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PRINTED IN U. S. A.

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Pay attention. Sometime soon, someone will make your life easier by selling you a computer. By Steven S. Ross

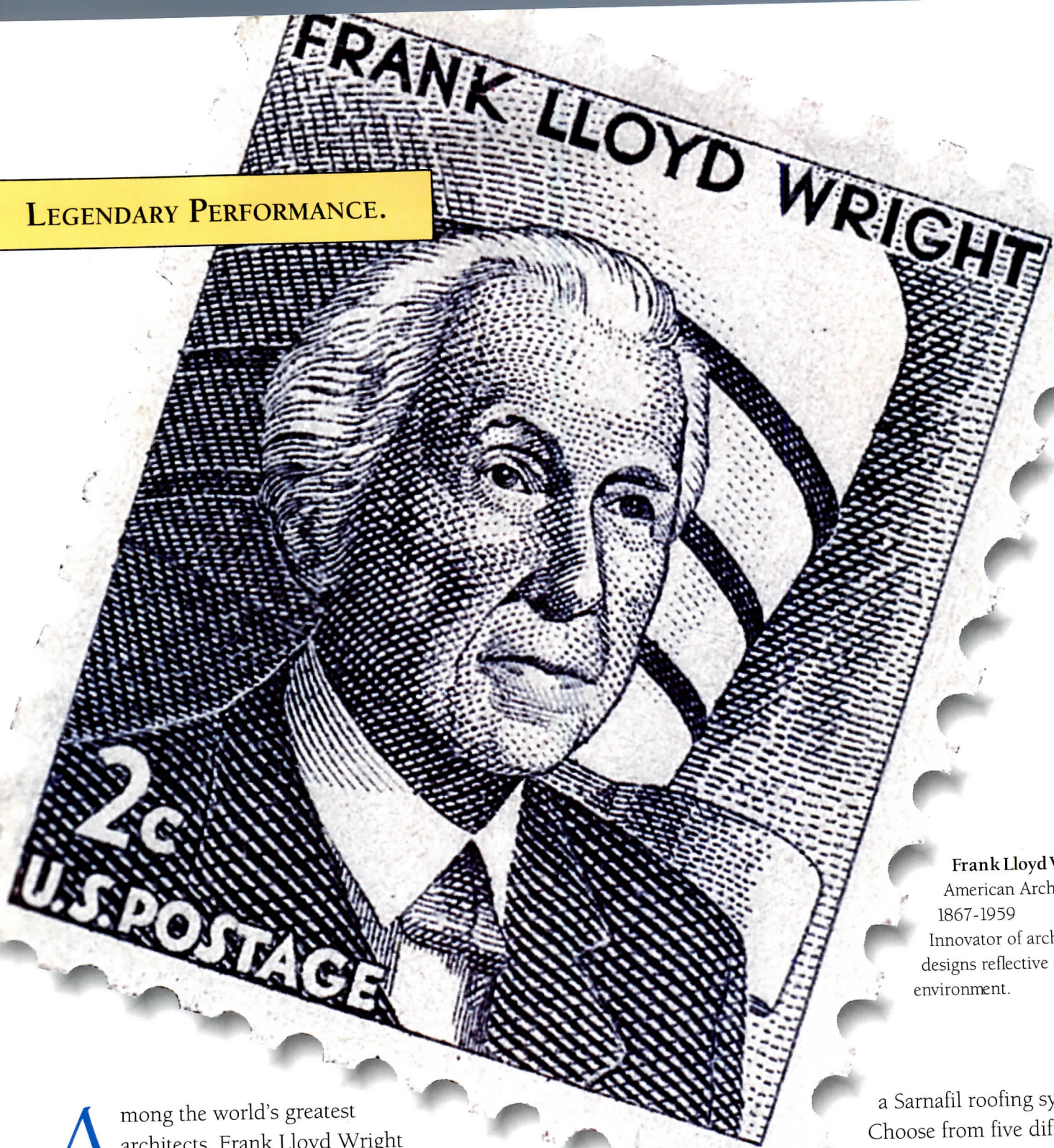
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Architects who have worked with Herman Miller have left us with lessons we are still learning. We are still working to become better students. Of course architects have also left us with buildings, but the buildings only remind us that bricks and steel are merely a beginning.





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Every possible effort will be made to return material submitted for possible publication (if accompanied by stamped, addressed envelope), but the editors and the corporation will not be responsible for loss or damage.

Executive, Editorial, Circulation and Advertising Offices: 1221 Avenue of the Americas, New York, NY 10020.

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Subscription rates are as follows: U. S. Possessions and Canada \$54.00; all other Foreign (including Air): \$160.00. Single copy price \$7.00; For Foreign: \$10.00. For Subscriber Services: 609/426-7070.

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ARCHITECTURAL RECORD (ISSN0003-858X/93) published monthly by McGraw-Hill, Inc. Second-class postage paid at New York, NY and additional mailing offices. Postage paid at Montreal, Quebec, Canada. Registration Number 9617. Registered for GST as McGraw-Hill, Inc. GST Number R123075673

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Rap New Salk Scheme

In your April 1993 issue [RECORD, page 27], you reported on the continued opposition to the proposed new additions to the Salk Institute. It is unfortunate that the same degree of rigor that Jonas Salk exercised both in his discovery of the polio vaccine and in his collaboration with Louis I. Kahn in the design of the Laboratory Building is noticeably absent in the current design process. This time, priority has been given to skillful but empty public-relations initiatives rather than a truly conscientious search for design excellence.

In and of themselves the proposed buildings are perfectly decent designs. But placed so close to Kahn's eloquent masterpiece, an exquisite dialog between a remarkable building and a glorious site, they become intrusive and mediocre. *Thomas O. Ramsey Stevens & Wilkinson, Inc. Atlanta, Georgia (For an update on the Salk imbroglio, see page 23.)*

Architecture Gagged

I appreciated the slight attention given to a recent "incident" (Architecture Gagged, [RECORD, February 1993, page 26]). The school in question is the School of Architecture and Urban Planning, University of Wisconsin-Milwaukee. Note that in most architectural renderings the human figure is placed as context to give a sense of scale to the building. In this project, however, the figures under attack were female and unclothed, along with a few unnoticed unclothed male figures. The figures represented humans, the majority of which were women, in ordinary everyday circumstances (in the nude). Although displaced from their original con-

text the figures were photocopies of existing works of art; i.e.: deAndrea's "Couple" and Rodin's "The Thinker."

The debate raises questions of sexism, social sensitivity, political correctness, and freedom of expression. According to Associate Dean David Kenneth Reed, "the naked body has nothing to do with architectural design." It can, however, be contested that the naked body has everything to do with architecture when it brings into focus the ignorance and social ineptitude of an entire University discipline. *Timothy Robert Gratkowski Milwaukee, Wisconsin*

Copyright Act "Impossible"

The article on the Copyright Protection Act by attorney Carl Sapers [RECORD, March 1993, page 21] points to a serious problem with this law. As a practical matter, compliance is impossible. Discovery of infringement upon a copyrighted design cannot be made with any degree of certainty. Any architect who would sign a warranty clause such as proposed in the article would be foolish indeed. Quite contrary to such a clause, he should include a disclaimer stating no such warranty is given due to the impossibility of discovery. *Reuben M. Welsh, Jr. Architect Corpus Christi, Texas*

Mr. Sapers replies: I agree wholeheartedly with Mr. Welsh's view of the new copyright act and would, of course, urge my clients not to sign such a warranty. On the other hand, I cannot imagine a well-advised owner neglecting to seek such a warranty. Only the architect can verify that the design was created by the architect and not copied.

Through June 18

"Changing Conditions of Architecture at the End of the Twentieth Century" exhibition; National Building Museum, Washington, D. C. Contact: Uwe Drost, 301/405-6297.

Through June 25

"The Architect and the Photograph" exhibition of the photographic work of Jose Antonio Coderch, Charles Eames, and Giuseppe Pagano. National Institute for Architectural Education, 30 West 22nd St., New York, N. Y. 10010. Call 212/924-7000.

Through Mid-August

Professional Development Architecture Courses, Harvard University Graduate School of Design; fees range from \$150 to \$1,090. Contact GSD, 617/495-1680; Fax 617/495-5967

June 7-10

A/E/C Systems '93 trade show, Anaheim Convention Center, Anaheim, Calif. Contact Sharon Price, 800/451-1196.

June 12-25; 13-14

San Francisco Institute of Architecture Summer Design Studio at Taliesin West in Scottsdale, Arizona. Tuition \$800. June 13-14: SFIA two-day seminar on Frank Lloyd Wright at Taliesin West; Scottsdale, Arizona. Tuition \$200. Write: SFIA, Information Office, Box 749, Orinda, Calif. 94563, or call 510/254-9397.

June 13-18

International Design Conference examines "Reconstruction Ahead." Write P. O. Box 664, Aspen, Colo. 81612 or call Lori Schwab, 212/725-2233.

June 14-17

NeoCon 93, Chicago Merchandise Mart. Contact Angela Krzysko, 312/527-7552 or Laura Mercier, 312/527-7555.

June 15-August 20

Design Diaspora: Black Architecture. Continued on page 149

To Find Work, Create Your Opportunity

A year ago I stood in a conference room listening to a presentation by Tadao Ando. What struck me as much as the quality of his work was his enterprise in identifying projects where no one else had yet seen the potential. He could pass a left-over, seemingly unbuildable lot, for instance, and present an owner with a powerful proposal which often developed into a real project.

After all, training equips the architect better than anyone to spot such opportunities, but there has always been a reluctance to create projects because it smacks of ambulance chasing.

Nothing could be more off-base. Take infrastructure, theme of this month's Building Types Study. Who would have thought that so many different types of projects, from telecommunications centers to parking garages to steam plants to subway systems, were able to benefit from the humanizing ministrations of an architect or landscape architect? As this issue's lead essay, entitled "Uncivil Engineering," points out, the climate is ripe for architects to look for such opportunities.

The funding will materialize, despite April's defeat in the U. S. Senate, after a successful filibuster, of a Clinton Administration bill that would have poured \$19.5 billion into the economy. Of this amount, some \$8 billion would have gone into infrastructure projects, including community development block grants and just under \$1 billion for waste-water-treatment plants.

In any case, the Intermodal Surface Transportation Efficiency Act, or ISTEA, passed in 1991, is pumping \$3.9 billion this year into construction-related development, about two-thirds for highway construction, the balance for mass transit. (States then match federal funds on a 20 to 80 basis.) Not only that, but ISTEA also encourages enhancements around the facilities—landscaped "lids" over freeways that bisect residential neighborhoods, for example—spawning opportunities for architects with the vision to "see" such projects.

What's more, on federal work, which must be announced in the *Commerce Business Daily*, the designer or other prospective vendor of a service or product is by long tradition assumed to have an edge by virtue of having helped shape the Request For Proposals on which qualifications are judged.

Creative openings exist also in other fields for astute and ambitious architects. For example, the redevelopment of large chunks of well-placed but derelict land in the nation's old industrial towns and cities is a need and an opportunity, as noted in the Somerville, Massachusetts, project described in this month's article on sustainable development (page 32). There are opportunities in adaptive reuse of historic structures, and in consolidating, expanding, or recycling school or manufacturing facilities. Growth of the "green" movement, into which the Administration is expected to put new teeth if it can work out the short-range conflict with jobs, is a source of architectural services, not only as "green" building projects, but also in consulting services, a direction I have championed in the past as a crucial ingredient in raising the architect's public stature. Green services could include such areas as lead-abatement consulting and "green" audit services.

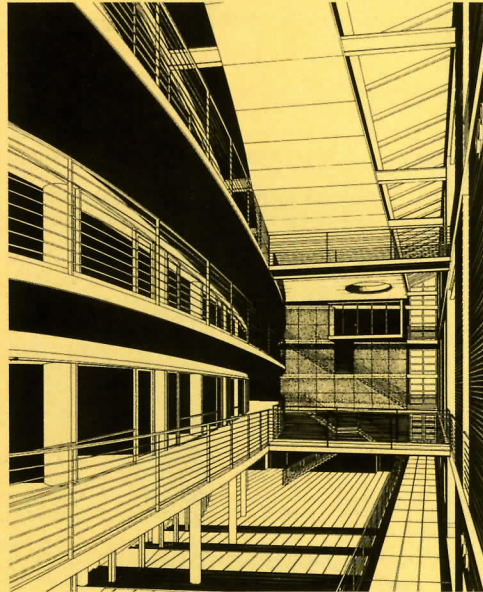
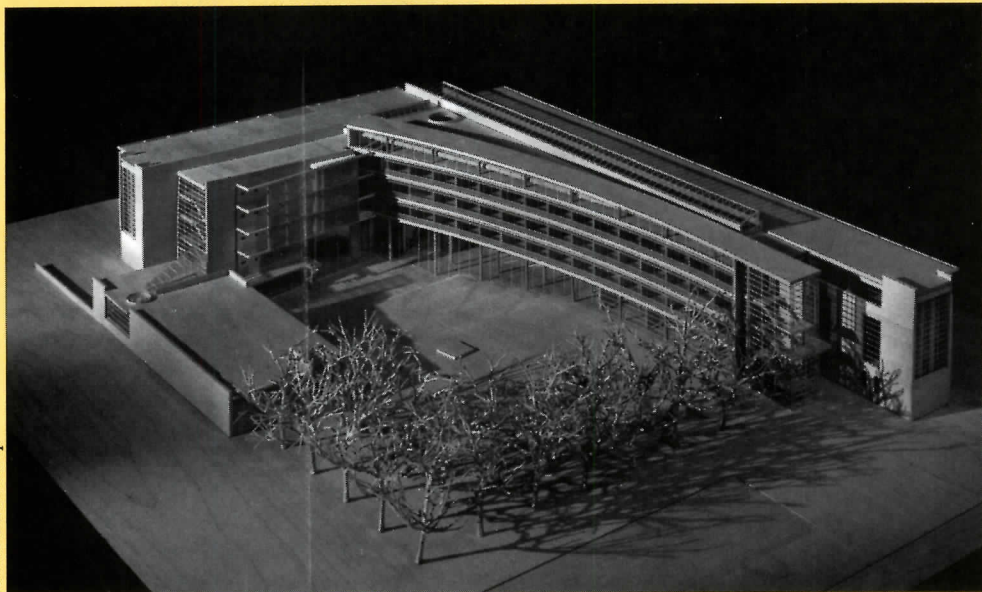
The range is huge. Where architects tap into it, and how, is limited only by their imagination, enterprise, and perseverance. *Stephen A. Kliment*

**SEPARATELY,
WE WERE
RECOGNIZED FOR
INNOVATION
AND QUALITY.**

**TOGETHER,
WE ARE SETTING
A NEW
STANDARD.**

Illinois

New Architecture School Will Sit at Campus Crossroads



Designed by Perkins & Will, Temple Buell Hall will help stitch together old and new at the Champaign-Urbana campus of the University of Illinois when it opens in late 1994. Set at the intersection of two major campus axes, the 77,000-square-foot complex, which

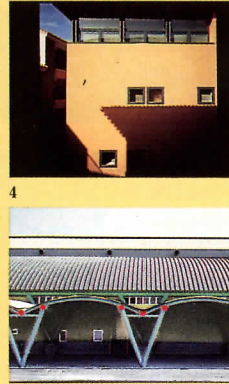
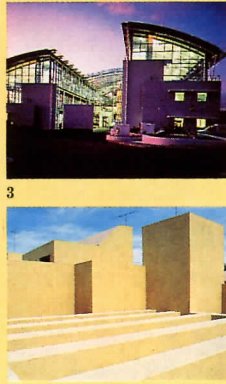
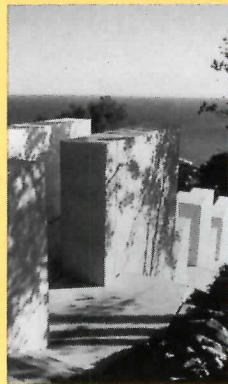
will house the School of Architecture and Departments of Landscape Architecture and Urban and Regional Planning, will present a masonry face to older Georgian buildings and a curving glass wall to the newer parts of campus, says Ralph Johnson, the partner-

in-charge. The masonry portion will contain studio lofts, while the glass structure will house offices. Equally important will be the spaces defined by these areas—an irregular indoor space usable for exhibits and gatherings and an outdoor garden. *C. A. P.*

International

Twenty Finalists Vie for Palladio Prize

The winner of the Andrea Palladio international prize for architecture will be chosen in late August from 20 finalists, including Marc Barani (1, cemetery, Nice, France); Dick Bruijine (2, weekend "tree" house, Almere, Holland); Gerald Sanderson (3, Windsor House office building, Plymouth, England); Enric Batlle and Joan Roig (4, restoration/extension of Fontes Palace, Murcia, Spain); Oscar Cadena (5, house, San Luis Potos, Mexico); Shuhei Endo (6, Toseki tile firing plant, Asaicho, Japan); Richard Stacy (house, [RECORD, April 1992, page 124]). ■



1

2

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Architectural Record June 1993 21

awards. Contact CAYC, Elpidio Gonzalez 4070, (1407) Buenos Aires, Argentina. Fax: 011/54-1-566-3867 or 311-3156.

• August 31 is the deadline for overseas entries in the Makmax Membrane Design Competition. Contact Shinkenckusha Co., Ltd., 2-31-2 Yushima, Bunkyo-ku, Tokyo 113, Japan. Phone: 011/3-3811-7101.



arts center—reimagine its future. As a result of a charrette, a local utility agreed to train neighborhood youth to weatherize the bungalows. The Village is assembling a proposal to expand the complex. The Coalition works with communities for whom last year's uprising was only the latest step in distintegration. *Aaron Betsky*

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the cost of a new house. Since March, prices have slackened, but long-term shortages will mean higher lumber prices. The timber industry has argued since the 1950s that it plants more than it cuts, creating a "sus-

depended on the spotted owl's listing as an endangered species. Environmentalists have found again and again that by the time a species is listed, its habitat is so threatened that a comeback is a heroic undertaking.

ica and Canada are among the new developed countries where wood framing and siding is widely used. Concrete framing and stucco or masonry cladding is much more common elsewhere. *James S. Russell*

Architectural Record June 1993 25

For the laminated glass... including the associated costs of wiring the panel into an electrical grid, costs are in the \$11 to \$16 per sq ft range, and generate about 5W of peak power psf.

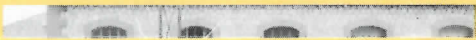
Joan E. Platterman

WINDOW 4.0 runs on IBM PCs or clones with DOS 2.1, and needs 512kb RAM. An extensive update of WINDOW 3.0 by Lawrence Berkeley's Windows and Daylighting

type (masonry or frame), fuel cost, internal loads and hvac type, and eight choices of window orientation. The user selects from seven window types (casement, awning, double hung, etc.) and specifies the glazed area

France

Marseilles Cheers Houston Students' Plan For Historic Tobacco Factory



Rough, tough, and worldly-wise Marseilles

England

Love in the Garden

ARCHITECTURAL RECORD Technology News

ARCHITECTURAL RECORD Technology

What's New in High-Performance Glass Coatings

Spin-offs from the car business add variable-transmission, spectrally selective, and energy-generating products to the architect's glass-design tool kit.

The car business, with its market- and consumer driven performance and production-cost requirements, is the engine that pulls the development of much architectural flat

Southwall Technologies, inventors of Heat Mirror, a suspended film used in insulating-glass units, developed a laminated configuration for automotive use that is now



ARCHITECTURAL RECORD Product News

Special-Use Architectural Glass

Glass...

Driven by expanding, hotly competitive markets and environmental concerns, more innovative products were developed in recent years for glass and glazing than for any other building category. But the pace of high-performance glass introductions has slowed in the past year, while product managers wait for the next generation of coatings to emerge in a cost-effective format. As for glass sales, many industry spokesmen polled by *Glass Magazine* in its 1993 forecast saw the year as being marginally—maybe 2 percent—better than a very down 1992. Potentially stronger areas are rehab projects, especially in late '50s and '60s strip shopping centers, and in the area of such special glass installations as security glazing and ADA-compliant automatic doors. And an optimistic Nick Limb, manager of architectural products for LOF, sees opportunities for architectural glass driven by the 1992 passage of the Energy Policy Act, promoting energy-efficient glass such as his firm's Energy Advantage low-E product.

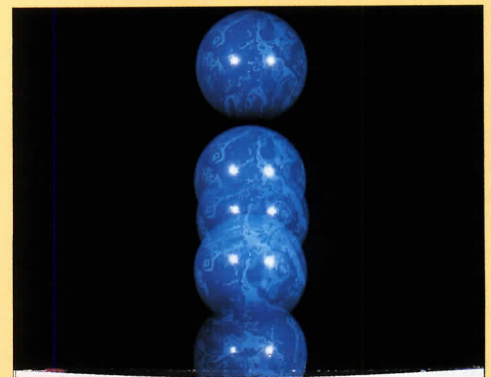
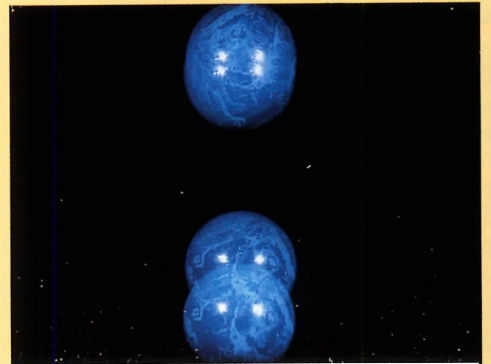
... and windows

Lacking the markets that would drive innovation, the window business is in a consolidating frame of mind. Rather than introducing more innovative products, companies are incorporating the thermal values and test standards developed through the National Fenestration Ratings Council [RECORD, June 1991, page 40] into residential windows. These standards represent a numerical means of comparing the thermal performance—the U values—of different windows as total assemblies of glass, spacers, and frame, information needed in cooler, heating-load climates. The ongoing, much more difficult, effort of the NFRC is how to compare solar heat-gain performance of complex windows, taking into account optical characteristics and the impact of shading devices. Some basic heat-gain calculations are included in Lawrence Berkeley Labora-

300. Single-pane laminate

A new specialty division of DuPont, maker of the Butacite polyvinyl-butryral interlayer for laminated glass, is now marketing SentryGlas, a composite film normally applied to the interior surface of glass, that gives a single pane many of the performance and security benefits of traditional, two-layer laminated glass, but with only half the weight and thickness. The three-layer film is factory-applied using standard laminating equipment under a vacuum, which eliminates the peeling and optical distortion associated with field-applied films. The composite film is based on an antilacerative product used in car windshields, and protects against injuries caused by minute slivers of glass (spalls) flying from the interior side of glass. The photos (right) demonstrate SentryGlas performance compared to standard glass under the impact of a 16 lb weight dropped from 10 ft. The composite also passes the more severe UL 972 test, in which an 1/8-in.-thick pane must resist penetration by a 5-lb shot dropped from 40 ft. It is an approved safety glass, and needs no special moisture-resistant edge treatment.

Ongoing full-scale testing on glass laminated with the PVB/polyester composite is being performed at Texas Tech, and is demonstrating in-use characteristics similar to standard, two-light laminates with respect to wind loads and blast resistance. Preliminary results indicate that SentryGlas qualifies for installations where codes might require two-light laminates or tempered glass. The diagram below calls out components of SentryGlas: a special, moisture-resistant PVB interlayer next to the glass; a layer of optically clear PET; and an abrasion-resistant coating. This surface is not affected by common solvents such as acetone or gasoline, and can be cleaned with standard window cleaners. DuPont Company, Advanced Glazing Products, Wilmington, Del. ■



302. Printed interlayer

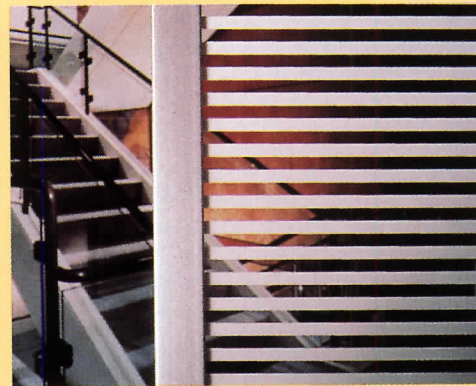
Originally introduced on a custom-pattern basis primarily for interior applications such as partitions and cabinet glazing, ChromaFusion laminated glass now comes in an expanded range of standard designs and colors. Maximum sizes are larger as well—58- by 133-in.—making the colorfast laminate suitable for exterior glazing and curtain walls. Developed by Claudio Cesar, an artist with special expertise in inks and pigments (with research and marketing assistance from DuPont), the architectural-graphic glass is produced in a new 28,000-sq-ft factory in Rhode Island.

Standard designs come in three groups: 14 geometrics, such as Negative Squares (1), Horizontal Lines (2), and Negative Grid (4); nine textures, such as Wisp (3); and five sandblast-effect densities. Since designs are printed on film and sandwiched between two sheets of glass, the surface will not fingerprint, stain, or wear. And unlike frit glass, the reflectivity of the pattern is identical from both viewing sides. Patterns are crisp, and can be specified in a range of colors and combinations of colors, including metallics. Costs for ChromaFusion, priced according to the size and specs of the glass lights and the volume of the order, start at about \$8.50 per sq ft, becoming more competitive with other glass-graphics techniques as complex, multiple-color treatments are specified. Since the dot-matrix pattern is printed on the interlayer, almost any graphic, such as halftones or line art, can be reproduced, incorporating the subtle shading of the original artwork even when greatly enlarged.

ContraVision, a companion two-way-reading laminate product, was used by architects CRSS, Inc., to create a special Presentation Center within a larger showroom space. A 20-ft-long glass wall presents a transparent face to approaching customers, set off by a corporate logo (5). But once inside the space, a large image is visible, an old news photo digitally photo-imaged and reproduced across five glass panels (5a). The relative brightness of each space affects the transparency. Both of these Architectural Graphics Glass products are true, PVB-laminated glass, with the impact-resistance, sound attenuation, and UV protection offered by standard laminate glass. Cesar Color, Inc., Burlingame, Calif.



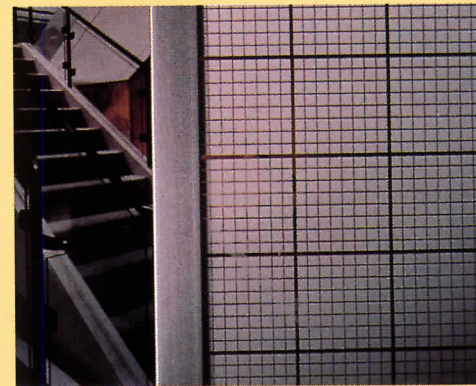
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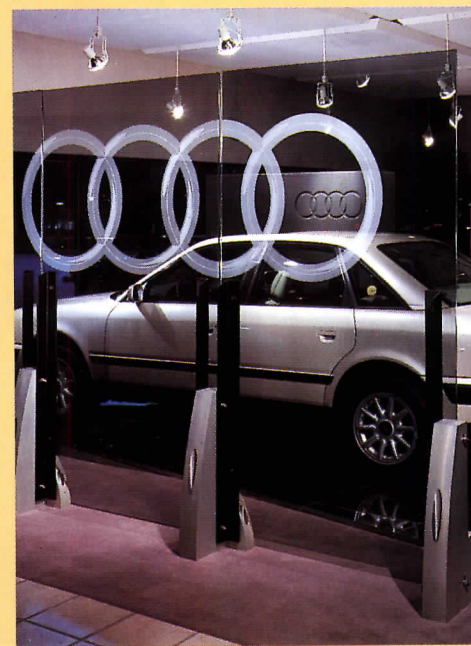
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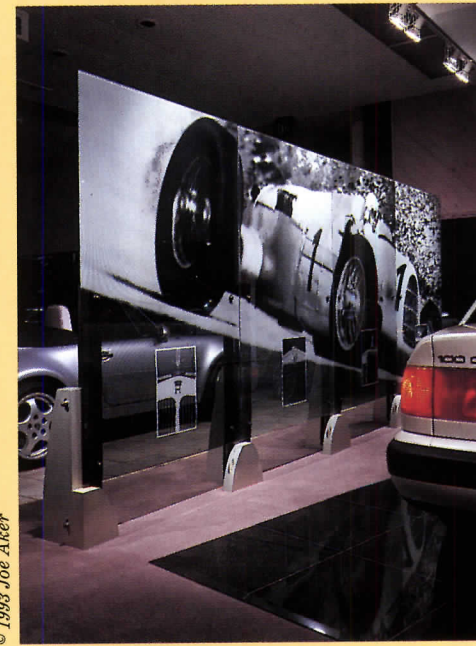
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4



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5a

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303. Nonreflective glass

Amiran is a multiple-layer interference coating for flat glass that reduces reflected light to less than one percent. (Standard plate glass reflects from 8 to 15 percent of incident light, depending on whether it is single- or double-glazed.) The coating is weather-proof, and is ordinarily applied to both sides of a glass light. It works like the matte glass used to protect artwork, keeping the view clear and free of distracting and confusing reflections. The dining room below has standard plate-glass windows, which reflect the illuminated interior after dark, essentially blocking the view for diners at any distance from the windows. In comparison, the restaurant at bottom (designed by Louis Owen, Inc., architects) has the identical view (it's on the floor above) but large (4- by 9-ft) Amiran lights permit an unobscured view of the Seattle skyline beyond. For a storefront, where the view is from the outside in, the nonreflective glass brings displays visually closer, without reflected street clutter, and reduces the need for overhangs or awnings to control glare.

Made in Germany, Amiran glass is being stocked in this country in sizes up to 10.14 by 6.1 ft, and in five thicknesses. Schott Corporation, Yonkers, N. Y.

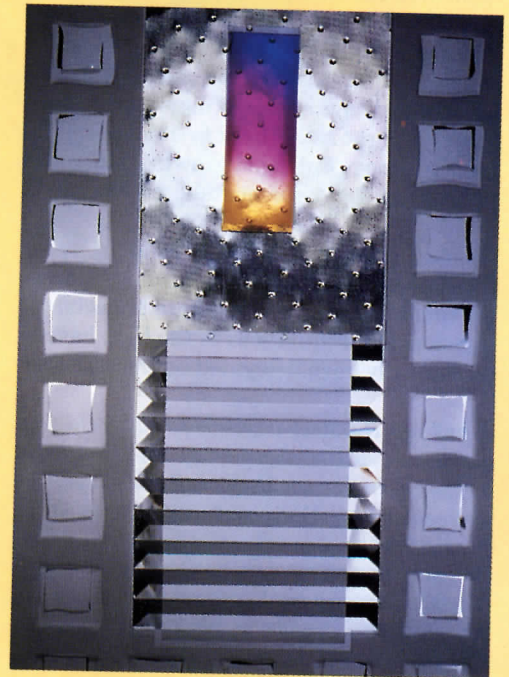


304. Multilayered decorative glass

The Inner-Lite process, developed by glass artist Gordon Huether, "suspends" colorful beveled, etched, or textured hand-blown art glass within an energy-efficient insulating unit. The technology is said to permit use of large-scale panels of decorative glass on exteriors as well as interiors in healthcare, school, and other public areas where maintenance might be a problem. No matter how intricate the interior glass pattern, the architectural glass is supplied to the jobsite as a glazed and sealed unit ready for installation in standard-dimension framing.

