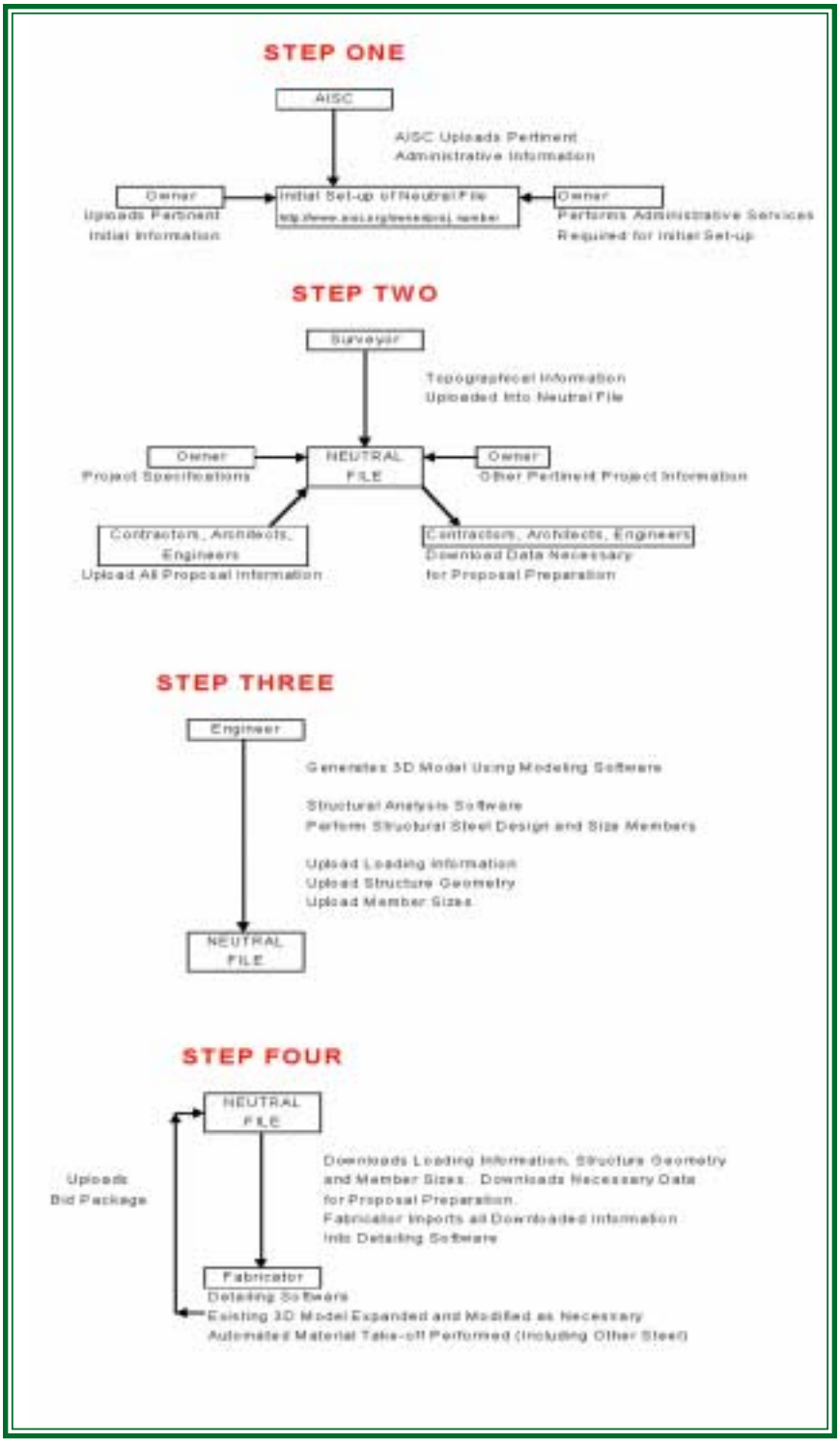
LEAPING AHEAD WITH EDI

Electronic Data Interchange has the potential to substantially reduce project costs while speeding project delivery



By Steven E. Hamburg, P.E. and Mark V. Holland, P.E.

