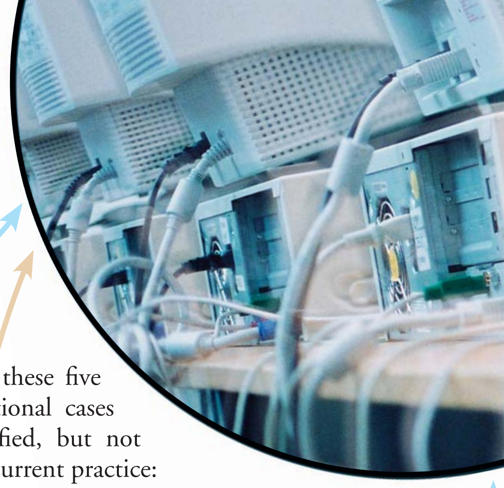
Interoperability for the Steel Industry

By Luke Faulkner



Much to its own detriment, the construction industry has historically been very slow to evolve. The A/E/C industry has traditionally been very skeptical of new technologies and resistant to new management methods. While the last decade has seen an increase in productivity from nearly every sector of the economy, it has seen a decrease from only one — construction. There is no doubt a secure feeling in the old methods, despite the fact that they often produce less than stellar results. In the coming months and years though, new project delivery methods will unfold rapidly. Those that don't adapt will falter and be left behind by those that embrace the most current technological advantages. The influence that information technology will have on the industry cannot be understated. One technology in particular, interoperability, is set to enter the main steam. Interoperability has the ability to cut project schedules by streamlining the design process, shortening procurement times, and eliminating costly interferences. Those that refuse to adopt this new way of doing things will find themselves out of business, left behind by those that have.

AISC and Interoperability

Interoperability (also known as Electronic Data Exchange or EDI) is the sharing of information across multiple software programs, from one native format to another. In the construction industry, it allows the ability to import drawings and models from one program to another. AISC has taken the lead in developing a neutral file format (CIMSteel Integration Standard Version 2 or CIS/2) for data exchange in the steel industry.

ASIC has not been shy about promoting CIS/2 as a data exchange standard, and for good reason. CIS/2 was developed to facilitate interoperability within the steel industry, and thus reduce the typical lead-time associated with structural steel. As the data exchange standard for structural steel, CIS/2 allows users to create a model in one program's native file format, and transfer all the components and necessary information to another program. For example, users need not start from scratch in an analysis package, they can simply import an existing design model from a variety of design packages. The end result being time saved, and the elimination of duplicated data.

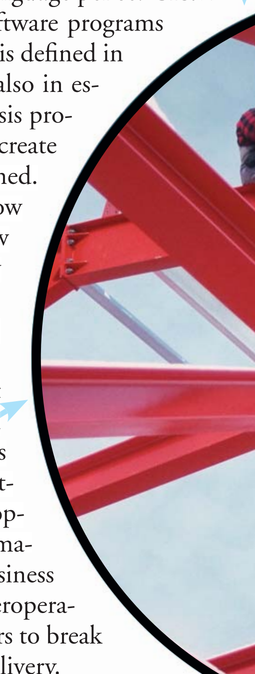
Developers at Georgia Tech have identified the following five occurrences as the most current use cases:

Design application to analysis application
Detailing application to analysis application
Analysis application to detailing application
Design application to detailing application
Detailing application to MRP

In addition to these five cases, three additional cases have been identified, but not yet adopted into current practice:

MRP Status to Detailing application
Incremental update from design to detailing
Syncing design and detailing data

Implementing CIS/2, Interoperability



The development of CIS/2 was a multi-year process that culminated with the introduction of a standard to facilitate data-exchange between software programs. The concept of a neutral file format can be very difficult for the average person to get his/her hands around. What is a neutral file format? It's not a program. It's not a function, it's not even a language per se. CIS/2 is a translator. It's a bridge that allows software programs to communicate. Once a steel component is defined in a CIS/2 compliant design program, it is also in essence defined in a CIS/2 compliant analysis program, eliminating the need to manually recreate a component that has already been defined. Simple changes and modifications can now be incorporated into the model that now exists, without all the manual data entry that has traditionally resulted.

One of the more difficult challenges is how to give this power to the industry. Many people in the industry are not even aware that they possess software with CIS/2 compliant translators, and as nice as it would be, there is no interoperability button to push and make your project interoperable. While the introduction of the fax machine and email changed the way we do business nearly overnight, and with little effort, Interoperability requires a commitment from the users to break from the traditional methods of project delivery.

