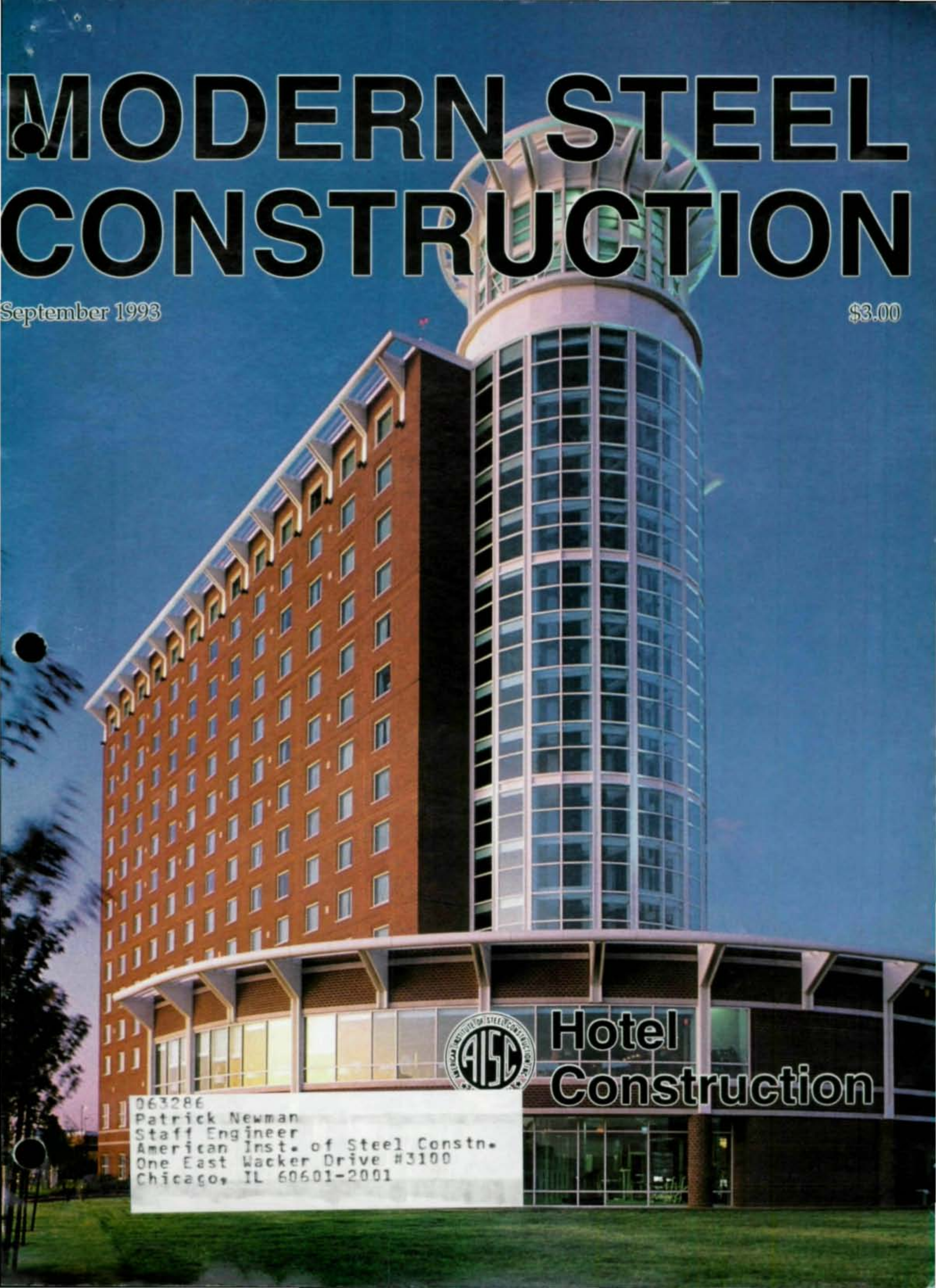
MODERN STEEL CONSTRUCTION

September 1993 $3.00



Hotel Construction

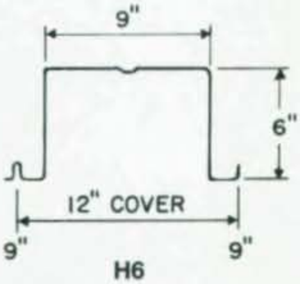
063286
Patrick Newman
Staff Engineer
American Inst. of Steel Constn.
One East Wacker Drive #3100
Chicago, IL 60601-2001

UNITED STEEL DECK, INC.

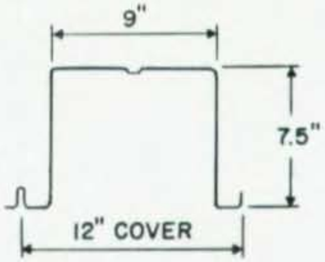
DECK DESIGN DATA SHEET

No. 19

DEEP DECK – 6" and 7.5" H



H6



H7.5

32' Maximum piece length.

Profile	Gage	Wt., psf	Section Properties			Allowable End Reaction, lbs. Bearing Width		
			Ip	Sp	Sn	3"	4"	5"
H6	18	4.5	7.28	2.24	2.36	690	780	870
	16	5.5	9.79	2.90	2.99	1210	1350	1480
H7.5	18	5	12.17	3.02	3.15	640	720	810
	16	6	16.22	3.92	4.04	1140	1270	1400

SINGLE SPAN TOTAL LOADS, PSF

Profile	Gage	Span														
		18'	19'	20'	21'	22'	23'	24'	25'	26'	27'	28'	29'	30'	31'	32'
H6	18	<u>77</u>	<u>73</u>	<u>69</u>	*62*	*55*	*49*	*45*	*41*	*37*	*34*	*32*	*30*	*28*	*26*	*25*
	16	119	107	*95*	*84*	*75*	*68*	*61*	*56*	*51*	*47*	*44*	*41*	*39*	*36*	*34*
H7.5	18	<u>71</u>	<u>67</u>	<u>64</u>	<u>61</u>	<u>58</u>	<u>56</u>	<u>53</u>	<u>51</u>	<u>49</u>	<u>47</u>	<u>46</u>	<u>44</u>	<u>43</u>	<u>41</u>	39
	16	<u>127</u>	<u>120</u>	<u>114</u>	<u>109</u>	<u>104</u>	99	91	*83*	*76*	*69*	*64*	*59*	*54*	*51*	*48*

Notes: Loads controlled by 3" end bearing are underlined.
Loads controlled by deflection (L/240) are shown in *italics*.
All other loads are controlled by bending. 10 psf has been added to deflection loads to account for roofing dead load. The designer is urged to check the fastener uplift resistance.

Also Available

Acoustic (perforated web) sections; Cellular sections with 24" cover; Custom adaptation of rib width, depth, and web angles; Multi Span and Diaphragm Load Tables are available on request; Complete information on all deck products — ask for catalog 303-11.

NICHOLAS J. BOURAS, INC.
P.O. BOX 662, 475 SPRINGFIELD AVE.
SUMMIT, NEW JERSEY 07902-0662 (908) 277-1617

ASSOCIATE MEMBER

USD

MEMBER
STEEL DECK INSTITUTE sdi

High Strength Structural Steels From Chaparral Put The Heat On Everything Else.

To discover the many advantages of Chaparral's high strength structural steel, put it up against any other construction material.

Price. Price is one of the greatest strengths of Chaparral steel. In fact, steel is less expensive today than it was 10 years ago. So you can now get all the benefits of structural steel at virtually the price of rebar.

Availability. At Chaparral, there's no waiting on rolling schedules. We are a stocking mill which means our inventories are ready when you need them. And because we're centrally located in Midlothian, Texas, we can get your order to you fast, no matter where you are.

High Strength ASTM Grade Steel. Chaparral pioneered stock availability of ASTM high strength steels at the same price of ASTM A36 steels. Engineers can now upgrade material strength without raising the costs. Certified ASTM A572 grade 50, A529 grade 50, A36, Canadian 44W and 50W are all readily available at one low A36 price.

Easy To Design With. Today's engineers are finding steel is the easiest material to design with by far. Many use available software packages that simply don't exist for other materials. And if you have any product questions, expert help is only a phone call away. Just contact AISC for engineering assistance at (312)670-5417.

Recyclable. Not only is steel a recycled product, but it's also recyclable. Unlike other construction materials, steel can eventually be scrapped, recycled and reused again and again. Environmentally safe, steel is good for the future and your company.

Steel is the building material of the 21st century. And Chaparral is one of the most efficient steel producers in the world. We have the best prices and the best service. Call us, and learn first hand why things are heating up at Chaparral.

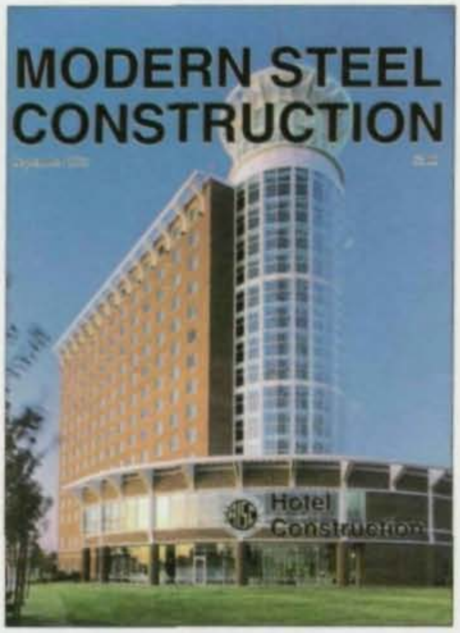
CHAPARRAL STEEL

Toll Free (800) 527-7979 Ext. 1241
In Texas (800) 442-6336 Ext. 1241
300 Ward Road, Midlothian, TX
76065-9651

© 1993 Chaparral Steel

MODERN STEEL CONSTRUCTION

Volume 33, Number 9 September 1993



The Harborside Hyatt Conference Hotels offers visitors a beautiful view of Boston across the harbor. Even more impressively, this 14-story building has a conventional steel frame and floor-to-floor heights of only 8'-9". To find out how the designers accomplished this, turn to page 14.

FEATURES

Modern Steel Construction (Volume 33, Number 9). ISSN 0026-8445. Published monthly by the American Institute of Steel Construction, Inc. (AISC), One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001.

Advertising office: Pattis/3M, 7161 North Cicero, Lincolnwood, IL 60646.

Subscription price:
Within the U.S.—single issues $3; 1 year $30; 3 years $85.
Outside the U.S.—single issues $5; 1 year $36; 3 years $100.

Postmaster: Please send address changes to Modern Steel Construction, One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001.

Second-class postage paid at Chicago, IL and at additional mailing offices.

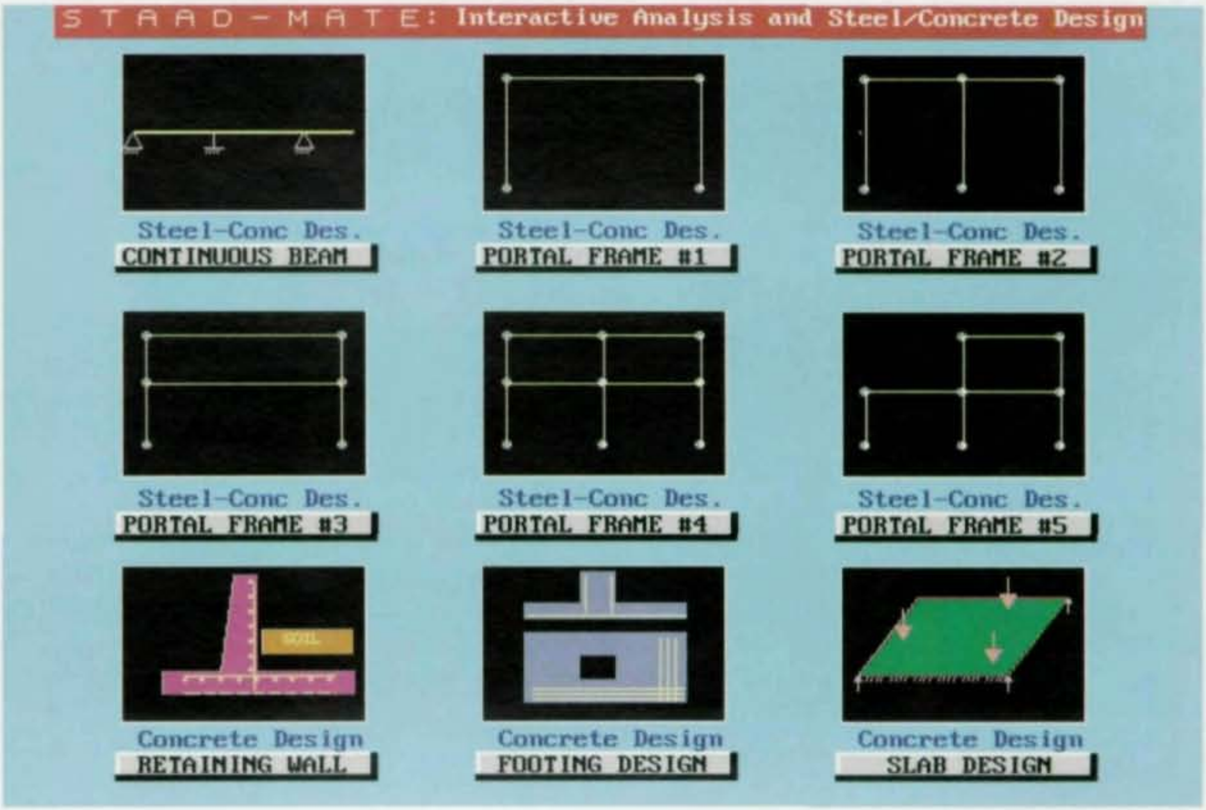
NEWS AND DEPARTMENTS

00554

Introducing STAAD-MATE ...

the perfect companion for the structural engineer

for as little as $495*



Research Engineers, Inc. announces the arrival of STAAD-MATE - a fully graphical interactive software for the analysis and design of structural components like continuous beams, portal frames, foundations, slabs, retaining walls etc. Easy to use and packed with power, it is designed to be your everyday companion in the structural design office.

Completely menu-driven and graphically interactive, STAAD-MATE allows you to generate the data quickly and easily - almost without using the manual. Analysis and design are performed in an integrated manner -the output includes analysis results like forces, moments, displacements etc. and design results like AISC code-check / member-selection, interaction ratios and ACI based bar details / layouts. Graphic outputs like bending moment diagrams, deflected shapes, interaction curves, reinforcement details etc. provides easy verification and documentation. All graphic outputs support CAD packages and various printers/plotters.

STAAD-MATE is brought to you by Research Engineers, Inc. developers of STAAD-III, the world's #-1 structural software. That ensures quality and reliability. With more than fifteen years of worldwide development and support experience behind it, STAAD-MATE represents the best value in the interactive structural software market today.

STAAD-MATE - the perfect companion ...

* Price valid for STAAD-III/ISDS users. List price $ 895.

Research Engineers

A reputation you can build on.

1570 N. Batavia Street, Orange, CA 92667
Phone: (714) 974-2500 Fax: (714) 974-4771
1-800-FOR RESE

USA UK GERMANY FRANCE CANADA NORWAY INDIA JAPAN KOREA

Editorial Staff
Scott Melnick,
Editor and Publisher
Patrick M. Newman, P.E.,
Senior Technical Advisor
Charlie Carter,
Technical Advisor

Editorial Offices
Modern Steel Construction
One East Wacker Dr.
Suite 3100
Chicago, IL 60601-2001
(312) 670-5407

Advertising Sales
Pattis-3M
7161 North Cicero
Lincolnwood, IL 60646
(708) 679-1100
FAX (708) 679-5926

AISC Officers
Stephen E. Egger,
Chairman
Frank B. Wylie, III,
First Vice Chairman
Robert E. Owen,
Second Vice Chairman
Robert D. Freeland,
Treasurer
Neil W. Zundel,
President
David Ratterman,
Secretary & General Counsel
Lewis Brunner,
Vice President,
Membership Services
Geerhard Haaijer,
Vice President,
Technology & Research
Morris Caminer,
Vice President,
Finance/Administration

Personal Glimpses

This month's issue strikes a very personal chord with me. More than a decade ago, when I first started writing about construction, I was given an assignment on a very preliminary proposal to build the world's tallest building. The project was down in Texas, and for a variety of reasons, neither the architect or engineer would comment on the project's design.

Needless to say, this left quite a hole in my story. Beyond the first sentence, there wasn't a lot else to write.

I pondered the problem, and decided to try a side-door approach. Instead of writing about the engineer's actual proposal, I'd do a story on possible structural systems for a super-tall building. After a little bit of investigation, it became increasingly obvious that I should talk to Bill LeMessurier, one of the country's most distinguished structural engineers and someone who had published quite a bit on tall buildings.

With immense hesitancy—after all, I was just a green assistant editor and he was quite an important designer—I picked up the phone and dialed his number in Cambridge. To my great surprise, the receptionist put me right through to him; and to my even greater surprise, he was more than willing to talk me through an article. He graciously gave me more than an hour of his time, and made a point of telling me to feel free to call him with any other questions.

After our conversation, I carefully wrote his name and number on a Roladex card for future use. I still have that card, and I was more than happy to have a chance to use it for this month's issue featuring a profile of Bill LeMessurier.

Interestingly, this issue also contains a story on the innovative design of an hotel in Boston. The project had a severe height restriction, and the typical way to design a steel residential project with that limitation is to employ a staggered truss system, which was partially developed by LeMessurier. Instead, however, the engineer utilized a more standard framing system, but through careful coordination with the mechanical/electrical engineers and architect succeeded in obtaining an 8'-9" floor-to-floor height. I'm always looking for innovative steel designs. If you've recently finished up a project—bridge or building—with some interesting features, drop me a note. **SM**

55500

Our breakthrough 3-D technology can't be shown in a 2-D ad.

Call for your first hand demonstration of the SDS/2 Detailing System.

Break through time-consuming 2-D, line-by-line graphics with the 3-D technology of the SDS/2 Version 5.4 gives you the ability to automatically produce shop drawings and other information about a structure never before possible. The benefits are invaluable to design engineers, steel fabricators and detailers...or anyone who is involved in the conception and production of steel.

The SDS/2 Software Solutions are the ultimate steel fabrication tool. All information created in SDS/2 or transferred through DesignLINK from third-party design software, can be used throughout all phases of design and fabrication. The SDS/2 Software Solutions include:

- **Engineering Analysis and Design Module**
- **Production Control Module**
- **Estimating Module**
- **Detailing Module**
- **CNC Interface**
- **DesignLINK**

Call Design Data to arrange your personal demonstration or to request additional information.

