MODERN STEEL CONSTRUCTION

January 1992

$3.00

Health Care Construction

UNITED STEEL DECK, INC.

DECK DESIGN DATA SHEET
No. 16

CUSTOM DECKS

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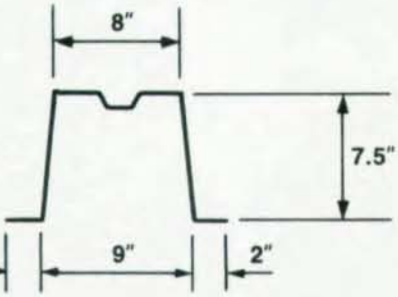
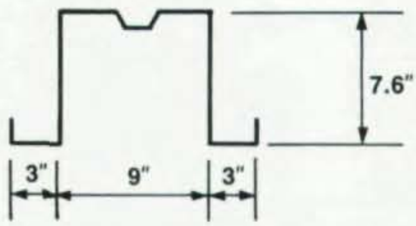
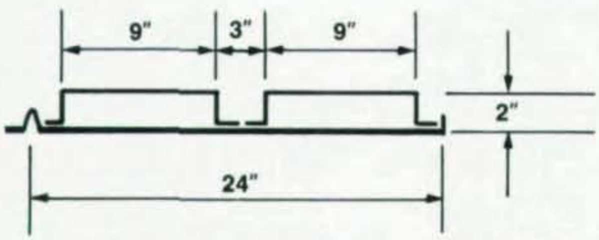


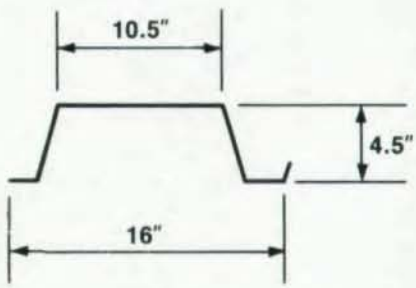
16 GAGE FORM DECK — USED TO BUILD A PIER WITH AN 18" SLAB.



12 GAGE 28′ LONG DECK WAS USED TO ROOF AN EXISTING TANK. 15" SLAB; 6" WIDE RIBS USED AS REINFORCED CONCRETE JOISTS AT 15" CENTERS.



12 GAGE TOP AND 16 GAGE BOTTOM CELLULAR DECK USED TO SPAN BETWEEN BOTTOM BEAM FLANGES IN A POWERPLANT. VERY THICK SLAB — FLAT UNDERSIDE LEFT EXPOSED.



16 GAGE LONG SPAN CANOPY DECK MADE FROM PREPAINTED STEEL.

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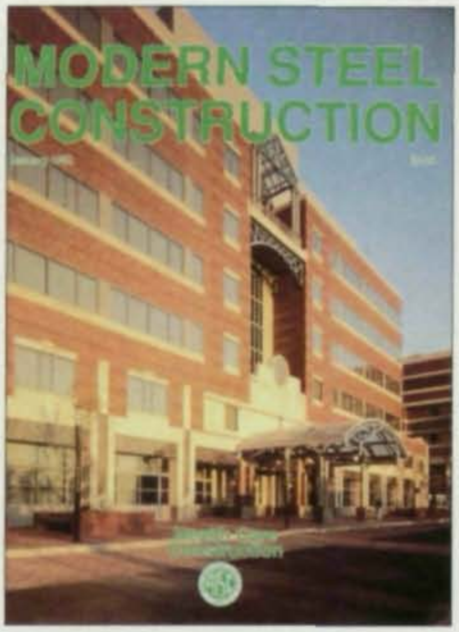
MODERN STEEL CONSTRUCTION

Volume 32, Number 1 January 1992



The brick- and limstone-clad research center at Children's Hospital was essentially designed as a speculative lab and office space, and then retrofitted to meet the hospital's continually changing needs. For more information on this unique design, see the story beginning on page 16.

FEATURES

NEWS AND DEPARTMENTS

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Bottom Line Benefits

Last year I was eavesdropping on a conversation one of my colleagues at AISC was having with a steel fabricator considering membership in the Institute. Because it was a phone conversation, I was only privy to half of it, but I quickly gathered that the fabricator wanted to know the benefits for joining.

My colleague began by stressing the importance of supporting the industry and its promotional efforts, including the Institute's work with engineering schools and code-issuing bodies. And, of course, he mentioned the discounts members received on Institute publications and seminars. While I never did find out whether that particular fabricator joined, I do know that the conversation would be a lot different today.

Money is tighter today than anytime since the oil wars of the mid-1970s. People want to talk about bottom lines and direct return on investments. So today, AISC tells its prospective fabricator members about new EPA requirements and how membership will save them money.

The conversation starts with the Clean Water Act and its regulations for stormwater runoff. Each facility subject to the regulations—and this means all steel fabricators—must obtain a permit to discharge this runoff. And obtaining a permit is not cheap. AISC estimates that preparation of each application—which includes water sampling and analysis—will cost $7,000 to $10,000. Fortunately, the EPA has created a group application procedure, which allows members of the group to share the expense, cutting the cost to each participant by as much as 85%.

Last year, AISC provided to the EPA information that would allow AISC members to apply as a group. And in November, the EPA gave its approval.

And that's only the beginning. The EPA also has new Clean Air and Used Oil regulations, and AISC is working to address these.

If you're a structural steel fabricator and would like more information on AISC's activities with either the Clean Water or Clean Air Acts, call the Institute's president, Neil Zundel, at (312) 670-5401. If you'd like a membership application, call Christy Depkon at (312) 670-5432. **SM**

Updated Gaylords And Stallmeyer Text Covers ASD & LRFD

By Robert F. Lorenz

Design of Steel Structures, Third Edition, is the latest entry in the arena of textbooks updated to deal with the move towards the limit-states era of steel design philosophy. But unlike some of its competitors, this volume addresses both Allowable Stress Design and Load and Resistance Factor Design.

For this updated work, the authors of the previous editions, Edwin H. Gaylord and the late Charles N. Gaylord, have been joined by James E. Stallmeyer of the University of Illinois (Urbana-Champaign).

The book retains its well-organized style to such an extent that to some readers it may seem more a heavy revision rather than a complete overhaul. The advantage of this approach, however, is the presentation of clear, evenhanded information on both methods of steel design, without letting "code details" get in the way of basic steel knowledge. The authors portray both ASD and LRFD in a balanced, neutral voice, which allows the reader to come to his own conclusions.

This text should be attractive to those educators reluctant to totally bury allowable stress procedures, but who still want the new load-strength method fully explained.

It remains an excellent source of derivation of structural theory. For example, students are given a fundamental understanding of buckling theory and how it relates to specific code prescriptions. Another good example is the development in the chapter on beams from the basics of simple bending behavior to the more complex post-buckling theories of plate girders. All of this, and more, is packaged in a crisp 792-page package.

The practice-oriented design problems remain, as in earlier editions, with good attention to both truss and steel girder bridges. Treatment of buildings has been trimmed back a bit, however. I miss in this edition the simplified design process for the Lever Brothers multi-story building, since it was personally helpful in my own career in digesting the "then" real world examples.

Chapter headings in this latest edition are: Loads on Structures; Structures, Metals, and Fasteners; Tension Members; Compression Members; Beams; Beam-Columns; Plate Girders; Connections; Plastic Analysis and Design; Stability and Strength of Flat Plates; Steel Bridges; Buildings. Also included is an appendix with SI Conversion Factors.

Copies of *Design of Steel Structures* (1992, order code 0-07-023054-4) can be obtained by sending \$54.95 + shipping and handling to McGraw-Hill, Order Services, S-1, Princeton Road, Hightstown, NJ 08520 (800) 338-3987. ■

Robert F. Lorenz is director of education and training for the American Institute of Steel Construction, Inc.

Wind Load Provisions

An analytical method of determining wind loads is detailed in a new publication by the American Society of Civil Engineers. *Guide to the Use of the Wind Load Provisions of ASCE 7-88* is designed as an accompanying document to the ANSI/ASCE Standard "ASCE Minimum Design Loads for Buildings and Other Structures."

The Guide provides background information on various wind parameters. Also addressed is the critical question of when a wind-tunnel investigation is deemed necessary to more accurately determine wind loading and/or structural response. Included are 17 figures and six tables.

Copies of the Guide (ISBN #: 0-87262-852-3) can be purchased for \$20 (\$15 to ASCE members) from the ASCE Publications Department (212) 705-7288. ■

Vibration Lecture Continues

Although Thomas Murray, 1991 Higgins Lecturer, has completed his six-city award lecture on Building Floor Vibration, the demand for his presentation continues. At press time, groups in several cities are planning to sponsor his talk (see calendar section on opposite page).

While AISC is encouraging additional lectures, it is up to the sponsoring group to contact Murray directly to set up a schedule. Murray can be reached at (703) 231-6074.

A summary of Murray's Higgins Lecture appeared in the June 1991 issue of *Modern Steel Construction*. ■

Correction

Two phone numbers were incorrectly printed in the November listing of "Software Programs That Support LRFD" on page 30. The correct phone number for ECOM Associates is (414) 365-2100. The correct number for Computers & Structures is (415) 845-2177. ■

January 12. **Workshop on High Strength Bolts**, Washington, DC. Contact: Frederick D. Hejl, Engineer of Materials and Construction, Transportation Research Board, 2101 Constitution Ave., N.W., Washington, DC 20418 (202) 334-2952.

January 12-16. **Transportation Research Board (TRB) 71st Annual Meeting**, Washington, DC. 237 sessions featuring more than 1,000 research papers and presentations. Contact: Transportation Research Board, 2101 Constitution Ave., N.W., Washington, DC 20418 (202) 334-2934.

January 22. **Northeast Steel Bridge Forum**, Cromwell, CT. Topics include: heat straightening of damaged girders; quality control for welding high-strength steel; and alternative fasteners. Contact: Camille Rubeiz, Steel Bridge Forum, c/o AISI, 1101 17th St., N.W., Suite 1300, Washington, DC 20036 (202) 452-7190.

January 23. **Southeast Steel Bridge Forum**, Ft. Lauderdale, FL. Presentation on Aesthetics & Curved Bridge Girders. Contact: Camille Rubeiz, Steel Bridge Forum, c/o AISI, 1101 17th St., N.W., Suite 1300, Washington, DC 20036 (202) 452-7190.

January 23. **Value Engineering for Low-Rise Buildings** (breakfast meeting), Milwaukee. Sponsored by AISC and the Society of Iron & Steel Fabricators of Wisconsin. Contact: Dave Matthews, Ace Iron & Steel, 5118 North 124th St., Milwaukee, WI 53225 (414) 466-9200.