WHILE THE STEEL DESIGN AND CONSTRUCTION INDUSTRY has taken a number of baby steps towards implementation of Electronic Data Interchange (EDI), the next few years should see a great leap forward. A useable standard now exists and both software vendors and end users are beginning to consider how it can be utilized.

EDI focuses on the electronic transfer of information solely for communication purposes. In other words, EDI involves the computer-to-computer exchange of data in a standardized format. Because information is organized in previously agreed upon formats, a fully automated computer transfer of information is possible without the need for manual data entry/manipulation on either end.

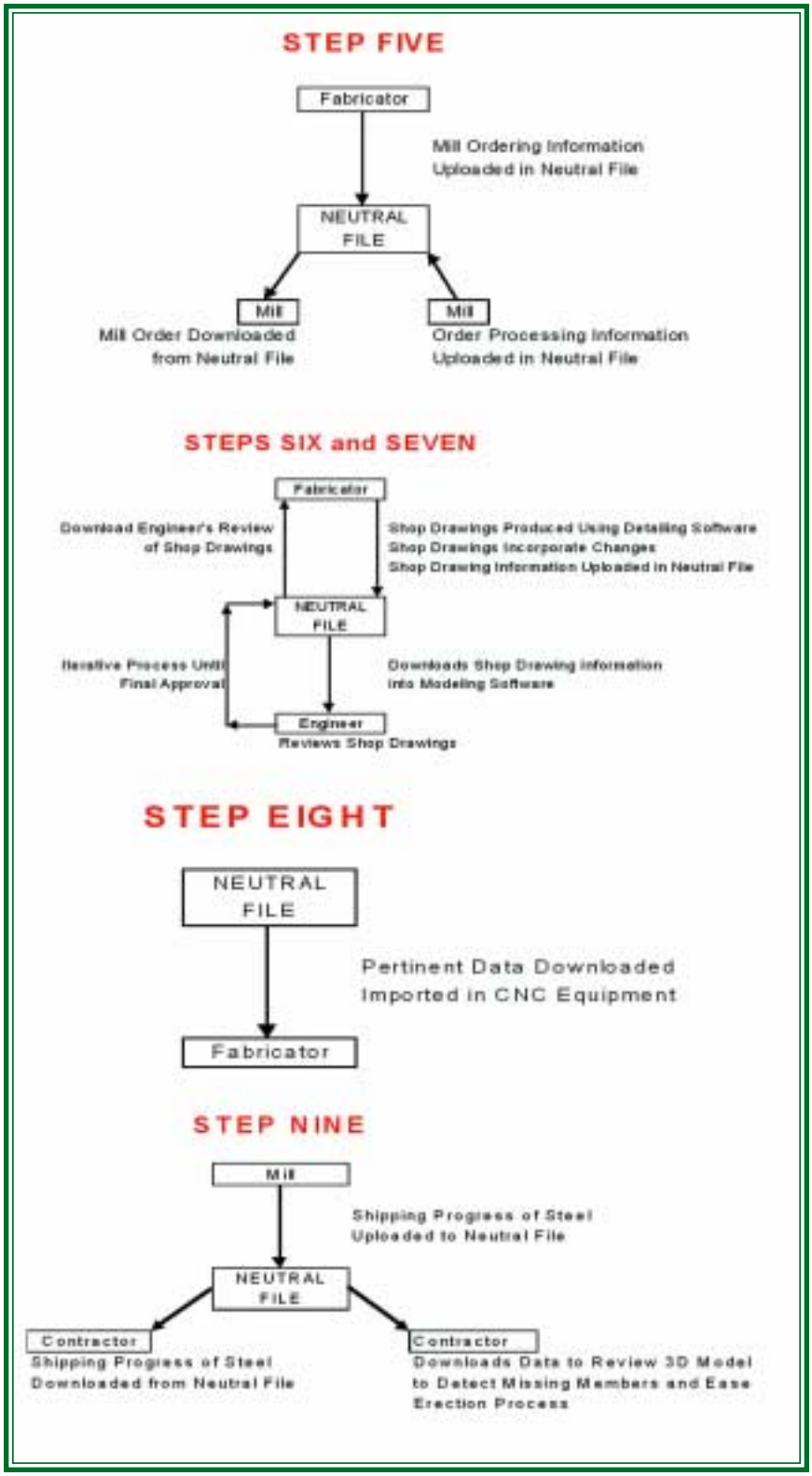
While EDI is most commonly associated with commerce-related applications, such as on-line banking, it is in no way tied to any one specific application or industry. For example, the shipping and transportation industries first began using EDI more than two decades ago to reduce paperwork requirements. EDI is commonly used for purchase orders, invoices, shipping orders and payments. Today, more than 100,000 U.S. organizations use EDI in their business ventures.