DESIGN DATA

"First in...software, solutions, service"

402-476-8378 or **1-800-443-0782**

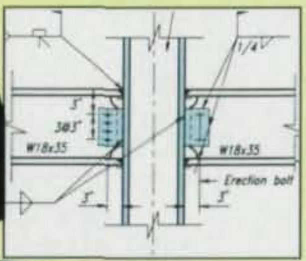
AISC ANNOUNCES

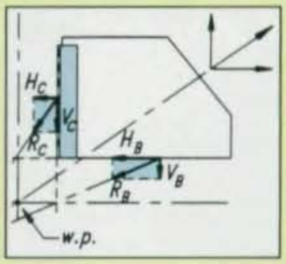
VOLUME II CONNECTIONS MANUAL

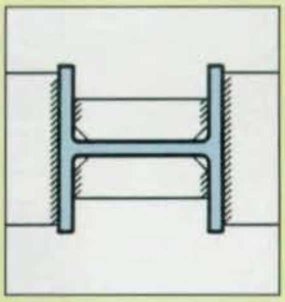
ASD/LRFD

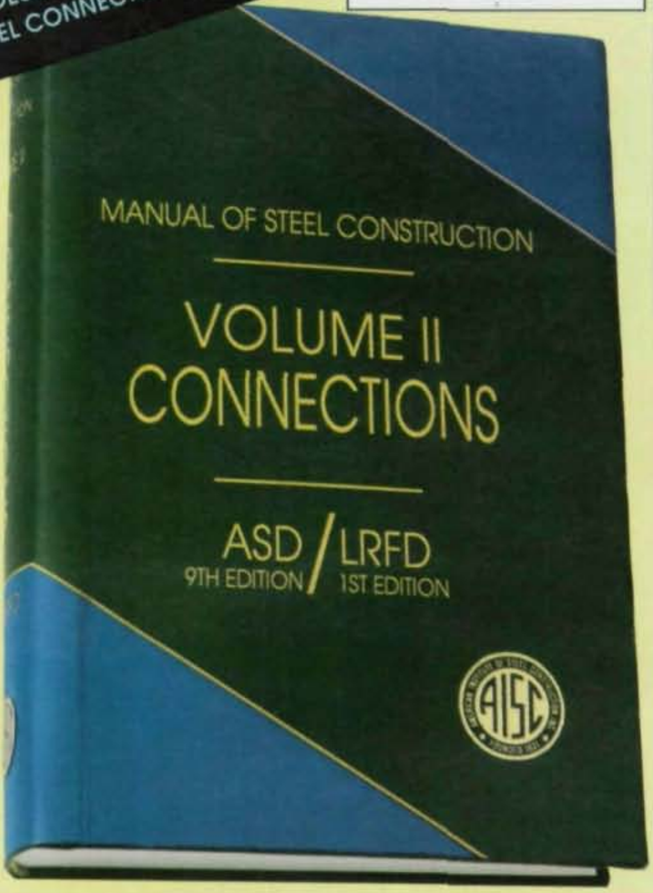
A 'MUST-HAVE' FOR ALL STRUCTURAL ENGINEERS, DETAILERS AND FABRICATORS...

ANYONE RESPONSIBLE FOR DESIGNING AND APPROVING STRUCTURAL STEEL CONNECTIONS.









▲ *Volume II Connections* is a companion and extension to the AISC *Manual of Steel Construction* (both LRFD, 1st Edition, and ASD, 9th Edition).

▲ **Contains examples and information on steel connections not published anywhere else.**

▲ Has practical and economical examples of complex connection designs in both LRFD and ASD.

▲ Based on the latest AISC LRFD and ASD specifications.

▲ Covers bolted and welded shear, moment, and bracing connections in applications not treated in either the ASD or LRFD *Manual of Steel Construction.*

▲ **FREE BONUS!** An updated copy of the AISC *Code of Standard Practice* will be sent with each book.

704 PAGES — ONLY $60.00 — ORDER YOUR COPY TODAY!

YES! I must have **Volume II Connections**.

Send me ____ copies at only $60 each.

Name/Title ________________

Company ________________

Address ________________

City/State/Zip ________________

Phone ________________

☐ Check enclosed ☐ Charge my ☐ Visa ☐ MasterCard

25% DISCOUNT FOR AISC MEMBERS

Acct# ____________ Expires _____

Signature ________________

Return to:
AISC Connections Offer
PO Box 806276
Chicago, IL 60680-4124

Phone Orders
312/670-2400 X433
FAX Orders
312/670-5403

Please enclose remittance. No COD orders. Add $5 for UPS charge. Foreign orders: $10 mininum for shipping.

Steel Interchange

Steel Interchange is an open forum for *Modern Steel Construction* readers to exchange useful and practical professional ideas and information on all phases of steel building and bridge construction. Opinions and suggestions are welcome on any subject covered in this magazine. If you have a question or problem that your fellow readers might help to solve, please forward it to *Modern Steel Construction*. At the same time feel free to respond to any of the questions that you have read here. Please send them to:

Steel Interchange
Modern Steel Construction
1 East Wacker Dr.
Suite 3100
Chicago, IL 60601

Answers and/or questions should be typewritten and double spaced. Submittals that have been prepared by word-processing are appreciated on computer diskette (either as a Wordperfect file or in ASCII format).

The opinions expressed in *Steel Interchange* do not necessarily represent an official position of the American Institute of Steel Construction, Inc. and have not been reviewed. It is recognized that the design of structures is within the scope and expertise of a competent licensed structural engineer, architect or other licensed professional for the application of principles to a particular structure.

Information on ordering AISC publications mentioned in this article can be obtained by calling AISC at 312/670-2400 ext. 433.

The following responses to questions from previous Steel Interchange columns have been received:

In the September 1, 1986 edition of the AISC *Code of Standard Practice*, the reference to bolts was deleted in Section 9.2, "Calculation of Weights." [This language is continued in the June 10, 1992 edition of the AISC *Code of Standard Practice*]. Was it, thus, intended that bolts not be weighed for payment, but instead be treated like weld metal or protective coatings?
Kenneth W. Derby
Cives Steel Company
Rosedale, MS

In the 1986 edition of the AISC *Code of Standard Practice*, Section 9.2.4 was modified by deleting any reference to rivets and to shop and field bolts, nuts, and washers. The reference to rivets was deleted because they were no longer in general use. The reference to the other items was modified because many alternative fastener designs and load indicating devices have been introduced for use since the 1976 edition of the AISC *Code of Standard Practice*. Many of these devices do not have corresponding tables of weights in the AISC *Manual of Steel Construction*.

As a result, Section 9.2.4 of the 1976 AISC *Code of Standard Practice* was split into Sections 9.2.4 and 9.2.5 in the 1986 Code. Section 9.2.4 is used for the weights of items shown in tables in the Manual, while Section 9.2.5 provides for the use of manufacturer's literature to determine the weights of items not shown in the Manual.

It is the consensus of the AISC Committee on Manuals, Textbooks, and Codes that all furnished items are intended to be weighed for payment unless specifically prohibited by AISC *Code of Standard Practice* Section 9.2. The new wording of these two sections is all inclusive of any furnished item and, thus, is not limited to fasteners. Fasteners, both shop and field, are weighed for payment accordingly; this remains unchanged in the current June 10, 1992 edition of the AISC *Code of Standard Practice*.
AISC Committee on Manuals, Textbooks, and Codes

How can one take into account blast effects in the design of steel structures?

Due to the high ductility characteristics of steel, steel structures provide a feasible solution to the potential loss of the owner' investment. The method for accounting of blast loads in the design of steel structures is achieved by evaluating stress levels in, and deformations of, the structure under the integrated effect of the blast overpressures and durations and the structure's dynamic response. This is done in an analysis of structure using the following simplified procedure.

a) Perform a design of the structure for all customary loads including equipment, wind and earthquake.

b) Establish the magnitude, duration and frequency of the impulsive (blast) overpressures. This is somewhat intensive and an equivalent static load (ESL) may be used. The ESL will result in higher material and construction costs.

c) Conduct the blast analysis of the structure. An analysis is generally performed of the previously designed structure, rather than designing members to withstand the blast load. The element analysis combines the natural frequencies of the elements and checks the capacity of the local members as they respond to the blast. Consideration must also be made of the global response of the structure to the blast. It is in this step that much of the cost saving is made over an equivalent static load approach. Checks for stress and instability are performed. Design iterations must be performed as significant changes in mass and stiffness occur.

d) Finally, deflections and ductility, including collapse mechanisms are checked to satisfy operational or functional requirements of the facility or other client placed requirements.

Steel Interchange

This is a very simplified approach; however, there are several excellent references available to guide the engineer.

Of steel structures analyzed under severe blast loadings, beams required approximately a 10% to 20% increase in weight and columns required approximately 20% to 25% above that required for the non-blast conditions. This, of course, will vary for each application.
Alfred A. Herget, P.E.
Bechtel National, Inc.
Oak Ridge, TN

How can one take into account blast effects in the design of steel structures?

For blast-resistant design, element and connection ductility is essential and details should be similar to those used in structures subject to seismic loadings. Because of the brief duration of a blast and uncertainty in its time vs pressure characteristics, design should consider structure dynamic properties and the consequences of plastic strains in structural elements. For example, large deflections might be permitted in roof beams but not in rigid frame girders or columns if that frame provides lateral support to the structure.

Guidance on design of structures for external blast loads may be found in some textbooks, including, *Introduction to Structural Dynamics* by John M. Biggs (McGraw Hill). More detailed design information exists in ASCE Manual 42, *Design of Structures to Resist Nuclear Weapons Effects* (1985), and U.S. Army TM5-1300, *Structures to Resist the Effects of Accidental Explosions* (November 1990).

Relatively simple design guidance, including recommendations on design loadings, is given in the Manufacturing Chemists Association Safety Guide SG-22, *Siting and Construction of New Control Houses for Chemical Manufacturing Plants* (1978).

For blasts internal to a structure, current practice is to vent the pressure through low mass break-out panels, louvers, or similar devices. Some guidance exists in NFPA 68-1988, *Guide for Venting of Deflagrations.*
Alan R. Shive, PhD, P.E.
Kingwood, TX

New Questions

Listed at right are questions that we would like the readers to answer or discuss.

If you have an answer or suggestion please send *it to the Steel Interchange Editor, Modern Steel Con*struction, One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001.

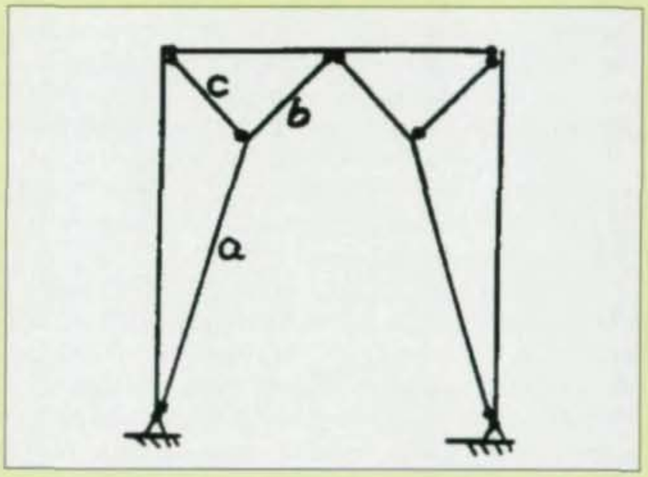
Questions and responses will be printed in future editions of Steel Interchange. Also, if you have a question or problem that readers might help solve, send these to the Steel Interchange Editor.

In regards to "beams rolled the hard way" according to the ad by Whitefab, Inc. in the April issue of *Modern Steel Construction*, what special considerations are made for the end connections supporting such beams?

Also, if the beam is bent to a curve on the "Y-Y" axis such the "X-X" axis is level, would the end column connection be stronger if eccentrically loaded at the column due to the built-in torsion stress at the beam center being out of alignment with the centerline of the columns?

And would such a connection be any different whether attached to the column following the inside radius of the curve or the outside radius?

The above questions concern a circular building with a perimeter mezzanine, thus the curved beams are loaded to one side only.
Alan W. Bliek
North Attleborough, MA



Due to some clearance requirement, a frame has the configuration shown. For out-of-plane buckling, what will be the unbraced lengths for members a, b, and c with the following conditions: (1) a and b are rigidly connected and (2) a and b are released at their ends?
Francisco M. Lacsina
San Leandro, CA

Symposium Aims For Consensus On Design Responsibility

During two days at the end of this month, representatives of various building industry segments will come together in Atlanta to begin hammering out a compromise on the issue of design responsibility. "If nothing else, we hope to at least begin an industry-wide dialogue that will address the allocation of risk," explained David R. Hendrick, the program chairman and an attorney with Hendrick, Spanos and Phillips.

Richard L. Tomasetti, PE

Robert A. Rubin

"Critical Issues In Design Liability: Emerging Risks and Liabilities in the Shop Drawing and Submittal Process" is sponsored by the American College of Construction Lawyers, Building Futures Council, Construction Industry Institute, and the Dispute Avoidance and Resolution Task Force. In addition, many major associations, including AISC, have offered their support for the two-day symposium beginning September 30.

After introductory comments from one representative each from the architectural, engineering, construction management, and general contracting fields, the meeting will break into seven workshops, including one on structural. "Especially in the steel area, there have been a number of informational programs conducted," Hendrick said. "We hope to take the next step." The vast majority of time during the symposium will be devoted to these workshops, where debate and movement toward consensus will hopefully occur. At the structural workshop, time has been allotted for presentations by representatives from regional fabricator groups, detailing groups and structural engineering groups to present the official position of their organization. All other attendees also will be given an opportunity to participate in the discussion.

Despite seemingly differing views, some industry observers believe that fabricators and engineers are not that far apart and there may be room for compromise. "The gap is definitely narrowing," reported Robert Rubin, a partner in the firm of Postner and Rubin and counsel for the American Society of Civil Engineers. Much of the problem, he claims, is semantic and the two-day Atlanta symposium hopes to address this. "One problem is that everyone has something different in mind with specific terms. When I talk about shared responsibility, I'm not talking about sharing responsibility for someone else's negligence. With shared responsibility, each is responsible for their own work. But no one should be excused from their own negligence."

Rubin's position is similar to one taken by Richard Tomasetti, P.E., a principal with Thornton & Tomasetti Engineers in New York, at AISC's Design Responsibility Symposium in March. "Each party takes responsibility for the design service that they provide," he stated during the symposium. "The engineer of record should take responsibility for specifying the connection loads and specifying all of the design criteria that those connections have to be designed for. If the fabricator is designing the connections—I'm talking about a job where the fabricator is designing the connections—then he or his or her engineer should take responsibility for the connection designs that they provide."

However, Tomasetti added, the engineer of record still has the continuing responsibility to review and approve the fabricator's connection designs. This review does not, he stressed, relieve the fabricator of responsibility. Both the fabricator and engineer must each take responsibility for the work they perform.

"I don't call this sharing responsibility. I don't think we should focus on that word. I don't want anyone to share my responsibility. I will take full responsibility for what I do. All I'm saying is that each party should take full responsibility for what they do."

Tomasetti emphasized at the symposium that if a fabricator is not negligent, they have no liability for the design. "It dawned on me through negotiations with certain steel fabricators on specific jobs that when engineers and architects see the wording that they're taking responsibility for something, they understand that means they are going to be hit over the head if they are negligent. That's how engineers and architects are judged by the law. When contractors and fabricators see the wording that they are going to be held responsible for something, I believe that they focus in on that meaning that they are going to be hit over the head whether or not it's their fault."

He cited a recent example where a specification read that the engineer's review and approval would not relieve the fabricator from design responsibility on the connections designed by the fabricator—a position to which the fabricator strenuously objected. "We finally came to a resolution. We changed the wording in our spec. Instead of saying our review and approval does not relieve the fabricator of his design responsibility, we changed it to our review and approval does not relieve the fabricator of any negligence in his preparation of designs on the shop drawing. All of a sudden, that solved the problem."

Both Tomasetti and Rubin are speakers at the Atlanta symposium are expected to elaborate on the remarks they made at the AISC session in March. Other scheduled speakers include:

- John F. Hayes, FAIA, president of The Architects Collaborative, Inc., in Cambridge, MA;
- Robert E. Holt, Jr., vice president and operations manager with CRSS Constructors, Inc.;
- Floyd Warkol, chairman/CEO with JWP Mechanical Services;
- James P. Groton, a member of the DART Task Force and an attorney with the American College of Construction Lawyers (ACCL); Kenneth M. Cushman, an attorney with the ACCL; and Stanley P. Sklar, an attorney with the ACCL;
- David B. Ratterman, an attorney with Goldbert & Simpson and counsel for AISC;
- Rebecca Burleson, a professor at Auburn University.
- Norman L. Scott, former president of the American Concrete Institute and current chairman of the ACI Committee on Responsibility in Concrete Construction. (see "The Concrete Position" above);
- Joseph D. Goldrich, representing the Coalition of American Structural Engineers;
- Leonard N. Ross, representing the National Institute of Steel Detailing.

In addition, an AISC fabricator spokesperson will shortly be named.

After the general session and individual workshops, the entire symposium will reconvene and receive reports from each workshop. Then, under a moderated format, the participants will debate and consider their proposals. Georgia Tech, which is hosting the symposium, will use the proceeds from the symposium to fund an ongoing administrative effort to follow through on the results of the workshop sessions as necessary to finalize and formalize agreed ANSI-type consensus standards among the members of the industry.

The cost of the symposium is $450. For more information, or to register, please call Georgia Tech Continuing Education at (404) 894-2547.

The Concrete Position

Design responsibility rests squarely on the shoulders of the engineer of record, according to a new draft document currently circulating among American Concrete Institute members.

"In a nutshell, ACI's position is very similar to ASCE's," according to Norman Scott, a past president of ACI and currently the chairman of the ACI Committee on Responsibility in Concrete Construction.

The draft document, "Authorities and Responsibilities in Concrete Design & Construction," places design responsibility on whoever is doing design. "If the engineer of record says a contractor can't make any design changes, then the EOR is taking full responsibility," Scott stated. "However, if the contractor wants to make engineering changes to reduce construction costs, then he has to take some responsibility. Authority and responsibility must go together. If you demand something be approved by someone, you're giving them authority. It cuts both ways."

National Bridge Symposium

An international panel discussion on innovative design concepts by a select group of award-winning bridge designers is one of the anticipated highlights of this year's National Symposium on Steel Bridge Construction. Other sessions will cover topics ranging from seismic design to high-performance steel. Continuing education credits are available. Also, the AISC Prize Bridge Awards will be presented.

The Symposium will be held November 11 and 12 in Atlanta. On November 10, two full-day workshops are scheduled, one on cost effective steel bridges and the other on bridge painting.

Featured speakers on the Innovative Steel Bridge Design Concepts panel include:

- Yuhshi Fukumoto from Osaka University in Japan;
- Jean Muller from J. Muller International in France;
- Ken D. Price from the Delcan Corporation in Canada;
- William Ramsay from British Steel in Great Britain;
- Charles Seim from T.Y. Lin International in the U.S.;
- Leo Spaans from Janssen & Spaans Engineering, Inc., also in the U.S.

The speakers will be addressing cutting edge topics. For example, Fukumoto will be discussing new developments in structural steels,

Bridges, Cont.

recent cable-supported bridge construction projects, seismic passive and hybrid control of highway bridges, and robotic welding for panel fabrication. Also, Price will present information on the design of the next generation of steel box girders, including such innovations as reducing the number of boxes, single box structures, post-tensioning of the concrete deck, incremental launching, and sliding.

Appropriately, a lot of attention is being given to painting at the symposium. Eric Kline of KTA-Tator, Inc., is moderating the full-day workshop on painting and also presenting a half-hour presentation on "Painting Strategies for Maximum Economy and Useful Life." During the workshop, an official from a major DOT will present a discussion on water-based zinc-rich paint. Another DOT official will discuss the merits of demolishing bridges when lead paint removal is anticipated. Kline will present a white paper on controversial shop practices such as edge grinding, profile requirements, and painting inside bolt holes. Also at the workshop, Tom Calzone of the Carboline Co. will present an update on VOC regulations as they relate to shop painting. And finally, the workshop will include a panel discussion that will air fabricator, supplier and owner-generated paint issues.

The other workshop is a six-hour training course on the design of cost effective steel bridges presented by Robert L. Nickerson, P.E., former chief of the FHWA structures division. The session will point out many of the current practices used by engineers during bridge design and detailing that add to the cost of highway structures without adding any value. Also, the differences in the costs of using Allowable Stress Design, Load Factor design, Autostress Design and the new LRFD method will be illustrated by use of actual design examples. In addition, Nickerson will discuss the cost impact of the following variables: wider web spacing; painted vs. weathering steel; different span lengths; type of deck form; cross-frame configuration; bolted splices; stiffened vs. unstiffened webs; detailing effects on fabrication cost; and substructure design effects. Finally, Nickerson will present information on the life-cycle costs of weathering steel, fatigue resistant designs and retrofit procedures, and deck drainage, bearings and joints. Each participant also will receive a set of recommended guidelines for producing low life-cycle cost, but high life-cycle performance highway bridges.