January 27-28. **Welding Structural Design** two-day seminar, New Orleans. Designed to provide engineers and welding inspectors a greater understanding of weld mechanics and welded engineering structures. Contact: AWS, 550 N.W. LeJeune Road, P.O. Box 351040, Miami, FL 33135 (800) 443-9353.

February 6-7. **Welding Structural Design** two-day seminar, Newark, NJ (See January 27-28 listing).

February 9-12. **National Association of County Engineers**, Frankenmuth, MI. Annual meeting, management and technical conference, and trade show. Contact: NACE, 440 First St., N.W., Washington, DC 20001 (202) 393-5041.

March 3. **Bolting Update** (co-sponsored by AISC and SASF) breakfast meeting in Atlanta. 45 minute description of changes since the issuance of the 1985 High-Strength Bolt Spec. Also includes a review of installation methods for high-strength A325 and A490 bolts.

March 11. **Texas Structural Steel Institute Quarterly Meeting**, Houston.

March 12. **Northeast Steel Bridge Forum**, Boston. Contact: Camille Rubeiz, Steel Bridge Forum, c/o AISI, 1101 17th St., N.W., Suite 1300, Washington, DC 20036 (202) 452-7190.

March 18. **Earthquake Design** (breakfast meeting), St. Louis. Sponsored by AISC Regional Advisory Missouri/Southern Illinois Committee. Contact: Phil Stupp, Stupp Bros. Bridge & Iron Co., 3800 Webber Road, St. Louis, MO 63125 (314) 638-5000.

March 24. **Tubular Sections in Building Construction** (co-sponsored by AISC and VCSSFA) breakfast meeting in Greenville, SC. Will include design criteria, Type 2 Connections, tube-to-tube connections, design guides, practical recommendations and application examples.

March 24-26. **American Welding Society Show and Exposition**, Chicago. Contact: AWS, 550 N.W. LeJeune Road, P.O. Box 351040, Miami, FL 33135 (800) 443-9353.

March 25. **Tubular Sections in Building Construction** (co-sponsored by AISC and VCSSFA) breakfast meeting in Columbia, SC (see March 24 listing).

March 26. **Tubular Sections in Building Construction** (co-sponsored by AISC and VCSSFA) breakfast meeting in Charlotte, NC (see March 24 listing).

March 27. **Tubular Sections in Building Construction** (co-sponsored by AISC and VCSSFA) breakfast meeting in Greensboro, NC (see March 24 listing).

March 31. **Bolting Update** (co-sponsored by AISC and SASF) breakfast meeting in Jacksonville, FL (see March 3 listing).

NSCC Scheduled For June 3-5

More than 45 seminars and meetings are scheduled for this year's National Steel Construction Conference in Las Vegas from June 3-5. Also, more than 100 exhibitors will showcase products for the design, fabrication and construction community.

Sessions focus on the specific needs of structural steel fabricators, engineers, architects, contractors, owners, public officials, erectors, detailers, researchers and educators. Topics include: codes and specifications; computerized design; research; project and shop management; inspection and safety; and fabrication and erection procedures. Workshop sessions get down to basics: the nuts-and-bolts details of designing, fabricating and erecting steel structures.

Contact: David G. Wiley, AISC, One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001 (312) 670-5422.

Prescription For Health Care Design

Since the mid-1970s, designers have increasingly turned to steel to help bring hospital projects in on budget

By James Stephenson, P.E., and Kurt D. Swensson, Ph.D., P.E.

Through more than 20 years and 2,000 completed health care projects, Stanley D. Lindsey and Associates (SDLAL) has found that steel construction consistently provides hospital owners and health care companies quality projects on schedule and under budget. Since 1967, SDLAL has been involved in health care projects ranging from small mobile MI additions to large new hospitals located in almost every state and overseas. Steel structures have provided viable structural systems for almost every one of these projects.

A Brief History

Prior to the mid-1970s, hospitals were primarily concrete framed. Designers felt concrete provided superior protection against fire damage, sound transmission and vibration problems. In addition, floor plans for hospitals at that time were fairly regular with short spans that allowed for economical concrete structures.

In the late 1960s and early 1970s, the widespread use of metal deck in a composite system with concrete slabs and steel beams began a revision of thinking in the health care industry. Another important technical advance at that time was the increased use of spray-on fireproofing. It was found that these two systems together could provide the fire protection and strength of concrete systems, often at less cost. Further, the development of "for profit" health care companies fueled the drive for innovation in construction systems.

With the boom in health care facility construction, "for profit" health care companies began to see structural steel as the system of choice. Advantages included: speed of construction; universal application; uniform quality control; and limited site labor needs. "For profit" health care companies developed several prototypical hospital plans that facilitated early steel orders and fabrication, eliminating the long lead times that can slow steel construction.

Location also played a role in the move towards steel. Since the majority of construction was in small communities, concrete in large quantities was not readily available because many communities lacked proper facilities. Steel allowed universal application of standard plans. Further, quality control of structural concrete was not a problem with structural steel.

Since steel construction requires less site labor than concrete, general contractors could send construction teams to a particular site and did not have to depend on a local pool of skilled labor.

Health care Today

Today the health care industry is facing a new set of challenges and again, structural steel is the right material to meet the industry's new demands.

- Economy. With the advent of LRFD, partially restrained connections, and eccentric braced frames, as well as more efficient floor deck profiles and fireproofing methods, structural steel is providing the economy owners demand. Structural steel's light weight compared to concrete also provides significant savings in foundation costs as owners are forced to use poorer sites for expansion and new development.

- Flexibility/Adaptability. By their nature, steel structures provide more flexibility during design and after construction. The modern high efficiency floor planning required for a profitable health care facility results in "shotgun" girds without regular bays. These irregular grids wreak havoc on forming prices but have little effect on steel's economy. Further, floor plans in steel structures are not restrained by shearwalls or large columns required by concrete systems.

After construction, steel structures are more easily modified to accommodate the floor penetrations and concentrated loads associated with new equipment or revised area uses. Steel construction also can provide for more vertical expansion than concrete construction on an existing structure. Nonstructural components such as HVAC duct, plumbing lines, suspended ceilings, etc., are more easily attached and relocated in steel structures than in concrete structures where embeds and interference with drilled anchors can be a problem.

- Speed of Construction. Today's health care construction provides the perfect format for taking advantage of accelerated construction schedules using structural steel.

In renovation/addition work, steel can be ordered and fabricated while necessary site preparation is completed so no time is lost to the lead time required for structural steel. "Down time" also is a large concern for hospital administrators. Since most steel is prefabricated offsite, actual "down time" for hospital additions/renovations with steel is less than with concrete.

For new hospitals, planning and review are necessarily long term procedures that allow for early

Seismic resistance is becoming increasingly important for hospital projects throughout the United States. Shown at top is a partially erected frame for a new hospital in California. The connection shown above is for a project in a high seismic area.

Case Study: Jackson Regional Hospital

This four-story, 170,000-sq.-ft., 143-bed hospital in Jackson, TN, was designed for two future expansion floors. This facility was the first in the area designed to resist seismic activity due to the recent concern over the activity of the New Madrid Fault.

The structural system included structural lightweight concrete floor slabs on composite metal deck and beams and moment resistant steel frames. The roof system consisted of lightweight insulating concrete on permanent metal form deck supported by simple span beams and continuous girders. The construction cost for this project, excluding owner furnished equipment, was $86 per sq. ft.

steel order and fabrication. After steel erection, the absence of shoring allows for quick follow-up of mechanical and other trades. For a typical steel hospital with 100,000 to 200,000 sq. ft. of space on four to six floors, total construction time from ground breaking to move-in is 10 to 14 months with structural steel.

- Seismic Resistance. In the past, concern with seismic resistance has been reserved for West Coast projects. However, the release of the new Standard Building and BOCA codes has brought seismic design issues to the rest of the country. Since hospitals are essential facilities, design for proper structural behavior during and after a seismic event is a major design concern. Structural steel's superior performance during seismic events has been well documented (see "The Performance of Steel Buildings in Past Earthquakes," written by EQE Engineering of San Francisco and available from AISI, 1133 15th St., N.W., Washington, DC 20005-2701).

Based on SDLAL's experience, the mass of concrete structures will result in high seismic design forces even in areas of low to moderate seismic risk. With concrete framing, the seismic loads will sometimes control over wind loads even in areas of low seismic risk. Structural steel's superior ductility and light weight make it the system of choice in any health care project where seismicity is a consideration.

Hospital Prototype

SDLAL has worked with architects, owners and contractors since 1967 to develop the most economical structural system for typical health care projects. This system incorporates a structural steel frame and a 5¼" structural lightweight concrete slab on a 2" composite floor deck supported by composite steel beams. The roof system is typically a lightweight insulating concrete slab sloped to drain supported by metal deck and steel beams. The floor and roof construction meet U.L. assemblies D916 and D921 respectively, eliminating the need to fireproof the deck.

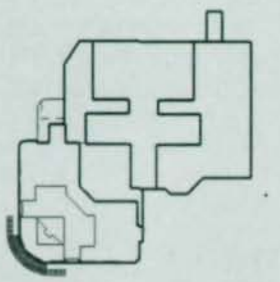
Lightweight structural concrete is chosen for the floors because it satisfies fire rating requirements with thinner slabs than would regular weight concrete. Compared to a normal weight concrete system, this results in a 25 psf reduction in dead loads, which reduces deck thickness, column loads and foundation sizes.

The lateral load resisting system typically is welded moment resisting steel frames. Shallow spread footings, in combination with site improvement techniques where required, are used whenever possible.

Case Study: Centennial Hospital Complex

This $105 million project in Nashville includes a 14-story hospital tower above a two-story parking garage and a five-story medical office building connected by a two-story 90' enclosed bridge. The associated low-rise ancillary area covers more than five acres.

SDLAL worked with the contractor and architect to analyze numerous concrete and structural steel systems for this project. Struc-

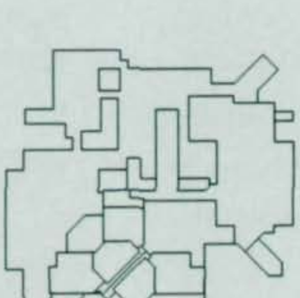


CENTENNIAL MEDICAL CENTER

tural steel was selected for its economy, flexibility and construction speed. Steel was erected and floor slabs placed on the 200,000-sq.-ft. office building in less than six weeks. At this time, the office building is nearing completion and the hospital is in the design phase.

