NEW DIRECTIONS: THE WORK OF KEVIN ROCHE JOHN DINKELOO AND ASSOCIATES
CITY HALL BY EDWARD DURELL STONE: NEW IMAGE FOR A CITY
FIVE RECENT HOUSES BY RICHARD NEUTRA
BUILDING TYPES STUDY: ARCHITECTURE FOR INDUSTRY
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The National Center for Atmospheric Research (left) in Boulder, Colo. was designed by I. M. Pei to harmonize with the mesa site and the sandstone Flatirons which mark the end of the Great Plains and the beginning of the Rockies. Three Over Geared Electric Traction Elevators were chosen for the building which has been called "entirely appropriate to the site and to its purpose." Architects: I. M. Pei & Partners, New York City; General Contractor: Martin K. Eby Construction Company, Inc., Englewood, Colo. Dover Elevators installed Dover Elevator Co., Denver, Colo.

WRITE FOR CATALOGS

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BUILDING TYPES STUDY: URBAN HOUSING

Perhaps no design problem deserves more attention by architects than design for low- and middle-income housing. It is beginning to get that attention; and government officials and community advocate groups alike are beginning to respond to the new approaches that some architects are exploring. The Building Types Study for June examines some of these new approaches—new forms, new planning systems, new ideas for creating not just living space but space for living—that are being carried on within the disciplines of restrictive controls and restrictive budgets.

A DRAMATIC SPORTS AND RECREATION COMPLEX

The new Coliseum in Oakland, California, a spectacular addition to the city’s skyline and a significant work of architecture by Skidmore, Owings & Merrill, is one of next month’s features. The complex includes a stadium for outdoor events and a unique Arena for indoor events with one of the world’s largest cable-supported roofs.
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Contractor: Burk Builders, Inc., Miami
Panels by: Stresscon International Inc., Miami
Let's work on total solutions, but keep going a community at a time.

As summer approaches, it seems to me that I've been reading more than ever about "total and comprehensive approaches" to the problems of our cities. The problems of any city reach out in every direction—and especially into Washington—more and more thoughtful minds are thinking about not city planning but regional planning and national planning. This raises some questions that worry me quite a lot: 1) Who is going to develop the "total and comprehensive approach"?; 2) Who is going to decide, at any such scale as a regional or national one, which "total and comprehensive approach" is the right one?; and 3) Who is going to administer it? What role will local planning and local architects play within that "total and comprehensive approach"?

Some of the most evocative (and worrisome) ideas I've heard lately were presented by Bill Slayton of Urban America at last month's international conference on Cities in Context at Notre Dame, while firmly, and repeatedly, arguing for reliance upon "the market mechanism rather than a bureaucracy to deal with the problem," he suggested that, "We should establish a national policy on urbanization—a policy that addresses itself to where the increasing population should be located." The mechanism could be new cities "of at least a quarter of a million." He also suggested "state development corporations with the power of eminent domain to acquire raw land and authority to issue tax-free bonds to buy the land and develop it." He called for a new "governmental mechanism—a governmental organization that can control or guide future metropolitan development." He argued, though I don't see how, that "such a structure need not threaten existing political entities," but insists that "particular predilections [of local political jurisdictions] should not permit them to skew or thwart the rational development of the metropolitan area." (I can understand the frustrations involved, but think it is important to remember that "particular predilections" have for a long time been highly thought of under such labels as "home rule.") Finally, Slayton suggested that "perhaps we should take a look at the more basic questions of how large, in terms of numbers, should the United States be? . . . Would we not be better off to try to maintain a constant population level and provide that population with as much of the resources and amenities as we can rather than channeling much of our economic growth into those activities that must provide for an increased population."

Many other proposals on such a broad scale are being made. Item: The Department of Housing and Urban Development has invited proposals for nothing less than "a comprehensive plan for designing, developing, organizing, implementing, managing, reporting, and analyzing . . . the entire low-cost experimental housing research and development program together with a plan for "proper and careful selection of some Model Cities (maybe 20) to participate in this program." Proposals were due April 19th, and as this is written there is no information on how many proposals were received and from whom. But surely it is logical to interpret this as an approach by HUD to the "systems people" and I, for one, consider this another rather worrisome prospect.

I'd like to be very clear about one thing: I'm all for making big plans and not just, I hope, because it is so much in vogue. The need for big plans is clear on every side and in every morning's newspaper. But let's go back to my list of worries: I'm worried about who is going to develop that "total and comprehensive solution," who is going to decide that it is the right one, and who is going to administer it.

Which means I'm worried about the control over local skills and talent and involvement inherent in such broad-scale approaches. The bulk of the money for "total and comprehensive" effort is going to come from the Federal government, and the power to distribute money is the power to wield great influence. The Federal record for generating quantity of building is really very good. But its record for generating quality of environment is—certainly not all that could be hoped.

So I would hope most earnestly that any new public policy growing out of any new approach would demand a high quality of environment and provide the money to pay the best architects to create it. For it is only on the architect's drawing board that two-dimensional plans for development of cities can be translated into three-dimensional designs for truly pleasant places to live. The approach can be national, but the architecture must be created a community at a time.

—Walter F. Wagner, Jr.
A new tribute to Walter Gropius

Walter Gropius, who will be 85 on May 17, was three months ago presented with the honorary degree of Doctor of Fine Arts by the University of Illinois. At the special convocation honoring Professor Gropius, the "Encomium" was delivered by his former student and later associate in both education and practice, now Dean of the College of Architecture and Art at the University's Chicago Circle campus, Leonard J. Currie. Dean Currie's words are a reminder of monumental contributions to the development of dynamic strategies of education and of practice to respond to the emerging social imperatives of an urbanizing society. And the contributions, of course, are continuing in Professor Gropius' continuing vigorous involvement in vast architectural projects on three continents. Excerpts from the address follow.

Considering this place and this occasion, it seems fitting to refer primarily to the highlights of Cropius' contribution to education, to his prescience with regard to the challenges arising from the evolutionary changes in a rapidly urbanizing society, and to his vision in identifying the institutional and formal devices required to shape human environment in response to social goals and imperatives.

The story is well known of how Walter Gropius took over the Weimar Art Academy—then arts- and crafts-oriented—secured support for a dynamic new school which he called the Bauhaus, brought together the most formidable array of talent—innovative artists such as Kandinsky from Russia, Paul Klee from Germany, Feininger from America—and before long had them joined by such great designers, architects, and teachers as Moholy-Nagy, Albers, Breuer, Herbert Bayer, Schlemmer, and Kepes—as diverse and dedicated and contentious a group of creative people as has ever been assembled. Small wonder that their interaction gave off sparks that illuminated the entire world of the creative arts. And who provided the cohesive force to hold these energies in dynamic tension but the man with the seminal idea of the Bauhaus—Walter Gropius. It was surely on this forge that he shaped and tempered and tested one of his favorite maxims—"diversity within unity."

Excitement ran high in the Harvard Graduate School of Design during the winter of 1936-37, when we got the word that Gropius, then in London, had accepted the position of chairman of the Department of Architecture. He was to arrive by February of 1937 and would take over the instruction in the Master's class. The architectural profession and architectural education were at their nadir in the United States. The pause in building activity during World War I had been followed by the boom of the 1920's—a period of lavish, shoddy, imitative building of almost orgiastic bad taste—and then the depression and the virtual cessation of building after 1930. With the profession so moribund, it is small wonder that the architectural schools lacked vitality. The American Beaux Arts system—a pale carbon copy of the Paris school—was engaged in endless competitions with projects quite unrelated to the real world or to the needs of society.

At Harvard Gropius did not replicate the Bauhaus—which can never be done anywhere again—but rather he provided a new thrust within the organized system of higher education of the United States. I know that he often found progress painfully slow, and the walls between departments exceedingly high. Yet Gropius managed in his 15 years at Harvard to set in motion the forces that changed the whole direction of architectural education in the United States—and ultimately throughout the world. Of course, he did not accomplish this all alone. As usual, he attracted talented collaborators who formed part of a team effort. But Gropius was the spearhead, the leader and the symbol of the sweeping changes that were to take place in schools of architecture, city planning, art and design throughout the country. He accurately anticipated the new and evolving pattern of professional practice and hence of education to meet the needs of dynamical changing society.

In an interview shortly after his coming to Harvard, Gropius was inveighing against dogma in education. He said, "It would be an absolute horror for me if my appointment would result in the multiplication of a fixed idea of 'Gropius architecture.' What I want to do is to make young people realize how inhaustible the means of creation are if they make use of the innumerable products of our age, and to encourage these young people in finding their own solutions."

The lessons we have all learned from Gropius are too numerous to cite, but they include: bringing art and technology into a new unity; emphasis on method—process rather than form—an open-ended system—a notion applicable not only to the building of an urban environment but to the creation of an educational ambience; teamwork, not only intra-professional but broadly interdisciplinary as well; erasing the 19th Century artificial division between the fine and the practical arts—bringing art out of the exclusive concern of the museum and back into a harmonious relation to the daily lives of all people; the social concern of the architect and city builder—change from the design of elegant buildings for individual clients to an attitude of responsibility to the community and to society as a whole.
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GAS ABSORPTION AIR CONDITIONING: “COSTS LESS TO MAINTAIN...USES LOWEST-COST FUEL...IS MORE RELIABLE”

...says Eliseo O. Mariani, Consulting Engineer

Mt. San Antonio Gardens has no stairs, only gently sloping ramps. Its doors are all wide enough for wheel chairs. Each living unit is connected to a 24-hour medical center by a 2-way communications system. Why? It's a retirement village. And these are just some of the ways life there was made more pleasant and secure for elderly people.

Another comfort feature was provided in the electrical and mechanical system by Eliseo O. Mariani, of Mariani and Cummings, Inc., Consulting Engineers. Mr. Mariani specified gas air conditioning for this Pomona project. His reasons were basic: “Besides the comfort it provides, we chose gas-fired equipment because it’s more reliable, costs less to maintain and uses the lowest-cost fuel.”

He designed a central plant system using 2 Cleaver Brooks boilers connected to a Carrier 359-ton steam absorption unit and a Pritchard cooling tower. Supplying the entire 13 1/2-acre project through a 4 pipe system, the plant provides hot and cold water as well as space heating and cooling. Residents select their own temperature the year 'round through individually controlled air handlers.

Mr. Mariani is convinced of the advantages of gas-fueled equipment for a variety of applications. For example, at Uarco Inc. in Riverside, he recently installed gas absorption air conditioning in their manufacturing plant; for La Celulosa Del Sud SACI in Argentina, he recommended natural gas engines to drive plywood-making machinery.

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Design Methods Group will hold first annual conference

The first annual international conference, the Design Methods Group, will be held at the Massachusetts Institute of Technology from June 2-4. The Design Methods Group was formed in June 1966, a conference in Canada for the purpose of exchanging information about research in design methodology.

The conference will be jointly sponsored by the Urban Systems Laboratory, the Department of Architecture, and the Department of Civil Engineering at M.I.T.; the Department of Architecture and the Laboratory for Computer Graphics at Harvard University, and the School of Architecture at the Boston Architectural Center.

The major portion of the program will consist of papers which emphasize the breadth of intents of environmental search and design. Registration information can be obtained by writing: Conference Planning, Department of Architecture/7-304, M.I.T., Cambridge, Massachusetts 02139.

Louisiana student wins first Eaton Yale & Towne fellowship

W. Barry Graham, a student in his final year in the Department of Architecture at Louisiana State University, has been named the recipient of the first annual Eaton Yale & Towne Urban Design Fellowship. The fellowship is administered by the American Institute of Architects, provides a stipend of $3500 for one year of study in an approved graduate program of urban design, with an additional award of $1200 for a minimum six-week foreign study tour of urban developments.

Bush-Brown is named design adviser to HUD

Albert Bush-Brown, president of the Rhode Island School of Design, has been named Adviser for Design to the Secretary of the Department of Housing and Urban Development, succeeding George Rockefeller, who has returned to private practice (March, page 36). Mr. Bush-Brown will serve on a consultant basis, and will work closely with Ralph J. Warburton, special assistant for urban design.

Mr. Bush-Brown has resigned as president at Rhode Island effective at the end of June.

In resigning his post Mr. Bush-Brown said: "Our performance for our students and for the public of Rhode Island strains our current resources. The model our faculty and staff would like to build in the future outstrips any predictable resources. It is time to reassess that model and to shape the school's future more closely to the resources that are available here, and that task is best undertaken by new leadership."

American buy London Bridge; it will be erected in Arizona

London Bridge, the 1005-foot-long structure over the Thames, has been bought for $2,460,000 through competitive bid-
Mr. Hornbeck joined the RECORD in 1952 after 19 years of experience in architectural education and practice, including two-and-a-half years with Harrison & Abramovitz and three years with Skidmore, Owings & Merrill in New York. His professional experience also included two years with the Manhattan Engineer District, with wartime work on the design and development of industrial buildings related to the atomic bomb project at Oak Ridge, Tennessee.

After getting his B.S. in Architecture at Penn State University in 1931, Mr. Hornbeck taught for five years at Penn State before doing graduate work at the Harvard Graduate School of Design. His interest in teaching continued and after coming to the RECORD he also taught design theory for several years in the evening program at the School of Architecture of Columbia University.

As a member of the American Institute of Architects, Mr. Hornbeck has been active on such committees of the New York Chapter as Architectural School Liaison, Esthetics, Publications and the Arnold W. Brunner Scholarship. Mr. Hornbeck has also been a member of The Architectural League of New York, and has served as editor of the League’s News-Bulletin and chairman of its Membership Committee.

On the RECORD, Mr. Hornbeck was responsible for many major architectural features and Building Types Studies; and he initiated and was the editor responsible for developing the RECORD’s continuing series on Architectural Details.

H. H. Richardson lives again: When the competition-winning building for the Cincinnati Chamber of Commerce designed by H. H. Richardson was gutted by fire on January 10, 1911, the pink granite facade was dismantled and removed to a site seven miles outside of the city. In 1927 the stones were moved to another site to be used on the facade of an observatory which was never completed. And now, 40 years later, a design competition has been initiated by an interested group of architectural students and faculty from the University of Cincinnati. The purpose of the competition, called Operation Resurrection, is to use some of the stonework as design elements in a park-like setting in Burnet woods, on a small rise directly north of the College of Design, Architecture and Art. The design competition, which will close May 3, will have a first prize of $200, a second prize of $100, and a third prize of $50. The competition is being financed in part by the sale of H. H. Richardson buttons for 25 cents and sweatshirts for $4.50 (as modeled, above center, by members of the faculty of the Department of Architecture). Front row, from left, John M. Peterson, William Widdowson, Richard Wheeler, head of the Department of Architecture, Denis Mann, Donald Stevens, and Robert Williams. At rear: Clay Hickerson and Harris N. Firooz. The sweatshirts (which have been ordered by a Pittsburgh architectural firm for their baseball team) and buttons can be obtained by writing to: Operation Resurrection, Department of Architecture, University of Cincinnati, Cincinnati, Ohio. Other groups which have given this active support and encouragement to the project include the Cincinnati Chapter American Institute of Architecture, Contemporary Arts Center, Miami Purchase Association, Cincinnati Historical Society, Smith-Haines Lundberg Waehler—Architects, and the Besi Transfer Company.

Obituaries

Winston Elting, well-known Chicago architect, died on January 25 at the age of 60. At the time of his death Dr. Elting was Professor of Architecture at the University of Illinois, Chicago Circle Campus, and chairman of the board of the recently organized architectural firm of Mega Inc. He was a past director of the Chicago Chapter of the American Institute of Architects and was elevated to fellowships in the A.I.A. in 1956 for design.

Frank Grad, founder and senior partner of Frank Grad & Sons, architects and engineers, Newark, New Jersey, died January 19 at the age of 85. Mr. Grad started his firm in 1907 after graduation from the Vienna Technical School. In 1932 he was joined by his two sons Bernard, an architect, and Howard, an engineer, who will continue the practice. Mr. Grad was a member of the American Institute of Architects, New Jersey Society of Architects, and the Society of American Military Engineers.

Stanley T. Tankel, Planning Director of the Regional Plan Association, New York City, died of a heart attack on March 1 at the age of 45. Mr. Tankel was an adjunct associate professor at the School of Architecture, Columbia University, trustee and member of the Executive Board, Open Space Action Committee and vice chairman of the Landmarks Preservation Commission, City of New York. Under his direction, the Regional Plan Association has been preparing a new master plan for the New York region.
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The Junior Achievement Center, Seattle, designed by Naramore, Bain, Brady & Johanson, will be a one-story building containing 9600 square feet and will cost $153,600. The project will provide space for 34 Junior Achievement companies and 640 students, with eight office and shop areas plus service and banking company facilities. Also provided will be staff offices, conference space, paint spray booth, and on-site parking for 10 cars.

A Fine Arts Building at the University of Southern Mississippi at Hattiesburg, designed by Benham and Dawson, an affiliate of Benham—Blair and Affiliates, architects-engineers, will be a $1.5-million concrete and masonry structure with stairwells on either side prominently expressed on the facade. The building will house a 780-seat auditorium, rehearsal and individual practice rooms, classrooms, faculty teaching studios and offices and workshop and storage areas.

The Central Library for the Public Library of Knoxville and Knox County, Tennessee, designed by Bruce McCarty & Associates, Architects, will be located on a busy downtown corner and is intended to be inviting to the passer-by and casual shopper. The $1.2-million library will have a reinforced concrete structure with brick exterior walls. It will contain approximately 67,000 square feet with staff facilities for 350,000 books. Facilities provided will include reading and work rooms, staff offices, an auditorium, children's room, and a special area for the McClung collection of historical books.

A church and community center for the New York Society of the Methodist Church, to be located in the Taft Housing Development, New York City, will be a one-story, 10-room, multi-use structure. It will contain a large meeting room/sanctuary for 200 people, smaller meeting rooms for groups of 30, and offices. The $338,000 project will be constructed of a new giant brick with fenestration limited to clerestory and atrium to prevent vandalism. Architect is Edgar Tale
Two additions to the Radcliffe College residential quadrangle, Cambridge, Massachusetts, designed by Integrated Design Services Group, Architects Associated Engineers, include the South House Central Unit, above left, and faculty housing, above right. A third unit in the quadrangle was designed by Max Abramovitz. I.D.S.G. was retained by the college to help convert the quadrangle from dormitories to a house system, as well as to design the new additions. The South House Central Unit will contain a dining room and kitchen, a master’s apartment, tutor’s offices and apartment residences for 12 girls and two visiting professors. The faculty housing will provide two four-bedroom, three three-bedroom, and two two-bedroom row houses, all with studies and/or studios. Studios on roofs of new and existing buildings as well as parking under the main green are projected.

A research-computer Center at Carnegie-Mellon University, Pittsburgh, designed by architects Deeter, Ritchey, Sippel, is an eight-story building for a site on the side of a deep ravine, and will be entered at the fifth-floor level below a cantilevered, 150-seat auditorium prominently expressed on the facade. It will complete an existing quadrangle, and is intended to relate to existing structures by height, massing and scale of the facade. Below grade will be a two-story research library with balcony, which will be skylighted from plaza level. The building will have faculty offices on the perimeter and laboratories and offices for various departments on the interior. Major building materials will be buff-colored concrete with random-width board finish and smooth-finish precast concrete panels. The $13-million project will contain 305,000 square feet.

A Fine Arts Complex, also at Carnegie-Mellon University, designed by Paul Schweikher, Architect, will house the departments of drama, architecture and design. The building will contain two 500-seat theaters, with a proscenium theater stacked above a thrust-stage theater, as well as a smaller experimental theater seating 200. The theaters will share an entrance lobby, workshops, dressing rooms and instructional facilities. Elsewhere in the complex will be the facilities for architecture and design, including studios, workshop laboratory, drafting rooms, classrooms, and offices. Other facilities include a library, 250-seat auditorium, and student-faculty lounge. In general, the structure of the $9-million project will be poured-in-place reinforced concrete, with punctuations of color and texture inside and out in other materials such as stone, metal and fabrics.
A half-mile long park on a 7.5-acre site 80 feet above the Hudson River, Yonkers, New York, will consist of three elements connected by walkways, and a dramatic two-level, 250-foot-long cantilever bridge with stairways leading down to the river itself. The site, over railroad tracks, had been used by the city as a dump for a landfill project. The Hudson River Valley Commission, a New York State agency charged with upgrading the area, disapproved the landfill project and made seven recommendations for better ways to utilize the area, one of these recommendations being a park. The main element of the design will be a central area including a three-level sitting area, walkways, and a multi-level playground. Flanking areas will contain a 40-car parking lot, quiet sitting areas and lookouts. The project will cost upwards of $1.5 million. Jose Roth and Associates are the architects.

A 54-story office building for United States Steel Corporation in downtown Manhattan, designed by Skidmore, Owings & Merrill, architects, will rise from a two-and-one-half acre site, a full acre of which will be made into a public park. The building’s frame is a modified exterior frame wall, using six-foot-high spandrel girders to connect the exterior columns with vertical trusses for support in the mechanical core. Gray tinted windows will be recessed from the cool gray of the exterior supporting members (see rendering above). It will contain more than 1,750,000 square feet of usable space. The building is the outgrowth of an extensive research project commissioned by U.S. Steel and carried out under the direction of SOM by a team of architects, engineers, the builders, and the developer.

A domed multi-use stadium for New Orleans (with top of mound removed) will place the baseball home plate in the “coffin corner” of the football field, so that the first base line will correspond with the football side line, and the third base line will be close to the football goal line. Maneuverable seats will bring baseball fans closer to the action. The 70,000-seat stadium (80,000 with temporary seats) will cost $46.6 million, not including a proposed three-level, 7000 car garage. The project is a joint venture of architects and engineers Curtis and Davis and Sverdrup & Parcel in association with Nolan Norman and Nolan, and Edward B. Silverstein and Associates.
50-million police headquarters complex, New York City, designed by Gruzen & Partners, architects, will consist of a 15-story building with its three-story lobby giving access to several one- to five-story structures. The complex, which will contain 750,000 square feet, will include a 1200-seat auditorium, a 400-seat cafeteria, a press room, a 175-seat auditorium, an underground parking garage for 478 cars, and a cond garage for 200 cars. It will have a reinforced concrete structural system and the main building material will be a medium-brown speckled brick with deeply recessed bronze-tone windows. The complex will relate to other municipal buildings by a three-acre landscaped pedestrian plaza which will bridge a street.

A 53-story office building for the Astor Hotel site on Times Square, in the theater district of New York City, will include two theaters in its 10-story base element—an 1800-seat legitimate theater and a 1500-seat motion picture theater. The inclusion of theaters in new office buildings in the district came about through the efforts of the Urban Design Team, a group of young architects and designers within the City Planning Commission, who recommended that a zoning amendment be enacted allowing developers to build larger structures if they included theaters. The zoning amendment now has been passed, and the City's Board of Estimate has given approval opening the way for start of construction. Architects for the project, which will contain 1.4 million square feet, are Kahn & Jacobs.

New campus for Thornton Junior College in South Holland, Illinois, will be a suburban, automobile-oriented campus consisting of a series of modular three-level structures connected by ramps and bridges, with a student center forming the spine of the project. Architects for the $21-million campus are Fridstein Fitch & Partners. On the lower level of the structure will be the music department, theaters, two-story student center, lecture halls, two-story library, dining, two-story vocational and technical departments, health and physical education. The intermediate level will house speech and drama, administration and classrooms. The upper level will contain classrooms, laboratories, art studios, multi-purpose areas and audio-visual facilities. The campus is designed for 5000 day students and 10,000 night students. A depressed parking lot for 4,000 cars, will occupy one-fourth of the site.
South Richmond High School, designed by Daniel Schwartzman Architect & Associates, is one of the newly programmed comprehensive high schools for the City of New York. The program calls for close integration of the vocational facilities with the academic high school's elements. Enrollment is to be 4,000 students. There are provisions for flexible study complexes, including a resource center for each; team-teaching in "large group complexes" and flexible shop complexes, convertible in whole or part to study spaces. Both auditorium and library are to be made available for community use and public utilization of the athletic facilities is programmed. "Within the confines of the established Board of Education standards," says Mr. Schwartzman, "the design creates a feeling of physical openness and also integrates the structure with its 20-acre site and the proposed residential environment." The main entrance is via a covered entrance terrace under the east classroom wing, leading into the landscape central court with its banked amphitheater adaptable for outdoor performing arts and discussion meetings, descending to ground level on the west. On the north and south sides of the court, cantilevered containers for lecture rooms and library introduce sculptural variety and provide protected play area for the remodeled classrooms located at the ground level. Structure is reinforced concrete with sandblasted spandrels and exterior columns.

Schenectady County (N.Y.) Public Library, designed by Feibes & Schmitt, Architects and now under construction, is organized around a three-story light well which spatially interlocks the ground floor public areas and staff work areas above. Located on urban renewal land and adjacent to McKim, Mead and White's Post Office and neo-colonial City Hall of the 1920's, the library will be important as a cultural and exhibition center. Open stacks for 100,000 volumes will house part of the 300,000 volume collection. Lively patterns of sun and shadow are achieved by using corbelled brick and sculptured concrete. Both interior and exterior surfaces are sandblasted Mohawk River pebble concrete and brown brick. The ceilings of coffered waffle slab construction emphasize the sculptured concrete effect.

A bank/office complex for Victoria Ward, Limited, in Honolulu, has been designed by Au, Cutting, Fairweather & Smith, Architects and Planning Consultants. The $1.3-million project will contain 40,000 square feet of rental office space in three separate two and three-story structures, including a branch bank and TV drive-in teller facility. The reinforced prestressed concrete structure provides parking for 160 cars on a partially excavated lower level. A landscaped plaza will serve as an entry court, and a bridge covering a portion of the plaza level ties the three buildings into a complex. The complex will have an exterior of natural concrete aggregate finish.

Theater-auditorium for the city of Sarasota, Florida, is designed by William Wesley Peters, Architect, member of Taliesin Associates of the Frank Lloyd Wright Foundation. Of 1,794-seat maximum capacity, the theater-auditorium will be adaptable for use as concert hall, recital hall, drama theater, and opera house as well as musical comedy theater. A separating acoustic curtain can be lowered to reduce the hall to half-size for more intimate uses. It will be possible to vary the acoustic characteristics for a given performance through the use of transparent mesh surfaces on walls and ceiling with provision for variable degrees of sound absorption. Acoustic consultant is Vern O. Knudsen. Theater consultant is George Izenour Associates. The plan is based on a parallelogram module. The building is designed as part of a master plan developed by the architects. Structural engineers are Frainoli-Blum-Yesselman. Mechanical and electrical engineers are E. R. Ronald & Associates.
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Tweed-Tex is attractive enough to be used for floors in automobile showrooms, theaters, banks, lobbies, schools, supermarkets, churches and restaurants. Yet it is tough enough to take the rugged use common in many industrial plants.

This new floor surface is a two component system—clear epoxy resin and ceramic granules. Granules are available in nine distinct colors which may be used singly or in any combination to achieve textured dimensional effects, or to complement any decor.

When blended, the epoxy forms a matrix that can be troweled on to a thickness of about \( \frac{3}{8} \)". It is so lightweight no structural reinforcement is needed. When cured, the floor is coated with an epoxy sealer that gives a smooth, even finish. When finished, the floor has the unique appearance of expensive tweed.

Tweed-Tex will bond to nearly any type of substrate—old or new concrete, wood or stone. Provides an extremely hard, tough surface that holds its color. Will not chip, crack, peel or flake.