The reality of interoperability is it could take years for the industry to come up to speed on the available technology. This technology is fine for the early adopters, but for the majority of people it would go unused without some further instruction. To that end, the AISC has designed a short course on implementing interoperability to be presented at the 2006 NASCC. This course is designed around three project teams that have used electronic data exchange successfully. To lend a balanced perspective, each project will be

presented with a balanced team, with members from a variety of A/E/C backgrounds. Rather than tell the story of these projects, the presentations will work within an interoperable checklist, providing instructions for a team to run an interoperable project.

AISC has intentionally chosen three projects of differing backgrounds to highlight how interoperability may be used in different situations. Featured projects include: GM V6 Plant in Flint, Michigan (recently featured in ENR), The Denver Art Museum, and a three story medical office building. Anyone with an interest is encouraged to attend. Those interested in attending may register at **www.AISC.org**.

CIS/2-IFC Harmonization and the BIM World

CIS/2 is a fabulous tool for the structural steel industry. Inevitably though the questions come up: How does the steel data exchange standard fit into a larger world? What place does CIS/2 have in the future of the industry?

The answer to that is Building Information Modeling. CIS/2 is currently in the final stages of a harmonization effort with the IAI's Industry Foundation Classes (IFCs). IFCs are an open international standard that allows software companies from the A/E/C world to integrate and share data, much like CIS/2 does for steel.

This standard allows for the definition of all building components into one BIM (Building Information Model). A BIM is a completely integrated 3D design. This gives users the ability to define, detect and avoid clashes in a virtual world, all but eliminating interferences before construction ever begins. By harmonizing with IFC, CIS/2 will remain an important component of the BIM world.

Within the BIM world, CIS/2 will be the repository for structural steel data. Since most trades involved in a project will never need to know detailed information about steel (analysis, detailing etc.), the IFC standard will be the repository for shared information in the BIM. Owners, tradesmen, and designers most concerned with clash detection, avoidance and coordination issues will have access to high level, shared data housed in the IFC standard. A CIS/2 model will house particular data about steel detailing, analysis, design and fabrication, allowing for a large amount of data, but only where needed.

The CIS/2-IFC translator is currently being developed to handle three use cases:

IFC design to CIS/2 analysis

IFC design to CIS/2 steel detailing applications

CIS/2 to IFC for design coordination

The functional harmonization of CIS/2 and IFC is expected to be completed by late winter of 2006, with additional extension will be added in the following year.

The Future

A 2004 NIST report found that a lack of interoperability cost the construction industry 6.73 *billion* dollars on 1.1 billion square feet of construction. Faced with this knowledge, a dramatic reshaping of the A/E/C community lays ahead. Gone will be the days of traditional project delivery, where every party is left to fend for itself. CIS/2 and other data exchange standards have the means to usher in a new era of interoperability and a collaborative team approach. One in which owners, architects, engineers, subcontractors all work together to eliminate costly interferences, and reduce schedules before construction has ever began.▪

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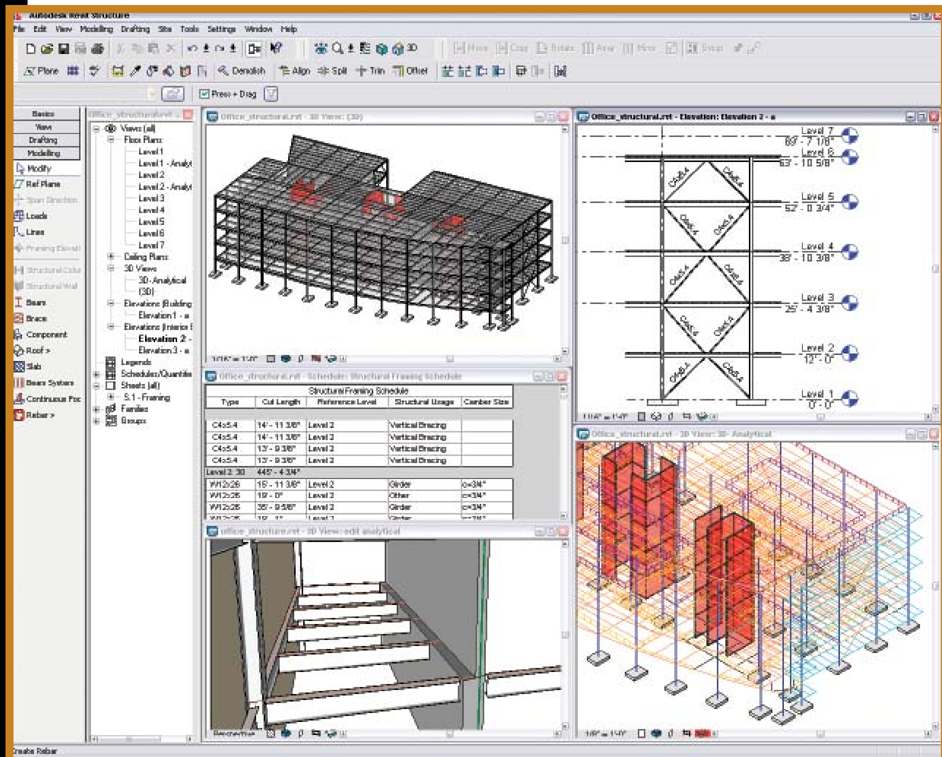