Case Study: Mayfield Community Hospital

This 201,000-sq.-ft, five-story hospital in Mayfield, KY, features an integral medical office building



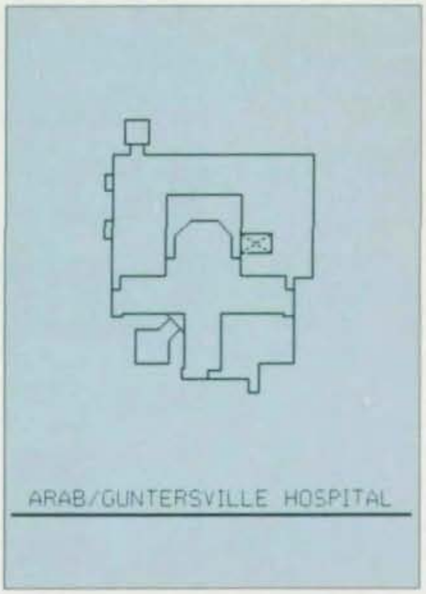
MAYFIELD HOSPITAL

and was designed to accommodate the addition of one additional floor. This project is typical of the new emphasis on large ancillary outpatient services in lieu of large number of hospital beds. These outpatient services require large open areas and irregular bays, which make them well suited to structural steel framing.

The structural steel frame was designed to resist Zone 3 magnitude seismic forces. Substantial savings were realized by the use of steel framing, which allowed shallow foundations in place of deep foundations required by the alternate concrete design. Total construction cost for this state-of-the-art facility was approximately \$100/sq. ft.

Caste Study: Arab/Guntersville Hospital

This four-story, 90-bed replacement hospital in Arab, AL, was originally designed as a concrete structure, which meant a deep foundation system was required. SDLAL recommended a structural



steel system on shallow foundations, which allowed the structure to be brought in within budget and allowed the project to proceed. Construction cost was approximately \$78/sq. ft.

Case Study: Suburban Medical Office Building

This six-story, 113,000-sq.-ft. medical office building in Louisville is designed to be constructed adjacent to an existing hospital. The project is scheduled to begin construction in the spring of 1992 with a construction budget of only \$65/sq. ft. To accommodate a possible future expansion of hospital activities, the steel structure is designed for live loads required for hospital occupancy, which are considerably higher than the code-required office loads. This design for future flexibility is becoming more common and can be accomplished using composite floor construction at only a minor cost premium.

Jim Stephenson, P.E., and Kurt Swensson, Ph.D., P.E., are project engineers with Stanley D. Lindsey and Associates, Ltd., a structural engineering firm with offices in Atlanta, Nashville and Louisville.

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Flexibility Crucial For Health-Care Design

By creating a new research facility that readily accommodates change, the designers met all of the owner's criteria

As important as flexibility is in the design of office buildings, it's even more important in the health care industry. And few structures demonstrate this need more than the recently completed research center at Children's Hospital in Philadelphia.

When design first began, the hospital had not yet determined where specific functions would be located. In addition, only two-thirds of the building was to be constructed, with the final third designed as a future addition.

"The building was well out of the ground before the location of floor openings was determined," explained James Borchard, a studio director with Ballinger, the Philadelphia-based architects and engineers on the project. "Steel was the obvious choice for the structure because it could easily accommodate the project's schedule and program needs."

Design Meets Evolving Needs

Essentially, the building was designed as speculative lab and office space, and then retrofitted to meet the hospital's specific needs. The use of a shell/fitout strategy reduced design/construction time on the project from an estimated 36 months to 30 months. In addition, it allowed the facility to more accurately meet the hospital's needs at the time of completion, rather than the owner's requirements three years earlier.

"The challenge of the project was dealing with the different functions: parking; clinic; lab; and ambulatory care," Borchard said. To make the project work, a common bay size was required, in this case a 20' wide module with varying lengths was chosen. Lab modules are 20' x 45', with each module having one wall free of utilities, which allows two modules to be combined to create a larger space.

The 120,000-sq.-ft. building has a moment resisting frame in both directions, according to William Harrison, P.E., a senior project engineer/assistant department manager with Ballinger. A braced frame was not considered because the lack of a structural core would have placed the bracing on the perimeter of the building, which would have interfered with the structure's aesthetics.

The building was designed for 100 lb. live loads. "Modern technology in hospitals results in very high loading, and additional loads are often placed in unplanned locations," said Harrison. "Who know's where the owner will eventually add an X-ray room?" In addition, some areas of the building were designated for high density files and are designed for 300 lb. live loads.

Resting on the roof of the structure is an 18,000-sq.-ft. mechanical penthouse which houses not only equipment to service the research facility, but also a back-up system to the main hospital complex's steam heat plant.

Columns were designed as W14 wide flange shapes because the structure was originally designed as only two bays deep with a third bay planned as a later addition. "The two bays had to resist the wind loads by themselves, and the W14s were needed," Harrison said. However, after the mill orders had already been placed, the owner's needs had changed and the third bay was erected along with the first two bays.

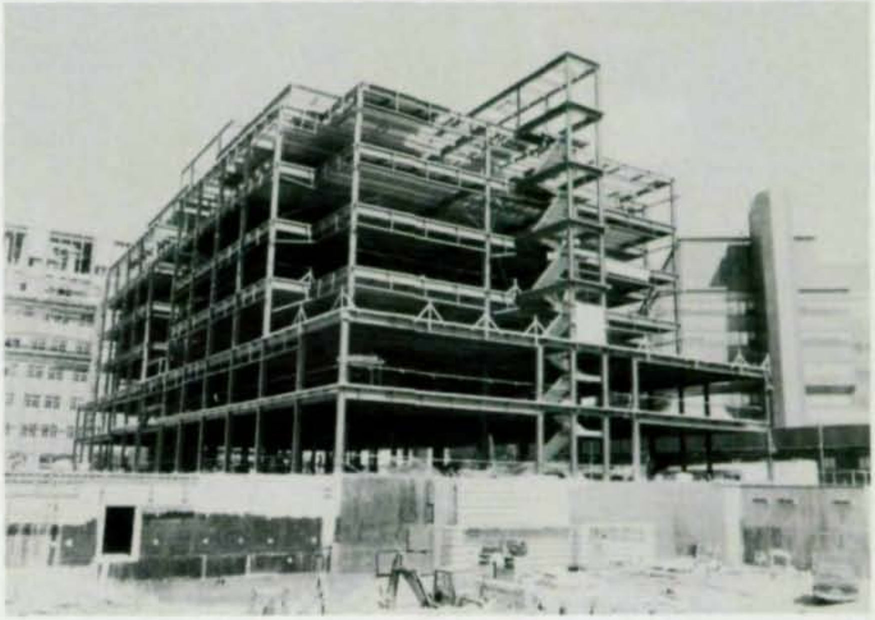
The entire building is 117'-wide x 267'-long with bay sizes of 20' x 44', 20' x 27', and 20' x 46'. The girders run in the 20' direction, with exterior girders consisting of W24x55 sections and interior girders consisting of W24x62 sections. Beams on the column lines of the 44' bay are W24x84 sections, while beams on the 27' bay are W16x31. The filler beams on the 27' bay are W16x31 sections and on the 44' bay are W24x62 sections. Steel fabricator on the project was AISC-member Samuel Grossi & Sons, Inc.

All of the steel on the project is A572 Grade 50. "With the bigger bay spacings being designed today, we've found high-strength steel to be more economical than A36," explained Harrison.

MRI Unit Added

Another major change that occurred after construction had begun was the hospital's decision to put a Magnetic Resonance Imaging (MRI) facility on the second floor. Because of the unit's shielding requirements, it creates concentrated live loads of 40,000 lbs. Fortunately, the columns were adequate to support the additional load and the beams and girders could be modified. "We added some additional beams and strengthened other beams and girders by adding plates to the wide flange sections," Harrison explained.

Fortunately, the floor slab had



The shell of the Children's Hospital of Philadelphia was designed before the hospital made the final determination of where specific services would be located within the structure. This flexibility was possible in large part due to the building's structural steel frame, which readily accommodated changes after construction had already begun.

Every hospital needs a covered entry, and the architect chose to use tube steel and glass to create dramatic focal point for the entire hospital complex. The exposed-steel theme is then repeated in the exterior bay above the entrance.

not yet been poured in that area. To meet the MRI manufacturer's requirements, stainless steel reinforcing rods were required.

Pedestrian Bridges

The new building is connected to the main hospital complex by a 250'-long, two-level pedestrian bridge. In addition to an elevation change, the bridge doglegs to the right to avoid existing structures. Structurally, it features welded truss construction of rolled shapes. "We couldn't use plate girders because we had clearance problems in an area where we passed over an access driveway," Harrison said. In addition, trusses more easily accommodated the bridge's two-story height. The three-span bridge rests on steel bents supported with X-braces.

A second bridge was added to the project after construction had begun to connect the building to an adjacent research building. That one-story bridge only spans 64'-6" and is supported off of the two buildings. "Because of the building's steel frame, it was relatively simple to add reinforcement as needed," Harrison explained.

The building's shell was constructed for $75/sq. ft. Fitout costs ranged from approximately $95/sq. ft. for research space to $55/sq. ft. for ambulatory care space to $35/sq. ft. for administrative space.

Architectural requirements

To meet requirements laid out in the hospital's master plan, the building's exterior is clad with brick and limestone. Re-entrant corners were designed to reduce the building's mass. And because of the structure's prominent location on the hospital campus, additional decorative features were added to the front of the building.

The drop-off canopy was constructed of steel tubes and covered in glass. That same feature was picked up with a sixth-floor steel tube pavilion. "The pavilion acts as a kind of symbol for the entire development," Borchard said. "It conveys a sense of place, of shelter. And we wanted to render it in a high-tech material to project a forward-thinking attitude."

AISC SOFTWARE

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The AISC Computer Data Base contains properties and dimensions of structural steel shapes corresponding to data published in Part I of the AISC 1st Edition LRFD Manual as well as the AISC 9th Edition ASD Manual.

The program includes the Computer Data Base in ASCII format for the properties and dimensions of the following shapes: W Shapes; S Shapes; M Shapes; HP Shapes; American Standard Channels (C); Miscellaneous Channels (MC); Structural Tees cut from W, M and S Shapes (WT, MT, ST); Single & Double Angles; and Structural Tubing and Pipe. $60.00

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This state-of-the-art software package is based on and includes the new AISC Design Guide *Steel and Composite Beams with Web Openings*. The program is designed to enable engineers to quickly and economically design beam web openings. The easy-to-use color coded input windows provide a clear, logical data entry system.

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Special Design Isolates Vibration

To eliminate noise and vibration transmission to the occupied space below during construction, the designers isolated the new construction with TS stub columns topped with neoprene pads.

While noise and vibration are concerns in any renovation project, they are of critical importance in a hospital project, where they can cause life-threatening problems. And when the project includes a vertical addition, the problems are multiplied.

The expansion of the Lutheran General Hospital Surgery Building in Park Ridge, IL, included a 25,700-sq.-ft. pathology laboratory, a 13,200-sq.-ft. mechanical penthouse, a 14,400-sq.-ft. Surgery Intensive Care Unit (S.I.C.U.), 7,900-sq.-ft. of pathology office space, and a 45'-long bridge link. Also, 15 labor/delivery/recovery rooms and three caesarean-section operating rooms were added.

