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MODERN STEEL CONSTRUCTION

NUMBER 1 • 1988

THIS ISSUE

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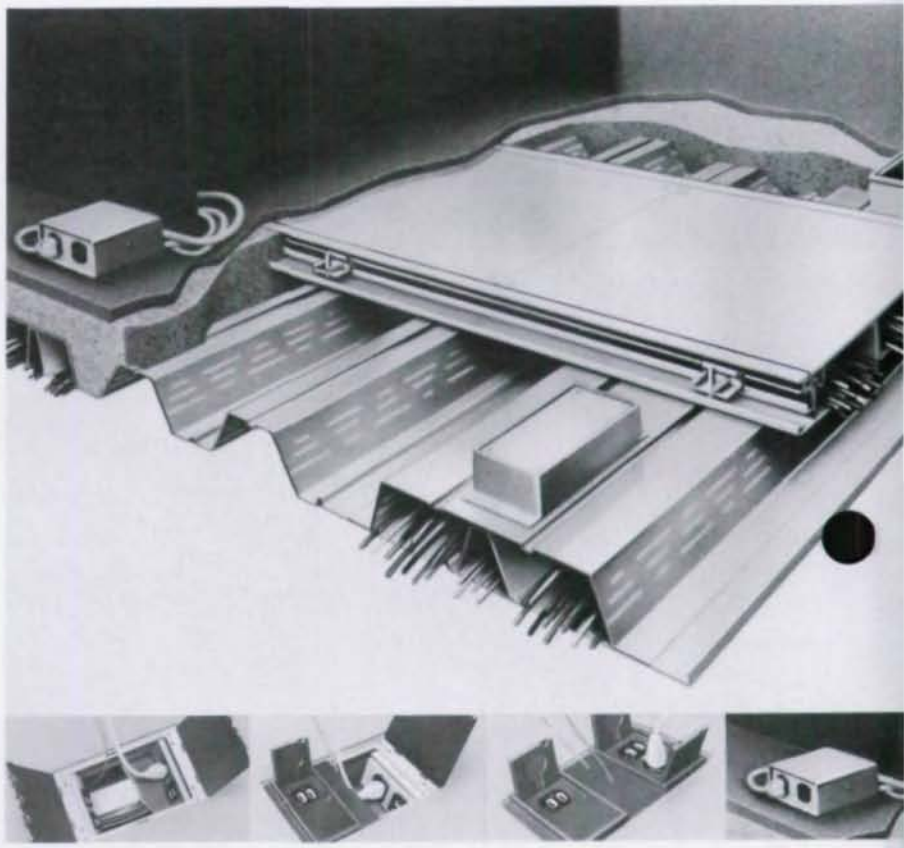

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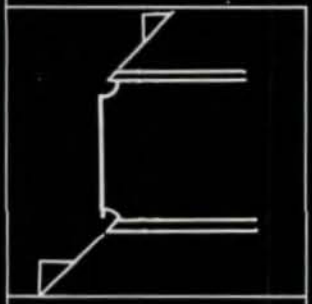
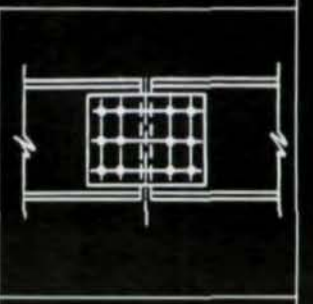
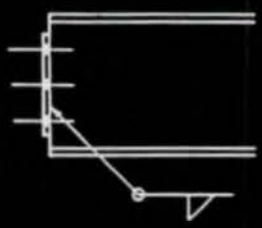


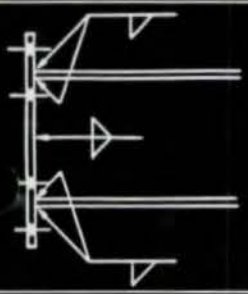


Computerized Detailing is a relatively inexpensive structural steel detailing program designed to run on the IBM-AT compatible computer systems. The system not only completes details, but also designs connections according to the A.I.S.C. specifications.

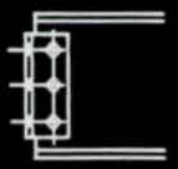
Computerized Detailing allows a multiple member input of material using a grid plan thereby allowing the operator to easily make global assignments of connections. **Computerized Detailing** can then produce an erection plan as well as detail the project as a total integrated unit.

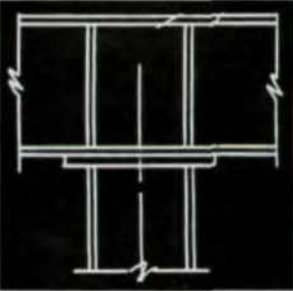


Computerized Detailing will handle wide flanges, channel, tube, pipe, angles, and plates. The design portion of the program investigates a wide variety of shop and/or field connections, that include combinations of bolted and/or welded, framed, cantilevers, knifed, end plate, stiffener and shear plates, moment connections, splice plates, tee connections, joist, joist girder, and one-sided connections. The design routines will also accommodate non-flush top beam framing, sloping beams, bracing, skewed beams, off column centerline framing (within limitations) and offset as well as opposite beam framing. An interface to Autocad graphics is available for additional special input.



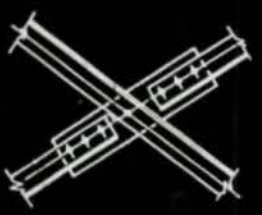
A complete bill of material, shop and field bolt summaries and drawing index is supplied.

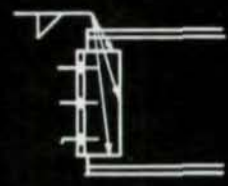




OVERALL VIEW UTILIZING DETAILING INTERFACES

By utilizing a standard IBM AT or 100% compatible one can draw the erection plan on the computer screen and automatically pass that information into **the Estimating** program, then by simply identifying the project a **Mill Order** can easily be developed based on preassigned values such as length desired, maximum weight, supplier, etc. The actual **Mill Order** can then be interfaced to the **Purchase Order/Inventory** system as being on order. Once the field and file use drawings are completed, by the Computerized Detailing Program, the **Detailing Interface** to **Production Control** allows the bill of material to be sorted into a cutting list by sequence, drawing number, main mark number, accessory piece, etc. The **Production Control/Multing/Inventory** interface then will look at your inventory and decide how to best utilize your inventory to minimize waste. In fact if you don't have enough material on order or in stock to fulfill the Bill of Material requirement, it will then decide how many additional pieces you need to purchase and how it should be cut. This information can then be passed to most shop **C.N.C. Equipment** automatically.





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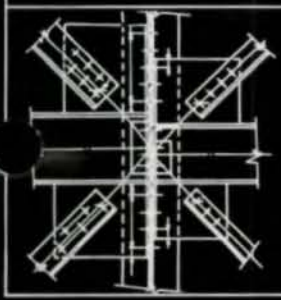

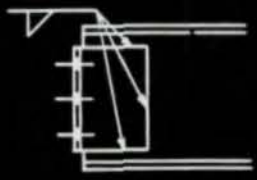

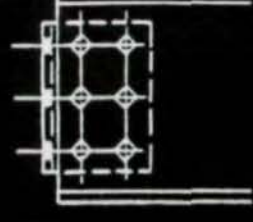

DETAILING INTERFACES: ESTIMATING – AUTO CAD – MILL ORDERS – PRODUCTION CONTROL – C.N.C. EQUIPMENT

MODERN STEEL CONSTRUCTION

VOLUME XXVIII • NUMBER 1
JANUARY-FEBRUARY 1988

American Institute of Steel Construction, Inc.

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ON OUR COVER:
Westside Terminal
Fargo, North Dakota

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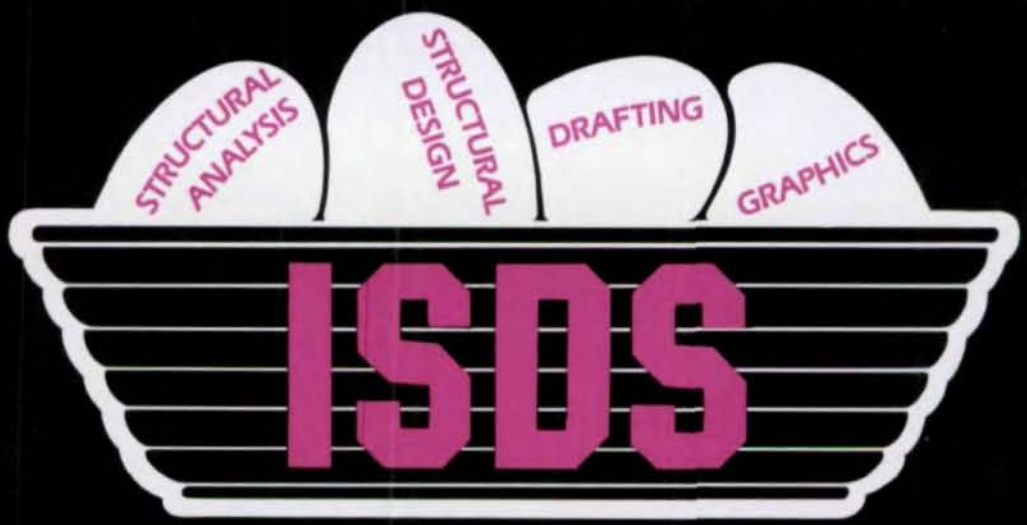

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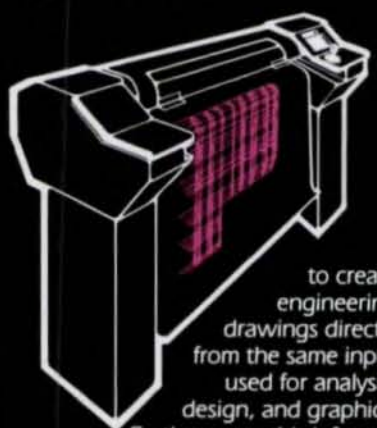

to create engineering drawings directly from the same input used for analysis, design, and graphics. Furthermore, this information is held in a central database maintained by ISDS. User interaction is minimized, improving both efficiency and data integrity.

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   h. **Single & Double Angles**
   i. **Structural Tubing**
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WESTSIDE TERMINAL

Architectural Design Based on Structural System

by Mark B. Foss

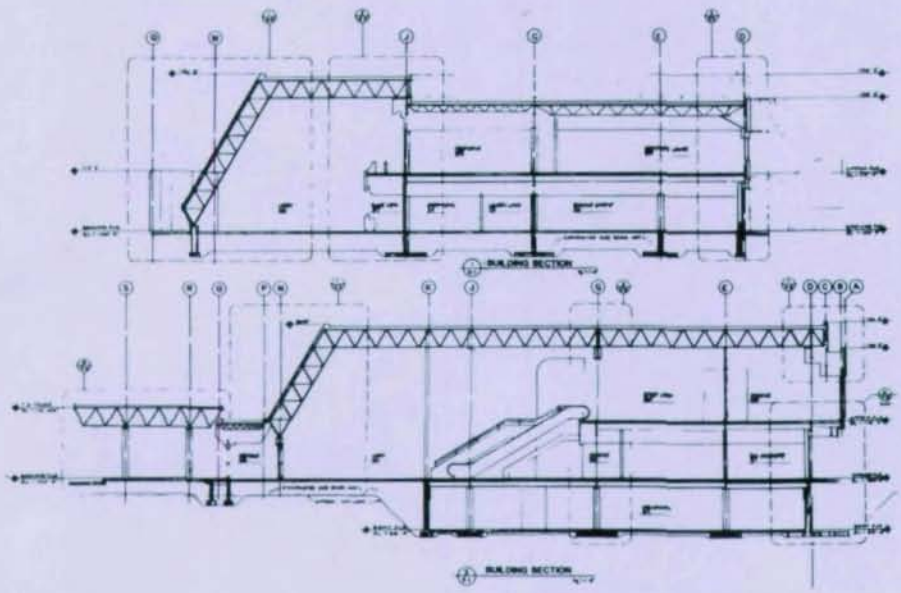
The new Westside Airport Terminal at Hector International Airport, Fargo, N.D. encompasses 76,000 sq. ft on two main levels, plus a partial basement, with a footprint of 312 ft × 140 ft. It replaces the 1950 airport terminal of 23,500 sq. ft, only 15,725 sq. ft of which was used for terminal functions. Designed for use by four airlines, it is used by three—Northwest Orient, United and Continental. Also housed are three car rental stations, a gift shop, bar and lounge, snack bar and restaurant, plus a meeting room and offices for the Municipal Airport Authority.

In view of escalating air traffic and advances in aircraft design in the 1960s, plus an expanding network of airport services and the North Dakota Air National Guard facilities, the master plan for Hector International Airport development called for relocation of the passenger terminal to the west side. The design solution for the new terminal had to meet these requirements:

1. Visibility from the new approach road
2. Ease of circulation and clarity of direction for incoming/outgoing passengers
3. Need to provide a positive, forward looking image for Fargo, since for many people it would be their first and last impression of the city
4. Future expansion in response to future trends in air travel

Both the ground level lobby and the upper level departure lounge cover the length of the building (312 ft). With the architec-

Westside Terminal, 1987 Dakota AIA design award winner

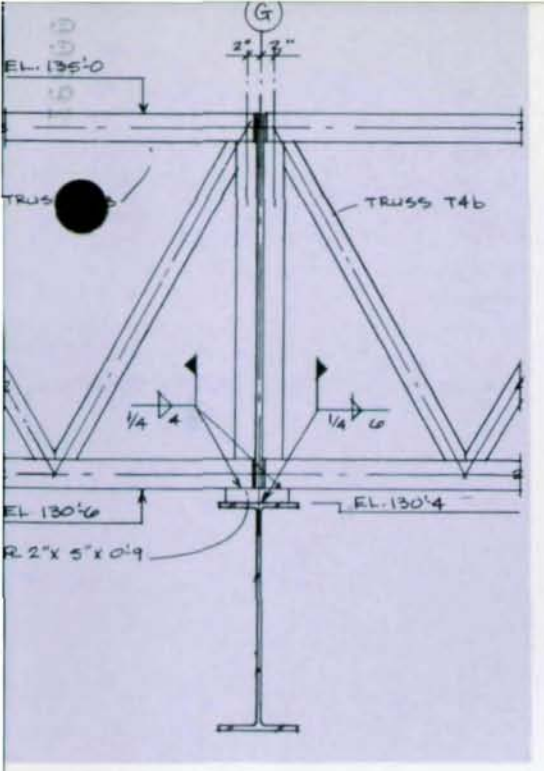


Building section

tural design based on the dynamic and exposed structural framing for the two-story lobby and central core, there was a very high level of detailed coordination work required between the structural engineers and architectural design staff.

The exposed lobby roof framing is 3-in. deep steel acoustideck over exposed architype, custom-made steel trusses (4 ft-2 in. deep) spaced 10 ft o.c., locally fabricated from square steel tubes (3 in. × 3 in. × .1875 in.). Truss spans varied from 47 ft-6 in. to 77 ft-4 in.

Another interesting structural feature of the architectural design of the terminal is the exposed steel framing of the separate front canopy. It consists of exposed steel roof deck over standard steel joists, supported by custom-designed steel trusses (4 ft-2 in. deep), also fabricated from square steel tubing (4 in. × 4 in. × .25). Steel trusses, supported by round rein-



Truss-beam detail

Exposed structural framing on separate front canopy is steel roof deck over standard joists, supported by custom-designed trusses.

forced concrete columns, span 15 ft, with cantilevers of 12 ft-6 in. and 7 ft-6 in. at the ends.