Currently, EDI is used in the steel design and construction industry only minimally. For example, fabricators are utilizing CNC downloads and engineers are transferring some data between analysis and design pro-

grams. In the future, a wider range of information will be transferred, including: project specifications; bidding information; topographical information; conceptual design information; engineering calculations; structural design information; changes in design scope/intent; procurement information; fabrication (shop) drawings; and shipping information. Full implementation of EDI will reduce costs throughout each phase of design and construction by eliminating the need for duplication of data entry. In addition, EDI should make it easier to track change orders and other project information, as well as making project reviewing/checking simpler.

Internationally, some engineering firms, fabricators and detailers are beginning to integrate EDI more extensively—though still no where near its full capacity. In the United Kingdom, one of the leading proponents of EDI is Whitby Bird and Partners, a consulting engineering firm headquartered in London. The reason for their interest? EDI translates into better customer service, which in turn means more business. "We have been fortunate to receive a dramatic increase in the number of awarded projects due to our current work processes reducing many of the risks others have been unable to overcome," explained Mark Whitby, a Partner with Whitby Bird & Partners. "We have successfully reduced risks by developing 3D models of structures at the very beginning of our projects. These models reflect the entire geometry and connectivity of the structure, and our tendered deliverable to the structural steel fabricator is a 3D model on a CD-ROM."

Whitby avers that their 3D model on CD-ROM enables fabricators to price the steel structure through the use of computer applications and enables seamless transfer of information from the 3D model to CNC machines.



"Exercising the process of developing 3D models has alleviated the necessity of manually developing design drawings, and also has alleviated tail-end duplication review of shop drawings. These two factors have contributed towards increasing our internal efficiencies in excess of 30%." And those efficiencies translate into consistently completing projects a minimum of 10% below the budgeted amount.

Whitby's business has grown

from 7 million British Pounds to more than 12 million British Pounds in the past year. Whitby attributes the growth to "providing more competitive and more client-oriented serviced bids while alleviating a substantial amount of risk." While Whitby frequently is not the lowest bidder on projects, their reputation for customer service and lower risk has earned them a substantial edge in the consulting engineering business.

EDI implementation may have an even greater impact on the fabrication business. "If industry-wide implementation is achieved, I am confident that EDI would introduce anywhere from a $75 to $150 savings per fabricated ton of structural steel, depending upon the complexity of the project," stated Robert Abramson, CEO of Interstate Ironworks Corporation in Whitehouse, NJ, a structural steel fabrication and detailing company. "EDI would also introduce a minimum of a 50% reduction in structural steel detailing costs, a 10% to 20% reduction in shop production costs and anywhere from a 50% to 80% reduction in estimating costs."

Overcoming The Obstacles

Today's design and construction world is increasingly computerized. Unfortunately, very few of the existing software applications can truly communicate with each other. It would be a far simpler world if everyone used the same programs produced by a single vendor (a "Microsoft World"?). However, the reality is a marketplace of many vendors. A commonly accepted EDI standard would allow each of these vendors to create mechanisms for their programs to communicate with other vendors' programs, as long as both vendors have incorporated these common standards. While some vendors are now providing limited translators that allow their program to communicate with a limited number of specific programs, it would be far more useful—and less costly—for everyone to adopt a common standard.

