAIN BUILDING

Four major elements are tied together in the main building in an articulated, cross-shaped plan which permits independent growth of those units which will require most space in the ultimate development. Largest elements lie along the east-west ridge of the knoll so that additions will not require level changes. Elements include: (1) offices at eastern end with open landscaped courts; (2) laboratory and development element at the western end, a sequence of enclosed rectangles of one- or two-story high spaces for labs and manufacturing; (3) space science lab to the north, a two-story unit for applied research not in the main flow of activity; (4) general services to the south including main lobby, personnel and public relations, and a two-level, gray glass-walled cafeteria.

Natural landfall is used to keep the roofs of various bay heights at a uniform, low profile against the sky. A consistent color scheme of off-white materials presents a uniform façade accented by shadow and by light blue Venetian blinds in all the windows. Low profile is emphasized by continuous horizontal bands of clear glass and precast concrete spandrel facings. Roof-top mechanical equipment is carefully disciplined in long narrow penthouses which run at right angles to the main axis. Stair cores are expressed at junctions of rectangular elements by vertical glass panels.

Structure is steel frame with spread footings on solid rock. Bays are 24 by 24 ft except in medium and high areas where 48-ft spans are provided. Lab-development area can be converted for either high-bay or two-story use by a removable intermediate floor. In two-story office areas, floors are concrete slabs on cellular steel deck. Utilities are provided on a 4-ft partitioning module for maximum flexibility.

Main building spandrel panels have a combed finish. Vertical ribbed aluminum sandwich panels painted off-white enclose penthouses and the western expansion end of the lab-development area. Stair cores, retaining walls and other vertical masses are faced with an off-white split brick with the rough granite-aggregate face exposed. Permanent interior walls are painted concrete block in stacked bond. More than 8 miles of movable partitions are used for office and lab subdivisions.

More than 50 separate air conditioning systems are used in the entire center because of the many controlled environment areas. Three 1,000-ton centrifugal refrigeration machines can supply 432,000 gph of chilled water which is piped to each air conditioning system and to 1,250 induction units throughout the buildings. Three steam generators provide heat and hot water.
Model shows roof framing and simulator placement

Simplified concept of simulator chamber
EXPANSION PROGRAM
Initial plan was for first phase construction of 360,000 sq ft with smaller additions at two-year intervals, but while construction of the first phase was still underway the owner ordered it expanded to 900,000 sq ft. Continuity of the master plan and extensive use of standard materials permitted these additions without interruption of the initial construction schedule. The Space Sciences Laboratory was occupied 12 months after excavations began, and the whole current phase was occupied within 18 months. Massing models above show second and ultimate phases.

SIMULATOR BUILDINGS (opposite)
The Space Environment Simulation Laboratory is housed in a separate structure at the west end of the main building complex. The simulator itself is a stainless steel pressure vessel 32 ft in diameter and 54 ft high in which full size space vehicles can be subjected to the vacuum, intense cold and solar radiation of outer space. The building is 104 ft square and 88 ft high with a modified space frame roof spanning an unobstructed, column-free interior with intersecting diagonal trusses which cantilever beyond the walls to form a canopy overhang. Steel framing is expressed on the outside of vertically ribbed aluminum panel walls which have 5-ft-high bands of windows top and bottom. The building is located below the crest of the knoll so that its roof line appears in scale with top profile of the main building.

Full clear height of the building is retained over the simulator vessel, and a traveling crane at the top lifts off the cover and emplaces units for testing. About a third of the structure is given to a three-story arrangement of office and control room space. At the second floor level, a preparation floor area surrounds the protruding top segment of the simulator. Four smaller test vessels are housed in a nearby building of similar expression.

1. Main Facility
2. Space Simulator
3. Space Environmental Test Facility
4. Structures Laboratory
5. Utility Building
6. Garage
7. Helicopter Landing Area

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HEADQUARTERS FOR A SPACE INDUSTRY

Albert C. Martin and Associates design a sun-shaded campus for space-age research and manufacture

Campus plan for the new headquarters of Space Technology Laboratories on a 110-acre site in Redondo Beach, California, was an accelerating factor in the concurrent planning, design and construction of the facility. First phase of a planned 10-building complex consists of five buildings now completed: a five-story engineering building, three two-story research buildings, and a one-story manufacturing plant. Occupancy of the first research building began 11 months after ground was broken, and the entire complex was dedicated seven months later. Total usable area is 638,700 sq ft, all devoted to the design and manufacture of spacecraft and space systems.

Long, rectangular engineering and research structures have been oriented at right angles to each other around a central mall and reflecting pool. Architectural theme of this group is stated by shadow-tint glass spandrels suspended from 10-ft overhangs embracing each floor at ceiling height. Behind the smoke-shaded spandrels are full length window walls of solar glass for peripheral offices and work areas in which louver drapes offer additional glare control. Each building has a distinctive thematic color painted on cantilevered marquees and on accent walls in open stairways.

Framing is reinforced concrete on caisson foundations. Interior partitions are removable dry wall. Each building is self-contained with respect to mechanical equipment, and each is capped with an instrumentation penthouse.

S.T.L.'s Space Technology Center Redondo Beach, California
OWNER: Space Technology Laboratories, Inc., a subsidiary of Thompson Ramo Wooldridge Inc.
ARCHITECTS AND ENGINEERS: Albert C. Martin and Associates Craig R. Sturm, project architect Arthur Barton, landscape architect
GENERAL CONTRACTOR: Twaits-Wittenberg Company
The five-story engineering building takes up the shadow glass motif and carries it to the roof. Offices are laid out in peripheral groups around secretarial bays off a central corridor. Top floor is temporary quarters for administration pending phase 2 construction of its own building. First floor plan is typical.
Industrial Buildings: S.T.L. Space Center

SECOND FL SLAB ABOVE

EMP LOBBY

CONF

SUN SCREEN

FIRST FLOOR

OFFICES

STRUCTURES LAB

ELEC

CORRIDOR

VIBRTN

SECOND FLOOR

OFFICES

CORRIDOR

PHYSICS LABS

CONC SLAB WALK

CANOPY ABOVE

CONC WALK & STEP

RESEARCH BUILDINGS

Typical floor plan of two-story research buildings, above, shows peripheral office modules designed for working groups surrounding a core of laboratory and service spaces. Sculpture in reflecting pool at top is by Ben Mayer. Computer area, left, in the lab section of one of the research buildings, has a double floor to protect complex wiring and permit flexibility in location of machines. Floor surface is constructed of removable 1 by 2-ft panels. Between floors a constant flow of 54-deg air circulates. When a computer is installed, the floor section beneath it is removed to supply cooling air to the machine.

MANUFACTURING BUILDING (opposite page)

Sculptured patterns in tilt-up concrete walls characterize the 136,500 sq ft manufacturing building. The master plan calls for several other structures in this style to be built in the second phase of construction. Housed in this unit is a 12,000 sq ft dust-free clean room for delicate sub-assemblies protected by air locks and rigidly controlled environment. High bay area, top right, contains 30-ft environmental test chamber, bottom right, and gantry cranes for handling assembled vehicles. Machine shops for fabricating and testing systems and assemblies are provided in the low area.
ELECTRONICS RESEARCH LABORATORY

William L. Pereira and Associates unify under one roof a three-building center for electronics research.

On a magnificent, 10-acre site atop one of the highest hills in Santa Barbara, the Hoffman Science Center unites indoors and out in an efficient working space of almost oriental serenity. Its 15,000 sq ft of floor space are divided among three buildings forming a U covered by a single gently pitched roof and joined by landscaped courts. Offices for the staff of fifty electronics scientists and engineers are all on the outer sides of the two parallel buildings, giving each a splendid view of the city below or the mountains to the northeast. Laboratory space that adjoins each office opens onto a central landscaped patio. Circulation is by means of covered walkways. There are no corridors. The building that forms the base of the U contains the entrance lobby, research library and visiting directors' suite. A dining room in the office building to the south overlooks a swimming pool.

Laminated wood, meticulously detailed, provides the principle decorative interest inside and out, framing panels of glass and painted plaster that form the exterior of the buildings, and forming the exposed beams that extend beyond the eaves. Entrance to the lobby is by a flight of stairs suspended over a reflection pool. The entire complex is slightly elevated from the ground on reinforced caisson foundation to provide an additional measure of privacy from surrounding parking areas and approaches.

Hoffman Science Center
Santa Barbara, California
OWNER: Hoffman Electronics Corporation
ARCHITECTS: William L. Pereira & Associates
Gin Wong, partner in charge
ENGINEERS: Woodward & Tom, structural
Levine & McCann, mechanical and electrical
Penfield & Smith, civil
LANDSCAPE ARCHITECT: Richard B. Talor
CONTRACTOR: Kenneth C. Urton, Inc.
Integration and definition of inside and outside spaces at the Hoffman Science Center is by the subtle interplay of exposed wood beams and columns with glass and plaster and wood panel walls embracing garden courts and walkways, free from the limiting lines of corridors. Space at the entrance lobby, below, is impressive; space for study or reflection, above, is inviting. Space for work is efficient. Sliding panel divider in library creates a conference room or opens for informal seminars.
Research at the Building Research Station in England falls into two main categories: (1) subjects such as the chemistry of materials, structural engineering or the physics of environment, (2) particular building types such as housing and hospitals. The report of last year’s research activities is especially interesting in the areas of lighting and structure.

Concerning hospital lighting the report suggests, “By day the corridor should be lighted to a level comparable with that of the wards and any other daylighted areas, and this level will not be far removed from that used in internal rooms. By night, however, after normal evening lighting is extinguished, the wards will only be dimly lighted, and the corridor will have to act as an adaptation step between these and internal rooms, the lighting of which must necessarily be of a higher level by reason of the more difficult visual tasks . . .”

In a different area of lighting, the first stage of work on glare from large sources has been completed at Cornell University (U.S.), in collaboration with the Building Research Station. This work has demonstrated that, “A large window can be made larger with little disadvantage, but a small increase in sky brightness seen through a large window will be immediately uncomfortable; equally, a light curtain drawn across will produce immediate relief from glare.”

In structure, the British researchers are using electronic computers for evaluating the working loads and collapse loads of skyscraper frames. Also on structure, the report suggests that, “Owing to the interaction between beams and slabs, between beams and walls, and many other kinds of ‘composite action,’ the distribution of loads on beams is not known with any degree of precision.” Several research projects are underway to develop design methods which account for the stiffening effect of exterior walls.

This research report, “Building Research 1961,” Department of Scientific and Industrial Research, is available from British Information Services, 45 Rockefeller Plaza, New York 20, N.Y. for $1.70.

The latest evidence appears to be negative on negative air ions or positive ions producing either an exhilarating or a depressing effect on healthy human beings, according to a recent research study presented at the ASHRAE annual meeting in June. In a four-month study at the former ASHRAE laboratory in Cleveland, atmospheres containing negative ions, positive ions, or a predominance of neither were tried out on 16 individuals first at 78 F and 50 per cent relative humidity and then at 87 F and 50 per cent relative humidity. The test subjects rated the atmospheres on the basis of thermal sensation, humidity sensation, pleasantness, moods and fatigue. The subjects’ ratings of mood stayed fairly constant throughout most of the tests, being characterized as “normal.” Pleasantness varied from “pleasant” toward “unpleasant” when temperature tests were jumped from the 78 F level to 87 F, regardless of the nature of the ionization. The tests were reported in the September issue of the ASHRAE Journal (American Society of Heating, Refrigerating and Air Conditioning Engineers) in a technical paper by C. M. Humphreys and B. H. Jennings.

Time flies, but not as fast as we made it last month on this page. Commercial electric lighting was only 80 years old in September, not 100 as we reported. The New York Times, from which we took our cue, had the story right. On September 4, 1882, the Edison Electric Company turned on 400 incandescent lamps for 59 of its customers.


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STRUCTURE CAN MOVE IF SOIL SWELLS

Roof panels are independent of one another, and are supported by knuckle joints atop the columns. The walls are built in 33-ft lengths, set back from columns. Idea is to prevent roof from ripping, walls from cracking, when heaving of clay soil is caused by moisture.

CONSULTING STRUCTURAL ENGINEER: Louis H. van Loon

This warehouse sits on a clay soil which heaves when the soil absorbs moisture. The engineer's problem was to design a structure that could adjust itself to the soil movement without the roof tearing apart, or the walls cracking. The engineer's unique solution was to make independent components of the roof panels, the columns and the walls. Each of five triangular roof panels is structurally independent of the one next to it. The load of a panel is transmitted to the columns by means of knuckle joints, so if a column is pushed up, stresses are not induced in the panels. The brick walls are divided into 33-ft sections and rest on strip footings.

The engineer, who is from Durban, South Africa, is now designing a project in timber and concrete shells of a similar triangulated construction, but for a building of 140- and 190-ft spans and some 800 ft long.

The swelling of the desiccated clay can amount to 8 in. and is caused by migration of moisture from the warm soil outside the building toward the colder soil situated below the building, resulting in a dome-shaped heaving pattern of the ground level, which invariably cracks the building founded upon it.

The new construction method employs a system of prefabricated timber shell roof units which are fitted together to form main triangular roof panels with concrete column supports in the corners.

Five such panels are combined with two special end sections to make up a rectangular building, approximately 60 by 202 ft.

Each panel consists of three typical shell roof units which are prefabricated on an underjig of timber scaffolding.

A typical shell roof consists of two layers of ¾-by-4-in. tongue-and-groove South African pine boarding, running in the principal convex and concave curvatures of the warped surface. The two layers of boarding are helix-nailed together, laterally connected with corrugated fasteners, and glued for a width of 3 ft along the perimeter of the shell.

The edge beams are of laminated timber, and ¾-in. diameter mild-steel ties connect the lower corners to restrain the horizontal thrust of the shell.

One typical roof unit took one day to complete and was then "slipped" off the underjig and transported some 30 ft along a slipway toward the building, where an erection mast lifted and positioned the shell. A typical shell weighs two tons and the whole process of slipping the shell off the underjig, erecting and positioning took no longer than 15 minutes.