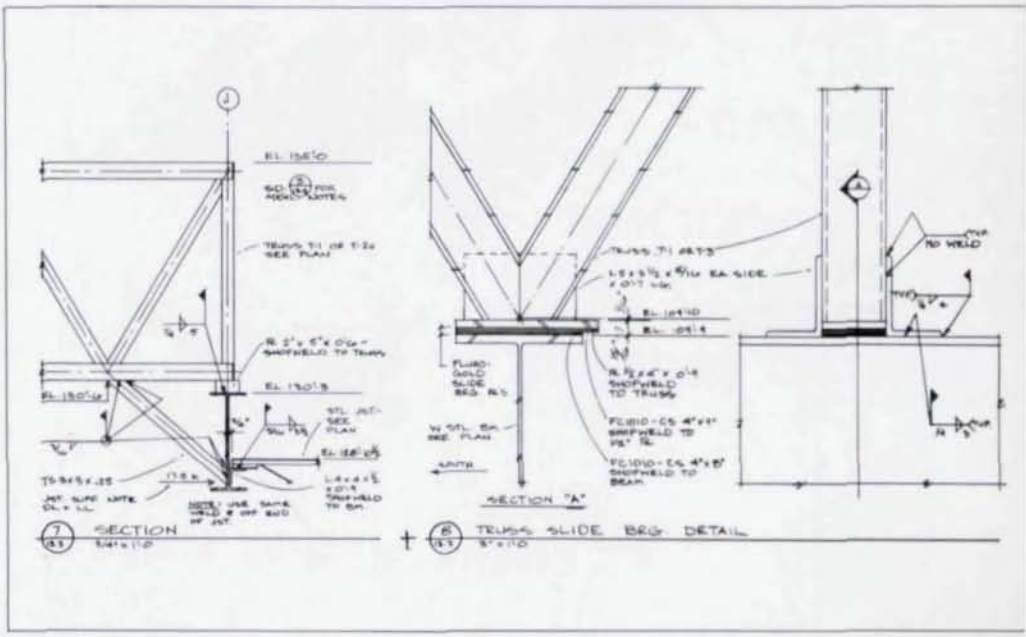
The balance of the terminal building structural system includes second-level concrete composite floor slabs on steel beams supported by steel girders and H columns. Unexposed roof areas are steel deck supported by standard steel joists, structural steel beams and H columns.

Steel Major Design Element

Design of the structural steel system created an open, spacious lobby that permits a view of all functions immediately upon a passenger's entering. As a result, they now can move quickly through the facility in an efficient, pleasant manner.

Of particular interest is the expression of the structural steel system as a major design element. The use of custom steel trusses presents a visual signpost to denote public spaces and to guide passengers from the canopied entrance, through the building and into the departure lounge. This structural system contributes to the high tech nature of the building and creates the desired special effect in a well-disciplined, orderly manner. Innovative structural design is evident in the way the exposed system springs from a more traditional post and beam system, extends to the ground and is penetrated by smaller, independent structures housing vestibules, waiting areas and car rental counters.

Finally, the structural steel framing permits future expansion horizontally (both east and west) for the airline ticket and



baggage claim areas, and horizontally in a northerly direction for future departure lounge area and increased number of ramps.

The Westside Terminal Building was b on May 24, 1984 with base bids and one add alternate totaling $4,207,078—well below the estimated cost of $4,463,256 for an area of 69,850 sq. ft. Several months after the start of construction, the building was increased to 76,000 sq. ft to serve another airline. This increased construction costs by $350,000.

Total construction, equipment and furnishing costs were $5,135,987, including all final charges, for a unit cost of $67.56 per sq. ft.

Westside Terminal opened on Jan. 13, 1986—on schedule! □

Architect/Structural Engineer
Foss Associates, Ltd.
Fargo, North Dakota

General Contractor
Meinecke-Johnson Company
Fargo, North Dakota

Mark B. Foss, P.E., is senior principal, Foss Associates, Fargo, North Dakota.

STEEL–A FRAMEWORK FOR DESIGN...

At University of Michigan's Engineering/Computer Science Building

by Julie A. Krzeminski and Kevin J. Baur

From rooftop skylights to laboratory floors, structural steel provides a strong, economical structural system for the University of Michigan's newest building. But strength and economy are not the only benefits of using such a system. Steel also provides the perfect framework for the building's fresh design.

At the center of Michigan's North Campus, the new Electrical Engineering and Computer Science (EECS) Building is the University's new focus of student life. This $30-million, 260,000-sq. ft facility is equipped to serve 1,600 students and 100 faculty. The building houses a variety of the most technologically advanced research laboratories in the country, including: the bioelectrical science lab, and labs for solid-state electronics, electro-optics and opto-electronics, computing research, radiation, computer vision, communications and signal processing, program in technology assessment and for mechanical engineering and applied mechanics.

Of special interest is the electronics lab, which has approximately 5,500 sq. ft of Class 100 and Class 10 clean room space. These rooms are cleaner than most pharmaceutical clean rooms.

The EECS Building is two, parallel, four-story structures, with the South structure housing laboratories and the North structure classrooms and offices. These are connected by one of the building's most appealing features, an atrium which runs the entire 365-ft length of the building. This atrium serves as a major pedestrian circulation path and a meeting place for students at the first floor level. Four bridges span the atrium at each upper level. These interior bridges connect each of the four levels of the laboratory structure to the classroom/office structure, creating rigid links between the two masses and providing deflection compatibility of the North and South structures.

Steel plays an important role in the construction of the atrium which covers the bridged area. Steel tube bents 5 ft o.c. span the peaked atrium, supporting four 54-ft x 30-ft skylights.

Structural System

The building's structural system is a composite-steel floor assembly with braced frames to resist lateral loads. Typical bay is 27 ft by 36 ft, with Gr. A-36 steel beams spaced at 9 ft o.c. The floor slab is 2-in. metal deck with 3¼-in. lightweight concrete, to provide a 2-hr. fire rating. The

Engineering Sciences Building

Electrical Engineering and Laboratory Building

floors were designed for a superimposed live loading of 100 psf. Typical floor-to-floor heights are 14 ft 8 in. The exterior wall assembly is 4-in. face brick and 2-in. cavity and 8-in. concrete masonry units. The wall is supported on a steel tube lintel system located at the window head and spanning from column to column.

Interesting Structural Considerations

Two interesting features of the building are the stepped back facade between mechanical spines and the submicron clean room. The exterior facade is stepped back 8 ft at each successive upper level from first floor to roof. The lower levels also required column-free spaces—accomplished by using a post-and-transfer girder system designed to minimize total deflection.

The submicron clean room, where computer chips are manufactured, requires a virtually vibration-free main floor level. The building vibrations were isolated from the clean room slab by eliminating all interior columns and spanning the building width with 76-ft long, one-story deep trusses spaced at 24 ft the length of the building. The 12-ft deep welded trusses are made of wide-flange chords and double-angle web members. All web members are diagonal to provide maximum usable space in the mechanical area. The trusses were fire-protected with Albi Dura spray, an intumescent paint. This type of fire protection was necessary to meet clean room requirements in the interstitial space. The truss bottom chord supports the interstitial floor at the mechanical equipment level, and the top chord supports an additional two levels of the building.

Site Challenge

The late Eero Saarinen, the architect who designed the North Campus Master Plan, would be proud of the way architects met the site challenge by placing the EECS Building between two existing structures, the G. G. Brown Building and the Automotive Building. According to project designer Victor Cardona, "Over the years, the nature of the campus use changed. It has become a vehicular-oriented campus, with parking lots bordering box-like structures. Our challenge in doing this large building on a small site, among a crowd of box-like neighbors, was not to overshadow them."

The new building is connected by pedestrian walkways on the North side to G. G. Brown's second and third floors and on the South side to the first floor of the Automotive Building.

The EECS Building's composite steel structural system provides many benefits to its overall design. The main structural system supporting the entire building and the various substructural systems—such as the steel tube substructure framing the front glass wall and the steel tube bents in the atrium—meet requirements for an efficient, rigid support system without detracting from an impressive design.

In addition to all these other benefits, a structural steel system resulted in a building completed within budget—and on time. □

Steel provides strong, economical structural system for university's newest buildings.

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Owner
University of Michigan

Julie A. Krzeminski is an assistant in marketing/public affairs, Smith, Hinchman & Grylls Associates, Inc., Detroit.

Kevin J. Baur, P.E., is an associate and chief civil engineer at Smith, Hinchman & Grylls Associates, Inc., Detroit.

Technical–Decks

HOW TO FASTEN STEEL DECK–

Update and Review

by Richard P. Heagler and Larry D. Luttrell

Typical test arrangement represents roof area, with specific deck type and fastening method. Far side restrained as at end wall. Measured shear forces are applied along near side and all corner movements are measured for stiffness evaluations.

Deck fastening to the frame was at one time only done by welding. Then, self-drilling screws started to share the duty. Now, fasteners that are shot in—either with air or powder—are being used increasingly. All these methods perform the intended function of holding the deck in place and providing shear strengths and stiffnesses that can be predicted.

Since connections are a very important part of diaphragm design, and since they also can be a part of the insurance and fire rating approvals, it is up to the designer to choose the fasteners to be used and also to judge the merits of substitutions requested by the contractor. Most of the new information about fasteners has been developed by continued diaphragm testing—and most of which has been sponsored by the Steel Deck Institute (SDI) at West Virginia University. It resulted in publication of the greatly revised second edition of the *SDI Diaphragm Design Manual*.

Welds

Welding, properly done, still provides the strongest and stiffest deck connections. It also requires the most skill and therefore the most inspection. It is the most widely accepted method because it is one of the oldest. Almost all Underwriters Laboratories UL fire-rated constructions for floors and roofs call for welding to the frame, and Factory Mutual recognizes ". . . welding or approved deck fasteners." An acceptable weld size for connecting deck, as recognized by the SDI, UL, and FM, is one with a minimum visible diameter of ½ in. This minimum size generally results in a specification calling for a ⅝-in. weld.

The American Iron and Steel Institute (AISI) Specifications and the American Welding Society (AWS) provide formulas for calculating weld strengths with sheet steel and heavier substrates. However, these specifications have an "effective" diameter of ⅜ in. as a lower limit. The visible diameter is then required to be greater than ⅝ in. for the thickness range of deck material. Because most weld diameters used with steel deck are between ½ in. and ¾ in. (visible diameter), the AISI (and AWS) formulas cannot be applied. Testing for the SDI diaphragm program therefore had to establish strengths for the ½-in. to ¾-in. diameters. The ultimate strength formula was found to be:

$$Q_f = 2.2tF_u\,(d\text{-}t),\ \text{kips}$$

where d = average visible dia., in.

F_u = steel strength, ksi

t = base metal thickness, in.

This formula agrees with the AISI Specifications (for larger welds) and also applies to welds with ½-in. minimum visible diameter. Although the AISI formula shows greater weld strengths can result with multiple metal thickness—such as at overlaps—the SDI suggests that for deck this effect be ignored. One metal thickness should be used in the formula.

The SDI also recommends, based on the scatter of test results, a safety factor of 2.75 be used for these welds rather than the 2.5 suggested in the AISI Specifications. These conservative interpretations cover some of the inconsistencies occurring in real jobs. Table I shows design strengths for welds using the SDI parameters.

Table I

Design weld strengths, lbs.
Washers not used.
Fu = 45 ksi. Safety factor = 2.75.

Deck Type	Metal Gage (in.)	Visible Diameter ½"	⅝"	¾"
22	0.0295	500	630	765
20	0.0358	600	760	920
18	0.0474	770	985	1200
16	0.0598	950	1215	1485

It is common, and good, practice to use welding washers on deck metal less than 0.0280 in. This practice is recommended by AISI, UL, FM and the SDI. However, no strength values were published for welds through washers, so it was important for the West Virginia University research program to develop values. The resulting formula is:

$$Q_f = 99t\,(0.50 + 0.3\,F_{XX}t),\ \text{kips}$$

Where F_{XX} is the electrode strength, ksi

t = deck thickness, in.

A standard washer is .06-in. thick, uncoated, and is a slightly arched rectangle about 1 in. × 1 in. with a ⅜-in. dia. hole in the center (Fig. 1). It should be welded with

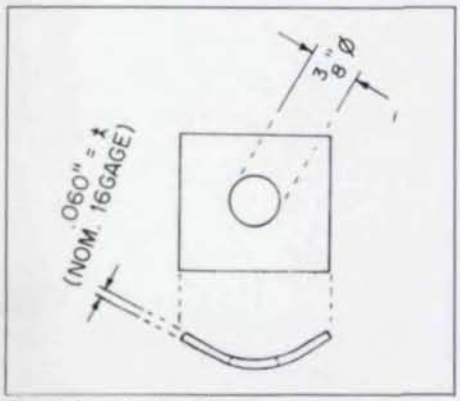


Fig. 1. Standard welding washer

a rod burn-off rate of 0.15 to 0.25 in. per second, with a welding time of three to five seconds. The final weld size should be larger than the original hole.

The heat of welding relieves cold work stresses in the sheet adjacent to the weld and particularly under the washer. Thus, the strength Q_f has no significant dependence on the tensile strength F_u of the panel. Table II shows design strengths for welds with washers in commonly used deck thickness.

Table II
Design weld strengths, lbs. Washers used. Safety factor = 2.75.

Deck Type	Metal Gage (in.)	Electrode E60xx	Electrode E70xx
28	0.0149	410	435
26	0.0179	530	565
24	0.0238	795	855

With increased burn-off rates and longer welding times, weld washers might be used in certain thicknesses greater than 0.0280 in. However, it is much more efficient to use ⅝-in. welds, without washers in material thicker than 0.0280 in., than to use weld washers. In no case should washers be used on interior sidelaps.

In adjacent deck panels with nestable or flat overlapping edges, sheet-to-sheet (stitch) connections will most likely be required. The placement of arc spot welds at such sidelaps can be difficult. And, the thinner the material, the more difficult the welding operation. Welding of sidelaps is not recommended for material of 0.0295 in. or thinner. It is likely that welding in deck materials will lead to a hole, which is to be expected, but the perimeter must be fused. Where good nesting exists, and when well qualified operators are used, sheet-to-sheet welds have been found to exhibit strengths of 75% of those shown by the same size welds connecting the deck to the structure. The values of Table I can be multiplied by 0.75 to find sheet sidelap strengths.

Screw Connections

Screw connections, such as Buildex TEKS screws, may be either self-drilling or the self-tapping types that require a drilled hole for installation. The most commonly used screws to attach deck to bar joists or structural steel are No. 12 and No. 14 sizes. Smaller No. 8 or 10 screws may be used for sidelap connections. The screw connection shear strength is dependent on both the screw diameter and the yield strength of the connected sheets.

