VOLUME XXV NUMBER 4/FOURTH QUARTER 1985

MODERN STEEL CONSTRUCTION

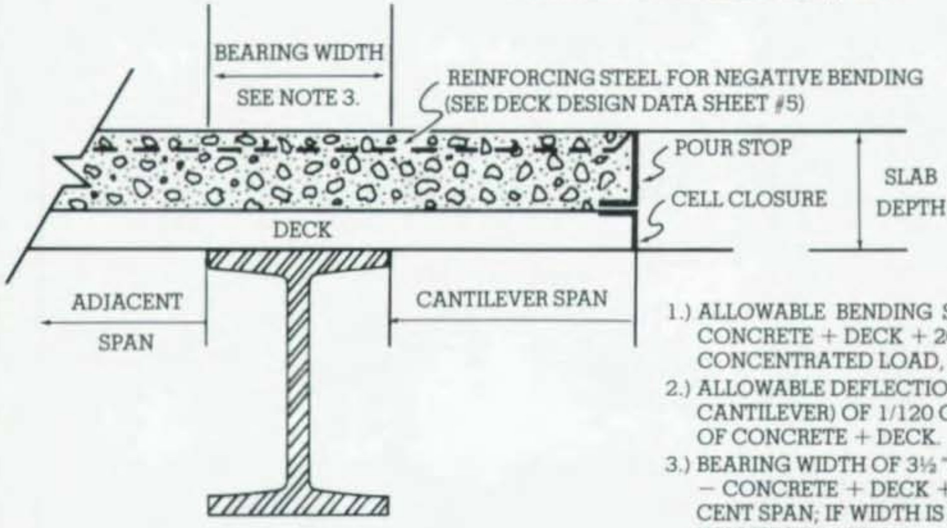
Banking on Steel's Flexibility
A No-frills Steel Approach to Stations
Federal Express Expresses in Steel
A Strong Contribution to Downtown Glendale
1985 Architecture Awards of Excellence Winners

DECK DESIGN DATA SHEET.

NO. 7

MAXIMUM FLOOR DECK CANTILEVERS

FOR UNITED STEEL DECK, INC.



NOTES:

1.) ALLOWABLE BENDING STRESS OF 20 KSI WITH LOADING OF CONCRETE + DECK + 20 PSF OR CONCRETE + DECK + 150 LB. CONCENTRATED LOAD, WHICHEVER IS WORSE.
2.) ALLOWABLE DEFLECTION OF FREE EDGE (BASED ON FIXED END CANTILEVER) OF 1/120 OF CANTILEVER SPAN UNDER LOADING OF CONCRETE + DECK.
3.) BEARING WIDTH OF 3½" ASSUMED FOR WEB CRIPPLING CHECK – CONCRETE + DECK + 20 PSF OVER CANTILEVER AND ADJACENT SPAN; IF WIDTH IS LESS THAN 3½", CHECK WITH SUMMIT, NEW JERSEY OFFICE.
4.) CALL NICHOLAS J. BOURAS, INC. ANYTIME YOU NEED DECK INFORMATION.

FLOOR DECK CANTILEVERS

NORMAL WEIGHT CONCRETE (150 PCF)

	UNITED STEEL DECK, INC. DECK PROFILE															
	1.5 IN B-LOK				1.5 IN LOK-FLOOR				2.0 IN LOK-FLOOR				3.0 IN LOK-FLOOR			
Slab Depth	22	20	18	16	22	20	18	16	22	20	18	16	22	20	18	16
4.00"	1'11"	2' 3"	2'10"	3' 4"	1'11"	2' 4"	3' 0"	3' 6"								
4.50"	1'10"	2' 2"	2' 9"	3' 3"	1'10"	2' 3"	2'10"	3' 4"	2' 6"	2'11"	3' 8"	4' 3"				
5.00"	1'10"	2' 2"	2' 8"	3' 2"	1'10"	2' 3"	2' 9"	3' 3"	2' 5"	2'10"	3' 6"	4' 1"	3' 8"	4' 3"	5' 3"	6' 0"
5.50"	1' 9"	2' 1"	2' 7"	3' 0"	1' 9"	2' 2"	2' 9"	3' 2"	2' 4"	2' 9"	3' 5"	4' 0"	3' 7"	4' 1"	5' 0"	5' 9"
6.00"	1' 9"	2' 0"	2' 6"	2'11"	1' 9"	2' 1"	2' 8"	3' 1"	2' 3"	2' 8"	3' 4"	3'10"	3' 5"	3'11"	4'10"	5' 7"
6.50"	1' 8"	2' 0"	2' 6"	2'11"	1' 9"	2' 1"	2' 7"	3' 0"	2' 3"	2' 8"	3' 3"	3' 9"	3' 4"	3'10"	4' 8"	5' 5"
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MODERN STEEL CONSTRUCTION

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CONTENTS

FIFTH ANNUAL AWARDS BANQUET SET FOR OCTOBER 22

The prestigous 5th Annual Awards Banquet to honor this year's Architectural Awards of Excellence winners will be held October 22 in Chicago's Westin Hotel. A well known-panel of five jurors recently chose 11 of the most outstanding buildings from a field of 145 entries. The black-tie banquet, which has become an industry tradition, provides a forum for leading architects, structural engineers, bridge designers, contractors, fabricators and developers.

NOMINATIONS INVITED FOR T. R. HIGGINS LECTURESHIP AWARD

Applications will be accepted in early Fall for the 1986 Theodore R. Higgins Lectureship Award. The award recognizes the author of the most significant engineering paper related to steel in the period from January 1, 1980 to January 1, 1985.

The winner, who receives a cash award, also presents his paper on six occasions during 1986. A jury of six distinguished engineers from the fields of design, education and the fabricated structural steel industry selects the winning author. Nominations, which must be received by Nov. 15, should be directed to the Committee on Education, AISC, 400 N. Michigan Ave., Chicago, IL 60611.

Norstar Bancorp:
Banking on Steel's Flexibility

by Gerd W. Hartung and Douglas C. Bean

Norstar Bancorp's new 11-story headquarters, Buffalo, N.Y.

Gerd W. Hartung, P.E., is senior associate, Cannon, Grand Island, New York.

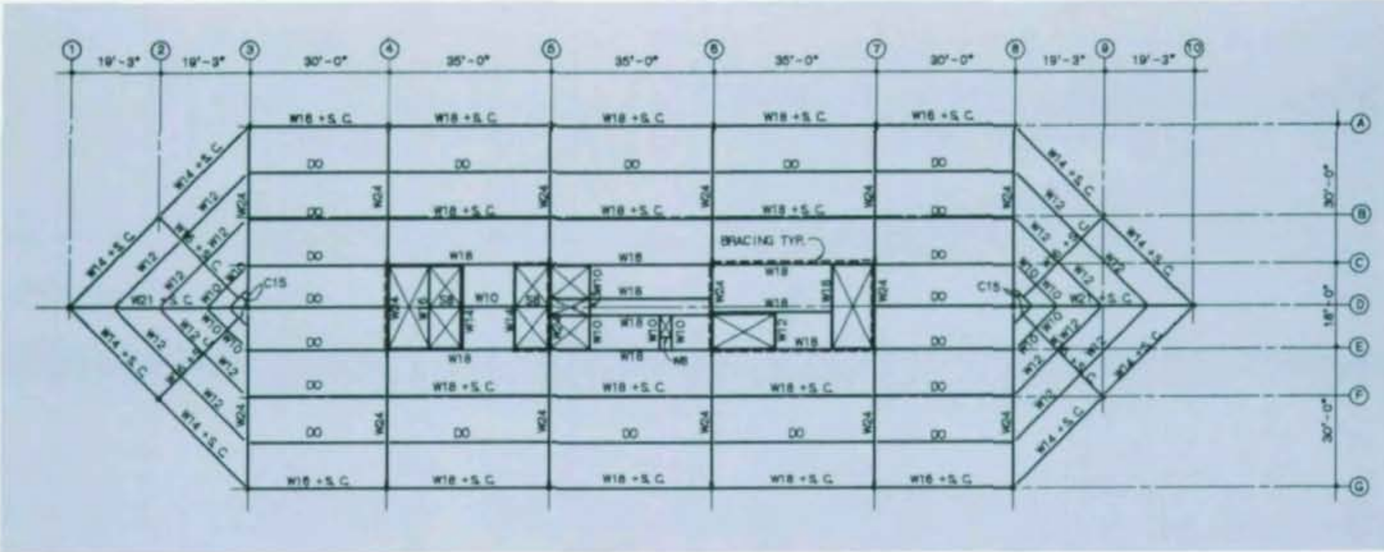
Douglas C. Bean, is marketing manager, Cannon, Grand Island, New York.

A focal point in the $100-million Main-Genesee redevelopment district is Norstar Bancorp's 11-story, 220,000-sq ft headquarters. The building, dynamically angled on the site, creates a major public plaza fronting on the new Rapid Transit Pedestrian Mall. In addition to the need to create a friendly, inviting image, the project team faced a number of other challenges: a tight delivery date of 24 months from initial design to occupancy; flexible interior spaces with a minimum of columns for improved marketability; office spaces oriented to provide the best views; high energy-efficiency; and effective wind-screening for the new public plaza. This last consideration is important in any urban design, but Buffalo, N.Y.'s "lake effect" wind and snow conditions posed a special challenge.

The angular orientation of the building, and its unusually narrow 80-ft width, were unique responses to these challenges. In addition to aesthetic considerations, wind-tunnel tests conducted at MIT verified the angular orientation would provide an effective screen against prevailing winds. A life-cycle cost analysis for energy consumption indicated a narrow building would be more desirable than a box to maximize daylighting. In addition, with the majority of the building leased, the narrow core gave it mostly exterior offices, advantageous for marketing, and also it permitted flexibility for multiple tenants on each floor.

