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Letters/calendar, 4
 Editorial: The Ticino Group—Toward an architecture of place, 9

Business

News, 27
 Marketing: Mastering polished audio-visual presentations, 29
 Economics: Whither housing in the next decade?, 33
 Computers: Changing the legal rules, 35
 Architectural education: The possibilities for research on architecture teaching, 41

Design

News, 45
 Design awards/competitions, 54
 Observations/books, 59
 Hugh Stubbins and the life of architecture, 61
By Roger Kimball

Building Types Study 638: Correctional facilities, 81
Philadelphia Industrial Correctional Center, Philadelphia Prisons, Philadelphia, Pennsylvania, 82
Jacobs • Wyper/Ehrenkrantz, (A joint venture) Architects
Clark County Detention Center, Las Vegas, Nevada, 88
JMA Architects, Architects, Hellmuth, Obata & Kassabaum, Associated Architects
Santa Cruz Pretrial Detention Facility, Santa Cruz, California, 92
Kaplan/McLaughlin/Diaz Architects
The Wyoming Women's Center, Lusk, Wyoming, 94
The NBBJ Group, Architects

Visitor facilities, The Statue of Liberty, Liberty Island, New York, 98
Swanke Hayden Connell Architects

Annenberg Library and Communications Center, Pine Manor College, Chestnut Hill, Massachusetts, 104
Shepley Bulfinch Richardson and Abbott, Architects

Architects of the Ticino, 110
Four interventions in Switzerland

Engineering

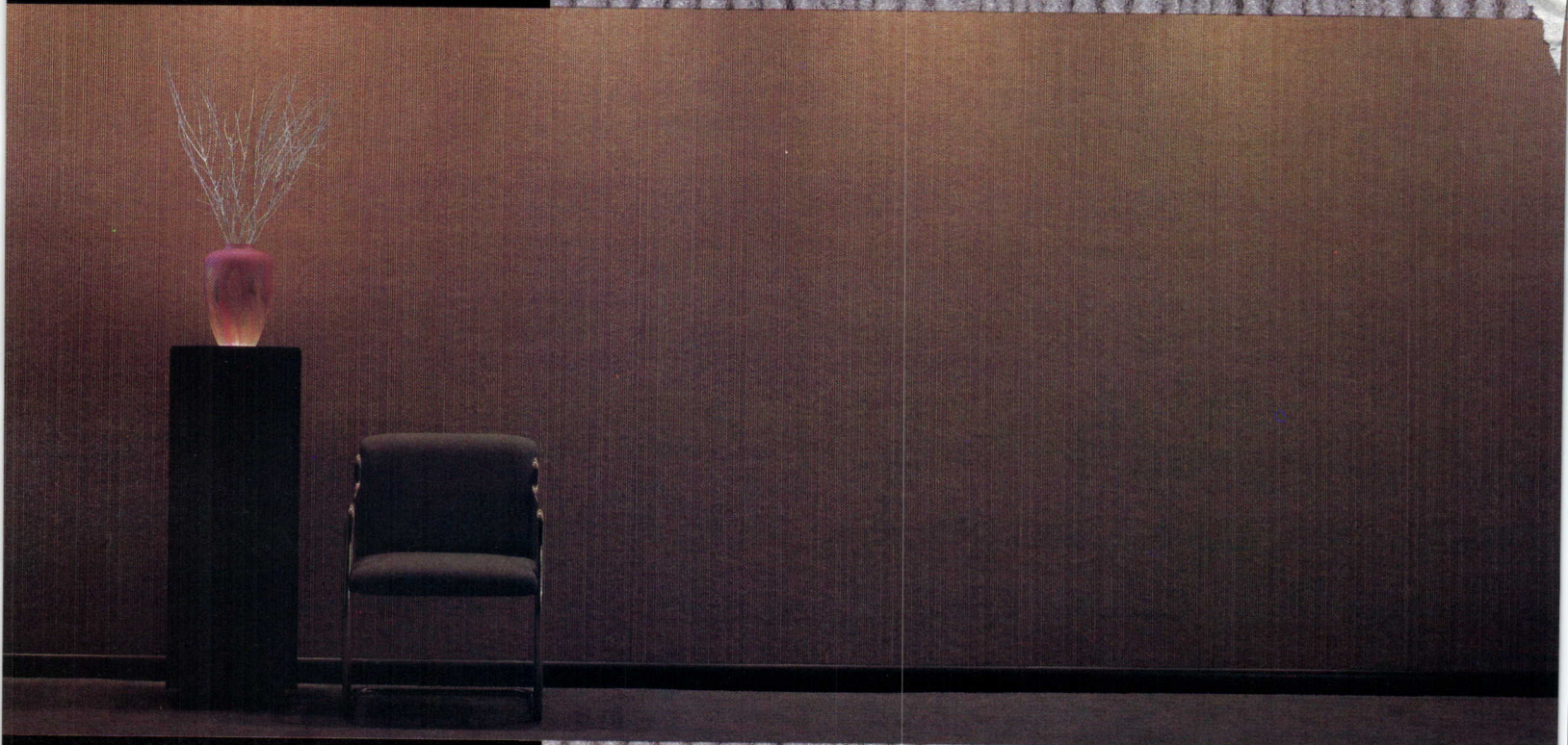
Dustbusting: How they build the cleanest rooms on earth, 128
By Edna M. Gabler

New products, 134
 Product literature, 142
 Manufacturer sources, 148
 Classified advertising, 164
 Advertising index, 178
 Reader service card, 181

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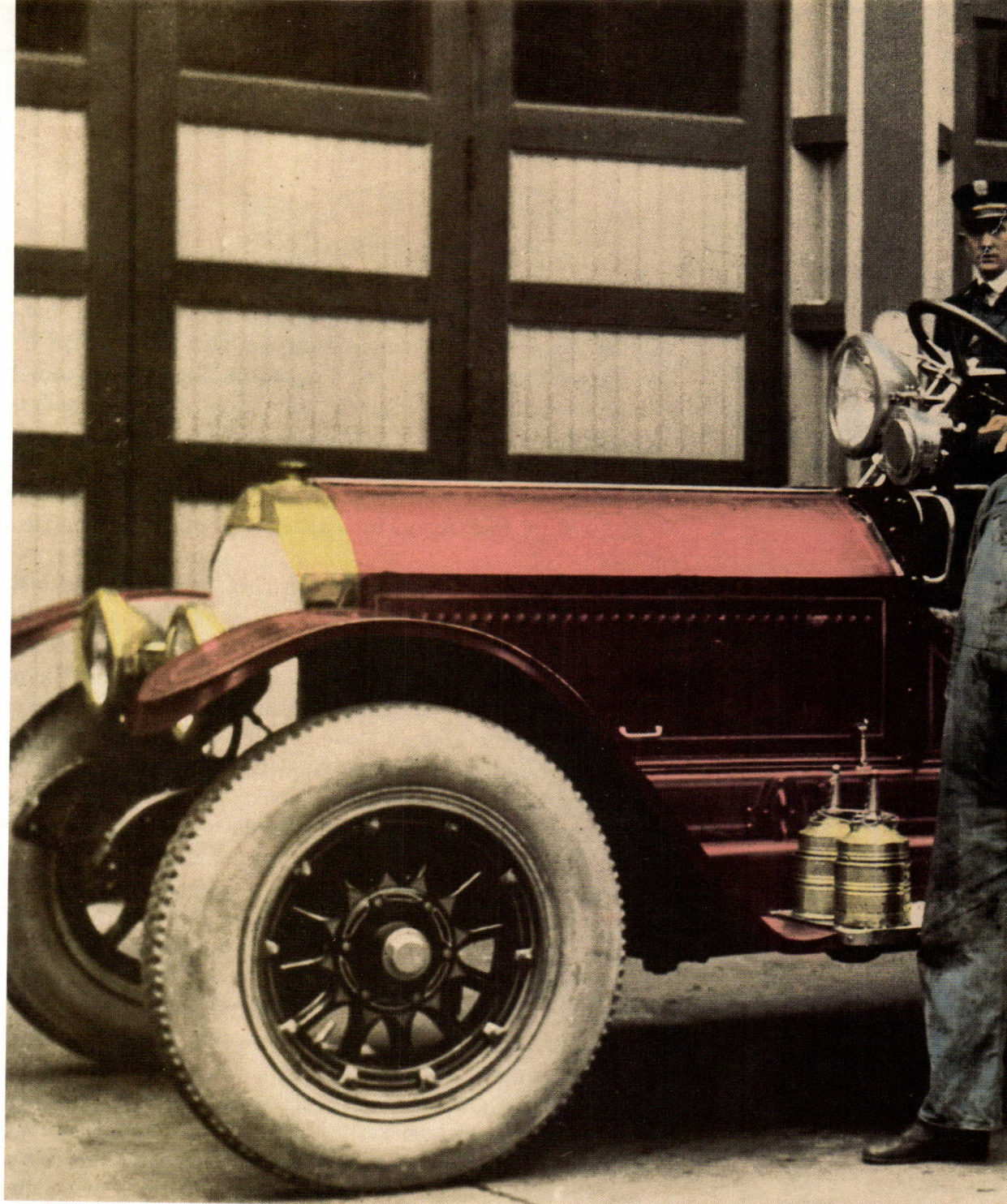
The Ticino Group: Toward an architecture of place

The word *regionalism* as used by architects evokes many images—the Bay Area tradition, for example, and individual works by Frank Lloyd Wright, Alvar Aalto, Luis Barragán, and many others. For those familiar with contemporary architecture in Switzerland, the architecture of the Ticino Group exemplifies a newly transformed regionalism characterized by the work of Mario Botta, but practiced as well by other leading Swiss architects of the region, including Luigi Snozzi, Aurelio Galfetti, Gian-Carlo Durisch, and Livio Vacchini, all four of whom are featured in this issue (RECORD editor Darl Rastorfer's article: "Architects of the Ticino" pages 110-127 and cover).

The concept of regionalism, furthermore, has become central once again in the world of critical polemic, as the following quote from architectural historian Kenneth Frampton demonstrates: "Regionalism, in my view, constitutes the potential interstitial middle ground between . . . two irreconcilable Postmodern positions The protagonists of Postmodernity—that is to say, those who are convinced that the heroic period of the Modern Movement has come to an end—seem to fall into two groups: the Neo-Historicists and the Neo-Avant-Gardists. The first, who seem to be more prominent in the eyes of the popular press, are those who feel that the entire apparatus of the *avant garde* has been discredited and that no choice remains but to abandon this ostensibly radical discourse and to return to tradition. The second, while repudiating global utopias, seem to welcome nonetheless the continuing escalation of modernization as an inevitable process. They see this process positively as one which, despite its predominantly technical character, contains within its nature the liberative and 'creative' forms of the future. Of the two groups it may be claimed that the second is the more realistic and consistent in that modernization continues in any case. The former, on the other hand, is culturally schizophrenic and politically retrogressive, for it too remains secretly committed to the benefits of universal civilization [Regionalism] is as critical of the one as it is of the other and [offers a critical basis] from which to evolve a contemporary architecture of resistance—that is, a culture of dissent free from fashionable stylistic conventions, an architecture of place rather than space, and a way of building sensitive to the vicissitudes of time and climate."* Frampton defines regional architecture as tactile as well as visual, pointing out that senses other than sight, such as perceptions of air movement, ambient temperature, sound, and smell, as well as actual physical movements, affect our experience of the environment.

Regionalism, then, does not begin as a style, and it is much more than an appropriation of selected formal aspects of the vernacular rendered in contemporary building systems and materials. As a concept it does not place in opposition sophisticated technologies versus the indigenous, modernism against tradition but, instead, as the Ticino Group is doing, discovers and transforms the underlying principles of each, creating new unities. Regionalism suggests that perhaps, in spite of ever increasing standardization of building technologies worldwide, architecture may continue to belong in the realm of art. Study Ticino, and hope. *M. F. S.*

*From "Ten Points on an Architecture of Regionalism," in *CENTER: A Journal for Architecture in America* © 1987, published by the Center for the Study of American Architecture, School of Architecture, The University of Texas at Austin.



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Hancock Tower ruling awards \$4.2 million to Trinity Church

The final ruling by the Massachusetts Supreme Court on those damages to Boston's Trinity Church resulting from the construction of the nearby 62-story John Hancock Tower awards some \$4.2 million to the plaintiff. Due to the 11-year period of the suit, accrued interest could bring the final figure to \$11.6 million.

The award is based on a new method of calculating damages that could become a precedent. The method, developed by consulting engineer Maurice Reidy, produces a value that is a percentage of what it would cost to take the entire 100-year-old structure down and rebuild it. The revolutionary nature of the method is part of the cause for the long term of the suit, and it was finally upheld as appropriate by the courts in the case of nonprofit institutions for which diminution of fair-market value could not be a test.

But another reason for the success of the method in this case was the exceptional landmark value of the building, coupled with the exceptional extent of the damage. The church is described as both Henry Hobson Richardson's "masterpiece" and the first building in the U. S. to achieve an integral marriage of art and architecture through Richardson's collaboration with artist John LeFarge, who produced the remarkable murals and stained-glass windows. The damage has not gone so far as to threaten collapse, but is said to have produced cracks in the massive masonry walls up to three inches in width, a five-inch list in the central tower, and a lateral migration of that part of the building nearest the new excavation caused by the movement of the wood pilings in the unstable landfill on which both the new and old buildings sit.

IRS clarifies employee/independent contractor classifications

Section 1706 of the new tax law more closely defines whether persons providing technical services, such as those for building design, may be classified as independent contractors or not. The regulations, however, only apply to services procured through a broker or other third party. New criteria include where the person works, how he is paid, and how much direct control the employer has.

Hackl to focus on education of the public and of architects

New AIA president Donald J. Hackl announced his goals for 1987 at the annual lunch for the institute's leaders hosted by RECORD at the McGraw-Hill New York City headquarters in February.

Among them:

- To use the public's new awareness of its environment to enhance its appreciation of what architects do.
- "The big story," he said, "is the unprecedented general interest in our most public of the arts. The number of publications and the number of writers whose subject is architecture have grown at such a pace that most American cities of any size boast someone who claims to write intelligently on the subject. We're seeing real-estate pages maturing into more than bulletin boards for the latest spec building. And the phenomenon called preservation has so altered the way Americans think about their environment that preservation tax credits maintained their special status even in sweeping tax-reform.

"If ours is a profession that builds walls," said Hackl, "the service of the institute is to build windows into those walls: windows for greater professional development, windows for minority architects, windows for the recognition of design excellence, windows for creative intervention in programs like our R/UDAT, windows for our profession to take a stand on national issues such as housing, energy, and historic preservation.

"Architects, by the very nature of this profession," he continued, "are committed to changing the environment for the better. To carry out that commitment means being the best we can possibly be."

- To create new opportunities for students who study architecture.

"In a real sense, the institute's commitment to education is nothing new. One of the primary reasons for the AIA's founding 130 years ago was to see that this country had a formal education program in its colleges. AIA members were instrumental in setting up the first such program at MIT.

"If the institute's commitment to education is venerable and long-standing, it is also far-sighted. It will not be the theme or preoccupation of any one president. It is the obligation of us all. In Orlando, architectural education will be the focus of three major programs, the centerpiece of which will be the Walter Wagner Education Forum.

"I am personally committed to a re-evaluation of just what it is that licensing entails. Far too many colleagues see licensing as their goal. I disagree. It is not a destination. It is the key that opens the door to our profession."

New interest in preservation in Congress?

Historic preservation apparently has never been of sufficient importance to become a major plank in presidential candidates' platforms. But if preservationists want it to be one, they should start lobbying immediately, said Rep. Barbara B. Kennelly at the AIA's recent Grassroots '87 in Washington D. C.

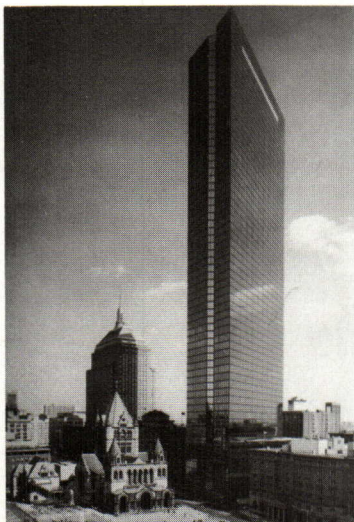
"You can see who the presidential candidates are likely to be," she said, listing the mostly undeclared office-seekers. "Right now, they are inclined to listen—which may become much more difficult as their races fire up."

Kennelly, a member of the House Ways and Means Committee, said that now is a "beautiful time" to make a pitch to all elected officials—because it is still the beginning of the new Congressional session and, with Democrats having won control of Senate, all are fresh committees.

Kennelly said the greatest problem for historic preservation in tax reform is the passive-loss provision, which limits benefits from real-estate investments to deductions on earnings from similar sources—and does not allow deductions on regular income. She noted that the new chairman of the Senate Finance Committee, Lloyd Bentsen, wants to do something to ease the "very tight restrictions" of the act, and she urged preservationists to help by providing information to Congress on how the current law has discouraged investment. She asked specifically for "concrete examples of projects throughout the country that have been in the development stages but have been dropped due to the 1986 tax act.

"We [in Congress] do not have hard information on what tax reform will do now or in the future," she said. "Providing that information will be your job. Our help in historic preservation cannot go forward unless you help us." And she implied that it could, indeed, be the intent of Congress to help keep historic-preservation projects going. "It has to be proven, then, that the passive-loss limitations run counter to Congress's intent."

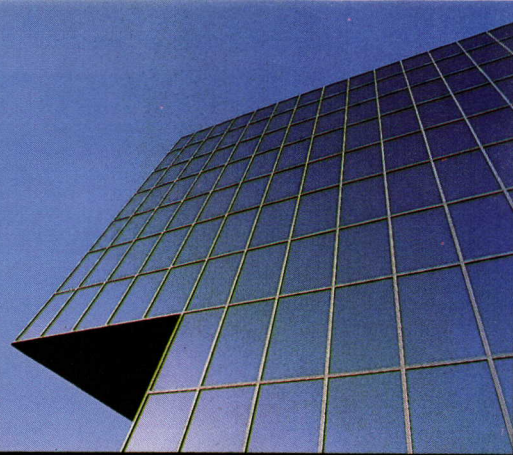
The basic climate in Congress has not changed, she said. It is still difficult to get any changes in the tax reform act that cost revenue. The aura of revenue neutrality is still all-pervasive and, given the immense federal deficit, any proposals that mean losing revenue will be hard to enact. She admitted that the Gramm-Rudman-Hollings bill, which she voted against, had some beneficial points: "It gives us bench marks to work against." *Peter Hoffmann, World News, Washington, D. C.*



The landmark Trinity Church, left, by architect Henry Hobson Richardson, stands within 60 feet of the much larger new tower designed by I. M. Pei & Partners.

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Marketing: Mastering polished audiovisual presentations

By Wright Salisbury

The author takes his cues from what he refers to as "corporate America," and urges design professionals to use the same polished audiovisual techniques for presenting their ideas and qualifications as seen in the more sophisticated boardrooms. When making presentations to clients from this sector—or indeed any other—such techniques may well be effective. These polished presentation techniques for business clients he refers to as "speaking the same language."

Of course, the techniques you actually use not only will depend on the type of audience but also the personalities of those who constitute it, as well as what you are presenting, and—ultimately—what you feel

The first step in planning a client presentation is to assure yourself that you are using the right media. Many architects rely heavily on their brochures, and brochures are a very handy medium to send in the mail or distribute after a meeting.

But, during a meeting, they get in the way. If you pass out a number of brochures at the beginning of a meeting, half your audience browses through your brochure, which means they're not listening to you. There's no doubt that an audiovisual presentation is more of an attention-getter.

As an architect, you probably talk and show slides of work that you have arranged in a tray prior to a meeting with executives. You undoubtedly choose slides you think will be relevant to your prospect's interests—schools for a school board, corporate headquarters for a corporation, restaurants for restaurateurs. The slides are in a single tray in a single projector, perhaps propped on a table in the back of the room.

That's okay. That's what most of your competition is probably doing. But you could be doing so much more with multiple images and a programmed audio accompaniment. The multiple processes of design can best be shown with multiple images, which enable you to project one slide image over another, show progressions of time, or superimpose a conceptual diagram over a final plan.

All of these processes are of intense interest to prospective clients. And you should let them know how your approach differs from and is superior to that of other firms. Thus, it would be best to show exactly what it is that is unique about your firm. Your final building may look good, but how did it get that way? What was the process you used? How did you analyze the client's needs? How well did you meet the budget and the schedule? What were the client's criteria? What were the site limitations? What were the intermediate design stages, flow diagrams, etc., that led to the final solution?

Start by perfecting an in-house presentation. When a potential client visits you, you should be able to walk into a conference room, sit down, flick a switch, and run an 8- to 10-minute multiple-image slide presentation that sums up your abilities. The cost could be \$10,000 for the equipment and \$20,000 for the presentation. But if it wins you

one good commission, it could well be worth it.

Now take the show on the road. Multiple-image equipment is portable, you'll find. It's not easy to carry but worth the extra effort to make a presentation effective.

Pick the right equipment

To help you in your choices, I recommend the following:

- **Projectors:** Three are enough to allow you to do smooth dissolves and interesting superimpositions. Three also allow you to have up to 240 slides arranged permanently in glass and plastic mounts, which keep your slides clean and in focus. Get a good projector—and zoom lenses so you can adjust to changing conditions on the road. You may want to stack the projectors vertically on a stand. Use a sturdy stand with easy-to-work adjustment controls. My projectors are Kodak Ektagraphics and my stand is made by Chief. The total cost: about \$1,500, including zoom lenses.

- **Dissolve unit:** AVL (for AudioVisual Laboratories) makes the Dove-X. There are other good dissolve units, but this is the one I like and use. The cost: about \$1,500.

- **Sound system:** I happen to use a TEAC 3440 4-track reel-to-reel tape recorder. It's sturdy and the 1/4-inch tape and four tracks enable me to keep the data cues that advance the slides distinct from my soundtrack. There are a lot of other good and popular tape recorders on the market, however. A good reel-to-reel tape player should not cost over \$1,500. You will also need an amplifier and speakers. Get a fairly powerful amplifier and some good speakers. Speakers and amplifier together shouldn't cost over \$500.

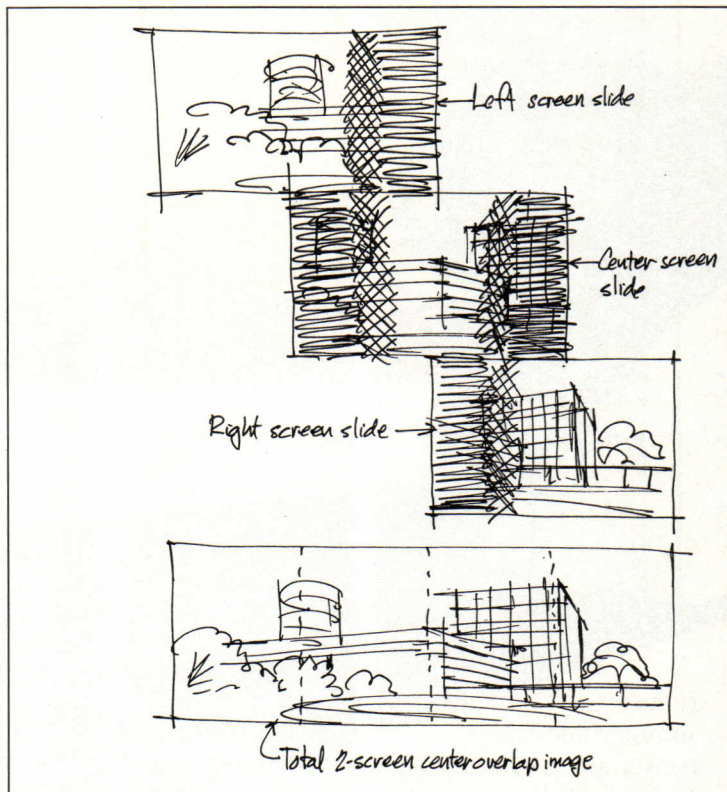
- **Traveling case:** The three projectors, mounted on a stand, can slide into a sturdy metal case (with built-in wheels and a fold-up handle) that is also a platform for the stand. The cost: about \$370.

You may want to consolidate your dissolve and sound systems. AVL makes such a unit, combining dissolve, cassette-tape player, amplifier, and speakers, that costs about \$2,500.

Concentrate on production

Unless you have extensive experience in audio-visual production, you will want to hire a consultant. You will want one core presentation that introduces your firm and shows its best work. This describes those aspects of your firm that are unlikely to change: its history, the services it provides, areas in which it offers special expertise, and an overview of major projects and other achievements, such as awards and citations. It

Continued on page 31



Graded continuous-tone pan masks, sandwiched with sections of a single photo in glass and plastic slide mounts, combine to create a single, very wide panoramic image. The appropriate projector setup is shown on page 31.

comfortable with to get your message across. In many instances, the single projector propped on a table at the back of the room may still be your best answer. After all, no matter how elaborate your back-up, it cannot make up for a bad idea poorly thought out, while a strong message in the hands of a master at personal communications can come across well without elaborate equipment. As one well-known architect's employee put it, "If only we could get his mouth in the door . . ."

Under certain circumstances you may want to do a very polished presentation. Here's how to do it. C. K. H.

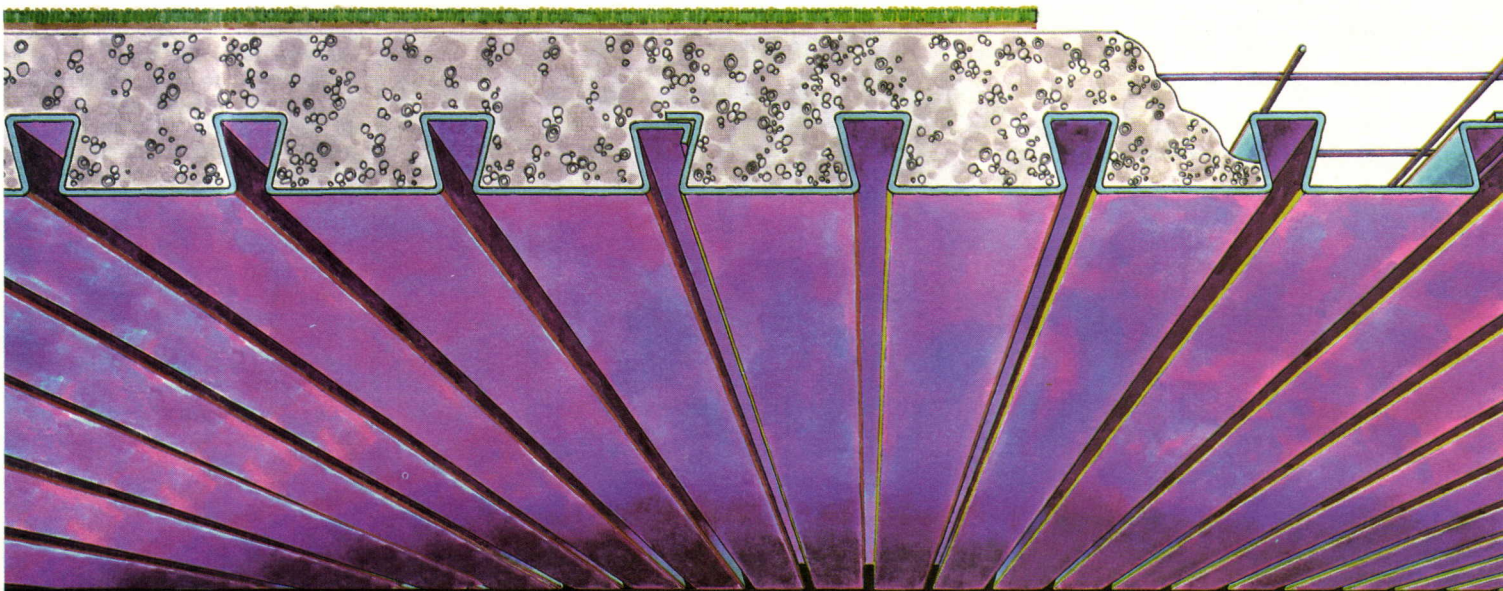
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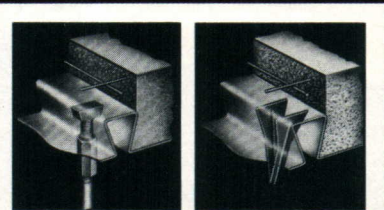
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Economics: Whither housing in the next decade?

A look at demographics shows some types of demand fading while new demands come along to take up some slack

By Jesse Abraham

In 1986, both the starts and sales of new single-family houses surpassed 1985 levels by 11 percent, making 1986 the best year for residential construction since 1978. But what about this year? Or several years down the road? It is well known that housing is a highly cyclical industry, so that today's boom often turns into tomorrow's bust.

Residential construction is, in fact, likely to decrease in 1987. After surging for the past four years, apartment building was due to soften this year, even without the enactment of tax reform. Single-family construction should, however, pick up some of the slack.

Even as we ponder the extent to which single-family housing will respond to low mortgage rates this year, and how large a correction to expect in multifamily housing, it is important to look beyond the current business cycle to examine the population and economic trends that will influence housing activity in the decade ahead.

Varying financial policies will, of course, continue to generate alternating periods of growth and retrenchment. Demographic patterns, however, determine whether the market is fundamentally expanding or declining.

Some observers see a protracted housing-market bust now that the last of the baby boomers are getting comfortably settled into their own homes or apartments. If last year's 1.8- to 2.0-million-unit pace is indeed housing's last hurrah, then it would be time to diversify out of residential design or think twice about jumping in.

Let's see what demographics can tell us

The annual population survey put out each March by the U. S. Census Bureau not only gives the total number of households but tells the age and sex of the head of each one.

Total households, as of March, 1986, were 88.5 million—up 1.7 million from a year earlier. As shown in chart 1, after growing 1.1 million on average per year in the 1960s and 1.8 million in the 1970s, new household formation fell back to 1.1 million from 1980 to 1985.

A usual way to forecast household formation is to combine population projections with forecasts of head-of-household rates—the share of the population heading their own households. The former come from the government with a high degree of confidence; the latter depend largely upon marriage and divorce rates, which

Mr. Abraham is a manager of economic forecasting with the Dodge/Data Resources, Inc. (DRI) Construction and Real Estate Service

can be tied statistically to economic factors such as employment.

General population trends are well known. There was that big jump in the birth rate right after World War II, lasting until 1964. Annual population growth averaged 1.7 percent in the 1950s, falling to only 1.0 percent between 1970 and 1985; the government projects population growth to slow further, to 0.7 percent, in the 1990s.

By the 1970s, the first of the baby boomers were old enough to start independent households. After increasing by an annual average of 700,000 between 1965 and 1970, the number of individuals of the prime household-forming age (between 25 and 34) soared by 1.12 million annually between 1970 and 1975, and 1.34 million between 1975 and 1980. Judging by historic household formation rates, this demographic bulge contributed to the demand for shelter by 200,000 to 300,000 units annually. Not surprisingly, housing starts, mobile-home shipments, and conversions of buildings built for other purposes were all very strong in the 1970s.

But the housing honeymoon from the baby-boom bulge is over. Within this group, household formation fell from 730,000 annually in the 1970s to 200,000 between 1980 and 1985; growth will likely slow to 100,000

households in the late 1980s and then formations will actually decline in the 1990s.

Back-to-back recessions and record-high interest rates explain some of the weakness in household formation early in the current decade. It is also true, however, that household formation and housing purchases accelerated in the late 1970s because home ownership was seen as a hedge against inflation; this rush to get into the housing market speeded up some of the increase that would otherwise have occurred in the 1980s. The strength of housing starts in 1977 and 1978 coincided with above-average rates of household formation; the weaker formation rates in the 1980s, then, largely brought us back to the expected trend. There was some pent-up demand in that period due to depressed affordability, but it was probably limited to several-hundred-thousand households. And it likely played out its course by the end of last year.

Where will new demands for housing come from?

Rising standards of living and changing social mores increase the propensity of individuals to form separate households. The baby-boom generation will continue to require additional housing because of high divorce rates. Changing

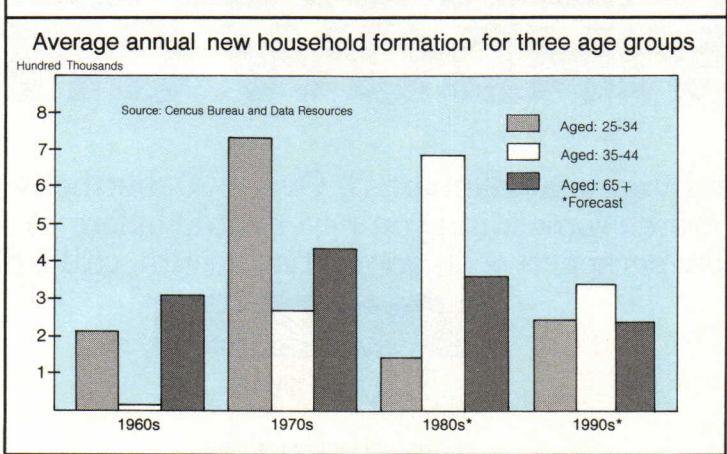
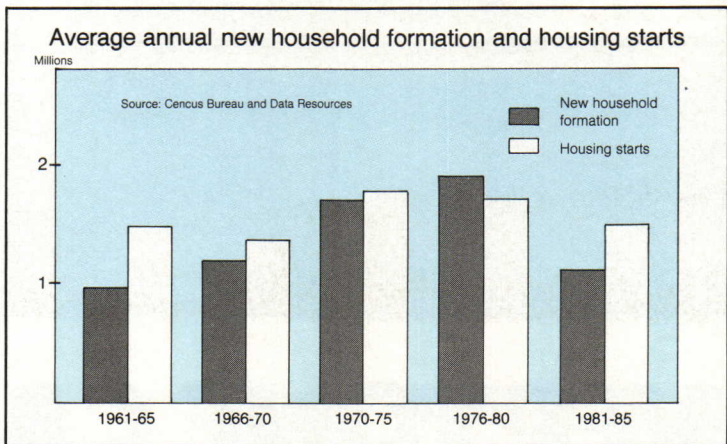
social customs in the 1970s encouraged women to work and thus gave them greater economic independence. Head-of-household rates have risen significantly for all age groups in the past 20 years. Quantitatively, this source of housing demand was as important in the 1970s as the increase in the number of 25- to 34-year-olds.

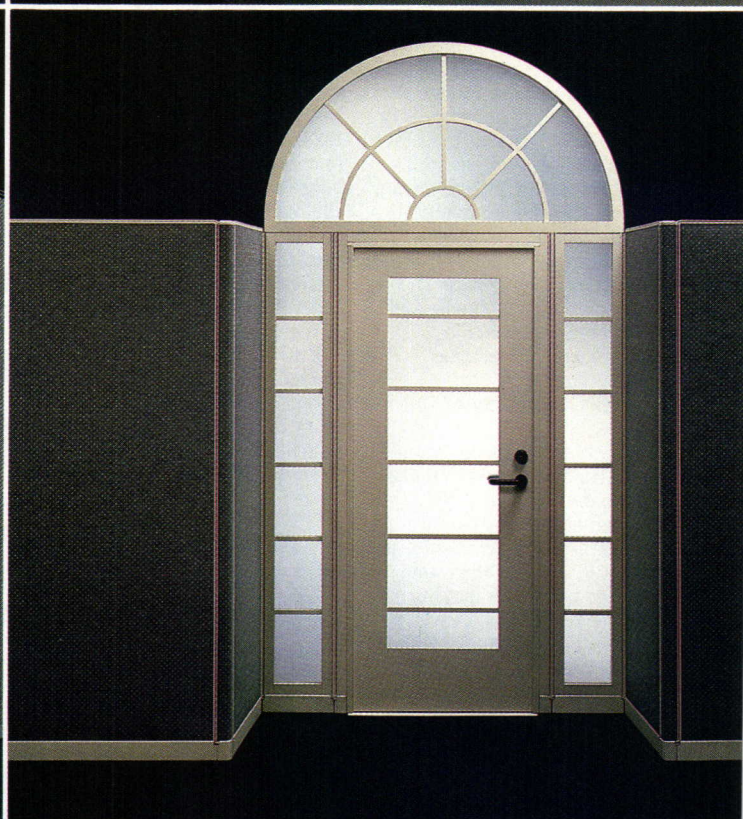
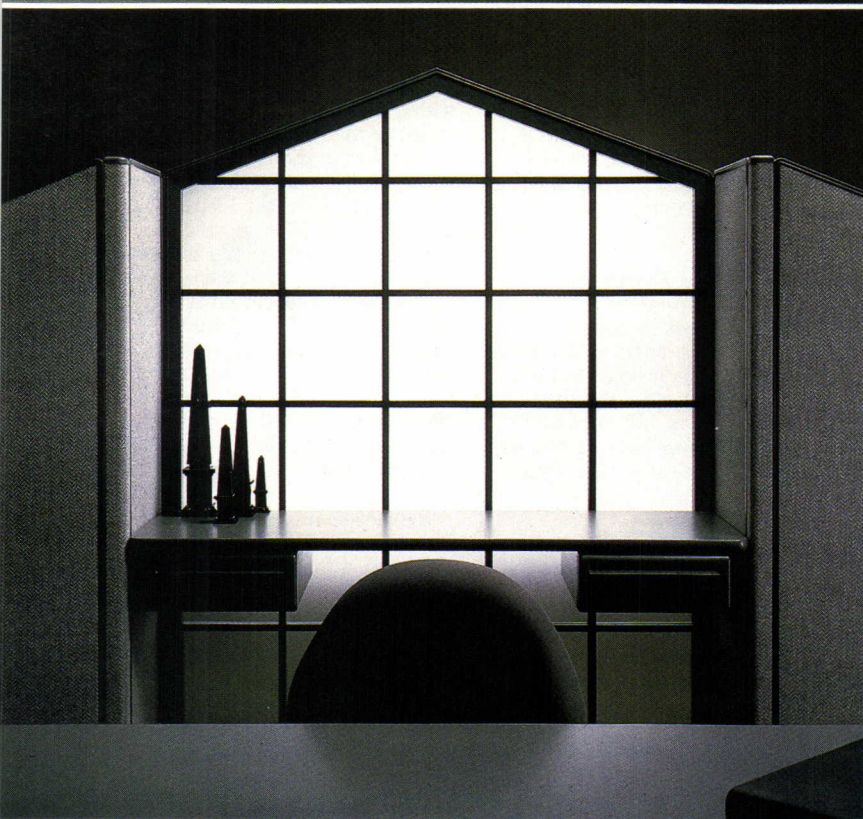
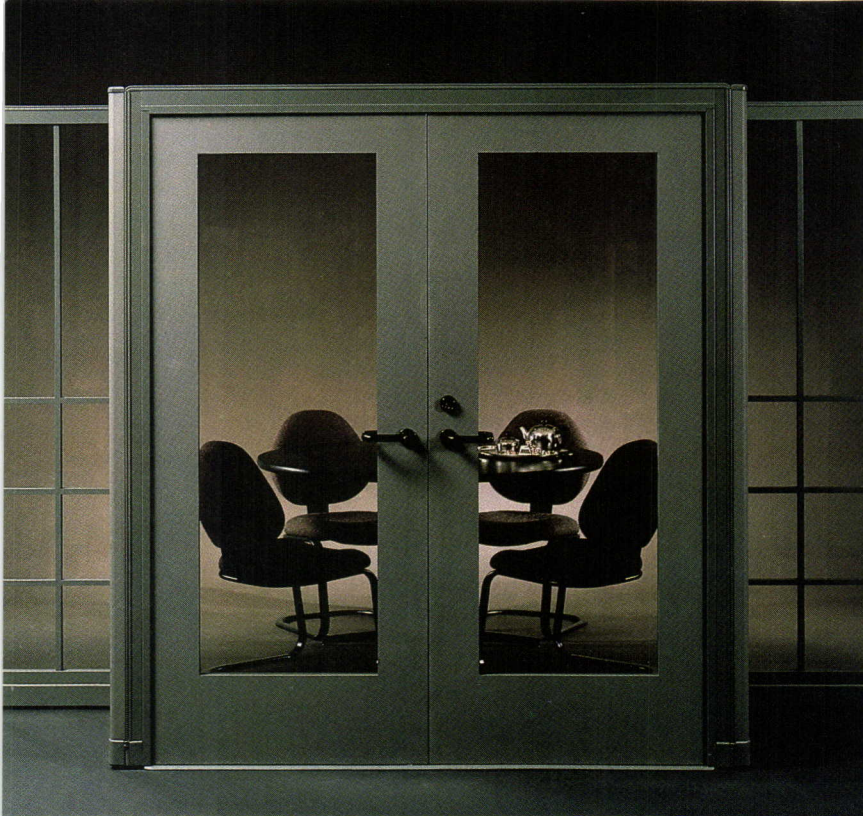
Thus, household-formation rates should remain fairly strong in the next decade based on two statistical findings. First, the propensity to form independent households now rises with age—from 49 percent of the 25- to 34-year-old group to 60 percent of the 55- to 64-year-old group; therefore, as the baby boomers grow older, their housing needs will increase.

Second, head-of-household rates within each age group are also expected to increase, albeit more slowly than in the 1970s. Annual household-formation rates through the second half of the 1980s should average 1.24 million, up 100,000 from the first half. DRI's statistical analyses suggest that there is room for head-of-household rates to continue to rise in the 1990s, supporting a formation rate of 1.3 million per year. Even holding head-of-household rates unchanged from 1983, as other researchers have done, leads to 1.1 million new households per year in the early 1990s.

Replacement of deteriorated structures will constantly increase the demand for new construction. Net losses from demolition and conversions to and from residential use now come to between 300,000 and 400,000 units per year. As the housing stock ages, there will be greater need for new construction on existing lots. Financial conditions, however, are very important here: if housing costs remain high, rehabilitation of existing structures may be preferable to demolition and new construction.

Although housing will likely soften in 1987 and 1988, the fundamentals thus support a relatively high plateau for construction through the 1990s. Housing starts should average 1.7 million units annually for the next eight years. The mix of structures that will be needed will be similar to the last 10 years, but with more emphasis on single-family units. As the baby boomers move into middle-age and their incomes continue to rise, they will expand that market (chart 2). Even so, a larger, wealthier elderly population will look for attached houses, possibly in retirement communities. Apartment construction will not die away since many of the new households will be headed by divorcees who won't want a detached home.