For more information on Tweed-Tex, write for FREE Brochure.

LEADER IN ADHESIVE TECHNOLOGY

H B FULLER COMPANY
1150 Eustis St., St. Paul, Minn. 55108, Dept. 269R42

For more data, circle 31 on inquiry card
Nobody pays much attention to OASIS® water coolers.

Maintenance men shower us with neglect because the OASIS has a heavy-duty cooling system built to be neglected.

Cleaning women ignore us. Since we eliminated "oversquirting" they don't have to mop around an OASIS.

Even thirsty people hardly notice an OASIS. Our bubbler never blasts them in the eye, never dribbles a frustrating trickle.

Architects do notice us. But only to pick the OASIS model that blends most inconspicuously with their scheme.

We make more water coolers than anyone, so it's satisfying to know people take our quality for granted. But everyone likes a little attention once in a while. Why not send for our informative booklet which shows all the features of all 29 OASIS models?

Quality you take for granted

See Sweet's, or write Dept. AR-11, 200 North Hamilton Road, Columbus, Ohio 43213

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A new solution to solar heat and glare problems

PLEXIGLAS® SOLAR CONTROL SERIES
The transparent grey and bronze colors of PLEXIGLAS acrylic sheet shown above have been developed by Rohm and Haas Company to help you control the sun's heat and glare. Each of the colors in the PLEXIGLAS Solar Control Series is produced in five densities from light to deep, providing a range of solar control values. Solar energy transmittance values range from 20% to 75% and visible light transmittance values from 10 to 76%. Using them for glazing dome enclosures, sun screens and windows, helps you achieve comfortable interior environments readily and economically.

In addition to its high breakage resistance, weatherability and light weight, PLEXIGLAS has three significant advantages for solar control glazing:

1. PLEXIGLAS is not subject to thermal shock—it will not crack when exposed simultaneously to hot sunlight on one portion and shade on another.

2. Solar energy and light transmittance values are approximately constant for all sheet thicknesses in each color density. Sheets of high color density need not be of greater, more costly thickness.

3. PLEXIGLAS is accepted under most building codes as an approved, slow-burning, light transmitting material for use in glazing and domed skylights.

Write for complete information including data on how to calculate solar heat gain for the PLEXIGLAS Solar Control Series. It's contained in our new 20-page brochure.

For more data, circle 33 on inquiry card.
This fibre form could
change your plans.

If you haven't been including round concrete columns in your designs, chances are you haven't heard of Sonotube® Fibre Forms. These forms are the fastest, most economical way to pour concrete columns. Matter of fact, they can save as much as 30% per foot over square columns.

They're lightweight, so they can be erected, braced and stripped quickly. And because they are disposable, all the forms can be set at one time.

There are no fabricating or assembly costs either. Because the fibre forms are one-piece units. What's more, they can be drilled, cut or sawed right on the job to fit beams and allow for utility outlets.

And they come in a wide variety of sizes. Diameters range from 6" to 48"; lengths to 48'.

Finally, the Sonotube forms achieve the simple, classic beauty of round. Much of that beauty appears in our new booklet: A Portfolio of Round Columns. So send for your free copy today. Write: Sonoco Products Company, Hartsville, South Carolina.

It could change your plans.
You don't have to specify JAMISON

but if you value VALUE, you will.

A Jamison cold storage door gives you the obvious values of the finest materials, excellent construction and proper functional design. It's what you'd expect from the oldest and most experienced maker of cold storage doors.

In addition to these obvious values, Jamison gives you hidden values. Architects find especially valuable the architect data sheets which describe in detail each door that we make. They also give complete specifications which may be used with possibly only slight modifications.

Another value we would like to offer you. Send for a free copy of our book "How to Select and Specify Doors for Cold Storage Warehouses and Food Processing Plants." This in no way obligates you to specify JAMISON. But if you value VALUE, you will.

For complete details write to Jamison Door Company, Hagerstown, Maryland 21740.
On today's campus, new buildings seem to rise as fast as student enrollment... and so do the high costs of maintaining these buildings thereafter. To alleviate these continuing housekeeping costs, Cambridge offers a full line of filters that supply clean air throughout the Halls of Ivy and student unions and dorms. This clean air keeps interiors free of dust, soot and smudge, protects air-conditioning equipment, safeguards rare book sections and provides more healthful air to breathe.

For each requirement, there is a Cambridge Air Filter... proven in performance, low in owning-and-operating cost, with virtually no maintenance during long service life.

Example: Cambridge Hi-Cap filter (below), a middle-efficiency type with triple the life and cleaning capacity of panel or roll filters. Replacement is less frequent and space requirements far smaller, especially when convenient side-servicing models are installed.

Cambridge Filters ‘endow’ libraries, lecture halls and labs with clean air

For more data, circle 36 on inquiry card.
HOLOPHANE INTRODUCES

the shy lens

Holophane’s new regressed Controlens® recesses itself discreetly into the ceiling. It creates a soft, luminous transition between lens surface and ceiling line.

Holophane’s regressed Controlens requires no metal splays that mar the appearance of your ceiling—the regression is molded into the lens itself. Even the flange is luminous, and can be cut to fit any standard troffer for suspended ceilings. And you get all the comfort and efficiency of Holophane precise, prismatic light control.

The regressed Controlens is available in 1’ x 4’ (#7150) and 2’ x 4’ (#7250) sizes. Ask your Holophane representative about this exciting new concept in regressed lighting. Or for more information, write: Dept. H-5 Holophane Company, Inc., 1120 Avenue of the Americas, New York, N.Y. 10036.

THE REGRESSSED LENS...NEW FROM

HOLOPHANE
For roofs of unexcelled beauty and durability...

specify T/NA 200° roofing (with Du Pont TEDLAR°)

The bold sweeping curves of this roof for the New Chapel for the Sisters of Mercy of Notre Dame High School in Elmira, New York illustrate the remarkable effects that can be achieved with a roof of Ruberoid® T/NA 200.

As functional and maintenance-free as it is attractive, this gleaming white pre-finished roof membrane will stay weathertight and beautiful for years and years. It's the ideal roofing material for roofs of unusual contour, on any slope.

The roof was fabricated by Hall Roofing & Sheet Metal Co., Inc., of Elmira and the T/NA 200 membrane was applied on the site. The smaller photos show some details of the construction.

Haskell & Connor were the architects and Welliver Construction Co., Inc., both of Elmira, were the General Contractors.

Write today for full information on this unusual roofing material. Also available in pastel grey or green.

* DuPont's registered trademark

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CREATE AN EPIC:
THE MANY FACES OF
DESCO EXPOSED AGGREGATE

With a cast of not one, but thousands!
And you are the great producer.
Desco Exposed Aggregate wall coatings provide you with the
most talented, exciting raw material available; it is then up to you
to style, to shape and to have them cast in your imaginative image.

The range of drama-building effects at your disposal is unlimited!
Endless variations of type and size of aggregate. Wide selection of matrix color.
Desco Exposed Aggregate coatings have even been seen going around corners.
Over arches. On columns. In murals. They respond beautifully to direction. And the
aggregate never has a falling out with the matrix.

Desco Exposed Aggregate coatings heroically resist fading,
weather and vapor transmission problems. They can be pre-cast at
the studio, or applied on location. And all are applied solely by
Desco's expert coatings technicians. Write today for further
information and the name of your Desco applicator.
Desco Exposed Aggregate coatings
are a Desco International
Association production.
These are the
They’re the ones who gave Allied Chemical

PROVEN PERFORMANCE COMMANDS: This unretouched photograph of the carpet that covered the floor of a major pavilion at the N. Y. World’s Fair shows how Allied Chemical nylon fiber carpeting takes a beating beautifully. If you think you have a special carpeting problem, look again. This is performance proved. 16,000,000 people walked on this carpet.

PRODUCT INNOVATION COMMANDS: The new tri-dye fiber at Allied Chemical’s Research Center is only one of the many new processes developed here that are opening up new styling and performance areas for commercial carpeting. A 1-step color bath to achieve a brilliant 3-color effect! Another example of how Allied Chemical works toward tomorrow’s most contemporary applications.

Become a Commander. Specify A.C.E* nylon on your next commercial carpet contract. Write to Allied Chemical
The number is Andorra 782

Your number for elegance. And only one of many stylish Mortise Locksets. Andorra, expressing the beauty, quality and security built into the complete Corbin line of door closers, exit devices, and many types of locksets.

Your Corbin distributor can furnish you with complete data on this design, or write P. & F. Corbin Division, Emhart Corporation, New Britain, Connecticut 06050. In Canada—Corbin Lock Division, Belleville, Ontario.

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GlaRverbel Drawn Sheet Glass... Specks Aren’t In Our Specs!

Our strict inspection guarantees glass with a different aspect—speckless. Without the “waves” of common window glass, with greater surface regularity—yet with ordinary economy. Architects and spec writers respect us for this. We suspect it was why GlaRverbel was chosen for the spectacular Seacoast Towers East in Miami Beach.

GlaRverbel

GLAVERBEL (USA) INC. Empire State Bldg., 350 Fifth Ave., New York, N.Y. 10001

Drawn Sheet Glass • Tinted Glass • Cast Glass • Floate Plate Glass • Plate Glass

Enamelled Glass • Diffuse Glass • Diffuse Non-Reflecting Glass


See Sweet’s Architectural File 4a/GL.

For more data, circle 46 on inquiry card
A Bally Walk-In . . . meets the challenge of mass feeding's growing needs. Today's kitchens demand the most modern equipment and advanced techniques. The emphasis is on fewer kitchen personnel . . . turning out more and better food . . . for a growing number of diners.

At the heart of these modern food preparation centers Bally prefab Walk-Ins, with an entirely new design concept, fill every critical refrigeration need.

Standard modular panels can be used to assemble any size or shape Bally prefab to fit available kitchen space. Four inch thick "foamed-in-place" urethane with remarkable insulating qualities suitable for temperature as low as minus 10°F, makes it possible to convert a cooler to a freezer by a simple change of refrigeration equipment.

It's easy to enlarge a Bally Walk-In for growth requirements by adding additional sections . . . just as easy to disassemble it for relocation. Metal finishes range in choice from galvanized steel and patterned aluminum to high polish stainless steel.

Bally Walk-Ins are the accepted industry standard of high quality. Constructed with unique and advantageous features, they are designed to move forward with today's evolution in mass feeding.

Send to Bally Case and Cooler, Inc., Bally, Pennsylvania 19503 for free 32-page catalog and urethane wall sample.

There's an evolution in the kitchen

For more data, circle 47 on inquiry card
This is beauty that lasts. Color that stays bright and clean with virtually no maintenance. And strength and durability.

Robertson Vitralume Panels, on the handsome building shown here, combine two of the toughest, most maintenance-free materials used in building: porcelain enamel and aluminum. Permanently fused into one material, these give you a wall surface that rain can't rust, sun can't fade, nor weather age.

With Vitralume, this building has a wall that washes clean in a rain, a wall that stands up to knocks and abrasion without marring. The coating is Reynolds Aluminum, so you can expose the bare edges without fear of rust or stains.

Aluminum gives you a panel that's strong, too. It's lighter in weight, easy to handle and fabricate in the field, and provides a long, unbroken span.

Vitralume Panels offer dozens of colors to choose from, including the new "Nature-tone" earth colors. If you want a special hue, Robertson can match practically any swatch sample. You can have a glossy or matte finish, and there's a wide range of finishes and textures available.

Sun can't fade it, rain can't rust it, weather can't age it.

Vitralume... porcelain on Reynolds Aluminum

The new Western Electric Plant, Shreveport, La., 150,000 sq. ft. of enduring, low-maintenance Robertson Vitralume on Reynolds Aluminum, manufactured by H. H. Robertson Company. Lockwood-Greene Engineers, Inc., Consulting Engineers, George A. Fuller Co., General Contractors.
lection of panel profiles to help you get custom effects with stand-

dard components.

For details on Robertson Vitalume panels using Reynolds Aluminum, 
visit your man at Reynolds at the local Reynolds office, or write 
Reynolds Metals Company, Dept. R-C58, Richmond, Virginia 23218.
The Automated Library is here!

New compact RANDTRIEVER™ system locates and delivers books in seconds automatically

Developed by Remington Rand, the remarkable new RANDTRIEVER system represents the first departure from standard bookstacks. For here, indeed, is the Automated Library. The only human touch is an operator, who issues electronic instructions at the Control Station console. The books are then delivered automatically—right to the point-of-use.

The RANDTRIEVER system sets a whole new standard for high cubic capacity bookstack installations. In fact, it actually accommodates three times as many books as a conventional stack. And this fantastic increase in capacity means, of course, that the system needs far less floor space—thereby reducing your building and operating costs dramatically.

Flexibility is still another important advantage. You get a natural tie-in between your new storage system and any EDP or punched card system. What’s more, you can create as simple or as elaborate a RANDTRIEVER system as your particular library requires.

To learn more about how we can help you create the library of the future today, contact your Library Bureau representative. He’s in your phone book, under Remington Rand.

For more data, circle 48 on inquiry card
Lennox modular central systems:

the “micro-climates” concept for any building

For more data, circle 49 on inquiry card
Lennox systems’ flexibility protects design freedom, boosts comfort performance, holds cost line

We air condition people in schools, offices, apartments, motels, plants, clinics, shopping centers, homes. And the people problems often can be as complex as the buildings themselves.

For instance: fat people and thin ones. Younger ones and older. Active and quiet. Emotional and calm. Crowded together or apart. Doing all manner of different things ... at the same moment ... in the same building. On the sunny side. Or the shady. Hot days or cold. Bright or cloudy. Windy or still.

No wonder that only the most sophisticated air conditioning systems can create the infinite variety of “micro-climates” to meet the people problems. Lennox modular central systems have that sophistication. Whatever the number and size of the “micro-climates” required for your planning, Lennox has the system—or combination of systems—to match.

Examples: the Lennox Direct Multizone System (DMS) for either rooftop or multi-story installation; DMS with dual ducts and mixing damper boxes for an infinite number of “micro-climate” comfort zones. And for single-zone areas, the Lennox GCS3 combination gas-heating/electric-cooling system; Model CHA air conditioning, with add-on heating; and Lennox condensing units combined with coil-blower units.

All Lennox multizone and single-zone systems are compatible, and may be combined easily where such requirements exist.

Lennox systems are factory-assembled, wired and tested, including controls. And they offer Lennox single-source responsibility.

Whatever the building you’re planning, consider the people problems ... and the “micro-climate” advantages provided by Lennox modular central systems.

For details, see Sweet’s—or write Lennox Industries Inc., 328 South 12th Avenue, Marshalltown, Iowa 50158.

LENNOX
AIR CONDITIONING • HEATING

For more data, circle 49 on inquiry card
Example: This modern shopping center, where single-package Lennox Model CHA rooftop air conditioning units provide "micro-climates" required for the varied comfort control zones. Stores, bakeries, music shops, drugstores, restaurants and malls are among the relatively large, undivided areas with high-occupancy people problems. The versatile, simple-to-install CHA is available in cooling capacities ranging from 25,000 to 273,000 Btuh. Easy to add either electric or gas heating.

Rooftop unit with POWER SAVER™ fresh air dampers and combination ceiling supply and return air.

Example: Efficiency in a nurses' dormitory. This entire 3-story building is heated, cooled and ventilated by just two Lennox DMS rooftop units. Use of dual ducts and individual mixing damper boxes make possible a precise individual temperature control—hot-and-cold-running air for 57 separate "micro-climate" zones, including nurses' rooms, lounges and housemother's apartment. The DMS can ventilate with 100% outside air, cools free when that air is below 57° F. And it permits inside walls to be changed—moved, added or eliminated—as needs change.

Dual-duct system with Lennox DMS rooftop unit adds to number of individual comfort zones possible.

Example: This new junior college, where 20 DMS (Direct Multizone System) units provide comfort for 94 zones of individual temperature control. Here are 409 tons of cooling and 7,000,000 Btuh heating for a 135,000-sq. ft., 208-room area that includes classrooms, lecture halls, laboratories, vocational shops, library and offices. The Lennox DMS can heat some areas while cooling others, with up to 12 "micro-climate" zones per unit. Thermal response is instantaneous, compensating for changes in weather, occupancy or activity.

Ceiling distribution system from rooftop unit serves top floor, also can be ducted to floors below.

Example: Offices of a large publishing company. Lennox unitary systems—roof top condensing units coupled with coil-blower units—were chosen as the most efficient means of installing nearly 400 tons of air conditioning for the 600-plus people in this 55-year-old building. Total comfort zones: 23—each served by a separate unitary system. Individual condenser capacities: 7½ to 25 tons. Unitary Lennox systems have definite maintenance advantages over the large central system: servicing is simpler, and affects only a single "micro-climate" zone each time.

Indoor fan-coil unit is mounted in ductwork and coupled with outdoor condensing unit.
Blueprint your own tax cut!

(Deduct up to $2500 extra this year—while building retirement security.)

Continental's new TARGET PROGRAM helps self-employed architects do it. Immediately reduce your current taxable income by 10% or up to $2500 each year. Also increases your spendable income, while permitting a sizable contribution to your retirement fund. Continental's TARGET PROGRAM, authorized under the amended Keogh Act, or HR-10, offers you many different methods of funding. You can tailor your own carefree retirement days of doing just as you please—and with financial security. For complete information on how much you can reduce your income taxes this year—and how many dollars you can expect to have for tomorrow—write Mr. Robert M. Powell, Asst. VP, Dept. 112, Continental Assurance Co., 310 S. Michigan Avenue, Chicago, Illinois 60604.

CA CONTINENTAL ASSURANCE CO.
Creative Financial Planning

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For more data, circle 50 on inquiry card
Looks like a shake, lasts like a shingle. Our new Hallmark shingle really isn’t a shingle, and it really isn’t a shake either. It’s the entirely new concept in roofing that combines the deep sculptured beauty of a wood shake and the lasting durability of the finest asphalt shingle. That’s why it’s sometimes referred to as the shangle. Hallmark can’t give you the problems of wood, because it isn’t wood. It won’t rot, shrink, split or warp and it’s fire safe. It’s easier to apply. Adds lasting beauty to modern and traditional homes and garden apartments with mansard type roofs. The elegant Nob Hill Club Apartments, in Atlanta, Georgia, pictured here, uses Hallmark shingles in bronzed brown to add still another dimension to its new concept in luxury living. We’d like to show you how Hallmark shingles, in bronzed brown, pewter grey and golden tan, can add a new dimension to your future homes and apartments. Write: Certain-teed Products Corporation, AA1, Ardmore, Pa. 19003.

For more data, circle 52 on inquiry card
the All-Steel® environment

It says a lot. About your clients. For you. The best in contemporary design with superb craftsmanship in steel—at a price that invites comparison. Catalog available. Showrooms in New York, Chicago, Los Angeles and Aurora. All-Steel Equipment Inc., Aurora, Illinois 60507.

All-Steel

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TOUGH NEW REICOTE

PLASTIC-COATED BUILDING PANELS

Ideal for signs, walls, displays, exhibits, counters, gondolas, toys, furniture... and a multitude of uses that we haven’t thought of yet.

Unique. ■ Non-porous surface—resistant to solvents and acids. ■ Easy to clean—lipstick, ink, grease, dirt quickly removed. ■ Abrasion resistant—4.41 times better than high pressure laminates, 8 times better than high baked melamine. ■ Color stable—non-fading. ■ Labor saving—never needs painting. ■ Economical—competitive with ordinary plastic coated hardboard and far less expensive than porcelain, ceramic tile and other plastic materials. ■ Easy to work with. ■ Isn’t this the exciting new product you should be using?

CALL...WRITE

Send additional information about new Reicote.

Name

Company

Address

City State Zip

For more data, circle 54 on inquiry card
Stop building sponge walls

Specify masonry fill-coats with PLIOLITE resins, for deep-down protection against rain and moisture.

Masonry soaks up water like a sponge. Soaks up expensive paint, too.

What can you do about it? Use fill-coats with Goodyear PLIOLITE® resins. They fill up the holes in masonry, forming a flat, nonporous shield that locks out moisture—and won't blot up paint. Your clients will need less paint to cover the same area. PLIOLITE-based fill-coats save on repainting, too—because fill-coated surfaces provide a more uniform base for better adhesion.

And these fill-coats are the only ones to meet Federal Specification TT-F-001-098. They successfully block wind-driven spray at the equivalent of 98 mph for eight hours.

PLIOLITE-based fill-coats are better in every way. They resist heat, cold and sun—as well as moisture and rain. They give you the most complete all-weather protection you can get for cinder block, concrete or stucco. Don't be satisfied with surface coatings. Go all the way to full protection.

Specify fill-coats with Goodyear PLIOLITE resins.

For information, write Goodyear Chemical Data Center, Dept. Q-8 Box 9115, Akron, Ohio 44305.
American business plans to spend $66.5 billion for new plants and equipment in 1968, an eight per cent increase over 1967, according to the 21st annual survey of business plans for new plants and equipment, conducted by the Economics Department of McGraw-Hill Publications. Out one quarter of the total capital lay will be for buildings.

"This planned increase is two percentage points higher than was indicated by the survey by the U.S. Department of Commerce and the Securities and Exchange Commission released in mid-1967," said Douglas Greenwald, chief economist of McGraw-Hill Publications. "While this planned gain brightens the outlook for plant and equipment expenditures, it is nowhere near the 16.7 per cent gain that occurred in the 1966 capital spending boom," Greenwald said.

"In 1966, plant and equipment investment amounted to 8.2 per cent of the gross national product. Even though industry has upped its plans since last fall, this year's expenditures will come to only 7.9 per cent of an estimated $845.6 billion," Greenwald said.

Preliminary planning for 1969 now indicates that American business plans to spend nearly $66.2 billion, only one per cent lower than 1968 spending plans. As for 1970 and 1971 are down two per cent in each year from the previous year's total.

Manufacturers plan to spend $3.5 billion this year
Manufacturers expect to add six per cent of their productive capacity this year, 47 per cent of their planned investment will be for expansion, with the remaining 53 per cent for modernization and replacement.

The industries are almost equally divided between those that will concentrate on expansion and those emphasizing modernization and replacement.

Eighty per cent of this year's capital spending by manufacturers go into facilities directly related to goods production. The remaining 20 per cent will be for nonproductive facilities such as warehousing, office building and distribution.

This year, expenditures for pollution control—air and water—are expected to rise 34 per cent, to about $1.6 billion, as compared to the $1.2 billion spent in 1967. Most industries expect to increase their spending in this area; the exceptions are paper, railroad equipment manufacturers and shipbuilders, and those included in miscellaneous non-durables.

**Aerospace and some non-durables may reduce capital spending**

Durable goods producers indicate their plans are now 10 per cent higher than 1967's spending. Sizable increases in spending are planned by the machinery, electrical machinery, and fabricated metals and instruments industries. Within the durable goods group, only the aerospace industry currently expects a decline in investment this year.

Current spending plans of the non-durables goods industries call for a gain of only four per cent this year. The chemicals, paper and pulp, and textiles industries all expect to spend less this year than they did in 1967. However, planned increases by three industries—rubber, petroleum, and food and beverage industries—are large enough to offset the declines.

**Airlines to spend nearly $3 billion this year**

In the nonmanufacturing area, planned changes range from an increase of 36 per cent for the airlines to a decrease of 12 per cent for railroads. Only the railroads expect a drop in investment; they now plan outlays of $1.35 billion this year, compared with $1.53 billion in 1967. The electric and gas utilities plan to increase their investment to well over $11 billion, a rise of 12 per cent.

The airlines, pursuing an aggressive investment program, plan to spend nearly three billion dollars this year.

**Computer graphics probed at Yale conference**

"Computer Graphics and Architecture" was the subject of a three-day conference at Yale University April 18 to 20. Some 200 architects, planners, and teachers were brought up to date on the vanguard of research and application of the visual capabilities of computers. Since the so-called "hardware" phase of development (involving linkage of cathode-ray tubes and light pencils to sophisticated storage and retrieval capabilities) appears to have gone beyond the capacities of usable "software" or program material, the main thrust of the conference was to report on software developments.

To become effective as a tool for architects, the computer is now being taught to respond to architectural modes...
Young architect speaks out on union problems as societies take action

In the April bulletin of the California East Bay Chapter, A.I.A., James Mawson entered the following position paper that seems to echo widely held opinion—especially among younger members of the profession—regarding conditions fostering unionization of professional offices of architects and engineers.

"Recently, the architectural and engineering professions have again had to face the spectre of unionism. However, this time the threat of unionism is not just an apparition, it is a reality. This can be seen from the fact that many firms—architectural and engineering—have gone and are presently going through the throes of a union drive.

"About five months ago, at a conference held in Chicago, nearly 500 architects and engineers gathered to discuss this mutual problem and to learn of the full scope of union activity and of the countering steps that might be taken. This topic was again discussed at a Grass Roots conference held in February in San Diego, and finally again at a C.C.A.I.A. conference of presidents in March in Santa Barbara. At that last meeting, it was decided to hire Case & Co. (the same firm that recently completed a study on the cost of architectural services) to make a state-wide study on the employment practices of our profession.

"A few minutes' study of the survey that the National A.I.A. released covering technical salaries paid by architectural firms points to the crux of the problem. Draftsmen are just not being paid enough money commensurate with their education or technical experience. Nor are they being paid a wage comparable to those persons in the building trades who execute their designs. However, every time this topic is raised, architects automatically point to low fees as the principal reason for low salaries. What architects don't see is that they are the only professionals who continue with fee schedules completely and hopelessly outdated. "Wages alone, however, are not the only problem. Most young draftsmen hope someday to be in a management position. To prepare for that day, draftsmen must learn what to do by observing the actions of the architects that they work for. During this observation period, they are faced with situations which are professional or non-professional, or ethical or non-ethical. They are, by the time they become architects, aware of what the architect's professional and ethical responsibilities are to his client and to his profession, but they are not made aware of the architect's moral responsibilities to his employees.

"The A.I.A. must begin to police itself. It must begin to take its place next to the other strong professional societies. It must seek a new method for determining its fees. It must bring its wages paid to its technicians up to the levels in other professions. Professionalism cannot be put in a paycheck, but if we don't perform these needed duties, unionism cannot be avoided.''

Architects and engineers propose joint action on union problems

A joint interprofessional action committee to deal with unionization problems has been recommended by the individual employer-employee committees of C.E.A., A.S.C.E., and N.S.P.E. The recommendation to the parent bodies was made following a meeting in Chicago in February co-sponsored by six national groups concerned with unionization of professional firms. They are A.I.A., A.S.C.E., American Congress on Surveying and Mapping and N.S.P.E. All societies concurred and indicated they would consider joining and would welcome other interested societies.

A.G.C. president calls national labor conference

A national conference on labor matters in the construction industry has been called by Fred W. Mast, president of the Associated General Contractors of America. The conference will be held in Washington, D.C. May 20 and 21 at the Shoreton Park Hotel. About 300 representatives of all segments of the industry will be invited to participate.

Labor problems on urban rehabilitation will undoubtedly come up for discussion at the Washington meeting. The A.G.C. Labor Committee has recommended that a subcommittee be appointed to meet with representatives of other national construction employer associations and representatives of the International Unions to negotiate a suitable national labor agreement limited to work performed under the provisions of the Demonstrations Cities Act with appropriate regard given to areas where employees are not represented by a union.
Mobile homes and modular apartments gain markets

Rudolph's stimulating concept of the mobile home as the "20th century shack" (AR, April, 1968) suggests that proper redesign its potential could easily and economically be expanded for high density, multi-family use.