Structural Considerations

The narrow building width required an equally narrow core, which posed the critical structural challenge—its center-line spacing is only 18 ft in the transverse direction (see Fig. 1). The final architectural floor plan showed the 18-ft by 105-ft central core with a 30-ft clear span on either side. This helped to meet the required energy performance by increasing daylighting while responding to the flexible layout criteria. At the ends of the building, a virtually column-free flexible floor plan was created.



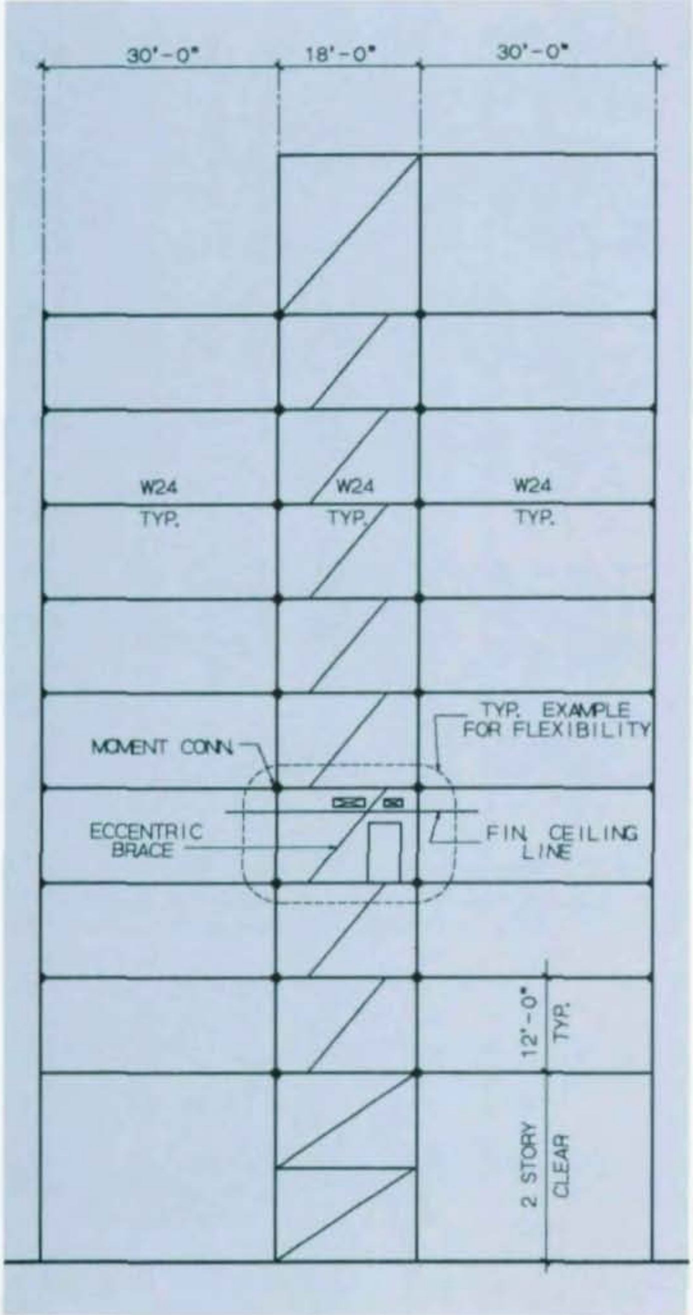


Fig. 1. Typical floor framing plan (above)

Fig. 2. Typical bracing elevation (l.) scheme akin to "Popov links" seismic design.

Early in the design process, it was clear the building's unique geometry seemed to say steel. The approach during preliminary structural design was to evaluate various framing schemes/materials following analysis of a full geotechnical report. Fast-track scheduling and coordination with other design disciplines also had to be accommodated. The geotechnical report defined a load limit for which the building could bear on a standard spread footing. All steel framing alternatives met this criteria. Concrete was too heavy and would have required a deep, foundation scheme, i.e., piles.

Framing Alternates

The steel framing schemes all assumed the core would accommodate bracing in the longitudinal direction. The final design did not change this assumption. Thus, the major hurdle was to achieve an economical solution for the structural stability requirements in the transverse direction. The core has a heighth/width ratio of approximately 8:1, a relatively slender profile. A simple braced-core strategy, evaluated using appropriate Buffalo, N.Y. windloads, resulted in severe base uplift forces. Several solutions were considered, all of which would have negated the savings of the spread-footing foundation scheme. A top-hat truss, which would lower the uplift forces, conflicted with architectural requirements. Even exterior bracing was investigated, but also proved architecturally unacceptable. The team considered using four lines of moment framing, but the unbalanced gravity conditions in combination with wind loads resulted in column sizes which were on the heavy side for a

Tight site required maximum crane efficiency and ease of erection

building of this height. A combination of column-to-column rigid bracing and moment frames still resulted in a relatively stiff core compared to the moment frame. In addition, uplift was still critical.

Structural Solution

A last scheme involved use of flexible bracing links in conjunction with moment frames (see Fig. 2). This scheme is akin to the Popov-links which are being used increasingly for seismic design. The term flexible is derived from the use of beams—flexural members—to support the diagonals. Supports are located approximately between 2 × beam depth and 20% of beam length from the face of the columns. For applications other than seismic, this results in a relatively straightforward analysis and design. The moment frame is sized for gravity loads. An offset of 3.5 ft was used initially as a guide for coordination with the architectural and mechanical disciplines. As shown in Fig. 2, available space above ceiling height for ductwork and piping is greatly increased compared to standard braces. Even though not required for this project, passages could be easily located between the column face and the bottom of the brace.

Fine tuning the linked system by varying offsets, girder stiffnesses and brace areas in various combinations produced the final design. These analyses were modeled using Cannon's in-house computer programs. A built-in quantity take-off simplified selection of the most economical system. It was found that fine tuning minimized the uplift problems. About 40% of the wind forces are resisted by the flexible diagonal brace, with significant reductions in the sizes of girder and columns achieved. Comparing the quantity take-off, a net savings of 160 tons (nearly 1.5 psf) was achieved. A check of the lateral deflection indicated that strength rather than stiffness controlled most member sizes. Therefore, F_y 50 ksi high-strength steel was used for most rolled shapes.

The floor framing is conventional, composite filler beams about 10 ft o.c. supporting a composite slab on a 3-in. metal deck; 18-in. beams are used for the 35-ft spans, 16-in. for 30-ft spans. Near the ends of the building, 24-in. composite girders span 39 ft to provide the almost column-free space called for in the program.

The exterior skin is principally precast concrete, spanning column line to column line. Because of the project's unique shading and light shelf requirements for daylighting, a facade offset of 3.5 ft from the grid line had to be accommodated. The design of the precast sections required that the architect address both—minimum weight for maximum crane efficiency and ease of erection. For a single piece spanning 35 ft, it became evident that an L-shaped section was the most economical. The bottom horizontal length provides the required stiffness to resist contributary wind loads, as well as minimize warping of the panel. The top is connected directly to the slab. Ease of erection mandated a point of support at the center of gravity in the panel. Shopwelded steel channels cantilevered from the columns provided these supports.

A Successful Conclusion

The finished structure averaged out at less than 10 psf, well within the approved budget. The construction phase was a major success as steel erection progressed virtually flawlessly. Space requirements for other trades were accommodated with no conflicts. Even a 10-week delay due to unanticipated site conditions during the demolition phase was overcome to achieve project delivery on schedule. In particular, the steel erection, precast installation and major mechanical phases proceeded smoothly. When the dust had settled, the deadline was met!

Part of the credit for the timely completion must be given to the flexibility of the steel framing system. There were few co-ordination problems, the erection process was straightforward and the building was occupied when promised and delivered within budget. Receipt of several design awards underscores the success of the design intent. Included among these are the Owens-Corning Energy Conservation Award, 1982; the Illuminating Engineering Society North America; Great Lakes Region, Lighting Design Award, 1984; a U.S. Office of Consumer Affairs Special Commendation; and the CSI, Project of the Year Award in 1983. Pleased by this performance, Norstar Bancorp subsequently retained Cannon to design their regional headquarters for the Hudson Valley.

Needless to say, it has also a structural steel frame! □

Architect/Engineer
Cannon
Grand Island, New York

Construction Manager
The John W. Cowper Co., Inc.
Buffalo, New York

Owner
Norstar Bancorp
Buffalo, New York

Recessed windows on south side, flush on north side, add to structure's variety of energy-efficient architectural features.

Atlanta's Lakewood/Ft. McPherson MARTA station represents wide departure in its steel-framed construction.

Steel framing was desired structural material for unusual gable roofs and numerous stairways and bridge spans.