Pictured (right, top and middle), the Bio-Medical Research Facility at Stanford University (by Stone, Marricini & Patterson, architect) has suspended shapes of German blown glass set within panels of tinted Solex glass. (High-performance commercial glass can be specified for increased energy efficiency, and so that the outer lights work with adjacent building materials.) Here, the inboard surfaces of the outer glass panes have been etched, creating a light-diffusing frame for the teal-colored art-glass squares adhered to the inner light of the triple-glazed unit. A glass sculpture by Gordon Huether (bottom photo) demonstrates some of the range of textures within a single panel. These include multicolored dichroic glass, colored blown glass, sharply beveled pieces that act as prisms, and hand-made seeded glass. Architectural Glass Design, Napa, Calif.

Literature from glass fabricators and manufacturers is featured on page 142



in environmentally sensitive areas without controversial changes to the current zoning map or community-financed site surveys that determine precisely where the sensitive areas are located. A developer applying for a

Sustainable Development: How to Make It Work

Observations

For the Record: Schuyler at the 1893 World's Fair

By Suzanne Stephens

Montgomery Schuyler's "Last Words About the World's Fair," published in *THE ARCHITECTURAL RECORD* in 1894, has often been considered the most perceptive critique of the Columbian World Exposition to be published at the time. Even among Schuyler's own work, this essay was judged "possibly the best thing he wrote," by William Jordy and Ralph Coe, who compiled Schuyler's criticism in *American Architecture and Other Writings of Montgomery Schuyler* in 1961.

Schuyler, a veteran newspaper journalist who had made architecture criticism a particular specialty, identified three attributes of the Fair, pertaining in particular to the Court of Honor, that were responsible for its "architectural triumph." These were unity, magnificence, and illusion. At the same time, Schuyler cautioned against using the Fair as a model to be imitated in further architecture and planning endeavors. This "festal" grouping of buildings, erected temporarily in a waterfront setting and landscaped by Frederick Law Olmsted and Henry Codman,

Suzanne Stephens is the editor of Oculus and a regular contributor to The New York Times. For this article, she drew from the research and writings of William Jordy and Ralph Coe, John W. Thorn, Helene Lipstadt, Andrew Dolkart, and Dudley A. Lewis.

should be seen, Schuyler urged, as a "stage set." To Schuyler, the Fair was not architecture. "The art of architecture is not to produce illusions or imitations, but realities, organisms like those of nature."

At first reading, it seems strange that Schuyler, who has come to be regarded as the premier proto-Modernist architecture critic of the period, would seem to actually approve of these Neoclassical concoctions. Or that he would look so benignly on their symmetrical disposition around the lavishly peristyled and porticoed basin of the Court of Honor. After all, Schuyler was singled out by both Frank Lloyd Wright ("In the Cause of Architecture II" published in *RECORD* in 1914) and Lewis Mumford (first in *Brown Decades* in 1931, then in *Roots of Contemporary Architecture* in 1952), for helping advance progressive ideals in architecture.

As Mumford put it in *Roots*, Schuyler "never hauled down the flag." Indeed Schuyler had initially criticized the choice of Neoclassical architecture at the Fair in an unsigned *New York Times* editorial since attributed to him. In the piece, written at the time of the Fair's dedication in October 1892 (still months away from the opening on May 1, 1893), Schuyler said about the architecture, "as a style it looks backward," calling it both "unmodern and undemocratic." Nev-

ertheless in the same piece he allowed that the Fair was still a "very remarkable triumph for our democratic Republic."

Adjusting his earlier appraisal

During the next year, in which he wrote over half a dozen pieces on the Fair for the *Times*, as well as three articles for *RECORD* (including an anonymous "Architectural Aberrations" now attributed to him), Schuyler seemed to adjust his earlier appraisal of the Classical architecture of the so-called "White City." While he panned the Neoclassical U. S. Government building by Willoughby J. Edbrooke as a "rude and crude and ignorant compilation of features" in his "Aberrations" piece, Schuyler declared the Neoclassical extravaganzas of McKim Mead & White's Agriculture building and Charles Atwood's Palace of Fine Arts to be "beautiful."

In "Last Words" Schuyler pointed out that the choice of a Neoclassical architecture gave a strong unity to the ensemble, as did the common cornice line 60 feet in height, and the shared material—an amalgam of plaster and hemp called "staff,"—that coated the temporary wood and iron structures. In this summary piece, he explained that the Classical buildings also achieved a magnificence not just through the staggering dimensions (George B. Post's Manufactures and Liberal Arts Building was 1,687 by 787 feet), but by grace of the

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Bird's-eye view of Lagoon and Lake Michigan.



Looking southwest from Manufactures Building.

The Art Institute of Chicago, Eyerson & Burnham Libraries

One hundred years after the event, Suzanne Stephens re-examines what architecture critic Montgomery Schuyler had to say about the Chicago World's Fair when it first opened.

"pillared avenues" of the Neoclassical arcades and colonnades that were associated with "the very beginnings of monumental architecture." Indeed, the size of the Fair, embracing 633 acres, was three times that of the Paris Exposition of 1889.

While the Transportation Building, placed away from the Court of Honor on Olmsted's picturesquely conceived lagoon, was designed by Adler & Sullivan as a monumental work, it didn't quite win Schuyler's complete approbation. On one hand, Schuyler commended the architects for treating plaster architecture as plaster, instead of trying to imitate masonry. Yet Adler & Sullivan attempted to "enliven" the plain expanses of staff by a color palette (basically red and orange) that Schuyler felt was "not successful." Since the colors played such a major role, the overall design suffered. Schuyler also observed that the huge 70-by-100-foot Golden Doorway ended up being an "isolated fragment, entirely unrelated to the general scheme."

Higgledy-piggledy planning

The State buildings also came under attack by the critic, particularly in their planning. In an article for RECORD, "State Buildings at the World's Fair," Schuyler condemned their clustered arrangement as "higgledy-piggledy," where buildings were "strewn promiscuously" around. Regarding their

individual architectural treatments, he didn't condemn their historicist leanings per se. The particular approach to history was at issue. Schuyler felt the state buildings should reflect the history of the colonies and/or the region. McKim Mead & White's adaptation of the Villa Medici for the New York State pavilion might be quite fine by itself, but he would have preferred an adaptation of an historic house from Albany instead. California's Mission-style building designed by A. Page Brown, on the other hand, at least made an homage to the local color and character of architecture of that state. Even New Hampshire's building, designed by George B. Howe as a modified chalet, was not, according to Schuyler, "inappropriate." The German pavilion, another historicist building evaluated by Schuyler in *The New York Times*, was commended for using staff in an honest way, but dismissed as an overexuberant rehash of German architecture of the 15th and 16th centuries.

Exuberance at the Fair was allowable, of course, but in its proper place. And no place was as fitting as the Midway Plaisance. In a *New York Times* review Schuyler noted that "It is out here in the Midway Plaisance rather than in the White City itself, that the World's Fair and cosmopolis is to be found. For the civilized world, or Christendom as it used to be called, is too much of a muchness to offer much of an ethnic study." But eth-

nic study only went so far. A notorious hit of the Fair was belly dancing, a.k.a. "the hootchy-kootchy." But it was too much for Schuyler: "The dancing at the Egyptian theatre is not describable, except by saying that it is disgracefully indecent." Schuyler urged that it be stopped. His other comments about the various ethnic exhibits in this entertainment district were more jocular in tone, but today would be described as racist.

The Fair as a stage set

With most of his commentaries on the Fair, Schuyler made it clear that the architecture and planning had to be judged on quite different terms than such efforts in the every day world. Indeed as he wrote in the "Aberrations" piece, "Here, as in stage setting, illusion is what is aimed at." Other critics missed this point, with possibly the exception of the European architects and historians. The European critics covering the Fair were divided roughly into two groups. Those who represented a general-interest audience often praised it highly. Some even marveled that Americans, known for their ugly, uncivilized cities, had it in them to come up with such a resplendent artifact. French writer Paul Bourget referred to the real landscape of Chicago he saw surrounding the Fair as "the black city." As for the European architects and architecture critics, they were much harsher in their assessments. They generally saw nothing new



Grand Basin and South Canal: Agriculture Building, the Colonnade, and Machinery Hall.



The U. S. Government Building, which Schuyler criticized in an "Architectural Aberrations" article.

C. D. Arnold, Chicago Historical Society

© The Bettmann Archive

there, only weak imitations of Beaux Arts classicism. The English historian Banister Fletcher, in fact, feared that American architecture, known for its inventiveness, would be set back by the Fair.

Generally the reaction to the Fair by the American critics, in both the popular and professional press, was favorable at the time it opened. It was only a few years later, when American architects and architecture critics, such as P. B. Wight and Claude Bragdon, began to lament the rapid embrace of Beaux Arts academicism by all of America, even in the home of Chicago School architecture, that the Fair began to be viewed in a dimmer light. By 1922, when Louis Sullivan denounced the “virus of the World’s Fair” that caused the “violent outbreak of the Classic and the Renaissance,” it seemed as if his words were indeed the last and truest ones. In spite of Schuyler’s warnings of the dangers of careless imitation, the Fair’s popularity had fostered the growth of Neoclassical public and commercial buildings anyway.

An esthetic filter

Schuyler’s criteria for judging the Fair buildings—unity, magnificence, and illusion—so applicable to this ephemeral situation, were integral to a larger framework of values by which he evaluated architecture. His criticism was based on the

belief in the honest and sincere expression of materials and building techniques, with design as an “organic” response to given conditions. He also examined each architectural response on its own terms. Yet these ideals were applied to the particular circumstances through a fundamentally esthetic filter. Traditional rules of proportion, scale, and harmony were basic to his evaluation, no matter whether Schuyler was criticizing Gothic Revival, Richardsonian Romanesque, Neoclassical, or proto-Modernist architecture. All such expressions still had to conform to the laws of the eye.

This approach to assessing architecture, from the point of view of the observer looking at buildings from the street, was not all that unusual at the time. Schuyler and others did not often address how the plans of the buildings affected the interior spaces or their functions. Nor was the perceptual and kinesthetic experience of space and light a major preoccupation of criticism at the time.

If Schuyler were to appear as a critic today, he would find more expected of his evaluations than the three criteria of unity, magnificence, and illusion, even for an ephemeral setting, would allow. He also might be perplexed to find that unity and coherence are no longer significant attributes of modern-day spectacles of a comparable nature. Instead images, often fragmentary,

are collaged together. While the hotels at EuroDisney obey a height limit, the variegated “themes” do not stress unity, magnificence, or illusion. If anything they accept their fakeness with a cheery bravado.

Schuyler would also be surprised to hear theorists today argue that unity is no longer a viable goal of architecture. “Unity” is now just a component of what K. Michael Hays and others would call “bourgeois humanism.” It is seen as a hopeless nostalgic dream of a *retardataire* value system that implies a belief in the presence of a centered, coherent world where the observer (or “subject”) still has a solid footing. Without a “subject” being important, magnificence and illusion are simply irrelevant.

An unideological approach

Fortunately Schuyler doesn’t have to deal with all the unresolved issues of the modern world. He’s gone. But his bequest to criticism remains. Happily, it is not in the form of a few phrases or rules that one is supposed to apply *a priori* to each new situation. Rather his implicit credo is that evaluating architecture and urbanism requires one to look unideologically at the work and confront it directly on its own terms, at that moment. Next, one tries to clarify the criteria by which the work is to be judged, and then attempt to communicate those final words to the audience. ■

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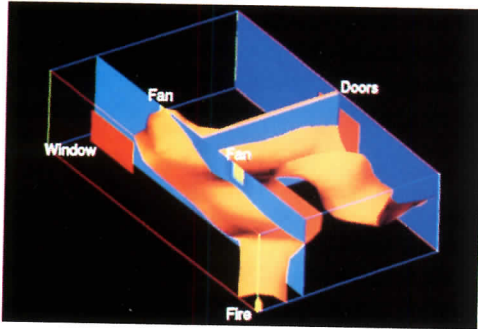
Grand Plaza in front of Administration Building.



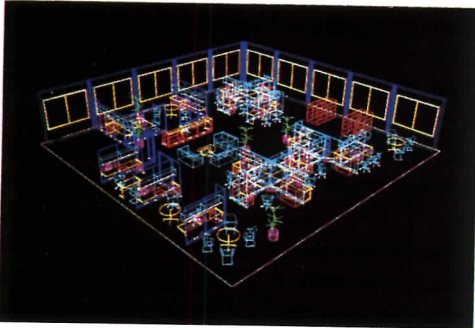
The Arch of Peristyle.

The Art Institute of Chicago, Ryerson & Burnham Libraries

Computerizing the Office



FLAIR simulates circulation of air and pollutants in a building.



The wireless-frame image (1) grew out of a 2-D AutoCAD floor plan. It was rendered in 3-D Studio and saved in Adobe Photoshop to produce image at right (2). Note the video-captured landscape through the windows in the more detailed closeup above (3).

Last year Columbia University, where I teach, hosted an exhibition of architectural drawings. The examples, spanning about half a millennium, showed a clean, stately progression from the work of Italian masters. Their art helped the designer design, helped the client and whatever government regulators who were around visualize the final product, and helped the builders put it all together.

The past few years have seen the development of technology that has the potential for moving architectural design and drafting further than at any time in the past 400. We can now rough out a design in three dimensions, test it for shadows and light, color and bulk, circulation and energy consumption. We can walk through a design, firm up a part of it, do the hard-line drafting, and modify at will. We can track possible costs, and correspond software with suppliers' computers. The software can even check our work as it progresses. Does it meet local codes? Targets for first cost? Life-cycle cost? Potential construction schedules? Are there incompatibilities between the windows you want and the exterior wall panels?

Although we *can* do all this, technically, we can't do it on a regular basis. The reason: You can only get out of a drawing what you put into it. Either your office does it by building expertise and adding to libraries of details, or product vendors provide the expertise with computerized catalogs. In fact, both are happening.

By the end of the decade, there will be a wide gap between those who have computerized correctly—from top to bottom in their organization—and those who still maintain an artificial separation between design and production drafting.

The people who sell software and hardware are trying to make it easy for you. As of this year, all major CAD software running on DOS, UNIX, and Macintosh will share more or less automatic file translation. Over the next few years, much of the expected increase in computer power will go into ease of use—software will train you as you use it, and even suggest alternative ways of doing specific tasks.

Most importantly, different software and hardware vendors have different views of how different architects want to work on different projects. Thus, they will continue to bring different products to market. Pay attention. Sometime soon, someone will make your life easier by selling you a computer. *Steven S. Ross*



Architect 2000

There's a computer in your future—your near future. In fact, there probably are several. Surveys of our readers early this year showed that more than three-quarters of the respondents are at offices where computers are in use for design and drafting. Computer use is increasing fast too, despite the mixed market for new construction.

But various practices are using widely different computer technology in widely different ways. This supplement cuts through the confusion to highlight the key trends, and to highlight how practices of different sizes and types are computerizing. Some conflicts:

- Computerization has spread most in the drafting room. But in the future, most practices may not have a separate drafting room at all. Each professional in the practice will have a computer or terminal.
- Use of computers for client presentations has spread at the high end—large projects—but also for the very smallest projects, to help less-sophisticated clients visualize designs. But it is generally not cost effective to do highly detailed visualizations too early in the process, when the design is still in flux.

- More conceptual design is being done on computers, but architects in many of the larger practices are resisting the trend—seeing it as a back-door way to force designers back to “drafting.”
- The variety of hardware and software in use in architectural practices seems to be increasing, not decreasing. But the lack of standardization has not been a huge barrier, thanks to technical advances that allow everything to work together almost—but not entirely—seamlessly.
- Software has become easier to use for simple tasks, but more dazzlingly complex for those who wish to explore all possible software capabilities.
- Training has emerged as a major cost—perhaps *the* major cost—of computerization. But much of the cost has remained hidden in on-the-job informal training time and lessened productivity.

Exactly how are offices using computer technology these days, and how can computers enhance productivity and design quality?

Survey results

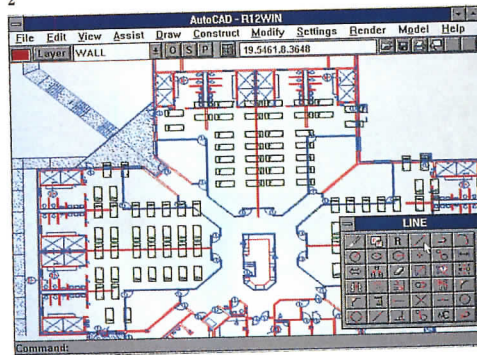
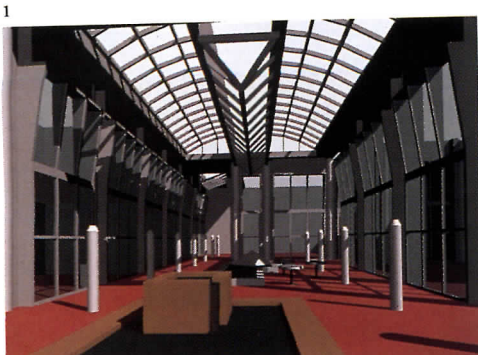
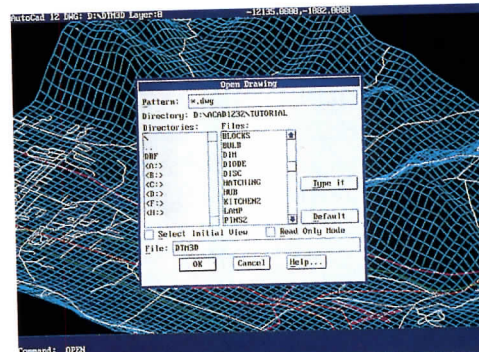
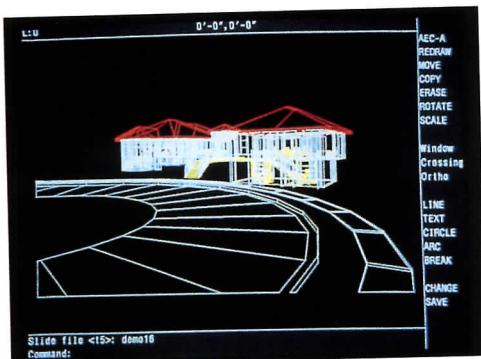
Our surveys, as you might expect, showed that most offices are using drafting and de-

sign software. But they also showed wide use of spreadsheet and word-processing packages, and software for presentations, brochures, and bookkeeping.

Our surveys confirm that users of UNIX equipment from Sun, Intergraph, and others do mainly production drafting on their computers. Owners of DOS and Macintosh equipment are, on the average, far more eclectic, using their equipment for presentations, brochures, word processing, office recordkeeping and more. DOS users are more likely to favor drafting than their Mac counterparts, and Mac users are more likely to favor design and modeling. It's not that there isn't great rendering and presentation

Focus by building type (firms can have more than one)

Commercial	68	45%
Residential	62	41%
Institutional/religious	30	20%
Industrial	27	18%
Educational	27	18%
Health care	23	15%
Retail	23	15%
Offices	21	14%
Government/public	15	10%
Rehabilitation/maintenance	11	7%
Other	24	16%



1. Even simple artwork can produce a slideshow-walkthrough that greatly enhances client understanding.
2. AutoCAD and other drawing software can be combined with the intelligence of geographical-information systems.
3. GIS representations can be rendered as in this RX image view.
4. Modeling software combined with full-color output provides near-painting quality of this Finnish shopping centre.
5. Windows-based CAD adds flexibility.

A survey of our readers shows how architectural offices are using computer technology these days, and how computers can enhance productivity and design quality.

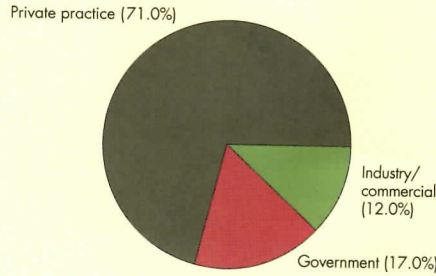
software for UNIX equipment. There is. But many practices seem to find it more cost-effective to do heavy-duty drafting on the heavy-duty machines, and do the other tasks on DOS and Mac equipment in the same office. That's odd in one sense, because tasks such as rendering actually take more raw computational power than straightforward drafting. But rendering and brochure and presentation materials are episodic; handling them on equipment dedicated to production drafting could disrupt the work flow.

As UNIX equipment continues to come down in price—the smallest from Sun, HP, and other firms are priced no higher than the larger DOS and Mac machines—this division of machine labor will probably lessen.

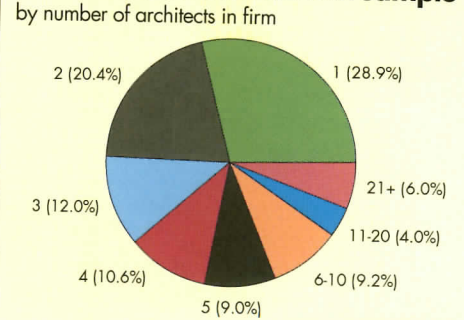
Small firms are much more likely to use computers for design than are larger firms. Firms with three or fewer principals are most likely of all to have computerized from top to bottom than are firms with more professionals.

About 30 percent of the respondents do all schematic design manually. Another 10 per-

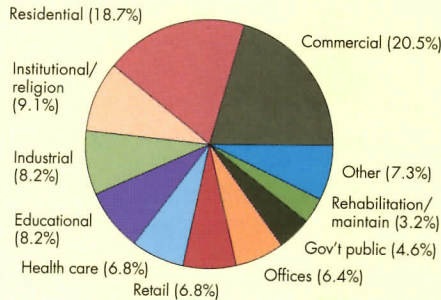
Firms by type in sample



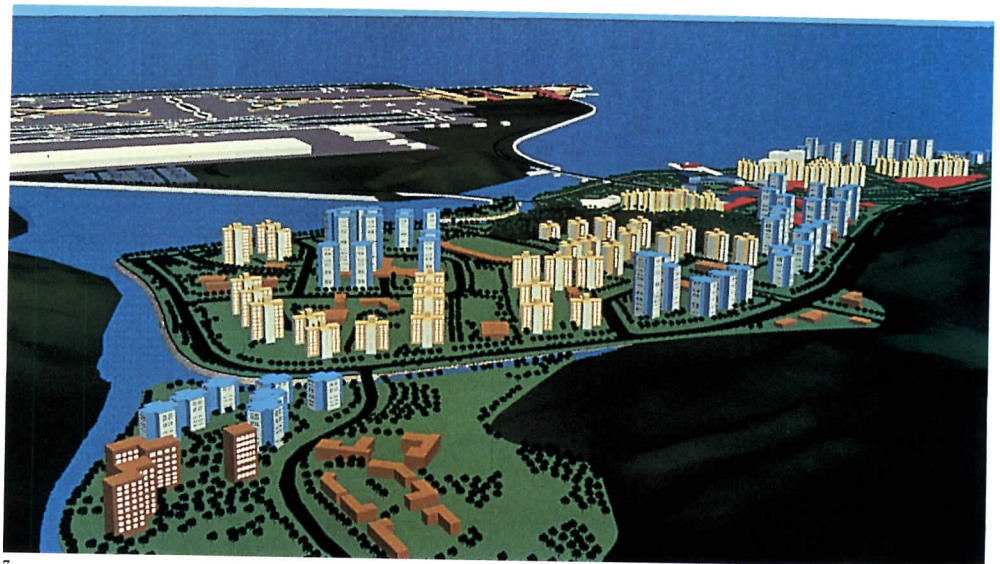
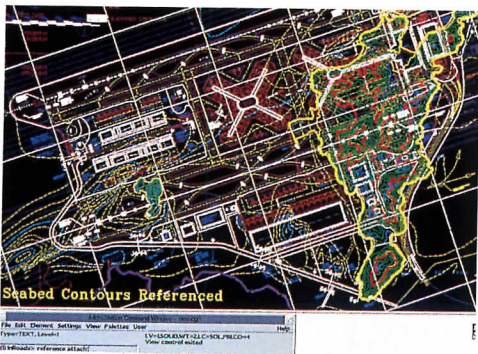
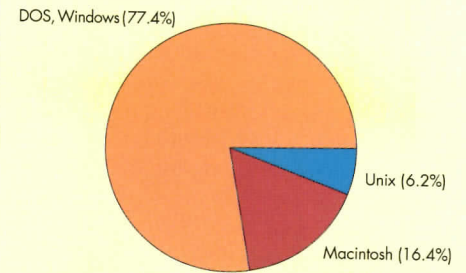
Distribution of firm sizes in sample



Activity by type in sample



Computers in use, in sample



6., 7. One drawing database can produce wildly different images for different purposes, as in these two views of the new Hong Kong Airport.

cent do as much as half of their schematic design without any automation. But only about one in 20 do it all on the computer. Design development is fast becoming computerized, however, with fewer than a fifth of respondents doing it manually, and about 15 percent doing it on the computer.

When it comes to construction drawings, about one in six of our respondents said they do drafting entirely by hand; about one in four said they do it all by computer. About half said they do 75 percent or more of their drawings on computer, but only about one in four said they do as much as 75 percent of their drawings manually.

Despite the existence of many cost-estimating software packages, the task is split about evenly between the computerized and the manual—about a fifth of the respondents do estimating manually; a fifth do it all on computer.

When it comes to specification writing, however, the battle is over—well over half of

our respondents say they do all of their specification writing on computer (although not necessarily with specification databases; many simply use word processors to cut-and-paste standard paragraphs). Fewer than 10 percent say they do it all manually.

The situation is much the same for preparation of brochures, bid documents, and other text-intensive tasks. Fewer than 10 percent still prepare documents manually.

Project management is split about evenly between computer and manual methods, and when it comes to training, more than a third of the respondents listed “on the job” training, with regular staff helping newcomers, as most important. Fewer than 10 percent use mainly outside training workshops, and about 10 percent have the luxury of using mainly in-house dedicated training staff.

Only a few—mainly Intergraph users—say they rely on dealer training. And only a few use college-based training courses or consultants coming to the office itself.

There's no particular pattern linking training methods or sources to other software or hardware. This seems odd, because most offices mix hardware and software from different vendors. Getting everything to work together in the most efficient fashion requires more than a careful reading of separate software and equipment manuals.

Three-quarters of the respondents report they distribute computer equipment among staff in general; only about one in seven say terminals are in specific, dedicated rooms.

On the following pages we've put together case studies of two architectural firms, highlighting how computer technology could affect your practice in the next three to seven years.

But first, consider this: On average over the past 20 years, computing power that can be purchased at a given price has doubled every 18 months. By the year 2000, if the trend holds, desktop computing power will double and redouble five times—ending up about 30 times greater than today's PCs.

Ever-increasing computing power allows us to “build” an entire project on a desktop. In the future, extra power will mean “smarter” drawings that “understand” building codes and incompatibilities between separate components. ■



Software that allows you to work directly in 3-D makes production of 3-D-rendered objects fairly easy. With ArchiCAD, used

for these chairs and table, you can draw in 2-D or 3-D and adjust light and shadow.



“Old-Fashioned” Architects Leap To the Cutting Edge

By Tom Bennett

For this Seattle firm, the decision to make the switch to computerization was easy or quick. David Nordfors and Guy Thomsen formed the firm in 1980, and for 10 years had been conducting business “the old-fashioned way.” Schematic design was done with perspective sketches, construction documents drafted by hand, specifications written for each project.

Office manager Barbara Whitney handled all correspondence, specifications production, and bookkeeping. The firm handled many different types of projects but specialized in remodels and renovations, many for institutional and government clients.

The impetus to move to computers truly began when important clients began requesting projects to be submitted in CAD formats.

The start

Nordfors admits that “The switching process—from initial commitment to the idea, to installation of computers—took nearly four years.”

This was in part because all employees of the firm were self-described “computer illiterates.” Before taking the plunge, they knew they would need a solid grounding in computers and CAD systems. The firm sent Guy Thomsen, a 45-year-old senior project architect with 20 years of professional practice, back to school for a nine-month intensive certificate course in CAD management. His thesis for the certificate became a study of the implementation of technology as well as the technology itself.

Thomsen, together with the rest of the firm, looked at the entire business process: How they communicated within the office, wrote letters, memos, obtained prints, conducted client communications, drafted details. Rather than laying down a CAD system on their current work process, they decided to sell their existing equipment, move to a new office, and create an entirely new environment designed around the new system.

Tom Bennett consults on computerization of design firms.

Besides involving everyone in the decision process, they also decided that everyone would know how to use the majority of the applications—not just CAD but word processing, spreadsheets, and other support software.

Homework

They talked with other architects using CAD, getting a general picture of what they needed, then began looking at specific systems. It soon became clear they needed an expert, not just on computers but on how computers relate to architectural process.

They decided on a Macintosh platform. “Ease of use, and finding applications (especially CAD) specific to architecture were paramount to our decision,” says Nordfors.

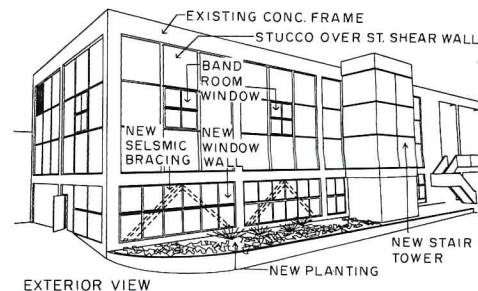
Once the platform was chosen, Nordfors solicited four separate proposals. They had to include the hardware, software, all warranties, technical service and support, and training. “Of course we were looking for the best price, but the other elements of the bid—the training, technical support, warranties—were really what would make the difference. We were going whole hog from the start, so our major concern was how long it would take us to be productive.”

This process put them in contact with d’Arch, a local ArchiCAD reseller and Apple user.

Berry Yamashita and Dana Kruse at d’Arch are practicing architects as well as computer consultants, making them able to bring a unique combination of technical and professional expertise to Nordfors’s problem.

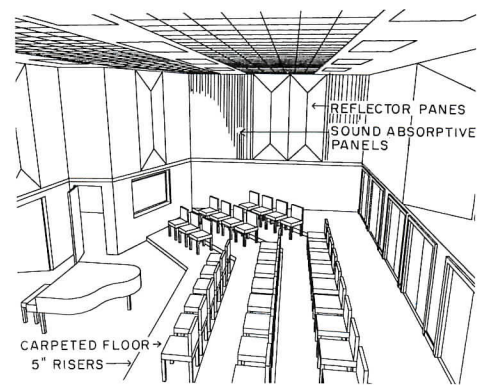
With d’Arch’s help, the firm bought the Macintosh IIci (8MB RAM, 100MB hard drives) and 21-in. gray-scale monitors for everyone as a standard, base configuration. All architects, including project architect Ty Heim and intern James Cave, have the same basic software: Microsoft Word for word processing, the Excel spreadsheet, Aldus Pagemaker, and ArchiCAD with Plotmaker.

“The more you do, the more memory and power your hardware has to have,” says



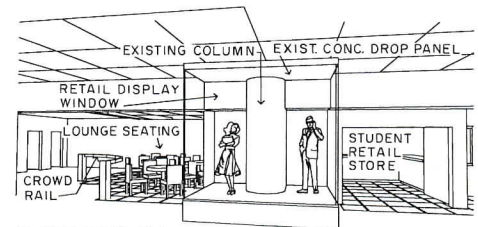
EXTERIOR VIEW

1



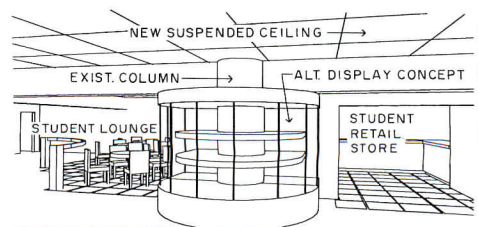
VIEW FROM ENSEMBLE ROOM

2



ALTERNATIVE #1

3a



ALTERNATIVE #2

3b

Art courtesy of David Nordfors Architects

Bellevue (Wash.) High School

Using ArchiCAD on a Mac, exterior view (1) shows how 3-D makes images more understandable. A perspective view for remodeling the ensemble room (2) demonstrates that many views can be pulled from the same 3-D drawing. Two of many alternatives for a new retail space (3 a, b).

