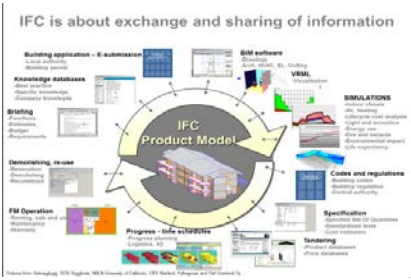
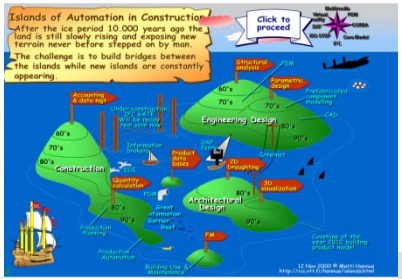
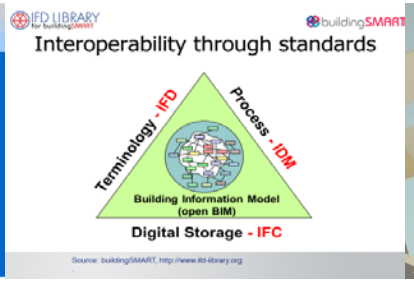
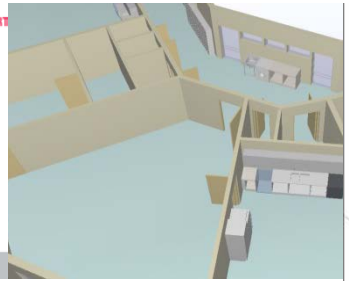
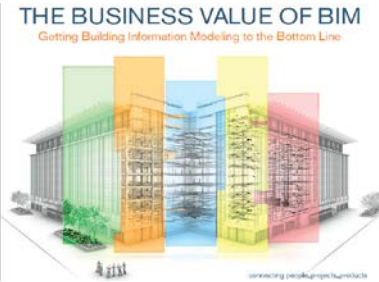






buildingSMART-standarder

IFC, BCF och IDM

- kort översikt

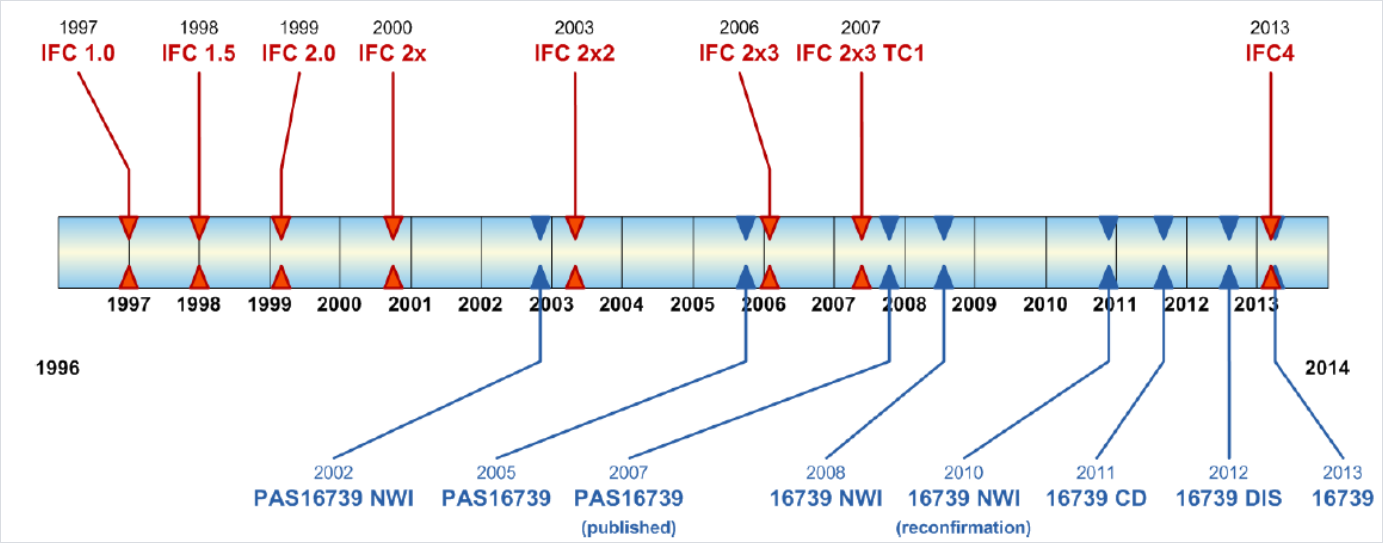
Väino Tarandi
Professor, KTH, Stockholm

Stockholm 2017-08-30

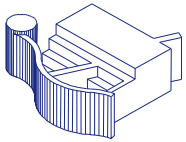
IFC

KTH Architecture and the Built Environment

IFC development history

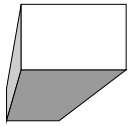


IFC2x3 standard (ISO/IS 16739)



Geometry (explicit)

B-rep
CSG

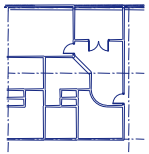


Geometry (Sweep)

volume - extrusion, rotation
areas - extrusion, rotation

Topology

element connectivity,
schematic design

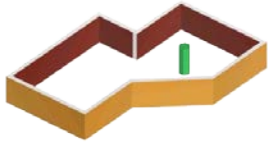


Building Elements

Walls, Openings, Doors
Roofs, Stairs, Ramps, etc.

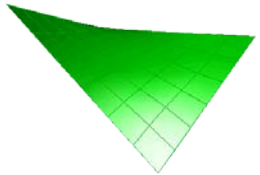
Relations between Building Elements

Wall Connections
Holes
Chases
Zones



Spaces and Spatial Structure

Space
Building Storey
Building
Building Site

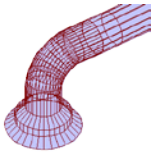


Site and Terrain Model

Site
Site attributes

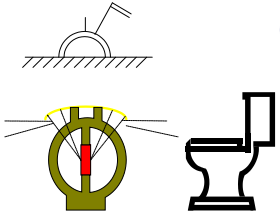
Source: buildingSMART, http://www.buildingsmart.org/

IFC2x3



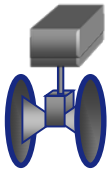
HVAC elements

ducting, piping
chillers, fans, etc
electrical comp.



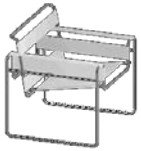
other building services

electrical elements
fire protection elements



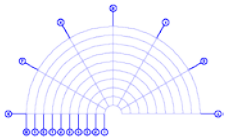
Controls, Instruments

building automation
sensor, actuator, controller,
gauge, meter, etc.



