How many choices do you have when a roof panel comes in three profiles, three widths, five different metals, and 14 colors?

**one.** Ours. ECI's Architectural Roofing Panels give you a wonderful world of very attractive choices. All with real down to earth advantages.

And all from one source. ECI. Start with the basics. A roof that provides trouble-free service. Our integral vertical water-proofing leg is a full 1¼-inch high, compared to the usual ½ to ¾-inches.

And the panels, offered in 12, 15 or 18 inch widths, are all held down with our unique concealed stainless-steel clip. A clip that permits thermal expansion and contraction with no through panel fastening.

On to aesthetics. Our choice of profiles includes a slim rib, one that's tapered, and a little heftier looking "box" rib. All offered in a choice of metals (plus optional embossing), and finishes. Choose aluminum, galvanized steel, Galvalume™, Terncoated stainless steel, or pure copper.

Our 14 colors range through a choice of natural earth tones, to bold contemporary. In short, when you're choosing an architectural roof panel, we can offer you a world of flexibility plus a complete assortment of support items including flashings, hardware and structural shapes.

Write for ECI's Architectural Roofing and Mansard Panel brochure. That single act gives you a world of choice.

---

**Engineered Components Incorporated**

A Subsidiary of ECO Corporation

P.O. Drawer C, Stafford (Houston) Texas 77477, 713/499-5611
Manufacturing plants in Houston and Amarillo, Texas, Jemison, Alabama, and Lockeford, California.

Please send me complete information on your Architectural Roof System.

Name: ____________________________
Title: ____________________________
Company: _________________________
Address: __________________________
City: __________________ State: _____ Zip: ____
Phone: ____________________________

---
Specify Duraflake FR.

Anything less and you could be playing with fire.

Play it safe with Duraflake FR, the fire-rated particleboard that exceeds Uniform Building Codes and was approved and awarded a Class I rating by Underwriters' Laboratories in 1975. You can specify Duraflake FR with confidence for buildings, furniture... any application where fire safety is vital.

Play it versatile with Duraflake FR: Order it drilled, routed, bullnosed, beveled, precision machined, filled or filled and base-coated. Smooth, grain-free Duraflake FR is also an excellent, economical substrate for fine wood veneers, high and low pressure laminates and vinyls for wall systems, contract furniture and fixtures.

Play it for all we've got: Besides fire-rated Duraflake FR, we offer industrial grade Duraflake that is edge-filled, surface filled, color coated, or treated with hot melt polymer. We also have table core, door core, stair tread, edge-filled shelving, mobile home decking and high density Duraflake in 50 lb. and 55 lb. weights.

Duraflake is sold through a nationwide distributor network. For complete information and the name of the distributor nearest you, contact: Duraflake, P.O. Box 428, Albany, OR 97321. Or call our sales office at 503-928-3341.
THE BEAUTY OF WOOD, WITHOUT THE PROBLEMS

THE YEARS AHEAD ROOFING SYSTEM
BY CLASSIC PRODUCTS, INC.
A design so unique, it's patented!

Beautify and protect your new home, and end the problems of temporary roofing with the Years Ahead Roofing System. Classic Products' Rustic Shake Shingles are deeply textured, and finished in natural and “Weathered Wood” earth tones. They offer:

- The Beauty of Wood
- The Durability of Aluminum
- Protection Against Fire***
- Savings on Heating & Air Conditioning Costs
- A 40-Year Limited, Transferable Warranty
- Added Value and Security for Your Home

***Classic Products’ Rustic Shake Shingle carries a Class A Fire Rating from Underwriters Laboratories.

Telephone Today
1-800-543-8938
for samples and full information, without obligation.

Classic Products, Inc.
234 East First Street, Piqua, Ohio 45356
The makers of quality aluminum building products.
CONTENTS

The Steve Chase Residence, Rancho Mirage. Holden and Johnson/Architects.


TWA, LAX. Architect: W. Hoos Associates.

Architecture in Flight: LAX and SFO, by Don Shaw, AIA and Janice Fillip
The Metro: Whistle-Stop Development in Los Angeles, by Kelly Collins
CCAIA Honor Awards

DEPARTMENTS

8 NEWS
33 COMPUTERS: The Declining Cost of Computers, by Eric Schreuder

COVER

Crocker Center and Galleria, San Francisco. Architect: Skidmore, Owings & Merrill. Photograph: Peter Aaron/ESTO.

Architecture California, an official publication of the California Council, The American Institute of Architects, is published six times a year. Subscriptions: complimentary to CCAIA members; $34 a year for all others. For subscriptions, write Circulation Department, 1444 K Street, Suite 320, Sacramento, CA 95814. CCAIA is not responsible for statements or opinions expressed in Architecture California, nor do such statements necessarily express the view of CCAIA or its committees. © 1984 by CCAIA.
Manufacturing the finest quality windows and doors
GREENHOUSE WINDOWS, SOLARIUMS, SKYLIGHTS, SLIDING GLASS DOORS, SLIDING WINDOWS, CASEMENT & PROJECTED WINDOWS, ROUND, ARCHED, & PICTURE WINDOWS, ENTRANCE DOORS & STOREFRONTS
SERVING NORTHERN CALIFORNIA FOR 30 YEARS

BLOMBERG WINDOW SYSTEMS
1453 BLAIR AVE., SACRAMENTO, CA 95822
(916) 428-8060

1983 Gold Nugget Award Winners
Christofer Centre—Sacramento
Architect: Alan Oshima
Builder: Harbison, Mahony, Higgins
Photo: Ed Asmus

CCAIA
California Council, The American Institute of Architects
1414 K Street, Suite 320
Sacramento, California 95814
(916) 448-9082
Executive Vice President
Paul W. Welch, Jr.

BOARD OF DIRECTORS
President
Harry Jacobs, AIA
First Vice President
Virgil Carter, AIA
Secretary
Cyril Chern, AIA
Treasurer
Harry Haimovich, AIA
Vice President/Governmental Relations
Ralph Bradshaw, AIA
Vice President/Education, Professional Development
William McCulloch, AIA
Vice President/Communications, Public Awareness
Warren D. Thompson, AIA
AIA Directors
Harry C. Hallenbeck, FAIA
Paul Neel, FAIA
Robert Odermatt, FAIA
William E. Patnaude, FAIA
Associate Directors
Kim Larson (North)
Anthony Araiza (South)
Student Director
R. D. McDonnell
Cabrillo Chapter
Kenneth Wang, AIA
California Central Coast Chapter
Kenneth H. MacIntyre, AIA
Central Valley Chapter
Julius W. Mirza, AIA
Robert A. Nelson, AIA
East Bay Chapter
E. Paul Kelly, AIA
Judith L. Rowe, AIA
Charles Stickney, AIA
Golden Empire Chapter
Warren Pechin, AIA
Inland California Chapter
William Carl Johnson, AIA
Los Angeles Chapter
Martin Gelber, AIA
Mark Hall, AIA
William Kiesel, AIA
William Landworth, AIA
Frederick P. Lyman, III, AIA
Robert Tyler, FAIA
Chester Widom, AIA
Monterey Bay Chapter
David T. Elliott, III, AIA
Orange County Chapter
Betsy Olenick Dougherty, AIA
James R. Harris, AIA
Leason Pomeroy, III, FAIA
Pasadena and Foothill Chapter
W. E. Griest, AIA
Peter G. Kudrave, AIA
Redwood Empire Chapter
Robert E. Anderson, AIA
San Diego Chapter
William Ferguson, AIA
William Krommenhoek, AIA
Michael B. Wilkinson, AIA
San Francisco Chapter
Frederick J. Klemeyer, AIA
Sandra D. Miller, AIA
Kenneth Nakin, AIA
John H. Quense, AIA
Christopher Raker, AIA
William B. Reiner, AIA
San Joaquin Chapter
Anthony C. Fings, AIA
Clayton B. Wardle, AIA
San Mateo County Chapter
Christopher Arnold, AIA
Santa Barbara Chapter
Bruce Bartlett, AIA
Santa Clara County Chapter
Robert N. Moberg, AIA
Ronald V. Ronconi, AIA
Peter G. Shuttles, AIA
Sierra Valley Chapter
Raymond C. Abst, FAIA
Ventura County Chapter
Andrew Alan Czubiak, AIA

Architecture California  March/April 1984
A new prefabricated masonry system.
The advantages are significant ... and so are the savings!

- Cost effective method of using brick as a building cladding for mid and high rise structures.
- Flexibility and appearance of face brick combined with the speed and flexibility of pre-cast concrete construction procedures.
- Self-supporting, pre-fab masonry structure capable of resisting all required handling, erection and in-place design stresses.
- Use of Higgins extremely strong 5" hollow internally-reinforced brick eliminates need for a "back-up" structural system and provides finished surface for both exterior and interior walls.
- Greater quality control of brick installation
- Great design flexibility in panel size and shape.
- Increased speed of construction with consequent reduction of construction financing.
- In place cost of only $16 to $20 per square foot.

Prefabricated brick panels are lifted into place and connected to the frame of the building.

The bottom line is you can invest your buildings with the beauty, maintenance and durability values of a brick cladding at a cost comparable to or less than other building skins.

