AUTODESK UNIVERSITY

Model Based Fabrication:
Connecting the Model to Fabrication (and back)

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Learning Objectives

- Understand the benefits of using model-based exchange over file-based exchange
- Understand how fabricators can utilize model-based information to organize and track steel fabrication
- Discover the IFC specification for Steel Fabrication and how and why it was developed
- Understand the importance of having a digital representation of the capabilities of a fabricator workshop

Description

When 3D modeling replaced 2D CAD, only the detailing method changed—not the way data gets transferred to steel fabricators (much of the knowledge in the model is lost). So, while detailers benefited, steel fabricators are still getting the same information in the same format.

But now it's possible for fabricators to extract better information from the Advance Steel software model. American Institute of Steel Construction's IFC for Steel Fabrication Specification is available directly from Advance Steel software to feed fabricators' production-management systems and workstations.

This workflow involves sending a single file that a fabricator can use to extract all the information needed for fabrication, including 2D and 3D views, connections, and material information. From there, it's possible to manage and organize the project ready for fabrication, optimize material, and create the data required to drive and track computer numerical control or manual workstations.

Your AU Expert

Chris Moor has extensive experience at the highest levels of business leadership, with more than 30 years international experience in the steel construction and construction software industries.

Starting his career in the shop floor of a major steel fabricator in the United Kingdom, Chris has risen through the ranks to become an effective speaker, coach, motivational trainer and natural leader within the steel industry and its peripheral supplier industries. He has extensive experience with structural steel fabrication, software for steel construction, BIM, project management, sales and marketing and business strategy.

A Brief History of Driving Shop Floor Production

This section provides a background, and lays the foundation for the major learning objectives

The Steel Industry is slow to Evolve and Adopt Technology

The steel industry is slow to evolve and change. However, in many ways it leads the construction industry in the adoption of technology. While the session description begins by discussing the change from 2D CAD to 3D Modeling, the truth is we need to go further back to get a clear understanding of how far the industry has actually evolved; however slowly.

The objectives of a steel fabricator remain the same now as they always did: Deliver assemblies to the job site for erection, as efficiently and accurately as possible. If the drawings are high quality, the material is purchased and arrives on time, and the shop floor is managed effectively, then the fabricator will be successful.

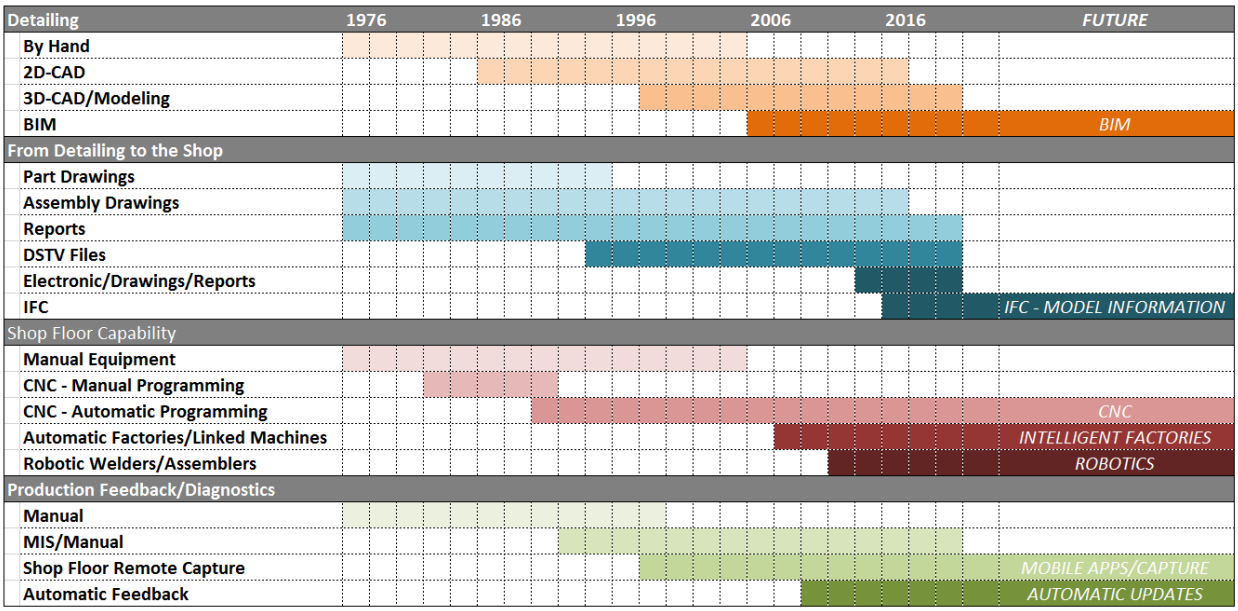
An analogy is of a race car:

