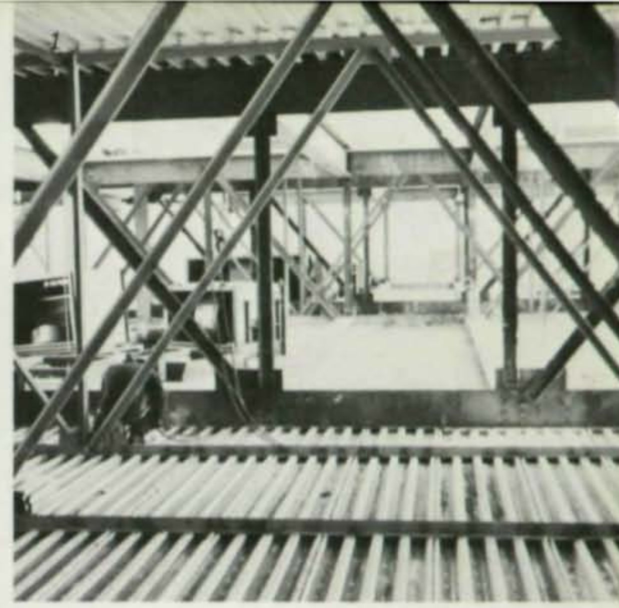
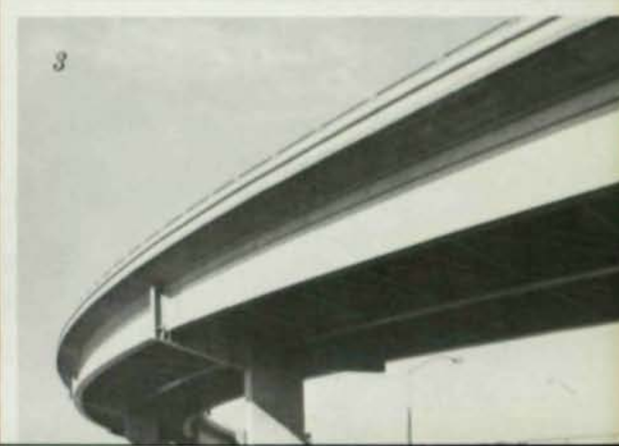
VOLUME XIII / NUMBER 3 / THIRD QUARTER 1973

MODERN STEEL CONSTRUCTION





MODERN STEEL CONSTRUCTION

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CONTENTS

THE FOURTH ANNUAL T.R. HIGGINS LECTURESHIP AWARD

The 1974 T. R. Higgins Lectureship Award has been announced nationally to educators, engineers, and architects. Named in honor of the former AISC Director of Engineering and Research, the Award recognizes the author of the technical paper judged to have made the most significant contribution to engineering literature on fabricated structural steel.

The Award-winning paper will be selected by a jury of six eminent educators, designers, and industry representatives.

They are:

Glen V. Berg *University of Michigan*
Egor P. Popov *University of California, Berkeley*
Stanley D. Lindsey *Stanley D. Lindsey & Associates*
Robert D. Vanderlyn *Baker-Wibberley & Associates*
Robert D. Paterson *Vermont Structural Steel Corp.*
John F. W. Koch *International Steel Company*

The Award winner will be announced on February 5, 1974. Presentation of an engraved certificate and a $2,000 honorarium will be made at the 1974 AISC National Engineering Conference in Chicago, where an oral review of the prize-winning paper will be presented by the author.

THE TWELFTH ANNUAL FELLOWSHIP AWARDS

The deadline for entries to AISC's 1974 Fellowship Awards Program is February 11, 1974. These awards serve to encourage expertise in the creative use of fabricated structural steel.

Four $2,500 fellowship awards will be granted to senior or graduate students enrolled in a structural engineering program at an accredited engineering institution. Additionally, the head of the department where each Fellow will undertake his study will receive a further grant of $500 for unrestricted general administrative use.

Students interested should contact the Education Committee, AISC, 101 Park Avenue, New York, N.Y. 10017 for the Rules and Instructions for Applicants.

Architect-Engineer:
Hoyle, Doran and Berry, Inc.
Boston, Mass.

General Contractor:
Vappi & Co., Inc.
Cambridge, Mass.

Steel Fabricator:
Bethlehem Steel Corporation
Bethlehem, Pa.

A New BEACON on the Hill

Use of steel for the framework of the 22-story John W. McCormack State Office Building, recently erected on Beacon Hill, is resulting in a considerable dollar savings to Massachusetts taxpayers.