In the relatively short space of time since the mobile home has been around, has already established itself as an important force in the housing market. Up to now, though, this force has been felt most solely in the very low-price end of the one-family home market.

Last year, mobiles accounted for 15 per cent of all newly built housing. In 1965, they represented about 12 per cent of the total—up from an average of 9 per cent during the years 1960-65, and only 5 per cent from 1950 to 1960.

Measured against just one-family housing demand, the mobile share is even higher—one out of every five of the combined 1967 total of conventionally-built single family and mobile units. But in the low-cost field that the mobile really a standout. According to the Mobile Home Manufacturers Association, mobile homes account for more than three quarters of all new homes sold for $12,500 or less.

Low cost is clearly the key to the mobile home's success to date. But it's not the only reason for its growing popularity. While factory mass-production methods can quickly produce a dwelling unit of reasonable comfort and utility that sells for well under $10,000, there are other advantages... as well as disadvantages.

One trend that has been strongly at work for the mobile market in recent years is the population mix. The primary markets for these units—young adults and retirees—have been and will continue to be the fastest growing segments of the population.

Credit markets have also favored growth of mobile home sales. Most are financed through installment credit departments of commercial banks over relatively short periods of time. This really paid off during the credit squeeze of 1966-67 when mobiles were able to continue to get financing while the traditional sources of credit for conventionally-built housing (savings and loan associations primarily) ran dry.

There are obvious disadvantages to mobiles as they exist today. To the architect, their design may head the list. Site limitations, (controlled by local zoning laws) and transportation of the finished unit to its site (typically the longest trip the mobile home ever takes) are others. Biggest drawback, though, is that the useful life of the average mobile is far shorter than that of a conventionally-built house.

The future of the mobile dwelling will be influenced by several conflicting trends:
- Land scarcity and stricter zoning make desirable "close-in" sites for mobile parks harder to find
- Rising income level encourages ownership of conventional single family housing
- Obsolescence of older units accelerates replacement with bigger new ones
- Use of mobile as an element of multi-family structures opens new potentials
- Multi-family application potential is likely to be encouraged by low-income housing programs.

There seems little question that the mobile home is here to stay, though its future growth may be in a use quite different from that of today.

Building activity: monthly contract tabulations

<table>
<thead>
<tr>
<th>$ (BILLIONS)</th>
<th>NONRESIDENTIAL BUILDING</th>
<th>$ (BILLIONS)</th>
<th>RESIDENTIAL BUILDING</th>
<th>$ (BILLIONS)</th>
<th>TOTAL BUILDING</th>
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<td>0</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

ARCHITECTURAL RECORD May 1968 83
Another outstanding example of Schokbeton's design plasticity.

Schokbeton precast concrete multiple-window curtain wall — Michigan Consolidated Gas Company Building Grand Rapids, Michigan

Architect: Daverman Associates
Contractor: Barnes Construction Co., Inc.
Precast: Precast/Schokbeton, Inc.

For the best in precast concrete, specify Schokbeton

EASTERN SCHOKBETON CORP.
A Subsidiary of U.S. Pipe and Foundry Company
441 Lexington Ave., New York, N.Y. 10017

EASTERN SCHOKCRETE CORP.
A Division of Granite Research Industries Inc.
65 Mountain St. West, Worcester, Mass. 01606
P.O. Box 56, Brandywine, Md. 20613

PRECAST/SCHOKBETON, INC.
P.O. Box 2088, Kalamazoo, Michigan 49003
39 No. LaSalle, Chicago, Illinois 60602
16110 James Couzens Hwy., Detroit, Michigan 48235

MARLE-BELL SCHOKBETON CORP.
P.O. Box 1558, Greensboro, N.C. 27402
Peachtree City, Georgia 30264
P.O. Box 6744, Miami, Florida

INLAND SCHOKBETON
A Division of Nebraska Prestressed Concrete Co.
P.O. Box 8850, Lincoln, Nebraska 68529

ROCKWIN SCHOKBETON
Division of Rockwin Prestressed Concrete Corp.
Subsidiary of United Concrete Pipe Corp.
P.O. Box 9556, Santa Fe Springs, Calif. 90670

SCHOKBETON INDUSTRIES, INC.
Loop Road—P.O. Box 780
Crockett, Texas 75533

EUGENER SCHOKBETON COMPANY
201 W 60th Place, Denver, Colorado 80211
2000 South Main St., Salt Lake City, Utah 84107

BASALT SCHOKBETON
A Division of Basalt Rock Company, Inc.
P.O. Box 2540, Napa, California 94559

CANADA
SCHOKBETON QUEBEC INC.
P.O. Box 240, St. Eustache, P.Q., Canada

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If fire breaks out, the cover opens automatically at a prespecified temperature when activated by a UL approved fusible link. Each unit can also be equipped with a solenoid valve activated by heat sensors located throughout the building. This means a system of Pyrovents can be programmed so that units open individually, all at the same time, or in desired combinations covering certain roof sections. The Pyrovent can also be opened manually from the roof or from below.

When the cover is open, a flue effect is created which prevents build-up of heat, smoke and gases, minimizing flame spread and possible explosion. This effect localizes the fire and helps firefighters locate it quickly. Loss of property and valuable production time is considerably reduced — an important factor in keeping insurance premiums at a minimum.

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City:
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Zip:
Phone:

☐ Please have representative call.

ARCHITECTURAL RECORD May 1968 85
VERSATILE BORDEN PRESSURE LOCKED GRATING

Borden’s Pressure Locked steel grating is used extensively as the flooring of the continuous balconies surrounding the new Washington, D. C. German Chancery building shown here. An integral part of the design of this striking 95,000 sq. ft. steel-and-wood-framed structure, the grating adds the practical advantages of sun shading, ease of window cleaning, and requires no maintenance.

Available in many subtypes, Borden’s Pressure Locked Type B, approved for all general purposes, was chosen for the above application. For complete information on this and other grating types, including Riveted and All/Weld in steel or aluminum, write for . . .

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The 16-page Borden Grating Catalog

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Accuracy of estimates: close but never perfect

A aspect of construction costs needs clarification more than accuracy of estimating—especially at it applies to architect's projections. The A.I.A. book, AIA Cost Control, although otherwise a thoughtful and useful work, treats the matter scarcely at all—confirming, perhaps, the difficulty of the topic.

Standards of accuracy are not clearly defined. The question of how accurate a given architect's estimate might be, presumes the existence of standards for gauging accuracy. If such standards do exist, it is clear that there is no general agreement among architects as to what they are and how they apply to individual estimating tasks. The subject might best be pursued by asking two questions:

1. What is the target or goal of an architect's estimate?
2. What are the factors governing attainment of that goal; the possibilities of achieving "bulls eye" on the target?

Some use the eventual bid as the benchmark of accuracy. We have all heard architects or estimators cite their estimating records in a statistical fashion—"We hit most of our bids within 3 per cent of the low bid." Or, "Our estimates range from minus 5 to plus 10 per cent, measured on the low bid" or "Our estimates aim at the middle third of the bidders and almost always fall within that range."

Such expressions suggest that accuracy can be measured and that the two questions above might be rephrased:

1. What, theoretically, constitutes 0 per cent accuracy?
2. What are the practical limits to realization?

The contractor then becomes the arbiter of accuracy. With respect, first, to the definition of accuracy, it is clear that the target or goal is established in some manner by the contractors actually bidding the job, and an architect's estimate might be considered an anticipation of the bids.

However, since the architect's lexicon includes terms such as "poor bids" or "non-competitive bidding", it seems equally clear that mere anticipation of bids is not enough. Rejection of bids as "non-responsive", or "too high", etc. assumes a standard against which they are measured. To avoid circularity, then, a working definition of an architect's estimate might be "an estimate of the bid likely to be received from one of a slate of interested, responsible bidders". Whether low bid, median bid, or some other representative is to be taken as the target is a matter of individual preference, dictated usually by job features or owner's desire.

Another way of phrasing our working definition might be "an estimate of the fair and reasonable cost to the performing contractor, to which are added reasonable markups for overhead and margin". This may be regarded as a mode of setting benchmarks for contractors' reasonable bids.

Responsible bids and reasonable costs both affected by market conditions

The two definitions are in fact compatible depends on the interpretations placed on the modifying words—"interested, responsible" in the one instance, and "fair and reasonable" in the other. If the conditions of the construction market are optimum, the interpretation is not critical. If, however, the market is not fluid, or if its capacity is taxed by too much work, one cannot rely on contractor competition to keep prices reasonable. If "responsible" contractors must pay significant premiums to attract competent tradesmen, their bids will, of course, reflect this fact. If pre-cast concrete yards are overly busy, their subcontract quotations can be expected to rise. Whether the architect's estimate should include these "extra" costs depends entirely on what the estimate is intended to express.

Let owners understand the basis of the estimate

It is of the utmost importance that the estimator's target be fully understood by both architect and owner. It is not unreasonable, surely, to clarify this matter with the owner in advance: "This building, on an optimum bid basis, will cost $1 million, but to advertise it on this market, now, will result in bid premiums of perhaps $125,000." When thus informed, the owner can consider his option to delay award or even to build in another place, although in practice, the owner seldom exercises this option, being bound, for a number of reasons, to build now. In any event, the definition of a proper target for an architect's estimate should consider the conditions under which awards will be made or not.

Functionally, then, an architect's estimate is a statement to an owner that a given sum of money should be budgeted to accomplish the desired construction, within limitations to be set forth by the owner. Since, in the experience of most architects, the funds available for the project are barely adequate for the construction under the best of market circumstances, a comfortable contingency cannot substitute for estimating accuracy in the first place.

If the accuracy of an architect's estimate is, in any of the foregoing ways, to be gauged by the resulting contractor bids, it is clear that seeking means for achieving accuracy involves some prior understanding of the factors governing preparation of contractors' bids.

Bidding methods differ on a given item of work

A persistent concept in the mythology of estimating holds that there is a "right"
price for a contract, which is a function of the “true” cost to perform the work. Much has been written recently about statistical approaches to contractor bidding, all of which assume that, armed with a knowledge of the true cost and a history of competitors’ bidding habits, a contractor may calculate the probable low bid. A study of contractor bidding practices conducted by my firm over a number of years, has confirmed that contractors disagree substantially about the basic cost to accomplish a specific construction task, and differ widely in their approaches to estimating.

**Responsible bids differ in spite of common bases**

To illustrate the difficulty in assessing true cost, consider a typical building project which we studied. Seven general contractors presented bids; the spread from low to high was 12 per cent; from low to third was 5½ per cent. The three low bidders all fit the description of interested, responsible bidders. They have incurred considerable expense in bidding and all want to perform the work. One is inclined to conclude that 5½ per cent is a fair way of stating the limits of accuracy that can be expected in anticipating the low bid. After all, the contractors approximated one another’s bids by that close a margin, and an architect’s estimator might aspire to the same degree of approximation.

However, these are general contractors and their bids are comprised in large measure—say 75 per cent—of quotes to them by subcontractors. Our examination went further. We discovered that the company of significant subcontractor quotes; that is, they shared the same body of information regarding the true” cost of 75 per cent of the work; and further, that the three bidders had used very nearly the same profit markup. Thus the difference between the low and the third bidder was either

a) a disagreement as to the “true” cost validity of the subcontractor quotes received, or

b) a disagreement as to the value of the 25 per cent of work to be performed by their own forces, a discrepancy then of .055/.25 or 22 per cent, or

(c) a combination of both.

Our examination went further. We made the same kind of analysis of the HVAC subcontractors who had quoted the job and discovered a similar pattern. The five subcontractor quotes varied from least to greatest by 18 per cent, and each included a shared package of quotations from suppliers or second tier subcontractors. Presumably the same would hold true for the plumber, the electrician and other bidding subs.

Two conclusions emerge from this analysis. First, we are fishing in murky waters indeed, and second, that the dollar difference between general contract bids for a single job in no way defines the limits of accuracy in evaluating the true cost of that job.

**Total job bids tend to level sub-bid differences**

It would appear that performing contractors differ as to the costs of accomplishing given construction tasks by a substantial margin. When these costs are summarized, the individual differences are largely offsetting and the net difference in total bid price implies a consensus which, as an approach to accuracy, is misleading at best.

Most general contractors would confirm this conclusion. They know from their dealings with subcontractors that differences between proposals for a given plumbing or electrical job differ not only in profit and overhead markups but also in the fundamental evaluation of the cost to perform the work which each reflects. This is not to say that it will necessarily cost one contractor more to perform the work than another, but rather that contractors will differ, and differ materially, in their estimates of the cost to perform the work.

**Sometimes actual costs derive from estimated costs**

Indeed contractors have discovered that what it actually costs them to complete a contract is related, frequently, in a derivative way to what they have estimated the cost to be. In other words, the estimate sets a norm which must be accomplished, a budget which must be adhered to. There are limits, of course, to this. In estimating, contractors have achieved significant results when after bidding too low, they set themselves to “save” a project by more imaginative efforts, better equipment, or closer supervision of the work.

Thus “true” cost is not a Platonist concept of which estimates are finite realizations. If the term has any meaning at all, it denotes a range of costs, within which a contractor, if lucky, can accomplish a given construction effort.

The architect’s estimate shoots at a moving target

The contractor’s estimate of the cost of the work must be seen for what it is—an estimate, truly, an approximation, an attempt to anticipate future events—with its own rather broad limits of probable accuracy. However, it is the contractor’s estimate, not his actual incurred cost, which serves as the target for the architect’s estimate, since the latter will be measured against bids, not performance records.

Thus the architect’s estimate is an approximation of an approximation. Accuracy vis-a-vis actual incurred cost can never be known.

How then, one might ask, is it possible for an architect to estimate costs with any assurance that he will approach the bids? Clearly, many architects do experience some success in their estimating efforts, and the reason rests in several factors.

**Averages and experience help architects to hit the mark**

First, there is the fact that while two estimators may disagree substantially about the true cost of a specific, finite item of work, they will be in much closer agreement about the aggregate cost of many items of work. It is for this reason that bids taken for individual subcontractors vary more than bids taken for all-inclusive general contracts. Estimates prepared by architects also will be closer to the low bid for the aggregate contract than it will be for any individual subcontract.

This pattern has been the experience of almost every agency which awards work to several “prime” contractors for a single structure. They find no difficulty in estimating the total cost within, say, 10 per cent, but find the estimates for plumbing, HVAC, electrical and general construction work may be much farther off the mark.

The second factor which improves estimating accuracy is historical precedent. The experienced cost of a building system influences the estimating efforts of contractors far more than architectural realize. In many cities, for example, plumbing contractors bidding on high-rise dwellings figure their bids on a “pound an apartment” basis, because their record reflect costs in this manner. General contractors, also, will “shop” subcontract seeking the cost-per-square-foot for the system which they believe supportable by experience. In this way, differences in agreement about the cost of specific work items are bypassed in seeking a more over-all price which seems reasonable.

The moral of the foregoing is simply that the architect should be modest about his, or anyone else’s, ability to estimate building costs. A good estimator requires consideration of all the pertinent information that can be gathered. If one comes close to target on the over-all project but misses badly on individual project features, this must be recognized as inherent in the process. Estimates and estimating practice can always be improved but there is no such thing as 100 per cent accuracy.
<table>
<thead>
<tr>
<th>Metropolitan area</th>
<th>Cost differential residential non-res. &amp; non-res.</th>
<th>Current Dow Index</th>
<th>% change year ago</th>
<th>1941 for each city = 100.0</th>
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<td>U.S. Average</td>
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The data in the table above provides a comparison of building costs in different cities for a specific period. The table includes the cost differential, the current Dow index, and the percentage change from the previous year. The data is presented in a tabular format, showing the city name, cost differential, current Dow index, and percentage change year ago. The data is normalized with the average cost in the U.S. for each city set at 100.0. The table also includes a column for the year, which is used to compare the cost changes over time.

The information presented here indicates trends of building costs in 21 leading cities and their suburban areas within a 25-mile radius. The data is broken down by year, allowing for the analysis of trends over time.

Additional tables included in the report provide data on the costs of living in a given city for a certain period may be compared with costs in another year by dividing one index into the other; if the index for a city for one period is 0.80 divided by the index for a second period (1.50) equals 125%, the costs in the one period are 33% higher than the costs in the other. Also, second period costs are 75% of those in the first period (150.0=200.0=75%) or they are 25% lower in the second period.

**ECONOMIC INDICATORS**

The table below provides economic indicators for specific years:

<table>
<thead>
<tr>
<th>Year</th>
<th>BUILDING MATERIAL PRICE INDEXES</th>
<th>BASE WAGE RATES $/HR</th>
<th>MONEY RATE &amp; BOND YLD. %</th>
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<tr>
<td>1965</td>
<td>$240</td>
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<td>5.22%</td>
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<td>1966</td>
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<tr>
<td>1967</td>
<td>$255</td>
<td>$5.35</td>
<td>5.50%</td>
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</table>

**STORICAL BUILDING COST INDEXES—AVERAGE OF ALL BUILDING TYPES, 21 CITIES**

The table below provides historical building cost indexes for various cities, normalized with the average cost in the U.S. for each city set at 100.0:

<table>
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<th></th>
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<td>Miami</td>
<td>256.5</td>
<td>259.1</td>
<td>266.3</td>
<td>269.3</td>
<td>274.4</td>
<td>277.5</td>
<td>284.0</td>
</tr>
<tr>
<td>Minneapolis</td>
<td>260.0</td>
<td>267.9</td>
<td>269.0</td>
<td>275.3</td>
<td>282.4</td>
<td>285.0</td>
<td>289.4</td>
</tr>
<tr>
<td>New Orleans</td>
<td>242.3</td>
<td>244.7</td>
<td>245.1</td>
<td>248.3</td>
<td>249.9</td>
<td>256.3</td>
<td>259.8</td>
</tr>
<tr>
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<td>270.8</td>
<td>276.0</td>
<td>282.3</td>
<td>289.4</td>
<td>297.1</td>
<td>304.0</td>
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<tr>
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<td>265.4</td>
<td>265.2</td>
<td>271.2</td>
<td>275.2</td>
<td>280.8</td>
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<tr>
<td>Pittsburgh</td>
<td>243.5</td>
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<td>258.2</td>
<td>258.2</td>
<td>263.8</td>
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<td>236.4</td>
<td>237.1</td>
<td>238.9</td>
<td>238.3</td>
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<tr>
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<td>352.4</td>
<td>365.4</td>
<td>368.6</td>
<td>386.0</td>
</tr>
<tr>
<td>Seattle</td>
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<td>247.0</td>
<td>252.5</td>
<td>260.6</td>
<td>266.6</td>
<td>269.0</td>
<td>275.0</td>
</tr>
</tbody>
</table>

The table above provides a comparison of building costs in different cities for a specific period. The table includes the city name, the year, and the normalized cost. The data is presented in a tabular format, showing the city name, year, and normalized cost. The data is normalized with the average cost in the U.S. for each city set at 100.0. The table also includes a column for the year, which is used to compare the cost changes over time.

**BUILDING COSTS**

Architectural Record May 1968 89
A report from General Electric on the 70-story

Specified: General Electric Zoneline heating/cooling units for the world's tallest reinforced concrete structure.

Basis: . . . to provide space-saving, flexible and economical solution for heating and air conditioning of buildings.

Nov., 1966 issue of Building Construction magazine says: "Living and bedrooms in each apartment in the all-electric building will be fitted with modified GE Zoneline heating and air conditioning units in a 17 x 17-inch continuous cabinet that abuts the window wall.

Full coordination of heating and air conditioning with window-wall components has been a major interest of architects Schipporeit and Heinrich.

'We wanted to whip the problems created by solar loads during those critical spring and fall months when air conditioning is needed on one side of the building, heating on the other. And we also wanted to provide an answer to individual temperature preference at reasonable costs to the owner.

'We think the unitary HVAC installation will accomplish these objectives.'

Knowing that breakdowns are inevitable in any air conditioning system, the Point Tower architects also recognize the ease of servicing the 3350 Zon units. When one breaks down, it is immediately replaced with a reserve and repaired at leisure. And a break in one apartment, of course, will not

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00-apartment Lake Point Tower in Chicago.

affect the other 899—as could happen with a central station system.

As nursing homes to high-rise construction zones, Zoneline units can save you space money and offer you complete design flexibility. For full specifications, call your local GE representative. Or write the General Electric Co., Louisville, Ky. 40225.

Tower: Chicago.

Hartnett Shib & Associates
Flor Properties

For more data, circle 58 on inquiry card.
Don't expect your sewage pumping system to run like a fine watch if you buy it a piece at a time.

Ridiculous! Who'd every buy a watch a piece at a time? It's just as inadvisable to put together a variety of components from several sources to get a single, reliable sewage pumping system. Apco-Trol solves this problem because it's a complete pumping system from one very reliable source, Aurora Pump. The brain of the system, Apco-Trol, utilizes modern solid state circuitry to sense changes in liquid levels and adjust the discharge rate to the influent rate smoothly, quietly, instantly. Saves space because smaller wet wells can be used. Lets you design facilities to handle present peak loads as well as long-range future requirements. The muscle of the Apco-Trol system is Spher-Flo, the sewage pump that's truly the finest available today. Bearing life is guaranteed to be at least 100,000 hours at shut off, the worst condition. Top centerline discharge eliminates need for left-hand pumps. Standard or split packing box. Maximum .002" shaft deflection. Unique skewed impeller vanes contribute to non-clogging features and minimize vibration and noise. External axial adjustment. Back pull-out design for easy maintenance. Three models. Heads to 250 ft. Capacities to 8,500 gpm. Handles solids to 6" diameter. Don't put your next facility together a piece at a time. Specify Apco-Trol, Aurora Pump, A Unit of General Signal Corporation, Loucks at Dearborn, Aurora, Illinois 60507.

For more data, circle 59 on inquiry card.
Before cost control: a posture for public work

dynamic technological progress finds expression in the increasing sophistication of contemporary building systems of all types. Increasing in proportion is the cost and the difficulty of predicting costs, though cost estimating and control methods have developed to a high degree, there is need now to examine some of the reasons and hopefully some of the medias for widespread frustration as architects confront the rigid, sometimes inadequate, budgets for public work and the seemingly complex operating methods of public construction agencies.

Budgets for investment buildings must be rationally computed. Adaptable budgets for certain building types, especially for industrial and commercial buildings, can be computed with reasonable precision on the basis of the return on capital investment from rent or operations. Budgets for projects of this nature readily lend themselves to economic evaluation and thereby retain a measure of flexibility.

For public building budgets are not logically developed. Public, institutional and some other categories of buildings do not lend themselves to economic evaluation on an investment basis. Budgets, therefore, are attached to the programs of such buildings on the basis of many considerations and judgments other than that of return. Once budget magnitude cannot be determined (or adjusted) on the basis of economic return, the initial budget often comes inviolate and unduly rigid—especially so when it is locked into a public propriation.

When bids come in over budget on a type of building, the architect is usually left with the burden of proof that his design is appropriate and that either the program or the budget must be adjusted. It too often he is expected to wave a magic wand of highly sophisticated cost control methods to equalize bid cost with budget—and then maintain control.

Sophisticated cost control can't overcome excessive program. The public client is deemed by some to be a very special client. Therefore, it is implied, his projects require special cost control techniques. When the architect is confronted by an inadequate and inflexible budget for an overly ambitious program (both generally established before the design process begins), what unusual cost controls should he apply to the public client's project?

The truth is that cost control techniques used by the architect for any given scope of project must be the same regardless of the nature of the client, public or private. Professional responsibility does not vary from client to client; why then should any special conditions surround cost control for the public client? Appropriate conventional cost controls should be applied from the very first discussions of program and budget for any project, public or private.

Public clients blame the architect when bids come in too high. If we recognize that the approach to cost control is essentially the same for both private and public clients, then we have to probe more deeply into reasons underlying the special apprehensions that seem to preoccupy both architect and client regarding cost control of public work. Roots of the problem seem to lie in the inflexible, often unrealistic budgets mentioned earlier which bring architect and client to an impasse.

It is in this stand-off confrontation that some widely held misconceptions about architects assert themselves. For example, there is the notion that the architect is incapable of designing within a budget, that his estimates are concocted with a certain X-factor built into them, and further that the architect operates throughout, from design to bidding documents, with little if any regard for cost. It does little to allay such baseless notions to point out that if the architectural profession were really deficient in these important areas of responsibility, it surely would not enjoy the continuous patronage of the private corporate business community.

Public agencies are seen as unrealistic budgeteers. On the other side of the coin, the public client or government agency is looked upon in some quarters—similarly without basis—as being incapable of setting up a proper budget and program to build anything. The impression is that the budget is pasted together by obscure methods and then modified by another mysterious X-factor. Further, reports persist that the client presents, throughout the preparation of construction documents, his arbitrary directives of the design which have little relation to pre-established cost limits.

The solution lies in approaches—not methods. The point is that misconceptions are attributed too easily to both architects and public clients. An architect who has dealt extensively with public clients knows that they are as much concerned about the cost of construction as any private client. Therefore, the problem seems to be not the method of cost estimating or of working within a budget, but rather the approaches and attitudes between architect and client. Again; approaches to cost control methods, public and private, should be virtually the same; attitudes are the variable.

Public clients must guard the people's money. Each public agency will have its own format as to how and when various costs of a project are to be presented. While...
This is also true of private clients, the private format is generally more familiar, more flexible and therefore, to some, seemingly more rational. Much of the frustration of architects and other professionals in dealing with public clients stems primarily from preconceptions about “how the government works” and the amount of red tape that must encumber the work; notions which have little to do with the actual professional relationship involved. Understanding is the key; understanding not only of the architectural problem but also of the characteristics which set the public client apart from the private client.

The chief difference lies in the government agency’s position in our society with respect to allocations of construction money. “Public” means just that: public money. The responsibilities of the agency for that money are custodial and strongly circumscribed by law. A private corporation may, by direction of its own management, allocate more money for a project. A government agency, under similar circumstances, may have to send a special appropriation bill through Congress or pass through city council approvals for additional funds. And this is rightly so—even though the process is longer, more involved and sometimes unsuccessful. The money is not “theirs” but “the people’s” money.

The architect must quickly state when budgets are inadequate
The importance of understanding this funding process is underscored in a situation, for example, in which a government agency presents an architect with an inadequate budget for an ambitious building program. This budget, set under stringent conditions, is all that is available for the project. Now the architect, applying his cost-estimating methods, must abide by them and state from the outset that this project cannot be built to meet the program within the budget. This action creates a mutual awareness of position that must prevail throughout the duration of the project.

The client can, of course, begin the process of trying to increase the budget or reduce the program. At this point, it is important that the architect understand the difficulty of the client’s situation and not allow what may appear to be inertia to pervade all subsequent decisions with the client. Neither the architect nor the client should delude himself when both know the budget is too small. If either persists, frustration begins to hamper decisions.

The fact that the architect almost always deals with his professional counterpart on the client’s staff—and that both aspire to achieve the best possible design—is too often forgotten by both. Even when relationships appear congenial, an apprehensive attitude portends disappointment in the end.

Some public standards may seem unduly restrictive
Another source of irritation is the injection into public work of a great many standard restrictions and design limitations. Antagonisms rise when application of some of these standards seems to the architect to be irrelevant and expensive. But the public client, particularly the large Federal agency which is responsible for tremendous amounts of construction, has found that cost control requires much standardization—especially when the agency deals with a great many professionals of varying degrees of experience in public work.