Higgins Brick
1845 Elena Avenue
Redondo Beach, CA 90277
(213) 772-2813

801 Civic Center, Santa Ana, California
Architect: Herbert Nadel, AIA & Partners
Masonry Contractor: R & R Masonry
General Contractor: Keller Construction Company
Developer: Ferrante/Walder Co.
San Joaquin Awards

Jurors for the San Joaquin Chapter Awards Program wrote, "The Jury's impression of Fresno as reflected in its architecture is one of a friendly community; of a nature which is derived from farm land; of a sense of individuality and open space and a non-ostentatious and strong work ethic. The special quality of life which exists here makes for a character of architecture to be found in few communities in the nation." Awards of Excellence were presented to the U.S. Government Employees Credit Union of Fresno County, by Edwin S. Darden Associates and to The Downtown Club in the Printery Building, by Allen Y. Lew & William E. Patnaude. Kastner Intermediate School, by Edwin S. Darden Associates and Fresno Art Center, by Allen Y. Lew & William E. Patnaude received Awards of Honor. Awards of Merit went to Quail Ridge Townhomes, by Thompson Architectural Group and Good Shepherd Lutheran Church, by L. Gene Zellmer Associates. Jurors for the program were George Hasslein, FAIA, George Bissell, FAIA and Ronald J. Rossi, AIA.

American Wood Council Awards

Three California firms were honored in the American Wood Council's second biennial nonresidential design program. Honor Award winners were Dutcher & Hanf, Architects of Berkeley for The College Preparatory School in Oakland (see page 28) and Esherick Homsey Dodge and Davis of San Francisco for Silver Lake and Snow Park Centers at Deer Valley Resort in Park City, Utah. Berkus Group Architects of Santa Barbara received a Citation Award for the Descanso Education and Exhibition Complex in La Canada. Jurors were Don M. Hisaka, FAIA, chair, Thomas Hall Beeby, AIA, Peter Q. Bohlin, FAIA, Jaquelin Robertson, FAIA, William Turnbull, Jr., FAIA, and Tod Williams, AIA.

P/A Awards

The 31st Annual P/A Awards, sponsored by Progressive Architecture, recognized two California architectural firms. Architects Broome, Orindulph, O'Toole, Rudolf & Associates of Portland, Oregon, ELS Design Group of Berkeley, and Barton Myers Associates of Toronto won an award for their joint project, the Portland Center for the Performing Arts (see Architecture California, May/June, 1983). Tanner & VanDine Architects of San Francisco received a citation for the design of the California DataMart in San Francisco.
REWARDABLE AFFORDABLE Clay

FaceBlock

Rewardable, affordable clay faceblock adds distinction to any wall or building—combining the natural beauty of brick with the economy of block. Offered in an extensive range of sizes, colors and textures.

All our structural clay block is facebrick quality. All manufactured in our new automated plant. Call the new Davidson today. You'll be glad you did.

DAVIDSON BRICK COMPANY
Quality clay block and brick

24100 Orange Avenue, Perris, California 92370. 714/943-2911
Inland California Awards Program

The Steve Chase Residence in Rancho Mirage, designed by Holden and Johnson/Architects, received an Honor Award in the Inland California Chapter's biennial awards program. The program recognized work in two categories: completed projects and projects currently being designed and planned. Merit Awards for Completed Work were presented to the ISH and Carol McKnight Residence, by Holden and Johnson/Architects; ICU/CCU Intensive Care Addition to San Antonio Community Hospital, by HMC Architects, Inc.; and the Village Center Building, by Guy G. Salts and Associates, Inc. A Citation for built work was awarded to Fire Station, City of Grand Terrace, by Wolff-Lang-Christopher/Architects. A Merit Award for Work in Progress went to the Nursing/Ancillary Addition and Cogeneration Power Plant at St. Luke Hospital, by HMC Architects, Inc. The Civic Center, City of Grand Terrace, by Wolff-Lang-Christopher/Architects received a Citation in the same category. Jury for the awards program were Ward Deems, FAIA, Martin Gelber, AIA and Donald Gibbs, FAIA.

CCAIA Firm Award

For the first time in its 40 year history, the California Council, The American Institute of Architects presented a Firm Award as part of its 1984 Honor Awards program. The Firm Award is given for outstanding contributions to the built environment and for active efforts to advance the profession of architecture. Two firms—Marquis Associates and MBT Associates, both of San Francisco—were selected to receive the honor.

Marquis Associates, established in 1953 by Robert B. Marquis, FAIA, emphasizes an atmosphere of design collaboration among its many principals, associates and staff. This cooperative effort has produced an impressive array of built works for which the firm has received over 50 design awards. Among its most notable projects are the Department of Justice, Division of Law Enforcement in Sacramento; the Cecil H. Green Library at Stanford University; the Marion Cerbatos and Tomasi office renovation in San Francisco; the Stern Hall Dormitory Addition for the University of California in Berkeley; and the Primate Discovery Center at the San Francisco Zoo.

Principals in the 35 person firm are Robert B. Marquis, FAIA; J. Peter Win-
kelstein, FAIA; Phyllis Martin-Vegue, ASID; James E. Caldwell, Jr., AIA; and Cathy Simon, AIA. The work of Marquis Associates will be exhibited at the AIA/ San Francisco Chapter’s Gallery, 790 Market Street, San Francisco, from February 13 to March 30, 1984.

MBT Associates, formerly McCue Boone Tomsick, is highly respected among colleagues, consultants, and clients for distinguished architecture. MBT Associates makes service to clients the firm’s guiding principle, taking special pride in the fact that it has served some clients continuously throughout its 30 year history. Among the firm’s most significant projects are the Santa Clara County Transit Facilities and IBM Santa Teresa Laboratory, both in San Jose; the Syntex Corporate Center in Palo Alto; the Berkeley Marina in Berkeley; and Oakes College at the University of California in Santa Cruz.

Principals in the firm are Frank Tomsick, FAIA; Gerald M. McCue, FAIA, Consulting Principal and Dean of the Graduate School of Design at Harvard University; Peter S. Hockaday, AIA; Alan R. Williams, AIA; Michael M. Hearn, AIA; and Rosalyn C. Koo, the firm’s financial manager.

Mixed-Use Development Survey

A recent survey by the Urban Land Institute reported a 209 percent increase in mixed-use development (MXD) for the eight year period 1975-1983. With nearly 100 new projects either in the planning stages or under construction, the pace of this development is expected to continue throughout the 1980s.

The survey noted certain trends in MXDs. A lion’s share (79 percent) of the projects are located in central cities, but developments in suburbs and smaller cities are on the rise. Nearly all of MXDs (97 percent) include both retail and office space, while almost two-thirds have hotels, and 42 percent offer residential living space. Less frequent uses for MXDs are recreation, theater, and/or convention center/arena facilities. A copy of Mixed Use Development Projects in North America: Project Profiles can be obtained for $35 from the Urban Land Institute’s Publications Orders Dept., 1090 Vermont Avenue, NW, Washington, DC 20005.

Foam Home

Ted Thoeny, a civil engineer from Sea- side in Monterey County, is advancing an idea for affordable, energy-efficient, fire-resistant housing. His idea is to create a sealed cocoon by erecting a ¾” plywood frame and spraying the inside walls and ceilings with polyurethane foam, apply-
Cobb offers 200 door designs—a door right for any kind of application. Cobb doors are built to the tightest specifications in the industry, and they cost less than you might think. T.M. Cobb is a business built on providing value and reliable service since 1935.

Cobb has more doors than all competitors combined. These doors are inventoried in seven conveniently located warehouses for immediate delivery. Rain or shine, Cobb’s 77 vans deliver on time.

When you specify a T.M. Cobb door, you know that you’re in good hands. Phone 714/979-4341 today for a free brochure and for the name of the T.M. Cobb distributor nearest you.

T.M. Cobb

Quality products to live with. Cobb Cares.

LOS ANGELES · SAN DIEGO · RIVERSIDE
CAMARILLO · SANTA ROSA · MORGAN HILL
SACRAMENTO
ing plaster and paint as a finish. Using this method of construction, Thoeny claims it is possible for two people to build a home in ten days, cutting labor costs substantially.

"Because there are no studs in the walls, we curved the corners to maintain resistance to sheer stress," explains Thoeny. A prototype built by his company, Thoni Thermal Homes," departs from conventional building design by eliminating the dividing line between walls and ceilings and capping the house off with flattened igloo-like roofs.

Energy Costs Rise

A residential energy study published recently by the U.S. Department of Energy reports that the average household paid $1,022 in 1981 for energy. This represents a 10 percent increase over the previous year. Survey data from 1978 to 1981 show a 10 percent drop in fuel consumption, but that was not nearly enough to offset the increase in fuel prices, which caused residential energy costs to soar 55 percent in the same four year period. The West continues to have the lowest energy bills in the country. Broken down by region, the average household paid $1,426 in the Northeast, $1,042 in the North Central, $922 in the South, and $721 in the West.

Grant for Advanced Study

The Arnold W. Brunner Grant for $10,000 will be awarded this summer to architects or those in related fields to fund advanced study in any special field of architectural investigation which will effectively contribute to the practice, teaching, or knowledge of the art and science of architecture. Applications are available March 15, 1984 from the New York Chapter of The American Institute of Architects, 457 Madison Avenue, New York, NY 10022. Phone: (212) 838-9670. Proposals must be submitted by April 25, 1984.

Competitions

Entry forms for a Design Competition for the New York Vietnam Veterans Memorial, a two phase competition, now are available. First prize is $10,000; second prize, $5,000; third prize $2,500; and discretionary honorable mention prizes are $1,000 each. Deadline for all submissions is April 14, 1984. Contact: New York Vietnam Veterans Memorial Commission, 110 Church Street, Suite 1700 A, New York, NY 10007. Phone: (212) 608-5800.