Three typical shell roof units are combined to make up one main triangular roof panel by interconnecting the units along the ridges.

The individual panels are connected by screw fastening ¾-by-2-in. steel straps at 5 ft. o.c. to the soffit of the ridge beams, and by coach screwing the beams together from the top.

Each main triangular panel is in-
Main, high-tensile steel ties run diagonally and peripherally between columns to take thrust of the triangular roof panels.

Pine boards take convex curve for first layer of paraboloid

Second layer of boards is nailed to first in concave curve.
dependent, and is supported on the concrete columns by means of a knuckle joint connection which allows free rotation in all directions.

Thus no secondary stresses are introduced in the shell construction because of heaving foundation soil.

There is a 1 1/4-in. joint between the panels, capped with an aluminum coping piece which fits over the timber edge beams.

The thrust of the completed triangular roof panels is taken by high-tensile steel main ties.

Roofing material on top of the 1 1/4-in. timber shell consists of two layers of five-ply bituminous felt painted in a light blue metallic color.

Rainwater is carried off through triangular openings in the lowest portion of the shell roof units, where it is collected in the mushroom column head from where it is discharged into a downpipe cast into the concrete column.

The brick walls and windows have been designed to be completely independent from the roof construction and the columns. They are built in 33-ft-long sections with joints in between to form panels which can individually adapt themselves to the heaving soil; lateral movements are prevented by means of special dowels cast in the concrete sills which allow for movements in the plane of the walls only.

The wall panels have been designed as follows:

1. As a beam 12 ft high, spanning 30 ft, and reinforced in the concrete strip footing; the footing being connected to the beam by means of dowels. The compression flange consists of a 2-ft 6-in-wide concrete sill, which is also connected to the wall with dowels.

2. As being cantilevered a maximum of 15 ft, with reinforcing in the sill, and the concrete strip footing as the compression flange.

The new building is esthetically pleasing, requires virtually no maintenance (as timber resists the corrosive action of the fertilizers which will be stored in the warehouse), is completely “heave-proof” without the necessity of piling and is comparatively cheap.

The completed building, with concrete floor, brick walls etc., cost $3.50 per sq ft and was erected in 8 weeks. General Contractor was Roberts Construction Co., Ltd.
COMPOSITE CONSTRUCTION IN A NEW LIGHT

By Robert E. Rapp, P. E.

More liberal engineering requirements for composite connectors combined with rigid-frame design make possible application of the method to lightly-loaded buildings such as apartment houses.

Elimination of interior columns is a desirable objective when they interfere with the functional layout of space for people and for mechanical equipment. But long-span construction in steel in the past posed two problems: (1) with ordinary beams heavy tonnage of steel was required. Thus the designer was obliged to resort to costly built-up members such as plate girders or to expensive truss framing, (2) relatively deep, heavy members were required to prevent excessive deflection, increasing floor-to-floor height.

Now, however, research into composite construction (steel beams and concrete floor slab working together as a structural unit) has made possible economical long-span construction for many ordinary types of buildings. (It will be shown later how a 60-ft span can be achieved in an apartment structure with a floor-ceiling depth of only 25 in.) At one time composite construction was restricted primarily to bridges and to heavily loaded building structures.

Composite design was established in a more realistic light when the Joint A.C.I.-A.S.C.E.* Committee on Composite Construction in 1960 issued their report, "Tentative Recommendations for Design and Construction of Composite Beams and Girders for Buildings."

Extensive tests conducted about this time for A.I.S.C.* at Lehigh University showed how shear connectors could be reduced by as much as 50 per cent of that given in the Joint Committee report, while still maintaining a safety factor of 2.5 based on ultimate strength. These findings led to the incorporation of the composite design provisions which appear in the new A.I.S.C. "Specification for the Design, Fabrication & Erection of Structural Steel for Buildings."

Composite design is an ideal method to reduce deflection and, consequently, floor depth. Deflection is inversely proportional to the moment of inertia of the structural section. And since a composite section has a greatly increased moment of inertia over the steel section alone, excessive deflection in long-span construction is greatly reduced. Also, since shear connectors fasten the concrete slab to the steel beam, lateral stability is increased.

To date, composite design in buildings has generally utilized simple beam-type connections under gravity loadings only. This restricted its economic application to low-rise buildings that were not influenced by wind loading.

But by utilizing the new A.I.S.C. Specification, the Buffalo firm of Backus, Crane and Love, Architects and Engineers, were able to design an 11-story apartment house with a 35-ft clear span and 7-ft cantilever.

* A.C.I.—American Concrete Institute. A.S.C.E.—American Society of Civil Engineers. A.I.S.C.—American Institute of Steel Construction.
on each side. Shear studs were attached to the girders—with the exception of cantilever ends—and to most of the beams. Formed steel decking was used as a permanent form for the concrete floor.

As a result of all these factors, the designers were able to reduce the weight of steel, and to save 2 to 3 in. in total depth per floor. It took just 17 working days to erect the 775-ton frame, shown in the photos below.

The principles of structural design of this building are the same as will be outlined below: composite design combined with rigid frame analysis.

A Design Example

Design of framing for a hypothetical apartment building which is shown in plan in Figure 2 will be used to exemplify the functional economic and design advantages of composite design. We will examine the framing of a 60- by 60-ft section.

If metal deck forms are used at spans no greater than 7½ ft, all temporary floor shoring and mill-type formwork can be eliminated. This type of construction is illustrated in Figure 1.

If a conventional steel grid pattern had been used, the economical framing plan would be as shown in Figure 3 with girders on 20-ft centers and intermediate beams at 6 ft 8 in. An economical design in concrete flat-plate construction, using staggered columns so that they would merge with partitioning, would require even more columns than the steel design.

Figure 4 shows the 60- by 60-ft module in steel designed with no interior columns; exterior columns are 15 ft on center. This design can be economical when composite construction is employed. The advantages are quickly apparent: (1) the total number of columns per unit area is reduced by one-third, (2) interior columns are completely eliminated, (3) the number of connections has been reduced by 79 per cent, (4) the number of individual pieces of steel to be handled has been reduced by 59 per cent.

By utilizing up-to-date composite design methods, the 60-ft long-span floor system would be approximately 20 per cent heavier in steel weight than the conventional framing shown in Figure 3. However, the functional advantages as well as savings in fabrication and erection costs offset this weight disadvantage. The former A.I.S.C. Specification would have required greater weight for the conventional framing, and if the design had been based on it, the increase in steel tonnage for the long-span frame would have been only 10 per cent.

The economy in long-span construction is achieved by composite design combined with semi-rigid connection theory. Presentation of this technique will take up the balance of this article.

Engineering Calculations

The 60-ft girders are spaced 7 ft 6 in. on center which eliminates shoring of the metal deck floor system. Fire resistance is provided by a vermiculite aggregate, gypsum plaster ceiling on plaster lath which serves as the finished ceiling. A 3-hr rating is obtained if the plaster is ¾ in. thick; a 4-hr rating if it is 1 in. thick, providing that a distance of not less than 14½ in. is maintained between the metal lath and the underside of the composite steel form.

The total gravity bending moment for this design amounts to 480 ft-kips. Construction loads were conservatively estimated to be 20 lb per sq ft which were added to the dead load requirements. If the designer does not apply construction loads, then he must be sure to add form loads where applicable. By neglecting construction loads, it would be possible to select a lighter steel member. The engineer, however, must be sure to add loads for partitions if they are required, when calculating live load moments applied to the composite section.

The 480 ft-kip gravity load is divided as follows: dead load moment (M_0) = 285 ft-kips; live load moment (M_l) = 195 ft-kips. If the engineer designs a fully rigid connection, the dead load moment is distributed as shown in Figure 5a. Deflection of a fully-rigid member is five times less than that for simple beam action; thus this fixed-connection design virtually eliminates deflection problems under dead load conditions. Also, if the end connection is made rigid, cambering of the beam is held to a minimum.

Figure 5b shows the distribution of bending moment under total load (live load plus dead load). This shows that the composite section is called upon to satisfy a positive moment of 290 ft-kips. The greater capacity of the composite member to absorb additional positive moment leads to the economical application of composite design by combining the composite action with semi-rigid connections to take care of the dead load moment only.

This criteria would classify the composite member for Type 3 (semi-rigid) construction under Section 1.2 of the new A.I.S.C. Specification. Connections of beams and girders are assumed to possess a dependable and known moment capacity intermediate in degree between complete rigidity and complete flexibility.

There is no point in extending the shear connectors to the ends of the beam. The Specification (1.11.4)
COMPOSITE VS. CONVENTIONAL FRAMING

Figure 2: Apartment plan of this shape will illustrate the advantages of composite framing.

Figure 3: In conventional framing for a 60-ft module, columns are on 20-ft centers; beams are 6 ft 8 in. apart states that shear connectors are to be evenly spaced between the point of maximum moment and a point of contraflexure in continuous beams. The black area in Figure 5b shows the limits of composite action; thus shear connectors should be spaced as required within these limits.

Figure 4: In composite, girders span 60 ft. Column eccentricity can be eliminated by cantilevering girders.

states that shear connectors are to be evenly spaced between the point of maximum moment and a point of contraflexure in continuous beams. The black area in Figure 5b shows the limits of composite action; thus shear connectors should be spaced as required within these limits.

Figure 5b: Bending moment for 60-ft beam due to the dead load.

Figure 5a: Bending moment for 60-ft beam due to the dead load.

BENDING LOADS

Figure 5b: Bending moment for composite section; live and dead load.

COMPOSITE SECTION DESIGN

Figure 6 (above): Design for composite section which will satisfy dead and live load moments

LOAD-CARRYING CAPACITIES

Figure 7 (right): 7a shows load-carrying capacity for non-composite section; 7b shows capacity for composite section with rigid connections; 7c capacity for semi-rigid connection available moments for a 21 WF 55 girder in A36 steel using composite and non-composite criteria.

Figure 7a shows the available gravity moment for a steel girder alone with fully-fixed-end conditions conforming to Type 1 (rigid frame) construction. The maximum allowable moment that can be absorbed is equal to 329.1 ft-kips.

Figure 7b shows the maximum available gravity moment for the composite section if the steel connection is designed to its fullest negative moment capacity. The theoretical moment indicated is 527.4 ft-kips. This is an increase of 39 per cent in load carrying capacity of composite over non-composite design.

Figure 7c shows the composite section designed as a semi-rigid connected member. Only a 172 ft-kip negative moment connection would have to be developed. The steel member alone has a capacity of 219.4 ft-kips at 0.66 Fy; therefore, if the capacity of the semi-rigid joint connection were increased to between 172 and 219 ft-kips, there would be no chance of the member becoming overstressed under static gravity loads. It should be noted that the composite beam has been designed without a cover plate which would raise the cost.

In order to accomplish a satisfactory design using composite design methods with simple beam connections, a 24 WF 84 section would be required.

Application of composite semi-rigid design yields a weight saving of 34.5 per cent over non-composite design and 27.6 per cent over composite design with simple beam connections. This saving was accomplished even
A. 21 WF 55 composite semi-rigid girder:
deflection, dead load=-1.08 in.;
deflection, live load=0.31 in.;
total deflection=1.39 in.

B. 24 WF 84 composite girder with simple beam connection:
deflection, dead load=-2.60 in.;
deflection, live load=0.87 in.;
total deflection=3.47 in.

C. 24 WF 76 non-composite rigid connection:
total deflection=0.99 in.

Total deflection of the 21 WF 55 semi-rigid composite section was figured at a maximum end restraint of 219 ft-kips as shown in Figure 7b. With dead-load deflection of 1.08 in. and live-load deflection of only 0.31 in., it would not be necessary to camber the girder.

Likewise, it would not be necessary to camber the 24 WF 76 girder; however, the 24 WF 84 composite member with no end restraint would require cambering to compensate for dead load deflection.

If the engineer investigates deflection in the semi-rigid composite 21 WF 55 girder with dead load moment equal to 195 ft-kips and live load moment equal to 285 ft-kips, he would find that total deflection would equal 1.17 in., distributed as follows: deflection due to dead load=0.74 in. for steel girder only, rigidly connected; deflection due to live load=0.43 in. for the transformed section.

The moment distribution, as indicated above, is more in keeping with loading conditions in which composite design has heretofore been utilized. The designer can visualize that deflection is of no consequence regardless how the moment is distributed when semi-rigid design is employed.

In addition to these advantages, the engineer will be able to use the new high-strength steels in this type of design without being limited by deflection.

Composite Design and Wind
Little thought has been given in the past to composite action under wind loading conditions. The reader will note that the available moment capacity for the section covered by figure 7b equals 527.4 ft-kips. This was accomplished, as outlined, by fully fixing the end connection to develop the full negative moment capacity of the 21 WF 55 steel member. If it is assumed that only a 172 ft-kip moment is required to satisfy gravity loads, then the difference between 172 and 219.4 (47.4 ft-kips) is the reserve moment capacity of the composite girder.

According to the A.I.S.C. Specifications, the designer can increase the allowable stress for combined loading conditions by 33½ per cent; therefore, the induced moment due to wind that would be allowed under combined gravity and wind loads would be:

\[ M_{w} + 172 = 219.4 \text{ ft-kips}; \text{ therefore,} \]
\[ M_{w} = 120 \text{ ft-kips}. \]

These moments are distributed as shown in Figure 8. Under combined wind and gravity loads, the maximum positive moment equals 314 ft-kips; the maximum negative moment equals 292 ft-kips. However, if these respective induced moments were reduced by 33½ per cent, or the allowable working stress were increased by this amount, the composite section with an end restraint equal to the capacity of the steel member alone would accommodate a gravity load moment of 480 ft-kips, plus an induced wind moment of 120 ft-kips.

As previously stated, a fully-rigid 24 WF 76 girder would be required to satisfy the gravity loads if composite design were not utilized.

Figure 9 shows a comparison between a fully-rigid, composite and a semi-rigid, composite 24 WF 76 girder subjected to combined gravity and wind loading conditions. By applying the same methods of analysis as in Figure 8 (i.e. equation top of this column) it was found that the non-composite steel member was capable of handling a wind moment of 296 ft-kips (Figure 9a).