- The race car needs fuel, the better the fuel the better the performance.
- If the race car has a good driver and a good engine, then it'll do well and be competitive
- To continually improve and be more competitive, the owners of the race car need good diagnostics and performance feedback

*Over the years, the **fuel** for fabricators – drawings, reports and of course material - has changed dramatically, from pencil and paper to BIM.*

*The shop floor **engine** has changed just as dramatically, from manual workstations to sophisticated CNC machinery and automated factories, **driven** by advanced management software.*

*And now the capability to track, report and **diagnose**, live, on productivity and **progress** is entering a new phase that supports the lean philosophy of continuous improvement.*



ILLUSTRATIVE EVOLUTION OF THE STEEL INDUSTRY

Moving to Model Driven Steel Fabrication

We're moving into an era where fabricators can now, finally, take advantage of all the knowledge and detail and time that went into building an Advance Steel Model.

Instead of 'dumbing down' the model into 2D part and assembly drawings, coupled with material reports and thousands of individual DSTV/NC files, we can use the model in its entirety: Taking the information needed for steel fabrication.

Instead of extracting literally thousands of files to drive equipment and provide the fabricator the information they need, we can extract a single model file that contains all the information needed.

And if we add to this a 'model' of the capabilities of the shop, we can now begin automate and 'self-drive' fabrication.

The Model Based Fabrication Process

This section covers all the learning objectives for the session:

- Understanding the importance of having a digital representation of the capabilities of a fabricator workshop
- Understand how fabricators can utilize model-based information to organize and track steel fabrication
- Discover the IFC specification for Steel Fabrication and how and why it was developed
- Understanding the benefits of using model-based exchange over file-based exchange

A Six Step Process for Model Based Fabrication

To illustrate and cover the learning objectives for this presentation, a six step process for steel fabrication is introduced. Each step is driven by the ability to use better data from the model and be able to deal with that data in a better way than in the past.

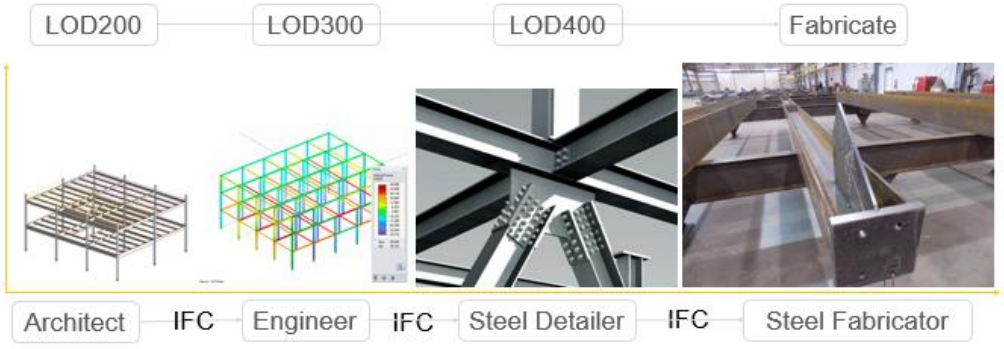
1. Build a digital workshop

Prior to considering the data coming from the model, it is important to understand the capabilities of the shop. Only by describing the functions, features, limitations and constraints of the shop floor workstations can we accurately start to consider how to manage production through the shop. By matching the data and geometry coming from the model, with the capabilities of each workstation we can immediately understand where each piece needs to go and how long it will take.

2. Import knowledge

Importing better data is the heart of this presentation and utilizes the AISC specification for steel fabrication known as 'IFC for Steel Fabrication (EM11)'. The specification uses IFC (Industry Foundation Classes) to enable a fabricator to extract a complete model, or sequence in a single file from the model. This file contains everything the fabricators needs to fabricate the individual parts, assemblies and deliver them to the project site.

IFC is an industry standard format managed and controlled by BuildingSMART International. A broad section of the industry already uses IFC for coordination and other purposes, but this IFC 'view' focuses purely on the needs of the steel fabricator.



IFC IS USED THROUGHOUT THE CONSTRUCTION INDUSTRY

IFC for Steel Fabrication (EM11) – a single data file - replaces the need for the detailer to produce hundreds or thousands of DSTV files that need to be managed and controlled by the fabricator.

