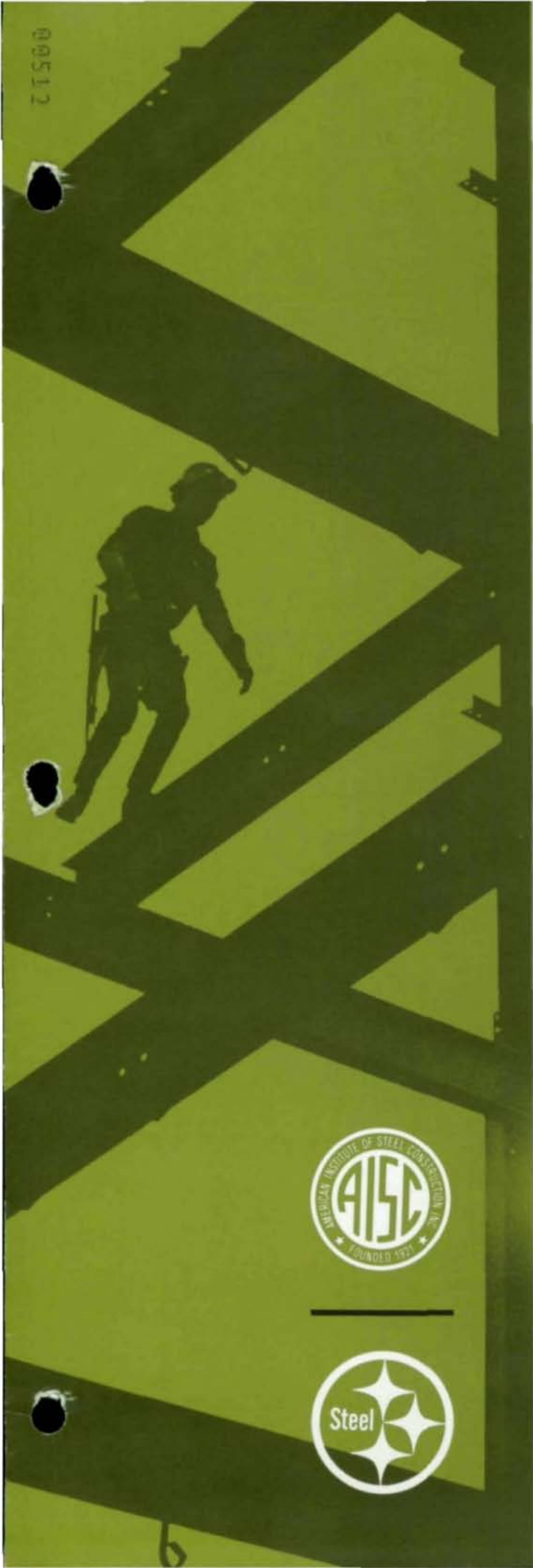
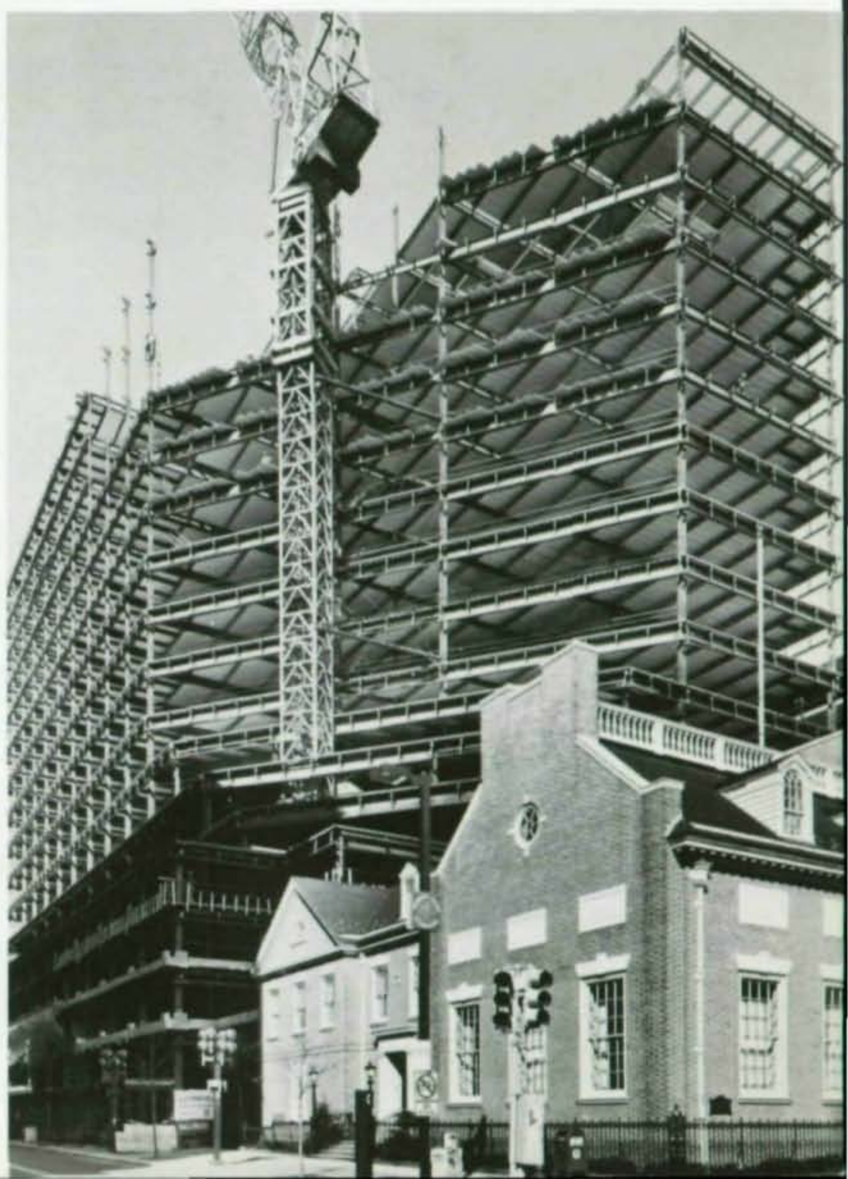


VOLUME XXI NUMBER 1/FIRST QUARTER 1981

MODERN STEEL CONSTRUCTION

Space Frame for the Stars
An Architect's Choice for Retail Stores
Million-Dollar Change Order—with Steel
Fast Track—and a Million in the Bank
Things are Looking Up at Sharpstown



MODERN STEEL CONSTRUCTION

Published by

American Institute of Steel Construction
The Wrigley Building
400 North Michigan Avenue
Chicago, Illinois 60611

REGIONAL OFFICES

NORTHEAST REGION	
New York, NY (Hdq.)	212/695-4291
Boston, MA	617/329-7417
Philadelphia, PA	609/858-9354
Pittsburgh, PA	412/391-4474
NORTH CENTRAL REGION	
Chicago, IL (Hdq.)	312/372-8957
Detroit, MI	313/358-2620
Minneapolis, MN	612/888-3791
SOUTHEAST REGION	
Atlanta, GA (Hdq.)	404/458-7679
Charlotte, NC	704/375-6547
Tampa, FL	813/879-0429
SOUTHWEST REGION	
Dallas, TX (Hdq.)	214/630-5236
Houston, TX	713/529-5564
St. Louis, MO	314/721-1332
WESTERN REGION	
Los Angeles, CA (Hdq.)	213/444-4519
Denver, CO	303/831-4622
San Francisco, CA	415/495-3550
Seattle, WA	206/624-5460
GOVERNMENTAL AFFAIRS	
Washington, DC	202/887-5766

VOLUME XXI NUMBER 1/FIRST QUARTER 1981

CONTENTS

Poplar Creek: Space Frame for the Stars	3
Steel: An Architect's Choice for Retail Facilities	6
Simmonds Precision: A Million-Dollar Change	10
Bedford Park Station: A Home Away from Home	12
A Fast Track—and a Million in the Bank	13
Sharpstown Center: Things are Looking Up!	16
Bridge to Renewal—Color it Red!	20

1981 ARCHITECTURAL AWARDS OF EXCELLENCE COMPETITION ANNOUNCED

The American Institute of Steel Construction is once again sponsoring its "Architectural Awards of Excellence Program." The 20th award program will seek to recognize and honor outstanding architectural designs in structural steel and to encourage further exploration of the many aesthetic possibilities inherent in steel construction.