AISC has recognized the benefits that can be achieved through the adoption of a common standard and has researched the various standards currently in use in the design and construction community. In January, AISC officially endorsed Version 2.0 CIMsteel Integration Standards (CIS) as the standard best able to satisfy the needs of the international steel design and construction industry.

> "Use of the standard within steel design software will increase productivity and accuracy while reducing design costs" — Joseph Harrison

Similar to a standardized filing system, CIS is a system whereby each specific type of project data is located at a specific location within each computer data file. This concept of a standardized computer data file is very similar to the input data files required by several engineering analysis and design software applications, computer numerically controlled (CNC) structural steel fabrication equipment and structural steel detailing software packages. However, the distinguishing factor between an EDI standard and the input data files described above is that the EDI standard is unencumbered by any specific software application or by any specific type of computer hardware. The correct terminology used to refer to this standardized EDI computer data file is, "standardized neutral file".

"By taking advantage of the extensive effort in developing CIS, the entire steel industry can share and exchange data that previously had to be reentered for each proprietary software package," explained Joseph E. Harrison, Senior System Consultant with Intergraph Corp. in Huntsville, AL. "For structural designers and engineers, use of the standard within steel design software will increase productivity and accuracy while reducing design costs. For software vendors, implementation of the CIS will greatly reduce the number of translators that currently have to be supplied and maintained to retain communication with other products. Adoption of the standard also creates business opportunities by providing access to data that may not have existed in or been generated from an application. Intergraph believes that AISC's selection of CIS/2.0 as the standard for electronic data interchange will prove beneficial for structural engineers, software vendors and the steel industry worldwide."

Technical Workshops Scheduled For February

To help introduce CIS to the U.S. software development community, AISC, together with Black and Veatch, Bechtel Corporation and Fluor Daniel, Inc., will co-sponsor a series of three-day technical workshops. These workshops will provide guidance for any interested software development company involved in the structural steel design and construction industry regarding translator development for CIS. The first AISC

EDI technical workshop is scheduled for February 17 through February 19 of this year. Please contact Steven E. Hamburg, P.E., AISC Director of Computer Technology and Electronic Communications (email: hamburg@aiscmail.com, ph: 312/670-5413), for further information regarding the anticipated content of the upcoming technical workshops, as well as for registration information.

Added P. Bradford Vaughan, P.E., Manager of Power Operations, Black & Veatch, LLP, in Overland Park, KS: "The adoption of an accepted protocol for electronic data exchange will provide both horizontal (exchanges between software performing similar function) and vertical (exchanges between products that rely on results from another as inputs) integration. This will result in data exchange throughout the steel construction process – engineering, bidding, procurement, detailing, fabrication, transportation, and erection – creating efficiencies that will lower the installed cost of structural steel construction."

A standardized neutral file makes this possible because any software application will be equipped with the sophistication to know the correct locations for adding new data into the specific neutral file. The same sophistication will also be present to enable applications to extract pertinent existing data in order to execute necessary operations within the application itself.

Realistic Timetable

"When CIMsteel was conceived in 1987, the strategic vision was developed of a universal open standard for the digital exchange of engineering information between the participants, and their applications software, through the structural steelwork supply chain," explained Alastair Watson, Senior Lecturer in CAE at the School of Civil Engineering, University of Leeds in the UK, and leader of the CIS effort. "It was recognized that efficiency gains, both through the effective use of new technologies and through the flexibility to adopt new business practices, would ultimately demand a global information standard."

"This need is still more evident in today's competitive climate, but the means to address it are now at the industry's disposal. Today, the challenge and the opportunity for the structural steelwork supply chain is to embracing and exploiting CIS/2, and thus to access new competitive advantages," Watson added. "It may be five to seven years before CIS/2 is fully implemented in software and usage is industry-wide. However, the potential of the technology and business efficiency improvements that are enabled by the CIS is such that it will take the industry considerably longer to exploit these to the full. The official endorsement of CIS/2 by organizations like AISC is clear evidence that this process has already begun."