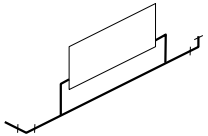
Furniture

furniture items
system furniture



Grid

linear, circular grids
positioning to grid



Systems

piping, ducting,
cable, structural

Lighting

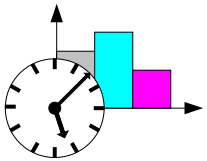
fittings,
rendering,
photo-accurate
lighting

Drafting

2D presentations in
model space,
dimensioning,
colors, texture
maps

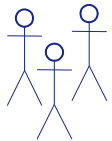
Source: buildingSMART, http://www.buildingsmart.org/

IFC2x3



Time Series

time related events
energy simulation

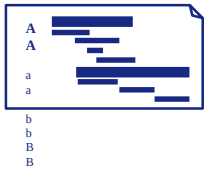


Actors

People
Organisations
Addresses

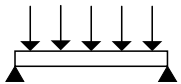
Constraints

rules, specifications,
requirements
trigger conditions



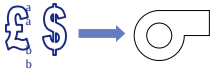
Work plans

schedules
resource allocation



Structural analysis:

structural members,
boundary conditions,
connections, loads, etc.

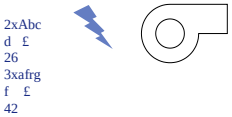


Costing

Cost of objects
Cost planning
Cost estimates

Structural Elements

members, profiles,
rebars, properties,
joints, features, surface



External Data

classification,
libraries,
documentation

Source: buildingSMART, http://www.buildingsmart.org/

IFC4 – buildingSMART data standard for tomorrow

IFC4 Documentation

Industry Foundation Classes Release 4 (IFC4) © buildingSMART International Ltd 1996-2013

Cover page	1. Scope	5. Core schemas	A. Computer interpretable listings	E. Examples
Contents	2. Normative references	6. Shared schemas	B. Alphabetical listings	F. Change logs
Foreword	3. Terms, definitions and abbreviated terms	7. Domain schemas	C. Inheritance listings	Bibliography
Introduction	4. Fundamental concepts and assumptions	8. Resource schemas	D. Diagrams	Index

The specification has been developed in 1999-2013 by the Model Support Group - MSG - of buildingSMART International Ltd.

Thomas Liebich - *MSG Leader*
Yoshinobu Adachi, James Forester, Juha Hyvarinen, Stefan Richter, Tim Chipman, Matthias Weise, Jeffrey Wix(†)

Comments, issues or any other feedback should be logged at the buildingSMART issue database

© buildingSMART 1996-2013 - This document is owned and copyrighted by buildingSMART International Limited
By using the IFC4 specification you agree to the following copyright notice

buildingSMART International home of openBIM

Major improvements – an extract – 2

Structural steel and timber

Definition of material profile association, Alignment at a cardinal point, anisotropic material properties

Structural analysis and detailing

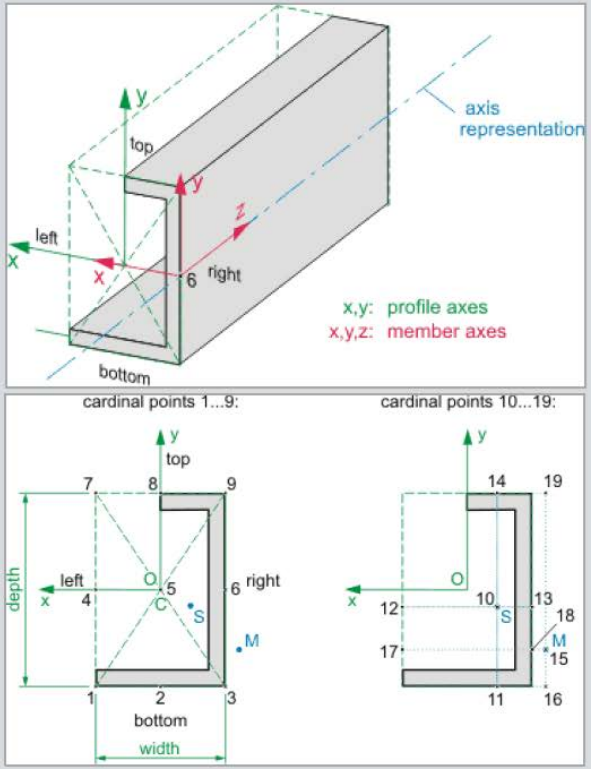
Enhancement of analysis model

Better support of detailing (simplified multiple placements, e.g. for fasteners, rebar)

Foundations enhanced by types

Standardized quantities for QTO

Definition of international base quantities, defined as separate XML schema + configuration files linked to IFC spec



Major improvements – an extract – 3

Energy and other performance analysis

Improvement of space boundaries, adding spatial zones and external spaces (against ground, water, air), shading devices

Environmental impact values

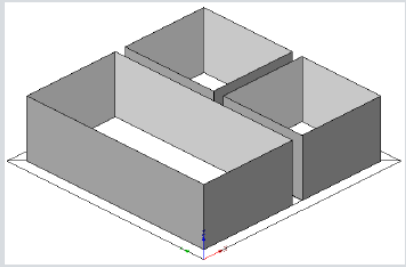
Adding environmental impact indicators and values to elements and element types

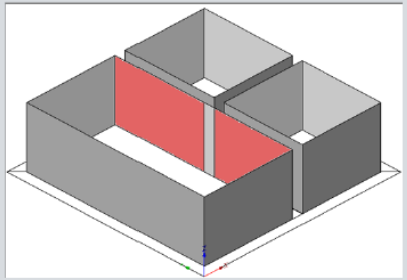
Site planning

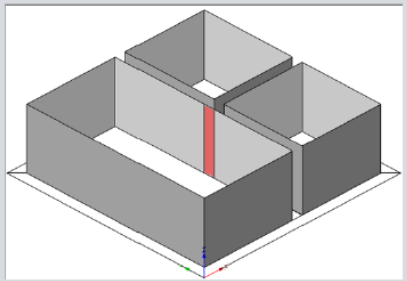
General geographic feature element enabling basic site planning and GIS connection

GIS coordinate system transformation

Enabling the mapping of a building design into a GIS system and vice versa







Major improvements – an extract – 4

Multi-lingual property sets

Property sets defined as separate XML schema + configuration files including aliases in different languages – linked to IFC spec

So far French and German, more to follow

Major efficiency improvement for 4D

Rework of the scheduling definitions, adding calendar support, switch to ISO 8601 time format, simplification of task relations. First prototypes show full support for MS Project and 75% decrease of model footprint