Figure 9b shows the same size section designed as a semi-rigid composite member. The allowable wind moment has been increased to 396 ft-kips. This is an increase in moment capacity of 25 per cent. By utilizing composite action, the same size member can be used to satisfy wind-induced moments ranging from 296 ft-kips to 406 ft-kips when combined with a gravity moment of 480.

It should be pointed out that the columns must be made stiff enough, or adjacent bays or cantilevers must be provided to ensure that the semi-rigid connection will act between the limits of the design assumptions.

Conclusion
Engineer and architect are seldom faced with the ideal situation when designing a structure. The author selected a problem employing apartment house loading conditions that heretofore had not been considered practical for composite design. This selection was made to emphasize new avenues that have been opened to the designer by utilizing the design techniques presented in this paper. Even greater economies could be achieved under heavier live loading conditions.

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DUAL-PURPOSE GLAZING ROOFS CONSERVATORY

Unique system prevents leaking of rain from without, dripping due to condensation from within, in three parabolic domes of Milwaukee's Mitchell Park Horticultural Conservatory.

How would you glaze a 90-ft-high, parabolic-shaped greenhouse to keep out rain and to prevent condensation from dripping anywhere inside?

Skylight specialists working on the Mitchell Park Horticultural Conservatory solved this double-edged problem through a unique glazing and condensate drainage assembly of glass, aluminum framing and neoprene gasketing. The glazing system sits atop and follows the curvature of the precast concrete structural frame.

The glazing system consists of aluminum tubes interconnected by hollow aluminum hubs, and neoprene gaskets which seal the glass and serve as gutters for the condensate.

Condensed moisture on the glass runs into the neoprene gutters, which channel the water into the hollow aluminum hub. The water cascades from hub to hub through the aluminum tubes until it reaches the bottom of the dome, where it is collected in a continuous gutter.

Expansion and contraction movements of the glazing system due to thermal change are taken up at each hub. The ends of the aluminum tubes coming into top of a hub are free to

Left: a special revolving scaffold, which covers one-fifth of the dome, is used by welders to fasten glazing unit solidly to the dome. Center: men outside on platform of boom guide glazing assembly into place. Right: lifting rig is used by crane to hoist glazing unit. A separate assembly rig in the shop properly locates the spherical joints so that the glazing unit will have the correct curvature for a particular segment of dome.
move. Tubes at the bottom of the hub are fastened and sealed to prevent leakage.

The aluminum sphere is pierced to provide a void where the free end of the tubular rafter enters it so that moisture condensing on the aluminum rafter will drain into the sphere, and so that the tube can move.

Moisture collecting at the corners of the glass enters the sphere through the open space between the inner surface of the glass and the top flange of the sphere.

The aluminum sphere is attached to the precast concrete framing by means of a stainless steel coupling. The stainless steel coupling in turn is welded to an insert set in the precast concrete.

There are 39 different types of spheres for different angular arrangements of the rafters.

Here are interesting statistics on the three domes: size—90 ft high, 140 ft in diam.; materials—115,000 sq ft of glass, 16,000 rafters, 5,500 spherical joints, 240,000 ft of neoprene gasketing. Total cost of the three domes is $3,600,000. Cost of the glazing is $1,096,000.

The glazing system was invented by Ronald G. Hawkins, vice president of Super Sky Products Co., Thiensville, Wisconsin.

ARCHITECT: Donald L. Grieb
STRUCTURAL ENGINEERS: Ammann & Whitney
GLAZING: Super Sky Products Co.
PRECAST CONCRETE: Hufschmidt Engineering Co.
CHARACTERISTICS OF ALUMINIZED STEEL

By W. H. Withey and H. H. Lawson

Twenty-three years after its initial development, aluminum-coated or aluminized steel is emerging from virtual seclusion as a major architectural material with a largely untapped design potential.

Since 1952, when the architectural grade of aluminized steel was made commercially available, an increasing but still relatively small number of architects and engineers have evaluated and selected the material. It has been used for a variety of industrial and commercial buildings as roofing, siding, curtain walls, interior panels and related architectural applications.

Performance records indicate that aluminized steel has earned a place in the building materials market in competition with galvanized steel on one hand and aluminum alloys on the other. Properties of aluminized steel are a hybrid combination of the key characteristics of both steel and aluminum.

Comparative Advantages

A combination of corrosion resistance and strength unique among building materials is the major asset for aluminized steel. In addition, it is not as expensive as most aluminum building alloys. Aluminum-coated steel is approximately 30 per cent more expensive than zinc-coated steel. But aluminized steel exhibits a coating life four times that of zinc-coated steel in mild industrial atmospheres.

The appearance and corrosion resistance of aluminized steel are similar to that of aluminum. The material resists fire damage in the manner of steel. At 800 degrees F, aluminized steel has ten times the strength of aluminum. And aluminized steel shows high heat reflectivity, reflecting unwanted external summer heat and retaining internal generated heat.

Types

There are two grades of aluminum-coated steel. Type 1 has aluminum-silicon coating which provides excellent resistance to a combination of corrosion and high temperatures to 1,250 degrees F. The material is currently the major 1962 automobile muffler material and is used in a variety of other high temperature applications.

Type 2, the architectural grade, has a commercially pure aluminum coating which exhibits excellent resistance to atmospheric corrosion. Type 2 is not recommended for use above 900 degrees F.

The aluminum used for coating Type 2 is commercially pure alumi-
num with a uniformly deposited coating thickness of approximately .002 in. per side—twice the thickness of a commercial hot dipped zinc-coated steel. General surface corrosion resistance of the coating in normal atmospheric exposure is similar to 1,100 aluminum.

Corrosion Resistance

We have been field testing Type 2 aluminum-coated steel in a mild industrial atmosphere since 1939. After 23 years exposure in the Middletown, Ohio corrosion yard, the material is still in excellent condition. Corrosion engineers predict that the material will continue to withstand the environment for many more years.

As a general rule, aluminized steel is considered to have the same weathering characteristics as aluminum sheet. A 10-year corrosion comparison test in a mild industrial atmosphere is shown in the first photo. Aluminized steel and aluminum, weathering side by side, exhibit a markedly similar appearance.

Corrosion where solid aluminum meets the steel base metal is not a problem with aluminized steel. Because of the nature of the aluminum-steel bond, moisture cannot enter between the layers of the material to initiate corrosion.

Some mild discoloration can be expected at sheared edges. But samples exposed for 23 years show no undercutting of the coating and no bleeding.

In general, the corrosion resistance of aluminized steel is such that painting is not required. If painting is specified for extra protection or decorative reasons, no surface preparation of the material is necessary or recommended. Wash primers and similar preparations should be avoided. Where aluminized has been painted, paint life has been excellent, exceeding that of galvanized steel. In effect, paint life increases as the corrosion resistance of the painted surface increases.

In-Service Corrosion

Data on how aluminized Type 2 reacts in specific environments have recently been gathered by a group of corrosion specialists from Armco’s Research Center. The researchers inspected 55 “in-service” installations exposed from 1 to 10 years. Involved were roofing and siding installations in a variety of industrial, commercial and farm buildings. Related building products such as canopies, air conditioner housings, rolling doors, water tank covers, gutters and insulation lagging were also inspected.

In rural, mild industrial and severe industrial atmospheres, researchers found Type 2 performing well.

In severe marine installations subject to direct contact with salt spray, Type 2 etched sufficiently to produce an unsatisfactory appearance. The attack was characterized by rough white deposits which form on aluminum surfaces exposed to similar conditions. It was noted that all zinc-coated components in this atmosphere were painted regularly. Painting Type 2 in this case would have improved performance.

In marine-industrial environments only slightly removed from direct contact with salt water spray, Type 2 was found to be bright after 9 years’ service. Researchers concluded that when considering materials for marine environments, an inspection should be made of other structures in the immediate area. If salt deposits are not present, unpainted Type 2 should be suitable for building components.

Interior Environments

It is apparent from the research study that far more difficulty is encountered from interior building conditions than from exterior environments. Gases and fumes from various plant operations, as well as condensation from humidity, should be carefully considered during the selection of materials. Inspection of installations reporting signs of corrosion revealed that most problems could have been eliminated by proper design.

Field inspections indicated unprotected aluminized Type 2 should not be used in areas contaminated with sulfurous and sulfuric acid. Two installations were inspected where these vapors were vented to the roof and the fumes permitted to impinge on the aluminized surface. Extension of the vent stack or use of special paints in this area would have alleviated this condition.

Economic Factors

On a price basis alone, aluminized steel is economically competitive with most building grades of aluminum. Since the density of aluminum is about one-third that of steel, it is necessary to consider the price per square foot as a basis for comparison. Cost estimates also must be based on decimal thickness because the gage system for aluminum alloys (Brown and Sharpe) is not the same as the gage system for aluminized steel.

Aluminized steel often will show a price advantage on the basis of equal thickness, the advantage being somewhat greater as thickness increases. Due to the greater strength and modulus of elasticity of aluminized steel, metal thickness can usually be reduced from that necessary with aluminum to provide an even greater economic advantage.

An approximate first-cost comparison of aluminized, cold-rolled steel treated for painting, standard zinc-coated steel and zinc-coated steel treated for painting is shown in the table.

Design Considerations

The strength of aluminized steel gives the material an added design dimension. In general, standard data for the design of light-gage cold-formed steel products apply to aluminum-coated steel. Mechanical properties of aluminized steel and zinc-coated steel are essentially the same, but aluminized is not quite as versatile when it comes to fabrication.

Continued on page 208
GLASS BLOCKS WITH RECESSED DESIGNS FOR WALLS

New wall design possibilities are offered with Intaglio Glass Wall Units—all-glass blocks in square and rectangular shapes with recessed design areas of patterned clear glass. The raised portion of each unit has a textured finish with an opaque gray ceramic finish on both faces. The finish is fired at high temperatures to assure permanence, and the gray color blends with the mortar used to join the units, tending to eliminate any sharp delineation between the separate units.

The contrasts in both surface and color and the light and shadow effect caused by recessing the design areas provide, in fact, glass and grill in one building material. The clear glass areas have a light transmission rating of 20 to 40 per cent. The inside of the clear areas is patterned to permit even diffusion of light without glare, and the texture is designed so that there can be no focusing.

The Intaglio units give a “one operation” wall with interior and exterior decorative effects provided by the same material. Since the interiors of the hollow units are at a partial vacuum, the wall has an insulation value equal to about 12 in. of concrete. There is an average sound reduction of 38 decibels.

Pictured above are the four patterns currently available: 4- by 8-in. oval, and hourglass, circle and nugget—all in 8- by 8-in. blocks. Pittsburgh Corning Corp., One Gateway Center, Pittsburgh 22, Pa.

CHAIN LINK FENCES WITH COLORFUL VINYL COATINGS

Colorbond chain link fences have the strength of steel combined with the colors possible with vinyl. Ten colors and any two-color combination are available. High strength, hot-dip zinc coated steel wire is used with a weather-resistant vinyl developed especially for the fencing by Union Carbide. The vinyl retains its flexibility and is self-extinguishing. Chemical resistance is high and maintenance costs are reduced to a minimum. Costs are reported to be slightly higher than those for bare galvanized steel and lower than for aluminum fencing.

With the long-term protection of its vinyl coating the fencing is warranted for 10 years and should last up to 20 years. It is available in standard 6, 9, 11 and 12 gage wire, in heights from 2 to 12 ft. Matching vinyl-base paint is supplied for posts and hardware.

In addition to the regular uses of chain link fencing for protective enclosures of various kinds, the colors suggest further uses, such as color-coded designation for fence-side parking and warning colors for restricted or dangerous areas. When used around power distribution stations, Colorbond boosts safety because the vinyl insulates against 12,000 volts. Colorguard Corp., 107 E. 38th St., New York 16, N.Y.

For more information circle selected item numbers on Reader Service Inquiry Card, pages 225-226
GLASS WALLS

(A.I.A. 26-A) “Creative Ideas in Glass” has 8 pages of full color photographs showing the varied uses of glass in curtain wall construction in existing buildings. Several building types are included. American-Saint Gobain Corp., Kingsport, Tenn.
Circle 400 on Inquiry Card

AUTOMATIC DOOR OPENERS

(A.I.A. 16-D) Specifications and detail drawings for hydraulic, electric and pneumatic automatic door operating equipment, for all doors that swing, slide or fold. The Stanley Works, New Britain, Conn.*
Circle 401 on Inquiry Card

CONCRETE BLOCK

The advantages of using 8-in. concrete masonry block for residential and commercial use are illustrated in a 16-page booklet showing both exterior and interior applications. National Concrete Masonry Assoc., 1015 Wisconsin Ave., N.W., Washington 7, D.C.
Circle 402 on Inquiry Card

CERAMIC FACING

(A.I.A. 9-A) Contours CV, a lightweight ceramic architectural facing for exterior and interior use, is illustrated in a brochure with photographs of 12 standard designs. Gladding, McBean & Co., 2901 Los Feliz Blvd., Los Angeles 39, Calif.
Circle 403 on Inquiry Card

WOOD GRILL WORK

Circle 404 on Inquiry Card

SLATE

Photographs of Pennsylvania slate finishes are shown in folder with suggestions for use, specifications and details on properties. The Structural Slate Co., Pen Argyl, Pa.*
Circle 405 on Inquiry Card

VINYL PANELS

Existing buildings and suggested designs using Barrett’s building panels of polyvinyl chloride are shown in a large-size brochure which includes specifications, installation data. Allied Chemical Co., Barrett Div., 40 Rector St., New York 6, N.Y.
Circle 406 on Inquiry Card

ROOF, WALL EXHAUSTERS

(A.I.A. 30-D-1) Engineering bulletin 2CE has data to enable one to specify both air moving capacity and exhaust sound level for roof and wall exhausters. Jenn-Air Products Co., Inc., 1102 Stadium Drive, Indianapolis 7, Ind.
Circle 407 on Inquiry Card