Builders, architects, planners, designers and developers are invited to enter the fourth annual Builder's Choice design and planning awards contest sponsored by Builder. Entry deadline is June 13, 1984. Contact Builder's Choice, National

Solve window covering problems of energy cost, heat gain, light and glare under difficult structural conditions with TRACKSTAR.™

PROJECT: Commerce Bank, Costa Mesa, California

PROBLEM: Radiant and ambient heat created significant customer and employee discomfort. Air conditioning proved inadequate and costly. Glare caused tellers to wear dark glasses, even though special darkened heat-absorbing glazing was used. Customers were lost. Traditional window coverings would not traverse both planes of the window.

SOLUTION: A TRACKSTAR™ motorized system with dual fabric canvas and sunscreen folding shades were specified by Interior Architect Will Fesler of WMF Designs.

RESULTS: Temperature lowered 20 degrees Fahrenheit. Tellers were able to work comfortably, without glasses. Customer retention increased. Energy savings will repay cost of TRACKSTAR™ system.

H & C CASTLE ARCHITECTURAL WINDOW SHADING SYSTEMS
7531 Coldwater Canyon Avenue, North Hollywood, California 91605 • (818) 503-8300 • (800) 828-2500

See Sweet's Architectural File 12.9 HOM or phone toll free to (800) 828-2500 for product design assistance for greenhouse and solarium shading problems.
Del Paso Boulevard Charrette

"Paint it up—Fix it up" could have been the theme for the Del Paso Boulevard Charrette, jointly sponsored by the Central Valley Chapter of the American Institute of Architects (CVC/AIA), the North Sacramento Chamber of Commerce, and the Sacramento Housing and Redevelopment Agency.

The charrette was called to propose inexpensive ideas for immediate revitalization of the area. Forty-five architects, landscape architects, planners, and artists volunteered their expertise in helping the community breathe new economic life back into the area.

According to Michael Chambers, AIA and Bruce Monighan, AIA, who coordinated the event for the CVC/AIA, the response from area merchants and residents was "overwhelming." For two days, the red and yellow T-shirts of the charrette were seen everywhere on Del Paso Boulevard. The local press, TV and radio were all on hand to cover the event.

"What we tried to do was to look at a building and make improvements that would respect the good architecture that is already there, finding key elements and emphasizing them. In the process of the weekend, we raised the design intelligence of the local community," Monighan said.

Among the more modest improvements suggested were a planned color scheme; new signage to provide an identifying, unifying logo for the area; additional trees and shrubs; and sandblasting of some buildings to expose the original tile and brick work. Better street lighting was considered a must to help deter crime and encourage pedestrian traffic during the evening.

Another charrette design team, lead by Barry Wasserman, FAIA, explored ideas for future development of the Boulevard. Included in their suggestions were new parking structures, mini-parks, a community theater, relocation of a proposed light rail station, and an area set aside for Saturday afternoon antique auctions.

Many business and property owners walked away from the charrette eager to begin the planned year-long revitalization program. The architects provided the community with its first opportunity to get together and express its collective intent to upgrade the neighborhood.

"It's good for our profession to do this," said Ted Walker, AIA, member of the charrette. "Normally architects work with wealthy people. We have a responsibility to give back to society, to depressed areas."
WHEN THE CHIPS ARE DOWN...
This may be the most important card you hold!

Prompt claim payment, usually within 48 hours of receipt, is an outstanding feature of the CCAIA Group Insurance Program which this card represents.

Participants in the CCAIA program receive personal hospital identification cards, personal insurance certificates, complete information material, and personal responses.

It's the hospital identification card carried by participants in the California Council, AIA Group Insurance Program. It guarantees coverage for eligible expenses for the first two days of hospital confinement, generally allowing entry without delays.

You're an AIA person with a real name, not a number, with AA&C. Personal attention is only a collect call away to 714/833-0673.

Association Administrators & Consultants, Inc.
19000 MacArthur Boulevard, Suite 500, Irvine, CA 92715
COMPUTER-AIDED DESIGN ON YOUR PC FOR ARCHITECTS WHO ARE TAKING OFF.

Draw elevations and floor plans—without a single pencil, xacto knife, triangle, or compass. Just slip in your AutoCAD™ graphics software disc and you're ready to take off.

Design a two-story office building—or plan a 50-acre office complex. Design a high-rise condominium—or a single home.

Do it all on your PC. AutoCAD is the industry standard. It's compatible with most any PC, from the IBM PC and XT, to the Zenith Z100, Victor 9000, NEC APC, DEC Rainbow, Texas Instruments Professional, and CP/M systems.

Take your pick of input/output devices: plotters, pens, mice, digitizers or color monitors.

You'll work better. And easier.

Draw lines—of any width. Add circles and arcs. Fill them in. Move items, copy, modify, erase or rotate them. Scale vertically or horizontally. Zoom in and work on details.

Draw a front elevation. Make things stand out with layers and colors.

Sound expensive? Hardly. AutoCAD costs only $1,500 with advanced drafting extensions.

Word Processing for Drawing
For a demo and further information, call or write:
Autodesk, Inc.
150 Shoreline Highway—Building B
Mill Valley, CA 94941
(415) 331-0356

AUTOCAD™
As California's population and economy have grown, the state has become the kind of national focal point that the Eastern seaboard was at the beginning of this century. Consequently, California's international airports are the principal gateways to the United States for many immigrants, business travelers, diplomats, and tourists. At the same time, the San Francisco-Los Angeles air corridor has become the busiest on the planet.

According to aviation forecasters, no major reversals are expected in the next 20 (or even 50) years in the trends which have brought so many people to the Los Angeles and San Francisco Airports. In response to passenger demand for air service to "LAX" and "SFO," both airports have embarked upon ambitious terminal expansion and rehabilitation programs. Both airports are providing new facilities for international passengers, and are upgrading or expanding their capacity for serving domestic passengers as well. The number of people using SFO and LAX and the economic importance of the airports to their communities (not to mention their symbolic value as gateways to California) make these two places perhaps the most important sites for civic architecture in the state.

When the $700 million program of construction underway at LAX is completed in mid-1984, the airport passenger terminal space will be doubled, about 4,000 public parking spaces will be added to the central terminal area, major airfield improvements and a new air cargo handling complex will be completed, and the Central Utility Plant will be expanded. LAX will have the capacity to handle 40 million passengers annually.

At SFO, the terminal modernization and replacement program is scheduled for completion in 1987. The program began in 1979, when a joint venture of John Carl Warnecke & Associates and Dreyfuss & Blackford designed the 1.1 million square foot, $67 million North Terminal for United Airlines. Current modernization projects for the Central and South Terminals, designed to increase SFO's capacity to 31 million passengers annually, are under the direction of Howard A. Friedman, AIA, master architect for SFO, in conjunction with Fong & Chan, associate master architects.

The 25-year-old Central Terminal, the first terminal built at SFO, was modernized to serve a new function as the airport's international facility. The modernization program called for an upgrade of the original building; a new boarding pier containing a 15,000 square foot retail concourse and 40,000 square feet of departure lounges, baggage handling and airline ramp facilities; a new 156-foot high FAA air traffic control tower; and new connectors to the existing North and South Terminals. Architect for the $100 million project was Gensler and Associates Architects. The project was completed in 1983, on schedule and within budget, according to Louis Turpin, SFO's Director of Airports.

Projects at LAX include:
- a $50 million second level deck for World Way, increasing roadway capacity from 4,100 to 6,300 vehicles per hour. Architects: a joint venture of DeLeuw, Cather and Company with The Ralph M. Parsons Company; Gin Wong and Associates for the roadway/terminal building interface.
- West Terminal, to handle the up to 7 million international passengers annually. Architects: a joint venture of Pereira/ Dworsky/Sinclair/Williams.
- Terminal One, to handle over 6 million domestic passengers annually. Architects: Welton Becket Associates; with Margo Hebald-Heymann, AIA, associate architect; Benito A. Sinclair & Associates, civil engineers; and Peat Marwick, Mitchell & Co., consultants for technical planning.
- remodeling and expansion of existing airline facilities.
- three new parking structures, a $36 million project to increase public parking spaces to nearly 27,000. Architects: Kennard Design Group.

Construction manager for all projects: Bechtel/DMJM, a joint venture of Bechtel Civil and Minerals, Inc. with Daniel, Mann, Johnson and Mendenhall. Supervising architects: Gin Wong Associates.
**Elements of Airport Design**

Expansion of facilities at both SFO and LAX is planned within the confines of the existing infrastructure, airfield layout and terminal building complex, rather than through major relocation or drastic reconfiguration. The work underway at LAX and SFO does not represent the current trend toward segregating the landside and airside functions of an airport and linking the two with a ride system. This approach, used at Dallas and Tampa and in variation at Orlando and Atlanta, is perhaps best suited to completely new airport developments. The additions to LAX and SFO represent the emerging tendency of airport facilities everywhere to make optimum use of the existing infrastructure, and reflect the trend toward centralized airline activity ("hubbing") which has occurred since airline deregulation.