Major efficiency improvement for 5D

Similar rework for cost items and construction resources, now linked to schedule and BIM

Name	Definition
Reference • **de-DE**:Bemusterung • **fr-FR**:Reference	Reference ID for this specified type in this project (e.g. type 'A-1'). Used to store the non-classification driven internal project type. • **de-DE**:Identifikator der projektinternen Referenz für diesen Raum, z.B. nach der Raumklassifizierung des Bauherrn, wie "Büroraum Klasse 1" • **fr-FR**:Référence à l'identifiant d'un type spécifié dans le contexte de ce projet (exemple : "type A1"). A fournir s'il n'y a pas de référence à une classification en usage.
FloorCovering • **de-DE**:Bodenbelag • **fr-FR**:RevetementSol	Label to indicate the material or finish of the space flooring. The label is used for room book information and often displayed in room stamp. • **de-DE**:Angabe des Materials für den Bodenbelag. Diese Angabe wird im Raumbuch verwendet und oft im Raumstempel angezeigt. • **fr-FR**:Indication sur la nature du revêtement de sol.
WallCovering • **de-DE**:Wandbekleidung • **fr-FR**:RevetementMur	Label to indicate the material or finish of the space flooring. The label is used for room book information and often displayed in room stamp. • **de-DE**:Angabe des Materials für die Wandbekleidung, oder den Wandbelag Diese Angabe wird im Raumbuch verwendet und oft im Raumstempel angezeigt. • **fr-FR**:Indication sur la nature du revêtement de mur.

Major improvements – an extract – 5

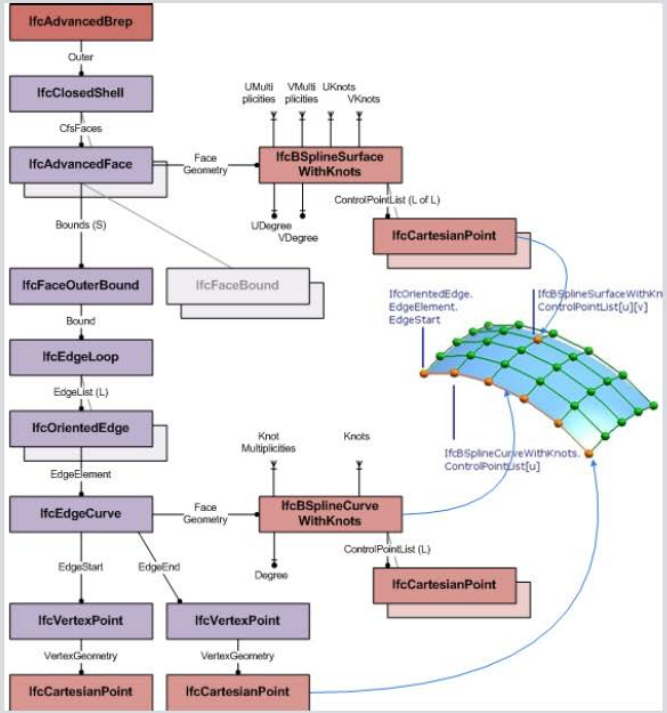
Enhancement of geometry resource

Adding support for NURBS, support for tapering in extrusions, and non-planar surfaces and surface bounds

Documentation improvement

Documentation, explanations and many examples are added to improve under-standing and readability of the spec

Makes IFC2x4 the most encompassing and complete open specification for BIM data formats



Information for a building element

KTH Architecture and the Built Environment

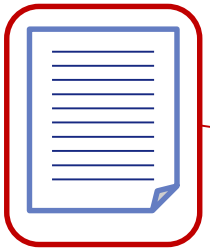
Identification

IfcWall: Basiswand:MW 17.5:98046
GUID: 3G_7N62zbD$BUYR_Q8WHA

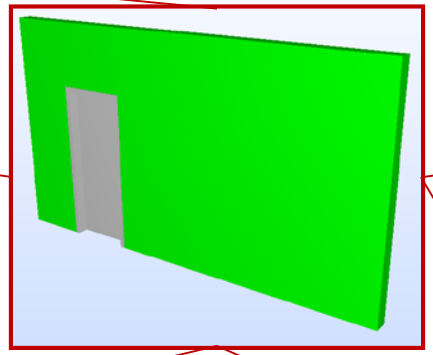
Locations

Identification | Location | Quantities | Profile | Relations | Classification

Property	Value
Building	Building.b1.1
Floor	Erdgeschoss
Top Elevation	2.80 m
Bottom Elevation	0 mm
Distance to Next Floor	3.00 m
Global Top Elevation	2.80 m
Global Bottom Elevation	0 mm
Global X	4.08 m
Global Y	6.29 m



Documents(link)



Properties

Identification | Location | Quantities | Profile | Relations | Classification
PSet_Revit_Type_Konstruktion | Pset_WallCommon

Property	Value
Reference	Basiswand:MW 17.5
ThermalTransmittance	2.28

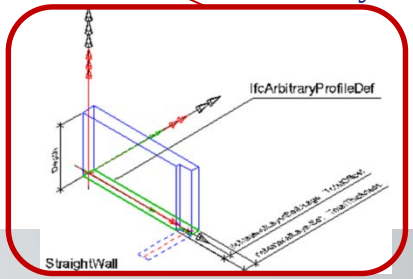
Relations

Wall.0.5

PSet_Revit_Type_Konstruktion | Pset_WallCommon
Hyperlinks | PSet_Revit_Abhängigkeiten | PSet_Revit_Bemaßungen
Identification | Location | Quantities | Profile | Relations | Classification

- Containment
  - Erdgeschoss
- Provides
  - Space Boundary.1
  - Space Boundary.44
  - Space Boundary.48
- Referencing
  - Space.0.2 : Wohnen[0.001]
  - Space.0.5 : Flur Eingang[0.003]
- Void
  - Opening.0.4

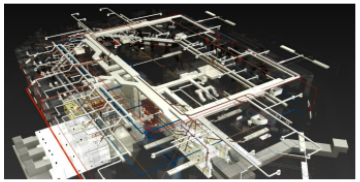
Geometry



IFC, http://www.buildingsmart.org/

IFC4 Add1 Release

Filed under: IFC Release, Specifications



IFC4 Addendum 1

Official landing page to publish the official IFC4 Addendum 1 release. it is a buildingSMART Final Standard.

Quick link for developer

- IFC4 Add1 Specification

IFC4 Addendum 1 Final

»access EXPRESS file«					»online access to HTML documentation«
»access XSD file«					»download of HTML documentation (90MB)«

What is new in IFC4 Addendum 1 ?