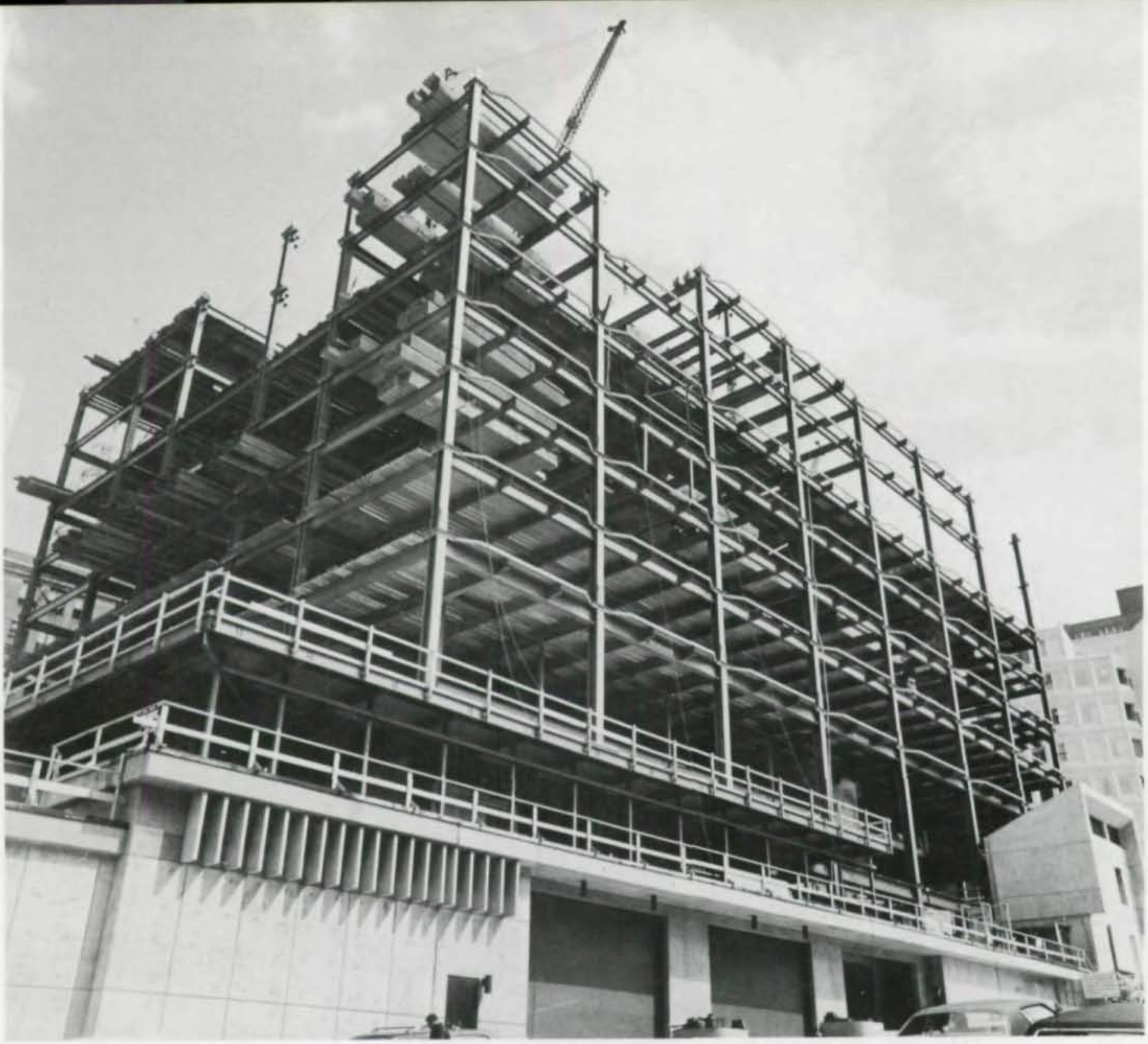
The $25-million structure is being built for the Commonwealth of Massachusetts, Government Center Commission, adjacent to the State House. Partners Austin J. Cribbin, Jr. and Nisso T. Aladjem of Hoyle, Doran and Berry, Inc., Boston architect-engineer for the project, explain:

"The structural steel — in order to gain time — was let as a separate contract about four to five months before the general construction contract was awarded.

"This was possible since we previously designed a newly completed 465-car, 4-level underground garage at the site with provision for steel erection from its roof when the time came. As a result, we could help the state save about five months on the overhead of the general contractor— and realize the use of the high-rise structure perhaps three to four months sooner.

"When you consider that the average rental cost of office space in the Boston area runs about $9 per sq ft (ranging roughly between $7.50 to $12.00 per sq ft of space) any time saved in getting into this 650,000-sq ft office structure can be very valuable to the taxpayers. Now that's a real plus for steel."

The 136-ft by 216-ft by 318-ft-high structure will use 6,100 tons of structural steel shapes and plates.



The John McCormack State Office Building has realized savings in time and money by selecting structural steel.

Structural Steel

Columns for the first three stories are made of high strength A588 steel (50,000 psi yield strength). Some of these columns weigh as much as 735 psf. Above the third story, the framework is A36 steel.

Because of an earth fault that exists in the Boston area, the structural framework is designed for Zone Two seismic conditions. Essentially, it is a moment-connected frame rigid in both directions. A490 high-strength bolts have been used for connections in the lower areas, while upper frame areas are connected by A325 bolts.

Typical bays are 30 ft, except for two at 20 ft each. (The 30-ft bays carry through to the garage columns, which were designed to provide adequate space for vehicles. The column-carrying foundation system in the garage area consists essentially of 6-ft stripped footing mats — similar to spread footings.)

The floor system utilizes a blend of cellular composite steel deck. Basic floor live loads are designed at a relatively high 70 psf (plus 25 psf for partitions) because many of the state offices keep heavy files and records.

Floor-to-ceiling height typically is 8 ft-9 in., while basic roof live load is equivalent to about 80 psf. The roof live load is high because of a 15-ton window washing machine that will move around the roof when required. In fact, it would be possible to land a helicopter on the roof, if necessary, according to the architect-engineer.

Fire Protection

Applicable building code for the structure is BOCA and the state code. Type 1A fire-resistant construction (four hours for columns, three hours for floors) is used throughout.

Guy A. Carbone, Chief Engineer of the Government Center Commission notes:

"Of prime importance during the design of the building was the safety and comfort of its future occupants. As a result of our concern, we incorporated into the structure a prototype advanced system for smoke evacuation and other safety measures."

Ceiling mounted ionization-type smoke detectors are strategically located on each floor throughout the building, according to Mr. Carbone. These firestats and smoke detectors, when activated, automatically and immediately start a smoke evacuation system, identify and annunciate the location of the detector activated, notify the Capitol Police, and summon the Boston Fire Department. This is all done simultaneously.

Because the building is 22 stories and will house approximately 3,000 occupants when it is operational, the chief engineer said that the entire building will not be evacuated when an alarm is sounded.

Instead, a visual and audio alarm will be set off automatically on the involved floor and the floor directly above the floor involved. At that time, preassigned fire marshals and/or their back-up personnel on the affected floors will initiate a predetermined procedure leading the occupants on those floors to safety.

When the firefighters arrive, designated Fire Department officials will assume command and, in conjunction with the Capitol Police, may selectively evacuate further areas of the building or the entire building by sounding appropriate alarms and giving instructions over a public address system installed throughout the building. A central control station is located in the Capitol Police headquarters. This station will be the nerve center when emergencies arise.

Mr. Carbone adds that "Naturally, we are concerned with panic by occupants should a fire emergency occur. Accordingly, we have made extensive arrangements for two-way communication between the central console, located in the Capitol Police area of the building, and the fire pump room and firefighters at standpipe connections at each floor. Fast and accurate information will be disseminated to the firefighters and the occupants of the building."

The smoke evacuation system is generally comprised of large fans which supply air to the floor involved and the floors directly above and below the involved floor. Exhaust fans remove harmful air and smoke from these three floors. A minimum of 30 air changes per hour will be simultaneously exhausted from all corridors on these three floors. In addition, smoke is evacuated from all stairwells, creating a sheltered route for movement of occupants.