Steel-framed buildings constructed anywhere in the United States and designed by registered architects practicing professionally in the U.S. (defined as the 50 states, the District of Columbia, and all U.S. territories) are eligible. Each building must have been completed during calendar years 1979 or 1980.

The structural frame of the building must be domestic steel, but it is not required that the steel be exposed, or a part of the architectural expression. Buildings of all classifications may be entered, and equal emphasis is given to all sizes and types in the judging.

Applicants are encouraged to submit their entries well before the May 8, 1981 closing date. There is no limit to the number of entries by any individual or firm. Buildings named as previous AAE winners will not be eligible.

Award winners will be featured in a special section of the October issue of Architectural Record magazine. A formal awards banquet in Chicago on October 27 will honor competition winners.

Members of the 1981 Jury of Awards are:

Jacques C. Brownson, State Buildings Division,
State of Colorado, Denver, Colorado

Bruce J. Graham, FAIA,
Skidmore, Owings and Merrill, Chicago, Illinois

Philip J. Meathe, FAIA,
Smith, Hinchman & Grylls Associates, Inc., Detroit, Michigan

Walter P. Moore, Jr., PhD., P.E.,
Walter P. Moore and Associates, Inc., Houston, Texas

R. Randall Vosbeck, FAIA,
VVKR Incorporated, Alexandria, Virginia

Competition rules are available from AISC, 400 North Michigan Avenue, Chicago, Illinois 60611. Entries must be postmarked prior to May 8, 1981. □

We invite you to join more than 6,000 of your associates who are now regularly receiving the AISC Engineering Journal. . . . The cost is only $6.00 for one year or $15.00 for three years; single issue $3.00; (Foreign rates: $8.00 for one year, $18 for three years; single issue $4.00). Simply fill out the attached form and send your check or money order to begin your subscription. *Payment must be enclosed with this order.* Make checks payable to AISC. *Foreign subscriptions are payable in U.S. funds only.*

To enter your subscription to the AISC ENGINEERING JOURNAL detach and return the attached envelope TODAY

Please ☐ Enter ☐ Renew my subscription to the AISC ENGINEERING JOURNAL

U.S. and *Canada

☐ 1 Year $ 6.00
☐ 3 Years $15.00

***Other Countries**

☐ 1 Year $ 8.00
☐ 3 Years $18.00

*Payable in U.S. currency by check drawn on U.S. bank.

Payment **must** be enclosed with this order.
Make checks payable to AISC.

NAME ______________________ (please print)

FIRM OR AFFILIATION ______________________

STREET ______________________

CITY ______________ STATE ________ ZIP CODE ________

Profession or occupation:

☐ Engineer ☐ Architect ☐ Educator ☐ Other ______________

DO YOU WANT THE LATEST INFORMATION ON STEEL DESIGN?

Keep Up-To-Date With a Subscription To The AISC ENGINEERING JOURNAL

Four times a year in the comfort of your home or in your office, you will have the rare opportunity of meeting some of the leading minds in structural engineering, through the pages of AISC's Engineering Journal. The official technical journal of the American Institute of Steel Construction, this is the only magazine in America devoted exclusively to the practical aspects of structural steel design.

Each issue contains articles of immediate use and lasting interest by experts in research, design, fabrication methods and new product applications—articles designed to improve and advance the use of steel in contemporary building and bridge construction—articles which will allow you to share the latest knowledge and expertise of practicing consulting engineers, educators, and leaders in the field of structural steel research.

FROM ______________________

ADDRESS ______________________

CITY ____________ STATE/COUNTRY ____________ ZIP ________

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 11588 CHICAGO, IL

—POSTAGE WILL BE PAID BY—

AMERICAN INSTITUTE
OF STEEL CONSTRUCTION
P.O. Box 4588
Chicago, Illinois 60680

Poplar Creek Music Theatre, Hoffman Estates, IL is largest of its kind. Steel-tube space frame bears on 42-in. concrete columns. Its 60,000 sq ft (below) shelters 7,000 people indoors. View towards lawn seating area.

Poplar Creek: Space Frame for the Stars

Music under the stars appears to be a coming attraction in this country. In keeping with this trend, the Nederlander Theatrical Corporation recently commissioned an outdoor theatre to serve the Chicagoland area. The firm now owns or operates 29 facilities across the country.

The newest—and largest—is the Poplar Creek Music Theatre in suburban Hoffman Estates, Illinois. The versatile facility, designed for popular and classical music and dance, seats 7,000 under roof, plus another 13,000 on terraced lawns. It provides the Chicago summer market with 90-100 performances, and related service and food concession structures.

Poplar Creek was commissioned to be a prototype for future theatres to be built in other parts of the country. That requirement led to a two-part solution: First, the parking and access had to be designed so that it could be modified to fit *any* site; and, second, the compound, which includes all the other theatre elements and relationships, must fit near the center of parking on *any* site, without substantial modifications.

After a three-year search in the Chicagoland area, the 130-acre site in

Hoffman Estates was chosen for its accessibility, its location within a 15-minute drive of the Chicago market and near a forest preserve to minimize sound control problems.

Sound Control Most Demanding

One of the most demanding requirements was sound control. However, its needs were in direct opposition to that of being in a densely populated market area. Both state and county noise ordinances were very restrictive regarding residential development within the cone of sound produced by a music theatre—estimated up to 110 decibels. Actually, only one residence falls within the cone of sound from the theatre. A 20-ft high sound barrier wall erected on the top of the lawn seating berm drops the sound level at that house below allowable maximums. The barrier also shields the theatregoers from sound from the nearby tollway.

Looking toward stage and lawn seating area (bottom). Radiating uplifts on columns hold house lights. Space frame and roof deck underside are painted bright red, add festive air by reflecting floodlights. Note sound barrier walls in background.

The shape of the theatre/compound, a circle, developed logically from the relationships of various elements. The major element, seating, is a 160° fan shape. The thrust stage at the center occupies nearly half of the circle, with a radius of 415 ft and a five-acre area.

Owners wanting to deliver spectators directly to their seats, without the need to go through or past another seating section, led to a major departure from most theatre plans. Spectators arrive at the theatre through a main entry gate into a central plaza—behind the stage. From this plaza, via ramps and bridges, they arrive directly at the edge of the continental aisleways under the roof, or to the edge of the lawn seating. This spectator traffic pattern was designed psychologically to create a series of emotional experiences. The sense of arrival at the theatre is controlled and enhanced because the ramps penetrate walls at the edge of the theatre, which restrict its approach view.

Flat as a Cornfield

To this point, the description of the theatre has been two-dimensional, as flat as the cornfield from which it rose. Actually, 370,000 cu. yds. of earth were excavated from the sunken central plaza and depressed seating under the roof and from the parking area to build the 46-ft high sloped lawn area with its excellent sightlines to the stage.

Security is provided to half the enclosed circle circumference by the 20-ft sound barrier fence. Security for the other half is provided by a "ha-ha" fence, so called because it cannot be seen in the depression between two 10-ft and 20-ft earth berms which enclose the central plaza. As a result, the only penetration of the circle occurs at the entrance gate and the depressed service drive which passes under the ramped bridges.

Unobstructive Space Frame

As for any theatre, unobstructed sightlines were an absolute must. Poplar Creek's 60,000-sq ft space frame roof met that requirement. It includes a 160-ft and a 220-ft clear span, 8-ft deep, with cantilevers up to 50 ft. The steel space frame is an irregular rectangle with serrated edges that step back from a maximum width of 230 ft to 90 ft at either end. Maximum length is 340 ft.

The space frame was totally assembled on the ground and erected by cranes. Steel-tube chords came to the site in 50-ft lengths, where they were field-bolted with diagonals to form 50-ft x 50-ft and 50-ft x 80-ft sections, which were then lifted in place.

The space frame bears on 12 concrete columns via 8-ft high pyramid space frame members. Only six of these columns circle the back of the theatre, to provide maximum visibility of the stage.