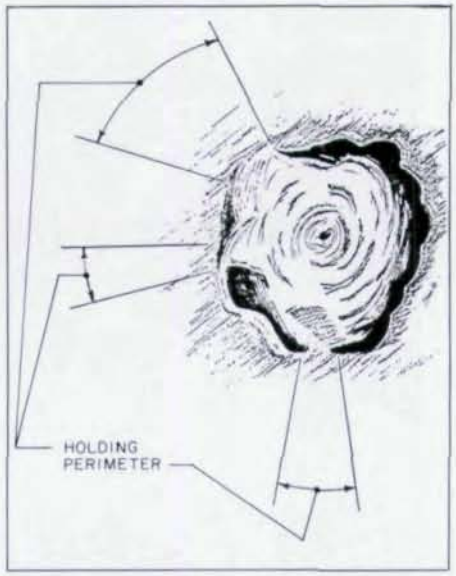


Fig. 2a. Example of poor-quality weld without washer

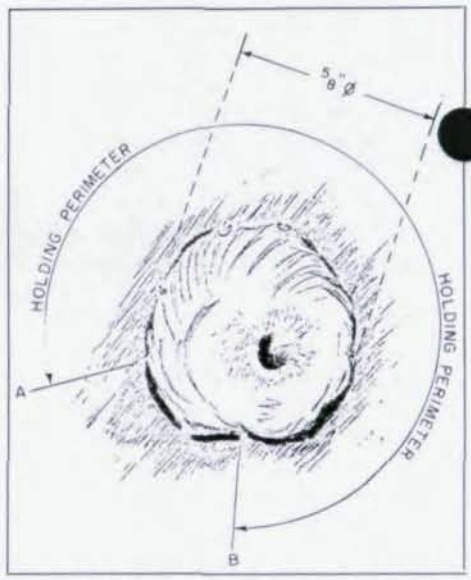
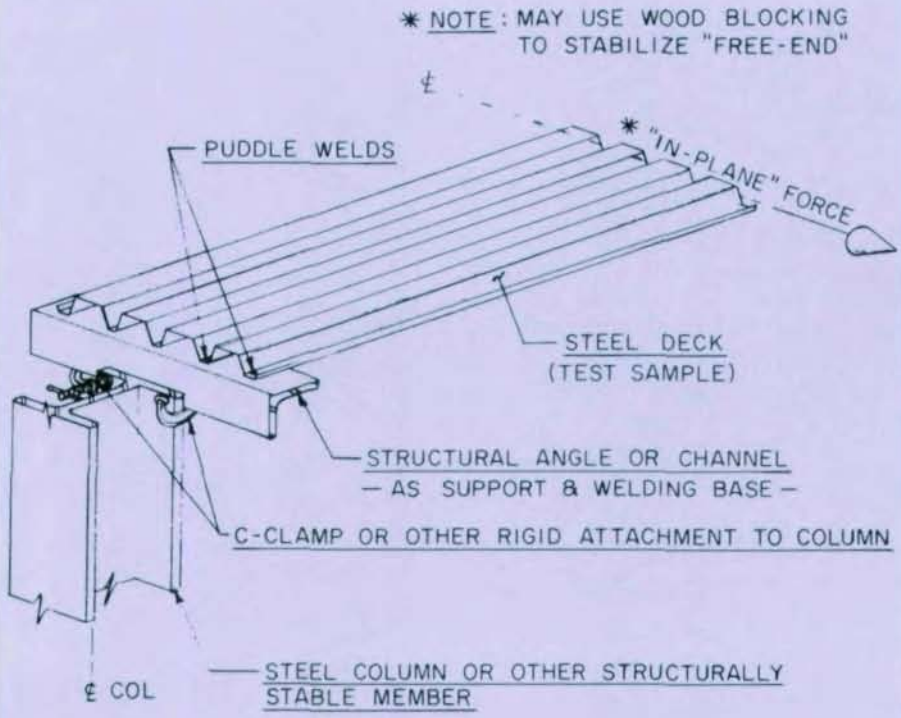


Fig. 2b. Example of good-quality puddle weld without washer.



Weld Quality Control Test Procedure

Maintenance of weld quality is essential for decks used as diaphragm for structural bracing. A preliminary check for welding machine settings and operator qualifications can be made through a simple field test by placing a pair of welds in adjacent valleys at one end of a panel. The opposite end of the panel can then be rotated, which places the welds in shear. Separation, leaving no apparent external weld perimeter distresses, but occurring at the sheet-to-structure plane, may indicate insufficient welding time and poor fusion with the substrate. Failure around the external weld perimeter, showing distress within the panel but with the weld still attached to the substrate, would indicate a higher quality weld. The ending of the weld operation may not permit complete fusion on the whole perimeter. Fusion should be visible over no less than three-quarters of the weld perimeter as indicated by Fig. 2. Spotty contact may be caused by power settings that are too high.

Table III
Design strengths, lbs. deck to structural steel with either No. 12 or No. 14 Buildex Screws. Safety factor = 2.35.

Deck Type	Metal Gage (in.)	Deck Material Yield Strength, ksi 33	40	80
28	0.0149	220	255	380
26	0.0179	260	305	455
24	0.0239	350	405	610
22	0.0295	430	500	755
20	0.0358	525	610	
18	0.0474	695	805	
16	0.0598	875	1020	

Table IV
Design strength, lbs., sidelap screw fasteners. Safety factor = 2.35.

Deck Type	Metal Gage (in.)	Screw Size 8 0.1635	10 0.1867	12 0.2111	14 0.2477
28	0.0149	120	135	155	180
26	0.0179	145	165	185	215
24	0.0239	190	220	245	290
22	0.0295	235	270	305	360
20	0.0358	285	325	370	435
18	0.0474	380	435	490	575
16	0.0598	480	545	620	725

In connecting thin elements to heavier structural units such as bar joists or beam flanges, little difference exists in the shear strength for No. 12 and No. 14 screws. This is because the failure mode is one in which the sheet material tends to "roll up" on the bearing side of the screw and one or two tearing lines develop in the sheet. The result obtained for both screw sizes (for sheet-to-structural steel connections) is:

$$Q_f = 1.25\ F_y t(1\text{-}0.005F_y),\ \text{kips}$$

A safety factor (for design) of 2.35 is suggested; see Table III for design strengths.

For stitch connections between sheets (at the sidelaps) a different performance ensues. The screw, not being anchored into a thicker, more rigid element, tips over more easily and is more flexible. Its strength may be limited by bearing-tearing in the sheets or, with sufficient tipping, a tearing-pull out combination.

The SDI screw studies indicated stitch-screw shear strength is virtually independent of F_y in all steel panels commonly used as deck diaphragms. The formulas for stitch (sidelap) screw strength is:

$$Q_s = 115\ dt,\ \text{kips}$$

where d = major diameter, in. Table IV shows design strengths.

The quality of the screw itself is not a major problem, though it can sometimes

Table V
Design strengths, lbs., powder-driven fasteners.
Safety factor = 2.35.

Deck Type	Metal Gage (in.)	Ramset 26SD	Hilti ENP2 & ENP3-21-L15
22	0.0295	670	675
20	0.0358	780	795
18	0.0474	960	1000
16	0.0598	1100	1180
14*	0.0747	1250	1360
12*	0.1046	1330	1580

*Not usual deck thickness.

Table VI
Design strength, lbs., button-punched sidelaps.
Safety factor = 3.0

Deck Type	Metal Gage (in.)	Well Connected Button Punches
22	0.0295	70
20	0.0358	105
18	0.0474	180
16	0.0598	285

fracture while being driven into a heavier substrate. The more common problem is one of allowing the screw to thread-up on the upper sheet before becoming engaged in the lower, thus leaving major eccentricities between units. Such screws should be removed and redriven nearby while forcing sheet layers to remain in contact.

Power-driven Fasteners
Sheet-to-structural connections can be made by using nail-like fasteners, driven either with pneumatic devices or using powder actuated tools. Such fasteners are made from hardened steel and usually have a heat-treated, knurled shaft to enhance anchorage. The shaft, which may have a slight taper, can be fitted with washers, concave to the driving direction, to absorb the final driving energy and clamp the sheet in position.

Since there are no predrilled holes, the driving operation displaces material and leaves it locked under the washer, resulting in a very stiff connection. The driving depth is controlled by the power selection for the tool used. Fastener strength is influenced by driving depths. These can be determined by measurements on the fastener, after driving, and are set by the manufacturer.

The West Virginia University tests showed the backing element thickness has no effect on shear strength since the thinner sheet material will control performance through its bearing on the pin diameter. Within sheet thickness between 0.024 in. and 0.1006 in., bearing controlled and

Table VII
Slip values for fasteners.

Fastening to the steel frame	Cs
Arc spot welds (0.5" to 1")	1.15
Welds through washers	1.15
No. 12 or 14 screws	1.30
Ramset 26SD	2.50
Hilti ENP2 or ENP3	1.25
Sidelap (sheet-to-sheet fastening)	Cs
Arc spot welds (0.5" to 1")	1.25
No. 8, 10, 12 or 14 screws	3.00
Well made button punches	30.00

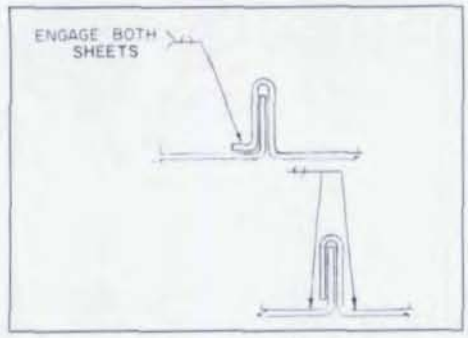


Fig. 3. Welding at supports with alternate lap details

shear failures did not develop across the fastener diameter. Ultimate strength formulas for two types of fasteners are:
Ramset 26SD installed with a T-26 tool:

$$Q_f = 62.5t(1\text{-}5t), \text{ kips}$$

Hilti ENP2 & ENP3-21-L15 installed with a DX-650 tool:

$$Q_f = 61.1t(1\text{-}4t), \text{ kips}$$

These formulas apply to steel with a minimum yield strength of 33 ksi. Full-hard (80-ksi yield) deck may produce higher values (see Table V).

A driven fastener should be installed so the head projects outward, from the attached part, to limits set by the manufacturer. The axis of the fastener must be substantially perpendicular to the sheet prior to driving, usually within ± 10°.

When placing pins at the edge of panel overlaps in a diaphragm, the available flat width is limited. In full scale diaphragm tests, the distances from pin center to sheet edges were ⅜ in. or more. At end laps, the end distance was kept at or greater than one inch. Thus, it is recommended that edge and end fasteners have minimum sidelap edge distances of ⅜ in. and a minimum end/endlap distance of 1.0 in.

Button-punched Sidelaps
In certain panels, one edge has an upstanding single element, while the opposite side has a folded-over double element. As panels are placed, the single element is inserted into the double element, producing an upstanding sidelap that can be button punched and provide some interlocking. The hand-operated punching tool forms a three layer nest of small cones that is left in a slightly loose state, because of elastic rebound, as the forming force is removed.

Manual button punched sidelaps do stabilize panel edges but, otherwise, may contribute little diaphragm strength as they can vary greatly in shape and effectiveness. Typical values from well controlled tests have led to the strength formula:

$$Q_s = 240\ t^2, \text{ kips}$$

A typical 0.0295-in. thickness provides 0.209-kips ultimate strength, which is about 33% of the strength of a No. 10 stitch screw. The quality of hand installed button punches is difficult to maintain. The attachment depends on the care and the energy used by the installer and the tool used. A safety factor of three is recommended (Table VI).

Diaphragms, required to resist higher shears, may need to have structural connections immediately to either side of the upstanding sidelap at supports. Otherwise, the majority of shear force will be transmitted across panel edges through the button punches only (Fig. 3).

Stiffness
When evaluating fasteners for a particular job, it may be important to examine their slip (stiffness) as well as their strength. Slip values for all connectors can be predicted by the equation:

$$\frac{S_f = C_s}{1000\ \sqrt{t}}$$

where C_s is the slip constant for each fastener type.

Table VII lists the C_s values for each fastener studied.

Uplift Loadings
At this time there is no standard test for uplift loading on fasteners. And, in most cases, uplift forces are not the most important factor in the functioning of a floor or roof deck. Typically a deck may have fasteners at 12-in. centers along joists at perhaps 6-ft centers. Then each weld has a tributary area of 6 sq. ft for an uplift load of 15 psf, which is 90 lbs. per weld uplift. Such values are negligible relative to direct shear loads. Even doubling the load, as may happen with 3-in. deck, still does not cause an overload.

The authors have never heard of an uplift failure of a deck panel under service loading. The spacing of fasteners is usually dictated by diaphragm or insurance requirements (Factory Mutual or Underwriters Laboratories) and uplift does not

govern the design. However an examination of proprietary weld and screw information lead to the conclusion that the same values shown in Tables I, II, III and V could be used safely.

Conclusion

Each fastener has advantages that can make a case for its use, so the designer may want to consider several options. The following topics may serve as a checklist:

1. Strength vs. cost. It may be better to achieve a required diaphragm strength with a greater number of weaker but less expensive fasteners. The designer should check deflection limits.
2. The fire rating or wind uplift requirements may not allow a substitution of fasteners or a change in spacing.
3. Tool or power availability may dictate the choice. For instance, a small roof area may be easier to install with powder-driven fasteners or screws rather than by using welding equipment.
4. The underside deck appearance may be important. Sidelap screws or even very weak button punches, may be the choice—diaphragm strength could possibly be obtained by increasing the number of frame fasteners. □

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2. *American Iron and Steel Institute* Cold Formed Steel Design Manual *1986, Washington, D.C.*
3. *American Welding Society, Inc.* Structural Welding Code - Sheet Steel *1981, Miami, Fla.*
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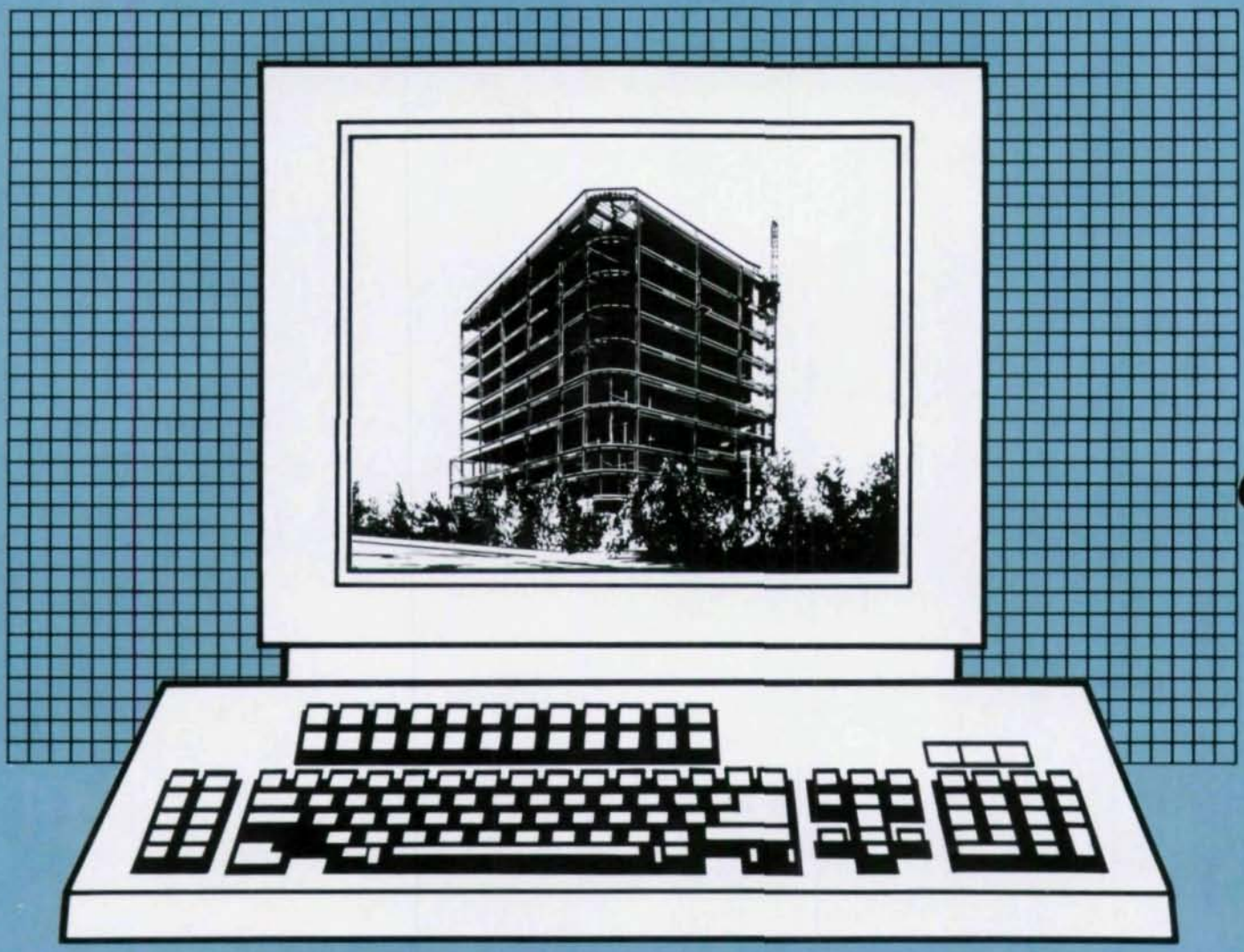

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Steel Notes

1988 NEC/COP ADVANCE PROGRAM & PLANS NOW FINAL!

The advance program and event plans for the 1988 NEC/COP National Steel Construction Conference, to be held June 8-11, 1988 at the Hilton Fontainebleau Hotel in Miami Beach, Fla., are complete. Conference organizers have announced that, in addition to the scheduled plenary and workshop sessions, a poster session will also be presented. Pages 25 through 32 have complete details on the all-steel conference sessions, accommodations and exhibit space availability.