MARTA Station: A No-Frills Steel Approach

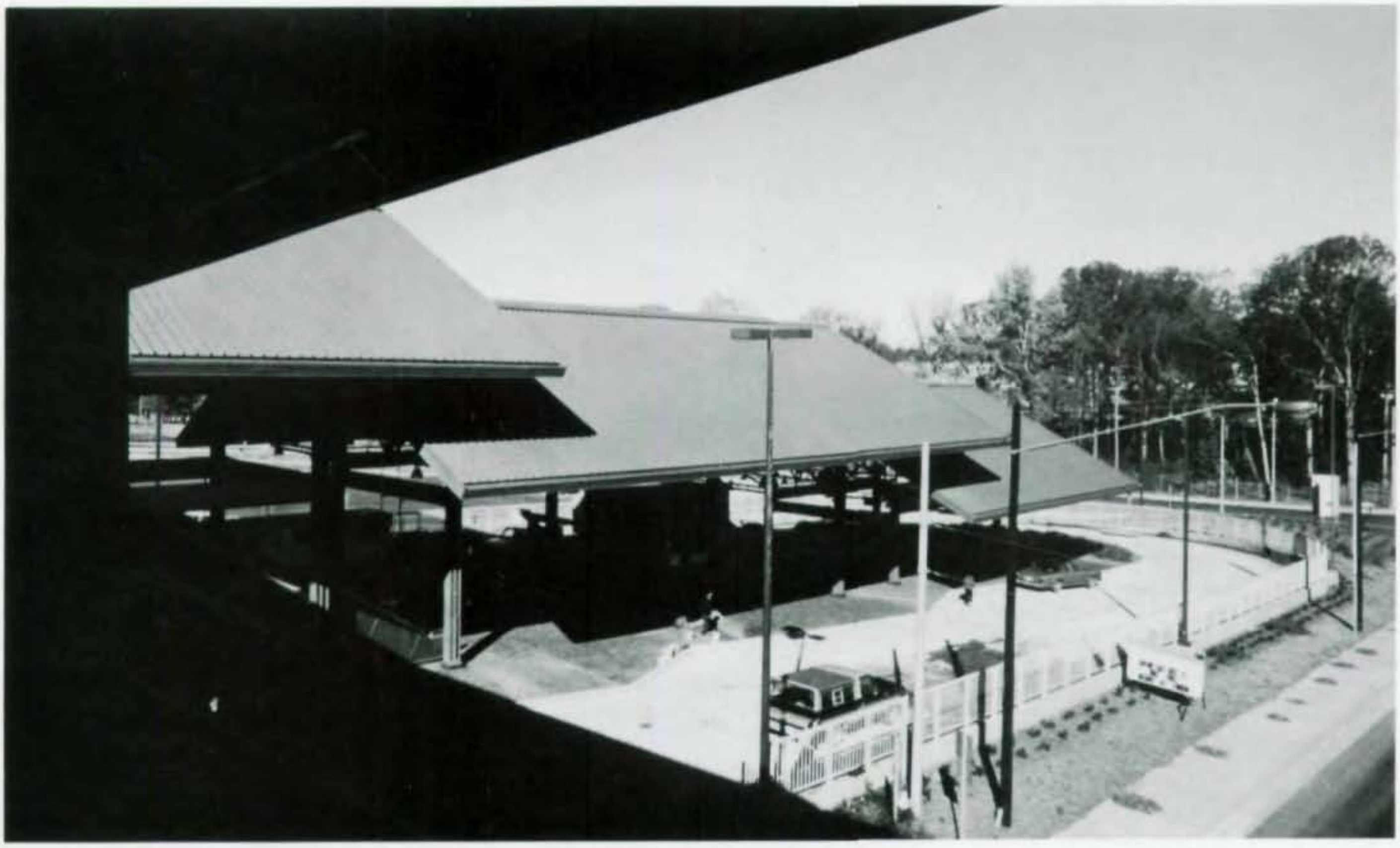
by M. Garland Reynolds, Jr.

When the Metropolitan Atlanta Transit Authority opened five new rail stations last December, one was a soaring steel building. Dramatically different from any of MARTA's other 24 stations, which are primarily concrete, the one at Lakewood/Fort McPherson overcame stringent design and fire code restrictions to evolve into a colorful red and blue all-steel structure reminiscent of an old Victorian-styled European train yard. MARTA inaugurated service on the first leg of Atlanta's rapid transit system in June 1979, with seven stations along 13.8 miles of high speed rail. The system has grown to 25 stations along 25 miles of rail. When the original plan is completed in the 1990's, MARTA will operate stations along 105 miles of track, stretching from Atlanta's suburbs to Hartsfield Airport. Plans are now being discussed to extend MARTA far beyond Metro Atlanta into adjoining counties.

These latest five new stations were designed with more stringent criteria than earlier stations. This new criteria, calling for a no-frills, more efficient, more economical approach, was based on the experiences learned in the earlier building programs. For example, the roofs originally constructed over the entire length of the 600-ft long platforms were reduced to 350 ft, ceilings were eliminated and escalators changed to stairways where vertical heights were under 10 ft.

Of the new stations, the Lakewood/Fort McPherson Station is dramatically different from any of the others with its exposed steel structure. The evolution of the steel design of this station in lieu of the accepted concrete design of the other stations was challenging because it gave an opportunity to go beyond the accepted limitations of the time. The station was designed for a total daily patronage of 42,000, with a peak hour patronage of 6,250. In addition to the train station, the program also called for a covered bus transfer facility to load 12 buses at once.

M. Garland Reynolds, Jr., FAIA is a principal in the firm of Reynolds Architects, Decatur, Georgia.



Station's suburban location called for gabled roofs similar to neighborhood housing. Gable permitted simple roof structure that was light and airy.

Two bridges, one across two sets of main line railroad tracks spanning 142 ft and another across an adjacent four lane street spanning 205 ft, were required to link the train station with the bus transfer facility and, in turn, to link each with two pedestrian access portals. Both bridges were required to slope because of the different elevations of the structures and the requirement for the bridge over the railroad tracks to clear the rails by 20 ft.

Since this was a commuter station, two large parking lots holding a total of 1700 automobiles were located close to the entrance portals. One of these entrance portals was also positioned to be easily accessible to the main gate to Fort McPherson, home of the US Army's Armed Forces Command Center (FORSCOM).

It soon became apparent that, in order to adequately protect patrons from the rain, the roof would be very large and would dominate the design.

The station's suburban setting suggested a gabled roof shape similar to the houses in the neighborhood. This type of roof was also very functional because it was the most efficient shape to collect and remove rainwater. Another advantage to the gable shape was the opportunity to design a simple roof structure that was dramatically light and open.

Steel was the desired structural material for a gable roof and for the various bridge spans and the bus transfer facility cantilevers. We were stymied, however, because the fire code stipulated that a supporting steel structure along the exit route from the train platforms to the exit portals must be protected with a rated covering to protect the steel from the heat of a possible fire. This stipulation was brought about because of the possibility of a train car entering and remaining in a station with its under-carriage ablaze. While this sort of fire is extremely rare, it has occurred in a number of transit systems so there was the possibility of it happening again. The resulting heat and smoke from such a fire could interfere with safe exciting.

Most recently constructed rapid transit stations have been concrete structures. Concrete automatically solves the fire code problem but limits design options. But rather than abandon the idea of an exposed steel system too quickly, we decided to make an effort to determine if there was some way to satisfy the rating provision without covering the steel with a bulky cladding.

Here our experience in designing an earlier MARTA station, the Civic Center Station, was very useful. The program for that station called for it to span Interstates 75 and 85 in downtown Atlanta and to support West Peachtree Street on the roof. Because of limited space, five steel Vierendeel type trusses were chosen for the span. This type truss allowed the train platform to be placed inside the structure freeing the limited height space for station use. To satisfy the fire code, the steel was covered with precast concrete on the exterior and ceramic tile on the interior.

Our research into use of uncovered steel for the Lakewood/Ft. McPherson station led us to representatives of The Bethlehem Steel Corporation who gave us a booklet entitled "Fire Experience and Exposure in Fixed Guideway Transit Systems" prepared by the American Iron and Steel Institute. This booklet, dated December 1980, addressed the issue of steel framed rapid transit stations. The conclusion, based on a study of existing transit systems, was that stations with a minimum of 25% open area on all sides and using heavy rolled steel supporting sections have a minimal or nonexistent fire risk factor.

Armed with this data and with the support of the MARTA A & E staffs, a presentation was made to the City of Atlanta's Fire Marshall. The Fire Marshall agreed with our position that because the structure was over 50% open that it was technically not really a building and therefore outside the parameters of the code.

(In 1983, The National Fire Protection Association adopted the NFPA 130 code which allows open steel construction for fixed non-combustible guideway transit systems in stations with a minimum of 25% open space on all sides and using heavy rolled-steel sections for supporting structure.)

Our final design for the station consisted of a series of gable roofs supported by light steel trusses similar to those in 19th Century European train sheds. Working with the engineers, the mechanical and electrical elements such as electrical conduits, drain pipes, gutters, escalators, lighting fixtures, TV cameras, lightning arrestors, communication cables, speakers and an assortment of other miscellaneous items were carefully organized and laid out on the architectural drawings. The result is an exhibition of the workings of a modern rapid transit station, visible to the thousands of passengers moving through the station each day.

The only other concern expressed about the use of steel was about the painting. All station materials were selected on the basis of being maintenance free for the longest time. Brick paving, porcelain panels, and ceramic tile were all selected for this reason. All exposed steel was specified to receive three coats of factory applied paint, consisting of two undercoats of epoxy and a top coat of urethane giving the finish a fifteen-year life span.

All of the station elements were color coordinated to allow each to be distinguished separately while showing each's relationship to the whole. The result is a festival of colors taken from the neighborhood—a red roof, cream brick, and blue panels.

The station was bid in at $10,200,000, 30% below its $15,000,00 budget and was constructed on schedule. □

Architect
M. Garland Reynolds
Atlanta, Georgia

Section Designers
The DeLeuw Cather Company, Consulting Engineers in association with Ewell W. Finley, P.C. Consulting Engineers

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Federal Express Headquarters: Expressions in Steel!

Fast tracking with steel proved to be very successful for Federal Express Corporation in the construction of its 65-ft high, 172,000 sq ft primary sort facility in Memphis, Tenn. Because of the tremendous growth in the volume of its business, the company's management determined late in 1983 that the new sort facility must be in operation by late fall 1984. Using routine construction methods, the facility could have been completed in about one and one-half years. However, by using a fast-track schedule, completion seemed possible in less than a year. This became the goal for Federal Express' project manager, Robert W. Shafer, the A/E team and the contractor.

Primary Sort Facility—fast-tracking and steel framing (above) on Federal Express' new Memphis facilities made early occupancy a reality. Nearly completed structure is shown below.