"We don't need drafting tables anymore. We may begin by sketching, but we move to the computer as soon as possible."

Nordfors. The IICI turned out not to be powerful enough; they were upgraded to Quadra 700's early in 1993. Coordinating software revisions with System 7 revisions has also caused some glitches.

As owner, Nordfors also uses Microsoft Project for project scheduling. Office manager Whitney maintains the accounting package. All of the computers are wired for EtherNet, though the slower AppleTalk is sufficient, allowing anyone to print or plot directly from their computer.

School

"We wanted to minimize any downtime as a result of the installation, so we got right to work learning the software," says Nordfors. "Our office is still small enough to gather around one computer, so we reserved two Fridays for basic training. A trainer began by running us through basic Macintosh skills—opening files, setting up the computer desktop, printing and saving. From there, we moved to basic software; opening Microsoft Word, typing a letter, formatting it. What quickly began to evolve was a shared excitement about what we were doing; people were spending weekends in the office on their own time, learning as much as they could. Nobody was sitting around wondering what to do or if to do it, another advantage of having everyone buy into the decision."

By the end of two weeks, everyone had mastered the basics, and was ready to move on. Then d'Arch began with a series of training sessions on ArchiCAD.

Nordfors emphasizes using all the resources available for learning, some of them free. "In addition to our training, we attended user-group meetings, help sessions, and used the free technical support telephone numbers extensively. Rather than try and slog through it yourself, you can get a quick answer from someone who knows what they're doing."

Changes

The firm now uses its computers for everything, from sending electronic mail to designing new projects on CAD.

"One enormous change is that everyone in

the office now does their own correspondence and specifications. We've reduced a five-step process to one step," Whitney says. "We actually use one program—Microsoft Mail—more than any other single program. It's really streamlined our interoffice communications."

Nordfors himself uses Aldus PageMaker, a desktop publishing and graphics program, to turn out professional-looking documents and proposals directly from templates.

For CAD design and drafting, Nordfors uses Graphisoft's ArchiCAD, an architecturally specific drawing and modeling program. "We may begin by sketching, but we move to the computer as soon as possible." One of the real productivity gains occurs by reusing information generated in one phase, say design development, as a base for the next, a construction document. Now they do everything on CAD, except for small trace revisions. Even details are drafted and plotted using Plotmaker, ArchiCAD's plotting layout utility. Thomsen and Nordfors estimate they use CAD for design about 40 percent of the time, and drafting 60 percent.

Thomsen credits ArchiCAD's modeling and visualization tools with saving time in design development. "Many clients and even contractors have a hard time reading blueprints. By calling up a three-dimensional model, or doing a walk-through of a proposed design, the ideas become much clearer far more quickly, saving time and minimizing miscommunication."

Working across different computer systems using different software, while still a concern, is becoming less of an issue as computer makers design more "open" operating systems. "We just finished a job where we had five different consultants, the majority working on AutoCAD DOS," says Nordfors. "We exchange files on nearly a daily basis, and by using the DXF format haven't had any problems at all."

Changes in productivity

Overall, the entire office has seen its productivity rise. "First, basic communication. A lot of people in our profession have forgot-

ten that we are a service-oriented industry," says Nordfors. "And as in any service industry, communication—whether it's with clients, contractors, associates in the field—is paramount. In the past, our correspondence level was too high for our resources.. and a lot of these things didn't get done.

"Secondly, the legal aspects. We do a lot of jobs, especially remodels and re-roofing projects, on very tight time frames. Changes that are made have enormous ramifications, and simple miscommunications can have grave consequences. The ability to put together what is essentially a legal document (a new detail or change order) quickly, print it out, and fax it out to the job site is becoming more and more critical."

Guy Thomsen says computers let them handle more jobs than before. "In overall productivity, there was a time last year when we were swamped, more work than we could handle without hiring additional staff, people who might not be needed after the peak. Having computers and a CAD system in the office allowed us to level our human resources; David was able to put aside his administrative work and get to work on the drawings without leaving his computer."

The computer has freed Nordfors to pursue new business and maintain tighter control over job management. Thomsen now has visualization tools that streamline his design process, even to explore new markets, and expand design services.

Return on investment

In treating the switch as a business decision, it helps to look at return on investment as a criteria for how much to buy. It is surprising for Whitney to see, for example, how many firms balk at the idea of spending \$30,000 on a computer system, but won't hesitate to spend that same money by hiring an additional person to do the same work.

Nordfors says the concept of payback is complex. "I think that there are really two separate issues to address. One is improved productivity compared to the way you used to get the job done. The second is the actual return on the investment in terms of doing things faster or expanding your scope of ca-

pabilities as a result of having the new technology. With the basics, letters and spreadsheets, it took about a month to get up to speed. CAD is more complex. I'd say it took us about six months before we were producing work as quickly as we had before. And drawing details still takes longer than by hand to finish from scratch. Yet, the greatest gains are realized over time; the ability to re-use and adapt existing data is where the real return happens. We keep getting faster every project."

The Future?

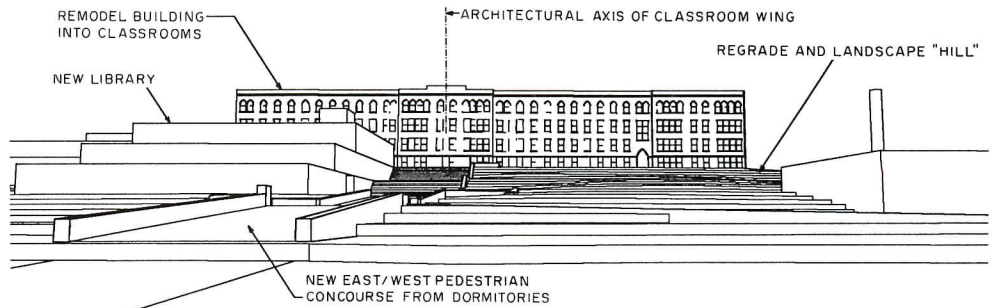
Although happy with what they've achieved so far with computers, Nordfors' office staff sees their skills increasing as the technology advances.

David says, "We'd like to increase our ability to provide visualization services; very simple concept drawings, even at the early stage, have proved extremely helpful in explaining designs to clients. We see technological improvements—cheap data storage, quicker rendering speeds—helping us improve communication with clients."

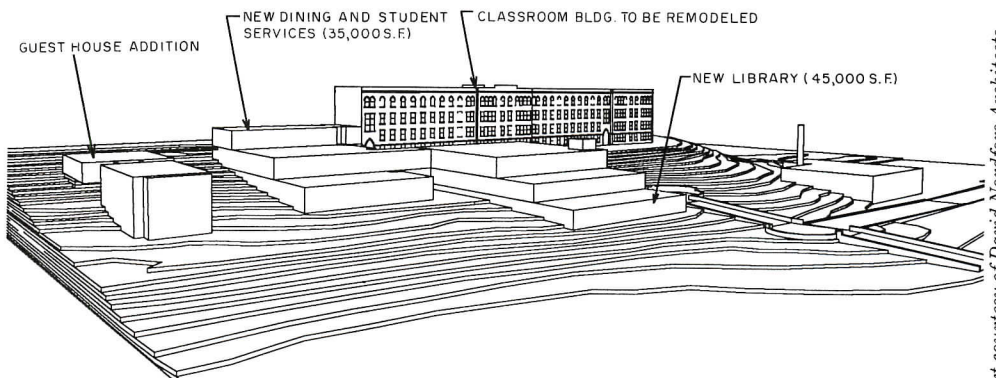
Suggestions for other firms

Having gone through the process themselves, Nordfors principals are happy to share their thoughts on how other firms might approach their own decision:

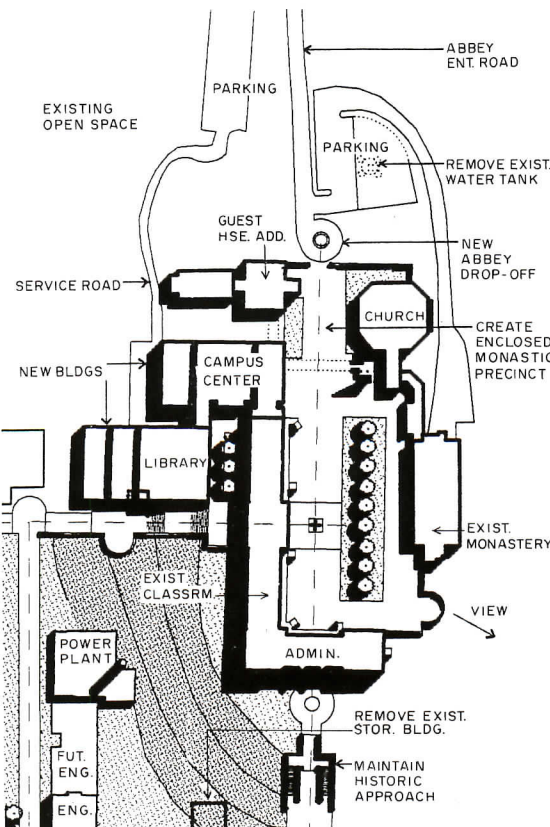
- Make the commitment, go all the way right off the bat if you can.
- Be prepared to change the way you work.
- Don't think of computers as just CAD—think of the entire work process; getting jobs, producing the work, getting the job out the door.
- When buying, deal with an expert—someone who knows architecture as well as technology. You can't expect the software to work exactly the way you do.
- Before buying, do your homework. Read magazines, go to trade shows, visit other offices, ask questions.
- Treat it as a business decision; look at financing options, return on investment, tax gains from depreciation.
- Assign a CAD Manager position in the firm.; someone with the motivation and knowledge to back up files, establish procedures, and handle day-to-day problems. ■



VIEW ALONG EAST/WEST PEDESTRIAN AXIS



MASS AND LOCATION STUDY FOR NEW BUILDINGS



St. Martin's Abbey and College

These drawings, sections of output prepared for St. Martin's, show how 3-D CAD capability can enhance client understanding. One properly prepared drawing can produce both the views above and an infinite number of others, simulating what people would see as they walk through the area. Even the plan view, part of which is shown at left, is enhanced with shadowing.

Art courtesy of David Nordfors Architects

Planning for the 21st Century

By Andy Smith, AIA

Snap! We threw away our pencils in 1989, and have enjoyed life in the ether ever since. That year, two Atlanta architectural firms, AECK Associates and Lord & Sargent, merged with a combined staff of 50. Today, Lord Aeck & Sargent includes 85 architects, interior designers, and related specialists.

It took nearly two years to combine our offices into a single one on a single floor. In an effort to amplify communications, we discarded all drafting tables and our new office design linked all staff desks, the library, the conference room, and project teams' tables with a data network and telephone. The network supports electronic mail and the telephone system supports voice mail.

Just as architects once ground their own pigments to create ink and paint, so must we now educate ourselves in bits and bytes,

Andy Smith is a 1984 graduate of the Georgia Institute of Technology, with a Master of Architecture degree. Since graduation he has been using and implementing computer technology in the architectural office. He is focusing on information integration and design tools for the architect.

Lord Aeck & Sargent has been an innovator in software development, and in the use of new computer tools for both the design and the management of new construction. Their approach

ROMs and RAM. Only after the commands and button-pushes become second nature will we be able to focus again on content.

Why? Our design tools must support an ever-wider range of activity. Technology has introduced, literally, a new medium rich in geometry, color, and even motion. The challenge for the architect of the 21st century will be to become the "master of the media" as well as the "master builder."

The business plan

All of this forced a new way of managing our business. The architectural business historically has not been capital intensive. Purchase of computers, software, and staff education would seem a new departure. The business plan of the merged firm was revised to include technology costs.

Out of this evolved our "\$15,000 rule," that for every hire \$15,000 must be available for hardware, software, and training. By early 1993, the total had dropped to \$12,000, reflecting the lower cost of hardware available for the desktop.

Hardware \$4,000
DOS PC, 486 CPU, 50 MHz, 8 MB of RAM,

SVGA color monitor, 120 MB fixed disk, digitizer tablet, network interface. In 1989 hardware costs were \$7,000.

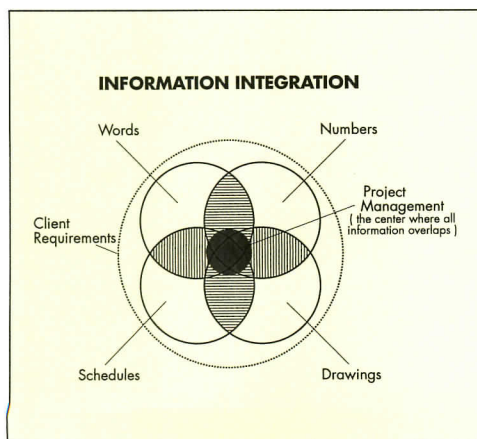
Software \$3,000
Intergraph MicroStation PC. We buy in quantity, and save on the price somewhat.

Education \$1,000
This is for formal education outside the office; in-house education is also provided.

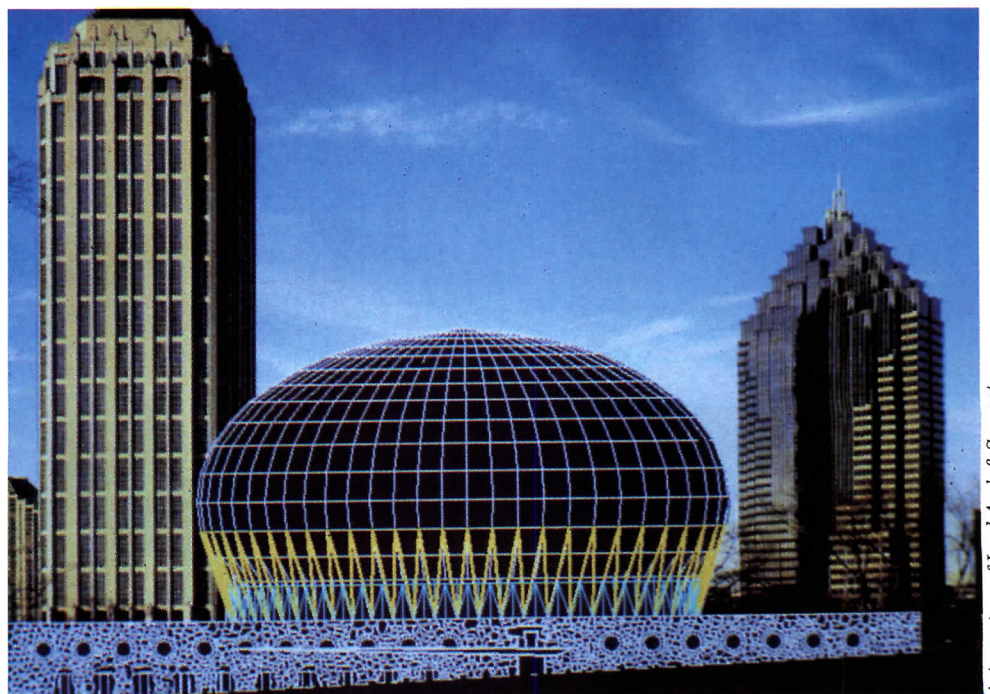
Individual PCs are linked on a network with Novell Netware. The central server has a cluster of 3.2 gigabytes of disk space. Other devices on the network include laser printers, CD-ROM players, modems, and a scanner.

Indirect time \$4,000
Investment is made in the first three months to move up the learning curve and become productive. In-house learning time actually costs more and is becoming the major part of the cost.

The entire office helped shape the plan to promote personal commitment, and it's always being revised. There are series of weekly firm-wide staff meetings to provide a



Lord Aeck & Sargent has devised new ways to integrate technology into the office's architectural process.



Art courtesy of Lord Aeck & Sargent

has helped them expand by over 50 percent in the past four years—while much of the profession has been struggling.

forum to debate aspects of the business and to acquaint the staff with our goals and direction.

Education

Discarding all drafting tables also meant discarding the traditional mechanical skills of drawing with pencil and paper. The new artist's palette includes CAD, rendering tools, pixel editing, desktop publishing, and black-and-white and color output devices.

In 1990, our response was to establish an in-house training program, Lord Aeck & Sargent University, to provide education to all staff in areas of technical computer use and the practice of architecture. LASU uses in-house seminars and professional education services. The entire staff takes courses in CAD basics, word processing, and spreadsheets. There are "graduate" courses in design and services delivery. LASU has evolved into a forum for discussing and developing new methods for integration of technology into the office.

Hiring and hierarchy

Lord Aeck & Sargent does not employ drafters as permanent staff; only architects, interior designers, project managers, and

specialists. There are no "secretaries" as such; the job has grown into one of Project Administrator. This reinforces the idea of team play, where each member takes responsibility for an individual component of the process, committing to the success of the entire project. Each team member has access to *all* the team's information. There is no "middleman" information traffic cop. This reduces hoarding of information for empire-building.

The "matrix" management structure supports specialists such as a mechanical contractor, materials expert, interiors librarian, cost estimator, construction superintendent, and several computer gurus. They all roam the office, providing teams with expertise as needed.

We also have established a family of mechanical, electrical, plumbing, structural, and civil engineering consultants that shares our vision. We write consultant agreements in a manner that reinforces communication and open sharing of electronic data. We also provide technical support to our consultants as needed.

Within the office, we use a buddy system—

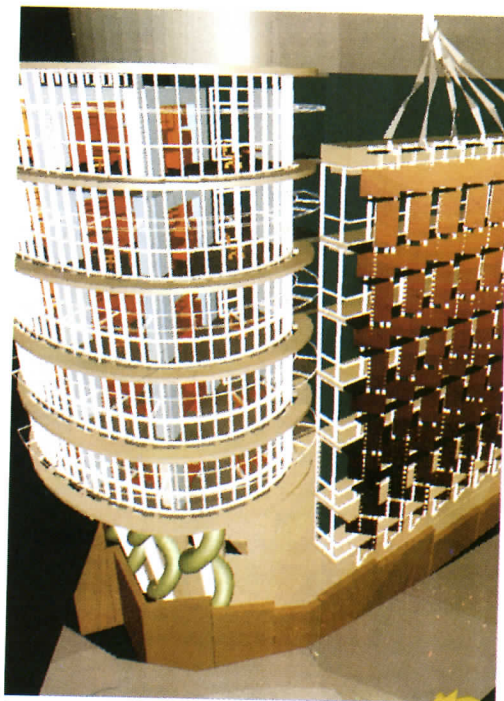
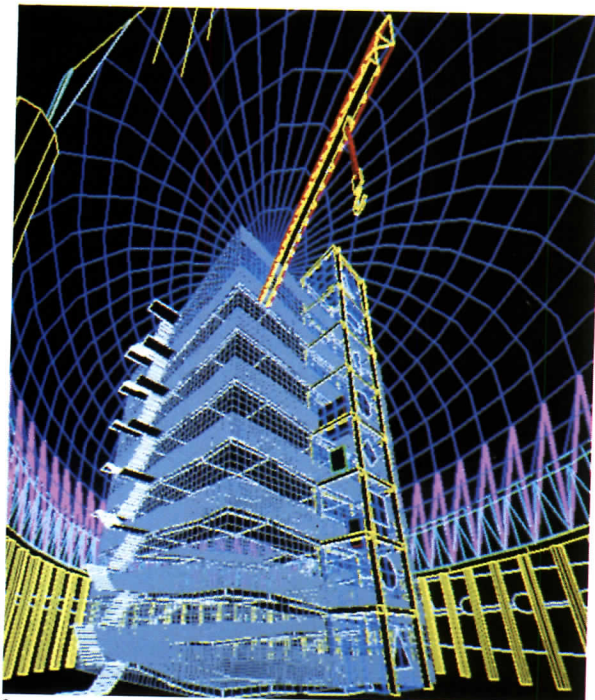
"ask whomever is in sight." If a staff member has a technical or architectural question, he or she first asks a "neighbor," other team members, or the support staff, in that order. After all, the person sitting closest is probably most familiar with the problem as it relates to the project.

Our technology

The computer enhances our ability to reference everything together in a design. At present, we work in 2-D drawings, words, and numbers. Our vision is to move to a complete integration of construction documents and building-systems information.

Our concept is still one of "architect as master builder, inventor, and artist," but "information manager" has been added. Raw data, even piles of it, has minimal significance. Only the retrieval and synthesis of information transforms it into something useful. We have begun to develop an idea of "corporate knowledge" to track ideas and practical experiences that all staff can tap into for help.

The system should also help track all project information and provide a simple way to report its status (see chart, page 78).



The Lord Aeck & Sargent proposal for a children's museum shows the capability of modern 3-D CAD and rendering software—in this case, from Intergraph—to handle non-standard shapes. The exterior view of this partially air-supported structure (1) is shown against the Atlanta skyline; the interior (2) is an attendee's-eye view.

Clients can get massive amounts of detail, as in this view of a laboratory and administrative offices building (3). Repetitive details are economical to draw and render.

"We will still be the master builders—as long as we control the technology and shape it to our purposes."

But there are some caveats:

- If you draw it in CAD, the system should remind you to write the specification.
- If you specified it, the system should remind you to cost-estimate it.
- When you do the cost estimates, the system should retrieve the quantities from the drawing and the quality from the specification.
- Your project schedule should include drawing time, specification writing, and cost estimating.

Building technical expertise

To support all this, specialists focus on day-to-day activity. The specialists manage hardware and software purchases, education, the network, and project support for the project teams.

The specialists also develop new software as needed. In fact, CADDshare Corporation, a software-development firm set up in 1981 and now part of the firm, developed the AIA CONDOC for CADD software for Intergraph MicroStation. CONDOC is a methodology for document formatting and linking drawings to specifications.

We also negotiated with a local reprographic company to provide an in-house print facility that includes a large-format laser (electrostatic) plotter, large-format copier, and other traditional printing equipment in black and white as well as color. We would not have been able to experiment with such output devices without the partnership.

We see the future in this context for all architects:

- We will access the world's databases to serve our clients better and to develop new client deliverables.
- We will communicate ever more frequently with consultants and clients during the design process.
- We will be able to manage, interpret, and present information with greater quality and clarity.
- We will bridge the gaps between client needs, manufacturing, design, and construction.

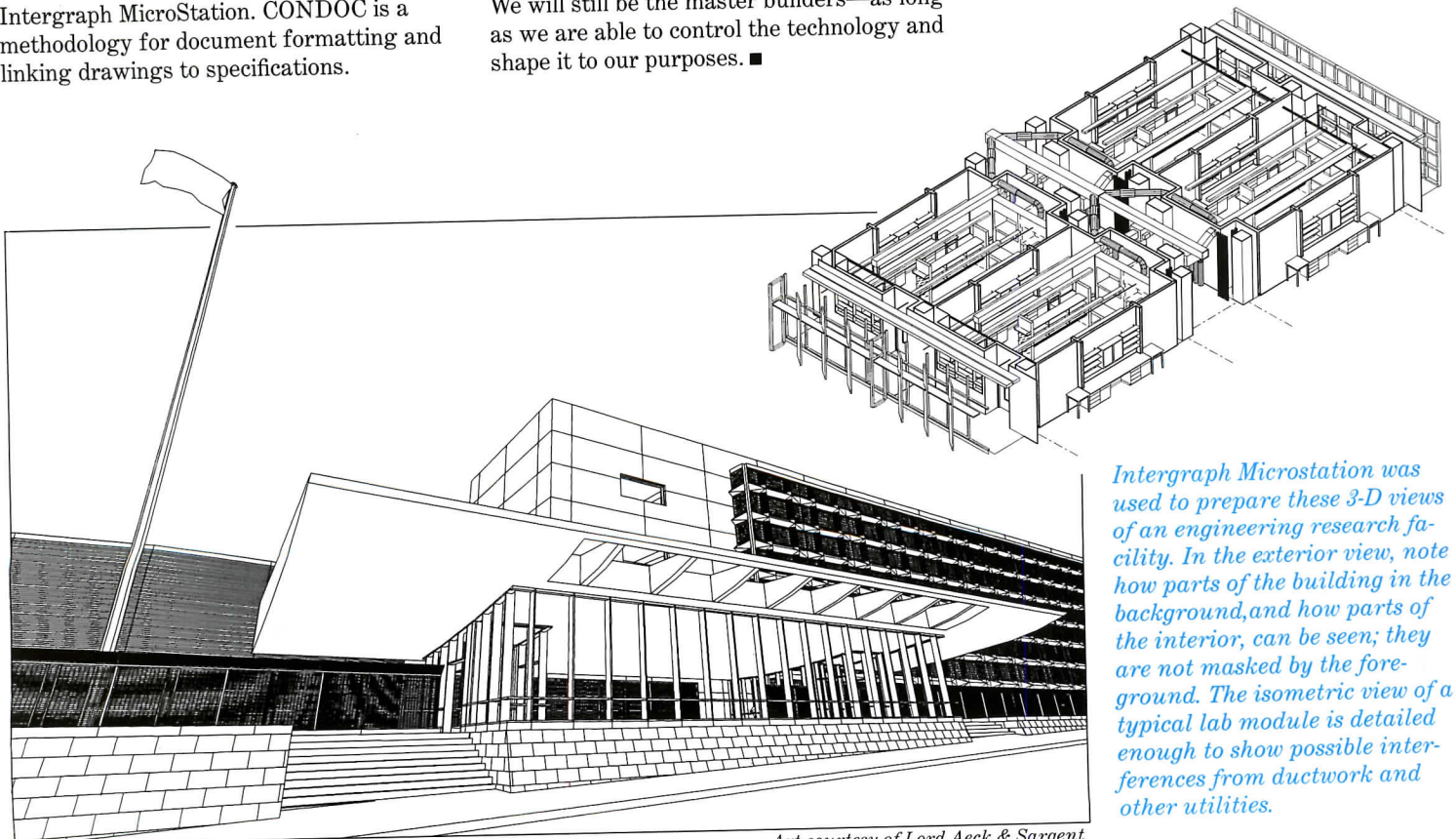
We will still be the master builders—as long as we are able to control the technology and shape it to our purposes. ■

Some indigestion

There have been some problems digesting all the technology. First, we underestimated how fast the firm would grow, and how fast each member would increase use of the system. Thus, fixed-disk space on the network is always insufficient. The network topology—how the wiring is arranged—is efficient but not flexible. When part of the system goes down, it can affect up to 10 users.

We also have underestimated the desire of staff to be trained on new software. We have yet to stabilize the process of choosing software packages, since it is constantly changing. We continue to spend too much time inventing the process.

Output always seems to be a bottleneck. Although we have a \$60,000 plotter, there are always too many people clamoring for plots all at once. There seems to be no way to schedule that effectively for architects. ■



Intergraph Microstation was used to prepare these 3-D views of an engineering research facility. In the exterior view, note how parts of the building in the background, and how parts of the interior, can be seen; they are not masked by the foreground. The isometric view of a typical lab module is detailed enough to show possible interferences from ductwork and other utilities.

Art courtesy of Lord Aeck & Sargent

Building Types Study 706/Infrastructure

These days transportation facilities and utility projects are too often treated as necessary evils, and they have increasingly become contentious neighborhood intrusions. This issue features examples where architects seized the opportunity presented by a renewed emphasis on infrastructure planning and building to show that design has an important contribution to make. In new airports in Pittsburgh (page 100) and Denver (page 106), the architects created public spaces that counteract the disorientation caused by their vastness, while a new terminal at London's Heathrow excels despite ad-hoc airport growth (page 108). A cooling plant in Minneapolis (page 112) and a telecommunications substation in Seville, Spain (page 116), make utilitarian facilities into good civic neighbors, rendering at once visible and understandable the usually hidden engineered viscera that undergirds our modern lives. Parking garages, typically eyesores, are, in skilled hands, elegant urban infill (page 126) or a forceful sculptural presence (page 130). Plans for the Jubilee Line Extension in London (page 120) show how a group of architectural firms unfettered by past conventions can bring new vigor to a difficult building type and, in effect, use design to repay the public for the enormous financial investment such facilities entail. *James S. Russell*

Manufacturers' Sources listed on page 147

Uncivil Engineering

On Mercer Island, near Seattle, a small wooden park shelter perches over a lushly landscaped "lid"—a three-quarter-mile-long platform of trees and tennis courts set atop three vast concrete portals conveying 10 traffic lanes of nearly complete Interstate 90. That tens of millions of dollars and thousands of tons of concrete and earth were arranged to support this shelter—worth perhaps \$60,000—and protect a few dozen homes from the noise of the freeway passing through their neighborhood, is emblematic of the bizarre realities of infrastructure development today. In communities all over the country, bridges are closed or allowable weights reduced due to lack of maintenance; water mains errantly break; trains creep when they should roar—all because we don't seem to have the money to fix tracks, pavements, and utilities. In a few communities, as in affluent Mercer Island, huge funds are spent, vastly disproportionate to any conceivable benefit, in unremarkable projects whose primary goal is to move ahead a long-stalled project (expansion of the I-90 segment was debated for some 20 years).

Architectural historian Robert Brueggman writes (in the Winter 1993 *Design Quarterly*), that infrastructure wasn't always done this way. "Thousands of stone viaducts, reservoirs, and lighthouses dating from the 19th and early 20th centuries stand as handsome reminders of America's pride in its infrastructure." Only a few decades ago, design attention was thought essential, producing such memorable structures as San Francisco's Golden Gate, or the beautifully landscaped parkways around New York City, whose ever-changing vistas gave testimony to the gracious life of the community they passed through. Today, it's rare to find a prominent bridge or utility structure that departs even slightly from the ultrastandardized civil-engineering kit-of-parts.

Last year, however, witnessed what seemed a sea change in the way we think about infrastructure. Transportation funding was approved (the Intermodal Surface Transportation Efficiency Act—ISTEA) that gave local officials much wider latitude in allocating funds to transit and a wide variety of "enhancement" (which can include bikeways, wetlands restoration, or historic preservation) based on needs developed through a comprehensive intermodal planning process. The ISTEA idea can be extended to other kinds of infrastructure planning, bringing a broader view than the civil-engineering tunnel vision that has produced the stupefying structures we too often see around us. Projects shown in this issue of ARCHITECTURAL RECORD focus on individual design and planning issues that have been too-long neglected in infrastructure development. Building a national consensus on what to build and how much to spend requires an understanding of broad trends, the subject of this essay.

Where's the money going?

Total federal spending on a wide variety of infrastructure categories has declined from about 5.5 percent of gross domestic product (GDP) in 1965 to 2.5 percent in 1990, well behind our international trading partners. Though many regions' state and local expenditures have

covered some of the decline, the federal withdrawal has exacerbated a gap between the infrastructure "haves" (rapidly expanding newer communities) and the "have nots" (older communities with declining tax bases and a high percentage of decaying facilities).