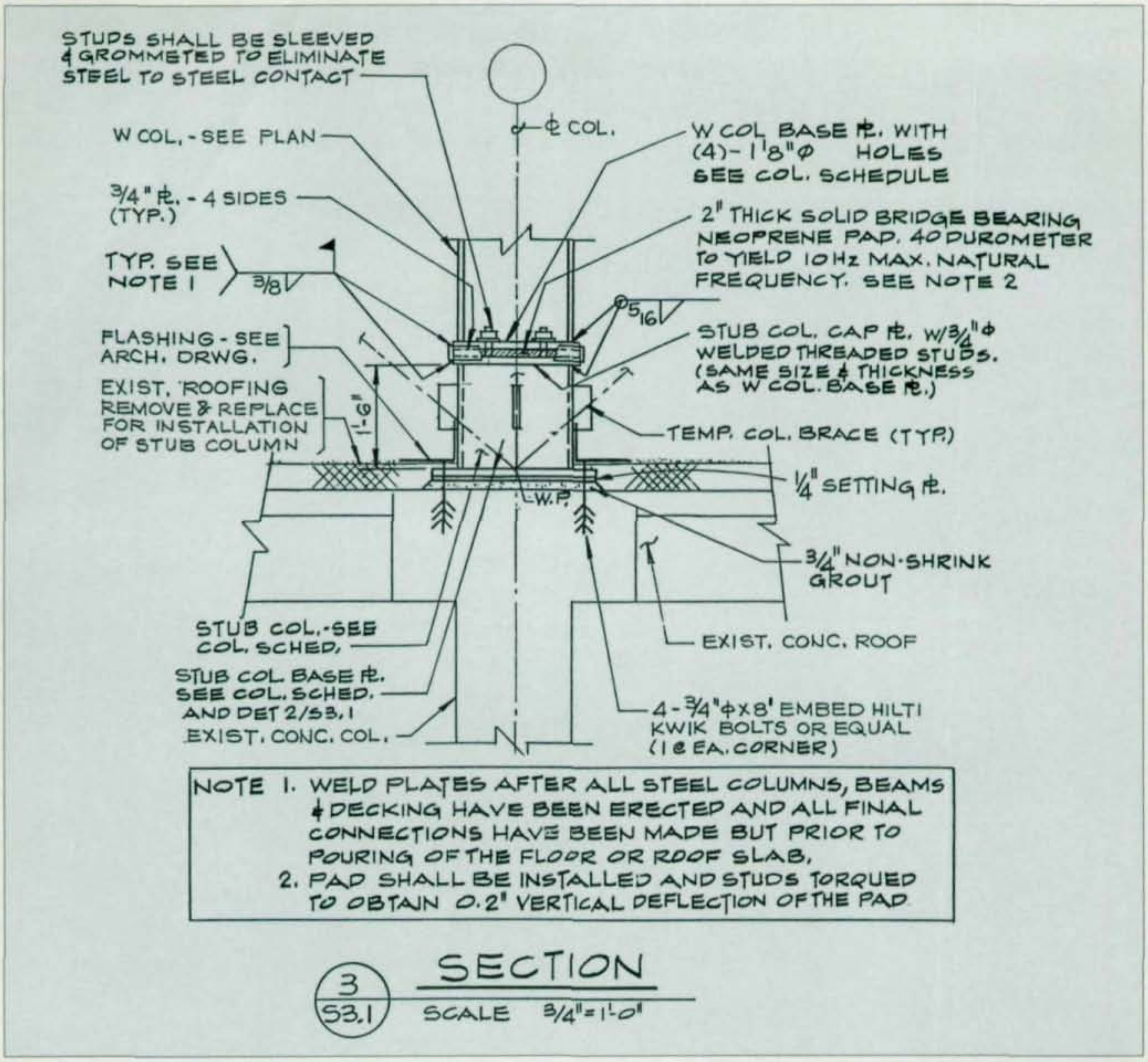
Almost all of the construction was to occur above existing space, and it was required that the hospital remain fully operational during construction.

The S.I.C.U. was to be built above the existing ground floor loading dock and at least two of those four loading dock bays had to remain operational during construction. "The delivery room was built directly above the existing second floor Newborn Intensive Care Unit and one floor above the existing first floor surgical suites, and the new pathology laboratory was built above that" according to Robert C. Andren, S.E., partner and chief structural engineer with Charles E. Pease Associates, Park Ridge, structural engineers on the expansion. "Both departments were to remain in operation during construction, therefore, the transmission of noise and vibration into these areas from the construction zone had to be minimized or even eliminated."

The existing structure was concrete-framed, and the designers of the addition considered precast and poured-in-place concrete, as well as steel, for the new addition. However, the layout of the site, which required a construction crane with a horizontal reach of more than 250', and the limited capacity of the existing frame to support new loads both conspired against the concrete alternatives.

"Problems with precast included the dead load of construction, the crane capacity required to erect precast elements, and the concern that this system would not have the flexibility to allow for potential revisions of floor use and loadings," Andren explained. Poured-in-place concrete had similar problems. "The existing roof of the surgery building was originally designed to be loaded as a future third floor. This framing did not have the capacity to support the uniform load of poured-in-place concrete construction above. As with the precast concrete scheme, being able to accommodate future flexibility in the use of space also was a concern."

Several factors made structural steel desirable. "Advantages included the relatively light dead load of construction, speed of erection, ability to erect in all seasons, reduced crane capacity, and the ease with which future needs, such as openings and reinforcement for heavier loads, could be accommo-



Each stub column was installed directly over an existing concrete column. A 2"-thick neoprene pad was used to prevent sound and vibration transmission between the steel columns installed on top of the stub columns and the concrete columns below. Photo by Architectural Camera, Ltd.

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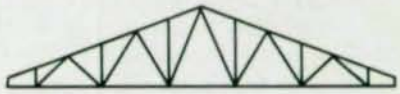

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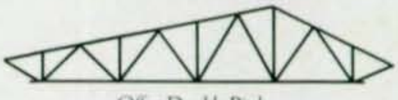

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Even though the new construction (left) cannot be seen from the street, everything from the size and loaction of the window openings to the brick cladding was designed to complement the existing buildings on the hospital campus.

The interior design accommodated a wide range of services, such as the lab stations pictured at right.

Photos by Architectural Camera, Ltd.

dated," Andren said. "Another advantage was that a detail could be developed to isolate the transmission of noise and vibration into the Newborn Intensive Care Unit and surgical suites below."

Structural Design

The addition consists of steel columns and beams with lateral load resistance provided by moment-resisting frames with Type 2 connections. Column sizes range from W8 wide flange sections to W14 wide flange sections. Since vibration was concern, A36 steel was utilized instead of A572 Grade 50. "With a higher strength steel you can use smaller members, but we didn't want smaller members because almost every area that we built was designed to support delicate equipment and needed to be designed with vibration in mind," according to Andren.

A composite system was selected for the floor framing, while the roof framing is non-composite. Spray-on fireproofing was used to meet code requirements. Where required due to insufficient headroom, reinforced web openings were designed to accommodate mechanical equipment. The design utilized the AISC "Steel Design Guide Series No. 2, Steel and Composite Beams with Web Openings."

Because the pathology laboratory included an electron microscope, there were strict limits on floor vibration in this area. "The floor framing in this area was designed to satisfy the specified frequency and amplitude criteria," Andren said.

In order to align with an adjacent structure, the roof of the existing building was made into the third floor and the first level of new steel framing was designated the fifth floor. Because there was neither enough room nor enough capacity in the existing structure, there is no fourth floor.

Part of the new third floor projected beyond the existing building footprint and over a loading dock ramp. Steel framing was cantilevered from the interstitial level, and small Firetrol columns were hung from these extensions to support the projected framing.

Design Changes

The flexibility of steel to accommodate changes after the initial design was complete was crucial to the success of this project. "At the S.I.C.U. addition, the second floor framing was designed with W18 beams as the most economical member for a 40' span," according to Andren. "Subsequent architectural revisions required a decrease in this beam depth to allow room for surgical lights in the first floor ceiling. This framing was redesigned with W12 beams, which still satisfied vibration criteria."

Another change concerned the design of the new elevators. The original architectural design called for a new elevator to serve the existing second and new third floor of the Surgery Building. However, it was decided to omit this interior elevator and add a new elevator tower to the exterior of the building to serve the first, second, third and fifth floors. "The new steel framing was attached to the existing concrete framing and to the new Surgery Building steel, which had long since been erected."

Quiet Construction

Because the addition was being built on top of occupied floors, it was crucial to eliminate as much noise transmission as possible. "Right below is the high-risk nursery, where the very sick babies are. And below that are all of the surgical suites," according to Robert J. Solka, project superintendent with Power Contracting and Engineering Corp., Rolling Meadows, IL.

And since hospitals are open 24 hours, there was no time that was completely "off-hours." Instead, innovative construction techniques were employed to limit noise and vibration.

"The detail designed to prevent the transmission of noise and vibration involved the installation of

short 1'-6" TS stub columns directly over the existing concrete columns," Andren explained. After each stub column was connected to the concrete, it was immediately flashed to keep the roof watertight. After all stub columns were installed and flashed, the stub column cap plates were surveyed for location and elevation in order to complete shop drawings for the remaining steel framing.

Threaded studs were shop-welded to the stub column cap plates. A 2"-thick neoprene pad was installed on top of the cap plate. The main building columns were then erected on top of this pad, with nuts on the studs tightened to a specified compression of the pad. The remaining steel beams and deck were then erected. The neoprene pads were designed only to support the dead load and construction live load prior to the pouring of the concrete slab fill. Steel plates were field welded attaching the main column base plate to the stub column cap plate on all four sides to provide the final connection for the support of all superimposed loads.

To further quiet the erection, small hose-like rubber grommets were placed over the bolts on top of the stub columns, Solka added.

"Virtually no complaints were received from the hospital staff while the steel was being erected and connected using impact wrenches," Andren stated.

However, once the steel was connected, there were some problems with sound transmission, especially when surgical procedures were underway on the floors below. In those instances, the contractor would halt work on that area and shift activity elsewhere. Coordination with the hospital was crucial, Solka explained.

Future Expansion

The design of the addition was created to allow for future expansion, and some of that work is already underway. After construction documents for the first addition had already been issued, the hospital determined that they needed a 12,600-sq.-ft., two-story addition on the west end of the new construction.

"The steel framing at the west edge was quickly redesigned and re-detailed to allow for the future expansion," Andren said. This new addition will require a new elevator to serve the first and second floor of the S.I.C.U. "The steel framing in this area has already been installed but it will not be difficult to design and install the necessary reinforcement required for these openings."