The Symposium will feature two half-hour sessions on weathering steel. On Thursday, Nickerson will make a presentation on "Weathering Steel Bridges: A Success Story Worth Hearing," and on Friday, C. Donald Hamilton of the Maine DOT will present "Performance of Unpainted Weathering Steel Bridges in the State of Maine. Nickerson will present data gleaned from recent FHWA studies of weathering steel bridges in environments ranging from marine to highway overpasses in areas using heavy deicing salts. He'll also provide information on the application of FHWA guidelines for cost-effective performance of weathering steel bridges. Hamilton will present data from an in-depth study of nine of the 84 weathering steel bridges in Maine.

Individual projects also will be discussed at the symposium. On Thursday, the Sverdrup Corp.'s Ernst H. Petzold will present a session on "The Cable Stayed Mississippi River Bridge at Burlington, IA." The structure is asymmetric with only one tower used to anchor the cable stays. The cable supported unit consists of three spans: a 600′ main span, a 405′ side span, and a 180′ suspended span. Unique features include: the geometry of the main span, which is on a horizontal curve with a 4% cross-slope; span articulation; and the hold-down link, which, in contrast to the typical link of high-strength steel bars, is provided by a set of parallel strand stays of similar construction to that of the primary stay cables. On Friday, Joe Siccardi from the Colorado DOT will present "Steel Builds a Better Mousetrap." Siccardi will discuss the interchange at the junction of Interstate Highways 25 and 70 in Denver. The interchange includes 12 structures with a deck square footage in excess of 612,000 sq. ft., with all but about 11,000 sq. ft. supported on steel I and box girders.

Abolhassan Astaneh-Asl, a professor of civil engineering at the University of California at Berkeley will give a presentation on the "Seismic Design and Performance of Steel Bridges." Specifically, he will examine the performance during the 1989 Loma Prieta earthquake of three bridges, the East Bay Crossing of the San Francisco-Oakland Bay Bridge; the Golden Gate Bridge; and the Hayward San Mateo Bridge.

Other sessions include:

- Pennsylvania DOT Plan for Implementing Metric Conversion;
- Economical and Functional Steel Bridge Details;
- Inelastic Design and Rating of Steel Girder Bridges;
- Inverset II—Segmental Bridge Deck Construction the Easy Way;
- Cost Effective Design of Steel-Girder Bridges;
- Comprehensive Package for the Design of Short-Span Steel Bridges;
- Bridge Research: Leading the Way to the Future;
- High-Performance Steels for America's Bridges.

In addition, a student bridge competition demonstration will be held during a cocktail reception on Thursday evening. The demonstration will feature a student team from the Southern College of Technology actually erecting their scale project. After the demonstration, a banquet will be held during which the winners of the 1993 Prize Bridge Competition will be announced.

Registration fee is only $275, and $50 for the optional full-day workshop prior to the start of the Symposium. For information on the Symposium, or to receive a registration packet, contact: AISC, One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001; phone 312/670-2400; fax 312/670-5403.

Accommodating Severe Height Limits

Befitting its location, the 270-room Harborside Hyatt Conference Center and Hotel is reminiscent of a lighthouse in form. While the use of a steel frame proved more economical than a concrete alternative, it required careful coordination among the entire design team to meet the required height limits. Shown on the opposite page are structural and architectural floor plans detailing how an 8'-9" floor-to-floor height was achieved. Photo by David Whitcomb/RTKL

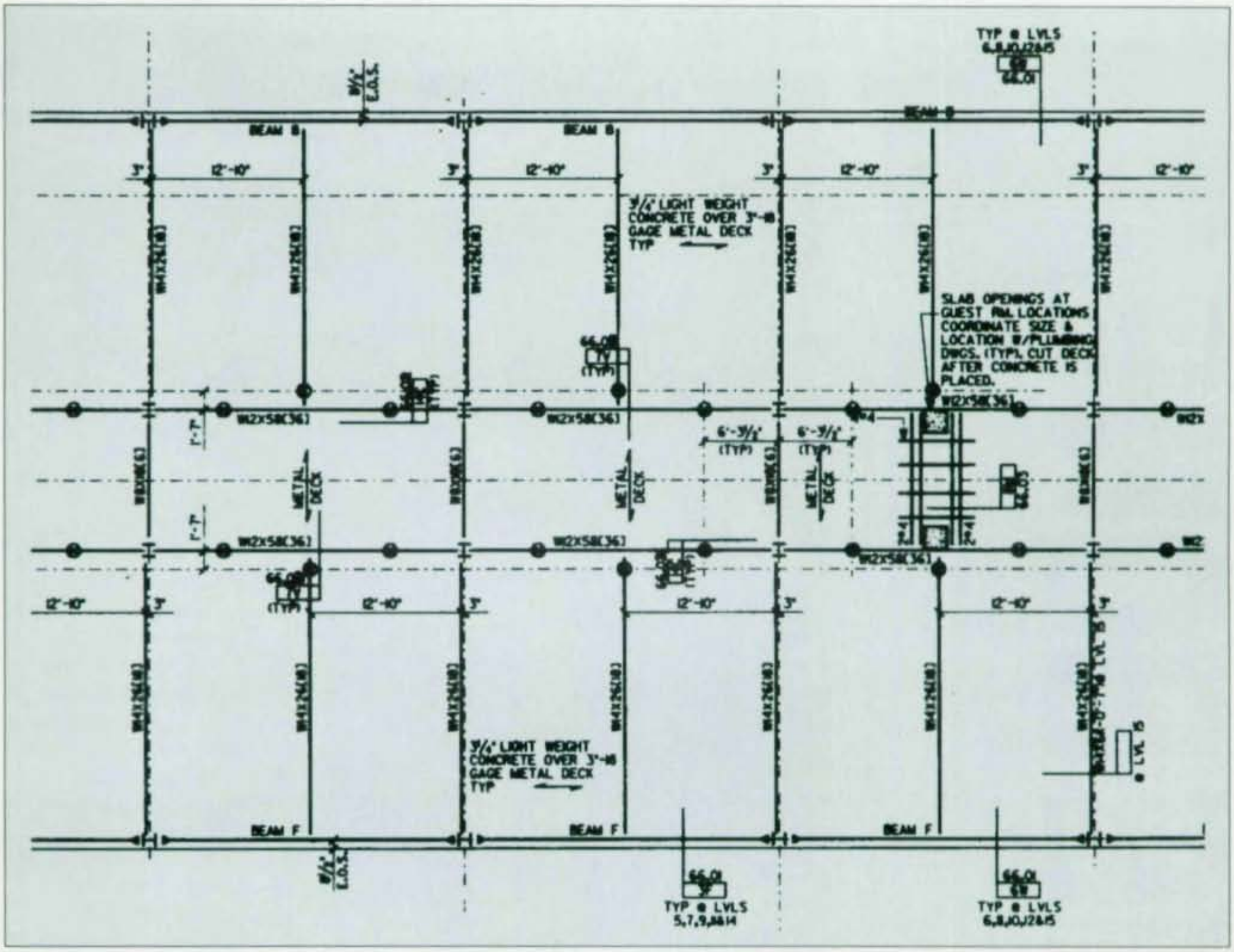
Innovative structural design and careful coordination of architectural, structural, and M/E/P details allowed an 8'-9" floor-to-floor height

By R. Shankar Nair, Ph.D., P.E., and William W. Houston, P.E.

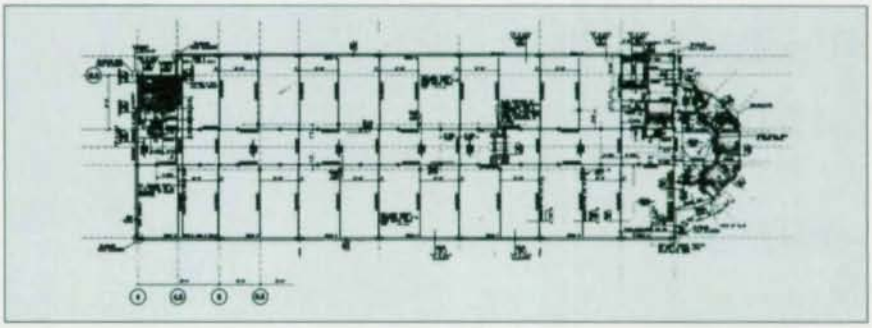
Located adjacent to Logan Airport, the 270-room Harborside Hyatt Conference Center and Hotel is designed to take advantage of spectacular harbor views. The 14-story, 200,000-sq.-ft. building opened this summer on Bird Island Flats in Boston and features spectacular waterfront views.

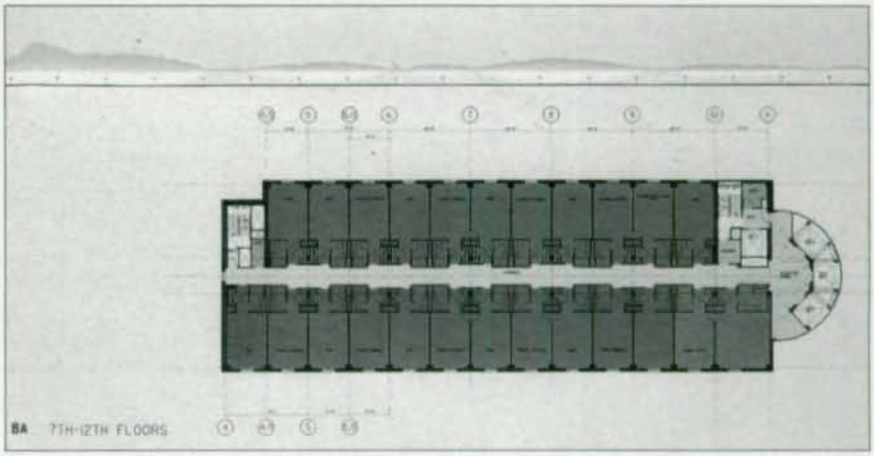
Reminiscent of a lighthouse in form, the hotel offers a rounded, multi-story glass tower housing the hotel elevators with lookout points offering views of Boston's skyline, harbor and airport. Guest rooms are located in a slender tower, while public spaces—including a two-story open lobby, 11 meeting rooms, ballroom, amphitheater, restaurant, and health club complete with an indoor swimming pool—are located within the more massive base.

Bird Island Flats was created in



the early 1970s by filling in portions of Boston Harbor. The hotel and conference center serve as the anchor for a major development effort that will include office, retail and manufacturing uses. As designed by RTKL Associates, which served as both architect and structural engineer, the hotel also serves as a noise barrier between the airport and the East Boston community. In keeping with the flavor of traditional Boston architecture, brick serves as the predominant exterior material. Project developer is Macomber Development Associates, Boston.





Material Considerations

While the hotel's location near Logan Airport is a prime attraction, it also created a design constraint by limiting the project's allowable height. RTKL won the commission for the project through an invited design competition where it was

CAD TO THE BONE

The industry's boldest, best-kept secret is out! *Cad***Vantage** Structural (CVS), a fully automated steel detailing software pakage, is the toughest of its kind on the market. CVS boasts the most flexible and simple format, while providing the fastest, most accurate and affordable automated detailing system available.

*Cad***Vantage** - the hardest working system in the steel business.

For a FREE demo disk and more information, call ***704-344-9644.***

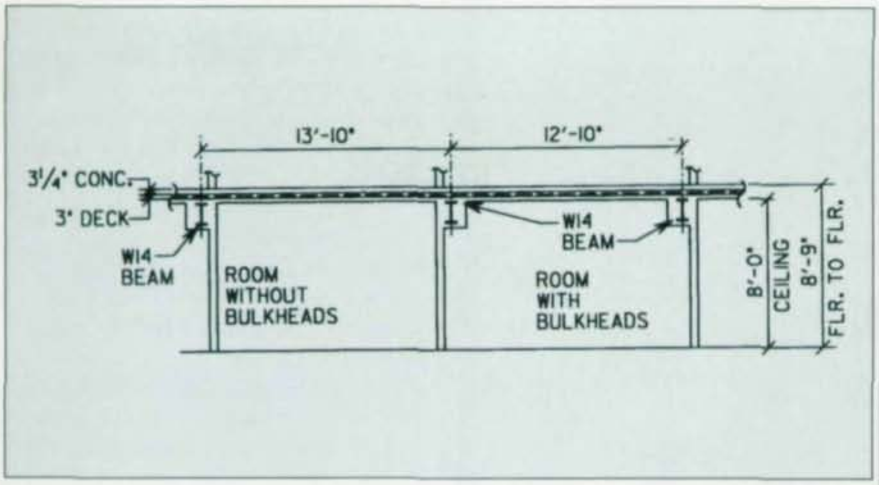
*Cad***Vantage**: *619 South Cedar Street / Studio A / Charlotte, North Carolina 28202*

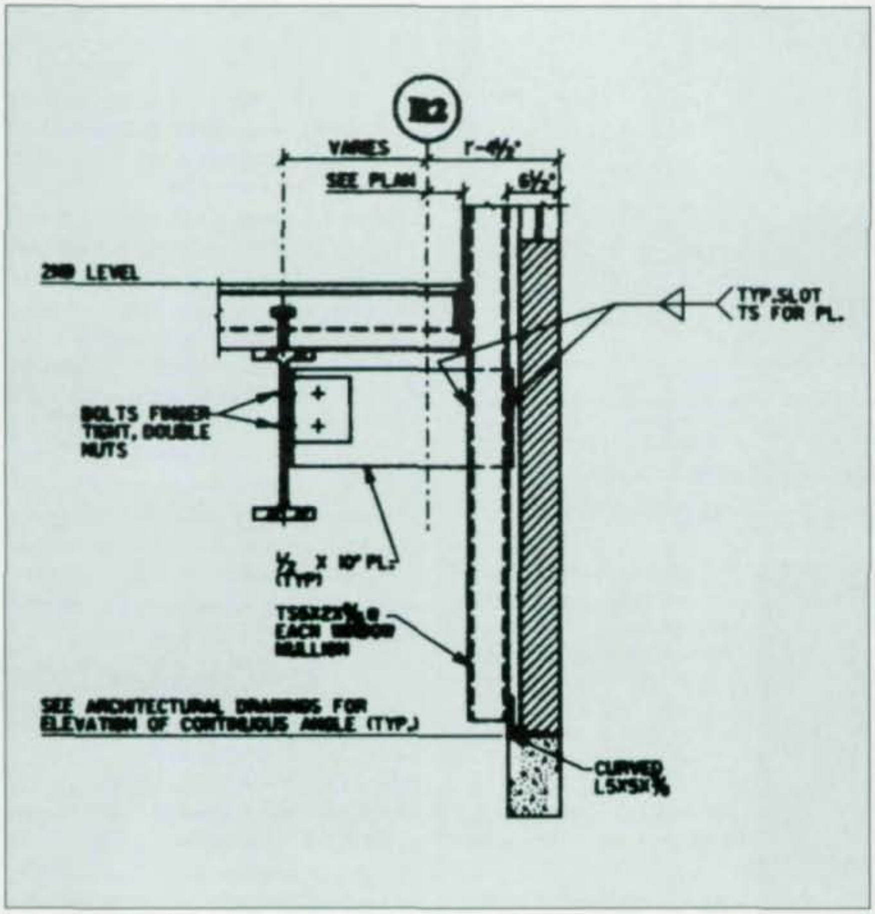
*Cad*Vantage

Pictured above is a web opening that allows one sanitary riser to serve two toilet drains. Shown at left is an upset beam used to allow flat ceilings in suites occupying two typical rooms. Note the blocked flange that allows sanitary risers to pass by the beam.Pictured opposite, top, is a section through typical rooms showing offset beams and asymmetrical bulkheads. Shown opposite, bottom, is a detail of a vertical member supporting the curved exterior wall at the second floor. Photos courtesy of RTKL.

assumed the building would be a flat-plate reinforced-concrete structure. Based on this assumption, an 8'-9" floor-to-floor height was established and the required zoning and regulatory approvals were obtained for the building based on the preliminary design's overall dimensions.

However, as the detailed design of the project got under way, value engineering determined that a steel frame would produce a more economical structure. Also, a steel structure was better suited to the construction schedule, which required quick erection due to the harsh winter conditions on the northern Atlantic Coast. A steel frame could be fabricated in the shop and erection could begin in the middle of winter, whereas concrete pours would be delayed until April when the weather would be warmer. The length of time required to construct the deep pile





foundation needed to build on infill land also meshed well with the time required for steel fabrication.

As a result, steel was selected for the project, even though the fixed building envelope and building program required the floor-to-floor dimension remain at 8'-9".

Structural System

Because of poor site conditions, the hotel is founded on precast concrete piles. Typical individual columns are supported on three piles with triangular-shaped pile caps. The two-story areas are supported on sets of two piles with rectangular pile caps. Wind trusses are supported on large rectangular pile caps at each end of the guest room tower.

The floors typically are constructed of light-weight concrete, 3" metal deck, and rolled steel beams. The beams are ASTM A36, with a few A572 Grade 50 members

KISS IT GOODBYE!

What pieces have shipped?
When did they leave?
What percentage of this job is complete?

Manually tracking job status leads to these questions, but the ***Structural Material Manager*** eliminates such confusion. ***SMM***'s Status Report, automatically updated after each shipping ticket is printed, lets you see at a glance the shipping history for every assembly. *No questions, no guesswork.*

***SMM* lets you kiss manual tracking methods goodbye!**

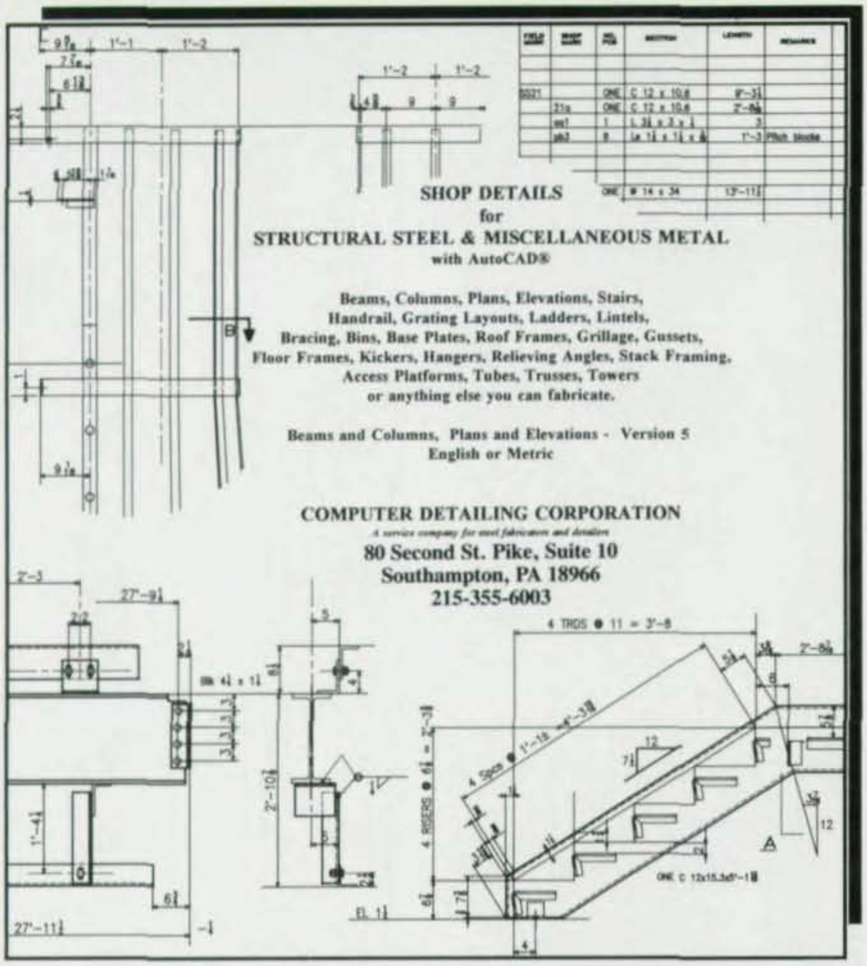
Call for a *FREE*, no-obligation demo disk with all modules and the full system's operator's manual.

