

The 1990 AISC Architectural Awards Of Excellence



Every two years the AISC presents awards to the best designed steel-framed buildings in the U.S. This year's nine winners were completed during 1987-1989 and ranged from a small office building on an industrial site to a college's new swimming pool.

Though the projects varied widely in size and function, they were all carefully detailed and architecturally striking. The competition's five judges carefully sifted through more than 100 entries, arguing back and forth about relative merits, before picking their winners.

This year's judges were:

- Robert Beckley, FAIA, dean of the College of Architecture and Urban Planning, University of Michigan in Ann Arbor;
- Joseph T. Colaco, PE, president of CBM Engineers, Houston;
- Sylvester Damianos, FAIA, president of the American Institute of Architects and president of Damianos Brown Andrew, Inc., Pittsburgh;
- J. Robert Hillier, chairman, The Hillier Group, Princeton, NJ; and
- Thomas W. Ventulett, III, FAIA, vice president and principal of Thompson, Ventulett, Stainback & Associates, Atlanta.

The next AISC Architectural Awards Of Excellence competition will be held in 1992. All buildings designed by U.S. architects, built in the U.S., and completed from 1987-1991 will be eligible.



Top photo, left to right: Sylvester Damianos, J. Robert Hillier and Thomas W. Ventulett, III. Bottom photo, left to right: Robert Beckley and Joseph T. Colaco.



Putting The Pieces Together



Cesar Pelli's addition to the Pacific Design Center created a new composition that enhanced his earlier design

One of the toughest jobs in architecture is to design an addition to an acknowledged masterpiece. Often—as in the case of the Guggenheim Museum in New York City—the controversy can be intense enough to substantially delay the project.

The decision to more than double the size of the Pacific Design Center in West Hollywood, CA, almost led to such a problematic situation. While stirring little public reaction, the initial expansion plan was so widely disparaged by Los Angeles' design community that the project's owners went back to the drawing board.

Fortunately, the property's owners had one advantage that others in similar straits did not have: they could turn to the original architect. Cesar Pelli, FAIA, principal of Cesar Pelli & Associates, New Haven, CT, had designed the building as a partner with Gruen Associates but later moved to the East Coast and started his own firm.

Renowned Architecture

The original Pacific Design Center is a blue-glazed, abstract sculptural form. As *Architecture* magazine stated: "It's startling color,

The architecture of the green-glazed second phase of the Pacific Design Center is strong enough to stand alone, but Cesar Pelli's design also integrates it into a larger whole. The massing, shape, and orientation of the building is designed to make it one element in an interesting composition.

The second phase building resembles an inverted pyramid (above). Because of the sloping walls and the skewed orientation in relation to the first phase building, every view of the project creates a unique geometric design (opposite above).

The Pacific Design Center houses numerous showrooms for manufacturers of interior design products. Pelli designed a crisp, clean lines on the interior both to highlight the display areas and to complement the exterior design (opposite below).

Photography by Joe C. Aker

unusual form, and sharp break in scale from its residential surrounding, the very qualities that once made it so controversial, are also what made it memorable. In a city where most of the good buildings are small, domestic, and removed from easy view, this pristine, free-standing object is one of the few large and easily visible buildings to achieve both professional and popular recognition."

"Architecturally, Phase I is like an extrusion," according to Allen Rubenstein, Pelli's former partner at Gruen Associates, which did the working drawings and construction administration on the addition. "How do you add to a unique building? The solution was to treat Phase I as an architectural fragment and add other fragments that would create an interesting composition."

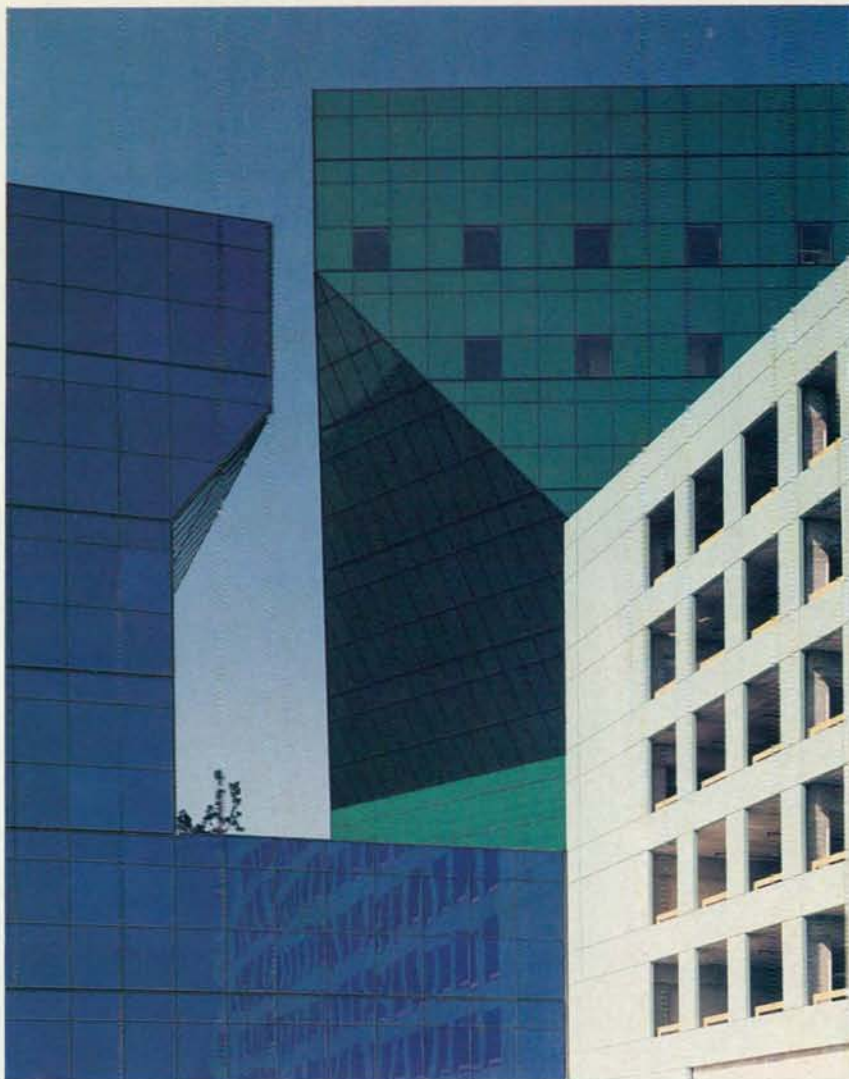
Inverted Pyramid

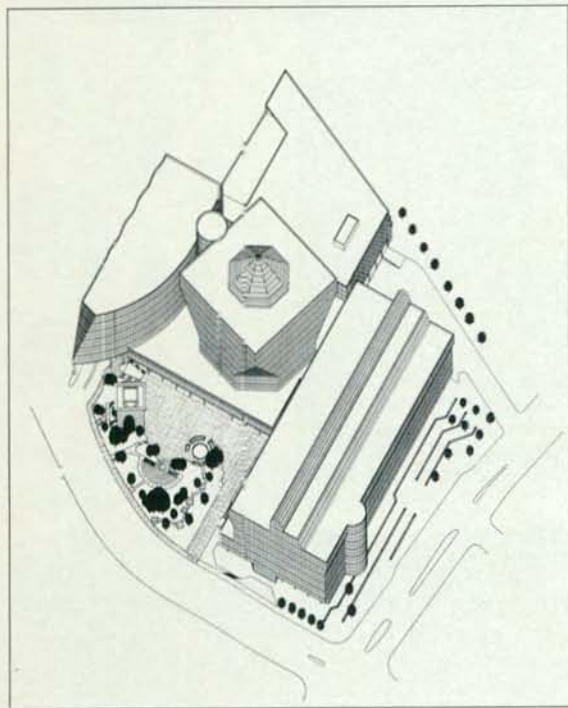
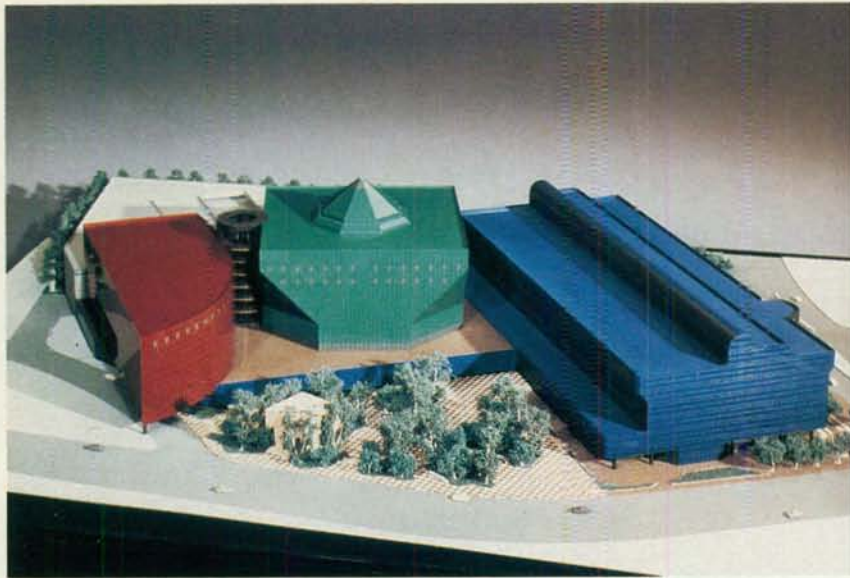
The recently completed 450,000-sq.-ft. Phase II is designed as an inverted pyramid, while the 375,000-sq.-ft. Phase III, which is not yet built, is shaped like a pie wedge.

"The massing and angle between the buildings is crucial," Rubenstein explained. The second building is offset 15 degrees from the first structure, and the third building is offset from both its predecessors.

Further differentiating the buildings is the use of vivid colors. "The blue color of the original structure was chosen for its ability to reflect the sky in an interesting manner," Rubenstein said. "The green color went well with the blue, and the red provided a strong variation."

While the inverted-pyramid design of Phase II presented a marvelous architectural solution, for the structural engineer it created a tremendous headache. The building rises from a generally square two-story base. From level three to level five, the corners of the square are cut off at a 45 degree angle, and from the sixth level to the eighth level, the floors cantilever out from the truncated corners forming a





The massing and the siting of the three buildings was crucial to Felli's concept of creating a composition based on architectural shapes. An examination of some of the building's floor plans (opposite) shows the effect of designing an inverted pyramid.

sloping vertical wall. At the ninth floor, the plan resumes a square shape.

As if a 60' cantilever on each side of the building was not enough of a problem, for leasing reasons unusually large bay sizes were required, explained Mohammed Hayat Khan, S.E., project engineer with Cygna Consulting Engineers, Marina del Rey, CA. While a typical building would have 30' bays, this project required 40' to 44' bays.

"We also had a problem because of the project's proximity to three faults," Khan added. The building is less than 1 mile from the Santa Monica fault, less than 3 miles from the Newport-Inglewood fault and less than 35 miles from the San Andreas fault. Based on computer analysis of ground conditions, earthquake data and the building's shape and massing, Cygna predicted the building could experience base shear four times greater than what the code requires it to resist.

"The building is modeled as a steel ductile moment with a rigid floor diaphragm to resist earthquakes," Khan said. To determine the optimal structural design, Cygna utilized three different analytical approaches:

- Static analysis per UBC 1982. Checked that the stress ratio of each member is less than 1.33 (1978 AISC Specification Part 1) and that the relative story displacement is less than .67(0.005h);
- Probable earthquake analysis. Dynamic analysis was performed based on the response spectra with the soil engineer to check that the stress ratio was less than 1.0 (1978 AISC Specification Part 2) and that the relative story displacement was less than 0.0075h;
- Credible earthquake analysis. Dynamic analysis was performed using 5% damping and a ductility factor of 4 to check that the relative story drift is less than 0.015h.

The core of the steel frame is

centered on eight box columns that rise from ground level to the ninth floor. "The structure is an eight-sided polygon with moment connections between the beams and columns," Khan said. The combination of extra large bays, the unusual building shape, and seismic conditions required larger-than-normal box columns—some of which are as large as 34" X 34" with 2½" plates.

5,000 Tons Of Steel

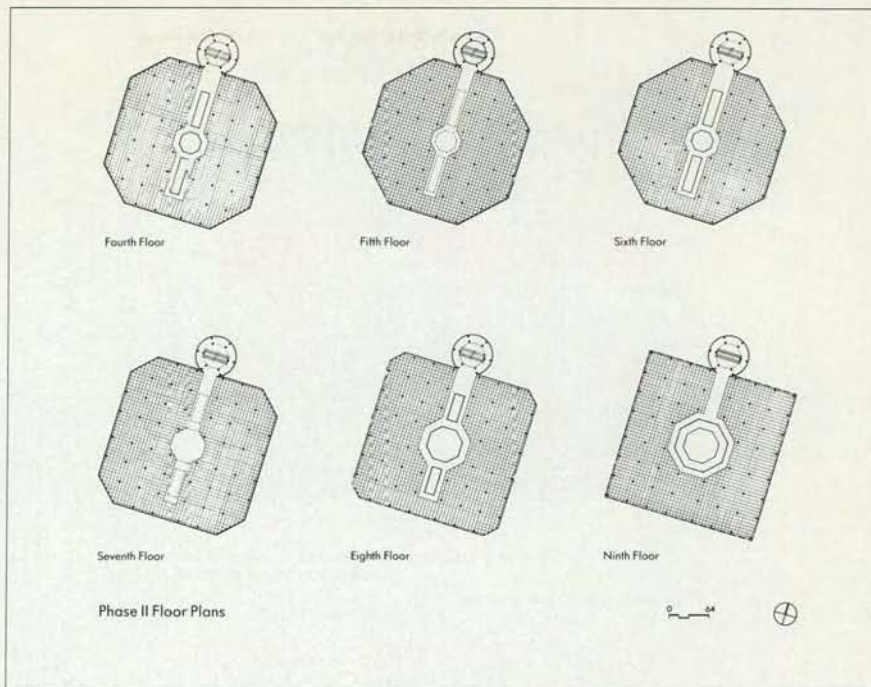
For the columns and heavier girders, the design called for A572 Grade 50 steel, while A36 steel was used on most of the beams and girders. In total, 5,000 tons of steel were used. The connections were a combination of bolted and welded with full-penetration welds. Steel fabricator and erector on the job was AISC-member American Bridge, Long Beach, CA.