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Computers: Changing the legal rules

Architects must tread warily when presenting their computer-aided design work to clients lest they find the legal ground shifting under them

By Paul M. Lurie and Barry D. Weiss

Computers hold great potential for reducing design mistakes and, therefore, liability. However, they also hold the potential for creating mistakes—especially if architects or engineers place undue reliance upon new systems which have not been substantially tested. Let's look at the liability risks created by the use of—or the failure to use—computers and what can be done to minimize those risks.

Computers may change the whole liability standard

While the legal responsibility of design professionals is to act only in accordance with the standard of reasonable professional practice, the use of computers may be changing that standard. As many design functions become automated and repetitive, the professional may be judged by strict product-liability standards.

In general, the law currently recognizes that mistakes are inherent in the professional practice of architecture and engineering and the mere existence of a mistake or failure will not produce liability. A designer's undertaking of a commission does not imply or warrant a satisfactory result. To establish liability against a designer, a claimant must prove the breach of a legally cognizable duty to have prevented damage to the claimant. The critical determination is whether or not the designer had the duty to the claimant. The major sources of these duties are contracts, government regulations and standards, and traditional common-law principles of negligence.

In general, unless contractual agreements have promised a particular result, a designer's liability will be determined by the common-law duties of negligence. This is the standard that requires the designer to conform with ordinary and reasonable practice. It is a flexible standard determined on a case-by-case basis through the testimony of experts familiar with the current state of practice. As practice standards change, the obligations of the negligence duty will also change.

Contracts and government regulations can create liability for failure to achieve a result. For instance, if a designer is required to meet a certain structural-loading condition by a building code, his failure to do so will most probably result in liability, regardless of whether his design was otherwise reasonable—and regardless of

whether or not the erroneous calculation was caused by a computer malfunction in programs not designed by him.

As an example of how a contractual promise can create liability, if a designer promises a heating system will produce a certain temperature level, the system's failure to meet that level will create liability, regardless of the reasonableness of the design and without regard to whether the mistake was caused by a computer error.

Design professionals are generally required to perform in accordance with their promises, codes, and reasonable care. However, sellers of products have liabilities created by the implied warranties of the Uniform Commercial Code and by strict liability "no-fault" concepts of the common law of product liability. If the designer can be found to be selling a product, liability may be determined by a bad result without regard to his promises, regulations, or his reasonable approach.

Computers can create liability in such situations as:

- A designer fails to use ordinary professional care in selecting, using, and relying on an expert system.
- Computerized modeling and projections create clients' unrealistic expectations of cost and performance.
- A designer fails to use ordinary professional care in investigating computerized databases for product and system information.
- The designer sells the product of software instead of services.

Expert systems. The power of computers can best be realized when used to solve complex problems such as structural calculations, energy loads and consumption, code analysis, and the translation of complex analysis into specific design criteria. Such "expert systems" save time, allow leaner and more innovative designs, and allow solutions to be created by persons who have a minimal understanding of the underlying mathematical equations involved in the problem-solving.

However, the power of these programs is also capable of creating designs that are not practical to build or maintain and that hold inherent seeds of failure because the computer model did not adequately incorporate all the relevant design criteria and allow for adequate safety factors. Furthermore, an expert system may limit creativity because certain assumptions used in creating the system may limit options.

The ability of an expert system to properly solve a particular problem depends on the following:

- (1) the applicability of that system's program to the unique characteristics of the particular project;
- (2) the expertise of the person who has written the program to anticipate all possible variables;
- (3) the ability of the program to alert the user to false assumptions;
- (4) the ability of the user to validate data and results;
- (5) thorough user training to insure he understands the logic and limitations of the system;
- (6) the ability of the system to incorporate new knowledge gained from experience in its use.

It is obvious that expert systems, while impressive on their face, can lull designers into a false sense of security on the reliability of the designs they produce. In a recent instance, a well-known, flat-plate, structural-analysis system determined a slab thickness for cantilevered concrete floors that were thinner than optimum. The slabs deflected during construction. The legal issue was whether the designer was reasonable in not questioning the output of the program. The case demonstrates that computerized expert systems add layers of complexity that separate the professional user from the process, often making it difficult to detect something is wrong until it is too late.

The computer's ability to provide information. A major factor contributing to the problems of building performance is the vast, generally disorganized nature of construction information. Computerized data-storage systems offer the potential to better understand the advantages and disadvantages of materials systems and technologies. Ironically, the easy availability of computer information also raises the question of whether or not a designer would be negligent in not thoroughly researching the performance of a product, system, or technology.

Enhanced client expectations. Computer simulations and graphics dazzle clients; reams of data on cost-benefit relationships and structural and hvac loads impress clients with the science of engineering. It is probable that both design professionals and their clients will have increased expectations on the cost benefits and life-cycle ratios. Unrealized client expectations can lead to liability claims.

The sale of a software product. If an architect designs a building in which the roof leaks and the beams deflect, he may not be liable if the design was in accordance with ordinary care. But, if the architect uses the same design as part of a software program to be sold to many clients for many standard

buildings, he is no longer providing a professional service; he is marketing a product. As a result, perfect results may be expected.

If a defective building results from an error in the program, he may be liable regardless of the reasonableness of his conduct. Why? When the designer is deriving economic benefits from many buildings instead of merely one, he is expected to be able to afford sufficient pretesting to ensure perfect results and to bear the greater risk of liability by spreading its cost among all of his customers by pricing his product accordingly.

If other designers who use his system do not exercise their independent judgment on its underlying algorithms and output, then they also may not be providing a service but instead may be distributors of a product. Again, they may be strictly liable for failures that result from errors in the system. Most states will allow them to pass on liability, in whole or in part, to the designer who was responsible for the error. However, the ability to pass on the legal costs involved in a defense may depend upon the existence of contractual indemnity and insurance.

Computers can also create liability by your not using them

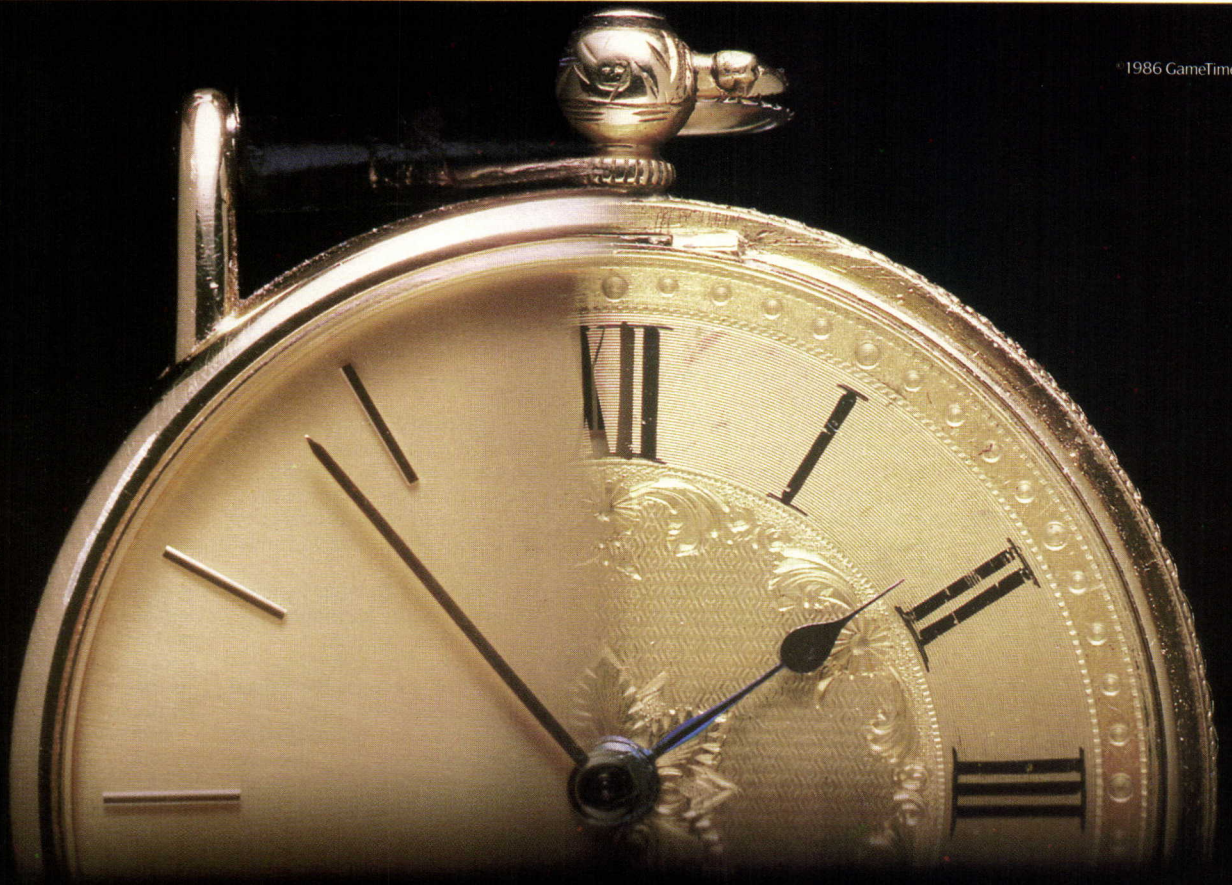
A building designer can be negligent in not using a technology—even if its use is not standard—if the proven technology is readily available and the benefits to society are very clear.

Cases in other fields of endeavor bear this out. The first reported case on the duty to use a new technology involved radar as a navigational aid. Two tug boats crashed in a foggy harbor. At the time, radar was an emerging technology. The argument was made that had radar been used, the tug boats would not have crashed. More importantly, the court found that a general practice of not using radar was not a persuasive defense when the benefits of radar were clear, the technology appeared sound, and it was readily available.

How might this rule be applied to design-analysis systems? CAD systems may provide greater accuracy than manual computations. Suppose a significant error in a complex beam design results from an oversight in its manual preparation. The design firm can show that it had checkers, cross checkers, double checkers, and recheckers and may have acted reasonably even though it missed the error. But if a CAD system would not have made the same error, there may be a duty to use the CAD system even if it is not standard practice.

Continued on page 37

Messrs. Lurie and Weiss are principals in the law firm of Lurie, Sklar & Simon, Ltd., in Chicago, and specialize in problems of the construction and computer industries.



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The same may hold true for expert systems. Suppose a structural engineering software system enables a designer to use 25 percent less concrete and steel than would be necessary using conventional manual structural analysis. A structural engineer does not use this available software and his client pays the additional 25 percent. When the client discovers that use of this system would have saved millions of dollars, the client may have a claim against the designer for not using the system.

There is a strong argument in the case of information databases. Suppose a designer specifies a certain brand of prefabricated trusses with which he had no problems on two prior designs and based upon the representations of the manufacturer. After construction, the truss fails. The designer is sued because a generally accessible database shows that 70 percent of the same truss systems installed within the past 18 months in this locale had failed. If the designer should have consulted the database as a matter of standard practice, failing to do so would be negligent.

New opportunities with computers can generate, if not liability per se, other problems

Gray areas of insurance coverage. Building designers who either develop and market software systems or deliver their construction documents in electronic form face the problem of whether their software business activities are covered by their liability insurance. The major errors-and-omissions policies are at best ambiguous. Insurance companies may take the position that selling software is not part of the traditional practice of architecture or engineering. It is a completely different risk.

New relationships between designers, clients, contractors, and manufacturers. Computer-aided design is destined to change the nature of these relationships. The computer's abilities to calculate and order bills of materials not only can make estimating more accurate, but also can increase the strength of designers in construction management at the expense of the traditional contractor. Conversely, computer-aided design can give new design skills to the traditional contractor and diminish the role of architects and engineers.

Sophisticated clients may do both design and construction management in house, which would not be possible without the computer. These changing relationships will also affect the ability to predict and allocate legally imposed liability.

Close structural tolerances. The level of precision now attainable (and what may be obtainable in the future using computerized design systems) demands a corresponding degree of precision from the contractor who builds the structure. Extremely close tolerances could result in costlier and more time-consuming construction, and may make construction errors more likely and more serious.

Changed shop-drawing procedures. On the rehabilitation of the Golden Gate Bridge, a steel fabricator's CAD system generated a significantly greater number of shop drawings than would normally have been required. There was a separate sheet for every drawing, while manual practice would have clustered four drawings on each sheet. The process was automatically repeated thousands of times with the result that the engineering firm on the job required greatly increased time for review. This exemplifies the type of shop-drawing problems automated systems can generate.

Transferring information from one system to another. It is not

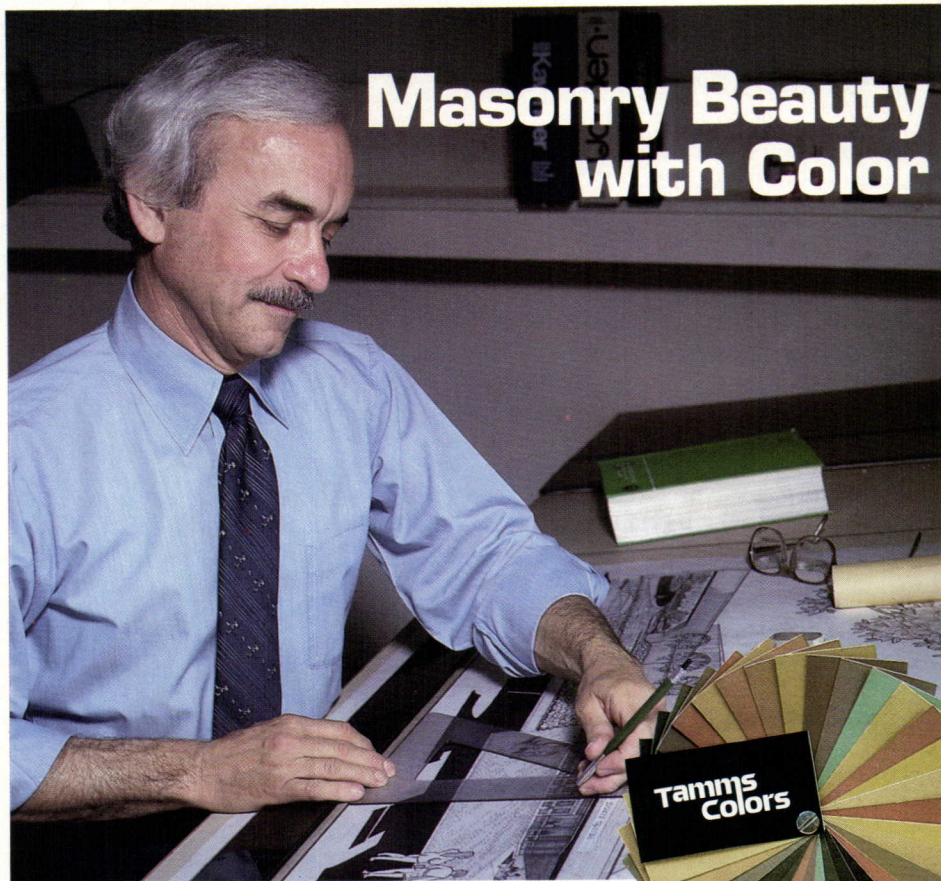
unusual for a designer to use a system different from that of his client or consultants. Transferring data from one system to another may not be easy and can create subtle errors difficult to detect. The need for compatibility between designers' systems and their clients' increases as clients expand their use of facility-management systems.

How much of the risks is born by systems suppliers?

Typically, suppliers of building-design analysis systems want to disclaim warranties and limit their liability. Conversely, the system user wants explicit warranties and complete indemnity in case anything goes wrong. Errors and

disputes often result from a lack of clarity in the supplier's assurances and the user's expectations. The precedent in contracts for computer products and services is generally not as well developed as it is in construction contracts. Larger suppliers often have very one-sided form contracts; there is no standard form contracts created by users. The most common element lacking from computer-system contracts is requirements for system documentation and performance criteria.

Despite the existence of special insurance to protect software programmers, many software suppliers, consultants, and service
Continued on page 39



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bureaus are not properly insured for their mistakes. Architects and engineers relying upon their performance and support must be satisfied on their financial stability. Because of the ease with which they enter the business, firms in this field are often undercapitalized and may not last very long.

Liability risks can best be avoided by using professional judgment

Most importantly, architects and engineers need to keep abreast of current computer developments so that they utilize current techniques. Computer systems should supplement rather than replace designers' professional judgment. In many firms, the computer experts are the younger personnel—who may not have the same professional judgment as more experienced practitioners.

Designers acquiring computer systems must first bargain for as much contractual assurance as possible in order to get the sellers to stand behind their systems and the consequences of their use. Design firms must fully understand the capabilities and limitations of the systems they use and must train their staffs fully.

Quality-control procedures are not new, but the means are different for automated systems and manual systems. More than likely, firms with sound manual quality-control programs will have less difficulty adapting automated quality-control to their practice. But quality control must be carefully considered when selecting systems, negotiating purchase contracts, inputting data, and applying the output to building designs.

Error-detection capabilities in engineering software systems are critical because the consequences of an error in a structural or mechanical analysis program can be disastrous. This issue has not gone unnoticed by engineers. Since 1966, a group of over 200 architectural and engineering firms have been united in a group called Automated Procedures for Engineering Consultants in Dayton, Ohio. APEC is essentially a pooling organization, in which members share engineering computer software and have access to the programmer's internal formulas and assumptions.

It is equally important that engineering systems provide audit trails and hard-copy printouts of their programs' operations. There should also be security capabilities to prevent alteration of programs and data by individuals who are not authorized to have access.

Because it is important to be able to establish in any claim against him that a designer's conduct was reasonable, he must have quality-control assurances and document his compliance with those procedures. This documentation is especially critical if the designer is modifying or enhancing the software systems.

While computers can increase client expectations, designers should avoid guaranteeing specific results and should state in their professional-service agreements that computer demonstrations do not constitute a warranty as to a

particular result—just as is done with cost estimates. A general contractual disclaimer of warranties may not otherwise be sufficient to overcome specific express warranties which arise from computer output given to clients.

When a client contracts directly with a designer's consultant, the designer is generally not liable for defects in the consultant's services. Assuming the designer intends to follow the more orthodox route and contract with his own consultant for computer-related services, contracts should allocate risks. Of course, to make sure that the contract is enforceable, the designer must know the financial capabilities of his consultant. He should also know the

extent to which his own professional-liability policy would respond in the event of an error or omission made by his consultant.

If a designer does intend to go into the business of selling software, he should establish a business corporation separate from his professional practice to avoid confusion of liability standards, use appropriate contracts, price the product to reflect risk, and obtain computer-products insurance. This will also protect the assets of his professional-service firm from failures and other exposures in the software firm. He should warn the user purchasing his system of its limitations and the need to exercise independent professional

judgment over its output.

Just as designers must update, not discard, their professional judgment and quality control because of computers, so too will courts update, not discard, professional liability rules. Smart professionals will keep abreast of new systems, databases, and practices, and understand the benefits and limitations of the technology. They will integrate these automated tools into their practices without sacrificing professional judgment and with an awareness of the new contractual, quality-control, and insurance issues.

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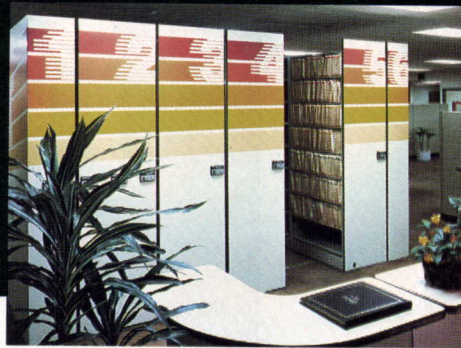


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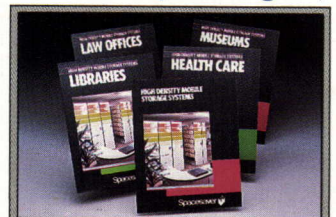
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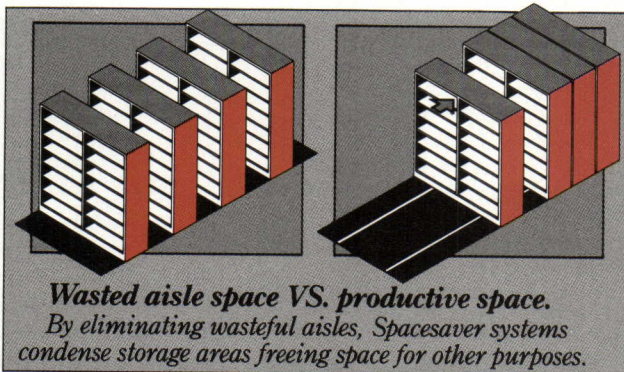
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Architectural education: The possibilities for research on architecture teaching

By Sarah M. Dinham



Compared with other fields such as teacher education and medicine, architecture and architects have conducted surprisingly little research on educational questions. Creative innovation, yes, and passionate interest, and thoughtful criticism, but little formal research. Are there special barriers to research on questions in architectural education? What indeed, might be some important educational questions? What does the future hold for architectural education research?

In some circles it is fashionable to question whether research is possible on a subject as diffuse and controversial as architectural education. Through these paragraphs, to illustrate my argument that insightful, well-crafted architectural education research is not only feasible but desirable, I describe several interesting research projects currently underway, and offer a list of questions demanding attention.

Is research impossible?

Some years ago a 1975 Mellon-funded study of architectural education was described for the *Journal of Architectural Education* by a dismayed writer: "The ACSA study was intended to be as objective as social science knows how to make anything objective in the descriptions of the characteristics and attitudes of teachers, students, and former students, and was intended merely to provide data which is not now available because we have 30,000 students and some 3,000 teachers and God knows how many former students, some of whom are graduates and some of whom are not. There is no individual, no matter how much he moves around, who can understand the increasing diversity of this group or who can understand what the characteristic attitudes and expectations of the people who make up architectural education may be at this time¹."

This pessimism about a relatively straightforward study illustrates a common mistrust of educational research. Obviously no single study can provide all answers to all conceivable questions. It's easier to think that merely because it is complex, architectural education cannot be studied. In fact its very complexity and uniqueness make architectural education a worthwhile subject for study—for careful description and examination, perhaps for innovative experimentation, conceivably for improvement.

Lewis Thomas, the eminent essayist, points out that all research begins with early, piecemeal steps that later might appear to have been misguided, even comical. In

Recently there has been much discussion—even committees formed—about research on architectural education, but so far there seems little real agreement on what to research. Professor Dinham has investigated what has been done, and adds some challenges worth pursuit

describing the earliest scientist he says, "What they did accomplish, however, was no small thing: they got the work going. They fiddled around in their laboratories, talked at one another incessantly, set up one crazy experiment after another, wrote endless reams of notes . . . and the work got under way. More workers became interested and then involved in the work, and, as has been happening ever since in science, one thing led to another. As time went on and the work progressed, error after error, new and accurate things began to turn up²." And then, in words we might take to heart, he says, "It works because the people involved in it work, and work together. They become excited and exasperated, they exchange their bits of information at a full shout, and, the most wonderful thing of all, they keep at one another³."

The barriers

Several years ago I was looking for research on architectural education as I reviewed the research about teaching in several professional fields⁴. For architecture, the paradox was this: on the one hand, most of the published thought on architectural education—much of it profound—was based in the writers' personal experiences rather than in research. The existing research on architectural education was virtually all unpublished—a scattering of project reports, conference papers, and private communications.

Why is this so? What have been the barriers to research on architectural education?

Probably most important is tradition. Although this is changing, architecture faculties have traditionally placed more emphasis on research about other topics, or on architectural practice. Research on architectural education simply has not been the norm. This, too, is changing, as we will see below.

Then, too, I find that many believe—with the frustrated writer quoted above—that it is impossible to do research on teaching (which is seen as ineffably personal), on learning (seen as bewilderingly idiosyncratic), or on thinking (seen as too complex for scrutiny). This is nonsense, of course; it is just as much nonsense as the assertion that because every architectural project is unique there are no general principles of architectural design.

Perhaps those who say research is impossible are unaware that creative approaches to research on teaching have already yielded results that illuminate our understanding of how students learn. Others may simply be desperate to protect their own teaching from view—a sad

indictment. Admittedly, research in architectural education—like research in architecture—is quite unlike the sciences of chemistry, sociology, or linguistics. Perhaps research paradigms most suited for architecture have not been explored.

There might also be a political element. Architectural scholars in today's research universities have found that the scholarship of architecture isn't similar enough to traditional forms of academic scholarship to meet traditional expectations. In architecture, scholarship is demonstrated through research or critical writings or exemplary practice; the frontiers are explored not only by researchers but by inquiring, innovative practitioners, by scholars merging theory with their practice. Not only our research but also our criticism or our practice may be judged by scientific criteria rather than by more appropriate measures of scholarship. Indeed, in the research university the artistry of exemplary, insightful, reflective practice is often unappreciated.

Some examples

Despite such barriers, there is exciting research on architectural education currently underway. Some studies employ strategies adapted from the sciences, such as Akin's creative work on architectural expertise, which draws on a cognitive science program at Carnegie-Mellon⁵ and Anthony's studies of educational juries⁶.

Other research in architectural education uses methods closer to those employed in criticism. Goldschmidt at the Technion University has for some years been studying design students' thought processes⁷, and Ledewitz at Carnegie-Mellon has investigated the models of design implicitly imposed in various kinds of studio teaching⁸. Tzamir and Churchman's work on ethical perspectives in architecture and their relation to architectural knowledge includes studies of students' knowledge and perceptions of the design instruction process⁹. Schon and colleagues are conducting three complex studies of designing and design knowledge in architecture and engineering, studies with far-reaching implications for architectural teaching. My own work on design studio instruction employs studio observations that are critically analyzed for themes (such as the role of stress or the uses of instructor time) for which there is an established, pertinent instructional theory. Case methods in architectural design instruction are under scrutiny both in the U. S.^{10 11} and in England¹².

Continued on page 43

Sarah Dinham, Ph.D., is a lecturer in the College of Architecture and associate professor in the College of Education at the University of Arizona, Tucson. Her research examines teaching and learning in professional fields such as architecture and medicine. During her recent sabbatical leave she studied design education in several Eastern schools of architecture. At the University of Arizona she continues research and writing on architectural education and teaches a seminar for architectural graduate students contemplating academic careers.



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Architectural education continued

These topics—diverse as they may seem illustrate only one thread of research on architectural education: they are studies of thinking, of designing, of judging design, of teaching design. Other themes are also being pursued today; for example, the forthcoming special *Journal of Architectural and Planning Research* issue on architectural education presents social and philosophical as well as psychological perspectives on the nature of architectural knowledge.

Other important questions

Many further questions will challenge the adventurer seeking new perspectives on architectural education. Our recent agenda for research in professional education¹³ includes questions pertinent to architecture as well as other professions. Questions addressed by projects like Akin's and Schon's yield even more questions: what is the special artistry of reflective architectural practice? What is architectural expertise? How can expert practice be taught? What are the important perceptions and reflections of the architectural teacher? What is instructional expertise? How can the artistry of skilled, reflective teaching be learned?

The current research on instructional techniques such as case-based learning raises further questions. What is the best way to incorporate our rich architectural past in teaching students for the future? What can be the educational contributions to technical advances for practice?

Schon¹⁴ describes further questions we can apply to research on architectural teaching: how do leading faculties design curricula? How do brilliant teachers envision teaching problems? What cases, categories, and precedents of some schools' educational leadership can be called upon to build the repertoires of other schools and teachers? What methods of thought and of inquiry, what theories of practice, do artful teachers use in their teaching?

The benefits

Research on architectural education can yield benefits beyond the obvious. Not only will architects of the future benefit when research results begin to influence their education—for example, when new knowledge about students' thinking influences studio criticism, or when reflective teachers add new talents to their teaching repertoires. The architectural faculty will benefit as well when research results suggest creative, engaging ways of thinking about learning, when they apply new criteria to course and curriculum design, when they see studies of their graduates' preparation, or the links between their teaching and their students' internship programs. As the 1983 AIA comprehensive educational policy¹⁵ and the new AIA *Initiative in Architectural Education*¹⁶ imply, the practitioners of today and those of tomorrow will enter into new and fruitful relationships with architectural faculty as well. Research with these benefits is worth pursuing.

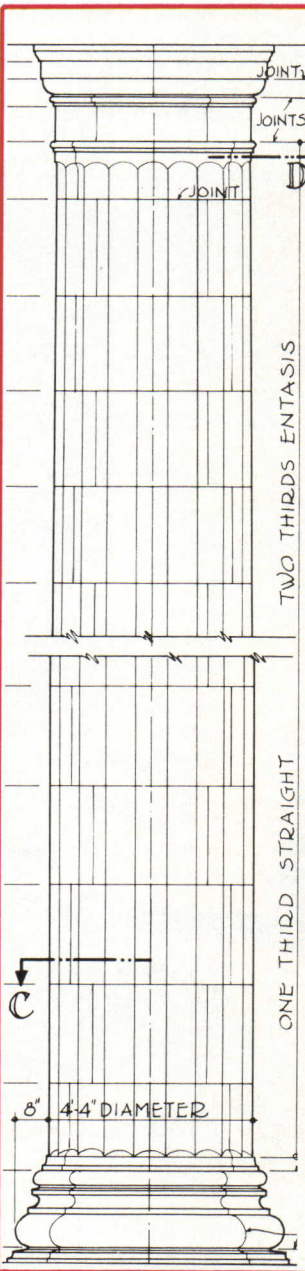
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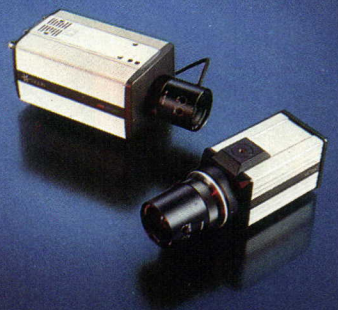


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News briefs

Kenzo Tange, the acknowledged father of postwar Modernism in Japan, has been named 1987 laureate of the Pritzker Architecture Prize, established in 1979 "to reward a creative endeavor not honored by the Nobel Prizes." Tange is the first Japanese architect to win the Pritzker, and the ninth overall recipient of the award, which carries a tax-free grant of \$100,000.

Henry-Russell Hitchcock, the acknowledged dean of American architectural historians, has died at the age of 83. The author of more than 20 books, Hitchcock was perhaps best known for the 1932 International Style exhibition at the Museum of Modern Art, which he co-curated with Philip Johnson.

Three projects have been selected to share the \$10,000 Los Angeles Prize, sponsored by the Los Angeles Chapter of the AIA "to promote the creation of new thinking and ideas for the architecture of the future." The three winners were a faculty/student team from the Southern California Institute of Architecture for its design of an international space-station module; Peter Cook of London for the so-called "Hulk" building, a system that can house a variety of uses by adding or rearranging elements; and three architects—José Sanchez M., Pedro Hoyos O., and Erich Herrmann M. (only initials used for last names)—from Ensenada, Mexico, for the PEP Construction System, a theoretical model that incorporates the technologies of sub-atomic mapping, lasers, and holograms.

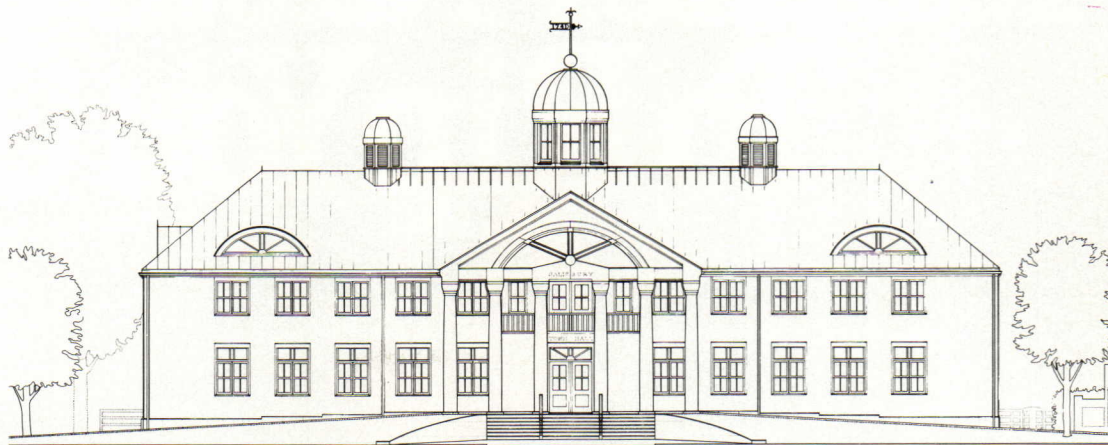
Reima Pietila of Finland has been named the recipient of the 1987 UIA Gold Medal, the highest honor given to a living architect by the International Union of Architects.

Leon Krier has resigned as first director of the Skidmore, Owings & Merrill Foundation's Institute for the Study of Architecture in Urbanism. The Foundation has begun a search for Krier's replacement.

Emilio Ambasz has been named the winner of the second annual International Interior Design Award for his Financial Guaranty Insurance Company offices in New York (RECORD, November 1985, pages 126-131). Sponsored by AGB Exhibitions in Great Britain, the award carries a prize of £10,000.

Benjamin Thompson & Associates has been named design architects for the revitalization of over 40 blocks surrounding Grand Central Terminal in New York City.

Columns and clapboards



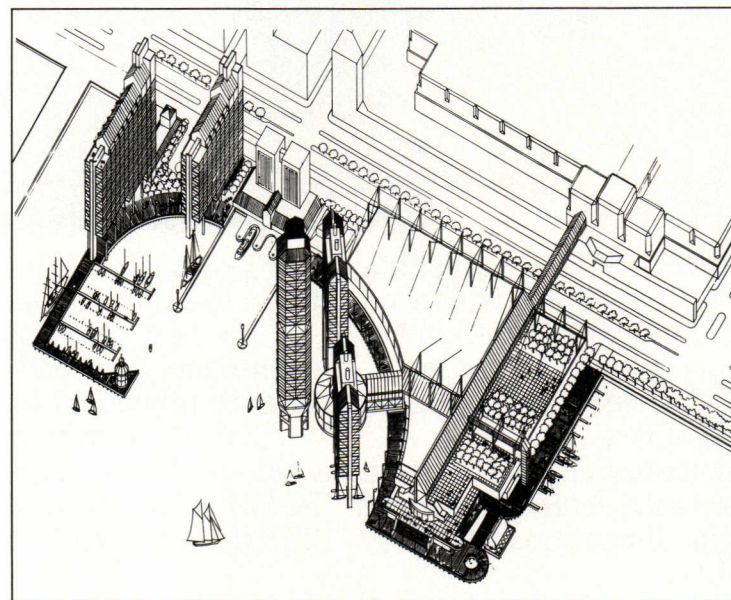
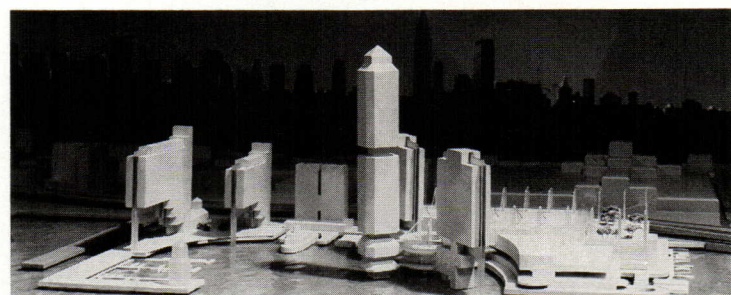
Except, perhaps, for the white-steeped Congregational church, no building type in rural New England is so cherished as the local town meeting hall. So when the mid-18th-century town hall in Salisbury, Conn., burned to the ground in the summer of 1985, the local citizenry first mourned, and then logically set out to find a replacement that would embody the spirit of the original. Although the town fathers

did not mandate any specific design criteria, it became clear to architects Robert Kliment and Frances Halsband that the one thing about the old town hall everyone in Salisbury seemed to remember most fondly was its Doric portico, which was added to the structure around 1900. The new 13,500-square-foot town hall that Kliment and Halsband have designed for Salisbury will likewise

feature a stately hexastyle portico which, along with a lead-coated copper cupola and white-painted clapboard and trim, is clearly meant to evoke colonial precedent and harmonize with adjoining public and religious structures in the town's center. The new building's 18th-century details belie its decidedly contemporary, steel-frame and concrete-filled metal-deck construction.

Beyond the water's edge, a new Manhattan project

Gruzen Samton Steinglass has been named architects for Hudson River Center, a mixed-use project planned for a 25-acre platform over the Hudson, opposite the new Jacob K. Javits Convention Center in New York. In addition to three hotels, two apartment houses, a marina, and a variety of retail and parking structures, the complex will include a new city pound for cars that have been towed for parking violations.



Competition calendar

- *Sunset* magazine and the AIA seek entries to the 1987-88 Western Home Awards, open to registered architects in the 13 Western states. Residential projects completed since January 1983 are eligible for awards, and the winning houses will be published in the October issue of *Sunset*. Entry deadline is April 30. For information, write AIA-Sunset Western Home Awards, Box 2345, Menlo Park, Calif. 94025.
- Kentucky Wood Floors, Inc., and the American Society of Interior Designers are sponsoring their second annual design competition focusing on the manufacturer's hardwood flooring systems. Cash prizes totaling \$5,000 will be given in the categories of existing applications and new floor designs. Entry deadline is May 15. For further information and entry forms, call 800/235-5235.
- Classical America, a nonprofit organization that encourages a continuation of the country's classical architectural tradition, is sponsoring its third annual student competition. This year's program is the design of an entrance, entrance hall, and flight of steps for an art museum. Cash prizes will be awarded, and the entry deadline is Sept. 1. For additional information, write Classical America, Box 821, Times Square Station, New York, N. Y. 10108.

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A contradiction in terms



If "user-friendly monumentality" sounds like an architectural oxymoron, this apparent verbal incongruity did not deter the architects of the new Cook-Fort Worth Children's Medical Center. A joint-venture of David M. Schwarz/Architectural Services and Karlsberger + Associates, the eight-story, 270,000-square-foot hospital spans two city blocks in Fort Worth's medical district and

has been designed, according to the architects, to be "both tall enough not to be overshadowed by surrounding hospitals, yet low enough not to overpower the children and their families." The architects solved this contradiction in terms by setting back a series of symmetrically massed pavilions behind a landscaped forecourt and breaking up the ensemble's daunting horizontality into an



assemblage of modestly scaled vertical components atop a two-story base. Other, deliberately noninstitutional touches include oversized windows, brightly colored glazed tiles set into masonry facades, and, perhaps most unusual for a hospital, a 56-foot-square central atrium whose upper levels will be clad in a reflective-glass curtain wall articulated by etched-glass stars.

New halls of justice, Charleston style

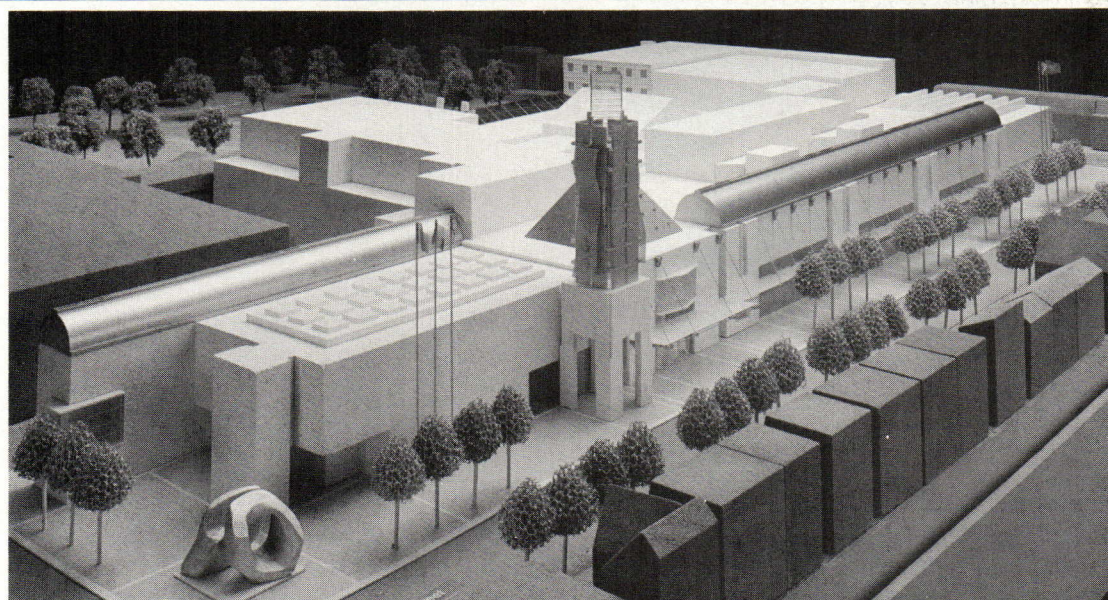
Controversy seems to be an integral part of any new building project in Charleston, and the recently approved proposal for an annex to the U. S. Courthouse in the South Carolina metropolis was no exception. Located near the historic intersection of Meeting and Broad streets—the locally dubbed Four Corners of Law—the project has been a five-year bone of contention between the federal government,

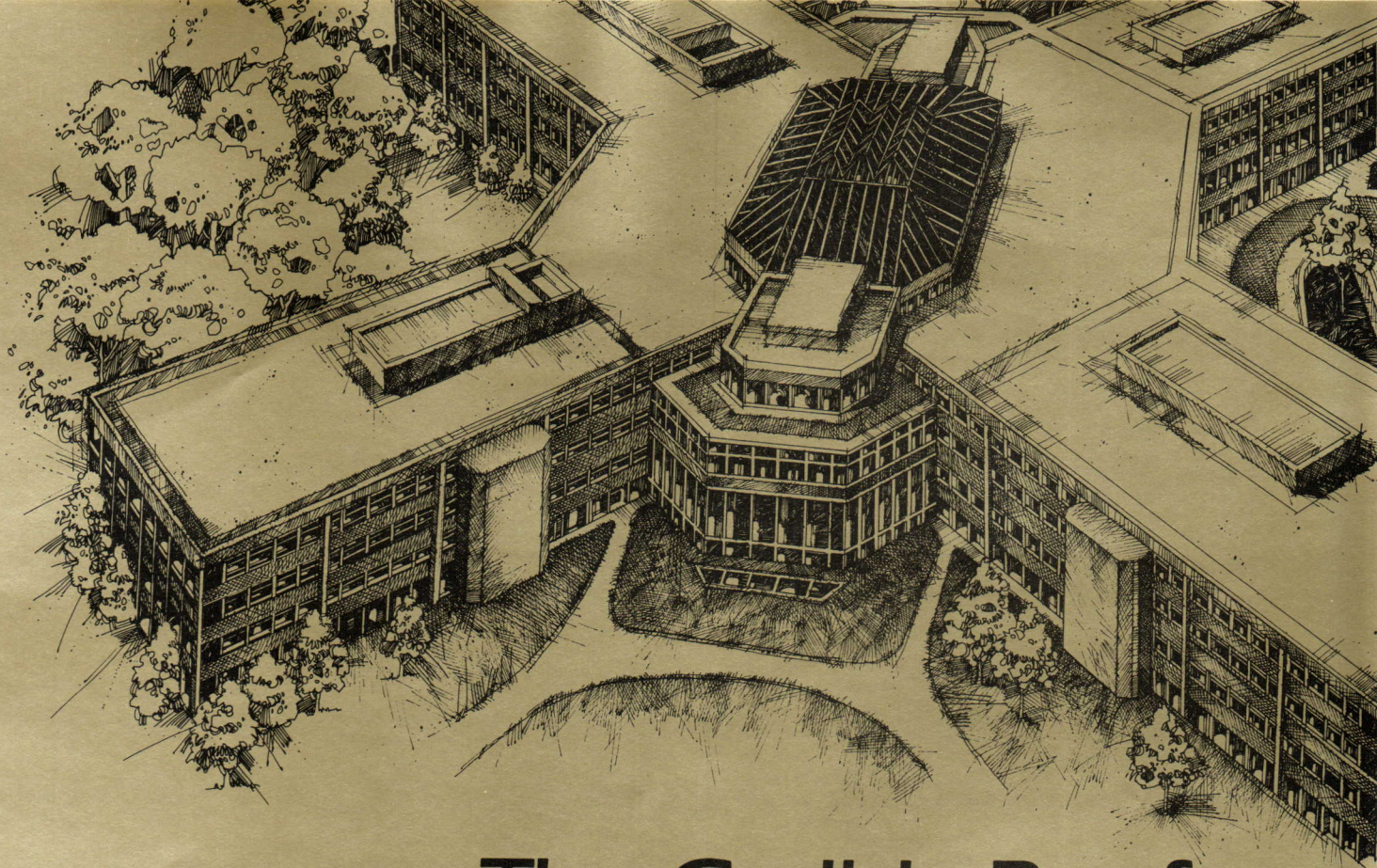


which wants the building for additional courtroom and office space, and the city, which also wants the building but in a form sympathetic both to the adjacent existing courthouse, a Beaux-Arts design by John Henry Devereaux, and to Charleston's overall 18th- and 19th-century architectural ambiance. The result of the debate, a carefully scaled, three-story structure designed by Goff Associates, features stylized pediments and a rusticated-granite first floor—details that echo elements on the original courthouse (right in rendering). Even U. S. Sen. Strom Thurmond, not known for his sympathy to preservation causes, had kind words for local preservationists who debated the annex design. "I thought at one time they were going too far," he said to a local newspaper reporter. "But they were right."