AISC MARKETING, INC. CELEBRATES SUCCESS

AISC Marketing, Inc., whose purpose is to search out projects which might be designed in concrete and then convince the decision-makers to construct the projects of steel, has enjoyed success, according to a recent study. Preliminary Design Study Results show that on buildings and bridges concentrated on by the firm, projects using over 180,000 tons of steel have been converted, with a potential for another 90,000 tons on projects where the choice of building material at the time of the study was undecided.

Ronald L. Flucker, vice president and general manager of the firm, also said that once an engineer, contractor and/or owner has used an alternate design of a project in steel proposed by AISC Marketing, Inc., he usually adopts the design philosophy for subsequent projects.

AISC Marketing Dept. analysts are convinced there is a link between AISC Marketing, Inc.'s success and the fact third quarter 1987 market share was one of the steel industry's best quarters in quite a while. Total square footage of all non-residential building construction contracts was up 10% nationally from the previous quarter, and 11% from the third quarter of 1986. More importantly, however, market share for steel for the third quarter gained 3% over a like period in 1986, and rose above its biggest competitor in market share for the first time since AISC has been keeping score.

BRUCE ELLINGWOOD IS T.R. HIGGINS WINNER

Bruce Ellingwood is the winner of AISC's 1988 T.R. Higgins Lectureship Award. The award has been presented annually by AISC since 1972. Ellingwood, who will receive an engraved citation and a check for $5,000, will present the winning lecture on six occasions. The premier presentation of his lecture on structural serviceability will be offered at the 1988 NEC/COP National Steel Construction Conference, to be held June 8-11, 1988 at the Hilton Fontainebleau Hotel in Miami Beach, Fla.

Ellingwood is currently a professor in the Department of Civil Engineering at Johns Hopkins University, Baltimore, Md. Previously, he had been a research structural engineer and leader in the Structural Engineering Group of the National Bureau of Standards, Washington, D.C. His studies include guidelines to establish limits for vibration, drift and deflection in modern buildings for the comfort of occupants.

Moon Over Miami Beach!

Miami Beach Welcomes AISC's 1988 National Steel Construction Conference

The *new* Fontainebleau Hilton, one of the largest convention hotels in the U.S. and a premier meeting facility, is the site of the 1988 National Steel Construction Conference set for June 8-11, 1988, in Miami Beach, Fla. A complete renovation of the facility, finished just last year, was so extensive that it really *is* all brand new.

The combination of AISC's National Engineering Conference and Conference of Operating Personnel again this year demanded a large meeting site, but also one that could operate efficiently. The Fontainebleau met every criteria: sufficient guest rooms for the more than 1,000 expected registrants (all just redecorated), 100,000 sq. ft of exhibit space, a ballroom for plenary sessions and meeting rooms for the many concurrent workshops.

Exhibits will be held in the completely refurbished Grand Ballroom, while the comfort and acoustics of the Fontainebleau Ballroom, only steps away, provides an ideal setting for the daily plenary sessions. Meeting space for workshops is located both above and below the two ballrooms, uninterrupted by guest areas and conveniently accessed by a conference-dedicated escalator system. Elevators and stairways complement this system.

Convention Center—Plus Resort

This is one hotel that is more than just a "Convention Center"—it would be hard to find a more beautiful spot for a meeting than this 18-acre oceanfront showplace.

Meeting participants will be treated to outstanding ways to get ready for a big day or wind down from one. Nothing beats a walk on the Fontainebleau's newly restored 1,200-ft wide beach to organize thoughts. A two-mile boardwalk parallels

Fabulous new Fontainebleau Convention Center and Resort/Spa

Magnificent half-acre tropical lagoon a short stroll from hotel's 1,200 guest rooms.

the ocean for strolling and jogging.

For those who prefer more athletic ways to clear the cobwebs, there are seven lighted tennis courts, a half-acre tropical lagoon pool, saltwater pool, a complete workshop gym, three whirlpool baths and complimentary shuttles to two nearby championship golf courses: the Bayshore and Normandy Shores.

Water sports enthusiasts will want to try windsurfing, parasailing, jet skis, hobie cats, and/or aquacycles.

Eight Restaurants on Site

The Fontainebleau also offers eight restaurants within the hotel:

Dining Galleries: Fine regional and continental cuisine. A spectacular Sunday Brunch.

Latin Club: Located just off the main lobby, on the ground floor, this new supper club offers dinner and show nightly. Reservations required; dinner only.

Steak House: Prime restaurant for people who love beef. Off the main lobby.

Under the Trees: An outdoor cafe featuring light tropical lunches and a fresh Florida Seafood Buffet on Friday evenings. Outside the lower-level shopping arcade.

The Beach Broiler: Light breakfast, burgers, fresh fruit, yogurt and ice cream. At the pool, 8 a.m. - 5 p.m.

Chez Bon Bon: Open for breakfast, lunch and dinner. 7 a.m. - 2 a.m. Lower level shopping arcade.

Lagoon Saloon: *Natural food and juice* bar, behind the waterfalls of the rock grotto. 11:30 a.m. - 5 p.m.

Granny Feelgood's: For a delicious meal, healthy snack or refreshing fruit smoothie. On the Spa Veranda.

(For information on restaurants located throughout Greater Miami, Fontainebleau's Hospitality Desk will provide information.)

Lounges and Entertainment

Coconut Willies: A breezy, open beachside bistro adjacent to the Lagoon Pool. Open 11 a.m. - midnight.

Garden Lobby Bar: Located right in the main lobby, with a spectacular ocean view—not bad for people-watching, either. 11 a.m. - 1 a.m.

Poodle Lounge: A late night spot with live entertainment and dancing. Adjacent to the main lobby. 5 p.m. - 1 a.m.

Complete Health Spa

Among the Fontainebleau facilities expanded in the recent renovation is the Fontainebleau Spa, which includes the Mount Sinai Sports Medicine Institute and the Cybele, Christine Valmy Skin Care Salon.

The Spa offers a computerized fitness evaluation and a complete Nautilus Center with free weights, classes in aerobics, aqua-aerobics, yoga and stretch-and-reaching. Equipment includes life cycles, rowing machines, stairmasters and treadmills.

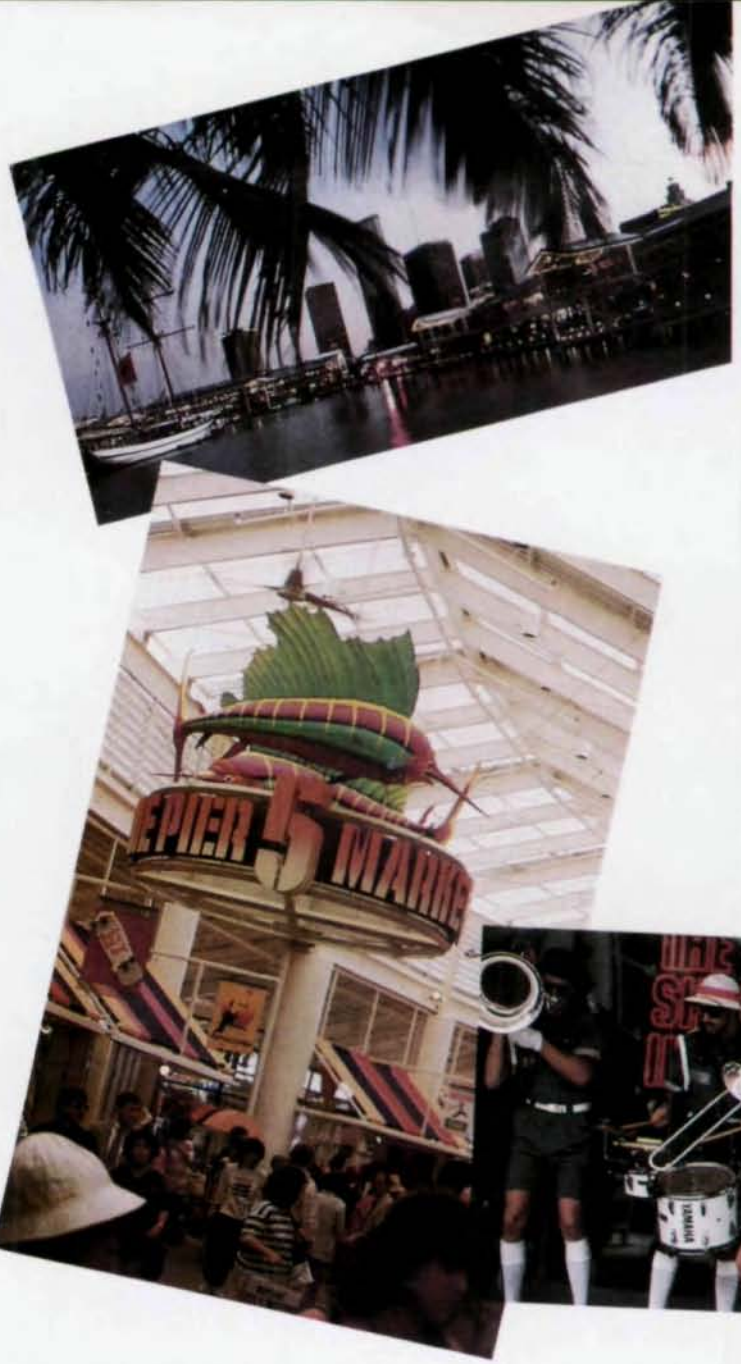
For rest and relaxation at the end of a busy day, there is sauna, steam and jacuzzis, loffah massage, mineral baths and herbal wrap.

Shopping, Too

A wide variety of specialty shops and boutiques are located throughout the Fontainebleau. The Shopping Arcade in the lower lobby of the hotel's Chateau Building has many reasonably priced stores. And there are also assorted shops in the main lobby and along the walkway to the pool. The hotel provides daily shuttle transportation to Bal Harbour Shops and Omni Mall.

World of diverse attractions—elegance of Vizcaya to excitement of Seaquarium

June in Miami: Events Around Town



For those attendees who would like to arrive early for the Conference, or stay a few days—or who might want to simply "slip away" for a couple of hours, we've compiled a list of events scheduled for Miami and environs June 5-12, 1988:

June 1-June 30
Stile Floreale
Michael Wolfson Jr. Collection of Decorative and Propaganda Arts
Miami Dade Community College-Wolfson Campus

Examples of Italian Art Nouveau, including two rooms reassembled completely with furnishings from an Italian palazzo.
Admission: Free
305/347-3429

June 1-June 30
Bent Wood and Metal Furniture
Center for the Fine Arts
Tuesday-Saturday: 10 a.m.-5 p.m.; Thursday: 10 a.m.-9 p.m.; Sunday: 1-5 p.m.
Admission: Adults $3; ages 6-12 $2

June 1-June 30
Seventy Years of Miami Architecture
Bass Museum of Art
Tuesday-Saturday: 10 a.m.-5 p.m.; Sunday: 1-5 p.m.
Admission: Adults $2. Senior citizens, students $1
305/673-7530

June 1-June 30
The Grand Tradition: British Art from Amherst College
Bass Museum of Art
Tuesday-Saturday: 10 a.m.-5 p.m.; Sunday: 1-5 p.m.
Admission: Adults $2. Senior citizens, students $1
305/673-7530

June 1-June 30
"Buenos Dias, Cuba"
Miami Youth Museum
Tuesday-Friday: 10 a.m.-5 p.m.; Saturday, Sunday: 12-5 p.m.
General admission: $1.75
305/661-ARTS

June 2-June 30
Alumni Invitation Exhibition: Juan Carlos Gardia & John Harms
Frances Wolfson Art Gallery
Monday-Friday: 9 a.m.-5:30 p.m.
Admission: Free
305/347-3278

June 3-June 5
Miami/Bahamas Goombay Festival in Coconut Grove
Peacock Park and throughout Coconut Grove along Grand Avenue from Matilda Street to Douglas Road
Friday: 5:30 p.m.; Saturday & Sunday: 11 a.m.-7 p.m.
Admission: Free
305/445-8292

June 3-June 30
John J. Audubon's Birds of America
Historical Museum of Southern Florida
Monday-Saturday: 10 a.m.-5 p.m.; Thursday: 10 a.m.-9 p.m.; Sunday: 12-5 p.m.
Admission: Adults $3, ages 6-12 $3
305/375-1492

June 5-June 11
1988 Royal Poinciana Fiesta
Venues throughout Dade County
Call for detailed schedule and admission information: 305/371-2723

June 6-June 30
Art in Politics: Sculptural Visions
InterAmerican Art Gallery
Monday-Friday: 12-8 p.m.
Admission: Free
305/347-3278

June 1-June 5
44th Annual Miami/Ft. Lauderdale Home Show
Miami Beach Convention Center
Admission: Adults $6, children $1
Call for exact times:
305/666-5944

June 1-June 8
American Art Today: Narrative Painting
Art Museum at Florida International University
Monday: 10 a.m.-9 p.m.; Tuesday-Friday: 10 a.m.-5 p.m.; Saturday: 12-4 p.m.
Admission: Free
305/554-2890

June 1-June 12
Play: "Waiting for You"
The Encore Room at the Coconut Grove Playhouse
Tuesday-Friday: 8:30 p.m.; Saturday: 8:30 & 11 p.m.; Thursday & Sunday matinee: 2:15 p.m.
Tickets: Friday & Saturday nights: $17
All other performances: $13
305/442-4000

June 1-June 24
West Coast Artists
North Miami Museum and Art Center
Monday-Friday: 10 a.m.-4 p.m.; Saturday: 1-4 p.m.
Admission: Free
305/893-6211

June 1-June 26
Hispanic Art in the United States: Thirty Contemporary Painters and Sculptors
Lowe Art Museum-University of Miami
Sunday, Tuesday-Friday: 12-5 p.m.; Saturday: 10 a.m.-5 p.m. (Closed Monday)
Admission: Adults $2. Senior citizens, students $1
305/284-3525

June 1-June 30
2nd Annual Great Black Music Month Festival
Model City Cultural Arts Center
6161 N. W. 22nd Avenue
Call for detailed schedule
305/638-6770

Special Fabricator/Exhibitor Program Precedes Conference

The Keynote Session officially opening this year's National Steel Construction Conference is scheduled for Thursday morning, June 9; however, Conference planners have dedicated a Special Plenary Session Wednesday afternoon to the subject of "Purchasing New Equipment."

This Wednesday plenary session will be followed by a workshop devoted entirely to a discussion of planning for the purchase of new automated equipment for the small and medium-sized fabricating shop.

Exhibits will open at 12 noon Wednesday. Exhibitors are encouraged to have representatives present at both the Fabricator Plenary Session and the workshop immediately following.

Educators, AISC Professional Members to Meet Wednesday Afternoon at NEC/COP

Special meetings devoted to the specific interests of educators who teach steel design, and the AISC Professional Member, have been scheduled for Wednesday afternoon, June 8, at the Fontainebleau. Agendas for the meetings will be announced in the final program (mid-March).