The columns support a 24'-deep truss that frames the building's ninth floor and transfers the cantilever loads back to the main core of the building. Because the corners of the sixth, seventh and eighth floors extend as much as 60' beyond the intermediate floors, the corners of these higher floors are suspended from the truss by columns and diagonal beams. "We had to use a large amount of steel—about 22 psf—to achieve the unusual design," Khan said.

Because of the outwardly sloped vertical walls, a tremendous amount of falsework was required during the steel erection. "We erected the columns, beams and girders as though it was a square building, but in the corners we used falsework," explained Alexander Fattaleh, senior vice president with American Bridge. "Then we put the trusses up and took the falsework down."

Falsework Supports

The entire frame was erected up to the ninth floor with falsework supporting the overhanging corners until the ninth-floor truss was in place, explained Joseph Borowitz, project manager with



HCB Contractors, City of Commerce, CA, the project's general contractor. To erect the truss, falsework was placed at the midpoint of the corner overhang and the diagonal beams were erected to that point. The truss sections were placed on top of the falsework and bolted and welded. Finally, the falsework was removed and the truss, which was cambered upward 1½" at the corners, was deflected into a level position as the

composite floors were poured.

Additional seismic insurance is provided by a raker beam between the midpoint of the fifth floor and the bottom of the ninth floor. "It supports some of the curtainwall, but it's mainly there to lend continuity to the structure," Borowitz said. The beam uses slip connections to allow for movement.

The crowning touch on top of the building was a 100'-diameter, 45'-high skylight supported on a



Punches & Dies

for your Geka Ironworkers



- Immediate shipment of stock punches & dies.
- Prompt shipment of oversize tooling.
- 48-hour shipment of most special sizes and shapes.
- Low, low prices

Call 1-800-446-4402

FAX 216-681-7009

First in quality and service

THE CLEVELAND STEEL TOOL CO

474 East 105th Street • Cleveland, Ohio 44108

All tooling made in U.S.A.

F-2717

20-ton tension ring. Again, the erection involved a tremendous amount of falsework. "Starting at the third level, we erected falsework nearly 100' up in the air and put the tension ring on it," Fattaleh said. "Then we built the roof structure. When the purlins and connections were attached to the tension ring, we pulled out the falsework.

"It was a piece of engineering art," Fattaleh added. □

Jurors Comments:

"Sometimes when you add something to a strong building you wonder how the two can sit compatibly with one another, but these two really do work well. Both the color and the form contribute to a dynamic statement."

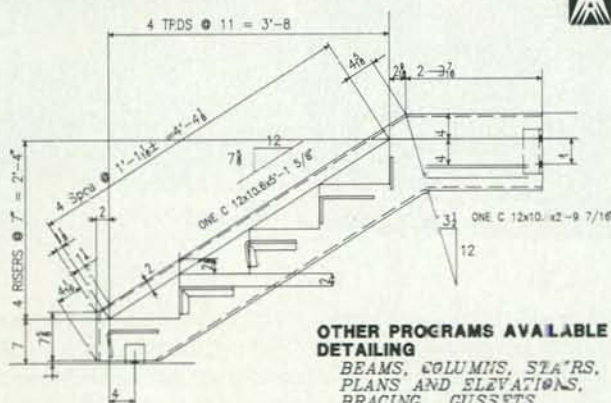
"It's the most appropriate container for a design center that I've seen. What I really like about the design is that the space between the two structures is as important as the building itself."

"There's a lot of buildings that try to be sculpture; this building is sculpture."

STAIR DETAILS

IN 90 SECONDS

WITH AutoCAD



OTHER PROGRAMS AVAILABLE FOR DETAILING

BEAMS, COLUMNS, STAIRS,
PLANS AND ELEVATIONS,
BRACING, GUSSETS,
MATERIAL MANAGEMENT

CALL NOW!
For information about saving time
with productivity programs from

COMPUTER DETAILING CORPORATION
1310 Industrial Blvd.
Southampton, PA 18966 215-355-8003

Project Principals:

Architect: Cesar Pelli & Associates, Inc.,
New Haven, CT

Associate Architect: Gruen Associates, Los Angeles

General Contractor: HCB Contractors,
City of Commerce, CA

Steel Fabricator/Erector: American Bridge,
Long Beach, CA

Owners: Birtcher, Laguna Niguel, CA; Catellus Development Corp., San Francisco; and The World Wide Group, New York City

Steel joists are integral part of structural frame...

New Pyramid Arena Built with Custom-Designed Steel Joists from Canam Steel.

Recreating the ancient design of the Pyramids is a monumental engineering and construction feat. The architecture of the new Pyramid Arena in Memphis, Tenn., called for new materials and methods. The steel fabricator had to find

"Canam remained an integral part of the team that succeeded in detailing, fabricating and erecting a beautiful, yet very difficult structure ahead of schedule."

John F. Kirse, Jr., Project Manager
Havens Steel Company, Kansas City, Mo.

a joist manufacturer willing and able to tackle a difficult engineering and manufacturing project.

Canam Steel Joins the Team

Havens Steel of Kansas City, Mo., was the steel fabricator who selected Canam Steel to design and manufacture the custom joists for the new Pyramid Arena. Canam Steel worked closely with Havens Steel's engineers and site personnel in determining the detailed design requirements.



The Pyramid Arena in Memphis is a unique steel framed structure. Joists were used as part of the support system for the skin of the building.

Project Manager Commends Canam

Havens Steel was pleased with Canam's performance, and said so. "Canam participated as a team member from the very beginning during planning. Bar joists were utilized on the sloped sidewalls as the supporting element for the exterior skin system... Canam's production control people responded with a high degree of cooperation and communication..."

"Since the bar joists were an integral part of the horizontal bracing design, there were

unusual requirements for the joist design including the joist bridging. Canam's engineering staff was intimately involved with Haven's engineering and site personnel..."

"Your engineering and customer service staff remained 'at our side' in arriving at solutions to avoid down time and delays."

The Pyramid Arena is an awe-inspiring tribute to teamwork and modern technology. Canam Steel is proud to have served the builders and fabricators of this new wonder of Western civilization.



canam steel
corporation

Open Web Joists-Longspan Joists-Deep Longspan Joists-Trusses-Girders

Plants: Lafayette, IN (317) 477-7764-Washington, MO (314) 239-6716-Point of Rocks, MD (301) 874-5141

Sales Offices: Boling Brook, IL (708) 759-7800-Batavia, OH (513) 752-3543-Parma, OH (216) 888-4922-Blue Springs, MO (816) 224-3353-Memphis, TN (901) 763-0266-Flint, MI (313) 230-8090-Delano, MN (612) 972-6135-Needham Heights, MA (617) 444-5504-Towson, MD (301) 494-1400-Findley Lake, NY (716) 769-7121-Virginia Beach, VA (804) 479-1828-Chambersburg, PA (717) 263-7432-Centerville, VA (703) 803-9371



A Grand New Entrance

Converting an urban plaza into a two-level retail center helped revitalize a connecting office building



Skylights played an important role in the Galleria at Erieview in Cleveland both by letting in a tremendous amount of natural light and because the steel superstructure created a rich textural appearance. Above photograph courtesy of Anthony Belluschi Architects, Ltd.

Even at dusk the skylights create an interesting view. Note that as visitors walk the length of the retail space they can look up and see the connecting office building through the glass skylights. Opposite photograph by Gregory Marpley.

During the 1960s, urban renewal advocates mistakenly imagined that creating downtown plazas would automatically spur redevelopment activity and interest.

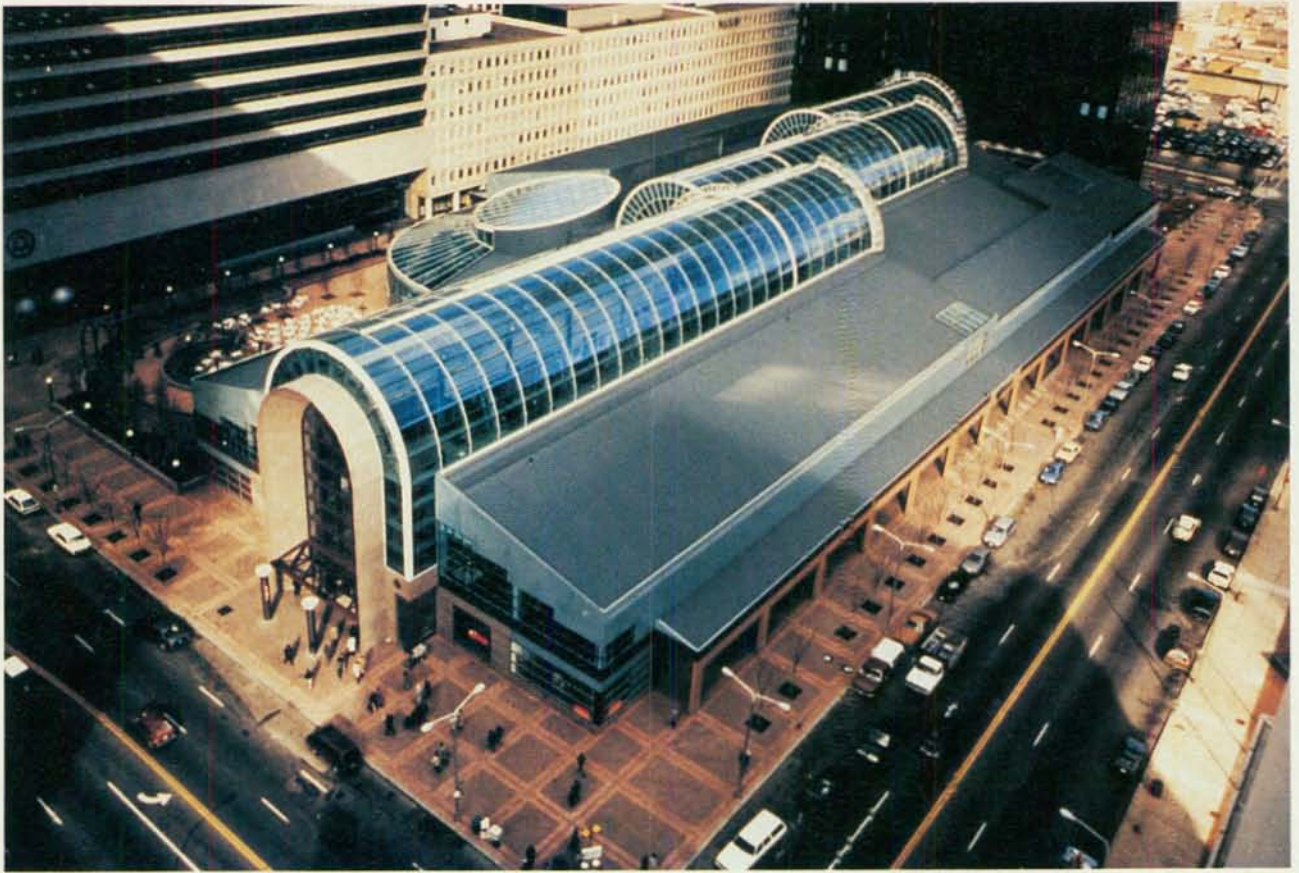
An example of this misguided urban planning occurred in Cleveland where a 40-story office building set far back from 9th Street with a large plaza in the intervening space. The plaza had one-level of parking below and an ice skating rink on top.

While the project was initially successful, by the early 1980s the building's occupancy rate was beginning to slip and the plaza was widely ignored. Before Cleveland real estate developer Jacobs, Visconsi & Jacobs Co. agreed to buy the office building, it first considered what could be done with the plaza. After careful consideration, the developer decided to add retail space.

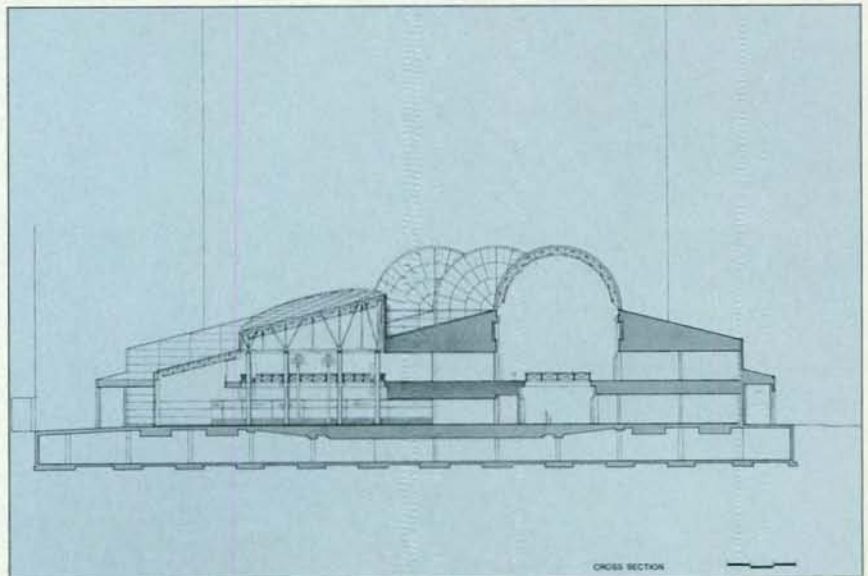
The retail space serves two purposes, according to Anthony Belluschi, AIA, president of Anthony Belluschi Architects, Ltd., Chicago. First, the former plaza is a good site for stores. Second, and most important, attaching retail space to the office building enabled the developer to create an entrance to the building on 9th Street.

"The retail space acts as a glass-enclosed pedestrian street," explained Belluschi. "It adds vitality to the plaza and creates a dynamic entrance to the complex." Originally, 100,000-sq.-ft. of retail on one level was planned. "But it worked





One of the concerns of the designers was that the Galleria not only look attractive from street level, but that it would also make a good impression on people looking down at it from the surrounding office buildings. Note the outdoor seating on the far left side of the Galleria. Photograph by Mort Tucker.



out so well that we went to a two-level, 207,600-sq.-ft. center."

The entire structure is designed to be eye-catching, both from the street level and when viewed from the surrounding tall buildings. The most striking feature of the project is the 85'-high, offset, barrel-vaulted glass skylight that forms the roof of the walkway.