The amounts various experts say the country must find to expand and update these systems are mind-numbing. *Business Week* projects \$800 billion or more in spending including the "digital highways necessary for the information age." (Congress appropriated about \$49.3 billion in aid for fiscal 1993, a whopping \$10 billion of which goes to various environmental cleanup funds). Water and sewer agencies and the EPA think we need to spend \$138 billion on systems and wastewater treatment over 20 years (\$6.9 billion per year versus the \$2.5 billion-plus Congress approved for fiscal 1993). This is already one of the fastest-rising categories of infrastructure spending. A nationwide fiber-optic digital data network (much of it privately financed) may cost \$325 billion.

Airports, transit, and highways

The recession has cut airline traffic and reduced congestion considerably. Thus, the FAA claim that 58 airports will be "seriously congested," causing delays for 74 percent of the nation's passengers

Does new transportation funding, mandating regionwide planning, represent a sea change in the way we think about infrastructure?

by the year 2000, may be overstated. Passenger taxes support much airport construction through a federal trust fund, much of which remains untapped as a deficit-reduction ploy. Financially troubled airlines are reluctant to bear much of the cost of new facilities, requiring New York's JFK Airport, for example, to drastically scale back a \$3-billion rehabilitation. (A vast central departure/arrival building, designed by Pei Cobb Freed to unsnarl the traffic mess created by nine existing terminals, each with its own idiosyncratic arrival/departure scheme, was cancelled.) Many airports have taken advantage of a new three-dollar-per-passenger departure tax to finance improvements. Over 34 years it will raise \$2.3 billion to pay off Denver's new airport (page 106). Real congestion relief is hard to obtain, however, because a combination of cost, lack of available land, and citizen objections to airport noise makes runway expansion virtually impossible in much of the U. S. These concerns have killed, for now, Chicago's up-to-\$10 billion third airport.

Transit funding has come under attack principally because all of the newer systems have been over budget and under ridership projections. "Actual patronage of [new] rail systems in nine cities was less

The stupefying bleakness of much of the civil-engineered landscape is creating new opportunities for architects and designers—if they can prove their value on every project.

than half of that originally forecasted,” the Department of Transportation found. The consensus of experts is summarized by *Fragile Foundations*, a report to Congress by the National Council on Public Works Improvements: “Systems in larger metropolitan areas are aging, deteriorating, and undercapitalized. Systems in smaller metropolitan areas are underused and overcapitalized.” An example: Los Angeles county projects spending \$48 billion over 30 years on 210 miles of metro urban rail and 190 miles of commuter rail lines. The New York metropolitan area, by contrast, which has 25 percent of the entire country’s transit users and thousands of miles of track, has barely managed to scrape up \$9.6 billion for a 10-year capital program (a response to decades of neglect) amid enormous budget pressures. It took \$16 billion over the last 10 years just to bring service to generally accepted levels of dependability.

Highways command an overwhelming share of infrastructure dollars (it is 36 percent of federal fiscal-year 1993 infrastructure spending; more than four times the runner-up category). Last year’s ISTEA legislation established a six-year, \$155-billion spending program. Of this, \$80 billion can be used for either highways or transit. Compare this to the \$129-billion price tag for the construction of the entire 43,000-mile Interstate highway system or the \$174 billion spent in federal-aid highway funds (which cover a wider range of projects) since 1976. Still, various analysts report that up to 60 percent of roadways need some rehabilitation and 40 percent of bridges are at least “functionally obsolete.” Road and bridge needs are increasing exponentially for several reasons. Highways wear out faster than other systems; declining populations in older cities mean that there are fewer resources to repair aging facilities; low-density development patterns require a high percentage of highway miles per person. And suburban drivers drive more: Department of Transportation studies show growth in mileage driven vastly outpaces population growth and is much higher than the growth of highway mileage. To keep highways uncongested will mean building them at a pace many times faster than we do now.

Financing infrastructure

President Clinton has pledged vastly increased funding for infrastructure projects both in the short and long terms. Old ways die hard, however. Critics are already contending that ISTEA money is not being used as legislators intended, and Clinton’s jobs bill—which included money for many infrastructure projects “ready to go”—has at this writing fallen victim to familiar congressional gridlock. With enormous government budget pressures, the nation will likely turn more to user fees—dedicated fuel taxes, for example—that are usually applied exclusively to the system from which they are collected. Highways are likely to shoulder most of the burden, since the overall user-fee support for direct highway costs is still below any other infrastructure category, according to an ISTEA-mandated report, *Financing the Future*, by the Commission to Promote Investment in America’s Infrastructure. And highway taxes will likely be diverted in greater amounts to transit funding as an urban congestion-relief measure. Other experts advocate “congestion pricing”

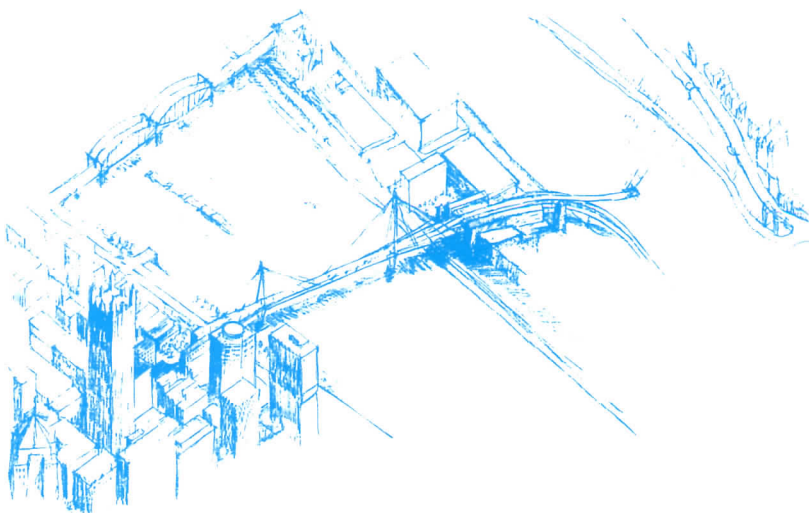
using tolls to reduce unnecessary travel during peak periods. *Financing the Future* also suggested some novel means to tap private capital as a means of underwriting infrastructure.

In spite of low ridership, the shift to transit and rail may increase because expanding and rehabilitating busy existing highways in built-up areas is so costly. While new highways in undeveloped areas can range as low as \$15 million per mile, new urban freeways (where the need is greatest) usually come in at well over \$100-million per mile. Also, the disruption of established traffic patterns for reconstruction reverberates through an urban freeway system, causing mind-boggling delays. Such concerns—and log-jammed airport improvements—are causing localities to turn to *multimodal* solutions, linking airports with downtown by rail; combining bus and transit terminals. States increasingly are boosting Amtrak service with their own funds as both an economic development tool and, where service is fast enough, a form of relief for airports. (Amtrak’s busy northeast corridor handles as much New York-to-Washington traffic as both twice-hourly air shuttles.) Advanced train technologies such as Maglev or Japanese bullet trains were recently given an administration push.

The designer’s place in infrastructure planning

With the enormous cost of infrastructure, architectural or landscape design strikes many as a hard-to-afford frill, and architects or designers as just another constituency to please. Historian Brueggemann speculates that infrastructure’s invisibility—its *lack* of design—may in part account for the public’s aversion to paying for it. With tight money the rule, design will have to prove itself on every project. Those featured in this issue went beyond solving the func-

Continued on page 145



Wabash Bridge Proposal, Pittsburgh

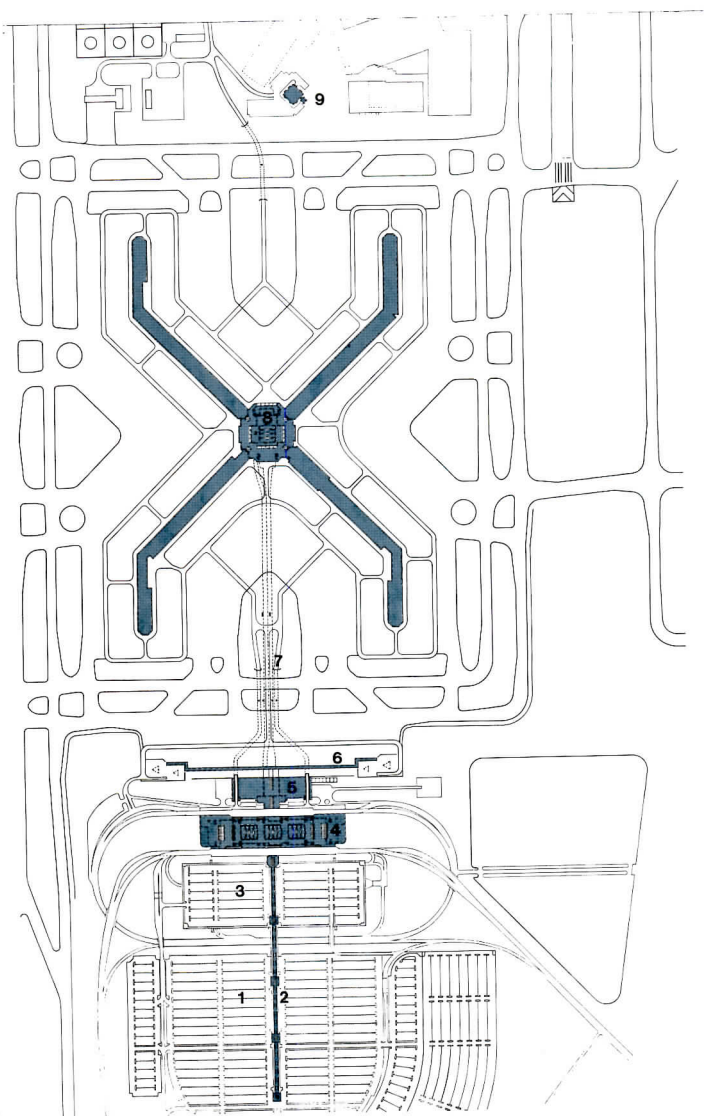
American airport design is still reacting to the changes wrought by airline deregulation in 1977, which led to the hub-and-spoke system that dominates airline travel. Airlines transport passengers from any number of locations through "spoke" connections to a central "hub," and on to a multitude of destinations. The hub system gives passengers many more travel choices, thus improving ticket sales. The new \$780-million Midfield Terminal at Pittsburgh International Airport is the latest hub incarnation.

In 1980, Tasso Katselas Associates (TKA) began developing a program and master plan with the Department of Aviation and the airlines. According to Katselas, all subsequent design decisions were measured against four established criteria: passenger convenience, operational efficiency, expansion capability, and economic effectiveness. The major differences between Midfield and previous hub airports are twofold. First, Midfield separates ticketing and boarding into "landside" and "airside" terminals. The landside terminal is flanked on the east side by grade-separated public transportation dropoff and pickup ramps, and on the west side by ramps for private automobiles. Katselas calls this doubling of the usual departing and arrival levels "the heartbeat of the solution" and essential to overall efficiency. Passengers check in at the landside ticketing level, descend to the transit level, pass through security, and catch the people-mover to the airside terminal. The farthest possible distance from parking lot to gate is 1.4 miles or 20 minutes by foot, automated walkway, and people-mover.

Second, Midfield's airside terminal is X-shaped instead of having separate linear concourses as at the prototypical hub of Atlanta and the new Denver airport (page 106). This allows passengers changing planes to access all 75 gates in the airside terminal on foot and via moving walkways rather than having to descend to a transit level as is required at the other two airports. Arriving and departing passengers and those transferring to commuter planes use the people-mover to the landside terminal. Midfield's principal tenant, USAir, invested some \$40 million in computers to provide up-to-the-minute information on flight schedules and a baggage-handling system with lasers to scan bar-coded baggage tags. The result is a veritable showpiece of current airport technology.

The X's four concourse arms are surrounded by dual apron lanes running in opposite directions and its core is a mini-mall of restaurants and shops, diversions for the mostly transfer-passengers. TKA's study of its airside terminal design, done with the Department of Aviation and FAA personnel, concluded that dual lanes ease airplane movement, servicing, and parking; current projections show savings between \$10 to \$15 million per year in fuel costs. Other measures to prevent interruption of taxiing airplanes include 12-foot-deep tunnels for service vehicles. During construction, changes in FAA security requirements prompted a new look at the overall accessibility of the tarmac and reinforcement of tunnel security.

For all of its innovations, Midfield's outward appearance is disappointingly like a conventional office building, especially when compared to such great monuments of flight as Eero Saarinen's TWA terminal at John F. Kennedy Airport. Barrel-vault roofs mark primary public spaces, but these are overpowered by the complex's sheer size (opposite middle). Steel canopies that cantilever 40 feet to cover dropoff ramps, while elegant (previous pages), are only accents to the precast-concrete framing. The complex projects a public face of brisk efficiency rather than being an uplifting symbol, more in keeping with the expectations of today's jaded air traveler. ■



1. Long-term parking
2. Covered moving walkway
3. Short-term parking structure
4. Landside terminal
5. Central services
6. Commuter-air terminal
7. Underground transit/baggage conveyor
8. Airside terminal
9. Control tower

The 3.3-million square-foot complex is serviced by a new \$220-million expressway. Departing passengers use upper ramps on both sides of the terminal (site plan, above); arriving passengers are picked up on grade. A moving ramp conveys passengers between ramps and a short-term parking structure and long-term lots.

Barrel-vault roofs mark atrium-like public spaces in the landside terminal (opposite 2,3). Red steel-framed canopies for departing passengers contrast with buff precast-concrete framing (opposite 4,5).



1



2



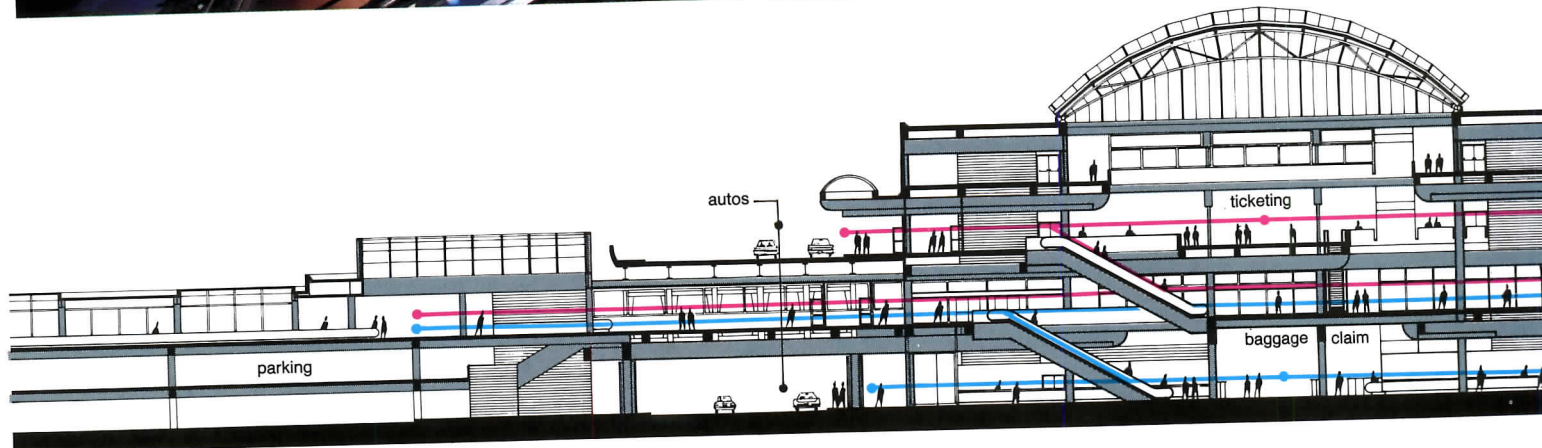
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4

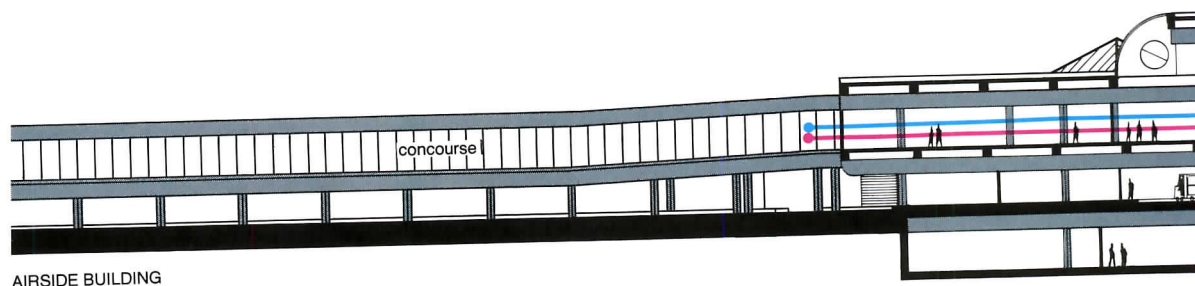


5



LANDSIDE BUILDING

● depart ● arrive



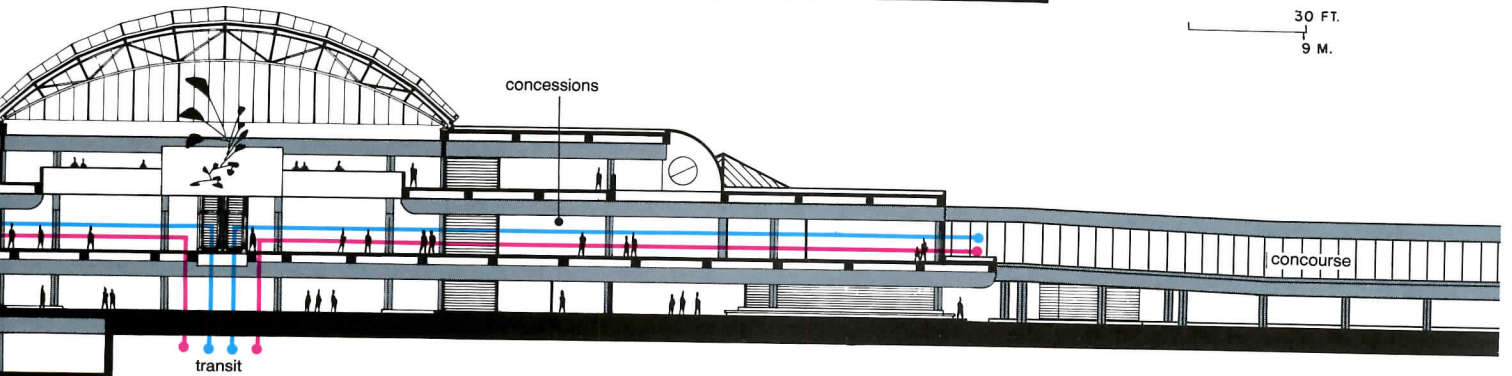
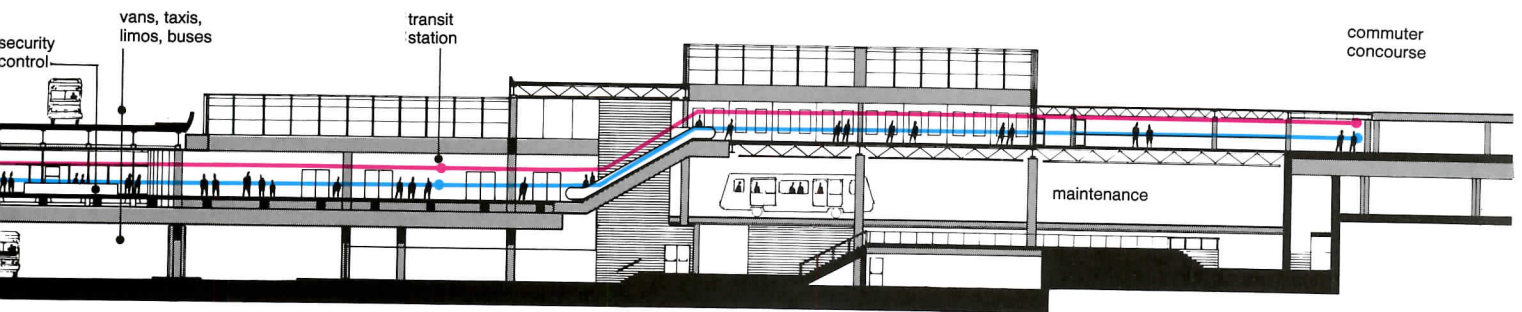
AIRSIDE BUILDING

The landside terminal (photo top right and top section) is dominated by a skylit vaulted roof supported by 120-foot-long steel trusses. Because of the many ways the terminal can be accessed, movement systems are complex. Moving walkways connect the terminal to the parking garage (rental car lots are on the lowest level). Departing passengers are either

dropped off along the upper roadway, where they are sheltered by 40-foot cantilevered steel canopies (pages 100-101), or ascend from parking to ticketing level before descending to security and the transit station to the airside terminal. (Commuter planes leave from the landside terminal.) Arriving passengers descend from the transit-station level to the baggage-claim area. The principal innovation of this hub airport

is the X-shaped airside terminal. Double-lane aprons surrounding the concourse arms permit airplanes to move between gates and taxiways with less stop-and-start interruption, thereby saving fuel. Since 65 percent of passengers using the Pittsburgh airport are in transit to another destination and never actually enter the landside terminal, the architects made the airside

terminal's core a mini-mall of restaurants and shops as a lay-over diversion (top left and opposite left). Each concourse arm has three moving walkways (opposite right) connecting the 75 jet gates. TKA's updated master plan allows for expansion to as many as 158 jet gates. The commuter concourse can grow from 23 gates now to 48 gates.



Credits
 Midfield Terminal Complex
 Pittsburgh International
 Airport
 Pittsburgh, Pennsylvania
Owner: Allegheny County—
 John Graham, director of
 capital projects; Peter Florian,
 chief engineer of capital
 projects
Architect: Tasso Katselas
 Associates—Tasso Katselas,
 principal-in-charge; George

Perinis, project manager;
 James Pappas, chief architect;
 Felix Cardella, III, Gavin
 Mellor, Jane O'Neill, C. Ayhan
 Ozan, Jose Heraud, Philip
 Rinaldi, John Foley, Wilmer
 Mutz, Greta Penn, Ronald
 Dellaria, Joseph Serrao,
 project team
Engineers: Gensert, Bretnall &
 Associates (structural);
 Michael Baker, Inc. (civil/
 mechanical/electrical);

Reynolds, Smith & Hills
 (mechanical/electrical)
Consultants: Breier Neidle
 Patrone Associates (baggage);
 Coffeen Fricke & Associates
 (acoustics); Irene Pasinski &
 Associates (graphics); Joseph A.
 Hajnas & Associates
 (landscaping); Theo Kondos
 Associates (lighting);
 Wackenhut (security)
Construction Manager: Mellon
 Stuart/Dick Enterprises

General Contractors: P. J. Dick
 Construction Company; Gust
 K. Newberg Construction
 Company; Mosites
 Construction Company

“Snow-Capped” Symbol

Currently under construction, Denver International Airport’s landside terminal will be a tentlike port-of-call for 50,000 to 100,000 passengers a day.

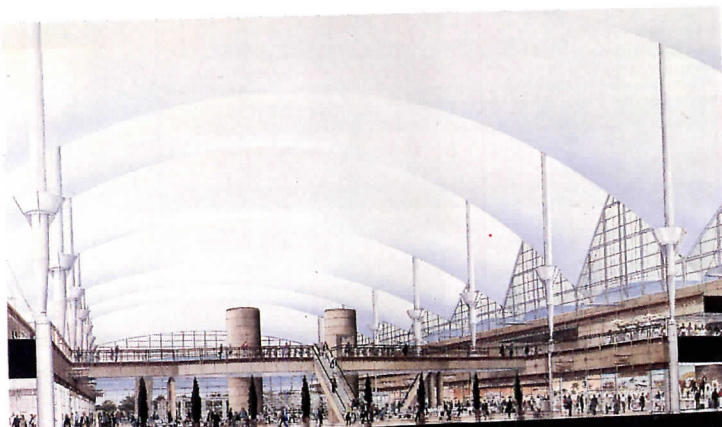
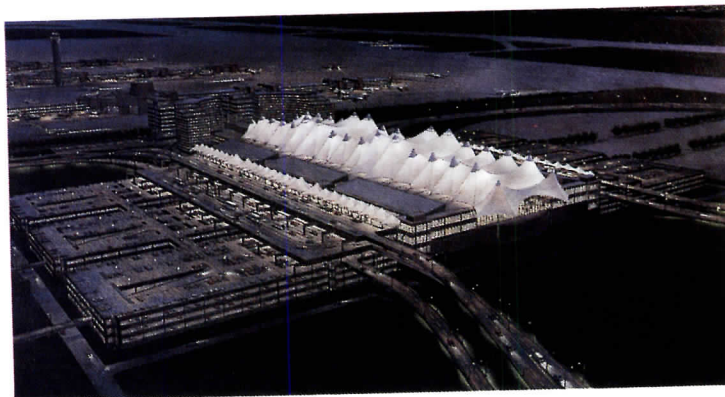
Gateway and aerodynamic symbol, the landside terminal at the Denver International Airport harks back to the Eero Saarinen school of terminal design. Controversy over the terminal’s cost—and whether it was needed—meant that visual drama was as important to the project’s success as planning efficiency and economic feasibility. Says principal-in-charge-of-design Curt Fentress, of C. W. Fentress J. H. Bradburn and Associates, “[It] needed to be unique to Denver, a form that would signify the meeting of the mountains and the plains.”

The sheer size of the 1.3-million-square-foot terminal and the need for a fast-track, low-maintenance solution led the architects to a fabric-roof design for the 900-foot by 240-foot Great Hall, the primary public space. It recalls another instant infrastructure landmark, the Haj Terminal in Jeddah, Saudi Arabia, by Skidmore, Owings & Merrill [RECORD, September II 1983, pages 74-75]. In Denver, the tented structure’s peak-and-valley profile consists of double layers of 0.28-inch-thick Teflon-coated fiberglass supported by two rows of steel masts and reinforced against wind and snow loads by steel cables. Construction of the roof began last spring and should take one year to complete; minor repairs to damaged areas can be made by welding on a new layer of fabric. The light and airy effect of the tensile structure is more than just imagery—at night, 12 percent of interior light is transmitted, giving the complex a soft glow, and during the day the fabric transmits 10 percent of the daylight while preventing solar-heat gain. According to the architects, the material reflects 70 percent of direct sun, thereby reducing artificial lighting and cooling costs.

Like Pittsburgh (previous pages), Denver has a two-sided landside terminal. Public transportation and private automobile access, however, is stacked on three levels on both sides of the building (section opposite). Departing passengers ascend from parking and lower dropoff levels to level six for ticketing (plan opposite), where they join passengers dropped off by private automobile. They then proceed to the glass-faced, fabric-roofed atrium at level five, which provides sweeping mountain views, to pass through security before boarding the Automated Ground Transportation System (AGTS)—a “people mover”—at level four that connects to linear airside concourses. Arriving passengers will take the AGTS from concourses to the landside terminal and ascend to baggage claim at level five before exiting at that level or descending to level four for private-vehicle pickup.

The landside terminal is expected to be completed this year at a cost of \$1.9-billion, including parking structures and roadways. A master plan provides for future expansion in modules linked by open spaces. Phase I has three airside terminals, totaling 90 gates, designed by different firms. At final build-out, the airport will have 240 gates.