Toronto museum expands

Barton Myers Associates has won a limited competition to design a 94,000-square-foot addition to the Art Gallery of Ontario in Toronto. Myers's proposal, which will increase the museum's exhibition space by 50 percent and add an indoor sculpture court, features barrel-vaulted galleries and a strong new entrance on Dundas Street marked by a pyramidal-roofed lobby court and tower.





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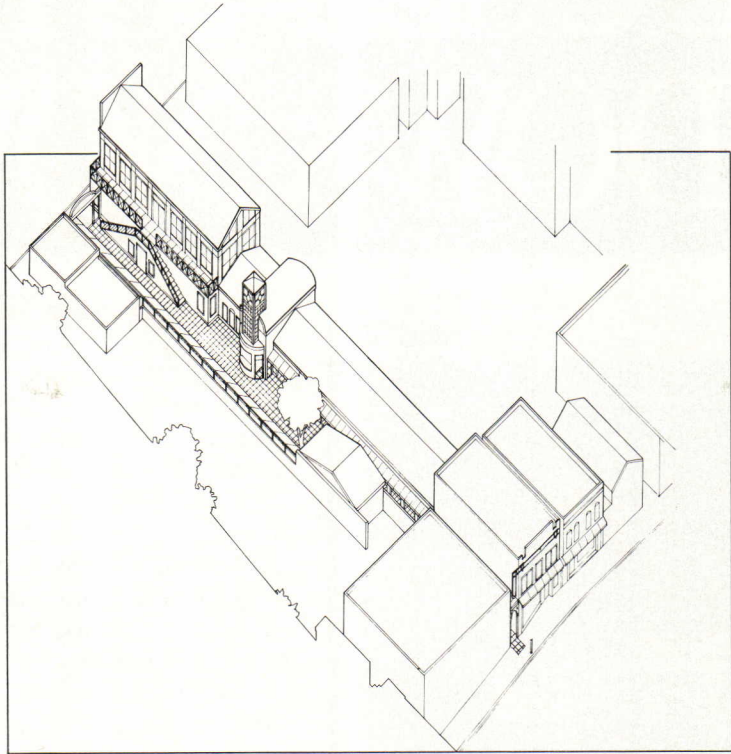
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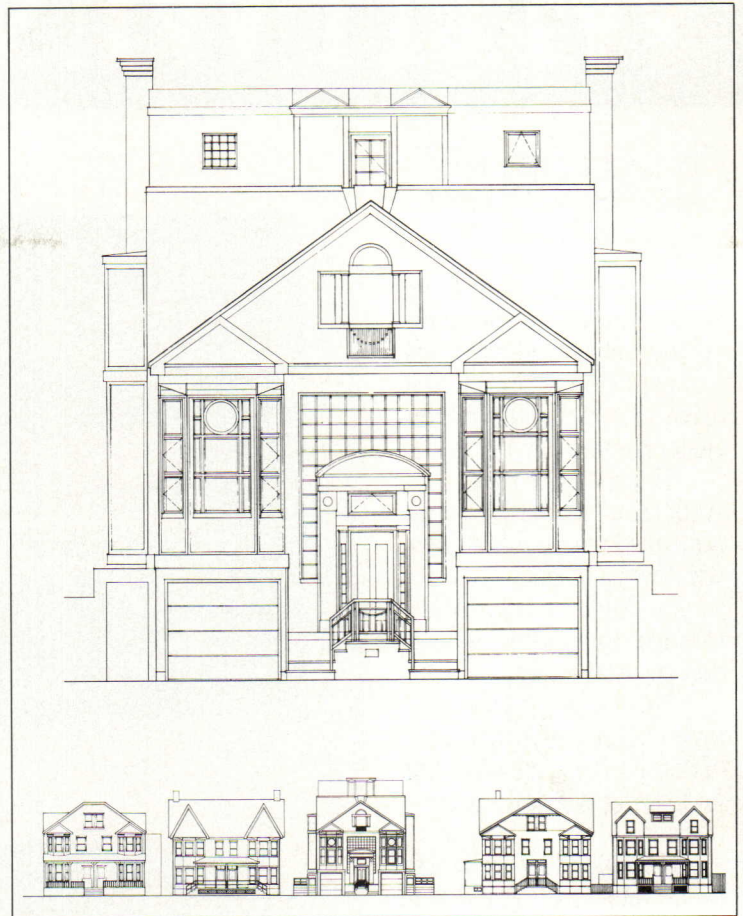
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Making a virtue of humility



1 Modest, contextually sensitive infill projects in older urban centers are the stock in trade of New Jersey architect Michael Burns—witness three current works-in-progress that involve a combination of adaptive use and carefully designed new construction. On a trackside block in the small New Jersey city of Metuchen, for example, Burns is designing a through-block arcade (1) that will link the local rail station

with a municipal parking lot. The project will incorporate specialty shops and restaurants housed in a renovated warehouse and new construction that will feature such railroad-inspired elements as a steel-framed tower, open trusses, and exposed metal-and-glass detailing. The goal, says Burns, is a “truly urban space” in a part of town that is “depressing and potentially dangerous.”

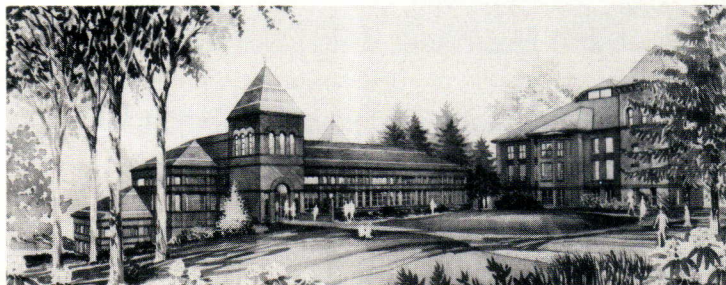


2 Two projects in Princeton are likewise intended to strengthen the existing urban fabric. A plan to reinforce a prominent corner in the town's Nassau Street commercial district will connect an existing 1930s fieldstone service station with a 19th-century house moved to the site from across the street (2). The two structures will be connected by a new lobby located at the rear of the house and adapted for use by a

bank (the garage's service bay will be converted into the bank's drive-up window). Finally, on nearby Bank Street, Burns has designed a single-family house (3) whose masonry-and-wood details reflect both the clients' request for an urban brownstone-style residence and Burns's wish for contextual harmony with the street's 19th-century row of wood-frame double houses.

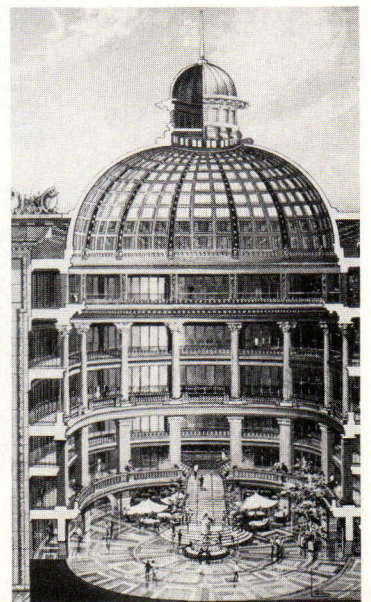
A Richardsonian revival

For the new Dolben Library at Northfield Mount Hermon School in Northfield, Mass., Architectural Resources Cambridge has designed a 29,500-square-foot building notable for its pyramidal-roofed entrance tower, round-arched openings, and red-and-brown brick facades—details seemingly meant to evoke the small-town libraries of New England's best known 19th-century architect, H. H. Richardson.



A rotunda reborn

After years of languishing in the shadow of its more famous sibling across San Francisco Bay, Oakland appears to be in the midst of a modest revival: witness The Rotunda, a 378,000-square-foot adaptive-use project whose three floors of retail space and five floors of offices will center on the elliptical dome of the former Kahn Brothers department store. Architects are Fitzpatrick/Karren Associates.



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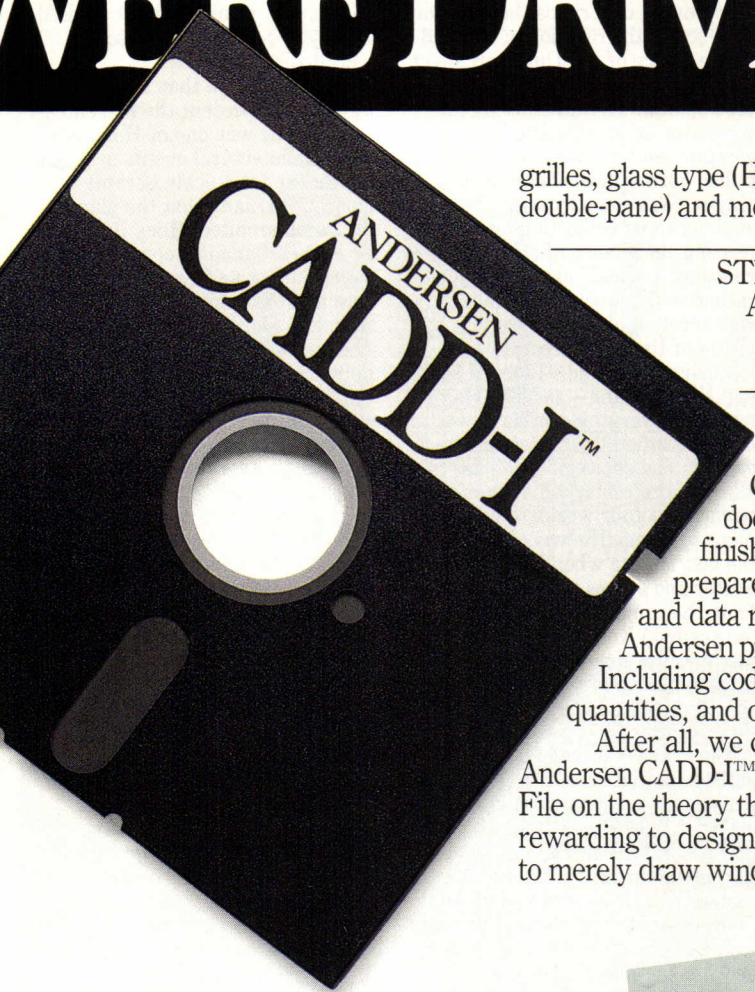
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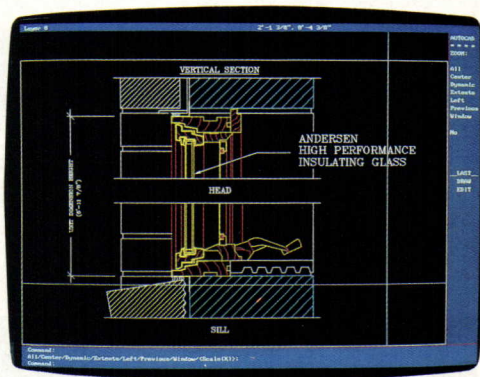


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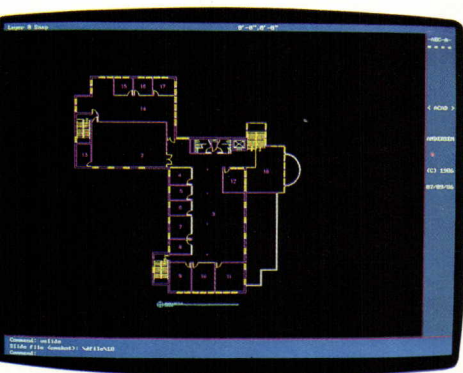


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B	AN41	22	C	N	HP	W	N	N	N	N
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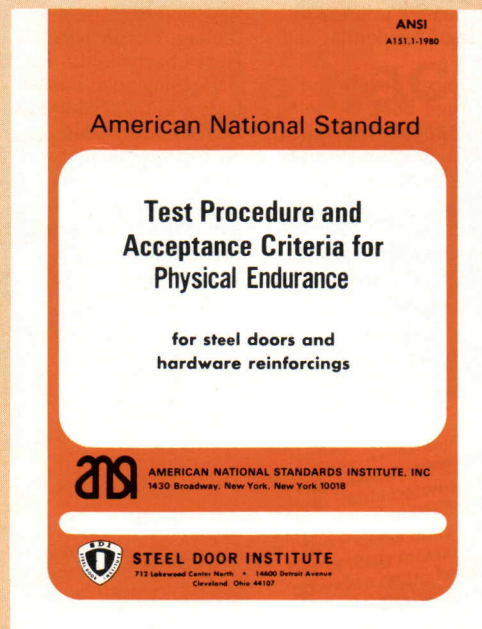
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Hugh Stubbins and the life of architecture

Top: Stubbins House, Lexington, Mass., 1946.
Middle: Weston Country School, Weston, Mass., 1952.
Bottom: Sharpe House, Pojac Point, R. I., 1955.

By Roger Kimball

In sheer number of words, at least, there is probably more being written about architecture now than at any time in the past. Architecture magazines proliferate, and there seem to be few major newspapers that do not have one or more writers doing duty as "architecture critic." But the real spotlight of critical interest in architecture continues to travel largely between two camps: between acknowledged masters—the Sullivans, the Wrights, the Corbus, the Mies van der Rohe—whose visions have transformed the face of modern architecture, and the coterie of fashionable practitioners whose claim to our attention sometimes seems to depend as much on their outlandish theories about architecture or their being featured in *Gentleman's Quarterly* magazine for their snappy clothes as on the quality of their work.

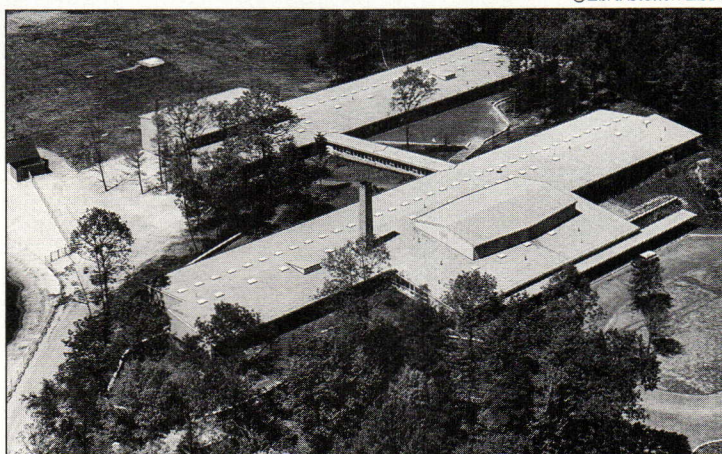
The architect who falls in between these camps, whose work lacks the transformative leaven of genius yet who has distinguished himself by consistently producing responsible work that has proved to be both practical and esthetically pleasing, tends to be passed over by the momentary enthusiasms of publicity. No matter that he may have enjoyed a singularly successful career, that his oeuvre includes landmark buildings in major cities here and abroad; he nonetheless remains in the critical shadows, acknowledged but effectively overlooked and, one feels, underappreciated. This is a pity because the work of such architects (and they are rarer than we may like to imagine) can tell us a good deal about the actual life and practice of architecture; indeed, in some ways it often tells us more than the works of the greatest architects, which tend to be *sui generis*, and certainly more than the creations of the latest fads, which concentrate on the production of fanciful facades at the expense of the more quotidian elements of architectural practice.

In searching for a tag to identify such architects, one might well recall W. H. Auden's category of "major minor" poets—a category to which Auden, incidentally, would probably have been pleased to find himself consigned by posterity. One is tempted to speak analogously of "major minor" architects, except that the inflation of language these days makes anything less than "brilliant" seem disparaging. But however we label him, Boston architect Hugh Stubbins is due an honored place in this middle camp.

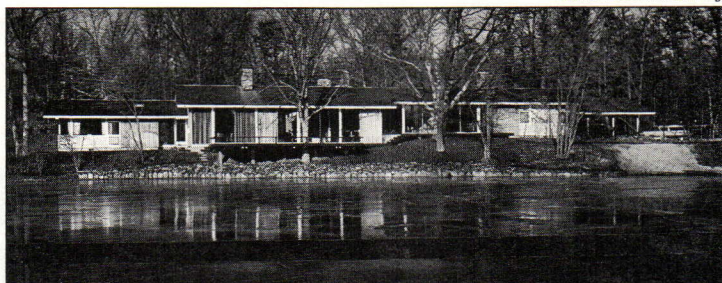
Roger Kimball is a freelance art and architecture critic who contributes frequently to RECORD, The New Criterion, and other publications.



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Eastern Aerial Surveys



Joseph W. Molitor

Stubbins has not proposed any revolutionary theories to explain the place of architecture in the modern world, nor has he devised forms that have essentially altered the way we think about the possibilities of architectural expression. What he has done is to consolidate and exploit the essential achievements of classical Modern architecture, producing a body of work that has again and again adapted the latest building technologies and materials in innovative and esthetically sensitive ways. For example, Stubbins was among the first American architects to explore distinctively modern home design in the 1930s and 1940s; he was in the vanguard of "open-school" design in the 1950s; and he has also designed some of the handsomest, most structurally advanced, large-scale Modernist buildings in the contemporary

urban landscape. One thinks especially of Stubbins's Berlin Congress Hall (1957), with its majestically sweeping catenary roof, his Loeb Drama Center at Harvard (1960), his Federal Reserve Bank of Boston (1978), and his Citicorp Center in New York (1977)—the last undoubtedly his single best-known project. Since 1986 marked Stubbins's 50th year in practice, it seems a propitious moment to step back and review his career and signal achievements.

Stubbins was born in Birmingham, Alabama, in 1912. He took his B. S. in architecture from the Georgia Institute of Technology in 1933, where he got a thorough grounding in the traditional Beaux-Arts system of architectural training, and his Master in Architecture from Harvard's Graduate School of Architecture in 1935, where the winds of

Modernism were beginning to gather force. In 1935, Stubbins was hired by the well-known architect Royal Barry Wills to help him compete more effectively in designing modern houses. Over the next three years, Stubbins designed and built six houses, winning, with Wills, several national design competitions. In 1938, he formed a brief partnership with Marc Peter in Boston and won numerous competition prizes for projects ranging from houses to a post office and a movie theater.

In 1940, at the invitation of Walter Gropius, Stubbins joined the architecture faculty at Harvard. He taught at Harvard for the next 12 years, becoming the school's chairman for a year in 1953 when Gropius retired. A stunningly motley cast of prominent architects passed under Stubbins's tutelage at Harvard, including Philip Johnson, Ulrich Franzen, Paul Rudolph, and Robert Geddes.

Stubbins quit full-time teaching in 1954 to devote himself to his growing practice, but by all accounts has remained intensely interested in architectural education. Geddes, Franzen, I. M. Pei, and others of similar repute apprenticed at his firm, and one cannot help thinking that Stubbins's own deeply pragmatic approach to architectural problems would find pedagogy better served by the "hands-on" studio training available in day-to-day architectural practice than in the classroom; it is, at any rate, likely to be the most effective way of helping young architects overcome what Stubbins has described as the "artificial divisions"—often encouraged, however inadvertently, by the academy—between design, engineering, economics, and the other disciplines that conspire to make successful architecture.

Among Stubbins's notable early works are such flat-roofed single-family residences as the Kronenberg House in Weston, Mass. (1948), and the house he designed for himself in nearby Lexington (1946), as well as the elegant pitched-roofed Sharpe House in Pojac Point, R. I. (1955). There followed a series of commissions for primary and secondary schools in the 1950s, perhaps best epitomized by the carefully sited and sensitively scaled Weston Country School (1952), which won Stubbins the Boston Society of Architects' Harleston Parker Gold Medal in 1955. During the 1960s and '70s, Stubbins's firm undertook commissions from colleges and universities as various as Princeton, Brandeis, the University of Virginia, the University of California at Santa Cruz, and the



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Top: Congress Hall, West Berlin, 1957.
 Middle: Citicorp Center, New York City, 1977.
 Bottom left: Federal Reserve Bank of Boston, 1978.
 Bottom right: Fifth Avenue Place, Pittsburgh, 1986.

University of Chicago, constructing everything from dormitories and theaters to laboratories, libraries, and classrooms.

Throughout all Stubbins's work, early or late, there is a fascination with structure and solving the practical problems of building in a way that is at once esthetically compelling, "liveable," and that uses the available technology and building materials in a straightforward, unabashedly contemporary way. Consider Citicorp Center in New York: the soaring, 910-foot aluminum-skin skyscraper, undertaken with structural engineer William LeMessurier and designer Peter Woytuk, was one of the first contemporary commercial projects to give serious attention to providing large-scale public amenities: its plaza level is a cornucopia of shops and gathering places. And for its time, Citicorp Center was also a collection of structural and technological innovations, from the solar panels proposed for its slanting roof to the tuned mass damper system—said to be the first in the nation—that helps maintain rigidity in high winds without additional steel bracing.

Stubbins innovations have not always been accepted without resistance, however, as his experience with Congress Hall in West Berlin unhappily illustrates. The floating catenary roof that Stubbins, together with structural engineer Fred Severud, devised for this international conference center and "symbol of freedom" was to hang, tentlike and flexible, between two supporting columns. But the German review engineers rejected the design and, over Stubbins's strong objection, redesigned the support so that the roof rested rigidly on the drum beneath it. The redesigned roof partially collapsed in 1980 and is scheduled to be restored according to Stubbins's original specifications on the occasion of the 750th anniversary of the city of Berlin this year.

Among other things, such examples underscore what Stubbins has described as his "great respect for function," where it is clear that for him "function" tokens a measure of esthetic as well pragmatic success. "Structure is of great importance," he wrote in his 1976 monograph *Architecture: The Design Experience*. "It should be forthright, logical, honest. It should have integrity, which does not mean that structure should necessarily be expressed. A building should in some way express its purpose as well as have unity in itself."

Unfortunately, not all of Stubbins's work lives up to this combination of ideals. Some of his academic commissions—the

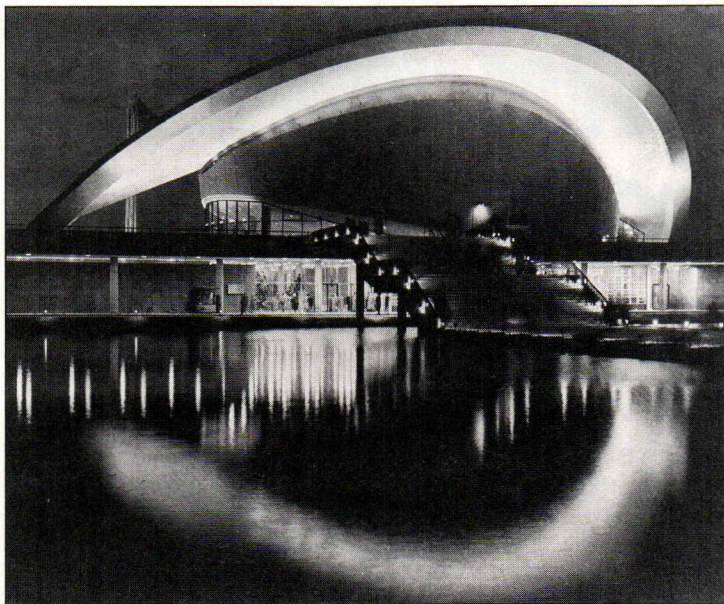
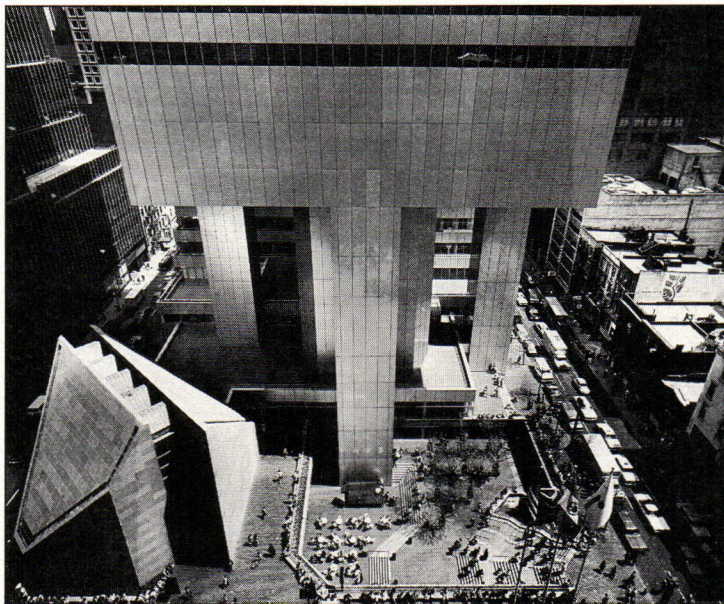


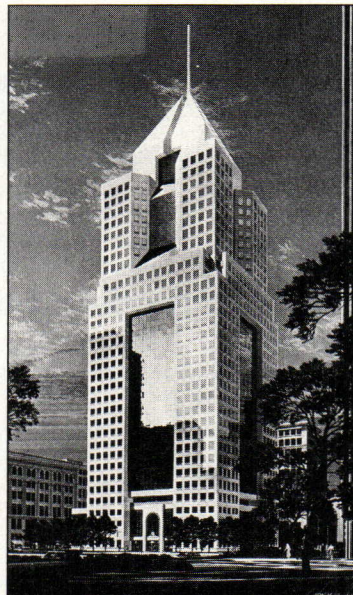
Foto Kessler



Norman McGrath



Ed Jacoby



Howard Associates rendering

Countway Library of Medicine at Harvard (1965), for example—will strike many as somewhat chilly and anonymous, even overbearing. And a good deal of his work over the years—like much of any longstanding architecture firm's work—seems merely competent when we review it as a body. Then, too, several of his firm's more recent ongoing projects—I am thinking in particular of Fifth Avenue Place in Pittsburgh (1987) and the American Fletcher Center in Indianapolis (1989)—flirt openly with Postmodernist bombast, compromising Stubbins's allegiance to an architecture that is "forthright, logical, honest." But such excursions are still isolated and few enough to be considered aberrations from a higher and more rigorous standard.

The origins of that standard are not difficult to trace. The most patent influences on Stubbins's mature architectural vocabulary are Eero Saarinen and, especially, Alvar Aalto, whom Stubbins met and befriended in the early 1940s. Saarinen's TWA Terminal at Kennedy International Airport in New York (1956-62) provided an obvious precedent for Stubbins's winglike roof at Congress Hall; but it was Aalto's fabled sensitivity to materials and low-key, understated approach to the practice of architecture that has been most important in the formation of Stubbins's own sensibility. Indeed, the ability to use modern industrial materials in an esthetically pleasing fashion, and to blend and contrast them effectively with such traditional materials as wood and water-struck brick, is arguably the aspect of Aalto's legacy that Stubbins has exploited most fully.

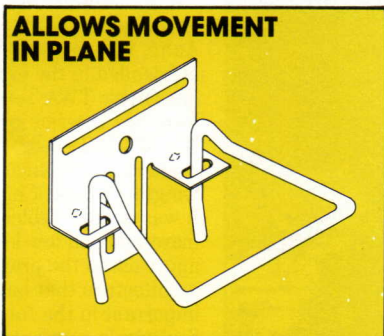
But ambition dignified by modesty, by a recognition that architecture's most pressing tasks are often the most mundane, is also an important aspect of Stubbins's architectural practice. As he put it in *Architecture: The Design Experience*: "Today, architecture is no longer an articulation of tradition or a search for a new style. A new style is not created by every generation, although each succeeding generation assumes its duty is to do so. In truth, architecture must be an approach toward life—a life no longer simple—and it cannot help but reflect the profound disturbances of our age. The fact that we know how to build a 100-story building or an astrodome ballpark doesn't imply indiscriminate use of this technology. The great question for American architecture in the next decade is whether society will continue to demand incessant innovation for its own sake or will

Continued on page 64

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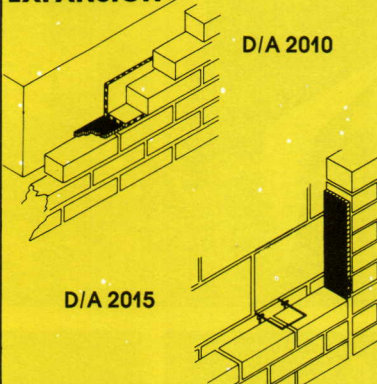
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Continued from page 63

begin to select the ideas most worthy of development and perfection—will in fact make a choice in favor of humanity. It is not necessary for all architecture to be 'great'—this should be understood. Most of it is 'background' or environmental architecture, but is no less important and should be taken seriously."

It follows naturally that "flexibility," the conviction that "there is no single solution" to an architectural problem, has become a hallmark of Stubbins's approach. In a sense, this is simply another way of underscoring his thoroughgoing professionalism, his refreshing lack of the "prima-donna" posturing that so many architects affect. But it also tokens Stubbins's recognition that, however "artistic" a particular design may be, one test of an architect's skill is his ability to accommodate his client's needs without compromising his artistic integrity. As he reminisces in *Architecture: The Design Experience*: "I remember once designing a house for a client who wanted a mantelpiece over the fireplace. I was completely enamored of the purity of my design concept and horrified that a mantelpiece would bastardize this chaste esthetic. I won the battle, and the mantelpiece was omitted. Later I realized that, of course, she should have had a mantelpiece. I should have been able to bend my mind to designing one that would harmonize with the basic concept for the house."

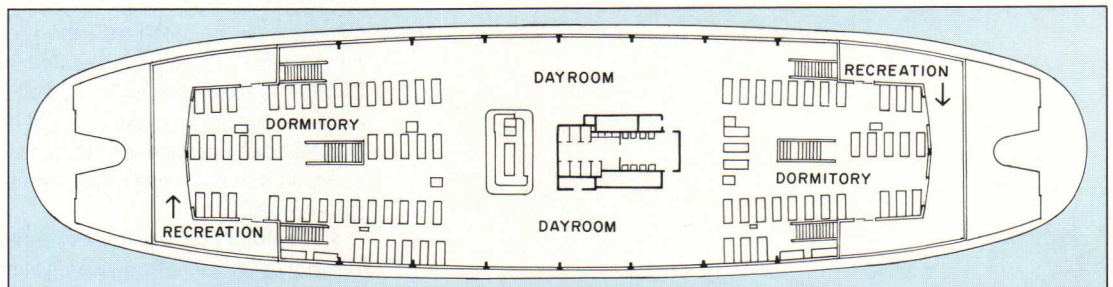
It is something of an irony that an architect like Stubbins, who early in his career garnered a reputation for innovative design and siting and the thoughtful use of contemporary materials, should now often find himself regarded as epitomizing an architectural ethos that, if not exactly *retardataire*, is at least firmly "establishment." In part, of course, this merely illustrates what has come to seem a natural law of artistic evolution in our times, whereby yesterday's vanguard is today's conventional wisdom. In part, too, it is a price of success: the very familiarity of Stubbins's signature solutions to architectural problems—the dramatic cantilevering of the corners at Citicorp Center some 100 feet above the street, for example, which opens up the city block below—is due precisely to the conspicuous place of his buildings in the current architectural landscape.

But, especially given the ferment in the world of architecture today, a world where claims to "originality" and "advanced" thinking are often based on nothing more than obscure theorizing or the arbitrary application of "traditional" ornamentation to what remain essentially Modernist buildings, it is well to remind ourselves that genuine innovation in architecture—innovation that is more than cosmetic—depends upon using contemporary resources to solve real problems in a graceful and visually memorable way. And in this sense—the only sense that matters, finally—Hugh Stubbins may well be counted among the dozen most innovative architects now practicing.

Crime and punishment

The most common complaint heard inside the nation's jails and prisons is by now a familiar one, and it is voiced by corrections officers and inmates alike: overcrowding. The complaint, however, has acquired a different dimension in recent years as supervision in the newer facilities (pretrial jails in particular) has evolved from *de facto* territorial rule—the officers rule the corridors and the inmates rule the cells—to face-to-face interaction between inmates and officers. The latter is a result of the relatively new and still controversial direct-supervision method of jail design, pioneered by the Federal Bureau of Prisons in the 1970s and endorsed by the Justice Department's National Institute of Corrections. This combined architectural and management approach maintains that the stress of confinement that often leads inmates to violence can be reduced if a facility is broken down into mini-jail housing units, even further if an officer well-trained in crisis-management is locked inside each unit with an eye on potential troublemakers. The operation of these "new-generation" facilities, like the Philadelphia Industrial Correctional Center (pages 82-87) and the Clark County Detention Center (pages 88-91), is particularly sensitive to significant increases in the inmate population. As the number of inmates per unit rises above the prescribed average of 50, the basic premise of direct-supervision is compromised. The resulting warehousing of inmates leads not only to substandard—and illegal—living conditions but also, as tension mounts, to life-threatening situations for the inmates and the officers.

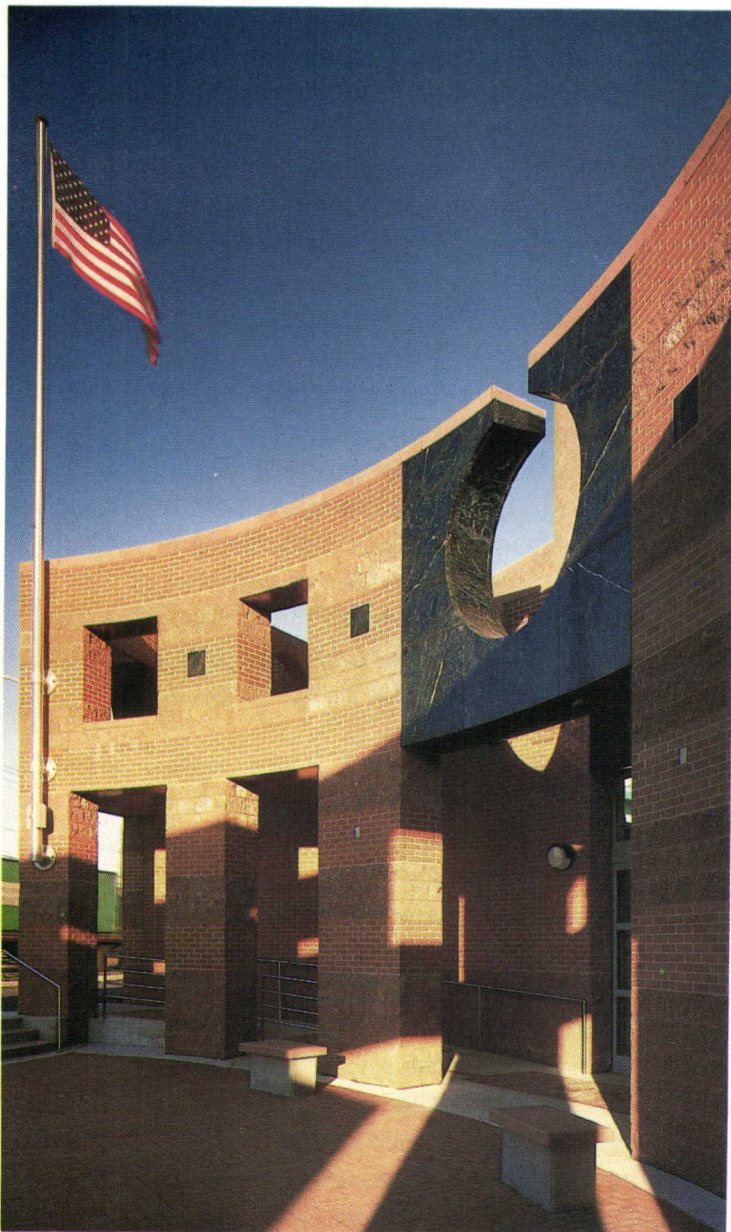
At a time when as many as 33 states are under court order to reduce the numbers in prisons and jails to their stipulated capacities, the courts are faced with their own problems. Public support for stricter sentencing continues to pressure judges into setting higher bails or, where applicable, no bail at all; but if judges do refuse, in fact, to let alleged offenders back onto the streets, they must send them to pretrial facilities. The choice, then, is between leniency or overcrowding. As the dilemma becomes even more acute, some states and counties are exploring fast-track expansion solutions such as the one conceived by New York City (below) to house low-risk inmates on a converted Staten Island ferry. Although the proposal conjures up images of the squalid prison ships of colonial times, the current "get-tough" policy must somehow be balanced by adherence to the ever-increasing list of jail and prison minimum standards, and, especially in the case of jails, where a majority of the inmates have not been tried, respect for basic human rights. *Karen D. Stein*



UPPER DECK

Proposed conversion of Staten Island ferry into a low-risk inmate jail to be docked at New York City's Riker's Island in the East River.

A new-generation jail



The law library in the new Philadelphia Industrial Correctional Center (PICC) is not crowded, and to project architect Curtiss Pulitzer this is proof that he and his colleagues did more than meet the standards of the American Correctional Association. "The inmates aren't all in there researching inmate rights, filing writs, trying to get out," observes Pulitzer. Though an absence of class-action suits brought against the facility is not the only measure of its architectural success, the comment does hint at the changing scene inside jails. In recent years, corrections experts have witnessed the birth of a new breed of facility, called a "new-generation jail." The progenitor is the Contra Costa County Detention Facility in Martinez, California (RECORD, March 1983, pages 82-85), considered the hallmark in the controversial direct-supervision style of management. Since Contra Costa's opening, only a select few have followed its program; the PICC is one of them.

Although the PICC was built in response to a court order to relieve overcrowding in the City and County of Philadelphia's Prison System, the architects (a joint venture between Jacobs • Wyper and The Ehrenkrantz Group) and clients realized that they could do more than satisfy the demand for 650 new beds: they had an opportunity to make a dramatic improvement in the conditions for both inmates and officers. It is axiomatic among architects who design jails that "the staff does more time than the inmates." (In a facility, like this one, where 75 percent of the inmate population is pretrial and the average stay is five months, the officers, in fact, do more time, but only in eight-hour shifts.) With that in mind, the architects set out to design a jail whose internal layout would reduce structural—and territorial—barriers between inmates and officers.

The PICC consists of a 250-cell-medium-security facility (foreground, bottom photo of facing page) and a 400-cell-maximum-security facility (background, bottom photo of facing page), which share intake, food service, industry, and administration areas. The separate facilities contain management pods of two or three 50-cell housing units, which have two tiers of cells grouped around a double-height common room or "dayroom." If the inmates are not appearing in court, meeting with counsel, or in class, they are confined to their respective dayrooms (with limited access to an adjacent courtyard for their state-stipulated period of outdoor recreation), where they eat their meals, talk on the phone, and watch television. Inside the dayroom supervising the inmates is a lone—and unarmed—officer, whose principal protection is the respect he hopes to muster and, just in case, a body alarm that, when triggered, alerts central control. For those familiar only with the jails of late-night movies—endless cellblocks, rusted bars, and roving guards who rule by the might of their batons—the PICC's innocuous institutional look and the emphasis on an officer's interpersonal skills are unexpected. The sunny corridors, brightly painted dayrooms, well-equipped gymnasium, 25,000 square feet of shops and classrooms all tucked behind a semicircular rusticated-stone and brick colonnaded courtyard are not, many initially argued, outwardly tough enough. And continuous contact among the officers and inmates is not the way "real" jails are run.