The underside of the three-inch wood roof deck, and the space frame, are painted a bright red-orange. House lights reflecting off this painted surface add to the festive quality of the theatre. All catwalks, sound systems and spotlight platforms are within the 8-ft high by 10-ft square grids of the space frame.

A Feeling of Intimacy

Although any theatre seating 20,000 is huge, comments of visitors on stage express an unusual feeling of intimacy, created in part by the enclosure. Even though lawn areas are not covered, the performers' sightlines do not include open sky. The edge of the roof appears to be below the top of the sound-barrier wall at the top of the lawn berm.

The "space frame for the stars" opens its second season in June, featuring such notables as John Denver, Bob Hope, Henry Mancini and the New York Philharmonic. □

Architect
Rossen/Neumann Associates, AIA
Southfield, Michigan

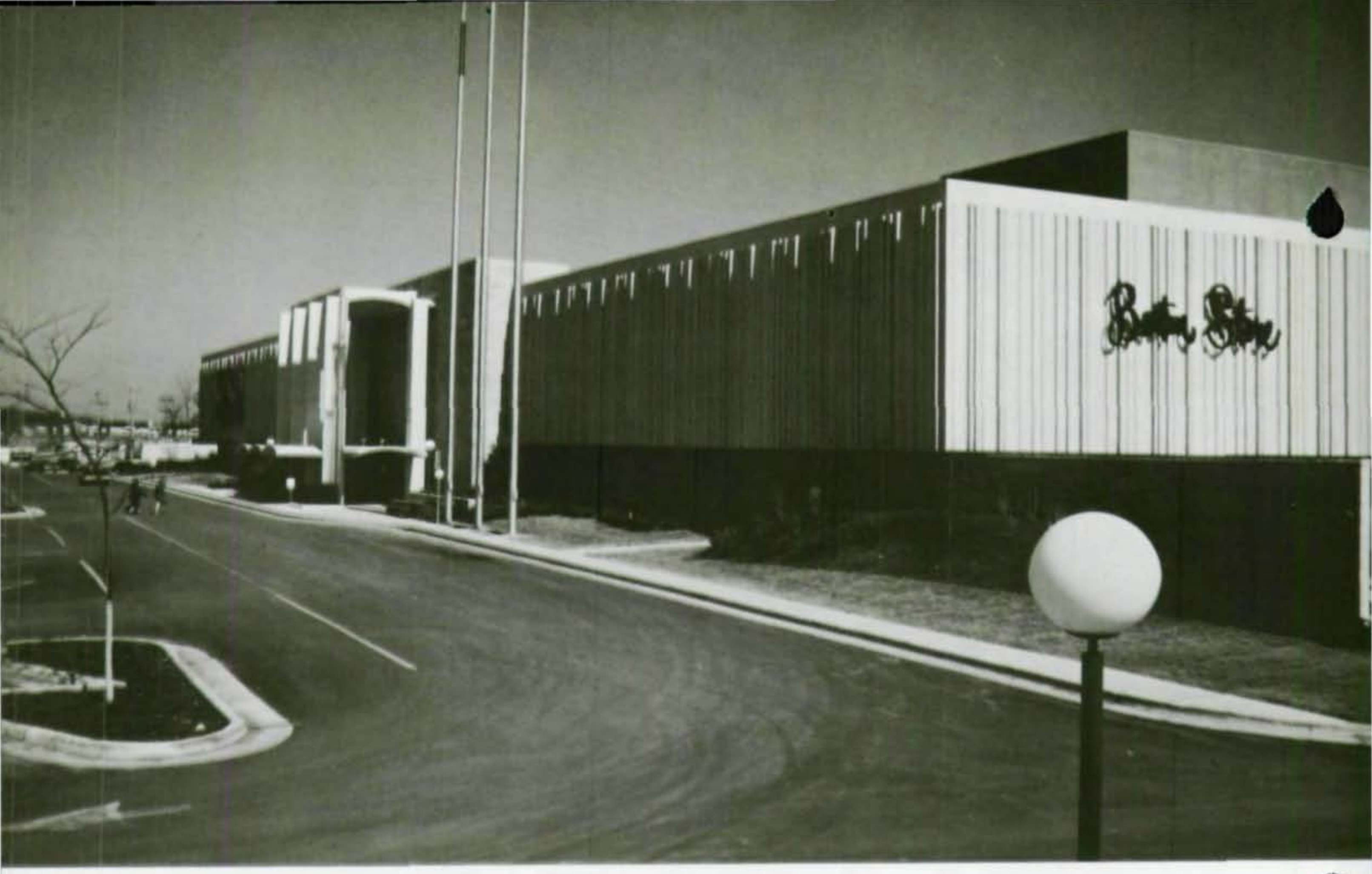
Structural Engineer
Paul Gugliotta Consulting Engineers
New York, New York

Fabricator
Volunteer Structures, Inc.
Nashville, Tennessee

Erector
Louis Hoffman
Milwaukee, Wisconsin

Owner
NED-PROP, a joint venture of Nederlander Realty and RKO General

Reverse-flow traffic, as spectators enter Poplar Creek back of stage, then cross bridge to indoor or lawn seating. Festive concession area atmosphere is enhanced by free-standing space frame that identifies entry gate to theatre (bottom).



Boston Store today in Milwaukee's Southridge Mall.

In Support of Steel: An Architect's Choice for Retail Facilities

by James H. Donnelly

Cost and time were the main reasons our last 12 department store projects have been designed with a structural steel system.

Over the last 20 years, we have completed over 50 major retail projects in various parts of the U.S. Mercantile facilities we design are generally low-rise, two- or three-story buildings with a floor area of between 100,000 to 200,000 sq ft. Structural bay dimensions range from 24 ft x 24 ft to 32 ft x 32 ft. Fire-resistive construction usually is a code requirement.

Cost Comparisons—Steel vs Concrete
The structural frame is a major cost item in multi-level department stores. Considerable research time is spent by our firm each year in analyzing the cost of various structural systems and their components. For some projects, several systems have been designed and bid, with final selection being made only after bids have been received and costs known.

In making cost comparisons, our estimators consider the cost of the superstructure, foundation costs, the cost of financing during the construction period and any wall cost differentials resulting from the depth of the structure.

Like many architects in the business of designing department stores in the late 1950's and early '60's, we provided clients with functional facilities, usually with a superstructure of reinforced concrete.

But even in those days, our edict from owners was a quality building at reasonable cost, finished on time and within budget. The conventionally formed concrete superstructure had been selected, on the basis of numerous engineering and cost studies which tended to prove the concrete system was the most economical at the time.

James H. Donnelly is a senior partner of Baxter Hodell Donnelly Preston, a forty-five person A/E firm in Cincinnati, Ohio. With the firm for over thirty years, he has extensive experience in retail/shopping center planning and design throughout the U.S.

By the early 1970's, labor rates were rising rapidly and costs of systems which were field-labor intensive increased more rapidly than those predominately shop prefabricated. In 1973, our cost analyses showed the fireproofed structural steel frame had a cost edge over the poured-in-place concrete structure.

As the years progressed, the cost differences widened, until today we rarely consider reinforced concrete as an economical structural alternative for this building type. Under special circumstances, we have found precast concrete to be competitive with steel.

In Wisconsin, we completed five buildings, and are in the process of designing a sixth for the Milwaukee Boston Store—a division of Federated Department Stores. Three of those Boston Stores, built prior to 1973, are poured-in-place concrete. They averaged 460 calendar days from start of construction to opening. The last three are structural steel, which averaged less than 320 days.

Other Advantages of Steel

For a project now being completed in Racine, Wisconsin, bids were taken on both steel and precast concrete systems. Steel was selected, based on cost and delivery. The design included a floor system of 4-½ in. concrete fill on composite metal deck, composite girder design. Roof framing is bar joists and metal roof deck. Floor systems and columns are protected with spray-on fireproofing. A double ceiling, used in the roof assembly, provides the necessary fire rating.

Speed of construction is particularly important in this northern state. The construction start is usually scheduled so as to complete the building enclosure during the relatively short construction period, from mid-April to mid-November. The steel structure system permits this kind of schedule, with time to spare.