The main purposes of the IFC4 Addendum 1 are the improvement of the specification documentation and the necessary enhancements of the schema that resulted from the pilot implementations and the first Model View definitions. All changes made are downward compatible.

- The documentation format has been further improved for readability. A language independent section to describe the entities and types with their attributes and relationships is now available and separate to the EXPRESS and XSD code;
- The use of concept templates (chapter 4) and concepts is greatly enhanced, based on the mvdXML specification to enable better MVD developments and validation;
- Minor schema enhancements reflect the experience from pilot implementations of the IFC4 enhancements;
- One additional schema enhancement has been added after intensive discussions and considerations, a simplified and far more compact definition of poly lines with arc segments
  - See the following »summary« of the rationale behind adding this additional geometry definition
- An overview of all changes is provided »here«
- A detailed listing of all issues resolved for the beta release is shown »here«

IFC4 Add 1 for MVD development

- the first official Model View Definition for IFC4 will be based on the Addendum 1. Therefore all upcoming buildingSMART International IFC Certification are based on IFC4 Addendum 1.
- see IFC4 Reference View and IFC4 Design Transfer View as the first two bSI

IFC4 Add 1 under ISO16739

- it is planned to create a new work item for a first Amendment of

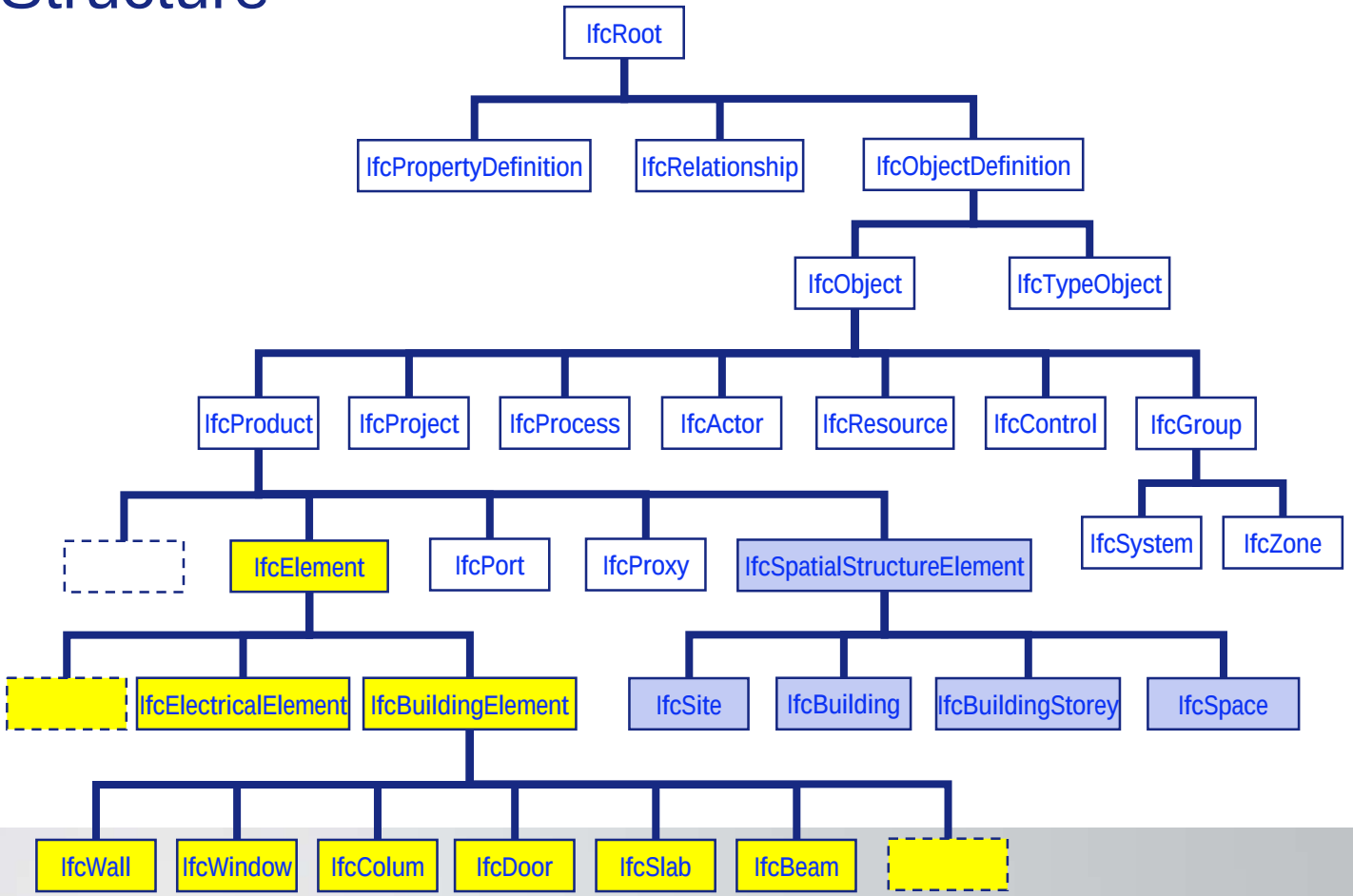
Specifications
- IFC Overview
- IFC Releases
  - IFC4 Add2 Release
  - **IFC4 Add1 Release**
  - IFC4 Release
  - IFC2x3 TC1 Release
  - IFC2x3 Release
  - IFC2x2 Release
  - IFC2x Release
- ifcXML Overview
- mvdXML Overview
- MVD Releases
- Pset Releases
- BCF Releases
- Related Specifications
- Specification tools