- Main Module computes weights, surface areas, bolt counts and lineal totals. It also sorts lists into proper order by section size, length, grade, etc.
- Length-Nesting Module produces optimum cut-lists from in-house stock, vendor stock or the best combination of both.
- Estimating Module tallies material costs, shop hours and field hours.
- Production-Control Module prints shipping lists, loading tickets and job status reports.
- Can import lists directly from ***CadVantage*** or your own ASCII text files.
- In daily use by hundreds of steel fabricators, suppliers and detailers.

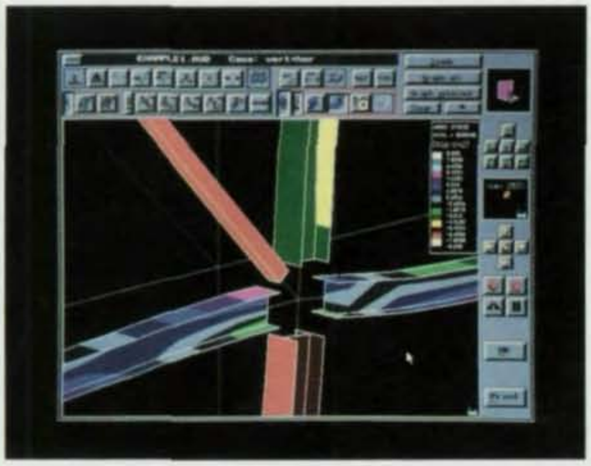
E.J.E. INDUSTRIES, INC.
Computer Software for Steel Professionals
287 Dewey Avenue, Washington, PA 15301

Phone (800) 321-3955
or (412) 228-8841
Fax (412) 228-7668

Call Today For Your Free Demo Kit!



2D and 3D Finite Element Structural Analysis Program



A new generation of engineering software is now available for structural engineers. ***Avansse*** V2.0 is an intuitive and TRULY interactive program with its strengths in simplicity and ease of use. All functions for editing, analysis, graphics, post-processing, etc., have been integrated into one single program that allows you to enter the data, solve your structure, see the results graphically and numerically, change the data and solve again without ever leaving the ***Avansse*** program. Spreadsheets for data entry and full featured graphics are combined in a way that is unmatched by any other program.

At $250 ***Avansse*** is not only an unbelievable bargain, but it also gives you a flexibility that you won't find elsewhere. Advanced structural design features are available in Avansse modules at prices up to $850. In addition, ***Avansse*** not only writes but also reads .DXF-files for/from CAD systems.

Request you **FREE** ***Avansse*** demo diskette plus brochure by calling a toll-free number: 800-200-6565 and test drive ***Avansse***.

For program information call technical support at 805-259-6902 or FAX your questions to 805-255-7432. North American Distributor: EBBS, 25439 Via Nautica, Valencia, California 91355.

where extra strength was required. The 3¼" of light-weight concrete above the deck's flutes provides a two-hour fire rating and the beams are protected with spray-on fiber fireproofing. The main roof construction is the same as the typical floor, except the low roof over the ballrooms and restaurant has 4" of regular weight concrete topping to provide isolation from airport noise.

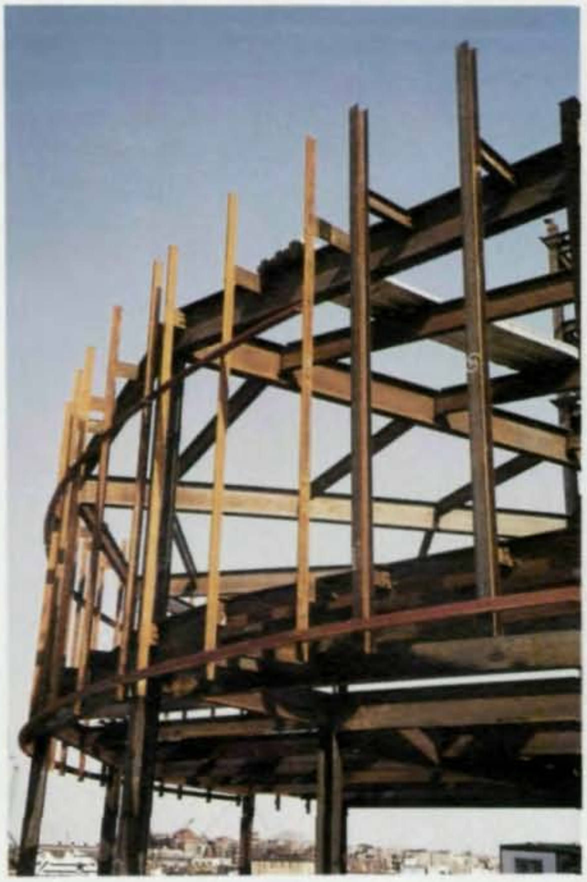
The lateral force-resisting system consists of K-braced frames in one direction and moment frames in the other. Two K-braced frames are located at each end of the guest tower. Each pair of braced frames is supported on a common pile cap, which provides increased resistance to overturning because of the larger moment arm. Resistance in the long direction is provided by moment frames on the exterior column lines. Two additional trusses provide lateral resistance at the ballroom. GT Strudl was used for the analysis and design of the wind system and the pile caps, while in-house developed software was used for the other beam design.

Typical exterior walls are constructed of brick on metal studs. Curtain wall is used at the guest elevator tower, lobby bar, and restaurant. Fiberglass panels was used at the lighthouse, which also serves as the elevator machine room.

Floor Structure

The combination of an 8'-0" clear ceiling height and an 8'-9" floor-to-floor height in the typical guest room floors imposed severe restraints on the design of the floor structure and required extraordinary coordination of architectural, structural and mechanical/electrical design.

There are three structural spans across the width of the tower. The outer spans are 24'-0" and the inner span is 11'-8". Along each of the four longitudinal column lines, the typical column spacing is 26'-8", which is twice the room module. Steel girders span the 26'-8" spaces between columns in the longitudinal direction. The girders are W18s at the spandrel lines and W12s at the two interior lines.

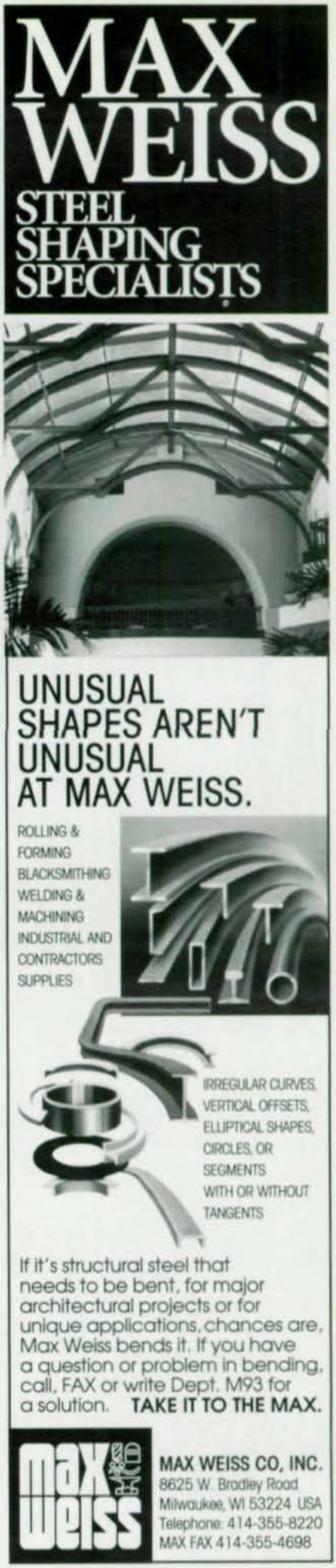


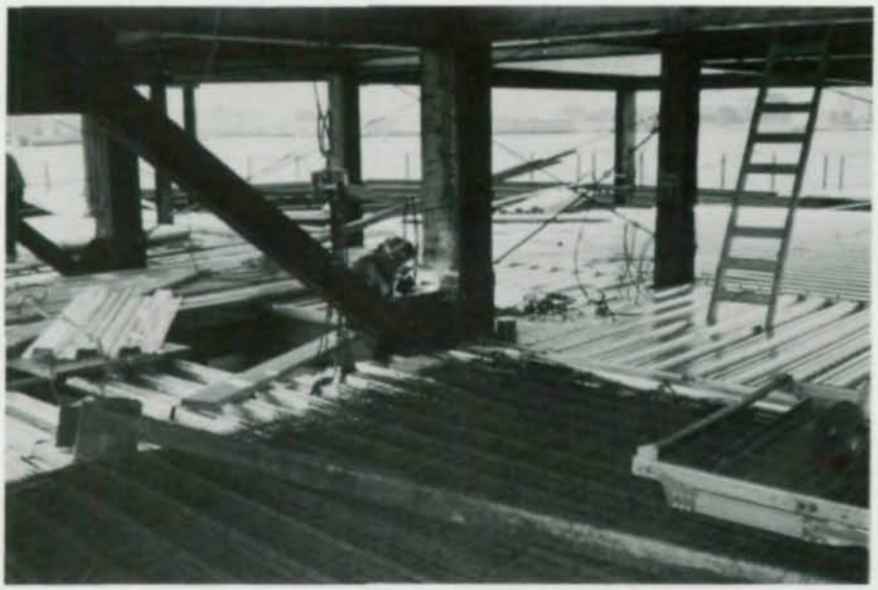
The use of vertical members to support the exterior wall avoided the need for a complicated system of variable length kickers and hangers. Photo courtesy of RTKL.

Steel beams at the guest room wall locations span the 24'-0" between the exterior and interior column lines. The metal deck and concrete floor slab spans between these beams, which are 12'-10" to 13'-10" apart. At the center of the floor, the metal deck orientation is changed, and the floor slab spans the 11'-8" distance between the girders on the inner column lines. Small W8 beams also are provided across this 11'-8" space at the column lines to help tie the framing together.

This structural configuration satisfied the basic design constraints. With no framing above the interior of guest rooms, it was possible to achieve an 8'-0" clear ceiling height in combination with the 8'-9" floor-to-floor height. However, numerous additional refinements were necessary to create an economical, coordinated project, including:

- The interior girders were located over the bulkhead above the bathtub and entrance foyer of the rooms. This area had a 7'-6" ceiling, which allowed a W12 to fit. Flanges were coped to clear vertical pipes. Round web openings allow the horizontal sanitary line from two toilets to share one vertical riser. Holes cut in the webs of the beams over the bathtubs permit sprinkler pipes to run across the building.
- Beams across the central hallway are small W8 members. The bulkheads used in the hallway to hide the beams and sprinkler pipes produce a pleasing coffered ceiling.
- To make the guest rooms symmetrical and to reduce drywall costs, the beams supporting the deck over the main parts of the room are offset a few inches rather than being located directly above the center line of each guest room wall. This produced beam bulkheads in every other room and allowed half the rooms to have walls with no bulkheads.
- For the suites, which each occupy the area of two typical rooms, "upset" beams were used to achieve double width spaces





The project's lateral load-resisting system for forces in the short direction of the guest tower consists of four K-braced frames. The top photo shows one of these wind trusses under construction. Pictured above is a view of downtown Boston from what will eventually be a third floor guest room. Photos courtesy of RTKL.

without ceiling coffers or bulkheads. In this area, the metal deck bears on the top of the bottom flange of the upset beams. These beams have unsupported top flanges and were therefore designed as laterally unbraced beams. The rooms above are slightly narrower to allow the upset beams to be hidden in the wall between rooms. The flanges of these beams were coped back to the width of a typical beam near the interior end to allow the vertical sanitary riser to pass by.

- Reinforcing in the concrete metal deck fill eliminates the need for additional steel members to frame the openings for bathtub drains and vertical bathroom exhaust ducts. This reinforcing created small concrete beams after the concrete hardened. The deck was left in place and the openings blocked out when concrete was poured, and the openings in the deck were cut after the concrete had hardened.

Exterior Wall Details

The exterior walls are faced with brick masonry at most locations. Several unusual structural features were used to reduce the cost and improve the appearance of the walls.

First, vertical steel tube and wide-flange members support the outside wall and eliminate the need for kickers at the curved walls. Variable length horizontals were attached to the vertical members with shop welded moment connections. These horizontal members then only required shear connections to the spandrel beams in the field. In the restaurant, where floor-to-ceiling windows were required, 2"-wide tubes were used as mullions. This system replaced a complicated system of variable-length cantilever beams, hangers, and kickers originally anticipated for this condition.

Second, the walls at the guest towers are supported on lintels at every other floor, which required heavier lintels but cut the detailing, fabrication, and erection costs in half. The spandrel beams were not required to change in size because they were governed by drift requirements for the lateral force-resisting moment frames.

Wind Bracing Requirements

The lateral load-resisting system for forces in the short direction of the guest tower consists of four K-braced frames with two located at each end of the tower. Because of doors and mechanical systems, they differ in configuration at the lowest two levels. This difference in configuration and stiffness results in significant forces being transferred between the trusses at the second and third floors.

Analysis of the initial design of the K-braced frames indicated that forces of the order of 400 to 500 kips would be transferred between the frames at the second and third floors. Forces of this magnitude could not be resisted by the floor slab or reasonably sized beams. To reduce the force transfer between frames, selected K-bracing elements were separated at their apex, forming an eccentric brace and thus reducing the frame's stiffness. By "tuning" frame stiffnesses in this way, transfer forces between frames were reduced to less than half their original magnitude.

The remaining horizontal transfer forces were resisted by reinforcement placed in the slab between each pair of trusses. Shear studs transfer the forces from the horizontal truss members into the floor slab. Slab reinforcement perpendicular to the trusses resists moments in the slab caused by the trusses not being in the same vertical plane.

The design engineer and fabricator determined that the most economical and technically valid connection was obtained through utilization of the Uniform Force Method. However, at the time this project was designed, the *Manual of Steel Construction, Volume II, Connections* had not yet been published, so the designers had to rely on preliminary information obtained at recent National Steel Construction Conferences, articles in *Modern Steel Construction*, and conversations with AISC staff engineers for advice on strong axis bracing connections.

Conclusions

The success of the Harborside project demonstrates that it is possible to economically build a steel-framed hotel with a floor-to-floor height that is customarily regarded as the exclusive domain of other structural materials. Moreover, this was achieved without resorting to staggered trusses or other non-conventional framing techniques.

According to the general contractor, George B. H. Macomber Company, Boston, the project was economical to build. And it required no significant functional or architectural compromises. All it did require was close cooperation and coordination among all of the members of the design team.

RTKL Associates Inc. currently is designing a high-rise hotel in Asia using a similar steel system and featuring 9'-2" (2.8 meters) floor-to-floor heights.

R. Shankar Nair, Ph.D., P.E., is vice president and director of structural engineering and William W. Houston, P.E., is an associate vice president at RTKL Associates Inc. RTKL is a full-service architecture/engineering firm with a multi-disciplinary staff of 450 and offices in Baltimore, Washington, DC, Dallas, Los Angeles, Tokyo and London. The firm's structural engineering group is located in Baltimore.

WHEN YOU BUY ST. LOUIS, YOU BUY AMERICAN!

AND YOU GET: • FULL TRACEABILITY
• LOT CONTROL
• CERTIFICATIONS

Registered Head Markings on all structural and machine bolts:

Products from ½"—3" diameter include:

ST. LOUIS SCREW & BOLT COMPANY

6900 N. Broadway • St. Louis, MO 63147

(314) 389-7500 • 1-800-237-7059 • Fax (314) 389-7510

MEMBER INDUSTRIAL FASTENERS INSTITUTE

Steel House

Weathering steel was the ideal material to create a monolithic residence-in-the-woods

This 2,300-sq.-ft. weathering steel home was designed with a sculptural appearance, both inside and out. The top portion cantilevers out from the main body to provide 360 degree views of the surrounding 40 acres of woods. Housed in the top portion is an elaborate library (right) with hung shelving. Shown on the opposite page is a south elevation showing the Vierendeel truss and the suspended library system. Finished photography by Eduard Hueber.

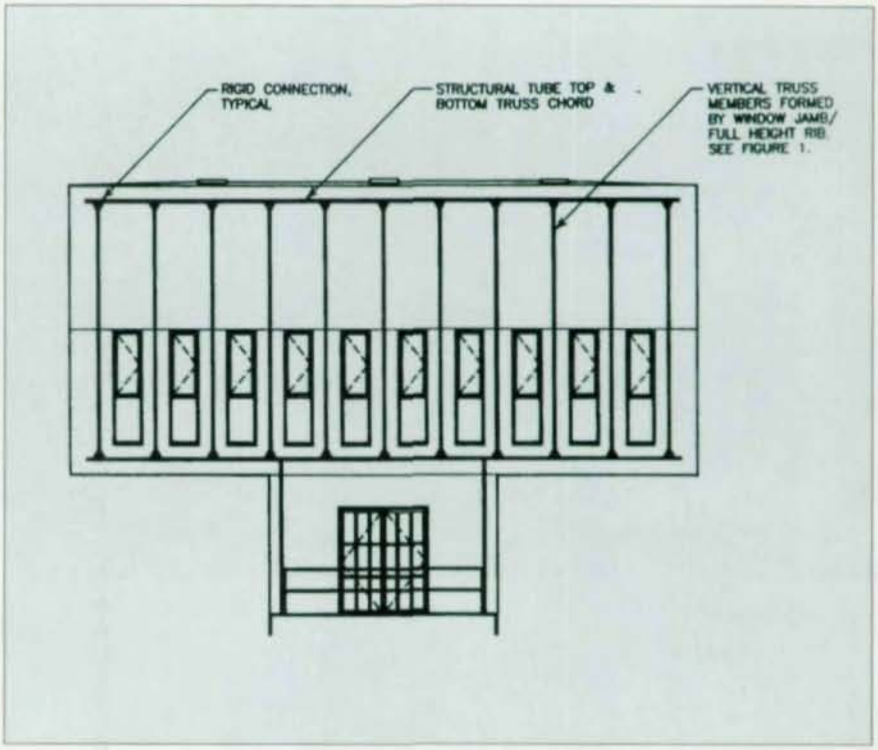
The last thing you'd expect to see when hiking through the woods in Northern Saratoga County in Upstate New York is a battleship. And you'd be right to doubt your eyes—the huge steel structure emerging from the ground is not some boat miraculously transported and then abandoned far from any ocean; rather it's a very private home.

The exterior of the rather unusual, 2,300-sq.-ft. home consists of weathering steel plate interrupted by windows. The owner, a science fiction author, wanted a secluded residence where he could write and where his growing library, which ultimately is expected to reach 10,000 volumes, could be housed.

In form, the home resembles a "T" set on a base, which allows the separation of the library and living space. "The configuration of the building is an interpretation of the client's functional requirements incorporating the topography of the site," explained Simon Ungers, co-architect of the project and an adjunct professor at Rensselear Polytechnic Institute. "The owner wanted a large library with a flexible living space," added Tom Kinslow, the other half of the design team and a professor at Rensselear.

Since the owner wanted to spend his time reading and writing in his library, it was decided that the library would be located atop and cantilevered beyond the living space to provide a 360 degree view of the wooded site. The home essentially consists of three spaces: 16' x 44' library; 16' x 16' entry; and 16' x 84' living space. The library, which sits above the living area, is turned perpendicular to the main space. "We didn't want the house to be uni-directional," Kinslow said. "The house addresses all four compass directions. Also, by turning the library, we provided more of a southern exposure for good reading light, while allowing east-west light for the living area."