Educators employed full time at an accredited architectural or engineering college or university may also be eligible for sponsorship by the AISC Education Foundation. The Foundation pays registration fees for the first 100 educators who register for the Conference and request sponsorship. To apply, educators should return a Conference Registration Form along with a letter on their college or university letterhead. Those who register after Foundation sponsorship is filled will be notified and, if they wish to attend at their own expense, will be billed a Special Educator Fee of $150.

Special Educator Fees and Foundation Sponsorship include all National Steel Construction Conference special and plenary sessions, workshop sessions and coffee breaks, Continental breakfast and luncheons both Thursday and Friday, and the Get-Acquainted Cocktail Reception Wednesday evening, as well as a bound copy of the Official Conference Proceedings.

1988 NEC/COP Exhibitors: The Only All-steel Show

The 1988 National Steel Construction Conference, combining the AISC National Engineering Conference and AISC Conference of Operating Personnel, is the only "all-steel" conference in the U.S.

Exhibitors have always regarded these AISC meetings as their most important show for reaching the structural steel industry. It is an opportunity to display products and services of interest to fabricators, engineers, erectors, detailers, educators and all other industry decision-makers.

The Grand Ballroom of the Fontainebleau has been dedicated to more than 100,000 sq. ft of exhibit space. Last year's exhibitors (and those expected to return this year) include:

Adsteel, Inc.
John F. Beasley Engineering, Inc.
Bridge Grid Flooring Manufacturers Association
Cadsteel (XYSYS)
CDC Coatings
Cleveland Steel Tool Co.
Compudron, Inc.
Computers & Structures
D & M Drafting Company, Inc.
Data Management Systems, Inc.
Design Data
Digital Controls
Dynamic Isolation Systems, Inc.
Epic Metals Corporation
Geometric Data Flow, Inc.
Hyd-Mech Saws Ltd.
JAFY, Inc.
Jancy Engineering
Johnson Controls Corp.
Kaltenbach, Inc.
KTA-Tator, Inc.
LeJeune Bolt Company
Lincoln Electric Company
Lohr Structural Fasteners, Inc.
Manufacturers Data Services, Inc.
Metal Fabricating Systems
Mi-Jack Products
Mountain Enterprises
Pangborn Corporation
Peddinghaus Corporation
Pettitt Lawrence, Ltd.
Richmond Steel Inc.
ROMAC Computer Services
Southern Coatings, Inc.
Steel Structures Painting Council
Steward Machine Co., Inc.
Structural Software Company
TradeARBED, Inc.
J & M Turner, Inc.
The Truss Co., Inc.
Vernon Tool Company
Yamazen USA

Exhibit Booths Still Available for National Steel Construction Conference

The National Steel Construction Conference, combining the AISC National Engineering Conference and AISC Conference of Operating Personnel, is the only all-steel show produced in the U.S. It is considered the perfect marketplace for those who manufacture or produce goods and services for the structural steel industry.

The conference brings together fabricators, erectors, structural engineers, architects, detailers, educators, owners and contractors for a "meeting of the minds." Last year's meeting in New Orleans, when these two major AISC conferences were combined for the first time, exceeded all previous expectations. More than 1,000 attendees visited the Exhibit Hall.

AISC has a special Exhibitor's Brochure available now for individuals or firms interested in displaying products or services at the 1988 NEC/COP in Miami. Call Lona Babbington, AISC headquarters (312/670-5432) for your copy, or for more information on exhibiting at this year's great conference.

First Time Ever:

1988 Conference Offers Speaker/Poster Sessions

This year, for the first time, the National Steel Conference (NEC/COP) will conduct a Poster Session, scheduled for Thursday, June 9, 1:30-3:30 p.m. During that 1½ hour period, selected papers will be presented by authors in informal discussion groups, using Bulletin Board displays of graphics and illustrations in lieu of slide presentations.

Authors wishing to submit presentations for the Poster Session may do so by providing the NEC/COP Planning Committee with a one-page abstract on the topic on 8½ × 11-in. paper. Authors whose papers are accepted for presentation in the Poster Session will be furnished on site with a 4-ft × 8-ft tackboard mounted on a standing easel, pre-printed with the paper title, author's name and company or university affiliation. Authors will mount their graphics, illustrations, photographs, etc., on the tackboard anytime between 11 a.m. and 6 p.m. Wednesday, June 8. Posters will remain on display during the entire conference.

While papers presented during these sessions will not be published in the official 1988 NEC/COP Proceedings, copies of the abstracts on which the papers are based will be available to all Conference attendees.

Authors may mail their single-page abstracts to:

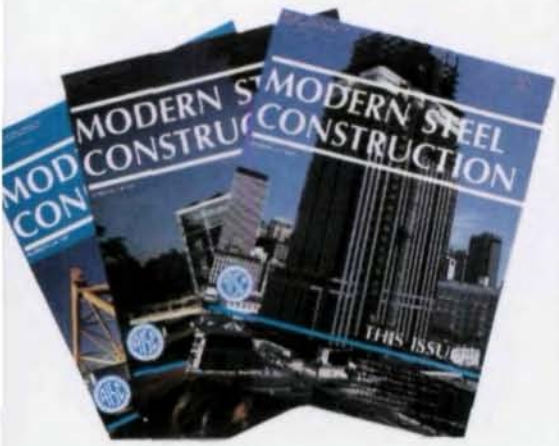
Lona R. Babbington
AISC Director of Public Relations
400 N. Michigan Avenue
Chicago, IL 60611-4185

before Feb. 28, 1988. The NEC/COP Planning Committee will notify authors of acceptance by April 1, 1988.

Please Note: Authors who present papers in the Poster Session receive no honorarium, reduction in registration fee or allowance for travel or other expense. AISC provides tackboards, map pins and 500 copies of the abstract for handout materials. Additional printed materials will be at authors' expense.

Poster sessions are not intended to be used for commerical purposes, and may not be used as advertisements for services or products.

MSC To Publish Special Show Issue



This year, for the first time, *Modern Steel Construction* will publish its May/June 1988 issue as The 1988 National Steel Construction Conference (NEC/COP) Official Program.

As a special bonus, each NEC/COP Exhibitor will be entitled to a free 2-in. Program ad in the 1988 NEC/COP Official Program Issue. Plus, each exhibitor will be entitled to a 25% discount on any ad ½ page or larger running in the Official Program Issue. (No other discounts apply.)

The Pattis Group, Lincolnwood, is the MSC advertising representative. Call Kirby Palait (312/679-1100) for details on advertising in this Special Program Issue.

Visitors to Exhibits Can Obtain Free Pass

The Planning Committee for AISC's 1988 National Steel Construction Conference (NEC/COP) extends a cordial invitation to all those interested in visiting the Exhibit Hall during the Conference, but unable to register for the entire meeting.

Visitors' passes will be available from 12 noon Wednesday, June 8, until 2:30 p.m. Friday, June 10.

Exhibitors who have issued invitations to groups or firms specifically for the purpose of visiting the Exhibit Hall are urged to make arrangements with the AISC Registration Desk in advance of guests' arrival, so that Visitors' Passes can be prepared prior to their arrival.

Visitors who wish to attend individual workshop or plenary sessions may request a "Partial Registration Form" (call AISC headquarters, 312/670-5432) in advance of the meeting or may register at the AISC Registration Desk. There will be no charge for a Visitor's Pass.

Southern Florida Attractions:

Places to Go and Things to See for "On-Your-Own" Adventuring

Variety is the key word to describe the many different and unique attractions Miami offers the visitor. The area lures with a combination of outdoor fun, arts and crafts, flora and fauna, natural wonders and cultural activities.

There's something for everyone. It's just a matter of choosing from the multitude of interesting and exciting places to experience and explore.

Art Deco District—Miami Beach, 305/672-2014. The area of Miami Beach covering 6th to 23rd Streets between Jefferson Ave. and the Beach contains over 800 buildings in the Art Deco style and pastel colors of the 1930s. Guided tours are available every Saturday starting at 10:30 a.m., $5 per person. Tours leave from the Design League Preservation Office at 1236 Ocean Drive, Miami. Special events from films to fashions take place throughout the year.

Bass Museum of Art—2121 Park Avenue, Miami Beach 33139; 305/673-7530.

Bayside Marketplace—330 Biscayne Boulevard, Miami, 33132; 305/577-3344. Miami's newest development, 235,000 sq. ft of restaurants, cafes, shops and boutiques housed in a pair of two-story pavilions with an open market and square between them; two free-standing restaurants and an entertainment stage.

H.M.S. Bounty—A fully rigged reproduction of an 18th century armed merchant ship, built for the 1962 film "Mutiny on the Bounty" is docked at Bayside and open for tours and receptions.

Cauley Square Village Shops—22400 Old Dixie Highway, Miami 33170; 305/248-3543. A 10-acre historic railroad village converted into a sprawling shopping area reflecting South Florida's early pioneer era. Features include garden tea room, aviary, shops, boutiques, arts and crafts and plants and foods.

Center for the Fine Arts—Metro-Dade Cultural Center, 101 W. Flagler St., Miami 33130; 305/375-1700. The center brings South Florida major art exhibitions from museums around the world, representing a rich variety of genres, styles and eras. Hours Tuesday - Saturday, 10 a.m. to 5 p.m.; Sunday, noon to 5 p.m. Snack bar, outdoor picnic tables, gift shop, nearby restaurants and shopping. Adult admission $3, children $2.

Coconut Grove Exhibition Center—3360 Pan American Drive, Coconut Grove 33133; 305/579-3310.

Coconut Grove Playhouse—3500 Main Highway, Coconut Grove 33133; 305/442-4000.

Dade County Auditorium—2901 West Flagler Street, Miami; 305/547-5414.

Fairchild Tropical Gardens—10901 Old Cutler Rd., Miami 33156; 305/667-1651. An 83-acre tropical botanical garden featuring 11 lakes and an impressive area of palms, flowering trees and shrubs. Open daily 9:30 a.m. to 4:30 p.m. Adults, $4; discounts to groups of 20 or more.

Gold Coast Railroad Museum—12400 S.W. 152 St., Miami 33177; 305/253-0063. Experience the world of locomotives and antique steam engines, when railroading was in its heyday. This non-profit museum contains the Ferdinand Magellan, the private railroad car of four U.S. presidents; two steam engines; baggage car displays and three cabooses, to name a few. Open daily 10 a.m. to 5 p.m. Admission, $4 for adults, $2 for children 3-12, free under age 3.

Frances Wolfson Art Gallery—*Miami-Dade Community College/Wolfson Campus*—300 N.E. Second Avenue, Miami 33132; 305/347-3278.

Guzman Center for the Performing Arts—174 East Flagler Street, Miami 33131; 305/374-2444.

Hialeah Park/Hialeah Race Track—East 4th Avenue & East 21st Street, Hialeah 33011; 305/885-8000.

Historical Museum of Southern Florida—101 W. Flagler St., Miami 33130; 305/375-1492. Open Monday through Saturday 10 a.m. to 5 p.m. except Thursday (10 a.m. to 9 p.m.) and Sunday (noon to 5 p.m.). Admission $3 adults, $2 children 6-12.

Metro-Dade Cultural Center—101 W. Flagler St., Miami 33130, houses the Center for the Fine Arts 305/375-1700; Historical Museum of Southern Florida, 305/375-1492; and *Miami-Dade Public Library* 305/375-2665.

Miami Jai-Alai Fronton—3500 N.W. 37th Avenue, Miami 33142; 305/633-6400.

Miami Metrozoo—Coral Reef Drive (S.W. 152nd St.) and S.W. 124th Ave., Miami; 305/251-0400. A cageless zoo on 200 acres exhibiting more than 100 species of animals roaming free in natural habitats, separated from visitors by moats.

Miami Seaquarium—4400 Rickenbacker Causeway, Miami 33149; 305/361-5705. South Florida's largest tropical marine park featuring Lolita, a four-ton killer whale; Sea Lion Magic Circus Show; 750-ft shark channel and exotic Lost Islands. Open 9:30 a.m. to 6:30 p.m. Adults $11.95; children 4-12 $6.95; children 3 and under free; senior citizens $10.15.

Miami Youth Museum—5701 Sunset Drive, 3rd Floor, South Miami 33146; 305/661-2787. Hands-on museum for children of all ages features continuously changing exhibits of cultural interest.

Monkey Jungle—14805 S.W. 2126th St., Miami 33170; 305/235-1611. "Where humans are caged and monkeys run wild." A natural Florida hammock is home for hundreds of monkeys, gorillas and trained chimpanzees. Visitors walk through protected walkways, while primates swing freely. Continuous shows feature trained chimpanzees and an Asiatic Ape exhibit with orangutangs. Open daily 9:30 a.m. to 5

p.m. Adults $6, children 5-12 $3. Senior citizens $5. Guide maps, bi-lingual staff, guided tours available.

Miami Museum of Science and Space Transit Planetarium—3280 South Miami Ave., Miami 33129; 305/854-4247. Experience the worlds of light, sound, electronics, electricity, biology, the human body and energy through participation with more than 140 hands-on exhibits and computer games. Museum open daily. Adults $4, children 3-12 $2.50, senior citizens $2.50.

The Space Planetarium—housed in a 65-ft dome where star, multi-media and laser shows in quadrophonic sound are presented daily. Adults $5. Show times and information on observation sessions available from the Hotline, 305/854-2222.

The Wildlife Center displays live giant insects, reptiles and marine life. The Florida Aviary features native birds of prey. Open daily.

Southern Cross Astronomical Society Observatory—Second level of Museum of Science; 305/854-4247. Free star-gazing and solar viewing, weather permitting. Open Friday, Saturday and Sunday evenings 7:30 to 10 p.m.

North Miami Museum and Art Center—12340 N.E. 8th Avenue, North Miami; 305/893-6211. Visual arts center features changing exhibitions of quality contemporary art of the works of Florida painters, sculptors and photographers.

Orchid Jungle—26715 S.W. 157th Ave., Miami 33031; 305/247-4824; 800/327-2832. Orchids from every part of the globe grow on oak trees in a natural Florida jungle. Complimentary orchids for the ladies. Adults $5, children $1.50; $4 juniors and senior citizens. Open daily 8:30 a.m. to 5:30 p.m.

Planet Ocean—3979 Rickenbacker Causeway, Miami 33149; 305/361-5786. One of the largest ocean science attractions of its kind in the world. Learn about the secrets of the sea through multi-screen panoramic theaters and three-dimensional, hands-on exhibits. "Sharks, Creatures of Fascination" exhibit features exotic shark specimens never before shown to the public and includes fossils, embryos and skeletons. Open daily, 10 a.m. to 4:30 p.m. Adults $5.50, children 6-12 $2.75, senior citizens $4.

SeaEscape Limited—1080 Port Boulevard, Miami 33132; 305/379-0000; 800/432-3564. A one-day excursion on SeaEscape vessel sailing daily from Miami to the Bahamas. Included are many activities found on longer cruises, three buffet meals, bus service, entertainment and casino fun. Adult fare is $99 from Miami.

Ancient Spanish Monastery—16711 W. Dixie Highway, North Miami Beach 33160; 305/945-1462. The oldest building in the Western Hemisphere. First erected in 1411 in Segovia, Spain, it was dismantled and brought to Miami and re-erected in 1954. The monastery features works of art and antiques surrounded by formal gardens and a lush subtropical jungle. Open daily from 10 a.m. to 5 p.m., Sundays noon to 5 p.m. Donations: adults $3, children 75 cents, juniors $1.50 and senior citizens $2 requested.

Theatre of the Performing Arts (TOPA)—1700 Washington Avenue, Miami Beach, 33139; 305/673-8300.

American Sightseeing Offers Special Excursions Before & After Conference

American Sightseeing International has been selected to arrange AISC's Optional Tours and Events during the 1988 National Steel Construction Conference (NEC/COP). The company is also the operator of Red Top Sedan Service, the official franchised limousine transfer carrier for Miami International Airport.