Primary Sort Building

Ground was broken on Feb. 1, 1984, and the building enclosed and sorting equipment installed by the first of June. Substantial completion was achieved by the end of October—a period of only nine months.

The job was complicated by a major drainage creek that cut through the site. The creek was replaced with four 14-ft x 14-ft box culverts during construction of the new sort building. In spite of this obstacle, the team brought the project in on time and under budget on a very compressed fast-track schedule—a feat that could not have been achieved without the extensive use of steel.

The success of this project was due to several factors, one being the cooperation and communication among FEC management, architect, engineers and contractor, all of whom had fast-track experience. Together, these team participants were able to coordinate the many overlapping tasks involved in this large, complex project.

Another key factor was the thorough building design developed by the owner and the A/E team. The project encountered change orders totaling about 10% of the initial costs, far below the 20% to 30% common in a project of this magni-

Customer Call Center—construction met seismic Zone 3 standards with K-bracing (Module J).

tude. There was also a very rapid turnaround of the more than 300 steel shop drawings traveling between Memphis and the Atlanta steel fabricator. This shop drawing process allowed the design to be verified and modified as needed while auger-cast piles were being drilled.

A critical factor in meeting the occupancy date was the unanimous decision to go with a steel structure rather than other materials—such as pre-cast or poured-in-place concrete—to achieve the greatest results through fast tracking. Steel provided the required flexibility for design changes to the building shell during actual construction, while plans for the sorting system were still being finalized.

In addition to the obvious advantages of using steel for fast tracking, there were other specific requirements by the owner for which a steel structure was the best solution. The new sort building was to be attached to an existing sort building. Consequently, columns could not be larger than 14 in. by 16 in. at their base and had to accommodate the exact spacing of the existing package sort system. Because of the height involved, the long spans and large loads, a standard column was not available, so box columns were used.

The size and design of columns permitted elimination of three-fourths of the number of columns that would normally be needed in a building of comparable size. The net gain has been more available floor space without sacrificing the ability to carry the large live loads.

The use of steel is also advantageous for making future changes in the use of the building. All bracing members within the building are secured with bolted connections to allow quicker, easier and less expensive modifications and expansion. Such flexibility was a major requirement of the FEC management. Another concern was to reduce vibration by using heavy mass in support members. Plate girders are used because of the heavy load. To allow for expansion of sort equipment through attachment to the roof, every fifth joist was replaced with a steel beam.

Customer Call Center

Fast tracking and structural steel also proved successful in the construction of the Customer Service Center located near the Memphis International Airport. The three-story structure was constructed of brick veneer on steel and contains approximately 91,000 sq ft with a 270-ft by 90-ft interior core. It is the first building in an office park that will serve as the Federal Express' corporate headquarters. The office park will soon have 10 to 12 similar mid-rise office buildings.

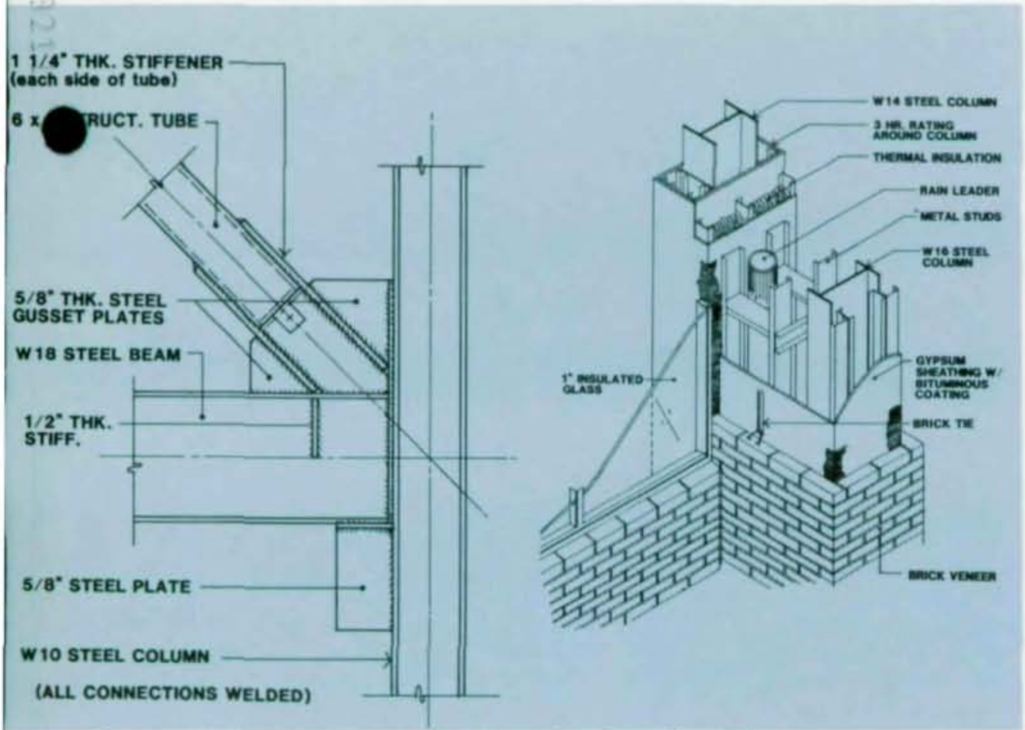
There were several reasons for fast tracking with steel on this project. The A/E team started working drawings in the summer of 1981 knowing that it was imperative the structure be substantially complete before winter. Deadlines involved with such a compressed schedule could not have been met without the use of structural steel. From a design point of view, steel columns reduced the total number required and thereby provided a more free area for interior spaces. The steel also proved to be economical. In the schematic phase, comparisons were made between steel-frame and poured-in-place concrete framing systems. The steel framing saved an estimated $100,000 plus.

One important factor involved in the decision to use steel was its ease in providing the desired seismic rating. Memphis, Tenn. is located near a major earthquake fault. Because the Memphis Service Center controls the package reservation activity for the central part of the nation, the FEC management considered its continued operation during an earthquake to be critical. They chose to design the structure to meet construction standards required in a seismic Zone 2. Further protection was provided for all mechanical and electrical systems, which were designed to meet the construction standards of seismic Zone 3. Extra bracing was added to all cable trays, ceilings and piping.

Steel was used in all major areas of the structural system. The floor system was constructed of 3-in., 20-ga. composite steel deck with 3-in. normal weight concrete slab on W18 stringers, 10-ft o.c., and W24 girders. The floor steel was cambered ½ in. to ¾ in. for dead load, resulting in a very level surface for setting furniture and free standing partitions. The roofing system consists of a 2½-in. composite slab, W16 stringers and W21 girders. Bracing for seismic loads was provided by welded rigid frames at perimeters and transverse K bracing. The foundation was constructed of shallow-spread footings on top of a 10 to 12-ft thick mat of over-excavated and recompacted earth fill. The fill was required because the building straddles a former drainage trough and fill area.

Flexibility for Expansion

A special feature of the building design is its flexibility to accommodate future modifications and expansion. The interior core area permits use of movable walls, open office panel systems, removable carpet tiles and an accessible ceiling. Another special feature is the passive solar design which incorporates daylighting of interior spaces on the north and south sides of the



Drawings show seismic bracing details at exterior column (l.) and pier isometric (r.) of Federal's Customer Call Center.

Customer Call Center was designed for maximum flexibility to meet future expansion needs. Steel framing pemits movable walls, open planning and accessible service systems.

Interior of massive Customer Call Building. This is first of series of buildings in complex, so use of steel-framed construction and exterior skin details are being studied extensively.

building. On the south windows a series of sun louvers block the summer sun but allows the winter sun to penetrate. The louvers also reflect daylight back into the building. Excessive heat buildup was minimized by limiting the openings in the east and west walls.

Because it was the first of a series of buildings to be constructed, the exterior skin and the framing were studied extensively. The construction schedule was carefully monitored to gauge the success of fast tracking with steel. This schedule went into effect with the approval of the schematic design by the FEC management on June 26, 1981. The foundation and structural steel design drawings were issued on August 17, 1981 and the structural frame erection was completed in December 1981, four months after bids were taken. The project had come in on time and under budget.

In this case, fast tracking with steel was put to the test—and came out a clear winner. □

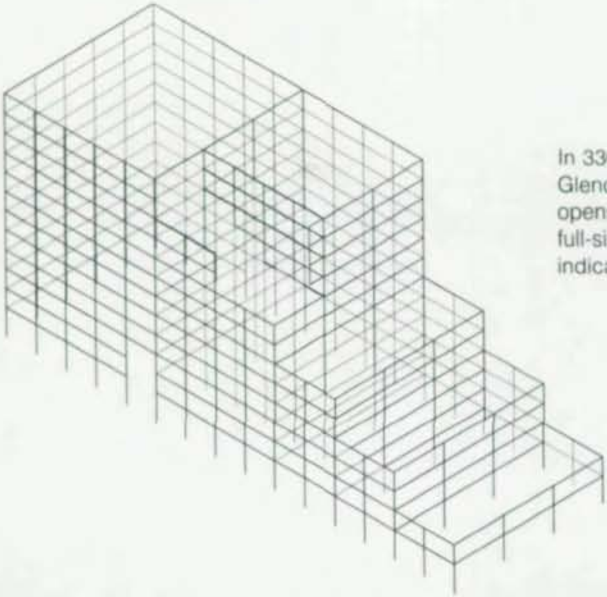
Architect (Primary Sort & Customer Center)
Lee Askew III Architects, Inc.
Memphis, Tennessee

Structural Engineers
Reaves & Sweeney, Inc. (Primary Sort Bldg.)
Memphis, Tennessee; and
Burr and Cole (Customer Service Center)
Memphis, Tennessee

Owner
Federal Express Corporation
Memphis, Tennessee

General Contractors
Starstone Construction (Primary Sort)
Memphis, Tennessee; and
Martin Cole Dando & Robertson (Customer Service Center)
Memphis, Tennessee

Steel Fabricator
Owen of Georgia, Inc.
Lawrenceville, Georgia



In 330 North Brand Building (below, l.), Glendale, Cal., three-story vaulted entry opens to plaza and garden with waterfall, full-size trees. Darker lines in drawing (l.) indicate setbacks.