Also, elevators will be controlled from a central control switch and selectively operated. There is no danger of elevators automatically stopping on floors involved in a fire. According to Mr. Carbone, the entire system is "fail safe" and can be run on emergency power.

Sprinklers, while not provided throughout the building, are located in designated areas. Provisions also are made for future connections to the sprinkler standpipes at each floor. Two 1,000-GPM fire pumps serve the building, each connected to an emergency power system.

Other Features

The new John W. McCormack building has been completely designed to accommodate the needs of the handicapped, many of whom are employed by the Commonwealth. For example, for the blind there will be braille-designated buttons on the elevators and special knurled doorknobs on doors leading to dangerous areas. Ramps and prudently located electrical devices will be installed for occupants in wheelchairs. Special drinking fountains, flashing lights, and buzzers will also assist the handicapped.

"As for the exterior of the structure," notes Mr. Carbone, "we tried to construct the building to blend harmoniously with the very sensitive surrounding area, which includes Beacon Hill and the State House. For this and other reasons, we limited the height of the building to approximate the height of pre-existing surrounding buildings.

"The architect has designed a facade of bronze-tinted glass, highlighted by warm precast concrete column covers comprised of a carefully blended amount of white cement with pink granite and quartz aggregates."

Occupancy is scheduled for early in 1975.

A588 steel was used for columns in the first three stories. The framework for the upper stories is A36 steel.

Inverted Pyramid for Florida Pier

Architect:
Harvard & Jolly, AIA
St. Petersburg, Fla.

Structural Engineer:
Erwin Reiss
St. Petersburg, Fla.

General Contractor:
Batson-Cook Co.
Jacksonville, Florida

St. Petersburg's "Million Dollar Pier" is coming to life again via a municipal pier complex. Situated at the edge of a pier, and extending into the waters of Tampa Bay, the main building — a new landmark — provides a terminus for the street approach from city to to bay, and at the same time maintains an openness at the end of the pier for viewing the water and the cityscape.

Reversed Pyramid

This unusual building has five levels open to the public. The design keeps the main pier open with the smallest space of 60 ft square at the base of the project; each successive floor expands in a "reversed pyramid" form to produce the greatest floor area, 150 ft square at the top of the building, without obstructing the lower level pier area.

On the first level a glassed-in lobby area is centered with a two-story "rain curtain" fountain related to the second level by a large circular opening. The second level will be used for exhibitions, art shows, and small receptions.

The multi-purpose third level has 10,000 sq ft of floor space that can be subdivided into several small meeting rooms or opened up for large meetings. A stage, along with portable seating arrangements, could convert the space into an auditorium, or the area can be used as a dance floor.

A restaurant, cocktail lounge and banquet room, with a seating capacity of 600, comprises the fourth level, taking advantage of the excellent view of the city and the sea from the higher elevation.

The fifth level is sun deck, promenade, and glass enclosed observation deck. The roof deck is designed to be covered in a future expansion, retaining a 15-ft promenade for observation on the perimeter. Mechanical equipment takes up the entire sixth level.

Structural Design

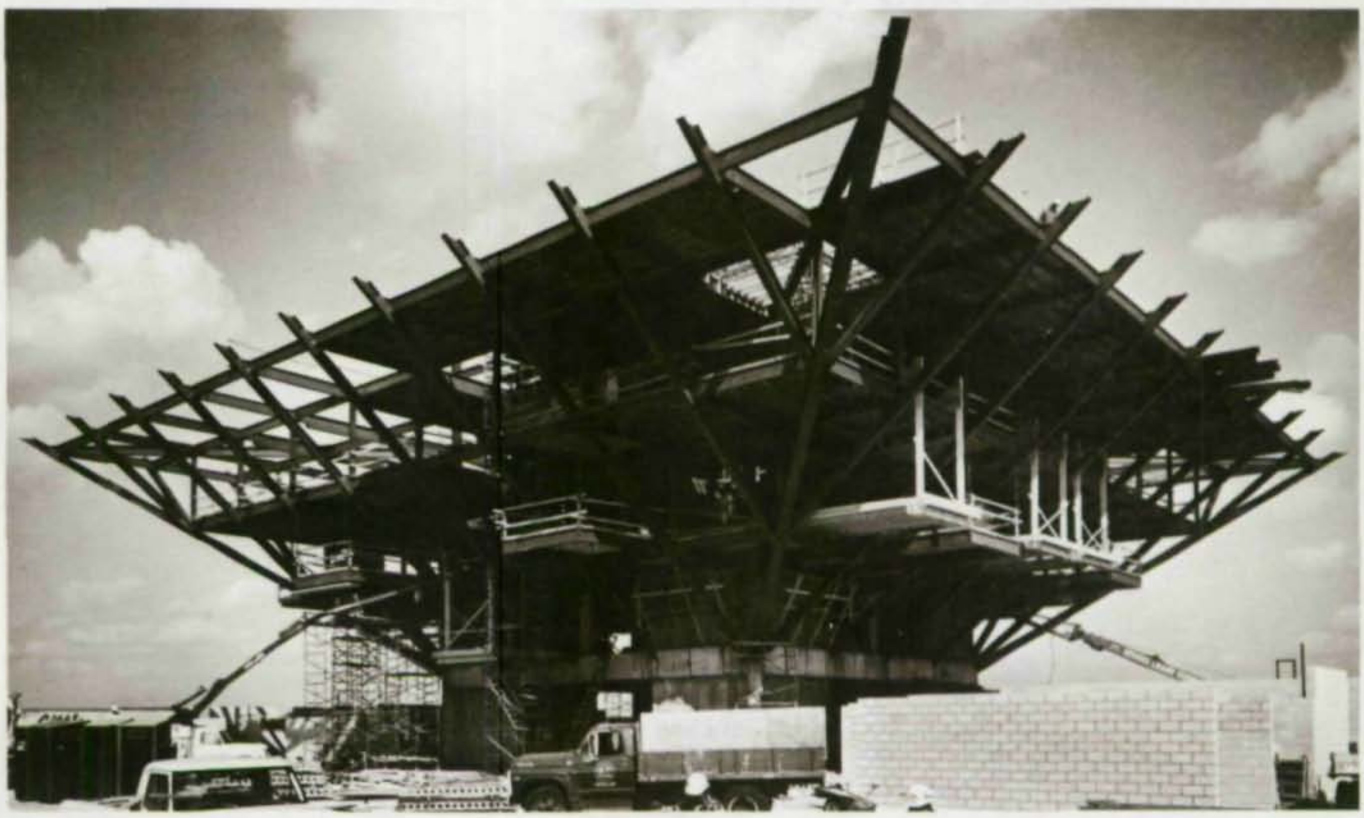
Surrounding the main structure are six one-story buildings housing specialty shops. These create interesting landscaped malls, courts, and exterior spaces well scaled to the pedestrian.