It has been our experience that comparable poured-in-place structures required a minimum of four months longer to complete. Construction of poured-in-place concrete during those harsh Wisconsjn winters is difficult and expensive. Our cost records show that temporary enclosures and heating for an average store building will be about $40,000 per month during the winter.

To hold the construction period to a minimum on these buildings, structural steel is pre-bid. Award of the structural steel contract six weeks prior to the award of the general contract usually gets the steel at the job site, ready for erection, about the time foundations are completed. The construction sequence is established very early in the building process. The building is often scheduled by quadrants, and steel is fabricated and erected according to the sequence that will be used for all other construction work, including store fixtures.

Fabrication of ductwork and pipe and their installation follow in the same sequences, and begin before erection of the total structure. As steel and deck are placed, mechanical and electrical trades can move right in to hang ductwork, pipe and conduit. The ability to start ductwork, sprinkler systems and electrical conduit immediately following the deck erection, without waiting for removal of shoring, is a distinct time advantage. Six months after start, the building envelope can be completed and is ready for finishing trades.

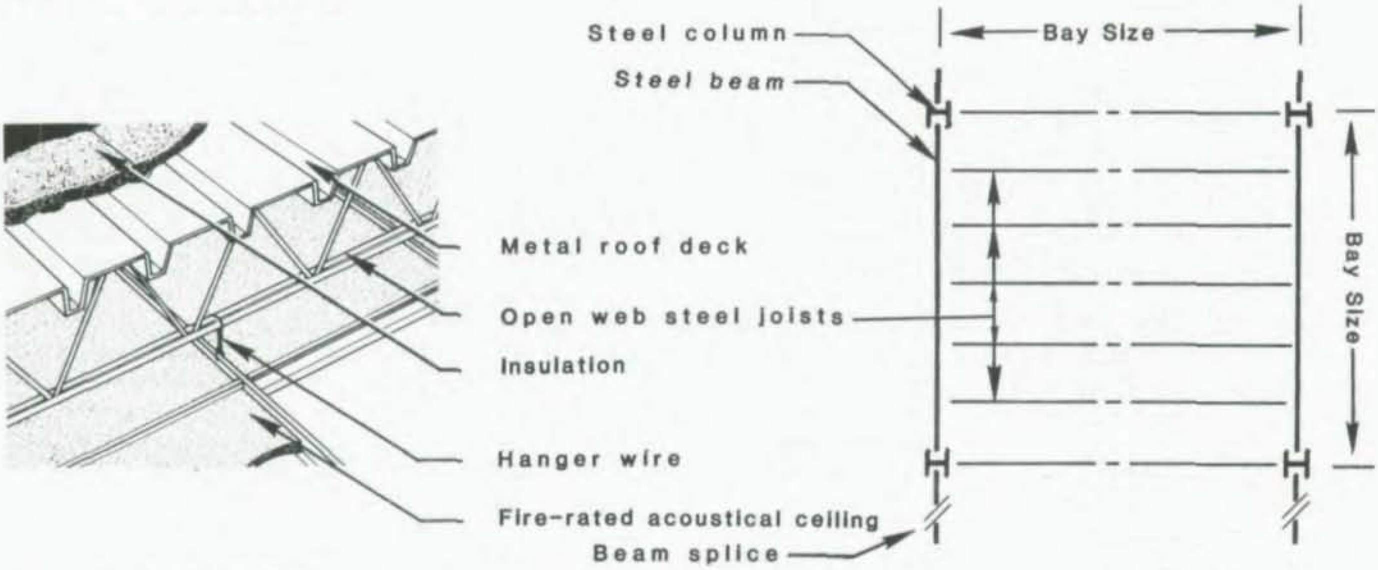
Another factor considered in evaluating systems is the dimensional

Original Boston Store's concrete-framed building was enlarged with steel-framed addition at considerable savings in both cost and time.

depth of the structure and its effect on floor-to-floor dimensions, cost of stairs, vertical transportation, and mechanical and electrical risers. To achieve a poured-in-place concrete structure of the same depth as structural steel, it was necessary to use main beams up to four feet in width. This often limited the routing of pipe and conduit through floors at column locations. With the steel structure, services can usually be routed through floors at columns with minimal additional cost.

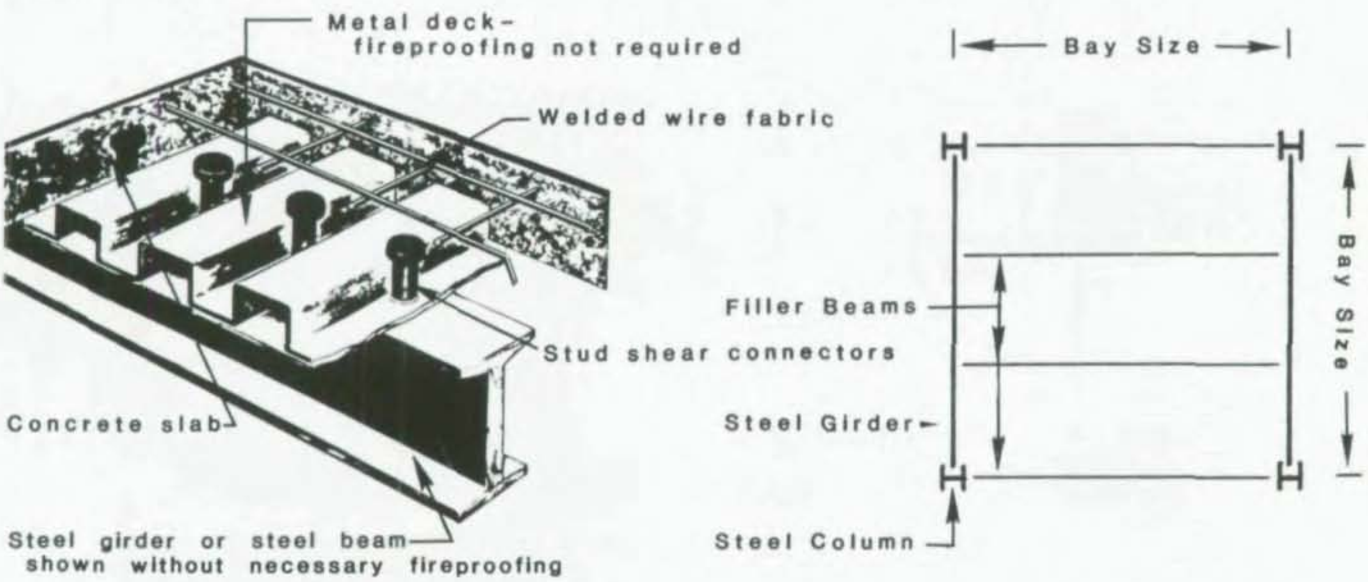
Always to be considered in the cost/time analyses is construction financing. In the last several years, interim financing costs have had a significant

Steel Roof System



1-½" deep x 22 ga. wide rib metal roof deck, factory painted, on open-web steel joists spaced between 5'-7" to 4'-10", depending on bay size; wide-flange beams; system is protected by fire-rated 2'x4' acoustical ceiling board in exposed tee suspension system. Unit costs include premium for light fixture protection, firedampers in ductwork, and hold-down clips. The regular ceiling costs are not included; wide-flange steel columns with spray-on fireproofing.