STEEL FLOOR SYSTEM

WacoPlate steel free-access floor system has panels made with a flat top sheet spotwelded to a die-form stiffener sheet. Panel Products Div., Washington Aluminum Co., Inc., Baltimore 29, Md.*
Circle 408 on Inquiry Card

WOOD BUILDINGS

Use of West Coast lumber for commercial buildings is illustrated in a full color, 40-page booklet showing banks, shopping centers, motels, country clubs and other building types. West Coast Lumbermen’s Assoc., 1410 S. W. Morrison St., Portland 5, Ore.
Circle 409 on Inquiry Card

LIGHTWEIGHT CONCRETE

The varied uses of Elasticerite lightweight concrete are described in a series of booklets, giving specifications and design details. Elastizell Corp. of America, P.O. Box 321, Alpena, Mich.
Circle 410 on Inquiry Card

SLIDING DOOR HARDWARE

A new line of sliding, folding and accordion door hardware for medium and heavy doors is illustrated in a 26-page catalog. House & Co., 219 E. 44th St., New York 17, N.Y.
Circle 411 on Inquiry Card

SANDSTONE

(A.I.A. 8-B-6) Color illustrations of Amherst sandstone installations are included in brochure with technical data and samples of patterns and finishes available. Cleveland Quarries Co., Amherst, Ohio
Circle 412 on Inquiry Card

FIR PLYWOOD COMPONENTS

(A.I.A. 19F) Structural details for folded plate roofs and stressed skin panels using fir plywood components are given in two pamphlets which have illustrations and descriptive text. Plywood Fabricator Service, Inc., P. O. Box 7, Riverdale Station, Chicago 27, Ill.*
Circle 413 on Inquiry Card

HEAT REQUIREMENTS

(A.I.A. 30-C-44) Technical bulletin TR-103 has charts and data for quickly determining radiant heating unit requirements, both for entire buildings and specific areas. General Products Co., Inc., P. O. Box 837, Fredericksburg, Va.
Circle 414 on Inquiry Card

COPPER PIPING

(A.I.A. 29-B-4) Technical information on copper tubing and fittings is given in a 16-page copper piping manual. NIBCO Inc., 500 Simpson St., Elkhart, Ind.
Circle 415 on Inquiry Card

AREA LIGHTING

Facts and figures on lighting various outdoor areas are given in a 48-page, illustrated booklet, GEA 7223A. General Electric, Schenectady 5, N.Y.*
Circle 416 on Inquiry Card

ACID-PROOF FLOORS

Circle 417 on Inquiry Card

*Additional product information in Sweet’s Architectural File
more literature on page 242
Why Del Webb’s luxurious new OceanHouse features NEVAMAR® surfaces in every room

Each of 200 gracious guest rooms at OceanHouse in San Diego, California contains trouble-free surfaces of Nevamar decorative laminate. You’ll find Nevamar in all the public rooms, too—throughout the Jolly Roger cocktail lounge, in the dining room, and on all dressers, chests, night stands and hi-fi sets. Interior designers for Del E. Webb Corporation created the OceanHouse decor to combine nautical feeling with Oriental-Tahitian influence. Furniture surfaced with Oriental Walnut Nevamar fitted the plan perfectly. For the public rooms and registration desk, the selection was Nevamar Imperial Flat-Cut Mahogany. Draperies of flameproof Saranspun by National also play an important part in the overall scheme.

Top designers are using Nevamar laminates to solve many decorating problems—in wall paneling, doors, furniture and countertops. We’ll be happy to help you do the same if you tell us your requirements.

Top designers are using Nevamar laminates to solve many decorating problems—in wall paneling, doors, furniture and countertops. We’ll be happy to help you do the same if you tell us your requirements.

For more data, circle 76 on Inquiry Card

ARCHITECTURAL RECORD November 1962 201
Corrulux® Double-Domes for better daylighting

ALL-ACRYLIC DOMES ARE PREFABRICATED AND FACTORY-SEALED...SPECIAL FRAME DESIGN ALLOWS UP TO 12% MORE DAYLIGHTING AREA

Now—a new unit with a special frame design that affords as much as 10-12% more daylighting area! J-M Corrulux Double-Domes are available in clear acrylic or in 3 shades of white for various light transmission values and insulation requirements. They are particularly suited to the low-pitched roofs favored for modern school, supermarket and factory buildings . . . and also have special residential applications.

On-site assembly is no longer a problem. The new PVC (polyvinyl chloride) frame is rigid and durable, yet flexible enough to adjust to curb openings that frequently deviate from specified dimensions. Therefore, each unit can be installed factory-sealed.

In service, weathering and age leave PVC functionally intact. The domes proper are of time-tested acrylic plastic that has proved itself in every climate zone for many years.

For more information about these adaptable new daylighting units, write for Brochure CXI-9A. Address Johns-Manville, Box 158, Dept. AR11 New York 16, N. Y. In Canada: Port Credit, Ont. Cable: Johnmanvil.

For more data, circle 77 on Inquiry Card
toward better classroom climate

Modine School-Vent, UNIT VENTILATOR

for heating, cooling and ventilating

ALL-SEASON COMFORT! FUNCTIONAL GOOD LOOKS!
LOW, SLIM SILHOUETTE! IN SEVEN ATTRACTIVE COLORS!

Introduced just one year ago... and already the Modine SCHOOL-VENT has won favor in modern schools coast-to-coast!

Teachers and pupils like the ideal "educational climate" it maintains. Engineers like its unique concept of air control... employing a simple, full-damper system that automatically adjusts to temperature and fresh-air requirements. School officials like its maintenance and operating economies.

And you'll like its fresh, attractive styling... its design simplicity and flexibility. The SCHOOL-VENT is thinner and lower than most other equipment of this type...

13" x 28" compared to the normal 18" x 32".

Choice of seven handsome colors: light gray, tan beige, light green, coral red, light blue, dark gray and cream yellow. And SCHOOL-VENT beauty is virtually "student-proof." Heavily reinforced, welded steel cabinets defy abuse. Front panels have attractive, scuff-resistant vinyl inserts.

Modine SCHOOL-VENT unit ventilators heat with steam or hot water... cool with central-source chilled water. Five sizes: 500 to 1500 cfm. For complete information, write for SCHOOL-VENT Bulletin 1261.

Modine MANUFACTURING CO.

For more data, circle 82 on Inquiry Card
DANISH EMBASSY Natural Cleft slate panels add dignified zest to the modern lines of the new Danish Embassy, in Washington, D.C. Architect—Vilhelm Lauritzen; Consulting Architects—The Architects Collaborative.

NEAL Cleft Slate tiling accents le motif moderne at the new W. E. Neal office building in Minneapolis. Architect—Donald Hustad.

SLATE IS MICA GRANULAR CRYSTAL-LINE STONE, derived from argillaceous sediments, solidified by metamorphism and characterized by perfect cleavage. It possesses both a horizontal and vertical grain. In aspect it can be as bold as Gibraltar or as delicate as a maiden's whim. It presents the pure essence of Nature, and is unequivocal... it enhances every architectural feeling.

SLATE has more uses than any other natural rock.
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PENNSYLVANIA SLATE enhances EVERY architectural feeling

Write for new brochure outlining the uses and characteristics of slate. Specific inquiries invited.

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ARCHITECTURAL RECORD November 1962
New Safety, Efficiency and Economy in Maintaining Building Exteriors!

**Product Reports**

*continued from page 199*

**MASONRY JOINT**

Aluminum Con-trol-joint for masonry construction controls shrinkage cracks, adds strength and permits use of different size and type masonry units without keying. The joints are adjustable for any wall thickness and can be used for both interior and exterior applications. United Area Products Corp., Burlington, N.J.

CIRCLE 302 ON INQUIRY CARD

**COOLING TOWER SCREENS**

Extruded aluminum cooling tower screens are designed to conceal cooling towers, water tanks and other equipment where high air efficiency must be maintained. Vertical and horizontal line screens are offered with a number of finishes. Variations possible in spacing blades and structural supports provide a wide range of styles to harmonize with the rest of the building. Construction Specialties, Inc., 55 Winans Ave., Cranford, N.J.

CIRCLE 303 ON INQUIRY CARD

**LIGHTING FIXTURES**

Coordinated fixtures for fluorescent and incandescent lights are available in walnut, birch, white, polished brass and brushed chrome finishes. Globe Lighting Products, Inc., 801 Second Ave., New York 17, N.Y.

CIRCLE 304 ON INQUIRY CARD

For more data, circle 84 on Inquiry Card
At Chicago O'Hare International Airport, B&G Hydro-Flo

320
B&G BOOSTER PUMPS

127
B&G UNIVERSAL PUMPS

The number of B&G Hydro-Flo System Units installed at O'Hare Field reflects the vast size of the airport. 462 B&G pumps and 46 B&G heat exchangers are required to furnish hot water and circulate it through the heating system. This installation aptly demonstrates the superior qualities of circulated water as a means of heating or cooling a structure.

The B&G Hydro-Flo System is extremely flexible in application...performing equally well in a low cost home, modern high rise or a building complex covering acres.

For large installations, B&G engineers have developed a method of Primary-Secondary pumping which offers designers unlimited versatility in meeting zone problems in the most efficient and economical way. Required pump horsepower is sharply reduced, heat control improved and fuel saved.
B&G pumps have the quiet operating characteristics, rugged construction and dependable performance which has won them their place as the world's largest selling heating and cooling system pumps. Their superior qualities have been proved in literally millions of installations.

Write for your free copy of "Hydronic Zone Control with Primary-Secondary Pumping"
Cookson Side Coiling Steel Rolling Doors introduce a new dimension of flexibility in the design of large hangar-type and industrial openings. The need for excessive space requirements normally associated with sliding doors, or heavy trusses to support overhead doors, is eliminated. The architecturally compatible curtain is formed of heavy-gauge, flat-face galvanized steel slats, as shown inset above, and is fully retractable into a coil box at one side. Engineering problems are greatly simplified and construction costs reduced. Can be operated electrically or by hand-crank, depending on size. Fill in and mail coupon for more information.

**Product Reports**

**FLOODLIGHTS**

A calibrated dial mechanism permits on-the-job focusing for more precise beam coverage in a new series of quartz iodine floodlights. Moving the lamp forward or back inside a double parabolic reflector can achieve a wide range of vertical beam spreads, as well as asymmetrical beams. *Stonco Electric Products Co., Kenilworth, N.J.*

**DRAWING INK**

A fast-drying, non-clogging drawing ink, No. 3080 Radiograph, is designed for use on all surfaces. The dense black ink comes in unbreakable plastic bottles. *Koh-I-Noor, Inc., Bloomsbury, N.J.*

**STEEL REINFORCES RUBBER DOOR**

Full-sized sheets of steel are permanently bonded to Durador’s marine plywood core, with the rubber exteriors of the door bonded to the steel. A full-length rubber hinge permits full openings in either direction and eliminates need for lubrication. *Clark Door Co., Inc., Rose St., Newark 8, N.J.*

For more data, circle 86 on Inquiry Card.
Amtico Vinyl captures the practical beauty of natural travertine...

See Amtico Travertine* Vinyl and natural travertine side by side. Your very own eyes proclaim it... Amtico has completely captured the heart and soul of natural travertine's look, its texture, its soft beige color! Advantages over natural travertine: Drastically lower price. Much lighter in weight... floor requires no reinforcement. Far greater durability. Resilient comfort underfoot. Much easier to install... will not chip or break. Mops clean... effortless to maintain... should never be waxed.

Ideal for smart commercial and residential installations. Adds true classic beauty to floors and walls. Standard and special tile sizes up to 36" x 36", 1/8" and .080" gauges. Four colors, others on special order. Write for free samples.

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Showrooms: New York • Chicago • Los Angeles
San Francisco • Dallas • Toronto • London, England
In Canada: American Biltrite Rubber Company Ltd., Sherbrooke, Que.

For more data, circle 87 on Inquiry Card
The Amelco Window offers many advantages... dual glazing with venetian blind between the panes of glass reduces solar heat gain by 65%. Just think of the savings in air conditioning equipment costs... and operating costs. Two inch air space and true thermal break in vent and frame offer 55% less heat loss in winter. Air space and efficient seals reduce noise transmission more than 50%. Horizontal pivoting offers ventilation if you need it and cleaning of all glass surfaces from inside... more savings. Many leading architects are specifying Amelco... the most versatile, most economical window in America. Write for full story.
NEW SLIMLINE 5
WITH 4 BALL BEARINGS

When talk turns to quality and design, architects and builders find this new hinge makes for good conversation. It's the only slimline with five knuckles, the only slimline with four ball bearings... and it's still the slimmest of them all. How the four intricate but rugged ball-bearing units integrate without increasing knuckle size is a tribute to hinge craftsmen at Hager.

The five knuckles mean 10% to 20% more strength on lateral pull and twice the bearing surface to support vertical weight. The pin, approximately one-third larger than other slimlines, naturally maintains a much greater protective margin in shear and tensile strength.

Medium and heavy doors move ever so quietly, ever so smoothly, ever so true, on the new four-ball-bearing Slimline 5. Write Hager, or contact your Hager representative for information. C. Hager & Sons Hinge Mfg. Co., St. Louis 4, Mo. Hager Hinge Canada, Limited, Kitchener, Ontario.

Everything hinges on Hager®

For more data, circle 89 on Inquiry Card
In Their New Plant at Mentor, Ohio
The W. S. Tyler Company—
Saves Floor Space and Speeds
Up Material Handling . . .

...with Kinnear
MOTOR OPERATED
Rolling Doors

Saving of space and time is only part of the story. Kinnear Rolling Doors are also the most durable, efficient-operating doors that can be installed. The steel interlocking slat curtain is extra heavily galvanized. Counterbalance is by Kinnear’s time-proved torsion spring mechanism. And the power unit is integrally designed specifically for rolling door operation. A complete “closure” package! One that insures minimum maintenance. A building component purchase that will quickly turn into a dividend-paying investment for Tyler.