But behind this construct of a seemingly domestic environment is a rigorous program of inmate classification and inmate-officer interaction that succeeds in minimizing violence both among inmates and among inmates and officers. The elimination of a main dining hall, for example, where large numbers of inmates congregate, reduces opportunities for organized resistance. Furthermore, the circulation routes of the medium- and maximum-security inmates are separate, and the alternating use of shared areas maintains peaceful coexistence among management pods. Although the "privileges" may seem numerous measured against old standards of incarceration, the threat of their removal is a powerful enforcer. Inmates unable to behave according to the rules of the PICC are transferred to one of the other facilities in the system, where, regrettably, it's more like the old movies.

Philadelphia Industrial Correctional Center
Philadelphia Prisons, Philadelphia, Pennsylvania
Jacobs • Wyper/Ehrenkrantz (a joint venture), Architects



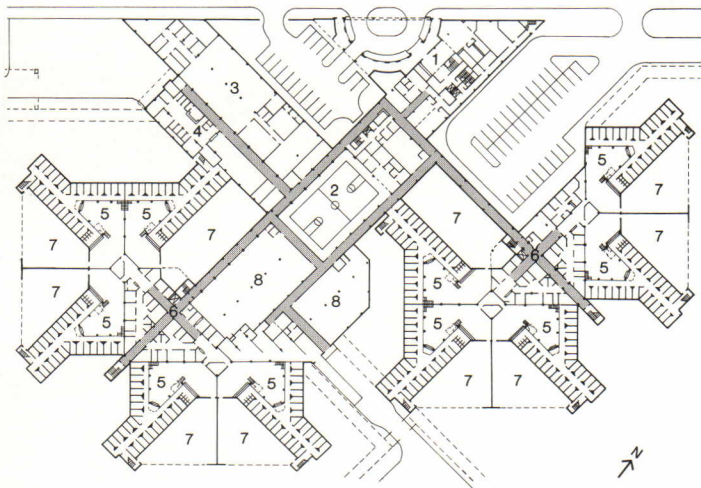
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Matt Wargo

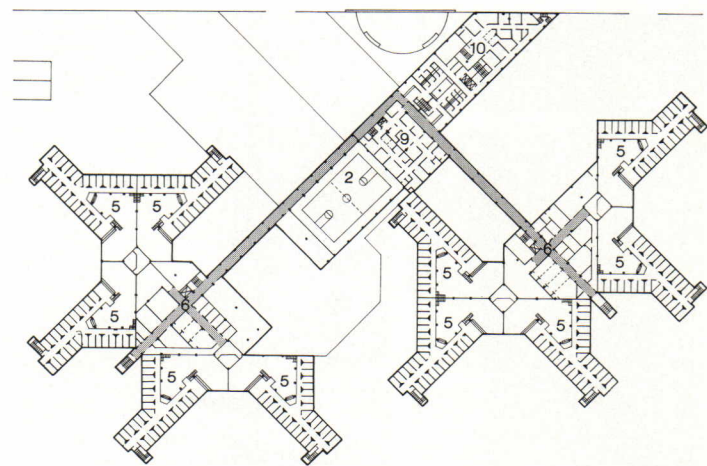
The Philadelphia Industrial Correctional Center is located in a predominantly industrial area of northeast Philadelphia (aerial photo page 83). The site was chosen for its proximity to two other jails in the City and County of Philadelphia's Prison System. Although the site previously had been a garbage dump, objection was nonetheless raised by a local councilwoman, who felt the district already had enough

jails. In order to temper opposition to the proposed facility, the architectural team of Jacobs • Wyper/Ehrenkrantz agreed to design a jail that wouldn't look like one. Toward that end, the architects placed a stone wall along State Road that effectively masks the \$50 million, 270,000-square-foot facility behind it. The screen is interrupted by a semicircular entrance courtyard (photo below).



GROUND FLOOR

- | | |
|----------------------------------|-----------------------|
| 1. Entrance/visitor registration | 5. Housing unit |
| 2. Gym | 6. Management unit |
| 3. Kitchen | 7. Recreation |
| 4. Intake | 8. Industry/shop area |



SECOND FLOOR

- | |
|--------------------|
| 9. Infirmary |
| 10. Administration |

Modeled on Italianate piazzas, according to project architect Curtiss Pulitzer, the colonnaded forecourt adds an appropriate measure of civic grandeur to the building. Behind this rusticated-stone and marble public facade, however, is the serious business of security, which depends on a structural system of steel columns and beams, metal decks, and concrete roof and floors.

The Y-shaped cell blocks and their respective dayrooms (plans below), are grouped around outdoor recreation areas surrounded by reinforced mesh fencing (below). Although the barbed wire is not electrified, hidden infrared beams detect any irregular movement near the perimeter; the patrol car that continually circles the blocks around the facility is alerted instantaneously.



The Superintendent of Prisons didn't want children visiting inmate fathers to be traumatized by their physical surroundings. With this in mind, the architects paid special attention to the design of the lobby: marble wainscoting lines the walls and large picture windows admit sunlight (below, top). In fact, natural light is generous throughout the facility, including in the corridors between management pods (below,

bottom), and each cell has its own—albeit constricted—view of the outdoors. Although the cells were designed for one, the current position of the courts to “get tough” on repeat offenders and drug abusers has brought a flood of inmates to pretrial facilities like the PICC, and, as a result, an increasing percentage of the inmates have roommates. The effectiveness of the direct-supervision style of

management depends on high staff-to-inmate ratios, which are included as requirements in the officers' labor union contracts. As the number of inmates per housing unit rises above the prescribed 50, tension mounts until supervision by one officer is no longer effective or possible; at that point, according to PICC officials, increased staffing (and operation costs) becomes inevitable.



Philadelphia Industrial
Correctional Center
Philadelphia Prisons
Philadelphia, Pennsylvania

Owner:

City of Philadelphia

Architect:

Jacobs • Wyper/Ehrenkrantz
(joint venture)—James Wyper and
Kenneth Ricci, principals-in-charge;
Curtiss Pulitzer, project director;
George Carr, project manager,

Paul Macht and George Olsen,
project architects; Robert
Zimmerman and Dennis Cormier
project designers; and Joyce
Lenhardt, Juan Abraham, Art
Palumbo, Donna Daly, Eric
Mumford, Robert Petito, and
Deanne Caswell, project team

Engineers:

Fairfax Engineering, Inc.
(mechanical); Paul H. Yeomans,
Inc., (electrical); McCormick

Taylor & Associates and Harry
Purnell P.C. (structural);
VEP Associates (civil)

Construction manager:

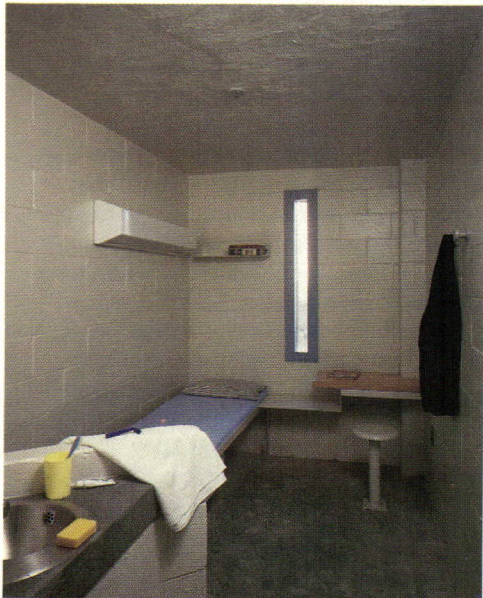
Morrison-Knudsen/Parametric—
D. Richard Linford, project
manager; Younsu Koo,
project engineer

Consultants:

Susan Maxman, Architects (interior
design); Romano Gatland
(food service)

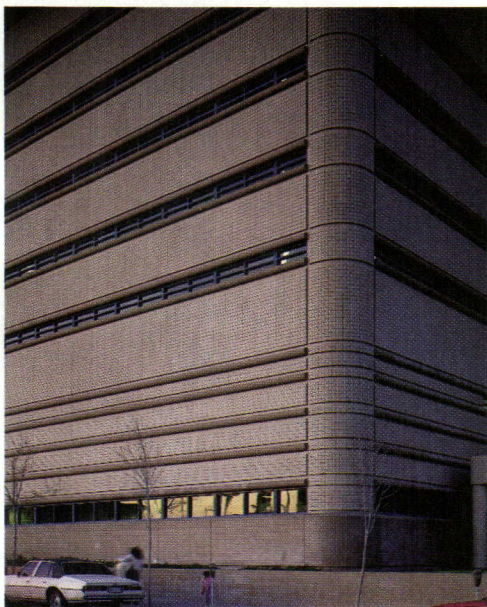


Matt Wargo



Clark County Detention Center
Las Vegas, Nevada
JMA Architects, Architects
Hellmuth, Obata & Kassabaum,
Associated Architects

Jails within a jail



With all the big spenders who come to Las Vegas for a high-stake thrill or a night out on the town, it's not surprising that the typical inmate in the new Clark County Detention Center has been charged with robbery or prostitution. As luxurious accommodations continue to flourish on and off the strip, so does the crime rate. Before the completion of the facility, the overcrowding in the local courthouse jail was so extreme (often filled up to three times its capacity) that riots and murders were business as usual. Faced with a lengthy class-action suit in 1977, the County Commission finally signed a consent decree, agreeing to the 239 provisions included in it to remedy the substandard conditions in the old jail. The construction of a new jail was the only long-term solution.

The site chosen for the \$42 million, 350,000-square-foot facility is diagonally across from the County Courthouse; inmates can be escorted between the two buildings via underground passageways. Since the new jail shares its piece of the strip with the Golden Nugget Hotel and Casino, the Downtown Businessman's Association was worried about a jail located close to one of the main tourist attractions in town. The only esthetic directive passed on to the architects—the two-firm team of Las Vegas-based JMA Architects and the correctional facilities department of Hellmuth, Obata & Kassabaum—was echoed, therefore, by the powerful DBA: the jail was not to look like a jail. In a town where a building's facade is usually dwarfed by its marquee, the jail's own discreet concrete canopy and relatively inconspicuous signage are, happily, lost in the crowd. The 12-story structure's rounded corners, uniform glazed brick-tile cladding, and recessed tinted-glass windows would be, in any other location, an obvious indication of an office building. But here, all is not what it seems.

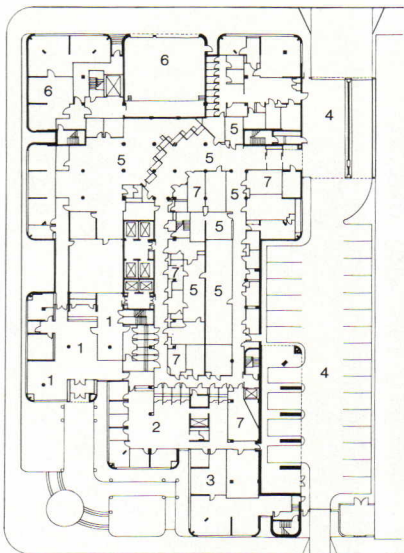
Behind this judicious facade is a 852-bed pretrial jail comprising 48-cell housing modules that operate as independent mini-jails. Each module houses a different classification of inmate and consists of a double-height dayroom surrounded by two tiers of 72-square-foot cells (photos, page 91). Although the jail was initially intended to be an entirely direct-supervision facility—with one officer locked inside each dayroom with the inmates—a change of director during construction brought a change in management policy. As a result, the design evolved into what project architect Chuck Oraftik refers to as "a more generic facility," consisting of modules that could be supervised directly from within the dayroom or indirectly from observation booths just outside.

With a 95 percent pretrial population and an average stay of under 60 days, the inmate turnover at Clark County is rapid, which results in a good deal of wear and tear on the facility, especially on the ground-floor intake and release areas (plans, facing page). After probable cause of a crime is determined in consultation with the arresting officer, an alleged offender has to wait in line for arraignment, which is conducted with a judge by videoconferencing. Following a big sweep, the booking backlog is often so great that inmates may be detained in intake for over 48 hours, and confined to holding cells where an individual's space entitlement, by law, equals only 18 inches of bench. (At night, however, the inmates are brought upstairs to sleep on the floor of the housing modules.) This lack of accommodation interferes with intake procedures and increases tension inside the modules. In the direct-supervision modules, the officers spend approximately 80 percent of their shift in the dayroom (and the remaining portion in the observation booth), according to members of the staff. But as admissions to the facility rise to over 1,100, that percentage, staff admit, is decreasing. Because of the overload of inmates in the modules, the officers are, understandably, backing out of the dayroom into their own glass sanctums. Unfortunately, the success of this "new-generation jail" is being sorely tested by old-fashioned overcrowding.

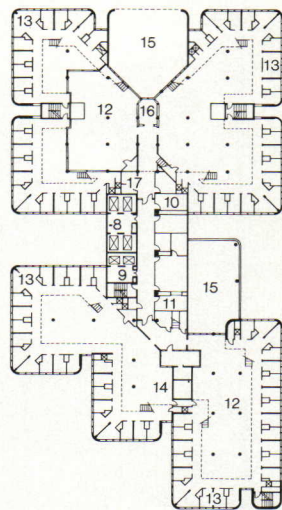
The administrative offices of the Clark County Detention Center are on the 12th floor, giving staff direct access to the top level of the adjacent parking garage and views of the Las Vegas strip. Although the architects were initially restricted to a building height of 85 feet, after the scheme was presented to various review committees, County authorities dropped the limitation, pleased that the jail did not look like one.



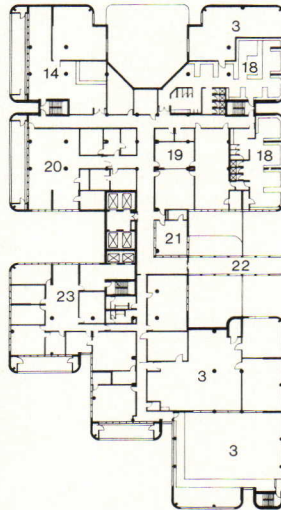
William Mathis photos except as noted



GROUND LEVEL



HOUSING LEVEL



ADMINISTRATION LEVEL

1. Lobby
2. Pretrial services
3. Mechanical
4. Vehicle sally port
5. Intake
6. Loading dock
7. Holding
8. Sally port
9. Secure elevator
10. Sick-call
11. Commissary
12. Dayroom
13. Typical cell
14. Food service
15. Outdoor exercise above
16. Control
17. Counseling
18. Lockers
19. Staff training
20. Roll call
21. Central control
22. Bridge to parking
23. Administration

After a shift change in the bulletproof central control room (bottom), where all activities of the Clark County Detention Center are monitored by closed-circuit television, officers can retire to the staff lounge (top) for a look at the activity on the streets below. Inmates' outside views, however, are limited to the small strip windows—sized to prevent escape—inside the cells. Each cell (facing page, bottom)

contains a wood bunk, a shelf/desk unit, and high-security, stainless-steel lavatory fixtures. On the inside of the steel-frame structural system, the walls have been sprayed with gunite—an easy-maintenance cement mixture. From dayrooms (facing page, top) the inmates have access to an outdoor balcony—shared by two or more housing modules—for scheduled recreation periods.

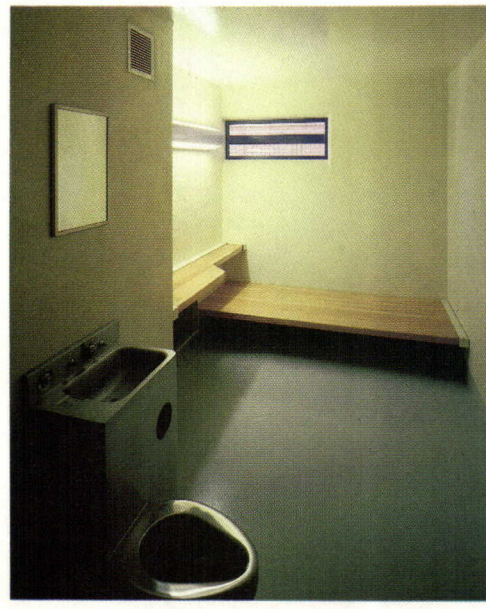


Clark County Detention Center
Las Vegas, Nevada

Owner:
Clark County, Nevada

Architects:
JMA Architects, Architects
Hellmuth, Obata & Kassabaum,
Associated Architects—Jack Miller,
Patrick MacLeamy, Tom Turner,
Chuck Oraftik, Harry Wilson, and
Frank McCurdy, project team

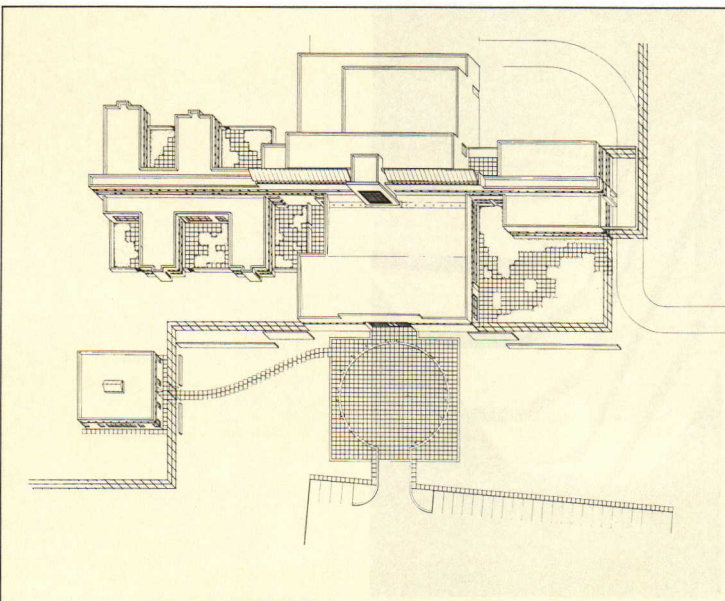
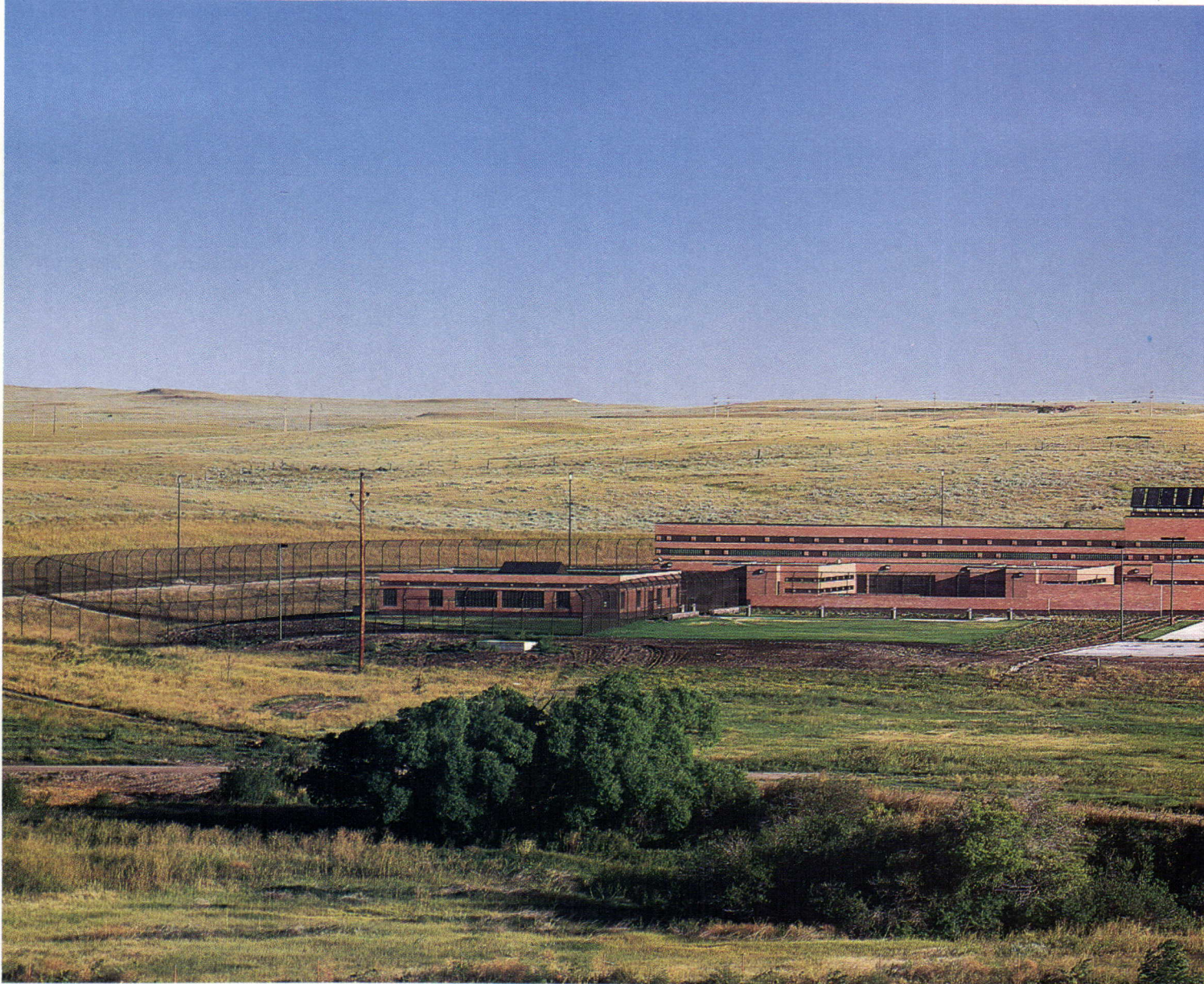
Engineers:
JBA Associates (mechanical/
electrical); Martin, Peltyn &
Associates (structural)
General contractor:
Neilson, Vasco & Earl/N. M. Sundt
Consultants:
Laschober & Sovich, Inc.
(food and laundry services)



Ronald Moore

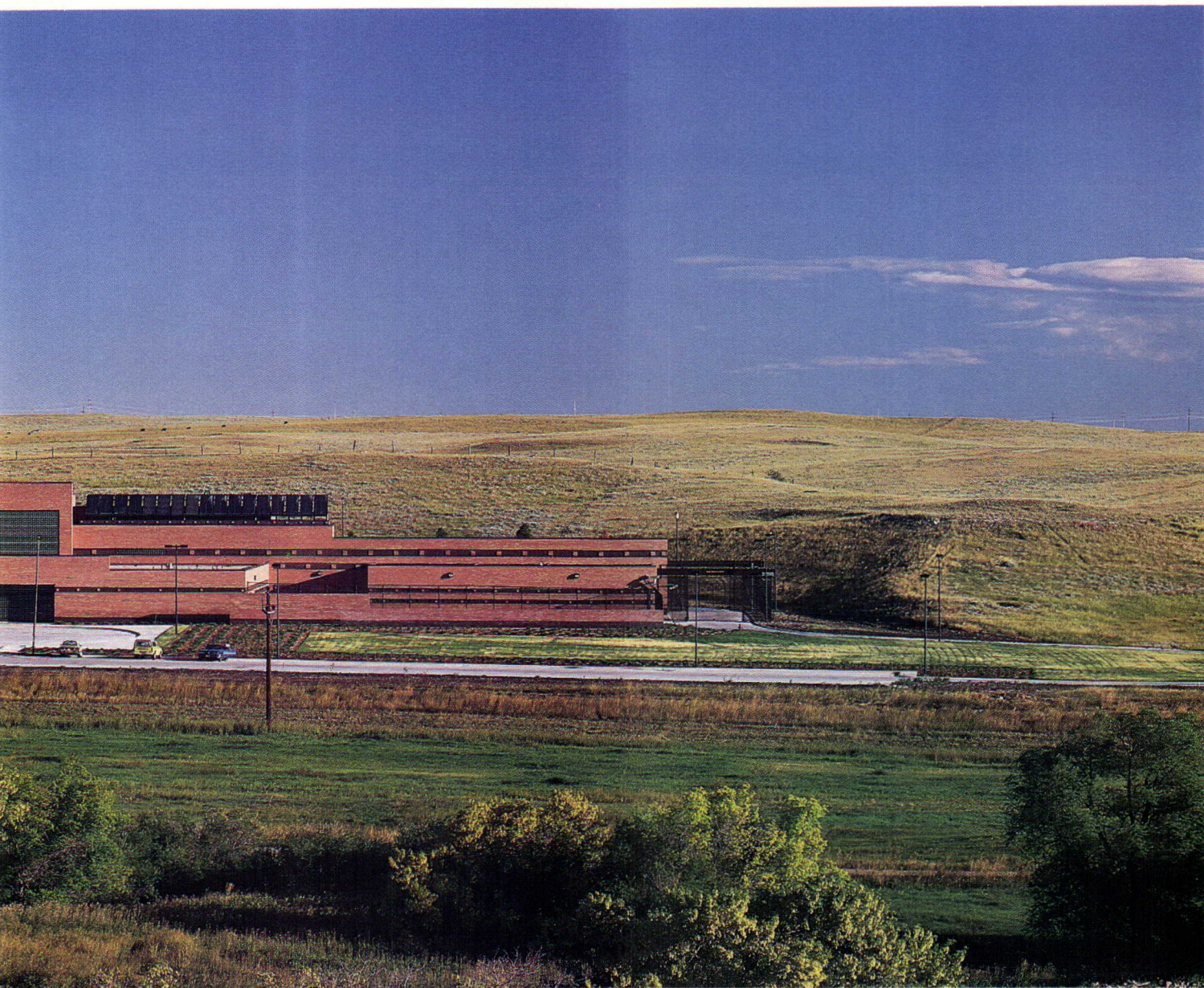
Prison house

Gary Vannest photos



The Wyoming state prison for women with long-term sentences opened in 1977 with a handful of inmates housed in the Evanston state mental hospital. The existing manacles and padded cells that ironically recommended the hospital for the conversion were grim reminders of a bygone era of incarceration. Nonetheless, Warden Judy Uphoff and her skeletal staff made do in their temporary quarters until 1984, when they, at last, transported their charges over 250 miles of barren plains to a state-of-the-art facility built to their own specifications in Lusk (population 1,650). The town, the winner in statewide bidding for the new prison, welcomed the newcomers. Wyoming's depressed economy—dependent on the flagging oil and coal industries—had brought hard times to Lusk and, to make matters worse, the infamous local tourist attraction, The Yellow Hotel, responsible for bringing a flow of big-spenders to town (especially during hunting season), had recently been closed down after more than 60 years of steady business. Lusk needed a new source of jobs.

Located on a 70-acre parcel of wilderness, which offers no easy route for escape, the Wyoming Women's Center was designed by The NBBJ Group to provide maximum security without overly dramatizing the cause in its outward appearance. The linear layout of the facility is based on the program developed by Warden Uphoff and her colleagues



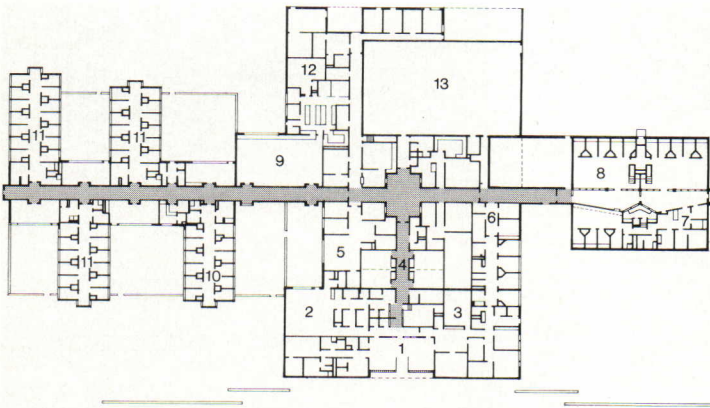
for a new inmate's gradual assimilation into the prison population (plan page 96). Newcomers all follow the same intake procedures. They spend their first week on "intake status," undergoing medical tests in a separate section at one end of the facility, followed by a 30-day to five-week "close-security status" period in the adjacent maximum security unit (page 97, bottom right), where the environment is intentionally austere. Here, a prisoner's behavior can be carefully monitored from the control booth and duly recorded in an individual unit file, which is reviewed at "team meetings." At this point staff may recommend moving their wards down the long corridor to the less restricted dormitory-style medium-security area (page 97 top and bottom left). Once an inmate is promoted to a higher status, the contrast in living conditions is often enough to enforce the prison's regulations; she knows that the penalty for breaking rules is, quite simply, back to "max."

The architects were sensitive to the difficult transition the prisoners face upon arrival in Lusk, with years of incarceration ahead of them. The building's low profile, brick cladding, glass-block banding, and frieze of solar panels (which heat the facility's hot water) contribute to the image of a modernized ranch house on the range. To some of those sentenced this place is home for life.



A half barrel vault admits light into the Wyoming Women's Center's main corridor (top and facing page, top left), which is located behind the lobby/waiting room (bottom) and central control (not shown), and spans the entire length of the facility. At one end of the corridor is the maximum-security unit (facing page, bottom right) and at the opposite end are blocks of individual cells (facing page, top right) opposite

a common dayroom (facing page, bottom left), where the inmates interact and wait for scheduled activities under the supervision of an officer. The disparity between the maximum- and medium-security areas is intentional. In fact, once inmates are moved to the medium-security area, they are encouraged to arrange and decorate their own cells in the way that makes them most comfortable.



- | | |
|-------------------|----------------------|
| 1. Lobby | 8. Maximum security |
| 2. Visiting | 9. Dining |
| 3. Administration | 10. Minimum security |
| 4. Classrooms | 11. Medium security |
| 5. Library | 12. Kitchen |
| 6. Infirmary | 13. Recreation |
| 7. Intake | |



*The Wyoming Women's Center
Lusk, Wyoming*

Owner:
*Board of Charities & Reform,
State of Wyoming*

Architects:
*The NBBJ Group—David
Hoedemaker, partner-in-charge;
Richard Dallam, Don Winkelmann,
project team; Niranjan Benegal and
Bonnie Cameron, criminal justice
planners; Paul Delo and Debra*

*Battle, technical architects;
Sam Sampson, project manager*

Associated architects:
Gorder/South Group

Engineers:
*Volk & Harrison (structural); BHCD
Engineers, Inc. (mechanical);
Garland Cox and Associates
(electrical); Worthington, Lenhart,
Carpenter & Johnson (civil)*
General contractor:
Westcon Corporation

Consultants:
*Business Space Design (interiors);
THK Associates (landscaping)*



The Statue of Liberty Exhibit



A colossus remodeled

Visitor facilities
The Statue of Liberty
Liberty Island, New York
Swanke Hayden Connell
Architects

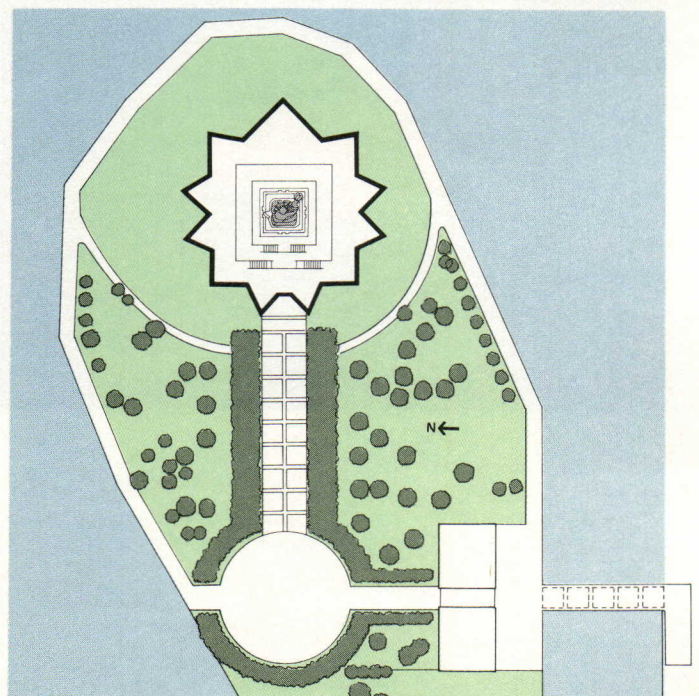
When Frédéric Auguste Bartholdi sculptured the Statue of Liberty and Richard Morris Hunt designed a pedestal to support it, no thought of future guests entered their minds. This was to be a colossus, not a building. From the start, however, people have been unwilling simply to admire the colossus from afar. Instead, they have ferried across the harbor in millions to see it from the inside and to climb to its crown. The landmark's owner, the National Park Service, made many ad hoc, sometimes contradictory, alterations over the years to deal with the constantly increasing crowds, alterations that architect Richard Hayden has characterized as a "jumble of failed spaces—intimidating, mysterious, and rather dizzying." The NPS decided that the statue's centennial restoration (RECORD, July 1984, pages 128-135) presented the opportunity for a serious overall response to the situation. And though the most pressing problem was efficient circulation, the NPS also wanted to give its visitors enjoyment and instruction in addition to their evident satisfaction in the arduous climb.

As their first move in clarifying circulation patterns, Swanke Hayden Connell, who were the architectural leaders of the restoration team and designers of the new museum and other visitor facilities in both pedestal and statue, created a prominent entryway directly behind the statue. Earlier, visitors had entered from one side after climbing an exterior stairway mounted on the wall of the old 11-pointed Fort Wood at the base of the pedestal. Outdoor circulation had already been reordered by architects Philip Johnson/John Burgee, whose landscaping plan called for a newly shaped and paved walkway from the ferry dock, with formal circle and allée (site plan). The landscaping also includes an esplanade around the shoreline of the pleasant little island, offering splendid views of the harbor and the Manhattan skyline.

At the end of the allée, Swanke Hayden Connell signified the entrance to the statue with Ghiberti-like Centennial Doors. Each of the doors, designed by sculptor Jordan Steckel, comprises five three-foot bronze panels showing such attributes of the 1986 restoration as artisans' tools, steel armatures and copper rivets, and the hydraulic elevator. The doors open inward so that they become a decorated portal for the diversion of tourists who must stand in long lines to buy their \$1 tickets and pass through the gate.

The discovery of an abandoned tunnel through the concrete core of Hunt's pedestal, on axis with the new entrance, allowed an entirely new circulation pattern indoors. The new route did, at the same time, require considerable excavation for the entry and the new lobby, since Fort Wood had been partially buried and filled with earth. The depth of soil removed is easily discerned. On the exterior, lighter granite at the base of the entry surround marks new construction. On the interior, the line where Hunt's poured concrete meets Swanke Hayden Connell's new granite wainscot (opposite) marks the old grade level. The architects made sure that when concrete had to be repaired it was patched with color-matched concrete, not as archeological trickery but rather to impress visitors with the power of Alexandre-Gustave Eiffel's structural engineering: at the time of construction, this was the largest concrete pour ever made.

Visitors, almost all of whom intend to climb to the statue's crown, must first make their way to the top of the pedestal, which is slightly taller than the statue itself. The route that takes them to the bottom of the spiral stairway in the statue is now made clear, indeed unmistakable: a broad flight of granite stairs directly opposite the Centennial Doors (across page) leads through the tunnel to the double-deck elevator. Those visitors who come only to see the new Statue of Liberty Exhibit use not the central stairway but smaller, less trafficked flights tucked under granite balconies on either side. (The large face visible in the museum entrance is a full-scale copper mask of the Statue of Liberty.) A second exhibit, the older American Museum of Immigration, occupies the next level. *Grace Anderson*

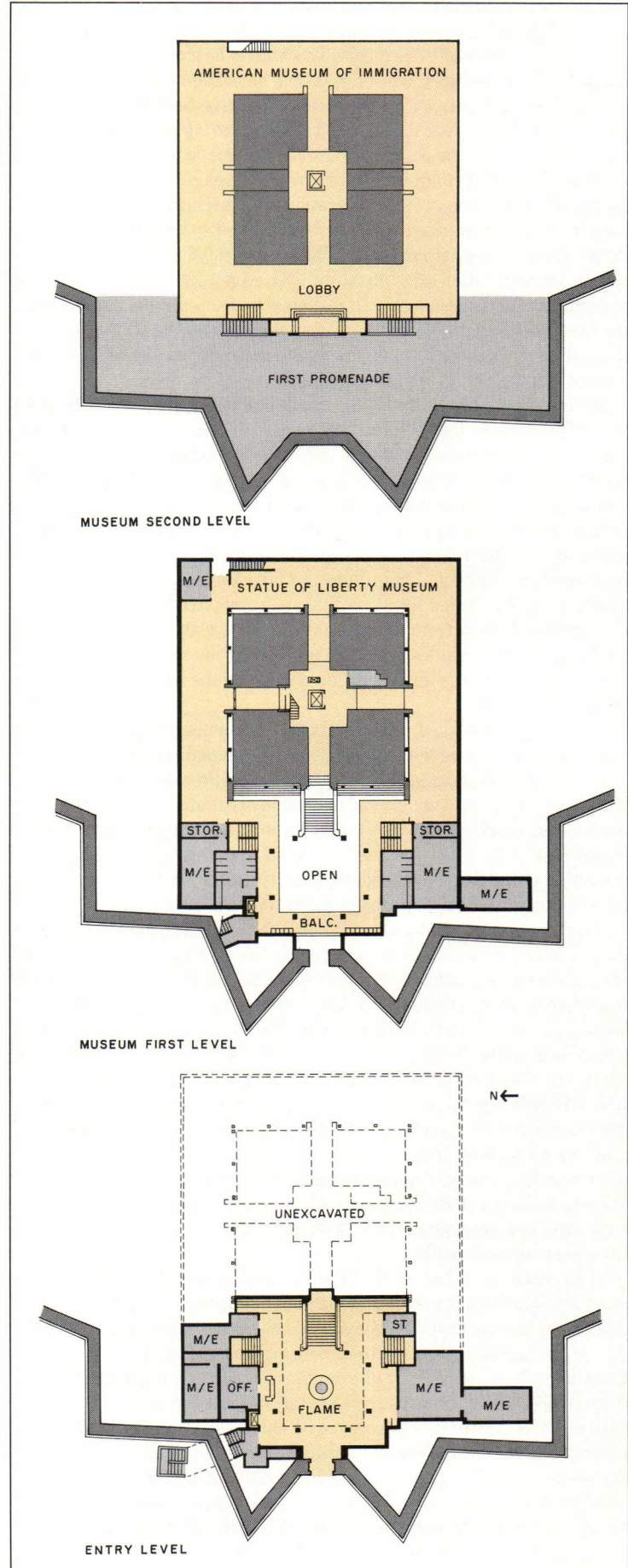
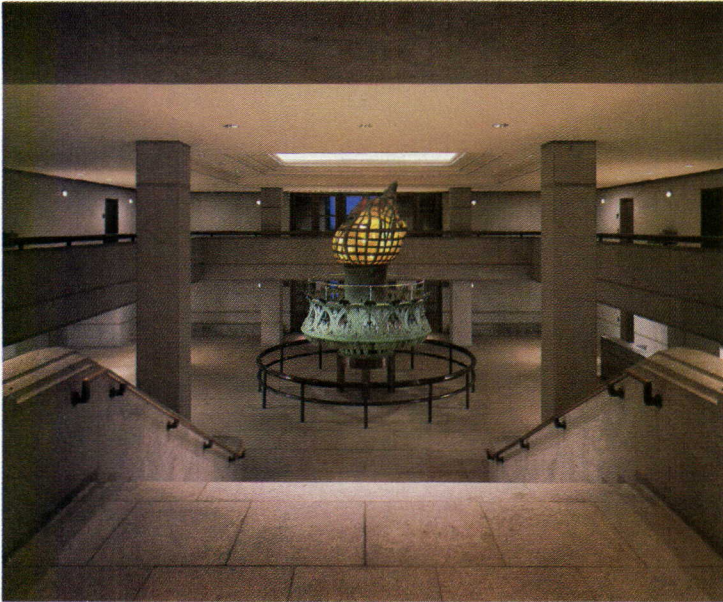


The new Statue of Liberty Exhibit displays not only replicas of the sculpture's face and foot (bottom left) but structural artifacts like framing bars, rippling iron armatures, and copper rivets and saddles, all replaced in the restoration, as well as a stupefying variety of advertisements and souvenir figurines made during the last hundred years. The most familiar artifact is the old glass and

copper flame, now replaced by a leaner, more authentic gold-leafed flame but occupying a position of symbolic honor at the center of the entry lobby (directly below). Perhaps the most appealing exhibit in Swanke Hayden Connell's museumlike interior of the pedestal, however, is the old but newly revealed and dramatized structural engineering, showing both the imagination of Eiffel and the vigor

of 19th-century workmanship. Visitors willing to take stairs instead of the elevator now have well-lighted close-up views of the pedestal's structural parts. The steel cables seen opposite tie two sets of dunnage beams that wrap around the elevator shaft (see also section on page 102); the girders and ties stiffen the upper half of the pedestal against overturning forces transmitted by the tall exposed statue. The energetic

tourist who climbs the pedestal also gets a vastly improved stairway, with nonslip stainless-steel treads and nosings and stainless-steel balustrades. The stairways are pulled away from the walls, allowing uninterrupted light to wash the surface of the concrete.