Steel Floor System

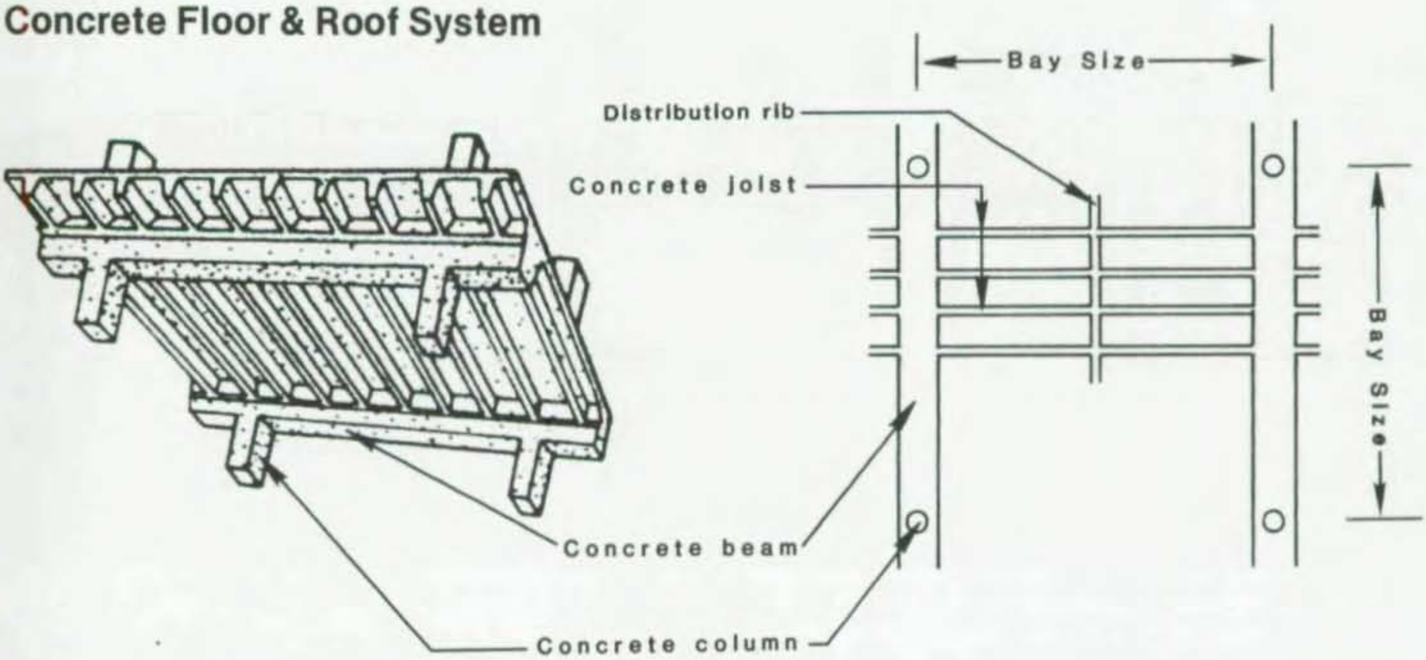


3-¼" lightweight concrete slab, 115 pcf, 3,000 psi, double steel trowel finish on 20 ga. x 3" ribbed galvanized permanent composite metal deck, no shoring required, 6x6-10/10 WWF, steel beams, girders and columns with spray-on fireproofing, stud shear connectors at girder locations. No fireproofing of steel deck required.

impact on cost comparisons and on the selection of the structural system. At 15% prime interest rates, construction financing of a typical department store project will be in the neighborhood of $400,000. The switch to structural steel, along with fast-track scheduling, has reduced financing costs more than 25%.

As retailers continue to battle inflation and pressure on their margins from fierce competition, we expect a stepped-up demand for more cost-effective buildings. At Baxter Hodell Donnelly Preston, selection of steel for the superstructure has resulted in significant savings to our clients in both cost and time. □

Concrete Floor & Roof System



All concrete heavyweight 4,000 psi; cast-in-place reinforced concrete slab (floor, 4-½"; roof, 2-½") with double steel trowel finish, formed on 30" wide removable pans; 12" or 14" deep x 6" wide reinforced concrete joists with one or two distribution ribs, depending on bay size; reinforced concrete beams supported on spiral reinforced concrete columns. For reinforced square concrete columns add an average of $0.06/ sq ft to unit costs.

Comparison of Framing Systems

Type	Bay Size	Floor Framing Systems			Roof Framing Systems		
		Overall Depth	Cost per sq. ft. June 1975	Cost per sq. ft. Jan. 1981	Overall Depth	Cost per sq. ft. June 1975	Cost per sq. ft. Jan. 1981
Steel	32' x 32'	2'-3¼"	$4.48	$6.51	1'-11"	$1.78	$2.59
	30' x 30'	2'-3¼"	$4.30	$6.25	1'-8"	$1.77	$2.57
	28' x 28'	2'-3¼"	$4.37	$6.35	1'-6"	$1.78	$2.59
	24' x 24'	1'-10¼"	$4.16	$6.05	1'-4"	$1.75	$2.54
Concrete	32' x 32'	2'-0"	$5.15	$8.27	2'-0"	$4.90	$7.87
	30' x 30'	2'-0"	$5.07	$8.15	2'-0"	$4.82	$7.74
	28' x 28'	1'-8"	$4.92	$7.90	1'-8"	$4.67	$7.50
	24' x 24'	1'-4½"	$4.64	$7.45	1'-4½"	$4.39	$7.05

Simmonds Precision Products' new headquarters in Vergennes, VT. Million-dollar change order added second story to building already under construction. Drawing (next pg.) details steel construction that speeded progress.

Simmonds Precision: A Million-Dollar Change

by Erik A. Davis, R.A.

Simmonds Precision Products, in 1979, decided to build an addition to its Vergennes, Vermont plant for an Instrument Systems Division. Previously, home for its administrative, engineering and manufacturing facilities was in an extensive amalgamation of pre-engineered buildings and rented trailers. Designers decided the new structure should combine the existing plant's metal skin with stone materials indigenous to Vermont's Champlain Valley. Their best choice was to use locally manufactured precast spandrel, pilaster and infill panels with exposed native aggregate over a structural steel frame.

Erik A. Davis is a project architect with Wiemann-Lamphere Architects, Inc.

Design Considerations

The fast-growing company felt its buildings had to have a flexible plan to allow for future organizational changes. Initial construction of one floor was planned, but with expansion potential for a second floor. Hence the roof system not only had to accommodate Vermont's 50 psf snowload requirements, but also the need to remove and revise the roofing and insulation system, with minimal waste, to provide for a second level. Designs also included plans for a future elevator.

A major design consideration was energy conservation, with the ability to recapture and distribute waste process heat within a thermally efficient building envelope.

Too, speed of construction, and the need to accurately schedule work around operation of the existing plant, was crucial to the owners.

Structural System

Early in the design stages, the architects recognized that a structural steel system provided the necessary flexibility within the tight scheduling demands. Structural bays, 24'x25', provided open-plan requirements, with a central core for mechanical/support facilities. Diagonal bracing was placed behind precast panels; 20" bar joists and 1½" concrete on 22 ga. wide-rib metal deck provided the roof system; and steel beams were inserted for future stair openings to a second level.

The bar joist system permitted the greatest flexibility for the mechanical waste-heat reclamation and distribution systems. The structural steel frame allowed a complete thermal envelope to be developed, broken only at points where the precast system was attached. The flexibility inherent in steel construction facilitated the compatibility of detail between the preformed metal siding and the precast materials.

A Million-Dollar Change Order

Early in construction, the flexibility of steel framing surfaced when Simmonds decided to expand to the second floor as part of the contract already in progress.