A representative of American Sightseeing will be at AISC's registration desk throughout the Conference to assist AISC staff with coordination of Optional Tours, and also to provide information to attendees on excursions to other destinations of interest, including:

Night Life Tours

Enjoy one of Miami's world renowned supper clubs, Les Violins or Copacabana, or a visit to one of Miami Beach's famous hotel nightclubs. Tours operate nightly. One Show Tour includes dinner, floor show, taxes, tips and transportation. Gentlemen are required to wear jackets.

Per person: $32

Walt Disney World

A one-day tour of either Walt Disney World's Magic Kingdom or Epcot Center includes round-trip transportation, admission and unlimited use of either attraction. Adults: $64; children under 12: $41

Multi-day Tours include round-trip transportation; overnight accommodations at a convenient Orlando area hotel for number of nights selected; admissions and unlimited use of attractions at Magic Kingdom and Epcot Center for number of days selected.

Sea Holiday

Enjoy a cruise aboard Discovery I, sailing daily from Ft. Lauderdale to Bimini in the Bahamas, Freeport on Grand Bahama Island, a gala evening dinner party cruise or just "cruisin' around." The liner offers a full casino, plus bingo, sumptuous cuisine, dancing/disco with two orchestras, gala entertainment, cocktail lounges, jacuzzis and pool, gym and massage, children's play room, deck sports and much more. Cruise prices vary.

3- or 4-Night Cruises to Bahamas

Select your choice of 3- or 4-night cruises to the Bahamas aboard Carnival Cruise Lines, Norwegian Caribbean Lines, Dolphin Cruises or Eastern Cruise Lines. Tour includes round-trip ground transportation between the Fontainebleau and the Port of Miami. Cruises of longer or shorter duration available upon request. From $290 per person, double occupancy; port tax not included.

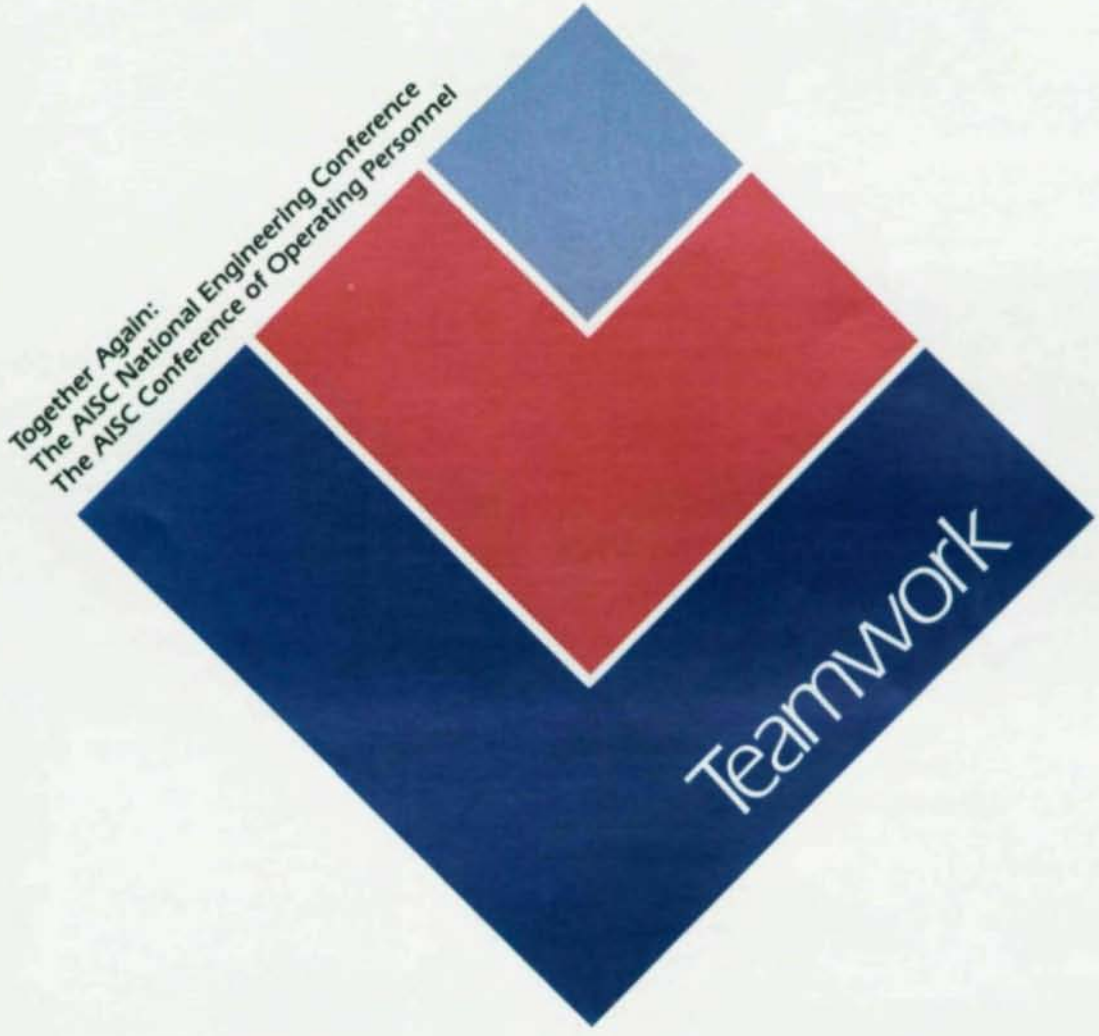
To make reservations for pre-conference excursions, or for further information on these special tours, call American Sightseeing at their Tour Information Desk in the Fontainebleau Hotel, 1-800/367-5149.

NEC/COP

1988 NATIONAL STEEL CONSTRUCTION CONFERENCE

HILTON FONTAINEBLEAU HOTEL

MIAMI BEACH, FLORIDA



ADVANCE PROGRAM & REGISTRATION FORM

JUNE 8-11, 1988

SPONSORED BY THE

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

TOGETHER AGAIN:

ADVANCE PROGRAM

MONDAY — JUNE 6

8:00 AM – 5:00 PM **Exhibitor Move-In** — Grand Ballroom

TUESDAY — JUNE 7

8:00 AM **Exhibitor Move-In Continues** — Grand Ballroom

11:00 AM – 5:00 PM **Registration Booth Open** — Lobby, Grand Ballroom

WEDNESDAY — JUNE 8

SPECIAL SESSIONS

8:00 AM **Registration Booth Open** — Lobby, Grand Ballroom

11:00 AM ***Partner in Education Advisors' Meeting*** — PIE Advisors Only

12:00 Noon **Exhibits Open** — Grand Ballroom

1:30 PM **Plenary Session** — Fontainebleau Ballroom

"Justification for Purchasing New Equipment" — Plenary Session
Fontainebleau Ballroom
This special plenary session devoted entirely to planning for the purchase of new automated equipment will be of special interest to fabricators. All exhibitors are invited to attend.

"Current Challenges in Steel Education" — Educator Session

AISC Professional Member Forum
Inaugurated last year, AISC will again extend an invitation to AISC Professional Members to attend this special Forum to elicit opinions and technical contributions on structural steel design.

2:30 PM **Coffee Break** — Grand Ballroom (Exhibits Open)

3:30 PM **WORKSHOP SESSIONS**
(See Workshop Schedule for Details on Individual Topics)
1 Heat Straightening
2 Heat Curving
3 Purchasing New Equipment — Workshop Session

EDUCATOR SESSION *(continued)*

AISC PROFESSIONAL MEMBER FORUM (continued)

5:00 PM **Adjourn**

OPTIONAL EVENTS

6:30 PM – 7:30 PM **Get-Acquainted Cocktail Party** (Event #1) — Grand Ballroom Exhibit Area

THURSDAY, JUNE 9

7:00 AM **Registration Desk Open** — Lobby, Grand Ballroom

7:30 AM **Continental Breakfast** — Grand Ballroom (Exhibits Open)

8:30 AM **THE 1988 NATIONAL STEEL *CONSTRUCTION CONFERENCE***
Opening Plenary Session — Fontainebleau Ballroom

Welcome:

Samuel Y. Golding, President
The Standard Structural Steel Company — Newington, CT
and Chairman, AISC

Victor H. Thompson, Jr., Vice President
Mosher Steel Company — Houston, TX
and Chairman, Conference of Operating Personnel Committee

L. A. Kloiber, President
L. L. LeJeune Company — Minneapolis, MN
and Chairman, National Engineering Conference Committee

8:45 AM **Keynote Address:**
"The Future of Tall Steel Buildings"
Walter P. Moore, Jr.
President and Chairman
Walter P. Moore Associates — Houston, TX

9:30 AM **"AISC Third Edition, Quality Criteria & Inspection Standards"**
A presentation by AISC Staff on the new Third Edition of this industry standard.

10:00 AM **Coffee Break** — Grand Ballroom (Exhibits Open)

10:30 AM **WORKSHOP SESSIONS**
4 Bolt Follow-up
5 Shop Planning
6 Steel Decks/Design and Construction
7 Economical Steel Design & Stability Provisions
10 Weld Design
11 Angle Compression Members
12 Short Span Bridges

12:00 Noon **LUNCH** — Grand Ballroom (Exhibits Open)

1:30 PM **EXHIBIT SESSION** — Grand Ballroom
No Workshops are Scheduled; All Registrants *are encouraged to visit exhibits.*

POSTER SESSION — Jade Promenade
A Poster Session is being presented for the first time at an AISC Conference. Selected papers will be presented in Poster Form, by authors, in informal discussions. For information on submitting papers for the Poster Session, call AISC Headquarters (312-670-5432).

Soft drinks and coffee will be available in the Exhibit Hall until 3:30 PM when the next Workshop Sessions begin.

3:30 PM **WORKSHOP SESSIONS**
- 5R Shop Planning (REPEAT)
- 6R Steel Decks/Design & Construction (REPEAT)
- 9 Quality Criteria—Workshop
- 17 Connections—Mixed Construction
- 19 LRFD Seismic Design
- 21 Computerized LRFD Specification

5:00 PM **Adjourn**

OPTIONAL TOURS

7 – 10:00 PM **Miami at Night** (Event #2, advance tickets required, see Registration Form.)

7 – 10:00 PM **"The Spirit" Dinner Cruise** (Event #3, advance tickets required, see Registration Form.)

FRIDAY, JUNE 10

7:00 AM **Registration Desk Open**

7:30 AM **Continental Breakfast** — Grand Ballroom (Exhibits Open)

8:30 AM **Plenary Session** — Fontainebleau Ballroom

"Solutions for the Use of Jumbo Shapes"
Reidar Bjorhovde, Head of Civil Engineering Dept.
University of Pittsburgh — Pittsburgh, PA

The plenary session on Jumbo Shapes will feature a general position paper. A workshop immediately following will include representatives from domestic and foreign mills and an open discussion on the subject.

9:30 AM **Coffee Break** — Grand Ballroom (Exhibits Open)

10:00 AM **WORKSHOP SESSIONS**
- 1R Heat Straightening (REPEAT)
- 2R Heat Curving (REPEAT)
- 8 United Airlines Terminal
- 10R Weld Design (REPEAT)
- 13 Jumbo Shapes — Workshop
- 16 Innovative Bridges

11:30 AM **LUNCH** — Grand Ballroom (Exhibits Open)

1:15 PM **WORKSHOP SESSIONS**
- 4R Bolt Follow-up (REPEAT)
- 7R Economical Steel Design and Stability Provisions (REPEAT)
- 14 Waste Disposal
- 15 Tubular Structures and Connections
- 18 Controlling Wind Response
- 20 Fire Protection

2:45 PM **Coffee Break** — Grand Ballroom (Exhibits Open)

3:30 PM **EXHIBITOR MOVE-OUT**
Exhibitors will be permitted to remove their displays after the conclusion of Friday afternoon's coffee break.

3:30 PM **WORKSHOP SESSIONS**
- 8R United Airlines Terminal (REPEAT)
- 9R Quality Criteria (REPEAT)
- 13R Jumbo Shapes (REPEAT)
- 14R Waste Disposal (REPEAT)
- 21R Computerized LRFD Specification (REPEAT)

5:00 PM **Adjourn**

OPTIONAL EVENTS

7:00 PM **The 1988 NATIONAL STEEL CONSTRUCTION CONFERENCE Cocktail Party, Dinner & Entertainment**
(Event # 4, advance tickets required — See Registration Form)

SATURDAY, JUNE 11, 1988

8:30 AM **Plenary Session** — Fontainebleau Ballroom

A Tribute to Memory of T. R. Higgins
Dr. Lynn S. Beedle, Head of Civil Engineering Department
Lehigh University — Lehigh, PA

THE 1988 T. R. HIGGINS LECTURE —
To be announced
(Judging for the T. R. Higgins Lectureship is now in process. The winner, and title of the 1988 T.R. Higgins Lecture, will be announced prior to the Opening Session.)

10:00 AM **Coffee Break** — Jade Promenade

10:30 AM **MORE STEEL FOR THE BUCK — Plenary Session**
A panel, moderated by a structural steel fabricator, will draw on the viewpoints of a consulting engineer, the chief engineer for a steel fabricator, a steel erector, and a structural steel detailer, in a discussion of specific areas of concern as these four types of team members evolve approaches and resolve problems arising in the production of economic structural steel frames for buildings and bridges. Following individual presentations by each of the four, the floor will be open for suggestions on ways in which the team can work together more efficiently and productively.

12:00 Noon **Drawing for Attendance Prizes**

12:15 PM **THE NATIONAL STEEL CONSTRUCTION CONFERENCE Adjourns**

OPTIONAL EVENTS (SATURDAY AFTERNOON)

1:30–5:00 PM **Seaquarium** (Event #5, advance tickets required)

1:30–5:00 PM **Parrot Jungle** (Event #6, advance tickets required)

Special Educator Fee — $150.00

(Educators employed full-time at an accredited architectural or engineering college or university may be eligible for sponsorship by the AISC Education Foundation. The Foundation will pay registration fees for the first 100 educators registering for the Conference. Simply return your registration form along with a letter on your college or university letterhead. Those registering after Foundation sponsorship is filled will be notified and, if they wish to attend at their own expense, will be billed for the $150 Educator Registration Fee.)

NOTE: Special Educator Fee, and Foundation Sponsorship, include all Plenary Sessions, workshop sessions and coffee breaks, Continental Breakfasts and luncheons both Thursday and Friday, and the Get-Acquainted Cocktail Party Reception Wednesday evening, as well as a printed and bound copy of the Proceedings.

THE 1988 NATIONAL STEEL CONSTRUCTION CONFERENCE

Program Summary

(NOTE: "R" Sessions are Repeats)

Wednesday, June 8 — SPECIAL SESSIONS

1:30- 5:00	EDUCATOR SESSION	
1:30- 5:00	AISC PROFESSIONAL MEMBER FORUM	
1:30- 3:00	PLENARY SESSION: Purchasing New Equipment	
3:30- 5:00	WORKSHOP SESSIONS:	1 2 3

Thursday, June 9

8:30-10:00	OPENING PLENARY SESSION/ KEYNOTE: Moore	
10:00-11:59	WORKSHOP SESSIONS:	4 5 6 7 10 11 12
1:30- 3:30	EXHIBIT SESSION POSTER SESSION	
3:30- 5:00	WORKSHOP SESSIONS:	5R 6R 9 17 19 21

Friday, June 10

8:30- 9:30	PLENARY SESSION: JUMBO SHAPES	
10:00-11:30	WORKSHOP SESSIONS:	1R 2R 8 10R 13 16
1:15- 2:45	WORKSHOP SESSIONS:	4R 7R 14 15 18 20
3:30- 5:00	WORKSHOP SESSIONS:	8R 9R 13R 14R 21R

Saturday, June 11

8:30- 8:45	T. R. Higgins Tribute
8:45-10:00	The 1988 T. R. Higgins Lecture
10:30-11:59	PLENARY SESSION: MORE STEEL FOR THE BUCK — Panel

1. HEAT STRAIGHTENING

The presentation will outline procedures for straightening material damaged in shipment or erection in order to make the material acceptable for the purpose originally intended.