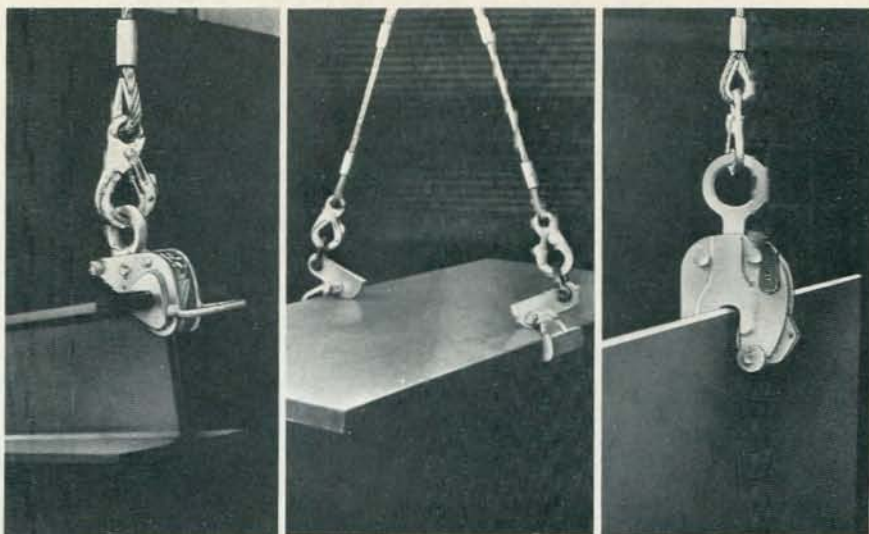
While the use of three offset barrel vaults was visually striking, the design was as much for pragmatic reasons as for aesthetic, Belluschi explained. The designer wanted the main entrance to the retail center to be centered, but because of the size and shape of the old plaza site, that location did not line up on the same axis as the entrance to the office building. "So we had to jog the walkway," he said.

The offset barrel vaults also allowed for the creation of a new, smaller outdoor plaza that would be sheltered from the wind. "It's a very windy site and an ideal solution was to put the new outdoor cafe in a vest-pocket site," Belluschi explained. Also, by partially surrounding the outdoor cafe with the retail center, the cafe becomes more noticeable from the offices looking down at the site from the surrounding buildings.

Because the top of the low-rise retail center is so readily visible from the surrounding buildings, all of its mechanical equipment was concealed beneath a metal roof. The equipment is accessible from a complex system of catwalks using light gage steel grating to minimize weight. The metal roof was painted green and green-tinted glass was used for the skylights to create a psychological impression of life and to reflect back to the earlier use of the site as a landscaped plaza.

The exterior of the building also is enhanced by a colonnaded walkway on one side and a dramatic front entrance including a main entry arch composed of Taivassalo, a red granite quarried in Finland and fabricated in Verona, Italy.

Aesthetics also played a significant role on the interior design of the structure. The glass skylights



RENFROE... Giving Industry the Lift It Needs

Manufacturing hooks and clamps has been our sole business for over 30 years. We plan to make it our business for another 30 years ... and then some.

Whatever your needs, and when-

ever you might be, call or write us for an on-the-spot consultation. Principal offices and plants are located in the United States, West Germany and Japan, with stocking distribution in all countries throughout the world.



R.J.C. RENFROE & SONS, INC.

P.O. Box 4273 • 1926 Sparring Street • Jacksonville, Florida 32201 • 904/356-4181 • Telex 056-579



Slugger
BY JANCY ENG. CO.

Model JM-100 **Slugger**® weighing only 24 pounds will cut up to 1¹/₁₆ inch diameter holes in carbon steel one inch thick in seconds. This is possible only because the JM-100 accepts Jancy's patented **Slugger**® annular cutters. These **Slugger**® cutters are center free and cut only the periphery of the hole thus requiring minimal torque and thrust. The JM-100 is also heavy duty enough to convert into a magnetic drill press accepting twist drills up to a half inch in diameter. The rugged cast aluminum frame and compact 16 inch overall height is ideal for steel fabricators who have holes to cut in hard to get at places.

Jancy Engineering Co.

4616 Kimmel Drive • P. O. Box 3098

Davenport, Iowa 52803

Phone 319-326-6251 • Fax 319-326-6943 • Telex 439002

provide magnificent views of the surrounding buildings, while also providing a tremendous amount of natural light. The 500'-long, two-level galleria is finished with high-quality, durable materials including brass, glass and marble.

One of the most notable features are tall columns capped with artificial ferns. In addition to softening the space, the planters cause visi-

tors to look up. "As you walk, your eyes follow the vertical line of the planters," Belluschi said. And when you look up, you see the office building for which the retail space serves as a grand entrance.

To accommodate this unique view, the skylight support system was carefully designed to provide a lacy, airy effect, but yet be strong enough to carry severe wind and

snow loads. The solution was a space frame of pipe trusses braced with a stressed bar bracing system, according to John Nyitray, P.E., president of Bliss & Nyitray, Inc., Miami. The trusses are structurally independent from the skylight framing in order to accommodate large differential movements caused by the various thermal loading conditions, he explained.

Uniform stressing of the tension bars was critical and was achieved by threading the ends of the bars with opposing threads and literally "tuning" each bar by sound. Other bar braces were heated to a prescribed temperature to achieve elongation, then welded in place before cooling to ensure residual tension under all loading conditions.

The semi-circular trusses were shop-fabricated in jigs to ensure uniformity. To reduce the skylight's weight, lighter pipe trusses were framed between the semi-circular trusses. The trusses are 30' long and 1½' deep. "The trusses were similar [in design] to bar joist but were made of pipe," Nyitray said. To reduce the cost of testing, the trusses were load tested prior to shipping instead of weld tested. "It was cheaper and quicker," he explained. The weight testing was done by the fabricator under the supervision of a testing laboratory.

Weight Considerations

One reason that weight was so important is that the entire new structure is constructed on top of the existing plaza deck structure over the subterranean parking garage and its existing foundations. The existing structure is concrete and the new steel columns were swedge-bolted into the existing concrete and connected with drilled anchors. The structure used 1,235 tons of A36 steel.

"We designed the structure to require minimal reinforcing," Nyitray said. "We tried to keep the weight down as much as possible, which was one reason we used steel." The structural engineer did



The BURCO STUD PAK

OUR TRADEMARK —
DURABILITY, QUALITY
AND RELIABILITY!



TOWABLE ARC STUD WELDING SYSTEM 1600 AMP and 2600 AMP

An innovative Engine Drive Concept with capacities to handle up to 7/8" Studs.

- Low Profile - Only 56" High
- Low Weight - Only 4,400 lbs.
- Convertible to skid mounted at the job site.
- Cost about 40% lower than conventional systems.

Air Cooled Deutz Diesel
LIMA Alternator
Fully Equipped for
User Comfort

BURCO



Power Systems

Manufactured by

BURCO, INC.

Div. of BURCO Manufacturing, Inc.
Box 2115 • 530 Chapel Hill Road • Tel. 919-227-2737
BURLINGTON, N.C. 27216-2115 U.S.A. Fax 919-228-0780

BC-90 JM 1/90



joint for the new building could not be made to coincide with the existing expansion joint of the parking structure.

"Our solution was to offset the expansion joint," Nyitray explained. Offsetting the expansion joints by one bay resulted in a 30' portion of the new building that literally slides on Teflon pads located strategically on the existing garage roof. The same solution is repeated in the last bay, where the new building meets the existing 40-story office building. The procedure eliminated the need for an additional expansion joint and the resultant extra cost.



Jurors Comments:

"This project creates a real gathering space—and one that's in the sunlight throughout the year despite Ohio's climate. It draws the public in. It looks like a happy space."

"The steel frame is light and delicate, and it fills the space with beautiful shadow patterns. It's inviting, and it's constantly changing throughout the day and evening, so the space doesn't tire you out. The simplicity and elegance of the structure was left to dominate the space. The design is admirable in that everything else takes a back seat to the structure, which is unusual in this age of overly detailed and overly wrought buildings."

specify some underpinning of foundations at four locations beneath retail spaces containing mezzanine levels. "We used compaction grouting underneath the existing footings to improve the soil capacity," he said. The use of compaction grouting minimized differential settlement and permitted the parking garage to remain fully operational during construction, which was critical to the tenants of the office building.

Other weight saving devices was the use of steel sandwich wall panels, steel deck, and lightweight concrete floor slabs using composite design. The ground floor of the retail structure is elevated since the

existing plaza was not flat. "In order to keep the weight down, we filled the space with polystyrene foam and put a deck over it instead of filling the entire space with concrete," Nyitray said. The same technique was used in the landscaped outdoor plaza to minimize soil depth.

Building over the existing plaza was complicated by the location of the food court. The food courts siting was predetermined by its location to the nearby buildings—which would provide its clientele. Further complicating the design was the food courts complex truncated cylindrical shape. Because of these two factors, the expansion

Project Principals:

Architect: Anthony Belluschi Architects, Ltd., Chicago
Structural Engineer: Bliss & Nyitray, Inc., Miami
General Contractor: Turner Construction Co., Cleveland
Owner: Richard E. Jacobs and David H. Jacobs, Cleveland

A New Vision For Airport Design



Airline travel may be commonplace, but the new United Airlines Terminal in Chicago is anything but common

With one bold stroke, the United Airlines Terminal Complex at Chicago's O'Hare Airport changed forever the design of airline terminals. No longer will a strictly utilitarian structure be tolerated. Instead, airports have now matured into modern versions of the grand pre-war railroad terminals.

But where the old railroad terminals emphasized ornate detailing in traditional materials, architect Helmut Jahn, FAIA, designed his "Terminal For Tomorrow" using glass and steel.

The terminal includes 42 gates in two parallel concourses, a ticketing pavilion, baggage handling areas, and an 800'-long connecting spine.

"The spatial sequences, materials, finishes and lighting are orchestrated in the building design to produce the appropriate scale and image for the carrier's flagship terminal," according to Jahn, president of Murphy/Jahn, Chicago.

The most dramatic features of the new airport are the 1,730'-long vaulted gate areas; the exposed steel, folded-plate roof trusses over



Glass, steel, and natural light combine to create a vision of the future in the new United Airlines Terminal at O'Hare Airport in Chicago.

the 120' x 810' column-free ticketing pavilion, and the 800'-long underground passageway connecting the two concourses.

The ticketing pavilion serves as the entrance to the structure. The area spans 120' and features 54 exposed steel, folded-plate trusses. Each fold of the trusses is set an angle of 37 degrees and is 14'-4⁷/₈" in depth, the maximum depth that can be shipped, according to Charles Thornton, P.E., president of Thornton-Tomasetti Engineers, New York City, the project's structural engineer. The trusses were shop-welded, with 8⁵/₈" diameter pipe top and bottom chords and 6⁵/₈" diameter pipe diagonals. At the ridges, the top chords of adja-

cent trusses are spaced 5' apart. At the valleys, the bottom chords of adjacent trusses are spaced 2'-6" apart.

A series of 8" wide-flange members spaced at 10' intervals undulate up and down directly over the folded trusses in a direction perpendicular to the span of the trusses. The W8 members make the individual planar trusses act as a folded plate system. This combination of flexural W8 members and the planar trusses allows for the components to be easily shipped. In addition, the W8 members simplified the connections of the architectural cladding by providing a planar surface.

The connection of the W8 mem-



bers to the pipe trusses are all bolted connections to simplify erection. Structural steel fabricator was AISC-member Trinity Industries, Inc., Houston, and steel erector was AISC-member Broad, Vogt and Conant, Inc., Cleveland. (For a complete description of the structural system used on this project, refer to pages five through 12 of *Modern Steel Construction* Issue Number 5, 1987.)

Natural Brightness

"The skylights in the 120' free-span roof provide natural light, which in combination with the

folded truss steel superstructure and terrazzo floors, produces a technically articulate environment," Jahn explained. "A major accomplishment was to demonstrate that the steel could be exposed, even though this would not be in accordance with the governing building code. Specific fire data demonstrated the effectiveness of sprinklers to provide the required protection. This was the primary justification of the code variance, however, analytical fire models later showed that size and volume of building would prevent the development of critical temperatures.

This type of rational approach to engineering fire protection will give greater flexibility in the future for the contribution exposed steel can make to architecture."

Just as dramatic as the ticketing area are the two concourses. The roofs of Concourses B and C are formed from welded steel arches. Because the structure is exposed, strict attention was paid to the connection details.

The main support system for the corridor roof is a series of steel-vaulted arches spaced 30' on center. In Concourse B, the arches span 40' to form a 1,730'-long corridor, while in Concourse C, the arches span 50' to form a 1,610'-long corridor.

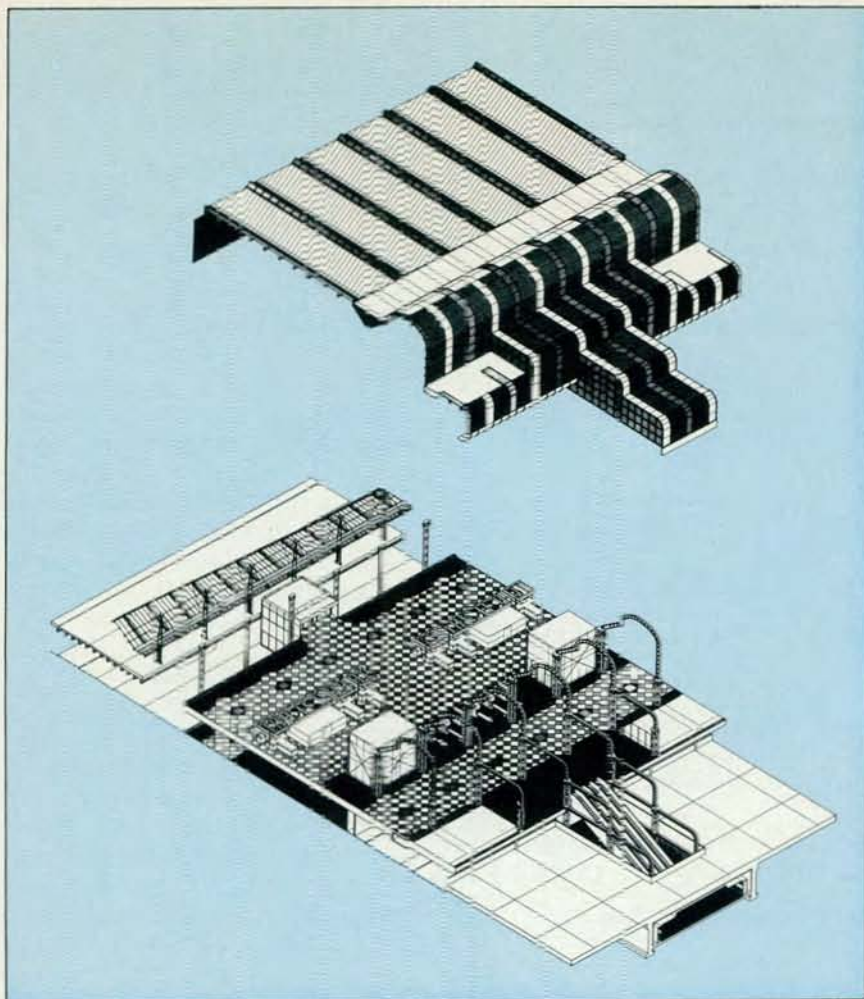
Aesthetic Perforations

The vaulted arches were shop-fabricated in an I-shape cross section, with continuous welds between flanges and web. Because of the size of the vaults, two splices are fully welded and ground so as not to detract from the architecture. For purely aesthetic reasons, the 24"-deep vault girders are perforated with 12" holes 24" on center.