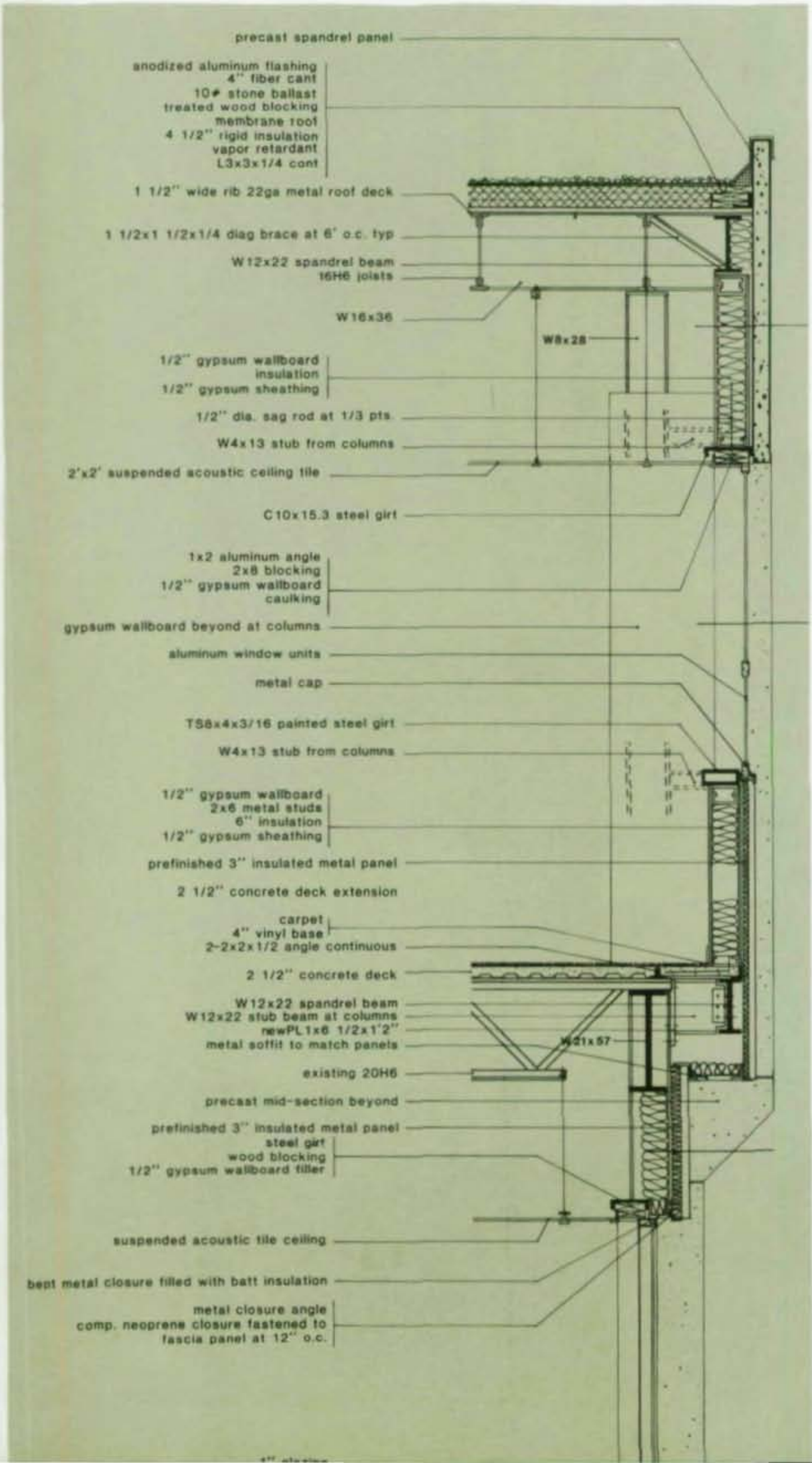
At this point, columns and beams were at the job site, and the remainder of the steel was in production. Coordination and timing were critical, so a fast-track process was established. The corporate architect quickly developed schematics for the exterior shell. Those came to local architects developing engineering and construction documents. Concurrently, interior planning between design architect and owner was rushed to completion.

Complications arose in the fact that the structural firm responsible for the first floor construction could not meet the additional fast-track schedule, due to other commitments. Another firm was retained for work on this second phase. The ease of detailing inherent in steel construction facilitated the transition. Several other design elements during progress also demonstrated the flexibility in a structural steel system.

1. A 20-in. cantilever was added to three sides of the building.
2. One stairway was added, another reoriented 90°.
3. Elevator size was modified.
4. A continuous band of glazing replaced the precast panel motif used on the first floor. This meant bracing had to be moved to the interior, and its exact location could not be determined until final plans were developed.

All of these design modifications were accommodated easily by the flexibility of detail inherent in steel. And, the readily available steel components permitted construction to continue without interruption.

The new work was incorporated into the original contract with one simple change order—for over one million dollars! □



Architects
Corporate: Edward Ballantyne
White Plains, New York
Wiemann-Lamphere Architects, Inc.
Burlington, Vermont

Structural Engineers
Phase I -Richard Dall & Associates
Burlington, Vermont
Phase II-Durbrow Associates
Burlington, Vermont

General Contractor
Breadloaf Construction
Middlebury, Vermont

Steel Fabricator
Vermont Structural Steel
Burlington, Vermont

Bedford Park Station: A Home Away From Home

Needed: a residential atmosphere for firemen—and a shelter for fire engines—all in one.

The answer: Bedford Park, Illinois Fire Station, a through-access four-bay structure that provides living, dining and sleeping areas. And engine shelter, additional equipment support spaces, work bench zone, gear lockers, a hose-washing/drying area and storage.

Living areas include small personal spaces, and a landscaped courtyard, walled-in for privacy.

A large clear-span structure houses the fire engines and permits unobstructed access to all fire-fighting equipment. Exposed structural steel trusses, 15 ft o.c.—highlighted by bright yellow paint—span 80 ft over apparatus in a longitudinal direction, and cantilever 5 ft beyond their supporting columns. A total of 10 wide-flange columns, five at the front and five at the back, support the entire roof structure.

The trusses are sealed at columns and perimeter with butt-jointed glass to minimize the need for artificial lighting. Finely detailed rolling glass doors permit the visual excitement of displaying both the space and the fire engines.

Another dramatic visual impact is created by a counterplay of environments: the fire-fighting area with its bright steel structure, the clear glass and the warm-toned, brick-enclosed residential home-away-from-home. □

Architect/Structural Engineer
Holabird & Root
Chicago, Illinois

General Contractor
Mutual Development Company
Palos Heights, Illinois

Owner
Village of Bedford Park
Bedford Park, Illinois

Just being completed addition to Philadelphia skyline is 615 Chestnut Street Building in heart of historic mall.