What has taken place at these two airports represents a "postmodern" approach to airport design, not in the sense that Charles Jencks coined the phrase, but in the sense that starting from scratch (the 1950s approach) is no longer economical in this era of limits. Air transport has matured, and the need to totally discard existing facilities because of radical changes in aircraft equipment is not as pressing as it was at the dawn of the jet age or when widebody aircraft were introduced. Only where extremely constrained airspace problems or overwhelming environmental issues exist can a case be made today for the construction of an entirely new airfield. The decision at SFO and LAX to build within the context of existing, functioning airports makes the architects' job much more challenging, if somewhat less glamorous.

To appreciate the work being done at Los Angeles and San Francisco requires some background in the general principles of airport design. To begin with, the area available for a terminal is determined largely by airfield layout. San Francisco and Los Angeles represent different types of runway configurations: LAX has dual parallel runways with staggered thresholds, while SFO has dual intersecting runways, due to its crosswind problems. Each runway configuration places different constraints on the area available for terminal building development. SFO is limited because the runway intersections prevent buildings from expanding in one direction and Highway 101 precludes expansion in the other. On the other hand, LAX's parallel configuration could allow a midfield terminal to expand in either direction, if tunnels were provided beneath the crossover taxiways. In practice, however, this would require the relocation of airline maintenance facilities at LAX. The net result is that physical expansion of terminals at both airports is constrained.

Another consideration in airport design is the generic type of terminal layout. Airport terminals generally fall into certain categories. The most common are the linear (or frontal gate) terminal, the pier finger terminal (either parallel- or cross-taxiway configurations), the satellite terminal, and the ride-system terminal. There are, of course, many combinations of and variations on these themes. Also, terminal activities may be centralized in one building or dispersed among several unit terminals connected by a common roadway.

The roadway itself is a major determinant of building design. All traffic may be on a single level, as is common at small facilities, or it may be separated into enplaning traffic on the upper roadway and deplaning traffic on the lower roadway, which is the most common arrangement for large facilities.

Although they started at different points, both LAX and SFO are evolving into "connected unit terminals," with pier fingers for aircraft gates and two-level roadways. SFO was built as a pier finger central terminal with a two-level roadway. LAX, in its earliest conception, was planned to consist of separate satellite-type unit terminals around a two-level roadway, but the

---

At SFO the $148.6 million facelift for the South Terminal includes the following elements:

- construction of a new West Entrance Building to the South Terminal by Group-4 Architecture, Research & Planning, Inc.;
- renovation of three boarding areas—Area A by Anshen & Allen, Area B by Esherick Homsey Dodge & Davis/Robert B. Wong, and Area C by Gensler and Associates Architects;
- construction of a new Boarding Area B concessions area by ED-2 Architects and Planners; and
- construction by Gerson/Overstreet of new tunnels to connect the existing parking structure to Boarding Areas A and C.
second level only recently was realized. "We're converting from a satellite to a finger system," said Bob Schoenfeld, AIA, deputy general manager for LAX. "We're only getting about 10 percent more gates, but we're getting widebody gates. I'm still convinced that, in theory, the satellite system is best."

Within constraints imposed by the existing runway configurations and terminal area layouts, the architects involved in the expansion and remodeling of these facilities must find ways to accommodate the various components of a modern airport. On the landside these components are parking, roadways, curbside, ticket lobby, ticket counters, baggage claim, baggage handling facilities, and circulation. On the airside, the major components are runways, taxiways, aircraft parking aprons, operations facilities, departure lounges, and concourse circulation. Security checkpoints and concessions may be either airside or landside.

Fitting all of these elements, each with its own requirements for space and functional relationships, into a limited site is no easy task. The South Terminal at SFO offers an example of this problem. "We were absolutely squeezed between the parking garage and the airside circulation," said Jim Caldwell, AIA.

Marquis/Wong & Brocchini proposed a new airside circulation pattern to ease the strain, but it was stymied by lack of budget and space. At LAX, a taxiway had to be relocated to provide a large enough site for the West Terminal. "No way could we move the taxiway any further," said Bill Schoenfeld. "The main problem we have here is space."

The building envelope, as defined by existing roadways and runways, is relatively set, whereas the space requirements are variable, depending on passenger volume and aircraft activity. To arrange the elements so that they will function and still fit within the envelope provided is, in itself, a difficult task. To further provide outstanding architectural design may be asking the impossible. This may be why airports rank with hospitals and prisons in the public mind as lacking beautiful, humane architectural design.

**Unique Design Issues**

Several issues are unique to the design of airports and distinguish them from other building types. These issues may not be obvious to architects before they design their first airport terminal. (And unfortunately, it is rare that a firm gets the chance to do more than one terminal.)

The most important issue is the direct impact airport terminals have on aviation safety. Many air carrier delays are caused by deficiencies in the terminal area, either in terms of aircraft maneuvering or passenger transfer times. If a plane cannot land because there is no gate available, it wastes fuel in a holding pattern and prolongs its exposure to safety hazards in congested airspace. For this reason, much effort recently has been devoted to developing a computer simulation model for passenger flow within the terminal building. If the terminal simulation for a projected airline schedule reveals that passenger congestion at security check points would delay departing flights, steps may be taken to add additional facilities before traffic increases. The "TERMISM" computer program was used in sizing key passenger handling facilities for Terminal One at LAX.

Apron layout is a second issue which distinguishes terminal design from other architectural problems. The economic value associated with aircraft parking space at a major hub is such that the world's most elegant terminal design would be discarded by the airlines without a second thought in favor of an aesthetic disaster with one more gate. Apron layout is the most critical part of airport planning from a functional viewpoint. Architects, before becoming involved in airport terminal design, tend to focus on the spatial qualities of the waiting lobby. After receiving their first airport commission, they may be disconcerted to learn
that no one involved in airline or airport management really wants a waiting lobby; their ideal airport would magically convey passengers from their cars to the aircraft with no waiting whatsoever. The terminal building functions as a pedestrian highway connecting a parking lot for cars with a parking lot for planes.

A third issue is the question of facility sizing, which is dependent on forecasts of aviation demand. Aviation planners forecast air traffic and derive facility requirements based on these forecasts which are integrated into the master plan or terminal development plan. The architect then responds to these requirements and designs a building to fit them. These forecasts may fluctuate during the course of master planning and preliminary design, forcing program space requirements to be revised. While aviation forecasting and even terminal building sizing require specialized experience, the architects are expected to respond to these changes, and are sometimes held responsible for the future inadequacy of a facility they did not size. Wally Haas, AIA points out that such problems have been particularly acute because deregulation of the airline industry occurred when construction of new facilities at LAX already was underway. Because carriers may now move in and out of a market at will rather than being committed to servicing an airport for a contracted length of time, expansion may be planned to accommodate a carrier which suddenly decides to fly elsewhere or goes out of business, as in the case of Golden West.

The Design Process

The terminal architects at LAX and SFO have had to balance these diverse demands within the context of the airport planning process. This process, although it differs from airport to airport, is somewhat more complex than planning for other types of buildings because it involves more people and more steps. The people involved are the airport management (including the airport staff, the Airport Commission, and the municipal government), the various consultants, and the airlines. The steps involved in airport planning generally fit into three categories: the master plan, the terminal development plan, and continual updates of the two.

At both airports the client—the Airport Commission acting through the airport staff—was extremely involved in determining the program for the expansion and modernization projects. Within those programs the architects were responsible for meeting the needs of two diverse users, one human and the other mechanical. "Most firms design the building as architects, but they don't design it as the airline uses it," said Wally Haas. "The mechanical user is not flexible. Most architects don't understand that the craft is the controlling factor in the shape of the building."

LAX and SFO both had master plans when the present terminal work was begun. The current work at LAX actually completes projects scheduled in the master plan written by William L. Pereira Associates in 1957. Completion of the master plan was stalled for 15 years when Environmental Impact Reports (EIR) became required by law. "Welton Becket had the contract for Terminal One 15 years ago and had to wait until the EIR was finished," said Elizabeth Kurth Armstrong, president of the Los Angeles Board of Airport Commissioners. "The project was needed 10 years ago, so we're 10 years behind in getting it built."

SFO's master plan was drawn by the John Carl Warnecke/Dreyfuss & Blackford joint venture in 1968. The current work at San Francisco is based on a version of the original plan modified by SFO's Airport Staff.
The International Terminals

The newly-opened Central Terminal at SFO and the West Terminal nearing completion at LAX both occupy dominate positions along the central axis of the airports' roadways. Each building bears the imprint of airside constraints. The Central Terminal's apron area is squeezed by the intersection of SFO's runways, while the West Terminal is so close to the major crossover taxiway between runways at LAX that the apron area had to be placed on the landside of the concourse. Giant 747s slide past the West Terminal's opposite face with breathtaking proximity. As a result of these constraints, SFO's Central Terminal was forced to have a very compact airside configuration, while the West Terminal at LAX had to have a long, linear layout.

Gensler and Associates used the constraints to advantage at SFO's Central Terminal by designing a triangular airside that organizes aircraft parking and common departure lounges along the perimeter. An enclosed courtyard with landscaped fountain is situated at the center of the triangle. From the viewpoint of arriving passengers, the effect is spectacular. "We wanted to create an atmosphere for the traveling public that's more human, warmer, softer," said project manager Gordon Johnson, AIA. "Instead of a purely functional aspect, we wanted to humanize it."

A stroll through the Central Terminal in the late afternoon is a special experience. The entire interior seems to glow with an inner light. The overall ambience would be described by most architects as "post-modern."