Use Kinnear Rolling Doors for your building needs. They are built in any size and suited to old or new structures.

WRITE TODAY FOR CATALOG

KINNEAR
Rolling Doors
Saving Ways in Doorways

The KINNEAR Mfg. Co.
Factories:
1500-80 Fields Avenue, Columbus 16, Ohio
1742 Yosemite Avenue, San Francisco, Calif.
Offices and representatives
in all principal cities

Product Reports continued from page 216

COLORED EXTERIOR PLYWOOD PANELING
Exterior plywood paneling with factory-applied colors is said to save costs as compared to unfinished siding with on-site painting. The line has Douglas fir veneers and acrylic-vinyl paint. A variety of sizes and thicknesses are available. The panels meet F.H.A. specifications for 303 C specialty siding and can be nailed directly to studs. Georgia-Pacific, Equitable Bldg., Portland, Ore.
CIRCLE 308 ON INQUIRY CARD

LIGHTWEIGHT ALUMINUM BEAM
The Alcoa Hico 59er adjustable beam weighs only 28 lbs and can be used as a support for concrete slab forms for spans from 5 ft 9 in. to 9 ft 9 in. The beam has a built-in camber curve, and bending moment is 3,000 lbs, with an end reaction of 1,750 lbs. Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.
CIRCLE 309 ON INQUIRY CARD

SURFACE BRICK
Vesta brick surfacing can be used without concrete footings, to save costs while providing a decorative surface. The product can be attached to any surface, using tar paper and a patented socket wire mesh with loops which serve as guides for the brick. Mortar is applied over the wire to the depth of the loops. Applications are wainscoting, fireplace facings, planters, room dividers, and interior walls. Vesta Mfg. Co., 275 Leo Ave., San Jose, Calif.
CIRCLE 310 ON INQUIRY CARD

For more data, circle 90 on Inquiry Card

For more data, circle 91 on Inquiry Card
THE ENTRANCE CANOPY  Wood says welcome and sets the mood that carries over into the house. Distinguished by the warm-timbered tones of exposed beams and posts with hanging gardens to give added interest, this entrance design is easy to look at . . . easy to live with . . . and exceedingly practical. It suggests one of the many exciting ways you can transform a standard doorway into a showplace of excellent taste with Osmose pressure treated wood. Osmose treated wood is virtually immune to exposure and termites, requiring the very minimum in maintenance and repair. All considered, it is a new material whose only design limit is your imagination.
Acoustical ceilings are designable

Architect Stanley Tigerman gives us a few of his ideas regarding three dimensional, acoustical ceilings. Mr. Tigerman is a principal of the firm of Tigerman and Koglin, 100 West Monroe St., Chicago.
now that Zono-Coustic is here

Enough is enough. The number of flat acoustical ceilings made out of itty-bitty squares has reached the saturation point.

Three dimensions and the play of light and shadow are the elements that make ceilings interesting.

Zono-Coustic Acoustical Plaster will stick to the shapes you design, add the texture you want, and give you an N.R.C. rating of .60.

It can be machine applied over any clean firm surface such as base coat plaster, masonry, galvanized metal, concrete or metal lath surfaces.

Help stamp out flat, dull, acoustical ceilings. For complete information about Zono-Coustic, write for Bulletin #PA-59, to: Zonolite Company, 135 South LaSalle Street, Chicago 3, Illinois.

For more data, circle 94 on Inquiry Card
PLASTIC LAB FAUCET
A rigid gooseneck compression faucet for labs is made of polyvinyl chloride to maintain the purity of distilled water. The Lab-Flo unit has needle valve control and wheel handle. T & S Brass & Bronze Works, Inc., 128 Magnolia Ave., Westbury, L.I., N.Y.
CIRCLE 311 ON INQUIRY CARD

HARDWOOD STRIP FLOORS
A cost-cutting method for installing hardwood strip floors over concrete without use of wood subfloors uses two-layer sleepers of 1-by-2-in. wood nailed together to suspend a moisture barrier of 4-mil polyethylene film between sleeper layers and across the air space. The bottom layer of each sleeper is secured to the slab by a latex mastic applied with a caulking gun and by concrete nails. The strip hardwood flooring is nailed at right angles to the sleepers. A 4-mil polyethylene film is placed directly over the base fill before pouring slab to prevent rise of ground moisture into the slab. The National Oak Flooring Manufacturers' Assoc., 814 Sterick Bldg., Memphis 3, Tenn.
CIRCLE 312 ON INQUIRY CARD

"U.S." CHEMICAL PORCELAIN LAB SINKS
No more need for corrosion charts ... for special sinks for special corrosives, with the chances of costly mistakes.
Time-proven "U. S." Chemical Porcelain laboratory sinks will handle safely all acids, alkalies, caustics and solvents — weak or strong, hot or cold. With normal routine rinsing, even hydrofluoric acid presents no problem. "U. S." Chemical Porcelain laboratory sinks will also withstand all the heat shock and physical abuse they'll ever meet in normal laboratory use.
Available in three attractive colors — cool "surf green," soft "mist gray" and sparkling white — these strong, non-staining, scratch-resistant sinks are as easy to clean as a china dish. Over one hundred different styles and sizes are available to meet every need.
For complete details, contact your Laboratory Furniture Manufacturer or write direct for free Bulletin L-10.

U. S. STONEWARE
AKRON 9, OHIO

ZONE CONTROL IN GAS HEAT
A gas baseboard heater for zone heating has the vented gas burner in a sealed combustion chamber, so no room air is used. The heater front is 10½ in. high and 4½ in. wide. Samuel Stamping & Enameling Co., Manufacturers Road, Chattanooga 1, Tenn.
CIRCLE 316 ON INQUIRY CARD

more products on page 238
Care-free windows for care-free living

Until someone invents a self-cleaning window, PELLA WOOD CASEMENT WINDOWS require the least maintenance, providing substantial savings for your client. Occupants can operate each ROLSCREEN®—the “instant screen” that rolls down in spring, rolls up in fall. Self-storing storm panels stay in place the year 'round, saving on seasonal labor and valuable storage space. Stainless steel, spring-type weatherstripping combines with wood frames to increase the efficiency of heating and air-conditioning systems. PELLA offers 18 ventilating sizes up to 24” x 68” and 48 fixed sizes for maximum planning flexibility. Full information and specifications in SWEET’s or see the Yellow Pages for the name of nearest U.S. or Canadian distributor.

ROLSCREEN COMPANY • PELLA, IOWA

For more data, circle 96 on Inquiry Card
Conceived as a super-luxury address to attract people to the city from country estates, Tulsa's new 2300 Riverside Apartments combines all the feel of the open with the ultimate in town living.

Coordination between the architect's office in Dallas and the building site in Tulsa imposes a two-way problem in color planning. The solution was simple: a "Man from Devoe" in each city covered the responsibilities at his end of the line. Working in closest cooperation, these men helped the architect and the painting contractor achieve the exact rhapsody in hues projected on the board.

Their combined assistance began with help in color selection...through the Devoe Library Colors® system, covering over 1,000 interior and exterior colors. It continued with the provision of all technical data required on paint, the supply of Devoe Dispensers for mixing of special colors, the scheduling of paint shipments, and complete follow through and cross-check of all details between Tulsa and Dallas.

Devoe Architectural Representatives are now available in 66 cities from coast to coast. Why not find out how much time, trouble and cost your near Man from Devoe can save for you. There is no charge or obligation for his assistance...even if two, three or more "Men from Devoe" work in tandem to cover projects hundreds of miles or more from your office. To contact a Man from Devoe, call or write the nearest Devoe office listed below.

Charles A. Barclay . . . Devoe Architectural Representative "on call" to architects in the Tulsa, Oklahoma area.

Tulsa's new, high-rise luxury 2300 Riverside Apartments (left) over the Arkansas River and downtown Tulsa. Architects: Harrell & Ham AIA; General Contractor: Centex Construction Company; Painting Contractor: Eddie H. Shahan, Inc., all of Dallas, Texas.
Adjust auditoriums from regular to compact sizes

PELLA WOOD FOLDING DOORS help create a closer relationship between smaller audiences and the stage by closing off excess seating areas. And, their rich, wood grain adds warmth to the decorative scheme. Available in 6 genuine veneers: OAK, ASH, PINE, BIRCH, PHILIPPINE MAHOGANY and AMERICAN WALNUT. Specify them factory-finished or unfinished. Stable wood core construction prevents warping. Patented steel spring hinging assures easier operation. Available in all widths, heights up to 12'1". Full specifications in SWEET'S or check the Yellow Pages for nearest U.S. or Canadian PELLA distributor.

PELLA ALSO MAKES QUALITY
WOOD FOLDING PARTITIONS,
WOOD SLIDING GLASS DOORS, ROLSCREENS,
WOOD CASEMENT,
MP AND TWINLITE WINDOWS

ROLSCREEN COMPANY • PELLA, IOWA
FOAM PLASTIC TILE
RV-Lite foam polystyrene tile provides an attractive covering material that is moisture-resistant insulation. The 12-in.-sq tiles are 1/8 in. thick and are available in a range of patterns and colors and unpainted white.
Artery Corp., 3300 N. Kimball Ave., Chicago 18, Ill.
CIRCLE 317 ON INQUIRY CARD

ELECTRO-MAGNET FOR FIRE DOORS
Fire doors can be kept open with an electro-magnet connected to an electric sensing system, located either remotely or at the door itself. Smoke, high temperature or other action that can be picked up on the sensor breaks the connection, allowing the door closer to close in advance of actual smoke or fire danger. Challenger Lock Co., 2349 W. La Palma Ave., Anaheim, Calif.
CIRCLE 318 ON INQUIRY CARD

PRODUCT BRIEFS
Sound-deadening fiberboard, when used with dissimilar materials, makes floors, ceilings and walls highly absorptive of air-borne and impact noises. Kaiser Gypsum Co., Inc., Kaiser Center, Oakland 12, Calif.
CIRCLE 319 ON INQUIRY CARD

Plastic-impregnation of fabrics in small quantities for window shades makes possible individuality at low cost. Window Shade Manufacturers Assoc., 341 Madison Ave., New York 17, N.Y.
CIRCLE 320 ON INQUIRY CARD

Patina anodic finish for architectural aluminum is available in 24 colors, all with good corrosion resistance and color stability. Reynolds Metals Co., 19 E. 17th St., New York 17, N.Y.
CIRCLE 321 ON INQUIRY CARD

Panels, folding screens, doors and shutters of Finnish plywood, poplar and birch are available in 11 patterns. Attco Designs, 227 Eagle St., Brooklyn 22, N.Y.
CIRCLE 322 ON INQUIRY CARD

Playground and play equipment design service for architects and planners has been opened in New York. Frank LaPreUe, 300 E. 44th St., New York, N.Y.
CIRCLE 323 ON INQUIRY CARD

Precoated steel and aluminum with a variety of finishes and paints is available for users in Midwest, South and West. Precoat Metals, Inc., 4301 S. Spring Ave., St. Louis 16, Mo.
CIRCLE 324 ON INQUIRY CARD

A Finnish sauna room is made of redwood bricks and has an electric heater. Viking Sauna Co., of New York, 330 E. 49th St., New York 17, N.Y.
CIRCLE 325 ON INQUIRY CARD

For more data, circle 99 on Inquiry Card
The big difference begins where the glass ends

PELLA SLIDING GLASS DOORS with frames of real WOOD say home to your clients. And, wood frames can be finished or painted to go with any decorative schemes—inside and outside. Wood frames eliminate condensation, too. Stainless steel and wool pile weather stripping combine to provide exceptional weathertightness. Screens close automatically. Removable muntin bars are available in regular or diamond shapes to add the traditional touch. o, ox, xo, oxo and oxxo combinations in 33”, 45” and 57” glass widths. Custom sizes, too. Ask your PELLA representative to show you a sectional sample of wood frames with steel “T” reinforcement. He’s listed in the Yellow Pages. Or, see details in SWEET’s.
LATERAL SECTION. Hi-Stress Flexicore slabs, 32' in length, are used for long-span ceilings on second floor of classroom wing of Rutherford B. Hayes High School, Delaware, Ohio. The entire frame is precast concrete columns and beams.

New Hi-Stress Flexicore Slabs
Give Improved Performance On 32-Foot Roof Span

SECOND FLOOR FRAMING, CLASSROOM WING. Lateral precast beams serve as bearing for standard Flexicore slabs. Both 8" and 10" slabs used.

ROOF FRAMING, CLASSROOM WING. Longitudinal precast beams support Hi-Stress roof slabs which are tied to beams to provide lateral bracing.

New Hi-Stress Flexicore slabs use high-tensile 7-wire stress-relieved strands to produce fully prestressed units. These slabs provide long, clear spans, high load carrying capacity and give improved performance.

The steel strands are accurately pretensioned, before the slabs are cast, and introduce a controlled camber into the units. In this project, Hi-Stress Flexicore slabs were used for 32-foot roof spans, and 12 months after erection, show excellent performance. Standard Flexicore units (with mildly pre-tensioned reinforcing rods) were used for floors at second story.

Ask for "Flexicore Facts 96" on this project and "Hi-Stress Flexicore" Bulletins. Write The Flexicore Co., Inc., Dayton 1, Ohio, the Flexicore Manufacturers Association, 297 South High Street, Columbus 15, Ohio, or look under "Flexicore" in the white pages of your telephone book.

RUTHERFORD B. HAYES HIGH SCHOOL, Delaware, Ohio has frame of precast concrete columns and beams, and floors and roofs of Flexicore precast decks. Kline & Swartz of Chillicothe, Ohio are the architects.
Provide flexibility of space with fold-back walls of wood

Panel dimensions of 10\(\frac{3}{4}\)" x 1\(\frac{1}{4}\)" provide the massive appearance compatible with schools, churches, restaurants, clubs and offices. You can specify PELLA WOOD FOLDING PARTITIONS from these 6 genuine wood veneers: OAK, PINE, BIRCH, WHITE ASH, PHILIPPINE MAHOGANY or AMERICAN WALNUT. Ask us to do the finishing at the factory or have it done on the job. Patented "live-action" steel spring hinging assures years of smooth, easy operation. Stable wood core panel construction prevents warping. Available for all widths and in heights up to 20'1". Full specifications in SWEET's or call your PELLA distributor listed in the Yellow Pages.
IN BLUEFIELD
A BUILDING TO REMEMBER

A bank building must have a special warmth and friendliness. Equally essential to commanding design in the architecture of a modern new bank is a feeling of warmth, friendliness and stability.