3. Organize, batch, route and forecast

Once the data is imported, the fabricator can choose which parts and assemblies need to be produced and batch them together to route through the shop and forecast a production time. Given the knowledge of the shop and the depth of data coming from the data import, the routing automatically guides the fabricator where each piece can or cannot go.

4. Optimize material

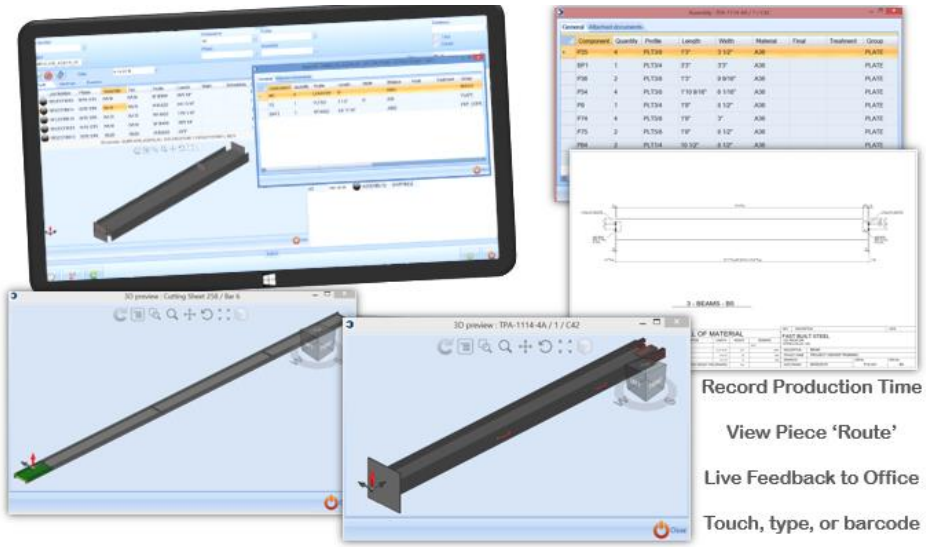
After routing, material optimization takes place. Aside from linear (profile) and shape (plate) nesting, this step also takes into account part routing and can minimize material handling across routes.

5. Produce workshop data and reports

Different workstations require different sets of data and this step is important to ensure the correct data is issued depending on the machine, the report requirement etc.

6. Track, monitor, and share production progress

While CNC machines can report feedback automatically, another advantage of the IFC specification is the ability for the shop to have all the information required for manual workstations such as welding, assembly, quality control instantly available. This includes material lists, drawings, 3D views of parts and assemblies. These tools also enable the operator to record their work and provide production managers with an unprecedented view on project progress and productivity.



SHOP FLOOR MODULES DRIVEN BY IFC ENABLE LIVE FEEDBACK CAPTURE

Resources

BuildingSMART International Website
- www.buildingsmart.org

American Institute of Steel construction (AISC) resources

BIMsteel Resources
- www.AISC.org/BIMSteel

IFC/EM11 Information
- http://www.aisc.org/BIMsteelFAB.aspx

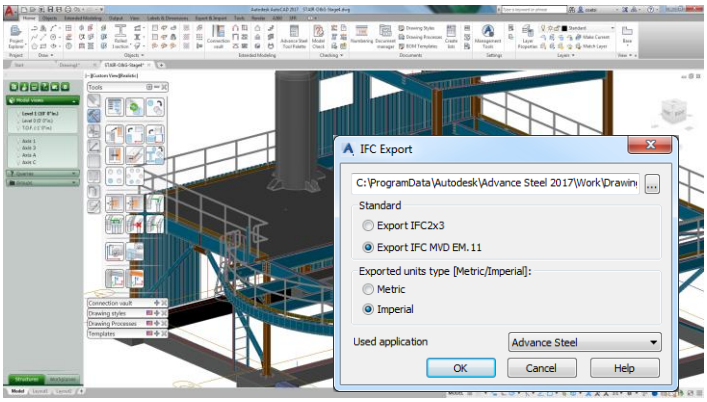
Autodesk Advance Steel / Steel Projects PLM Press Release – First Implementation of IFC
- http://bit.ly/SPIFC-Release

Video – Using IFC data from Advance Steel in Steel Projects PLM
- http://bit.ly/SPIFC

Steel Projects PLM
- www.SteelProjects.com

FICEP Group
- www.FICEPCorp.com

Exporting IFC/EM11 from Advance Steel



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