Karen D. Stein



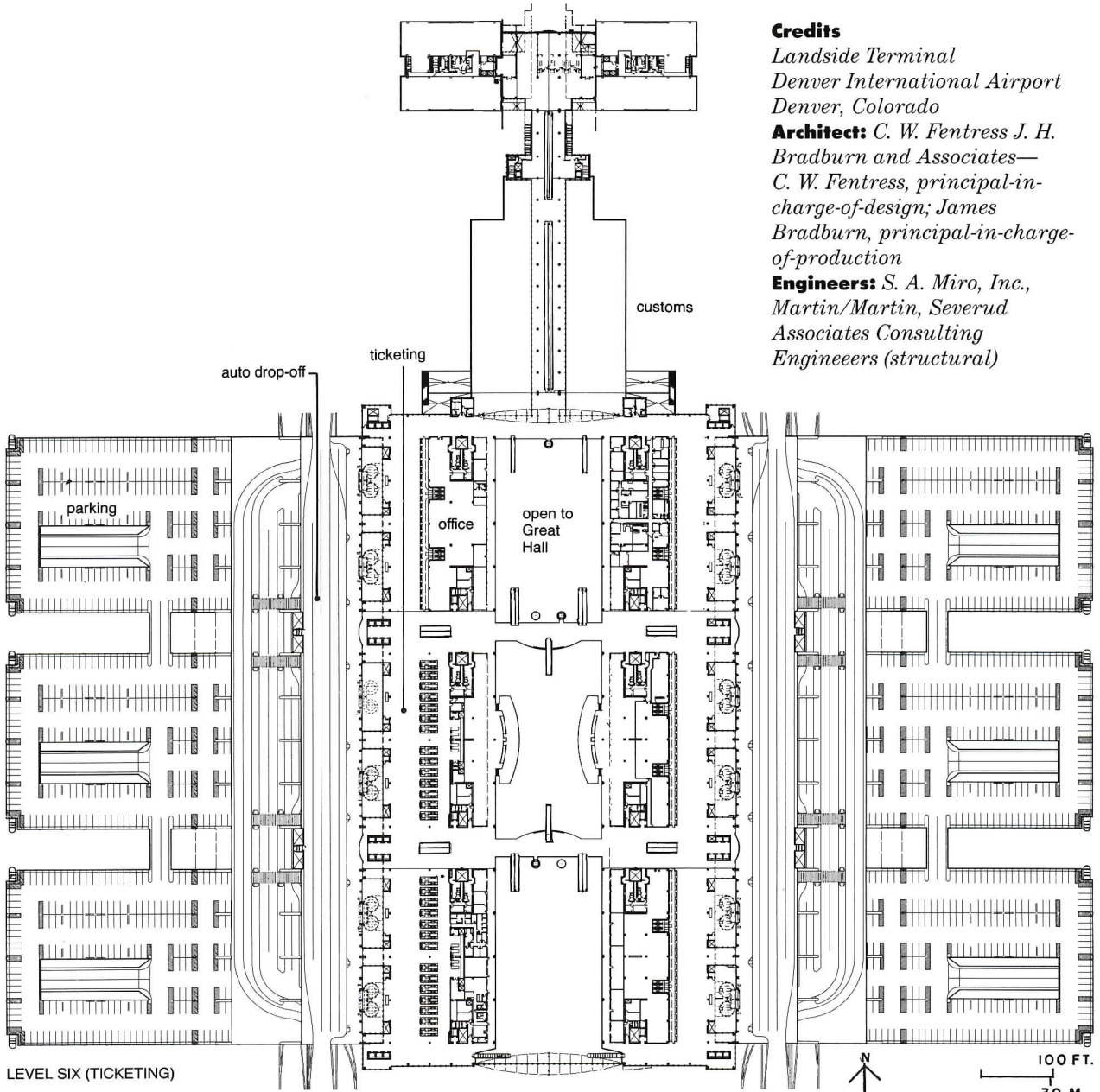
© Robert Reck photo courtesy Birdair

Credits

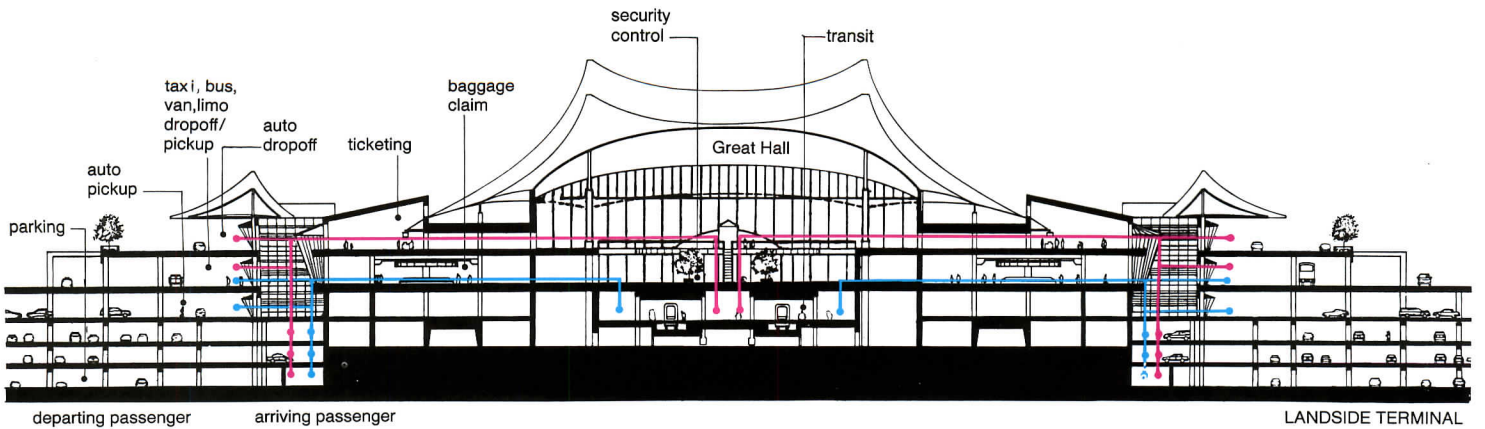
*Landside Terminal
Denver International Airport
Denver, Colorado*

Architect: *C. W. Fentress J. H. Bradburn and Associates—
C. W. Fentress, principal-in-charge-of-design; James Bradburn, principal-in-charge-of-production*

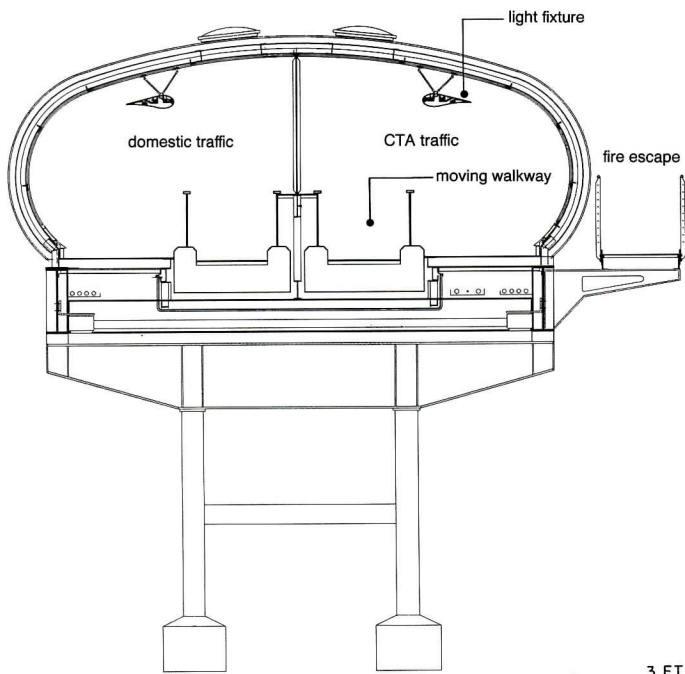
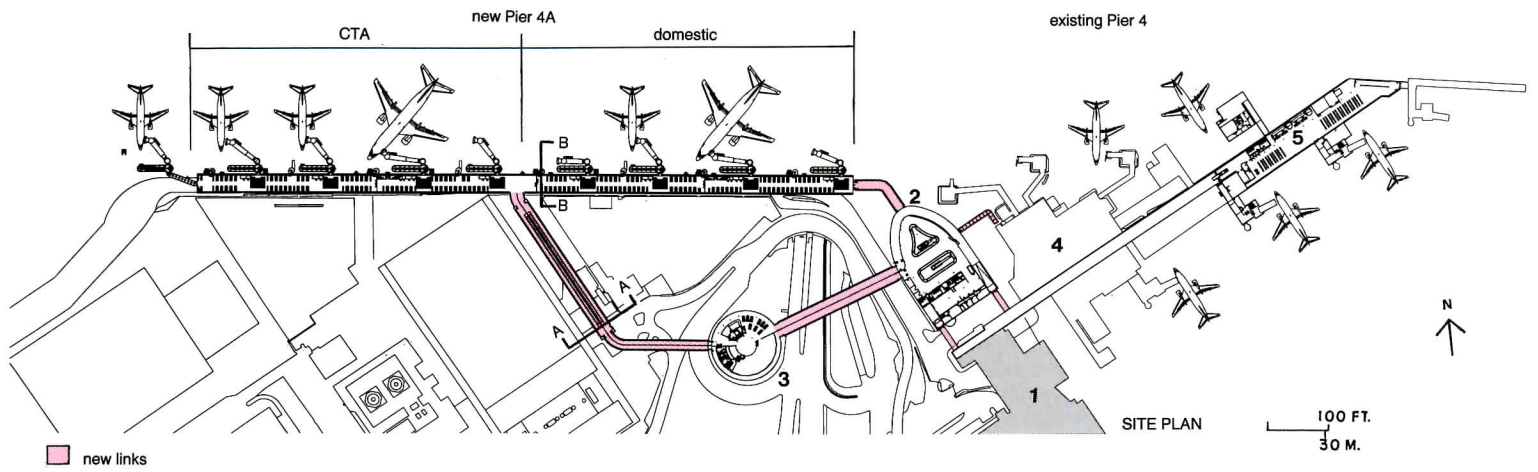
Engineers: *S. A. Miro, Inc.,
Martin/Martin, Severud
Associates Consulting
Engineers (structural)*



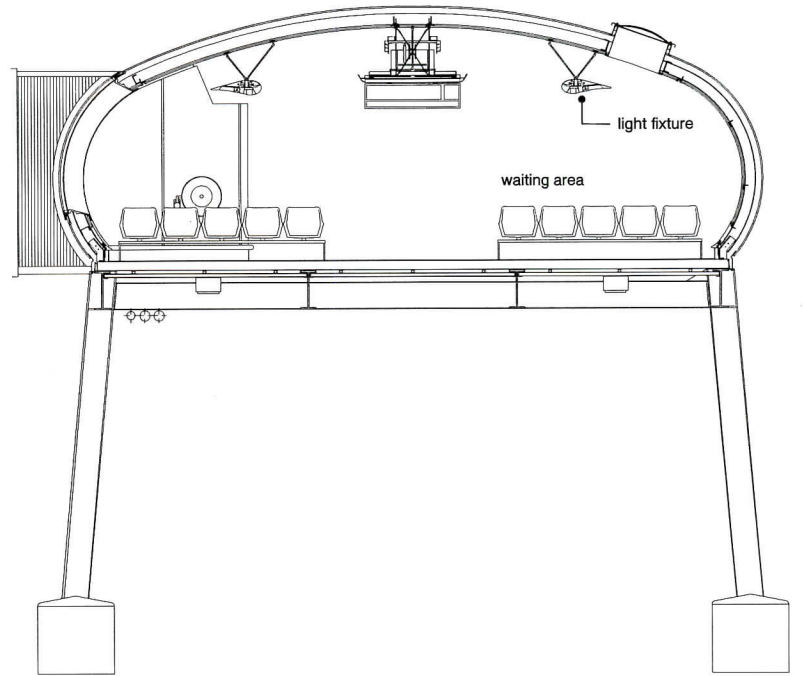
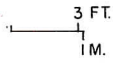
LEVEL SIX (TICKETING)



LANDSIDE TERMINAL



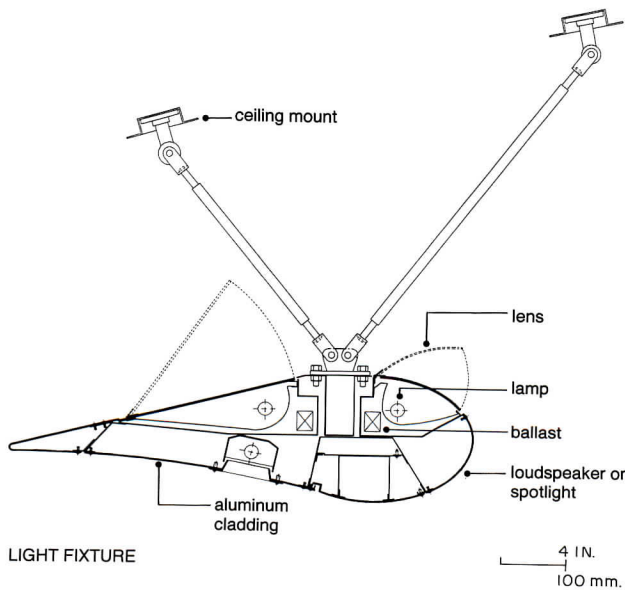
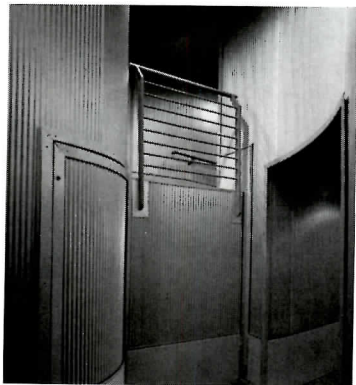
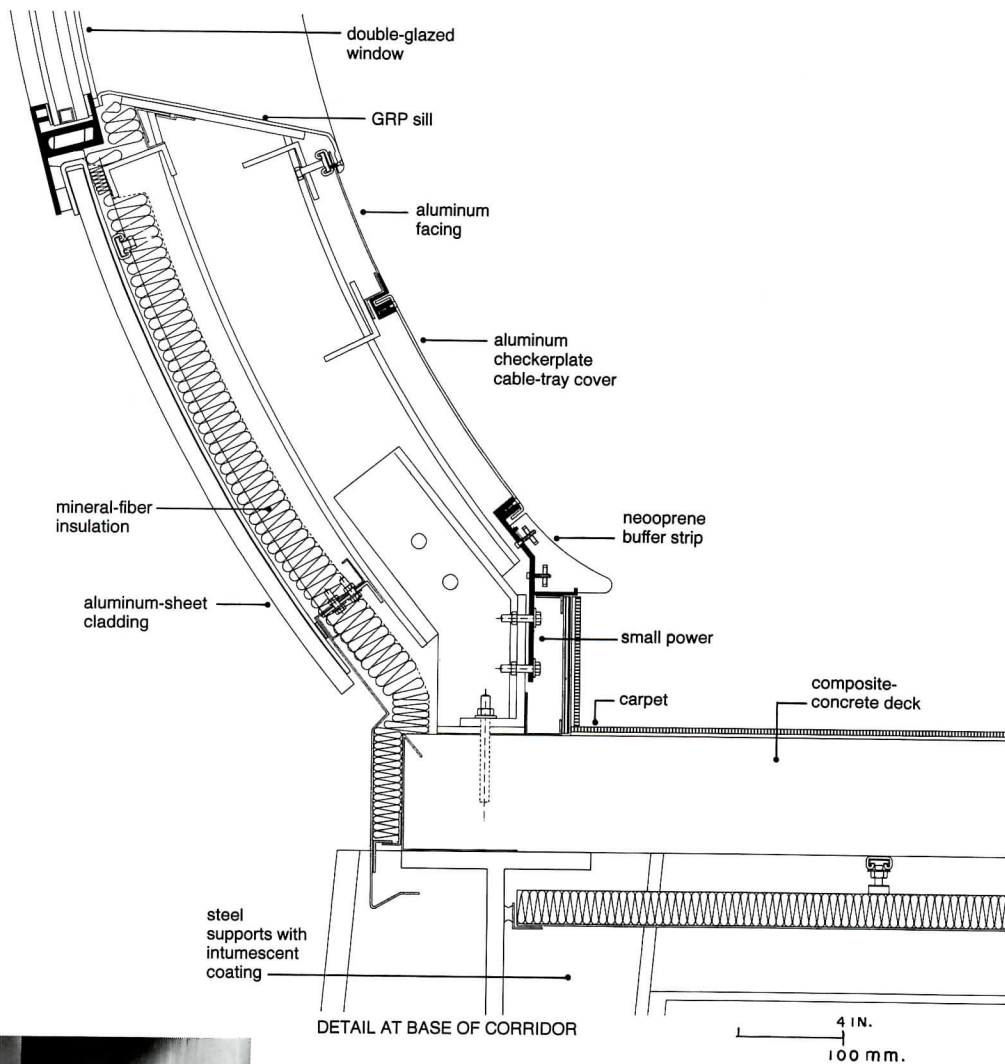
SECTION A-A



SECTION B-B

- 1. Existing Terminal One
- 2. "Nose" building
- 3. CTA lounge
- 4. Shuttle lounge
- 5. Belfast lounge





The ad-hoc appearance of the plan for Piers 4 and 4A (opposite) came about because the supposedly temporary addition is tucked where space was available. It handles passengers in three domestic categories. Northern Ireland and the Channel Islands are considered part of the Common Travel Area (CTA). Baggage may be examined and passengers may indulge the British obsession for buying duty-free goods. The "nose" building segregates regular domestic passengers from CTA passenger and travelers to and from Belfast, for whom extra security requirements apply. An outer corridor in the "nose" building directs CTA passengers through a link to the CTA lounge (containing a snack bar and duty-free shopping) to gates. Arriving CTA passengers claim baggage in the "nose."

So that the links and piers would not exceed minimal sightlines, they were framed in low, elliptical rolled-steel hoops (the corrugated metal cladding supplies rigidity). Heat pumps serve the departure lounges through a suspended boom, avoiding lowered ceilings. Double-glazed, gasketed windows follow the profile of the piers (opposite bottom). Wing-like light fixtures (left) provide up- and downlight and connections for public address and emergency lighting.

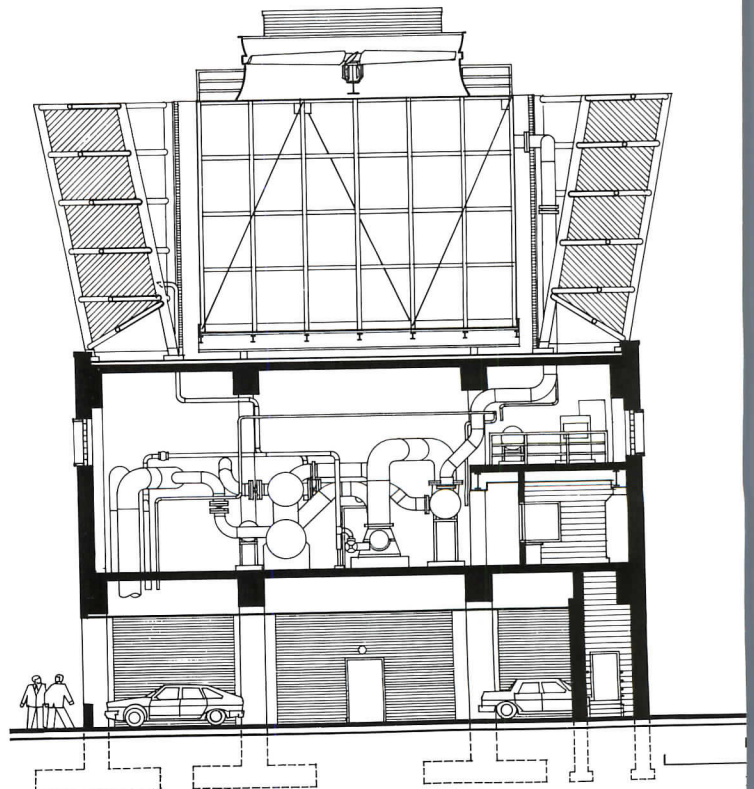
Credits

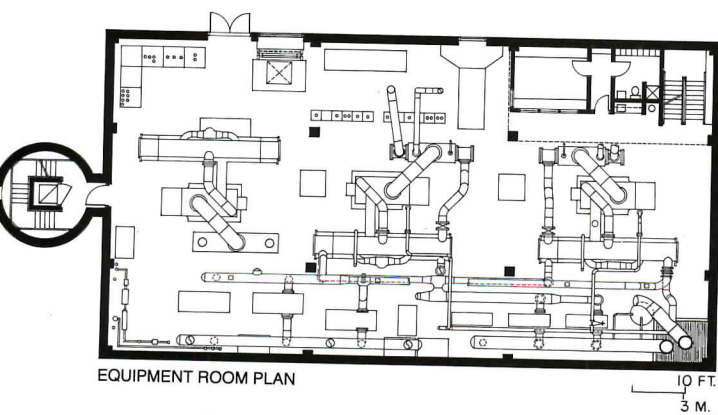
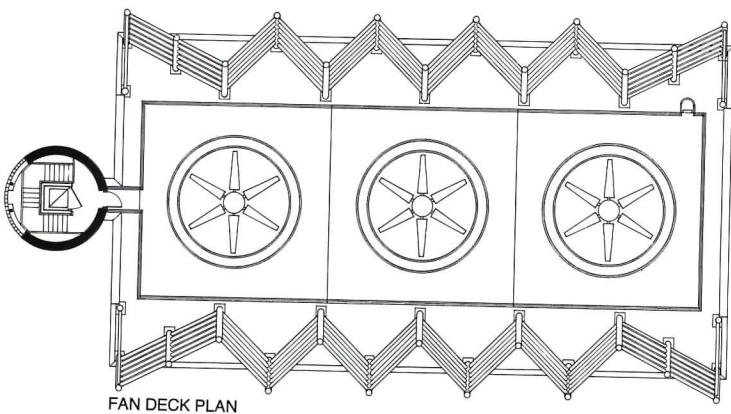
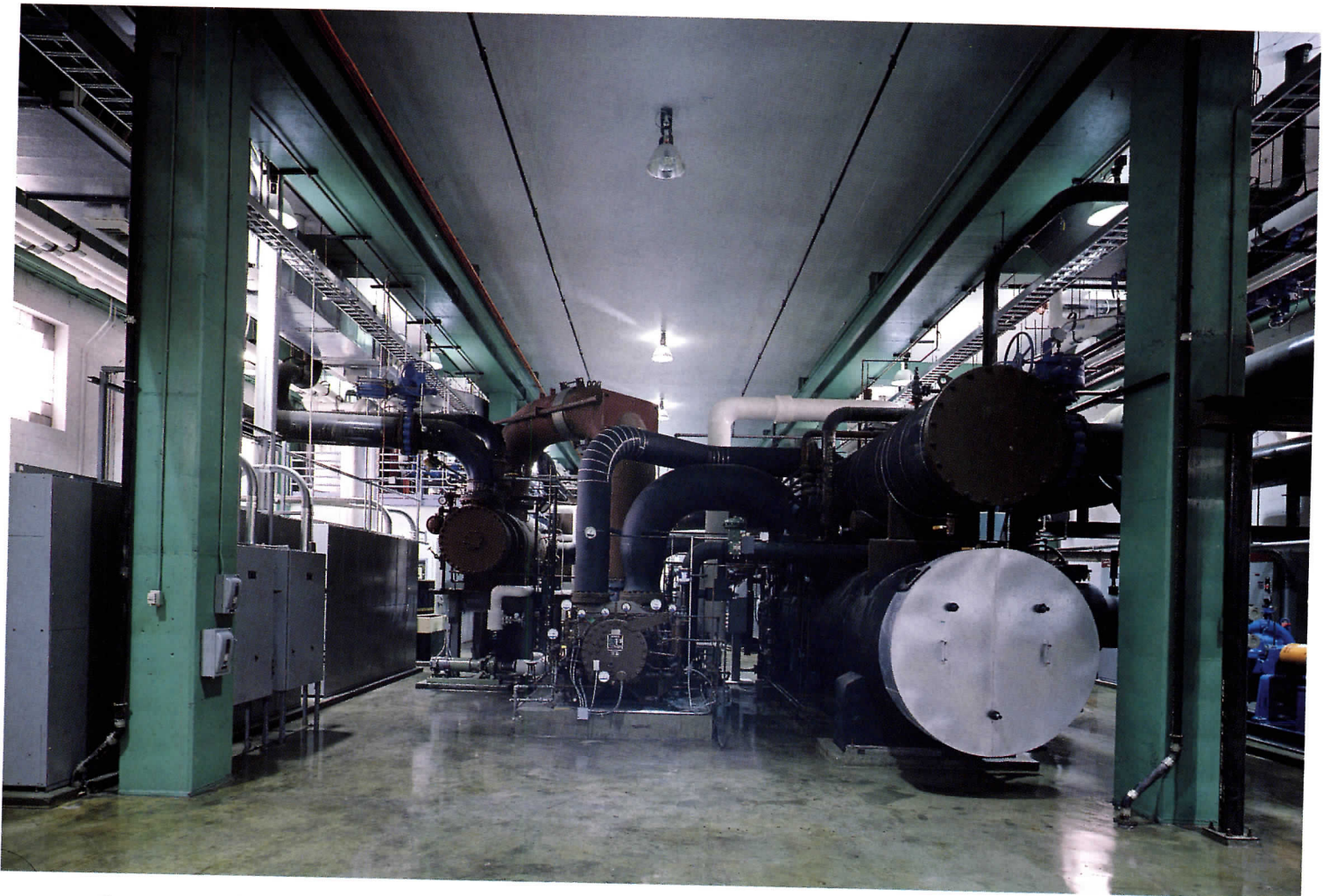
- Pier 4/4A, Heathrow Airport London, England
- Owner:** Heathrow Airport Ltd.
- Architect:** Nicholas Grimshaw & Partners, Ltd.—David Harriss, project director, Hin Tan, project architect
- Engineers:** B. A. A. Consultants (structural/mechanical/electrical/plumbing/electronics)
- Consultants:** W. T. Partnership (quantity surveyors)
- General Contractor:** AMEC Projects, Ltd.



Straightforward planning provides a parking garage on the street level, a mechanical room for the chillers on the second floor, and cooling towers on the roof. A lone worker monitors the chiller operation from a soundproof control room served by adjacent lockers (right in plan and section). A mezzanine above is used for auxiliary pumps, control units, and refrigerant storage. The angled shape of the steel pipe and vinyl-covered chainlink crown of the building, which screens the cooling towers, came from more than a desire for dramatic effect, "expressing the kinetic spirit of

the machine processes involved," according to project architect Bruce Paulson. "We tried a straight-wall solution, but there was no way to support it without the required bracing interfering with the towers. By angling the structure, it could be self-supporting except for connections to the concrete end walls." The open mesh allows for free passage of the massive amounts of air needed in the evaporative process. The interior of the machine room (photo opposite) is painted concrete and concrete block lit by the round glass-block windows. Extra space awaits a third chiller.





Credits

*First Avenue Cooling Plant
Minneapolis, Minnesota*

Owner: *Minneapolis
Energy Center*

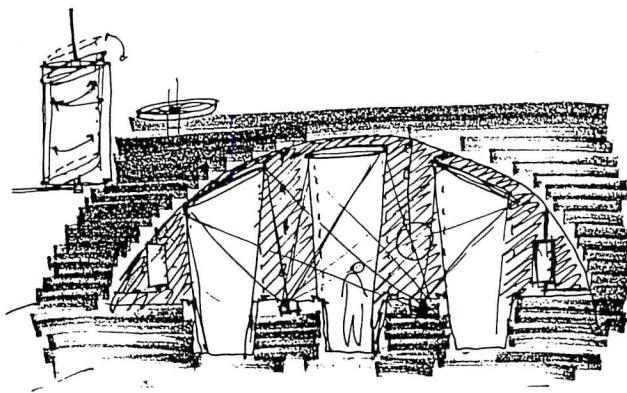
Architect and Engineer:
*Ellerbe Becket—Douglas
Maust, project manager;
William Huntress, project
designer; Calvin Olson, chief
architect; Bruce Paulson,
project mechanical engineer;
Cliff Ingles, project structural
engineer; Allan Wenzel, project
electrical engineer; Theodore
Lee, project landscape
architect*

General Contractor: *M. A.
Mortenson Company*

Consuegra's unwritten assignment in designing a new plant was to give compelling architectural form to the stunning technical advances that are propelling Spain into the 21st century. *David Cohn*

David Cohn is a freelance writer based in Madrid.

Down the Tube



1

The London Underground is the world's oldest urban transport network and one of the most complex. It also has a distinguished architectural heritage. It began as separate companies that were unified during the 1920s largely through design guidelines established by then managing director Frank Pick, acquiring its modern identity epitomized by the famous roundel symbol. Pick also commissioned Charles Holden to design new suburban stations. While these are now much-loved landmarks, London Underground has done little to continue this pursuit of excellence in the intervening 60 years.

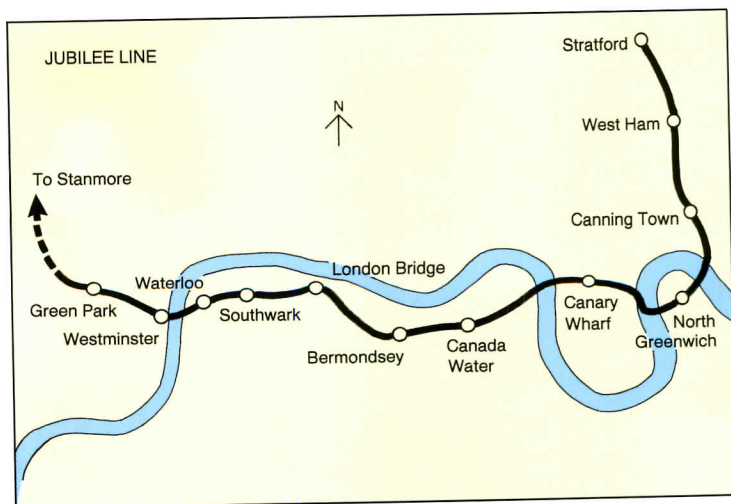
A \$2.7-billion plan to extend the Jubilee Line south and east from central London in a loop to Canary Wharf and Greenwich promises to make amends. The five-year project has some government funding and now awaits finalization of private investment arrangements (some from the beleaguered owners of Canary Wharf). Then site work could begin on 10 miles of track (mostly underground), 11 new station stops (one exists), and many other buildings.

Unlike Pick and Holden, who produced a monolithic evocation of the company, the Jubilee Line Extension reflects the tenor of the times, exchanging paternalism for pluralism by employing a roster of architects whose work is similar in spirit, but far from uniformly corporate. The impresario behind this sophisticated vision is Roland Paoletti, who came to London Underground from a position as architect of the Hong Kong metro. Paoletti considered appointing a single architect for all 11 stations, but quickly rejected this course for several reasons: station sites vary; parallel design would speed

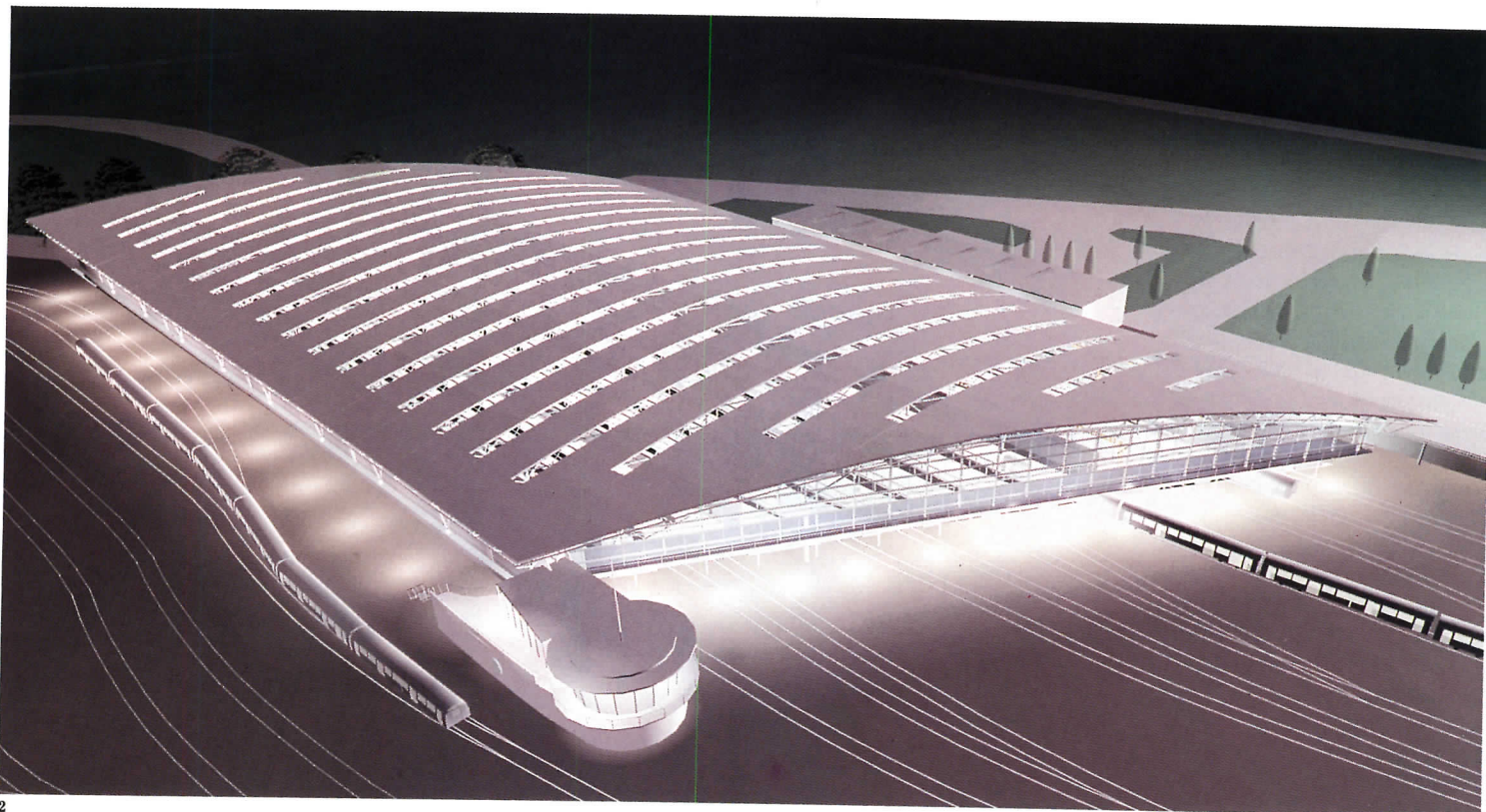
the project; and smaller firms, he thought, would be more imaginative. While fee proposals and qualifications were taken seriously, the most important criterion was design quality.

"I tried to choose 11 architects that fit together," says Paoletti. "They are all modern, all structuralists. The unifying idea is the exploitation of civil structure." The Jubilee Line work provides an economical introduction to the rising stars of British architecture. Norman Foster and Michael Hopkins are merely the best known. Others include Ian Ritchie, Ron Herron (once of Archigram), Troughton McAslan, and Alsop and Störmer. Who was not chosen (high-tech romantics Richard Rogers and Nicholas Grimshaw) is as instructive as who was.