Still another unfamiliar irritant for architects is the fact that very often public budgets, programs and sometimes even preliminary designs are set in order to establish appropriation requests before the architect becomes involved in the project. This reversal of the private approach to budgeting seems to be another disconcerting evidence of inflexibility of the public client’s position.

A third-party cost consultant could help both sides
When mandatory requirements seem to the architect to be at odds with reality in his cost analysis, one device he can use is to retain an independent cost consultant for preparing estimates throughout project development. This could prove advantageous in several ways. First, architect and client are not drawn into battle directly over methods of estimating. Second, a disinterested party (the cost consultant) may be better able to convince the client that the initial budget was unrealistic. Third, the consultant’s estimate can serve as a gauge of both client’s and architect’s accuracy.

All facets of cost estimating and control deserve the best attention at the earliest point and then continuously to completion. But apprehensive attitudes on the part of client and architect give rise to excessive preoccupation with “control of costs.” The costs issue becomes a rationalization for ignoring perhaps the most basic problem itself—that of finding the means of establishing an initial realistic budget in concert with the building program.

In the offices of both architect and public client there is too much speculative reaction to the other’s pre-supposed actions. Far more important is ferreting out suspect and competitive attitudes which prevent understanding and hinder cooperation.
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Mr. Taylor's point that construction cost comprises only part of the total project cost is well taken. Too often many of the supplementary costs are grossly underestimated or ignored in the establishment of the initial project budget. It should be noted that the Architectural Record article was treating only the subject of construction costs and the procedures adopted for their control.

Franklin Square Hospital: a response
Your article on Franklin Square Hospital (February, page 135), while it contained imaginative ideas, presented most unfortunate cost data. It states, concerning a modern 300-bed hospital capable of being expanded to 600 beds, that "Total cost, including site work and separately-bid fixed equipment will be about $5.3 million—$17,667 per bed."

Using the cost per bed as an index is misleading since it does not indicate what space or services are provided. From data shown in our own Cost Comparison Table, the Towson, Maryland Hospital, which Mr. Wilson uses as a Hill-Burton hospital comparison, provides more than twice the cost per bed. Mr. Wilson reports a total cost figure of $17,667 whereas the cost provided by our grant applicant is $25,369—a difference of approximately 50 per cent. He may not have been aware of the data filed by the applicant listing cost which totaled $7,610,687. Mr. Wilson's figure of $5.3 million was construction cost only and did not include: Group II and III equipment; site survey and soil investigation; supervision on the site; insurance and moving; relocated fixed equipment; reused movable equipment.

We cannot refrain from commenting on the low square foot per bed, especially since this hospital expects to expand to 600 beds.

In our experience, when the square foot area per bed is low, the unit cost is high. In our Cost Comparison Table (since Mr. Wilson mentioned other Baltimore hospitals) the cost per square foot is $44.40 for Franklin Square, while the two others are considerably lower.

These comments are not meant to discourage experimentation by Franklin Square and other hospitals in cost reduction in purchased services such as laundry, food supply and power as well as the other shared sponsors to show incomplete cost data.

Wilbur R. Taylor
Department of Health, Education, and Welfare
Silver Spring, Maryland

... and a reply
Mr. Taylor's point that construction cost comprises only part of the total project cost is well taken. Too often many of the supplementary costs are grossly underestimated or ignored in the establishment of the initial project budget. It should be noted that the Architectural Record article was treating only the subject of construction costs and the procedures adopted for their control.

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Filterglow luminaires are the only fully enclosed units that deliver up-light. Once only available in open units, up-light is an integral part of all enclosed Filterglow luminaires. About 10 per cent of each fixture's output is directed toward the background, to reduce contrast and improve visual comfort.

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When made of non-oxidizing weather-resistant Enjay Butyl rubber, economical Butyl sealants resist cracking and hardening... are non-staining and offer superior adhesion with minimum shrinking. Normal service life is 20 years or longer. Except for extreme movement joints (lap joints with more than 20% relative movement and butt joints with more than 15%), performance of these economical sealants is comparable to that of expensive, chemically cured rubber-base sealants, both the one- and two-part variety.

Enjay does not make Butyl sealing caulks, but we do supply Butyl rubber and other elastomers to quality-conscious manufacturers that do. Enjay Chemical Company, 60 West 49th Street, New York, N.Y. 10020.

For more data, circle 80 on inquiry card
Letters

Classic real beauty survives the ever-changing tastes of a world in motion

More than 21 centuries, and a pair of broken arms, haven’t daunted the Venus de Milo. She is a beauty that transcends the ages; a classic form still as exciting in today’s computer era as it was in the ancient studio of that unknown Hellenistic sculptor who created her. This renowned Aphrodite belongs to all times, and all places. You might even say that about Precise.

Hers is a beauty that transcends the ages, a classic form still as exciting in today’s computer era as it was in the ancient studio of that unknown Hellenistic sculptor who created her. This renowned Aphrodite belongs to all times, and all places. You might even say that about Precise.

To keep the record straight, no comparison was made, nor intended, between the construction cost of Franklin Square Hospital and that of any other particular Baltimore hospital. However, since Mr. Taylor has made such a comparison, it might be well to take a closer look at his figures. Adjusting for rising prices, the total Project Cost of Project No. 104 would be approximately $36,200 per bed today while that of Project No. 100 would be $37,500 based on newspaper reports of actual expenditures. Using the latest figures submitted by the hospital to the Public Health Service, the comparable Project Cost for Franklin Square Hospital is $22,939 with a resulting square foot cost lower than that of Project No. 100. It must be emphasized that the comparison is neither fair nor valid since the three hospitals differ in their philosophies, needs, services and procedures. The above is presented only to bring Mr. Taylor’s figures up-to-date.

Similarly, it is invalid to equate the cost, efficiency or quality of a hospital to square feet per bed. In the case of Franklin Square Hospital substantial reduction in circulation and dietary space, omission of a laundry plus detailed analysis of the hospital’s actual needs resulted in a low gross area with no compromise of its medical care programs. Most space savings were a consequence of the understanding, cooperation and direct participation of the administrative and medical staffs in all phases of design development.

Interestingly, Mr. Taylor’s examples are illustrations of the serious pitfalls which Franklin Square Hospital is hoping to avoid through full involvement of a Construction Consultant. Project No. 104 required rebidding to bring it closer to the construction budget while Project No. 100 experienced severe financing problems occasioned by unexpected costs following receipt of bids.

David H. Wilson
David H. Wilson & Associates
Towson, Maryland

Alan Dunn and architecture

I am a great admirer of Alan Dunn’s cartoons on the Perspectives page every month. As soon as I have a copy of RECORD, I turn to that page and enjoy it. I was never more delighted than when I saw the November cartoon: What a wonderful way of expressing, admiring, criticizing contemporary architecture!

A. N. Suryavanshi
Consulting Engineer & Architect
Maharashtra, India

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Complete information about Deep Rib Trapezoidal Form Liner available on request.

ON THE CALENDAR

MAY

26-28 Annual Theatre Television and Film Lighting Symposium, Illuminating Engineering Society — Barbizon-Plaza, New York City.
29 Construction Specifications Institute Twelfth Annual Convention—Denver Hilton Hotel, Denver.

JUNE

5-7 Annual Pacific Coast Builders Conference—Fairmont Hotel, San Francisco.
16-21 International Federation of Landscape Architects Biennial Congress—Bonneventure Hotel, Montreal.
23-26 American Society of Landscape Architects Annual Meeting—Sheraton-Brock Hotel, Niagara Falls, Ontario.
23-29 A.I.A. Annual Convention—Portland Memorial Coliseum, Portland, Oregon, and Ilikai Hotel, Honolulu (June 28-29).

JULY

8-12 Annual Summer School Planning Institute, Stanford University. Topic: The processes of planning as they affect educational planning. For information, write: School Planning Laboratory Summer Institute, School of Education, Stanford University.

OFFICE NOTES

OFFICES OPENED

John Fowler, Registered Architect, has opened an office at 104 Audubon Street, New Haven, Connecticut 06510.

Hammel Green and Abrahamson, Architects Engineers announce the opening of a new office at 329 Park Avenue...

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Precise

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For more data, circle 84 on inquiry card
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For full information about the new GE MAINLIGHTER fluorescent—see your GE Large Lamp Agent. Or write to us: General Electric Co., Large Lamp Dept., C-809, Nela Park, Cleveland, Ohio 44112.

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Because of the versatility and workability of copper, architects today are using it to create many unusual effects. The new conception of the old cornice you see on these pages is one of them.

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PRESTRESSED CONCRETE INSTITUTE
ARCHITECTURAL STRUCTURAL
OFFICES OPENED

continued from page 777

South, New York City 10010. The firm also has offices in St. Paul, Minnesota.

Hester & Brady, Architects, P.O. Box 4303, Magnolia Towers, Jackson, Mississippi 39216, announce the opening of an office for the practice of architecture.

Jules G. Horton, P.E., Lighting Consultant, recently opened a new office at 245 East 25th Street, New York City.

NEW FIRMS, FIRM CHANGES

Hilario Candela, A.I.A. and Peter Spillis, A.I.A. have been named senior partners in the Miami firm of Pancoast/Ferendino/Grafton/Architects.

Reynolds, Smith and Hills, Architects and Engineers have admitted Robert F. Darby, A.I.A. and Dr. C. I. Harding, A.A.E.E. as partners. The new partners are both located in Jacksonville.

The Office of Masten and Hurd, Gwathmey, Sellier, Crosby, Masten, Hurd, Architects announced the retirement of Charles F. Masten, F.A.I.A. The firm continues its practice from its new location under the designation: Gwathmey, Sellier, Crosby, Architects, the Office of Masten and Hurd, One Kearny Street, San Francisco 94108.

Schutte-Phillips-Mochon, A.I.A., Illinois architects, planners and engineers have announced the change of the firm's name to Schutte-Mochon Inc. Ralph J. Phillips continues with the firm as an engineering consultant.

Ronald D. Schwab and Paul M. Twitty, Architects, have formed a partnership under the name of Schwab and Twitty, Architects, A.I.A. for the comprehensive practice of architecture at 400 Royal Palm Way, Palm Beach, Florida.

Harold Spitznagel and Associates, Architects, Engineers, Planners have announced a change in name to The Spitznagel Partners Inc. The firm is located in Sioux Falls, South Dakota.

ADDENDA

On page 35 of the February issue we incorrectly reported that I. M. Pei and Partners had been commissioned to develop the design of the proposed Robert R. Young Village development in New York City.

Attention is also called to the misleading statement appearing on page 35 of the March issue that Marcel Breuer's "notable works include the UNESCO World Headquarters Building in Paris". In fact, the UNESCO buildings (there are four) were not designed by Mr. Breuer alone but by Breuer with Pier Luigi Nervi of Italy and Bernard Zehrfuss of France.
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In 1961, Kevin Roche and John Dinkeloo, both long-time associates of Eero Saarinen, took over the completion of his unfinished work. In the few years since, the new firm of Kevin Roche John Dinkeloo and Associates has clearly earned its own place. Its architecture is its own, even though it may have roots in an approach to architecture that could have been learned from Saarinen. That approach is an almost uncompromising concern for solving each architectural problem for itself. If that approach once brought Saarinen criticism for "stylistic inconsistency," it is now well understood; and we can now see in Roche's work a FRESH FORMS AND NEW DIRECTIONS FROM A SPECIAL KIND OF PROBLEM SOLVING.

"We think first about the purpose of the building; then about the environment—the nature of the site—and what contribution we can make to it; then about how to build it." That is not a rare and innovative process, but it is, in the hands of Kevin Roche, a process that leads to a rare degree of innovation—and to some of the best architecture being built today. There are 75 on the staff of the firm's Hamden, Connecticut office. There are no organization charts and no titles. But it is clear that all of the work that comes out of the office is the result of a very personal kind of involvement and control by Roche, who is the designer, and Dinkeloo, who is responsible for engineering and for getting the buildings built. The major work of this collaboration is shown on the pages that follow. —Walter F. Wagner, Jr.
ETNA LIFE
COMPUTER CENTER
WARTFORD, CONNECTICUT

This is a very large building—it has seven stories including two below grade; its base is 364 by 307 feet; its floor area is some 747,000 square feet; and it will house over 3,000 employees. The biggest design problem: creating a form that would not dwarf the adjacent neo-Colonial office building.

The three lower floors—below the lighted setback—house the computers and associated gear. The four upper stories are huge open office spaces, lighted by an open court and by big panels of reflecting glass at the corners and in the center of each wall. Thus, the building, while it at a first glance appears windowless, actually has very large windows—quite in scale with its mass and the size of the spaces inside.

The "core" of the building is separated into shallow rooms which give thickness to the outside walls. The building, of concrete construction, will be completed next year.
For Oakland, this four-block complex of three museums (art, cultural history, and natural history) is more than a cultural asset—it is a new core. The outside is designed as a series of gardens, and as such it serves as a central forum and major new park for the city.

The stepped-back design creates a series of tree-lined walks and planted terraces, each the roof of the space below, and as the photos show the landscaping (by Dan Kiley) is an extraordinarily integral part of the design. The main plaza—about 200 feet square—includes a pergola, reflecting pool, small courts, and shaded pathways—settings for sculpture and exhibitions.

The structure is exposed reinforced concrete, partially supported on piles. In addition to 95,000 square feet of gallery space, the complex includes a 300-seat auditorium, lecture hall, classrooms, offices and restaurant. A two-story garage below the galleries holds 250 cars.

The building itself is now essentially complete, though the gallery spaces will not be opened until early next year.

Some streets were rerouted as part of the design, and one runs under a corner of the complex.
COLLEGE LIFE
INSURANCE COMPANY
INDIANAPOLIS

For passers-by on the Interstate highway, this complex will be a constantly changing pattern of concrete and mirrored glass shapes. The unique, sculptural design grows out of a simple program requirement: the building is for a fast-growing insurance company. This scheme permits the client to add to his space in 110,000-square-foot increments. Three towers—each 11 stories, 120 feet square at the base and 60 feet square at the top—will be built initially (construction to start this year). The shape of the units puts 40 per cent of the building population on the lower three floors, minimizing the vertical transportation problem. All core facilities are at the solid L-shaped walls, leaving open uninterrupted general office space typically needed by insurance companies.
AIR FORCE MUSEUM
WRIGHT-PATTERSON BAS
with exhibits designer Herb Rosenthal

This giant project, finally expected to be under construction this year, was designed to express a technology as advanced as the aircraft it houses. Visitors will enter at the narrow edge of the wedge (and at Wright's Flyer) and proceed under the cable-hung roof into a space that expands outwards and upwards until, standing under the 800-foot span of the main truss, they may see the very newest planes flying by. The entire structure is suspended from four pylons.

Structural consultant for this project is Hannskarl Bandel of Severud Associated

WESLEYAN UNIVERSITY
MIDDLETOWN, CONN.

The program in this case was to design—a site with existing buildings and many fine old trees—a fine-arts center to include two theaters, a concert hall, rehearsal halls, rooms suited for presentations of ethnic music, a cinema, a library, art studios and galleries, and classrooms. Roche's solution: this complex of very small buildings—tucked under the trees and linked with walkways and passageways—creating a sub-campus. To eliminate heavy equipment and minimize construction damage to the trees, all buildings will be constructed with a 3-foot 6-inch by 2-foot 6-inch by 14-inch lightweight (aggregate concrete) block. This construction discipline gives all the buildings within the complex the simple shapes and openings visible in the drawings at left of the concert hall. Most buildings open to controlled views of the handsome site.
U.S. POST OFFICE
COLUMBUS, INDIANA

In this design, a pilot project for regional post offices sponsored by the Cummins Foundation, the entire complex is walled in. This solution retains the traditional sense of a formal block within the town's street pattern, but screens the unsightly elements of parking lot and service yard from passers-by. On the main-entrance side, an arcade creates the same sense of dignity once achieved with broad lawns. The enclosed space will follow the standard post office plan. Construction will begin this year. Materials are local silo tile and weathering steel.

UNIVERSITY OF PENNSYLVANIA
PHILADELPHIA

The major effort in the design of this dormitory building—one of two for 250 women each—was to break the scale to a comfortable residential feeling. Thus, the space within the four-story complex is divided into 36 rooms around a stairwell. Also included, libraries, dining facilities, apartments for masters, lounges and the like. A change in the University's housing plans has halted the development of this project.

INSTITUTE FOR ADVANCED STUDY, PRINCETON, N. J.

This building—with office, study, and conference space for professors and associates—was to be sited in front of the existing Institute building (at rear in drawing), and the most difficult design problem was to relate the addition to the older building while allowing the older to be dominant. In this two-story solution, each office area has a terrace or balcony, walled to create privacy and quiet, and opening inward to community spaces. An enclosed dining court is under the center skylight, opening in both directions to sheltered courts for seminars or conversation. This solution was not acceptable to some faculty members, and the architects have withdrawn to permit the expansion to be built in the style of the existing buildings.
REPERTORY THEATER, UNIVERSITY OF MICHIGAN, ANN ARBOR

The site for this 1,450-seat theater, which is expected to be under construction this year, was the last remaining park space on campus. The building will be placed across the rear of the park where there are few trees and where it will screen the park from a powerhouse.

During the day, a wall of reflecting glass—set back from the columns to form an arcade—will create an image of additional park space, but at night when the theater is lighted, the glass will permit a view of the life of the theater inside. The 8-foot columns will support concrete beams as long as 145 feet.

RESEARCH LABORATORY, NEW YORK CITY

The design and the structural system for this high-rise laboratory grew out of the need for extensive mechanical and electrical services throughout the building. The outside columns are in pairs which enclose the service risers. Between the beams spanning to the inside columns are service runs and fume hoods.

The exterior will be precast concrete in floor-high panels. The windows will be shaded by precast eyebrows or "awnings" set within the depth of the columns, which will reach down almost to eye level and eliminate the need for drapes or blinds. The windowless spaces at the base of the tower will house the extensive mechanical equipment and storage spaces.
It is interesting to compare this design solution with the Creative Arts Center at Wesleyan (page 152), since many of the same kinds of varied spaces are called for but the solutions are very different.

At Wesleyan, the various fine-arts facilities are scattered in a complex of small buildings (for very good design reasons) while here they are organized into a single building (also for very good design reasons).

Because of its site astride the main mall, the building will form a gateway to the central campus and serve as a bridge —symbolically as well as physically—between existing humanities buildings and existing science buildings. It is sited and designed to create a constant exposure for students of all disciplines to the fine-arts facilities: a concert hall for 2,200 (drawings right), a 750-seat repertory theater, an experimental theater, a recital hall, art studios, a gallery, a library, the music school, television studios.

The design creates two different scales: the bolder and simpler on the gateway elevation; the smaller and more fractionated on the rear, relating to the scale of the smaller existing buildings leading off in both directions.
NATIONAL FISHERIES CENTER AND AQUARIUM
WASHINGTON, D.C.

with Charles Eames as program designer

The 100-foot-high steel-framed greenhouse—designed to exhibit complete ecological systems and certain to be an extraordinary environmental experience—is but one section of this complex and unique building. On the same terrace level are a variety of outdoor exhibit spaces and landscaped areas. A number of broad stairwells lead down to the lower level which houses a number of marine exhibits, research facilities, a library, offices, and orientation theaters.
I.B.M. PAVILION, NEW YORK WORLD'S FAIR

designed in collaboration with Charles Eames

This pavilion was designed not only to express the wonder of the computer world, but to prove that human-scale techniques are the basis. Visitors participated in a series of experiences within a grove of 32-foot-high steel trees designed to suggest that thin sheet steel could be used as an expressive as well as a structural material.

FORD FOUNDATION HEADQUARTERS, NEW YORK CITY

The challenge was to create an office building that would not isolate the individual in a cubicle with no sense of his working community and with no view. The large park enclosed by the C-shaped building with its 10-story-high sheer glass wall not only accomplishes the goal, but gives the passerby enjoyment. In addition, the design conscientiously observes the lines and planes created by the other buildings in the area and extends the existing public parks.

NEIMAN-MARCUS, DALLAS

The prestigious character of this store is reflected in the distinctive detailing in white brick—the flared corners of perimeter recesses, the massive parapet, and the major exterior trances from grade at both floors. The rounded projections skylighted shields admitting daylight through the windows the fitting rooms within.

ORANGERY

This fascinating greenhouse for orange trees is located at the end of a private walkway lined with trees. The building is a 25-foot cube with retractable windows and screens. A slatted skylight provides changing patterns of light on the circular rear wall.
minimum of clutter and of the rawness often associated with manufacturing plants makes this simple rectangular box a positive contribution to its community. Factory and office space are flexible working areas, each capable of extension. Where possible the interior spaces are open so that the manufacturing process is in one large room. Each girder is mounted on an 18-inch steel F plinth that rests on the main steel girder, giving a 36-inch space between girder top and roof deck for all main utility runs and 18 inches under purlins for branch utilities.
RICHARD C. LEE HIGH SCHOOL, NEW HAVEN

This strongly patterned concrete building creates permanence and dignity among dilapidated structures and rehabilitation. The school houses 1,600 students in four separate areas, each a 200-foot span modular building 136 foot by 70 foot with movable partitions, and each connected to the central library. The peripheral corridors have continuous windows above a bank of lockers. The wide overhangs, supported by colonnades of square piers, shade the glass, insure efficient air conditioning, and provide sheltered area outside. Ramps allow entrance on both levels.

ROCHESTER INSTITUTE OF TECHNOLOGY, ROCHESTER, NEW YORK

This complex of buildings presents a closed face to the grey and winter Rochester climate, but is designed to create instead a series of pleasant interior views. From the student-unit lounge (lower left in plan) students can see over the swimming pool, the gym, and the skating rink in one direction, and enjoy a winter garden in another.
These two buildings—for separate clients—are on the same site in downtown New Haven. The form and structure of the 26-story Knights of Columbus building, now under construction, grew out of an unusual program requiring floors of 10,000 square feet each, smaller than building economics normally dictate. Further, since most of the space to be used for insurance operations, operating floor space was needed. The design solution called for the unusual structural system: The core of the building contains only the six elevators; mechanical space, toilets, and stairs are housed in the four tile-clad concrete towers. The towers support 80-foot girders, which in turn support the steel floor structure.

The Coliseum includes an arena, exhibition hall, and a parking garage. A water condition and a street which had to be left open suggested using the four-level, 2,400-car garage as a roof for the other two units. Further, since a garage has a regular and orderly structure (here, 62 feet o.c.) and the arena a very special structural system, it is easier to relate the two with the garage on top. Over the column-free arena space—span of 184 feet—the garage/roof is supported by the superstructure shown in the elevation below. Construction will start this year.
NATIONAL CENTER FOR HIGHER EDUCATION
WASHINGTON, D.C.

The form of this seven-story office building clearly grows from the wedge-shaped site on DuPont Circle. The design gains strength in the narrowest though most important face by the folding back of the reflecting glass walls and the deep entrance court, sheltered by a glass roof. The open office floors wrap around and overlook an interior courtyard in which the elevator core stands free.
ARCHITECTURE FOR A CITY'S NEW IMAGE

The elegance and distinction of this city hall have special significance to the residents of Seaside, California. Not only does the handsome building house the city's administrative, governmental and police offices, but its architectural solution epitomizes the new Seaside which is replacing the unplanned, ramshackle old Seaside.

photos: Marley Baer
The building is the first city hall that the city of Seaside—a small coastal community which became a city only 14 years ago—has had. The first settlers—mainly squatters whose tarpaper shacks blighted the dunes on which they were built—did nothing to develop a community. Even the expansion—during World War II—of nearby Fort Ord did little more than add hastily built housing and tawdry commercial establishments to the unplanned, unzoned little town. In 1954 Seaside became an incorporated city, with its own government and a population of over 15,000. Zoning and building codes were enacted, a General Plan was adopted. Seaside's determination to change its public image was real and earnest. Its population has grown to over 24,000. The new city hall evidences the dignity with which the community views itself today—and with which it wishes to be viewed. The simplicity of the building—its plan is square, its four sides similar but not identical, its lines horizontal in keeping with Seaside's low-rise character—is appropriate to the scale of the area and of the community. An ivy-covered earth berm surrounds the lower of the two floors so that the building appears to sit on a promontory. Landscaping is appropriately simple, with grassy lawns around the building site, and olive trees in planters set in the berm. The exterior walls of the building are essentially alternating T-shaped concrete block columns and fixed glass panels. A 12-foot overhang shields south and west sides from sun, east and north sides from glare.
The Council Chamber is at the center of the main floor. A shallow thin shell dome 40 feet in diameter roofs its central area. Concealed lighting at the base of the dome floods the chamber with soft light which is enhanced by skylights over the corners of the chamber. Skylights also break the ceiling in the 12-foot gallery which surrounds the chamber and provides access to offices on the building perimeter.

In 1923, the year Neutra arrived in New York from Europe, LeCorbusier's *Vers Une Architecture* first appeared in book form with illustrations of American grain silos, factories, bridges and city skylines. The polemical text urged revolution in architecture. In the Twenties, America with her vast industrial resources and advanced technology, promised the means by which a truly modern architecture could be realized. Avant-garde architects of that remarkable era shared LeCorbusier's idealism, and it was surely with the spirit of a revolutionary that Neutra left the Old World for the New.

Shortly after his arrival, Neutra published a documentary on architecture in the United States. He explored in detail the new methods of construction of skyscrapers and factories: a kind of architecture then unknown abroad. At the same time he himself built radically new buildings in California by adapting similar methods of construction to his designs for houses. From this period, the Lovell House (Los Angeles, 1929) and his own residence, the VDL Research House I (Los Angeles, 1932; see below) are now fixed in the corpus of great modern buildings of the twentieth century.

Today, Neutra has still never wavered from his position that technology is the architect's servant. He would find it prejudiced to believe that technology removes man from nature. His forms have a unique style precisely because they are derived from a comprehension of the relationship of materials and technology in making meaningful forms for human accommodation. With similar understanding, each of Neutra's buildings is also conceived in relationship to its site. There is established a sensitive unity between interior spaces and the outdoors, a relation particularly meaningful to the architect, who believes that a home must fit into the given environment. To Neutra, a home is the vantage point from which one views the world, and it is through a consciousness of the world that we realize ourselves and our desires. In this way, a house becomes our "anchor" in reality.

Neutra once wrote, "I have tried as well as I could to compose my designs housing human activities with an eye to the travel of the sun, to prevailing breezes, and to relate them more sensitively to the landscape than perhaps an ancient uninhabited temple or windowless pyramid tomb had to be. This subtle relating to the landscape combined with a by no means infinite number of measures of form giving, yields a surprising manifoldness, so to speak, all over a common denominator."
VDL RESEARCH HOUSE
LOS ANGELES, CALIFORNIA

While the VDL Research House I was, in 1932, meant to be a demonstration of most progressive building methods, it showed, above all, how to build on a small urban lot of only 60 by 70 feet, and to give privacy and a feeling of spaciousness to its residents. Its design was dictated by Neutra's philosophy of an organic architecture which establishes human needs and biology as the first determinants for form. In 1932, many of the materials used were not to be found in residential architecture: pressed wood, steel sash, large amounts of glass, custom-built sliding doors, fire-enamed metal wall coverings; structural innovations included prefabricated electrically-vibrated reinforced concrete joists and a suspended arched concrete floor slab. When the house was rebuilt in 1964, certain changes were made in the interior and on the patio side of the original house design. Today, the lower floor serves as the headquarters of the Richard J. Neutra Institute; the Neutras live upstairs.