Architect for the expansion project is O'Donnell Wicklund Pigozzi and Peterson, Inc., Deerfield, IL. ■

Rehab Center Designed For Growth

Large Vierendeel trusses were used to meet unusual program requirements in an addition to an acute care and rehab center in Atlanta

By Albert F. Lagerstrom, P.E.

Hospitals don't usually include swimming pools and basketball courts, but both of these were required for an addition to the Shepherd Spinal Center in Atlanta, an acute care and rehabilitative facility. When completed in April, the 175,000-sq.-ft. structure will include patient floors, transitional living areas, outpatient services, and an auditorium, in addition to the aforementioned athletic facilities.

The steel-framed building is L-shaped, with the west wing ground floor approximately one level below the east wing ground floor, and the two wings are separated with a retaining wall. The combined wings contain approximately 28,000 sq. ft. The structural system is designed to accommodate 11 stories in the west wing and 10 in the east wing, with three of the west wing floors and five of the east wing floors are planned as future additions.

One of the challenges on the project was designing several clearspans that were needed to meet the center's program. Clearspans of 75' were required on the ground floor of both the east and west wings to accommodate the gymnasium and the swimming pool, respectively. Standard trusses were considered for spanning the two floors, but this was rejected due to the need to maintain a constant 13' floor-to-floor distance. This was necessary because the new building was to be connected to the existing building with a three-story bridge, and the bridge floors had to be level to accommodate wheelchair traffic. As a result, the structural depth was limited and neither collection girders or trusses were feasible. Instead, the north-south building frames crossing the pool and gym were designed as multi-level Vierendeel trusses.

Another clearspan area is for the mechanical floor above an auditorium on the fifth level of the west wing. The span in this case is 71' and was accomplished with plate girders. One end of each of the two plate girders is supported by a column that extends to the foundation. The other end frames into a column that is part of a Vierendeel frame and does not reach the ground. Each girder supports approximately 1,200 sq. ft. of mechanical floor and two intermediate columns located at its third points, which are designed to carry three patient floors and the roof.

Due to sight line restrictions from the auditorium projection booth, the girder depth was limited to 5'-11". A 5' x 2' web opening was required at the mid-span of each girder for mechanical penetrations. the section was built up using 2½" x 22" flange plates and a ½" x 66" web plate, stiffened as required.

Since several future floors are planned, it was necessary to design the frames for both the immediate stresses plus those that will be imposed by the future floors. The stresses were calculated using the CSTRAAD program from ECOM to analyze first the initial frame fully loaded and then the entire frame with only the future floors loaded. A computer program was then written to access member loads from the frame program outputs and combine them for design. In-house design programs were then employed to determine slenderness ratios and member sizes for both beams and columns.

In both wings, the Vierendeel frames are three bays wide. One advantage of this design is that the beams in the center bay are significantly smaller than those required for the outside bays. This allowed space for mechanical ductwork and piping trunks that could serve branches to the outside bays.

The floor slabs are composite metal deck and concrete with a total depth of 4½" supported by composite filler beams.

Moment Connections

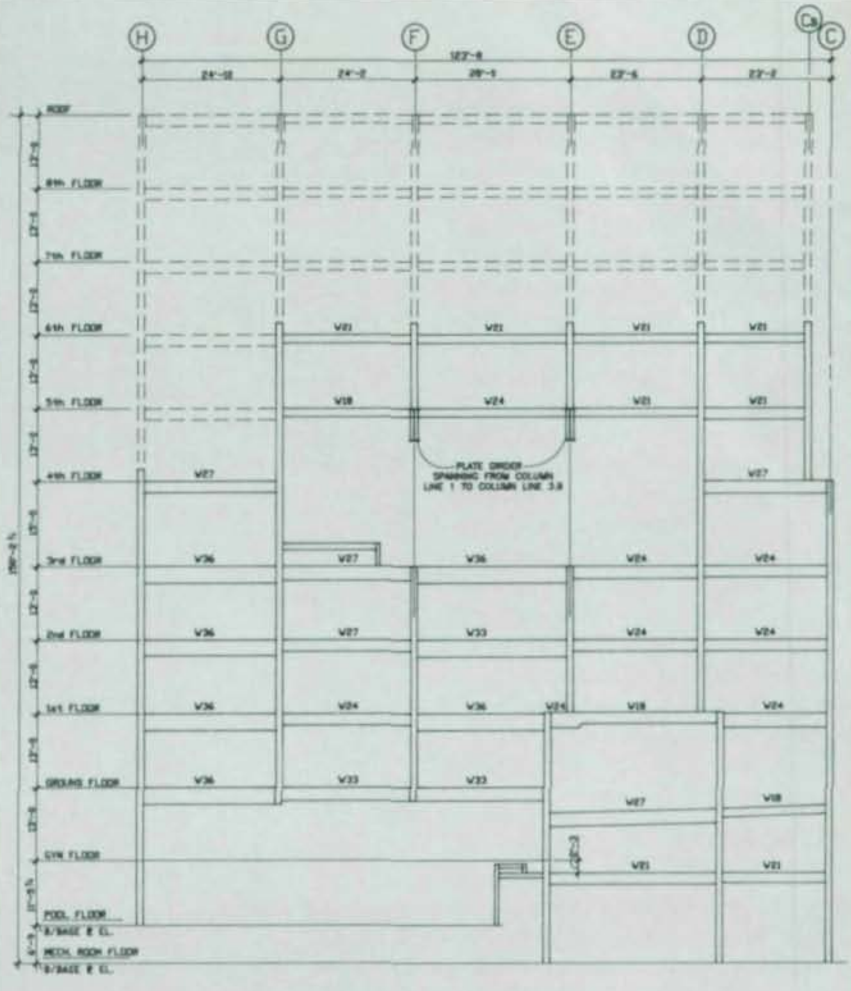
Very large moments were induced in the frame beams and columns. The beam-to-column connections are full penetration flange welds with bolted web connections.

Very thick stiffeners were required and the fillet welds needed to transfer stiffener loads into the column webs were often at least twice the size of the stiffener, in which case groove welds the thickness of the stiffener were used. In many cases doubler plates were required in the column webs. To facilitate design, a computer program was developed to extract loads from the analysis output and design the joints, including stiffeners, doubler plates, all required welds and bolts, and clip angles for the beam web connections.

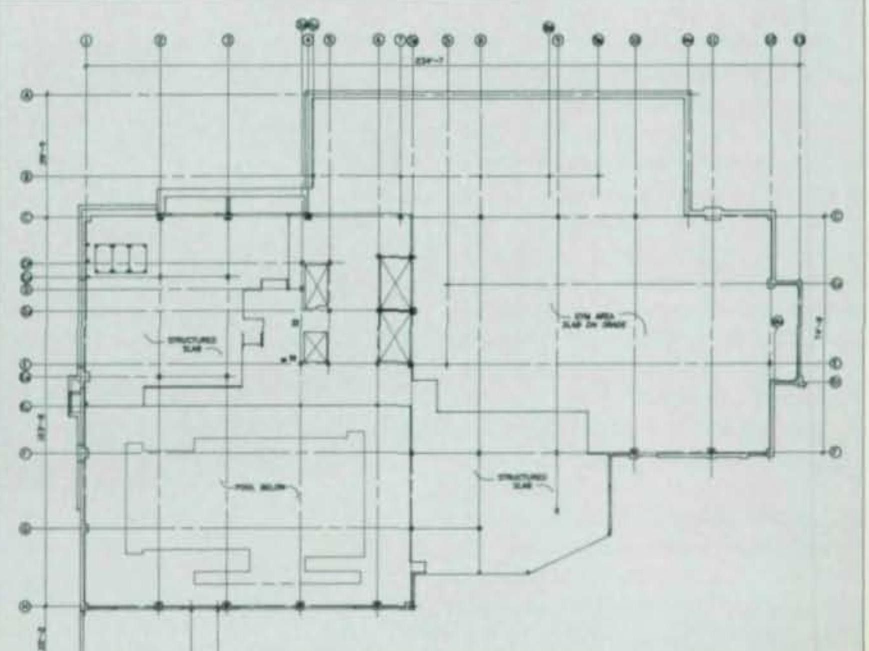
Several of the frame beams and columns are Group 4 and 5 shapes. The current AISC Specification For Structural Steel Buildings—Allowable Stress Design And Plastic Design requires that back-up bars and weld tabs be removed from *tension splices* made using Group 4 and 5 shapes.

A question arose as to whether

Hospital additions are often difficult due to the existence of other buildings that limit site access. Shown at left on the bottom is a connection with stiffeners at the intersection of a collection girder and column. Note the holes in the beam and girder flanges to allow mechanical and electrical penetrations.



ELEVATION – COLUMN LINES 2 & 3



GYM FLOOR SLAB PLAN

or not this requirement applies to the welded connection of the tension flange of beams-to-columns. After discussion with AISC staff, it was determined that it does. When the full penetration weld is made the top of the back-up bar is fused into the weld and therefore becomes part of the connection, according to the AISC. The back-up bar, however, is only tack welded to the column flange so the connection has a built-in discontinuity. It is thought that this crack can propagate up through the weld causing failure.

The column splices were detailed for bolted web connections with the flanges welded using double groove welds. The erector requested a substitution of single bevel welds in order to eliminate the need for back gouging. Several connections were made this way, but the additional weld metal required proved more costly than back gouging and the erector reverted to the double V. It also was necessary to remove back-up bars from many of the single bevel welds. Steel erector on the project was AISC-member Williams Enterprises, Inc., Smyrna, GA, and fabricator was AISC-member Steel, Inc., Scottdale, GA.

During the construction period it was necessary to provide temporary columns from the bottom of the discontinuous Vierendeel columns to temporary footings that remained in place until the frames were fully welded. "Camber" was introduced into the frames to offset the deflection anticipated upon removal of the temporary columns. This was achieved by holding the center beam level but slightly higher than the exterior ends of the exterior beams at each floor level. The exterior beams then slop upward toward the center beam. The measured deflections after removal of the temporary columns were slightly less than the calculated values and there is no bounce or vibration in the floors.

The foundations for the building also required a complex design. Rock under the east wing was above the bottom of the foundation level and required blasting.

This rock was the top of an underground hill with sharply sloping sides. Drilled piers were therefore required to reach rock under the west wing, despite the ground slab elevation being 11′ lower in this wing.

Further, the entire area had been used as a landfill for many years so the soil was of very poor quality. A basement wall retaining outside earth varying in height from 30′ to 40′ encloses the basement levels along the west and north sides of the building. Because of the poor soil quality, tie-backs were not feasible, so the walls were designed as cantilevers. The close proximity of a parking deck to the est wall required that the south end wall footing be supported on drilled piers.