Architectural considerations dictated a 15-ft grid module with uniform fixed vertical heights. This required careful coordination with the structural and mechanical designs. A two-way continuous floor system was selected; the deep beams required for the system permitted the more than 200 penetrations required for the high velocity air conditioning ducts, as well as other horizontal piping.

To facilitate erection, stubs of the diagonal strut members were shop welded to the horizontal framing. The remainder of the diagonal strut members were then field welded to the stubs using splice plates. The corner diagonals support as much as 500 tons. The all-welded structural frame was X-ray and ultrasonic tested. All structural steel was A572. The structure is designed for the hurricane and wind loads of the coastal area.

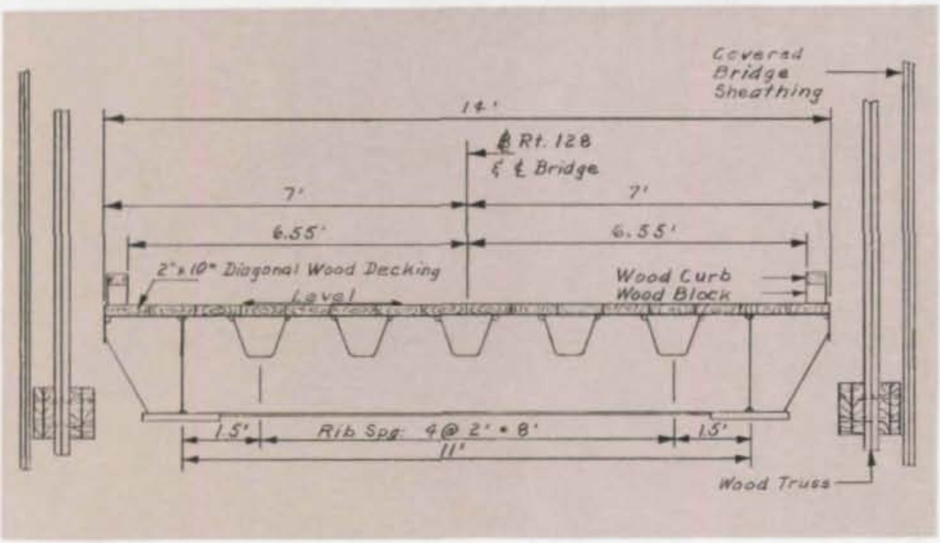
The corner diagonals support up to a 500 ton load.

The "reversed pyramid" shape produces a floor area of 150 ft square at the top of the building.



A BRIDGE WITHIN A BRIDGE

by Robert F. Victor and Ciprian A. Pauroso



Interior, underside, and cross-sectional views of the restored covered bridge over the Housatonic River, Conn.

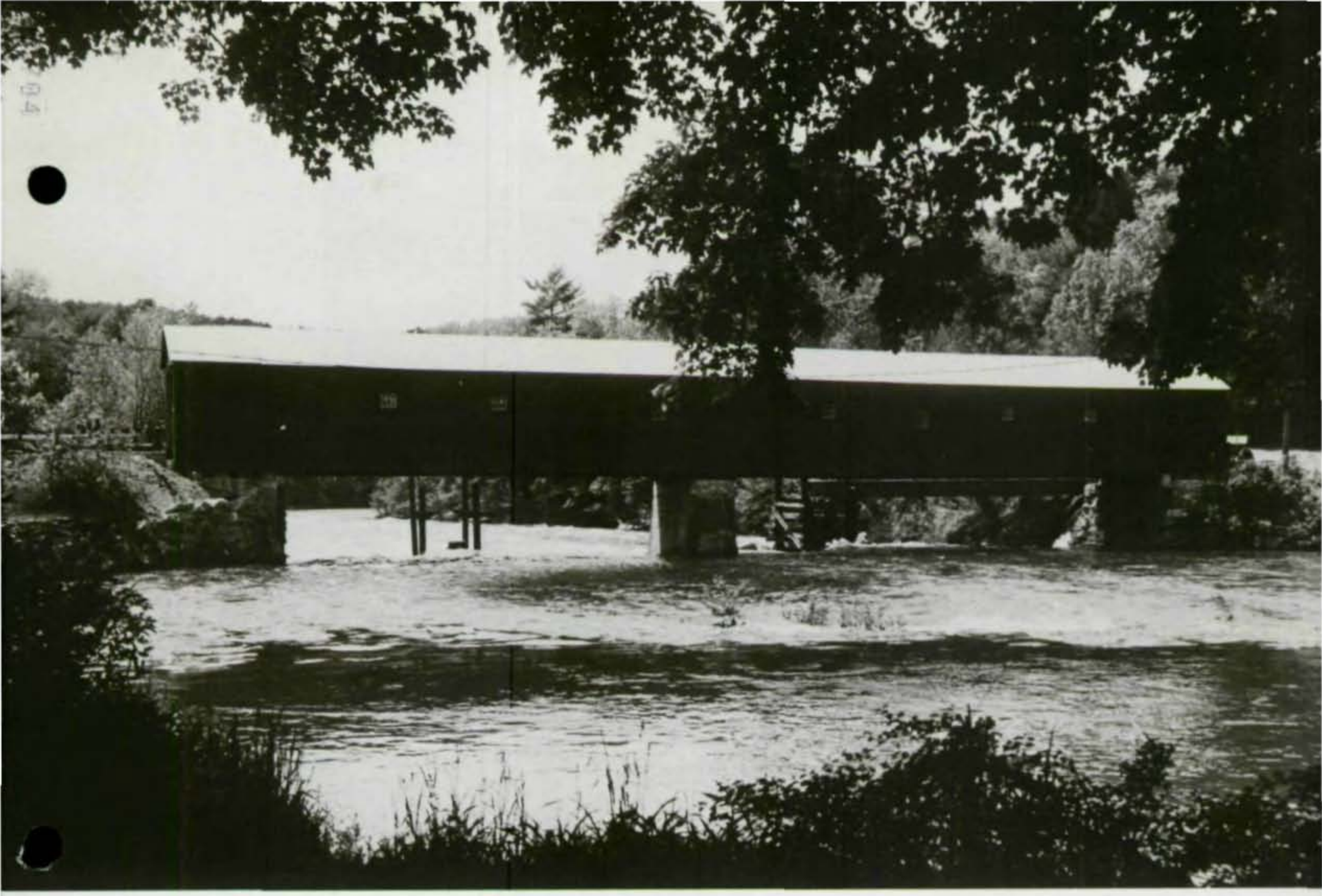
Restoration of the 132-year-old covered bridge over the Housatonic River between Sharon and Cornwall on Connecticut Route 128 involved unusual and complex construction. A major part of the construction called for an orthotropic steel deck bridge.