The concept of airport-as-shopping-mall is well-realized at the Central Terminal. The shops were intentionally located in the direct path of all passengers heading to their gates to boost airport revenue from the concessions, according to Jason Yuen, AIA, head of the Bureau of Planning and Construction at SFO. The plush retail concourse overlooks the Federal Inspection Service baggage claim area, which is glazed to prevent interactions with passengers not yet cleared through customs. It is astonishing that the architects were able to get the F.I.S. to go along with the design, since federal design guidelines prohibit views from the waiting area into the customs area.

If San Francisco's Central Terminal provides a warm welcome to the arriving passenger, the new West Terminal at LAX will provide a grand bon voyage. "The West Terminal, because of its size, will have a dominant position in the airport," said Daniel Dworsky, FAIA. "It's on axis with other landmark buildings, and it's higher than the other buildings in the loop. Because of the site, we were able to set back about 30 feet from the second level roadway to create a landscaped buffer zone. The functional relationships between the roadway and the building set the tone."

The departure level ticket lobby is monumental, with enough space for three simultaneous football games. The facade of the West Terminal is a handsome, restrained example of what might be termed a "late modern" vernacular, but the five-story entry lobby promises to be a real tour de force, particularly if the interior finishes are as good as the raw space. The outlook is promising. "We feel that the structure, the architectural forms, have to be respected," Dworsky said. "Whatever we insert into the interior must be harmonious and integrated into the total architectural concept."

The West Terminal's exterior complements the rectilinear layout of LAX terminal complex in form and massing. Its neutral color is consistent with other buildings, such as Terminal One and the remodeled facade of United Airlines by Leo Daly Associates. The Central Terminal at SFO, on the other hand, is a point of departure, both in hue and shape, from the curvilinear North Terminal and the radically symmetric parking garage.

Separated from the white North Terminal by blue metal connectors, the warm beige exterior of the Central Terminal echoes the flat rectilinear form of the original central terminal. The architects appear to have made a conscious decision not to reference the surrounding buildings, but rather to assert strongly the unit terminal concept and introduce variety into the terminal area. This approach reflects the philosophy of Howard Friedman, AIA, special consultant to San Francisco International, who set the design criteria and handled architect selection for the Central and South Terminals. "My feeling was to push for diversity," Friedman said. "I'm fighting the thing you see at most airports; if you don't know their names, they all look the same. We've tried to make the airport interesting. The diversity creates a better design that is more human and indigenous to San Francisco."
The Domestic Terminals

The South Terminal forms the entry to SFO's terminal complex, as does the recently-completed Terminal One at LAX. Both buildings actually may be as far into the airport as many passengers ever get, since both principally will serve the domestic, commuter traveler. As many as six million people a year shuffle between Terminal One at LAX and the South Terminal at SFO. Conceptually, these terminals might be viewed as two ends of the same building, connected by an airplane.

Other than their similar functions and locations, there are more contrasts than coincidences between the two projects. The South Terminal at SFO involves a great deal of modernizing (although 300,000 square feet of the 850,000 square foot total is new construction), whereas Terminal One is an entirely new facility. Terminal One is also smaller, both in square footage and the number of gates. Both facilities represent innovative approaches to airport planning, technically in one case, and architecturally in the other.

Welton Becket & Associates has risen to the opportunity presented by a new (if rather tight) site at Terminal One to design a terminal which is technically innovative with respect to apron layout and baggage handling. Welton Becket and their team have provided an unusually flexible building which allows for different apron layouts by virtue of the flat sides of the facade, and provides modular loading bridges and exterior stairs which could be readily relocated along the face of the building to accommodate different aircraft types. The building also has a sophisticated common baggage handling system to serve all the airlines using the facility. These innovations will allow an effective gate management program and should add significantly to the useful life of the structure by eliminating the need to radically alter it to meet fluctuations in the airline industry.

Terminal One does not provide a strong statement of entry to LAX, but it does set an example for the kind of facade which could be extended around the new upper level roadway without visual clutter. The parking structure and its overhead connecting bridge "took the emphasis off the building," according to Warren Dahl, AIA, vice president and senior project designer for Welton Becket. "In many ways it turned into an interiors treatment."

The forte of Terminal One is probably the concourse. The 10,000 square feet of skylights, two 2500 square foot gardens, and a muted color scheme provide a restful waiting area for weary commuters. "The problem is that LAX is very heavily used," Dahl said. "I had to fight to get the gardens in. The gardens break up the space psychologically so that the walk—375 feet from security to the end gate—would psychologically seem like a walk from one garden to another."

Since the concourse is where most passengers, especially commuters, spend their time, it is appropriate that design effort should extend there, and not just be lavished on the ticket lobby.

If Terminal One breaks new ground technically, the South Terminal at SFO is certainly a departure in architectural project management at airports. Rather than assign all the work to one firm, the Airport Commission has parcelled out the work to a variety of firms under the direction of supervising architect Howard Friedman.

The unique approach was intended to spread the work around to a mixture of new, established and minority firms, according to Friedman. SFO's chief project manager for the South Terminal, John Costas said, "The pioneering effort was done purposely to enrich the architectural stream of the building. There are always areas of interface and conflict, but we've been able to bridge that. It's amazing that we've been able to coordinate as much as we have. The intent is to look at the terminal as one building which makes a unifying statement, but each piece has its own architectural character. The average passenger will have a short course in architecture by the time he gets to the airplane."

In plan, the South Terminal appears to offer an architectural solution to the formal problem posed by the disparate styles of the North and Central Terminals. The reworked facade of the South Terminal by Marquis/Wong & Brocchinii has both vertical lines and horizontal curvilinear ones. The new West Entrance to the South Terminal, designed by Robin Chan of Group-4, will provide a vertical element at the entry to the airport complex which foreshadows the Central Terminal's control tower. Perhaps after driving past a renovated South Terminal, the viewer will be better prepared for the differences in style, color, and form which characterize the juxtaposition of the Central and North Terminals as presently configured.

The Great American Airport

On the whole, the architecture at SFO and LAX represents the good efforts of some of California's best architectural firms. Each firm has grappled with numerous physical and economic constraints, extremely challenging technical problems, and highly-charged political issues during the course of design. The results, with regard to accepted standards of airport design, are extremely competent. The respective airport managers have adopted a clearheaded approach to development, wisely avoiding the temptation to pursue the latest fads in airport planning. Rather than seeking imported solutions, the airport managers and their architects have managed to solve the unique problems at hand. The results, in almost all respects, successfully address the real needs of the passengers and airlines alike.

The new architecture at SFO and LAX stands up well compared to efforts at other airports across the country. But the airport terminal, despite being a semi-industrial building type, could and should aspire to higher design standards. How can the airport terminal rise above the status it shares with hospitals and prisons as the stepchildren of the design profession?

One suggestion is that the budget for professional fees should be structured to allow for sufficient research, programming and technical planning prior to the start of physical design. Many architects unfamiliar with the building type are probably unrealistic about the learning curve required and, as a result, find themselves squeezed between the demands of preliminary technical planning and working drawings. By budgeting for adequate consulting services or by insisting that the client provide a terminal development plan which is more detailed than the typical airport master plan, the architect could devote more effort to the creation of a beautiful and humane architectural design.

Perhaps the great airport terminal, like the great American novel, has yet to be created. The technology of air transport has reached maturity only in the last decade. As a building type, the airport terminal is still evolving. The development at SFO and LAX are steps in this evolution. Perhaps around the turn of the century another surge of construction will integrate the diverse architecture at these airports, and produce a final statement in airport architecture.

Don Shaw, AIA has an architectural practice in San Francisco, and is a consultant on aviation planning. Janice Fillip is editor of Architecture California.
The Metro: Whistle-Stop Development in Los Angeles

by Kelly Collins

For years, Los Angeles has solved its transportation problems by pouring more concrete, making bow ribbons of freeway interchanges that are far too complicated for the laissez-faire mind. But now, the City is taking a new approach, embarking on construction of a $3.3 billion rapid transit system that will provide commuters with an alternative to the slow, agonizing crawl of “rush” hour traffic. The 18 mile trip between North Hollywood and downtown LA will take only 35 minutes on the new high speed rail system. The Metro will be the “starter” line for a region-wide transit grid that will change the urban fabric of Los Angeles and provide a catalyst for future development.

The prospect for total saturation of Los Angeles freeways and surface streets could become a reality by the end of this century according to an Environmental Impact Statement (EIS) released last December by Southern California Rapid Transit District (SCRTD) and the federal Urban Mass Transportation Administration. By the year 2000, daily travel on LA freeways will increase an estimated 24 percent, and the number of severely congested key intersections on arterial streets will triple. More buses will not solve the problem, since buses must use the same clogged streets as automobiles. The answer appears to be a transit system that has its own right-of-way which, of course, the Metro does.

But Metro planners not only view the subway system as a panacea for the ills of freeway congestion, they also tout the importance of the new Metro’s role in revitalizing LA’s regional core. Existing City and County plans specifically mention rapid transit as a tool to shape future growth. In 1970, the County of Los Angeles adopted the “Urban Form Policy” which calls for a series of regional centers connected by a rapid transit system. Four years later, the City of Los Angeles adopted its version, the “Centers Concept,” as a 50 year master plan for urban development. The Centers Concept proposes 30 or more high density, multi-use centers, linked by subway, to service their surrounding communities. Financing a rapid transit system won voter approval in 1980 when a county-wide referendum was passed self-imposing a ½ percent sales tax specifically to fund SCRTD’s mass transit efforts.