Autodesk Revit Structure is a building information modeling platform where a single model is used for drawing production as well as by 3rd party structural analysis software

Building Information Modeling for Structural Engineers

An Introduction

Building information modeling (BIM) is an approach to building design, construction, and management supporting the continuous and immediate availability of high quality, reliable, and coordinated information. While architects have been creating building information models for several years, new software is enabling structural engineers to practice building information modeling and combine a physical representation of a building with fully associated analytical representation. The common, computable building model can be used for structural design, drawing production, and coordination — and drives third-party structural analysis applications.

Digital data is not necessarily computable data — a distinction that at first glance may seem insignificant, but in actuality wreaks havoc for the user of the data. For example, a word processor can be used to create rows and columns of financial data, but most of the numeric calculations and modifications must be done manually. The data is digital, but not very useful.

In contrast, a spreadsheet version of the same financial data might look identical to the word processor version, but the spreadsheet model contains numerical values, relationships, and sophisticated calculations. When a number changes, the rest of the spreadsheet updates automatically. The spreadsheet model is computable whereas the word processor representation is not, even though both are digital.

The building industry, for the most part, has adopted the word processor approach to documenting building designs over the past 20 years. CAD tools are primarily used to create electronic drawings of buildings. Even some 3D models are little more than 3D drawings. Although the output of these systems may resemble the output of a BIM solution — just as the financial table in the word processor looks the same as the spreadsheet table — it is not computable information.

It's quite common to try to use this incomputable building design data for analysis and find that the data, although seemingly computable, is actually an empty shell — a collection of graphic elements with no implicit knowledge of building elements such as walls, beams or ducts. For the most part, humans look at the data, interpret it, and transfer it to new applications for additional analysis.

Architects make occasional use of analysis packages, lighting studies, or baseline energy calculations, for example, which are typically outsourced to specialized engineering firms. The structural engineer, on the other hand, is heavily dependent on analysis, which is an integral part of the structural design process. As a result, a computable building model is a key ingredient in efficient structural design processes.

Without BIM, individual models must be produced to front-end each type of analysis. One common complaint of structural firms is that their highly educated staff spend too much time transcribing information from one software package to another, configuring various analytical models for input into different analysis software applications, and then manually coordinating the analysis and design results with documentation.

"A computable building model is a key ingredient for efficient structural design processes."

With BIM, the analytical and physical representations are created simultaneously, and are just different views of the computable building model, containing the necessary information needed for third-party analysis applications. Autodesk Revit Structure and other BIM software doesn't replace the analysis applications; it provides a common modeling interface to them and a common model to document the results. Data moves directly from the building information model to the analysis software, and the analysis results are delivered back into the model — keeping analysis, design, and documentation all synchronized.

The use of a building information model gives structural firms an integrated modeling environment for analysis and documentation — so that the structural design and documentation are always coordinated, consistent, and complete. Leveraging existing architectural digital design information and sharing the structural building information model with architects and engineers further coordinates the building design and documentation — a winning combination for all parties involved in the design, construction, and operation of a building.▪

This introduction to building information modeling for structural engineers was provided by the Building Solutions Division of Autodesk, Inc..