The plans for restoring the span grew out of opposition by local residents to original plans of the Connecticut Department of Transportation to build a new multimillion dollar bridge and only retain the existing bridge for historical purposes. The old bridge had a load limit of only four tons. These plans were subsequently dropped and state engineers worked cooperatively with local officials and interested citizens to develop the mutually accepted design which preserved the covered bridge and made it fully serviceable for traffic.

The heart of the construction that makes this a modern load-carrying bridge is the separate orthotropic steel deck bridge enclosed within the old structure. The orthotropic deck is composed of thin, high-strength steel plates welded together to form a complete one-piece bridge deck. The new orthotropic bridge, not attached to the trusses of the old structure, supports itself and vehicular loads independently. The old structure now just supports itself. This "bridge within a bridge," one of the few orthotropic bridges constructed in the United States, is probably the first ever built inside a covered bridge.

To work on the covered bridge, a temporary 200-ft one-way bridge was built on the south side of the present bridge. This allowed the covered bridge to be closed to traffic and restoration to take place. The floor of the old bridge was removed. The old bridge was jacked up off the existing substructure to a new permanent elevation two feet higher to protect it

Mr. Victor is Senior Highway Engineer, Connecticut Dept. of Transportation, Bureau of Highways, Bridge Design Section, Wethersfield, Conn.
Mr. Pauroso is AISC Regional Engineer in Hartford, Conn.



from future flood waters. Also new abutments inside the old were built to support the orthotropic bridge.

The deck plate of the orthotropic bridge is ⅜-in. thick (based on L/300 deflection criteria between rib walls) and 14 ft wide. The bridge has 5 ribs at 2 ft o.c. Brake press formed, the ribs are 9-in. deep, 5/16-in. thick, 6.5-in. and 12.12-in. wide at the bottom and top respectively, and are trapezoidal in shape. The ribs are joined to the deck plate by 80 percent penetration groove welds.

The two main girders are 11 ft apart and each consists of an 1¼" x 18" bottom flange plate and ⅜" x 22" web, fillet welded to the deck plate. Two edge plates (⅜" x 6") are welded to each edge of the deck plate by partial penetration groove welds.

The bridge is two-span continuous (93' - 75' spans) with each end cantilevered out from the bearings to form a total deck length of 172.55 ft. In the longer span, floor beams are 15.5 ft o.c.; in the shorter span 15 ft o.c. A ½" x 6" bottom flange and a ⅜" x 22" web (castellated to tightly fit around the ribs) form the floor beams which are fillet welded to the deck plate and ribs. The web is fillet welded directly to the girder webs and the bottom flange is butt welded to the girder bottom flange. Trapezoidal plates (⅜" x 22" deep) stiffen the deck plate outside the floor beams.

At each end of the bridge, the ribs are seal welded to the last floor beam. Trapezoidal plates (⅜" x 22") support the end of the deck plate. An edge plate is welded to the end of the deck plate.

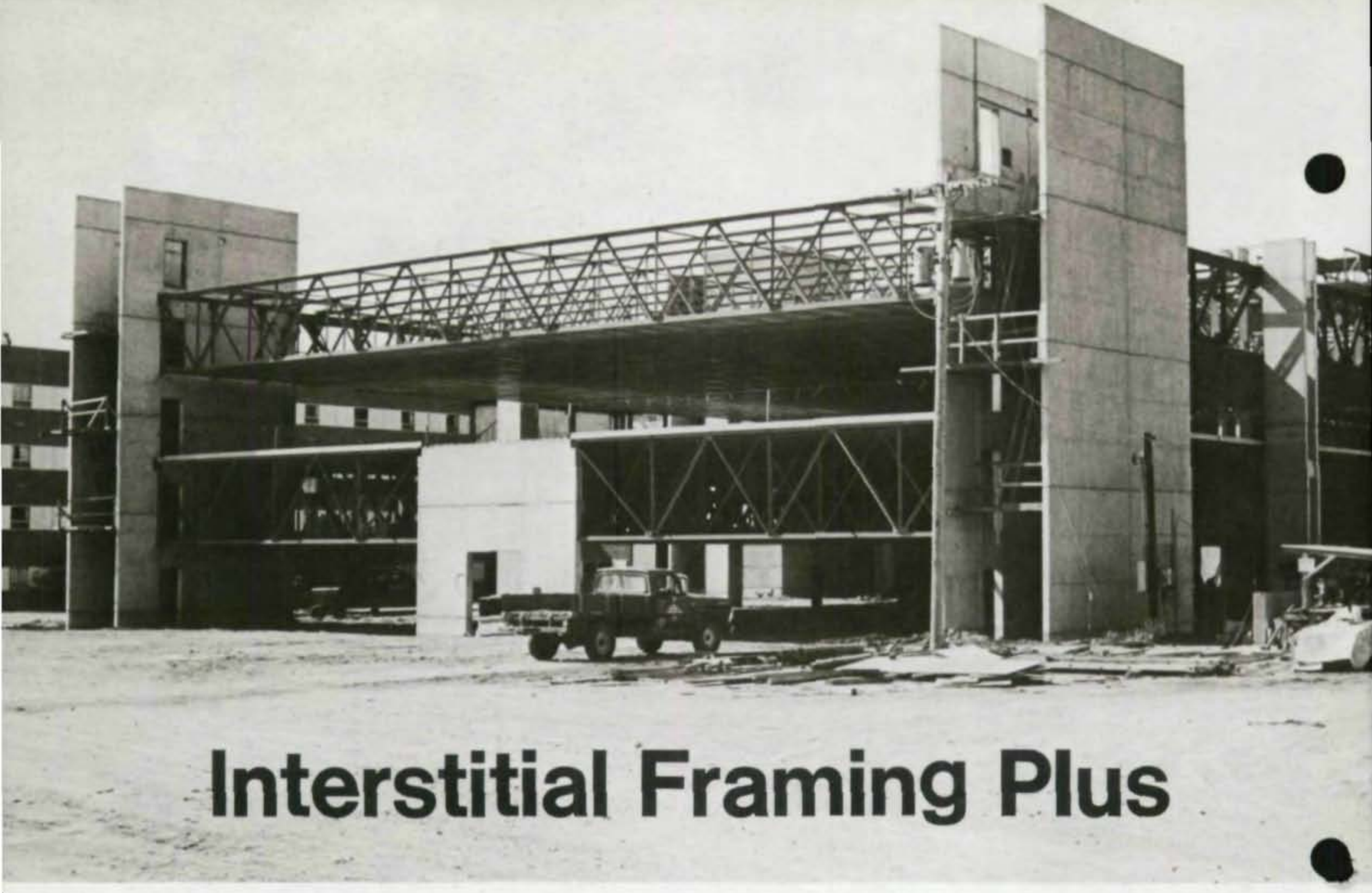
All steel is A588. A protective coating system was used on top of the deck plate under the wooden decking. A four-coat system was used: a weldable, pre-construction, inorganic zinc primer, an inorganic zinc prime coat, and two topcoats of a high-build winter grade epoxy polyamide.