The 18.6 mile Metro is the beginning of a proposed 150 mile rapid rail network that would link San Pedro/Long Beach with Van Nuys and Glendale/Pasadena with Santa Monica. The route for the starter line follows the Centers Concept through the regional core, serving the Central Business District, Westlake District, the Wilshire Corridor, Hollywood and North Hollywood—an area that accounts for 60 percent of SCRTD’s total ridership.

Last year, Congress passed an appropriations bill earmarking $1172 million of the federal gas tax fund to cover the first year of Metro construction, which is scheduled to begin in June. Completion of the estimated $3.3 billion project is not expected until 1990. Contracts for advance station and tunnel design have been awarded, but actual work will not commence until Congress issues a “letter of intent,” expected this month. Federal funding, critical if the project is to go ahead, will cover 62 percent of the projected costs. The Metro will not be attempted with local funds alone.

Congress is expected to fund the project. What is in real doubt is which of the three options provided in the EIS it will choose. The three options are: all 18.6 miles underground; 16 miles underground with 2.6 miles of aerial trackway in the San Fernando Valley; and an 8.8 mile “Minimum Operable” subway option from Fairfax/Beverly Station to downtown.

Writing the EIS entailed a three year process of study and debate. Station locations were the focus of much attention during public hearings. The hearings resulted in some modifications being made to the original plan. One change was moving the Central Business District station alignment one block, from Broadway to Hill Street, to increase the number of potential patrons served. Five routes were proposed through the Hollywood District. A community advisory committee finally settled on two stops: Sunset Boulevard at La Brea and Hollywood Boulevard at Cahuenga. The proposed stop in front of Hancock Park and the world-famous La Brea tar pits generated an outcry to save this valuable paleontological area. As a result, the station was moved to a less sensitive area, the current parking lot behind the May Company at Wilshire and Fairfax.

In selecting the Metro stops, planners also had to consider the impact of construction on historically significant buildings. Dr. Knox Mellon, State Historic Preservation Officer, cited three buildings—Union Station, Title Guarantee Building, and
Pershing Square Building—as vulnerable to the adverse effects of Metro Station construction. A proposed entrance to the downtown Metro stop at Fifth and Hill would come up through the ground floor of the Title Guarantee Building, unavoidably altering part of the structure and introducing visual and aural elements out of character with the building. The Pershing Square Building across the street faces the same predicament, except that the entrance in question is being proposed for future expansion.

At Union Station, the Metro stop was designed to impact the site as little as possible. Bob Pigati, AIA, of Harry Weese & Associates, the project manager for Union Station, said, “The main terminal building won’t be touched at all.” The station is located under existing trackage, and will be dug in segments so as not to disrupt present rail service. Construction of one of the entrances, however, will necessitate removal of a baggage shed, which will be restored. To preserve the integrity of these historic buildings, the EIS states that all new construction must be made compatible in terms of scale, massing, color and materials with the original structure, and attempts must be made to salvage as much of the orginal architecture as possible.

The basic design for the Metro stations, created by Harry Weese & Associates, has several standardized elements:

- a plaza-type entrance into an existing or planned development (instead of on-street entrances, which are being discouraged);
- a mezzanine to serve as a fare collection area;
- 450 foot platforms which can accommodate six 75-foot-long Metro cars; and
- various equipment spaces to house facilities such as traction power substations, electrical distribution rooms and fan rooms.

Standard design was chosen by SCRTD for its economy and its increased efficiency in moving people in and out of the Metro. The Los Angeles Times reported that architects involved in design are privately concerned that SCRTD guidelines are not flexible enough to reflect the distinct personalities of the surrounding neighborhoods. One architect was quoted as saying that Metro’s station-in-a-box design “won’t say anything about LA.” But the opportunity for joint ventures between SCRTD and developers in actual station construction may pry the lid off the box somewhat.

SCRTD is trying to set up a separate governmental entity, tentatively named Transit Corridor Development Corporation (TCDC), to represent all City and County planning jurisdictions, and the Community Redevelopment Agency in executing future agreements with developers. To operate effectively, SCRTD is proposing that TCDC:

- plan, coordinate, and write a comprehensive Station Area Master Plan;
- have the authority to alter station design and location of entrances;
- establish predictable timetables for making decisions, so that proposals can move ahead without unforeseen delays;
- negotiate connector fees and land lease/air right agreements, which alone are expected to bring in $6.7 million in revenue; and
- infuse public money into development on a co-venture basis, when deemed necessary.

SCRTD is not wasting time, either. It already has entered into its first joint development with Parklabrea Associates as a result of having to relocate the Wilshire/Fairfax Station because of its paleontological significance. Parklabrea Associates will share in the construction costs of the station, saving SCRTD some $30 million. An entrance will be built right into the May Company store. (In other Metro cities, stations placed in department stores have significantly increased retail sales.) “A unique feature of this agreement,” said SCRTD’s General Manager, John Dyer, “is that Parklabrea will set aside up to 20,000 square feet of enclosed storage space for 15 years for any fossils unearthed during station construction.”

This joint development is very important to SCRTD as a means of deferring Metro’s costs. Downtown office space is expected to increase 3 million square feet by the year 2000, simply in response to the Metro. But through active pursuit of joint development, SCRTD expects to boost that number to 7 million square feet. The State Legislature also has given SCRTD the authority to set up Special Assessment Districts to tax the windfall in property values expected to occur to parcels adjacent to the Metro. These Districts may bring in between $26 and $53 million in new revenues for SCRTD by the year 2000.

How realistic are these plans? Will new economic blood be effectively pumped back into the heart of southern California’s sprawling metropolis through Metro-related development?

California’s other subway system—BART (Bay Area Rapid Transit)—provides a functioning model of the impact a subway system can have on regional growth.

When BART broke ground in June of 1964, it was the largest locally-financed construction project ever undertaken, and the first subway system to be built in the United States in over 60 years. The $1.7 billion price tag would cost $5 billion today and, unlike LA’s Metro, the 71.5 mile regional system was built all at one time.
BART’s impact on development was painfully slow in coming. In its early years, technical troubles caused performance problems that kept BART’s patronage figures low. BART seemed jinxed by a series of freak accidents that made the headlines: a Fremont train ran off the end of the line when the computer refused to recognize that there were no more tracks; the Automated Train Control (ATC) showed “ghost” trains on unoccupied sections of track; and a near-disastrous fire swept a BART train stalled in the Transbay Tube.

But as BART engineers gradually made improvements in the system, the length of time patrons had to wait for a train decreased and ridership began a steady climb. By 1983, BART had over 55½ million riders. New patrons began to switch from their cars to mass transit. As a result of increased patronage, areas around BART stations have developed like gang busters.

The Market Street Corridor in downtown San Francisco is experiencing an office building boom unparalleled on the West Coast. Since BART, the average annual growth rate for new office space in downtown San Francisco has been 1.7 million square feet, doubling from its pre-BART figure to 55 million square feet in 1983. With commuters riding BART, the Planning Commission was able to waive the usual parking requirements for downtown projects. Across the Bay in Oakland, an active redevelopment program is taking similar advantage of BART. (See “Oakland Renaissance,” Architecture California, September/October, 1982.)

Further out along the line, however, development around BART stations is markedly different. At the end of the Fremont line in southern Alameda County, BART has not stimulated commercial growth. The area around the station still serves largely as a parking lot for commuters. Much of the land remains undeveloped. At the end of the line going north from Oakland, in the City of Richmond, area redevelopment is going very slowly, and there has been no appreciable increase in land values around the station. "BART can’t reverse conditions of blight,” pointed out Kathy Ogden, Director of BART’s Joint Development Department.

But on the other side of the Berkeley Hills—around Walnut Creek, Pleasant Hill, and at the end of the line in Concord—development has been rapid. In the “Golden Triangle,” an area around Walnut Creek’s BART station, two new mid-rise buildings went up last year, and three more presently are under construction, adding about one million square feet of new office space to the area. According to Walnut Creek City Planner Jerry Swanson, this development “would not have occurred without BART.”

Not all the communities around BART stations saw development as desirable. The Glen Park area in San Francisco and the City of Lafayette in Contra Costa County are two communities that downzoned in response to citizen demands that BART not affect the residential character of their neighborhoods. To that end, the downzoning has been successful. But in areas where growth has not been intentionally limited, the indicators point to overall increased density and rising property values around BART stations.

Experience from BART and other new subway lines in Atlanta, Washington, DC and elsewhere form a pool of knowledge that SCRTD can draw upon to ensure the Metro’s success. The people of Los Angeles should be moving into the 21st Century with a more efficient, ecologically sensitive means of getting around town, and a blueprint for directing future growth.

Kelly Collins is assistant editor of Architecture California.
CCAIA Honor Awards

Ahmadu Bello University
Theater-Workshop
Zaria, Nigeria
Steven D. Ehrlich, AIA Architect

Jury Comments: This is the only building we looked at that hasn't been influenced by post-modernism. Every little part you look at—the colors and the decorations—are very sensitive. The finish against the roughness and the outside of this building tie in with its setting. You see a native theater that looks truly indigenous, even though you know it was designed. The colors and the materials, the construction techniques, even the use appear to be really indigenous. The closer you come to it, the more finesse the materials and design have. This theater touches the symbolism of African life. The mystery of symbolism is integrated into the whole design, which is something we lack so much. This building is more than a stage—it presents a real background for a theater.