Most important, rebuilding the Research House gave Neutra an opportunity to once more explore the relationship of technology and human comfort.

The roof surrounding the glass-enclosed penthouse is flooded with water which insulates it from the hot California sun (below). More important, a certain ambience is created in which the penthouse becomes a sequestered pergola visually linked to Silverlake beyond. A number of new structural innovations were also made, mostly to insure that this second house would not burn. In Research House II, electricity becomes an important element. A new electrical system allows for versatile lighting effects, intercom-paging, stereo music, fire alarm signal and FM-TV antenna distribution throughout the house.
COVENEY HOUSE
GULPH MILL, PENNSYLVANIA

The theme of this small house is growth. Provision for change is allowed for by the spaciousness of the site and by the plan. No matter how the house may be extended—to accommodate more sleeping rooms to the east or west, or more service area to the north—the core of the house, composed of the family rooms and kitchen, remains the center of general activity.

The skylighted kitchen in this central location serves an adjacent formal dining area. Over a front counter Mrs. Coveney can supervise the children at play in the family room. Similarly, she has a view of the family room, from the laundry as well.

The house is approached from the north and one enters directly into this center of activity. To the left is the master bedroom suite, to the right is the children's wing, and straight ahead one reaches the formal living room with a place for dining. The three prongs of the house are separated by the family room, yet each is accessible through it.

All major rooms have southern exposure. The living room has an intimate sitting corner oriented around a fireplace. Both areas share the large expanse of glass and open up onto a terrace.

Architect Richard Neutra pays a quiet moment in front of Coveney's fireplace (below right). A family room filled with light can be supervised from the vantage of Mrs. Coveney's two work inters: in the kitchen and in the library (right). When the children have their meals, the kitchen counter, the right, one catches a glimpse of the dining room. The dark, recessed lighting in eaves expands the spaciousness of the living room beyond glass wall, and at night, lighting reduces window sections in the interior (upper right). A winter view of the house from the southeast—the master room wing is at the right.
HOUSE ON A WOODED SITE
BRYN ATHYN, PENNSYLVANIA

On a large, thickly wooded property, Neutra has sited this house so that it overlooks a deep valley. The house was built for a young family and had to be planned with an eye to the future, as there may be more children. The building, supported by strong boxbeams and outriggers, is adapted to a steep portion of the site in such a way that the large family rooms are adjacent to a central court at grade. The bedrooms and den, more private, quiet places, face outward toward the woods, with their windows raised substantially above the terrain.

Main entrances are reached from opposite sides of the house away from the family court. A service door is adjacent to the garage (below the terrace to the west). The formal entrance is at the south. Here, the way in is accented by a pool which reflects the southern sunlight into the hall and onto a stair leading to a circulation gallery above. In these ways, Neutra has made full use of the sloping site to define separate areas of privacy: a general entry for deliveries, a formal entry for family and guests, general activity rooms for the family with an adjacent court, and the quiet, intimate spaces for each member of the household lifted into the surrounding trees.

View from the south-west (above) shows the large terrace which extends the living room space into the outdoors (left). Beyond the terrace and separated from it by a solid masonry wall is the formal entrance into the house. The entrance hall and stairs are illuminated by the reflections off of the pool at grade. The living and dining rooms are separated by a change of level and by a low cabinet and aquarium. A garden court adjacent to the living, dining and play rooms serves as a private outdoor area for the entire family in good weather.

photos upper right and below by Lawrence S. Williams, Inc.; all others by Julius Shulman
FRIEDLAND HOUSE
SUBURB OF PHILADELPHIA

This house continues the idiom of Neutra's houses of the 20's and 30's with its taut, white masonry surfaces and long expanses of strip windows. Though there is stylistic continuity in all of the architect's work, the Friedland house clearly belongs more to the style of the VDL Research House I than any of the other houses published here. The massing of its spaces into large, simple rectangular volumes gives the building a certain serenity and monumentality which seems correct for such a large and impressive residence. Approaching from the east, the drive circles a reflecting pond and leads visitors beneath a porte-cochere. The glass entrance is the only opening in an otherwise windowless masonry wall. The two storied entrance hall, with its marble floor and elegantly spiraled stair, is in harmony with the overall impressiveness of the house. The composition of all parts of the house relies on simple, clearly defined geometric forms. In this way the house is related to the important buildings of the early Modern movement—but as in all of Neutra's work becomes a new and resourceful interpretation of his esthetic.

The spiral stair in the entrance hall (left) is constructed with cantilevered treads extending out over a reflecting pool. The pool is made in two basins, one inside the house and the other outside, and the water appears to extend through the glass entrance wall. At night the pool is illuminated from underwater, reflecting the surface of the water on the underside of the porte-cochere and giving a unique, general illumination to the entrance way. The family room (below) has a southern exposure and the dining room has an adjacent area outdoors, which is shaded by the swimming pool terrace above.
CASA EBELIN BUCERIUS
NAVEGNA, SWITZERLAND

This extensive residence for one of Europe’s foremost publishers is isolated almost 2,000 feet above Lago Maggiore in southern Switzerland. The magnificent lake view, however, becomes visible only after one has passed through the entrance hall and into the living rooms which have spacious balconies facing toward the south and east and the lake below. As in many of his designs, the architect protects the rim of such high, elevated balconies and terraces by wide and shallow “waterguards.” As reflecting pools these “waterguards” mirror the clouds during the day and at night the moonlit mountain silhouette.

All rooms of the house are skillfully oriented to some aspect of mountain landscape. At the same time, the architect has insured a feeling of intimacy in a variety of places within each room. With intimacy in mind, he has most ingeniously created a kind of cavernous, quiet pool below the house which can be utilized in all seasons.

CASA EBELIN BUCERIUS, Sopra Navegna, Switzerland. Architect: Richard J. Neutra; job captain: Egon Winkens; resident architect: Bruno Honegger
The inner and outer portions of the pool (left) are separable by pushing a button and turning up a "sub-marine" trap door. The pool is heated according to comfort. Above the living quarters of the first two floors, there is a top story and a terrace. The surrounding roofs are flooded with water, insulating the house in summer and mirroring the changes of color in the sky and the mountain landscape. To Neutra, this effect offers a visual and psychological linkage to the waters of Lago Maggiore far below; further proof of the architect's remarkable skill in relating a house to its landscape.
The fireplace is composed of a raised hearth slab and a stainless steel hood (right above). Living quarters open onto a water-guarded balcony terrace (above) where the usual protective railings have disappeared and one's view is unimpeded. The same detail exists at the windows of the private suite of master bedroom, dressing room and bath (right below).
Architecture for Industry

There are many forces for change bearing upon architecture and industry—ever-changing and more complex technical requirements, industrial-union demands, construction-union demands, the cost squeeze, and a technical design gap through which non-architectural professions are launching sorties.

“Rocketing changes in American business technology have, recent years, produced new demands on architecture and engineering for industry. Computers, new manufacturing methods, and the multiplication of product lines have created needs for new spaces. The large corporate client is a very sophisticated client, usually with engineering and management staffs well versed in current technology and continually pressing the limits of design capability.” So says a recent publication of B. A. Daly Company, underscoring the advent for all architects of new kinds of commissions calling for nationwide industrial master-planning and the design of unprecedented dimensions of space.

Gino Rossetti, vice president of architectural design for Fell & Rossetti, feels that the interest of industrial-union representatives in attending the U.I.A. industrial architecture seminar Detroit (May 19 through 25), reflects an encouraging awareness of the need for solving architectural problems implicit in management and labor’s mutual needs. These problems involve not only working conditions in industrial plants (how will all plants be air conditioned?) but also the impact of labor negotiations on construction planning. For example, the automotive industry especially, management is not able to make long-range plans in the midst of frequent changes in labor’s requirements. Further, the negotiation period itself, which in May, occurs at a critically inconvenient time—at the beginning of the construction months. It would be helpful, Rossetti observes, if labor negotiations could be concluded November, thus providing time for planning of construction based on the results.

Demands of the construction unions, observed John Andrews, director of the industrial division of Smith, Hinchman and Grylls Associates, at the Industrial Building Conference in Philadelphia, have brought the effective presence of the industrial plant owner to the collective bargaining tables of the construction contractors. Contractors insist that owners’ demands for rigid schedules, together with labor shortages, have put them in a bad bargaining position. And so, for example, electricians may well succeed in this year’s demand for a 59 per cent increase to $10.22 per hour—with other trades in hot pursuit. The result, Andrews points out, may well be increasing use of prefabricated systems to minimize field installation labor—and the increasing search by architects for new design solutions involving far more than the exterior shells of industrial buildings. Further, contracting patterns and services change critically, Andrews said, as general contractors become more and more brokers of subcontracts that call for increasing technological coordination on the part of the architect/engineer. The solution of this problem calls for more comprehensive planning and construction management firms capable of serving clients from the inception of ideas through final occupancy.

The cost squeeze, says George Heery, calls for new methods in industrial architectural design using every computerized resource to control schedules of development and construction. Using these resources, architects can perform a service well beyond the capabilities of the so-called package-dealers.

Finally, the combination of technical problems and economic forces seems to have created a gap in the available manpower of the architectural field—through which newly created organizations that have been solving similarly complex problems for the aeronautics and space industries are seeking opportunities to enter the field. While many of these organizations have much to learn in the fragmented world of the construction industry, their learning capabilities are formidable and their capacities—if honestly and professionally directed—may be welcome reinforcement for some aspects of comprehensive architectural services.

—William B. Foxhall
ASSEMBLY PLANT FOR CHRYSLER:
A GOOD NEIGHBOR, ON TIME, IN THE BUDGET

Design of an automotive assembly plant, such as this one for
Chrysler in Belvidere, Illinois, underscores the seemingly oppo­
sing actions of two major disciplines bearing upon architec­
ture for industry. First is the absolute urgency of schedule and
budget (and this $40-million complex was designed and built
in 17 months). Second is the increasing attention to human
aspects of the working environment imposed not only by the
demands of labor, but also by the economics of production
and quality control as employees respond to amenities of the
working space. An assembly plant will never be a pleasure
palace, but in modern plants the uses of color, acoustical con­
trol, air-handling, food service areas, and the like must be
given full architectural attention.

In this plant, with its appended office structure, almost
2-million square feet of manufacturing space is provided on
a 300-acre rural site. Its orientation to the highway gives it
high visibility so that the appearance, especially of the office
section, was an important consideration. Offices are fully air
conditioned.

CHRYSLER CORPORATION, BELVIDERE ASSEMBLY PLANT, Belvidere,
Illinois. Architect-engineer: Smith, Hinchman and Grylls Associates,
Inc.; general contractor: Regnar Benson, Inc.
A system of white sun screens and grey glass provide a strong horizontal shape for the two-story office structure, in keeping with the extended backdrop of the plant to which it is attached. Sidewalls and sun screens in the office area are porcelain enamel aluminum.

In the shop area, welded Warren trusses were used to reduce cost and to provide open spaces for service and processing. Precast concrete sill walls are topped with aluminum siding to reduce maintenance. A second floor mezzanine area in the plant provides space for the paint shop in which a conveyer carries bodies through painting, baking and curing operations. An electronic materials transport system on the main floor of the plant consists of a signal and tracking network embedded in the floor slab so that transport carts from the loading area are keyed to a selected destination and automatically guided by the floor system without physical contact or trolleys. Other automated handling and conveyor systems are linked to a computerized scheduling and quality control system. High-intensity process lighting is used at key points and a luminous ceiling provides 150 footcandles in the final inspection area.
RESEARCH CENTER FOR UNION CARBIDE: A BRIDGE FOR MANY DISCIPLINES

Design for industrial research deals with its own special set of disciplines: the certainty of change in processes, materials and required spaces; diversity of utilities; communication among scientists who cherish privacy for their work but demand high-grade community facilities for their families. These were some of the factors taken into account in the master plan for the Union Carbide Technical Center in Tarrytown, New York. The 300-acre site, irregularly shaped, is divided about in half by a permanent secondary highway with convenient access to the major parkway network serving its location about 15 miles north of New York City. To unify the site and to provide a central avenue of general office and utility spaces for the various divisions of Union Carbide, a long spine structure will serve as a bridge across the dividing highway and as a two-story distribution system for people and utilities. Attached to this spine, or nearby on the site, will be laboratories for the specialized divisions of Union Carbide. The first of these will bring together the now-scattered research operations of the Linde Division in a two-story laboratory building connected at the upper level to the extreme end of the spine building (far right in the air-view rendering opposite).

FOUR SERVICE CENTERS FOR ONE CLIENT: CONSISTENT QUALITY, COMPETITIVE COST

In these four distribution and service buildings for Air Reduction Company, architect Norman Jaffe met head-on the “guaranteed-price” competition of the package builder and delivered not only the square feet per dollar—a phrase well understood in the tough lexicon of industry—but with an architectural quality that has been respected and acknowledged with repeat commissions. He has solved the problems of an extremely conservative budget combined with requirements for attractive (without frills) sales and service areas in three of the buildings and a strongly expressed structural discipline in another which serves as a regional distribution and training center.

Typical of the service and sales buildings are the two shown below and at right. These buildings are used for the distribution and sale of industrial gases and welding equipment. The buildings enclose 10,000 square feet each. Fabrication of the structural beams used in the display rooms is a demonstration of the welding and cutting equipment manufactured by the owner. The webs of typical rolled sections were cut in a serrated pattern, offset and rejoined at the flat ends of the pattern.

FOUR DISTRIBUTION AND SERVICE CENTERS for The Air Reduction Company, Inc. Architect: Norman Jaffe—job captain: Costas Terzis; mechanical engineer: Herbert Hecht; structural engineers: Richard Miller (Houston) and O. C. Floyd (Atlanta).

Hartford: One of the simplest of the four buildings for Air Reduction, the sales and service building at Hartford, Connecticut, is straightforward, rectangular plan divided into the five categories of space typical of such centers: a sales area, offices, demonstration and training space, equipment storage and a separate room for cylinder refilling and storage. Exterior cylindrical forms are utilized as gas storage and cylinder refilling and storage. The steel roof deck which forms the ceiling of display rooms is turned down to form a metal curtain over a recessed product display.

Atlanta: Similar in public image to the Hartford center, this one accommodates itself to a more shallow site and includes a more extensive office area to fulfill a wider regional function. It also has a “light manufacturing” area for equipment repair and cryogenic reconstitution of oxygen, argon and welding gases. The steel roof deck which forms the ceiling of display rooms is turned down to form a metal curtain over a recessed product display.
Houston: This regional distribution center (left and right) consists of 32,000 square feet of air-conditioned warehouse space and another 18,000 square feet of office and service centers. The service area is for technical assistance to regional managers and distributors in the use of welding and cutting equipment. The column bay module (sketch below) was established to accommodate pallet racks and fork-lift maneuverability. Exterior walls 20 ft high are brick and block bearing walls with cement plaster. Stiffened pilasters are expressed with cement plaster carried to the interior. A generous overhang provides protection against the sun.

Dallas: This sales and service center provides a variation on the basic solutions shown for Hartford and Atlanta. Here the display area is designed to stand as a strong statement of stability and dependability. Using similar brick and concrete materials, the building establishes rectangular efficiency while maintaining similar cost and purpose.
WESTYARD OFFICE-WAREHOUSE: NEW LEASE ON LIFE FOR URBAN INDUSTRY

The Westyard Distribution Center, a combination warehouse, light manufacturing and office building, is under construction at 10th Avenue and 31st Street over the busy main line of the railroad approaches to New York's Pennsylvania Station. The building was designed to accommodate tenants for the various categories of space as leases were signed during preliminary phases. (Two tenants, large manufacturers and wholesalers of garments and costume jewelry who were reluctantly considering moving out of New York City, account for about half the leased space—and an ice skating club will have a year-round rink on the top floor.) The poured-in-place concrete construction, including the placement of column footings between railroad tracks, was accomplished without interruption of rail service. The problem was slightly simplified by discovery that a retaining wall and continuous bridge footing placed by the railroad in 1907 tested at over 7,000 psi strength and provided adequate support for several of the columns required to support the 12-foot-deep steel beams bridging the tracks.

Access to the building is at both first floor and second floor levels owing to sloping of the site. There are some 38 truck docking stations distributed around the building.

Warehouse and office floors generally alternate. The windows of the office floors are at floor level (see left), but those for the warehouse floors are clerestory windows above precast concrete spandrels. Panformed reinforced concrete floors and ceilings are designed for extra-heavy duty so that the mix of tenancy remains flexible.

An unusual feature of the building is a giant watertight required to control the unlikely event of flooding along the railroad tunnel approaches from the Hudson River.

Elaborate materials handling equipment includes many passenger and freight elevators with one elevator designed for 40-ton capacity, vertical and horizontal chain conveyer systems, and spiral chutes.

The flared walls on three sides of the building provide additional floor space and increase the strength of the structure. The straight wall on the fourth side is cantilevered out from the base by concrete beams beginning at the fifth floor level to overhang Port of New York Authority approaches to the Lincoln tunnel.
AN AIRLINES COMPUTER CENTER:
SYSTEMS AND SCHEDULE KEEP CONTROL

Design and construction of this computer center for Delta Airlines demonstrate some of the principles which architects Heery and Heery increasingly apply to a varied but substantially industrial list of clients: rigid attention to schedule and cost control through computerized methods of scheduling and the use of systems in construction similar to the SCSD concept. This all-electric building of 50,000 square feet of specialized space was designed and built in 271 days. There are basically three categories of space: a computer machinery room with its special floor of raised panel construction permitting access at any part for electrical and air conditioning supply to the computers; programming area where specialists can perform their duties in quiet isolation; and an office area where key-punch and other clerical operations are performed.

End-to-end phasing of the schedule, as shown in the diagram opposite, has been found by the Heery organization to accelerate completion of the project more rapidly and with much better control of costs than so-called “crash programs” of overlapping design and construction where both competitive bidding and whole-project coordination are forfeited.

The wall structure of precast concrete panels is shaped with vertical fins to provide some solar screening to reduce air-conditioning loads. The structure is designed to carry a second story, and the first story itself can be expanded by a proposed 18,000 square foot addition.

The critical electrical supply to the computers is assured by the combination battery and generating system located in a separate building on the south side of the computer center. Interior wall systems of gypsum wall board are finished in vari-colored paint and vinyl wall covering, and a colorful symbolic mural decorates the wall of the main entrance.
A ROCKET TESTING STATION: 
DESIGN FOR AN EXOTIC PROGRAM

The unusual performance program is commonplace in architecture for industry; and for the space program, unusual requirements sometimes test the limits of feasibility. Such buildings as the vertical assembly building at Cape Kennedy and the various test centers duplicating the conditions of space have extended the state of the art of construction. This laboratory for the Ames Research Center at Moffett Field evolves around a 110-foot-high vacuum test tower where space conditions can be simulated. Because of proximity requirements of support laboratories and shops to the tower, the architect points out, it became necessary to design the tower as a part of the main building mass. The tower is pentagonal in plan in order to solve requirements for sound attenuation and a pressure load of one atmosphere (2200 psf). The most efficient plan shape for these requirements would have been a circle, but the pentagonal solution was found to be the most economical design. The building also contains supporting offices, laboratories, instrument rooms and shops which are grouped around the tower in a two-story block with offices and small shops facing to the north.

structure is poured-in-place concrete. The entire building is
constructed by a concrete floating foundation since soil conditions
the testing program within the
building would not permit piles or
conventional footings. The walls of
tower are three feet thick at the
bottom and 2 1/2-feet-thick at the top,
the portion of the foundation
under the tower is six feet thick.
Structure is left exposed in all
areas except offices and special in-
strumentation rooms.
LOADING DOCKS:
A KEY DESIGN AREA

The ugly, prosaic loading dock at the business end of the industrial building has increasingly gained the attention of architects and owners with the realization that every pound of raw material and finished goods must pass across that dock. Exotic and sophisticated inplant materials handling systems have failed to pay off when they do not function as an integral part of the total materials handling system which begins and ends with the loading dock.

Design approach: the mobile-room concept
At any given minute in the United States, millions of 40- by 8-foot mobile storage rooms are wending their ways through the interstate highway system to hundreds of thousands of plants and warehouses. Thinking of these millions of trucks as "mobile rooms" which must be connected to a materials handling system gives the architect an opportunity to approach the design of a truck loading dock with a concept that covers the whole spectrum of need from the time the incoming truck crosses the property boundary until it leaves.

Specifically, components of the design problem are: 1) movement of the mobile rooms from property line to dock area; 2) positioning; 3) securing; 4) attitude of the rooms with respect to the dock; 5) lighting; 6) sealing (temporarily) the mobile room to the building; 7) joining the floors of the room and dock to permit fast, safe, efficient movement of goods.

1. Provide adequate service roads. Insufficient passing clearance, random storage of materials, poor road surfaces, poor traffic control, poor traffic patterns, and inadequate curves are too often permitted. Recommended standards exist:

- At any given dock, some trucks ride high...
- Others are below dock level.
- Reefers have thick, insulated floors.
- High-cube loads ride on 15-inch wheels.
- Dock bumpers make gaps to be bridged.
- Heavy loads depress or tilt truck floors.
- Rear steps on trucks make even bigger gaps.
- Dock height for a level driveway...
- Unloaded springs push truck beds high.

Minimum 22-foot-wide roadways for two-way traffic; 12 feet for one-way traffic. If pedestrians are involved, 26-foot widths are recommended, with pedestrian traffic separated by a cut or physical barrier. Smooth roadway surfaces should be capable of carrying 34,000 pounds on two axles. Curves should have a minimum 50-foot radius. Gate widths should be 20 feet for one-way traffic, 30 feet for two-way traffic and 36 feet if pedestrians are involved.

2. Design for positioning and dock approach. On the assumption that legal tractor-trailer lengths will go from the present 55 feet to a 60-foot average in the next eight years, a truck apron now under consideration must accommodate the 60-foot length (see table 1, page 202). Driver skill can be counted on to put a vehicle in almost any width berth you provide—four out of five times. Prudence, however, dictates a 10-foot minimum width with 12 to 14 feet far more acceptable. Each berth should be clearly marked with yellow lines extending 30 feet from the base of the dock and up the face of the dock.

Where should berths be placed? Common practice lumps both receiving and shipping on the same dock or puts shipping at one end of the plant and receiving at the other. It would seem, with today's sophisticated communications and mobile in-plant handling equipment that truck berths could be placed at several logical points around the building.

Depth of platform, as a rule of thumb, should be a minimum of 12 feet (three times vehicle width or about 24 feet for two-way traffic) measured from the rear of dockboard to nearest obstruction. If possible, the platform should be free of columns except along the outer edge.

One of the best ways to determine dock length is to calculate the tonnage which must be shipped per day, and how much can be moved across a single truck position in an hour.
when you must decide how many effective loading hours you use per day (many plants figure an average of three hours). From these data you can easily calculate the number of positions needed.

3. Secure the vehicle against movement. When the truck connected to the dock, the wheels must be chocked and jacked set. The architect should specify chocks chained to the foot of the dock at each berth.

4. Consider attitude and dock height. This is the single most important factor in design. Depending on type of operation you may have to accommodate carrier bed heights ranging from 44 to 58 inches (in extreme cases 38 to 66 inches). Obviously, the only solution is to make a survey of all trucks to be serviced and calculate the best average dock height.

5. Adequate lighting is a must. The architect should provide a minimum of 50-foot candle in overhead lighting on the dock. In vehicles, supplementary light is best provided by permanently installed dock lights designed with steel housings and shock-mounted sockets to protect the flood or spot light bulbs. They can be mounted on columns between truck positions or pendant mounted above openings. They are equipped with single- or double-arm swivel mountings so light can be directed into the truck where needed.

6. Seal against weather. Moving the roofline out to the end of the platform improves environmental control. The problem of excluding cold, wind, ice, and snow from the building can be solved in various ways: Closed overhead doors are reasonably weather-tight, and ring loading and unloading when the door is open the gap between the truck and building can be effectively bridged through the use of dock seals—canvas or rubber units which are mounted on the face of the building. Another method of enclosing the platform area is through construction of an inner wall to create a vestibule and equipping the inner wall with traffic doors. The doors are load actuated. They open only on impact, only to load width, and close immediately. It is normal to install a traffic door for each truck position.

7. Join dock and truck floors in a marriage of convenience. In the final analysis, the entire problem boils down to how effectively the architect connects the wide variety of mobile rooms to the dock. In fact, all other factors being equal, the total loading and unloading effectiveness depends on the dockboard device he chooses.

Often architects must design the dock to accommodate existing in-plant material handling equipment. With his knowledge of the dock-to-truck-height differentials, he can quickly establish the length of dockboard needed, remembering that powered handling equipment will be needed if the dockboard incline exceeds about three per cent. If slight differentials exist and shipping volume is low, the use of portable plates might easily be justified. On the other hand, where fast, efficient high-volume handling is needed, the introduction of permanent adjustable dockboard equipment is indicated.

Permanent dockboard equipment, being part of the dock itself, can be any length needed (5 to 10 feet), any width (6 or 7 feet), any capacity (12,000 to 40,000 pounds) and, of course, cannot slip or slide. Proper width is becoming increasingly important as shippers are turning to palletized loads.

**Below-dock trucks, tilt, and other problems**

When trucks with low beds back into dock facilities, dock attendants face a serious problem. Truck floors are often 12 to 15 inches below dock level, and are loaded to the doors. Under this condition, all portable plates and many permanent adjustable dockboards are of no help, since the end cannot be set in-

[Sketches below show problems of the add-on room with change of level similar to the situation that prevails at loading docks.]

A ramp should be full width of the aisle... and long enough to make a practical grade.

It should be strong enough for any load.

It should be secured against slipping.

It might go through an impact door like this.
side the truck. As a result, mechanical material handling equipment cannot be used. When this situation exists, the permanent dockboard equipment must be equipped with a below-dock-level control. This control permits the dockboard to be lowered without extending the lip. Allowing mechanical handling equipment to pick up the load.

Weak springs, uneven loads, ice and snow on the approach, under-inflated tires, etc., are the primary reasons for out-of-level trucks. When this situation occurs dock personnel are subjected to extreme hazards. When the fork lift is going into a truck, the gangplank will suddenly conform to the truck bed causing the fork truck to lurch to the left or right. This is often enough to spill the load into the trucks. Upon backing out, attendants must force the gangplank to conform to the truck bed and push or pull the cart onto the gangplank. If using a mechanical truck it will hit the edge of the gangplank, and either stop abruptly or push the plank back with sufficient force to break off the anchoring lip.

Most permanent adjustable dockboards have built-in tilt mechanisms. This tilt enables loads to move in and out smoothly and without incident. As the attendant and equipment cross the center line of the dockboard, it automatically conforms to the truck bed. Since the load, attendant and fork truck are at the center of the board they notice little change in attitude. The reverse is true as the equipment returns from the truck to the dock. Not all permanent dockboards are equipped with this feature. Some can be tilted only with extremely heavy loads. Others have tilt mechanisms which respond to pressure of less than 200 pounds.