The prefabricated steel bridge was brought to the bridge site in three full width (14 ft) sections of 61, 61, and 50.5 ft. These sections were joined with two full width splices using a combination of welding the deck plate and high-strength bolting the ribs and main girders. After making the splices, the new steel deck bridge was pulled from one bank to the other, as was done with the original covered bridge.

To put the finishing touches on the bridge, a diagonal plank wooden floor was bolted to the steel deck with threaded welded studs. Wood curbing was installed and the interior whitewashed to complete the inside work. Outside, the roof was reshingled with white cedar shingles and the siding was painted barn red.

Designer:
Connecticut Dept. of Transportation
Bureau of Highways
Bridge Design Section
Wethersfield, Conn.

General Contractor:
De Fonce Construction Corp.
Bridgeport, Conn.



Interstitial Framing Plus

by Dennis Brizee, AIA

Versatility of the interstitial framing concept can be seen in the new addition to a Tucson, Ariz., hospital. After studying existing interstitial designed hospitals, the architects came up with a different approach to the design, at no additional cost.

Generally, the interstitial system consists of a series of primary trusses or load bearing walls, which support a secondary joist system. The mechanical and electrical equipment, along with service catwalks, are usually housed in this space in existing interstitial hospitals, often restricting mobility within the interstitial area.

The new system at St. Joseph's Hospital comprises a corrugated metal deck, covered with insulating lightweight concrete fill, which spans between the bottom chords of the trusses to create a total working/maintenance floor. Top and bottom chords of the trusses are completely stayed laterally by the steel deck, with only temporary bridging required during erection.

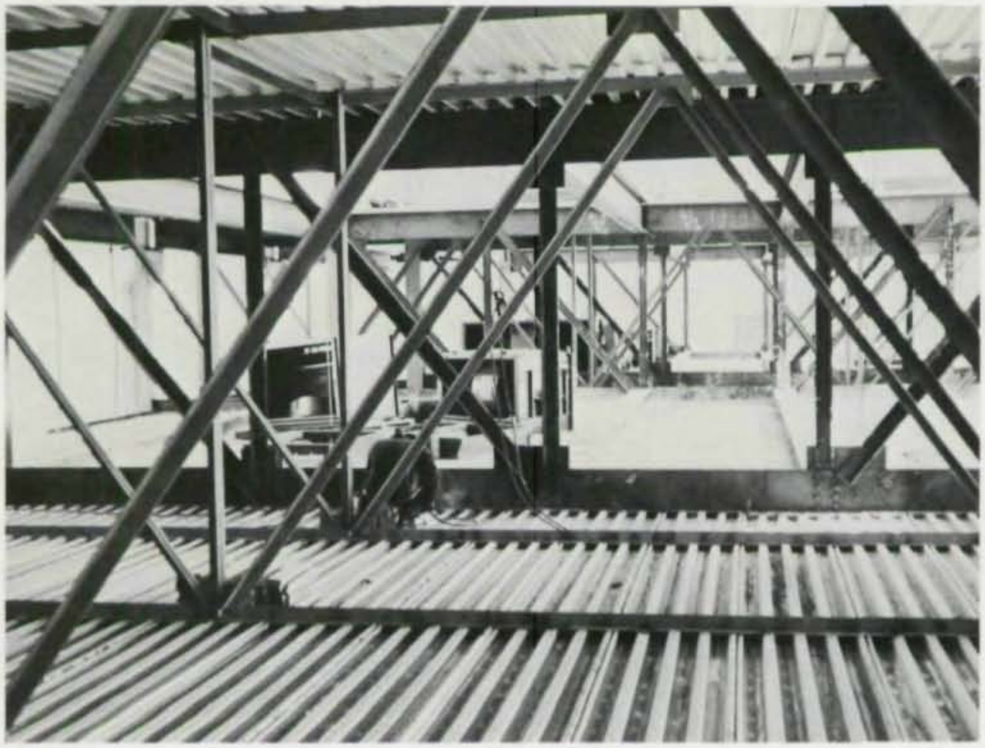
This new approach offers features not found in hospitals first using the interstitial system, yet costs the same as the conventional interstitial design.

Because the interstitial floor with its lightweight insulating concrete/metal deck is a fireproofing membrane, fire sprinklers, normally required in the interstitial space, are not necessary; neither was fireproofing of the trusses. One of the hazards of the catwalk system is the noise level made by workmen in the interstitial space and transmitted to patient areas below. The insultating metal deck in the new system acts as a buffer to keep the noise level to a minimum.

To provide large open spaces for future flexibility requires long spans and minimum use of interior columns, but reduces the framing needed to effectively support lateral loads produced by wind and earthquake forces. Resistance to lateral forces was therefore provided by diaphragm action of the floor structure spanning between reinforced concrete shear walls located at either end of the building. The public areas, not encompassing the interstitial space floor, have 3-in. deep V-shaped metal decking topped with a 4½-in. concrete surface. This typical floor system acts as a supported horizontal beam (diaphragm), spanning 290 ft between vertical shear walls that cantilever from the foundations. Gravity loads are transmitted from the trusses to the precast concrete columns through corbels cast integrally with the columns. Lateral loads are transmitted from the floor decks to the columns and shear walls by studded wall plates and edge angles with field welded connections.