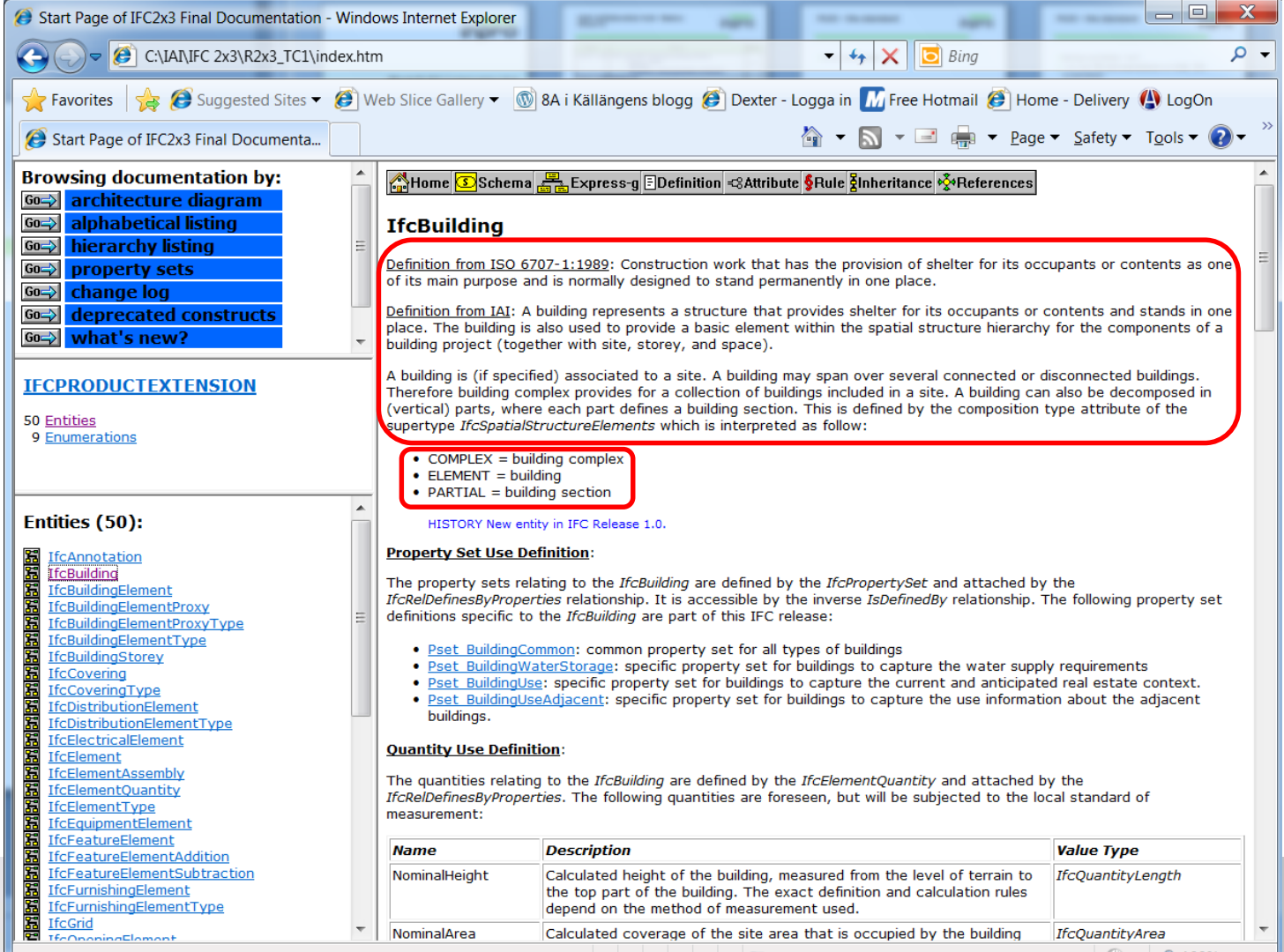
Search
Search Site
Search
Advanced Search...

News
IFC4 Add2 published
Jul 15, 2016
More news...

KTH VETENSKAP OCH KONST
KTH Architecture and the Built Environment

IFC Structure




Start Page of IFC2x3 Final Documentation - Windows Internet Explorer
C:\IAI\IFC 2x3\R2x3_TC1\index.htm
Bing
Favorites
Suggested Sites
Web Slice Gallery
8A i Källängens blogg
Dexter - Logga in
Free Hotmail
Home - Delivery
LogOn
Start Page of IFC2x3 Final Documenta...
Page
Safety
Tools
Browsing documentation by:
Go architecture diagram
Go alphabetical listing
Go hierarchy listing
Go property sets
Go change log
Go deprecated constructs
Go what's new?
IFCPRODUCTEXTENSION
50 Entities
9 Enumerations
Entities (50):
IfcAnnotation
IfcBuilding
IfcBuildingElement
IfcBuildingElementProxy
IfcBuildingElementProxyType
IfcBuildingElementType
IfcBuildingStorey
IfcCovering
IfcCoveringType
IfcDistributionElement
IfcDistributionElementType
IfcElectricalElement
IfcElement
IfcElementAssembly
IfcElementQuantity
IfcElementType
IfcEquipmentElement
IfcFeatureElement
IfcFeatureElementAddition
IfcFeatureElementSubtraction
IfcFurnishingElement
IfcFurnishingElementType
IfcGrid
Home
Schema
Express-g
Definition
Attribute
Rule
Inheritance
References
IfcBuilding
Definition from ISO 6707-1:1989: Construction work that has the provision of shelter for its occupants or contents as one of its main purpose and is normally designed to stand permanently in one place.
Definition from IAI: A building represents a structure that provides shelter for its occupants or contents and stands in one place. The building is also used to provide a basic element within the spatial structure hierarchy for the components of a building project (together with site, storey, and space).
A building is (if specified) associated to a site. A building may span over several connected or disconnected buildings. Therefore building complex provides for a collection of buildings included in a site. A building can also be decomposed in (vertical) parts, where each part defines a building section. This is defined by the composition type attribute of the supertype IfcSpatialStructureElements which is interpreted as follow:
COMPLEX = building complex
ELEMENT = building
PARTIAL = building section
HISTORY New entity in IFC Release 1.0.
Property Set Use Definition:
The property sets relating to the IfcBuilding are defined by the IfcPropertySet and attached by the IfcRelDefinesByProperties relationship. It is accessible by the inverse IsDefinedBy relationship. The following property set definitions specific to the IfcBuilding are part of this IFC release:
Pset_BuildingCommon: common property set for all types of buildings
Pset_BuildingWaterStorage: specific property set for buildings to capture the water supply requirements
Pset_BuildingUse: specific property set for buildings to capture the current and anticipated real estate context.
Pset_BuildingUseAdjacent: specific property set for buildings to capture the use information about the adjacent buildings.
Quantity Use Definition:
The quantities relating to the IfcBuilding are defined by the IfcElementQuantity and attached by the IfcRelDefinesByProperties. The following quantities are foreseen, but will be subjected to the local standard of measurement:
Name
Description
Value Type
NominalHeight
Calculated height of the building, measured from the level of terrain to the top part of the building. The exact definition and calculation rules depend on the method of measurement used.
IfcQuantityLength
NominalArea
Calculated coverage of the site area that is occupied by the building
IfcQuantityArea

