

IFC's and Interoperability

VERSION 1.0



What are IFC's

IFC is a 3D file format specific to the Building Industry that allows a user of 3D software to **Save as** or export a file such that any other 3D software that is IFC compliant can open it and retain the intelligence built into the file's objects.

IFC is an acronym that stands for Industry Foundation Class, a *specification* for sharing building data.

IFC offers a *common language* for the sharing of intelligent objects between disciplines across the building lifecycle. In the IFC file format, a window knows it's a window, a wall a wall, etc., no matter what software opens the IFC model. The IFC intelligent file format is to the 3D model, composed of walls, windows, doors, slabs, roofs as the DWG or DXF file formats are to the 2D world of lines, arcs and circles.

The IFC format is based on the idea that Building Industry objects, families, or components can compose an integrated 3D Building Information Model (BIM) or Virtual Building. These objects are defined to support the whole life cycle of a building's development from inception, design, documentation and construction, then through building operation, facility management and finally demolition and/or disposal.

IFC is an open standard file format available to all participants in the Building Industry, for use world-wide, including use by all Building Industry software vendors.

Why use the IFC format?

Why would you choose IFC instead of traditional techniques such as 2D files in DWG/DXF or DGN format? The principal benefit of IFC's is their object description – not only does the IFC protocol preserve the full geometric description in 3D, but it also knows its location and relationships, as well as all the properties (or parameters) of each object, such as finish, serial number and material description. This means users can safely work without fear of being isolated from consultants, clients or other specialists using other software. Industry-wide and continuous sharing of information between CAD (and non-CAD) applications for the life cycle of the building is the goal of the IFC.

What is *interoperability* and why is it necessary?

Interoperability is the ability to exchange intelligent information reliably and consistently between different software applications. For a user, it is the ability to utilize data in his/her application from another project participant on a different system & discipline and vice versa.

Traditional CAD software is based on a two-dimensional drafting paradigm. The member organizations of the IAI and other industry colleagues were frustrated when they tried to share information between their 2D (and some 3D) applications. They could not access data completely, and sometimes not at all. The reason was that there was no standard for defining the parts of a building, which caused duplications, errors, delays, low quality and extra costs. For the non CAD users in the industry – of which there are many – it is almost impossible to access information for costing, construction management, etc, so these segments of the industry have to reinvent everything. This is hardly a productive way to work.

How does the IFC format help interoperability?

IFC's are non-proprietary, and available globally to any company that defines AEC objects. The important concept here is the term *object*. Objects in a building, have geometry, that is, a 3D description. Objects also have properties, like their product name, finishes, and cost. Some objects are *real* like a door; some objects are abstract, like construction cost.

The difference between this and blocks or objects in 2D CAD software is that the IFC's are by definition 3D and reside in an integrated model that composes the virtual building. Instead of working with 2D entities such as line, arc, text, you work with the objects directly, using their familiar names, like *wall, slab, roof, building*.

Who developed the IFC file format?

The IFC format was originally developed by the International Alliance for Interoperability established in 1995 by American and European AEC (Architecture Engineering and Construction) firms, along with software vendors, to promote interoperability between software in the Industry. Since 2005, the IFC specification is developed and maintained by buildingSMART International. buildingSMART International is actively facilitating IFC implementation and adaptation via local chapters world-wide.

Graphisoft, a leading AEC CAD vendor and the developers of ArchiCAD, was the first software company world-wide to allow users to save/export their files in the IFC format. Graphisoft has been a member of the International Alliance for Interoperability (IAI) since 1996.

But what does this do for an architect who is primarily concerned with producing proper documentation?

In this new paradigm consider an HVAC engineer. Traditionally, the architect gives him plans, elevations and typical sections of the building. The engineer has to determine the room usage, calculate room volumes from the plans and sections, determine the construction materials and calculate the HVAC load. Only then is he able to plan the routes and sizes of ductwork, etc, which he sends back as a new layer on the 2D plans the architect gave him.

Contrast that with the IFC approach. The architect sends the engineer the full geometry of the building in an IFC file; the engineer immediately has access to the room volumes, can see if the architect has selected specific construction types for the walls and roof assemblies, etc. The HVAC application, accessing directly now much richer and integrated data from the architect, fills in missing design parameters and sets about designing the ductwork system. This time, his library is based on 3D objects, and his system automates the selection of these once the design system is calculated. Now he returns to the architect his service proposals; not as a set of plans, but an assembly of 3D objects located accurately in the architect's 3D object model. The architect can now truly coordinate with the client, and later with the construction manager, as he refines the design while identifying clashes and construction conflicts.

IFC gives you the same quality data for every design and engineering discipline!



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