C-shaped columns carry all conduit and pipe between the various floors of the hospital. These concrete columns are accessible from the exterior by hinged metal door units, while the interior side of the column or the web of the channel unit has openings into the interstitial space at each level by conventional metal doors.

Mr. Brizee is senior vice president in the firm of Wliiam Wilde and Associates, Inc., Architects, Tucson, Ariz.



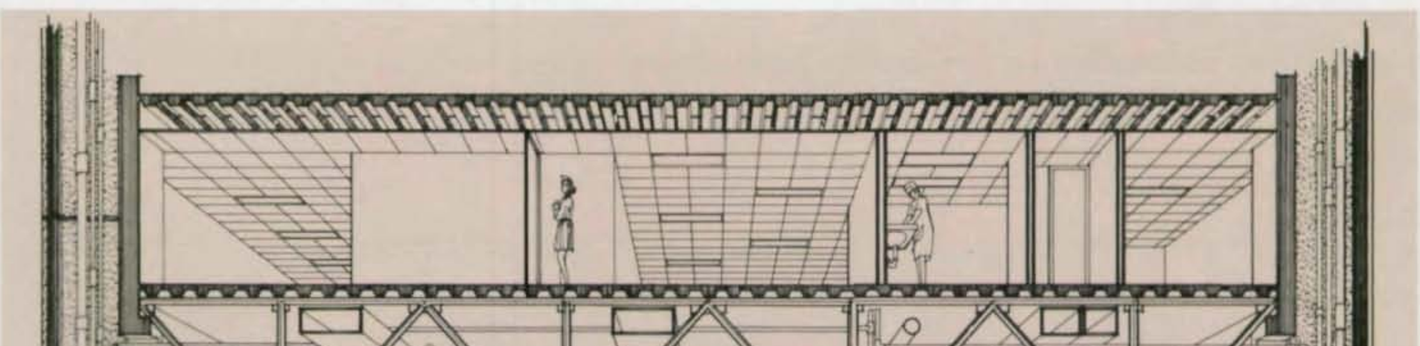
A corrugated metal deck spans between the bottom chords of the trusses to create a working maintenance floor.

Architects:
William Wilde and Associates, Inc.
Tucson, Ariz. and Los Angeles, Calif.

Structural Engineer:
Morris Self
Gainesville, Fla.

General Contractor:
M. M. Sundt Construction Co.
Tucson, Ariz.

Steel Fabricator:
Robberson Steel Company
Oklahoma City, Okla.



Partial perspective of structural system, St. Joseph's Hospital.

PRIZE BRIDGES OF 1973

PRIZE BRIDGE 1973 — LONG SPAN

Atchafalaya River Bridge
Simmesport, La.

Designer: Modjeski and Masters
Owner: Louisiana Dept. of Highways
General Contractors:
Superstructure: John F. Beasley Construction Company
Substructure: Massman Construction Company
Fabricator: Vincennes Steel Corporation, Division of NOVO Corporation
Erector: John F. Beasley Construction Company

PRIZE BRIDGE 1973 — MEDIUM SPAN, LOW CLEARANCE

Railway Bridge, LL Line Over N. P. Ry. & LD 5 Line
Woodland, Wash.

Designer: Washington State Highway Commission
Architectural Consultant: Edward J. Green, AIA
Owner: State of Washington
General Contractor: Peter Kiewit Sons' Co.
Fabricator: Isaacson Structural Steel Company, Division of Isaacson Corporation
Erector: Peter Kiewit Sons' Co.

PRIZE BRIDGE 1973 — SHORT SPAN

Hatfield Bridge
Hatfield, Wisc.

Designer: Owen Ayers & Associates
Owner: Jackson County Highway Dept.
General Contractor: Lunda Construction Company
Fabricator: Phoenix Steel Corporation
Erector: Lunda Construction Company

PRIZE BRIDGE 1973 — HIGHWAY GRADE SEPARATION

Glen Lily Road No. 2 Over Green River Parkway
Bowling Green, Ky.

Designer: Kroboth Engineers, Inc.
Owner: Commonwealth of Kentucky, Dept. of Transportation
General Contractor: Peter Kiewit Sons' Co.
Fabricator: Peden Steel Company
Erector: Nashville Bridge Company

PRIZE BRIDGE 1973 — ELEVATED HIGHWAYS OR VIADUCTS

Latah Creek Bridge
Spokane, Wash.

Designer: Howard Needles Tammen & Bergendoff
Owner: Burlington Northern
General Contractor: Hensel Phelps Construction Company
Fabricator: Kansas City Structural Steel Co.
Erector: Don L. Cooney, Inc.

PRIZE BRIDGE 1973 — MOVABLE SPAN

Harvey Canal Bridge
Jefferson Parish, La.

Designer: de Lauréal Engineers, Inc.
Owner: Jefferson Parish, Dept. of Roads & Bridges
General Contractor: Boh Bros. Construction Co., Inc.
Fabricator/Erector: Bristol Steel & Iron Works, Inc.

PRIZE BRIDGE 1973 — SPECIAL PURPOSE

Pedestrian Overpass At Avenue Z
San Angelo, Tex.

Designer/Owner: Texas Highway Dept.
General Contractor: HCW Construction Co., Inc.
Fabricator: Robberson Steel Company
Erector: HCW Construction Co., Inc.

AWARD OF MERIT 1973 — LONG SPAN

Piscataqua River Bridge
Portsmouth, N. H. - Kittery, Me.