2. HEAT CURVING

Shop procedures for the application of heat to material to provide the required curvature in members in accordance with contract drawings.

3. PURCHASING NEW EQUIPMENT — WORKSHOP

Particular emphasis on considerations in planning for the purchase of new automated equipment for the small and medium shop, with the specific intent of reducing man hours per ton of production, a discussion of the planning process and the factors which should take precedence in decision-making.

4. BOLT FOLLOW-UP

This session is a follow-up to last year's workshops on high tensile bolts. New developments will be presented, together with a detailed report on the influx of counterfeit bolts and their impact on the industry.

5. SHOP PLANNING

Presented by a fabricator, the session will present an overview of methods and procedures for planning and scheduling work, particularly in the small and medium-sized fabricating shop, and will emphasize how to achieve adjustments to the schedule necessitated by design revisions.

6. STEEL DECKS/DESIGN AND CONSTRUCTION

The presentations will review the different types of composite floor and roof deck systems available, their compatibility with various types of structural framing, and will discuss revisions and modifications which may be suggested in response to problems encountered in the field.

7. ECONOMICAL STEEL DESIGN & STABILITY PROVISIONS

Practical solutions to stability and bracing problems will be presented, as well as means of reducing steel fabrication and erection costs.

NAL STEEL CONSTRUCTION CONFERENCE

8. UNITED AIRLINES TERMINAL

This "Terminal for Tomorrow" at Chicago's O'Hare Field features an exposed steel structural system supporting the roof of a 1,730-ft. long vaulted gate area and exposed steel folded plate roof trusses over the 120-ft. x 810-ft. column-free ticketing pavilion area.

9. QUALITY CRITERIA & INSPECTION STANDARDS

AISC has just published the Third Edition of this document, and this presentation will discuss problems and conflicts of interpretation involving fabricated tolerances and procedures. Those revisions which supercede the Second Edition will be highlighted.

10. WELD DESIGN

Important considerations in welding from both a design and fabrication point of view will be discussed. Emphasis will be on weld quality and "fitness for purpose" inspection.

11. ANGLE COMPRESSION MEMBERS

Latest research and design information will be presented on behavior of single angles with combined axial load and moments and, also, double angle struts.

12. SHORT SPAN BRIDGES

Steel is successfully competing with concrete in short span bridges. Precast composite units are being used in Oklahoma and neighboring states. The Autostress Design method was first used for rolled beams. Trial designs of welded compact beams show even greater economy.

13. JUMBO SHAPES — WORKSHOP

There are presently conflicting views on the use of jumbo shapes in tension. AISC, together with producing mills, is attempting to arrive at a unified approach to the problem. In this workshop session, representatives of domestic and foreign mills will provide their proposed solutions.

14. WASTE DISPOSAL

Current Environmental Protection Agency regulations have presented problems for fabricators who must dispose of waste products from painting and abrasive processes. The session will review the requirements as they apply to various quantities of waste materials, and will discuss the methods for containment and disposition of such materials in order to fully comply with the EPA regulations.

15. TUBULAR STRUCTURES AND CONNECTIONS

Increased use of tubular sections in structures has presented the fabricator and detailer with new fabrication and connection problems. Economical connection details and fabrication techniques which are — sometimes uniquely — applicable to tubular sections will be outlined.

16. INNOVATIVE BRIDGES

Steel is demonstrating itself to be an effective material for innovative bridge applications. A novel bridge structure with a triangular cross-section has been built in France and will be described by the designer. In the U.S., truss bridges have been given a modern look which proved competitive with concrete. A case study is offered.

17. CONNECTIONS — MIXED CONSTRUCTION

A fast-growing structural system includes structural steel beam framing into composite columns. A researcher and designer will discuss possible ways of making the connection.

18. CONTROLLING WIND RESPONSE

Tall buildings are often subjected to wind-induced vibrations which can cause human discomfort and other serviceability problems. Research which has been done regarding human sensitivity and procedures to predict motion will be reported. Also, a design engineer will discuss the successful use of visco-elastic damping devices.

19. LRFD SEISMIC DESIGN — CASE STUDIES

Two design engineers will discuss how LRFD was used in the seismic design of a 40-story building in Los Angeles, and an office building in Mexico City featuring composite columns.

20. FIRE PROTECTION

Fire protection research is being conducted on an international scale. European research will be described that is able to predict the effect of local fires on overall structural behavior. Analytical methods are being used to replace testing in many instances. Australian research provides new data on the effect of fires in open and closed automobile parking garages.

21. COMPUTERIZED LRFD SPECIFICATION

The developers of the AISC Computerized LRFD Specification will describe and demonstrate this new tool that enables automated and semi-automated interpretation of the LRFD Specification and evaluation of structural components for conformance with the LRFD provisions.

SPOUSES' PROGRAM

The greater Miami area offers so many things to do, so many places to see, that we found it difficult to narrow the choices down to those that we felt spouses — or other traveling companions — of conference registrants would most enjoy.

SPECIAL NOTE: This year, for the first time, we are also offering each of the events on the spouses' program as a separately priced event. All those registering for the COMPLETE Spouses' Program will receive tickets for each event listed below. Anyone wishing to register for any one or more of these events INDIVIDUALLY may do so by selecting the events of their choice on the Conference Registration Form (see opposite page).

WEDNESDAY, JUNE 8

6:30 — 7:30 PM
Get Acquainted Cocktail Party **(Event #1)** in the Exhibit Hall (Grand Ballroom). You'll have a chance to visit the Conference Exhibits, greet old friends and meet new ones. Drinks are "on the house"; and there'll be plenty of hors 'douevres. We're also planning some special entertainment this year, taking advantage of the Ballroom stage and the multitude of great talent available in Southern Florida. You might like to sleep in tomorrow morning, so we'll delay our next event until

THURSDAY, JUNE 9

11:00 AM
Brunch in the Fontainebleau's Versailles Gallerie, **(Spouses' Event #A)** where a breathtaking view of the ocean will almost lure you away from the hotel's famous Surfsider Buffet. But we've found an even better lure . . . buses will load in front of the hotel at

12:30 PM
for a trip to Vizcaya **(Spouses' Event #B)** . . . the Italian Renaissance-style Villa on Biscayne Bay where John Deering, co-founder of International Harvester, assembled treasures from all over Europe in a magnificent collection: 34 rooms of 15th through 19th century furnishings and decorative arts. Under construction from 1914 through 1916, it is estimated that 1,000 of Miami's residents were employed in construction of the (then) 70-room house, its buildings and gardens. You'll have refreshments in the formal gardens, surrounded by the natural subtropical forest.

FRIDAY, JUNE 10

9:00 AM
We'll whisk you back to the present, with a far more down-to-earth (and water) tour of the Everglades. **(Spouses' Event #C)** Among the high points will be a visit to the Miccosukee Indian Village, an airboat ride deep into the Everglades, craft exhibits and a stop at the Village gift shop. For those not too faint of heart, there'll be a bit of alligator wrestling — no audience participation, of course. Lunch is included at the Village restaurant. (NO alligator steaks on the menu.) Back to the Hotel by 5 PM.

SPOUSES' PROGRAM REGISTRATION FEE: $100.00

(Includes Event #1, Spouses Events #A, B & C)

OPTIONAL TOURS AND EVENT

EVENT #1 Wednesday, June 8, 6:30 – 7:30 PM

Get-Acquainted Cocktail Party
This annual get-acquainted party, held in the Exhibit Hall, will include complimentary cocktails, hors d'oeuvres and entertainment.

Price: Included in Registration Fee for Conference Registrants, Spouses registered for COMPLETE Spouses' Program and Registered Exhibitors

Individual Ticket Price: $25.00

EVENT #2 Thursday, June 9, 7 – 10:00 PM

Miami at Night
Enjoy one of Miami's world renowned supper clubs. Tour includes dinner, floor show, taxes, tips & transportation. (Gentlemen are required to wear jackets.)

Price: $32.00

EVENT #3 Thursday, June 9, 7 – 10:00 PM

"The Spirit" Dinner Cruise
All the elements of an ocean-going cruise on an affordable intercoastal adventure. Live entertainment, dinner and dancing while cruising one of the most beautiful waterways in the country. Price includes motor coach to and from ship, cruise, dinner, entertainment, dancing, taxes and gratuities.

Price: $32.00

EVENT #4 Friday, June10, 7 – 10:00 PM

The National Steel Construction Conference Dinner: "Moon over Miami"
We'll bring some of Miami's finest entertainment to you at The National Steel Construction Conference "Moon over Miami" dinner, held beside the Fontainebleau's ½-acre pool-lagoon. Join new and old friends under the stars for a sumptuous poolside buffet and star-studded entertainment.

Price: $45.00

EVENT #5 Saturday, June 11, 1:30 – 5:00 PM

Seaquarium
A half-day treat you'll never forget. Meet the sea's super star, Flipper, and his co-stars: killer whales, but gentle as lambs. Tour price includes all admissions to attractions in this world famous sea-sized aquarium.

Price: $21.00

EVENT #6 Saturday, June 11, 1:30 – 5:00 PM

Parrot Jungle
Unique, dazzling . . . beautiful. Parrots, macaws and exotic tropical birds fly free — a talented few perform on roller skates, solve math problems and even ride bicycles. Bring your camera. Tour price includes all admissions.

Price: $21.00

REGISTRATION AND ROOM RESERVATION FORM

AISC MEMBER FEE: Early Registration (before April 11): $250
Late Registration (after April 11): $300
(Includes AISC Active, Associate and Professional Members)

NON-MEMBER FEE: Early Registration (before April 11): $300
Late Registration (after April 11): $350

EXHIBITOR FEE: (for additional Exhibit Personnel only): $100
(Exhibitors are entitled to one registration for each booth reserved. Above fee is payable ONLY if in excess of one person per booth, and does not include attendance at Workshop Sessions or copy of Proceedings.)

SPECIAL EDUCATOR FEE: $150

REGISTRATION FEES INCLUDE all Special and Plenary Sessions, workshops, coffee breaks, Continental breakfast Thursday and Friday, luncheons Thursday and Friday, the Get-Acquainted Cocktail Reception Wednesday evening, and a printed and bound copy of the Proceedings. (The special Exhibitor Fee for additional Exhibit Personnel includes all of above except workshops and Proceedings.)

EDUCATION FOUNDATION SPONSORSHIP OF REGISTRATION FEE: Available to first 100 educators registering for the Conference. See instructions elsewhere in this Program for applying — and check appropriate box below.

REGISTRATION CANCELLATION POLICY: Cancellations received before May 25, 100% will be refunded; after May 25, 50% will be refunded. (Those cancelling after May 25 will receive a printed and bound copy of the 1988 NEC/COP Proceedings.)

PLEASE REGISTER: (Type or Print)

Name _____ Nickname (for badge) _____

Company _____ Title _____

Mailing Address _____

City and State/Zip _____ Bus. Telephone ( ) - _____ Home Telephone ( ) - _____

If Spouse or other guest wishes to register for Complete Spouses' Program, or individual Spouses' Events, complete next line:

Name of Individual Registering for Spouses' Program _____ Nickname (for badge) _____

REGISTRATION FEES ENCLOSED:

AISC Member Fee $ _____

Non-Member Fee $ _____

Exhibitor, as indicated below: ☐
Fee Included in Booth Price (1 per booth)
Not Included in Booth Price:
Fee $100.00 $ _____

Educator, as indicated below: ☐
Foundation Sponsorship Requested, Letter attached
(Educators registering after Foundation sponsorship is filled will be billed $150)

Spouse's Fee/Complete Program ($100.00)
Includes Event #1, #A, #B and #C) $ _____

Fees for Optional Events (from Col. 2) $ _____

TOTAL FEES ENCLOSED $ _____

*Included with registration and spouses fee

REGISTRATION FOR SPECIAL SESSIONS

PIE Advisors Meeting ☐
(11:00 AM Wednesday, PIE Advisors Only)

Educator Session ☐
(1:30 PM Wednesday — No Additional Fee)

AISC Professional Member Forum ☐
(1:30 PM Wednesday — No Additional Fee)

Wednesday Plenary Session: Purchasing New Equipment ☐
(1:30 PM Wednesday — No Additional Fee)

REGISTRATION FOR OPTIONAL EVENTS

Event	No. Tickets	Total Price
#1–Cocktail Party (Wed., 6:30 PM)	_____ @ $25.00	$_____ *
#2–Miami at Night (Thurs., 7:00 PM)	_____ @ $32.00	$_____
#3–Dinner Cruise (Thurs., 7:00 PM)	_____ @ $32.00	$_____
#4–"Moon over Miami" Party (Friday)	_____ @ $45.00	$_____
#5–Seaquarium (Sat., 1:30-5 PM)	_____ @ $21.00	$_____
#6–Parrot Jungle (Sat., 1:30-5 PM)	_____ @ $21.00	$_____
#A–Surfsider Brunch (Thurs., 11 AM)	_____ @ $25.00	$_____
#B–Vizcaya Trip (Thurs., 12:30 PM)	_____ @ $30.00	$_____
#C–The Everglades (Fri., 9 AM-5 PM)	_____ @ $35.00	$_____
	TOTAL OPTIONAL EVENT FEES	$_____

Make checks payable to AISC. If you wish to pay for the Optional and/or Spouses' Events selected with a separate check, you may do so. Tickets for all events are reserved on a first-come, first-served basis, and will be delivered to you on your arrival at the Registration Desk. AISC reserves the right to limit number reserved by any individual.

REGISTRATION FORM—FONTAINEBLEAU HOTEL

Special Rate: Single ($85) _____ Double ($85) _____
If Two Double Beds are Required, Check Here: _____
Arrival Date _____ Time _____
Departure Date _____
(Hotel Check-in Time is 3 PM, Check-out 11 AM)

NOTE: Rates are subject to 10% local & state tax; children any age free in parents' room. Rooms must be guaranteed by a separate check, payable to the Fontainebleau Hilton, in the amount of one night's stay, or by credit card (See space below). The hotel will honor and guarantee reservations received by May 6, 1988, so return this form promptly.

____ I enclose check for $85, payable to the Fontainebleau Hilton.

____ Please charge my Credit Card # _____

Expiration Date _____

Circle Card Used: American Express VISA MasterCard
Diners Carte Blanche Discover

Signature (if Credit Card Charge) _____

MAIL COMPLETED FORMS, REGISTRATION FEES AND HOTEL GUARANTEES TO:

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CINCINNATI CONVENTION CENTER

A Monument to Steel Construction

by Randy R. Wilson

The summer of '87 marked completion of the Albert B. Sabin Convention Center in Cincinnati, O. This $62-million project has been under design and construction for the past five years and in planning for several years before. The project goals were to expand the existing facility to about twice its original size and completely renovate the original building, with minimal interference to operations of the Convention Center. The expansion was needed to support the growing hotel and convention trade in Cincinnati and to provide a modern facility with the flexibility to accommodate activities ranging from small meetings to large exhibits and grand banquets.

The Convention Center is well integrated with its surroundings. An elevated pedestrian skywalk system, which serves much of the downtown hotel and business district, enters the center from three directions and passes through a skylighted lobby/atrium at the main entrance. Twenty four-hour public access to this lobby will make this building a fulltime member of the downtown community. Nearby parking garages can be reached through the skywalk system. Large glass curtain walls provide excellent views of the city from several lobby and prefunction areas. Building setbacks and skylighted arcades along exterior sidewalks reduce the visual mass of the building as viewed from street level. Replacing the facade of the existing building created the appearance of a single "new" building of outstanding architectural quality for this Cincinnati showplace.