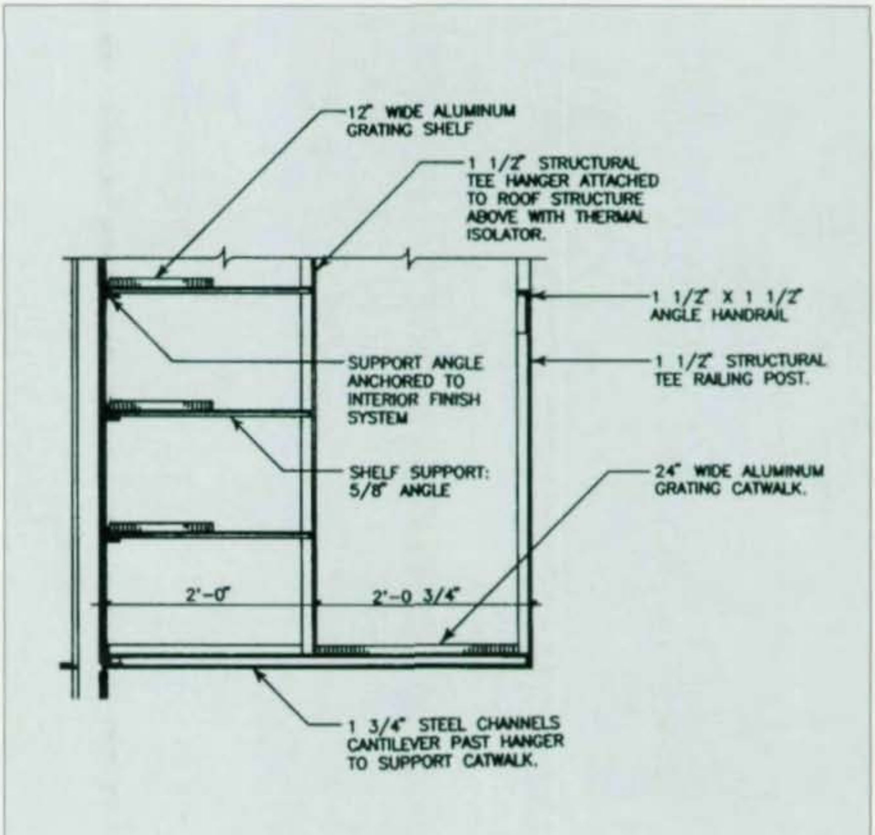
In keeping with the sculptural concept, the designers sought a monolithic form in which the seams disappeared into the finished product. They also sought to create a highly rigid machined element to form a brutal juxtaposition on the free-form site. "We thought about using concrete, but the seams were to visible," Kinslow explained. "Brick had the same problem." Wood was rejected as not meeting fire codes given the proposed height of the structure. "We determined that steel would work, but only if the walls were structural. And then we decided on weathering steel, since the seams would disappear as the steel weathered."

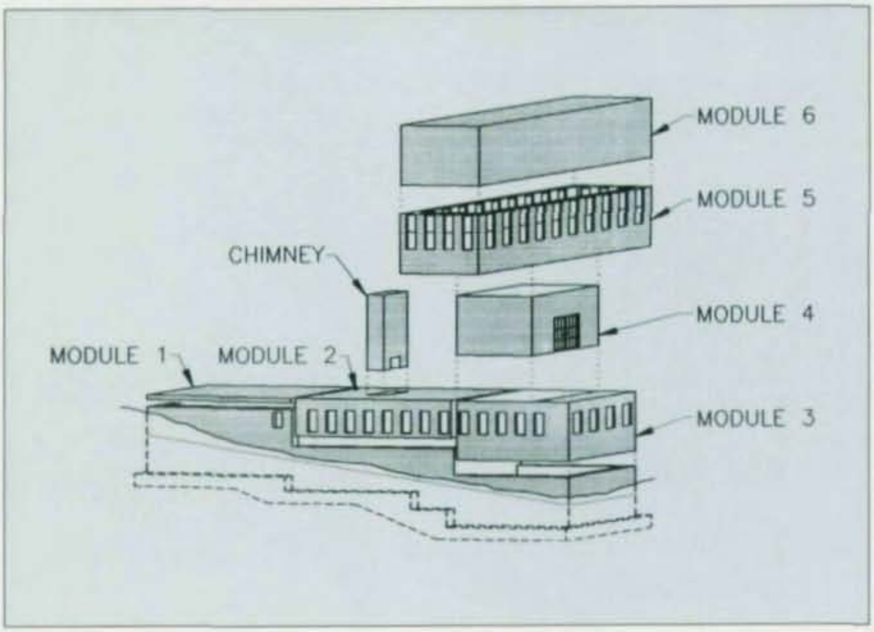


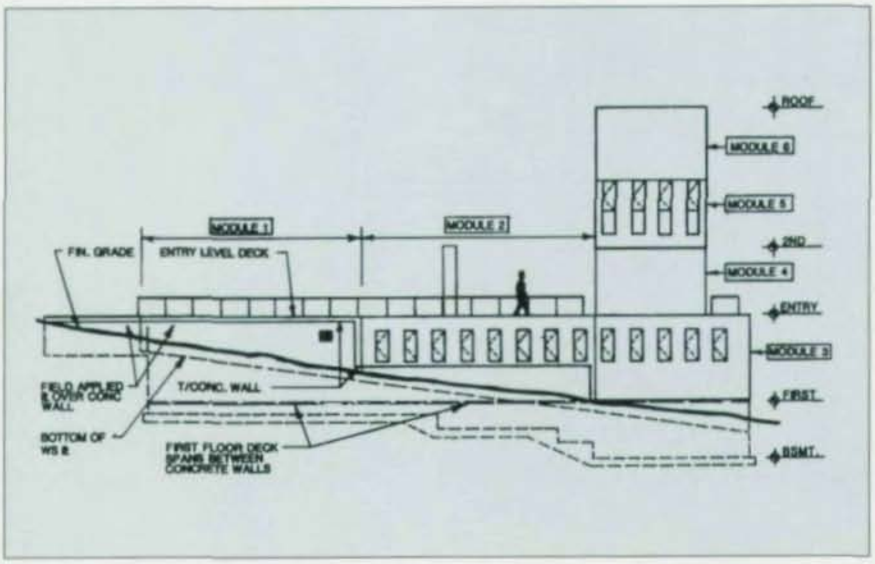
Massive Structure

"The overall size of the residence and the sloping site posed problems with the designers' desire to create a monolithic structure," explained Paul Ruiz, P.E., a structural engineer with Ryan-Biggs Associates."They had even considered building the residence in a shipyard in one piece and barging it up river. Overland transport to the site would, however, not be possible." In addition, if constructed as a steel vessel and set into the hillside, as much as 10' of the plate would be below grade, which would have created large earth pressures as well as preventing the plate from weathering properly.

Instead, RBA developed a scheme involving dividing the superstructure into special erection modules that could be fabricated by AISC-member STS Steel, Inc. and trucked to the site. "The shop fabrication of the large modules resulted in an extremely high quality level and enabled the near zero tolerances to be met," Ruiz said. "The residence was in reality a steel sculpture that could be inhabited." The modules were placed on a concrete foundation that stepped down the sloping site so that only







12" of plate extended below finished grade.

The seams between the modules were carefully designed and located for field welding with a continuous butt groove weld using a special weathering filler metal. The welds were then ground flush. "This ensured that the seams between the modules did indeed disappear as the architects desired," Ruiz said.

Since the entire exterior skin of the building was steel, the interior wood finish system needed to be thermally isolated from it. A 5" air cavity was provided between the two to allow condensate to drain out or evaporate. "Fans bring fresh air into the cavity to keep the inside of the weathering steel dry," Kinslow said. A special sliding connection was provided between the skin and concrete foundation to permit differential thermal movement.

Structural Design

While the walls are structural elements, RBA's preliminary analysis showed that stiffening of the seamless skin plate would be required. To provide support, the engineer designed a truss consisting of 16" x 8" x 5⁄16" tubes for the top and bottom chords and C8 x 11.5" channels for the vertical members.

In addition to functioning as part of the truss, the vertical channels also served as the window jambs. This was possible because the home's windows were recessed to prevent staining during the weathering process of the steel skin. "The two jambs and a portion of the skin plate between the windows formed the vertical elements of a distinctive 20'-high Vierendeel truss, which became the side walls of the residence and supported the roof framing and suspended stack loadings," Ruiz explained.

The main supports for the truss are four W8 columns. The interior floors also are steel framed. The floor joists were designed with MC10 x 8.4 topped with a corrugated metal deck. On top of that is plywood, and the final surface is hardwood.

The library also includes a mezzanine, which is suspended from the roof plate joist using $1\frac{1}{2}$" x $1\frac{1}{2}$" x $\frac{3}{16}$" structural tees.

The roof is $\frac{5}{16}$"-thick plate with a track burned in it to provide positive drainage.

Fabrication And Erection

The house was fabricated as six modules and then trucked to the site. Module 1 is an entry area on the far north section of the residence; modules 2 and 3 are both living areas; and modules 4, 5 & 6 form the "stack."

"Since fit up of the six basic units in the field was critical, trial assembly of the units was performed in the shop," explained James Stori, P.E., president of STS Steel, Inc. The sequence of erection was: module 3; module 4; module 2; module 1; and finally modules 5 & 6. "The corner vertical seams of module 6 (the 16' x 44' x 10' high upper library "box") were left unwelded until after it was assembled on top of the lower unit (module 5—also 16' x 44' x 10'). By thus matching the corner joints, we insured perfect alignment in the field." Each of the upper units weighed approximately 18 tons and the entire project utilized 80 tons of steel.

Every Detail Crucial

"From the start, the architects stressed the final appearance of all weld joints and corners," Stori said. "The structure was to look as if carved out of a solid block of steel. This was accomplished by using full penetration joints made with weathering electrodes, all ground and polished to sharp right angles. Grinding was all done by the same individual to ensure uniformity. Once sand blasted, the corner and seam joints disappeared."

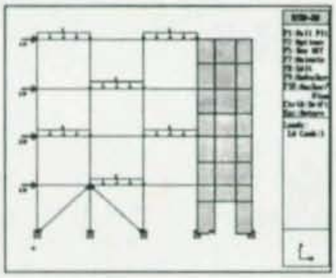
Despite the relatively small size of the project, its complexity meant a long design and construction period. Foundation work began in the fall of 1990, shop fabrication started in May 1991, the modules were shipped and erected in August 1991, and interior fit-up was finished in February 1992.

Pictured above is the house's main entry. The interior is finished with wood panels; a 5" air cavity was left between the wood and the exterior steel plate. Photo by Eduard Hueber. Pictured on the opposite page is a construction photograph and two line drawings detailing the construction process. The home was fabricated as six modules, which were then transported to the site and erected.

A Quick Quiz For Structural Engineers

The more a computer program costs, the better it is.	*TRUE*	*FALSE*
A program that solves complex, difficult problems must be complex and difficult to use.	*TRUE*	*FALSE*
Structural engineering software can never be fun to use.	*TRUE*	*FALSE*

If you answered *TRUE* to any of the above, or you would like to know more about a truly innovative software program, call us!



RISA-2D

Your complete solution for frames, trusses, beams, shear walls and much more!

RISA TECHNOLOGIES

26212 Dimension Drive, Suite 200
Lake Forest, CA 92630
1-800-332-7472

Breaking Barriers

William J. LeMessurier's name is indelibly linked with innovative concepts, including the staggered truss and tuned mass damper

The Cambridge (MA) Center Marriott Hotel utilized a staggered truss system both to minimize floor-to-floor heights and to help create a window configuration that would maximize views. Architect on the project was Moshe Safdie. Photo by Warren Jagger Photography.

By Stephanie Rosen

In 1967, the United States Steel Corporation challenged William J. LeMessurier and his colleagues at the Massachusetts Institute of Technology to develop an improved structural design for high-rise apartment buildings that would increase steel's competitiveness with concrete.

LeMessurier and the MIT research team accepted the challenge and the result was the creation of the staggered truss system. The innovative solution utilized full floor height trusses on every other level running within wall space, thereby reducing the overall height of the structure while still creating large column-free areas.

While LeMessurier is perhaps best known for his work on the staggered truss system, his legacy is far greater. Since studying architecture at Harvard and then engineering at the Massachusetts Institute of Technology more than 40 years ago, LeMessurier has practiced structural engineering with major works worldwide, including buildings in Abu Dhabi, Egypt, France and Singapore. Throughout, he has combined aesthetics with state-of-the-art structural designs.

"He doesn't just look for the ordinary solution. He looks for ways of improving what's been done before, and in the process, he innovates new solutions," said Alex Kaufman, an architect with Jung/Brannen in Boston. Kaufman has known LeMessurier for 40 years and has worked on various projects with him, including Boston's One Post Office Square in 1980.

Structural Innovations

LeMessurier, now 67 and chairman of LeMessurier Consultants, Inc., in Cambridge, MA, contributed two significant systems to the structural engineering lexicon: the staggered truss system and the tuned mass damper system.

"The staggered truss system came about due to sponsored research at MIT in the 1960s by U.S. Steel," LeMessurier explained. "Since we were competing with concrete, we started by looking at a concrete model of a typical high-rise residential building. At the time, everyone thought you couldn't achieve the same floor-to-floor height with steel as you could with flat plate concrete."

The design team began by putting the columns in the walls in the long dimension. "The question was how to connect these columns," he said. Coincidentally, LeMessurier had recently designed a college auditorium which utilized a truss concealed in a wall—the perfect solution to his current dilemma. "We started with trusses in every bay. But we weren't satisfied to simply match concrete's floor-to-floor height, we wanted to beat them." The solution was to stagger the trusses on a 12' module, meaning that on any given floor the trusses were 24' apart. "An added benefit was that we discovered the system worked fantastically for wind—no bending moment at all!" And still another advantage is that it readily spans across any parking structures that might be built beneath the housing.

Tishman Construction Corporation analyzed the costs of the MIT design and discovered that it beat the cost of a comparable concrete design by $0.50 per sq. ft. They noted, and experience has borne it out, that as labor costs increase as a percentage of total construction costs, the cost savings would grow even larger.

"I got to present it to the public at the AISC Steel Conference in Boston [in 1966]. People from all over the world were there to find out what the Americans were up to," LeMessurier reminisced.

The Japanese were the first to capitalize on the staggered truss system, and LeMessurier didn't utilize the system until the late 1970s when he designed the Lafayette Place Hotel in Boston. "The staggered truss was important to the design to accommodate retail space underneath the hotel, plus a garage." Since then, numerous designers have used the system, including LeMessurier himself on his 1986 Cambridge Center Marriott Hotel project, where in addition to lowering floor-to-floor heights, it helped to maximize views.


The unique Citicorp Center in New York City (above left) provides, on one site, an office tower for Citibank, a church for St. Peter's Lutheran congregation, low-rise shops, and offices surrounding a public atrium, a pedestrian plaza, and a connection to the subway. Because of the church's location, the tower is elevated on four 114'-high columns that support the tower at the midpoint of each facade. To provide the desired clear-span floors on the slender, 914'-high structure, the designer utilized diagonal bracing and a tuned-mass damper. Architect was The Stubbins Associates, Inc., with associate architect Emery Roth and Sons. Photo courtesy of The Stubbins Associates.

Shown above right is a rendering of the proposed Bank of Southwest Tower. The design of the 1,220'-high tower would have included two large columns on each of the building's four sides. The gravity load of each floor would be gathered in the bracing and transmitted to the base of each module. The shear system interconnects columns on opposite sides of the building and carries gravity loads to the perimeter columns. Architect on the project was Murphy/Jahn. Photo by Keith Palmer & James Steinkamp.

Minimizing Movement

One of LeMessurier's favorite buildings is the Citicorp Center in New York City, where he got to use another of his innovations, the tuned mass damper system. LeMessurier first developed the tuned mass damper system, which is designed to stabilize tall buildings by reducing wind sway, while working on the preliminary design of a building which ultimately was never built.

The concept of damping was suggested to LeMessurier by Alan Davenport of the University of Western Ontario, one of the world's leading experts on wind resistance of structures. From there, LeMessurier contacted Robert Scanlon, then at Princeton

STEEL BRIDGE DESIGN on your PC

Our steel bridge girder design software has been licensed by many of the largest ENR Top 500 Design Firms, as well as smaller firms and state DOTs. We now offer the following design and analysis features:

Integrated Grid Analysis & Girder Design

- ***Generates influence surfaces,*** *loads lanes or uses wheel load distribution*
- *Generates geometry for girders and bracing from a minimum of input*
- ***Plate girders and box girders w/ haunches, rolled shapes w/ cover plates***
- *12 continuous spans, variable horizontal curvature, skewed supports*
- *Powerful* ***nonprismatic girder optimization*** *processor (one that works!)*
- *Optimized girder designs satisfy user's preferences and the code*
- ***1992 AASHTO Specification, Allowable Stress Design, Load Factor Design***
- *Full control of composite action, slab pour sequencing analysis*
- ***Excellent for analyzing existing structures for specification compliance***
- *Comprehensive tabular output, graphical output of stresses and deflections*

For more information, or to request a free trial, contact:

MDX *software*

Phone	Also available:	Fax
(314) 446-3221	Screed Elevation Program	(314) 446-3278

ROBOT V6

GRAPHICAL FULLY INTEGRATED STRUCTURAL ANALYSIS AND DESIGN SOFTWARE

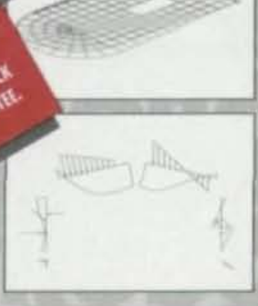
NEW INCREMENTAL PRICING STRUCTURE. FROM $495.
Now you no longer have to switch to different programs when your problem gets larger, or you want to run special analysis. Starting with the identical program base, our $495 version, full featured version, and all those in between utilize the same easy to use yet sophisticated user interface as our full featured program. So you can buy the power you need now, and upgrade as your needs grow in the future. You won't have to learn another package. Large design firms can benefit by using ROBOT V6 packages with various capacities throughout the firm, each providing engineers with the same user interface and standardized printed output.

NEW. $495 VERSION OF OUR FULL FEATURED PROGRAM.

THE BEST TOOLS FOR STRUCTURAL ANALYSIS AND DESIGN
As a new generation software, ROBOT V6 is emerging as a new standard of excellence in structural analysis. Only ROBOT V6 provides you with unparalleled quality, reliability, calculating power, and ease of use. An investment of over 50 man-years of development effort has resulted in more than 400,000 lines of object oriented C and C++ code. Thanks to state-of-the-art programming techniques, ROBOT V6 is extremely fast and the most powerful structural analysis program running on the PC platform.

NEW. 30 DAY MONEY BACK GUARANTEE.

THE MOST EFFICIENT AND INNOVATIVE PROGRAM TODAY
ROBOT V6 will let you increase productivity of your design team, even if you use other programs now. ROBOT V6 capabilities leave the competition far behind. ROBOT V6 is especially geared for structural engineers, and supports various national codes for steel and concrete design using point-and-click, interactive design procedure.



metrosoft
332 Paterson Ave
E. Rutherford, NJ 07073

DEMO AVAILABLE (LIMITED VERSION OF PROGRAM AND SELF-RUNNING EXAMPLES)
OVER 1200 USERS WORLDWIDE. FOR MORE INFORMATION CALL 201-438-4915 OR FAX TO 201-438-7058

	UK	Germany	Italy	Belgium	Spain/Portugal	France	Luxembourg	Poland	Jordan	Morocco
tel:	081 742 7224	(08557)410	011/6699345	(086)34 49 70	(33)61 27 00 68	76 41 80 82	25 03 60	(0 12)33 13 72	687483	26 89 43
fax:	081 747 4663	(08557)550	011/6699375	(086)34 47 95	(33)61 27 10 90	76 41 97 03	25 03 63	(0 12)33 88 64	681600	26 09 99

The 52-story Singapore Treasury Building's rounded form minimizes exposed surface area and therefore reduces energy consumption. The tower's structural system optimizes the performance of its cylindrical form. The floor system, supported by radial steel trusses, is cantilevered 38' off a cast-in-place concrete core. This system allows wind and gravity loads to be transferred to the core and results in column-free office space. The enclosed girders provide three-dimensional coffers that reinforce the circular design and provide high ceilings for indirect or direct lighting. Architect on the project was The Stubbins Associates, Inc.