Here, the rich, enduring beauty of Kershaw and Angel Mist granite dramatizes the clean, functional proportions of the building... and adds a special warmth of color and texture.

A fine example, indeed, of an imaginative use of maintenance-free granite.

THE FIRST NATIONAL BANK OF BLUEFIELD, WEST VIRGINIA
ARCHITECTS:
C. E. SELING & ASSOCIATES
CHARLESTOWN, W. VA.
INTERIORS:
AMERICAN FURNITURE & FIXTURE, INC.
RICHMOND, VA.
GENERAL CONTRACTOR:
JUNO CONSTRUCTION COMPANY
CHARLESTOWN, W. VA.
GRANITE:
KERSHAW AND ANGEL MIST FOR
COLUMN FACING, WALL FACING
AND SITE WORK

GEORGIA GRANITE FOR BUILDINGS TO REMEMBER

Office Literature
continued from page 200

OFFICE FURNITURE
A new “sled-base” group of chairs with chrome bases are illustrated in Catalog Supplement I. Tables, desks and chairs with stainless steel legs are also included. Edgewood Furniture Co., Inc., 334 E. 75th St., New York 21, N.Y.*
CIRCLE 418 ON INQUIRY CARD

GLARE-REDUCING GLASS
Tables of light and solar energy transmittances for Solarbronze plate glass are given in a booklet describing its solar heat control and warm gray hue. Pittsburgh Plate Glass Co., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa.*
CIRCLE 419 ON INQUIRY CARD

DUCT HEATERS
(A.I.A. 31-K-3) Electric blast coil duct heaters are discussed in a 36-page bulletin. Industrial Engineering & Equipment Co., 24 Hanley Industrial Center, St. Louis 17, Mo.*
CIRCLE 420 ON INQUIRY CARD

HARDWOOD PANELING
(A.I.A. 23-L) Full-color photographs show all 14 varieties of Evanite hardwood paneling, as well as pictures of typical installations. Evans Products Co., 1029 S. W. Alder St., Portland 5, Ore.*
CIRCLE 421 ON INQUIRY CARD

FLOORING SPEC MANUAL
A revised “Specification Manual” for Northern hard maple, beech and birch flooring includes current grading rules and is described as a textbook on hardwood flooring and installation procedure. Maple Flooring Manufacturers Assoc., 35 E. Wacker Dr., Chicago 1, Ill.*
CIRCLE 422 ON INQUIRY CARD

SEALANTS
Case histories of the use of Thiokol polysulfide sealant in recent building projects are given in “Thiokol Facts.” Thiokol Chemical Corp., Trenton, N.J.*
CIRCLE 423 ON INQUIRY CARD

*Additional product information in Sweet’s Architectural File
more literature on page 246

For more data, circle 103 on Inquiry Card

242 ARCHITECTURAL RECORD November 1962
J-M Colorlith won't slick or shine up...ever

Most chalkboard materials look good when they're new. But, after years of use and abuse, the colors may fade, the surfaces turn slick and shiny and impose a visibility-impairing glare. With Johns-Manville Colorlith®, this can't happen because the color is an integral part of the sheet and retains its soft shade indefinitely.

Available in three eye-pleasing, research-proved shades (Spruce Green, Cameo Brown and Charcoal Gray), Colorlith offers superior visibility. Made of asbestos and cement, it takes chalk easily providing excellent visual contrast. Further, it erases cleanly without "ghosting."

For full details on J-M Colorlith, write to J. B. Jobe, Vice President, Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario. Cable: Johnmanvil.

JOHNS-MANVILLE

For more data, circle 104 on Inquiry Card
We designed this aluminum window to be **STURDIER**

Cupples new "Series 300" double-hung aluminum window was designed especially for architects and owners who want a better-operating, stronger, sturdier window for use in Apartments, Hotels, Motels and College Dormitories.

**FRAME SHOWN HERE**

- **FULL SIZE CROSS SECTION DETAILS**
- **EXTRA WIDE WOOL PILE WEATHERSTRIP**
- **HEAVY TUBULAR SECTIONS**
- **WHITE BRONZE HARDWARE**
- **DOUBLE SEAL WITH FULL 1/2" WIDE WOOL PILE WEATHERSTRIP**
- **INTERLOCKING MEETING RAIL**
- **CONTINUOUS HAND LIFT**
- **3" WIDE SLOPING SILL**

**OTHER CUPPLES BUILDING PRODUCTS**

**CUPPLES SERIES 1100 SLIDING GLASS DOORS**

For rooms leading to balcony or terrace. Beautiful Alumlite finish. Extra strong, sturdy construction with tubular vertical rails. Adjustable ball bearing rollers. Interlocking meeting rails plus double wool pile and vinyl weatherstripping. In 2, 3 and 4 door units from 6 ft. to 20 ft. width. Sliding screens available.

**QUALIFIES UNDER DH-A2 SPECIFICATION**

Approved for Mitchell-Lama Housing under New York State Division of Housing and Community Renewal.
...NOT CHEAPER!

Instead of taking metal out, and designing the Cupples "300" window downward to a price, or to fool bargain hunters, we beefed up the sections to make it stronger and sturdier. We used double width wool pile weatherstrip all around the window and at the meeting rail to keep out dust and dirt as well as rain and cold drafts. We made the "300" a foolproof, easy-operating window that will give satisfactory, maintenance-free performance for many years to come. It's a window you should specify for any apartment house or for the hard, rough usage of hotels and college dormitories.

Sure the Cupples "Series 300" costs a few dollars more (approximately $3 to $4) than lightweight minimum standard residential windows, but its heavier sections, better weather-tightness and foolproof operating qualities make it a worthwhile investment that will pay handsome dividends in lower maintenance and tenant satisfaction.

Before you specify or order aluminum windows for your next job be sure you investigate the Cupples "300." Remember, too, that when you deal with Cupples you get dependability of product, quality, service, delivery and a well-established Company behind the product (Cupples is a division of Alcoa). Our representative in your area will be glad to consult with you at your convenience. Write for full size details and complete information. Address Dept. AR-211.

CUPPLES PRODUCTS CORPORATION
A Division of Aluminum Company of America
2650 S. MANLEY ROAD, ST. LOUIS, MO.
815 W. SIXTH STREET, CORONA, CALIF.

ALCOA
CUPPLES PRODUCTS DIVISION
ST. LOUIS, MO.

FOR USE IN APARTMENTS, HOTELS, MOTELS AND DORMITORIES

CUPPLES SERIES 600 PROJECTED WINDOWS
These strong, sturdy projected windows will take usage for many years. All horizontal rails in frame and sash are tubular for extra rigidity and strength. Adjustable, patented 4-bar operator mechanism. White bronze hardware. ¾" glass rabbit, interior or exterior metal snap-in bead glazing optional.

CUPPLES ALUMI-GOUSTIC CEILING GRID
For luminous or acoustical ceilings in the lobby, in kitchens and bathrooms. Inexpensive. Easy to hang aluminum grid. Holds 2' x 2' or 2' x 4' panels.

CUPPLES ENTRANCE DOORS
New "40 LINE" of stock units combine beauty with flexibility of design and simplified installation. Choice of hardware locks and door closers.
Alarms and Supervision by ADT

Architects strive to design each building so that it will have a long and trouble-free future. One of the things that can threaten that enduring future is fire—accidental or incendiary. Other hazards are burglary, vandalism and sabotage.

Alarms and supervision by ADT—specified in your plans—can protect both your building, and your client's interests, against these threats.

Architects and engineers are invited to call the ADT office listed in Yellow Pages for free consultation and catalog information. Or see Sweet's File, Section 34-a.

COMPLETE PROTECTION through AUTOMATIC DETECTION

ALARMS FOR:
Fire Burglary Sabotage
Holdup Smoke Intrusion

SUPERVISION OF:
Sprinkler Systems
Industrial Processes
Heating Systems
Pumps and Power
Watchmen and Guards

AMERICAN DISTRICT TELEGRAPH COMPANY
155 Sixth Avenue, New York 13, N. Y.

Office Literature continued from page 242

PARTITIONING

CIRCLE 424 ON INQUIRY CARD

ACOUSTICAL TILE
Folder gives details on Stylitone-Fire Rate 3 mineral acoustical tile. Baldwin-Eker-Hill, Inc., 500 Breunig Ave., Trenton 2, N.J.*

CIRCLE 425 ON INQUIRY CARD

STEEL DOORS
Nomenclature for steel doors and frames is approved by the American Standards Association. Steel Door Institute, 2130 Keith Bldg., Cleveland 15, Ohio

CIRCLE 426 ON INQUIRY CARD

DECORATIVE LIGHTING
(A.I.A. 31-F-23) Pendant lighting fixtures which mix and match for decorative lighting are presented in a 16-page booklet. Lightolier, 11 E. 36th St., New York 16, N.Y.

CIRCLE 427 ON INQUIRY CARD

CURTAIN WALL SYSTEM
(A.I.A. 17-A) Specifications for a curtain wall system featuring sliding windows in a split mullion system are given in folder. Peterson Window Corp., 704 Livernois Ave., Ferndale 29, Mich.*

CIRCLE 428 ON INQUIRY CARD

GAS ENGINE CONDENSER
Details and specifications about the Janitrol 68-090 gas engine condensing unit for residential and commercial air conditioning applications. Midland-Ross Corp., 400 Dublin Ave., Columbus 16, Ohio.*

CIRCLE 429 ON INQUIRY CARD

ROOFING
Changes in installation recommendations for Roofmate FR expanded polystyrene insulation board are given in an 8-page illustrated booklet. Dow Chemical Co., Midland, Mich.

CIRCLE 430 ON INQUIRY CARD

*Additional product information in Sweet's Architectural File

For more data, circle 106 on Inquiry Card

For more data, circle 107 on Inquiry Card

For more data, circle 108 on Inquiry Card
REDWOOD GIVES EXPRESSION TO THE CHANGING IDEAS IN APARTMENT PLANNING. The Bay Tree Apartments, designed by Fred Marburg, A.I.A., are an interesting example of the present trend in garden apartment design. For exterior siding, the architect chose saw-textured redwood in reverse board and batten. To provide an interesting variation for stairs and balconies the boards are applied horizontally as lapped siding. The textured face of the redwood adds depth and visual interest to the wall surface and is extremely practical—leaves it virtually maintenance-free. The warmth and charm of redwood helps make garden apartments livable—

leads to a high rate of occupancy.

Are you receiving the prize winning quarterly, "Redwood News"? If not, write CRA, Dept. A-15.
We go to any lengths to solve your downlighting problems.

From a completely recessed fixture all the way down to a stem mounted one, Lightolier gives you the most efficient downlighting these simple, handsome Calculite® designs.

Lightolier engineering has a solution to your number one problem in downlighting—surface brightness. In the type above, for example, Lightolier's answer is the exclusive Multi-Groove® downlight—ring baffles, arranged 3/8” apart, one above the other, so that ea
If the vertical surface is just below it in total shadow, it provides a finer texture than the coarse pattern of the conventional unit. This Multi-Groove Baffle Calculite is just one of 16 types of precision downlighting instruments in a total of 96 sizes and styles. All these Calculites have unique mechanical, installation and design features. All provide the efficient lighting and clean, crisp design which have made Lightolier the preferred name in lighting. For more information on Calculites, write for Brochure 31, Lightolier, Jersey City 5, New Jersey, Department AR-11.

LIGHTOLIER
Showrooms in New York, 11 East 56th Street; Chicago, 1267 Merchandise Mart; Dallas, 1718 Hi-Line Drive; Los Angeles, 2515 South Broadway. Calculites are stocked by the Authorized Lightolier Distributors listed on page 290.

Montgomery elevators assure fast, safe, smooth, dependable service for hospitals . . . the kind of service that saves seconds when seconds count most. Automatic door-operating, load-limiting and traffic controls coupled with Montgomery's PREVENTIVE MAINTENANCE service will provide added years of 'dependable' in-service operation. Investigate the many plus features of Montgomery elevators . . . both passenger and service types. Call your Montgomery Representative listed in the Yellow Pages, for detailed information. And, ask for the listings of the hundreds of hospitals that depend on Montgomery elevators for the past 60 years.

For more data, circle 109 on Inquiry Card

For more data, circle 110 on Inquiry Card
INTEGRILLE is a combination of extruded aluminum Separable Frame and Removable Core.

The frame is easily installed—only the core need be removed for access or redecoration. Eliminates cracks, scratches or marring of plaster or wood paneling. The visible portions of both frames combined represent only a narrow 1 1/4" overall width.

And Intigrille can be finished in Satalum® — another Waterloo exclusive! Gives a smooth satin-like texture to natural aluminum, further protected by a hard, clear lacquer coating...for lasting beauty.

This then...is Intigrille. This handsome, bevelled frame is worthy of accommodating the finished art of the masters...yet it is designed solely to contain the decorative, functional Intigrille core.

Write for the unique Intigrille brochure. Our representatives will gladly tell you more!

WATERLOO REGISTER CO., INC., WATERLOO, IOWA

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DYNAMICS CORPORATION OF AMERICA

For more data, circle 111 on Inquiry Card
I'm in the roof deck business. We tell architects and contractors they don't need any reinforcement with our deck.

"After all," we say, "Decks are only required to be designed for uniform static loads. Why worry about impact loads?"

And when workmen dropped materials on the deck after the roofing material was on, well... nobody got wise that the material beneath was shattered. After all, the roofing material covered it up.

But things got a little sticky when a building inspector jumped from a low parapet onto one of our unreinforced decks. His replacement was very unreasonable about okaying the deck.
'Besides,' we say, 'Our decks do have some impact resistance. If a 75 lb. man falls 6 inches onto our deck he won't bother it a bit. If he doesn't do it too often.'