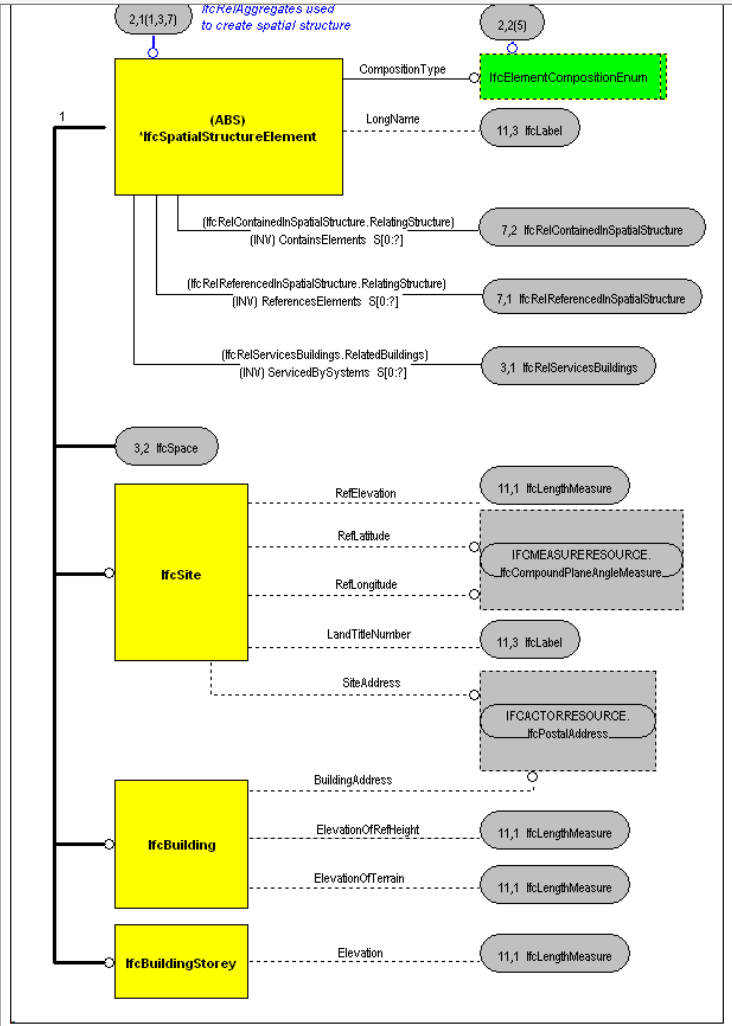
Browsing documentation by:

- Go ⇨ architecture diagram
- Go ⇨ alphabetical listing
- Go ⇨ hierarchy listing
- Go ⇨ property sets
- Go ⇨ change log
- Go ⇨ deprecated constructs

Alphabetical index

- Defined Types
- Enumerations
- Select Types
- Entities

IfcAxis2Placement3D
IfcBSplineCurve
IfcBeam
IfcBeamType
IfcBezierCurve
IfcBlobTexture
IfcBlock
IfcBoilerType
IfcBooleanClippingResult
IfcBooleanResult
IfcBoundaryCondition
IfcBoundaryEdgeCondition
IfcBoundaryFaceCondition
IfcBoundaryNodeCondition
IfcBoundaryNodeConditionW
IfcBoundedCurve
IfcBoundedSurface
IfcBoundingBox
IfcBoxedHalfSpace
IfcBuilding
IfcBuildingElement
IfcBuildingElementComponer
IfcBuildingElementPart
IfcBuildingElementProxy
IfcBuildingElementProxyType