"Daylight is used throughout the ticketing pavilion and the concourses both to improve the quality of space and to take advantage of significant savings in energy costs," Jahn said.

To support the glass mullion system, purlins spaced 5' on center span between the vaulted girders. The purlins are built-up members on 8 $\frac{5}{8}$ "-diameter pipe and a WT5. The WT web is oriented perpendicular to the plane of the glass to improve the flexural strength of the purlins.

Parallel to the segmental planes of the glass are a series of 1 $\frac{7}{8}$ "-diagonal sag struts that stiffen the pipe purlins about their weak axis and transmit unsymmetrical loads through the structure. Cross-bracing members are placed intermittently within the planes of the sag struts to stabilize laterally the vaulted arches. Five expansion joints were required in each con-

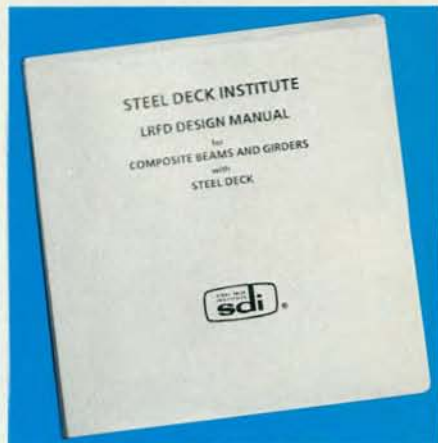


Large expanses of glass allow travelers to see into the concourse as they approach, creating an inviting view of action and life. (opposite above). From the inside, the glass creates a more comfortable atmosphere while reducing energy costs (left). One of the most exciting parts of the terminal is the sculptural underground passageway (opposite below).

JUST PUBLISHED!

LRFD

DESIGN MANUAL



Design for the 21st Century in the 1990's

- Composite Design—Steel Beams with Steel Deck
- Example Problems
- Quick Selection Charts
- Look-Up Charts

LRFD Design Simplified

Every Design Professional
Should Have a Copy!
Be Competitive.

ORDER YOURS TODAY!

Send checks, postal, world money-orders, drafts in U.S. Currency.

Quantity @\$75.00 ea.

All New LRFD Design Manual
for Composite Beams and
Girders With Steel Deck

US Currency Total _____
Out of USA Surcharge 15% _____
Add on Airmail _____
TOTAL ENCLOSED _____

STEEL DECK INSTITUTE

P.O. Box 9506 • Canton, Ohio 44711 • (216) 493-7886

course to reduce thermal expansion movements. The vaulted arches are supported on a series of clustered pipe columns similar to those at the folded-plate trusses.

One area that does not have access to any natural light is an underground walkway connecting the two concourses. Passing through an 800'-long passageway would normally be boring and tedious, but

the architect instead succeeded in making it one of the most exciting public spaces in Chicago. The walls are formed of undulating back-lit translucent panels. Running the length of the ceiling is a kinetic neon sculpture that sequentially flashes on and off. And as travelers are whisked along a moving walkway, appropriately futuristic music serenades them. While the music

and lights were at first controversial, the walkway has since become the first tourist attraction seen by many visitors to Chicago. □

Jurors Comments:

"It's a great structure, a great piece of architecture. To me it's music and it's a lot of fun. Its scale, height, daylight, detail and the originality of the structural form contribute to making it an exciting place. And the sculpture walk in the underpass is like a gift to the people, something that didn't have to be done, but contributes to make a most memorable experience."

"The thing I liked most about it was the correctness of its structural form. The members and diagonal bracing is elegantly expressed on the outside. The holes in the structural members make it light and airy and give you a feeling of wanting to be in that space. I think the building is a classic. We'll look back 25 years from now and still consider this to be a world class, elegant building."



METAL DECKS STEEL JOISTS TRUSS GIRDERS

For over 35 years, Riopelle has been providing customers with high quality, S.J.I. Specification steel bar joists, ASCE Standard metal decks.

- Fast Estimates: Fax us your lists or send us your plans
- Quick In-House Detailing
- Delivery When You Want It
- Structural Engineering

We serve all fabricators and structural engineers. Our large volume assures both fast delivery and highly-competitive quotes. No job is too big or too small. International shipments available.

For unbeatable prices and favorable credit terms, give us a call today.

Call Collect: 414-353-8080
FAX: 414-353-8093



RIOPELLE

ENGINEERING SALES, INC.
8817 West Lynx Avenue
Milwaukee, Wisconsin
53225-1833
U.S.A.

Project Principals:

Architect: Murphy/Jahn,
Chicago

Associate Architect:
A. Epstein & Sons
International, Chicago

Structural Engineer:
Thornton-Tomasetti,
New York City

General Contractor: Turner
Construction, Chicago

Steel Fabricator: Trinity
Industries, Houston

Steel Erector: Broad, Vogt and
Conant, Inc., Cleveland

Owner: City of Chicago

PROJECT:
FALL RIVER SCHOOL
SPECIAL THANKS TO:
WESTRA CONSTRUCTION



An Invitation To Travel

Philadelphia takes a bold approach to new subway entrances

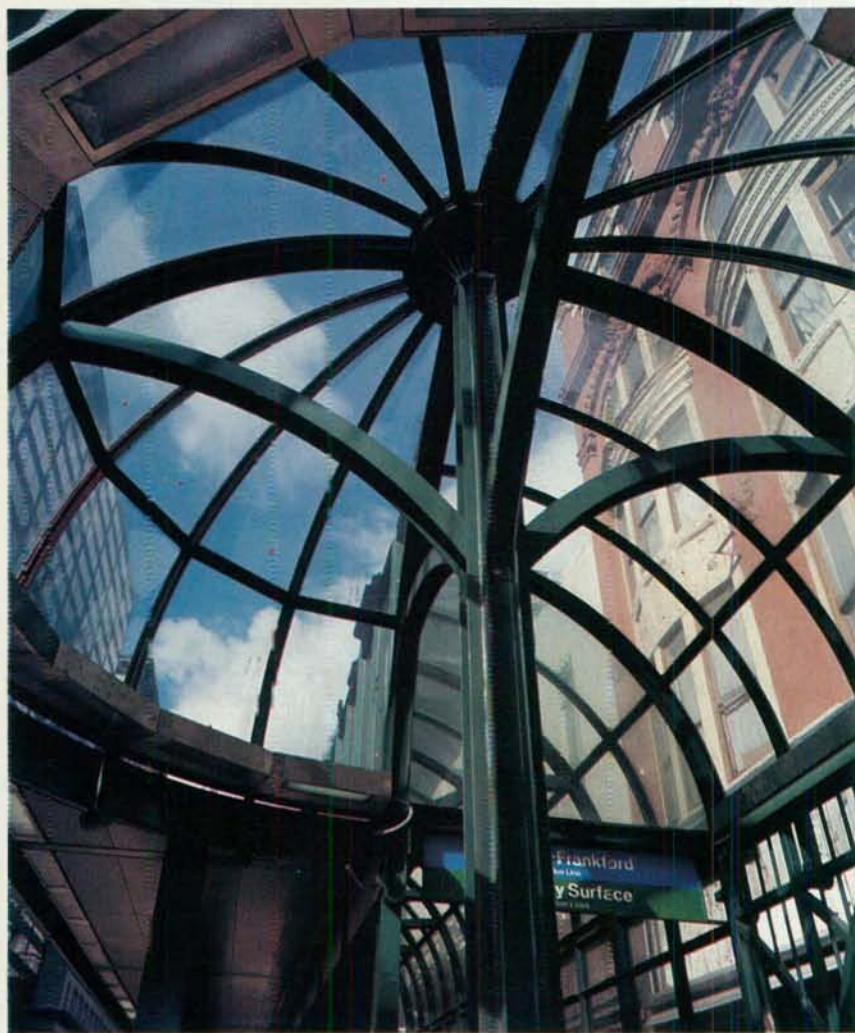
Subway entrances all too often are uninspired rectangles. Rather than duplicate this pedestrian approach, the architects of seven new entrances for Philadelphia's subway system opted for a dramatic combination of glass and steel.

"We used an umbrella design as a welcoming shape, as opposed to the box-like shapes found so often in public works," explained C. Anthony Junker, AIA, a partner with Ueland and Junker, the Philadelphia-based architects of the headhouses. "Our inspiration was Paris' Art Nouveau subway stations. We wanted a similar flower motif, something light and airy."

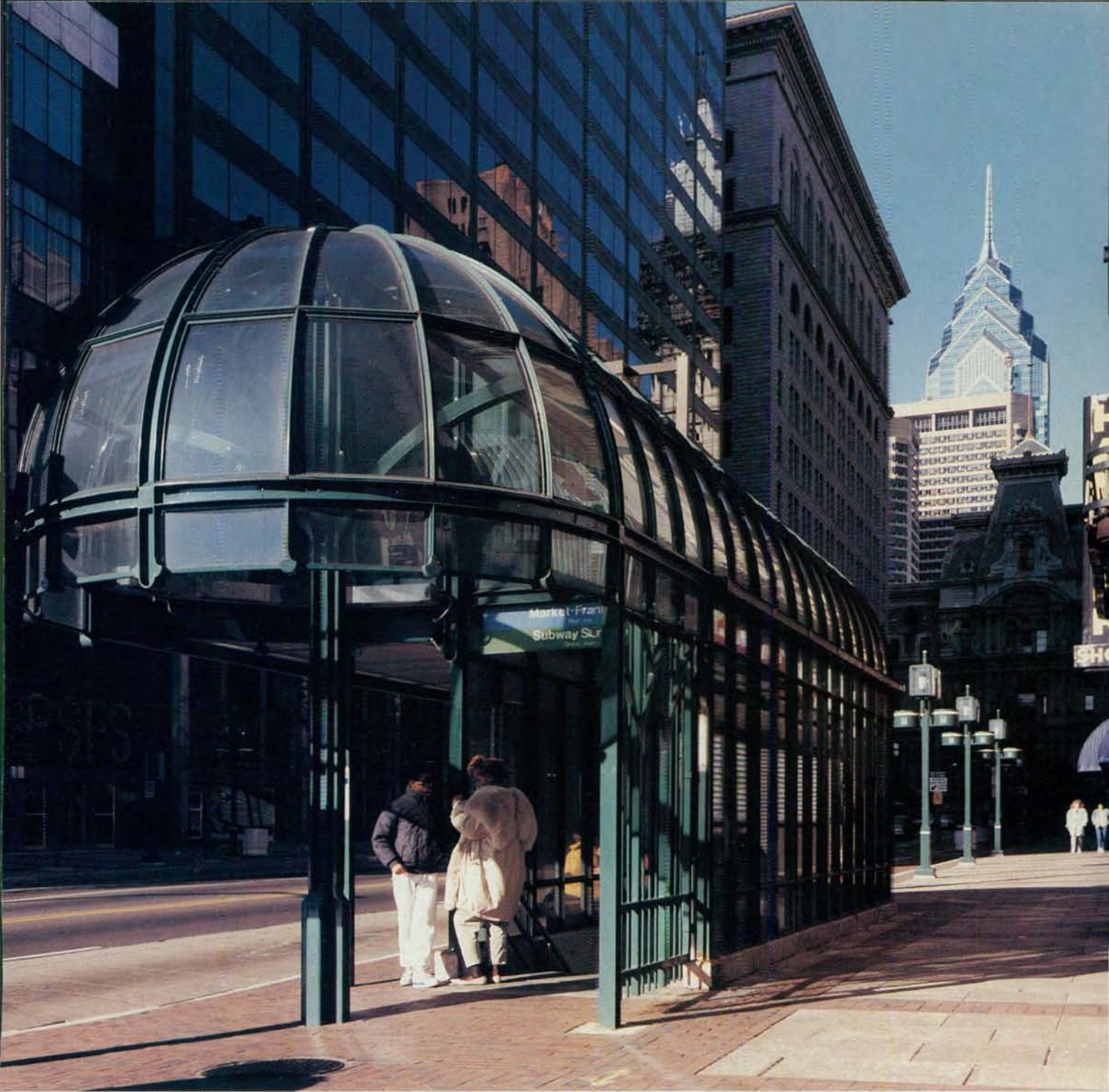
The seven new subway entrances stretch along Market Street, one of the city's major retail and office thoroughfares.

The architect's desire for a light and airy structure led to the use of curved steel columns covered with tinted glass. "We considered using aluminum columns, but the sections would have been heavier and more boxy," Junker said.

The designer also considered stainless steel, but the cost was too high, so painted A36 steel was specified instead, according to George Formanek, P.E., the project's structural engineer with Ang Associates, Philadelphia. "The weight of the main structure is 15 lbs./sq. ft., while we took a more conservative approach to the um-



Philadelphia's new subway entrances are designed with a "welcoming" umbrella shape instead of a more common boxy look. Glass and steel were essential to the design in order to create an open, airy look.



brella, which is 24 lbs/sq. ft." The extra steel in the umbrella is designed to resist both inward and outward forces, especially wind, he explained.

The connections are all welded, and from an engineering standpoint, the design was very straightforward. "However, the curved members did require the fabricator to take extra care," Formanek noted. The frames were transported

to the site in four sections and required very minimal field welding. The glazing was installed at the site.

The size and shape of the steel members were chosen both for beauty and to resist vandalism. The members were rolled into a highly irregular shape with many rounded protrusions. "We were trying to make use of the full potential of rolled steel, so we chose a

shape that would cast a lot of shadows and make the structure visually interesting. We built decoration into the material itself," Junker said. The irregular shape also was designed to resist vandalism by making it very difficult to attach posters to the steel.