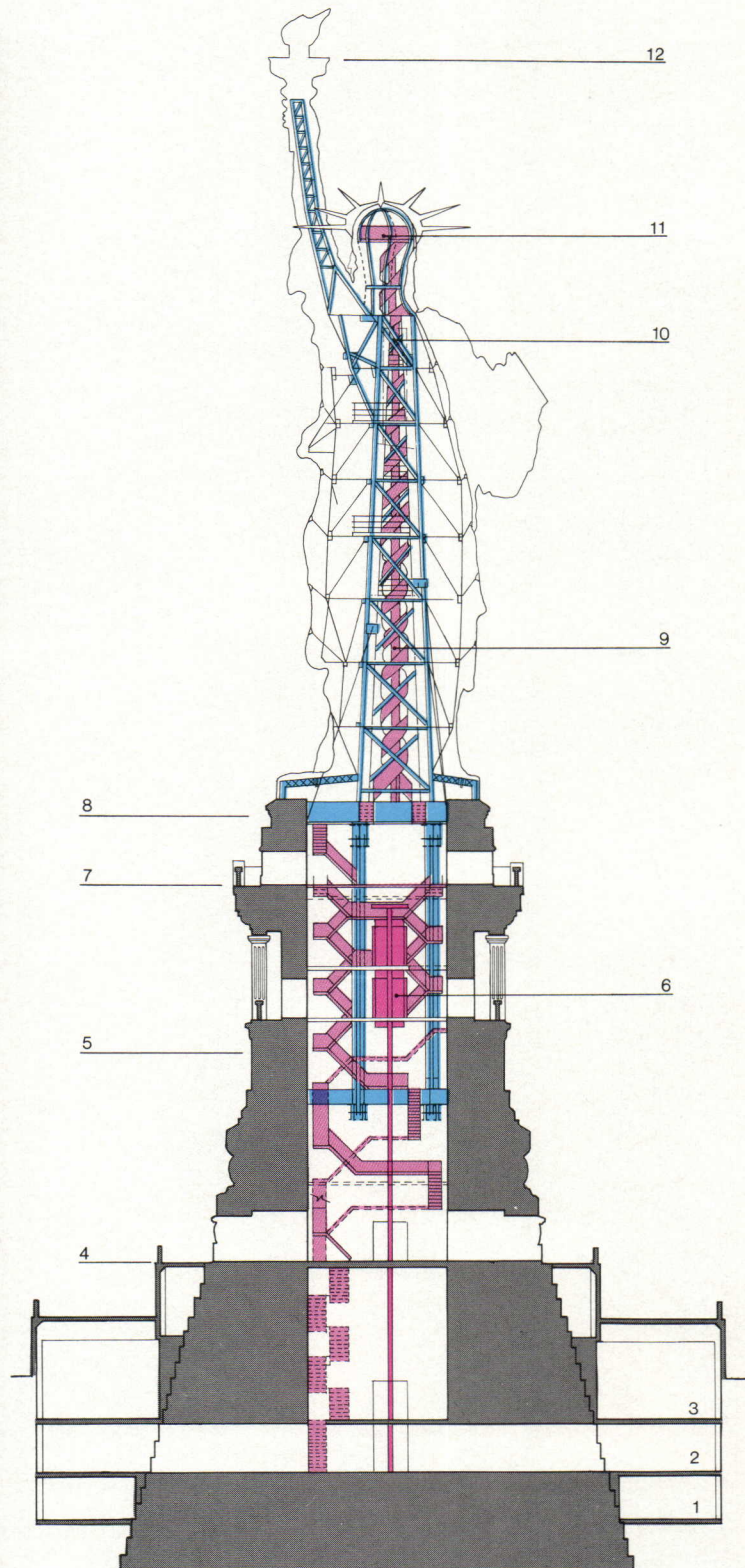




Up Only

Also newly revealed and dramatized are the inside of the statue's drapery (bottom), along with Eiffel's support for that structure (opposite), all of these things formerly obscured by bad lighting and a white expanded-metal cylinder that encased the double-spiral stairway. The new 95.5-foot-high hydraulic elevator in the pedestal (directly below) has two cabs to allow simultaneous loading for up and down circulation. Lighting

for the glass-walled elevators was designed to encourage admiration of the pedestal's interior: the cabs' ceiling lights turn on only when the elevator stops, while the strong exterior lights illuminate the concrete walls and steel cables when the elevator is in motion. Swanke Hayden Connell also redesigned the viewing platform at the crown.



Statue of Liberty
Liberty Island, New York

Owner:
National Park Service

Architects:
Swanke Hayden Connell
Architects—Richard Seth Hayden,
managing principal; Robert
Landsman, project director;
Dominic Scali, job captain
Associated architects:
The Office of Thierry W. Despont

Engineers:
Amman & Whitney (structural/
mechanical); W. A. Digiacommo
Associates (mechanical/electrical
for the museum)

Consultants:
Howard Brandston Lighting Design,
Inc. (lighting); John A. Van Deusen
and Associates, Inc. (elevators)

Construction Management:
Lehrer/McGovern

- | | |
|-------------------------|------------------------|
| 1. Entry | 7. Balcony |
| 2. Museum I | 8. Mezzanine |
| 3. Museum II | 9. Helical stair |
| 4. Promenade | 10. Emergency elevator |
| 5. Colonnade | 11. Crown platform |
| 6. Double-deck elevator | 12. Torch |



independently or together.

The second level, spanning old and new wings, has tall ceilings following the roof lines, and is devoted to what used to be the all-encompassing function of libraries: books (there are open stacks here for up to 100,000 volumes)—and, of course, well-lighted places to read, study, and work with those volumes. Both in design and function, this relatively small center deftly merges familiar ways with a good dollop of innovation. *Herbert L. Smith, Jr.*

Richardsonian recalls

A variety of emphatic, Richardsonsque fenestration, set into the sweeping slate roofs sheltering the second floor, enlivens the design of the new addition, both within and without. It also forms bright focal points for lounge-like

reading areas flanking the central

range of open book stacks, as can be seen in the photos directly below. Soft colors (Postmodernish, but with considerable Mauve Decade

overtones), and good artificial lighting, add much to the pleasant comfort of the spaces. Between the lounges are ranged a number of red-oak study tables and carrels, and a small music-listening area is placed in a corner beneath the flat, wide

curve of the eyebrow window. Roof-

hugging ceilings, which follow the gables and slopes, add three-dimensional interest to the loft-like space. A skylight tops the bend in the



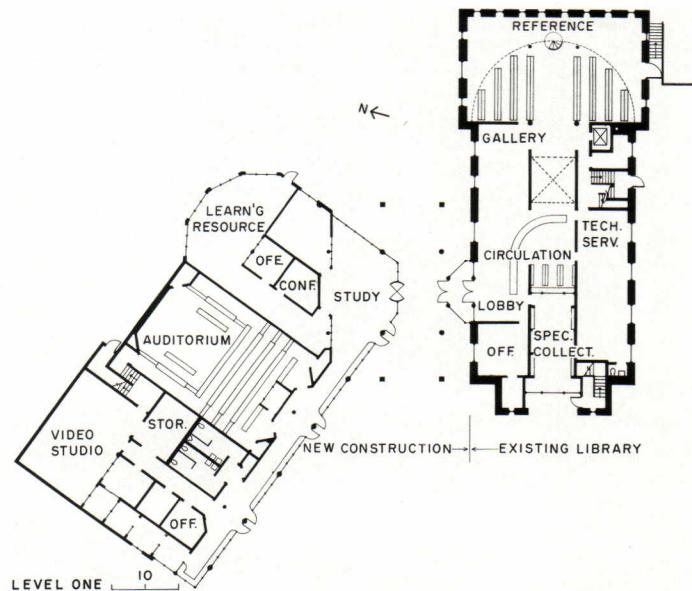
plan. As can also be seen in the plan (page 109), a series of small conference and seminar rooms are banked along one wall of the new addition, with several grouped to form a low, multisided, and peak-roofed turret—a design device that delighted the nostalgic Victorians, and gives a visual focus for the otherwise neutral, shingled rear elevation of the new wing. The interiors of the first floor of the

addition—TV and radio station, multimedia auditorium, learning resource center—are all designed in a soft-spoken, contemporary fashion, befitting their up-to-the-minute functions within the rather timeless structure. The open walk separating the original coach house and stable from the new wing serves as a commodious entrance to the two sections, and as a connecting passage to other buildings of the campus.



In renovating the existing coach house, strong emphasis has been made of the structures of the original ceilings, and of the wide variety of square-paned fenestration. Added light has been brought into the center of the building by creating a small, skylighted atrium (photo below left) above part of the new gallery. The original stable area, now the reference center (below), retains its tall, timber-arched ceiling and

punctuations of little windows that were originally for the horse stalls. A mezzanine, reached by a spiral metal stairway, has been inserted—much in the manner of some of Richardson's own 19th-century libraries. In the masonry-vaulted basement under the stable, a computer center supplements reference facilities. Glass blocks echo square-paned windows in all these areas.



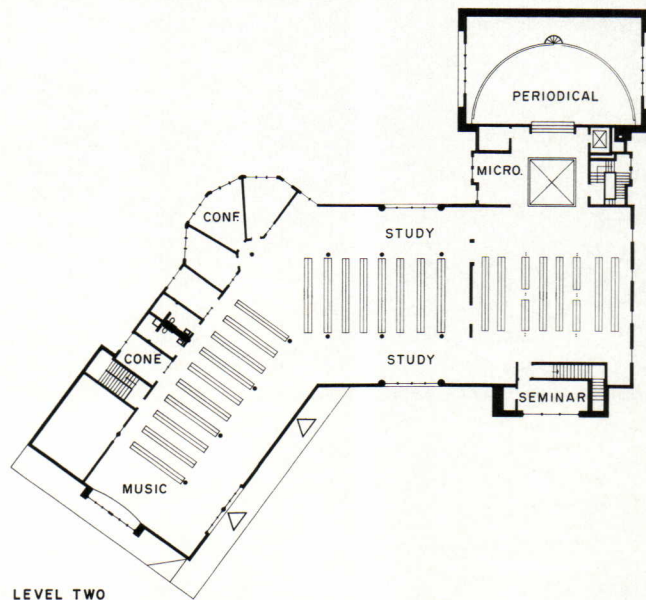
Annenberg Library and
Communications Center
Pine Manor College
Chestnut Hill, Massachusetts

Owner:
Pine Manor College

Architects:
Shepley Bulfinch Richardson
and Abbott—Geoffrey T. Freeman,
principal-in-charge; Paul Sun,
project designer; John Kuipers,
Bill Mead, project architects

Engineers:
Fitzmeyer & Tocci (hvac, plumbing);
Johnson & Stover (electrical);
Abraham Woolf & Associates
(structural)

General contractor:
Gourdeau Construction Co.



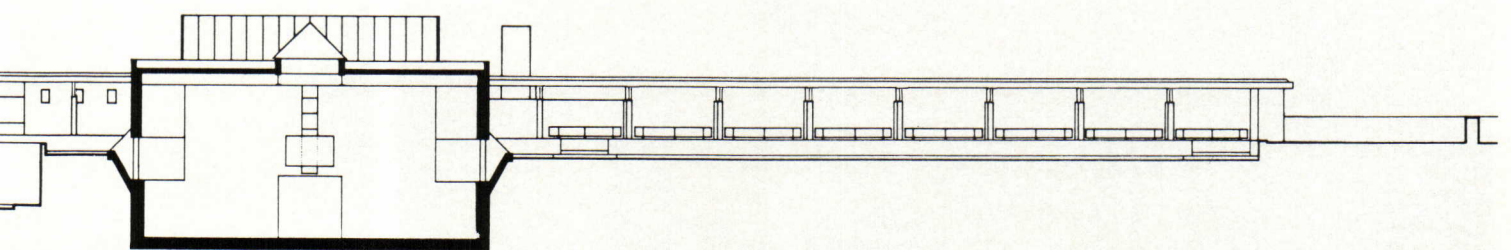
LEVEL TWO

Architects of the Ticino





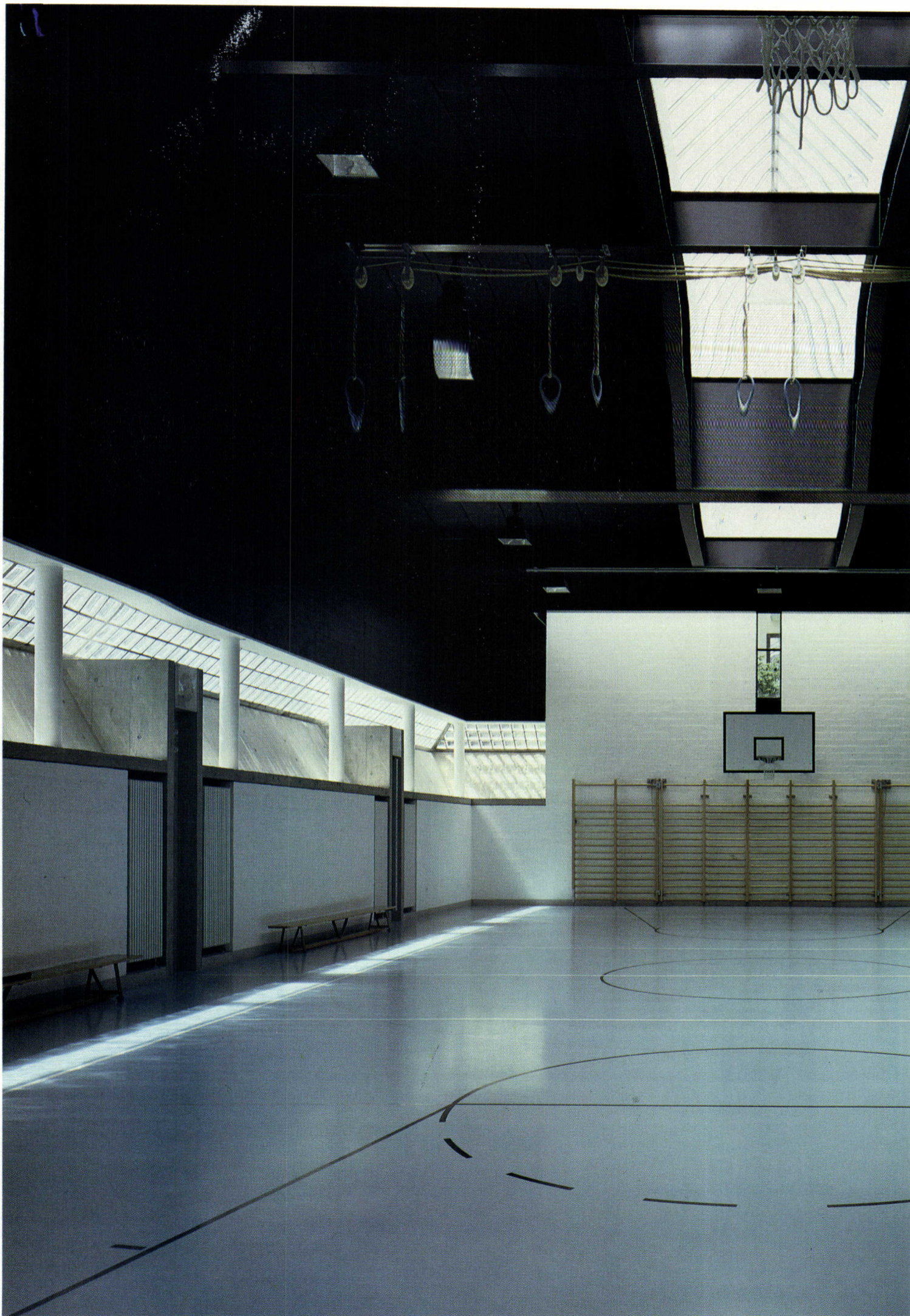
designed facade as such.



Much of what makes the gymnasium an outstanding work is the architect's profound sensibility for, and devotion to, the materials and processes of construction. As he has stated: "My training makes it impossible for me to conceive of an 'idea of architecture' in any other way than by construction. In fact, all of my attempts to approach the significance of architecture were based upon observations and

experiences made during the design process, in particular my attempt to solve construction problems. In construction practice, for example, there are recurring themes: the roof, the openings, how the building is supported by the terrain, etc. All of these elements of a building, which define its relationship to 'nature,' are in fact extremely complex. This is true on the technical level alone These difficulties indicate

basic problems affecting the very nature of architecture." From the expression of material and craft on the exterior, to the care taken in lighting and detailing an interior corridor (far right, middle photo), Snozzi's keen interest in construction rises above the merely technical to support a fully conceived, truly rich architecture.



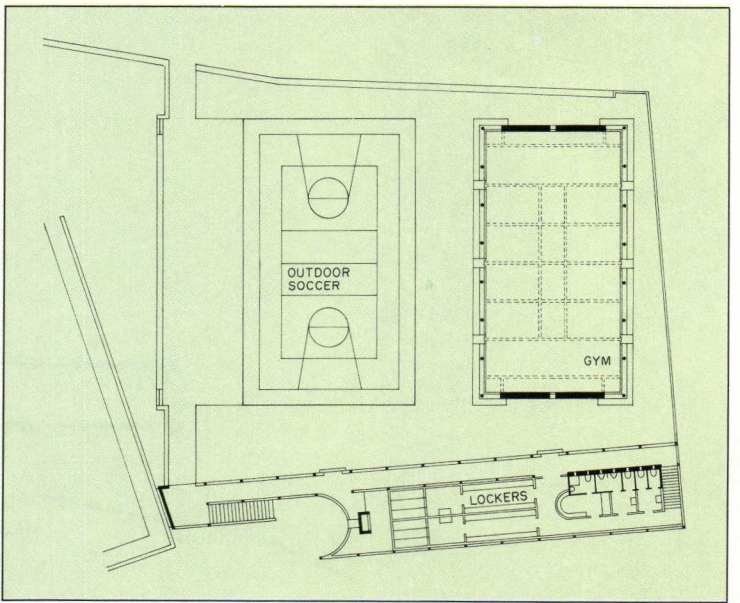
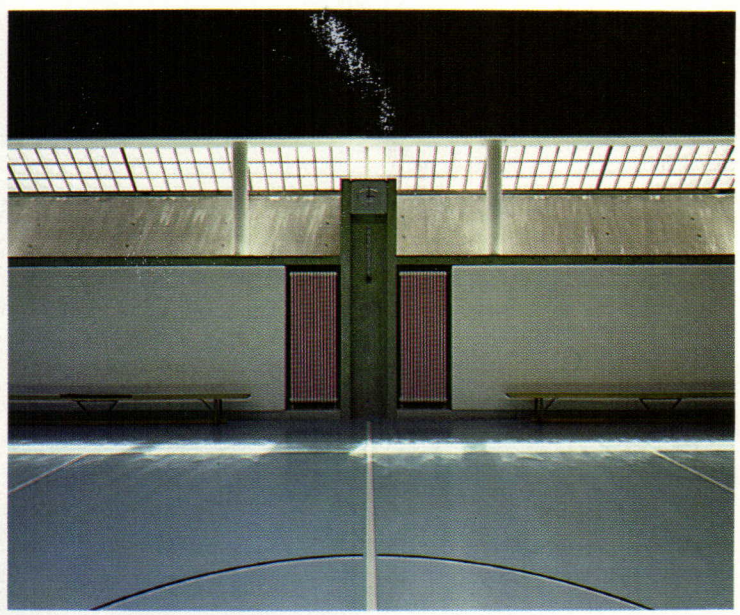
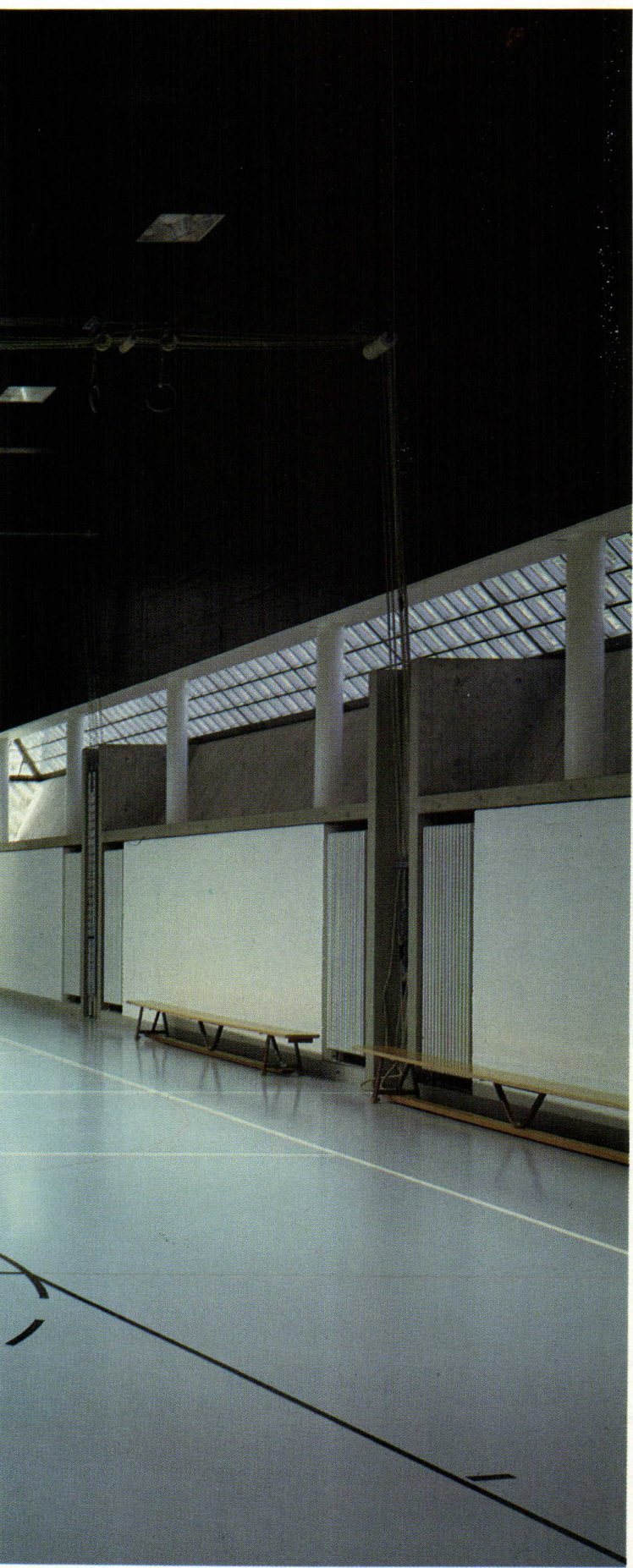
Monte Carasso Gymnasium
Monte Carasso, Switzerland

Owner:
Commune di Monte Carasso

Architects:
Luigi Snozzi; Walter Von Eww,
Michele Arnabolbi, Matteo Bahler,
Claudio Buetti, Raffaele Cavadini,
and Giuliano Mazzi, project team

Engineers:
Filippini and Balmelli (structural);
Visani Talleri (hvac)

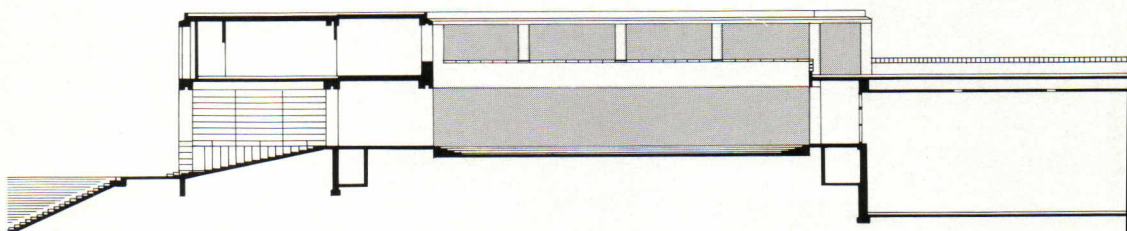
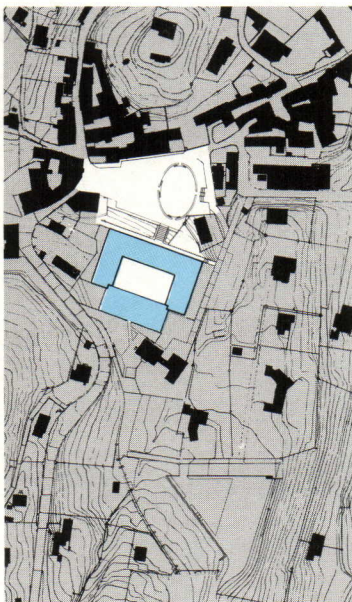
Contractor:
Guizotti



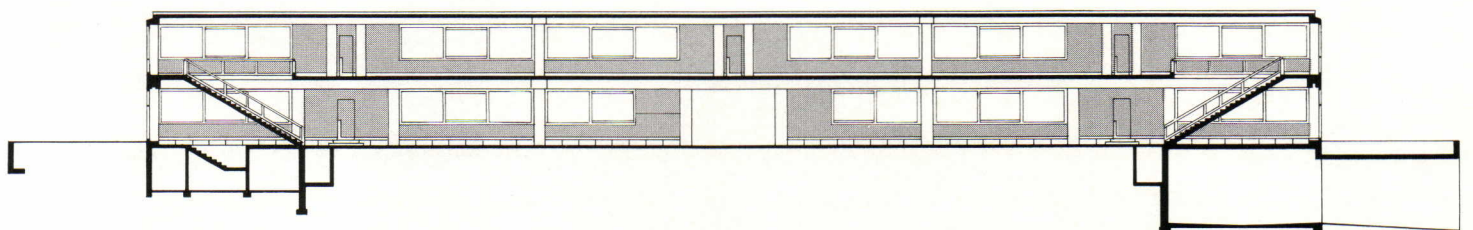
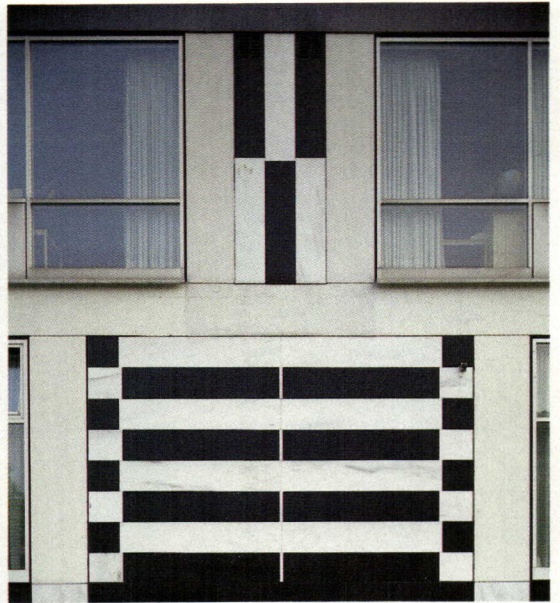
Relating the parts

"To build means to ascertain the relationship between things and try to illuminate them," states Livio Vacchini. The architect's design for the public elementary school in Montagnola does just that, from its formalistic role in the existing built environment, to the way in which connections are detailed between metal and wood. The school relates itself to the village by enclosing a previously ill-defined piazza (site plan) with a confident, spirited facade. The school's courtyard which, like the piazza, serves as an outdoor room for the village, is directly linked with the piazza by a broad portal atop a cascade of stairs that bridges the two (section below and lower photo, opposite page). The courtyard is related to the classrooms with the intervening layer of space held within the circumventing gallery (page 120). Thus, within the embrace of a simple building, classrooms are related to the central courtyard, which are in turn united with the community at the piazza.

Vacchini's work shows a clear inclination toward axuality and symmetry. The architect employs axuality, asserting that it allows him to express a single motif (the courtyard in the case of the school) with simple means. Furthermore, axial arrangements organize the spatial succession of solids and voids into a sequence possessing an overall sense of calm. With the compositional device of symmetry, optical equilibrium is achieved within compositions that incorporate a wide variety of materials and details. Vacchini admits that the precise discipline of symmetry does not guarantee success, but states that though "... the need for variety is perfectly legitimate, one must not forget that the 'one' precedes the 'multiple.'"



Elementary School
Montagnola, Switzerland
Livio Vacchini, Architect

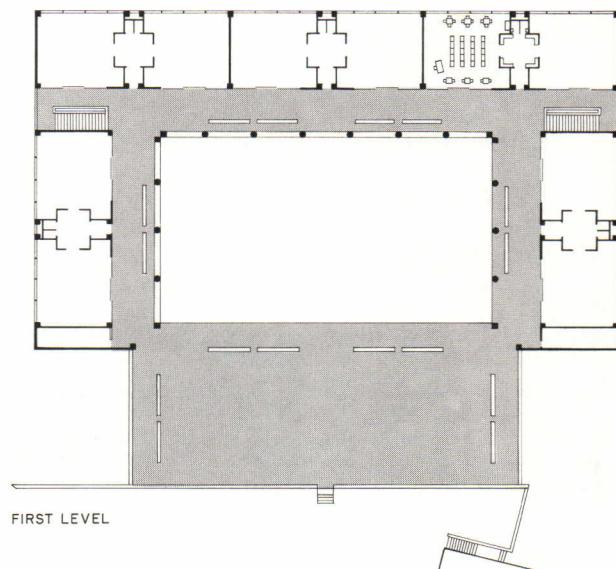


The elementary school at Montagnola is Vacchini's first project to incorporate poured-in-place concrete. Formerly he has used rolled steel, profiled steel plates, prefabricated concrete, wood, and plastic. In fact, he has never repeated the means of construction of one project in another. Rather, each commission is taken as a fresh opportunity to think about a given material with respect to its density

and physical weight. A material's sense of gravity, as perceived by the architect, will in turn influence the overall design of a project. Thus, the elementary school's concrete frame favors the horizontal proportions of a heavy structure being pulled toward the earth. Yet, the strength of the reinforced concrete to resist gravity is clearly expressed in the deep, long-span beams that ring the courtyard while

supporting round columns (opposite). Various pavement and finish materials bring patterns, color, and an overall sense of precision to the building. The articulated concrete frame in the piazza facade (118-119) is infilled with metal panels, black and white marble revetment, and glass. The courtyard is paved with granite, and the roof of the gymnasium, which provides a terrace for the school's

outdoor activities, incorporates terra cotta and buff-colored cement pavers (top left photo, opposite page). Classrooms are softened with wood floors and paneled walls (bottom right photo, opposite page). Lest wood at entrances get soiled by little hands, a band of metal is attached, energizing the tactile qualities of the contrasting materials (bottom left photo, opposite page).

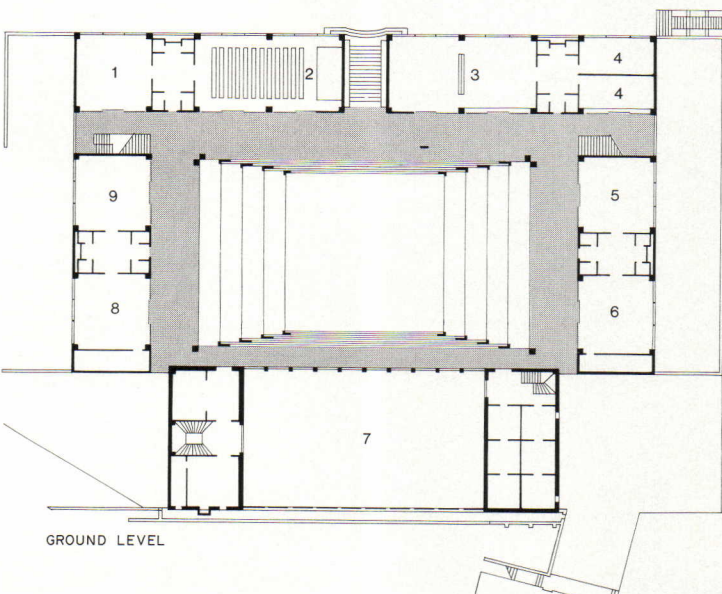


*Elementary School
Montagnola, Switzerland*

Owner:
*Consorzio Scolastico Montagnola,
Agra, Gentilino*

Architects:
*Livio Vacchini; C. Bodmer,
G. Lotterio, and M. Vanetti,
project team*

Engineers:
*Gini and Prada, S. A. (structural);
Roberto Piona (electrical); Marelli
and Manzoni (heating); Sergio
Rusconi (sanitary and ventilation)*



1. Meeting room
2. Assembly hall
3. Library
4. Office
5. Physical therapy room
6. Exercise room
7. Gymnasium
8. Boys' workshop
9. Girls' workshop

Assertive interventions

The public middle school is Gian-Carlo Durish's second intervention in the medieval village of Riva San Vitale. Several years prior to the school's construction, the architect built a house for himself. The residence's distinctly nonvernacular geometry—a concrete cube cut diagonally into two triangles—is shown above and to the right of the middle school in the site plan (opposite page). Like the house, Durish's school stands in stark contrast with the village vernacular. It also stands aloof with regard to adjacencies. Pulled away from the center of town, it distances itself with a broad lawn, standing fortress-like in the landscape. By detaching his project from the historic townscape, the architect confidently makes an intervention that is forthrightly modern and, by virtue of siting, justifiably self-referential. The exterior aspect of the architecture follows the design prerogative held by all the Ticinese architects: namely, strong landscapes demand strong buildings so that the power of each is magnified.

The school is comprised of four rectangular classroom blocks, each three stories high, and connected by a gridwork of glass at their corners (plan and atrium photo, opposite page). In keeping with the stern exterior, the concrete atrium interior has no finish material or detail to soften the building fabric. Instead, the central space is delineated by the lines of the concrete frame, waffle slab, and pavement pattern; and is rendered by light that enters at the four corners of the square, and by ocular skylights diagonal to the corners.

The middle school, particularly the atrium, is used by the community-at-large for a variety of civic events. The weekend I visited the village, a festival was underway at the school. Adults and children were freely moving between the grounds and the atrium, where tables were set up and food was being served. As tough as the building may seem, when graced with the life it was designed to support, it assumes a wonderfully benign presence.

*Middle School
Riva San Vitale*

Owner:

Canton of Ticino

Architects:

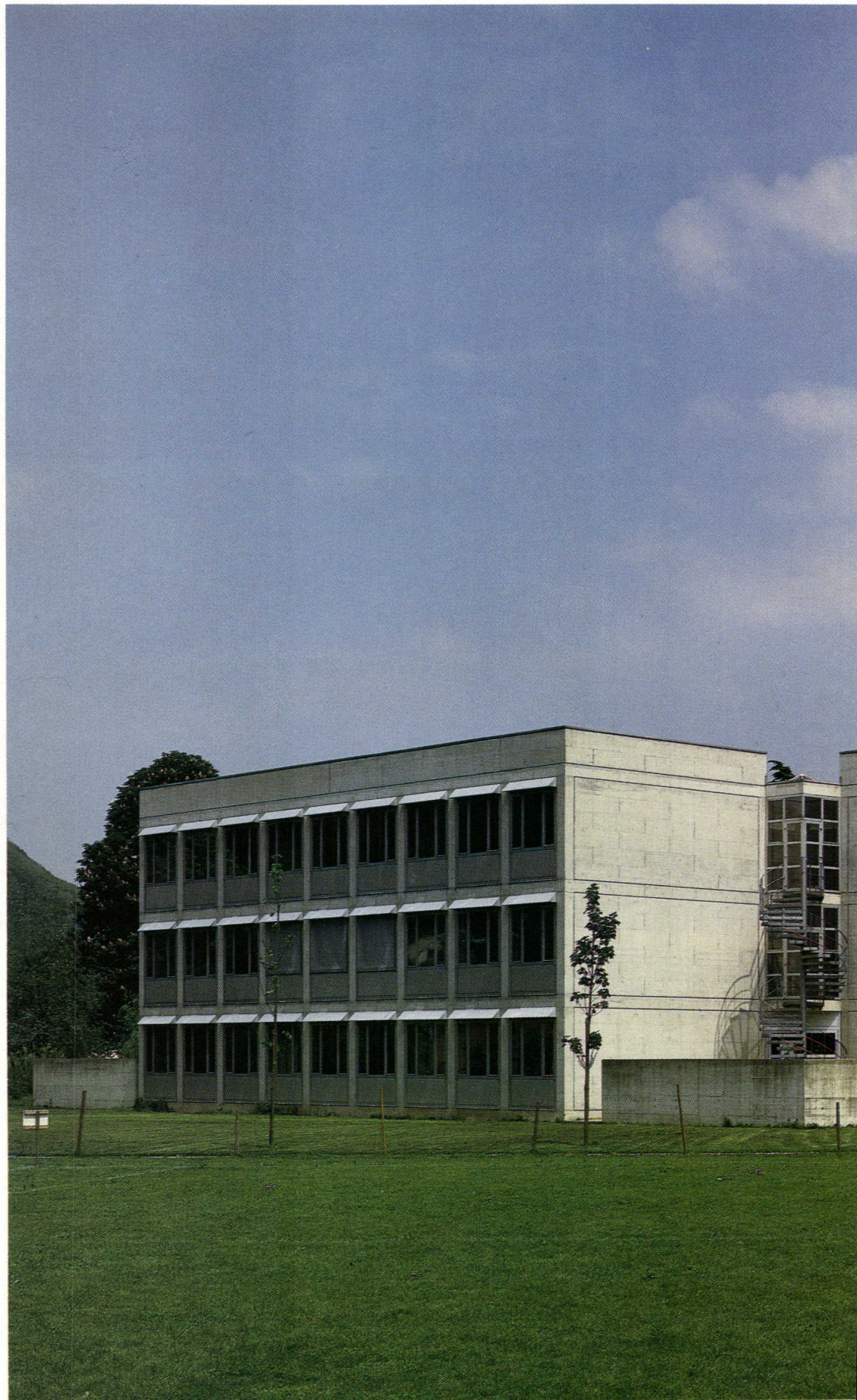
*Gian-Carlo Durish
with Renato DeMarchi*

Engineers:

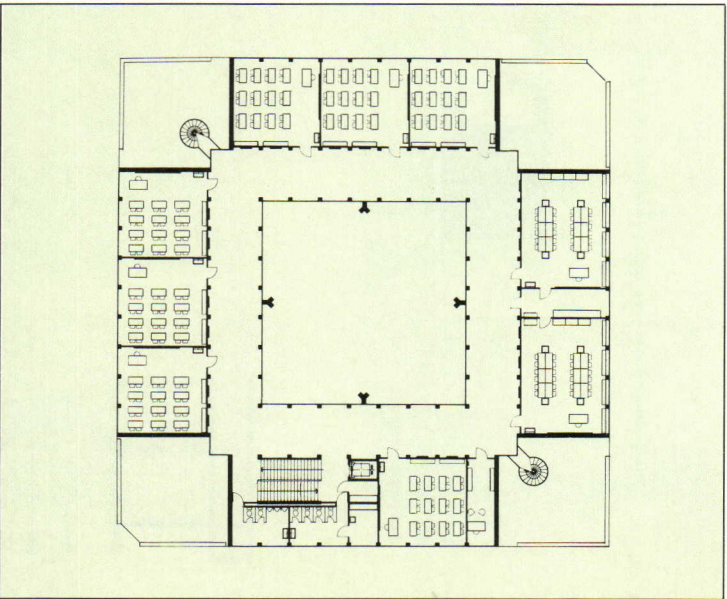
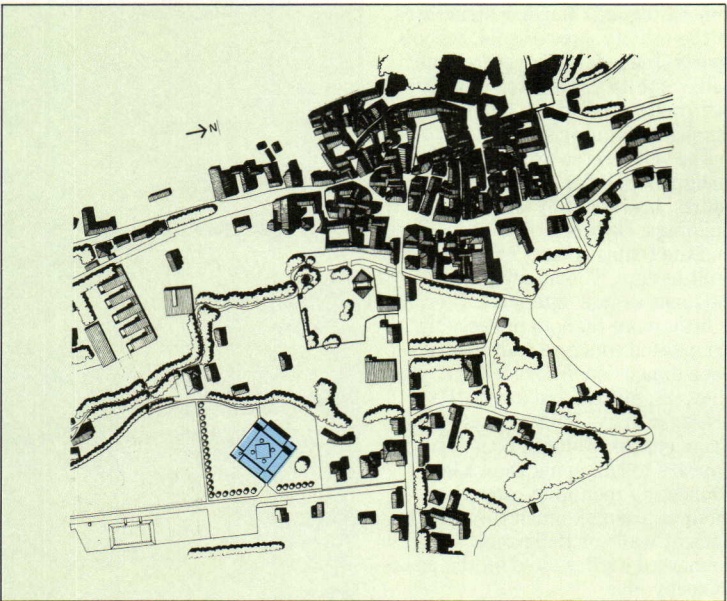
*Mantegazza and Cattaneo
(structural); Mario Pontiggio
(electrical); Studio Roberto
Modena (hvac)*

Contractor:

Barella, S. A.