If a truck were unexpectedly to pull away from the dock, some other means must continue to support the dockboard while the attendant can remove himself and the load. This realization led to the modern front-supported dockboard. Some permanent equipment manufacturers provide front-support by using the hinged lip itself. This is adequate only if the dockboard is above or at dock level. Others use simple telescoping posts with large cotter keys. This system requires the attendant to jump down into the driveway and hand-set the post to match the height of the incoming truck. One manufacturer has a patented system described as automatic cross-trailer legs. These hinged and notched legs work in conjunction with the hinged lip. When the lip is extended the legs retract permitting the dockboards to be lowered to its full below-dock level. When the lip drops into the pendant position the legs swing forward to provide full support. Through use of the notch this system provides for cross traffic support even if the dockboard is in the below-dock position.

Any of the above systems will work and supply the protection during normal operation. However, the biggest danger and one that almost inevitably results in death or serious injury occurs when a truck pulls out while an attendant and load are on the board. To prevent this, one manufacturer has developed what he terms a "panic stop." This device consists of a stop post with notches operating past an escapement mechanism. Under normal conditions the posts slide up and down with the dockboard, but the moment the board is accelerated downward at a rate faster than one-inch per second, the escapement mechanism locks the posts and supports the board—normal limiting free fall to less than one inch.

Permanent recessed equipment, with all the features previously mentioned, is considerably more expensive than portable gangplanks or plates. Management, aware that up to 60 per cent of its labor force is involved in material handling, increasingly agrees that the need for faster and more efficient loading have made the use of permanent dockboards an economic necessity.

<table>
<thead>
<tr>
<th>Over-all length, tractor trailer, ft.</th>
<th>Width of berth, ft.</th>
<th>Apron space, ft.</th>
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<tbody>
<tr>
<td>40</td>
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Apron space is defined as unobstructed space measured perpendicular to the dock face for (1) the unobstructed dock, 2) canopy support posts, or 3) the front wheels of other vehicles in loading position.
Sealing joints: 
the technology and the art

There is now a body of experience on plants and gaskets—their merits and efficiencies are now apparent. These modern elastomeric materials can be lored to the building application ed, but—if leaks are to be avoided—e joint must be properly designed the first place.

Robert E. Fischer

If all buildings could be made seamless, architects would be saved many headaches when it rains. But as long as buildings are assembled from a number of components there will be joints, and one way or another the joints must be waterproofed. And while the modern-day technology of sealants and gaskets is meeting some of the newer demands of buildings, this technology does not work miracles: building joints still have to be properly designed, the right material or combination of materials have to be determined, and both the building materials and joint-filling materials must be properly installed in the field.

Joint problems are hardly new, but when they occur nowadays they are generally more serious in nature. For example, the traditional glazing and caulking compounds always dry out after a time and have to be replaced. But this is expected as a matter of normal maintenance. On the other hand, if a modern sealant failure occurs, not only has a more expensive material been wasted, but the repair work is usually costly; sometimes it is nearly impossible to accomplish at all because, perhaps, of fouling of the substrate, difficulty in removing the original sealant materials, or movement that no sealant can take.

It's the reality, not the theory, that is the final test

Despite the great advances made in materials development there still is no simple, universal solution to the sealing of joints and glazing rabbets. There are just too many variations in materials combinations, climate, esthetic demands and budget requirements.

Perhaps early in the marketing of the new toxic sealants too much confidence was generated in their abilities to take large joint movements (100 per cent and more) without losing adhesion, without tearing apart, and without degrading with exposure to the weather. Laboratory conditions are not field conditions in one procedure. The sealant industry has pretty much agreed that no sealant materials should be expected to take more than a plus or minus 25 per cent joint movement, opening and closing. The point of this is that the sealant should not have to take more than 25 per cent extension or 25 per cent compression.

Elastomers compared to plastics; 
the difference is chemical

Elastomers—the basic materials used for sealants and gaskets—are defined as polymeric materials (long-chain molecules) which, at room temperature, can be stretched to at least twice their original length and, upon immediate release, will return quickly to approximately their original length. The basic difference between plastics and elastomers is that plastics have long, regular chains of molecules that intertwine and run somewhat parallel, while elastomers have long molecular chains that are cross-connected by chemical bonds along the chains. This cross-linking is known as vulcanization and results in the rubbery characteristic of elastomers. When a single type of molecule (monomer) is polymerized with others of its type, the resulting material is known as a polymer. If two different types of molecules are polymerized the resulting material is a copolymer; if three, a terpolymer, etc.

Sealants are made by compounding the basic polymer with fillers, plasticizers, extenders and coloring pigments and sometimes tackifiers (to make them stick to surfaces). They are cured to a solid state by means of chemical vulcanization or by solvent evaporation.

The basic characteristics of the sealant are, of course, determined by the basic polymer employed, and certain desirable qualities can be built into the polymers themselves—that is, a different monomer can be chosen to impart various characteristics. Beyond this tailoring by chemistry, the compounding modifies the end product to suit certain product requirements: right consistency for application, right color, right aging characteristics, right hardness and sometimes tackiness. These are the factors that architects consider in choosing a sealant.
Joints may be classified as either working or non-working. With working joints the sealant will be stressed in a combination of tension and compression; with non-working joints, shear; and with combined joints, all three types of stress. Practically, however, working joints will be subjected to the three types of stress in varying degrees, depending on the nature of the movement that is anticipated in the design. For example, take a metal window masonry wall. A sealant bead between the sash and the masonry will experience mainly shear because of the differences in the expansion and contraction of metal and masonry.

These diagrams show how stress in the sealant is affected by the shape of the bead. A square bead, pulled apart, will neck-in, and front and back faces of the bead will be stretched more than the center. With a deep, rectangular bead, the surfaces, obviously, stretch more than those of the square bead. If the stress in the surface of the bead exceeds the adhesive strength of the joint, the sealant will start to peel cause failure. The correct bead shape has concave surfaces front and back obtained by tooling the bead into a fillet and providing a curved back-up material behind.

The sealant bead should never be allowed to bond to the bottom of the joint; otherwise, stress concentrations may occur causing the sealant to tear. A fillet bead in a corner joint can be a source of trouble. If at all, a feathered edge is a worst spot. Also, if the bead adheres both abutting wall materials it will tend to tear. If such joints are avoidable, then back-up material should be placed behind the back-up beads and the bead should have a concave shaped. A better approach, of course, would be to have a larger joint so that a regular bead of sealant can be used.

gaskets and tapes: not foolproof

Plastic and extruded rubber gaskets have been used mainly for sealing lights of glass, or joints between metal parts, although casually they have been employed in joints between precast panels. These gaskets are of two principal types: 1) compression gaskets that are put under pressure by means of the glazing stop used with the window sash and 2) structural gaskets, which, themselves, hold the lights of glass and resist movement due to wind. These gaskets are put under pressure by means of a zipper strip that may or may not be part of the gasket itself. This zipper causes the gasket to be expanded in such a way that the edges of the gasket grab the glass.

While gaskets might seem foolproof, care must be taken in their application to assure a weathertight seal, to assure resistance to forces caused by wind and to assure proper installation without ripping of the gasket.

When structural gaskets are used, construction tolerances must be kept under good control, and all surfaces to which the gasket is to seal must be smooth. If there is too much clearance between the edge of the glass and the gasket, wind forces will rotate the gasket. When this happens, the sealing lips may lose contact with the surfaces of the glass or frame; worse, if there is insufficient "roll-out" resistance, the glass may even be blown out. On the other hand, if insufficient edge clearance is provided, the glass may crack due to differential movements. Structural gaskets sometimes have shop-molded corners, and all in one piece, like a picture frame. Originally these corners had 90-degree angles, but this sharp-molded corner has given way to new designs because with the sharp corner, insertion of the zipper piece caused the corner to lift, opening the way for leaks. One type has a thin-radiused lip molded inside the square corner, a second has a completely radius corner.

The sealing tapes are either non-vulcanized polybutylene or polysobutylene or partially vulcanized polysobutylene. Because the non-vulcanized tapes are not resilient, they cannot be used where much movement is expected; thus, they are generally employed in non-working joints. Partially vulcanized tapes are frequently used in glazing joints. While they are moderately resilient, these tapes should be kept under compression by a glazing stop, by the pressure of some solid elastomeric material, or by a combination of both.

Rainproofing the exterior wall: the new way uses a double barrier

Buildings have always had joints, and joints have often had leaks, at least to some degree. But traditional masonry buildings didn't place such severe demands upon the integrity of joints, as do many buildings of today—whether they be faced with lightweight metal and glass skins or with precast concrete panels.
Glazing gaskets have taken on a variety of configurations to suit a variety of functional and esthetic requirements. One of the most common types is the structural gasket, a spin-off from the automotive industry. This gasket not only has to seal the rain but must withstand wind forces as well. Tolerances are important because too much clearance between edge of glass and the bottom of the gasket may result in "roll-out" of the gasket which can lead to loss of glass from wind forces. One type of H-gasket made the same width as the mull head and sill members so that a two-element system, the gasket appears to be the only glazing element.

At left is an L-shaped channel gasket used in the Ford Foundation building. The short leg of the gasket is on the exterior face of the glass; a needle bead of sealant provides assurance against the penetration of rain. With this combined technique very little sealing material is visible.

Composite seals frequently are used with glazing, i.e., several materials are employed in one joint. In some cases this means more efficient, thus less costly, use of materials. In other cases it may have been the most logical solution, considering the nature of the window surround. For example, the details at the immediate left show the glazing details for the in-situ facade used in the Earth Sciences building at M.I.T. architect I. M. Pei. The use of deep rabbet at the sill and deep sweep in the jamb allow some variation in field dimensions. Foam takes up space; tape cushions the glass on exterior face; neoprene rope squeeze glass against tape; sealant shuts out weather. Tape, which remains tan, is left exposed only at the head where dirt will not settle as readily. Because neoprene rope tends to snake around in the glazing slot during application, material should preferably have shape and depth so that glazier can drive the material "home" so it is neat, and little tape is wasted.

Credits: All drawings except Ford Foundation detail and large H-gasket system by Kawneer.
It is the realities of building movement and field tolerances that have caused some building researchers and manufacturers to seek other methods than making the outer skin of a building water-tight by increasing the thickness of the outer wall. They say that any slight "break" in the exterior wall spells trouble. Thus, some people suggest that the outer cover of a building—the wall and even the dow sash—serve only as a "rain screen" to divert the main portion of the falling water; then, means are provided to weep any moisture that does penetrate the outer barrier. The interiority of course must be fully waterproof.

One of the physical principles employed in this technique is "pressure equalization." The idea is this: When the outer air pressure serves as the sole barrier against penetration and something happens to the seal, rain can be forced through the joint because of a difference in air pressure between the outdoors and the indoors or the void behind the joint. If, however, there is a void behind the joint ch is open to the atmosphere, no difference exists, and the order that can enter will be that due to driven rain, and as mentioned above, this is drained from the cavity. Various joint designs have been eloped to reduce rain penetration into "open" joints.

The rain-screen approach is not without its negative points:

1. Wall designed this way may be more complicated. It does not necessarily follow that the wall must be double—in some cases a pressure-activated seal is employed at the joints. But these joints sometimes are not visible in configuration and may present difficulties if a sealant material has to be elched far back in the joint to act as the final water barrier. Also it may not be visible for inspection. When the rain screen consists of a cavity wall, care must be taken that the inner wall has vapor barrier; otherwise there is the menace that in winter, humidity from air inside the building might pass through the wall, condense on the cold outer face, and perhaps even lead to the formation of icicles.

2. Joints in single-wall elements: at makes them work—or fail?

The rain-screen idea has its advantages, many designers will continue to use single wall elements. Since there is only one line of defense, there can be mistakes in joint design, sealant selection, or sealant application. If the joints are to be working joints, then the care and extent of movement must be determined as accurately as possible, and the joint spacing sized accordingly.

Over 90 per cent of sealant failures, it is said, are adhesives. It is also said that most of the failures are caused by the lack of a primer, by poor primer application, by a joint contaminated with dirt, or by the joint being damp. Other adhesives (as well as cohesive) failures may be caused simply by too much joint movement so that no bond could be expected to hold. A different adhesives may be required for masonry than for metals and glass to increase adhesive bond. The only commonly used sealant that does not require a primer is the solvent-release acrylic terpolymer which "wets" the joint.

A sealant bead should have a concave shape—preferably inside and out—to help minimize chance of adhesive failure. For this reason, and also sometimes to prevent bond to the back of a joint, a back-up material is required behind the sealant (this also keeps too much sealant from being pumped into the joint and wasted).

Joint size is critical in the application of sealants because it affects the relative movement of the joint, and thus the severity of the stress imposed on the sealant. In the extreme case of a hairline crack, almost any opening represents infinite movement. Small butt joints between sections of aluminum are impossible to seal.

Sealant manufacturers recommend that no joint be less than ¼-in. because the caulker will not be able to get the material into the joint. The best recommendation is that joints be designed as generously as possible. The sealant bead should never be deeper than it is wide. For joints over ½-in. wide, the depth may be one-half the width. For joints over 1-in. wide, the depth may be one-third the width.

Preferably, caulking should be done when the temperature is moderate. In colder weather there may be frost or condensation on the joint which will prevent adhesion; in the hottest weather the joint will be in its closed position.

The back-up material should be a compressible material that is compatible with the sealant and that will not bond to the sealant. Some of the recommended materials include resilient, rope- or bead-type foams of expanded polyurethane or polyethylene. Butyl and neoprene cellular rubbers may bond to sealants and/or discolor them; oakum or bituminous-impregnated materials should not be used.

Compatibility with sealant compounds is an extremely important characteristic for both back-up materials and for tapes used in composite seals.
The "rain-screen" principle maintains that the exterior face should not be the sole barrier against rain penetration. Rather, proponents of the "rain screen" principle state, the exterior skin should ward off most of the rain, and inner barriers provide a final moat as well as an air seal. Basically, the concept is an air pressure equalization chamber which prevents pressure differential between atmosphere and the interior of a joint. When a sealed joint in the exterior face of a wall is the only barrier, it is said that a pressure difference between outside and inside force water right into the joint. When a slight defect occurs in the joint, sometimes the rain screen concept of a baffle set in a slot forms two adjacent pieces of precast concrete.

Sometimes no baffle is used at all. Instead, a cavity wall is employed and only a hairline joint is left between panels. The exterior face of the wall then keeps out the rain; the air chamber behind the joint equalizes pressure across the joint. Any water that does get through will drip down the inside face of the wythe. The same idea can be applied to window sash and metal and curtain walls. Window sill is slotted at the bottom to equalize pressure; a gutter behind traps water that gets by. Window rounds are vented to the outside as are the spaces immediately behind column covers.

The reason is that some sealants are adversely affected by oils and plasticizers. These sealants may lose adhesion and even erode to a gooey mass; remedial work then is difficult and expensive.

Some of the major problems encountered in the field:

1. Joints difficult for the caulker to reach.
2. With precast concrete panels, the joint may be too small for the caulker to reach.
3. Joints larger than the caulking contractor bid on; he may try to make profit by skimming on the job—no mixing, for example.
4. Improper tooling, i.e., no tooling or use of wrong tooling compound.
5. Skinned bead, i.e., only a surface of sealant is applied by the caulker.
6. Improper priming—no priming, primed priming, wrong primer.
7. Improper jointing—no jointing, improper jointing, wrong primer.
8. Improper mixing of two-part sealants.
9. Caulking beyond pot life of the sealant (poor adhesion).
12. Incompatible waterproofing materials.

Before building starts it would be advisable for the architect to hold informal group meetings involving all participants in the wall construction to iron out any potential problems.

The building details are in any unusual, the caulking contractor would be asked to apply sealant to a ge-ge-ge-ge-enough area to demonstrate the method of joint preparation, material mixing, application and final cure. Thus there are any problems to be ironed out that can be taken care of in the beginning of the job.

Sealing sealant properties—standards and government specifications

The characteristics of sealants that architects should be most concerned about include: 1) extension and compression, plus or minus 25 per cent without adhesive or cohesive failure of the sealant; 2) sealant modulus (ease of stretch), initial and aged material; 3) change in hardness with age; 4) tack-free time (the sooner the sealant is tack-free, the less dirt it will collect because of the surface stickiness; 5) materials non-staining when applied to masonry surfaces; 6) weather resistance (ultraviolet radiation).

All of these characteristics are covered in existing standards and Federal specifications except the compression-extension test. Currently the only test for movement is a bond-cohesion test. The Federal specification requires that prescribed samples be oven dried for 24 hours, immersed in water for seven hours, placed in a zero-degree cold box for eight hours and then extended 150 per cent at the rate of 33 per cent per hour; this is done for three cycles.

The National Bureau of Standards, which developed the Federal specifications for one- and two-part sealing compounds for the General Services Administration (TT-S-230a and TT-S-00227c) is considering revising its cycling test to include a dynamic testing procedure in which the sealant will be extended and compressed automatically to 25 per cent of its width a number of times per hour. The heat-aging portion of the durability test would include compression of the samples to 25 per cent of the width. The cycling might be repeated as many as nine times.

The USASI Standard 116.1, covering two-part sealants, revised, approved by ASTM in January, and published in April, is now very similar to Interim Federal Specification TT-S-227b except that the cycling test involves no heating or immersion.

Some of those who have been close to standards preparation and testing procedures feel that existing tests may not be wholly realistic—that more meaningful tests would include test performance under shear loads, as well as more reliable means for predicting sealant durability. One polymer manufacturer has developed a computer program which he believes capable of accurately predicting sealant performance when fed the data on only a few basic tests. The idea has also been advanced that perhaps movement in testing should not be by mechanical means, but by the temperature effects on a liquid, so that perhaps movement might be more closely related to temperature change. The point to keep in mind, however, is that any test procedures that are developed must be capable of being reproduced in any of the commercial testing laboratories—the equipment can be neither too complicated, nor too expensive.
### Glossary of sealant and glazing terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Adhesive Failure</strong></td>
<td>Failure of a compound by pulling away from the surface with which it is in contact (see cohesive failure).</td>
</tr>
<tr>
<td><strong>Back Up</strong></td>
<td>A material placed into a joint, primarily to control the depth of the sealant.</td>
</tr>
<tr>
<td><strong>Base</strong></td>
<td>The general composition of a compound, such as vegetable oil, polysulfide, acrylic, silicone, etc. Also, in a two-part compound, the major unit of the compound to which a curing agent or accelerator is added before use.</td>
</tr>
<tr>
<td><strong>Bead</strong></td>
<td>A sealant or compound after application in a joint, irrespective of the method of application, such as caulking bead, glazing bead, etc. Also a molding or stop used to hold glass or panels in position.</td>
</tr>
<tr>
<td><strong>Bleeding</strong></td>
<td>The absorption of oil or vehicle from a compound into an adjacent porous surface, different from migration, which is the spreading or creeping of oil or vehicle from a compound onto an adjacent non-porous surface.</td>
</tr>
<tr>
<td><strong>Bond Breaker</strong></td>
<td>A release type of material used to prevent adhesion of the sealant to the back-up material or back of the joint.</td>
</tr>
<tr>
<td><strong>Chemical Cure</strong></td>
<td>A change in the properties of a material due to polymerization, or vulcanization, which may be affected by heat, catalysts, atmospheric pressure, or combinations of these.</td>
</tr>
<tr>
<td><strong>Cohesive Failure</strong></td>
<td>Failure of a compound when placed under a strain in which, because of insufficient elasticity and elongation, the compound splits and opens.</td>
</tr>
<tr>
<td><strong>Compound</strong></td>
<td>A formulation of ingredients usually grouped as vehicle and pigment, to produce some form of sealant, such as a glazing compound, caulking compound, elastomeric joint sealant.</td>
</tr>
<tr>
<td><strong>Curing Time</strong></td>
<td>The time required to complete the chemical reaction of a product to reach its final physical form as a result of the chemical reaction.</td>
</tr>
<tr>
<td><strong>Elasticity</strong></td>
<td>Pliability, ability to take up expansion and contraction; opposite of brittleness.</td>
</tr>
<tr>
<td><strong>Elastomer</strong></td>
<td>An elastic, rubber-like substance which may either occur naturally or be produced synthetically.</td>
</tr>
<tr>
<td><strong>Elongation</strong></td>
<td>The amount of stretch exhibited by a compound, before rupture.</td>
</tr>
<tr>
<td><strong>Filet Bead</strong></td>
<td>Placing caulking or sealant in such a manner that it forms an angle between the materials being caulked.</td>
</tr>
<tr>
<td><strong>Gasket</strong></td>
<td>A preformed shape of rubber or rubber-like composition used to fill and seal joints or openings, either alone or in conjunction with a supplemental application of a sealant.</td>
</tr>
<tr>
<td><strong>Gun Consistency</strong></td>
<td>Compound formulated to a degree of softness suitable for application through the nozzle of a caulking gun.</td>
</tr>
<tr>
<td><strong>Heel Bead</strong></td>
<td>Compound applied at the base of channel, after setting light or panel, and before the removable stop is installed, its purpose being to prevent leakage past the stop.</td>
</tr>
<tr>
<td><strong>Knife Consistency</strong></td>
<td>Compound formulated in a degree of firmness suitable for application with a glazing knife such as used for face glazing and other sealant applications.</td>
</tr>
<tr>
<td><strong>Mastic</strong></td>
<td>Descriptive of compounds that remain elastic and pliable with age.</td>
</tr>
<tr>
<td><strong>Migration</strong></td>
<td>Spreading or creeping of oil or vehicle from a compound out onto adjacent non-porous surfaces, as contrasted to bleeding which refers to absorption into adjacent porous surfaces.</td>
</tr>
<tr>
<td><strong>Needle Glazing</strong></td>
<td>Application of a small bead of compound at the sight line by means of a gun nozzle about ( \frac{1}{4} ) in. by ( \frac{1}{8} ) in. opening size.</td>
</tr>
<tr>
<td><strong>Polymer</strong></td>
<td>A material which has been polymerized from smaller molecules into longer molecules, or chains. This can be done by addition or condensation reactions.</td>
</tr>
<tr>
<td><strong>Primer</strong></td>
<td>A special coating designed to enhance the adhesion of sealant systems to certain surfaces.</td>
</tr>
<tr>
<td><strong>Sagging</strong></td>
<td>Caused by compounds not capable of supporting their own weight in a joint, or by application in joints larger than the compound is designed for, or by improper application.</td>
</tr>
<tr>
<td><strong>Sealant</strong></td>
<td>Compound used to fill and seal a joint, as contrasted to a sealer which is a liquid used to seal a porous surface.</td>
</tr>
<tr>
<td><strong>Setting Blocks</strong></td>
<td>Use of small blocks made of neoprene (preferred), wood or lead to distribute weight of glass or panel to strong point of sash, aid in centering glass or panel and preventing glass to metal contact.</td>
</tr>
<tr>
<td><strong>Shore &quot;A&quot; Hardness</strong></td>
<td>Measure of firmness of a compound by means of a Durometer hardness gauge. Range of 20-25 is about the firmness of an art-gum eraser. Range of 40-45 is about the firmness of a rubber heel.</td>
</tr>
<tr>
<td><strong>Shrinking</strong></td>
<td>Deficiency of a compound, when it occurs excessively, in which the applied bead loses volume and contracts, by evaporation of solvent, or loss of oil or vehicle into a porous surface, etc.</td>
</tr>
<tr>
<td><strong>Sight Line</strong></td>
<td>Imaginary line along the perimeter of lights or panels corresponding to the top edge of stationary or removable stops, and the line of which sealants contacting the lights or panels are sometimes finished off.</td>
</tr>
<tr>
<td><strong>Spacer Shims</strong></td>
<td>Devices that are U-shaped in cross-section and an inch or more in length, placed on the edges of lights or panels to serve both as shims to keep the lights or panels centered in the sash or frames, and as spaces to keep the lights or panels centered in the channels and maintain uniform width of sealant beads. Usually made of rubber.</td>
</tr>
<tr>
<td><strong>Spacers</strong></td>
<td>Small blocks of composition, wood, rubber, etc., placed on each side of lights or panels to center them in the channel and maintain uniform width of sealant beads. It prevents distorting the sealant excessively.</td>
</tr>
<tr>
<td><strong>Tooling</strong></td>
<td>Operation of pressing in and striking a compound in a joint in order to press compound against the sides of a joint and secure good adhesion. Also the finishing off of the surface of a compound in a joint so that it is flush with the surface.</td>
</tr>
<tr>
<td><strong>United Inches</strong></td>
<td>The addition of the dimensions of one length and one width of a light of glass.</td>
</tr>
<tr>
<td><strong>Weeping</strong></td>
<td>Failure of a compound to support its own weight in a joint, but less pronounced than sagging.</td>
</tr>
<tr>
<td><strong>Wrinkling</strong></td>
<td>The formation of wrinkles in the skin of a compound during the formation of its surface skin by oxidation after application.</td>
</tr>
</tbody>
</table>
PROFILITE

GLASS that could change your thinking about design, lighting, strength, heat and sound insulation

PROFILITE

lets you use glass as never before

MISSISSIPPI GLASS COMPANY

For more data, circle 108 on inquiry card
PROFILITE

PROFILITE
the channel-shaped glass
that brings a fresh n e w c o n cept in daylighting practice
You need to think differently
about glass to bring Profilite into
your building plans. With it you
have new design possibilities.
It also offers new structural efficiencies. Picture the rising
channels of Profilite giving their
upsweep to building exteriors.
Look down corridors where vast
stretches of glass wall let in
more light and stand strong
without any framing to get in the
way of the repeated vertical
pattern.

BOLD V E R T I C A L LINES
add decorative effect
The adjoining flanges of the
channel-shaped sections of Profilite eliminate the need for
muntins . . . save this cost and
provide attractive wall sections
that are easily maintained. The
vertical accent gives height emphasis to interiors and the glass
helps distribute daylight for a
more spacious feel in the environment. Each vertical line not
only adds its heightening effect
but also signifies built-in strength
of Profilite.

C H A N N E L E D SECTION
so easily handled two men
can install

Profilite sections are just undd
12 inches in width ( l l ^ ' O - Th
stock lengths of 8, 10, and 1:
feet are easily handled by tw|
men without special equipmenProfilite weighs 4.34 lbs. pe|
linear foot, so a ten-foot sectioi
could be lifted and set in plac|
by one man if necessary am
easily by a two-man team. Prd
filite is set in anodized aluminun
sills supplied as part of thi
Profilite glazing system. Slip-ii
vinyl inserts seal the areas bej
tween metal and Profilite glasf
channels.


CHANNEL MOVEMENT helps compensate as building shifts or settles
Profilite sections, because of their channel linkage, can move in relation to each other without tension. And there are no rigid metal members in between. Profilite’s “flange joints” are cushioned top to bottom by non-hardening sealants or vinyl insets. The seal is positive, yet the glass is free to contract, expand, or move vertically. Profilite is thus especially suited for glazing buildings that may tend to settle.

SO STRUCTURALLY STRONG it’s practically self-framing
Profilite has proved it withstands substantial wind pressures and suction forces. The structural configuration of each section forms extra strength every foot of the way. It is so resistant to lateral pressures that you do away with vertical members necessary in conventional glazing. You enclose vast stretches of wall areas, “channeling in” Profilite that builds in extra strength section after section.

GIVES PLANTS CURTAIN WALL LOOK
Profilite’s biggest volume use at present is for exterior walls where its vertical lines give a curtain wall effect. Installed cost compares favorably with that of conventionally glazed areas. Double-glazed Profilite forms a 1\(\frac{1}{2}\)" air cushion between inner and outer channels for heat and sound insulation—U-value 0.55; visible transmittance 72%.