Of course, true implementation of CIS is ultimately dependent on the software development companies and it may be some time before a large number of software companies jump on the bandwagon. "In order to justify translator development for CIS, it must be warranted from a business perspective," explained Randall Corson, Structural Engineer with Computers and Structures, Inc., Berkeley, CA, the developers of SAP 2000 and ETABS. "If users of our software do not present a strong demand for CIS implementation, it will not be a high development priority for us. However, a vocal request by our user base for CIS implementation will certainly serve as persuasive motivation for us to incorporate the CIS technology into our programs in the most rapid manner possible. Our ultimate goal is to meet the needs of our users. Technically, Computers & Structures, Inc. has concluded that CIS is the best EDI solution for the structural steel design and construction industry. The potential of EDI, using CIS, may prove to be revolutionary for the industry."

Peter Carrato, Senior Engineering Specialist with the Bechtel Corporation in Gaithersburg, MD, provided further insight with respect to short-term expectations involving the larger-sized design-build companies. According to Carrato, "Bechtel hopes to be using software that is integrated by CIS/2 translators, for all phases of the structural steel design process, by the first quarter of 2000."

Dan Fisher, Principal Structural Engineer with Fluor Daniel Inc. in Irvine CA, expressed that: "Many of the potential applications for the CIS Standard are not fully foreseen today. However, Fluor Daniel will expend the resources necessary to become early users of the CIS/2 for the benefit of the company and our clients."

Another complication involves the stage following translator development. The mere presence of translators within software applications does not insure that implementation will be begun by the users of the software applications. Following translator development, it will become a business decision that will need to be made by the structural steel design and construction industry regarding whether or not to implement CIS.

"The economics of scale dictate that large companies will be the first to implement and successfully use new technology. The large engineering firms lead the way from hand drawing to 2-D CAD on to 3D structural modeling. Smaller engineering companies, architectural firms and others have followed suit as the technology matured and the costs decreased. CIS offers much more than simply the sharing of data. CIS creates a universal format through which every aspect of a steel structure can be described; from the analysis loads down to the smallest bolt

and weld. This will lead to the elimination of many of the drawings that our fabricators and we currently produce." explained Fisher of Fluor Daniel.

Fisher's comments could not be more accurate. An effective analogy is to reflect upon the evolution of computer technology. Thirty years ago, a notebook-sized calculator that could merely add, subtract, multiply and divide cost $200. Only larger companies could justify the expense. However, the demand for calculators quickly rose and the price fell.

Implementation of EDI through using CIS will evolve in a similar manner as did the indispensable compact calculator. As Martin Fischer, Assistant Professor in the Department of Civil and Environmental Engineering at Stanford University mentioned, many of the EDI experts agree that a desirable level of global implementation of CIS could be realized within five to seven years. "It is probable that small-scale structural steel projects (750 tons or less) will be completed through the use of EDI within the next two years. However, it is feasible that larger projects could be completed as well depending upon the willingness of all affected project team members to work together and share the information electronically."

As a track record of real projects evolves, lending credibility to the time savings and cost-savings achieved through the use of EDI, increasing numbers of companies will implement EDI. It is not beyond the realm of possibility for a strong penetration of projects using EDI to surface within a five-year period.

"CIS implementation must start with the owner or with a progressive group of project team members," added Fischer. "The owner can do much to create a project atmosphere that fosters collaboration and trust; but innovative firms could use EDI on their own while adhering to CIMsteel Standards. The software firms need to start to focus on developing software that not only generates information for its users, but that also makes it easy for users to share the information electronically. Once EDI capabilities are integrated into software applications, it will then become the responsibility of the engineers, detailers, fabricators, contractors, etc., to implement EDI."

Ultimately, full implementation depends on market forces. If EDI proves its worth, it will be adopted.

Concluded Bechtel's Carrato: "Adopting CIS/2 as an EDI standard for the structural steel industry provides a number of cost saving opportunities. Three-dimensional building models that include not only geometry but also information such as weight, coating, shop status, etc, for every beam and column will become common place. Using 3D models to check connection details, rather than piece by piece shop drawing review, could reduce engineering job hours by 20% to 30% on a large building. Not only does this represent a direct savings of engineering costs, but also implies a general improvement in the overall project schedule."

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