KTH Architecture and the Built Environment

Geometry - example

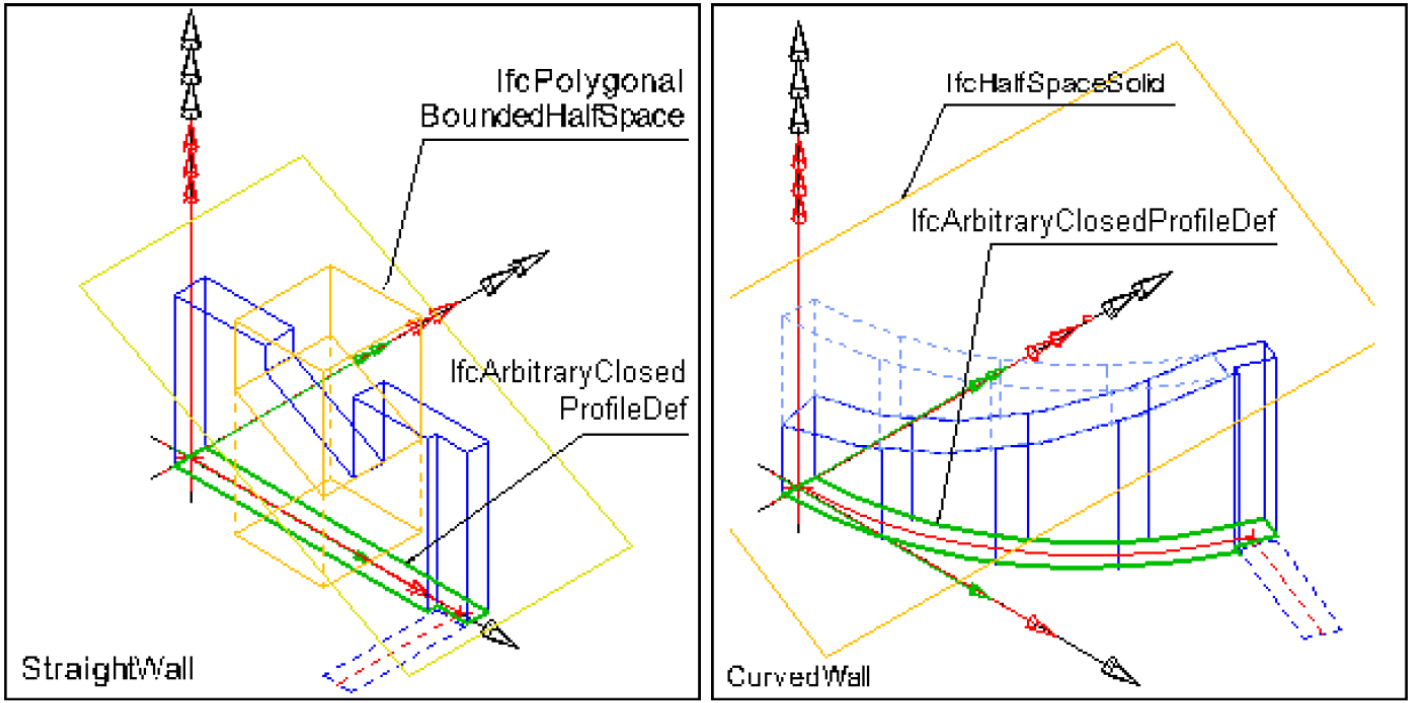
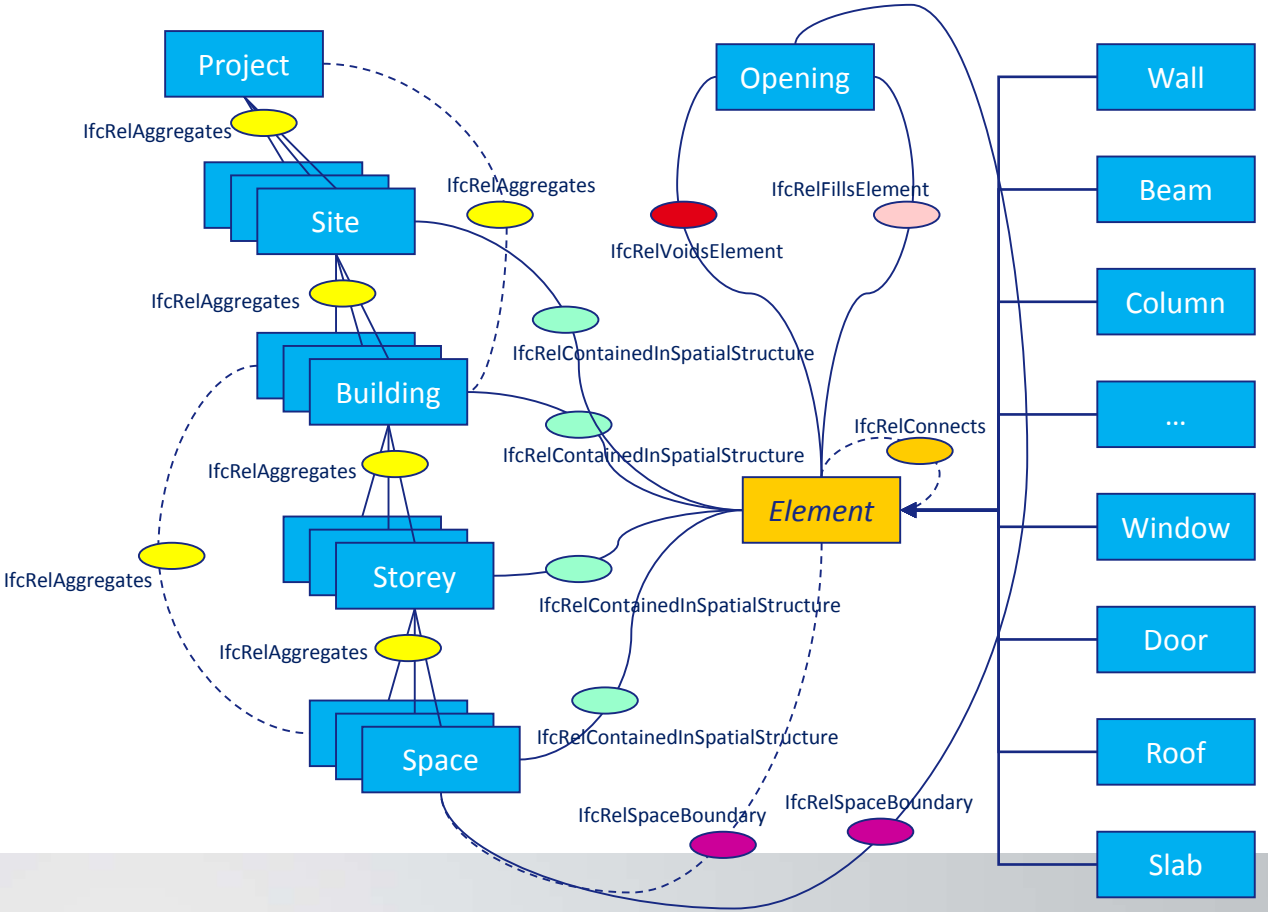
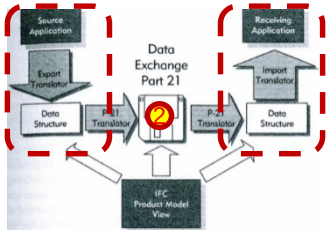