Steel Vs. Concrete

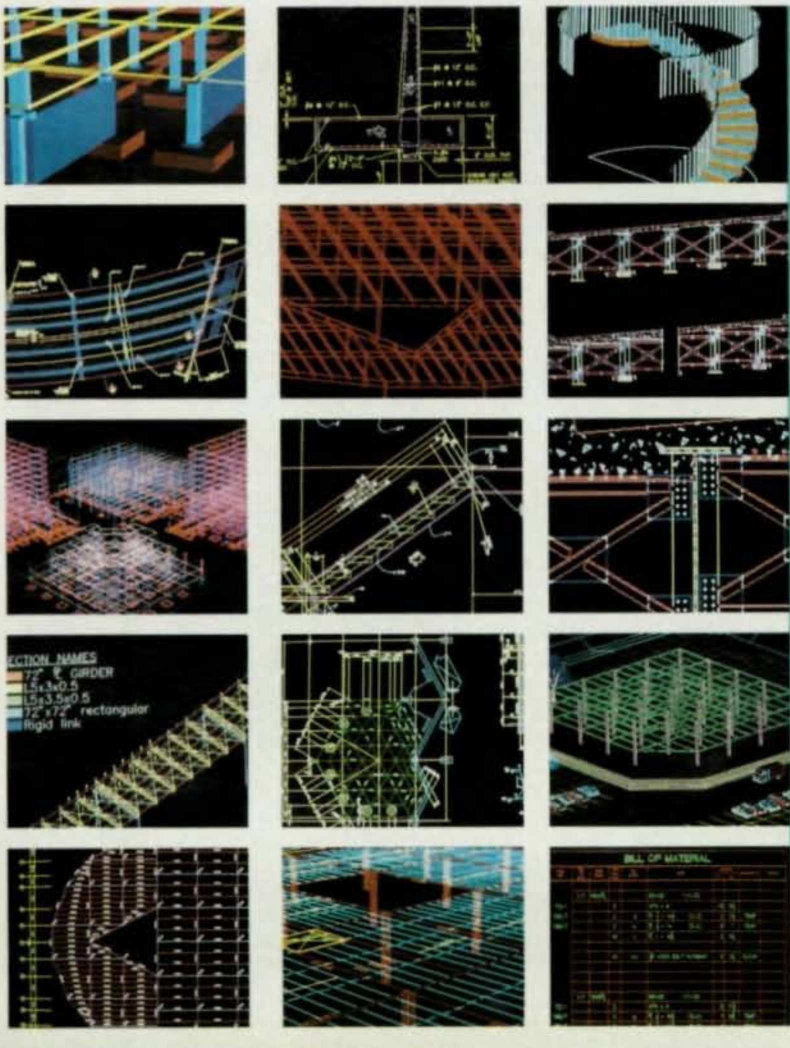
During preliminary planning, concrete framing was considered as an alternative to structural steel. However, due to the required clearspans, post-tensioning would have been necessary. But because additional floors were planned in a future vertical expansion, post-tensioning was considered undesirable. Unless each floor was clearspanned, concrete construction would have required staged post-tensioning, which would cause a disturbance in the facility when the later floors were added.

Clearspanning each west wing floor was not feasible because the fifth level auditorium had to be clearspanned in the east-west direction such that the column at one end of the girder would not reach the ground, which would require a huge collection girder at the lowest level, for which insufficient space existed between the floor and ceiling below.

Of course, the column could have been eliminated in favor of a north-south girder spanning to columns that do reach the foundation, but this would have created a situation where a girder spanning 77′ would support two girders, each spanning 71′ and carrying a mechanical floor with a live load of 150 psf and a vibration and noise isolation floor weighing 50 psf. Further, the column sizes required to resist the loads and moments imposed by such heavily loaded girders were larger than could be tolerated by the architectural layout.

General contractor for foundation was Barge/Wagener & Co., Atlanta, and for the superstructure it was Holder Construction Co., also of Atlanta. Architect on the project was Henry Howard Smith, AIA, Atlanta, GA.

Albert F. Lagerstrom, P.E., is a principal with Lagerstrom & Associates, a consulting and structural engineering firm headquartered in Decatur, GA.



CALL FOR PAPERS

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Invitation/Call For Papers

The 1993 National Steel Construction Conference will be held at the Orlando Convention Center, March 17-19, 1993. Participants include structural engineers, fabricators, erectors, educators, and researchers. Potential authors may submit abstracts of papers on design, fabrication and erection of steel structures for buildings and bridges. Topics of interest include:

Practical application of research;

Advances in steel bridge design and construction;

Composite members and frames;

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Guidelines for Abstract Proposals

Abstracts for papers must be submitted before June 15, 1992. They should be approximately 250 words in length, and submitted on a separate sheet of 8 1/2" x 11" white paper attached to this form.

Authors will be informed of the Organizing Committee's decisions by September 1, 1992. Successful authors must submit their final manuscripts for publication in the 1993 Conference Proceedings by December 15.

Preparation of Paper

Final manuscripts for publication in the official 1993 Conference Proceedings are expected to be approximately 20 pages in length. Copy (including photographs) must be camera-ready. Complete instructions will be forwarded to authors upon acceptance of Abstract Proposals.

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Papers not accepted for presentation at the Conference may, at the author's expense, be presented at the Conference Poster Session. Guidelines for the Poster Session will be provided upon request.

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Tight Site Complicates Construction

Site restrictions, a fast-track schedule and the need for flexibility all helped steer the project to a steel solution

By Frederick M. Gibson and James F. Stewart, P.E.

Surrounded by existing hospital buildings and with limited street access, the site for the new 462,000-sq.-ft., 24-story Ellison Building at Massachusetts General Hospital presented a unique challenge to the design team.

In 1982, Massachusetts General Hospital began developing a master plan to modernize its entire 1,080-bed inpatient facility. After detailed analysis, it was determined that two existing buildings, housing approximately 400 beds, would be retained and renovated. The remaining five structures would either be demolished or rehabilitated for other uses. After reviewing the master plan alternatives, the hospital opted to construct a new three-phase 580-bed inpatient facility adjacent to the existing inpatient core structures, with the $105 million first phase being the 441-bed Ellison Building.

Site Challenges

In addition to limited street access through a narrow 14'-high archway in an existing building, the new building was to sit on filled land reclaimed from the Charles River. Because the surrounding structures were supported on wood piles, it was necessary to ensure that the groundwater level was not depressed during the construction of the new tower. Therefore, the excavation and foundation construction was performed within a steel sheet piling enclosure, which was driven into impervious glacial till or silty clay soils. A groundwater recharge system was installed around the excavation perimeter where groundwater levels were monitored relative to the wood pile foundations.

Another challenge was the minimal space available for the new tower's footprint, which was limited in size by the surrounding existing buildings. The tightness of the site required that cornices on two adjacent buildings be temporarily removed during construction in order to permit the erection of the new tower's curtainwall.

Alternative Structural Systems

Because of the lengthy review and approval processes involved in health care construction, the hospital wanted a design that could be constructed as fast as possible. However, the lengthy approval process—combined with the 10-year phased construction period—meant that the building's structural system also had to be readily adaptable to change. Flexibility also was important during the life of the structure since medical technology is constantly changing, and it was essential that the building be designed to house functions that could not be anticipated during the design phase.

To speed up the project, a fast-track schedule was adopted, which permitted the demolition, excavation, and subsurface work to begin while construction documents for the superstructure were being prepared. Likewise, the interior fit-up documents were prepared while the substructure and superstructure were being erected.

Initially, both steel and concrete

structural systems were considered. A structural steel frame was selected based on its lower cost, its ability to meet a fast-track schedule, and its inherent flexibility.

Lateral Loads

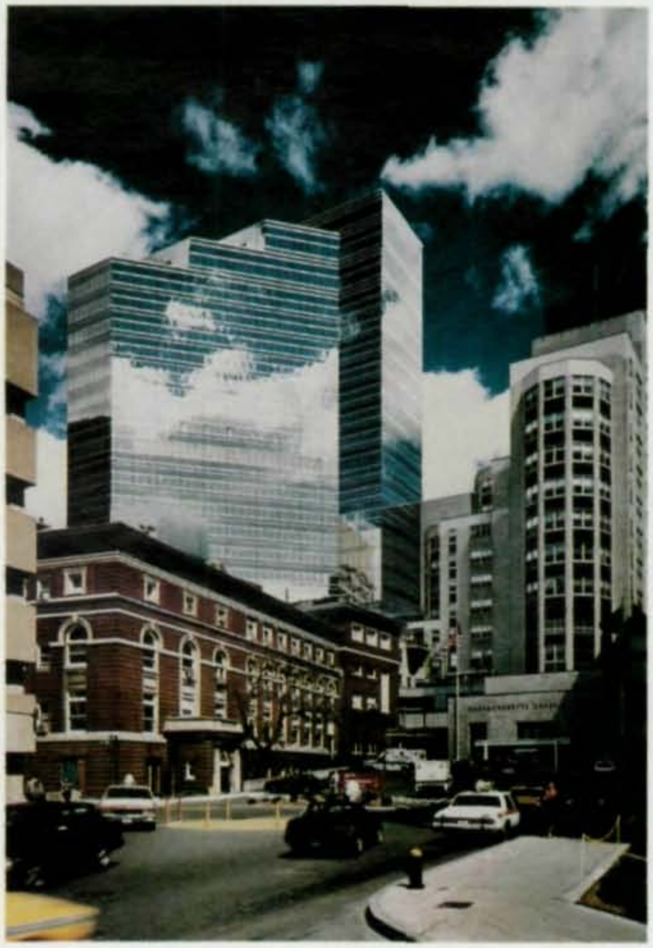
Building lateral resistance is provided by a moment frame using 27"-deep wide flange column sections spaced 26′ on center to accommodate a patient room layout uninterrupted by columns. Columns were all A572 Grade 50 steel. A more economical centrally braced core was not feasible due to the required location of elevator banks.

The floor system consists of 2"- and 3"-deep composite metal decks with light-weight concrete fill and composite beams and girders spanning up to 34′. Both A572 Grade 50 and A36 steel were used, both for economy and to meet serviceability requirements. Shored construction was specified to allow the use of shallower sections under the constraint of matching floor elevations with existing adjacent buildings, which were approximately 12′ floor-to-floor.

Steel fabricator for the 4,300-ton project was AISC-member Owen Steel Co., Inc. Because of the site constraints, offsite receiving, staging and marshalling areas were used for all of the structural steel.

The unusual, triangular shape of the new building, as well as the varied programmed spaces demanded in a hospital, presented additional challenges. While the triangular shape provided an efficient floor configuration for hospital services, under certain wind conditions it had a tendency to uplift at the corners. The problem was resolved by anchoring each column with six 2¼"-diameter by 5′-6"-long high-strength bolts, as well as reinforcing the drilled pier for tension and anchorage into bedrock.