University, who had done research on bridge damping (in addition to his work on vibrations and the Saturn rockets). (Scanlon received the T.R. Higgins award from AISC in 1976 for his work on bridge damping.) "I asked how to dampen a tall building, and he explained the principle of a tuned mass damper." Essentially, the system involved suspending a dash pot on a spring connected to a large mass, which would then absorb energy and limit building movement. The system is adjusted so that its frequency matches that of the building. Initially, LeMessurier considered using ball-bearings in the dashpot, but a mechanical engineering professor at MIT convinced him that a hydraulic system using pressurized oil would be more effective.

While the first project on which LeMessurier proposed using a tuned mass damper system was never built, the concept proved invaluable for the 52-story Citicorp Center. The project was built on air rights purchased from St. Peter's Church, which remained on part of the site. However, this resulted in severe limitations on column placement. As a result, LeMessurier designed four exterior columns at the sides of the square footprint to support the tower. Cross bracing was used to resist gravity and wind shear and the tuned mass damper system prevented excessive wind sway. The system includes a 400-lb. weight that sits in the damper room near the top of the building. When sensors detect movement, an oil pump causes the block to rise and counteract the motion. It then returns to its base when the wind stops.

The architect on the Citicorp project was Hugh Stubbins, principal of Stubbins Associates. Stubbins' relationship with LeMessurier dates back more than 40 years and continues today.

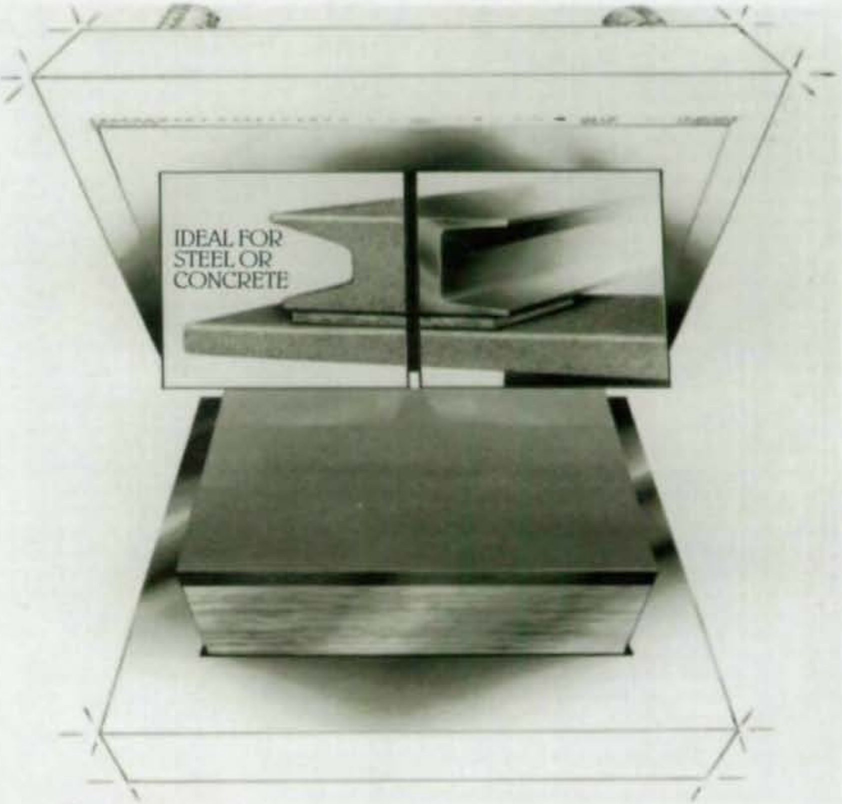
When it was determined in 1976 that the movement of the John Hancock Building in Boston was greater than anticipated, LeMessurier was called in to correct the problem. His solution was a tuned mass damper system featuring two 300-ton weights installed on the 58th floor "It was important to see that the system also could be used on existing buildings," LeMessurier explained.

While tuned mass dampers still are commonly used in Japan, LeMessurier doesn't expect to see many of them in the U.S. in the near future. "The drawback of the tuned mass damper is the complexity of the system. Viscoelastic systems are more economical and simpler if the architect is willing to work with you."

Unique Designs

During his long career LeMessurier used many different struc-

VOSS ENGINEERS THE RIGHT BEARING PAD FOR YOU!



SORBTEX
Expansion Bearings

- High Load
- Seismic and Thermal movement control
- Low Friction
- Low Deflection
- Rotation Capabilities
- AASHTO Approved

FIBERLAST
A new choice in a structural bearing pad which meets today's higher load requirements while remaining cost effective.

VOSS Slide Bearings
Steel backed PTFE accomodates structural movements due to thermal expansions - can also be bonded to other Voss Bearings to allow for misalignment or rotation.

NEW CRITICAL BEARING PAD DATA!

Write for your **free** Design Manual and software Design disc. Also available: Fiberlast conventional manual & disc.

Voss

VOSS ENGINEERING, INC.
6965 N. Hamlin Ave.
Lincolnwood, IL 60645
ph: 708 673 8900
fax: 708 673 1408

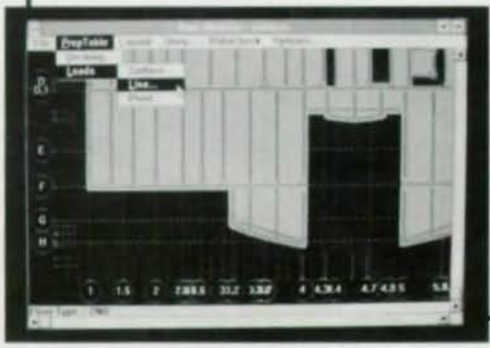
*RAM*STEEL Asks: "How Much Time Do *You* Spend On These Tasks?"

- Computing tributary loads, computing live load reductions and tracking the reaction of one member to the next.
- Designing beams, girders, bar joists, joist girders, columns and base plates.
- Preparing calculations and creating framing plans.

See how *RAM*STEEL can help you do this work in a *fraction of the time!*

RAM™ STEEL

30-DAY TRIAL AVAILABLE



INTEGRATED ANALYSIS, DESIGN AND DRAFTING OF STEEL BUILDINGS

Ram Analysis
5315 Avenida Encinas,
Suite M, Carlsbad, CA 92008
Tel 800-726-7789
Fax 619-431-5214

When complete, the 73-story, 1,000'-high Landmark Tower in Yokohama will be the tallest building in Japan. Architect on the project is The Stubbins Associates.

COMPLETE THE LOOP AND INCREASE YOUR PROFITS WITH STEEL 2000.

Find out why some of the top fabricators in the United States and Canada have choosen Steel 2000. Call 601-932-2760.

STEEL SOLUTIONS INC. P.O. Box 1128 • Jackson, MS 39215

tural systems. "I want an intellectual mixture. I'm bored doing the same thing over again," he said.

The aesthetics of a structure also is important to LeMessurier. "He bridges the role between architect and engineer," said John Sheehy, FAIA and principal with The Architects Collaborative in Cambridge, MA.

In 1973, LeMessurier helped TAC win the Johns Manville World Headquarters project in Colorado with an innovative composite design. The floor system utilized steel beams and the concrete floor slab in composite action to substantially reduce the weight of the long-span members. In addition, composite design was used to reduce the deflection on the long spans where beam depth was limited. Three large cores laterally support the

750,000-sq.-ft. building against wind and earthquakes.

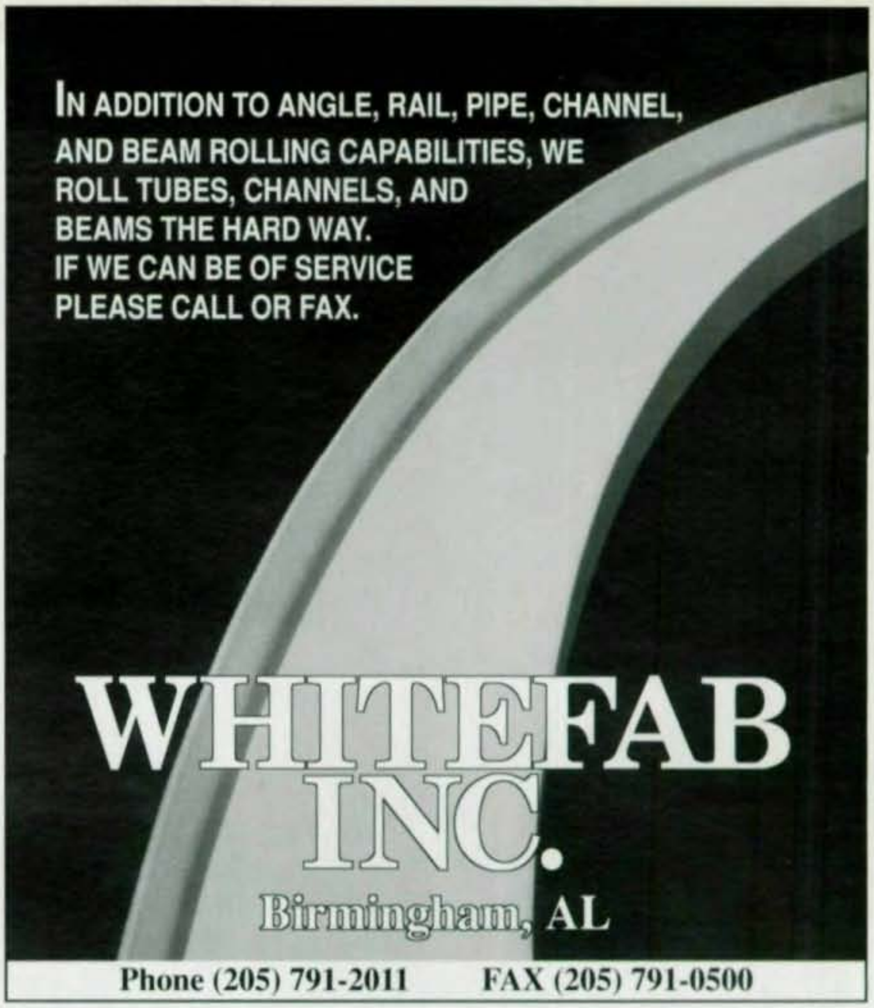
"The architects that have worked with him see him as a fellow architect, not only as a brilliant engineer," Sheehy said. "He thinks like an architect, but brings us around with his keen engineering mind. That is why he was made an honorary member of the Boston Society of Architects a few years ago."

Another unusual design LeMessurier worked on was the Interfirst Plaza of the Dallas Main Center, which opened in 1986. The tallest and most slender of Dallas' skyscrapers, the 72-story structure is supported on 16 exterior columns and an interior, rigid steel frame. The building core hangs from the interior frame to transfer all of the gravity load to the exterior. Wind shear is transferred to the exterior columns through the grade and concourse level floors.

Unlike the rigid frame used in the Dallas building, LeMessurier proposed a network of diagonals for the Bank of Southwest Tower, which, unfortunately was never constructed due to a faltering real estate market. Century Development, the owner, wanted the building to be the focal point of Houston. As designed by the Chicago architectural firm Murphy/Jahn Inc., the building would have soared 1,220'—more than 200' above its nearest competitor.

LeMessurier's plan would have supported the structure on two large columns on each of the building's four sides. The gravity load of each floor would be gathered in the bracing and transmitted to the base of each module. The shear system interconnects columns on opposite sides of the building and carries gravity loads to the perimeter columns.

Though the owner was initially skeptical, LeMessurier ultimately convinced him of the value of his design. "He has a way of presenting himself and his ideas. He's very convincing with people," explained Martin Wolf, a designer with Murphy Jahn. "He's intelligent, witty and has a good sense of humor," Wolf added. "He re-



World-Famous POWER STRUCTURE
$650 *(Regular Price $795)* **Sale Ends 11/30/93**

POWER-STRUCTURE

"The Complete Toolbox for the Building Designer"
A "power" collection of 50 of SAI's most useful structural analysis and design programs plus 50 famous "TALK" programs; a total of 100 programs! **Power-Structure** has been designed for concrete, steel and timber engineering projects. The two packages which make up **Power-Structure** are **ANALYSIS-PAK**, a team of 17 powerful structural analysis programs for large, medium and small buildings; and **DESIGN-PAK**, a powerful mix of 33 mutually supportive structural design programs for structures of varying size, shape and form. Each program has an associated "TALK" program. A **graphics** module **G-Power** is also included at no extra charge.

DESIGN-PAK

CONCRETE PROGRAMS
CONSLAB One-way slab analysis and design
TEBEAM Concrete tee beam design or investigation
HEADER Concrete header beam analysis and design
BMINERT Transformed concrete section properties
PLATESHR Slab punching shear analysis
COLCON Biaxial design of concrete column sections
CIRCON Design of circular concrete column sections
MOMAG Concrete column moment magnification
BEAMCOL Combined compression/bending member design
BEAMTEN Combined tension and bending member design
SHEARWAL Design of shearwall sections
SQFOOT Square footing design

CONNECTIONS, MISC.
BOLTS Bolted connection in wood members
SECTPROP Section property calculation
HANK Hankinson formula problems in wood
BOLTGRP Forces in eccentric bolt group
NOTCH Shear in notched wood beams
DEVELOP Development length of rebars/hooks

STEEL PROGRAMS
STEELBM Steel beam analysis and design
STEELCOL Steel WF column design
PIPE Steel pipe column design
TUBE Steel tube column design
BASEPL Steel baseplate design
STLDES Steel member investigation or design
TRUSS Steel truss analysis and design

WOOD PROGRAMS
WOODRAFT Timber rafter and joist design
WOODBEAM Timber girder design
WOODCONT Continuous timber beam design
WOODCOL Timber column design
WOODMEM General timber section design
PLYWALL Plywood shearwall design
DIAPHRAM Plywood roof or floor design
WOODTRUSS Timber truss design

ANALYSIS-PAK

GENERAL
BEAMANAL Simple beam analysis
CONTBEAM Continuous beam analysis
COLOAD Column loading analysis
IDTRUSS Indeterminate truss analysis
WALLS Forces in walls/frames from rigid diaphram
MULTISTR Multistory frame analysis
FRMWAL Frame-shearwall interaction analysis
SEISMIC Seismic loading computation
DYNAM Fundamental frequency of structure
WIND Wind forces on structures

STEEL PROGRAMS
LOADSTL Steel column load accumulation
MULTISTL Multistory steel frame analysis
P-DELTA P-Δ steel frame-shearwall interaction analysis

CONCRETE PROGRAMS
LOADCON Concrete column load accumulation
MULTICON Multistory concrete frame analysis
COUPLE Coupled shearwall analysis
RATIONAL Inelastic, P-Delta concrete frame-shearwall analysis

Call Now or Order by Mail!
Take Advantage of this
Special Limited Time Offer!!
(Offer Good Until November 30, 1993)
(407) 394-4257

'THE MOST PRODUCTIVE STRUCTURAL DESIGN SOFTWARE SINCE 1966'

SAI
STRUCTURAL ANALYSIS, INC.
555 S. Federal Hwy.
Suite 210
Boca Raton, FL 33432
(407) 394-4257

☐ YES, Please send me POWER STRUCTURE at your special price $650 (plus $24 S/H)
Florida Orders Add 6% Sales Tax
(Offer valid in the U.S.A. and Canada only, expires November 30, 1993) 036

NAME ____ COMPANY ____
STREET ADDRESS ____
CITY/STATE/ZIP ____
PHONE ____ ☐ MASTERCARD ☐ VISA
ACCT. NO. ____ EXP. DATE ____ ☐ CHECK ENCLOSED
SIGNATURE ____ DATE ____

The 48-story Bank One Center in Indianapolis is Indiana's tallest building (above). The 1,000'-high structure employs an efficient stacked truss sytem that maximizes interior column-free space while leaving the exterior entirely available for architectural treatment. Architect on the project is The Stubbins Associates.

Currently under construction is a 58-story tower in Hefie in the Anhui Province in China. When complete, the project, which also was designed by The Stubbins Associates, will be the tallest structure in the province.

minded me of Sigmund Freud or Louis Pasteur with his little glasses. He was like someone out of the 16th century. And extremely intelligent."

Another project LeMessurier worked on in the early 1980s was the 52-story Singapore Treasury Building, which has no exterior supports. Instead, it uses large steel trusses to cantilever the floor 40' from the concrete core. The structure rises 751' and LeMessurier calls it a "high-tech American building."

"It's a spectacular floor system," LeMessurier explained, and the lack of exterior supports allowed the creation of spectacular window vistas.

As with many of his other projects, LeMessurier was involved with the Singapore project from the start of design. "He has the ability to conceptualize at the beginning of the project and enhance the design," said Richard Green, chairman of Stubbins Associates. He also has a great understanding of the materials he uses, which helps him design very cost efficient structures, Green said.

"He is very professional and has a statesmanship-like quality," Green added. This ability came in handy when the two took an excursion to Nepal while working on the Treasury building. During a sightseeing trip to view the top of Mt. Everest, the pilot announced that it was clouded over and they would not be able to see it. Although they had flown around for 20 minutes, he said if they turned around the 14 passengers would get their fares back. They turned back, but the airline did not give them their money. LeMessurier became the elected spokesman and was able to get refunds for everyone.

With an interest in super-tall structures, LeMessurier has hypothesized on how to build supertall buildings. "People always ask me how tall you can build," LeMessurier said. He decided to answer that question in 1985 when he created a model for a half-mile high building for a museum exhibition in Boston. To make a 2,760'-high building (the Sears Tower is

1,454'), the frame would have to be rigid enough to withstand very strong winds. His design included a 10 second natural period of vibration that would make the building safe in 140 mph winds. The hybrid structure features a rigid concrete core with interior diagonal steel braces that transfer the loads to four corner columns.

"I just stretched it out as far as I could until there were impossible wind conditions due to the dynamic nature of buildings. When I found it was feasible, I was astonished. It's a joke really. There's too much space," he explained.

"I would like to take a vote that we should let the Sears building stand in memory of Fazlur Khan and stop going any higher. On the other hand, if anybody wants to do it, I'm ready," LeMessurier said at an ENR symposium nearly 10 years ago. So far no one has taken up the gauntlet.

What's Next?

Though semi-retired (he only comes to the office three days a week), LeMessurier hasn't stopped designing—or innovating. For example, he describes his design for the Bank One Center in Indianapolis as possessing "the most rigidity per pound of steel of any project I've ever done." The 52-story, 700'-high building features steel diagonals running internally through the building and connecting the core to perimeter columns in a unique K-braced vertical truss system. The diagonals slope over six stories. "Two floors out of every six have completely open space, while on the others the diagonals can either be hidden in partitions or left exposed for drama." In addition to being very efficient, the design completely frees the exterior for any desired architectural treatment. And by recessing the exterior columns, window placement is completely unimpeded.

"The K-braced vertical trusses, which provided the maximum lever arm to resist the wind load overturning forces, also serve to transfer the weight of the core to the exterior columns thereby keeping the main perimeter columns at the same dead load stress levels as the remaining perimeter columns, which do not serve the lateral load system," explained Peter J. Cheever, P.E., a vice president with LeMessurier Consultants. "This was accomplished by removing the core column every 12th floor, thus directing the accumulated gravity load along the main diagonals and into the main perimeter columns. In addition, the stepped back corners were cantilevered to maximize the tributary area of gravity load delivered to the main perimeter columns and eliminating the need for transfer girders."

LeMessurier also recently served as a consultant for the 1,000'-high Landmark Tower in Yokohama, Japan. The building features both an exterior and interior tube. Due to its height, the design was governed by wind load rather than seismic. It was designed for strict motion control and incorporates a tuned mass damper system.

The far east has proven to be fertile ground for LeMessurier. Currently, he is working on a 58-story building in mainland China.

In addition to designing buildings, LeMessurier has dedicated much of his life to teaching. From 1951 to 1986 he taught engineering at MIT. In 1956, he began teaching engineering to architecture students at Harvard, where he is still currently an adjunct professor. He also has been a visiting lecturer around the country.

Not only does he teach, but he also has designed academic buildings at such prestigious institutions as Harvard, Princeton and Cornell Universities. He also serves on various professional committees, including the AISC Committee on Specifications. And in 1978, he was elected to the National Academy of Engineering.