Designer: Hardesty & Hanover
Owners: State of Maine, Dept. of Transportation
State of New Hampshire, Dept. of Public Works & Highways
General Contractors: Bethlehem Steel Corporation
Cianbro Corporation
Fabricators: Bancroft & Martin Inc.
Bethlehem Steel Corporation
Erectors: Bethlehem Steel Corporation
Cianbro Corporation

AWARD OF MERIT 1973 — LONG SPAN

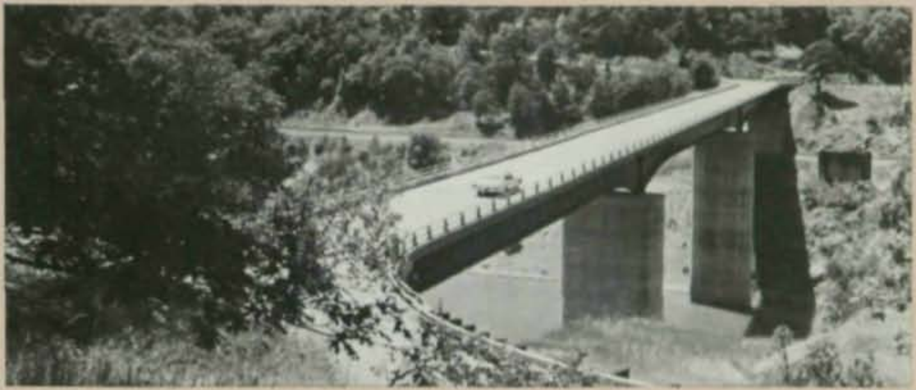
I-80 over Missouri River
Omaha, Neb. - Council Bluffs, Ia.

Designer: Howard Needles Tammen & Bergendoff
Owners: Iowa State Highway Commission
Nebraska Dept. of Roads
General Contractors:
Superstructure: Pittsburgh-Des Moines Steel Company
Substructure: Jensen Construction Company
Fabricator: Pittsburgh-Des Moines Steel Company
Erector: John F. Beasley Construction Company

AWARD OF MERIT 1973 — MEDIUM SPAN, HIGH CLEARANCE

Adlerpoint Bridge
Eel River at Alderpoint, Calif.

Designer/Owner: County of Humboldt, Dept. of Public Works
General Contractor: Lew Jones Construction Co.
Fabricator/Erector: Kaiser Steel Corporation



AWARD OF MERIT 1973 — MEDIUM SPAN, HIGH CLEARANCE

Green River Bridge
Henderson County, N. C.

Designer/Owner: North Carolina Dept. of Transportation
and Highway Safety
General Contractor: Wannamaker and Wells, Inc.
Fabricator/Erector: American Bridge Division, United States Steel

AWARD OF MERIT 1973 — MEDIUM SPAN, HIGH CLEARANCE

Missouri Highway 7
Over South Arm of Harry S. Truman Reservoir
Warsaw, Missouri

Designer: Harrington and Cortelyou, Consulting Engineers
Responsible Agency: U.S. Army Corps of Engineers,
Missouri River Division
Owner: Missouri State Highway Commission
General Contractor: Anderson Construction Company
Fabricator: Kansas City Structural Steel Co.
Erector: Anderson Construction Company

AWARD OF MERIT 1973 — MEDIUM SPAN, LOW CLEARANCE

Eagle River Bridges On I-70
West of Wolcott, Colo.

Designer/Owner: State of Colorado, Division of Highways
General Contractor: A. S. Horner Construction Co., Inc.
Fabricator: The Midwest Steel & Iron Works Co.
Erector: A. S. Horner Construction Co., Inc.

AWARD OF MERIT 1973 — HIGHWAY GRADE SEPARATION

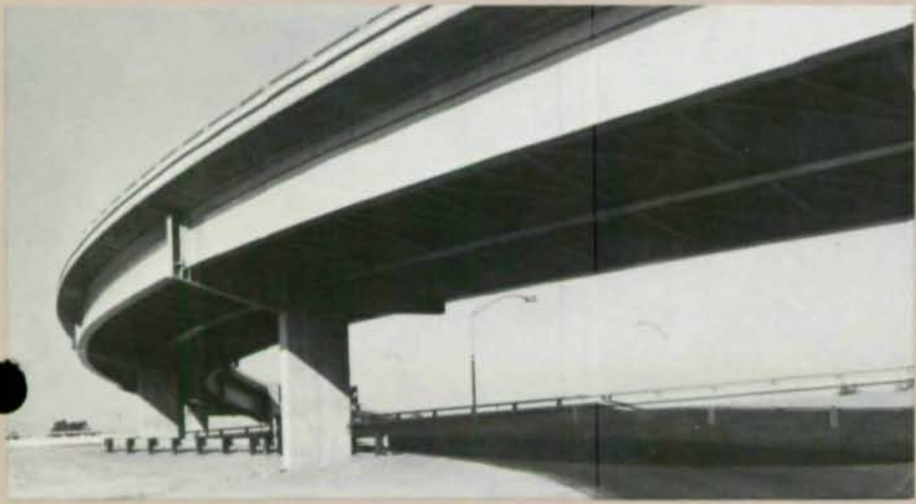
East Evergreen Interchange
West of Denver, Colo.

Designer/Owner: State of Colorado, Division of Highways
General Contractor: Northwestern Engineering Company
Fabricator: The Midwest Steel & Iron Works Co.
Erector: Northwestern Engineering Company

AWARD OF MERIT 1973 — HIGHWAY GRADE SEPARATION

Ridge Road Arch Over I-70
West of Frederick, Maryland

Designer: Green Associates, Inc.
Owner: Maryland Dept. of Transportation
General Contractor: C. William Hetzer, Inc.
Fabricator/Erector: Pittsburgh-Des Moines Steel Company



AWARD OF MERIT 1973 — ELEVATED HIGHWAYS OR VIADUCTS

West Connector Viaduct
San Jose, Calif.

Designer: California Division of Highways, Bridge Dept.
Owner: State of California
General Contractor: Lew Jones Construction Co.
Fabricator/Erector: Pittsburgh-Des Moines Steel Company

AMERICAN INSTITUTE OF STEEL CONSTRUCTION
101 Park Avenue • New York, New York 10017

Address Correction Requested

AWARD OF MERIT 1973 — SPECIAL PURPOSE
Pedestrian Bridge Over Wantagh State Parkway at Beltagh Avenue
Wantagh, New York
Designer: Andrews & Clark, Inc.
Owner: Long Island State Park and Recreation Commission
General Contractor: Horn Construction Co., Inc.
Fabricator: R & M Steel Corp.
Erector: Horn Construction Co., Inc.

AWARD OF MERIT 1973 — SPECIAL PURPOSE
Elevated PRT Guideway Over Monongahela Blvd.
Morgantown, W. Va.
Designer: Frederic R. Harris, Inc.
Sponsor: Urban Mass Transportation Administration
General Contractors: Trumbull Construction Company
Fabricator: The Allied Metals Company
Erector: Connell Steel Erectors