Well, we sold a few of our roof decks at first. But after they were up, it seemed when wheelbarrows loaded with heavy materials turned off the runs, spider cracks showed up in our unreinforced deck.

If you're not interested in one of our unreinforced roof decks, I have a nice line of pencils and shoelaces.

This advertisement published by the makers of KEYDECK that remarkably good roof deck reinforcement

• MAKERS OF KEYCORNER • KEYSTRIP • KEYWALL • KEYMESH® AND KEYMESH PAPERBACKED LATH • WELDED WIRE FABRIC • NAILS

For more data, circle 112 on Inquiry Card
EGGERS OF TWO RIVERS PROVES BIGGEST DOESN'T MEAN BEST in Architectural Plywood and Solid Core Doors

"Lots of people" don't insure quality. The "right people" do, craftsmen who put their skill and pride into every job they do. Lots of manufacturing space doesn't insure quality. But the latest equipment does help, when used by people who know and appreciate quality.

These two factors, plus Eggers all-out customer service, have made Eggers a quality leader since 1884. For real quality in a project that calls for Architectural Plywood and Solid Core Doors, contact Eggers of Two Rivers. Respect for quality and service will insure your job being created for the exact effect you want, when you want it.

EGGERS PLYWOOD COMPANY Two Rivers, Wisconsin Telephone 793-1351

On the Calendar

November
1-3 1962 meeting, American Society of Designers; theme: "Relationship of Industrial Design to the Arts"—Waldorf-Astoria Hotel and the National Design Center, New York City
2-3 Sixth annual conference, the Organization of Cornell Planners; theme: "The Heart of the City"—Cornell University, Ithaca, N.Y.
5-9 National Metal Exposition—Chicago
7-9 1962 convention, National Warm Air Heating and Air Conditioning Association—Hotel Robert Meyer, Jacksonville, Fla.
8-10 Annual convention, Florida Association of Architects—Hotel Soreno, St. Petersburg, Fla.
9-15 55th convention, National Association of Real Estate Boards—Detroit
12-16 47th National Hotel Motor Hotel Exposition—the Coliseum, New York City
25-30 American Society of Mechanical Engineers winter annual meeting—Statler-Hilton Hotel, New York City
27-29 Building Research Institute 1962 Fall Conferences—Mayflower Hotel, Washington, D.C.

December
10-16 NAHB convention and exposition—Chicago

January
22-25 19th Annual Technical Conference, sponsored by the Society of Plastics Engineers—Ambassador Hotel, Los Angeles

Office Notes

New Firms, Firm Changes—Charles F. Terry and Jack E. Rosenlund have associated in the practice of civil and structural en-

continued on page 262

TOTAL COMMUNICATIONS

In hotels, motels, schools, churches—anywhere, the meeting room is first and foremost functional. Lighting, ventilation, and public address facilities are co-equal necessities—yet, too often the P.A. system gets minimum attention. Take the matter of microphone placement...it's safe to say that 19 out of 20 meeting rooms don't have enough of the right kind of microphones to adequately cover meeting rooms for today's "open" discussions. True, microphone placement is "tricky"—and because of that, Shure has prepared a guide to Total Communications which explains the fundamentals of the strategic placement of microphones for meetings:

For use by your staff, or with clients. Non-technical discussion of the role microphones play in today's meetings. Valuable suggestions and ideas based on years of practical experience.

WRITE ON YOUR LETTERHEAD TO SHURE BROTHERS, INC. 222 Hartrey Ave., Evanston, Illinois Dept. AR-K

For more data, circle 113 on Inquiry Card

For more data, circle 114 on Inquiry Card
YOU SPECIFY THE FLOORING!

Let him

SOLVE THE MAINTENANCE PROBLEMS

Shoes are murder.

Stiletto-like high heeled slippers. Dress shoes. Work shoes. Day in and day out, they’ll pound any flooring you specify . . . grinding in abrasive dust, dirt, even gravel . . . robbing it of its appearance and condition . . . leaving behind the scars of time and traffic.

How do you protect your building and your reputation against these floor-killers? Simple. Just hand over your floor maintenance worries and headaches to the gentleman behind the drum. He’ll love it. Solving floor maintenance problems has been his way of life for an average of 19 years.

Your Man Behind the Huntington Drum has the ability and experience to create an overall maintenance program: for every area of your building . . . for every flooring material you specify. In his zeal, he’ll even supervise the maintenance crews to make sure application is proper.

So why not call in our floor-oriented friend? Discuss with him the flooring you’re about to specify, and dump the problem of its care into his lap. You’ll lose a headache . . . and gain an ally.

FILL OUT AND MAIL THIS COUPON

Huntington Laboratories, Inc.
Huntington, Indiana

Gentlemen: I would like a Man Behind the Huntington Drum to call on me to discuss floor maintenance.

(Ask him to leave his drum outside.)

NAME

ADDRESS

CITY

ZONE

STATE

For more data, circle 115 on Inquiry Card
Now! York makes it possible for you to provide custom comfort for any building—without costly zoning or extra ductwork!

Here's the modern way to air condition a motel, hotel, apartment or office building . . . any multi-room building! It's the YORKAIRE Three Pipe Air Conditioning System that meets varying occupancy and solar factors, when some rooms require heating, others cooling—at the same time.

Pioneered by York, the YORKAIRE Three Pipe System uses one pipe for chilled water supply, one for hot water supply, one for return. A special valve admits just the right amount of chilled or hot water—from full flow to trickle to no flow—to each room terminal. There is no mixing of the hot and cold water supply, no bucking heating with cooling. The results are improved comfort conditions for occupants, lower heating and cooling costs for building owners.

Completely flexible, the YORKAIRE Three Pipe System may be applied in fan-coil or induction systems. For induction systems, less primary air fan
Air conditioning...that can cool others, at the same time!

Each guest chooses the climate he wants!

Shaded rooms may be heated, while sunny rooms are being cooled!

Capacity is required and no return ducts are needed...so there is considerable space-saving as well as reduced installation and fan power costs.

Plan ahead with York when you plan air conditioning for any type of building. For over 75 years, York has pioneered major advances in conditioning air for comfort and process. For complete facts on the YORKAIRE Three Pipe System—and a list of the major buildings where it has been installed—see your York Representative; or write York Corporation, York, Pa.

York Corporation
Subsidiary of Borg-Warner Corp.
YORK, PENNSYLVANIA

The quality name in air conditioning and refrigeration

For more data, circle 116 on Inquiry Card
Create beautiful home interiors with wear-without-care Marlite paneling

There's no better material for building or remodeling any room than versatile Marlite plastic-finished paneling. The reason is simple. Marlite offers all the advantages of easy, fast dry wall construction with outstanding beauty, lifetime durability and easy maintenance that requires only an occasional damp cloth wiping.

Marlite's impervious surface resists heat, moisture, stains, and dents. It goes up fast over old walls or new framing. No messy plaster dust. No lingering paint odors. What's more, the Marlite line (styled by American Color Trends) includes an array of beautiful colors, decorator patterns, and authentic Trendwood finishes.

Get complete details before starting your next building or remodeling project from your building materials dealer, or consult Sweet's File or write Marlite Division of Masonite Corporation, Dept. 1105, Dover, Ohio.

Marlite plastic-finished paneling

ANOTHER QUALITY PRODUCT OF MASONITE RESEARCH
NEW FROM WESTINGHOUSE

MERCURY-MASTER
FLOODLIGHT

offers up to 60.2% more efficiency than other makes.

The Mercury-Master Floodlight gives more usable light than any other mercury floodlight on the market. With a 54,000 lumen lamp, it has a beam efficiency of 69.2%. That's up to 60.2% more than other similar units. ■ Using a 57,000 lumen lamp, it has a 146° x 123° beam spread—widest in the industry. Saves money because you need fewer units, fewer poles, less wire, and less installation labor. ■ The Mercury-Master's ADUR-BIL® insulation system—a Westinghouse exclusive—assures long ballast life and unusually good electrical performance. It will withstand a nominal impulse of 15,000 volts and is tested at 4,000 volts to ground. It takes a 45% reduction in voltage before lamp dropout occurs. Life-guard® mercury lamps will start at ambient temperatures as low as —20°F. ■ The MFB-10 Mercury-Master can be used with plain or control type lens, 700 or 1000 watt lamps. There's a complete selection of mounting accessories for any installation requirement—with integral or remote mounted ballasts. For details, see your Westinghouse representative, or write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio. ■ You can be sure . . . if it's Westinghouse

Westinghouse

For more data, circle 118 on Inquiry Card
New Sylvania buildings richly reflect Lupton’s

Sylvania’s new headquarters provide another shining example of how Lupton handles the complete job, from architect’s design to final installation. Make your creative demands as exacting as you like... Lupton single-source responsibility makes certain that your most imaginative uses of aluminum curtain wall systems are fully realized.

Our units allow full scope for projects of any size... for unlimited versatility of function... for uninhibited architectural expression, planning, and form. Now you can specify—and get—virtually any combination of colors, finishes, and textures. And when it comes to skilled assistance from project engineers, Lupton’s staff can advise on or coordinate the manufacturing processes your design requires. After that, our curtain wall craftsmen see to it that your concepts are followed to a T. For final expert touches, Lupton field supervisors assure speedy, efficient installation, always with an eye to maximum savings.

You have the assurance, too, of Lupton’s financial

undivided responsibility on curtain wall projects

responsibility. Ours is a solidly established com­pany that backs up all jobs with a reputation for reliability of 25 years' standing.

In short, you can confidently rely on LUPTON total services and ability to turn your ideas into fully achieved realities. Why not investigate every advantage we can offer for your present or future projects? See Sweet's Architectural File (sections 3 and 17) for the Michael Flynn Aluminum Curtain Wall and Window catalogs. A call to the nearest LUPTON representative (see Yellow Pages under "Windows—Metal") will bring fast action without obligation.

LUPTON

MICHAEL FLYNN MANUFACTURING CO.

Main Office and Plant: 700 East Godfrey Avenue, Philadelphia 24, Pa. West Coast Office and Plant: City of Industry (Los Angeles County), California. SALES OFFICES: San Leandro, California; Chicago, Illinois; New York City; Cleveland, Ohio; Dallas, Texas. Representatives in other principal cities.

For more data, circle 119 on Inquiry Card
Consider a MATOT booklift dumbwaiter

There is a time-saving Matot dumbwaiter for every building you design. And there is a Matot representative in every major city to provide you with complete information and engineering services.

Choose from the world's most complete selection of dumbwaiters. Many standard Matot designs can also be modified to economically meet special requirements.

Neat in appearance and functional in design, Matot units satisfy the requirements of modern architecture. In addition they are precision made to insure smooth operation with low maintenance.

MATOT VERTICAL HANDLING UNITS INCLUDE:
- Book lifts
- Supply lifts
- Money lifts
- Record Carriers
- Food lifts
- Production lifts
- Linen lifts

Please have a Representative call.
Send me the Matot 12-page catalog containing detailed information on vertical lift equipment (also in Ma/24 Sweet's File).

Name
Company
Address
City & State

For more data, circle 120 on Inquiry Card

Office Notes
continued from page 254

gineering under the firm name of Terry-Rosenlund & Co., Consulting Engineers. Offices are at 2625 McKinney Ave., Dallas.

Arthur K. Hyde, architect, has joined Eberle M. Smith Associates, Inc., Architects and Engineers, Detroit, as director of public and client relations.

Following the death of William Gladstone Merchant, William Gladstone Merchant & Associates, Architects, San Francisco, Hans U. Gerson has taken over the office. The firm name is now William G. Merchant and Associates; the address, the same.

Robert L. Thorson has been named an associate of Ulrich Franzen and Associates, Architects, 124 E. 40th St., New York. Oliver and Smith, A.I.A., Architects and Planners of Norfolk, Va., have announced three new senior associates and two associate promotions. Senior associates are: Philip W. Hansen, in charge of design; Waverly C. Ormond, in charge of production; and Herbert A. Gygi, in charge of supervision. New associates are M. Ray Jordan and Frank C. Holton Jr.

Joseph W. Leinweber has been named resident architect-engineer in Saigon, Vietnam by Smith, Hinchman and Grylls Associates Inc. of Detroit. There he will direct construction of a new medical complex for the International Cooperation Administration. Mr. Leinweber, who will spend two years in Saigon on the project, has recently returned from a two-year stay in Seoul, Korea, on a similar assignment for the Korea Joint Venture.


Richard G. Sawler is now an associate of the firm, Clifford Douglas Stewart, Architect, 123 Newbury St., Boston 16.

Wm. N. Bonham, A.I.A., and Arthur C. Jones, civil engineer, have formed for the general practice of architecture and engineering the firm of Bonham-Jones Associates. Offices are at 600 North Sepulveda Blvd., Los Angeles 49, Calif.  

For more data, circle 121 on Inquiry Card
MAGNA MATIC

emagnetic door holder

A “fail-safe” holder
for self-closing fire and smoke barrier doors.
Self-contained and non-mechanical.

Automatically releases on interruption of current. Used independently or with any fire or smoke detector system.

The MagnaMatic Door Holder represents an important breakthrough in the control of the spread of fire and smoke. It releases self-closing fire and smoke barrier doors from an open position, for simultaneous closing upon signal from any fire detector system or manual switch.

The MagnaMatic Door Holder is “foolproof” and “fail-safe.” That is, any interruption of the current, whether by detector, through power failure, or manual switch, deactivates the magnet and allows the doors to close. A signal from a fire or smoke detection device in any part of the building will release all doors simultaneously. Individual doors may be closed manually with ordinary effort, or released to close by an individual detector.

Fire Marshals state that the MagnaMatic Door Holder represents a major breakthrough in the saving of lives and property, by controlling the spread of fire and smoke. The National Fire Protection Association, The Fire Underwriters, Safety Officials and Code Officials have long wanted such a device. The MagnaMatic Door Holder complies with the description of the release device in the National Fire Codes, Volume 3, Section 101, paragraph 3209 (b), which requires an approved release device on barrier doors that are permitted to be held open.