Vandalism also was a concern with the large expanses of glass. "We had to weigh the possibility of vandalism against the benefit of cre-

SUMMER SALE !

- General Structural Analysis
- Concrete Analysis & Design
- Steel Analysis & Design
- Post-tensioned Concrete Design
- Masonry, Timber & Foundations

- > User friendly, integrated, with graphics
- > Simple beams to large 2D & 3D structures
- > Frame/shearwall interaction (including torsion); p-delta effects
- > Final concrete bar schedules
- > Final steel and timber shape selections



over 20 years of use
by over 2000 firms

Save up to 50% - our lowest prices ever !

The most productive structural
design software since 1966

(sale ends October 31, 1990)

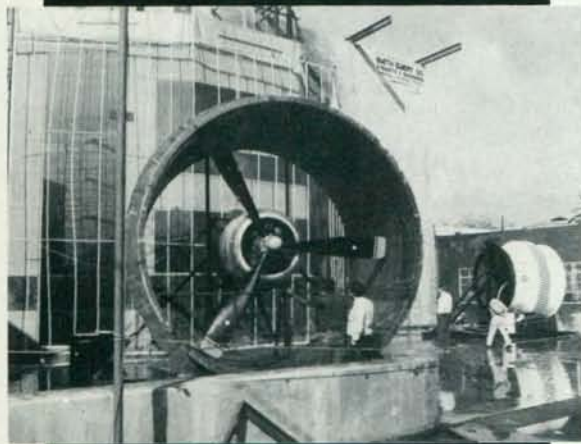
SAI

STRUCTURAL
ANALYSIS, INC.
429 Fifth Avenue
Indianapolis, IN 46203
(407) 394-4257 or
(407) 640-6047

Call us for additional information or complete this form
and mail or fax to SAI

NAME _____ COMPANY _____
STREET ADDRESS _____
CITY/STATE/ZIP _____
PHONE (_____) _____

Window Wall/Curtain Wall Mockup Testing



Wilshire/Westwood, Los Angeles
Granite and Aluminum/Glass Window Wall Mockup ready
for Dynamic Water Infiltration Test.

SMITH-EMERY COMPANY

The Full Service Independent Testing Laboratory, Established 1904
781 East Washington Blvd., Los Angeles, California 90021
213/749-3411 • Fax 213/746-7228



- Testing Facility is 45-foot high by 70-foot long; 300 psf loading capacity.
- Per ASTM and AAMA Specifications.
- Computer aided data acquisition with instant deflection readings +/- .001 inch.
- Dynamic Tests using 2000 HP Aircraft Engine w/13.5 foot propeller.

ating the desired effect," Junker said. "Often in subway work, you put in grillage or bars. But that's depressing. And we didn't want to use plastic because it hazes over the long-term." Instead, 1/2"-thick safety glass was specified. "So far, there's been almost no vandalism," according to Junker.

The glass' green tint and the steel's green paint were chosen as a color "with some life to it," Junker explained. "Also, green has an association with weathered bronze, which is a traditional material for outdoor fixtures but one that can very rarely be afforded today." □

Jurors Comments:

"It's a set of very elegant subway entrances that are very reminiscent of the iron subway entrances in both Paris and London. I think, given the nice pedestrian scale of Philadelphia, that these do an excellent job of decorating the street and making a suitable entrance to the subway."

"The thing I like about it is the two directionally curved umbrellas with their graceful curvilinear form that complements the curvilinear roof.

"It's delightful to find a little gem like this. To be a gem, all the little pieces have to come together. I think this structure with all its detail could really be called exquisite."

Project Principals:

Architect: Ueland and Junker,
Architects & Planners,
Philadelphia
Structural Engineer: Ang
Associates (formerly Omega
Consultants), Philadelphia
General Contracting Firm:
Neshaminy Construction,
Inc., Feasterville, PA
Owner: Southeastern
Pennsylvania Transportation
Authority, Philadelphia



A Traditional Racecourse

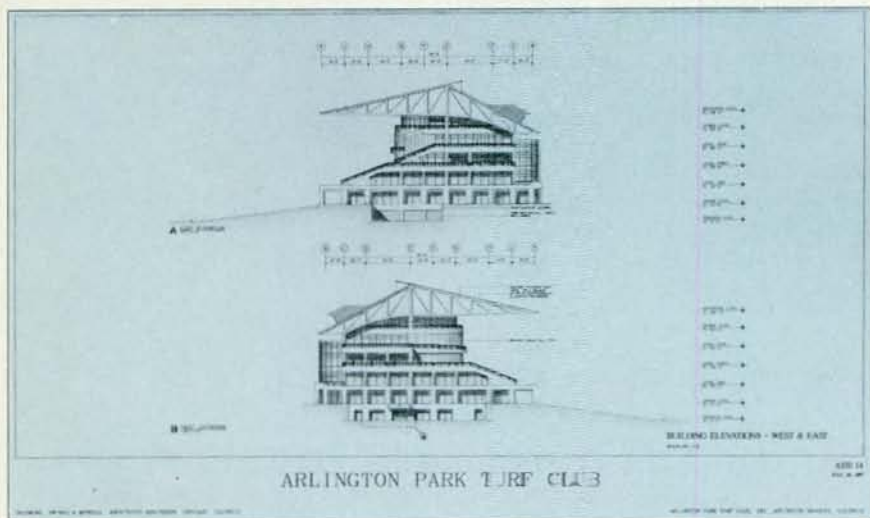
State-of-the-art facilities are combined with traditional design to create a first class racing facility

When the old and beloved Arlington International Racecourse in Arlington Heights, IL, burned down in 1985, the owner vowed to rebuild an even better structure. But horseracing is a traditional sport, and while the new 700,000-sq.-ft. facility is modern and technologically up-to-date, it's design reflects traditional values.

"Architecturally, the client wanted a simple, yet traditional solution," explained Hal Iyengar, S.E., a partner with Skidmore, Owings & Merrill, Chicago, the project's architect and engineer. A traditional approach also helped the facility blend in with some of the older brick buildings.

The primary purpose of the facility is as a grandstand, though it also houses ancillary functions such as a clubhouse. "We considered various high-tech solutions, such as a cable-stayed roof, an exposed tetrahedral truss and a mast with cables, but we rejected them as untraditional. They were just too jazzy for such a tradition-rich sport," Iyengar said.

Instead, SOM designed a 200'-wide by 680'-long, six-level structure with a 120' cantilevered roof



The grandstand at Arlington International Racecourse features a 120'-long cantilevered roof system. The articulation of the large trusses can be clearly seen in both the photograph and building elevations above.

system. The roof truss cantilever is believed to be the longest span cantilever for such a facility in the United States, according to Iyengar.

"The roof form is traditional in shape and respectful of the traditions of horse racing," he explained.

The structure essentially consists of tapering triangular cantilever trusses that are approximately 27' deep at the support and narrow to only 2' at the ends.

The trusses are spaced 40' on the centers. The bottom of the cantilevered part is nearly horizontal with a slight camber upward while the top is tapered for a downward roof slope. The cantilevered truss is continuous with the back truss, which spans over a distance of about 80'. The columns over the back spans provide the necessary tiedowns, thus assuring the stability of the cantilever system. The articulation of the truss can be clearly observed in the end elevations (see diagram).

The columns and the back-span structure were erected first and the 120' cantilever part was prefabricated into a single unit and was connected to the back-span truss at the ridge column line.

Tight Tolerances

The trusses were assembled on the ground to very tight tolerances to achieve a uniformly cambered structure for a straight eave edge. "The engineer was shooting for a very low deflection," explained William Hanson, who was formerly a project manager with AISC-member Broad, Vogt & Conant, River Rouge, MI, the project's steel erector. "We measured the heck out of it on the ground and ended up with less than $\frac{5}{8}$ " deflection.

Each of the 18 trusses weighed 52 tons and were erected in two pieces. The entire project used 6,600 tons of structural steel. Steel fabricator was Pitt-Des Moines, Inc., Melrose Park, IL.

The trusses support a 3" metal deck on its roof with a 2" architec-



The large trusses were assembled on the ground to very tight tolerances. Safety nets were attached to the trusses with twin cables and pulled into position before the iron workers were allowed onto the trusses, which were erected 100' in the air.





Construction photos from the back of the facility show the basic construction sequence. The columns and the backspan of the grandstand structure were erected first and then the 120' cantilever part was connected to the back-span truss at the ridge column line. A rear view of the finished structure aptly illustrates some of the building's traditional design elements

tural standing seam metal enclosure. This metal deck system spans 10' between W8 purlins that span 21' maximum to secondary girders spanning 40' between the trusses. Transverse trusses perpendicular to the main trusses are provided at several locations including one at the ridge line. This truss system provides lateral stability to the overall roof system, and the lateral system of vertical trusses is continued on framing at the bottom chord level of the trusses. The bottom chord also supports light framing with a metal ceiling system over the grandstand seating.

The client considered installing a glass wall the entire length and breadth of the grandstand area, but decided that it would hinder sightlines. However, provisions were made so a glass wall could be installed at a later date.

The new facility was constructed over the existing foundations of the old facility, which involved extensive consideration of imposed loads, and structural steel framing was therefore a natural selection. The primary truss members are wide flange sections with connections involving two gusset plates that are bolted to the members. The bolts are high-strength A490 in slip-critical connections and were generally 1" in diameter.

The design of the roof system in-

volved studies of snow and wind forces including wind tunnel testing to appropriately evaluate the dynamic characteristics and the imposed loads. "We looked at the trusses at Wrigley Field [where the Chicago Cubs play] shortly after completing this job and the trusses at the racetrack are engineered to carry far greater loads, primarily because of snow considerations," Hanson said.

"The roof system in structural steel represents a highly efficient conventional truss system for an elegant, modern roof form for a state-of-the-art grandstand facility," Iyengar said. □

Jurors Comments:

"The grandstand has a unique form and a strong awareness of the landscape. It relates very well to the existing buildings. I think it's a socially inviting structure that offers a lot of opportunities for interaction between people, and the races, and the horses coming into the ring. There's a constant feeling of people all around the place."

"It's a heroic structure handled very well in a straight triangular truss form that comes down to a sharp point, which makes it very elegant in form."

Project Principals:

Architect: Skidmore, Owings & Merrill, Chicago
Structural Engineer: Skidmore, Owings & Merrill, Chicago
General Contractor: McHugh Construction Co., Skokie, IL
Steel Fabricator: Pitt-Des Moines, Inc., Melrose Park, IL
Steel Erector: Broad, Vogt & Conant, River Rouge, MI
Owner: Turf Club of Illinois, Arlington Heights, IL

WE BEND STEEL



**WIDE FLANGE BEAM, CHANNEL
T SECTION, ANGLES
RECTANGULAR TUBE**

STRUCTURAL & DECORATIVE

**CALL GARY BEDWELL
703 628 4157**

Time Saved Is Profit Earned.

Is wasted time causing your profits to vanish into thin air? Outdated software or manual processing can waste minutes in the office, and that equates to hours or days lost in the shop or field. STEEL 2000 is the solution.

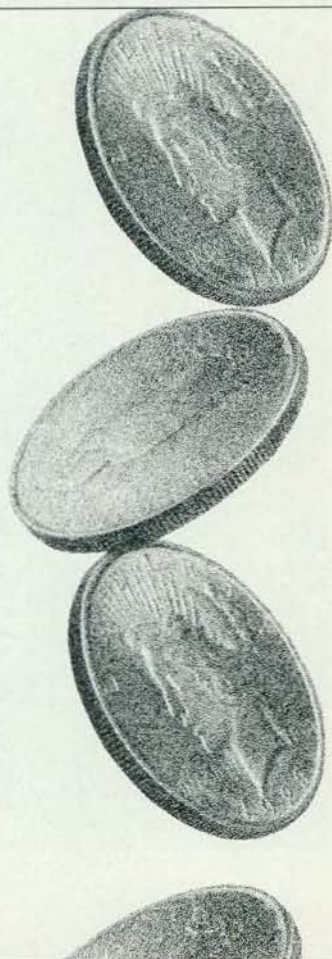
STEEL 2000 is a new, fully integrated, multi-user steel fabrication management system, created to increase your profits by decreasing the time you spend on each job. Even computer novices can become productive immediately.

Designed and implemented by fabricators, STEEL 2000 is the result of years of research and development by Steel Solutions, Inc., in conjunction with Steel Service Corporation, an operational, multi-plant steel company. Call today for more detailed information — before your profits disappear.

Service Center	Mill Orders	Estimating
Fabricator	Purchase Orders	Drawing Control
Inventory	Mulging	Accounting

STEEL SOLUTIONS, INC.

2260 Flowood Drive
P. O. Box 1128
Jackson, Mississippi 39215
601-932-2760 FAX 601-939-9359





Redefined Skyline



A 925'-tall architectural gem has forever altered Philadelphia's once conservative skyline

Landmark status is rarely given to a building immediately upon completion, but One Liberty Place is such a powerful architectural statement that it has forever altered Philadelphia's skyline.

For more than 100 years, City Hall—topped by its statue of William Penn—was Philadelphia's tallest building. In fact, for many years, a gentlemen's agreement between developers and the city precluded any design from topping the statue's height. But by proposing a 925'-tall, yet relatively thin building, Rouse & Associates persuaded the city that in the long run the quality of light and air at street level would be improved.

And Rouse's case was bolstered by Murphy/Jahn's Art Deco-influenced design that recalls the Chrysler Building's beauty.

"The design strives toward a synthesis between expression of the romantic yearnings of traditional skyscrapers and the display of

modernist technological imagery," according to Helmut Jahn, FAIA, president of Murphy/Jahn, Chicago.

Elegant And Optimistic Design

"Streamlined and powerful, the building's profile and structure represent a combination of boldness and refinement," explained Charles Thornton, F.E., president of Thornton-Tomasetti, P.C., the project's structural engineer. "The structure makes an elegant and optimistic statement about Philadelphia and its future. Consequently, it is a unique, dynamic design—influenced by the past but without duplication of all the forms, materials and structural systems. A building of this size designed in the 1920s or 30s would have had between 40 to 50 lbs. of structural steel per sq. ft.; not 23 psf as constructed."