330 North Brand Building: Strong Contribution to Downtown

by Marvin Taff and Andrew Cohen

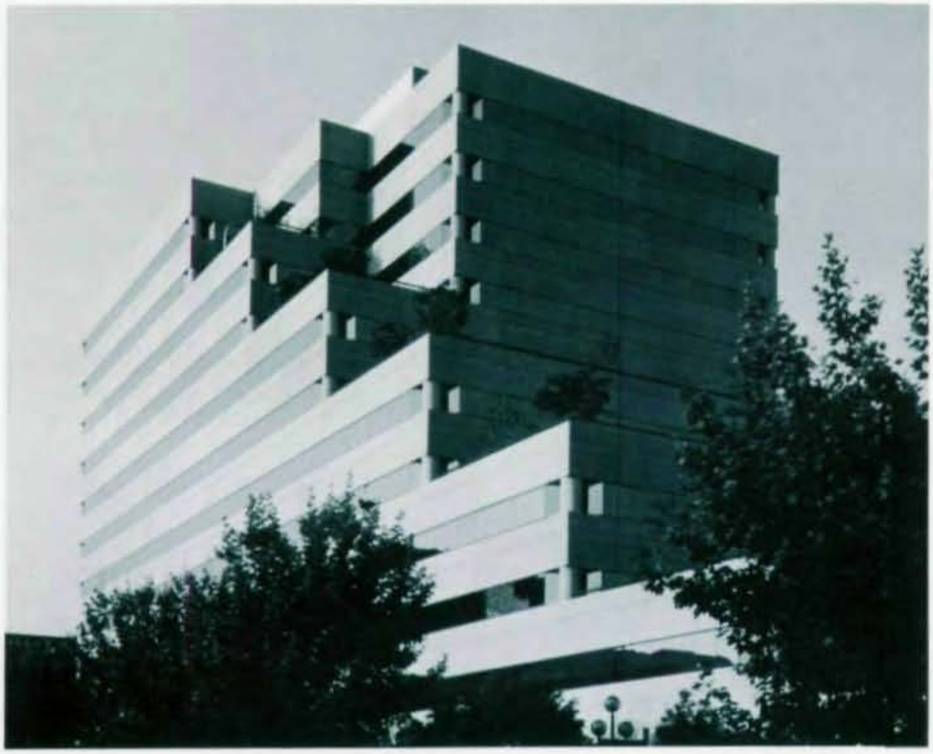
Marvin Taff is vice president, and *Andrew Cohen* is project engineer for Gensler and Associates/Architects, Los Angeles.

A major new mixed-use complex in downtown Glendale, Cal.—the 330 North Brand Building—combines two elements which often are at odds: a complex architectural design and low construction cost.

The dramatic stepped design with three-story galleria at ground level required solutions for a number of unusual architectural and structural elements. Close collaboration between the owner, engineers and the design team made it possible to build a complex 12-story structure for just $47 a sq ft, almost 10% below budget. The high quality of the building earned it the top award for a new commercial high-rise this year from the California State Building Officials.

The Building Design

The developer of the 330 North Brand Building approached us in 1982 to design an office building which would offer high quality office space in Glendale's redevelopment area, with a budget of just $16 million. The objective was to build an energy-efficient structure with a high ratio of leasable space to gross area. In addition, the ground floor was to be dedicated to a retail and restaurant area to serve as an important public amenity in downtown Glendale.



Brand Building (l.) steps down, with every floor of different design. Every other floor features large 25 × 115-ft terrace, fully landscaped. Highly efficient in weight, structure has perimeter ductile moment-reducing steel frame (r.).

A three-story vaulted entryway opens into a plaza and garden with full-size trees and waterfall, drawing pedestrians into an urban park setting with shops and restaurants. While the design is contemporary, certain elements were used to evoke the past, including a richly detailed ground floor facade. Columns recessed into niches frame display-type windows similar to traditional retail stores and relate the building to tree-lined Brand Boulevard with its smaller shops.

The design, stepped at every second floor, created a variety of tenant floor sizes and also helped to separate the building from future highrise development to the south. A major objective of the design planning was to create an efficient ratio of net to gross rental area. Larger populated floors were placed near the bottom, allowing five elevators to effectively serve a building normally requiring more. The basic single corridor design minimizes the amount of corridor committed to multi-tenant floors. And, larger floor areas yield a high ratio of usable space due to the inherent efficiency of large floor areas. This also accommodated the larger tenants anticipated in the Glendale market.

The building facade consists of articulated blue-gray precast concrete panels with blue/green reflected glass, designed to reflect colors of nearby mountains and sky. The glass cuts at a 45° angle at the corners to reveal massive concrete columns at the base. The ground floor precast work recalls classic columns and capitol architectural components.

The Steel-framed Structure

The design team worked closely with the structural engineer to solve a number of challenges posed by the unusual shape of the building. The building steps down in a longitudinal direction, with every floor a different design. Every other floor includes large set-back terraces (115 ft by 25 ft) with full landscaping, all elements that normally increase the weight of the building.

The structure's weight, however, was reduced to below average because of the three-dimensional dynamic earthquake analysis done. Teo Otova, the chief structural engineer, points out that although a dynamic analysis response was not required by the building code because the building is less than 160 ft high, such an analysis made it possible to bring in the tonnage below budget. The building, as a result, is highly efficient in weight at 13.5 psf, including connections.

The building is a perimeter ductile moment-reducing steel frame structure. High-strength steel was used for columns (Gr. 50) and girders (Gr. 36) while a composite beam design was used for floor members. A reinforced concrete ductile-resisting grade beam proved a unique foundation solution to reduce building drift, which contributes to the weight of the structural steel, by fixing the base of the steel frame.

The building required an intricate precast exterior skin with many shapes, recesses and offsets, the connections hidden to give it a sculpted look. Precast panels, designed and fabricated by Tecon, were then checked for seismic factors. Because the spans were quite long, connections were particularly critical, requiring careful structural design. Architecturally, the design team chose to expose columns on corners and then clad them in precast concrete. These corner columns are restrained by steel girders in two directions with ductile-moment connections. The moment frames are well planned to achieve the balance of the rigidity and the building dead load distribution.

The terraced areas of cantilevered steel frames covered with fiberglass also required careful structural design and support. A transfer moment frame was located at the border of the terraces which are heavily loaded with planters.

The Galleria

The ground floor galleria, 40 ft high with an arched ceiling, divides the building in half and creates vistas from the street through the building lobby to the waterfall. Because the lobby cuts directly through the building base, it required a design to ensure the structure would not be weakened. Ramez Nour, the structural engineer's principal in charge, worked with the architect in designing two connecting bridges at the second floor, suspended from the third floor, which serve as horizontal trusses. To achieve full ductility of the bridge structure, the horizontal truss is carried an extra bay inside the main building and ductile-moment connections used at all truss joints.

A major focal point for the galleria and an important architectural element is the 25-ft waterfall visible to passersby on the street. A large circle of patterned brick evokes the piazza while a restaurant and dining area next to the waterfall create a hidden park environment. The 35-ft free-standing structure was created from a 14-in. steel square tube which provides both vertical and lateral support. A three-dimensional computer analysis ensured its structural strength.

The Parking Structure

The adjacent parking structure with capacity for 1,000 vehicles features glass-enclosed elevators which pass behind the waterfall and become part of the artwork. The structure was constructed of prefabricated columns and beams with walls poured around them. We chose to pour most of the exterior walls in place with concrete painted to match the office building. Gridded concrete blocks were also used for a portion of exterior walls.

The recently completed 330 North Brand Building is now virtually fully occupied. Unique structural challenges were met by a successful team effort involving the architect, the structural engineer and the owner that produced a high quality mixed-use development that makes a strong contribution to Glendale's redevelopment. □

Architect
Gensler and Associates
Los Angeles, California

Structural Engineer
Cygna Consulting Engineers
Marina del Ray, California

General Contractor
Turner Construction Co.
Los Angeles, California

Owner
Cabot, Cabot & Forbes
Boston, Massachusetts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1985 AISC
Architecture Awards of Excellence

AISC honors 11 architects who designed the best of today's steel-framed buildings, as selected by a distinguished jury, at the industry's Fifth Annual Awards Banquet in Chicago on October 22.

Architect Mies van der Rohe predicted—way back in 1950—that when technology and architecture grow together they become so closely bound one seems almost the expression of the other. He says then, "We will have an architecture worthy of its name—architecture as a true symbol of our time."

The AAE Awards have traced the fulfillment of that prophecy. As we approach the second century of the steel-framed skyscraper, the 1985 award entries make it clear, as van der Rohe stated, "Technology is not only a useful means but . . . it has powerful form." His conclusion was, "Wherever technology reaches its real fulfillment, it transcends into architecture."

AISC salutes both technology and architecture at the prestigious Fifth Awards Banquet at Chicago's Westin Hotel. Guests of honor will be the architects who designed 11 of the best of today's steel-framed buildings, chosen from a field of 145 entries—"award-winning symbols of our time."

Award winners receive AISC's Kinkel Award—plaques adapted from the Joe Kinkel sculpture, "The Long Reach," on permanent display at AISC headquarters. The black-tie event honoring these winners has become a premier event for leaders in the construction industry—architects, engineers, contractors, steel fabricators and erectors, developers and suppliers. Next year's competition will feature the Prize Bridge Awards.