Middle School
Riva San Vitale, Switzerland
Gian-Carlo Durisch, Architect

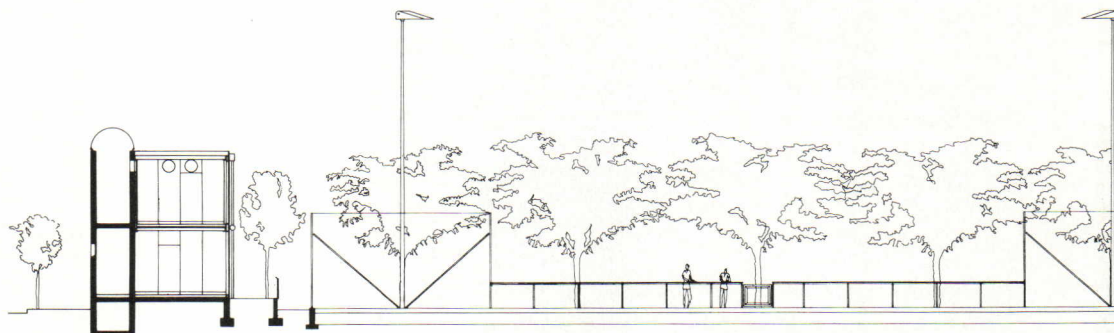
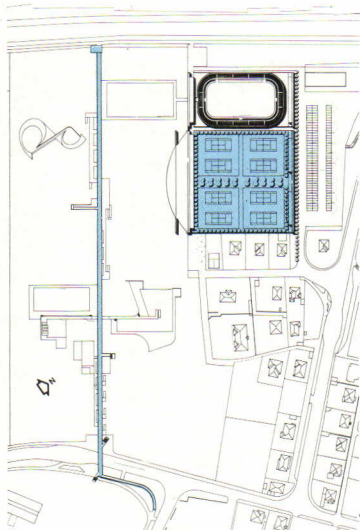


Uniting walls

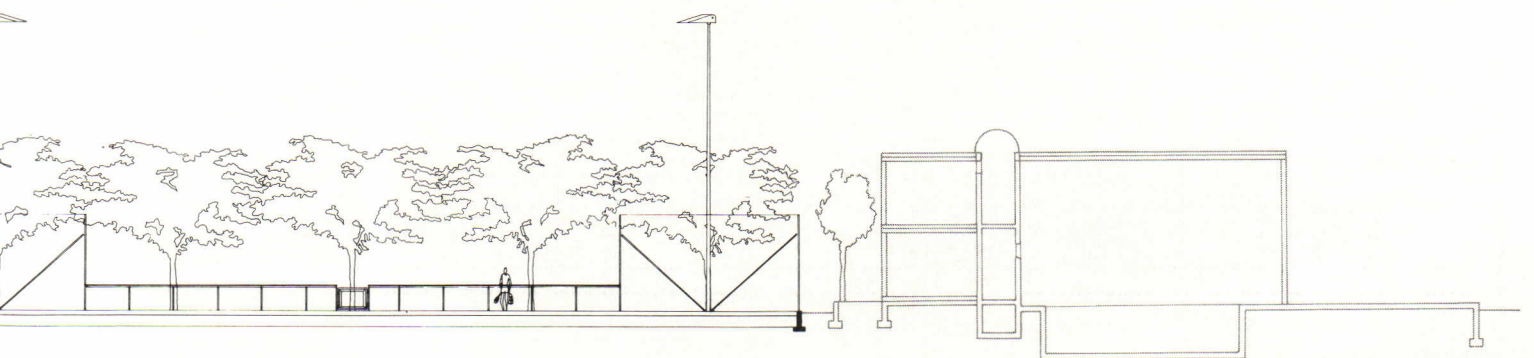
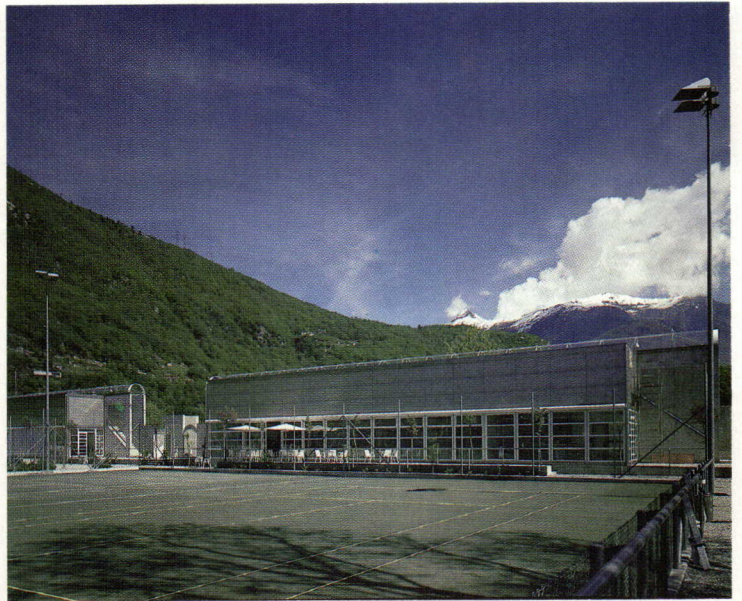
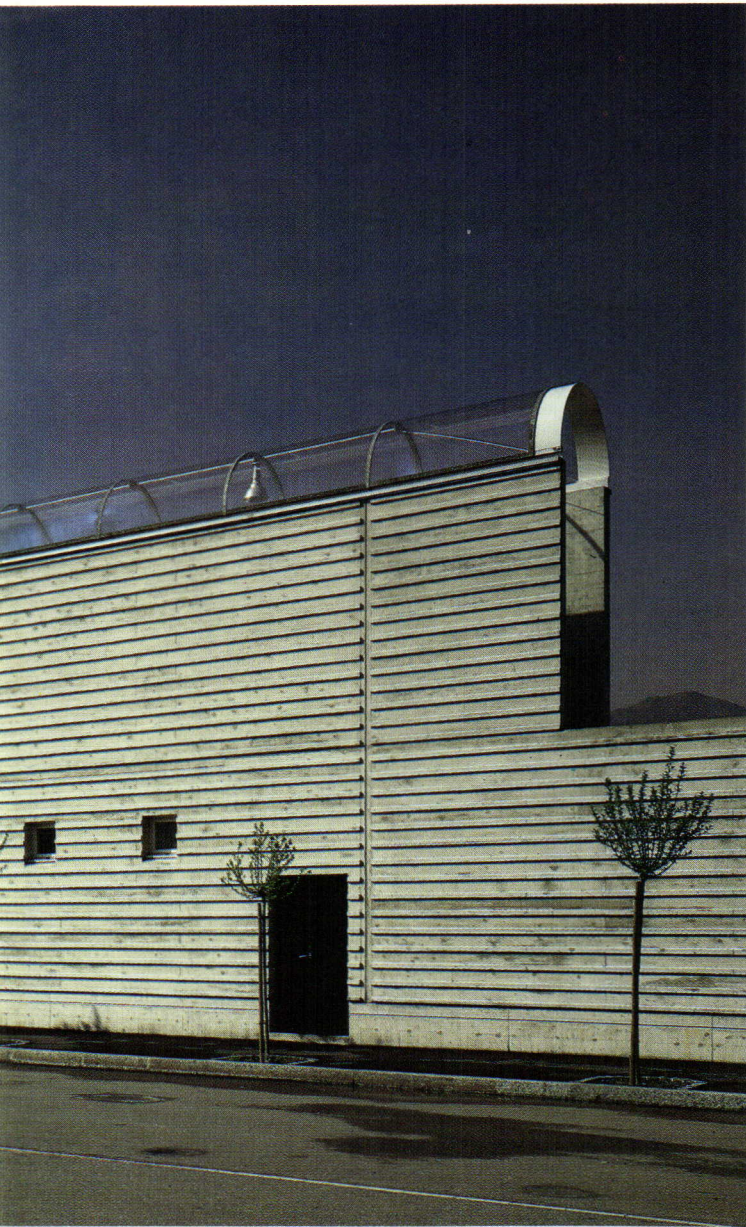
Bellinzona is heir to a magnificent network of medieval fortification walls that climb up and down steep hills, connecting three castles. These walls define the original town center. North of the old town, near the banks of the Ticino River, Aurelio Galfetti has designed a modern network of walls that reinterprets a local tradition.

His efforts to develop an extended complex of new urban walls began in 1970 with the completion of an outdoor public bathing facility (site plan below). Roughly 450 yards long, four major swimming areas branch off the central spine. The design addressed a range of urbanistic concerns. The town was threatened with losing its connection to the river due to the construction of a two-lane expressway. Like a long, low bridge, the bathing establishment reaffirmed the connection. Also, the facility was intended as a generating axis for new structures in the vicinity: apartments, schools, sports. Indeed, houses were built, and, some 15 years later Galfetti returned to the site to build a new municipal tennis center.

The scheme the architect designed includes eight tennis courts, bracketed by wall-like buildings. Only one of the buildings, and the tennis courts, have been built to date. The building is as eloquent as it is ingenious. It really is little more than an impeccably articulated concrete wall that has been dimensioned for locker rooms, showers, offices, and a café. Its presence in the landscape is strong. From certain vantage points, it appears to run along the valley, connecting mountain range to mountain range, much the way the ancient walls of Bellinzona connected castles sited on the peaks of rocky hills.

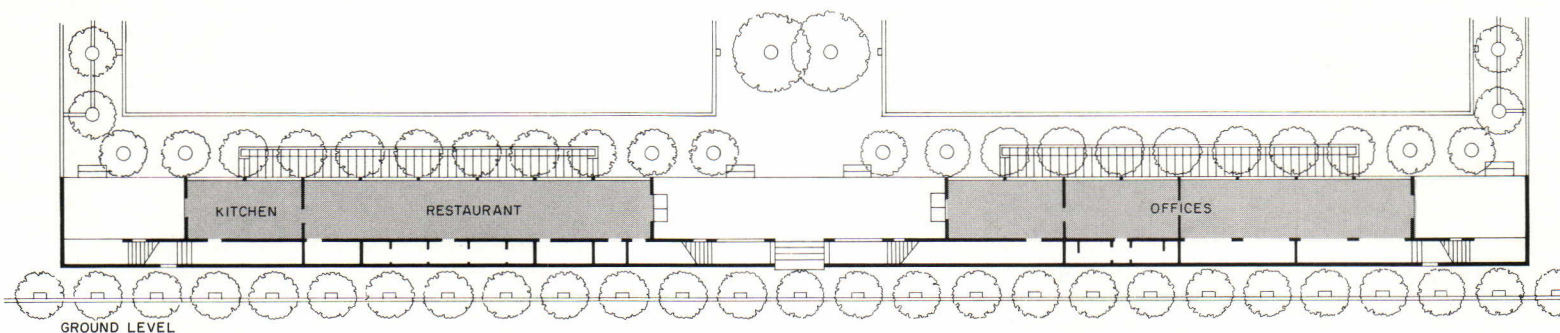
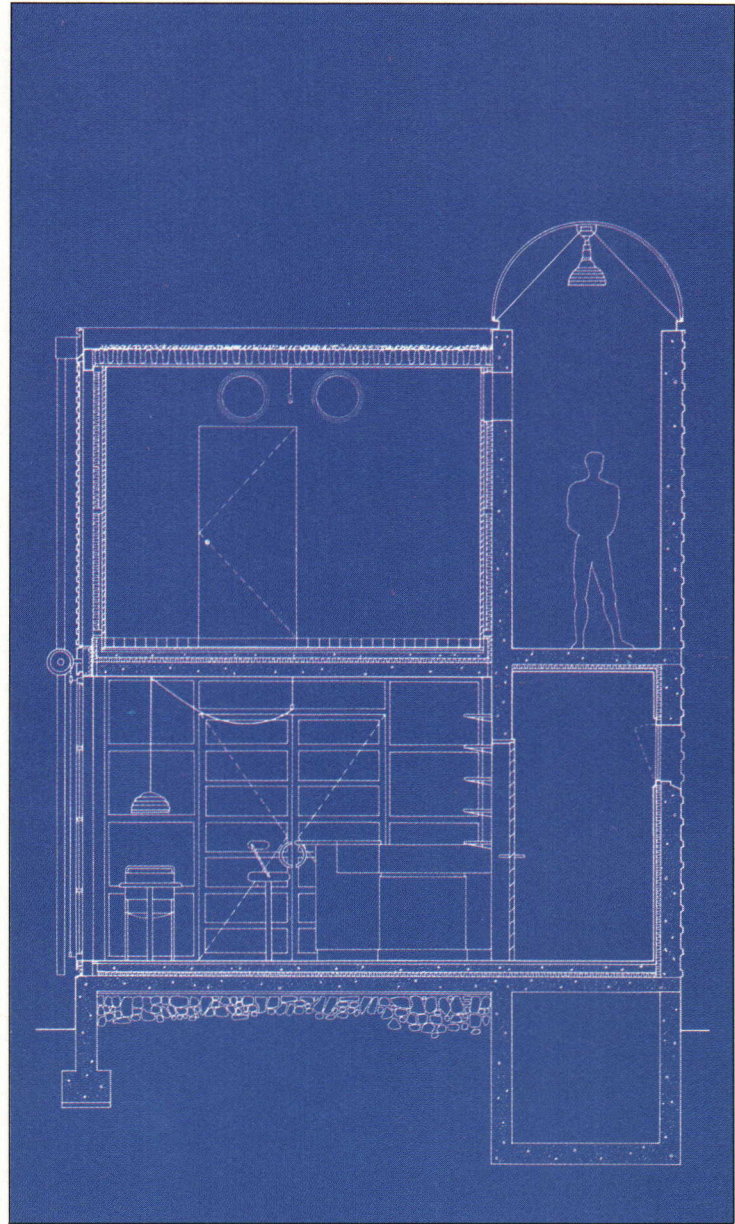


Municipal Tennis Facility
Bellinzona, Switzerland
Aurelio Galfetti, Architect



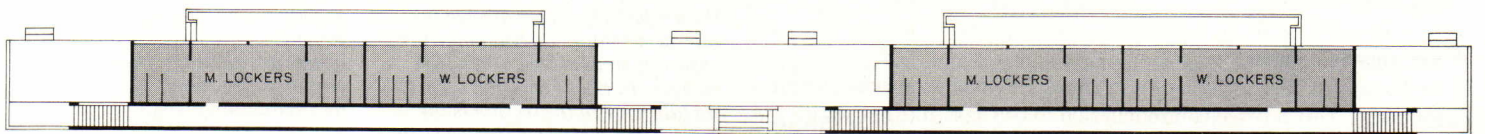
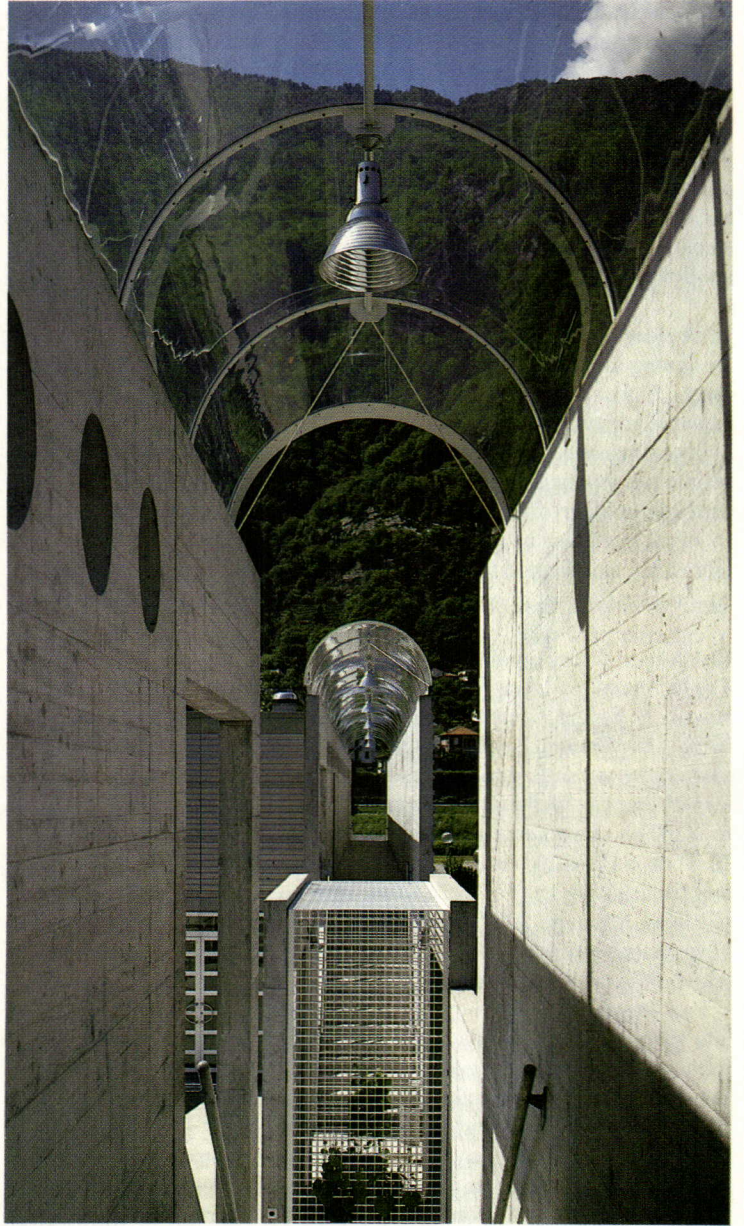
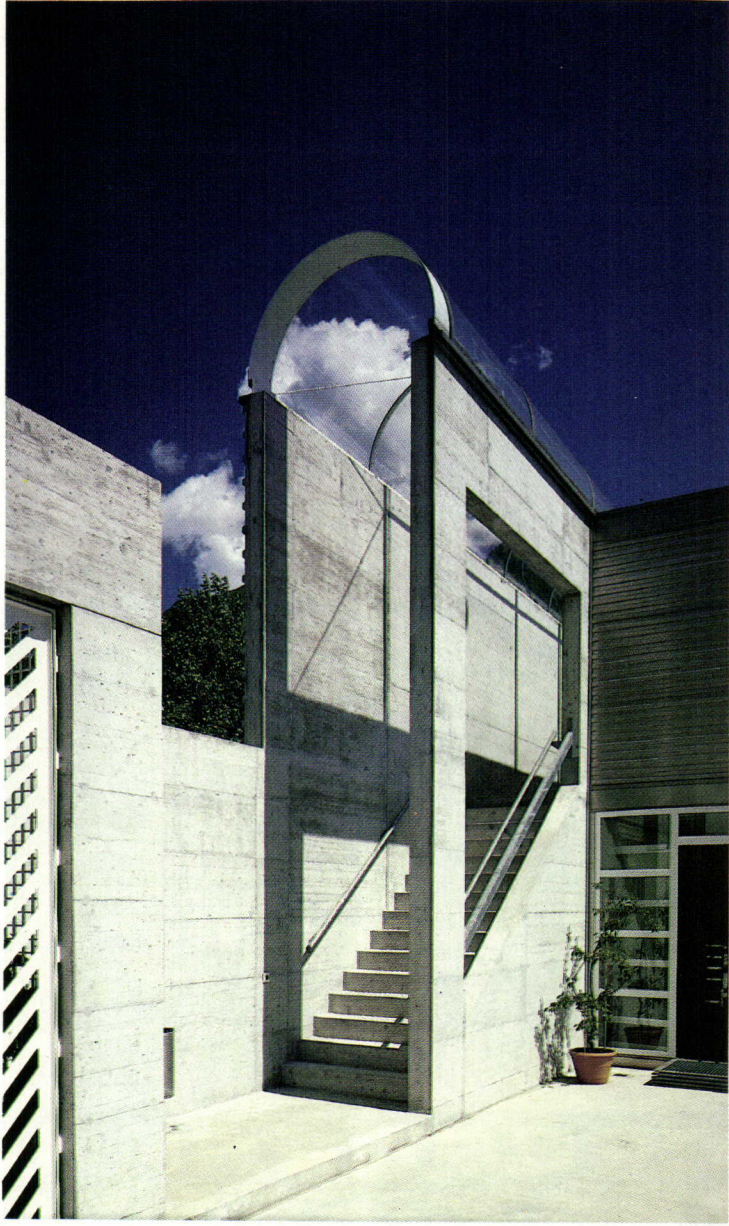
Aurelio Galfetti's municipal tennis facility proceeded from two clear and simple concepts: the building should form a boundary to the complex, and the building should be a hollowed wall in which its functions are housed. On the ground floor of the "hollowed wall" are offices, storage, a café, and pro shop (see plan below and café interior, page 125). Above are changing rooms, lavatories, and showers. A

circulation spine facing the entrance side is vaulted with plexiglass on the upper level. The concrete work, infill, and finishes are a marvel, which speak of both the care with which the architect detailed the building fabric and the precision of execution Swiss contractors bring to design. The role of architect as master builder remains the norm in Switzerland. In part, the Swiss system continues to work because quality in the



construction of building (regardless of the quality of design) is a point of national pride. Builders view themselves, and are viewed, as artisans. Certainly the tennis center is an inspired collaboration between a design that considers materials and details, and building trades that can make those considerations sing.

*Municipal Tennis Facility
Bellinzona, Switzerland*
Owner:
Commune di Bellinzona
Architect:
Aurelio Galfetti
Contractor:
Renato Antonini, S. A.



FIRST LEVEL

Due to inexperience, it cost \$600,000 and took almost four months on site to balance the hvac system in one facility

filtration system is considered sufficient for Class 100 to Class 100,000 clean rooms and is satisfactory for pharmaceutical manufacturing. To reach the degree of sophistication required to remove 0.12-micron-size particles, which can hamper production of highly sensitive microelectronics components, an ultra-low penetration air (ULPA) filter operating at an efficiency rating of 99.9995 percent is required. (ULPA filters are also called very large-scale integration filters, or VLSI.)

HEPA or ULPA filters are used in two basic ways: to cover an entire ceiling or only the exposed work areas (see illustrations, page 133). The latter method is less expensive and—at least in the case of pharmaceutical manufacturing, where the work surfaces tend to be small—is the commonly preferred configuration. Supply air is introduced either through a plenum above a ceiling made up of HEPA or ULPA filters or via a large duct that feeds into separate filter hoods (again, see illustrations, page 133).

The role of airflow

High-quality filtration by itself isn't sufficient to ensure desired levels of cleanliness in work areas. The direction and velocity of the air as it enters, circulates, and exits the room are just as important. Regardless of whether the airflow patterns are normal or turbulent, the HEPA-filtered air can enter a room and mix with the pre-existing air, causing particles to be deposited on products being made in the room. When this happens, cleanliness is achieved by recycling the air until the harmful impurities and contaminants are removed.

For Class 100 or cleaner environments, a low-turbulence (or laminar-flow) air-handling system is required. In a laminar-flow system, the air moves in a unidirectional pattern that permits the particles liberated in the room to be carried away as quickly and directly as possible. Usually the air travels vertically from ceiling to floor, although it can move horizontally from one wall to another. It then exits either through a ducted, raised floor or through the lateral walls, returning to the filters through side wall chases (see illustrations, page 133).

A laminar-flow system is quite expensive. Les Rosenberg, head of the engineering department of Daniel, Mann, Johnson & Mendenhall in Los Angeles, says that where money is an object, a compromise is often reached whereby a laminar airflow is used over the exposed production area and nonlaminar flow is used in the circulation aisles.

As one might expect, the more frequently the air is changed—that is, pumped into the room and taken out—the cleaner it will become. In a Class 10 clean room with a 10-foot ceiling and a minimum air velocity of 90 fpm, the air will be changed approximately 540 times an hour. In a Class 100 room with the same ceiling height and air velocity, the air will be changed approximately 420 times an hour. By comparison, the air in a typical office building is changed about six times per hour.

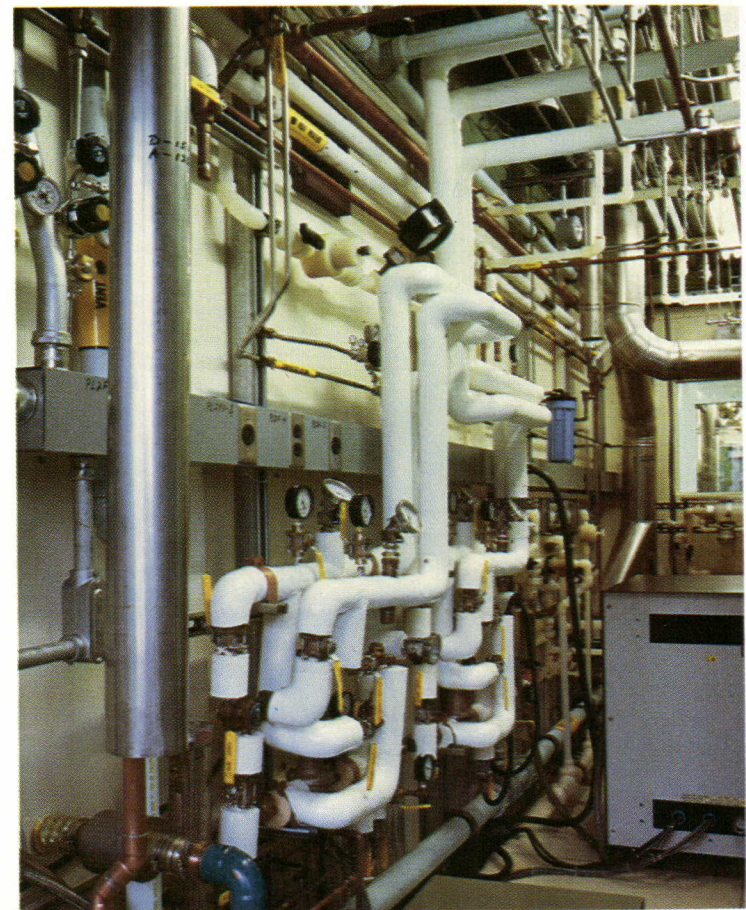
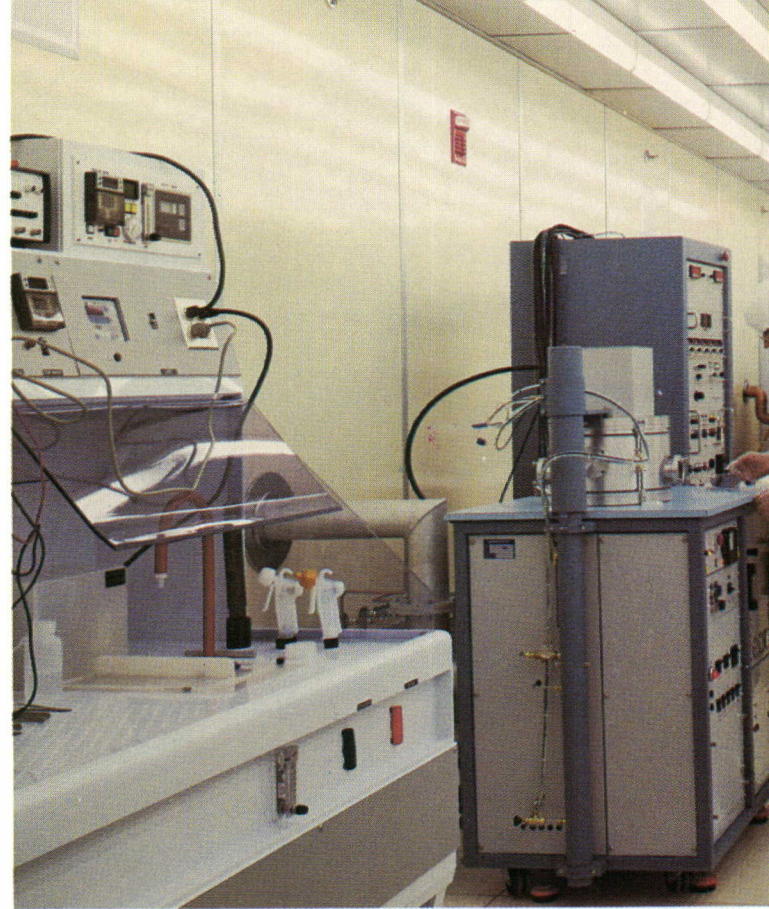
Air pressure in the clean room is kept higher than in adjacent service chases so that, if leakage occurs, dirty air will not infiltrate the sterile environment. To maintain high pressurization, replacement air representing 5 percent to 10 percent of the total clean-room air is continually added to the recirculated air.

Other criteria

Temperature and humidity controls are also important in establishing and maintaining optimal clean-room conditions, especially in the semiconductor industry. Temperature fluctuations can cause expansion and contraction of the wafer from which silicon chips are made. When this happens, it's impossible to properly align the mask, or stencil, used to map exquisitely fine geometric circuits onto the wafer. A constant ambient temperature, usually 68F, must be maintained in all the production areas.

Similarly, in most semiconductor clean rooms the relative humidity must be kept constant, though the moisture levels may vary between 35 percent and 50 percent from one room to another, depending upon the

Ralph Hutchins



Blake Prator photos, except as noted

The Sanders Associates's facility in Nashua, N. H., incorporates class 100 production areas designed by Symmes, Maini & McKee Associates, Cambridge, Mass. (top photo, below). HAPA filtered ceilings were specified with removable teardrop lighting fixtures. A demountable wall system, with panels running from floor to ceiling, simplifies retrofit installations. The lab's heat-welded, nonconductive vinyl floor

minimizes static, which will attract and attach dirt. At MIT's Microsystem Technology Laboratory, also engineered by Symmes, Maini & McKee, interior service aisles (bottom left) lie between clean rooms and are used as return air cores with individual gas exhausts. Deionized water piping (bottom right) also serves the MIT laboratory.



nature of the production process taking place there. Changes in humidity can cause deformations in the wafer, leading to misalignment of the mask. In addition, low humidity can cause electrostatic discharges that may short-circuit chips, while high humidity (above 60 percent) can produce rust in the equipment, a serious contaminant in itself.

Clean rooms used in the manufacture of microchips must be designed to be vibration-free. At the outset, the site of the plant should be carefully chosen. Make sure it's not near a railroad line or a busy highway. Floors and other structural elements should be solidly grounded. Concrete is commonly preferred over steel to achieve mass and stiffness, but roof structures made of steel can help reduce vibration that is generated in part by the powerful 40- to 125-hp fans needed to circulate large volumes of air.

The air-handling units should be isolated against the building, and all fans, even those incorporated into air-handling units, should have vibration absorbers. Vibration generated by noise and turbulence has to be eliminated effectively.

Overall, the trend is toward smaller clean rooms. "It's a matter of economics," says Mike Powers, director of project management at Symmes, Maini & McKee. Initial construction costs are exceedingly high—estimates run from \$350 to \$500 per sq ft for Class 10 clean rooms and adjacent Class 10,000 service chases, to \$1,000 or more per sq ft when hvac and other support areas are figured in. And the high cost of the energy needed to circulate huge volumes of air throughout the workplace has also fueled the movement toward miniaturization.

Notwithstanding this across-the-board trend, there are differences between the designs of clean rooms for the semiconductor and the pharmaceutical industries. Production equipment tends to be smaller in the pharmaceutical industry, and the production process itself is composed of a series of discrete steps, in which the product is exposed to the air only for a brief time. For example, a sterile liquid is exposed to room conditions only when it is transferred from the sterile piping through which it travels to a container, and when it is capped. Usually only the small work areas where the product is exposed have to be Class 100; the surrounding areas may be less clean.

To prevent drugs from being put into the wrong bottles by mistake, the U. S. Food and Drug Administration (FDA) has prohibited the processing of more than one drug in a given work space. Therefore, the typical configuration of manufacturing operations in the industry is a network of small rooms, each approximately 800 sq ft in area. Because the air return for these rooms is usually in the side walls, their width is limited to approximately 15 feet, says Lang.

In the microelectronics industry, on the other hand, the production process takes longer and the product is exposed to the room conditions for a longer period of time. The equipment is larger than in the pharmaceutical industry, and there is usually more of it. Not only are these rooms bigger, but they must meet higher cleanliness standards. Because of the extensive support equipment needed in microelectronics manufacturing, Lang says it's common to build facilities three stories high, with the hvac equipment on the top floor, the clean room in the middle, and the necessary piping and ancillary equipment on the bottom (see illustrations, page 133).

All areas in which dirt might collect should be kept to a minimum. This is often accomplished by setting equipment into or flush with the walls, and by eliminating seams and projecting surfaces wherever possible. The junction between the wall and floor is often coved and overlaid with seamless vinyl. Electrical outlets and light-switch plates are caulked to prevent contaminated air from seeping through them and into the clean room.

Work surfaces should be made of smooth, easily maintainable non-shedding materials, such as coated metal, laminates, formicas, or hard porcelains. In the pharmaceutical industry, walls and floors must be

Model clean-room design

Three typical clean-room configurations are illustrated in these models developed by the Spartanburg, S. C.-based A/E firm of Lockwood Greene.

A three-level plan (right), common in the microelectronics industry, has hvac on the top level, ancillary support equipment for holding chemicals, gases, and solvents on the basement level, and a Class 10 clean room capable of removing 0.125-micron-size particles on the middle level. The air supply is introduced through a plenum over the clean-room ceiling, which is made up of ultra-low penetration air (ULPA) filters. Air moves through the room at an average velocity of 90 feet per minute and exits through a perforated raised floor. This arrangement is best for laminar airflow. The air returns to the hvac units via service chases on the side walls and is then recirculated into the room. This type of clean room is very expensive to build and maintain.

The air supply for a Class 100 clean room (below) is introduced via a large duct that feeds into separate filter hoods over the high-efficiency particulate air (HEPA) filtered ceiling. HEPA filters can remove particulates as small as 0.3 micron in diameter, sufficient for most pharmaceutical manufacturing processes. The air flows laminarly most of the way (until about 39 inches above the floor), then turns in a horizontal direction and exits the room through the side walls, after which it returns to the hvac system for recirculation.

A less-expensive clean room (opposite page) works well in some pharmaceutical manufacturing processes. Here, particles down to 0.5 micron in size are removed from the Class 100 areas over the two workstations. The aisle between the workstations is Class 1000. A duct feeds into two small plenums over the HEPA filters that cover the work areas. The airflow, which is nearly laminar over the workstations (90 fpm) and nonlaminar, or turbulent, in the aisle, returns through the side walls.

able to withstand frequent washings; in the semiconductor industry, antistatic materials are needed to eliminate electrostatic discharges that can damage the product.

"Flexibility is always an issue in clean-room design," says E. I. Brown's Davis. When the Digital Audio Disc Corp. (DADC) in Terre Haute, Ind., needed more production space for compact discs, the designer was able to respond quickly because of its computer-aided design system, Davis says. DADC, a subsidiary of Sony Corp. of America, had 10,000 sq ft of clean-room space and a production capacity of 500,000 discs per month at the time of its completion in September 1984. Two expansions of the facility have already taken place, and a third, scheduled for completion by spring 1987, will increase DADC's clean-room space to 40,000 sq ft as part of an effort to boost disc production to between 4 and 5 million a month. "Detailed CAD documentation and the ability to immediately demonstrate the benefits and disadvantages of alternative layouts to the owners have been critical to our success," says Davis.

"It's difficult to second-guess the state of the art," says SM&M project-management director Powers, who estimates the life span of microelectronics clean rooms to be between three and five years. Nevertheless, there are ways to build in flexibility to extend the useful life of these rooms. For example, he suggests providing flex space for later use, movable walls, and continuous piping ceiling systems. CRS Serrine's Williams adds that, whereas products may change frequently in the pharmaceutical industry, there is less need to redesign the clean room: "Usually you can use the same space—you only have to clean up the piping system."

Considering their very high initial and operating costs and the rapidly changing technology that renders their manufacturing processes and equipment obsolete in short order, clean-room clients should be advised to guard against overdesigning, both in terms of size and standards. Furthermore, they should make sure that designs are as flexible as possible to allow for expansion, contraction, and alternative layouts of equipment as production processes change.

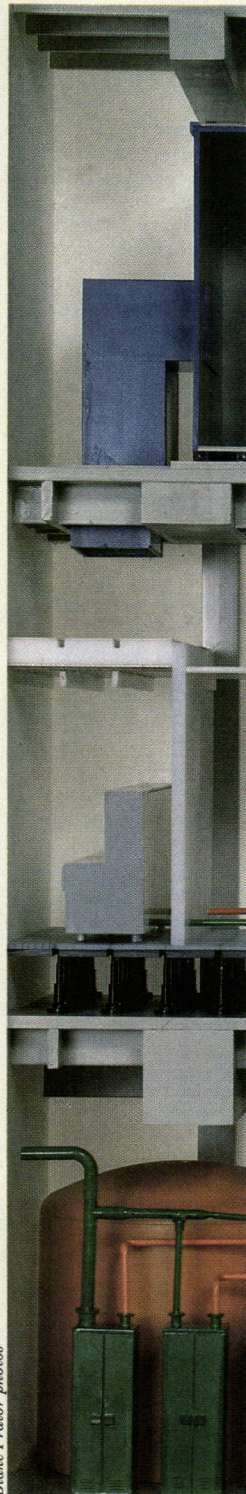
An ounce of prevention

Most of the experts agree that inadequate maintenance—not complex design and construction criteria—is the weak link in guaranteeing the continued effectiveness of clean rooms. "It's 20 percent design and 80 percent discipline," says Powers, in assessing clean-room problems. Companies almost uniformly neglect contamination-control maintenance programs, says the head of construction design for a major semiconductor manufacturer: "We design sophisticated systems, and then they don't maintain them."

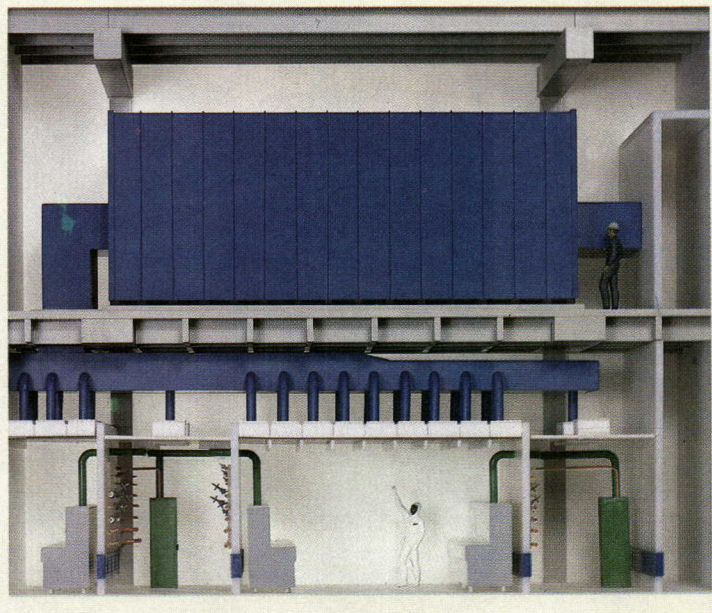
Two major factors contribute to the breakdown of clean-room systems: improper use of the room, and inadequate monitoring of the system to make sure it continues to operate as designed. "Ninety percent of contamination is caused by people," says Williams. If gowning procedures and other clean-room personnel practices are violated, it doesn't take long for a Class 10 room to lose its rating. In addition, adjustments in the air handling and other hvac systems often go unrecorded, and these changes play havoc with the speed, direction, and volume of air entering or leaving the room.

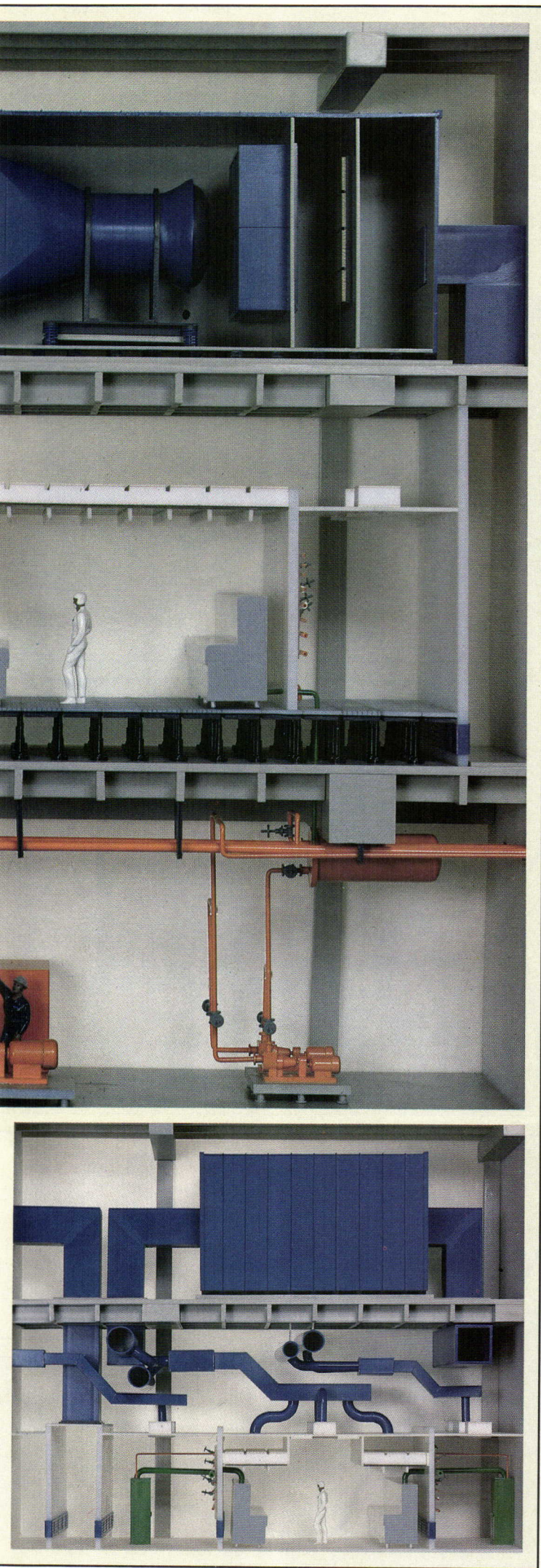
Testing

The architect/engineer has a responsibility to demonstrate that the completed room does what it's designed to do. After this initial testing, the clean-room client, often with the aid of a testing consultant, conducts whatever periodic testing is needed. But many experts in this field doubt whether existing instruments can effectively test if a Class 10 room is removing 0.12-micron-size particles. Recognizing that such testing always leaves room for error, Lockwood Greene's Dick Lang nevertheless feels that today's electronic particle counters do a good job



Blake Prator photos





of assessing room cleanliness. But, he adds, "we're at the limits of the state of the art in measuring particulates."

Questions also arise as to whether you test at the floor, ceiling or workstation level, with purists contending that every cu ft of air has to be measured for an accurate assessment. According to IBM's Douglas Cooper, the Institute of Environmental Sciences' committee on the revision of 209b will recommend increasing the number and volume of air samples as well as varying the locations from which they are taken. Ideally, the room should be tested periodically under normal production conditions to ensure that it still meets the original standards.

Although the FDA requires validation that clean rooms used in the manufacture of pharmaceutical products are up to standards, the pharmaceutical companies themselves set standards and do their own testing to see if these standards have been met. This self-regulatory policy notwithstanding, the FDA reserves the right to examine and shut down a facility if it feels that the standards or the verification techniques are inadequate.

In the microelectronics industry, certification and testing are not even required. Here, it's purely a matter of self-interest. "If your yield factor goes to hell, you know something in the room isn't operating the way it should," says Lang.

In the case of very sensitive semiconductor chips, increasing the yield—the number of chips that make it through the manufacturing process—by just one percentage point can make a difference of millions of dollars in annual bottom-line profitability, says James Burnett, executive director of the Institute of Microcontamination Control in Santa Barbara, Calif. "For example," he notes, "a 10,000-sq-ft clean-room facility manufacturing a complex microelectronics chip seven days a week, three shifts a day, might gross \$204 million annually, based on a 30 percent yield. Increase this yield by just one percentage point, and your annual gross jumps to \$210.8 million." Thus every jump of one percentage point in yield translates into an extra \$6.8 million in annual income.

According to Dan Milholland, president of Biocon, Inc., a Raleigh, N. C.-based testing company established in 1980, most microelectronics clean rooms larger than 6,000 sq ft in area are tested. But after initial certification, many are neglected, except for those that are retested after major renovations or retrofits. To maintain peak performance, clean rooms require constant monitoring and adjustments, says Milholland, adding that the technology exists to do this. "Computerized monitoring systems, similar to those used in the nuclear-reactor industry, are just now being introduced to clean-room users," he says. These systems, capable of monitoring almost every clean-room function, can warn users of problems before they arise.

If a client asks you about selecting a testing company, Milholland suggests that you advise your client to first review one of the testing firm's sample test reports. "A carefully prepared and documented test report can be used as a database to compare future performance against original specifications," he says. He also advises that your client examine the type and condition of the firm's testing equipment: "A testing company is only as good as its instrumentation."

Because production in the microelectronics and pharmaceutical industries is directly related to the cleanliness of the work environment, the demand for ever-cleaner clean rooms is likely to increase. Yet, as sources point out, better dustbusting is not merely a technological problem, but a management problem as well. Contamination-control maintenance, long given short shrift, deserves top priority.