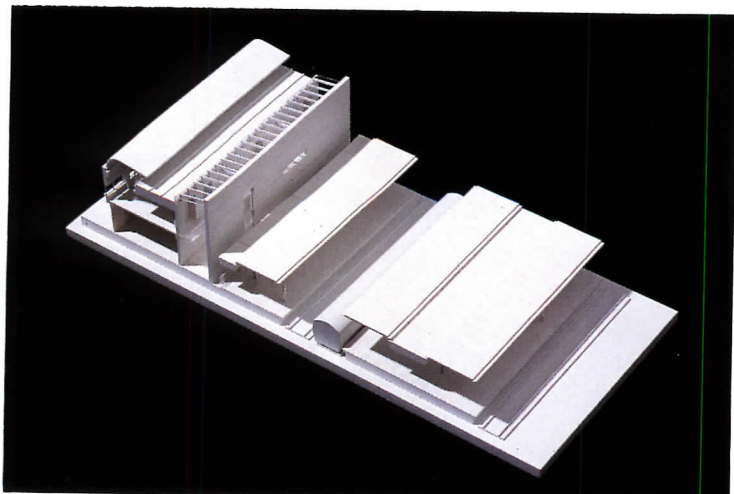
Paoletti regards the San Francisco BART as a watershed. There the system architects forced a reappraisal that led to the appointment of several architects asked to design individual stations using a common kit of parts. To develop this idea, Paoletti asked the architects to propose designs for elements that will ultimately be incorporated as unifying standards in all the stations. (He has yet to choose from among the proposals.) Paoletti's taste and trust in his choices (he could have chosen firms with a less-risky esthetic) means that he and the architects share something akin to an intellectual kit of parts. If Paoletti seems to be acting as a patron, it is what he calls "accidental patronage." The Extension could stand as a new exemplar of an architectural corporate identity in the 21st century.
Hugh Aldersey-Williams



An extension to the Jubilee Line will reverse the neglect of London Underground's design legacy, showcasing a dozen of Britain's best architects.



2



3

© Richard Davies

1. Waterloo

The sketch suggests the way accommodations for the new Waterloo Station fit within the piers supporting the Edwardian British Rail terminal.

Jubilee Line Extension Architects, a consortium of London Underground's design staff, developed the scheme. (See also figure 7).

2. Stratford Market

A parallelogram building spanning 100 meters covers 11 maintenance bays at the East London terminus of the Jubilee

Line Extension (JLE). Designed by Chris Wilkinson Architects, the roof structure is based on a 30-deg diagonal grid of 2.4-meter-deep lattice trusses.

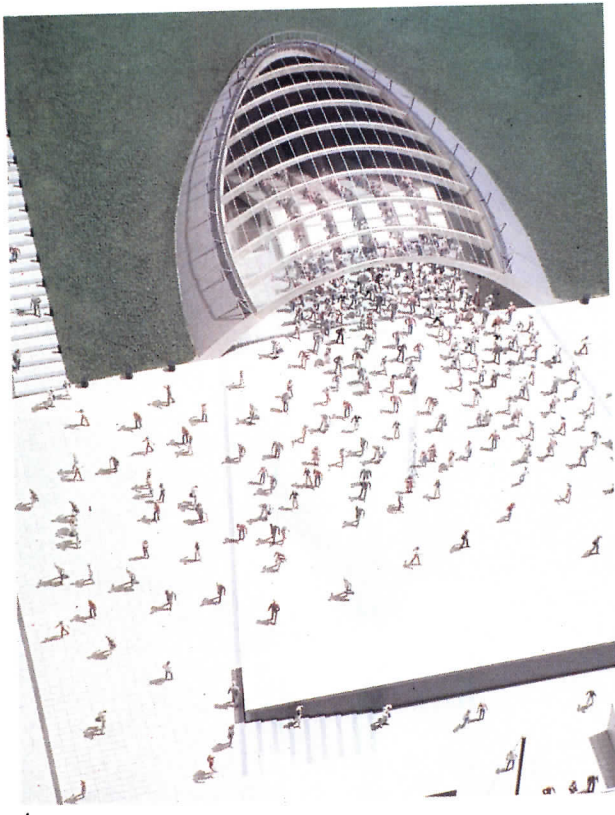
3. Stratford

Designed by Troughton McAslan, the sectional model shows stainless-steel-clad wing-like canopies over the tracks for both the JLE and the Docklands Light Rail. A zinc-clad wall separates the public part of the station from two-story accommodations for personnel.

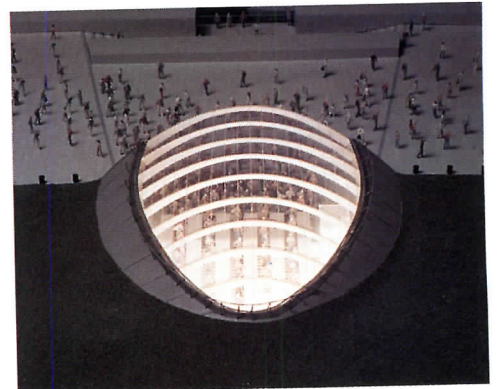
The program by London Underground's architect, Roland Paoletti, asked architects of the new Jubilee Line to admit daylight and avoid decoration.

4. Canary Wharf

A glazed, scallop-like canopy marks this long-overdue link to the ambitious but troubled centerpiece of London's Docklands. Designed by Sir Norman Foster & Partners, the new station will interconnect with an existing but inadequate Docklands Light Railway station, providing a peak passenger flow of 23,000 persons per hour. Arriving passengers emerge gradually into daylight and a public park from under the shelter of the canopies (4, 4a). Inside (4b), space is scarcely more constrained as passengers descend to a broad underground "street." The 19 escalators spear the space, typically off-axis, a recurring motif of Foster's that has been seen from the Sainsbury Centre to the Hongkong Bank.



4



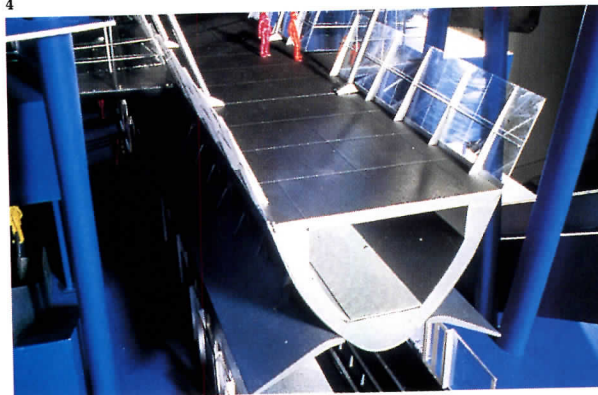
4a



4b

5. North Greenwich

The use of space and color is particularly dramatic at this entirely new station. Designed by Alsop and Störmer, the station has a roof supported by angled concrete columns that appear to stride through a double-height space. Cables from the roof suspend walkways, which appear objectlike over the tracks.



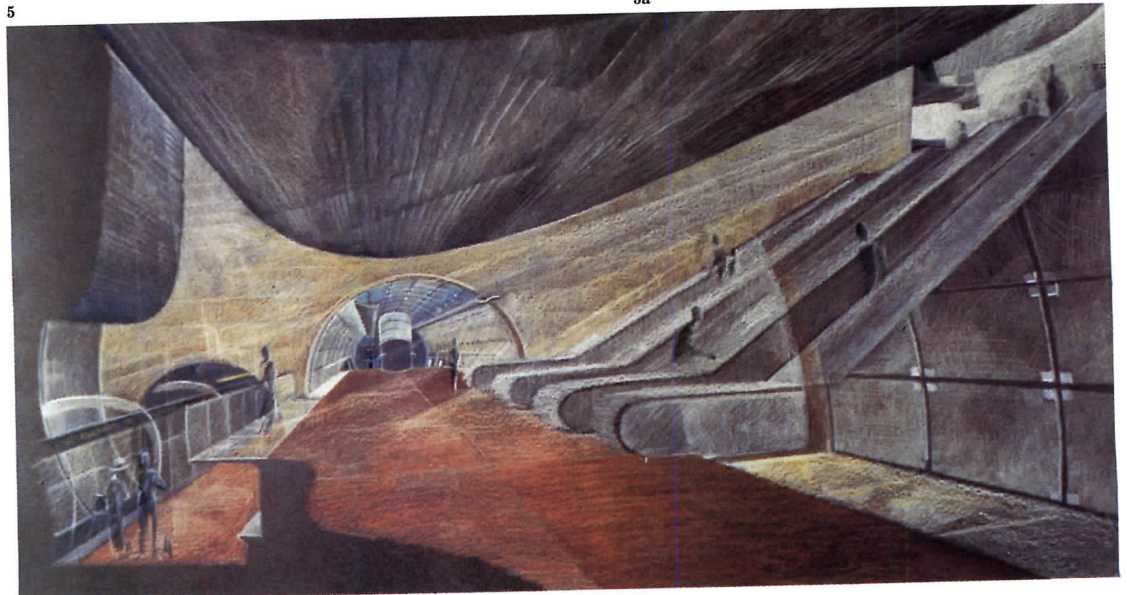
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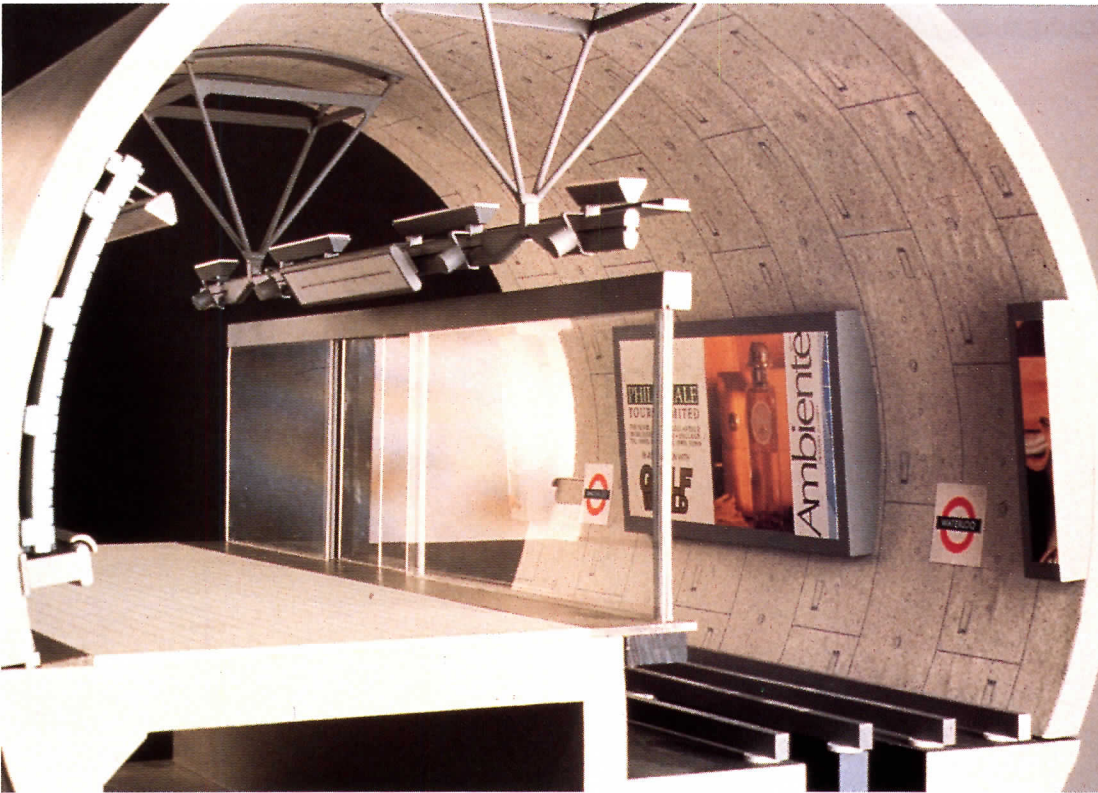
5a

6. Southwark

Pursuant to Roland Paoletti's brief, the perspective sketch of the lower levels at the new Southwark Station, by MacCormac Jamieson Prichard, shows shafts of light providing a visual link between the upper escalator concourse (6a, opposite) and track level. A subterranean concourse provides a balcony overlook to the tracks (6).

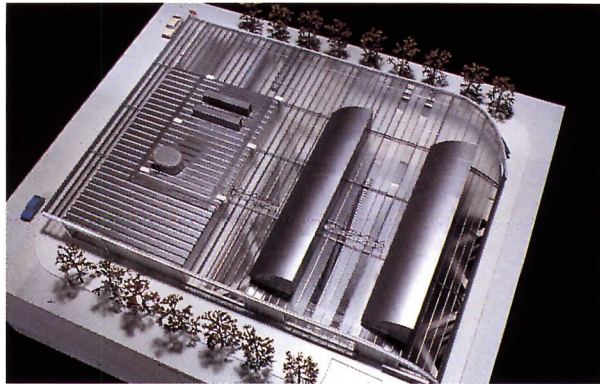
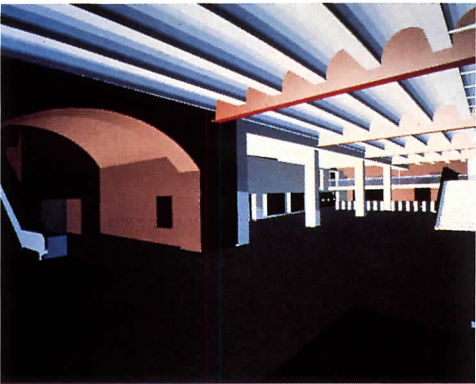


6



7. Waterloo

Waterloo is one of several stations in which Paoletti asked the architects to propose tunnel cladding panels and platform furniture, signage, lighting, and advertising facilities for inclusion in systemwide guidelines. Though each JLE station is unique, these elements of the designs are meant to be consistent, updating London Underground's corporate identity. One of these common elements would be new sliding transparent barriers at trackside. Currently, the system's passenger platforms are open to the tracks, not adequately preventing accidents and potential suicides. The in-house Jubilee Line Extension Architects designed barriers (?) that will eliminate these risks while providing the sense of openness offered by views across the tracks and retaining a clear line of sight to billboards located on the far tunnel wall. 7a: concourse and ticket hall, set within the structure of the existing Waterloo railroad station.



8. Bermondsey

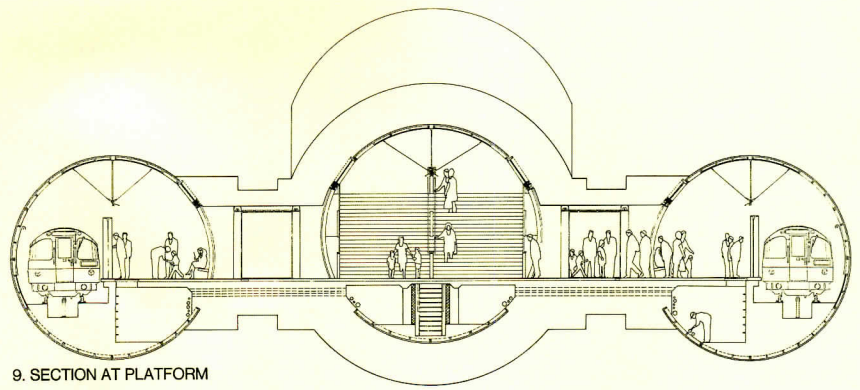
Ian Ritchie Architects provides a graphic expression of the way light is reflected down into this deep station interior through two roof-mounted scoops (see also figure 11). Huge horizontal braces cross the light wells diagonally. The model shown is incomplete, omitting a six-story commercial development to its left. Even without this addition, the project has more impact on its immediate neighborhood than most of the other stations. Ritchie's is a straightforward functionalist solution, avoiding the obvious "public-works" symbolism in the above-ground structure, which was a hallmark of stations designed by Charles Holden in the 1920s and '30s for London's suburbs.



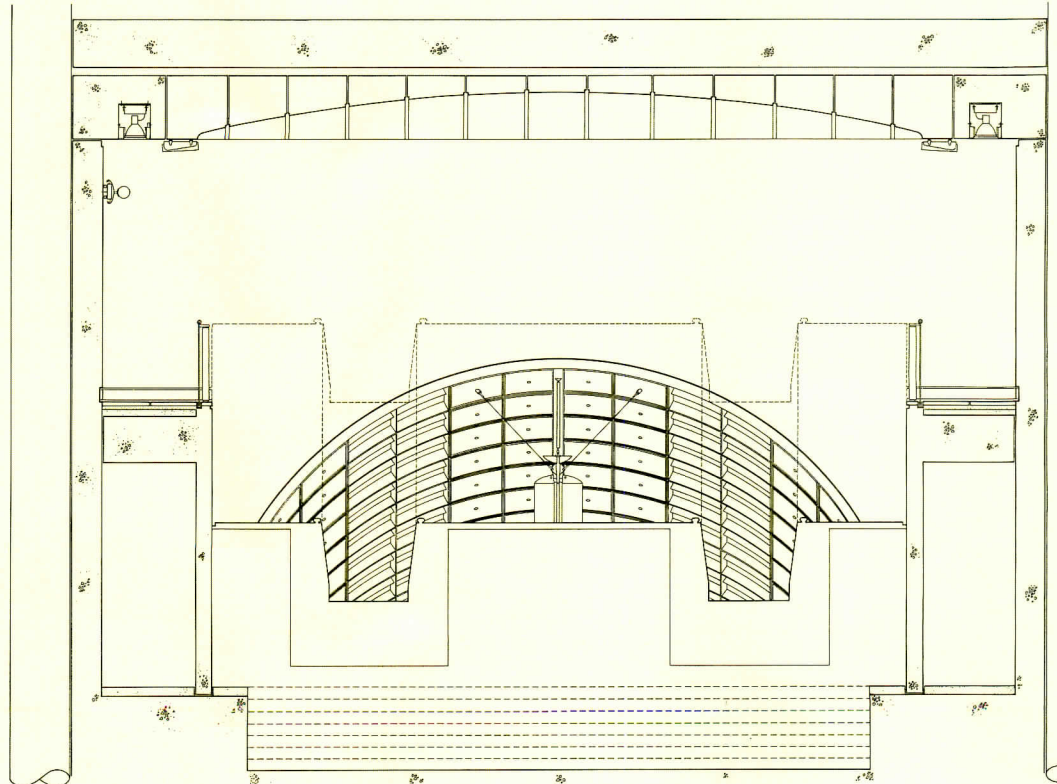
Though platforms will conform to a common reinvented house style, each station "becomes personal to the architect as you move away from the platforms," says Paoletti. Of the 12 JLE stations, all but two connect to other London Underground lines, and several must also offer transfers to British Rail commuter-rail or long-distance stations.

9. London Bridge

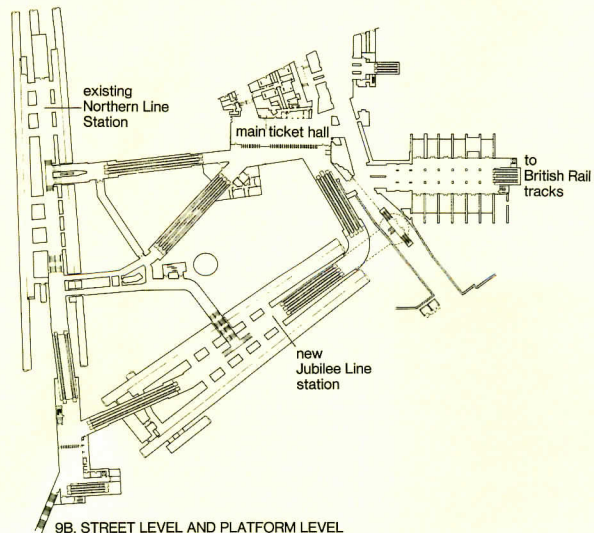
London Bridge Station, by Weston Williamson, incorporates proposals for many of the new design elements that will be common to the JLE stations, including his version of sliding glass doors adjacent to the tracks. The final design of these standardized items has yet to be decided. The cylindrical tunnels at platform level (9) remind patrons of the configuration of the existing system. The architects have devised modular infill for the cellular, ribbed-steel tunnel lining to accommodate signage, utilities, and acoustical treatment behind cast-iron facings (escalators to platform, 9a). Additional lighting and public-address speakers are attached to a T-shaped extrusion suspended from the ceiling. The circulation plan (9b), illustrates the complexity of the conditions at many of the stations, which must interconnect track and street levels with minimal opportunity for new above-ground architecture. New concourses link the existing Northern Line with the JLE line platform.



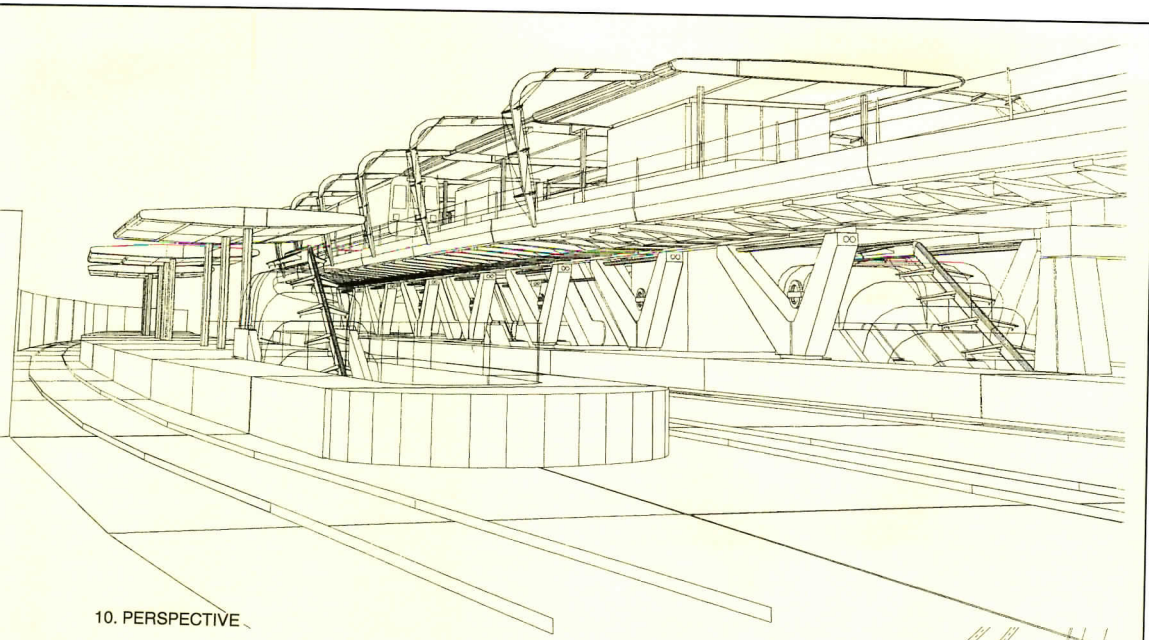
9. SECTION AT PLATFORM



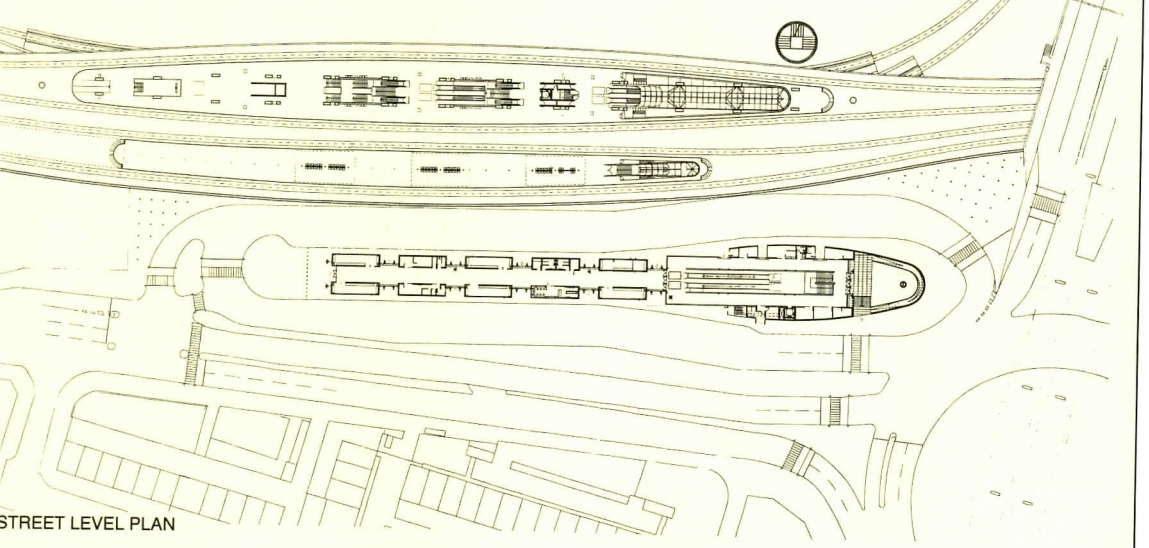
9A. SECTION THROUGH ESCALATORS



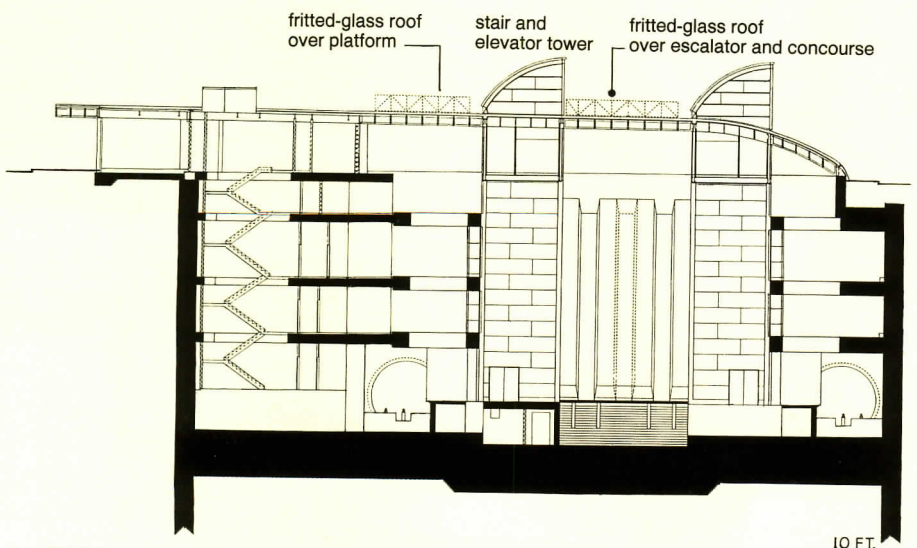
9B. STREET LEVEL AND PLATFORM LEVEL



10. PERSPECTIVE



STREET LEVEL PLAN



fritted-glass roof over platform stair and elevator tower fritted-glass roof over escalator and concourse

11. SECTION

10 FT.
3 M.

10. Canning Town

Troughton McAslan's design for this surface station is understandably more explicit than the subterranean stations in its handling of the engineering tradition that informs most of the JLE designs. British Rail and Docklands Light Railway services connect with London Underground trains here, and all three lines are brought into close proximity. The Docklands line runs above the Underground line in a cage-like superstructure raised on concrete supports (10). In plan (10a), the JLE runs under the Docklands Light Rail with British Rail tracks shown middle, and a bus transfer station shown at the bottom. Patrons cross to any of the at-grade platforms through an underground concourse.

11. Bermondsey

A section through the station (also shown figure 8) shows that the depth of the new rail route is shallower than many branches of the existing system, enabling use of cut-and-cover construction. Under these circumstances, architect Ian Ritchie has made access to platforms and the provision of natural light much more generous than is usually seen in subways.

Perpetual Motion

*Leamington Municipal Transit Hub
Minneapolis, Minnesota
Ellerbe Becket, Architects*



Occupying almost a full city block between the new convention center and Minneapolis's central business district, the nine-level Leamington Municipal Transit Hub could easily have been a black hole sucking life out of an urban area undergoing transition. Certainly, many other parking structures of this size have been exactly that. But instead, the 2,100-car garage and transit facility brings a refreshing sense of animation to its setting and fully engages its surrounding streets.

A series of public hearings at the beginning of the project helped identify two seemingly contradictory goals, which Ellerbe Becket set out to resolve. "The city wanted it to look like a building but be clearly identifiable as a parking garage," says Rich Varda, the partner-in-charge. "No one wanted a static structure with long horizontal slots." In addition to seven levels of parking, the facility would also include an express-bus station one level below the street and a shuttle-bus station on-grade.

As designed, the building is a poured-in-place concrete structure with post-tensioned beams. Epoxy-coated reinforcing bars and micasilica added to the concrete help reduce damage from water penetration and cracking. To make users feel safe from crime, the architects used nonreflective green-tinted glass for stair and elevator towers and created many openings to view interior spaces. A security office with a bank of television monitors is on full display on the ground floor and lighting levels are kept high (at least 5 footcandles in parking areas). To engage the street, the building bows out at the center of its Second Avenue facade and then curves inward at the corners so the sidewalk and pedestrians are drawn inside. Retail space at two corners also helps create active street frontages.

In designing the building's exterior, the architects took two different approaches. Because the city asked that the structure's ramps—those elements that scream "garage" the loudest—be played down, Ellerbe Becket clad the north and south elevations with tightly spaced horizontal bands of precast concrete. On the more public east and west elevations (Second and Third avenues), the architects used large double-floor openings that reveal the concrete frame within and reduce the apparent size of the building. These facades also angle slightly away from the street (at about 5 degrees), widening the sidewalk where people congregate and introducing a sense of animation. This same angle appears as a vertical slope on the glass face of the main stair tower and in a variety of details such as handrails and guardrails. The cumulative effect of these subtle gestures is to chip away at the building type's traditionally boxlike nature.

Traffic circulation within the garage is organized as a "double-threaded helix," in which cars can move along either of two intertwined loops on each level. The pattern enhances visibility of parking spaces from the loops and is an efficient way of moving many cars in and out of the garage at one time. *Clifford A. Pearson*

© Jon Miller, Hedrich-Blessing photos

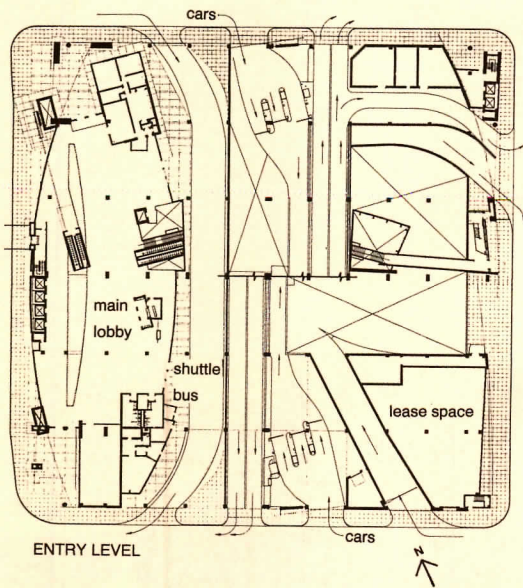


The east facade (opposite) includes retail on the ground floor and double-height openings that make the seven-level structure appear to be a three-story building. The west facade (above and top) is the most public side of the building and has a skywalk on the second level connecting to a nearby hotel.

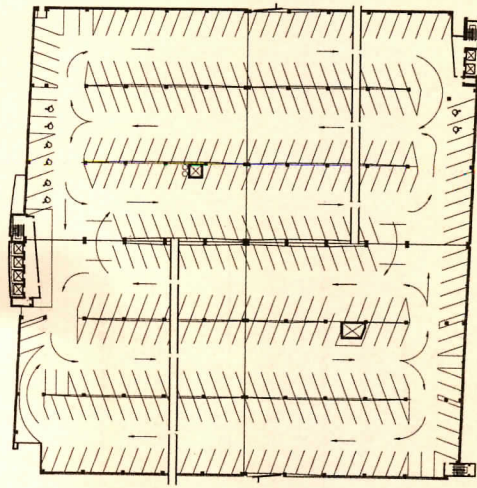


Precast concrete used as cladding for the exterior of the building (above) picks up the color of the nearby convention center. A shuttle-bus station (right) is located on the street level just behind the building's main lobby (opposite left). An express-bus station is located one level below the street (opposite right). Because large numbers of people from the convention center arrive and depart at one time, the architect and traffic engineer designed a double-threaded helix pattern for circulation within the garage (plans opposite). Each trip around the loop takes a car up two levels.