A Fast Track— and a Million in the Bank

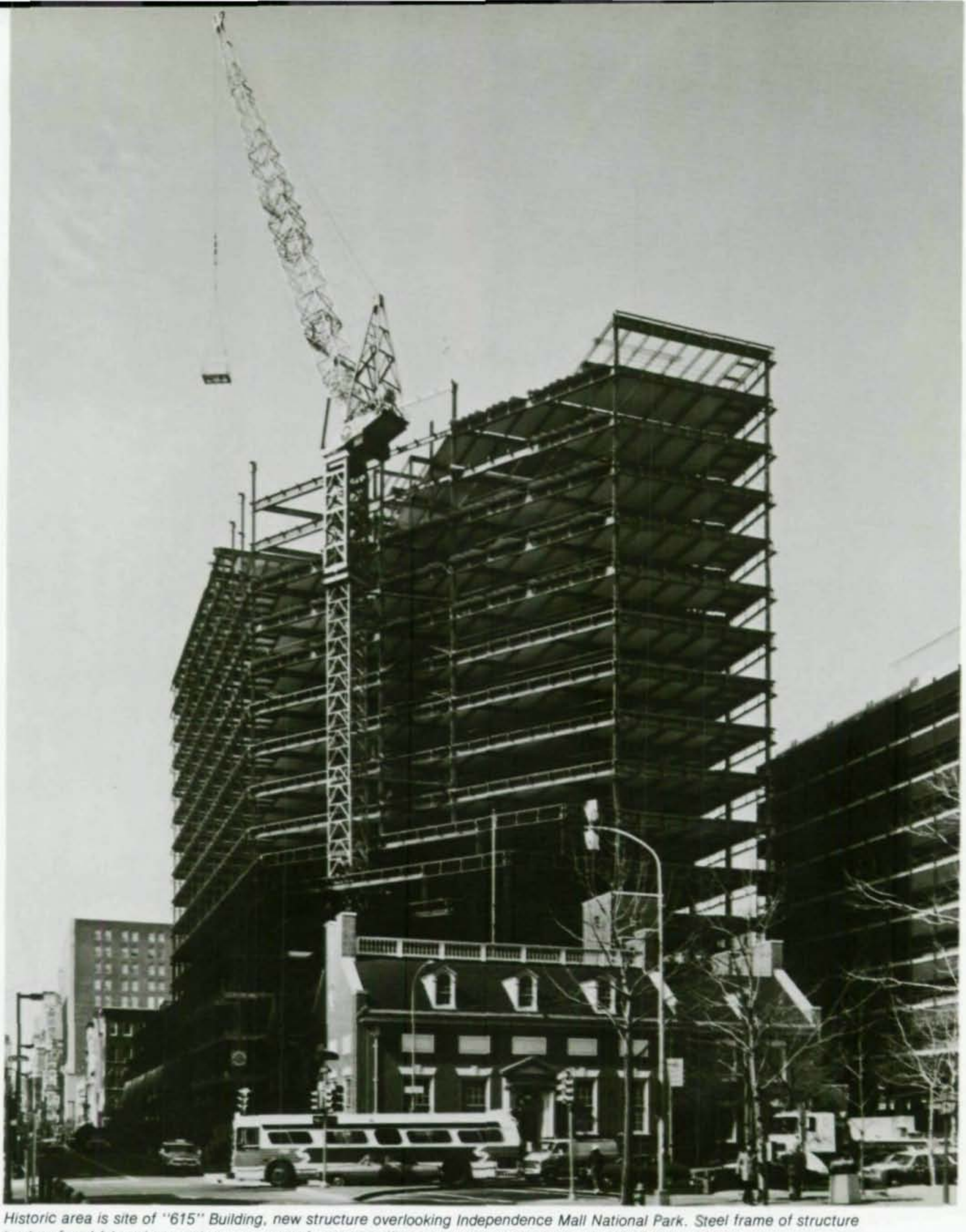
by Robert K. Huzzard

In the shadow of Independence Hall, a just-being-completed office structure met the needs of design—and saved $1 million with steel framing.

The 17-story structure—the 615 Chestnut Street Building—does much *more than provide 12 floors of prime* office space and house 400 cars in Philadelphia's Independence Mall.

The building's steel framing provided the design and end-use flexibility for the $19-million structure, according to John D. deMoll, PE, AIA, president of Ballinger, the architectural/ *engineering firm who designed the* building. "We really chose a steel framing system because it was the most efficient way to meet our design specifications and the developer's require-

Robert K. Huzzard is a sales engineer with the Philadelphia Sales district of Bethlehem Steel Corporation.



Historic area is site of "615" Building, new structure overlooking Independence Mall National Park. Steel frame of structure is chamfered (above) to maximize amount of rentable office space overlooking city. Note floors six to eight feature stepbacks for balconies.

ments for fast-track construction."

Ballinger knew from the beginning that steel framing would be cost-efficient for the structure. But further analysis of the economics of steel, compared to reinforced concrete, indicated a savings of between $1.50 and $2 per sq ft.

Distinctive Shape

Another plus, "Steel framing gave us flexibility to create the chamfered corners that give '615' its distinctive six-sided shape and stepped, landscaped terraces," deMoll says. "The use of steel resulted in easier fabrication and quicker construction on a congested downtown site, which '615' virtually fills. The land was the last open parcel in the Independence Mall Urban Renewal Area."

Construction, which began in May, 1979, is soon to be completed. The fast-track construction schedule required all-season construction, so steel was used "because it was not affected by the weather."

More Rentable Space

Foundation costs of the "615" were reduced because the steel frame weighs less than a comparable concrete structure, deMoll further notes. "The use of steel allowed longer spans—45 ft—than practicable with other materials. These spans were accomplished with beam depths permitting efficient floor-to-floor heights (floor-to-floor, 12'-8"; floor-to-ceiling, 8'-6")."

Ballinger's design director, Bill Gustafson, adds, "These longer spans, resulting in typical bays of 45' x 20' allow tenants to plan their space with greater flexibility. Floor plans are designed around 5' x 5' modules so tenants can more efficiently arrange large computer areas, conference rooms and additional work spaces."

What this means is that the 351,455 sq ft (net rentable) of office space is virtually column-free, providing open areas that permit tenants to have more corner offices. The building ground floor includes 20,000 sq ft of retail stores in a prime commercial Quaker City area, and a finely appointed lobby.

Changing Configuration—In Steel

The next four levels, rectangular in shape, provide 168,000 sq ft of leased parking space. But at the sixth story, the first office level, "615" changes its shape. Chamfers are formed at the southeast corner—which faces Independence Mall, Society Hill and the Delaware River—and at the northeast corner which angles for views of The Gallery, the country's first new center city shopping mall.

The beveled corners gradually step back to form a series of terraces on the sixth to eighth floors. Here full chamfers form and continue to the top floor.

The "615's" frame is primarily ASTM A572 (Gr. 50) high-strength, low-alloy steel. Wind frame and braced frame members were fabricated from A36 steel. Typical girders are W24x76, columns vary from W14x211 to W14x48, and typical floor beams are W12x14.

The composite steel frame, 11.2 psf, has moment connections to resist longitudinal wind loads, while braced frames resist transverse wind loads. Connections are welded or field-bolted with ASTM A325 high-strength bolts. The floor is a 3¼-in. lightweight slab on a 2-in. deep galvanized steel deck.

Historical Setting

The site, purchased from the Philadelphia Redevelopment Authority was developed in keeping with the city's architectural tradition, according to Designer Gustafson. The three-story limestone facade on Chestnut Street complements a similar one on the Public Ledger Building across the transitway and provides a street scale for "615's" stores. Russet brick facing harmonizes with Independence Hall and other nearby office buildings. Those warm tones continue through the lobby, for which an original George Segal sculpture was commissioned. □

Architect/Structural Engineer
Ballinger
Philadelphia, Pennsylvania

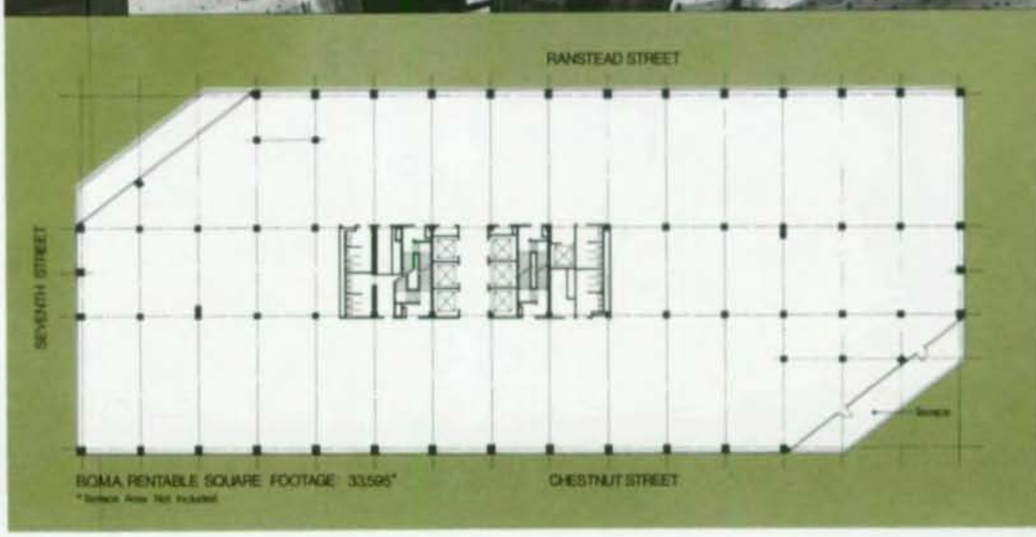
General Contractor
L.F. Driscoll Co.
Bala Cynwyd, Pennsylvania

Fabricator
Lehigh Structural Steel Company
Allentown, Pennsylvania

Erector
Falcon Steel Company
Wilmington, Delaware

Owner
Seventh & Chestnut Street Associates
Philadelphia, Pennsylvania

Office with a view—and what a view—of cradle of liberty. Building's strategic location places it in center of city activities. Three floors boast landscaped balconies. Longer spans of steel framing permit greater floor plan flexibility (see plan, below).



Spacious 50-ft high atrium houses two escalators for new second story addition to Sharpstown Center's booming shopping mall. Landscaping of 12-ft ficus trees and hanging baskets of ferns lend refreshing ambience to modernized facility.

Sharpstown Center: Things are Looking Up!

What happens when a 20-year old shopping center runs out of badly needed space for new stores? And there is no adjacent land area on which to build the new space? At Sharpstown Center, in booming suburban Houston, the only way to build was *up*—with a steel-framed second story on the existing concrete-framed structure.