The MagnaMatic Door Holder has no moving parts, is self-contained, requires no maintenance, is easily installed, and can be used with 120 or 24 volt AC current. Twenty of these devices can be operated for the kw cost of one 60 watt light.

Application for UL listing for Label Service has been made.

For more information contact your local Sargent Architectural Builders Hardware supplier, fire detection system supplier or write: Sargent & Company, New Haven 9, Connecticut.
Honeycomb
BRIGHT NEW IDEA IN DECORATIVE LIGHTING

There's nothing else quite like Honeycomb. Imaginatively, it creates unique visual effects from a blend of color and exciting new textures. Result: a family of 16 decorator-inspired styles, and distinct new beauty for your decorative commercial applications. See Honeycomb at Moe Light Distributors, or write for literature.

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And Graybar Electric Co., Inc., in 137 major cities from coast to coast.
Totally new wood stain holds color even when exposed to strong sunlight!

**Tonetic Wood Stain**

by PRATT & LAMBERT

This new and exclusive Pratt & Lambert stain will hold its color on paneled walls, cabinetwork, trim, floors, window frames, sash and sills even though exposed to strong sunlight through glass.

Tonetic Wood Stain comes in a choice of modern pastel, fashionable medium and traditional dark tones to meet every decorating need. No shellac is required as a sealer. Apply the appropriate P&L varnish directly over this stain.

For color card, sample panels, complete information and recommended specifications, ask your P&L representative or write Pratt & Lambert-Inc., 75 Tonawanda St., Buffalo 7, N.Y.; 254 Courtwright St., Fort Erie, Ontario.

PRATT& LAMBERT-INC.

The paint of professionals for over a century

NEW YORK • BUFFALO • CHICAGO • FORT ERIE, ONTARIO

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**EPCO MAGNETIC CATCHES**

to meet every need or specification!

The EPCO family of catches includes a style for every building need. Each features "touch" closing and secure holding power. Each is self-aligning to an enlarged strike, and to mount in diverse ways simply and quickly. Each is handsomely encased and has lifetime magnets.

THE ENGINEERED PRODUCTS CO.

P.O. BOX 108 - FLINT, MICHIGAN - PH. CE 9-8689

FREE 32-Page Catalog on all EPCO magnetic catches, track and pulls available on request.

For more data, circle 124 on Inquiry Card

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For more data, circle 125 on Inquiry Card
To those people who take uncommon pleasure in good books, music, and other works of art... six uncommon offers

You are invited to become a Charter Member of the Collector's Book Society by accepting any one of the Society's introductory offers illustrated on this page. Each of these offers includes a one-year trial subscription to a new periodical, the Collector's Quarterly. Each of these offers includes a one-year trial subscription to the Collector's Quarterly Report. (Price at $6.00.)

1. The Yale Editions of the Private Papers of James Boswell: 12 volumes, handsomely bound (publisher's price $45.00) plus one-year subscription to the Collector's Quarterly Report. (Price at $24.95.)

2. Choice of Two Copies of the first three lavish volumes in the series: The Bowes Art, Romantic Art, and Gateway to the Twentieth Century (total publisher's price $37.50) plus one-year subscription to the Collector's Quarterly Report. (Price at $6.00.)

3. The Bridge's Opera: a reproduction of the 1726 edition of John Gay's masterpiece with modern commentary, and a new 2-CD version of the original score (combined price $21.95) plus a one-year subscription to the Collector's Quarterly Report. (Price at $6.00.)

4. The Art of Ruth Draper: 11 monographs on the Greek Archaic and the Romanesque, containing the types of the records and permanent photographs (combined price $34.00) plus a one-year subscription to the Collector's Quarterly Report. (Price at $6.00.)

5. The Complete Letters of Vincent van Gogh: 7 volumes, based, with 164 tipped-in facsimiles of drawings, sketches, and watercolors (publisher's price $50.00) plus a one-year subscription to the Collector's Quarterly Report. (Price at $6.00.)

6. The Character of Delphi: A life-size reproduction of the classic head, and Greek Sculpture by R. Laffign and M. Hittner (combined price $55.50) plus a one-year subscription to the Collector's Quarterly Report. (Price at $6.00.)

A $4.50 value for $24.95.

To order what they want—and when—often at sizeable savings, and almost always with bonus credit which members are not obliged to make any purchases. They may return it within ten days for a full refund, and my membership will be cancelled automatically.

Please circle the number of volumes for your Charter Membership selection.

1 2 3 4 5 6

Note: Enclose payment now... and receive a copy of "Portrait & Affirm" (Value $4.95) as a gift.

Please fill in name and address above, mark coupon "subscription only," and enclose check or money order for total amount.
NOW AVAILABLE! Attractive, new VANITY TOWEL HOLDER! Accommodates any number or combination of towels! Write for details.

HOTEL - MOTEL OWNERS SAVE UP TO 50% WITH PLAZA TOWEL HOLDERS!

After an owner takes possession, he is still interested in cost-saving efficiency . . . more than 100,000 Plaza Towel Holders now in use in hotels and motels across the country testify to the positive savings they guarantee!

Designed by a motel owner, Plaza Towel Holders hold each towel separately . . . eliminate spilling and handling . . . save laundry, space, and labor. Guests are guaranteed clean towels . . . use towels only as needed. Present users report savings even up to 50% on towel costs!

WRITE US DIRECT for illustrated literature and full details . . . 3 sizes available — or see our Sweet's Architectural File listing.

PLAZA TOWEL HOLDER CO., 2016 North Broadway, Wichita, Kansas

For more data, circle 126 on Inquiry Card

School and Gym Floors
Our Specialty!

AVOID BUCKLING AND WARPING OF MAPLE FLOORING with EDGE GRAIN
CONNOR'S "LAYTITE"

Up to 50% Less Expansion in the Use of Edge Grain (ACCORDING TO FOREST PRODUCTS LABORATORIES)

AVAILABLE IN REZILL-CUSH* SYSTEM — "CONTINUOUS STRIP" — REGULAR STRIP

FOR DETAILED SPECIFICATIONS WRITE OR CALL

SEE SWEET'S FILE Specs. #13J/CO.

CONNOR LUMBER AND LAND CO.
PHONE VI 2-2091
P. O. BOX B-810-E • WAUSAU, WISCONSIN
For more data, circle 127 on Inquiry Card

ARCHITECTURAL RECORD November 1962
**Expand-o-flash**

Neoprene bellows with metal edging for **EXPANSION JOINTS AND WATERSTOPS**

See us in Sweets, or write for further information and sample.

**Lamont & Riley Co.**

300 SOUTHWEST CUTOFF, WORCESTER 7, MASS.

For more data, circle 128 on Inquiry Card

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**NEW Packaged Shower Systems by SPEAKMAN**

**WALL PANEL PACKAGED SHOWER**

A TOTALLY NEW CONCEPT IN GROUP SHOWERING DESIGNED AND DEVELOPED BY SPEAKMAN TO MEET THE NEED FOR SPACE SAVING, GROUP SUPERVISION AND EASY MAINTENANCE. Factory assembled in ready-to-install units, Speakman Packaged Shower Systems are available for small or large group showering. Design versatility is unlimited. Combine two or more of the systems—tailor the shower-room to meet the requirements of the budget. Write for details.

**SPEAKMAN COMPANY**

Wilmington 99, Delaware

In Canada write Cuthbert-Speakman, Montreal 3, Quebec

For more data, circle 129 on Inquiry Card

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**Now! In 12" panels...**

**new Woodmaster 1200**

- For sheer size and beauty, the new Woodmaster 1200 has no peer. Extending across giant openings in foot-wide panels, a single partition can span as much as 50'8" x 16'0". And pairing or use in series can add any further width desired. Yet, despite its huge size, the 1200 operates easily on ball bearing trolleys. Available in four handsome genuine hardwoods: oak, walnut, philippine mahogany and birch...each finished to a satin smoothness. For full information, write Dept. A-2112

**NEW CASTLE PRODUCTS, INC. • NEW CASTLE, INDIANA**


For more data, circle 130 on Inquiry Card

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**ARCHITECTURAL RECORD November 1962 269**
now available!

SYLVANIA FIXTURES
with
HOLOPHANE
CONTROLENS®

To offer you a wider selection than ever in the choice of quality shielding materials, Sylvania now offers Holophane Controlens No. 6150 and No. 6250 as cataloged items with the fixtures shown on this page.

These Holophane lenses, made of acrylic plastic, feature precise prismatic control of light providing high illumination with a minimum of brightness and glare.

Look to Sylvania to meet your lighting requirements. You get a broad selection of quality fluorescent lighting fixtures plus a wide, wide choice of shielding media.

The following Series of Sylvania Fluorescent Lighting Fixtures can now be obtained with Holophane Controlens® No. 6150 — (1' x 4' Panel) and No. 6250 — (2' x 4' Panel).

Sylvania's Mohawk Series

1' Wide Mohawk

Shallow, attractive surface-mounted units with clean, rectangular lines. One and two foot widths . . . four and eight foot lengths. High efficiency. Perfect for low ceilings.

2' Wide Mohawk

Sylvania's Recessed Troffers


Sylvania's Sylva-flo Troffers

Combines lighting and air-handling in one efficient unit. Offers outstanding lighting and mechanical qualities of Sylvania Troffers integrated with Multi-Vent system of low-velocity air diffusion.

Multi-Vent is a registered trademark of The Pyle-National Co.

SYLVANIA

SYLVANIA LIGHTING PRODUCTS A Division of SYLVANIA ELECTRIC PRODUCTS INC. One 48th Street, Wheeling, West Virginia

For more data, circle 131 on Inquiry Card

270  ARCHITECTURAL RECORD  November 1962
V-groove holds %" rib lath for studless solid partition.

NEW Milcor®
Solid Partition Track

Saves erection steps – provides anchorage and grounds
You reduce job time and costs on space-saving solid plaster partitions with this new track, because it: 1. Eliminates ties or other supplemental fastening of channel studs or %" rib metal lath at the floor. 2. Saves installation of separate plastering grounds by providing strong, straight grounds for both sides of the partition. 3. Avoids lost time for repairs, since the strength of the inverted channel design protects the grounds against damage by on-site traffic. 4. Provides quick, accurate 12" or 16" channel stud spacing — without premeasuring — through location of retaining slots 4" o.c. Milcor Solid Partition Track is too new to be in Sweet’s. Write for literature.

For more data, circle 132 on Inquiry Card

ARCHITECTURAL RECORD November 1962 271
Office building and part of banking facilities at Denver U.S. National Center. Third building (not shown) at right rear.

Motor Bank Building now under construction across the street. Architect is James D. Sudler Associates.

Courtyard between buildings at top. One Honeywell control center will supervise heating-cooling equipment throughout complex.
How much automation is practical for your buildings?

Centralized automated control will save $17,000 per year at Denver U.S. National Center

Installed as Center adds fourth building

Honeywell automation will return 19% yearly on investment, pay for itself in 5 1/4 years, in savings on labor, power, depreciation

Whether you are considering automation as an item in planning new construction, or as an improvement to an already existing structure, the experience of the Denver U.S. National Center could be helpful.

Three buildings have been in service for from three to seven years. A fourth is now under construction.

At an early stage in planning the newest building, Honeywell engineers and F. E. Stark, consulting mechanical engineer, made a cost comparison analysis of previous operating methods as against automated centralized control for all four buildings.

The study showed that under the old methods 3,874 manhours per year would be needed just to turn heating and air conditioning equipment on and off, to check temperatures and make adjustments.

But, with a Honeywell Selectographic* DataCenter installed this time would be cut to just 376 manhours per year—saving $10,320 in labor costs alone.

Further, the centralized control system would save $1,728 in electricity and steam each year, plus $5,000 in replacement and depreciation costs.

Altogether, a saving of $17,048 per year—a 19% return on investment—or enough to pay for the control center and installation in just 5 1/4 years.

Using only present manpower, the Honeywell Selectographic* DataCenter will start and stop all air handling equipment in all four buildings; check and adjust temperatures; give instant reports of machinery operation (with an audible alarm for malfunction); and provide inter-com to every mechanical equipment room.

So helpful in this instance, central control is a basic step in automating any building’s mechanical-electrical systems to wring maximum efficiency from equipment, cut a surprising waste in manhours, and plug needless leaks in fuel and power costs.

Today, however, central control is only the beginning of automation—ranging up to computer-guided systems that digest scores of variables, then instantly allocate the load to equipment for optimum results at minimum cost.

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ARCHITECTURAL RECORD November 1962 273
When Charles Luckman Associates took on the *Hotel America* project, it represented a planning problem as complex as that required by a 3-class passenger liner. Among the major considerations: the building had to be harmoniously integrated into the $100 million Prudential Center. It was planned to fulfill a multiplicity of private and civic needs. Three hotels in one, *Hotel America* combines the functions of a luxury residence tower, a commercial metropolitan hotel and a drive-in resort motor hotel. It will also serve the Boston area as a center for dining, convention facilities, shopping and entertainment, thus enabling the city to attract and accommodate large convention groups.

“When we were named as architects,” said Mr. Luckman, “we informed the Dodge Reporter who visits us regularly. And as the project developed we kept him abreast of it. We also filed our plans in the Dodge Plan Room in Boston.

“Past experience has proved this to be the most efficient way to publicize our needs,” he continued. “Dodge helps to create the kind of healthy bidding climate that we depend upon to achieve our job objectives inside the budget. From the start, Dodge Reports helped cut down excess office traffic by alerting suppliers who were conversant with our problems and knowledgeable enough to make accurate on-the-spot estimates.”

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Common design denominator for a recently completed complex of municipal buildings in Long Beach, California is Mo-Sai. The Mo-Sai panels have a deep-etch texture, using coarse 1½” aggregate ranging in color from white to smoky gray. The Mo-Sai motif was carried from the curtain wall panels on the main buildings through planter boxes and a wall that surrounds the entire four-block civic center group.

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