The building's curtain wall is composed of glass and granite pan-

els set in an aluminum grid of shaped members that reinforces the tower form with its articulated structure. "The building's verticality is emphasized by the gabled centerpiece on each face which express the eight main 'super columns'," Jahn explained. "The contrasting horizontal treatment of the corners emphasizes the effect, as does the gradual transition of the skin from stone at the podium to all glass at the top. The multiple gables on top of the tower create a visual image and logical conclusion to the building's geometry."

Steel Minimizes Member Size

Structural steel framing was chosen for its flexibility, high strength, and its ability to transmit large tensile and compressive forces efficiently and yet keep the size of members to a minimum, according to Thornton. Built-up wide-flange sections were used for all outrigger diagonals and core and outrigger columns because of the large forces and required thickness of plates. Their use also facilitated fabrication and erection. Steel fabricator was former AISC-member Steel Structures, Inc. (no longer in business) and steel erector was AISC-member Cornell & Co., Woodbury, NJ.

Superdiagonal Outriggers

The selected lateral load resisting system is a superdiagonal outrigger scheme comprised of a 70' X 70' braced core coupled with six four-story diagonal outriggers at each face of the core located at three points over the height of the building. "The system works in a similar manner to the mast of a sailboat, with the braced core acting as the mast and the outrigger superdiagonals and verticals forming the spreader and shroud system," Thornton explained.

Three sets of eight outriggers were found to be most efficient, with the outside end of the superdiagonals placed at the 20th, 37th, and 51st floors. To reduce uplift forces on corner core columns and the outrigger columns, most of the



One Liberty Place's distinctive Art Deco spire has quickly made it one of Philadelphia's most widely recognized buildings.

building's dead load was concentrated on the corner core columns and the outrigger columns. This was accomplished by introducing exterior transfer trusses at the 6th, 21st and 37th floors. The trusses span between the outrigger columns within the exterior face and thus funnel dead load into the outrigger columns to compensate for uplift due to wind pressure.

(For a complete discussion of the building's structural system, including alternatives considered, see *Modern Steel Construction*, Issue Number 2, 1987.)

Re-entrant Corners

The tower is square with re-entrant corners, and the tower and podium merge through clear distinction of wall surfaces that either reach the ground or are setback, Jahr explained.

"There is a shift in plane between the building's shaft and the corners emphasizing the location of eight major columns that tie



The building's richly detailed base reinforces the Art Deco feel of its roof line.

with outriggers to the building's braced central core at intermittent floor levels," he said. "This treatment creates a synthesis between the structural determinants and the figurative form of the tower's shaft and reinforces the structure as

load-bearing and the nature of the skin as infill between."

In developing the superdiagonal outrigger system, the engineer and architect worked closely together to ensure that the presence of the diagonal outriggers pene-

"I always like to take stock at the end of the year. Looking at where we've been always helps me see where we're going.

"It's been a darned good year. I started with the big decision to computerize. While we were at it, we decided to integrate the entire detailing and fabrication process into the same computer system. That decision paid off. With the SDS/2 Estimating, Detailing, Production Control and CNC Interface Modules, the whole operation is more productive and profitable than ever before.

"Where do we go from here? The industry has changed and I expect it to keep on changing. But no matter where it goes, I know we'll be competitive enough to stay cut in front of the pack. With SDS/2 working for and growing with us, we'll be able to capitalize on those changes and turn them into opportunities.

SDS/2— THE TOTAL SOLUTION

for today
and the future

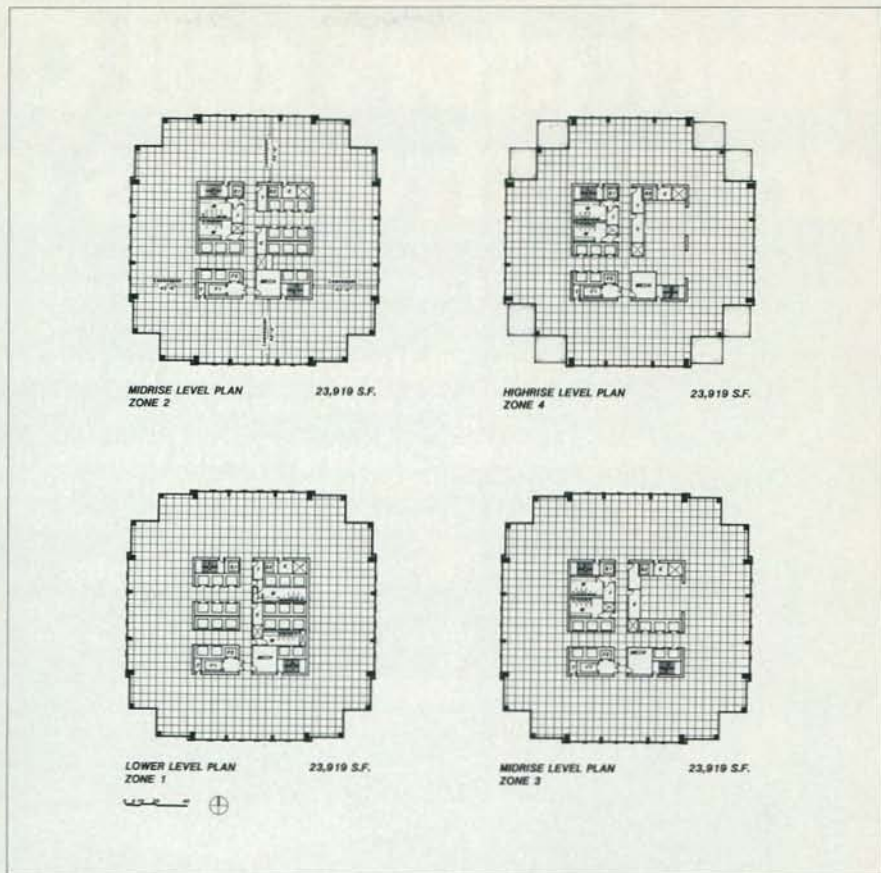
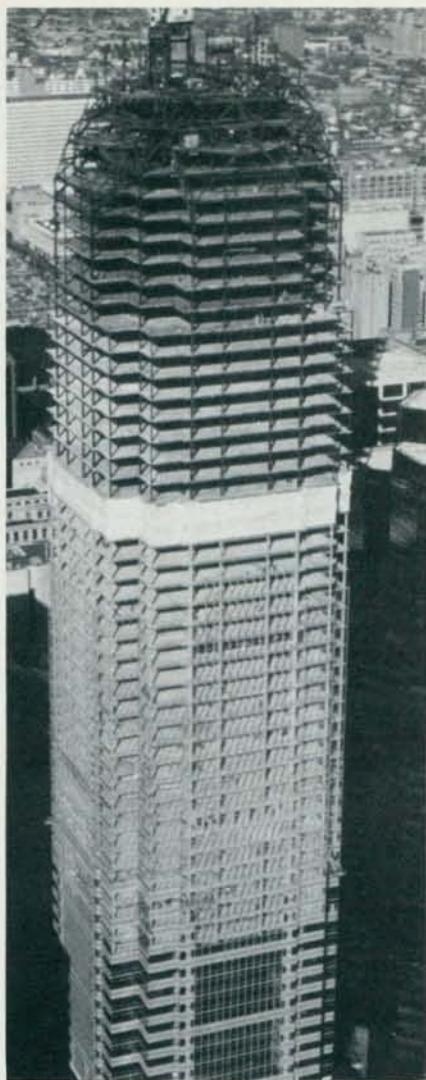
Take control of change...

With SDS/2 you enter data only once to estimate, detail and produce each job. This complete integration saves you time and money because the same information is used all through the process. Fewer people are needed to control more data—and they can control it with

greater speed, accuracy and consistency than ever before. And while SDS/2 conforms to the fabrication processes you use now, it doesn't lock you into the present. It lets you improve, upgrade and make the changes needed to stay competitive. Rest assured we're thinking about the future, too. Periodic updates mean your SDS/2 software modules will always be at the leading edge. The total computer solution is here today and it has a name—SDS/2.

"Software for the Professional"
800-443-0782

DESIGN DATA



The tower is square with re-entrant corners and the tower and podium merge through a clear distinction of wall surfaces that either reach the ground or are setback. Interior designers studied various layout plans to ensure that the floor shapes and sizes were conducive to leasing activity.

trating down through certain lease space at eight locations on 12 floors would not interfere with an efficient layout. "Interior planners made various layouts for full-floor and partial floor tenants and concluded the inclined superdiagonal columns would not hinder real estate leasability," Thornton said. □

Jurors Comments:

"The thing I liked about this building is the presence it has on the skyline and the way it attracts your eye upwards as the shape starts to diminish in form all the

way up to the spire. The structure is very clean and straightforward."

"The real test of the success of this building is that even though it started out in controversy, in the end everybody has agreed that it was the right move and it truly does create a new landmark for the city. It has moved the center of Philadelphia and caused a resurgence in development in the city."

"This building has a particularly Modernist cast to it without being a throw back to the high-rises of the past. This building is a high-rise of the present."

Project Principals:

Architect: Murphy/Jahn,
Chicago
Structural Engineers:
Thornton-Tomasetti P.C.
New York City
General Contractors:
(Joint venture)
Driscoll/Huber, Hunt and
Nichols, Inc., Indianapolis
Steel Fabricator: Steel
Structures, Inc.
Steel Erectors: Cornell & Co.,
Woodbury, N.J.
Owners: Rouse & Associates,
Philadelphia



Industrial Context



This small office building fits in with its industrial neighbors while still making a strong design statement



The use of metal siding on Electro-Coal Transfer Corporation office building helps relate it to the surrounding industrial buildings. The architects designed large translucent panels and windows to let in a lot of natural light, but added overhangs to prevent excessive summer heat gain and glare. Photo by Alan Karchner

Industrial centers are not normally known for award-winning architecture. All too often they tend to be either huge, bulky structures or run-of-the-mill prefabricated buildings. But by adopting the basic design of the sites' existing metal buildings, the architect of a new office building for the Electro-Coal Transfer Corporation in Davant, LA, succeeded in creating a simple, yet elegant, structure.

"There are a lot of rectangular metal buildings on the site with their entrances on the short end," explained Peter Priola, AIA, project designer with The Mathes Group, New Orleans. "We wanted to keep the same linear feel, but also provide a space that would serve the needs of the building's various occupants." The building houses executive offices, field supervisory personnel and a meeting/training room for use by all employees.

The result is a 120' x 76', two-story linear building dominated on the lower level by metal cladding and on the upper level by glazing. And adding to the building's industrial feel is a partially exposed structural frame. As a consequence of the design, the structure at once relates to the other structures on the

site and boldly announces itself as an office and not an industrial building.

In addition to relating contextually to the other buildings on the site, the linear shape optimized the views of an adjacent river. "Large windows were more important on the second level because the view of the river from the first story is blocked by the river's levee," Priola explained. Rather than install blinds or drapery to shield the offices from the sun, the architect designed a translucent canopy above the window wall.

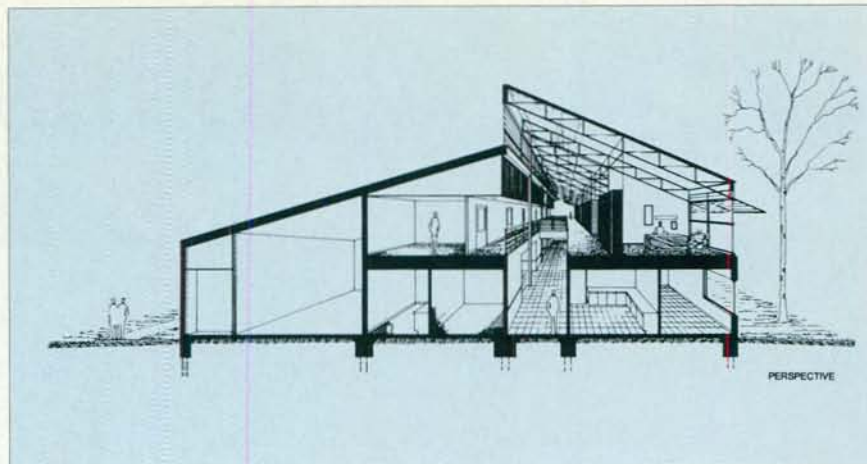
Natural Light Crucial

On the interior, the first floor features a double-loaded corridor. Most people's offices open directly off of this corridor, with a few offices grouped around alcoves. The floor of the second story above the corridor has been cut away, which allows a tremendous amount of natural light to penetrate down to the first floor.

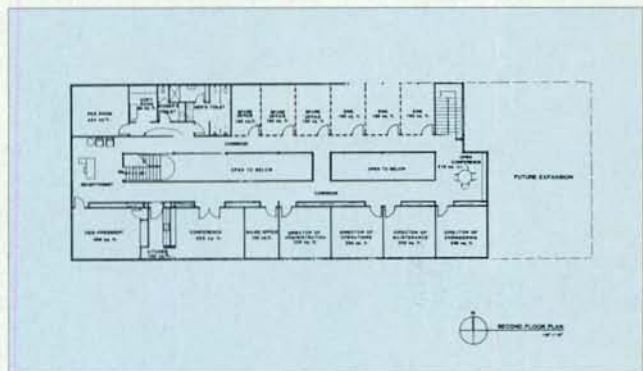
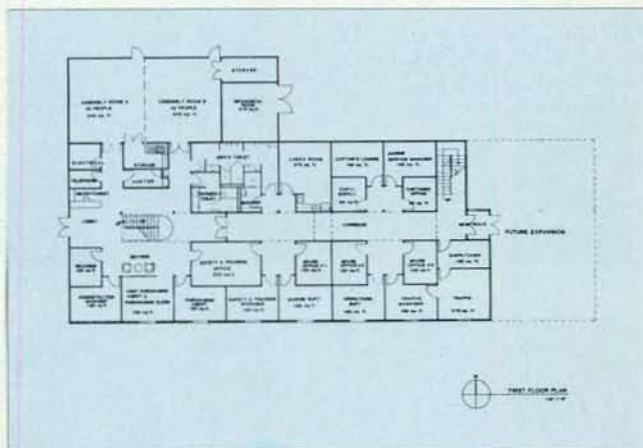
"We grouped the people who would be in-and-out of the building all day on the first floor," Priola said. "The second floor contains more executive space and the offices for the engineers. The vice presidents' offices received larger glass expanses."

Structurally, the building is fairly straightforward. "In the short direction, we had moment connections, while we had bracing in the long direction," explained William Cromartie, P.E. Cromartie is now with the Port of New Orleans, but when the project was designed he was an engineer with The Mathes Group.