AAE award jury, hard at work choosing 11 winners from a field of 145 entries, included (l. to r.): R. Bruce Patty, principal in PBNA Architects and current president of AIA; James C. Allen, an architect and general manager-operations for Perkins & Will; George W. Qualls (seated), a principal in Geddes Brecher Qualls Cunningham; Dr. Charles H. Thornton, president of Lev Zetlin Associates; and Albert C. Martin, partner in Albert C. Martin Associates.

THE JURY OF AWARDS

JAMES C. ALLEN
General manager–operations, Perkins & Will
Chicago, Illinois

ALBERT C. MARTIN
Partner, Albert C. Martin Associates
Los Angeles, California

R. BRUCE PATTY
Principal, PBNA Architects, Inc.; and current president of AIA
Kansas City, Missouri

GEORGE W. QUALLS
Principal, Geddes Breacher Qualls Cunningham; and professor of Architecture, University of Pennsylvania
Philadelphia, Pennsylvania

DR. CHARLES H. THORNTON
President, Lev Zetlin Associates, Inc.
New York, New York

Joe Kinkel's "The Long Reach" sculpture

HOEKSTRA HOUSE

Homewood, Illinois

Jurors' comments: *"We are delighted to see modular housing alive and well . . . an incredibly simple, yet elegant, solution to a factory-built house."*

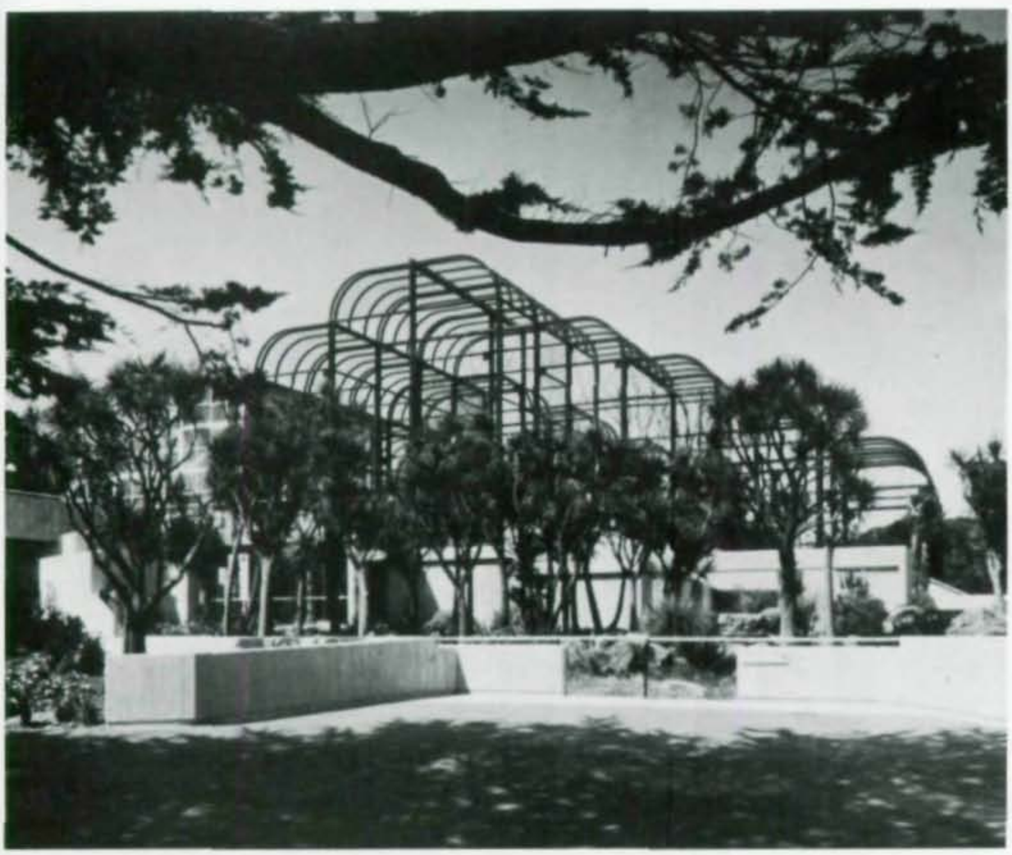
The home, a prototype for a low-budget modular steel house, was factory-made, and assembled at the site in one day. About 2,400 sq ft in floor area, the house consists of 11 10-ft × 9-ft × 24-ft steel boxes. The modules are flexible enough to be arranged in various configurations. Owners indicate the home performs well, and costs less than half the per sq ft cost of the average custom-designed home in the Chicago area.

Architect
David Hovey
Chicago, Illinois

Structural Engineer
Rittweger & Tokay, Inc.
Park Ridge, Illinois

General Contractor
Optima, Inc.
Chicago, Illinois

Owners
Douglas and Barbara Hoekstra
Homewood, Illinois



PRIMATE DISCOVERY HOUSE

San Francisco Zoo
San Francisco, California

Jurors' comments: *"We are impressed with the use of metal, and the consistency with which the arch-like forms, both glazed and open mesh, give the structure a distinct personality most appropriate to its function.*

The Primate Center, an entirely new concept in zoo exhibits, brings together a mix of animals, landscaped habitats, multi-level viewing areas and an interpretative center for educational purposes. The architectural treatment, with its mesh vaults and curved forms, provides space for animals and plants in an enclosed but "outdoor" environment.

Architect
Marquis Associates
San Francisco, California

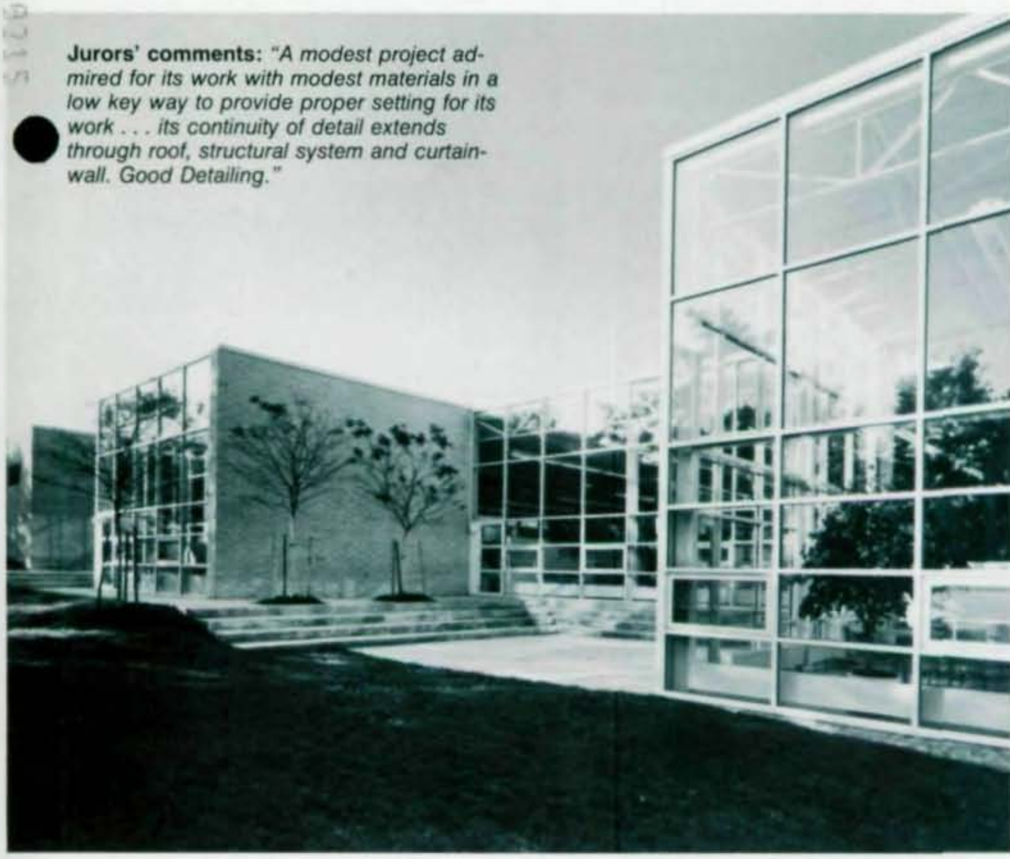
Structural Engineer
Rutherford & Chekene
San Francisco, California

General Contractor
Engstrum & Nourse
Mountain View, California

Steel Fabricators/Erectors
West Bay Steel, Menlo Park, California; and C.E. Toland & Son, San Francisco, California

Owner
San Francisco Zoological Society

Jurors' comments: *"A modest project admired for its work with modest materials in a low key way to provide proper setting for its work . . . its continuity of detail extends through roof, structural system and curtainwall. Good Detailing."*



ADULT TRAINING CENTER

Maple Heights, Ohio

The center, a workplace for 230 handicapped adults and 33 staff members, fosters an environment promoting development of work habits and constructive vocational and social skills. A structural steel frame was chosen for its economy and ease of construction. The system, designed to be exposed, insured detail and aided in space articulation.