"I go beyond engineering. I look at the aesthetics of the structure and I have an interest in society," he stated.

Stephanie Rosen is a free-lance writer formerly based in Evanston, IL.

For the BEST in Bridge Software...

DESCUS-PLUS

Design of Curved Girder Bridges

NEW FEATURES:

- ❑ Live Load Distribution - Automatic (Longitudinal & Transverse)
- ❑ Mesh Generation - Automatic
- ❑ Rating - Auto Rating Factors
- ❑ Influence Line Output (From Influence Surfaces)
- ❑ Metric Conversion
- ❑ Uses AASHTO 15th Edition
- ❑ Lease or License
- ❑ Timesharing

Free Trial... FULL Program!

MERLIN DASH
Design & Analysis of Steel Girder Bridges

- ❑ AASHTO - Uses New 15th Ed.
- ❑ FHWA - Endorsed and Used by
- ❑ DOT's - Used by 35 States
- ❑ Design - Cost Optimized
- ❑ Friendly - Menu-Driven Input
- ❑ Graphics Display of Output
- ❑ Output Report Selection
- ❑ Quality and Performance

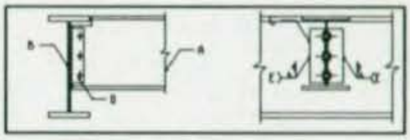
MICROBARS
Bridge Analysis And Rating System

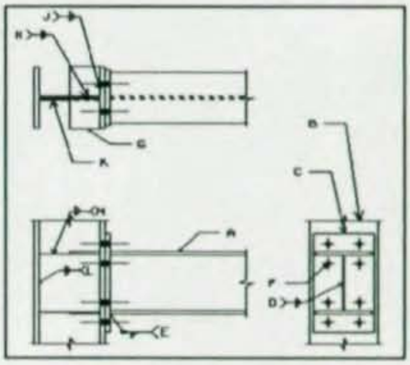
- ❑ Derived from Original BARS Program
- ❑ Compatible with DOT's Structural Databases
- ❑ Rates All Conventional Member Types
- ❑ Considers All Construction Materials

Available Exclusively Thru:

OPTI-MATE, INC.
P.O. Box 9097, Dept. A, Bethlehem, PA 18018
(215) 867-4077

DESCON
DESIGNS AND DETAILS STEEL CONNECTIONS





FOR A FREE DEMO DISK
CALL OR WRITE TO

OMNITECH ASSOCIATES
P.O. BOX 7581
BERKELEY, CA 94707
(510) 658-8328

Riveting Experience

In a throwback to an earlier age, a small bridge in Winchester, MA, is being fastened with rivets

The Aberjona Bridge replacement, which was being erected in August, was historically accurate—right down to the use of rivets. Shown above are riveted trusses in AISC-member Spector Metals' shop. Pictured on the opposite page, from top to bottom, are: a test rivet cut in half for examination; rivets being pre-heated in a forge; and the actual riveting process.

In an effort to recreate an existing historical bridge, the designers have reached back more than 40 years and revived the use of rivets. "The Aberjona River bridge is one of last existing three-hinge deck arches and we wanted to replicate what was out there," explained David Lenhardt, the chief bridge engineer with the Metropolitan District Commission. The bridge was originally erected in 1890 and was in need of replacement.

The two-lane bridge, in Winchester, MA, spans only 52' and was a fairly simple design project. The complication came when the fabricator, AISC-member Spector Metal Products Co., Inc., attempted to resurrect the process of riveting.

Finding Equipment

The first obstacle was obtaining equipment. "My dad [Morris Spector] had worked on riveting gangs and one of our estimators had, but our company hadn't," explained Richard Spector, a co-owner of the company. "So of course we didn't have any equipment. Fortunately, we discovered that my father's ex-partners' plant still had an old riveting machine." Spector bought the machine for \$200 and his brothers Steven, the company's quality control manager, and Brian, plant superintendent, rebuilt it.

Fortune continued to smile and Spector soon found a working forge. "My father, Morris, was talking with a gas station owner who owned horses and he mentioned a blacksmith who had a forge for sale." The forge, though relatively new, was too small for the blacksmith's needs but—with a little tinkering—was perfect for a steel fabricator doing riveting.

Finding rivets also was no easy task. "Our company's purchasing manager, Dennis Girardi, finally found a company, Vulcan Rivet & Bolt Co. in Birmingham, that still had their old dies," said Morris Spector, the family patriarch. Spector purchased 3,320 rivets, which included about 300 rivets for training and practice.

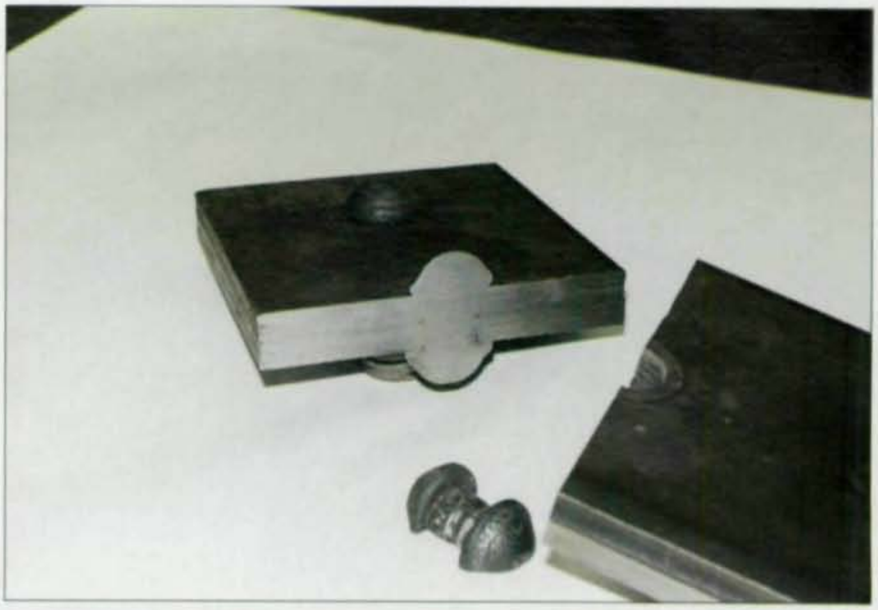
"We read the old specs and we talked with a lot of people to find out as much as we could," Richard Spector reported. Unfortunately, they could find very little specific advice. "People didn't say heat a rivet to a specific temperature, they said heat it to cherry red or bright orange." An old AISC Manual of Steel Construction did have some information, but what it really came down to was a learning process where a process was first tried and then the result was examined. "We made drove a lot of rivets on scrap before we started on the actual fabrication," he added.

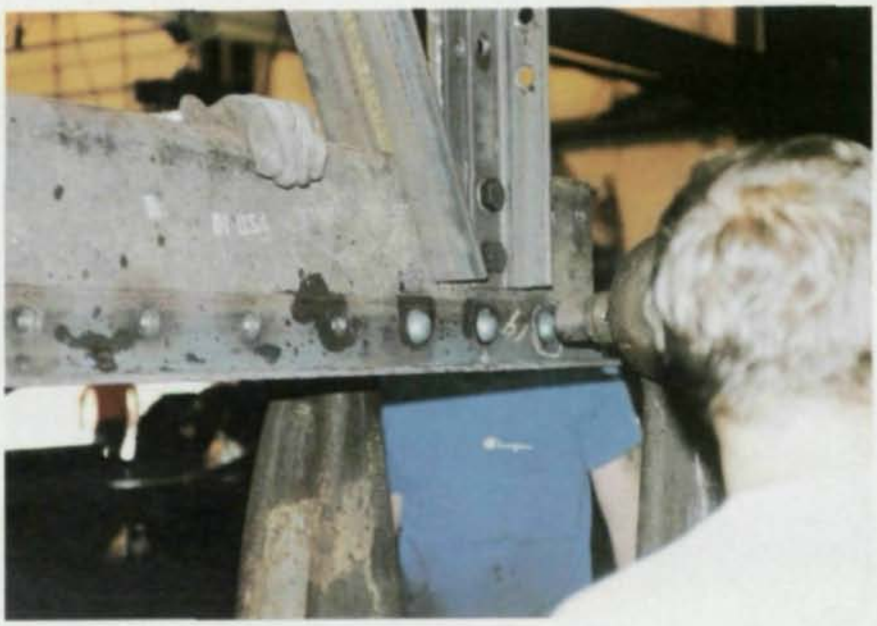
"We've been in the bridge repair business since 1957 so we've taken out a lot of rivets and we've had some experience in telling a good rivet from a bad one. When we started this project we pressed a lot of rivets until we got the quality required," Richard Spector said. The workers quickly discovered that part of the secret was to preheat the rivets.

Time Consuming Process

They also quickly discovered that rivetting is a lot more time consuming and labor intensive than either welding or bolting. "Because the stock has to be moved into position for each rivet, we averaged only about 1 rivet every four or five minutes," explained Morris Spector. All of the riveting was done in the shop, and then the bridge was transported to the site in 10 pieces and connected together using buttonhead bolts.

While the structural design aspects were simpler than the fabrication, it was still an interesting project. "From the engineer's point of view, there's very little difference between using rivets and bolts," explained Abdul Hamadeh,





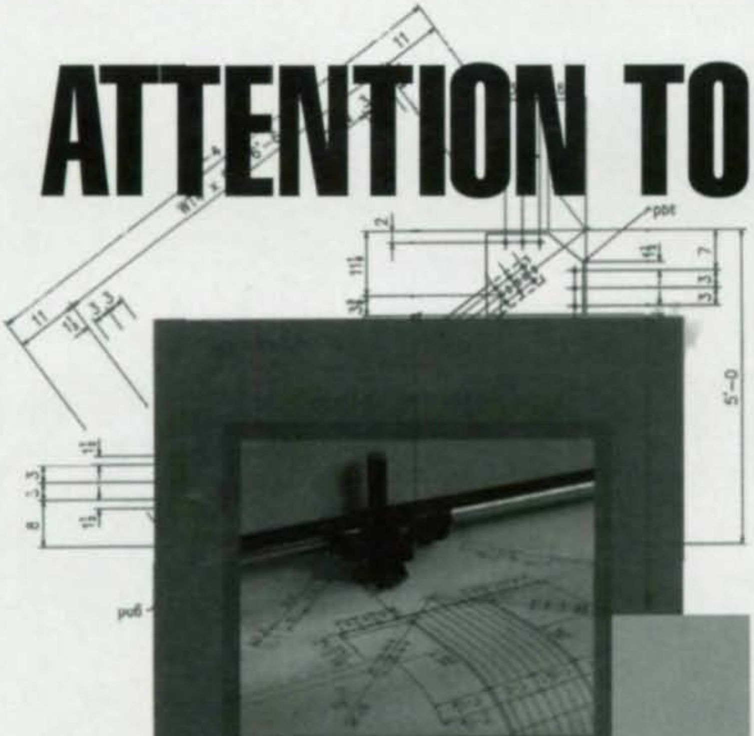
Riveting is a time-consuming and labor intensive process, as workers at Spector Metals discovered. The company was well-suited for the work, however. Though a small company, Spector is certified AISC Class III for major bridge work. But just as important, the company has a lot of experience with specialty work.

P.E., president of ASEC Corp. in Quincy, MA. ASEC was the structural subcontractor for Vollmer Associates. "However, we don't usually see a three-hinge arch, especially on a bridge with such a short span." The engineer used STAAD-III for analysis on the project.

Meeting Current Codes

"The only changes from the existing bridge was in certain member sizes to bring the bridge up to modern loads," Hamadeh explained. The replacement bridge was designed for an HS20 loading. Also, because the decking of the new bridge was 4" thicker than the original decking, the arch profile was raised slightly and the depth of the truss was reduced slightly to maintain the same opening under the bridge. The only other change was that the bridge was hot-dip galvanized and then epoxy painted

ATTENTION TO DETAIL



Computer Detailing Systems, Inc. introduces a state of the art structural steel detailing system which allows fabricators and detailers to meet the demands of the future with the ability to generate connection calculations, download to CNC equipment and interface with major design firms through the Steel Detailing Neutral File.

A practical, flexible system requiring minimal training, CDS is capable of producing intelligent 3D models, floor plans and elevations as well as shop drawings of unsurpassed quality using your standards and paper.

CDS is currently used by fabricators and detailers throughout the US and in Canada.

CONTACT COMPUTER DETAILING SYSTEMS *today* FOR A FREE INFORMATION PACK.

CDS

Structural Steel Detailing System

Computer Detailing Systems, Inc. • 7280 Pepperdam Avenue • Charleston, South Carolina 29418 • (803)552-7055

to minimize long-term maintenance costs.

General contractor on the project was ET&L Construction Corp. of Stow and the contract was for $969,537, including the reconstruction of an approach roadway. The project has garnered much attention and may not be the last of its kind. "I've gotten calls from people in several New England states who are interested in re-creation work," Richard Spector reported.

And the Metropolitan District Commission reports that they're not through with riveting. The historic Longfellow Bridge, which spans more than 1200' over the Charles River and is the showpiece of the Charles River Basin, will soon need a major rehabilitation and the Commission is currently negotiating to contract with an engineering firm to do the project—which may very well include riveting.

The old bridge, one of the last existing three-hinge deck arches, dated back to 1890 and was in need of replacement. The trusses, thrust bearings, and connections to wood stringers all showed definite evidence of substantial corrosion.

Estimating

Isn't it time to make the move to computerized estimating? In these days of declining profits and increased competition, couldn't you use a tool that will produce more bids with the same personnel and increase the accuracy of each bid? If so, SSC's Estimating program is the tool you need!

Call now and ask about our SUMMERTIME SAVINGS while they're still available

(800)776-9118

New Automated Drawing Log

Tracks drawings, revisions, and transmittals

Only $299.00

Ask for a free demo disk

SSC

STRUCTURAL SOFTWARE CO.
SOFTWARE FOR THE STEEL INDUSTRY
P.O. Box 19220, Roanoke, VA 24019
(703)362-9118

Other popular SSC products:
Production Control
Inventory Control
Purchase Orders
Combining

Ask for a demo

Reinforced Elastomeric Bearings

While most often considered for seismic applications, dynamic isolation systems also are used in bridge design in non-seismic areas. The DIS Force Control Bearing is a reinforced elastomeric bearing with a lead core. The bearing is vertically stiff and capable of supporting significant vertical loads. Positive mechanical shear transfer is provided by dowels or bolts connecting the bearing load plates to masonry plates. The bearing is environmentally inert because it is fully encased in rubber. For bridges, which are dynamically loaded structures, the benefits go beyond seismic protection. Benefits include: force control and redistribution; rigidity under short-term loads; elastic restraint; multi-directional properties; no maintenance requirements; mechanical reliability; and dependable long-term force. The bearings meet all of the requirements of the AASHTO "Guide Specifications for Seismic Isolation Design" and also are ideal for retrofit applications.

For more information, contact: Dynamic Isolation System, 2855 Telegraph Ave., Suite 410, Berkeley, CA 94705 (510) 843-7233; fax 510/843-0366.

Structural Bearing Pad Handbook

Voss Engineering has published a new structural bearing pad design handbook. The handbook describes the performance characteristics of Sorbtex preformed fabric pad, Fiberlast random fiber pad, and Voss Slide Bearings. PTFE coated Sorbtex mated to polished stainless steel is a high-load, AASHTO approved expansion bearing system. The Sorbtex system can be designed to accommodate bi-axial rotation. The handbook includes material test results as well as design equations and tables.

Also available is a free bearing pad design computer program. The disc allows the user to design Sorbtex, Fiberlast and Voss Slide Bearings using an IBM PC or compatible computer.

For more information, contact: Rick Voss, Voss Engineering Inc., 6965 N. Hamlin Ave., Lincolnwood, IL 60645; (708) 673-8900; fax 708/673-1408.

Isolation Bearing System

The EradiQuake System (EQS) from R.J. Watson is a state-of-the-art Isolation Bearing System designed to minimize forces and displacements by structures during an earthquake. The basic components of the system consist of a sliding multi-rotational bearing assembly and a maintenance free damping device. The EQS transfers the energy of a moving mass, such as a bridge deck, into heat and spring energy. This is done through the damping device, which can be adjusted at the discretion of the design engineer to achieve a wide variety of energy dissipation levels. Advantages of the system include: low cost; durability; no maintenance; low profile; compact size; ease of retrofit; simple installation; and multi-directional protection. R.J. Watson offers a no-obligation design service for engineers interested in examining the feasibility of the EradiQuake System as well as an interactive software design program.

The company also produces Flexcon 2000 Joint Sealing System, which incorporates an elastomeric concrete edge member with specially formulated polysulphide bridge joint sealant to provide a practical and simple solution to the problem of joint sealing. The system is watertight and easy to install. Also, since it is comprised of a high quality elastomer mixed with sand and graded aggregate, vehicle impact forces are absorbed by the material.

For more information, contact: R.J. Watson, Inc., 282 Wood Acres Dr., East Amherst, NY 14051 (716) 688-0094; fax 716/688-0008.

Self-Lubricating Bearings

Lubrite self-lubricating bearings accommodate expansion, contraction and rotation of structural members—without maintenance or supplementary lubrication. The bearings also are unaffected by temperature extremes, immersion and/or corrosion. The company produces bearings for a wide variety of applications: flat expansion plates are designed to accommodate expansion and contraction in a single plane; radius plates are flat on one face and either concave or convex on the opposite face, with the radius plate accommodating the deflection or rotation of the structural member and the flat face providing for linear expansion and contraction; and spherical plates provide for rotation or deflection in any direction as well as normal expansion and contraction. All bridge bearings can be supplied in standard Lubrite or Lubrite F 100% teflon fiber mat, which offers a very low 0.03 coefficient of friction. The company offers a wide variety of completed assemblies, as well as design assistance. Also, quick turnaround is provided, which is particularly helpful in rehabilitation work.

For more information, contact: Merriman, 100 Industrial Park Road, Hingham, MA 02043 (617) 749-5100.

Base Isolation Systems

Base isolation provides a medium between the earth and a structure through which the energy of an earthquake must pass. Base-isolating bearings alter the characteristics of the energy and its effects on a structure in several ways, including allowing a structure to move perpendicular to its base and by lowering shock acceleration. Bridgestone's multi-rubber bearings feature: high capacity; high damping; numerous laminations; round shape for even stress distribution; and fixed mounting.

For a free brochure, contact: Bridgestone/Firestone, Inc., Bridgestone Engineered Products Co., 50 Century Blvd., Nashville, TN 37214; (615) 872-1425; fax 615/872-1437. For technical details, call (714) 962-1666.

Expansion Joints

The Jeene Structural Sealing Joint System provides watertight integrity throughout the entire bond life of the expansion joint while being able to handle all types of bridge movement, such as expansion, contraction, rotational skew, and vertical and lateral movements. It also minimizes joint gap size requirements because it tolerates thermal cycles and dynamic loadings up to 100% of its nominal size. Due to its unique fabrication system, the Jeene System will not leak, even at curb lines. It is quick to install and can be driven on immediately afterwards.

For more information, contact: Hydrozo/Jeene, Inc., 8570 Phillips Highway #103, Jacksonville, FL 32256-8208; (904) 739-0401; fax (904) 739-9120.

Structural Bearings

The most distinctive feature of the Wabo-Fyfe Structural Bearing from Watson Bowman Acme is the Bonafy rotational element, which accommodates structural rotation in any direction. In addition, the element also has excellent damping characteristics to absorb live loads and structural vibrations. All translations are simply transmitted by a stainless steel PTFE slip plane. The rotational element is designed to stay flexible in a wide temperature range and also is highly resistant to long-term weathering. Another key feature of the system is the shear restriction mechanism, which can easily accommodate high horizontal forces or provide uplift restraint. The mechanisms independent, central location allows it to rotate while providing structural translation. The bearings low height and compact plan size make it ideal for both renovation and new construction.

The company also produces other bridge products, including Wabo Compression Seals, Elastoseal Liquid Sealant, Wabo Modular Expansion Joint System; and Molded Rubber Expansion Systems. In addition, Watson Bowman Acme has an engineering staff to help with technical details.