Due to the fill deposits overlying the site, a deep foundation system was required to extend 40′ to 90′ below the foundation level to bear on shale-like bedrock depos-



The close proximity of the adjacent buildings in the hospital complex greatly complicated the construction of the new 24-story Ellison Building at Massachusetts General Hospital.

Photo top right by Michael Krigman Photography.

Left photo by Wheeler Photographics.

Health Care Design

The triangular configuration of the tower portion of the structure was selected to provide an efficient floor configuration for hospital services. Also, the new building was designed with similar floor-to-floor heights as an adjacent structure, which permitted the construction of connecting bridges.

its. The bedrock surface slopes relatively steeply across the site from northeast to the southwest.

Although precast concrete piles would have provided the most economical foundation system, drilled piers were selected in consideration of the effect of noise and vibration levels on sensitive hospital procedures and patients. A typical pier consists of an 8'-diameter reinforced concrete shaft belled into bedrock. An 18"-thick structural slab, designed for a 20' hydrostatic head, caps the drilled pier and completes the foundation system.

Improved Efficiency

Throughout construction, it was essential that the hospital complex remain in full operation. Although the critical bridge linking new and existing facilities is part of the second phase, its construction was timed to coincide with the first phase to facilitate patient movement during the rest of the second phase.

Fore operating economies and access, it was essential that the new structure match the existing building floor elevations, which were approximately 12' floor-to-floor. Integrating the old with the new facilitated internal movement and helped to reduce operating costs. In addition, the matching floor elevations allowed, in many cases, four inpatient units to share support facilities, which allowed the hospital to avoid duplication of services.

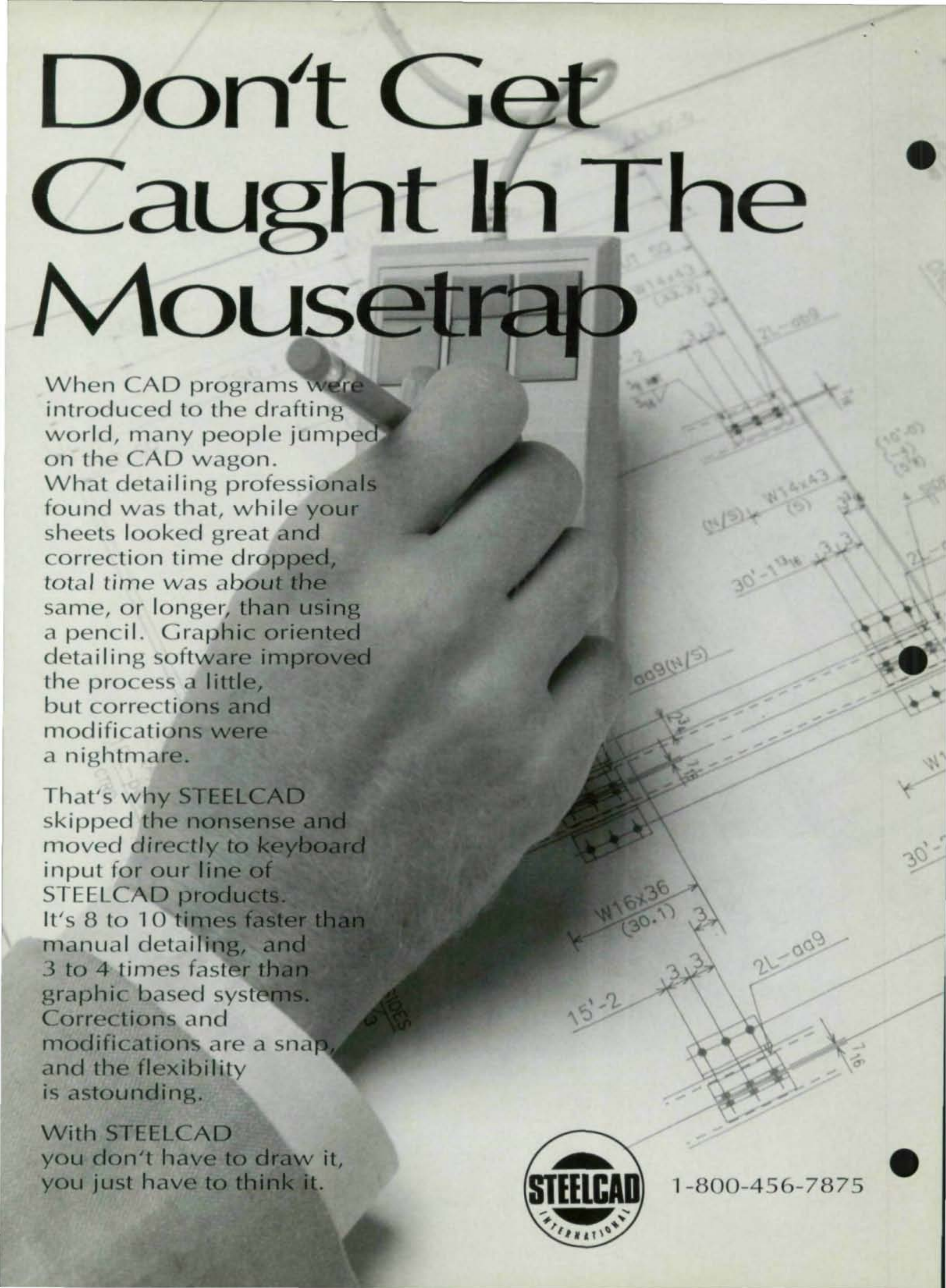
The 26'-wide by 34' long bay was selected to maximize alternatives for patient room configurations, which ranged from intensive care cubicles to the project's standard private/semi-private convertible patient room.

The larger-than-standard bay length allowed planning flexibility for specialized requirements in certain services, such as offset corridor alignments for increased visibility in intensive care and pediatric in-patient units. An additional benefit is that the corridor wall of the patient rooms does not straddle column and beam locations, which yielded improved access from above the ceiling for ductwork and plumbing.

Creating a design that would allow for changes while the structure was under construction required close cooperation between the hospital, architect Hoskins Scott Taylor & Partners, Boston, general contractor Walsh Brother, Inc., Cambridge, MA, and structural engineer McNamara & Sylvia, Boston.

Frederick M. Gibson is an associate partner with Hoskins Scott Taylor & Partners, an architectural, planning and interior design firm with offices in Boston and Minneapolis. James F. Stewart, P.E., is with McNamara & Salvia, Structural Engineers, Boston.

The project was fast-tracked and interior fit-up documents were prepared while the substructure and superstructure were being erected.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When CAD programs were introduced to the drafting world, many people jumped on the CAD wagon. What detailing professionals found was that, while your sheets looked great and correction time dropped, total time was about the same, or longer, than using a pencil. Graphic oriented detailing software improved the process a little, but corrections and modifications were a nightmare.
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Software For Fabricators And Detailers

Hess Technical Services

Connect is a productivity-boosting package for structural steel detailing calculations used by structural engineers and detailers. It essentially designs all of the connections covered in the AISC *Manual of Steel Construction* (Ninth Edition), including framed beam connections, seated beam connections, eccentric connections, connections in tension, and moment connections. It also includes single plate connections and a wind moment connection, both from the AISC *Manual of Steel Construction*, a program for connecting angle welds under combined shear and axial load, and triangulation. Version 3.5 consists of 25 programs and an extensive data base.

Connect ensures consistent calculations and complete, permanent documentation. It includes a complete file handling and annotation utility. The menu-driven program is self explanatory and guides the user step-by-step. User friendly features include a HELP key available at all times and an automatic default feature. An error-trapping feature also is included.

The software runs on IBM compatible computers. While not essential, a hard drive is strongly recommended.

For more information, contact: Hess Technical Services, 2389 Millgrove Road, Pittsburgh, PA 15241 (412) 831-2010.

Softdesk

All Softdesk (formerly DCA Software) Structural products are integrated, modular and run inside AutoCAD. Packages include: *The Modeler*, which allows the creation of a complete 3D model inside AutoCAD; *Plans & Elevations* draws all types of structures in plan, section, elevation or 3D; *Details & Sections* creates accurate construction details; and *Steel Detailer* provides the tools to create shop fabrications, erection and bolt setting drawings.

The *Steel Detailer* couples structural information with parametric programs to quickly produce accurate high-quality drawings. Operating interactively within AutoCAD, the detailing system provides the user total control over drawing production. Sophisticated reporting features automate the preparation of project material summaries. The price of the module is $2,995.

For more information, contact: Softdesk, 7 Liberty Hill Road, Henniker, NH 03242 (603) 428-3199.

SSDCP

An updated package of programs for making *Structural and Miscellaneous Steel Shop Drawings* has been introduced by SSDCP. Improvements in this latest release give the designer more flexibility. At the present time, SSDCP has more than 93 different parametric LISP programs that will run inside AutoCAD Release 10 or 11.

Because the programs run inside AutoCAD, the drawing is made as you watch the monitor. Any modification or change can be easily made using any of their sub-programs or any standard AutoCAD command you choose before the drawing is plotted. Prices vary depending on number of programs ordered.

For more information, contact: SSDCP, 110 Shady Oak Circle, Florence, MS 39073 (601) 845-2146.

Structural Analysis, Inc.

A powerful new package of programs assembled for steel fabricators is available from SAI. The *Steel Fabricator* consists of 41 programs from SAI's library of steel design, structural analysis and graphics software developed during the past 25 years. Programs are included for the design, detailing and analysis of beams, columns, trusses, baseplates and footings. This huge package is being offered at an introductory price of $395 (less than $10 per program). Several free sample programs may be obtained for a small material and handling charge of $19.

The package is production oriented. It's very easy to use and gives fast, accurate design results. A menu with spreadsheet formats and on-screen help features simplifies use. A built-in text editor and error checking also is included. Input always is saved for reruns or future use. Graphics programs allow the user to check input and view results. Standard steel shapes are stored within the program or on disk files for fast easy access.

The software runs on IBM-compatible computers.

For more information, contact: Structural Analysis, Inc., 555 South Federal Highway, Suite 210, Boca Raton, FL 33432 (407) 394-4275.

AutoSD

Two of the strengths of a complete detailing package from AutoSD are its handling of gusset plates and stairs.

The gusset plate program can be used to calculate everything involved in the gusset plate. It can be used not only to derive dimensions for detailing, but can also check dimensions of an existing detail by inputting the dimension from the work point to the first hole. If that dimension works it will be used, if it does not, the correct dimension will be calculated and used instead. The checker will be prompted if a design problem occurs. There are six different types of gusset plates to choose from and each has many available options, making it very easy to customize. After the calculations are made, the plate is drawing on-screen to scale in whatever orientation is selected.

The stair program offers four bottom conditions and two top conditions, pan treads, bolted treads or individually designed pan treads. The stair is drawn to scale with bevel sloping up to either the right or left.