Cleveland Arcade
Cleveland, Ohio
Kaplan/McLaughlin/Diaz

Jury Comments: In order of credit, the honor should go first to the original architect; next, the person who decided they weren't going to destroy it; then, thirdly, the architects who showed a delicate restraint in restoring this beautiful building. More cities with harsh environments should have arcade spaces like this. They're beautiful. In this case, the building is so eloquent, the railings are so richly woven, that palmettos actually diminish rather than add to the structure. The art material actually interferes with the beauty of the architecture.
George R. Moscone Convention Center
San Francisco
Hellmuth, Obata & Kassabaum, Inc.

Jury Comments: The structure is beautiful. The whole building receives you off the street and makes the street itself richer. Ordinarily a building with that kind of volume overwhelms everything around it. The scale is right for masses of people. Many convention centers are so heavy. Just having the interiors all pure white makes the whole structure glow.

The Federal Reserve Bank of San Francisco
Skidmore, Owings & Merrill

Jury Comments: The arcade is very powerful. The building and the street level need the power of an arcade like that to relate the streetscape to the tower. This arcade conveys the strength of the Federal Reserve Bank. It is a very intriguing alternative to the pedestrian experience. People might well walk across the street in order to use it, just to see what it is like. The design is unusual in its articulation and massing. The building, because of the setback, does not overpower the street, and gives some variety.
The College Preparatory School
Oakland
Dutcher and Hanf, Architects

Jury Comments: The whole site plan, the way it’s ordered and the way it expands into the ravine, is excellent. This is an unusually beautiful, sensitive handling of this little ravine site that opens to receive you. The way they used the recycled portable classroom buildings in relation to the new buildings is very sensitive. The buildings are arranged in a loose, lyrical pattern without being stiff. It's vernacular architecture at its best. A great deal of subdued elegance was achieved with throw-away buildings, surplus buildings. The architects are not trying to make a show here. It's a very workmanlike way of going about solving architectural problems, not for the sake of calling attention to yourself, but for the sake of making the most out of what you've got to work with. It seems to be almost the perfect solution, making a warm-hearted environment for the children, and creating a good sense of campus and community in a small space. The main auditorium has an enormous Japanese quality about it. The simple building gets its beauty just from its structure, the rich warm tones of the wood and the pure white walls.
Malibu Cove Residence
Malibu
Ron Goldman, AIA

Jury Comments: This is a very successful Mediterranean building. The entrance is sculpturally handled with the spaces dropping back to present a completely blank facade except for the rich grill up above where bougainvillea can grow. It's an elegant expression of a beach house. The walls are high enough to blank out the neighbors who are very close on either side, yet the openings allow the landscape to loom up. Being all white with a highly varnished wood deck, it's like a ship; it has the quality of the sea. The residence is unified throughout all its areas. The scene looking from the bedroom is almost a painting in itself. The living room isn't a four-square shape, but expands and moves out into different directions, yet holds its center with the fireplace. The tendency on a small lot is not to be able to be in contact with nature. Here, you're constantly aware of the sky and nature. That's the real accomplishment.
Galaxy Theater
San Francisco
Kaplan/McLaughlin/Diaz

Jury Comments: This theater is just the right kind of architecture for that location on Van Ness. It's a sparkling, brilliant invitation to come there. If it's post-modern, this is where post-modern really comes into its own. The spatial structural quality inside, and the colors, are delightful and very engaging. It's a great example of how to do a theater—it says entertainment. The integration of lighting with the architecture is really very well handled. But will it be as successful once the signage is complete? The graphics should be congruent with this building; they shouldn't be slapstick. The theater is a sign in itself. The whole thing is a graphic expression of what's going to happen inside.
Crocker Center and Galleria
San Francisco
Skidmore, Owings & Merrill

Jury Comments: The tower is better than the galleria. It enriches the skyscape; it doesn’t destroy things. The ornamental quality of the skin, the fact that the attachment method of the assembly is what creates the ornament, makes the tower ornamental at several scales. The galleria is a streetscape entrance into the tower. The side of the galleria is a very strong and eloquent expression. The galleria entrance respects and relates well to the Hallidie Building, a beautiful old glass and iron building located across the street.

King Khaled International Airport
Riyadh, Saudi Arabia
Hellmuth, Obata & Kassabaum, Inc.

Jury Comments: This airport combines strength and opulence befitting its desert siting. It is curious that the photographs don’t show any people; the building really can’t be understood without the numbers of people that it’s meant to accommodate. Still, you see that it is truly an elegant, astonishing series of spaces. It reads Islamic. The overall design is exquisite. The way the building stretches across the desert and the way the sky comes down to the desert—it’s a faceted jewel.
Slow, tedious drafting and redrafting. Redrawing for major changes—and minor revisions. Drawing the same elements time and time again. They're time-wasting tasks that choke creativity, productivity and profitability.

The CAD-MASTER 400—the turnkey computer-aided drafting and design system from Data Design Logic Systems—ends all that. Developed by architects for architects, the CAD-MASTER 400—at less than $30,000—brings fast, simplified production of architectural drawings to even the smallest firm.

You get the IBM PC XT computer, our high-resolution DDLS Model 3200 intelligent plotter and the easy-to-use Production Lines software package integrated in an attractive workstation.

More than 100 routines for drawing, dimensioning, note entering and modifications are at your fingertips—literally. Most commands need only one keystroke. None more than two. So you're productive from the start. No extensive training or computer background needed.

The CAD-MASTER 400. Overdraft protection made easy—and affordable. Call George MacDonald or Karen Lauterbach at United Scientific's DDLS. They'll tell you why you'll want to try ours—even if you've already seen theirs—before you buy.

DATA DESIGN LOGIC SYSTEMS, INC.
A Subsidiary of United Scientific Corporation
A Data Design Company
4800 Patrick Henry Drive
Santa Clara, CA 95054
(408) 988-7722
The Declining Cost of Computers

by Eric Schreuder

Full computerization is beyond the financial reach of most architects, but this state of affairs is not likely to last for very long.

An example of the remarkable progress made in computer technology, consider the following: the first completely electronic computer, ENIAC (Electronic Numeric Integrator and Computer) was developed at the University of Pennsylvania in 1945. The various quantum leaps in computer technology since then have resulted in today's personal computer, such as Apple and IBM, being more powerful than ENIAC. Today's personal computers are 20 times faster, have a larger memory, are thousands of times more reliable, consume the power of a light bulb rather than that of a locomotive, occupy 1/10,000 the volume and cost 1/50,000 as much as ENIAC. And they are available by mail order or from your neighborhood computer store.

What does all this mean for architects? It means that soon it will be possible for even small architectural firms to acquire powerful computer capabilities and thus make Computer-Aided Design (CAD) a cost-effective reality.

Architects communicate information, to a large extent, with graphic images. Most of the information flowing through an architect's office is either on drawings or directly related to drawings. Productivity is enhanced in an architect's office by minimizing the wasteful configurations and otherwise translating graphic information into other forms. A CAD system is an obvious means to achieve this, but CAD is not for all firms.

My company, the Computer-Aided Design Group, has done extensive investigation of all currently available CAD systems, as well as in-depth analysis of the costs of CAD. We have reached three major conclusions from our investigations:

1. Available Project Fee For CAD. Given a fairly realistic distribution of drawing activities from schematics through to construction supervision, we have found that about 28 percent of the project fee is in work that could be carried out on a CAD system. For a small office this may only be around $210,000.

2. Minimum Number of Workstations Required. Assuming a $15/hr. salary rate for a draftsperson and an overhead multiplier of 2.5, the effective rate/hr. for these drawing activities is $37.50. We can get 5,600 person-hours out of $210,000. Assuming a 2:1 pro-

I'd give it an unqualified 'Aha'!
Prefinished metal roofing systems

Save installation time and cost
while providing a lasting architectural finish.

Available in twelve colors
and over ten different styles.

Standing seams  Rustic shakes
Batten seams   Victorian shakes
Mansard frames  Spanish tile
Equipment screens  Soffit
Bermuda shakes  Facades

DELTA THERM INC.

1625 Remuda Lane, San Jose, CA 95112/(408) 280-7278
Outside California call toll free 1-800-231-8127

First Church of the Nazarene, Architect: Gaede-Alcorn & Associates

Productivity ratio (not unreasonable with a CAD system), this should reduce to
2,800 person-hours. With a typical
terminal utilization factor of 70 per-
cent, we require two workstations to
achieve these hours.

3) Cost Per Workstation. Given that
this two workstation system must not
cost more than $210,000, at 2:1 pro-
ductivity we are realizing an annual
 savings of $105,000, or $310,000 in three
years (the typical useful economic life
of a computer system). Hardware and
software costs amount to around 35
percent of the three year costs (65
percent is absorbed by training, main-
tenance, interest costs, etc.). In order to
be economical, this two workstation
system has to cost less than $110,000
($315,000 × 0.35), or $55,125 per
workstation.

There are no CAD systems, in our
opinion, that can offer the functionality
required by an architect at a price of
$55,125 per workstation. The reason for
this is that CAD vendors are not selling
you hardware at a discount. In fact, many
of their system components are standard
items sold to you bearing a different label
or wrapped in a custom enclosure at a
price sometimes considerably higher than
their standard item. Computer hardware
has to be made cheaper for CAD systems
to become economical. Now the computer
industry is doing just that.