The first air-conditioned shopping center in the Gulf Coast area, Sharpstown was a very profitable center, with 100% occupancy over the last 18 years. The demographics of its location, and a demand for more retail space, pointed to a need for expansion—a need that rocketing land prices would have made prohibitive, even if land were available.

So, instead of moving outward, as most older centers do, Sharpstown moved up.

Double-decker Precedent

Houston-based shopping center developer Arthur M. Fischer, owner of Sharpstown, believes the trend of the '80's will be to build upward. He applied his "double-decker" thinking to

Sharpstown, not only the largest but also the shopping center with the highest gross sales per square foot of any in the dynamic Houston market.

Fischer embarked on a 519,000 sq ft expansion, marking the first time a major shopping center of this size (one million sq ft) had a second level added to it. The task of building a second level was precedent-setting. There were no textbooks to follow. One of the major needs was to keep the center operational during construction.

Pardon Our Dust!

To keep the center operative, the project had to proceed from the outside in. First, they had to build a second-story roof before they destroyed the old one. Once the new roof was on, the old one was stripped away to be converted into the floor of the second story.

Customer and merchant relations were vital to the project. To minimize disruption of retail activities by the construction efforts, the general contractor worked a night crew from closing until store opening time. Crews entered at 9 p.m. with drills, cranes, forklifts and air compressors—and quit at 6:30 a.m., in time to clean up the debris and move out their equipment in time for a 10 a.m. store opening.

"At night the center's interior looked like the Houston freeway at rush hour," according to the project manager, Peter Jacobson.

The general manager of Sharpstown Center, Ed Wolochin, points out, "Maintaining the trust of our merchants was the key to continued cooperation and high enthusiasm. From the start of construction, I received calls from merchants commenting on how pleased they were with the cleanliness and the progress." Sales reports showed increased business for most merchants.

After the Christmas rush, construction accelerated. Demolition crews

Business as usual (r.) as huge second level nears completion, while shopping continues uninterrupted on first-floor retail area.

Architecture of new upper level adds welcome modern motif to Sharpstown Center.

worked round the clock. Maintaining that merchant cooperation became more difficult. Fischer indicates, "By February, we were saved by the shape the mall was taking. Customers and merchants alike were tantalized by the appealing direction and design of the renovated mall."

Steel goes up on Sharpstown Center roof. Existing concrete columns were located and squared to steel columns with 20-in. anchor bolts (lower right corner of photo). Giant crane with 400-ft boom (bottom) hoisted steel columns up and across roof of center.

Creative Technical Challenges Met

"When this structure was built on Texas prairies in 1961, no one even considered a need for additional space. The technical challenge was to develop an economically feasible design for the second level," Jacobson commented.

Very little construction is without surprises. The first one at Sharpstown was a long underground river bed. It was discovered when the structure's foundation and steel support columns were tested for their strength to carry a second level. As a result, the foundations needed to be fortified in 44 places. The contractor had to go into shops and take 20-ft borings for soil samples. Then he went back and poured new footings seven feet down in weak soil areas. The lighter weight of steel framing became a key reason to use structural steel on the second-level addition.

Steel Up—with World's Largest Crane

Now that the new structure had a solid foundation, next step was to add structural steel on top of existing concrete columns. The new steel columns had to be squared to the old columns and attached with 20-in. anchor bolts. For each steel column, two holes had to be drilled in the roof to lodge the anchor bolts—a process which took a whole day for each column.

After the anchor bolts were in place, there was a two-month waiting period before the 1,000 tons of steel could be erected. During that time, Jacobson's team scoured the country for a crane with a 400-ft boom needed to hoist the steel up to the new roof level. Ironically, they found the world's largest rubber-tired crane, a 200-ton monster manufactured by Clark, right in their backyard.

In just three months, Sharpstown Center had a new, waterproof roof — a four-ply builtup roof, 2-in. of Perlite over an insulated metal deck. Second floor walls were enclosed with marblecrete. Now the old roof could come down.

Night Crew is Back

Interior work brought the night crew back. After store hours, demolition of the roof over the main central area moved fast. The roof, sculptured in precast concrete folded plates, had to be cut into five sections to be removed. Each weighed 88,000 pounds. Special steel beam jigs were set up to ease the sections down to a forklift to be carted away to the rubbish heap.

Removing the old builtup roof was next. This arduous, time-consuming task took three months because the work had to be done by hand. The older structure could not support the weight of heavy demolition equipment. Two complete asphalt - and - gravel roofs had to be removed, and three inches of lightweight concrete taken off of the 1,500 original double tees.

More Surprises

The double-tees presented another surprise. They were supposed to be arched to a positive camber—but 18 years had flattened them out. Before a new floor could be poured, every one of the 1,500 tees had to be surveyed at each end and in the middle, to check the proper arch. Where they had negative arches, workmen had to go into stores, remove the ceiling and jack up the tees with shores.

With the old roof gone, a delightfully spacious 50-ft atrium was created for Sharpstown's center court. The final stages of the extensive remodeling included a pre-finished metal ceiling, new storefronts, three escalators, glass elevators and decorative stairways.

Did it Pay Off?

The Sharpstown expansion has proven to be a very successful venture. Over 85 new tenants moved into the center, some making their initial entry into the booming Houston marketplace.

"The continued growth of Southwest Houston, plus the tremendous customer acceptance of products and services offered by Sharpstown retailers, dictated this expansion. Though we took a risk of sorts in this precedent-setting expansion, we couldn't be more pleased with the outcome. Dollar for dollar, Sharpstown's expansion proves that, for the shopping center industry of the future, the only way to go is up." □

Architect
Nikita Zukov, AIA
New York, New York

Structural Engineer
T.Y. Lin & Associates
Houston, Texas

General Contractor
H.A. Lott Construction Co.
Houston, Texas

Owner/Developer
Arthur M. Fischer, Inc.
Houston, Texas

Roof goes on over new addition before old one was removed. Airconditioning and skylight units also remained in place until building was enclosed.

One shortcut to save time was to remove old precast folded plates before structure was enclosed along sides. Massive 88,000-pound pieces were gingerly lowered by special steel beam jigs shown.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION
The Wrigley Building, 400 North Michigan Avenue
Chicago, IL 60611

Address Correction Requested

BULK RATE
U.S. POSTAGE
PAID

WHEATON, ILL.
Permit No. 1786

Bridge to Renewal—Color it Red!

A pedestrian bridge in Harrisburg, Pennsylvania was suggested as a first step to the city's downtown renewal plan. The new Walnut Street Bridge crosses a major street to connect the hillside Capitol Park to a new mixed-use complex named Strawberry Square.

The park-level bridge permits those who work in the capital buildings, situated in the park, to have easy access to other state buildings, offices, restaurants, entertainment and retail shops in the Square. Future phases of the renewal plan include extensions of this pedestrian walkway.

The structure, which spans 130 ft from the park sidewalk to the second floor of the Dept. of Revenue Building, consists of two unusual steel girders, connected by wide-flange beams and topped with a concrete slab.

In plan, elevation and cross-section, the bridge is shaped to satisfy the different needs of park and building. The vertical curve of the lower girder flanges suggests the support and spring of traditional bridge construction. The bridge deck widens as it approaches the building to provide a gracious entryway—a width not required for the street crossing. The top flanges of the girders slope downward toward the deck at a 45-degree angle to discourage pedestrians sitting and climbing.

The windscreen is glazed with tempered/laminated glass. The soffit, enclosed with an aluminum ceiling, is equipped with down lights that become a nighttime marker for the street-level entrance.

The bright red paint shouts this is no railroad bridge—but rather new life for downtown Harrisburg. □

Architects
Lawrie & Green-Mitchell/Giurgola
(joint architectural venture)
Philadelphia, Pennsylvania

Structural Engineer
Skilling, Helle, Christiansen, Robertson
New York, New York

General Contractor
Mellon-Stuart Company
Harrisburg, Pennsylvania

Steel Fabricator
Williamsport Fabricators, Inc.
Williamsport, Pennsylvania

Steel Erector
C & S Engineers
New Cumberland, Pennsylvania

Owner
Harristown Development Corporation
Harrisburg, Pennsylvania