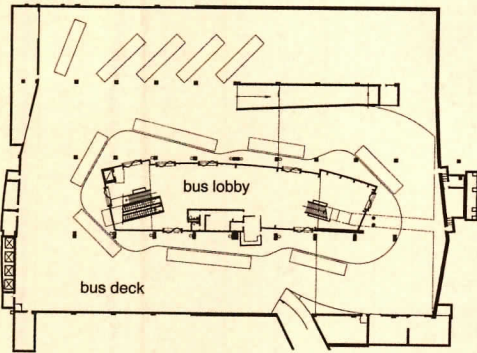




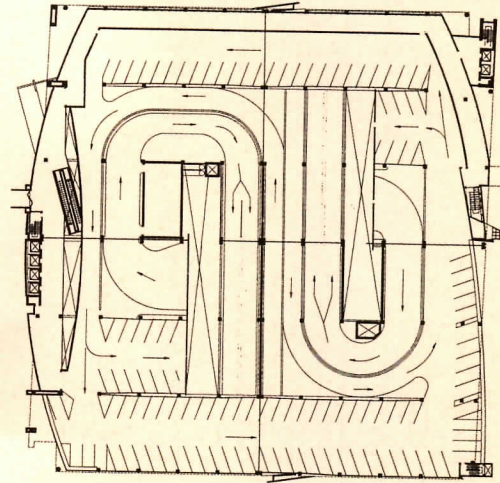
ENTRY LEVEL



TYPICAL PARKING LEVEL



LOWER LEVEL



SKYWAY LEVEL



Credits

*Leamington Municipal
Transit Hub
Minneapolis, Minnesota*

Owner: *City of Minneapolis*

Architect/Engineer: *Ellerbe
Becket—Rich Varda, design
principal; Greg Nook, project
director; Pat Bougie, project
architect; Mark Wentzell,
designer; Scott Saunders,
structural engineer; Stan
McCoy, mechanical engineer;
Doug Renier, civil engineer;
Steve Earl, electrical engineer;
Randy Manthey, landscaping*

Consultant: *Carl Walker
Engineers (parking)*

Construction Manager:
Kraus Anderson

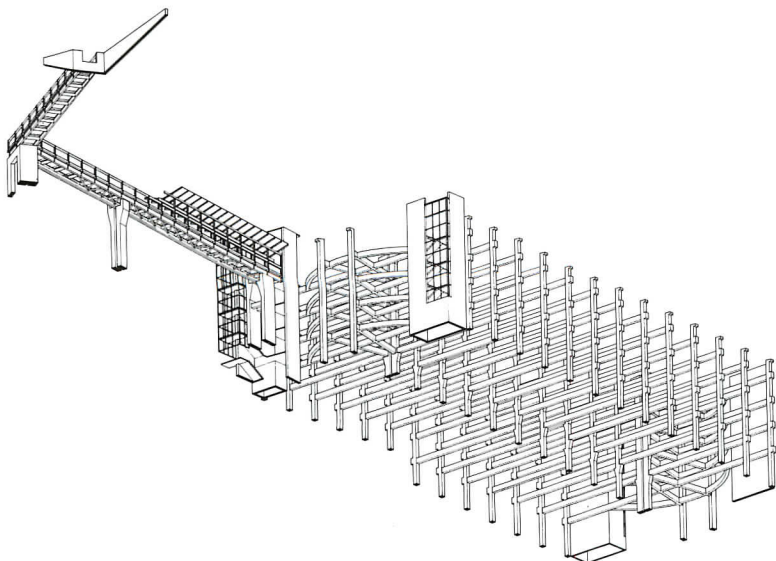
Making the Grade

Although not the most glamorous building type, parking structures offer architects the chance to show off their knowledge of architectural anatomy. Free of many of the demands made on enclosed buildings, garages allow designers to focus on expressing structure and exposing elements usually hidden by curtain walls and cladding. Bohlin Cywinski Jackson took full advantage of this opportunity with its Irving Avenue Garage at Syracuse University. "This was a wonderful chance to show the building's bones, the structure itself," explains Peter Bohlin, partner-in-charge of the project.

On full display is the garage's poured-in-place concrete framing—rectangular columns dividing two aisles, and five levels of parking slabs set within exterior columns. Egress towers stand at the north-east and southwest corners, while a third tower supports a steel bridge connecting the garage to the main part of the university campus. Each of the key elements—frame, ramps, towers, and bridge—is clearly differentiated from the other, reflecting an approach often found in Bohlin Cywinski Jackson's work. Poured concrete is post-tensioned and includes silica fume, a fine-grain additive that makes the material less porous and prevents cracking caused by temperature changes and road salt. Because the amount of expansion and contraction in concrete columns varies with their exposure to the elements and their structural loads, the amount of reinforcing built into each column had to vary as well. As a result, the garage's columns were "tuned, almost like a musical instrument," says Frank Grauman, the project director. In general, columns closest to the perimeter were designed to move the most and those near the center the least. Instead of ramps, the garage has sloped floors for cars to drive up or down; only the curved ends of each floor are level.

Located on a sloping site, the 433-car garage connects to the central part of campus via a steel-frame pedestrian bridge supported on poured-concrete towers. To help negotiate the change in grade, the garage features a floor-to-floor height of 12 feet, instead of the more typical nine feet. As a result, the structure has an open, skeletal feeling which the architects carefully enhanced by using post-tensioned cables rather than solid panels as perimeter barriers. By making the garage as transparent and sunlit as possible, BCJ dealt with a growing concern for security while also creating a structure that reaches out toward, rather than shutting itself off from, its surroundings.

Clifford A. Pearson



© Karl Backus photos



While cars enter the garage at either of the short ends of the structure at grade, pedestrians enter from the top level via a steel bridge (above) connecting to the central part of campus. For security reasons, stairs inside the access towers and the bridge tower (above center and opposite) are wrapped in glass and open to view. The 433-car garage was designed so another level of 88 parking spaces could be added. The bowed portion of the garage (opposite) provides room for cars to turn and helps express the movement of traffic inside. Worm's-eye view (axonometric) shows the structure's concrete frame.



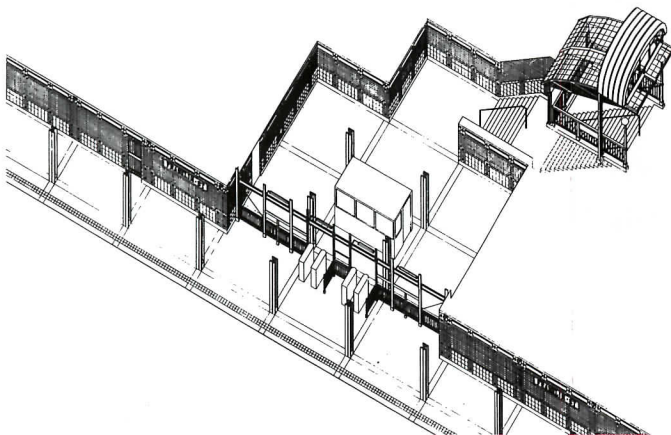
UNIVERSITY VISITOR PARKING
FROM STADIUM PLACE
DISTANCE: 7-0

Focus on: Value-added Infrastructure

The word “infrastructure” conjures up the unglamorous, stark appearance of concrete sewer plants and grim transport structures. But some architects, designers, and their clients have found good reasons to bring better design to projects that might otherwise be gross intrusions on their communities. Input from a merchants’ organization in New York City prompted the design of a fanciful structural steel-and-glass canopy over a subway station entry stair. In Seattle, an environmental-design firm used berms, native plants, and grasses to blend a sewage-treatment plant with an adjacent park.

Franklin Street Station

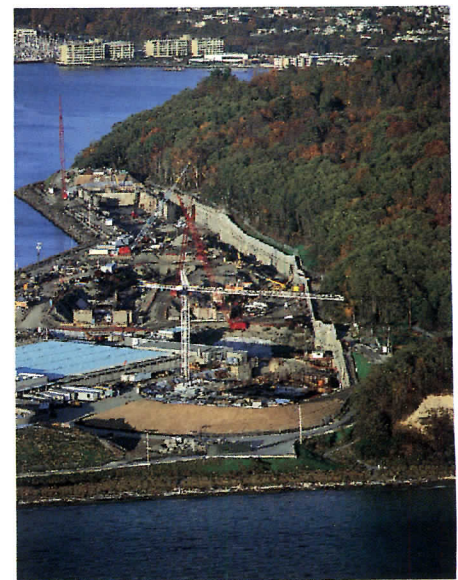
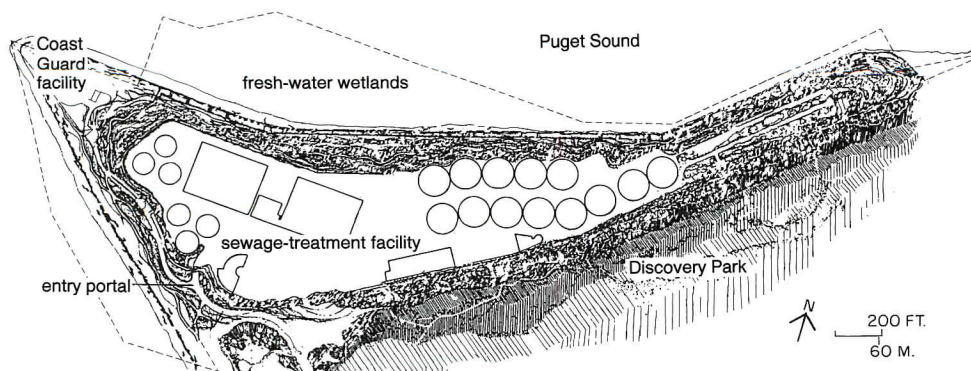
New York City
Karahan/Schwarting Architect



© Paul Warchol photos

West Point Treatment Plant

Seattle, Washington
Danadjieva & Koenig, Environmental Designer
CH2M Hill, Prime Engineer



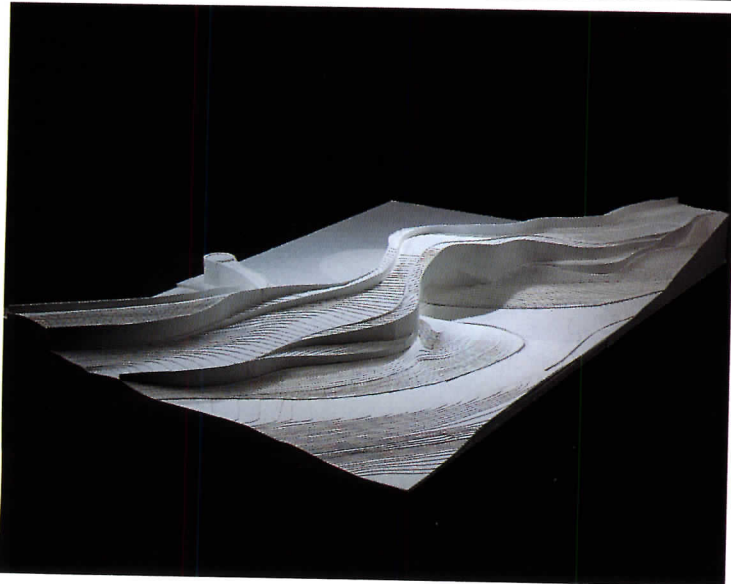
J. F. Housel photos

Also near Seattle, impetus to remodel Sea-Tac International Airport's concourses was in part to provide a warm civic welcome, in recognition that the airport is a major gateway to the Pacific Northwest. Likewise, the sculptural presence of the High Falls Garage in Rochester, N. Y., acts as both a gateway to the historic district and a tribute to that city's industrial heritage. Finally, a power-distribution station in Los Angeles got a gutsy, design-committee-approved facelift. All of the projects prove that infrastructure need not look crude or dull. Charles D. Linn



Station rehabilitation

Starting with an Otto-Wagner-inspired canopy, Michael Schwarting's renovation of the Franklin Street station has brought new life to a typically bleak subway station. The project was accomplished with Economic Development Corporation funds, and included input from a neighborhood merchant's organization which insisted on the canopy. The structure draws on an industrial vocabulary, using exposed bolts and columns built up from steel plates and angles as a structural system. A vaulted roof of terne metal crosses a grid of sand-blasted glass block that allows daylight into the stairwell. Schwarting reused the existing torchères and handrailing, and notes, "When viewed head-on, the lamps and vaulted canopy combine to look like a train pulling into the station." Below ground, the grungy concrete platform floor has been veneered with terrazzo tile. "We had a hard time convincing the transportation authority that it would be durable enough," laughs Schwarting, "but they liked the fact that chewing gum would blend right in." The walls of the station received new tile, but the original mosaic-tile station signage and border near the ceiling were left intact. Indirect fluorescent uplighting softens harsh shadows. ■



Out of sight, out of mind

The environmentally sensitive site of the West Point Treatment Plant created unique design challenges for environmental designers Danadjieva & Koenig Associates and prime engineers CH2M Hill. In order to receive shoreline-use permits for the \$578 million project, the Municipality of Metropolitan Seattle had to submit plans for controlling noise and odor from the plant, to conceal it from view, and to restore the landscape. Nestled on a spit of land between Seattle's Discovery Park and Puget Sound (plan, opposite left), several treatment plants have been located here over the years because unique local off-shore currents always carry outflow away from shore, regardless of tidal conditions. The current expansion (opposite right) is being jammed into 32 acres. CH2M Hill's engineers designed the plant to maximize capacity while minimizing footprint. Danadjieva & Koenig designed a bermed zone around the plant that will be used to screen it from view. The soft earth-forms (model, left) eliminate the need for hard, man-made surfaces like high walls and fences. The bermed areas will have recreational trails, and will be seeded with native plants and grasses. ■

Seattle-Tacoma International Airport Concourse Improvements

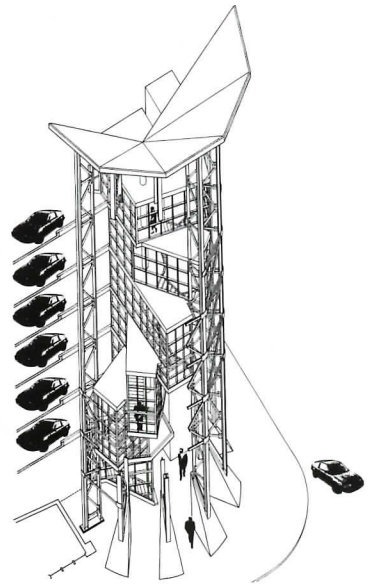
Seattle, Washington
NBBJ, Design Architect
Leo A. Daly, Production Architect



© Paul Warchol photos

High Falls Garage

Rochester, New York
William Rawn Associates,
Design Architect
LaBella Associates, Architect of Record



Sun Valley Distribution Station

Los Angeles, California
LPA, Inc., Architect

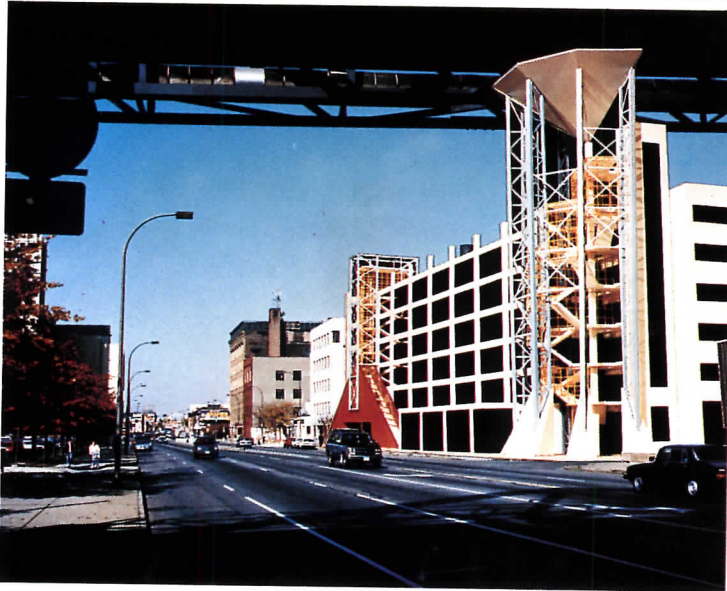


Adrian Velicescu photos



Facelift for flyers

Sea-Tac International Airport's Concourses B, C, and D were a disparate amalgam of styles and construction types that had been erected since the 1960s. "The prime mission of the remodeling was to improve the airport's appearance as a gateway," says NBBJ's project designer Rick Zieve, "which is very important, since Sea-Tac is the first thing people see upon their arrival in the Pacific Northwest." The project involved adding from 12 to 38 feet to the concourse widths, and brightening passenger waiting areas through the expansion of view glass areas (left), and the addition of translucent insulated fiberglass-panel clerestories. The panels are uplit (opposite) to give the concourses a strong nighttime identity. In addition to interior and hvac improvements, the exterior structure of all three concourses was wrapped with white metal panels to unify their appearance. "As it becomes more and more difficult to build new airports, we'll see more airports expand and upgrade by remodeling existing concourses," says Zieve. ■

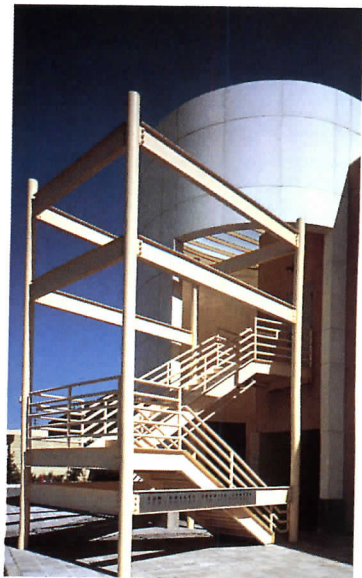


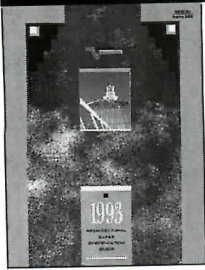
"Primal imagery" enlivens parking garage

Architect William Rawn says that because parking garages function as portals to downtown shopping and working districts, they may be the most important urban building type in medium-sized cities. "People have a choice. They can drive to the suburbs or they can drive downtown. If you build ugly parking garages, the people won't come." The entrance and stair tower of the High Falls Parking Garage will make it a delightful destination. Rawn describes the huge masonry pyramid where autos enter and sculptural steel stair tower as "primal imagery" that is inspired by the fragments of locks, raceways, and iron construction along the nearby Genesee River. Atop the stair tower, tilted screens will be used to reflect laser light to mark the garage during downtown Rochester's special night lighting events. "You have to give Rochester Mayor Thomas Ryan a lot of credit for this garage," says Rawn. "Parking garages are extremely important elements of the urban landscape. It takes a lot of courage on the part of politicians not to just keep on building things the way they always have been." The garage will be completed early this winter. ■

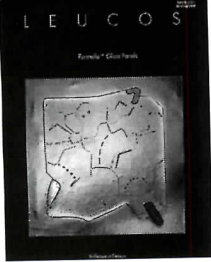
Order from chaos

The improvements to the Sun Valley Distribution Headquarters, an electric-utility-operations complex, uses a vocabulary of industrial materials—concrete block, steel mesh, and structural-steel framing—to unify an assortment of unrelated buildings dating from the 1950s. The grounds are wrapped by an articulated assembly of block and steel mesh (opposite) that serves as security fence, courtyard wall, and interior partition. "The fence creates a dancing horizon line on an otherwise flat suburban wasteland," says architect Jim Wirick. Brightly colored I-beams cradling steel stairs mark the entries to two of the buildings, with a huge white steel drum overhead marking the entry to the main structure (left). This high-style was the mandate of a local design board, the Cultural Affairs Committee, a group that oversees the design improvements to publicly owned property. "The Department of Water and Power had to start getting design approvals on improvements to their property about five or six years ago," says Wirick. "Coincidentally, that's also when they started hiring outside architects to do the design work." ■





400. Glass-fabrication guide
A 28-page architectural catalog highlights recent high-rise curtain-wall projects using reflective, monolithic, and coated-glass products. Performance data are charted for each glass type and tint, and includes both ASHRAE and European U values. Viracon, Owatonna, Minn.



401. Venetian-glass panels
A brochure on Italian Formelle decorative glass outlines the design potential of the colorful panels, and explains the technical support available through the firm's New Jersey office. Panels are available in single-, double-, and triple-glazed, shatter-proof, and bulletproof configurations for indoor and outdoor use. Leucos USA, Inc., Edison, N. J.



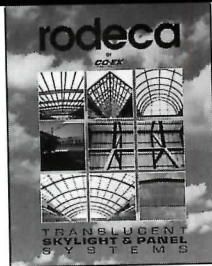
402. Low-E for vinyl windows
Thermolect is a proprietary, two-coating low-E high-performance glass designed for this maker's welded-vinyl replacement window. The system—frame, glass, and spacers—is said to have the highest R value of any similar double-pane window. Glass has no color reflection or haze. CertainTeed Corp., Valley Forge, Pa.



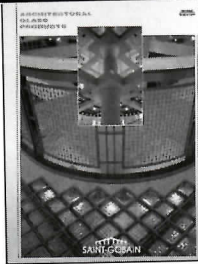
403. Colored-wire labeled glass
Fire glass that meets CSPC 16 CFR-1201 Cat., ANSI Z97.1, and ASTM C-1036 now offers six standard colors of wire mesh: black, red, blue, green, white, and yellow. The 1/4-in. laminated clear float glass is awaiting certification with ETL as to its 20-minute fire rating. Priced comparable to standard wire glass. Federal Doors, Inc., Fairfax, Va.



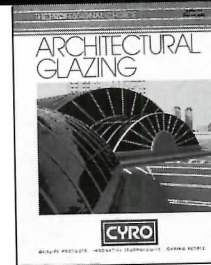
404. Energy-saving curtain wall
A color brochure illustrates recent Visionwall high-rise installations in the U. S. and Canada, and details insulating-unit components with cutaway drawings. The suspended-film system has a total-window R-value of 6.5, and is available for curtain-wall, punched, and strip-window applications. Visionwall Technologies, Stow, Mass.



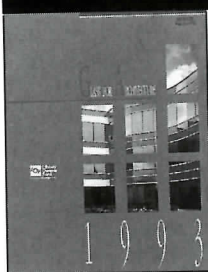
405. Translucent-sheet skylight
The Rodeca skylight and panel is a modular polycarbonate structured sheet with a self-supporting aluminum-frame system. Suitable for both vertical and sloped glazing, it comes in clear, bronze, opal, green, and blue tints. Co-Ex Corp., Rocky Hill, Conn.



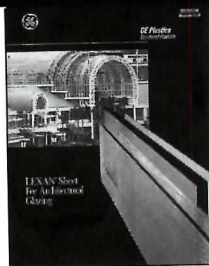
406. French architectural glass
A design guide features flat, reflective, and patterned glass, and glass-block products, made by Saint-Gobain and sold in the U. S. All patterns are illustrated in color, including 15 cast-glass styles in the new Masterglass line. Euroglass Glasrep Corp., White Plains, N. Y.



407. Chemical-resistant acrylic
A six-page guide describes Acrylite and other acrylic-sheet products, polycarbonate double-skinned, and monolithic materials, including glazing with superior abrasion- and ultraviolet-resistant characteristics. Technical sections cover the special installation requirements of plastic glazing. CYRO Industries, Mt. Arlington, N. J.



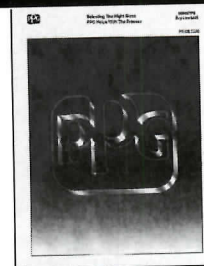
408. High-performance glass
A 24-page catalog discusses performance and technical data for all LOF architectural glass, including EverGreen, Energy Advantage Low-E, Eclipse reflective, Mirropane E. P., and a range of clear and tinted float-glass options, illustrating each glass with built projects. Libbey-Owens-Ford Co., Toledo, Ohio.



409. Lexan glazing
A colorful 20-page brochure illustrates Lexan polycarbonate in all its architectural permutations, including the most impact-resistant systems for almost-vandal-proof glazing and security enclosures. Details demonstrate suggested wet, dry, and dual-glazing installations. General Electric Co., Structured Products, Pittsfield, Mass.



410. Designing laminated glass
DuPont's *Imagine* booklet and companion videotape showcase dramatic architecture made possible with laminated glass—in skylights, floors, large atria, and secure enclosures—explaining its acoustic, solar-control, storm-resistant, UV-limiting, and decorative properties. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.



411. Glass-selection guidelines
A 24-page catalog covers glass-selection criteria: structural and thermal strength, solar-control tints and coatings, frit-pattern options, and spandrel and cladding glass in solid colors and patterns. All glass is illustrated as-used in recent built projects. PPG Industries, Inc., Ford City, Pa.
Continued on page 159

Infrastructure continued from page 99
 tional issues to respond to some larger civic need. Indeed, ISTEA mandates areawide planning, so that highway and transit facilities are genuinely complementary. Los Angeles architect William Fain is taking the concept even further, seeing in his city's plan for 450 miles of mass transit an opportunity to piggyback a system of greenways for a city that sorely lacks public open space. (The plan would also take advantage of unused rail rights of way and flood-controlled riverbeds.)

Thinking on this scale requires a kind of citizen involvement that is unfamiliar to many professionals. But just such efforts, under the umbrella of the Surface Transportation Policy Project (STPP), pushed through the most progressive aspects of ISTEA. "The STPP coalition [including the AIA, ASLA, urban planners, and the National Trust for Historic Preservation] was the first time we went beyond handcuffing ourselves in the path of bulldozers," explains Lisa Wormser of STPP. The process mandated by ISTEA is a kind of "trickle-up effect," she says. "The federal government says it wants state and local governments to drive the process upwards." It's already happening in St. Paul [RECORD, April 1993, page 31] and Pittsburgh, where the local AIA chapter sponsored a design charette to create a unified vision of what five separate engineering projects, most prominently, the Wabash Bridge (page 99), could contribute to the city's defaced waterfront. The group reviewed bridge-design options (the agency scheme was an off-the-shelf eyesore in this city of great bridges) and suggested a more integrated design that would improve access to the waterfront and provide a more useful location for a planned light-rail station. The scheme, though more costly than the projects considered separately, has been embraced by planners, public agencies, and the local press. Understating the case, chapter president Robert Pfaffmann says such projects, "need not be a necessary evil, but could produce something greater than initially imagined." *James S. Russell*

Further Information

The Surface Transportation Policy Project publishes a Resource Guide, which explains the ISTEA planning process and gives examples. STPP, 1400 16th Street, N. W., Suite 300, Washington, D. C. 20036.

"A Summary: Intermodal Surface Transportation Efficiency Act of 1991," is a 42-page pamphlet produced by the

U. S. Department of Transportation, 400 7th Street, S. W., Washington, D. C. 20590.

"Financing the Future" provides broad background on federal infrastructure spending as well as recommendations for financing it. U. S. Department of Transportation, Office of Economics, P-37 (address same as above), 202/366-5412.

"Transportation Infrastructure: Urban Transportation Planning Can Better Address Modal Trade-Offs," is a brochure that

explores efficiencies that can be derived from planning for transportation needs based on using the mode best suited for the problem (bus, rail, cars). United States General Accounting Office, P. O. Box 6015, Gaithersburg, Md. 20877.

"Fragile Foundations: A Report on America's Public Works," a report to the President and Congress by the National Council on Public Works Improvement, is out of print but should be available in libraries. ■

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* On 3.1/2" IBM-compatible disks

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Manufacturer Sources

For your convenience in locating building materials and other products shown in this month's feature articles, RECORD has asked the architects to identify the products specified.

Pages 100-105

Midfield Terminal Complex, Pittsburgh International Airport
Tasso Katselas Associates, Architect
Precast concrete: Sidley Precast. Exterior masonry: Burns & Russell Co. (Spectra-Glaze). Metal cladding: Alucobond Technologies. Skylights: EPI. Canopy glazing: General Electric Plastics, Sheet Products Div. (Lexan). Modified-bitumen roofing: Tamko. EPDM membrane: Carlisle SynTec. Terne-coated stainless steel: Follansbee Steel Corp. Curtain wall: Kawneer Co., Inc. Glass: PPG Industries, Glass Group (Solar Gray). Automatic doors and entrance: Stanley Magic Door. Metal decking: EPIC Metals. Acoustic ceiling: Armstrong World Industries. Grid: Chicago Metallic. Latex and alkyd paints; red interior accent on metal surfaces: Sherwin-Williams. Special coating: Zolatone. Wallcoverings: Forbo Industries, Inc. (Viertex). Carpeting: Lees Commercial Carpet. Holdroom seating: KI. Exterior and pole fixtures: Kim Lighting, Inc. Moving walkways, escalators: Schindler Elevator Corp.

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Landside Terminal, Denver
C. W. Fentress J. H. Bradburn and Associates, Architect
PTFE-coated fiberglass membrane: Chemical Fabrics Corp. Fabrication: Birdair Inc. Glass: PPG Industries, Glass Group. Entrances: Horton Automatics.

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Pier 4/4A, Heathrow Airport
Nicholas Grimshaw & Partners Ltd., Architect
Profiled-metal cladding: British Alcan Aluminum Ltd. Curtain wall: Don Reynolds Facades, Ltd. Glass: Pilkington Glass Ltd. Single-ply roof: Sarnafil, Ltd. Coatings on metal: Pennwalt Plastics, Ltd. (Silver PVF₂). Sheet-rubber flooring: Freudenberg Co. Carpet: Collins & Aikman UK, Ltd. Lighting booms: Concord Lighting, Ltd. Moving walks: O & K Escalators, Ltd.

Pages 112-115

First Avenue Plant
Ellerbe Becket, Architect
High-bay lighting: Metalux. Decorative fixtures: BEGA/FS. Brick: Endicott. Glass block: Pittsburgh-Corning (Essex). Galvanized-steel roofing: Vincent Metals. Paints: Glidden.

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Leamington Municipal Transit Hub
Ellerbe Becket, Architect
Aluminum-frame curtain wall: Harmon Contract. Cast-in-place concrete seating: custom by architects. Micrasilica additive for concrete: W. R. Grace. Single-ply roofing: Carlisle SynTec. High-bay light fixtures: Lithonia. Glazed block: Burns & Russell Co. (Spectra-Glaze.) Lobby ceiling: Armstrong World Industries. Phone kiosk: King Products, Ltd. Recessed lighting: Kurt Versen. Lobby benches: Forms+Surfaces.

Pages 130-135

Irving Avenue Parking Garage
Syracuse University
Bohlin Cywinski Jackson, Architect
Interior and exterior lighting, custom standards: Kim Lighting. Elevator: Otis. Operable grilles: Overhead Door Co.

Pages 136-137

Franklin Street Station
New York City
Karahan/Schwarting Architects
Sand-blasted glass block: Pittsburgh-Corning. Italian terrazzo tile: W. D. Virtue Co. Fluorescent lighting: McPhilben. White wall tile: Summitville. Gray base tile: American-Marazzi Tile Co.