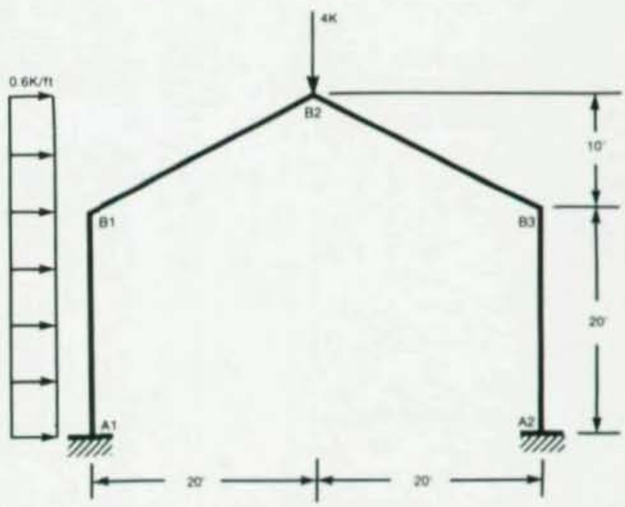
Architect
William A. Blunder
Robert A. Barclay Associates
Cleveland, Ohio

Structural Engineer
Chacos & Associates
Highland Heights, Ohio

General Contractor
Jance & Co.
Mentor, Ohio

Steel Fabricator/Erector
CLC Enterprises,
Mentor, Ohio

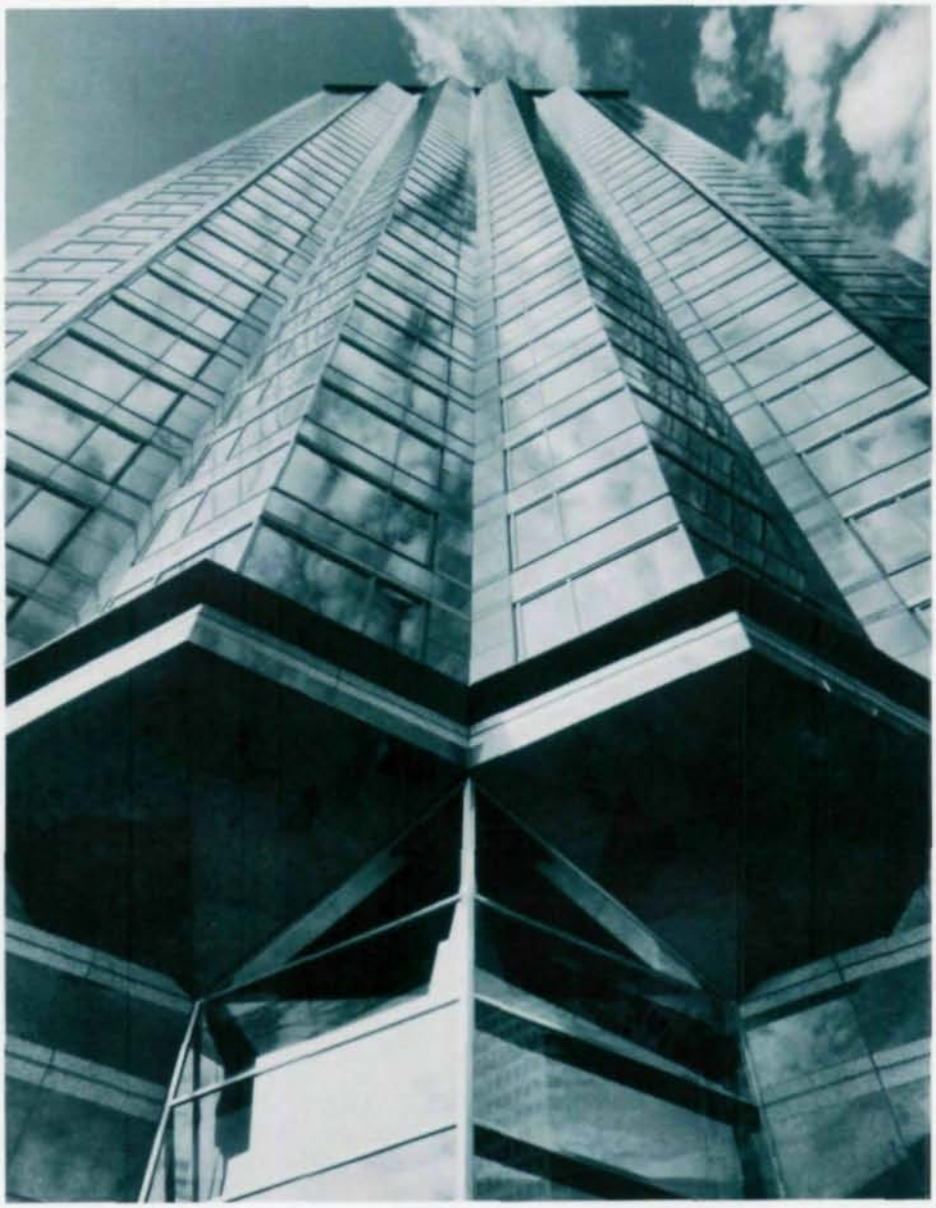
Owner
Cuyahoga Co. Board of Mental Retardation
Cleveland, Ohio



LTV CENTER

Dallas, Texas

Jurors' comments: *"This dominant building has a cohesion and a presence that goes well with its massiveness in the city . . . a building that changes the skyline and gives the city a new personality."*



LTV Center, the first commercial development in the Dallas Arts District, was designed to set the tone and quality of architecture to distinguish the 1.7-million sq ft project as an important cultural center. The tower's cruciform shape and classic composition enforce its position as the bell tower of the Arts District. Key issues in selecting a structural system centered on an ambitious schedule, cost, aesthetics and optimum tenant layouts. Ten structural systems were evaluated, and the building evolved into an all-steel structural framed tube on the perimeter and all interior framing of structural steel.

Architect/Structural Engineer
Skidmore, Owings & Merrill
Houston, Texas

General Contractor
Avery Mays Construction Co.
Dallas, Texas

Steel Fabricator
Flint Steel Corporation
Oklahoma City, Oklahoma

Steel Erector
American Bridge Div., USS Corp.
Pittsburgh, Pennsylvania

Owner
Trammell Crow Company
Dallas, Texas

CROCKER CENTER
San Francisco, California

Juror's comments: ***"Developing new space next to old was beautifully handled with a long atrium . . . skin of building fits well into environment . . . tube makes sense, but exterior was made more appealing."***

The new 38-story chamferred tower provides 959,000 sq ft of office space for Crocker Bank's new headquarters and other tenants. Accommodating the original bank and the 111 Sutter Building, it retains the historical significance of the financial district. The structural system is welded ductile moment-resisting, space-framed tube on the exterior, with 36-in. deep wide-flange sections on columns and spandrel beams for seismic loadings.

Architect/Structural Engineer
Skidmore, Owings & Merrill
San Francisco, California

General Contractor
Dinwiddie Construction Co.
San Francisco, California

Steel Fabricator/Erector
The Herrick Corporation
Hayward, California

Owner
Crocker Properties
San Francisco, California

TRANSCO TOWER

Houston, Texas

Jurors' comments: *"This building is certainly first rank . . . it has dignity, yet is active . . . a building of great class and quality . . . very elegant."*

The tallest building outside a central business district in the U.S., this 901-ft high Galleria area office building features multiple setbacks at 15-ft intervals on five floors. The steel frame with an exterior tube design has columns on 15-ft o.c. Corner columns were excluded so spandral beams run diagonally to reduce shear lag.

Architects
John Burgee Architects
New York, New York; and
Morris/Aubry Architects
Houston, Texas

Structural Engineer
CBM Engineers, Inc.
Houston, Texas

General Contractor
J.A. Jones Construction Co.
Dallas, Texas

Steel Fabricator
Mosher Steel Company
Houston, Texas

Steel Erector
Peterson Brothers Steel Erection Co.
Houston, Texas

Owner
Gerald D. Hines Interests
Houston, Texas

CIGNA SOUTH BUILDING

Bloomfield, Connecticut

Jurors' comments: *"We admired the building for its consistency of design in both architecture and furnishings . . . sits gracefully in countryside . . . a comfortable place to work."*

The architect was called upon to design a building that was cost effective, enduring and economical—with a priority on expressing human scale, light and openness. The design philosophy combines the functional and energy efficiency with aesthetic value in a four-story central atrium that floods the structure with light. Steel framing permits flexibility of office layout, with areas of 20 to 30,000 sq ft possible, to support a 125% annual relocation rate. Welded pipe trusses span the 75-ft wide atrium, a major design feature.

Architect
The Architects Collaborative
Cambridge, Massachusetts

Structural Engineer
LeMessurier Associates, Inc.
Cambridge, Massachusetts

Construction Manager
Turner Construction Co.
Boston, Massachusetts

Steel Fabricator/Erector
The Berlin Steel Construction Company
Berlin, Connecticut

Owner
CIGNA Corporation
Hartford, Connecticut

JOHN A. SIBLEY HORTICULTURAL CENTER

Pine Mountain, Georgia

Jurors' comments: *"We favor its design because of its easy relationship with a natural setting . . . very clean and straightforward . . . very low-key and sensitive to its planning . . . color of weathering steel is nice, and natural."*

The garden complex, begun in 1940's, is to preserve, in a natural setting, the plant life of the Southeast. It is part of a long-range plan to expand the center's educational mission and promote gardening concepts for visitors. A structural grid of small steel bays maintain an intimate scale with the exterior. Weathering steel tubes were selected for the primary structure to permit it to recede visually and provide a permanent brown patina to blend with floral displays.