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PROFILITE EASY TO INSTALL

With Profilite you have a complete glazing system. Aluminium framing for periphery, jambs, heads and sill and vinyl setting blocks and slip-ins all supplied for double or single glazing.

SINGLE GLAZING

1 Extruded aluminum periphery frame.  2 Vinyl setting block.  3 Vinyl slip-in.  4 Bent aluminum section.  5 Profilite.  6 Extruded aluminum sill snap-on.  7 Vinyl roll-in.

DOUBLE GLAZING

For more data, circle 108 on inquiry card
Furniture and partitions for office flexibility

More and more offices require interiors that can be readily altered to accommodate changes in personnel and operations from time to time. Three manufacturers offer suggestions here.

The Omni Plus system for custom signing (upper left) features extruded aluminum rails and brackets which allow complete vertical and/or horizontal closure of space. The system can be arranged and re-arranged to form work study areas as shown. Component pieces, files, panels, work surfaces and organizers are available in a variety of materials including fine walnut veneer, ear or bronze glass, plastics and laminates.

Omni/Aluminum Extrusions, Charlotte, Mich.

Circle 300 on inquiry card

Fitting together matching components of the Artwood System (photos right) makes possible the exact amount of work surface, file area and storage space needed by each employee, instead of all having to conform to a standard desk unit. And as work requirements change, alterations and additions can be made. Included in the system are a bin file, which opens from the top, and wastebaskets contained within the desks. The result is a versatile furniture layout that can assist in the most efficient use of manpower in the minimum space.

Massey-Ferguson Inc., Des Moines.

Circle 301 on inquiry card

Panel dividers (lower left) can be firmly attached to backs or sides of desks, returns, tables or file cabinets to create rows of individual cubicles or semi-private bays, which may be changed easily and quickly. In addition, the dividers can be free-standing with two, three, or four panels connected at right angles to the same post, and can be joined together end-to-end for any length. The all-metal sections have honeycomb cores for lightweight strength, and help to wall out noise without interfering with air conditioning or lighting. Panels are enameled in a choice of colors, trimmed with chrome, and come in lengths of 20, 30, 45, 60 and 66 in.

Art Metal Inc., Jamestown, New York.

Circle 302 on inquiry card

More products on page 226
I PRACTICAL GUIDE TO PERFORMANCE ENGINEERED CARDOX CARBON DIOXIDE FIRE EXTINGUISHING SYSTEMS

Cardox has compiled a complete A.I.A. File 29-E which includes fundamentals of carbon dioxide fire protection, descriptive and technical data on Cardox Fire Protection Equipment and specifications guides. Architects and design engineers who have used this file report the savings of countless design hours in the planning of fire protection systems for all types of constructions...industrial, commercial, municipal and institutional. Be sure you have this valuable information on hand when preparing the plans for your next project...write today for your copy of A.I.A. File 29-E. Address your request to CARDOX, Division of Chemetron Corporation, Chicago 11, Illinois.

FOR MORE ASSISTANCE...

"Hot spot" hazards occur in virtually every building. Protect them by providing Cardox special hazard Fire Protection in your plans. Your Cardox representative will gladly assist you in determining the proper fire protection for your building projects...call him today; no obligation, of course.

CARDOX
Performance-engineered carbon dioxide fire protection systems

All-aluminum railing systems are high in style, low on maintenance. Ideal for balconies, stairways, entrances, even rooftops and sundecks.

Now, Anchor® protects and beautifies...from the ground up.

Anchor all-aluminum railing systems and Privacy fencing bring you new dimensions in security and styling. Anchor railing systems, in a variety of decorator colors, extend their attractive protection from the ground up...railings for balconies, entrances, stairs, traffic control, indoors or out. Anchor all-aluminum Privacy fence comes in many handsome colors...to conceal, protect, and add beauty. For more ideas to color your thinking, see our new 12-page booklet. ANCHOR FENCE DIVISION, ANCHOR POST PRODUCTS, Inc., BALTIMORE, MARYLAND 21224. Plants in Baltimore, Houston, Los Angeles; 48 branch offices.

All-aluminum board-on-board Privacy fence, in baked-on enamel colors, provides protection, attractive appearance, concealment. Available with barbed wire arms.

Anchor Fence, Dept. C-05
6500 Eastern Ave.
Baltimore, Md. 21224
Please send 1968 "New Dimensions" color booklet.
Name______________________Title____
Firm______________________
Street______________________
City______________________State____Zip____
Please list applications that interest you:
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Thank you.

For more data, circle 109 on inquiry card

For more data, circle 110 on inquiry card

For more data, circle 111 on inquiry card
Introducing luxurious deep-pile carpet squares loose-laid and totally interchangeable.

Heugatiles are a totally new concept in wall-to-wall carpeting. This dramatic new texture brings its own excitement to every application. WIRA abrasion tests prove Heugatile outwears the finest Wilton or Axminster better than 3 to 1. This combined with interchangeability that equalizes wear patterns means your Heugatile wall-to-wall installation can retain its beauty far longer than the floor coverings available until now. 1,440 square yards of Heugafelt was installed in 1/2 a day in the sports palace pictured at the left. Although loose-laid, the squares are so thick and the fit snug a 75 piece marching band didn’t budge a one during the opening ceremonies and the acoustical qualities enhanced the music. Because Heugatile is loose-laid, no adhesive or tacking was necessary. Later the same 1,440 square yards were picked up and packed for storage in less than 3 hours. Cigarette burns brush away with a whisk broom. The majority of stains can be removed by gentle rubbing with a cloth dipped in lukewarm water and mild detergent. In the event of serious damage such as spilled acid, the Heugatile square can be moved to a less visible spot or simply replaced. Heugafelt is the original loose-laid carpet-tile totally interchangeable by hand. Two Heugatile products, Heugafelt and Heugafloor, are available through 1968 within a 200 mile radius of Newark, the San Francisco Bay area and Toronto. Contract dealers needed, please write or phone.

Please visit Booth 825 at Contract ’68, New York Coliseum, June 4, 5 & 6.
ROOF INSULATION / A cellular glass insulation achieves both built-in slope and constant insulation value in one application. The system uses a flat roof deck; to achieve the slope, tapered blocks of varying thickness are placed in a predetermined pattern, sloping toward the drain. They can be placed over concrete, steel or wood decks. The application is made by laying the blocks in a mopping of hot asphalt or pitch.

- Pittsburgh Corning Corporation, Pittsburgh.

ELEVATOR SYSTEM / L. W. Armitage, a Sydney, Australia engineering firm, has designed a system that eliminates button and top-floor elevation. Instead, the passenger presses a destination button on a per-floor basis, which elevator will be stopped on. With this system, any of the elevators can be placed side by side. Photo is a composite showing destination panel and buttons for a single elevator. Destination panels are above each elevator door and can be set with a single set of buttons for each floor. The system utilizes existing machinery, cars and auxiliary devices. (Australian Government Department of Trade and Industry.

REPLACEMENT WINDOW UNITS / A double-hung aluminum window unit system is being installed in the structurally sound century-old brownstone apartments in Brooklyn's Park Slope North district. The system can be adapted to any opening, even if the area is warped. - Season-All Industries, Inc., Indiana, Pa.

For more data, circle 115 on inquiry card
What they definitely need today

The new SCHLAGE DOUBLE SECURITY ENTRANCE LOCK. It provides extra inside-and-out deadbolt security. It has a recessed cylinder. It has an armor-plate shield... has a free-spinning outside knob and a roller bearing in the deadbolt. It is a “panic-proof” lock that opens instantly with one twist of the inside knob. This lock resists being jimmed, sawed, pried, punctured or drilled!
COLD STORAGE SYSTEM / A system called Glas-Gard which employs lightweight substructures with metal siding and roof, in combination with permeable insulation, prevents vapor dams, roof failures and maintenance shutdowns. Components include a steel structural frame, non-conducting studs and purlins, a free-hanging vapor barrier, wall and ceiling insulation, and interior finish materials. The system provides protection from thermal shock, allows moisture flow-through, and is light in weight. • Owens-Corning Fiberglas Corporation, Toledo, Ohio.

Circle 306 on inquiry card

Thats all there is to know about long-lasting sealants.

Insist on a DPM-1002 polymercaptan resin base for sealants that last. They're smooth-flowing and easy-to-tool. With rapid skinning and curing to save construction and finishing time.

Test formulations for Federal Specification TT-S-00230 (single component systems) show as little as 1.7% weight loss. Moisture absorption and age hardening figures are just as exceptional. Sealant elongation was up to 430%, with up to 97% recovery. And there's more.

Get full details, and a list of manufacturers who base their sealants on DPM-1002, from Diamond Shamrock Corporation, Polymercaptan Resins, 300 Union Commerce Building, Cleveland, Ohio 44115.

For more data, circle 127 on inquiry card

M ICROFILM READER / A lightweight 16-

mm unit makes possible individualized
data systems located at the desk. The
instant-access cartridge contains 4,400
pages of product information. The sys-
tem provides "all the data and the sam-
indexes as the 16-mm Data Center at a
much lower cost, and a section or sec-
tions of the file applicable to a specific
design specialty for as little as $348 per
year. Specialized sections include "Elec-
trical," "Mechanical," "and Architectural
& Structural." • Information Handling
Services, Inc., Englewood, Col.

Circle 309 on inquiry card

LIGHT DIMMING PANEL / Panel Board

Incandescent light dimming system is
completely self-contained, except for
control stations, which can be remote,
located up to 2,000 feet from the main
power modules. Units are capable of
controlling loads of a maximum of 14,400
watts for 120/240 single phase or 120/208
three phase service. Load may be incan-
descent lamps, quartz iodine, or any
resistive power load such as heating
elements. Each circuit is protected by a
20-amp circuit breaker, and units are
available in up to eight 15-amp circuits
as well as in units of three, four, and six.
• Hunt Electronics, Dallas.

Circle 310 on inquiry card

For more data, circle 126 on inquiry card
Meet our 30-ton baby.

It's just one of 15 basic models of our Duopac gas heating/electric air conditioning unit. It's neat. Compact. Light. Lies unobtrusively low on ground slab or rooftop. From 1½-ton to the new 30-ton with 2-stage, separate-circuit cooling variations, Duopac runs quietly. Under all kinds of climatic conditions. With varying heating/cooling ratios. With 2 high-quality cast iron compressors. And multiple units give zone control, individual operation and easy service. Well over 50,000 Duopacs are delivering these benefits in every state. Mail the coupon, and see how Duopac can fit into your plans perfectly—including a very big boost on final sale.

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Send your brochure on the Duopac product line plus complete information on Day & Night heating and air conditioning.

Name ____________________________
Company ____________________________
Street ____________________________
City ____________________________ State ______ Zip ______

For more data, circle 182 on inquiry card

ARCHITECTURAL RECORD May 1968 246C
Proven perfect answer for specifiers for carpeting areas with wheel activity...

Direct glue-down installation of double Jute-backed carpets

Nothing could be simpler. Double Jute-backed carpet cemented directly to the floor...new or old concrete or wood. Or over previously installed resilient flooring. No cushion back on the carpet. No padding under it.

Works perfectly, as Ford Motor Co. proved in a two-year test in Dearborn. Ford is now practically standardized on this technique in new office building construction and for replacements in existing structures.

Benefits
The acoustical qualities, esthetics, luxury and thermal advantages of carpet...plus easy wheel and caster movement. Conventional wheels and casters can be used. Pads are unnecessary under chair casters if carpet pile is of good commercial grade.

Savings
Double Jute-backed carpets cost substantially less than cushion-backed carpets with equal pile specifications...or equivalent carpets plus separate underlayment. Installation is greatly simplified.

Jute's function
Jute secondary backing is vital because it provides maximum floor bond. This quality also guards against delamination of the secondary backing from the basic carpet. Jute's greater stability prevents carpets from shifting, which can misalign floor outlets with cut-outs in carpets.

Applications
Use in any location where free movement of conventional wheels and casters is desired. General offices, hospitals, libraries, supermarkets, computer areas, restaurants, etc.

Taking up
When replacement is necessary, Jute backing comes off easily with solvents or fast-operating scrapers. None of the removal problems common with cushion backing, such as crumbling and sticking.

Write for complete copies of editorial features shown, plus outline of glue-down installation technique and additional material.
The Cold Hard Facts of Lab Research:
Starting Point for Steel Joist Improvement

An aggressive program of research and development by the Steel Joist Institute has played a big role in the continuing improvement of open web steel joist designs and their acceptance by the building industry. For many years the Institute has sponsored R & D projects on steel joists at leading university engineering laboratories.

The photo above is a case in point. In this project, performed at the University of Kansas, tests were conducted to determine the ultimate strength and load-bearing capacity of compression chords in variously designed joists under concentrated and uniform loads. Manufacturers can also have investigations conducted on their J- and H-Series joist designs to determine conformance with SJI standards and specifications. New ideas in joist materials and design are also carefully checked out before standards are established.

The Steel Joist Institute has just published a new edition of the SJI standard specifications and load tables. It's a practical working handbook for anyone specifying or using open web steel joists. Write today for your complimentary copy.

STEEL JOIST INSTITUTE
DuPont Circle Bldg., Washington, D. C. 20036

For more data, circle 128 on inquiry card
Our new cross beam lamp is so complex, it makes everything simple.

Our new Hide-a-Lite has an elliptical reflector built in.
So you can install it in a plain socket. No more external reflectors to get dusty and start absorbing either the light or the maintenance money. The Hide-a-Lite reflects the heat out of the fixture so the lamp lasts its rated life of 2,000 hours. No more early burn-outs. Which is nice for you, if you happen to own the building.
And if you're a fixture manufacturer, you can start making fixtures without reflectors. There's going to be a whole new market for them.
If you're an architect, all you need for the Hide-a-Lite is a shallow recessed fixture. No more wide-open wasted spaces in the ceiling. Because the ellipse causes our beam to focus through a two-inch opening in the bezel.
The lamp is so complex, it has a long formal name. The Sylvania Elliptical Aluminized Reflector Hard Glass 150-Watt 125-Volt Medium-Skirted-Base Lamp.
But we've nicknamed it Hide-a-Lite, because that sounds as simple as the way the lamp works.
Sylvania Lighting Center
Danvers, Massachusetts.

For more data, circle 129 on inquiry card
A single climate conditioning system would
Most Indians have grown out of tepees. And most schools have grown out of single spaces using single climate conditioning systems. Today's schools have both core and perimeter learning spaces. And if you choose one type of system—unit or central—to handle both types of situations, you're compromising.

That's why we make the range of equipment we do today. Without compromising anything, you can select the matched equipment that best fits your needs. And you can use the most economical fuel available in your area whatever the equipment.

For instance, you'd probably select our Nesbitt Rooftop Multizone Unit for flexible learning areas. It can individually service up to 12 separate zones through flexible ducting which can later be altered easily to meet changing space requirements.

Then again, in perimeter classrooms, you may find Nesbitt Unit Ventilators most economical. They can be installed with steam, hot water, electric or gas heating. Mechanical cooling can be added now or later using a central chilled water system or individual condensing units mounted remotely or adjacent to the unit. Where glass is used extensively, Nesbitt Wind-o-line Radiation is designed to offset the radiant heat loss and prevent chilling downdrafts.

Whether you're designing a new school or an addition, call your Nesbitt man. He has the air conditioning, heating and ventilating equipment to meet your requirements better. After all, he's a specialist in schools. And that's what you're building, isn't it?

Nesbitt Operation, ITT Environmental Products Division, Philadelphia, Pa. 19136.
FHA 221D (3) gave
Wheeling gave 'em a

"We put down Tensiform and had an instant working platform for other trades.

Now speaks Project Manager Dave Lesky: "We used over 10 acres of Tensiform. Delivery was on time. Every piece laid flat and matched perfectly. Spot welding to joists was a snap."
We were fortunate to have been able to observe the wearing qualities of the Cabin Crafts carpet in our first one hundred units for over two years before we specified Cabin Crafts again. These are the words of Mr. Alex Murphy, General Manager of the magnificent Salishan Lodge at Gleneden Beach, Oregon.

Salishan boasts 126 of the most luxurious rooms you'll find anywhere. Just recently completed is the new Chieftan House with 26 more deluxe suites—complete with Cabin Crafts carpet of Acrilan acrylic fiber. “The fact that dirt gets on the carpet rather than in it should be reason enough for installing it,” Mr. Murphy adds, referring to the density of the pile. “We are definitely pleased with our Cabin Crafts installation.”

Salishan Lodge is a perfect example of how Cabin Crafts becomes an integral part of the architect's and designer's scheme of things. Cabin Crafts styling, coloring and manufacturing leadership gives them the ability to fit your exact specifications. For more information, send the coupon below.

This is a typical room in the newly completed Chieftan House. Cabin Crafts carpeting of Acrilan acrylic fiber lends beauty, warmth and practicality to all 26 new guest rooms. It was re-specified after a two-year "test" in the original 100 rooms!
NEW DESIGN SAVES COSTS

1 BOBRICK UNIT SERVES 2 TOILET COMPARTMENTS

Save equipment costs. Bobrick partition mounted washroom units combine several accessories.

Save installation costs. One mounting through the partition replaces multiple accessory installations in two toilet compartments.

One servicing reduces custodial time. Filled and emptied from one side only.

Lifetime stainless steel throughout, with satin finish exposed surfaces. Always looks new, can't corrode, easy to clean.

A complete selection of partition mounted units is included in Bobrick's Catalog of 400 matching washroom accessories. Send for your copy. Bobrick: Brooklyn, New York 11210 • Los Angeles, California 90039 • Bobrick-Canada • Bobrick International

Since 1906 Designers and Manufacturers of Washroom Equipment

For more data, circle 137 on inquiry card

B-357 (above) replaces 6 accessories. Dispenses 1000 toilet seat covers and 2000 toilet tissues, half from each side of partition. Self-closing disposal on each side for feminine napkins.

B-354 provides self-closing feminine napkin disposal on each side of partition. Receptacle removed from one side only for easy servicing.

B-386 holds and dispenses 4 rolls of standard size toilet tissues, 2 from each side of partition. Spare rolls automatically placed in use by patrons after first rolls are used up.

SCHOOL WARDROBES / Semi-concealed wardrobes make double use space: Behind panels of chalkboard tackboard are students' wardrobes. Vogel-Peterson, Elmhurst, Ill.

Circle 311 on inquiry card

SCHOOL MAIL BOXES / Horizon style mail boxes are specifically designed for use where building employees distribute the mail. Front construction is entirely extruded aluminum. Interior compartments are bonderized electrolytically zinc-plated steel, reinforced with aluminum extrusion and of double-wall construction. • Auth Electric Company, Long Island City, N.Y.

Circle 312 on inquiry card

MULTI-PURPOSE LAV / The Lady Far designed primarily as a shampoo lavatory and/or a baby bath, it is recommended for homes, hotels, motels, and girls' dormitories. It measures 28 by 19 in. with 23 by 14-in. basin and is made of vitreous china. It requires no metal rim or frame.

• Kohler Co., Kohler, Wisc.

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New Krueger action furniture” for ’68

Take a look at Krueger and you’ll see big things are happening to institutional furniture. With designs as new as tomorrow, Krueger affords a practical, accommodating convenience needed by a “generation on the move”. New ’68 innovations include contemporary styled, plain and upholstered Modular Seating especially adaptable to airports, hotels, banks, hospitals and other lobbies; new classroom Sequence Seating; new Pedestal Base Tables and Stack Chairs; extensive selections of Hat and Coat Racks with new space-saving floor models — plus a Single Pedestal rack. Include Krueger ’68 in your planning and stand by for action!

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"As the years passed your firm developed 'soft' stainless named MicroFlex. This product has taken our staff by storm. It is presently being used in all areas of flashing, coping, planting liners, fountain basins, etc. We have yet to experience any failure of any project on which MicroFlex has been incorporated."

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"Having just completed a very large MicroFlex installation, we are pleased to report that, in addition to the tremendous material cost saving involved in the use of MicroFlex rather than copper, our mechanics reported a singular ease of handling this dead-soft stainless steel when compared to the normal handling of other alloys."

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"MicroFlex can definitely fill a need in the Sheet Metal Industry where extreme workability and flexibility are desirable qualities in addition to the regular qualities of stainless steel."

Wayne R. Lansdowne
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"During recent months we have completed several jobs using large quantities of MicroFlex stainless steel and are pleased to find it functions in every manner true to your claims. To date we have had complete success and acceptance of this soft stainless."

Lloyd Hitchins
President
Hitchins Roofing Company
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"The re-roofing of the Commonwealth pier in Boston for the Massachusetts Port Authority presented a problem in the selection of material. In replacing the old copper roof, the continuous exposure to a marine environment required a high degree of corrosion resistance. However, economy and ease of fabrication and installation were important factors. MicroFlex type 304 stainless steel sheet met all these qualifications and assured long and trouble-free service. The attractive installation also includes stainless steel ventilators, copings and flashing."

D. L. Adler
Assistant Manager
Columbia Cornice Company
Cambridge, Massachusetts

"You will be pleased to know that true to your claim the alternate (MicroFlex) reflected an appreciable saving compared with the cost of copper."

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Garriott, Bogart & Associates
Cincinnati, Ohio

Get the full particulars . . . and you'll specify MICROFLEX — Write to —

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Hexagonal. Square. Rectangular. Mosaic Tile has the shapes to shape up any setting. You get a flexibility of design for any level or any space. Mosaic is the material with a message for today.

Colorwise, Mosaic shapes up, too. Our built-in color compatibility gives you even more design possibilities. And you'll find Mosaic tile harmonizes with other materials, landscaping and decorator objects. Of course, you can't overlook Mosaic economy with its low-cost maintenance and unbeatable durability.

Mosaic tile. Today's tile. It's never been in better form for what you want to create.

Trouble with contaminated air and improper thermal environment?

The Mammoth Nu-Aire prevents air loss, back drafts and negative pressures... decreases heat loss and improves temperature control... reduces maintenance and operating costs... and keeps air clean in industrial and commercial buildings.

Problems with contaminated air and improper thermal environment can be eliminated in industrial and commercial buildings. The Mammoth Nu-Aire direct gas-fired make-up air unit is designed to maintain favorable environmental conditions... and keep air clean in plants where manufacturing and processing operations create a noxious atmosphere.

Nu-Aire maintains proper thermal environment by providing better forced exhaust to remove contaminants, at the same time sustaining normal inside pressure. The unit also maintains desired temperatures and eliminates undesirable air infiltration through exposed building walls, doors and windows, thereby effecting greater heating economy. In addition, Nu-Aire prevents back drafts, reduces air moisture content to prevent corrosion, improves processing operations and lowers maintenance and housekeeping costs.

Flexible designed for year-around operation, Nu-Aire provides ventilation in summer, heating and ventilating in winter. For winter operation, Nu-Aire heats filtered air with an extremely efficient combustion system, delivering the heated air in an optimum pure condition.

The completely packaged Nu-Aire units are available in eight sizes and 44 models supplying from 140,000 Btu at 1,400 cfm to over 11,000,000 Btu at 100,000 cfm. Nu-Aire is available fully weatherproofed for space-saving rooftop installation or non-weatherproofed for location indoors.

There are 350 Mammoth representatives in 85 offices in the United States and Canada. One of them can tell you more about how Nu-Aire provides clean air plus proper environment for either new or existing buildings. Or write, wire or phone Mammoth (612-544-2711) for the full Nu-Aire story.

Nu-Aire is fully documented in Mammoth Bulletins NA-964 and PNA-1266. Write for your copies.
TRI-CON*

The world’s slimmest concealed ball-bearing hinge!

The makeup of any door deserves Tri-Con’s touch of beauty. You see only two, thin horizontal lines. Even the pin tips and plugs are hidden. And inside the trim, uncluttered barrel are functional elements fitted with watchmaker precision. Ball bearings roll in nested raceways. Delrin sleeves lubricate every move and cushion the pin so it never touches the barrel. Specify this slimmest of all ball-bearing hinges. Write for the Tri-Con catalog.

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*Patent Pending
Looking for that "impossible" lighted lens, the one that floats in the surrounding void creating the illusion of an absolutely frameless lens? Sechrist has it. The new Air Lite Series 300. This handsome fixture offers new dimensions of aesthetic beauty for clean, crisp modern architectural design. The secret? Sechrist's special "hidden door" in a regressed air slot troffer which is compatible with most all air diffusers. Before your next job, check with Sechrist, where new things are happening in the most advanced concepts of air handling and lighting.
Now... **Ultimet Curtain Wall Components**

...available in **Cor-Ten Steel**

**Ultimet** curtain wall framing members in **Cor-Ten** steel include the mullion (in 3/8", 4 1/2" or 5 1/2" depths) and the outside horizontal retainer cover or muntin. All other components and the snap-on section on the back of the mullion are of stainless steel.

**USS Ultimet**, the latest idea in competitive cost curtain wall components, now comes in **USS Cor-Ten** Steel as well as stainless steel. **Cor-Ten** steel, which "paints" itself, actually coats itself with a dense, oxide skin that virtually stops corrosion. It weathers to a rich russet color and does not require maintenance painting.

**Cor-Ten** high-strength low-alloy steel is the natural material for building exteriors that will give you a distinctive, attractive finish that will last a lifetime.

**USS Ultimet** Roll-Formed Curtain Wall Components go up fast, easy, and fit precisely. Most members snap-lock into place. There's no on-site cutting, no welding, no exposed fasteners, no clutter. **USS Ultimet** Curtain Walls are clean and uncomplicated. But perhaps the best part is the economical cost. **USS Ultimet** is priced to compete with other materials which possess less strength, beauty and permanence.

**USS Ultimet** Wall Framing Components

Take a good look at good-looking, cost-saving **USS Ultimet** Curtain Wall Components in **Cor-Ten** steel—before you build or remodel. Write for a free copy of our folder, ADUSS 88-2932, to United States Steel, P.O. Box 86 (USS 5297), Pittsburgh, Pennsylvania 15230... or contact a **USS Architectural Products** Representative through the nearest **USS Construction Marketing** or **Sales Office**. **USS, Ultimet** and **Cor-Ten** are registered trademarks.
GLAZED ENCLOSURES / Custom and standard systems are pictured in a 16-page booklet. Such installations as the sky dome in the Student-Faculty building at the State University of New York in Albany by Edward Durrell Stone and the custom front and roof skylights of the Bird and Reptile Habitat building by George E. Christensen at the Marsalis Park Zoo in Dallas are included. • Ickes-Braun Glasshouses, Deerfield, Ill.*
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LIBRARY SYSTEMS / An 8-page folder explains Danish contemporary systems in three series. • Reska Inc., Buffalo, N.Y.
Circle 401 on inquiry card

CHURCH SPIRES / A 4-page brochure describes prefabricated metal church spires, steeples, domes and campaniles. • Overly Manufacturing Company, Greensburg, Pa.*
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For more information circle selected item numbers on Reader Service Inquiry Card, pages 319-320

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Covers in just one coat
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These Smith Walls are a stainless steel showcase

They make a beautiful building! But, better than that, they are an outstanding product display of Crucible Steel Company's own stainless steel. The Shadowall fluting of the panels demonstrates the formability of the material. And, years from now, the gleaming finish of the metal will reflect its maintenance-free durability.

What you can't see when you look at this typical Smith installation is the single responsibility that made it possible... and typical. The walls were designed, custom-fabricated, delivered and erected by Smith personnel... to the architect's specifications... to the customer's satisfaction. With the complete responsibility on our shoulders, we make sure the job is right... and completed on schedule.