New products: Cologne furniture fair

For more information,
circle item numbers on
Reader Service Card

Maybe it was due to the frigid weather, maybe to the continuing slump in the furniture market. But for its size and international scope—1,495 manufacturers from 35 countries—Cologne's 23rd International Furniture Fair held in January revealed few new design developments. Clunky, Memphis-style and 1950s-inspired designs predominated, punctuated by only a smattering of the elegant, neo-Modern forms that stole the Milan show last fall.

With only half of the huge exhibition halls devoted to German companies, the most numerous offerings this year were from Italy, the Netherlands, and Denmark. As usual, the Italians made the biggest splash. Though most of the products were previously unveiled at Milan, the firm Driade chose Cologne as the place to reveal its new Philippe Starck collection. More Starck was in evidence at a stand sponsored by the French government, and pieces such as the shelving from Christian Farjon (3) underscored the rising popularity of metal even in Postmodern forms. The Scandinavians, on the other hand, seem to be stuck in a well-worn groove by continuing to offer knock-down wooden furniture that now looks dated. More inspired were designs from the Dutch, who have continued to refine their International Style past, as illustrated by Interart's *Spinner* table (2).

As for the Germans, innovation lagged behind sober practicality. The most interesting products were from the Baden-Württemberg group of manufacturers. They included the tubular steel *Tango* chair from Draenert (4) and the kinky *ISI* modular seating from FSM (1). Refreshing in their simplicity were the concrete and steel stools designed and displayed by Hermann Becker (5, 6). But for all the strained attempts at Cologne to be avant-garde, the Bauhaus classics still remained ahead of the pack. *Deborah K. Dietsch*

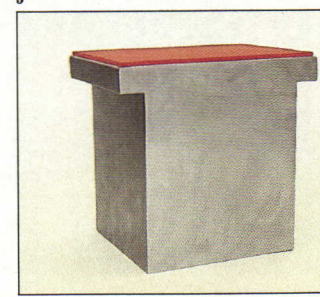
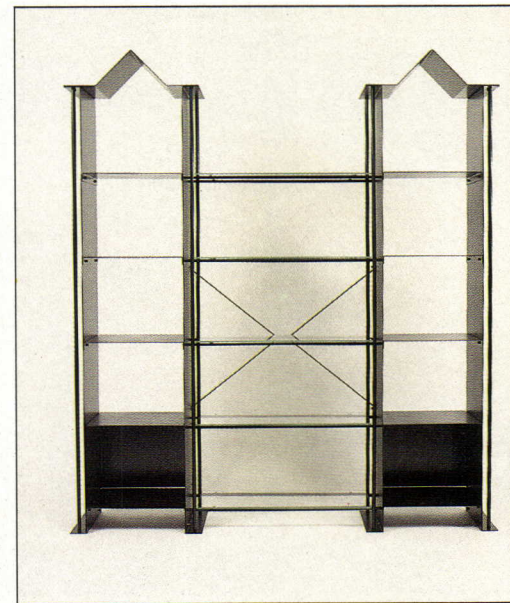
1. ISI, Kurt Ziehmer; FSM Frank Sitzmöbel, Sulzbach, West Germany.
Circle 300 on reader service card

2. *Spinner*, Else Staal; Interart Design Group, Schiedam, Holland.
Circle 301 on reader service card

3. *Mercure*, Philippe Diani; Christian Farjon, Aubusson, France.
Circle 302 on reader service card

4. *Tango*, Andras Dozsa-Farkas; Draenert, Philadelphia, Pa.
Circle 303 on reader service card

5, 6. Stools 3 and 5, Hermann Becker; Krefeld, West Germany.
Circle 304 on reader service card





There's little evidence this courthouse has been renovated. And custom Pella Windows are sworn to secrecy.

A passion for authenticity in restoration and renovation sometimes goes unnoticed. And nothing could make the architects of this municipal building renovation happier. They gleefully recall a local resident's comment: "I looked at the building and I don't see that you did anything. Why did they pay you to do nothing?"

Nothing, indeed. The historic 1914 Municipal Building in Sewickley, Pennsylvania, has been restored inside and out. Council chambers have been renovated, administrative offices expanded, a conference room added along with an elevator tower and a wing for fire department apparatus. The intent was to restore the existing building and have all additions match the original in kind, in both materials and design. It shows, or doesn't show, in everything from the original brass hardware to the red common brick of the new additions to the custom Pella Windows.

Custom Pella sizes and colors.

Custom Pella Windows were a vital part of the project. No other wood window manufacturer could provide the custom sizes and custom clad color the project required, with the quality the architects demanded.

Drafty, white double-hungs and basement windows were replaced with custom Pella Clad Double-Hung and Awning Windows. The architects "didn't want to look at the building and see a window and a window and a window" but rather intended the whole of the exterior to work together for a monolithic look. So Pella Clad Windows were specified in a custom tan enamel finish that matches the cleaned Cleveland limestone of the building's foundation.

Only Pella offers custom colors in aluminum cladding, adding just a week to normal delivery time. The baked enamel finish resists fading, chemical attack, chalking, chipping, peeling and cracking so the windows need no painting.

Inside, the natural wood beauty of Pella Windows complements the original oak woodwork, doors and molding which were carefully preserved.

The Pella Clad subframe system neatly covers the exterior of the old wood frame and allows for installation from indoors. Since no scaffolding or cranes were needed, the Sewickley Council of Garden Clubs could do the landscaping unimpeded.

Lower heating and cooling costs.

Some things, like the charming hose-drying tower, are used today as they were in horse-and-firewagon days, but many things needed a drastic update. The building's energy efficiency, for instance. Pella's Double Glazing Panel System was specified for all Pella Windows, giving nearly an inch of insulating air between panes. The perfect space for the removable wood muntins, safe from dust and damage.

Another of Pella's seven glazing and shading options, Type E Slimshade® blinds can be specified or retrofitted between the panes of the Double Glazing Panel System, where they help give Pella Windows a low U value of .23, actually outperforming triple glazing.

As for maintenance economies, Pella Double-Hung, Awning and Casement Windows pivot or rotate toward the center of the frame for easy cleaning from indoors.

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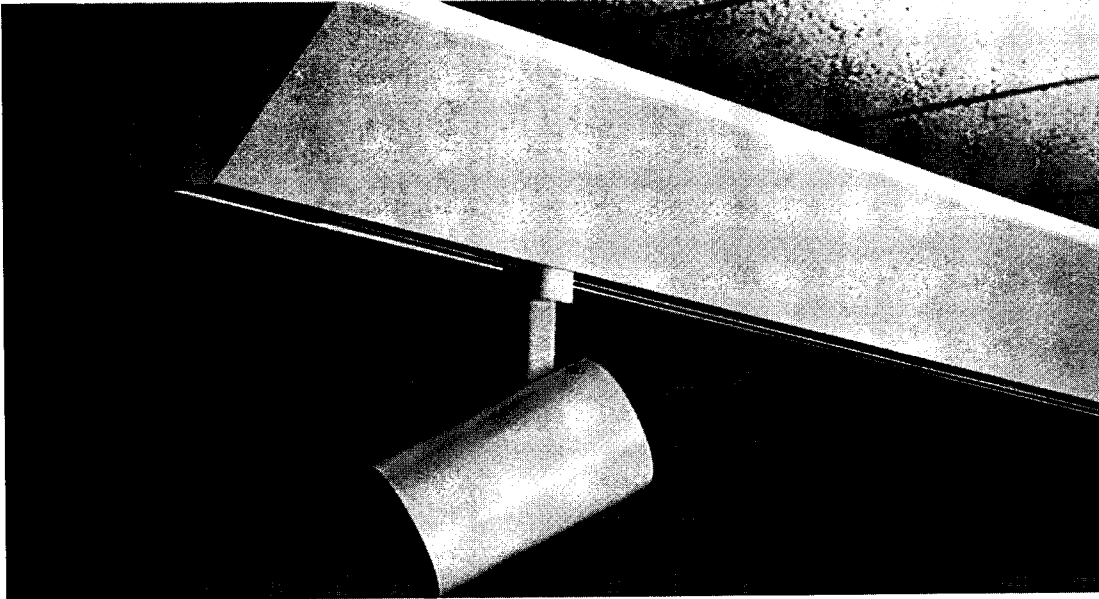
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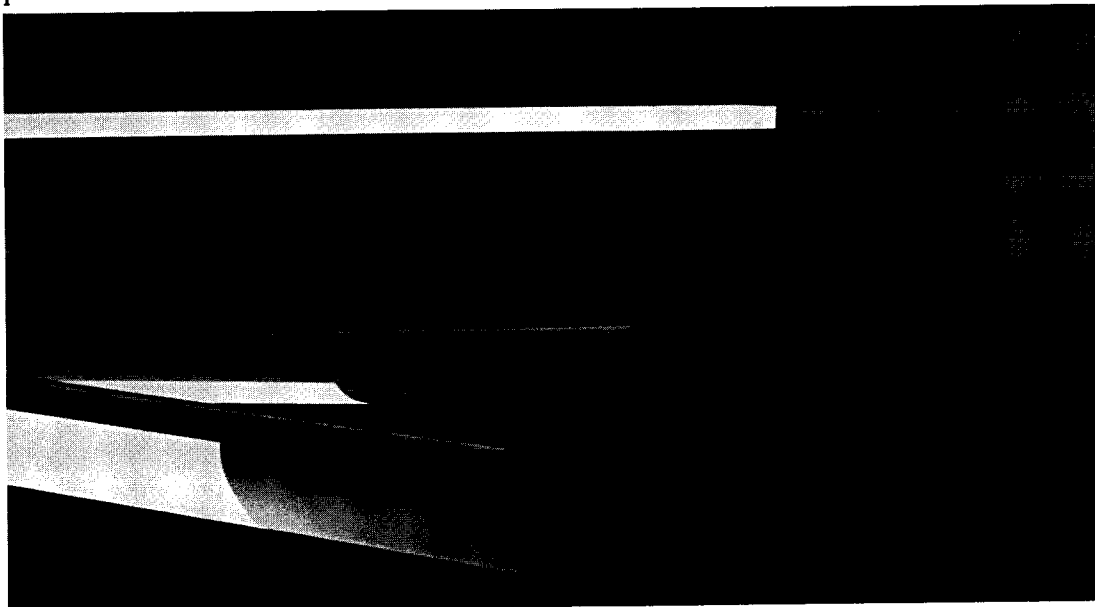
Pella. The significant difference in windows.

Sewickley Municipal Building
Sewickley, Pennsylvania
Architects
Robert D. Graham, Sewickley, Pennsylvania
J. Ronald Reynolds, Coraopolis, Pennsylvania
Contractor
Coco Brothers, Inc.
Allison Park, Pennsylvania

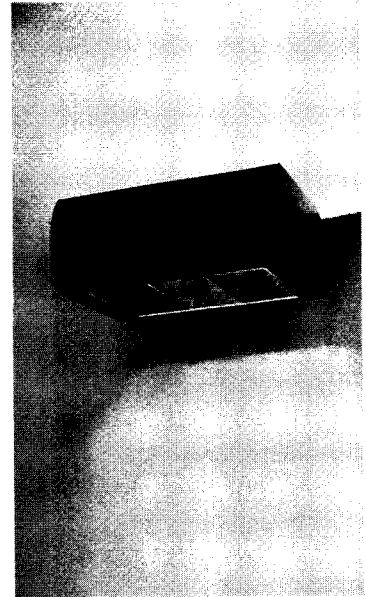
New products



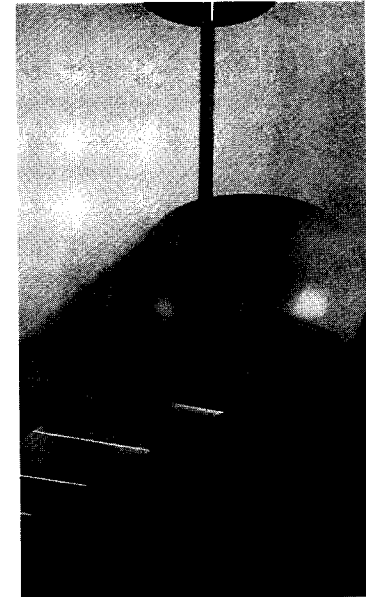
1



2



3



4

Indirect lighting for the general office has many visual requirements—high levels of seeing comfort; no veiling shadows; no glare; uniform, diffuse light—but with sparkle and no hot spots. Lighting should also be easy to install, quiet, flexible, attractive, and energy-efficient! Some new fixtures try to fill this tall order.

1. Dual-purpose

Combining ambient and accent lighting, the *Via* suspended fixture can be specified with an integral recessed slot to accommodate single-track fixtures from any of several manufacturers. A low-profile linear unit less than 5-in. high, *Via* combines a wide top opening for efficient light output with a narrow bottom shape to reduce shadows. Its *HighLite* edge configuration spills some light from the rim of the fixture, increasing

the apparent brightness of the area. Matte white is the standard finish color for the 20-gauge steel housing; 15 other colors are available. Litecontrol Corp., Hanson, Mass.

Circle 305 on reader service card

2. Linear tubes

Based on an oval-shaped aluminum housing, the *Elan Multiplex* system contains both accent and ambient lighting elements. Special fixture hangers permit each segment to be individually aimed upwards, downwards, sidewise, or at other positions. Each segment can be lensed or diffused, and can be ordered in lengths of up to 16 ft. *Elan* may be mounted to coordinate with modular ceiling systems. Light sources include *Octron* and rapid-start lamps. Lam Lighting Systems, Wakefield, Mass.

Circle 306 on reader service card

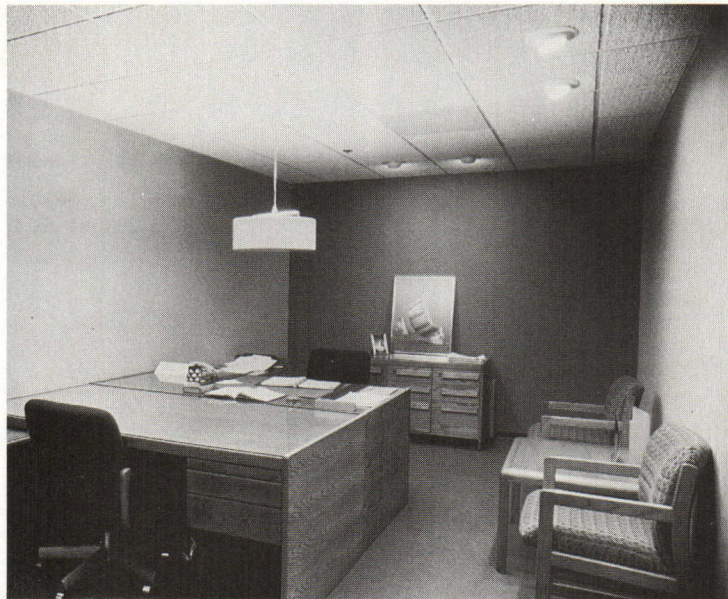
3, 4. Indirect/direct

The *Paraclete* wall bracket has been added to the *Pendacurve* line of indirect/direct fixtures. The suspended, linear *Pendacurve* fixture may be ordered with a molded end cap that extends the rounded lines of the extruded aluminum housing. The wall bracket takes a compact 13-Watt fluorescent lamp. Both luminaires have *Parabolume* louvers for low-glare direct illumination of work areas. There are 14 standard gloss- and satin-enamel color options, and four anodized-finish louver choices. Columbia Lighting, Spokane, Wash.

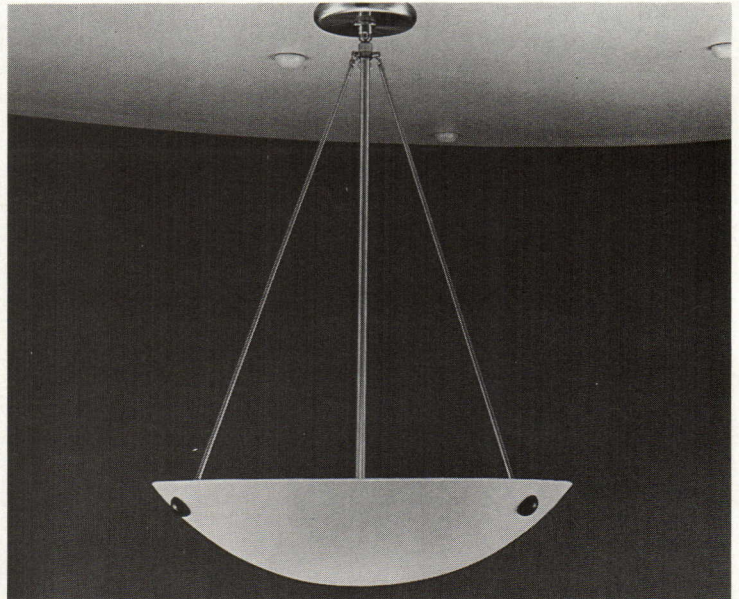
Circle 307 on reader service card

5. Ceiling fixtures

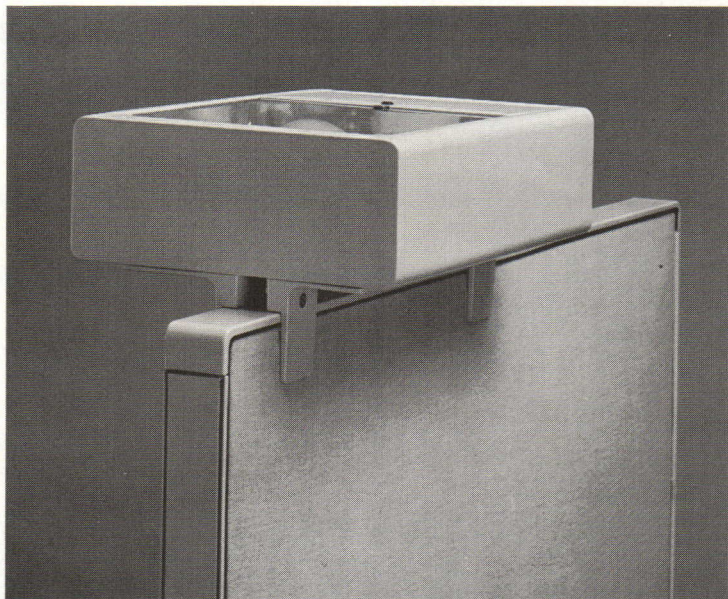
Indirect illumination supplied by both HID and incandescent sources is shown here in an office setting. *Halo* architectural downlights recessed in the ceiling wash the wall



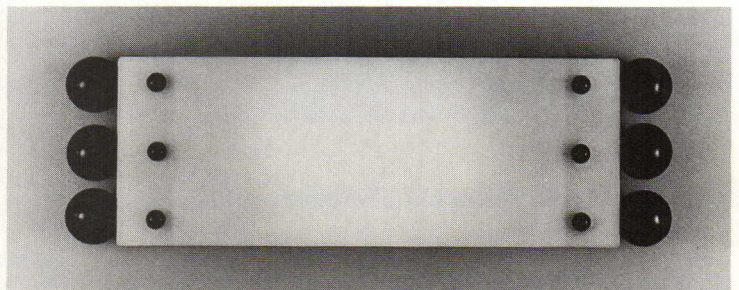
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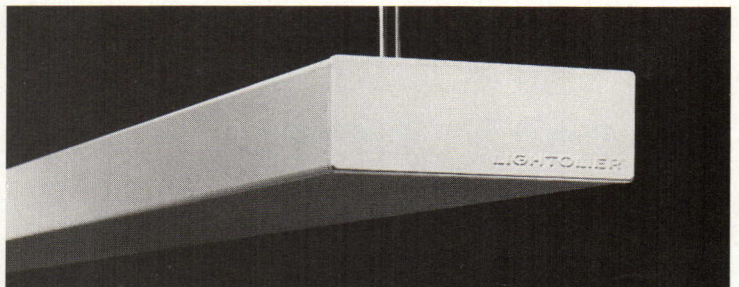
7



6



8



9

with warm incandescent light. The pendant-mounted *SFB* luminaire provides indirect illumination, and is placed over the desk to eliminate glare on the work surface. The *SFB* is a seamless steel round unit, with a specular aluminum reflector symmetrically distributing the light from 175-, 250-, and 400-Watt metal halide, or 150-, 250-, and 400-Watt diffuse HPS lamps. SPI Lighting, Racine, Wis.
Circle 308 on reader service card

6. Portable light

The *SPL* portable indirect fixture features the ultimate in easy-installation methods: you plug it in. It measures 18-in. long by 12 1/2-in. wide by 5-in. deep, and comes with rubber feet for freestanding installation on shelves and other flat horizontal surfaces. Shown here with an adjustable bracket for mounting the light on the top of

workstation panels, the *SPL* can also be hung on the side of the panel, bringing the fixture down level with panel tops. The symmetric optics of the fixture distribute lamp output over a wide area, while asymmetric optics provide the necessary directional control of the lighting when fixtures are mounted close to panels or walls. Halo Lighting, Elk Grove Village, Ill.
Circle 309 on reader service card

7, 8. Sandblasted glass

Working with similar design elements, the *Danny G* pendant fixture and the *Mabel* wall bracket provide sophisticated office illumination. Both are constructed of sandblasted glass and satin-finished aluminum, with black-painted brass ornamentation. The bowl-shaped shade of the pendant is available in 22-, 32-, and 48-in. diameters. The wall bracket

measures 16-in. wide by 5-in. high (it may also be mounted vertically), and takes two PL7 fluorescents. The American Glass Light Co., New York City.

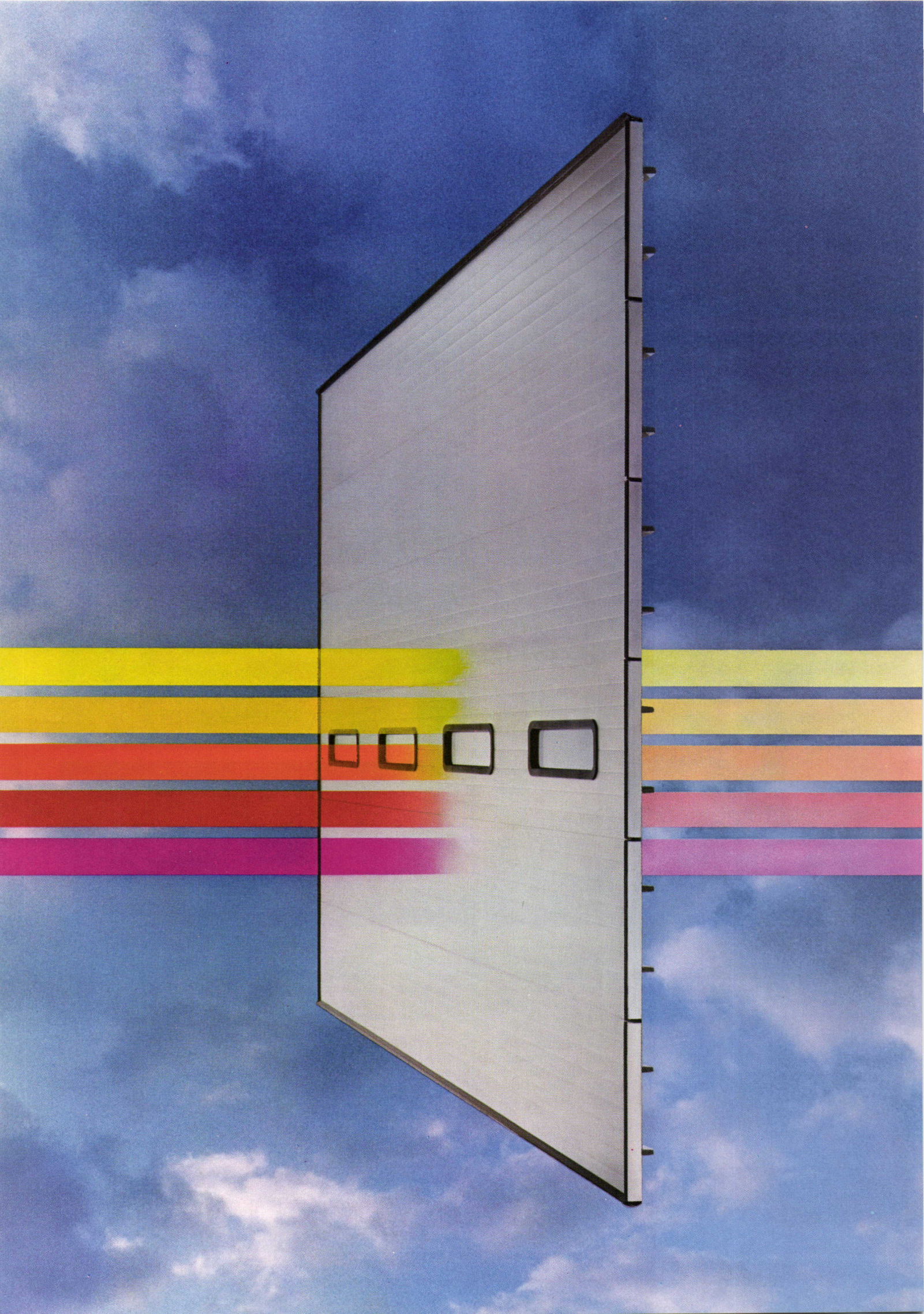
Circle 310 on reader service card

9. Open office lighting

A low-profile indirect fixture, *Lytespread* is described as an affordable, easy-to-install system that can provide the glare-free lighting required for computer display terminals and open office areas. *Lytespread* comes in three versions: 7, with a precise spill light along the fixture length; 6, a totally indirect version; and 4, with a cross-section that distributes light up, toward the ceiling, and out, toward the wall. Swivel stem mounting allows alignment up to 38 deg. Lightolier, Compton, Calif.

Circle 311 on reader service card

More products on page 147



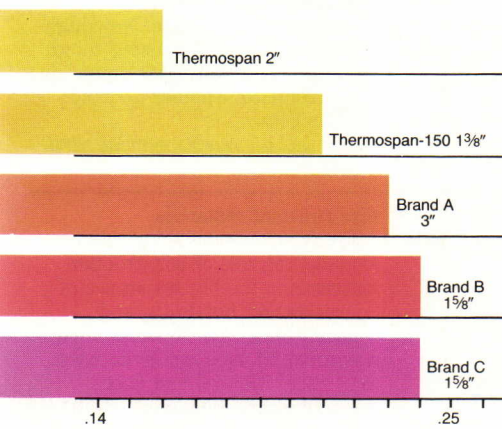
It's what your door stops that counts.

Lots of traffic through your doors is generally a good sign in the world of business. But when heat and cold come to call, your doors – especially your insulated overhead sectional doors – shouldn't let them in.

When your building specs call for minimum heat transfer through overhead sectional doors, you should specify Thermospan™ insulated doors.

In a series of head-to-head installed-door tests conducted by Architectural Testing, Inc., the Thermospan 2" door proved to be significantly more energy efficient than other leading insulated doors.

Thermal (U_C) Test Results



All doors tested were 10'-2" x 10'-0" no-glass doors installed to manufacturer's specifications.

The independent testing service and the test procedure were recommended by the National Association of Garage Door Manufacturers.

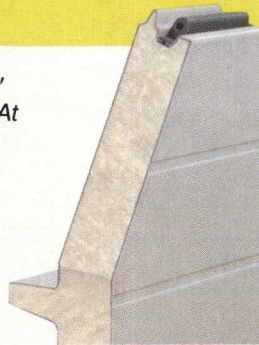
The Wayne-Dalton Thermospan-150 1 3/8" door also allowed less heat transfer than the competitive doors, including one 3" door.

It's the total door that determines heat transfer, not just the section. That's why we pay special attention to every aspect of the door.

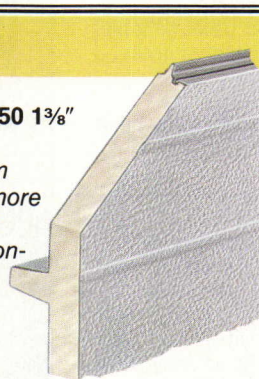
Thermospan sections have high-tensile steel skins with roll-formed integral struts. Sections are bound together by foamed-in-place polyurethane insulation. A complete thermal break along joints and end caps reduces heat transfer between skins.

Rubber bulb joint seals minimize air infiltration. Integral vinyl jamb seals raise with the door to retard seal damage when the door is open. U-shaped bottom seal won't ice up, seals against uneven floors. The factory-installed top seal reduces infiltration between header and door.

Thermospan 2"
Top of the line. At least 43% more energy efficient than other non-Wayne-Dalton doors tested.



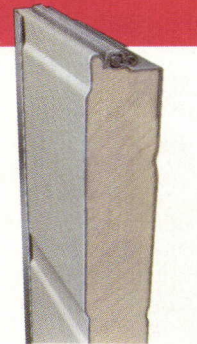
Thermospan-150 1 3/8"
Competitively priced, premium door features, more energy efficient than the best non-Wayne-Dalton door tested.



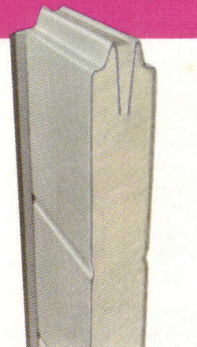
Brand A 3"
Polystyrene glued-in block insulation. Various moldings and end caps bridge thermal break.



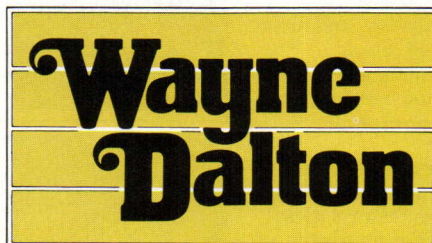
Brand B 1 1/8"
Bare galvanized interior steel skin. Extra struts required on panels over 16' long.



Brand C 1 1/8"
Foreign-made building panel converted for door manufacture.



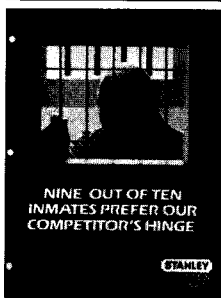
When heat and cold are regular visitors, specify Thermospan. Call or write for our new test results and complete Thermospan specifications. Wayne-Dalton Corp., P.O. Box 67, Mt. Hope, OH 44660, Phone: (216) 674-7015.



WAYNE-DALTON CORP. • MT. HOPE, OHIO 44660
Phone 216-674-7015

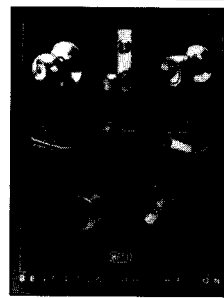
Circle 53 on inquiry card

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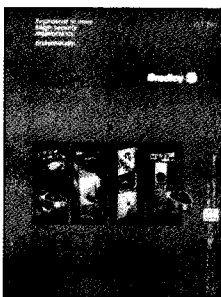
Security hinges

A color folder describes security door hinges for such institutional applications as penitentiaries, jails, and reformatories. All *LifeSpan* hinges are guaranteed for the full life of the building. The Stanley Works, New Britain, Conn.
Circle 400 on reader service card



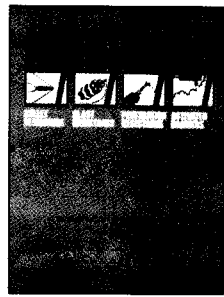
Locks

A full line of locks, locksets, and padlocks are shown in a 20-page catalog from *Best*. Function charts, trim and finish options, and product specifications are given for cylindrical, mortise, tubular and auxiliary locks. Best Lock Corp., Indianapolis, Ind.
Circle 406 on reader service card



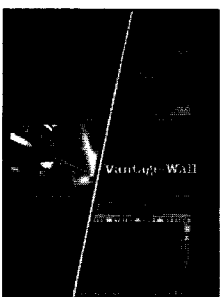
Stainless-steel fixtures

Lavatories, water fountains, toilets, showers, and combination units designed for penal facilities are described in a 44-page full-line catalog. Product presentation includes chase and clearance requirements, and explains security, suicide prevention, and sanitary features. Bradley Corp., Menomonee Falls, Wis.
Circle 401 on reader service card



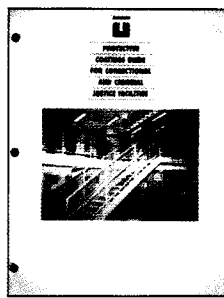
Bullet-resisting products

A number of protective security systems are explained in a color catalog on the *Bullet Proof* line of special-purpose doors, frames, and hardware assemblies. Installation photos show solid and glazed doors and walls used in banks, subway systems, and government facilities. Chicago Bullet Proof Equipment Co., Park Forest, Ill.
Circle 407 on reader service card



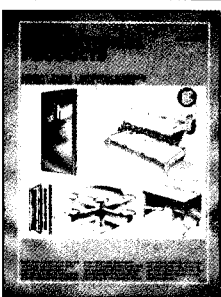
Steel detention screening

The *Vantage-Wall* is a heavy-duty security panel made of woven rods welded into slots, which restricts an inmate's reach outside the cell to finger length. An illustrated catalog describes panels for cell openings, windows, and enclosures in jails and other high-security institutions. Kane Mfg. Corp., Kane, Pa.
Circle 402 on reader service card



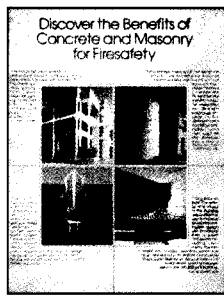
Protective coatings

A binder-format "Protective Coatings Guide for Correctional and Criminal Justice Facilities" helps in the selection of systems by exposure and substrate. New high-performance coatings using tough yet environmentally safe materials are introduced. Tnemec Co., Inc., Kansas City.
Circle 408 on reader service card



Correctional products

Doors, windows, furniture, and accessories for severe-use prison requirements are shown in a 4-page catalog. Steel units include a fixed-seat pedestal table, bunks, and floor-mounted desks. Chief Industries, Inc., Grand Island, Neb.
Circle 403 on reader service card



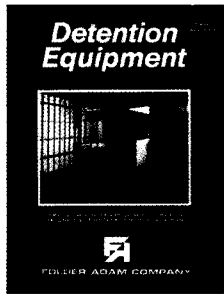
Fire-resistant materials

A four-color illustrated brochure explains the role of construction materials in the fire resistance of nonresidential buildings, and contains brief case histories of eight concrete and masonry structures. Six typical FR wall and floor assemblies are detailed. Portland Cement Assn., Skokie, Ill.
Circle 409 on reader service card



Ceramic-faced block

An 8-page color booklet contains photographs of structural glazed facing tile used in several jail applications: individual cells, shower and toilet areas, visitors' and inmate dayrooms, kitchens, booking areas, etc. The block's durability, economies of installation, and fire safety are explained. Stark Ceramics, Inc., Canton, Ohio.
Circle 404 on reader service card



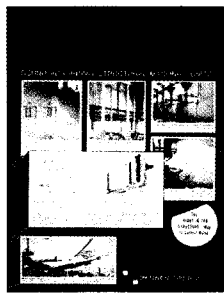
Detention equipment

A color catalog profiles a complete line of architectural security products, including mechanical and electrical locks, door hardware, detention furnishings, and control systems. Locking devices, for remote operation of cell doors and gates, are explained. Folger Adam Co., Lemont, Ill.
Circle 410 on reader service card



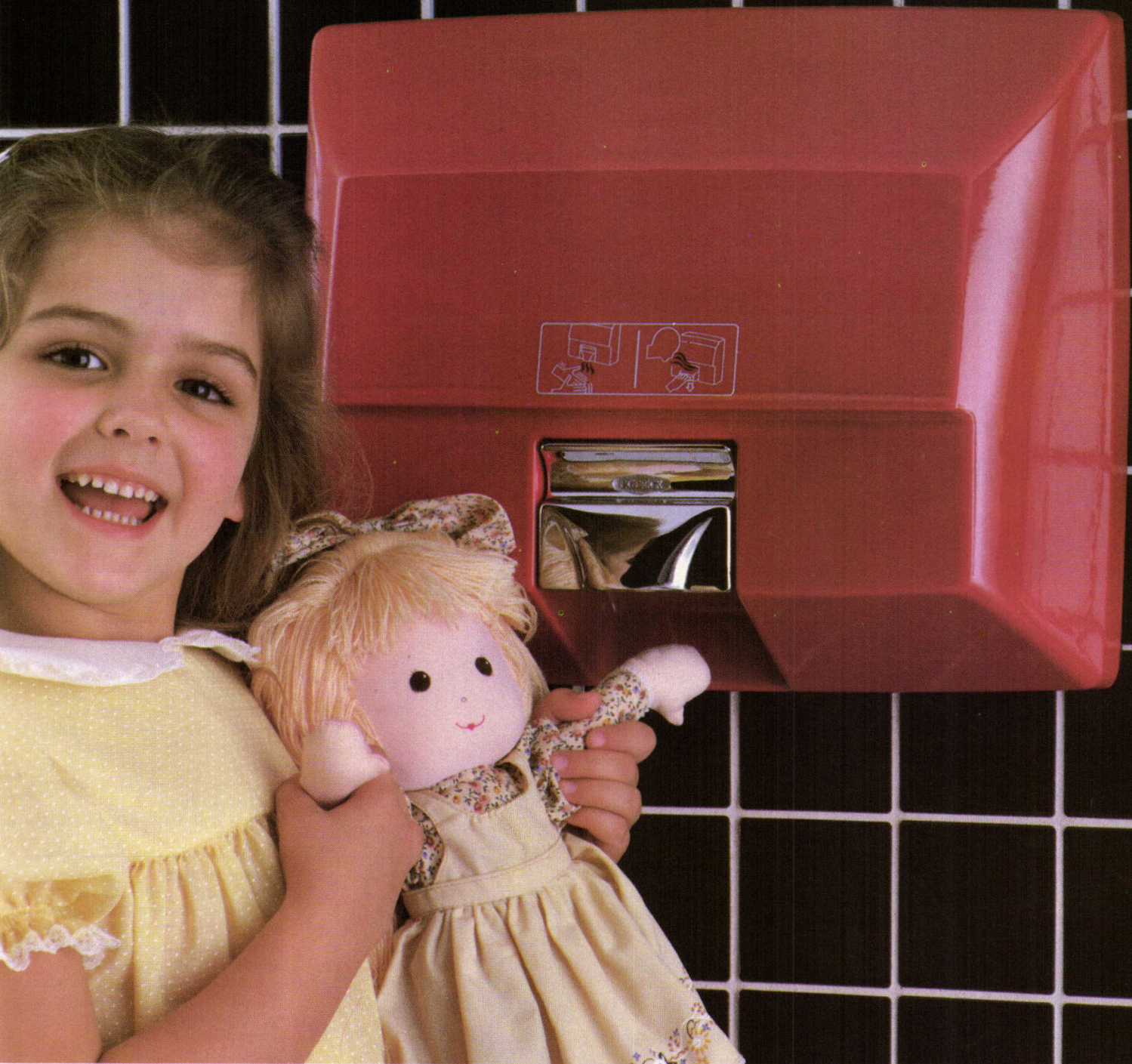
Laminated glazing

A 24-page color catalog illustrates safety, security, and other applications of architectural glass laminated with *Saflex* interlayer. Test and performance information on high-security, burglar- and bullet-resistant glass products is included. Monsanto Co., St. Louis.
Circle 405 on reader service card



Sound-absorbing masonry

The 1987 *Soundblox* catalog contains full product-specification and performance data on sound-absorbing structural masonry units. Split-rib face, reinforceable, and *Spectra-Glaze*-faced units are included. The Proudfoot Co., Inc., Greenwich, Conn.
Circle 411 on reader service card
More literature on page 144

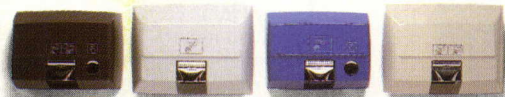


© 1986 Bobrick Washroom Equipment

Look mom, no hands.

New! An extraordinary group of AutoPilot and TouchButton warm air dryers featuring solid state reliability, elegant low profile design, vandal resistance, and amazing durability. Want that good warm feeling? Specify Bobrick's new AirCraft™ Warm Air Dryers in your next washroom design. AutoPilot models with touch free operation, and TouchButton models with on-off feature (for energy savings), both with automatic shut off. Seven gorgeous cast iron vitreous enamel cover colors, 5-year field proven electronics. HandCraft™ Hand Dryers have a unique 2-position nozzle for drying hands and face. HairCraft™ Hair Dryers are ideal for health clubs.

All with low noise levels, even-flow air volume void of hot spots, vandal-resistant cover and nozzle, low profile silhouettes, 5 and 10 year warranties, and competitive prices. For further information contact your local Bobrick representative, or write Bobrick, 11611 Hart Street, North Hollywood, CA 91605-5882. 818/764-1000.