Progress in the computer industry has
been nothing less than astonishing—more
computing power continually is being
offered at less cost. A dominant factor has
been the spectacular cost reductions in
computer processors and memory.

The first computers were very large and
very expensive, making extensive use of
vacuum tubes. The discovery of the
transistor then produced a generation of
computers that were smaller, more
reliable, and cheaper. The interconnections
of electronic components are a major
source of unreliability and large costs and
this led to the trend toward the elimi-
nation of interconnections through the
fabrication of integrated circuits. The
principal revolution in the computer
industry in the past 10 years has been the
use of Very Large Scale Integration (VLSI)
technology where many components are
crammed onto a small area providing
increased functionality at very low costs.

These developments have allowed
increasingly powerful processors to be
fabricated on single chips. The initial
rapid growth of small computers in the
early 1970s was fueled by the mass
production of cheap 8-bit processor
chips. The unexpected popularity of these
small computers led the chip manufac-
turers to develop 16-bit processors on
single chips which give minicomputer
1 TECHNOLOGY
Start with a TRICAD G3 CADD System with all available software. Add a DEC processor, high-resolution color workstations, color hard-copy from a Dunn camera, CalComp 1077 pen plotter and a Printronix high-speed matrix printer/plotter. This is a system offering 2-D and 3-D operation, full-color capability and a highly sophisticated, flexible, integrated database. It quickly and easily generates drawings, reports and overlays initially and through all subsequent revisions, saving you time & money on design, repetitive drafting & modifications.

2 EXPERTISE
Of course, it takes knowhow to get the most out of state-of-the-art technology. That's where the staff of Graphic Systems comes in, representing 30 years experience in data processing, CADD, reprographics and service bureau management. Two architects on-staff assist our batch drafting service and advise customers' hands-on use of the terminals. A full range of reprographic services—including vacuum frame composites, wash-off composites, diazo prints, and drafting media—makes GSI an exemplary, one-site service bureau.

3 DEPENDABILITY
As a relatively new resource for Bay Area architects and designers, we're able to be flexible and innovative. We have the managerial and financial resources to expand service capability in any direction where sufficient demand exists. Our TRICAD hardware & software is constantly expanded and improved. Furthermore, we'll expedite your projects with free pick-up and delivery in the San Francisco-Oakland area. We're committed to keeping pace with the changing needs of our clientele—and that means growth in every dimension. Bring us your challenge soon.

GRAPHIC CADD & REPROGRAPHIC SERVICE SYSTEMS

3045 TELEGRAPH AVENUE - OAKLAND - CA 94609 - 415/652-9000
The power of a computer is not only measured by its processor, but also by the amount of fast Random Access Memory (RAM) it has available. Here, too, progress has been remarkable. The cost of semiconductor RAM is declining by a factor of 35 percent each year, increasing capacity four-fold every time. Innovations in memory technology hardly are established before they are overtaken by others. 8K (about 8,000 bytes) RAM memory chips became 48K chips in a matter of about eight years, but even these are about to be superseded by the 256K RAM chips. A 64K RAM personal computer was a big deal not very long ago; today's small systems begin at about 128K for the same price. Some small systems such as Apple even have a megabyte (million bytes) memory. The availability of small, powerful computer systems has been made possible by the ability to provide large amounts of memory in a small space at a reasonable cost.

Since the cost of RAM is still rather high, and since the contents of RAM disappear when power is removed, computers need some other means of permanently storing large amounts of information. This is accomplished by the use of disk storage. Disk storage technology also has advanced since the early days of the computer industry, but not in nearly such spectacular fashion as VLSI technology. The reason for this difference is quite fundamental: disk devices are electromechanical rather than electronic. They are made up of large numbers of individual parts (many of them moving) which are relatively expensive to fabricate and assemble, and which will eventually wear out. Advances have been made in storage capacity, speed, cost reduction, and reliability. The most important recent technological innovations have been the emergence of the floppy disks and the Winchester disks.

Floppy disks are made of Mylar rather than the more traditional aluminum. The orientation of this technology, since its introduction in the 1970s, has been toward achieving cost reductions. Today's floppy disks have four times the capacity of those made five years ago and sell for one-half the price.

Floppy disks have made disk storage possible on low-cost computer systems, but at a price: reduced capacity, speed, and reliability. Low-cost computer systems using floppy disk storage have
proven adequate for applications such as word processing, where storage and data transfer requirements are moderate. However, their capacity to support intensive applications, such as CAD, which tend to impose heavy demands on the storage system, is very limited.

Hard (metal) disk technology, until fairly recently, was limited to the larger, more expensive computers. Hard disks are considerably more reliable, offer greater capacity, and are many times faster than floppy disks. Recent advances in disk technology combined with ingenious engineering and innovative electronics design have resulted in hard disks being scaled down to the size of 5 1/4 inch floppy disk drives.

Up until the early 1970s, hard disk systems usually had reentrant read/write heads and removable disk packs. This kind of technology is still widely used on large systems. The innovation of the Winchester disk drive, introduced for large systems in the 1970s, incorporated fixed heads in a sealed assembly, giving higher speeds with greater reliability. This technology has allowed reduction in the size of disk storage units and substantial cost reductions both on a per-megabyte and a per-drive basis. The cost of a 10 megabyte 5 1/4 inch Winchester disk is five times that of a 400K byte floppy drive, but the Winchester disk offers 25 times the storage capacity. Winchester drives for small computers now offer from five to 20 megabytes of storage, and the capacities are becoming even larger—a leading manufacturer recently announced a 135 megabyte 5 1/4 inch Winchester drive.

All the radically new technological improvements mentioned above are being or have been incorporated into new, very small computers that are extremely powerful and very cheap. For instance, Digital Equipment Corporation’s popular VAX line of 32-bit minicomputers (the basis of most leading CAD systems) has been extended by the addition of the “micro-VAX” computer that stands on the floor under a desktop. All other major manufacturers have followed suit, and a host of newer companies are getting into this area, offering very competitive hardware at a cost.

This year will see a major change both in the costs of computing and the number of people reaping the advantages of these new developments. Architects will be no exception.

Eric Schreuder is an associate at The Computer-Aided Design Group in Santa Monica, where he is a consultant in selection and application of computer systems and a principal systems analyst and software developer. Mr. Schreuder is a registered architect in South Africa.

NOW—GIVE KROY® THE COMPUTER CONNECTION!

The K Retro O interfaces the Apple II+, Apple IIE, and Apple III with the KROY® 80E printer. Also available for the IBM PC.

**Features:**
- Easy assembly. No special tools
- Easy to use
- 256 character display
- Flashing cursor indicates character being printed
- Repeat capability
- Visual status display counters
- Sequencing any increment
- Editing features—insert, delete, replace
- End of tape sense
- Store text on disk for future re-use
- Auto-kern (optional)
- Full 90-day warranty on our interface hardware and software

**PRICE ONLY**
- $995 Apple
- $1095 IBM PC

**CALL US FOR ALL YOUR KROY NEEDS**

400 ELYSIAN FIELDS • OAKLAND, CALIFORNIA 94605 • (415) 559-8600 • (415) 632-1757

INSIGHT 8444460

We can furnish the complete system. Call for details.

CLASSIFIED

Architecture California now accepts Classified Advertisements for positions available, positions wanted, services, business opportunities and miscellaneous. Rates: $80 per word, $40 minimum. Payment must accompany the classified ad copy. Address all ads to Classified Ad Department, Architecture California, 1414 K Street, Ste. 320, Sacramento, CA 95814. Phone: (916) 448-9082.

Position Available

Dean of Architecture and Environmental Design, California Polytechnic State University, San Luis Obispo, California. The School contains accredited baccalaureate programs in Architecture, Architectural Engineering, City and Regional Planning, Construction, and Landscape Architecture, as well as Master’s programs in Architecture and City and Regional Planning. The position is available July 1, 1984. Applications and nominations should be received by April 1, 1984 though recruiting will continue until the position is filled. Information and application instructions may be obtained from Dr. Tomlinson Fort, Jr., Provost, California Polytechnic State University, San Luis Obispo, CA 93407. Affirmative Action/Equal Opportunity/Title IX Employer.

PROFESSIONAL LIABILITY INSURANCE

It’s a negative, but we can probably make it a little more positive. A&G works exclusively with architects and engineers!

If I can supply you with quotations from our competitive markets, please call or write to me:

Michael T. Holle
Account Executive
Association Administrators & Consultants, Inc.
19000 MacArthur Boulevard, Ste. 500
Irvine, CA 92715

Telephone
(714) 833-0673 Collect

March/April 1984 Architecture California
Capture the enduring beauty of the California redwoods with SunCrete’s new line of concrete rooftiles.
RANCH SHAKE™
Concrete rooftiles for a lifetime under the sun.
The handsomeness of old wood shake. The same 10-by-15-inch size.
Straight ends or broken. Smooth or brushtextured surfaces.
The ruggedness of concrete. Strong.
Fireproof. Impervious to rot and vermin.
Easy to install.
In seven naturally distinctive shades, blended through and baked in to last.
Warranted.
Ranch Shake™ from SunCrete Rooftiles, a division of Sunrise Company, builder of America's finest country club communities.
LIFETILE™
The Leader

- Quality products
- Choice of styles
- Knowledgeable personnel

LIFETILE™ Corporation

Beautiful roofs for the good life