Would additional views of this interesting installation be helpful to you? We've made a limited number of color photos available for the asking.

Specify Smith Walls... the single responsibility... for your next project. You'll find details in Sweets' Catalog File 3b/Sm and 8b/Sm. Or write.

ELWIN G. SMITH & COMPANY, INC. Pittsburgh, Pa. 15202/Atlanta • Boston
Chicago • Cleveland • Cincinnati • Detroit • Philadelphia • Toledo • New York

For more data, circle 150 on inquiry card
OFFICE LITERATURE

NEW LOAD TABLES FOR STEEL DECK

The Steel Deck Institute has approved Standard Load Tables for Intermediate and Wide rib steel roof deck.

The standard load tables provide a fast convenient design reference ... no need to check all manufacturers' catalogs. The Institute has now approved standard load tables for Wide, Intermediate and Narrow (approved 1967) rib decks.

Steel roof deck with rigid insulation and built-up roof is one of the most economical, fire rated deck assemblies available today.

For a copy of the load tables, fill out coupon below and clip to your letterhead.

STEEL DECK INSTITUTE

Airtherm Manufacturing Co. • Armco Steel Corp. • Bowman Building Products Div., Cyclops Corp. • The Ceco Corp. • The Goldsmith Metal Lath Co. • Granco Steel Products Co. • Inland Steel Products Co. • Macomber, Inc. • The R. C. Mahon Company • Plasteel Products Corp. • Republic Steel Corp., Mfg. Div. • Roll Form Products, Inc. • H. H. Robertson Co. • Wheeling Corrugating Co.

Fill in coupon and clip to your letterhead for your free copy

STEEL DECK INSTITUTE 9836 W Roosevelt Rd., Westchester, Ill. 60153

Please send me a copy of the SDI Standard Load Tables.

NAME

TITLE

For more data, circle 151 on inquiry card

ACOUSTICAL UNITS / A 12-page bulletin describes GEOCOUSTIC units designed to be mounted on ceilings or walls. With the "patch technique," acoustical correction method designed to improve acoustics in existing rooms and buildings, the units project from wall so that all six sides are exposed to sound. • Pittsburgh Corning Corporation, Pittsburgh.*

Circle 410 on inquiry card

ARCHITECTURAL GLASSES / Technical catalogs include selection tables, suggested glazing methods and specifications, strength data and transmittance values for various flat glass products. One of the catalogs, "Glass For Construction," gives details on all of the company's glasses, including Vari-Top coated glass and VigilPane safety glass for show windows. The other two brochures describe Vitrolux spandrel glass and Tuf-flex tempered glass doors. • Libbey-Owens-Ford Glass Company, Toledo, Ohio.

Circle 411 on inquiry card

MASONRY / A 2-page report presents Tex 4572, a structural clay facing panel with a 12-in. by 12-in. face size and 4-in. thickness. The wire-cut velour textured finish is combined with the large square face proportions and ranges from red to buff and a new smoky brown-hogany color. • Natco Corporation, Pittsburgh.*

Circle 412 on inquiry card

ARCHITECTURAL HINGE / Illustrates 12-page brochure features informative selection tables and full specification information on new product lines. • Stanley Hardware, New Britain, Conn.*

Circle 413 on inquiry card

SUSPENDED CEILINGS / An 8-page brochure presents a wood-grained design with a "beamed" look and a beveled ceiling panel. The grid is made of galvanized steel with a baked-on wood grain finished with a clear protective coating. The beveled edges of the panel create a tile-like effect. • Lea Products, Inc., Coopersville, Mich.*

Circle 414 on inquiry card

PRESTRESSING CONCRETE / Technical Manual S57 gives information on post tensioning bar and strand systems. Specific design and detailing information tabulated. • Stressteel Corporation, Wilkes-Barre, Pa.*

Circle 415 on inquiry card

* Additional product information in Sweet's Architectural File

more literature on page
Bright ideas

A better way to specify and install lavatories and accessories: Bradpack! Bradpack pre-assembled wash centers have everything you want or need built in: lav, foot control, operating mechanism, temperature selector, dispensers—everything. Installation? They're all factory pre-assembled and ready for hook-up. And foot-operated Bradpacks are sanitary. Choice of three models, all in stainless steel: foot-controlled lavs with and without storage cabinet; or cabinet and lav with wrist blades. For all installations—from hospitals to college dorms—write in Bradpack. It’s Bradley’s idea to make things easier for you! See your Bradley representative. And write for literature. Bradley Washfountain Co., 9109 Fountain Boulevard, Menomonee Falls, Wisconsin 53051.

For more data, circle 152 on inquiry card

from Bradley!
SPECIFY THE TY-SEAL TEAM...
the winning combination that makes better joints in seconds.

Add 'em up. It's the most complete, efficient joining system in the industry . . . AND it's been job-proved by more than 20,000,000 in-service Ty-Seal applications. For faster joining and better joints, put the profit winner on your side. Go all the way with the Ty-Seal Team!

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PENN PLANT, MACUNGIE, PA.

TPI makes Tyler cast iron soil pipe and fittings • Wade plumbing-drainage products
• Tyer water main fittings and municipal castings.
great
looking...
and
movable

What’s more, our KW-330 Movable Partition System involves practically no waste when moved from one location to another. And, it is just as easy to install as it is to move, has a one hour fire rating, possesses excellent sound transmission ratings, and can be installed for a reasonable in-place price. Panels can be field painted or prefinished in a wide variety of colors and textures. In fact, the KW-330 incorporates the best features of all the wall systems we’ve ever made. And that makes it the best there is. For full technical details and specifications, write: Kaiser Gypsum Company, Inc., 300 Lakeside Drive, Oakland, California 94612.
If your clients cater to comfort, why not drop in a heating system like this?


Even a gourmet dinner is more enjoyable if the diners are comfortable. And they will be. Everyone is, with a heating system incorporating new 3M heating panels.

They radiate gentle sun-like warmth. There are no drafts. The floor stays warm. Each room is thermostatically controlled. They are ideal for maximum comfort total heat, or for supplementing a central system in high heat loss areas.

This ceiling-mounted system does not interfere with ductwork, utilities, or structural members. You enjoy complete freedom of design.

3M Heating Panels have no moving parts to whir, rattle or wear out. They cycle on and off without a sound.

Designed specifically for drop ceilings, the panels are one-inch thin, and fit into the standard 2' x 4' T-Bar module. To install simply drop them in and wire up.

Supplied in flat off-white; they can also be painted to blend or contrast with surrounding panels of acoustical material or translucent lighting panels.

More information? Write Electric Products Division, 3M Company, Building 220-5W, St. Paul, Minn. 55119

"3M" is a registered trademark of 3M Co.

For more data, circle 155 on inquiry card
Metal walls provide lasting beauty with finishes containing Kynar 500®

By using metal walls, you can now get a wide range of colors . . . colors that harmonize with existing structures or community . . . and get long-lasting metal protection at the same time!

How? With finishes containing Kynar 500, a fluorocarbon base made by Pennsalt Chemicals Corporation. Accelerated tests by Pennsalt plus years of outdoor exposure on more than 150 major buildings, project 30 years of maintenance free life.

Equally important, with metal walls, you can save up to 1/2 - 1/2 over brick or masonry; save time and money by faster erection; save time and money in future expansion.

For your next industrial building, consider metal walls highlighted by a colorful finish containing Kynar 500. For more information, contact Plastics Department, Pennsalt Chemicals Corporation, 3 Penn Center, Philadelphia, Pa. 19102, LO 4-4700.

Make your base specification Kynar 500!

*Fluoron is a trademark of De Soto, Inc.

For more data, circle 156 on inquiry card
for the life of your building, put WASCO® in your plans

For 33 years, construction products bearing the WASCO® brand name have enjoyed an unexcelled reputation for quality, durability and trouble-free service. That's why WASCO® brand products are still today the most specified products in their respective fields.

WASCO® SKYDOMES
Still the best known, most specified line of plastic dome skylights. Over 300 shapes, types and sizes, plus custom-built units. Sweet's Architectural File, Catalog 22a/AM . . . and Sweet's Industrial Construction File, Catalog 17a/AM, contain complete descriptive data and model specifications.

WASCO® FLASHINGS
Still the one complete, most specified line of building flashings for waterproofing from foundation to roof. Sweet's Architectural File, Catalog 21g/AM . . . and Sweet's Industrial Construction File, Catalog 17a/AM, contain complete descriptive data and model specifications.

When specifying flashing and skylights remember... for the life of your building put WASCO® in your plans.


Circle 416 on inquiry card

THERMOPLASTICS / Boltaron Corrosion Resistant Materials designed especially for industries concerned with corrosion, air and water pollution and fume handling are the subject of a 1968 catalog. A materials usage chart and typical application photos are included. • The General Tire & Rubber Co., Lawrence, Mass.

Circle 417 on inquiry card

GLASS / The winter edition of “Creative Ideas in Glass,” an architectural review quarterly, contains, among others, architect Thomas E. Stanley's production research center for Atlantic Richfield, Stanley L. Horowitz's Stonehenge Tower in North Bergen, N.J., and a residence in Detroit by Donald Paul Young. • American Saint Gobain Corporation, Kingsport, Tenn.*

Circle 418 on inquiry card

STAINLESS STEEL FRAMING / A 16-page booklet details the use of COR-TEN and stainless steel in ULTIMET wall framing. The booklet explains why only seven basic roll-formed shapes are needed to achieve a variety of architectural treatments. The booklet also discusses the first use of ULTIMET in the 841-ft.-high Pittsburgh headquarters for U.S. Steel. • United States Steel Corporation, Pittsburgh.*

Circle 419 on inquiry card

SUBSTATIONS / Compact secondary unit substations for industrial, commercial, and utility installations are described in a revised bulletin. Indoor and outdoor installations with a choice of system designs are covered in the 54-page publication. • I-T-E Circuit Breaker Company, Philadelphia.*

Circle 420 on inquiry card

SEAMLESS FLOORING / A 12-page color brochure covers resilient flooring and wall covering products. Included are a thickness guide and a comparative data chart. • Torgnol of America, Inc., Montebello, Calif.*

Circle 421 on inquiry card

* Additional product information in Sweet's Architectural File.

more literature on page 288

Success is something you can't leave a son

In today's complex and specialized world, success depends more and more on whether he gets a college education.

But he may not be able to get one unless the nation's colleges can answer some serious questions: How to cope with rapidly increasing student enrollments? How to keep the quality of education constantly improving with more modern laboratories, better libraries, new classrooms? How to attract able new faculty members?

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Give to the college of your choice.
Lyon doesn't Stop with the most Versatile Design

The freedom to select and join components to fit your needs is a big advantage in itself. But wait'll you've pounded on our desk top and discovered it has two layers of steel, with a ribbed underside for extra strength. Wait'll you've thumped the back and end panels and felt the vault-like solidity of double-wall welded construction. Found sound deadeners everywhere—in the back panels, pedestals, and even the drawers. Tried the exclusive Lyon "lock-in-top" that controls all drawers. Learned that the 100% acrylic finish will last with the furniture. Then you'll agree that Lyon is a better buy in many ways. See your Lyon Dealer. Or, write: Lyon Metal Products, Inc., 551 Monroe Ave., Aurora, Illinois for our free color brochure.

For more data, circle 157 on inquiry card
SERIES J1600
Top-jamb mounted closers featuring narrow styling to blend with the slim styling of modern aluminum door frames.

SERIES J7030
Top-jamb narrow-projection closers with covers in anodized or painted finishes to match hardware or door finish.

SERIES J6120
Top-jamb mounted Unitrol controls. A combined door closer and door holder with shock absorber to protect door, frame, and closer.

Even where heavy traffic indicates the use of a door holder, there's no need to compromise the appearance of your entranceway. The unique Norton® combination of door closer and door holder, the Unitrol® control, provides the answer. All the functions of a closer and a holder in a single styled package. Mounted on the door-jamb to eliminate the cluttered look and improve the door silhouette.

CONTACT YOUR NORTON REPRESENTATIVE FOR COMPLETE DETAILS.
A solid foundation in sandy soil at a fraction of the cost of piling

How? Vibroflotation®. This unique method presettles and compacts sandy soils by simultaneous saturation and vibration. Result? Uniformly densified columns of granular material that provide greater bearing capacity and differential settlement protection— at a fraction of the cost of piling!

Vibroflot®-compacted foundations effectively withstand the rigors of Saturn Rocket blastoffs, yet are economical enough to be used for drive-in hamburger stands. The Vibroflot machines shown here are compacting foundations for two new high-rise residence halls at the University of Miami. Residence halls in the background are on similar foundations.

If you are planning a building of any size that is to rest on sandy soil, a phone call to us could mean real savings. Call collect, or write for Bulletin B-42. 930 Ft. Duquesne Blvd., Pittsburgh, Pa. 15222, Phone (412) 391-6424.

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They put their reputations; perhaps their jobs. So they want the facts. 
The full facts. In print. And they want to refer to the facts. Pass them along 
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Because print makes sales. Business sales.

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Two trouble-free grouts for all quarry tile and brick pavers

Hydroment Joint Filler for: restaurants, kitchens, schools, hospitals, lobbies, etc.

U-poxy for all processing industries: canneries, metalworking, bakeries, dairies, breweries, etc.

When you specify a quarry tile or brick paver floor, it's more economical to rely on a “trouble-free” grout instead of taking chances. Hydroment Joint Filler has over 25 years of proved performance, comes pre-packaged for dependable uniformity. Clients will appreciate the dense, non-shrinking, easy-to-clean joints — comes in 10 non-fading colors.

There's U-poxy for the processing industries — for the areas that take a beating from acids, alkalis and chemicals. These joints actually stronger than the tile units themselves!

U-poxy is also unusually resistant to oils, greases, fats, solvents — you name it! Meets Dept. of Navy Specification TS-T21.

Remember, brick and tile floors are no better than their joints — so specify either Hydroment Joint Filler or U-poxy. Write for technical data! (We're in Sweet's!)

The Upco Company
A SUBSIDIARY OF UNITED SHOE MACHINERY
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Provides instant and direct 2-way conversation between any Apartment and Vestibule...Greater Performance with Exclusive Talk-A-Phone Features:
- Ample Volume—Whispers, shouts and normal voice are heard clearly without "boom" 
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Send for Free Catalogs... Dept. AR-5A
TALK-A-PHONE CO., 5013 N. Kedzie Ave., Chicago, Illinois 60625

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STEEL DOORS AND FRAMES / "Standard Nomenclature for Steel Doors and Steel Door Frames, USAS A12-1967" is a revision of the original 1964 standard. New information includes nomenclature for door types and nomenclature of swing for steel door frames.
- The Steel Door Institute, Cleveland. Circle 426 on inquiry card

CEILINGS / "Total Environment Ceilings" is a 32-page booklet that contains photographs, sketches, exploded view drawings and environmental factor/performance data tables. • Luminous Ceilings Inc., Chicago.* Circle 427 on inquiry card

COOLING AND HEATING / A 12-page bulletin covers the complete line of "CH" Series, all-season cooling and heating systems that range in size from 3 to 50 tons of cooling, and 75,000 to 1,600,000 Btu per hour heating, in a combination of sizes. • Hastings Industries, Inc., Omaha, Neb. Circle 428 on inquiry card

TEMPERATURE CONTROLS / A condensed specification guide covers most common pneumatic controls for commercial heating and air conditioning. • Honeywell's Commercial Division, Minneapolis.* Circle 429 on inquiry card

FAUCETS / Just about everything in the way of fittings to meet the special requirements of hospitals, institutions, educational and industrial installations is covered in a 40-page book. • The Chicago Faucet Company, Des Plaines, Ill. Circle 430 on inquiry card

PLASTIC PANELS / Structural plastic panels that offer both corrosion and built-in fire resistance are covered in a 12-page bulletin. A cross-section of commercial and industrial installations is pictured. Bulletin explains that panels may be translucent or opaque, with smooth, crinkle or pebble surface, either flat or corrugated in configuration. • Durez Div., Hooker Chemical Corporation, North Tonawanda, N.Y.* Circle 431 on inquiry card

CONTRACT CARPETING / A 24-page color booklet shows thirty contract installations in such public areas as stores, offices, banks, apartment houses, churches, and schools. • Downs Carpet Company, Inc., Philadelphia. Circle 432 on inquiry card

For more data, circle 162 on inquiry card
Tapered FOAMGLAS® roof insulation automatically drains flat roofs...

like water off a deck's back.

You know the flat roof deck problem. Ponding. Here's a new solution: Place tapered FOAMGLAS insulation blocks and you've got a perfect slope for positive drainage. The roofer can do it himself and roof over immediately.

FOAMGLAS is lightweight, incombus-
tible . . . permanently waterproof and vaporproof (it's cellular glass). It will keep its original insulating value indefinately. We guarantee it in writing for 20 years.

Write for information and a free sample. Pittsburgh Corning Corp., Dept. AR-58, One Gateway Center, Pittsburgh, Pa. 15222. In Western Europe, write Pittsburgh Corning de Belgique, S.A., Brussels.

The Insulation People

For more data, circle 168 on inquiry card

For more data, circle 169 on inquiry card
Take the KAWNEER Zipperwall that keeps comfort in, weather out.

Now available, an improved version of Zipperwall, architect-accepted gasket wall. Zipperwall 2 vastly increase
design options. No pre-engineered system gives as maj-
All this in an airtight, watertight system that "zips" toget-
in Du Pont Neoprene.

double the features...

2 visual effects—aluminum mullions are reversible—
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insulators prevent condensation on aluminum mem-

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prevents leakage; split mullions and telescoping he
accommodate expansion.

and it meets highest specifications.

Specify Kawneer aluminum in non-fading, corrosion-resist
Permanodic® hard color finish. Get one source quality cont
from aluminum billet through installation by an authori
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Kawneer did. They custom-designed a self-sealing structural gasket to make Zipperwall 2 install quickly. A gasket that keeps a tight grip between mullions and glazing... that locks comfort in and weather out.

make it of Du Pont Neoprene...

Kawneer did. They chose Neoprene because of its history of dependability in curtain wall systems. Because of its proven resistance to sun, rain, heat, cold and corrosives. Because of its flame resistance.

and get long-term performance reliability...

Kawneer did. They wanted a gasket that would stay resilient in any climate... keep its sealing pressure... maintain a weathertight wall year after year. They wanted long-term reliability... and they got it with Du Pont Neoprene.

Du Pont makes Neoprene, not gaskets. Du Pont Company, Room 6250, Wilmington, DE 19898.
This is the new Moduflex by Air Preheater, the first cooling tower available in dimensionally identical modular units with casings that develop their own weather-tight, oxide coating. The longer the coating is exposed to the weather, the tougher it gets.

Moduflex features a remarkable low-alloy steel that has gained wide architectural acclaim. It forms an ever stronger, ever better-looking oxide coating that inhibits corrosion and obsoletes painting. What’s more, the new Moduflex’s resin-impregnated asbestos fill is fireproof and fungus-resistant. But good looks and long life are only the beginning. Moduflex is truly modular. Fully preassembled, a single common-basin Moduflex tower is composed of a bank of from one to ten identical 50-ton-capacity modules. Here’s unlimited layout flexibility, plus the capability of adding on individual modules if and when cooling requirements increase. And economy. Moduflex not only delivers full rated capacity, but each module has its own axial or centrifugal fan and heavy-duty motor for independent operation. This allows you to conserve power when weather permits.

Oh, and let’s not forget the low, unbroken silhouette that makes Moduflex perfectly compatible with modern building design. Moduflex blends beautifully with building lines, and presents a clean, uniform appearance that’s really good looking. But that’s where we came in. For your catalog write Dept. MOD.

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A Subsidiary of Combustion Engineering
For High-light, Spot-light or "Punch"...

LIGHTING VERSATILITY
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Need the punch to floodlight large parking, loading, terminal or industrial areas? Or, the precise beam control to meet a "TV Vertical" level of illumination for a sports field? Maybe you need a powerful beam to illuminate a high-rise?

Steber Super-Sportsliter combines a unique new reflector design with precise beam control—to usher in a welcome new era in outdoor floodlighting efficiency. Narrow, medium, medium-wide and wide beam spread types let you select the pattern that is, esthetically or functionally, best suited for the job.

Super-Sportsliter is specifically designed to make the brilliant most of modern metallic and incandescent sources. It will provide more light output than any fixture in its class—yet save you money in power consumption and reduced maintenance on relighting jobs.

Ask your Steber representative for more details on Super-Sportsliter. Better yet—arrange for a Show and Sell lighting demonstration.

Steber Division, Pyle-National Company
1334 North Kostner Avenue, Chicago, Illinois 60651
The Macomber V-LOK® Modular Component System: Mechanical energy

Success of Macomber's V-LOK Modular Component System is due, in large part, to the wide choice of components it offers, and to the built-in flexibility of all components.

At present, there are four components in the system: the steel structure; mechanical energy system; lighting-ceiling; and interior partitions. Macomber Incorporated supplies the V-LOK steel structure, including floor and roof decking. There are at least two major suppliers for each of the other components, providing several possible combinations of components, all compatible with the basic 5-foot module.

All of the components are engineered to permit quick and easy changes in the floor plan of the building throughout its life. This complete flexibility of interior space allows the owner to accommodate the structure to the changing needs of the tenants. VLMC buildings need never become obsolete.

Mechanical energy systems

Compatible mechanical energy systems, like the other VLMC components, contribute to the flexibility of the structure. Basically, they are roof-mounted, multizone units designed to handle areas of from 4,000 to 10,000 square feet per unit. Each unit can serve four to 15 zones, and each zone is served independently of adjoining zones for maximum comfort in each.

The air supply distribution network is individually designed by the architect's engineer. In one- and two-story structures, it consists of fixed...
systems contribute to building flexibility

ductwork to the intended zones, and flexible ducting from there to the air diffusers in the individual rooms. In structures of more than two stories, a remote unit is recommended, but the interior distribution network remains the same.

The 36-inch depth of the Macomber open-web girders and purlins allows passage of a duct up to 14 inches by 20 inches, so that a single duct can furnish air to an entire zone.

The flexible ducts and their air diffusers can be relocated to create a new arrangement of air supply to accommodate changes in the floor plan.

METHOD OF ROOF MOUNTING

The VLMC mechanical energy unit rests on special purlins that form an integral part of the steel structure. After installation of the unit, deck is laid up to and around the unit. This method of installation allows roof mounting of the heavy units that may be required in cold, northern climates. Absence of deck under the unit provides easier access to the mechanical component.

LENNOX DIRECT MULTIZONE SYSTEM

The Lennox Direct Multizone System uses direct-fired gas or oil heat exchangers or electric resistance heating in parallel with air-cooled refrigeration to provide precise individual zone control simultaneously in as many zones as needed. Absence of water eliminates completely the danger of costly freeze-ups. A special roof-mounting frame which exactly fits the perimeter of the DMS unit simplifies mounting and results in a neat, weatherproof installation.

Standard Lennox control systems utilize fresh outdoor air to do all the cooling when the temperature drops below 58° Fahrenheit, and to carry part of the cooling load between 58° and 65°. Above 65°, direct expansion refrigeration equipment does all the cooling.

The Lennox DMS unit is a complete factory assembly of highly integrated components in a weatherproof, sound-deadened, low-silhouette package. It includes all necessary controls factory installed, factory tested, and approved by the necessary authorized agencies.

NESBITT ROOFTOP MULTIZONE

This "second generation" Nesbitt unit incorporates a new air conditioning concept that dehumidifies all air supplied to conditioned spaces during the mechanical cooling cycle. The unit permits automatic control of heating, mechanical or natural cooling, dehumidification, filtration and ventilation in as many as 12 individual spaces.

Nesbitt Rooftop Multizone design provides peak efficiency in those hours when some spaces require cooling while others must be heated. When mechanical cooling is operating, a coil in the hot deck utilizes high temperature refrigerant to reheat air flowing to spaces calling for heating. It is not necessary to operate the heat source at these times.

Placement of the cold deck over the hot deck prevents stratification of supply air. Modulation of outside-air and return-air damper banks is accomplished by a single electric or pneumatic damper motor.

All units are shipped fully assembled, precharged and factory tested, reducing on-site labor costs.

For more information on the Macomber V-LOK Modular Component System, contact your local Macomber representative, or write to Macomber Incorporated, Canton, Ohio 44701.

For more data, circle 172 on inquiry card
Knurling, Smurling who needs it?

You do, sir, it's one of ten good reasons to use Dur-O-wal® Truss masonry wall reinforcement.

You're looking at the most efficient masonry wall reinforcement ever devised, Dur-O-wal Truss Design.

1. Special knurling deformation in side rods means maximum bond with mortar—nearly double that of smooth side rods.
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3. Dur-O-wal Truss carries material approvals from three important building codes: BOCA, ICBO, SBCC and many state and local codes.
4. Dur-O-wal Truss is available in a wide selection of shapes, sizes and finishes. You can reinforce almost any masonry wall—single wythe, cavity or composite.
5. Dur-O-wal research is the most extensive in the business. We back up every claim for our product with independent research.
6. When you need Dur-O-wal Truss you can get it. Over eight thousand dealers stock and sell our product.
7. Dur-O-wal Truss is nationally distributed.
8. Dur-O-wal has trained factory representatives who can help you with reinforcing problems.
9. A constant supply of technical literature based on current research is available to you.
10. Dur-O-wal offers additional products exclusively for masonry construction, all backed by the same reputation for quality.

Questions on masonry wall reinforcing applications? Just write to Dur-O-wal, P.O. Box 368, Cedar Rapids, Iowa 52406.

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For more data, circle 173 on inquiry card
New low cost 225kW emergency power
For the first time—all the advantages of a gas turbine generator set priced competitively with standard emergency generators!

Solar's new 225 kw Spartan gas turbine generator set. And it is priced well within the range ofparable reciprocating engine generators. Any measurement, there's no more reliable or maintenance-free kind of emergency electrical power. Since the very reason for an emergency generator furnish power in case of commercial power failure you must have equipment you can count on.

What are the advantages of a gas turbine emergency generator set compared with a reciprocating engine generator set?

Proven reliability. The new Solar 225 kw Spartan gas turbine generator set starts in seconds and has full power capability immediately. No elaborate heating systems needed as in the case of reciprocating units. In fact, the 225 kw turbine set actually thrives in freezing temperatures. And the set embodies the same principles proven so reliable in hundreds of Solar generator sets already installed, including those chosen by American Telephone and Telegraph Company to provide emergency power at its disaster-proof, hard-site communications centers from coast to coast.

Compact size. Light weight. The Solar 5 kw set weighs only 2650 lbs, and occupies only 4 ft—a half the weight and half the size of a parable reciprocating set.

Vibration-free. None of the annoying vibration inherent in a reciprocating engine.

Installation & maintenance costs. The set quickly and easily installed anywhere from rooftop to basement! No special foundations or cooling water needed, and it operates on diesel fuel. Low heat rejection from this set considerably reduces room ventilating requirements. Result: lower installed costs per kilowatt than any other kind of emergency power! And the simplicity of the Solar gas turbine set with its few moving parts minimizes maintenance. Since it will operate at no load without detrimental effects, no expensive load banks are required during exercising periods. Components are designed for years of trouble-free service in normal emergency duty.

More complete information. For details on how the new Solar 225 kw Spartan gas turbine generator set supplies low-cost, reliable emergency power, contact the Solar office in the city nearest you, or write: Solar, Dept. Q-233, San Diego, California 92112.

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