The connections are a combination of bolted and welded connections. "A lot of the connections were dictated by architectural considerations. Because some of the steel was exposed, it was a design decision as far as the number of bolts and whether the bolt heads were showing or not," Cromartie explained. Most of the steel is A36, but some of the exposed columns were designed as A500 tubes. In total, the building used 90 tons of



Most of the offices are grouped around a central lightwell. The use of steel framing enabled the designers to allow for the contingency of adding bays on the east end at a later date.



structural steel, 25 tons of bar joist, and 10 tons of miscellaneous steel.

While the structural design was relatively simple, fabrication and erection was made more difficult due to the required tight tolerances. On one side of the building, the columns extended 40'. The column depth was 6", and normally the erector would be given a 3/4" lee-way. But because it was contained within a 6" wall cavity the toler-

ance was much tighter. Fortunately, the contractor, Claiborne Builders, Inc., New Orleans, did an excellent job of placing the anchor bolts within the foundation.

The building also had to be very plumb because of the window walls on the second story and due to the framing for the awnings.

Another complication was the sloping roof line, which created a lot of different angles. And finally,

A lot of natural light flows into the center of the building from an overhead skylight. Also, the exposed structure adds to the industrial feel of the building's architecture.



the stair rotated 180 degrees and was only supported at the top and bottom with moment connections. The stairs were shipped as one unit, and fabrication had to be very precise.

The total project cost was \$74.86/sq. ft., or just under \$1 million. □

Jurors comments:

"I like this building because, as opposed to a lot of the other ones where there's a lot of customization of the steel in a very sophisticated way, this one seems to use steel literally right off the shelf. These are a bunch of standard manufactured pieces that have been put together in a very elegant way and the detailing is extremely consistent."

"I think this is a real sleeper because it doesn't try to do anything overly exciting or make any high architectural gestures. It's

just a very simple, utilitarian building that's quite elegantly done. It's not trying to be more than it is, and it's beautifully executed.

"I'd say this is the kind of building you wish you saw more often. It's a simple, modest program from a budget standpoint, it utilizes steel as a very expressive element by using the standard elements detailed elegantly."

Project Principals:

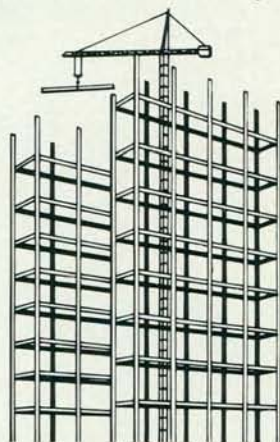
Architect: The Mathes Group, A Professional Architectural Corp., New Orleans
Structural Engineer: The Mathes Group
General Contractor: Claiborne Builders, Inc.
Owner: Electro-Coal Transfer Corp., Davant, LA

A project designed for the future deserves a coating with a future: Tnemec.

A great idea is worth protecting, whether it's a new structure or an older building that's being renovated.

Our high-performance coatings for specialized architecture are the best protection you can specify. Their long service eliminates frequent repainting and lowers life-cycle cost.

And they're beautiful. Give your building a bright future. Give it Tnemec. Call us today.



Call your nearest Tnemec representative or us direct at:

Tnemec Company, Inc.
 Post Office Box 411749
 Kansas City, MO 64141-1749
 TEL: 816/483-3400
 FAX: 816/483-1251



Natural Light Enhances Pool

**Steel arches
proved the most
economical and
aesthetic method
of creating a
required 65' clear
span**

When movie producers envision a college campus, they usually picture something similar to Hamilton College in Clinton, NY. Founded in 1812, the campus features grassy knolls, stands of trees, and fine old buildings of locally quarried stone.

Though many of these old buildings can be readily renovated for use as modern classrooms, the college's pool was hopelessly outdated. In addition to being drafty and leaky, the building, which was built in 1838, was only large enough for a 25-yard pool—much too small by today's competitive standards.

While it was clear that a new building was needed, it was less obvious what form it should take. The program that was finally developed called for a pool facility that would be very modern in use, but would still be aesthetically appropriate to the campus and the adjacent buildings.

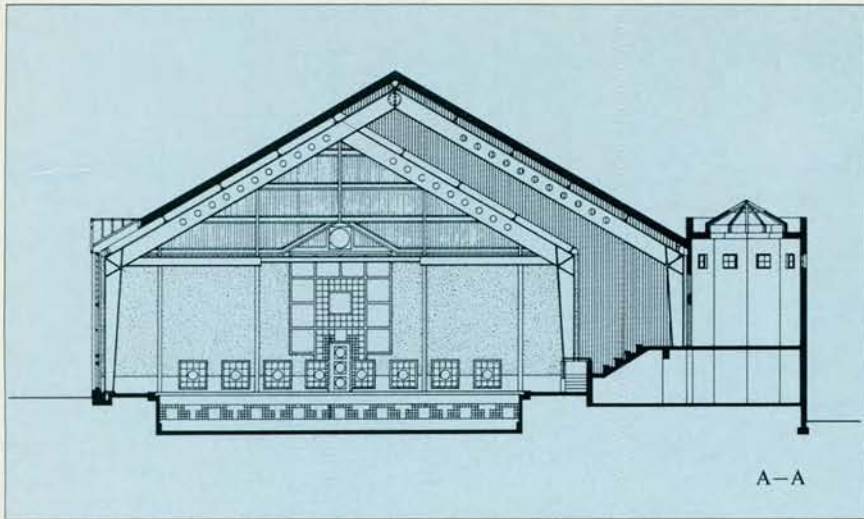
Stone Exterior

The architects met the aesthetic concerns by cladding most of the building in stone from the same quarry that produced stone for many of the other buildings on



A view from inside and out: Letting in a huge amount of natural light was crucial to the designer's plan for the Hamilton College Pool. Just as important was the use of steel three-hinged arches for the structural system, which allowed both the required 53' head room and 65' clear span. Photography by Richard Mandelkorn © 1989





The use of large glass block and vision glass windows not only let natural light into the pool area, but also created an attention-getting exterior.

Photography by Richard Mandelkorn ©1989

campus. In addition, the sloped roof was covered with tile, with the exception of metal roofing on the gables.

Cost Savings

To reduce costs, however, one side of the building was finished with metal panels. This was not an aesthetic concern, however, because that face of the building is in a service courtyard area that is not

generally accessible to the public. A green color was chosen for the metal panels to relate them to the copper that was used on the parapets of several neighboring buildings.

While the exterior is clearly traditional, once visitors enter the corridor leading to the pool area, they immediately become aware that this building is unlike any other on the campus. One wall of the corri-

dor is simply painted wallboard over the existing wall of the neighboring gymnasium. But the other wall is a shimmering wave of glass block.

"We wanted to put people in the right mood as soon as they entered the facility," explained Charles Rogers, AIA, project principal with architect Perry Dean Rogers & Partners, Boston. "The curving glass block wall relates to the quality of light on water." It's the beginning of a nautical scheme that is all the more impressive for its subtlety.

The 60' x 100' pool is beautifully detailed—from the 6" floor tiles to the exposed steel structure to the natural cedar decking that is part of the roof assembly. But perhaps its most notable feature is the abundance of natural light.

"A big argument in designing pools is whether to have windows," Rogers explained. "We took a trip to Finland and examined their treatment of natural light in pool and sauna areas." As a result, it was decided to feature large window walls, again primarily featuring glass block, though there is some vision glass.

The pool's brightness is further enhanced by the beautiful deck and high ceiling, which reaches 53' at its zenith.

The roof deck is a sandwich panel of 3/4" marine plywood, 2 x 12 joists, cedar planks and roof insulation and vapor barrier. "The roof deck acts as a lateral diaphragm designed to take the forces in that plane of the roof," explained Llewellyn S. Bolton, III, P.E., a principal with Bolton and DiMartino, Worcester, MA, the project's structural engineer.

53'-High Ceiling

"The deck system is supported on 12"-wide flange purlins spanning 25'. The top flange has a variable moment of inertia and is supported on a three-hinged arch spanning 95'. The arches are 25' high at the eave and 53' high at the ridge line." The hip roof portion is framed with wide flange beams

supported on 8" diameter pipe columns.

The arches have moment connections, while the other sections are all shear connections. The joints are a combination of shop welds and field bolts. All of the steel is blast cleaned and painted with a 3-mil-thick zinc rich primer at the shop. The second coat is a 4-mil high build epoxy.

"We considered using a truss system or a simple beam," Bolton explained. "But a simple beam at 95' would have meant using a plate girder, and that's very expensive. We didn't want to use a truss because of its depth." With a truss, in order to achieve the necessary headroom for divers, the roof would have had to be raised, which would have meant additional framing costs, as well as the expense of heating the larger space.

"The engineer and I went through a lot of structural options before deciding on this system," Rogers added. "This system gave us a lot of natural light and the roof line we wanted at no extra cost."

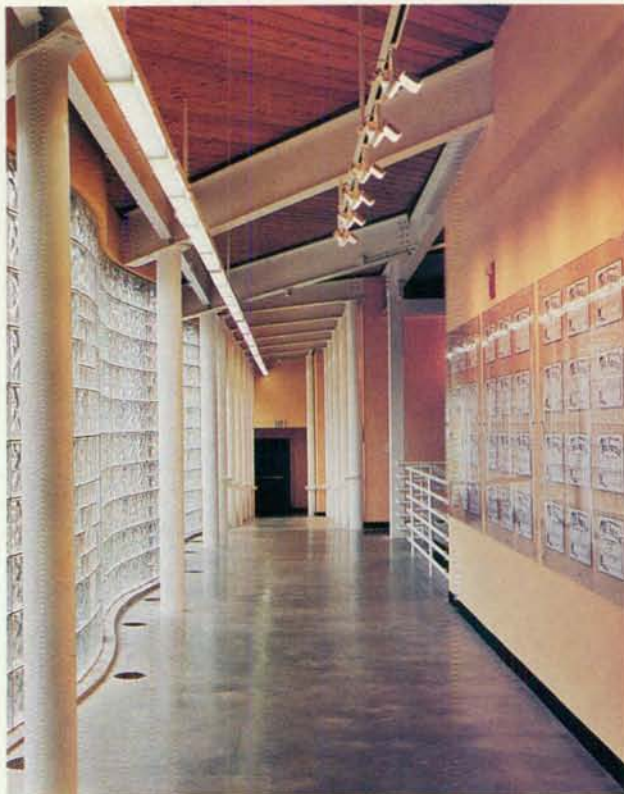
Decorative Elements

For added decoration, the 3'-deep arch rafter beams are perforated with 1' diameter holes at 2' 9" on center. "The holes are purely decorative. The web takes the shear, while the flange takes tension and compression. The holes don't effect the strength of the member," Bolton said.

"The holes relate to the nautical environment," Rogers added. "They suggest portholes and also present the steel on a more human scale."

The use of 6" tiles also created a more inviting arena. But the tiles also were chosen in an attempt to create a faster swimming environment. One theory that was presented to the pool's designers contends that a larger tile has less surface resistance and contributes less to the pool's turbulence than would a smaller tile.

The pool is adjacent to the old



A wavy glass-block wall in the corridor leading to the pool creates a psychological image of water. Photo by Richard Mandelkorn ©1989

gymnasium and shares with it locker and shower facilities, as well as use of the gym's boiler plant. The pool does have a separate HVAC system, which utilizes large air handlers to maintain a comfortable and odor-free atmosphere in the pool area. The air supply is introduced at the floor level through linear grilles and along the three exterior glass exposures. Exposed 12" stainless steel stacks blow hot air across the building's skylights. This sheet of warm dry air over the glass and walls is designed to effectively prevent condensation on these surfaces. □

Jurors Comments:

"The interior spaces are really quite a lot of fun. The way daylight comes into the space keeps it from ever being tiring. I think it's quite light-hearted, which fits this type of space. It has a great deal of consistency in the detailing and

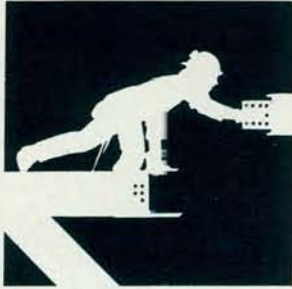
the expressions of the steel. It has a clarity and simple design that is carried throughout the whole concept"

"I think this building has some exquisite details to it. It holds together as a building even though it's somewhat eccentric in some of its expressive elements."

"It's a joyous building that celebrates the activities and the spirit of its use. It says: "I'm a recreational facility. Enjoy me."

Project Principals:

Architect: Perry Dean Rogers & Partners, Boston
Structural Engineer: Bolton & DiMartino, Worcester, MA
General Contractor: Murnane Associates, Whiteboro, NY
Owner: Hamilton College, Clinton, NY



Reinterpreting The Past



388 Market Street is a modern version of the famed flatiron buildings of a bygone age

San Francisco's plethora of angled streets once led to the proliferation of flatiron buildings. As real estate values soared, these old buildings were gradually replaced with modern highrises. Unfortunately, in the name of leasing efficiency, these new structures were almost always rectangular in form.

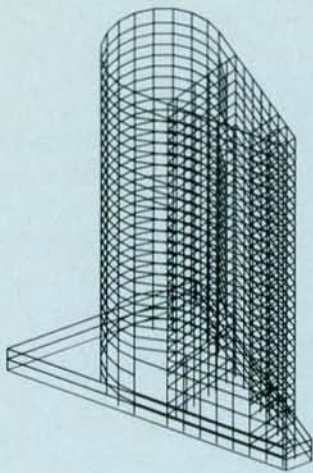
When several small buildings were demolished on a triangular site in the heart of the city's commercial district, it was almost expected that another rectangular structure would be built.

"My first impression of the site, however, was that there should be a flatiron-type building on it," said Lawrence Doane, FAIA, a senior partner with Skidmore, Owings & Merrill, San Francisco, the project's architect and engineer. In addition to the aesthetic advantages and historic precedents of a flatiron building, the tight site enabled the designer's to construct a larger building. "I really wanted to do that shape, and the site is so small that it helped to justify it."