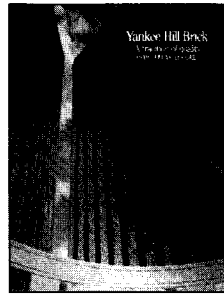


BOBRICK AirCraft™ Dryers

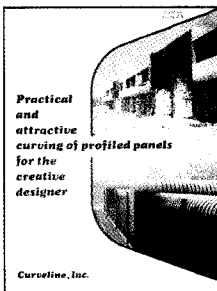
New York Los Angeles Toronto



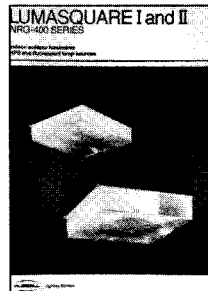
Slotted grating
Specific case histories illustrate a variety of applications of heavy-duty slotted grating, such as weather-resistant ceilings for seven subway stations in Boston. The corrosion- and vibration-resisting properties of the aluminum product are featured. United McGill Corp., Groveport, Ohio.
Circle 412 on reader service card



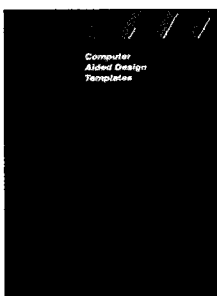
Pavers and face brick
A brochure includes photographs of commercial and residential buildings to illustrate the range of colors available in brick and paver products. The high-density clay used are said to provide low absorption and exceptional hardness, as well as tightly held colors and dimensions. Yankee Hill Brick & Tile Mfg. Co., Lincoln, Neb.
Circle 418 on reader service card



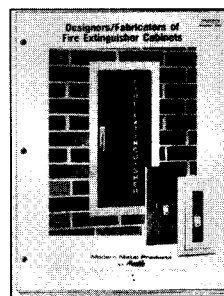
Curved metal panels
A 6-page color catalog suggests some of the building design possibilities offered by *Curveline* steel and aluminum panels. The profiled metal product allows a continuous curve from wall onto roof panel; mitered corners; and curved flashings. Curveline, Inc., Ontario, Calif.
Circle 413 on reader service card



Indoor/outdoor luminaires
An 8-page product brochure describes *Lumasquare* compact architectural luminaires for canopy, ceiling, or pole-mounted applications. Lamp options include 35- to 150-watt horizontal-burn HPS, dual 13-watt fluorescent, and 100-watt metal halide sources. Hubbell Lighting Div., Christiansburg, Va.
Circle 419 on reader service card



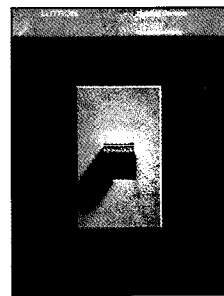
Facilities' design templates
CAD templates let the designer work with either simple shapes or precise office-product graphics, while providing specification capability when needed. A color folder explains how the templates link *Intergraph* core graphic hardware, PC-based *CAP System* software, and an electronic catalog. Steelcase Inc., Grand Rapids, Mich.
Circle 414 on reader service card



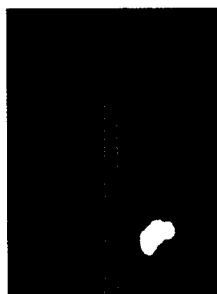
Fire-extinguisher cabinets
Firefighting equipment, including extinguisher cabinets, hose-rack assemblies, cabinet alarms, and portable fire extinguishers are covered in a 12-page color catalog. Color options for all aluminum, steel, and stainless-steel products are shown. Modern Metal Products, Owatonna, Minn.
Circle 420 on reader service card



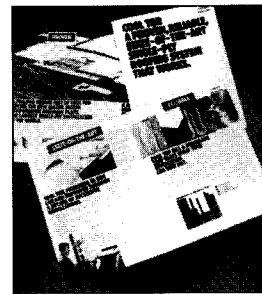
Pre-engineered stairs
Manufactured stair and landing systems are illustrated in a color catalog. Concrete, reinforced-cement and steel treads and landings are included, as well as several rail styles mounted on *FadeAway* posts. American Stair Corp., Willow Springs, Ill.
Circle 415 on reader service card



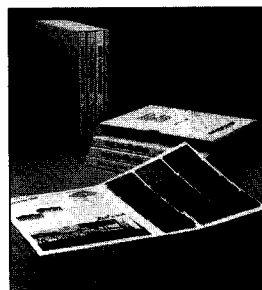
Lighting controls
A condensed selection catalog provides information on wallbox dimmers, fan and motor controls, and dimming systems, as well as control products offered for international applications. Details on product colors, silk-screening, and engraving are included. Lutron Electronics Co., Inc., Coopersburg, Pa.
Circle 421 on reader service card



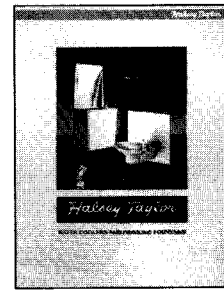
Flame-retardant fabric
A color brochure introduces *Sunbrella Firesist*, described as the only exterior fabric woven from flame-retardant, pigmented modacrylic fiber. Rated for use in commercial buildings, schools, and other code-controlled applications, *Firesist* comes in 10 fade-resistant colors. Glen Raven Mills, Inc., Glen Raven, N. C.
Circle 416 on reader service card



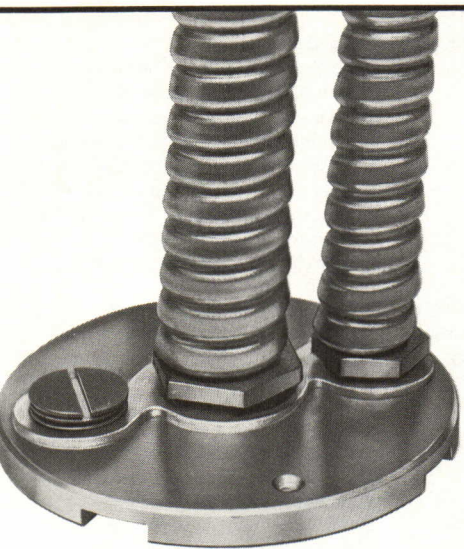
Single-ply roofing
An 8-page catalog describes the quality-control and seam-testing procedures conducted on the installation of the world's largest single-ply roofing project. Complete test and product-characteristic data are included for *Cool Top* polyester-reinforced membrane. Cooley Roofing Systems, Inc., Pawtucket, R. I.
Circle 422 on reader service card



Heavy-traffic carpet
A British import, *LoboFlor* is said to combine the long-wear and easy-to-clean qualities of vinyl with the warmth and comfort of carpet. Four contract lines are presented in architectural folders containing technical details, product samples, and installation photos. Bonar & Flotex, Dallas.
Circle 417 on reader service card



Water coolers
A 1987 Buyer's Guide and Catalog provides dimensioned installation drawings, capacity data, color choices, and product features for a full line of coolers and drinking fountains. Halsey Taylor, Freeport, Ill.
Circle 423 on reader service card



NOW AVAILABLE WITH CONDUIT ADAPTER

The Raceway Flush Poke-Thru is becoming a family. Here's a new "baby" with special flexible conduit connections. For modular furniture connections you might just use the center $\frac{3}{4}$ " connections for power. Or, you might want to use the two outside $\frac{1}{2}$ " openings for low tension data or communications. Its completely flexible.

An exceptionally ideal application for the "conduit connection" at the retail point of sale, allowing relocation of the kiosk while leaving behind a clean flush abandonment. There's the power connection to energize the register. One of the data lines runs to the mainframe for sale and inventory records. The other runs to credit check. Both are protected from disconnect and loss of data integrity.

Learn more about the Raceway Flush "Conduit Connection". Write or call Raceway Components, Inc., 53 Hillside Avenue, Nutley, N.J. 07110. 201-661-1116.



RACEWAY COMPONENTS, INC.

M

Circle 56 on inquiry card

Continued from page 139



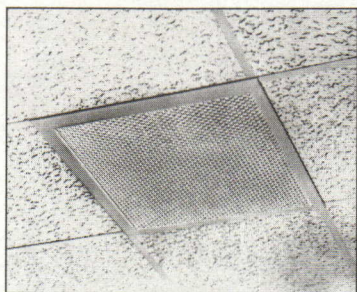
Outdoor lighting

An addition to the BEGA line of outdoor illumination fixtures, this pole-top luminaire may be specified in many acrylic enamel colors, as well as the standard black or white. Light sources include incandescent, compact fluorescent, and various HID lamps. BEGA/FS, Santa Barbara, Calif.
Circle 316 on reader service card



Service outlet

For flush mounting in raised access floor systems, this "Multi-Task Service Outlet" comes with two duplex receptacles; optional data panels can be added for telephone, IMB LAN, coaxial, and other special connectors. The 6-in. Lexan lid can be fitted with a carpet insert as shown. Tate Access Floors, Inc., Jessup, Md.
Circle 317 on reader service card



Troffer light control

The *Refractive Grid Controlens*, a troffer lens for general office lighting, is said to reduce glare up to 70 percent, while producing half as much light as other troffer light-control devices in the glare zone of 60-90 deg. The laminated lens can be used in luminaires with a shallow configuration, saving plenum space. Holophane, Denver.
Circle 318 on reader service card

Circle 57 on inquiry card



Wolfgang Uplight 20" wide

Because the Details Make the Difference.

The new American Glass Light collections uniquely combine fine detailing with glamorous and classic composition. All fixtures are UL listed and manufactured in our own American factories. Most are available in fluorescent and some are even available in up to 3' and 4' widths.

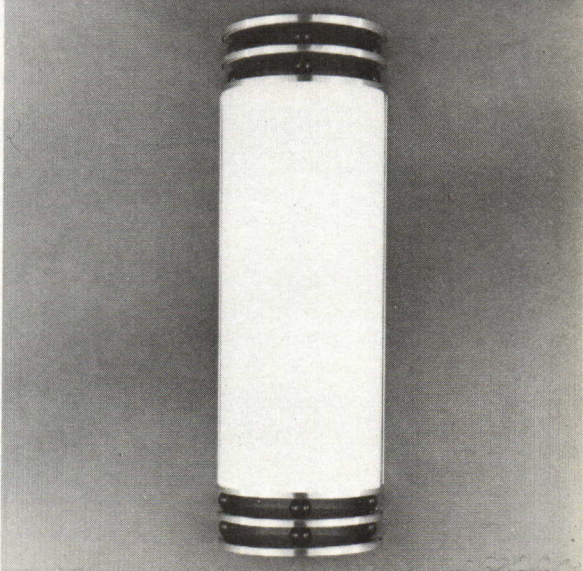
SHOWROOM:
49 West 27 Street
New York, NY 10001
(212) 213-1200



© 1987 The American Glass Light Co. A Littman Group Company



Sandy's Favorite Pita Sconce 14", 18" & 22" wide



Chardonnay Cylinder Sconce 24" h x 7" w

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 82-87

Philadelphia Industrial Correctional Center
Jacobs, Wyper/Ehrenkrantz-A Joint Venture

Pages 82-85—Built-up roofing: Koppers Co. Single-ply roofing: W. R. Grace & Co. Ventilators: Greenheck. Brick: Delta Macon; Taylor Clay Products. Block: Fizzano Brothers. Flagpole: Flagpoles, Inc. Pavers: Delta Macon. Signage: Adelpia Graphics System. Area lighting: Keene;

Infranon (Stern). Wall lights: mcPhilben. Entrance: Stanley. Window frames: Kawneer. Glazing: Hordis Brothers. Security glazing: Falconer Glass. Chain link and mesh fencing: Page-Wilson Corp. Wire: American Security Fence Corp. Water fountain: Western.

Page 86—(top) Seating: Rudd. Terrazzo: Roman Mosaic Inc. Carpeting: Lee's. (bottom) Vinyl flooring: Amtico. Smoke detector: Kidde. Glass block: Pittsburgh Corning. Exit sign: Dual-Lite. Hvac grilles: Tuttle and Bailey.

Page 87—(top) Wood-base seating: Blockhouse. Carpeting: Bigelow. Exterior glass and metal door: frames custom fabricated by Curion Industries; glass-clad polycarbonate glazing: Falconer Glass Industries. Closers: Russwin. Hardware and locksets: Southern Steel Co. Railings and stairs: custom, fabricated by Crescent Ironworks. Paints: M. A. Bruder & Sons, Inc. Cell doors: Superior Fireproof Door, Inc. Ceiling tile: Armstrong. Grid: National Rolling Mills. Light troffers: Illuminating

Concepts & Engineering. Showers: Leonard. (bottom) Basin: Just, Inc. Counter: custom, Beavertown Cast Stone. Fixture: Illuminating Concepts & Engineering. Paints: M. A. B.

Pages 88-91

Clark County Detention Facility JMA Architects in association with Hellmuth, Obata & Kassabaum
Pages 88-89—Masonry cladding: Stoneware. Built-up roofing: Johns-Manville. Entrance: Kawneer. Security and laminated glass: Binswanger Mirror Products (Saflex). Pavers: Ironspot.
Page 90—(top) Ceiling tile: Armstrong. Diffusers: Carnes. (bottom) Electronic security: R. C. A.; Sentry; ScanPen. Lighting (throughout): Globe; Acme Dunbar.

Page 91—Paints: Colony. Plaster: Laticrete. Plumbing unit: Acorn. Laminates: WilsonArt. Window: P. P. G. Wood doors: Weyerhaeuser. Locksets: Brinks; Folger Adam. Hinges: McKinney.

Sliding door hardware: Fries; LCN.

Pages 92-93

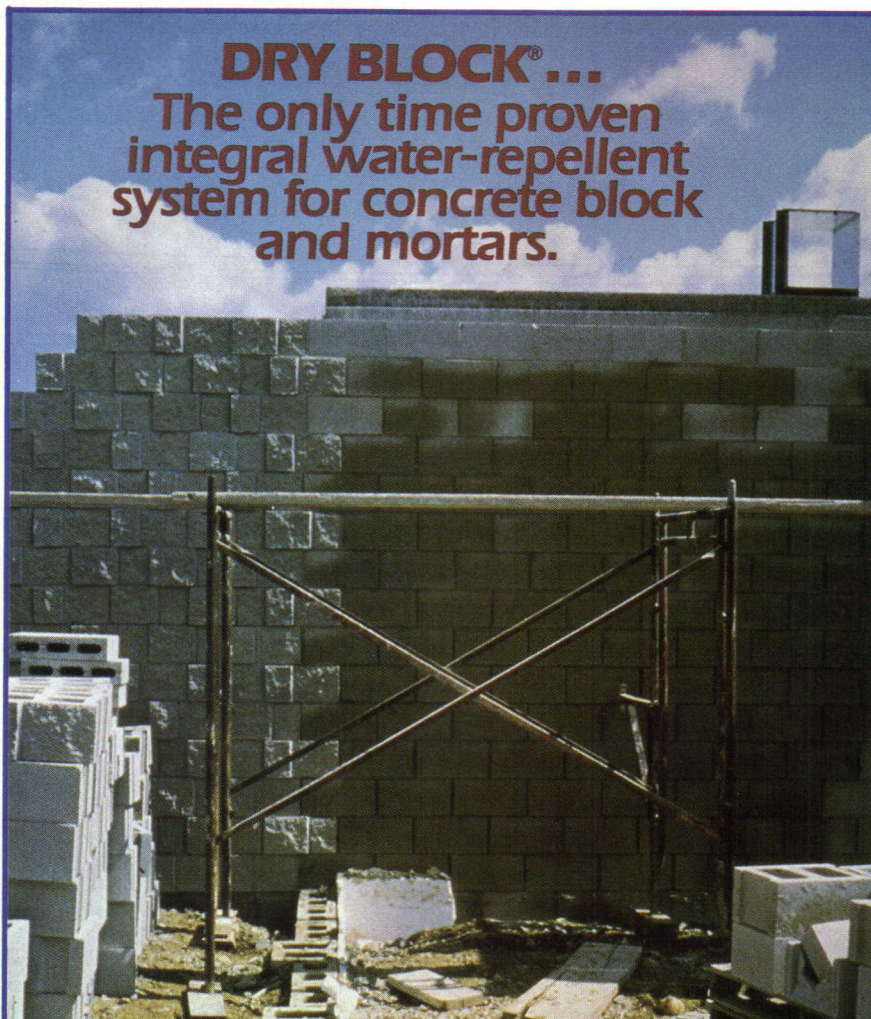
Santa Cruz County Detention Facility Kaplan/McLaughlin/Diaz Architects
Pages 92-93—Block masonry: Baselite Block. Steel windows and doors: Holomet Corp. Glazing: Riotglass (Super II). Locksets, hinges: Folger Adam. Closers: Norton. Cap sheet roofing: Johns-Manville. Elastomeric roofing: Dex-o-Tex. Sheet metal roofing: Anning-Johnson. Sallyport doors: Cookson.
Page 93—Tile ceiling: Armstrong. Sprinkler heads: Reliable. Paints: Dunn-Edwards. Hvac grilles: Titus. Laminate surfaces: WilsonArt.

Pages 94-97

The Wyoming Women's Center The NBBJ Group
Pages 94-95—Face brick: Endicott Clay Products. Glass block: LOF Glass. Aluminum-framed windows: William Bayley Co. Security and laminated glazing: Sierracin/Transtech (Omnilite/Omniarmor).
Page 96—Carpeting: Stratton Industries. Closers: LCN. Exit devices (public areas): Von Duprin.
Page 97—(lower left) Blinds: Del Mar. Security cameras: Viacom. (upper right) Fixtures: Bradley. Cell windows: William Bayley Co. (lower right) Sliding doors: Koansake Iron & Steel. Security hardware: Folger Adam. Locks: Southern Steel. Metal security doors: Holden.

Pages 104-109

Annenberg Library and Communications Center, Pine Manor College Shepley Bulfinch Richardson and Abbott
Pages 104-107—Stone walls and granite sills: New England Cut Stone. Sheet roofing: Goodyear (Versiguard). Slate roof: Vermont Structural Slate Co. Copper flashings and guttering: Revere Copper Products, Inc. Skylights: Midwest Skylights. Revolving entrance: International Steel. Windows: J. B. Sash & Door Co. Outdoor lighting: Bega
Page 106-107—Lamps: Koch & Lowy, Inc. Tub chairs: Jack Cartwright. Fabric: Maharam. Tables: Custom design, fabricated by Nescor of Boston. Upholstered seating: Tuohy Furniture Corp.
Page 108—(left) Drywall and veneer plaster: U. S. Gypsum. Planters: Robert Charles Inc. Diffusers: Titus. (right) Stair treads: Flexco. Carpeting: J & J Carpet. Paints and stains (throughout): Sherwin-Williams. Red oak ceilings and architectural woodwork: fabricated by A. Galluzzo Woodworking. Stacks and periodical racks: Library Bureau. Study tables and carrels: Custom design, fabricated by Nescor of Boston. Chairs: Claud Bunyard Design, Inc. Closers: LCN. Locksets: Schlage. Hinges: Stanley. Exit devices: Von Duprin.
Page 109—Red chair: Claud Bunyard Design, Inc. Acoustic ceiling: Celotex. Laminate: WilsonArt.



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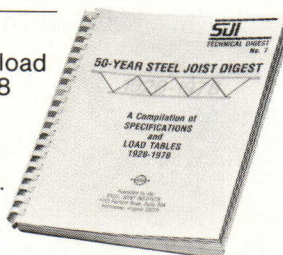
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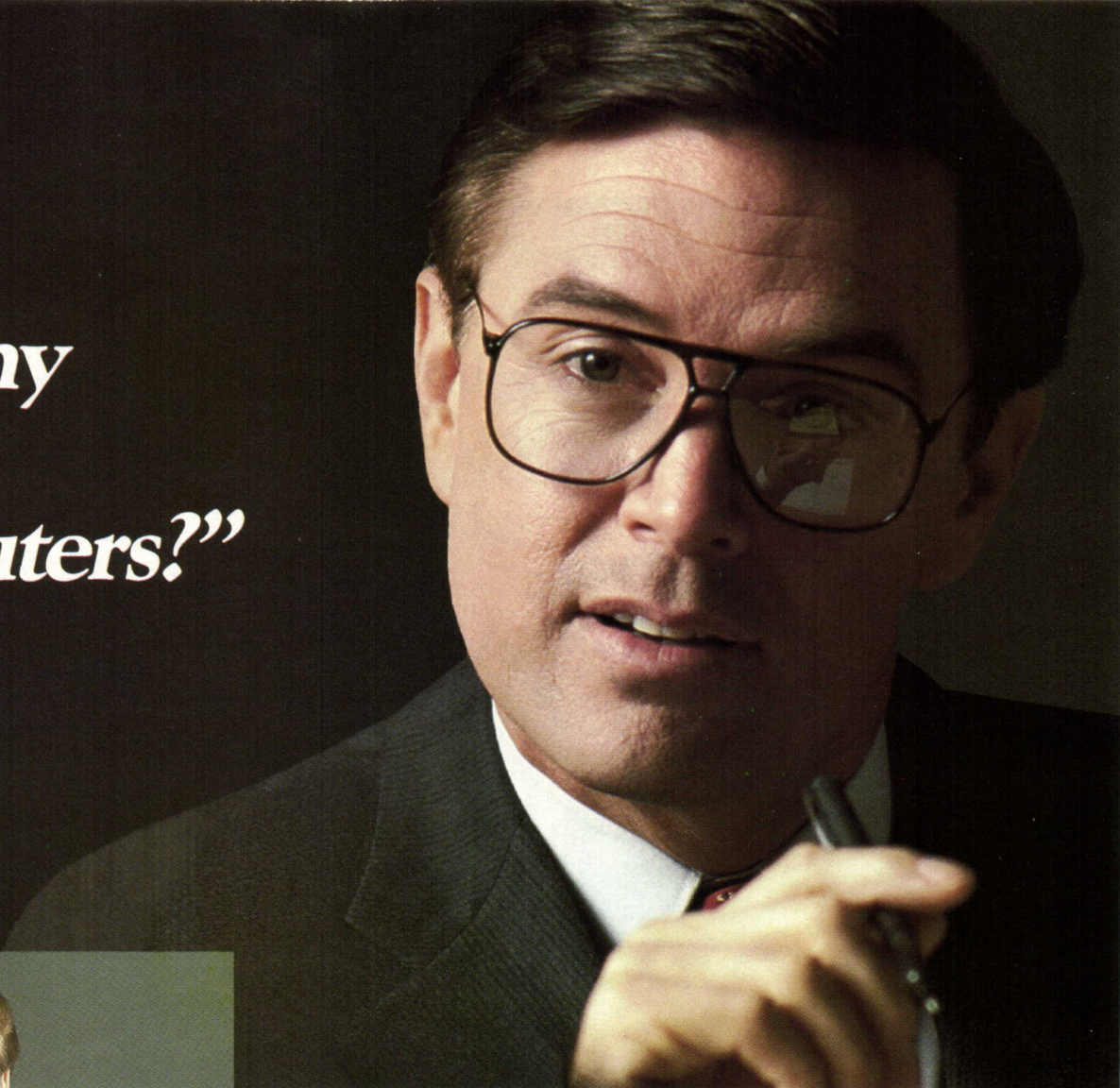
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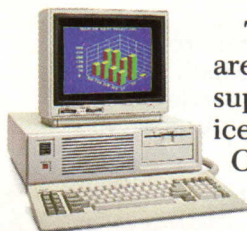
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Continued from page 45

New York Board of Standards and Appeals was about to turn down its application for a zoning variance, and the Whitney when it seemed clear that the city's Landmarks Preservation Commission would never buy Graves's scheme (the Whitney is located in the Upper East Side Historic District).

Now, nearly two years later, both museums have unveiled their revised expansion proposals, and although the new designs will still trouble those who feel that any addition to these buildings is tantamount to architectural heresy, Gwathmey Siegel's new Guggenheim scheme and Graves's reworked Whitney project respond admirably to many early criticisms. For the Guggenheim, Gwathmey Siegel has abandoned the notion of a tile-clad cantilevered tower in favor of a chaste slab that rises directly from the columns of an existing museum annex. Twenty-nine feet shorter, 15 feet narrower, and 5,750 square feet smaller than the original proposal, the new 133-foot-high scheme approximates the size and shape of Wright's own 10-story annex for the Guggenheim, designed in 1949. The building's limestone-sheathed Fifth Avenue facade would be grooved on an eight-foot module and would be articulated by four two-foot-high recessed windows meant to echo the deep cuts of Wright's spiraling rotunda skylights. Inside the new building, the first seven floors would house exhibition space for the museum's permanent collection; the primary concession that Guggenheim officials made in agreeing on the smaller addition was the continued off-site location of art-storage facilities, conservation studios, and the library (the earlier proposal had provided for these functions).

Perhaps even more than Gwathmey Siegel's work at the Guggenheim, Michael Graves's original scheme for the Whitney was attacked both for its size (it literally wrapped around the original building, and rose high above neighboring brownstones) and for its historicizing detail, which many felt was incompatible with Breuer's stark brand of Modernism. While the new Graves addition has the same three major elements of the original proposal, the overall height has been lowered by 47 feet (to 157 feet), and the gross area of the addition has been reduced by just over 30,000 square feet. Graves has slimmed down the cylindrical hinge between the old and new buildings, moreover, and by moving elevators from the eastern edge of the building into the core, he has eliminated the high rear wall, made necessary by the elevator overrun, that many area residents felt overwhelmed the low-rise scale of the side streets off Madison Avenue. Ornament on the red quartzite granite facades has been refined (an especially egregious triangular alabaster window is now a trapezoid that refers to Breuer's famous geometric cyclops eye), and both street fronts feature what Graves calls "surrogate brownstones" that reflect the scale and coloration of nearby row houses. *Paul Sachner*

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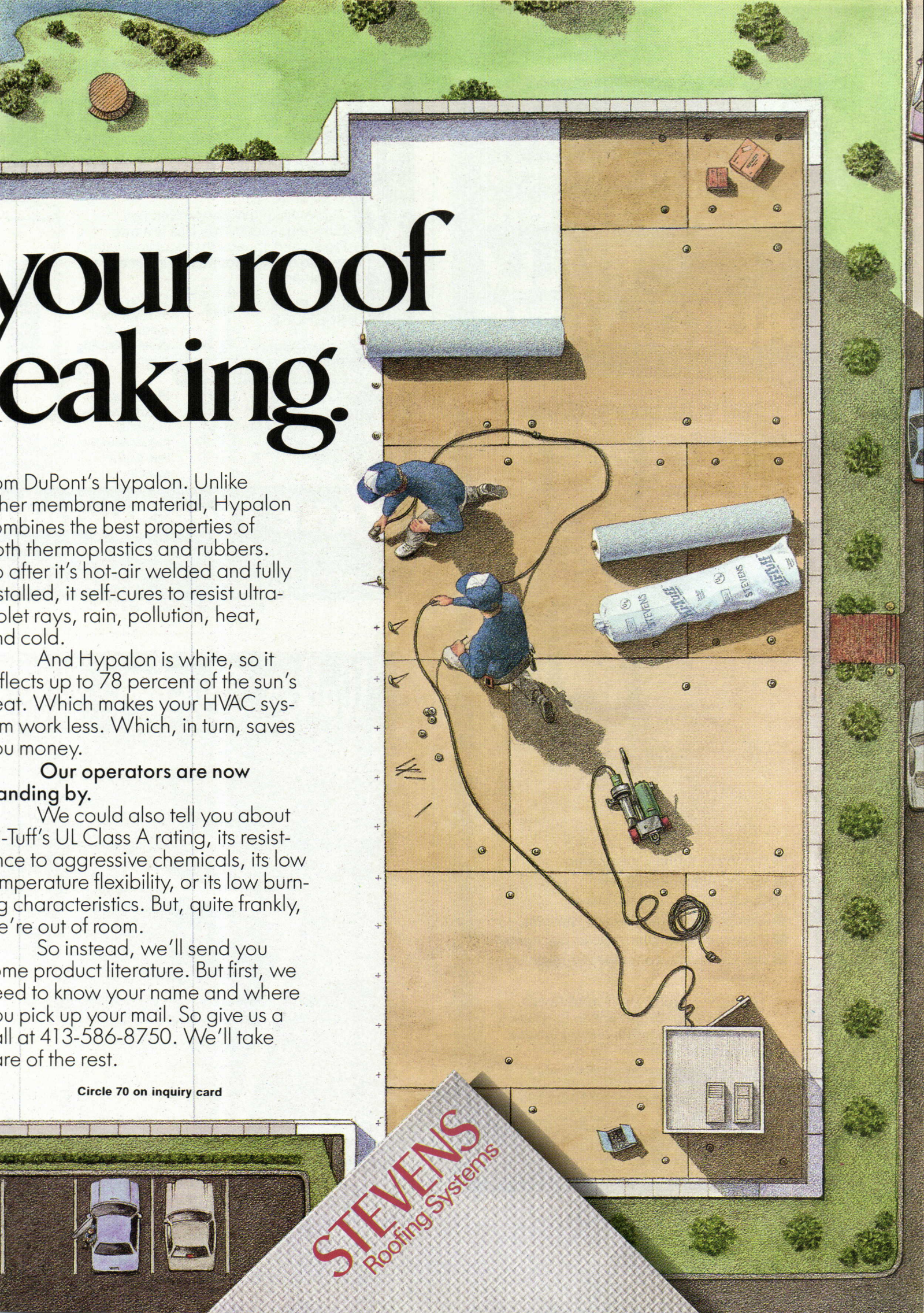
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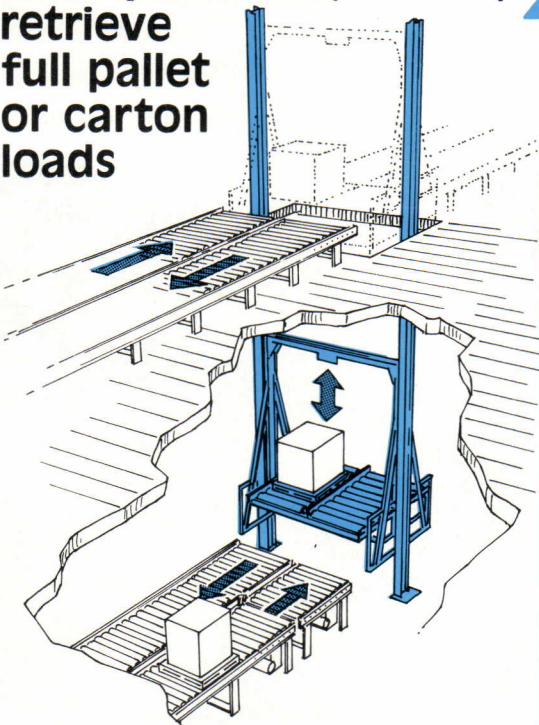
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Advertising index

Bold face—page number
Italics—Reader Service number

A

A/E/C Systems '87, 168; 76
(800) 237-3900
Alply, Inc., 32Eb; 22
(412) 787-0150
Alucobond Technologies, Inc.,
12-13; 7
(314) 851-2346
American Gas Association, 77; 48
American Glass Light Co., The,
147; 57
(212) 213-1200
Andersen Corp., 52-53; 38 [G-L]
Architect's Book Club, 151 to 153
Armstrong World Industries, Inc.,
Cov. II-1; 1, 2-3; 2 [G-E-D]
(800) 233-3823
Autodesk, Inc., 76; 47

B

BeadeX Mfg. Co., Inc., 154; 62 [G]
(206) 228-6600
Best Western International, 157
Bilco Co., The, 154; 61 [G-E-I-L]
(203) 934-6363
Bobrick Washroom Equipment, Inc.,
143; 54 [G]
(818) 764-1000
Bradley Corp., 135; 51 [G-E-I]
(414) 251-6000
Building Industries Tradeshows,
156; 65

C

Carlisle Syntec Systems, Div. of
Carlisle Corp., 50; 37 [G-E-I]
(800) 233-0551
Ceco Door Div., 167; 75 [G-E-I]
Celanese Industrial Fibers, 48; 35
(704) 554-2963
C/S Group, The, 30; 19
(201) 272-5200

D

Dataprint Corp., 173; 83
(800) 227-6191
Detex Corp., 155; 64 [G]
DuPont Co.-Corian, 2 page
advertising
supplement included with Eastern,
Central and Western copies only.
DuPont Co.-Hypalon, 14-15; 8
1 (800) 441-7111
Dur-O-Wal, Inc., 64; 42 [G]
(312) 577-6400

E

Efco Corp., 16; 9 [G-E-I]
Epic Metals Corp., 32; 20 [G-E]
(412) 351-3913

F

Fierre Di Verona, 171; 79
Firestone Building Products, 38; 28
[G-E-I]
(800) 428-4442
Flood Co., 171; 80 [G-L]
Florida Tile Div., Sikes Corp.,
169; 77 [G]
1 (800) FLA-TILE
Folger Adam Co., 62; 41
Follansbee Steel Corp., 42; 31 [G]
(800) 624-6906
Forms + Surfaces, 8; 5
(805) 969-7721
Forrer Chemical Co., 148; 58 [G]
1 (800) 558-7066

G

Gametime, Inc., 36; 26 [G]
(205) 845-5610
General Electric Plastics-Lexan
Sheet, 20-21; 12 [G-I]
(800) 845-0600
General Polymers Corp., Div. of
Cambridge General Corp., 73; 45
Georgia Marble Co., 175; 87
[G-I-L-D]
(404) 735-2591
Georgia-Pacific Corp., 24-25;
15, 16 [G-I-L-D]
(800) 225-6119
Glen Raven Mills, Inc., 10-11; 6 [G]
(919) 227-6211

H

Haworth, Inc., 34 25
(616) 392-5961 ext. 3289
Hewlett Packard, Cov. III; 93
1 (800) 367-4772
Hickman Co., W.P., 173; 84 [G-I]
(704) 274-4000
Hordis Brother, Inc., 44; 33 [G-E]
(609) 662-0400

I

Integrated Ceilings, Inc., 80; 50
(213) 478-0781
International Masonry Institute,
174; 86
(202) 783-3908
ISPO, Inc., 159; 69 [G-I]
(800) 343-1188

For detailed data, prefiled cata-
logs of the manufacturers listed
below are available in your 1987
Sweet's Catalog File as follows.

K

Kawneer Co., Inc., 26; 17 [G]

L

Laminators Safety Glass Assn.,
163; 74
(913) 266-7014
Libbey Owens Ford Corp., 28; 18
[G-I]
Lighting Services, Inc., 171; 81,
173; 85

M

Manville Corp.-Mineral Panels Div.,
6; 4 [G]
(303) 978-4900
Marble Institute of America, 43; 32
(313) 476-5558
Marble Modes, Inc., 32Ea; 21
(718) 539-1334
Merchandise Mart Properties, Inc.,
158; 68
Merillat Industries, Inc., 176;
55 [G-L]
(517) 263-0771
Milcor, 32Ca to 32Cd; [G-I]
Monier Co., 32Sa; 24 [G-L]
(714) 538-8822
Monsanto Chemical Co.-Saflex Sound
Control, 65 to 70; 43 [G-E]
1 (800) 325-4330
Musson Rubber Co., 154; 63 [G-I]

N

Nora Flooring, 39; 29 [G-D]
Northwest Airlines, 145
(800) 447-4747
Nucor Corp., 18-19; 11 [G]

P

Pella Rolscreen Co., 136-137; 52
[G-L-D]
(512) 628-1000
Pflow Industries, Inc., 162; 71
(414) 462-8810
Philips CPMS, 48B-48C; 36
Pittsburgh Corning Corp., 78-79; 49
[G-E-I]
(412) 327-6100
Plan Hold Corp., 22; 13
Presray Corp., 180; 92 [G-E-I]
(415) 321-6002

(G) General Building & Renovatio

(E) Engineering & Retrofit

(I) Industrial Construction &
Renovation

(L) Homebuilding & Remodeling

(D) Contract Interiors

R

Raceway Components, Inc.,
146-147; 56
(201) 661-1116
Radio Shack, 150; 60
Redi Park Systems, Inc., 32Wa; 23
(604) 524-4471

S

Sargent & Co., 5; 3 [G]
(203) 562-2151
Sharp, 71
Sloan Valve Co.-Plumbing Div., 170;
78 [G-E-I]
Spacesaver Corp., 40; 30 [G-I]
(414) 563-6362
Steelcraft Mfg. Co., The, 60; 40
Steel Joist Institute, 149; 59
Sternberg Lanterns, Inc., 179; 89
[G-E]
1 (312) 252-8200
Stevens & Co., J.P., 160-161; 70
[G-I]
(413) 586-8750
Sunbilt Solar Products, 156; 66
(718) 297-6040

T

Tamms Industries, Inc., 37; 27 [G-E]
Tectum, Inc., 180; 91 [G]
(614) 345-9691
Thoro System Products, Inc., 179;
90 [G-E]
(305) 592-2081
3M-Commercial Office Supply Div.,
17; 10 [G-E-I-L]

U

UC Industries, 172; 82 [G-I-L]
(201) 267-1605
USG Industries, Inc.-Interior Durock
58; 39
USG Interiors, Inc., Cov. IV; 94
United States Gypsum Co.-Light
Steel
Framing, 74-75; 46 [G-E]

V

Varitronics Systems, Inc., 177; 88
Velux-America, Inc., 23; 14 [G-L]
Vicon Industries, Inc., 46; 34
(800) 645-9116
Vistawall Architectural Products,
72; 44 [G]
(214) 563-2624

W

Walker Systems, 162; 73
WANE Tree Systems, 162; 72
(813) 961-1060
Wayne-Dalton Corp., 140-141;
53 [G-I]
(216) 674-7015
West Hollywood Civic Center, 156; 67

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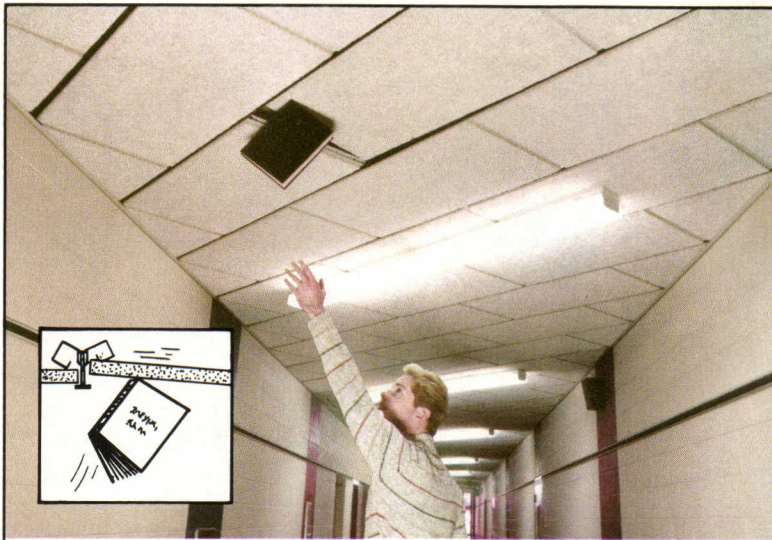
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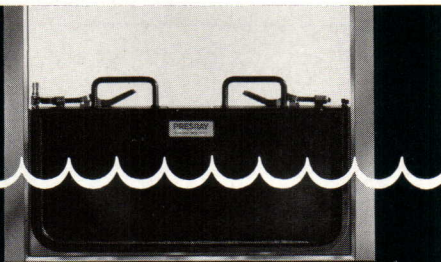


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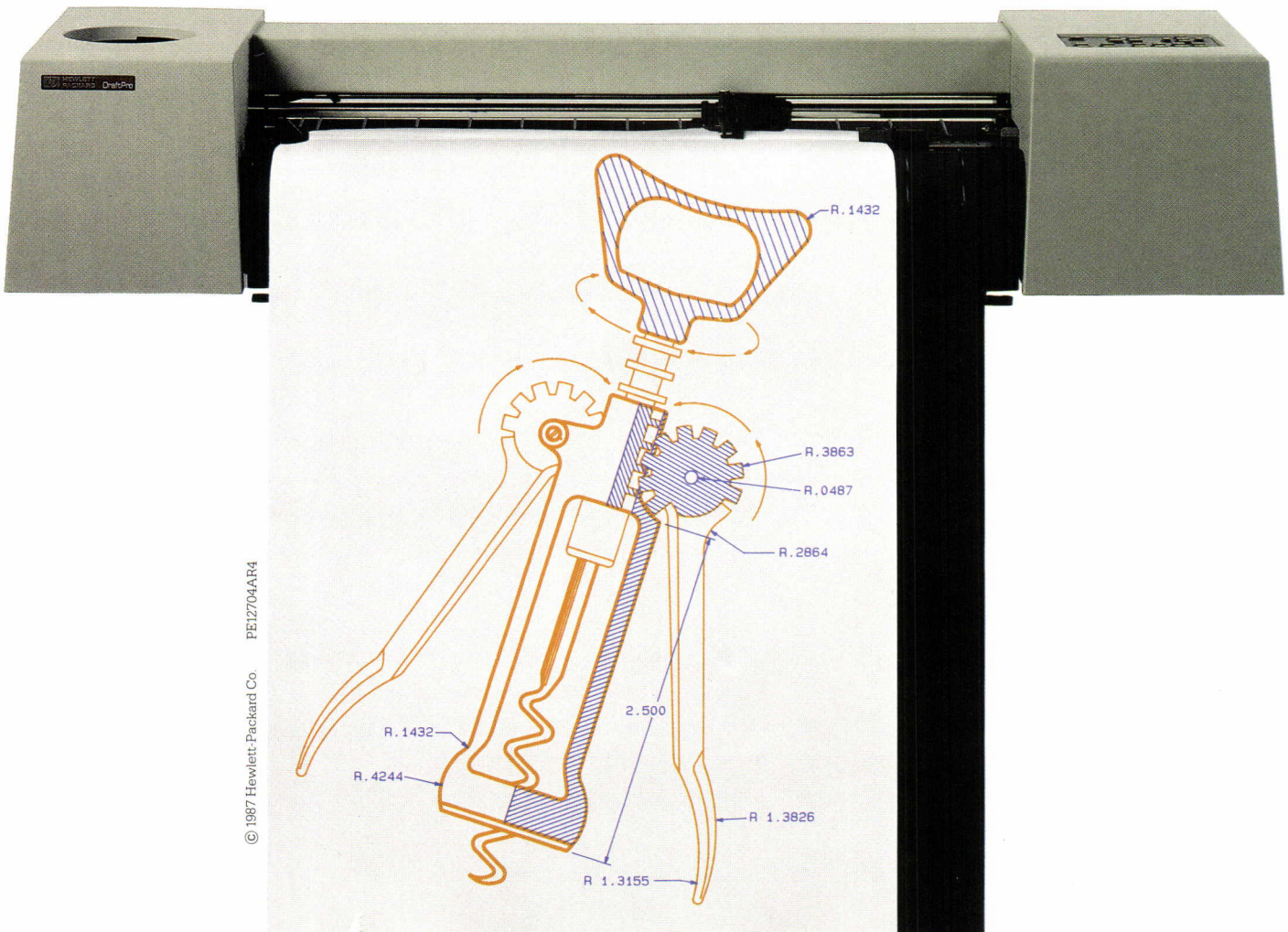


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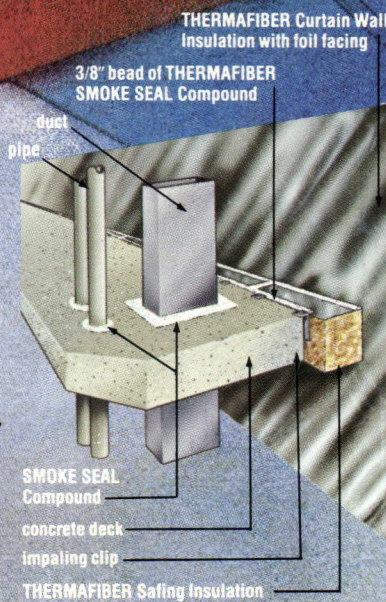
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