Pages 138-139

Seattle-Tacoma International Airport Concourse
NBBJ, Architect
Translucent-fiberglass panels: Kalwall Corp. Textured-surface metal cladding: E. G. Smith Construction Products. ■

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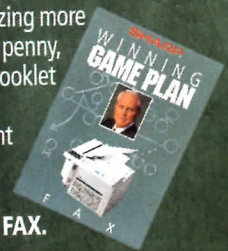
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Calendar continued from page 4

texts & International Architecture 1970-90 at the Chicago Athenaeum. Call Carolyn Armenta Davis, 312/266-0269 or Christian K. Laine, 312/280-0231.

June 16-19

Pacific Coast Builders Conference at San Francisco's Moscone Center. Contact Rick Arkus, 916/325-9300.

June 16-July 2

Chicks in Architecture Refuse to Yield (CARY), a "collective whose goals are to focus attention on the status quo of women and the position of women in the field of architecture," presents "Exhibition of Provocative Vignettes to Address AIA Convention in Chicago." Contact Kay Janis, 312/427-9290 or Sally Levine, 312/472-6747.

June 18-21

American Institute of Architects convention in conjunction with World Congress of Architects, Chicago. Contact Lynne Lewicki, 202/626-7467.

July 25-31

International Congress for the Conservation of Historical Cities and the Built Latin American Heritage at the University of Alcala de Henares. Write Secretariat of the V Congress, Plaza de Cervantes, 8 28801 Alcala de Henares, Spain; call 34-1 885-4014; Fax 34-1 885-4095.

August 1

"Moscow Avant-Garde Architecture: 1955-1991," presented by the Art Institute of Chicago. Contact Eileen Harakal or Patricia O'Connell at 312/443-3625.

September 8-12

"Frank Lloyd Wright and the Prairie School in Iowa," Mason City, Iowa. Contact Judith Trent, 708/848-1141 or Jeanette Fields 708/366-9342.

September 29-October 2

"Adapting in a Changing World," the Association for Preservation Technology International's 25th anniversary conference, Chateau Laurier, Ottawa, Canada. Contact Robert Hunter, 819/997-6974 or Fax 819/953-4909.

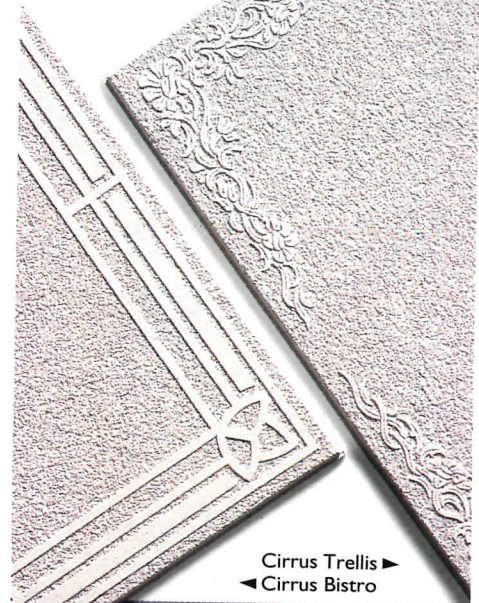
Competition

The Concrete Reinforcing Steel Institute Design Awards XII Competition for Concrete Structures. Deadline October 1. Open to registered architects and other building professionals. Write CRSI, 933 N. Plum Grove Road, Schaumburg, Ill. 60173-4758. ■

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Birdair's Tensioned Membrane Lands at Jacksonville International Airport

Birdair's Teflon® coated fiberglass membrane technology makes permanent translucent structures of any size or configuration possible. In Jacksonville, architects used tensioned membrane to create a "wagon wheel" curbside canopy, which is 26 ft. wide and 824 ft. long. The crossover canopy is 26 ft. wide and extends 174 ft. from curbside to the parking garage. Birdair continues to pioneer technology it introduced in 1956, now providing imaginative and thorough detail, fabrication and erection services to design and building teams world wide. From California to New York, to Canada, Italy and Saudi Arabia, Birdair has created sports domes, skylights and magnificent canopies.

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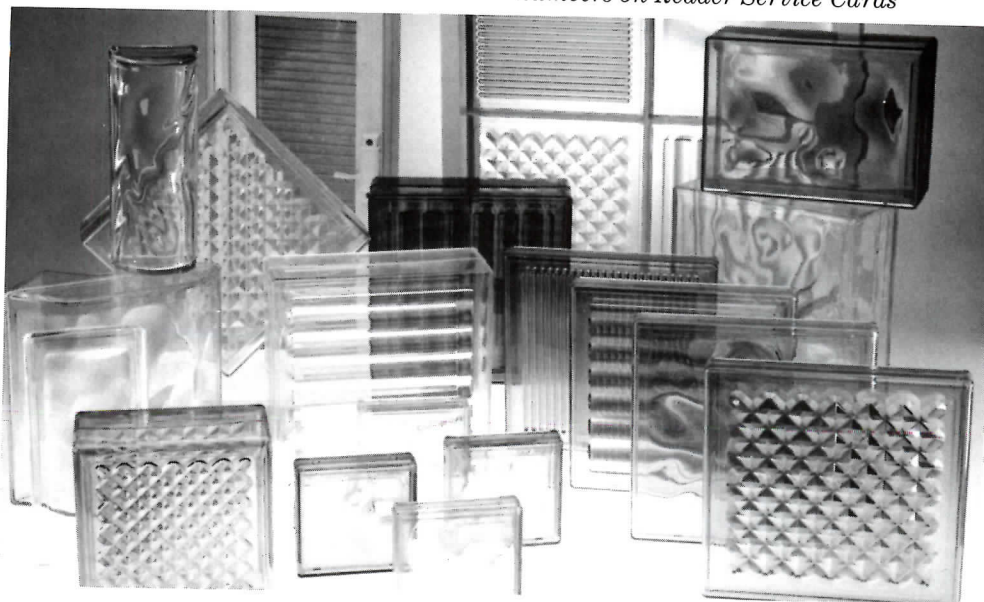
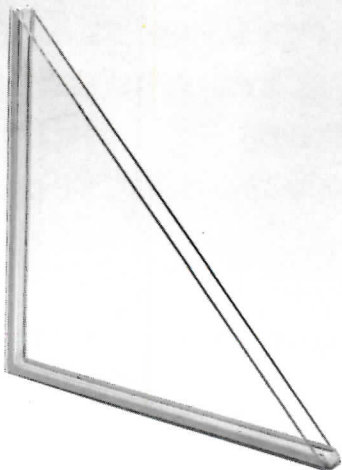


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305. Warm and dry

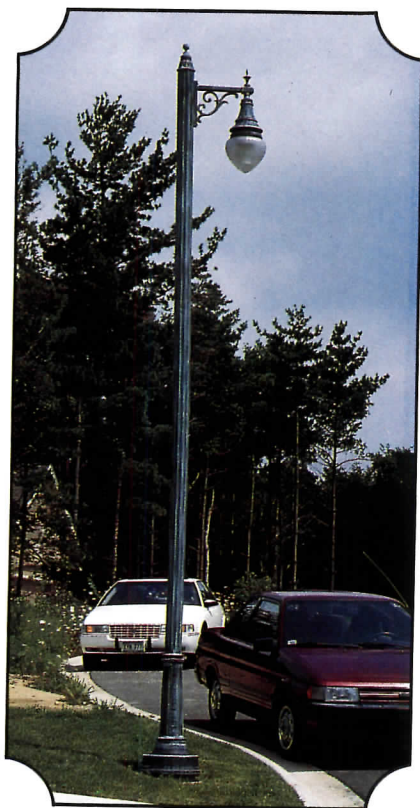
A new gray-colored matrix desiccant, Insul-Dri, adsorbs moisture from insulating glass, resists long-term exposure to UV, moisture, and thermal shock, and blends well with steel spacer constructions. It was developed for glass-house use with PPG's Intercept insulating-glass edge system. H. B. Fuller Company, St. Paul, Minn.

306. Acrylic block

A Plexiglas product 87 percent lighter than glass units, block comes in a variety of colors and surface patterns, as well as corners and end-cap shapes. Described as equally

suitable for interior and exterior construction, the block is guaranteed not to discolor or fade for up to 19 years. Guardian Plastics, Inc. Jeanette, Pa.

Continued on page 153



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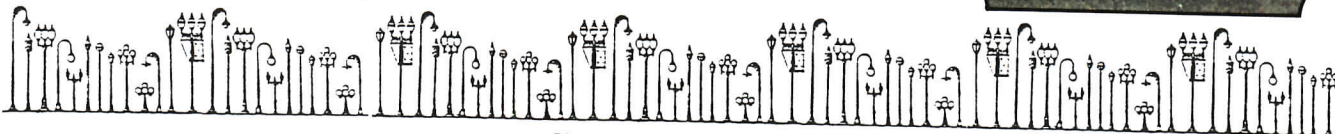
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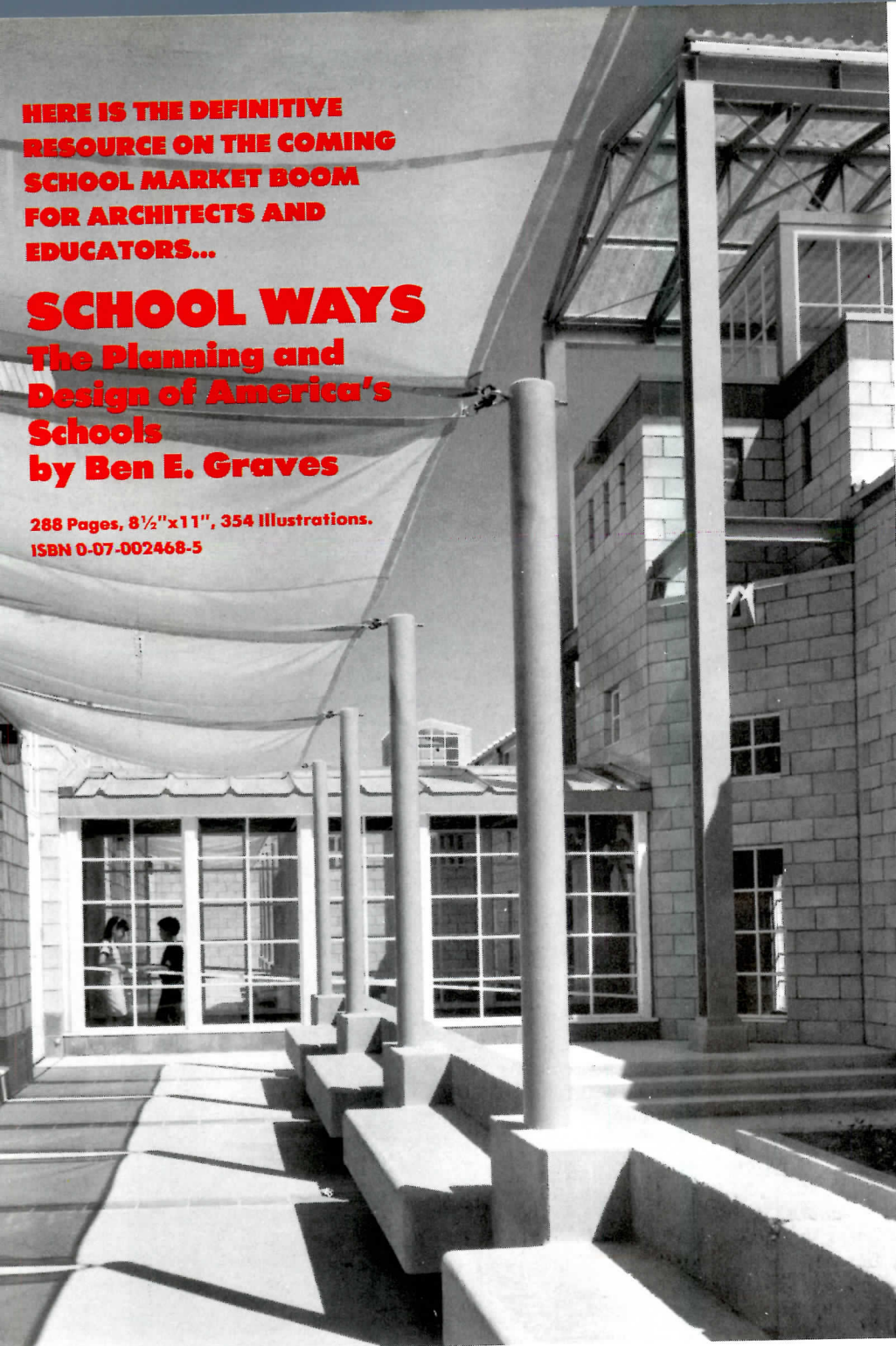
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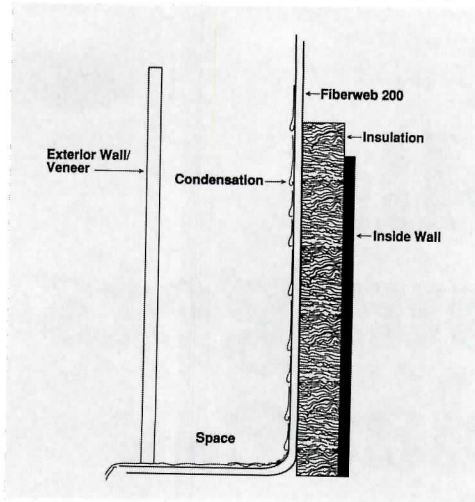
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307. Flexible fabric flashing

Fiberweb 200 is a fiberglass-reinforced polyester flashing backed with waterproof vinyl acetate, materials that resist the caustics and alkalies found in concrete and mortar. Offered in a range of widths, flashing is suggested for use in insulated veneer-wall systems which tend to cause accelerated corrosion of masonry ties and metal studs. Flashing is said not to shrink, sag, or delaminate for at least 100 years. Dur-O-Wal, Inc., Arlington Heights, Ill.



For more information, circle item numbers on Reader Service Cards

308. Heavy-duty entrance

A flush-panel style made of fiberglass-reinforced polyester, the Vision Lite door has a rustproof, seamless face that is not affected by repeated cleaning with strong disinfectants and industrial-maintenance products. FRP surfaces can be specified in any of six colors, different sizes, and several vision-glass options. Vistawall Architectural Products, Terrell, Tex.



309. Architectural faucet

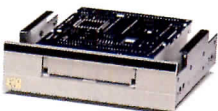
The Neuville fitting has a tapered escutcheon and semi-cylindrical lever handles described as "ritzzy art deco." Offered in chrome, brass, and nickel finish options, the fitting comes in designs for lavatories, baths, showers, and bidets. Kohler Co., Kohler, Wis.

Continued on page 155

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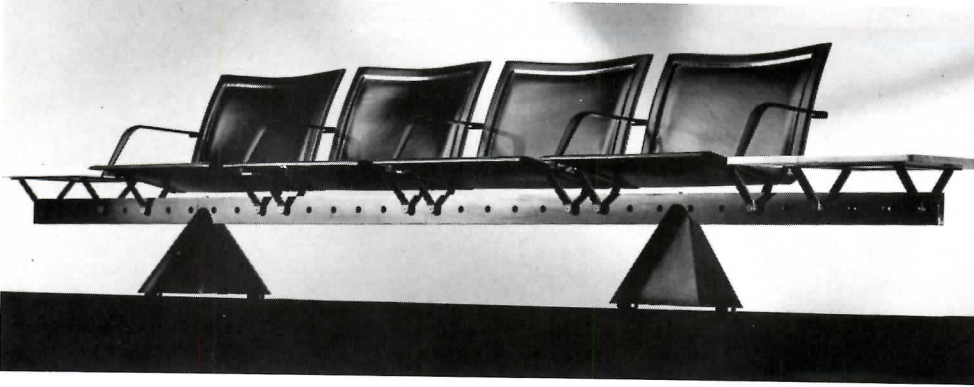
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310. Large-scale beam seating

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seating suitable for Executive Class lounges in airports or other large waiting areas. Seats and backs, made of hides 2.5mm thick, come in 25 colors; optional inset tables are marble. Brianza Furniture International, Ltd., High Point, N. C.

For more information, circle item numbers on Reader Service Cards



312. Traditional-style wood benches

Made of Indonesian shorea, a decay-resistant resinous hardwood that weathers gray, public-area chairs, benches, planters, and tables are recommended for outdoor use. Though the pieces may be left natural, they are also available in a range of custom-color finishes including lacquer, stains, polyurethane paints, whitewash, and aniline dye. Continental Creative Sales, Inc., Garfield, N. J.

Continued on page 157



311. Waiting-room furniture

Versa Conference Tandem seating, based on a double-tubular steel beam that supports both seat and table modules, matches free-standing stack chairs. Legs and beams can come in any of 30 powder-coat colors; corner tables provide an attachment for a 90-degree beam application. KI, Green Bay, Wis.

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313. Wood-face fire door

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For more information, circle item numbers on Reader Service Cards



314. Faucets for healthcare

Designed by architects Stanley Tigerman and Margaret McCurry, wrist-blade handles and gooseneck spout are said to offer ease of use and excellent water control. American Standard Plumbing Products, Piscataway, N. J.

315. Curved tempered glass

A new bending line can handle tempered glass over 3/8-in.-thick, in virtually any shape or size, and combine tempered with laminated glass. The Toyota AirFlite Center (Jeffrey M. Kalban, architect) uses 1/2-in. glass across a 50-ft radius. Dlubak Corp., Freeport, Pa. ■



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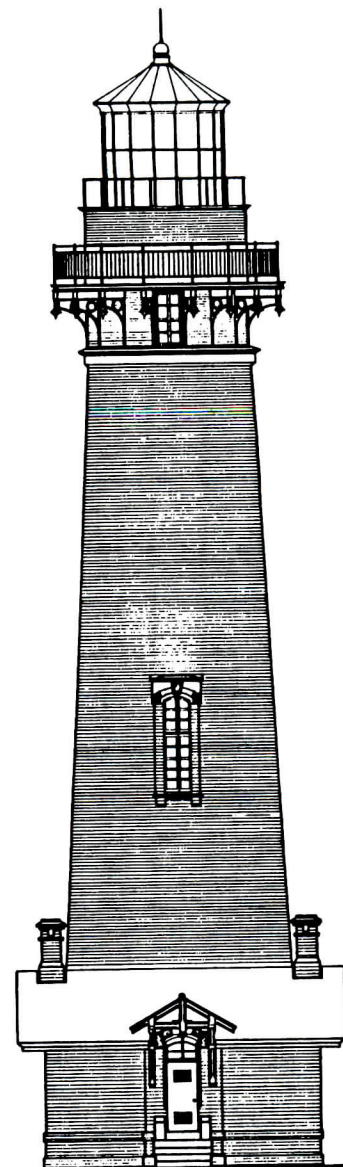
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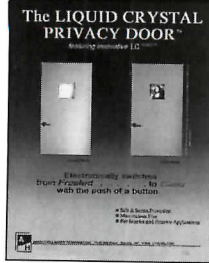
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412. Coated glass

A brochure describes low-emissivity, multifunction, and solar-control coatings for application to insulating, spandrel, and residential glass. Easy-to-read charts match performance data with all substrate/coating combinations. Interpane Coatings, Inc., Deerfield, Wis.



413. Electronic shading

A data sheet describes a commercial door offered with a liquid-crystal vision-light option. The glazed inserts go from private/opaque to view/clear at the touch of a remote switch. LC glass can also be ordered in colors, and in larger-light sizes. Abadi/Hollander Corp., Bayside, N. Y.



414. Laminated glass

A 28-page catalog covers all aspects of laminated-glass specification, from the dynamic racking performance of curtain-wall systems in an earthquake to its safety value used in zoos (or prisons). CAD-based structural-design programs are available free of charge. Monsanto Co., St. Louis.



415. Plexiglas in architecture

A color catalog presents general design principles on Plexiglas acrylic plastic for building applications, and specific design and specification recommendations on Plexiglas sheet for window glazing. Specialty products include a range of Flair patterns, which resemble cast glass, and ultra-violet-filtering sheet. AtoHaas North America, Inc., Philadelphia.



416. Solar-control glazing

An 18-page brochure provides technical support for all Heat Mirror sputtered-film products, including Heat Mirror Plus, Superglass, and California Series glass. Colorful charts match solar-heat and daylight transmission and reflection numbers with various primary-glass options. Southwall Technologies, Palo Alto, Calif.



417. Printed-pattern glass

Sumitec catalog illustrates the decorative and solar-control potential of various safety-glazing products, including Sumiglass printed-interlayer laminate and light-refracting PrismGlass. Sumitec, Inc., Benton Harbor, Mich. ■

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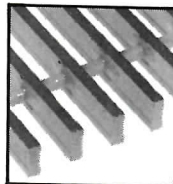
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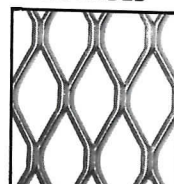
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Safety Gratings!

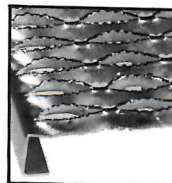
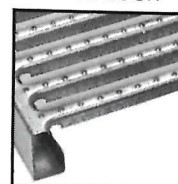
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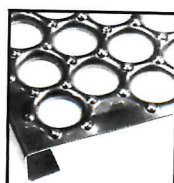
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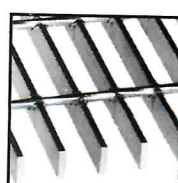
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Architectural Record June 1993

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Project Coordinator, 40hrs/wk., 9am - 5pm, \$28,800/year. Analysis of architectural requirements and development of schematic and detailed designs. Establish/manage computer systems for the CAD production of architectural details and construction documents. Construction administration of building repair projects including on-site survey, inspection and parking garage repair. Interior design. Master of Architecture as well as six months experience as a Project Coordinator or Designer required. Previous six months experience must include: CAD production of architectural details; interior design; budget calculations using spread sheet software; parking garage repair; survey; construction administration. Must have proof of legal authority to work permanently in the U.S. Send two copies of resume to: Illinois Department of Employment Security, 401 South State Street, Chicago, IL 60605, Attention: Jean Woodson, Reference #V-IL-10078-W. No calls. An Employer Paid Ad.

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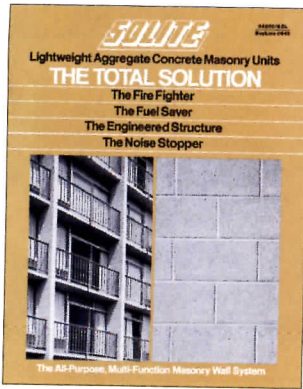
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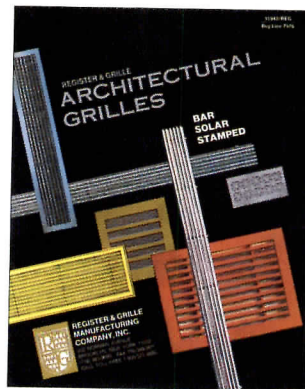


SOLITE® lightweight aggregate concrete masonry units provide the total solution for your building needs. 8-page brochure features multi-function wall system of concrete masonry units composed of rotary kiln produced aggregate. Fire resistance - up to 4 hr. rating. High insulative values save fuel. High resistance to sound transmission provides maximum privacy. Brochure also explores the benefits of an engineered masonry structure. P.O. Box 27211, Richmond, VA 23261 (804) 329-8135

SOLITE Corp.

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Register & Grille Mfg., Co.

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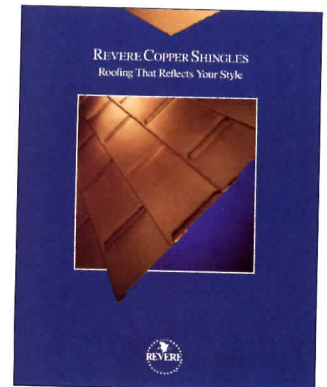


Innovative designs are made simply, economically & easy to install with PLASTRGLAS Glass Fiber Reinforced Gypsum. A complete line of columns, domes, coffered ceilings, capitals, & light shelves are offered & are engineered to meet the most exacting architectural specifications. Products are shipped in special crating to avoid handling problems. Architectural fabrications are available for interior as well as exterior use. (402) 455-0652.

PLASTRGLAS, Inc.

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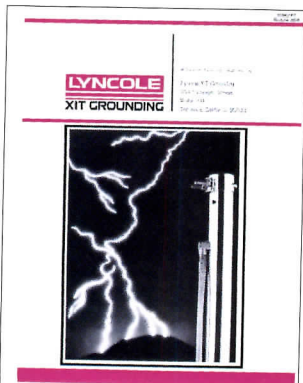


Revere Copper Shingles are quicker and easier to install than ordinary asphalt shingles. There are no special skills required and no special tools. Because Revere shingles are manufactured from solid copper, not a foil laminate, they will likely last as long as the building they protect. To learn more about our copper shingles, or any of our other copper roofing products, call us toll-free at (800) 448-1776.

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XIT Grounding/Lyncole Ind.

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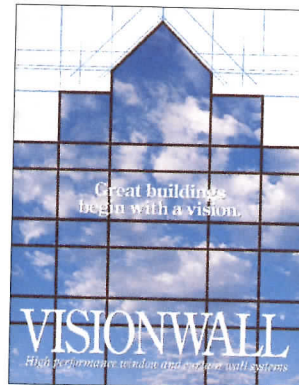


FiberBond Sheathing is designed for use on outside or sidewall framing. It provides a water-resistant backing for various exterior siding materials. They are exceptionally strong and fire-resistant with superior fastener-holding ability. Sheathing can be used in E.I.F.S. construction and meets or exceeds ASTM C79 requirements. Underlayment and wallboard also available.

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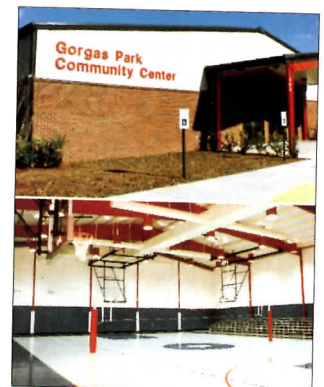


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United Panels, Inc.

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Product Literature Showcase

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Ceco Building Systems

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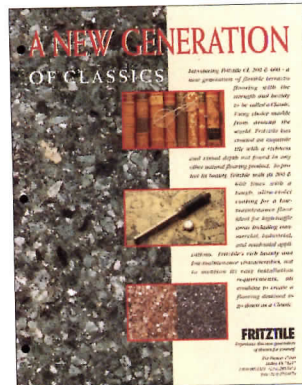


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Spartan Showcase, Inc.

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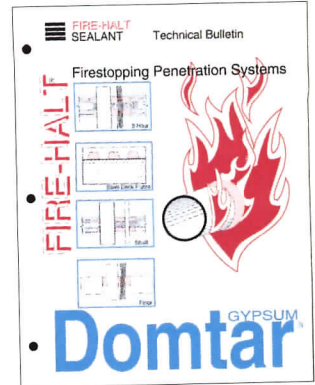


Fritztile introduces "A New Generation of Classics" with its Classic 200 & 600 Series flexible terrazzo floor tile. Accented with imported and domestic marble this dynamic flooring is available in a range of colors from pastels to earthtones. Exceptionally wear and stain resistant, Fritztile is perfect for commercial, institutional and residential applications - anywhere beauty and durability are important. 1-800-955-1323

Fritztile

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Domtar Gypsum

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Raymond Enkeboll Designs

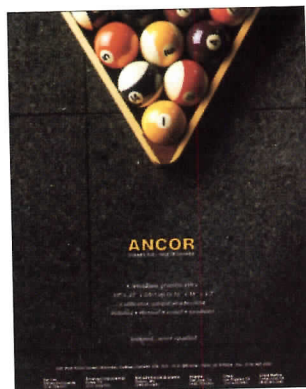


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Raymond Enkeboll Designs

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ANCOR GRANITE TILE

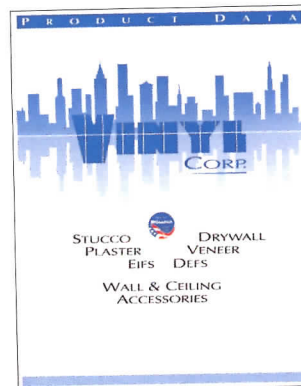


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Ancor Granite Tile

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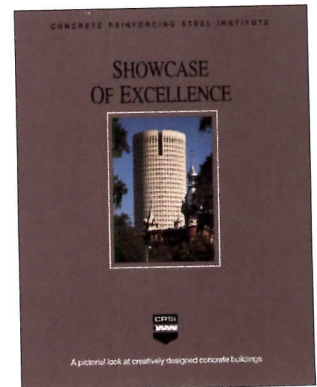


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Vinyl Corp.

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Produced by the Concrete Reinforcing Steel Institute, this 16-page, 4-color brochure pictorially highlights the advantages & benefits of cast-in-place reinforced concrete. Thirty-seven structures are featured in nine categories, including: Parking Structures, Housing, Commercial Buildings, Educational Buildings & Recreational Facilities. All show the strength and versatility of concrete.

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Duraflake

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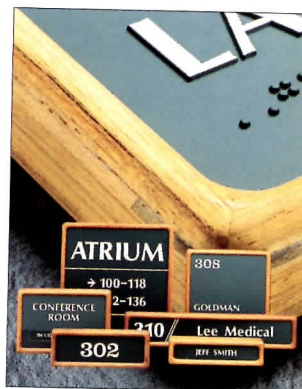


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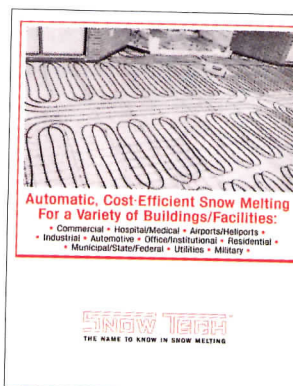


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Moldcast Lighting

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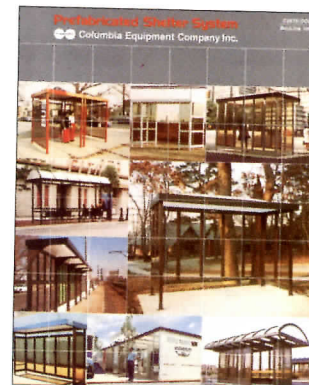
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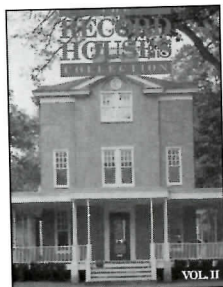


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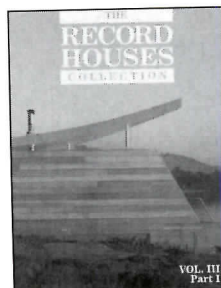
Columbia Equipment Co.

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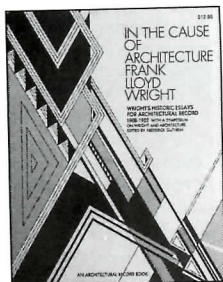
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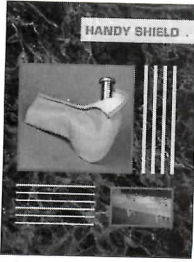
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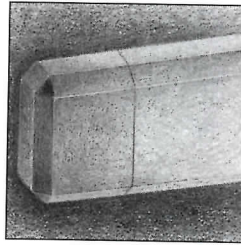
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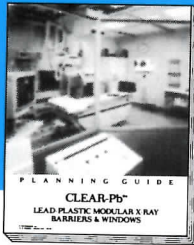
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