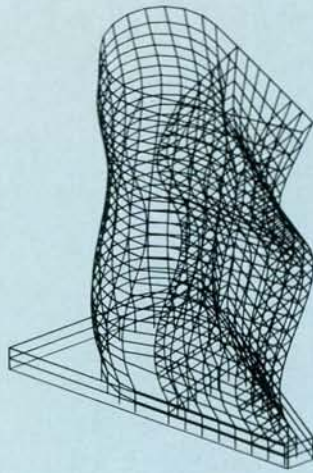
The desire for more floor space also dictated the usage of the building. San Francisco's interim development guidelines at that time allowed a greater density in return for specific uses and public

388 Market Street's distinctive flatiron shape creates a breathtaking view from almost any angle. The triangular shape has historical precedents and clearly fits the site. The rounded portion was designed to conform to San Francisco's zoning size requirements. Photography by Jane Lidz Photography

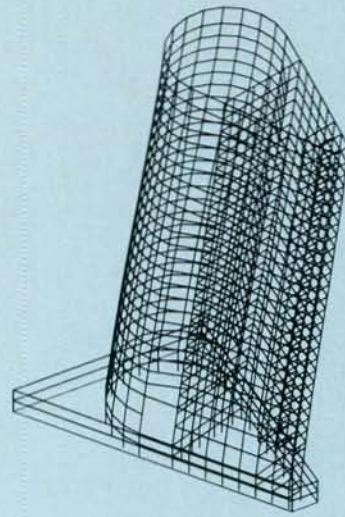




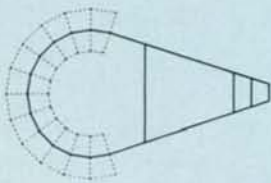
3D MODEL
STRUCTURAL SYSTEM



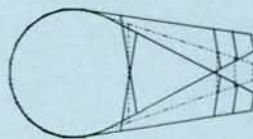
SEISMIC ANALYSIS
MODAL RESPONSE



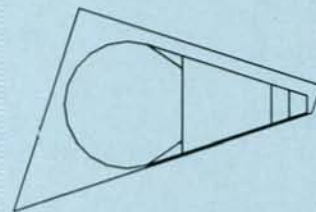
WIND ANALYSIS
DISPLACEMENTS/PERCEPTION



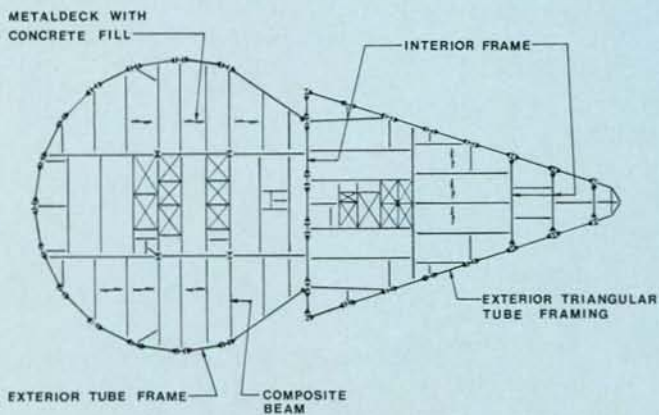
PLAN LAYOUT
STRUCTURAL SYSTEM



ROOF PLAN
DISPLACEMENTS
INTERSTORY DRIFTS



GROUND LEVEL
SHEAR WALL SYSTEM



TYPICAL FLOOR FRAMING

The building is designed with a multiple-tube structural system, with a tube forming the triangular portion and a second tube forming the circular portion. This unusual shape, as well as the need to join together the two sections of the building, required that the seismic design be carefully analyzed.

amenities. By designing the building as a mixed-use residential/office building, amongst other items, the design team was able to increase the site FAR from 14:1 to almost 19:1.

The 26-story, 422,000-sq.-ft. tower includes below-grade parking for 120 cars, ground floor retail space, office floors, and 63 residential condominium units.

The building's distinctive de-

sign most resembles a circular tower attached to a triangular tower. "We used the cylindrical shape because at the time the building was designed San Francisco had a 200' diagonal size limit," Doane explained. "The cylinder reduced the bulk, and it was pretty. Also, it helped the building work structurally."

The building is clad with a polished imperial red granite cladding

that helps relate it visually to such nearby commercial San Francisco landmarks as the Bank of America World Headquarters. "Even though San Francisco is generally comprised of light-colored buildings, we chose a dark and rich color because we didn't want the windows to look like dark patches on a white background," Doane said.

Multiple-Tube Structural System

The building is designed with a multiple-tube structural system. "The system is comprised of a tube as the triangular portion of the building and a tube as the circular portion," said Navin Amin, S.E., chief structural engineer and associate partner with SOM. The two tubes share a common frame where they come together, and are further linked at the mechanical level and roof. In addition, there are additional cross frames at the tip of the triangle.

The tubes are ductile, moment-resisting structural steel frames with column spacings at 16'. Deep steel wide-flange sections are used as columns and spandrel beams for optimum stiffness and ductility with respect to seismic loading.

"We considered a concrete core with a steel moment frame, but that would have required a lot more coordination between the different trades," Amin said. "Also, it was generally a more expensive option and the concrete core would have occupied too much space."

Another consideration was whether to go with 8' or 16' column spacing, with the latter being chosen. While 8' would use about 1 lb./sq. ft. less steel, the 16' column spacing was more economical to erect and fabricate, which reduced the overall cost. Also, the 16' spacing meant there were fewer columns to interfere with views. "We normally would have used 36"-wide columns, but it would have interfered with the vision areas," Amin said.

To reduce sight obstruction, the columns were specified as jumbo

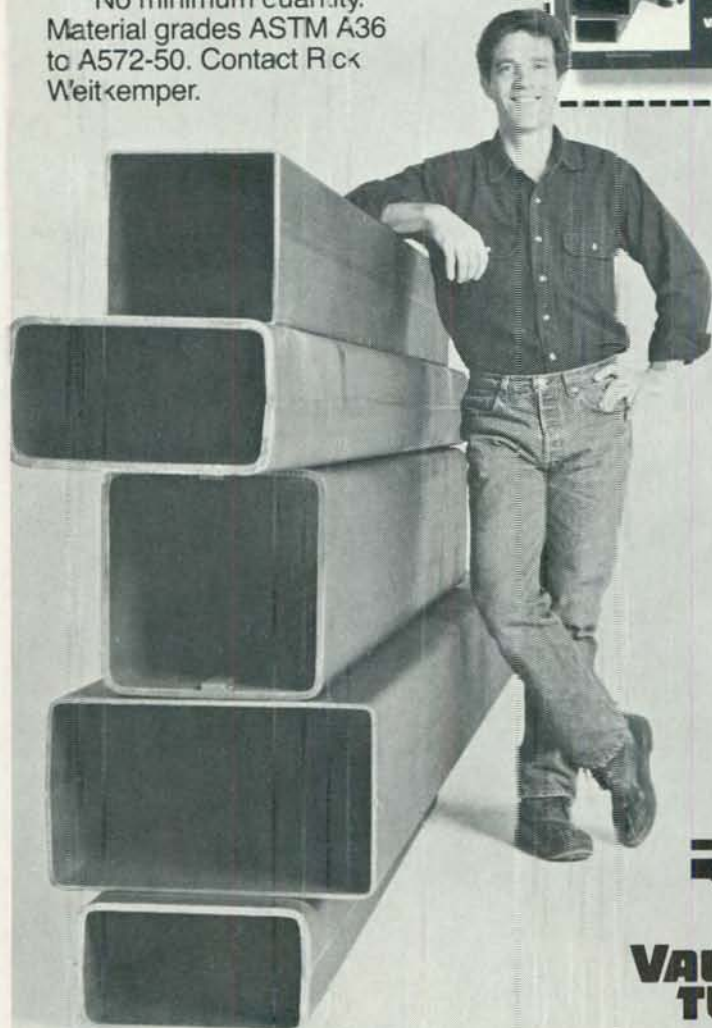
800-331-3002

Custom squares and shapes. Order squares from 12" to 24". Rectangles from 12" x 16" to 24" x 30".

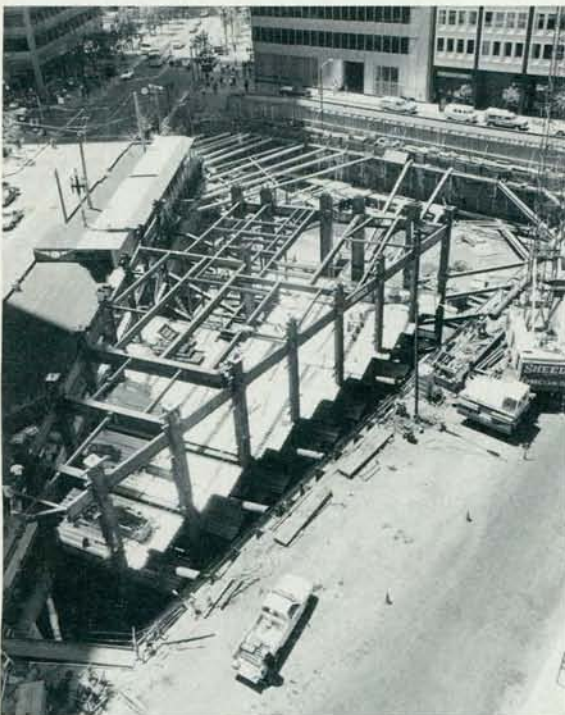
Single lengths from 5' to 40', spliced lengths to 60'. A500 dimensions.

No minimum quantity. Material grades ASTM A36 to A572-50. Contact Rick Weitkemper.

FREE CATALOG



**VALMONT
TULSA**



The multiple-tube design utilizes ductile, moment-resisting structural steel framing. The 18-deep columns are spaced 16' on center to maximize vision lines and reduce fabrication and erection costs. Construction photography by Edwin T. Scott

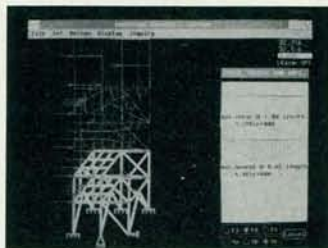
shapes. "We wanted 18"-deep columns but with 300 to 400 lb./ft." Because of the 16' column spacing, the design specified 24"- to 36"-deep spandrel beams. The structural system used nearly 5,000 tons of steel.

The use of an exterior steel frame tube also greatly simplified the task of erecting the exterior

granite wall system. The curtainwall is a series of T-shaped panels which readily attached to the frame. The use of steel also facilitated the fast-tracked construction of the building and reduced the weight of the structure, which was important in reducing seismic loads.

"The building is symmetrical in

INERTIA



- Graphical Modeling
- Finite Element Analysis & Design
- Heat Transfer (Thermal)
- Kinematics & Dynamics (Mechanism)
- Structural Design (AISC)
- Spring Design (ASME)
- Available on all PCs and Macs

MCAE, Inc.

Tel 1-800/444-6223 • FAX 1-317/463-7166

KOPE-ING

The company with the turnkey answer to your Steel Detailing Needs!

KOPE-ING and Mountain Software LTD have designed a complete system based on Sun platforms, Sun compatibles such as Solburne Computers, as well as 486 and 386 computers using Sun OS, SCO Xenix, and Arris software.

Steel-Pac features include:

- A wide variety of connection types
- Automatic determination and verification of all connectivity relationships
- All standard AISC and CISC materials are supplied
- Over 40 software switches to allow the user to tune the system to their needs
- Direct interface to NC equipment
- Hardware or Software can be purchased separately

For more information call or write:

KOPE-ING, 3970 Broadway,
Suite 201A, Boulder, CO 80302
Tel (303) 449-2251
Fax (303) 444-7656

An Authorized Arris Dealer



one direction, and asymmetrical in the other, so torsion was a large consideration. The tubular concept provided a structurally rigid building, which was confirmed in wind tunnel tests," Amin explained.

"One of the challenges was to make sure both parts moved together," he said. The major connections are at the 18th floor and at the roof level. "We designed a series of moment connections to make sure the building moved as a single structure."

Complex Seismic Design

The unusual shape complicated seismic design. "Because of the shape, one side was much stiffer," Amin explained. "We had to carefully proportion the stiffness and ductility that was required to absorb the earthquake energy." The need for additional stiffness was another reason to use the jumbo shapes. "If there ever was any damage, we wanted to make sure it would be to the spandrel beams and not the columns."

The floor system consists of a composite metal deck slab supported between the building core and exterior frame tube. This provides the column-free lease space required for flexible office/tenant space planning.

Because the building is surrounded by taller structures, the design of the roofscape was important. "The mechanical floor is lo-

cated between the office and residential portions, and we fully concealed the cooling tower on the roof," Doane said.

Jurors Comments

"I think it's an elegant building and it's absolutely overwhelming when you come around the corner and see it. Even though its shape is quite simple as you walk around it, still it's very complex and distinctive. It's one of the more sophisticated buildings in a very sophisticated city."

"I like the elegant way in which the granite facade mirrors the structure that is behind it. The two are absolutely in harmony with one another. The idea of bringing a building to a sharp point with a very narrow dimension has been handled very elegantly. It makes a tremendous impact on the skyline and on the view from the sidewalk."

"It's a building that takes your breath away. It's so exquisitely detailed that you stop and look at the building and admire it the way you'd look at a fine piece of jewelry in a window. I particularly liked the articulation of the building, which reflects the different uses that it has, and yet it still hangs together as a single entity."

Project Principals:

Architect: Skidmore, Owings & Merrill, San Francisco

Structural Engineer: Skidmore, Owings & Merrill, San Francisco

General Contractor: Swinerton & Walberg, San Francisco

Owner: Honorway Investment Corp., San Francisco

**THIS IS NOT THE TIME
TO FIND IT DOESN'T FIT**



Having trouble getting good detailers?

Testimonials from our overseas clients verify our competency and ability to deliver on schedule

"they have submitted prices consistently which are economic and which have aided us to obtain a substantial share of the market"

"they are used to working with companies at a fair distance away from their (BDS) home base"

For complete steel detailing



BDS STEEL DETAILERS
4849 Manzanita Ave, #81
CARMICHAEL, CA 95608
Ph: 916 332 0987 Fax: 916 332 1758

AutoSD Steel Detailing

At last, the sensible detailing program written for detailers. Menu driven means easy to use. Supported by numerous graphics means easy to learn. See what you are drawing as you draw it. You stay in control.

Detail beams, columns, braces, gusset plates, stairs, stair rails, anchor bolt plans and erection drawings.

Layout complicated geometrics to determine work points, control lengths, angles and bevels.

All this at the speed and accuracy of a computer making backcharges and delays a thing of the past.

Automated Steel Detailing Works with AutoCAD® release 9.0 or later.

For more information write:
AutoSD, Inc.
4033 59 PL \$3500.00
Meridian, MS 39307
(601) 483-0601