For more information, contact: AutoSD, Inc., 4033 59th Place, Meridian, MS 39307 (601) 483-0601

Steel Solutions

A complete managerial software package for steel fabricators and service centers is available from Steel Solutions, Inc. Included in its *STEEL 2000* product line is an Interactive Estimating system that costs labor instantaneously as a bid is being input and a Material Management program that includes multing, nesting of plates, ordering of material and inventory control. The shop is managed with the Production Control module that includes bill of material, cut lists, production status and CNC interfaces. The Plate Block Nesting and True Profile Nesting programs insure the fabricator that the most economical method of cutting plates from stock and remnant sizes is achieved.

Through the use of a fourth generation data base manager, *STEEL 2000* has become a leader in open architecture design. All of the data base files and reports are available to the user for his own manipulation and ad hoc reporting. The program was developed in conjunction with Steel Solutions sister-company, Steel Service Corp., a large Southern fabricator and service center.

For more information, contact: Steel Solutions, Inc., P.O. Box 1128, Jackson, MS 39215 (601) 932-2760.

Romac Computer Services

A series of programs to assist steel fabricators with their material management requirements is available from Romac Computer Services. These programs include Production Control with Bill of Material, Inventory Control, Purchasing, Length Nesting, and Plate Nesting. Each module can be purchased and implemented individually or can be integrated with the other modules. Additionally, modules are available to transfer data between Romac applications and selected third party applications such as detailing and accounting.

The software offers an economical solution to computerization of material management with individual modules starting at $295.

For more information, contact: Roger McCarter, Romac Computers Services, Inc., 332 South Main St., P.O. Box 660, Lake City, TN 37769 (615) 426-9634.

Computer Detailing Corp.

Beams and Columns, a program for creating fabrication drawings for structural steel and miscellaneous metal, uses AutoCAD to create a detailing environment and therefore is extremely versatile. Anything that can be fabricated in a structural shop can be detailed with this system. The program can be configured to produce details with a variety of different shop standards, including Bills of Material. The system follows the same procedures that an experienced person uses when producing details manually, and therefore is very easy to learn.

Because of its versatility, it can be used very effectively on small jobs with a variety of structural elements and by small drafting companies. It is not necessary to learn a complicated input system or to have extensive training in computer aided drafting. Details with spandrels, moment connections, fittings and other trades can be easily handled. Other programs for detailing stairs and creating plans and elevations are available. All routines and programs are integrated allowing information, job and company standards to be established one time for use on all subsequent drawings, without reentering data.

For more information, contact: Computer Detailing Corp., 1310 Industrial Blvd., Southampton, PA 18966 (215) 355-6003.

E.J.E. Industries

Version 4.0 of E.J.E. Industries' *Structural Material Sorter* is now available. The Novell Network or MS-DOS compatible system is designed to aid steel fabricators and detailers in managing material lists. It reduces the man-hours required to process the lists by requiring the operator only to enter the material items and then automatically providing weights, surface areas, bolt counts, shipping lists, estimating reports and optimum cut lists. In addition to processing jobs, it also keeps the company's in-house inventory, which allows an inventory-dollar figure to be provided for accounting purposes. It also allows the nesting Module to utilize inventory lengths and add back any useful remnants (drops) that remain after cutting.

The program produces extremely efficient count lists by running thousands of combinations on the lengths, as opposed to other techniques that use a simple placement-algorithm that does not yield a truly optimum cut. In terms of operating flexibility, the system can accept dimensions in feet and inches, inches, or millimeters, which eliminates the need for cumbersome conversions during entry.

For more information or a free demo kit, contact: E.J.E. Industries, Inc., 287 Dewey Ave., Washington, PA 15301 (800) 321-3955.

Structural Software

FabriCAD Six, a detailing program from Structural Software, features a new graphical input that simplifies the interaction between user and computer. Everything that goes into a job is centralized under one menu option. All attachments, base and cap plates, moment plates, splice plates, skewed beams, etc., are entered directly through the graphical E-plan. A new mouse-driven menu further simplifies selections. No detailed setup work is required because rid lines are unlimited and can be added, inserted, adjusted or deleted at any time. The unique member placement feature allows the user to re-process a job as many times as he likes without having to worry about re-plotting all of the sheets.

The company also offers an Estimating program that comes preloaded with information based on real-world industry averages and offers several pricing databases that can ultimately reflect the actual cost of labor at your shop. It keeps track of current discounts, base prices, cambering and force milling extras from U.S. Steel and Bethlehem Steel, as well as length, grade, size and quantity extras. Schedules for additional mill suppliers can be set up as needed. Plus, the program mults the material before it is priced so that the estimate reflects any waste encountered on a job.

For more information, contact: Structural Software Co., 5012 Plantation Road N.E., P.O. Box 19220, Roanoke, VA 24019-1022 (703) 362-9118.

Silver Collar Systems

ProFAST from Silver Collar Systems is a fully automatic (no point and shoot), fast-track detailing system designed to remain in production should the operator leave. Easy input plus on-screen manual combine with automatic framing and sheet handling to make the system easy to learn and to use. With a few days of training, each detailer can generate a minimum of 10-12 full sheets per day of straight, sloped or skewed framing plus hips and vallskewed framing plus hips and valleies. A comprehensive connection design analysis and printout also can be produced.

All column and beam details have the needed section cuts. All sections and details are drawn clearly and, where required, are exaggerated for shop readability. The data entry system allows the detailer to setup connection standards and then interact, as needed, to control the final connection configuration. The main software module, which is written entirely in "C", costs $4,995.

For more information, call Silver Collar Systems at (214) 699-1994.

NES, Inc.

PODGE is an integrated system of modules designed to perform both complicated and common geometric calculations with both speed and simplicity. It performs calculations on bracing, circles, roof elevations, oblique triangles, skewed plates, sloping beams and stairs. Also includes an AISC file.

Contact: Northridge Engineering Software, P.O. Box 2014, El Segundo, CA 90245 (800) 637-1677.

Dogwood Technologies

Dogwood Technologies offers two *Procedural Detailing Systems* to provide realistic solutions to the problems faced by steel detailers and fabrication engineering departments. Both *PDS* and *PDS Lite* were developed to detail a wide variety of structural members through the use of text input, allowing greater productivity than most graphics packages. In those rare instances where a member cannot be described with text, it may be detailed with interactive graphics, an integral part of the system.

Dogwood Technologies has augmented the versatility of the UNIX-based system with interfaces to other engineering analysis and graphics packages, permitting downloading of design drawings and optional interference checks. The systems are designed to allow the uninterrupted flow of information from detailer to fabricator and have the capability for the exchange of information between the project control manager, accounting functions and warehouse facilities.

Turnkey configurations are configured to a customers' needs. Configurations range from single-user PC-compatible systems to multi-user systems with more than 25 workstations.

For more information, contact: Dogwood Technologies, Inc., P.O. Box 52831, Knoxville, TN 37950-9928 (800) 346-0706.

Design Data

A new enhancement for the *SDS/2 Integrated Steel Fabrication Computer System* from Design Data, which will allow the program to run on the Hewlett Packard UNIX system, promises revolutionary speed and flexibility. *SDS/2* offers independent but fully-integrated modules for Estimating, Detailing, Production Control, and CNC Interface, allowing a shop to build their computer system as they grow into it, both technically and financially. HP-UNIX's flexibility is made possible by its increased processing speed and the use of multiple "x-windows" that allow the computer to accomplish more tasks at the same time. For example, an *SDS/2* user can now process a newly entered job in the Detailing module, print a report in the Production Control module and review data in the Estimating module, all at the same time. HP-UNIX is now being used as the regular operating system for all *SDS/2* software, and is available to current users through an upgrade.

These modules are designed to work within the existing fabrication standards, instead of making the user conform to the needs of the system. Data is entered once, and then shared by all modules. The 3D Frame Input System allows the user to work in any plane of the structure.

For more information, contact: Doug Evans, Design Data, 1033 "O" St., Lincoln, NE 68508 (800) 443-0782.

Vertex Design Systems

The *Vertex Detailer* is an AutoCAD application that enables the user to assemble building details rather than having to draw them using CAD primitives. The program greatly increases productivity, consistency and accuracy. More than 25,000 building "components"—product and material drawings—are included, including thousands of structural shapes. Components are organized in CSI divisions and are selected via icon menus. In addition to drawing production, the *Detailer* automates plot sheet layout and utilizes a database manager for easy look-up of the many components and details. Retail price is $1,995.

Also available is the *ASC Pacific Electronic CADalog*. One of 18 produced by Vertex, this electronic catalog provides steel roof system information, detail drawings and specifications. These catalogs run on PCs using a simple, intuitive pull-down menu system and are available for free to qualified professionals.

For more information, contact: Vertex Design Systems, 282 Second St., 4th Floor, San Francisco, CA 94105 (415) 957-2799.

Mountain Enterprises

The *ME2* system from Mountain Enterprises produces finished details from erection drawings built with easy on-screen menu choices or by direct, highly efficient entry of individual members (piece-by-piece detailing). Also, a combination of both may be used. The program runs on IBM-compatible computers and are mouse-based with on-screen menus for ease of data entry, eliminating coded input forms and most typing. Under development is a Windows version. Currently available is version 3.1, which can run on inexpensive Wyse/Amdek 1280x800 Hi-Res monochrome monitors or a variety of SVGA monitors.

The program composes details from connection components premade by Mountain Enterprises or by the user with *ME2's* parametric, steel-specific CAD. While more complicated than simple CAD programs, the system has the advantage of being limited only by the user's capabilities, rather than the programmer's expertise. The detailer can have control over every aspect of the product, including down-loading CNC data and fabrication style. Because a wide variety of connection types are included in the program, the detailer does not have to produce incomplete details and then fix them with a CAD program or by hand.

For more information, contact: Mountain Enterprises, 117 E. German St., P.O. Box 190, Shepherdstown, WV 25443 (304) 876-2534.

Steelcad International

Steelcad's range of *Automated Steel Detailing Software* are designed to be true production tools for the steel fabrication industry. Where some Automated Detailing products use a CAD-based graphic interface for input, Steelcad uses a text-based input, taking "raw" numbers and automatically producing drawing files, gathering them, and then moving them to either a CAD program for display or directly to the plotter. The text-based system allows greater productivity (an 800% increase in total drawing output vs. 250-300% with a graphic system) and more flexibility and speed in effecting changes, corrections and alternative proposals.

Steelcad also provides a graphic input module (Steelcad III), allowing automated detailing from erection plans. The information input to Steelcad III is passed to Steelcad II for processing and output. The drawing calculations are accessible in report form, with all material collected for individual drawing Bill of Materials (B.O.M.) and complete contract B.O.M. Also, CNC files are provided and automatically updated.

For more information, call Ben Galloway at (800) 456-7875.

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