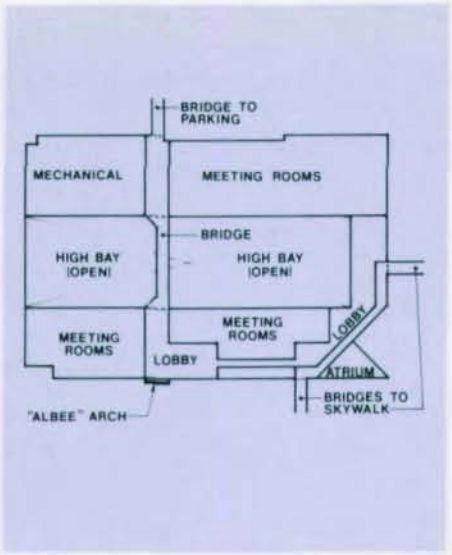
Tribute to History

As a tribute to the architectural history of Cincinnati, and in an effort to make the building sympathetic to the historic district south of the center, the arched marble facade of the former RKO Albee Theatre was re-erected at the Plum Street entrance. Reconstruction of the Albee arch required exacting construction techniques because of the much tighter joint tolerances used in the original construction. The shape of the arch is carried into the building as a barrel vault which spans a second floor lobby.

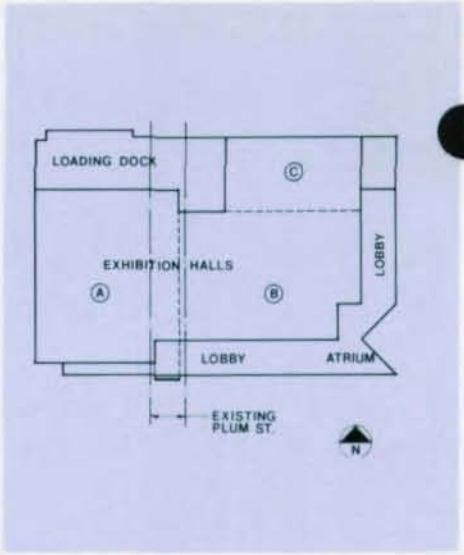
The completed facility boasts a 161,000-sq. ft exhibit hall which can be divided into three separate exhibit areas for smaller shows. The 30,000-sq. ft lobby and the loading dock facilities are designed to provide direct access to the three exhibit areas. The second floor contains meeting and assembly rooms ranging in size from 500 to 12,000 sq. ft. A 30,000-sq. ft ballroom is on the third floor. A series of second and third floor lobbies extending the

Albert B. Sabin Convention Center expanded to twice original size, with original building entirely renovated.

Reconstruction of arched marble facade of RKO Albee Theatre demanded exacting construction techniques.



First floor



Second floor

entire width of the building along the Plum Street axis provide easy access to all areas of the building.

Major Design Requirements

There were a number of requirements of the design program which affected the nature and scope of the structural design. These included a 36-ft high bay area with a 160-ft span, a large atrium with a pyramidal skylight, a column-free ballroom supported over the high bay area, lobbies with vaulted ceilings and skylights and replacement of the entire facade of the existing building to match that of the addition. Important to all of these requirements was the need for large, open spaces to provide maximum flexibility for building functions.

One major requirement of the design program called for the creation of a ballroom with banquet seating for 2,100. Because of program requirements for exhibit space, lobby, dock facilities and building profile, this ballroom was placed above the central exhibit hall in the addition. Sixteen-foot deep floor trusses were placed at 40 ft o.c. to span the 160 ft and support the 40,000 sq. ft of column-free ballroom and pre-function space. Even though the bulk of the existing building was left in its original form and function, selective demolition, new framing and foundation work were required around the entire perimeter. A 10-ft bay was removed along the south wall to provide space for an exterior arcade and skywalk stair. A 10-ft bay was added to the north side of the building to provide pre-function space for a large assembly area. Replacing the original precast wall system with a masonry facade required addition of new perimeter foundations.

Phasing Concept Simple

The initial phasing concept was simple—build a new building and move operations into it, then renovate the existing building. An existing 160-ft clear-span, high-bay area was located along an east-west axis in the middle of the existing building. The new addition was to be added to the west of the existing building and the high-bay area extended to the west wall of the addition. Unfortunately, all of the central mechanical and loading dock facilities in the existing building were located between the existing high bay area and the new addi-

Spectacular central lobby created by rebuilding triangular area at corner of existing building. Photo by Cable Studios, Chicago.

tion. It was necessary to relocate these services before the expansion could take place. The northern 140 ft part of the frame for the new addition was the first structure to be erected. Mechanical services were then relocated to this area and fed to the existing building.

The original building occupied an entire city block. In order to have exhibit floors in the addition continuous with those in the existing building, it was necessary to close Plum Street for one block and reroute traffic. In addition, a number of street utilities had to be relocated prior to the street closing.

Framing for the mechanical areas in the existing building did not match the required bay spacings and could not be reused in the completed structure. These areas were demolished and replaced with new foundations and columns to support a continuation of the high-bay framing into the new addition. A number of obstructions in the form of existing footings and framing members were encountered in the design of these new structural supports. A temporary barrier/shoring wall, erected inside the existing building along the demolition line, separated convention and construction activities for the duration of the project. Along this line, a 120-ft span truss was replaced with a 160-ft span truss using the temporary wall to support the roof during truss replacement.

Framing for the western part of the new addition was erected while structural modifications were being made to the existing building. Finally, new framing was added to tie the new addition to the existing building. Because of the inter-relation of many trades and services, phasing and scheduling of the project remained the critical factor in meeting project deadlines throughout the construction period.

Steel the Choice for Framing

Steel was the obvious choice for the structural frame because of the long spans and large floor heights. A total of 4,300 tons of new structural and miscellaneous steel was incorporated in this project. Typical bay size is 40 ft x 60 ft and the floor-to-floor dimension is 26 ft-8 in. Long-span concrete framing and the formwork required would not have been economical. There were other reasons for using steel. The

Gusset plates connect flanges of intersecting members. Trusses, weighing from 50-70 tons, were assembled on site.

new construction had to be integrated with the existing steel frame and several mezzanine areas had to be suspended between floors. And steel would provide better flexibility for the future.

The slab system is 4¼ in. of lightweight (115 pcf) concrete on 2-in., 18 ga. composite metal deck. This 6¼-in. system provides a 3-hr. fire rating. Headed studs, ¾ in. dia. × 4-in. long were welded to the top flanges of supporting beams to form a composite beam/slab system. This helped to economize the steel required to support 100 psf assembly live loads and to add stiffness to the floor system. The purlins and girders were cambered to compensate for dead-load deflections. The slab was then placed to a uniform thickness by using screed pins welded to the top of steel framing. In a typical bay, W21 purlins were placed 10 ft o.c. and span 40 ft. Girder spans vary from 40 ft to a maximum of 70 ft over the loading dock area. Plate girders as deep as 72 in. and weighing 580 plf were used for 60-ft and 70-ft spans. A572, Gr. 50 steel was used for all rolled steel beams and columns and plate girders.

The central lobby and main entrance to the building was created by demolishing and rebuilding a triangular area at the southeast corner of the existing building. This area, extending 120 ft along both exterior walls, required removal of the second floor, roof and a mezzanine. The reconstructed lobby features a 50-ft high atrium capped by a pyramid-shaped skylight extending another 50 ft above the roof to the peak. The skylight is supported by a series of 54-in. pipe trusses with 6-in. dia. chords. Forty-eight inch plate girders were

New structural steel tied addition to existing building. Project scheduling was critical to meeting deadlines.

used to laterally brace the skylight framing and span 100 ft from peak to base.

Three Types of Framing

Three types of framing were used to support the roofs above the series of lobbies along the Plum Street axis. Barrel vaults were placed over the second floor lobbies located north and south of the high-bay area. These were constructed using a 4-in. × 9-in. built-up arched box section placed 5 ft o.c., spanning 20 ft. A 1⅜-in. form deck spans between the arches. Plywood was fastened to the deck to provide a smooth substrate for a standing seam metal roof. Parallel chord pipe trusses were used to span the third floor pre-function space. Spanning 40 ft, the trusses rise at a 40° angle from each support to a peak at mid span. The roof above the escalators which tie the second and third floor lobbies together is shaped similar to that above the pre-function space. A series of W27 bents 10 ft o.c. is used to support the roof and limit lateral deflections at perimeter walls of this area.

The 16-ft deep roof trusses in the existing building which span the 160-ft high-bay area are built-up of double angle sections with heavy angle chords. The support of the ballroom over this high-bay area in the new addition called for a much heavier truss system. These trusses are 16 ft deep and constructed of W14 shapes, with the weak axis horizontal for both chord and web members. Gusset plates were used to connect the flanges of intersecting members and the trusses were assembled on site. The completed trusses, weighing from 70 to 90 tons each, were then lifted as a

Three types of framing used to support roofs over lobbies. Barrel vaults employed over second-floor lobbies.

Deep (16-ft) roof trusses in existing building spanning 160-ft high bay area are double-angle sections with heavy angle chords.

unit into place using two track-mounted cranes. All member splices and field connections are bolted. Bridging trusses placed perpendicular to the main trusses were designed to provide redundancy and stability to the main trusses. A 20-ft wide second floor pedestrian walkway which traverses the high-bay area is suspended from the floor trusses. Roof trusses above the ballroom, also 16 ft deep, use W14 chords. But, since the forces are much lower, double-angle web members were adequate. These trusses weigh in at a relatively light 25 tons.

Because of the long span and the intended use of this area for ballroom functions, the dynamic characteristics of the floor truss system were investigated. It was determined the natural frequency of the system was about three to four cycles per second, similar to that of dance music. To prevent possible occupant discomfort because of resonant vibrations, it was decided the dynamic characteristics of the trusses should be altered. It was not possible to increase the truss depth and it was not economical to increase the truss member sizes enough to be effective. A force limiting link was added to the bottom truss chords to provide end fixity of the truss to its supporting built-up column for the small transient loads associated with a dynamic forcing function. Under more significant increases in live loads, this link deflects to prevent overstressing of the columns.

Bracing provides lateral stability for the building. Because of the requirements for open space, the frame was analyzed initially as an unbraced frame. Member sizes from this analysis were unreasonable because of story heights and bay sizes. Bracing was added to the design, but had to be placed at locations that did not require architectural modification. This led to a number of unusual bracing patterns and details. Braces are typically rectangular tube sections welded to a centered gusset plate at connections.

Because of selective demolition in the existing building, an entirely new lateral bracing system had to be added in this area. Twenty-six of 32 existing sets of lateral bracing were removed. Removal and addition of this bracing had to be included in the overall phasing of the construction work to maintain stability of the existing building.

The building facade in both the addition and the existing building is a combination of brick and granite. The granite was placed at the base of the wall and featured on the arcades. As a result of the 26 ft-8 in. floor-to-floor height, a miscellaneous steel framing system supported the wall materials. Ledge angles were attached to W8 junior columns spaced 5 ft o.c. Where possible, all wall loads were transferred directly to the foundation by this building facade support system. Although simple in concept, the support system was complicated by a strict modular arrangement of rustication joints in the wall materials and numerous setbacks and openings in the building design. The successful erection of this system required careful coordination of the support system with architectural and structural details during design and shop drawing preparation, and erection procedures which accounted for existing conditions and masonry tolerances.

The Convention Center addition and renovation was a long and sometimes tedious project for all those involved in its successful completion. It is now a source of pride for all of Cincinnati. As a structure, it is a monument to the flexibility of design and strength which can be achieved by using structural steel framing. □

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Houston, Texas

Associate Architect
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THP Limited
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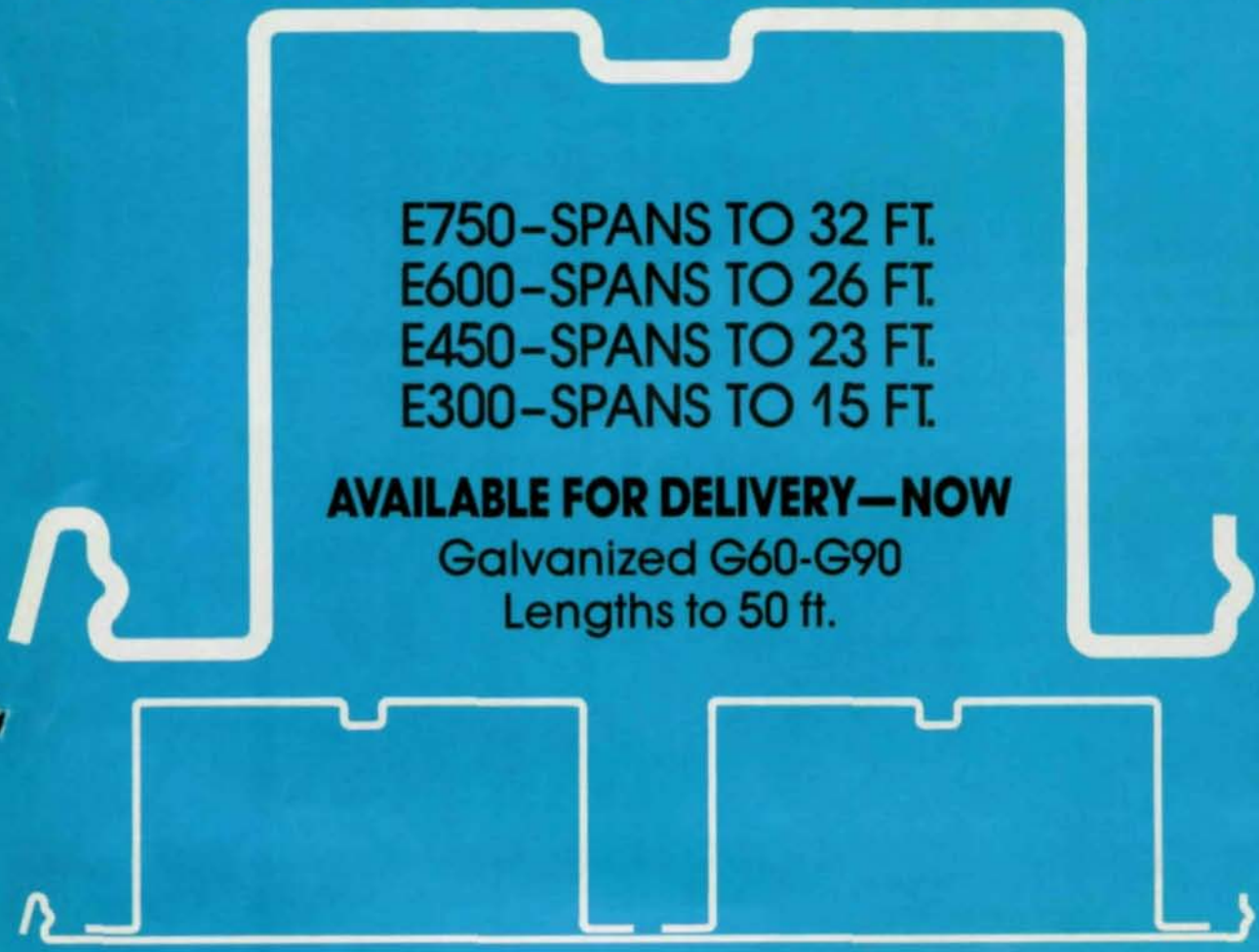
Steel Fabricator/Erector
Southern Ohio Fabricators, Inc.
Cincinnati, Ohio

Owner
City of Cincinnati

Randy R. Wilson, P.E., is a partner in the structural engineering firm of THP Limited, Cincinnati, Ohio.

EPIC
LONG-SPAN DECKS



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