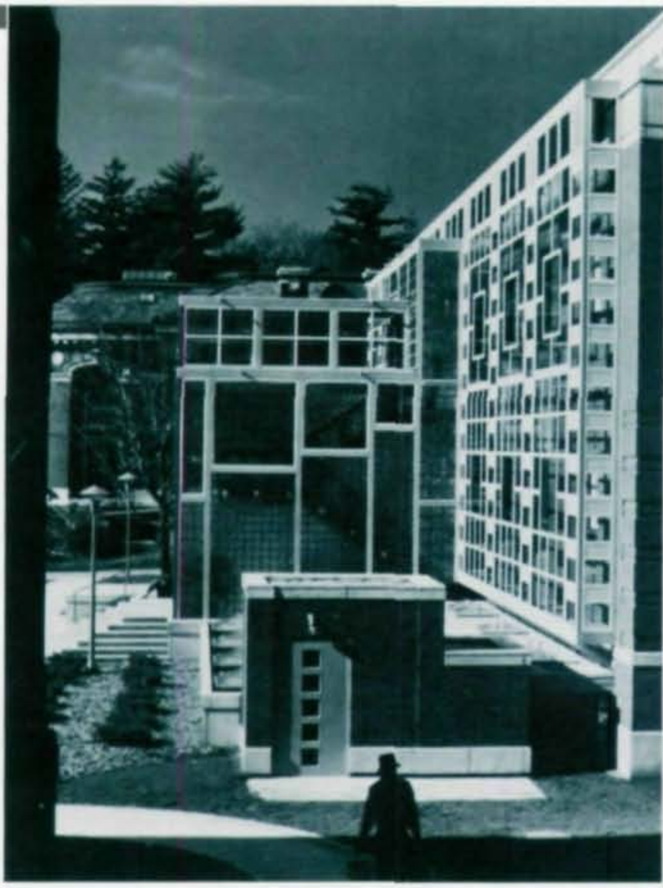
Architect
Craig, Gaulden & Davis
Greenville, South Carolina

Structural Engineer
Horst Berger Partners
New York, New York

General Contractor
West Point Construction Co.
West Point, Georgia

Qualico Steel Co., Inc.
Webb, Alabama

Owner
Ida Cason Callaway Foundation
Pine Mountain, Georgia



VASSAR'S SEELEY G. MUDD CHEMISTRY BUILDING

Poughkeepsie, New York

Jurors' comments: *"One of the more striking entries because of its human scale . . . a presence on the campus in relation to other buildings . . . excellent detailing."*

Designed as a free-standing chemistry building for undergraduates and faculty research, Vassar's new structure includes two floors of labs with flexible bench design. Another floor houses the library, lounge and classrooms. Sited due south, the building uses both active and passive solar strategies: collectors on the roof, and a modified trombe wall which interacts with the mechanical system to provide heating.

Architect
Perry-Dean-Rogers & Partners
Boston, Massachusetts

Structural Engineer
Zaldastini Associates
Boston, Massachusetts

General Contractor
W.J. Barney Corporation
New York, New York

Owner
Vassar College
Poughkeepsie, New York

NEW BOGARDUS BUILDING

New York, New York

Jurors' comments: *"A good companion to older loft buildings . . . with a festive quality that fits its location . . . the curtainwall could only be executed in steel."*

Interestingly, this building is not a direct reproduction, but a new version of one existing in the 19th Century—a good companion to the adjoining loft buildings. It takes the typical cast iron details of an 1850's structure by Architect James Bogardus and replaces it in today's material—steel—the only material that could replicate the curtainwall.

Architect
Beyer Blinder Belle
New York, New York

Structural Engineer
Stanley H. Goldstein
New York, New York

General Contractor
Gramercy Contractors, Inc.
New York, New York

Steel Fabricator
Harris Structural Steel Company, Inc.
South Plainfield, New Jersey

Owner
South Street Seaport Corp.
New York, New York

HUNTINGTON CENTER

Columbus, Ohio

Jurors' comments: *"We were impressed by its genuine functional punctuation—four atriums—to break down the building's scale . . . the longer spans are expressed differently and come through as distinct structural elements."*

The Center, developed for the Huntington National Bank, both reinforces and complements Capitol Square near Ohio's state house. Two slender towers, linked by a transparent, multi-atrium pillar, align in elegant symmetry and both planes the east-west axi to that of the capital rotunda. Structural studies resulted in the choice of structural steel to provide symmetrical towers with sawtooth floor configurations, and satisfied the desire for maximum flexibility in floor planning.

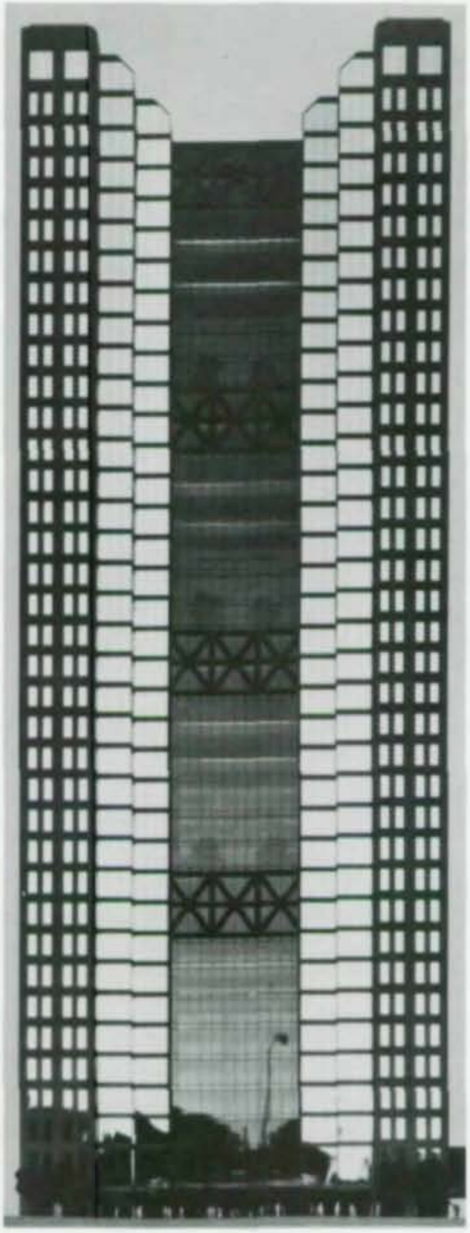
Architect/Structural Engineer
Skidmore, Owings & Merrill
Chicago, Illinois

General Contractor
Dugan & Meyers Construction
Cincinnati, Ohio

Steel Fabricator
Southern Ohio Fabricators, Inc.
Cincinnati, Ohio

Steel Erector
John F. Beasley Construction Co.
Columbus, Ohio

Owner
Gerald D. Hines Interests
Houston, Texas



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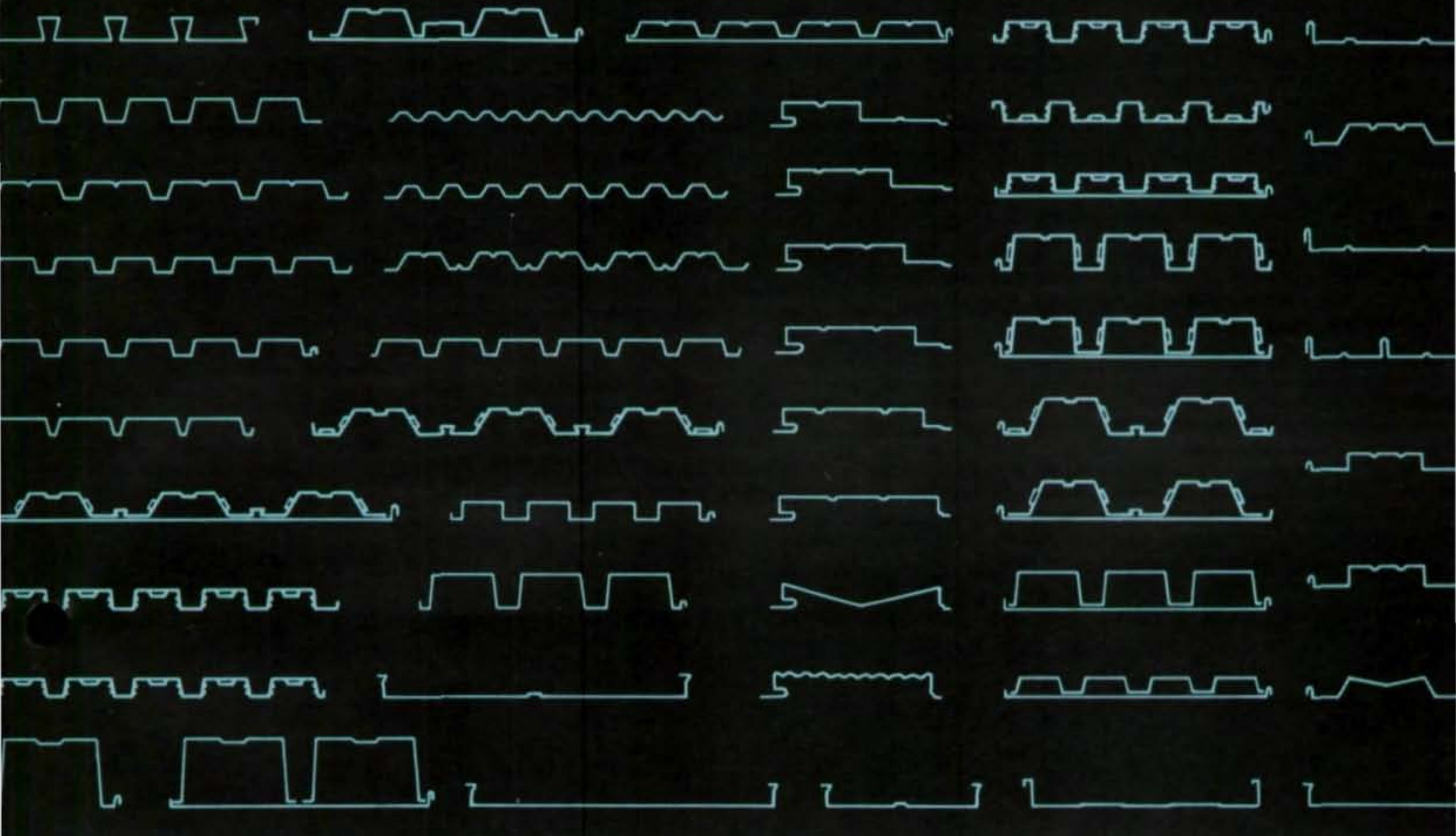

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