For more information, contact: Watson Bowman Acme, 95 Pineview Dr., Amherst, NY 14228-2166; (716) 691-7566; fax 916/691-9239.

Joint Systems

A full line of sealant products is available from E-Poxy Industries, including: adhesives, grouts, penetrating sealants, injection resins, coatings, and flexible epoxies. The company offers a wide range of joint systems range. On the high end is a sophisticated armored joint system involving sinusoidal anchoring and energy absorbing elastomeric concrete where high traffic volumes are subjected to extremes of abrasion and distortion.

For more information, contact: E-Poxy Industries, Inc., 14 West Shore St., Ravena, NY 12143 (518) 756-6193; fax (518) 756-3003.

Bridge Joints

Thorma-Joint, an asphaltic plug type joint, is capable of absorbing all bridge deck movements up to 2". The product, from Linear Dynamics Inc., is composed of an aggregate combined with an elastomer modified bituminous binder. It provides the flexibility a joint needs to accommodate longitudinal, tranversal, and vibrational movement. Installation is performed quickly and efficiently by LDI's own crews. On heavily traveled roads, it can be carried out on one lane at a time, either in the day or at night.

For more information, contact: Linear Dynamics Inc., 400 Lanidex Plaza, Parsipanny, NJ 07054 (201) 884-0300; fax 201/884-9407.

CBridge

CBridge is a 3D bridge analysis and design program from Syracuse University designed for 386/486 computers. It is a full function, easy-to-use program that generates design, analysis, or rating of curved or straight girder highway and railroad bridges. The rigorous 3D analysis determines all the forces and moments in every member of the structure, precluding the need for approximate distribution factors as used in 2D analyses. This results in increased accuracy for simple and complex geometries with no span limitation.

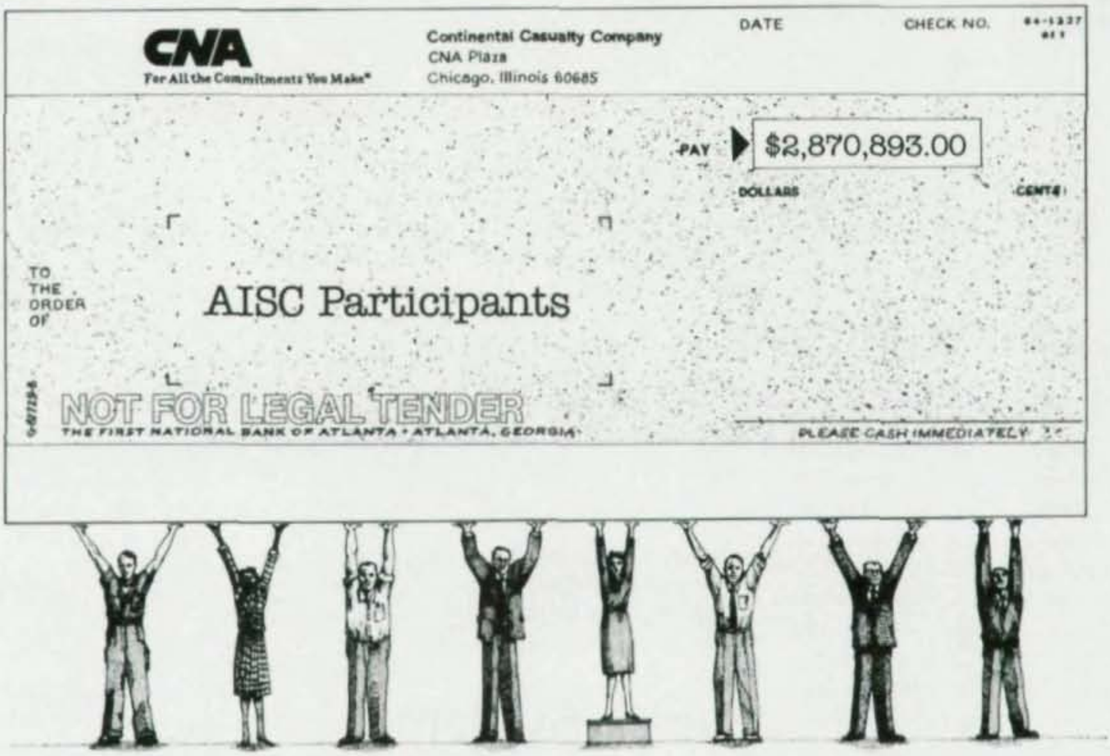
For more information and a free demo disk, contact: Telos Technologies, Inc., 1201 E. Fayette St., Syracuse, NY 13210 (315) 471-0113.

Bridge Design

Version 5.0 of MERLIN DASH (Design Analysis of Straight Highway Bridge Systems) is now available from Opti-Mate. The program is fast running and features an extremely user-friendly menu-driven input system. An AASHTO Code check is performed for LFD and WSD. New features include: design capability for rolled beams with 40" sections; pouring sequence where curing rates are considered; and special boundary conditions, such as partially or fully fixed supports as well as support settlements and frame simulation.

For more information, contact: Ollie Weber, OPTI-MATE, Inc., P.O. Box 9097, Dept. A1, Bethlehem, PA 18018 (215) 867-4077.

When it really pays to participate...
(21.9% dividend.)



Recently, the CNA Insurance Companies distributed $2,870,893.00 in dividends to participants in the American Institute of Steel Construction safety group dividend program.

These dividends are directly related to the close relationship we have had with AISC since 1989.

By working with your association, we have come to understand the risks of your business. Through the combined safety efforts of AISC, CNA and plan participants, losses have been kept low, making this safety group dividend possible.

All firms that participated in AISC's safety group dividend plan for the 1991-92 policy year received a dividend.* If your current insurance carrier isn't paying you a dividend, take advantage of our comprehensive plan designed especially for AISC. Call 1-800-CNA-6241.

*Based on efficient control of losses. Safety group dividends, available in most states, are declared by CNA's Board of Directors and cannot be guaranteed.

CNA
For All the Commitments You Make®

The CNA Insurance Companies underwriting this program will vary according to the coverage. Available in the Continental U.S. only. These companies include: Transportation Insurance Company, Valley Forge Insurance Company, Continental Casualty Company, National Fire Insurance Company of Hartford, Transcontinental Insurance Company or American Casualty Company of Reading, Pennsylvania. CNA Plaza/Chicago, IL 60685.

STEEL MARKETPLACE

Detailing Software

Purchase your own detailing system and modify it to match your needs! That's right, purchase the source code for your own detailing system and let your programmers specialize it for your company's detailing standards. The software already details most standard structural connections and is completely automatic. The details, complete with dimensions, for each framing condition are prepared automatically based on the framing condition. The program also uses a framing plan type input for speed and simplicity.

Bring the power of computerized detailing in-house!

Please send inquiries to:

Detailing Software, P.O. Box 319023, Chicago, IL 60631

SAVE $ — BUY USED — ALL GUARANTEED

PEDDINGHAUS Angle Master (1983) GE Controls 6x6x½, 50 Conv
FABRILINE FS 1010 Shear 10" Angle, 10" Channel, 14 Flats (1976)
VERNET Angle Line, 6x6x½"
KALTENBACH Saw HDM 1300 17½"
DOALL TF 245A Bandsaw, Vert., Tilt, w25" Power Conv., 24" x 24"
BERTSH Roll ⅜ x 8" Initial Pinch w/Air Drop End
WELLS B-25 Bandsaw 36 x 25" CAP
CINCI 16' x 400 Ton Hydraulic Brake
CINCI ½ x 10' Shear

Call Or Fax For Complete List Of Saws, Ironworkers, Shears & Brakes

Westbrook Engineering Co., 23501 Mound Road, Warren, MI 48091
Ph: (313) 759-3100 or (800) 899-9192; Fax: (313) 759-3106

STEEL BEAMS AND PLATE FOR SALE

Excellent used steel beams, 12" @ 65 lb. and 1" steel plate used for bracing on construction project.

Like new condition — .10/lb., F.O.B. Michigan

Many other sizes available.

Call Curly at (313) 669-4103

2D Software

RISA-2D provides a fast, truly interactive environment for the solution of a wide range of structural design problems.
Use RISA-2D for frames, trusses, shear walls, continuous beams and much more.
Statics and dynamics are included, with full steel design.

For a free demo, contact:
RISA Technologies, 26212 Dimension Dr., Suite 200, Lake Forest, CA 92630 (800) 332-7472

Structural Steel & Miscellaneous Metal

Detailing software with AutoCAD for structural steel and miscellaneous metal detailers. Developed by a structural steel detailing company with over 30 years in the steel detailing business. Extensive AutoCAD training is not required. English or metric. ANYTHING that can be fabricated can be detailed with this system. Beams & Columns, Plans & Elevations, Bills of Material, Stairs, Bracing & Gusset Plates.

COMPUTER DETAILING CORPORATION
1310 Industrial Blvd., Southampton, PA 18966
phone: 215-355-6003 fax: 215-355-6210

CLASSIFIED ADS

Reach 35,000 engineers, fabricators, architects, contractors, bridge officials and building owners inexpensively with a classified advertisement in Modern Steel Construction. It's fast and easy—we'll even do the typesetting for you at no charge.

For rate and placement information, call:
Greg Poland at (708) 679-1100.
Or fax him a note at (708) 679-5926.

STAAD-III/ISDS Design Training Seminar

Dallas, TX September 1993

Call CADVisions (214) 720-2023
(214) 720-0617 FAX

IMAGES—3D

2D-3D Structural/Finite Element Analysis

Easy to learn and use	Automesh Generation
Shear & Moment Diagrams	Static, Modal, Dynamic
AISC Code Check	Enforced Displacements
Large Problems To 3,000 Joints	P-δ Analysis

Complete Static Package — Only $795

Celestial Software, 2150 Shattuck Ave., Suite 1200, Berkeley, CA 94704
Tel: 510-843-0977 / Fax: 510-848-9849

Fifty-node full function evaluation package for only $49.95

STRUCTURAL INDUCTION BENDING

NAPTECH, Inc. is the leader in structural induction bending. Structural shapes such as heavy angles, channels, wide flanges, as well as square, rectangular and round hollow sections are easily bent. Engineers, designers and architects are specifying the versatility of induction bending over other methods. NAPTECH's highly skilled, professional team can help you in virtually all of your structural bending needs.

NAPTECH INC—North American Piping Technologies
851 South Freeport Industrial Parkway, Clearfield, UT 84015
tel: (800) 658-8550; fax: (801) 773-6185

GT STRUDL

New PC Version with Interactive Graphics and Links to CAD systems.

Static, Nonlinear & Dynamic Analyses and Integrated Steel Design

Curved Steel Girder Bridge Module

For information, contact: Alex Krimotat at SC Solutions
(415) 903-5050

Steel Inspection News: An Informational Digest

This bi-monthly newsletter keeps you informed on quality and inspection issues for steel-framed buildings. Specifications, codes, quality criteria, inspection and industry practices are discussed in a direct and practical manner for the fabricator, erector, inspector, engineer, code official, owner and contractor.

Subscription rates: $36 per year; $60 for two years

For more information or a sample issue:

Steel Structures Technology Center, Inc., 40612 Village Oaks, Novi, MI 48375 phone: (313) 344-2910; fax: (313) 344-2911

GREAT NEWS FOR ESTIMATORS...

Now you can grind out a day's work in about 3 hours. No more tedious longhand calculations! The GRINDER™ software program accurately sorts and organizes your projects materials automatically. Optimizes ferrous and non-ferrous materials. Keeps track of hardware, bolts and assembled units. Includes cutting lists, pricing list, efficiency report and more.

GRINDER™ Software Company, 1774 Rose Vallet Road, P.O. Box 431, Kelso, Washington, 98626
800-677-4474; fax 206-577-4474

CBRIDGE — 3-D Bridge Analysis/Design Software
Straight 0r Curved Bridges

CBRIDGE, the Syracuse University Bridge Design program is a full featured, 3-D bridge analysis and design system for straight or curved girder bridges. The rigorous 3-D analysis handles both simple and complex highway and rail bridges. Offering standard and custom loadings, vehicles up to 30 axles are automatically positioned on an influence surface. Multiple vehicle types may exist simultaneously. Automatic or user defined dead loads may be used. Mouse driven graphical interface allows rapid building and editing of design model. AASHTO code check performed during design sequence. In addition, Telos Technologies is an authorized dealer for STAAD III/ISDS, the world's most popular and widely used general purpose structural engineering software. FREE **DEMO DISK** and additional information is available on both products.

Telos Technologies, 1201 E. Fayette St., Syracuse, NY 13210
(315) 471-0113

Engineering Journal

The only technical magazine in the United States devoted exclusively to the design of steel structures, the AISC Engineering Journal provides structural engineers, architects, fabricators and educators with the latest information on steel design, research, and construction.

For a one-year, U.S. subscription, send $15 to:
American Institute of Steel Construction, Inc. (312) 670-2400
P.O. Box 806276
Chicago, IL 60680-4124

CALIFORNIA STRUCTURAL ENGINEER
EXAM SOLUTION MANUAL 1987-1992

Complete problem statements and solutions for the last 6 years of California S.E. exam (except the alternate bridge problems). All solutions are based on the 1991 Uniform Building Code, 1989 AISC (ASD) manual and the 1989 ACI Code.

This 600-page manual is an excellent reference for engineers preparing for S.E. or P.E. exams and a major source of practical problems for educators in the field of structural engineering. Also, every structural engineering firm would benefit from having this reference available to their employees. Problems deal with types of building materials and strongly emphasize seismic design and analysis.

For more information, or to obtain an order form, contact: Ben Yousefi, S.E., at (619) 236-7368 or Mehrdad Maher, S.E., at (619) 236-7324.

110' MANLIFTS AVAILABLE FOR RENT OR SALE

1992 Simon MP 110', 4 x 4. Price on Request.
Best Buy: 1979 JLG 110 FDR: Diesel; Outriggers.
Dealer rebuilt. Excellent for bridge jobs. $65,000.
Ross Equipment 1-800-648-4972; Fax: 216/524-6751
Over 300 Manlifts Available
Buy, Sell, Rent, Trade

INTERSTATE IRON WORKS CORPORATION
Servicing: New York, New Jersey, Pennsylvania
and the New England States
Steel fabrication, delivery & erection...one source for all
Our state of the art production facility of 140,000 sq. ft. built in 1986 is located on 40+ acres in Whitehouse, New Jersey.
For informative brochure please fax your request to:
Interstate Iron Works Corp., Whitehouse, NJ 08888
Tel: 908/534-6644; Fax: 908/534-4949
Celebrating our 75th year

FREE DEMO DISK
$250 Graphics Toolbox For Steel Detailers

Works from a bar type menu. All dimensions are displayed in true feet, inches, sixteenth. Developed by a steel detailer.

Oblique and right triangles, circles, rectangular bracing, stairs & connections, non-rectangular bracing, welded bracing, camber, feet-inch calculator, bracing end connections.

All onscreen graphics. No manual reference necessary. EGA monitor or better. Dos 3.0 or greater

Glen-Nevel Systems, 3599 Nina St., Oceanside, CA 92056
1-800-722-2945 **(fax) 619-722-7365**

Ram Analysis Steel Design Software

Now, get SBEAM by Ram Analysis for only $100. Full featured composite/non-composite single beam design and analysis software (LRFD or ASD). Easy-to-use with Windows graphical interface. Full 90 day money back guarantee. Also available, the RAMSTEEL Integrated Structural Software System. Fully integrated analysis, design and drafting of steel beams, joists, columns, and baseplates.

Ram Analysis
5315 Avenida Encinas, Suite M, Carlsbad, CA 92008
Phone: 800/726-7789
Fax orders: 619/431-5214
—30 Day Trial Available—

ADVERTISERS

Coming In October:
Institutional Buildings (education & judicial)
Machinery, Tools & Material Handling

Coming in November:
AISC Prize Bridge Awards
Metal Decks

Coming in December:
Special Report: Innovative Structural Systems
Coatings & Paint

The National Symposium on Steel Bridge Construction

November 11-12, 1993

Atlanta Airport Hilton, Atlanta, Georgia

SYMPOSIUM TOPICS

- State Plans for Implementing Metric Conversion to Meet FHWA Mandates
- Painting Strategies for Maximum Economy and Useful Life
- Weathering Steel - Success Stories Worth Hearing
- Cost Effective Design and Details
- Seismic Design
- Bridge Research Leading the Way to the Future
- **International Panel on Innovative Designs**

PRE-SYMPOSIUM WORKSHOPS NOVEMBER 10, 1993

"Cost-Effective Steel Bridges"
"Bridge Painting, Problem or Opportunity"

Continuing Education Credits (CEUs) will be awarded.

Co-Sponsored by:

Amer. Assoc. of State Highway and Transp. Officials
The American Institute of Steel Construction
The American Iron and Steel institute
The Federal Highway Administration

For more information contact:

American Institute of Steel Construction
One East Wacker Drive, Suite 3100
Chicago, IL 60601-2001
Phone (312) 670-2400
Fax (312) 670-5403

ETABS®
Building Analysis & Design

STATE OF THE ART

SAP90™
General Analysis & Design

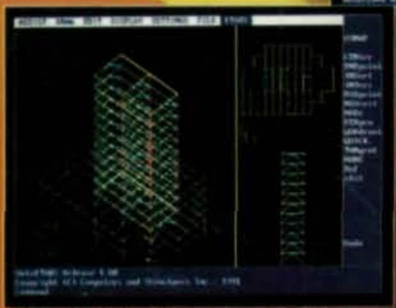
STRUCTURAL STEEL DESIGN SOFTWARE

STRUCTURAL ENGINEERING • EARTHQUAKE ENGINEERING
AISC ASD '89 • AISC LRFD '86 • UBC '91

INTEGRATED ANALYSIS & DESIGN SOFTWARE FOR STEEL STRUCTURES

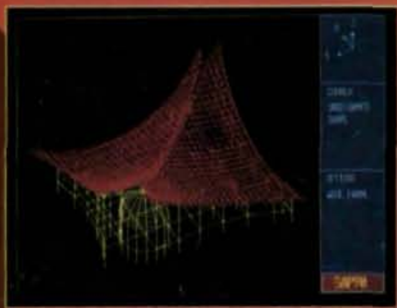
By: Ashraf Habibullah
& Edward L. Wilson

Composite Floor Design

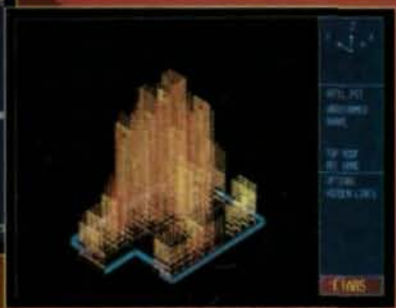


Integrated with CAD

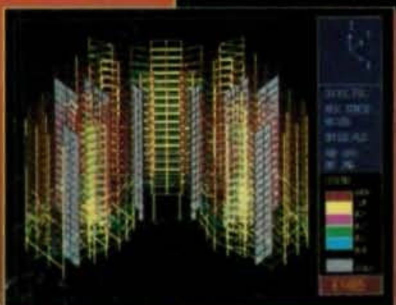
Eccentrically Braced Frames



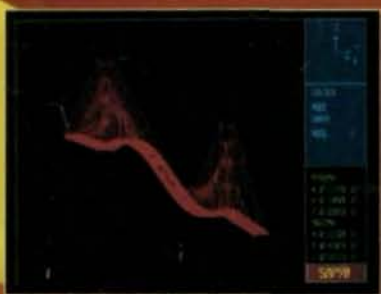
Complex Space Trusses



Highrise Moment Frames



Automated Stress Checks



Structural Dynamics

CSI

For more information:

Computers & Structures, Inc.
1995 University Avenue
Berkeley, California 94704

TEL: (510)845-2177
FAX: (510)845-4096

ETABS is a registered trademark of CSI.
SAP90 is a trademark of CSI.
©1992 Computers & Structures, Inc.