Figure 27 : Example of bounded and unbounded clipping planes

Typical IFC data exchange file structure



Export the IFC file



KTH Architecture and the Built Environment

IFCExample1-2IFCExport.ifc - Notepad

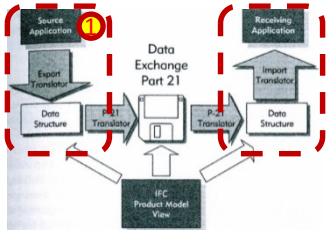
File Edit Format View Help

```
ISO-10303-21;
HEADER;
FILE_DESCRIPTION(('ViewDefinition [CoordinationView, QuantityTakeOffAddOnView]','Option [Filter:
VisibleElements]'),'2;1');
FILE_NAME('C:\\Users\\NenadB\\Documents\\CGI\\Projekti\\CITA\\CAD\\IFCExample1-2IFCExport.ifc','2010-
05-17T11:44:37',('Architect'),('Building Designer Office'),'PreProc - EDM 5.0','ArchiCAD 13.00 Release
1. Windows Build Number of the Ifc 2x3 Interface: 64125 (21-07-2009)\X\0A','The authorising person');
FILE_SCHEMA(('IFC2X3'));
ENDSEC;

DATA;
#1= IFCORGANIZATION('GS','Graphisoft','Graphisoft',$,$);
#5= IFCAPPLICATION(#1,'13.0','ArchiCAD 13.0','ArchiCAD');
#6= IFCPERSON('','','',$,$,$,$,$);
#8= IFCORGANIZATION('','','',$,$);
#12= IFCPERSONANDORGANIZATION(#6,#8,$);
#13= IFCOWNERHISTORY(#12,#5,$,.ADDED.,$,$,$,1274089476);
#14= IFCSIUNIT(*,.LENGTHUNIT.,.MILLI.,.METRE.);
#15= IFCSIUNIT(*,.AREAUNIT.,$,.SQUARE_METRE.);
#16= IFCSIUNIT(*,.VOLUMEUNIT.,$,.CUBIC_METRE.);
#17= IFCSIUNIT(*,.PLANEANGLEUNIT.,$,.RADIAN.);
#18= IFCMEASUREWITHUNIT(IFCPLANEANGLEMEASURE(0.017453293),#17);
#19= IFCDIMENSIONALEXPONENTS(0,0,0,0,0,0,0);
#20= IFCCONVERSIONBASEDUNIT(#19,.PLANEANGLEUNIT.,'DEGREE',#18);
#21= IFCSIUNIT(*,.SOLIDANGLEUNIT.,$,.STERADIAN.);
#22= IFCSIUNIT(*,.MASSUNIT.,$,.GRAM.);
#23= IFCSIUNIT(*,.TIMEUNIT.,$,.SECOND.);
#24= IFCSIUNIT(*,.THERMODYNAMICTEMPERATUREUNIT.,$,.DEGREE_CELSIUS.);
#25= IFCSIUNIT(*,.LUMINOUSINTENSITYUNIT.,$,.LUMEN.);
#26= IFCUNITASSIGNMENT((#14,#15,#16,#20,#21,#22,#23,#24,#25));
#28= IFCDIRECTION((1.,0.,0.));
#32= IFCDIRECTION((0.,1.,0.));
#36= IFCDIRECTION((0.,0.,1.));
#40= IFCCARTESIANPOINT((0.,0.,0.));
#44= IFCAXIS2PLACEMENT3D(#40,#36,#28);
#47= IFCDIRECTION((6.1232340E-17,1.));
#51= IFCGEOMETRICREPRESENTATIONCONTEXT('Plan','Design',3,1.0000000E-5,#44,#47);
#54= IFCPROJECT('2HT2nJiIT08A2IhpvNb9sW',#13,'D                                    206),#26);
#61= IFCPROPERTYSET('03FnQt2TbALgDt6WbsDs1Z',#1
#66= IFCPROPERTYSINGLEVALUE('GS_TimeStamp',$,IF
#70= IFCRELDEFINESBYPROPERTIES('05l5OWhdr02gf1B
#72= IFCLOCALPLACEMENT($,#44);
#75= IFCSITE('25j2mdBRTOsPjnZ3xTMA6H',#13,'Defau                                  ,28,0),(54,25,0),$,
$,$);
#85= IFCLOCALPLACEMENT(#72,#44);
#88= IFCBUILDING('3m1fgA4Hn6IQ_7595zbBLn',#13,'                                   ENT.,$,$,$);
#98= IFCAXIS2PLACEMENT3D(#40,#36,#28);
#101= IFCLOCALPLACEMENT(#85,#98);
#104= IFCBUILDINGSTOREY('3R_UY84BP0XgG_TENPVnYW                                   01-0000-0000-0000-
000000000000',.ELEMENT.,0.);
#114= IFCMATERIAL('Masonry Block');
#117= IFCDIRECTION((6.1232340E-17,1.));
#121= IFCGEOMETRICREPRESENTATIONCONTEXT('Plan','Plan',3,1.0000000E-5,#44,#117);
```

Starting Solibri Model Viewer

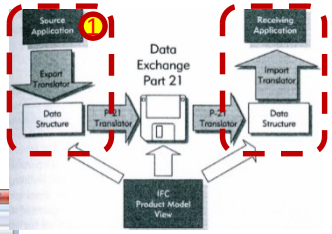
Changing the IFC information



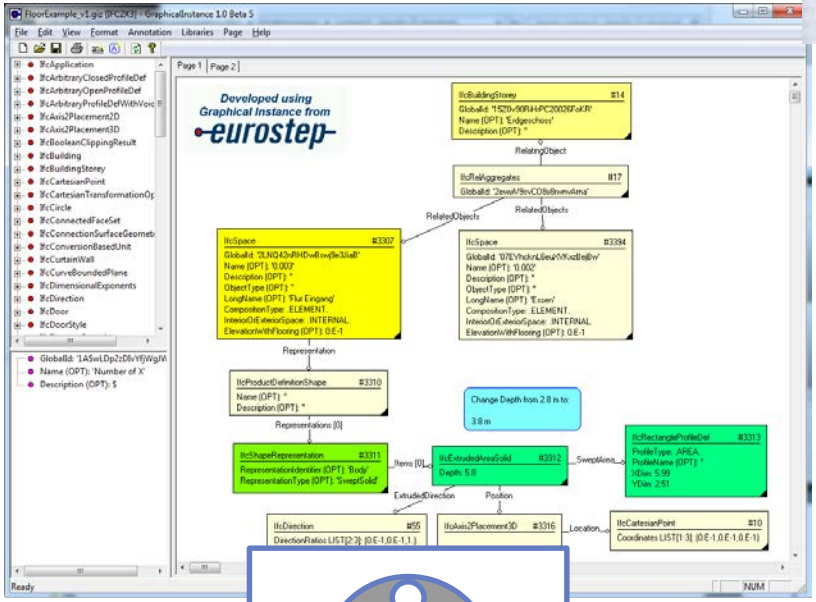
KTH Architecture and the Built Environment

- You can create and change the building objects in an authoring tool, like a CAD-system
- You can do it in other tools too, like Graphical Instance – you only need to know the standard, i.e. IFC
- In Graphical Instance you can access the IFC file, modify it and export a new version

Changing the IFC information

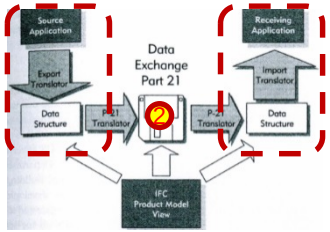


KTH Architecture and the Built Environment

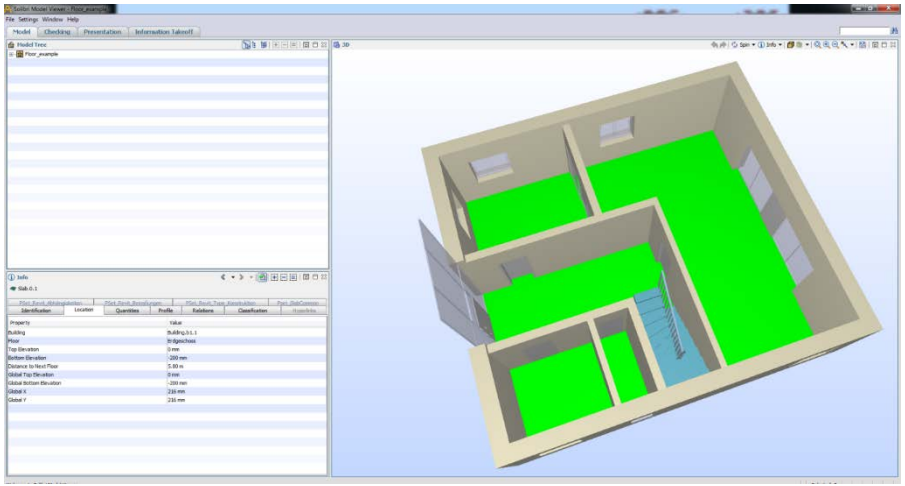


Starting Graphical Instance

Export the IFC file



KTH Architecture and the Built Environment

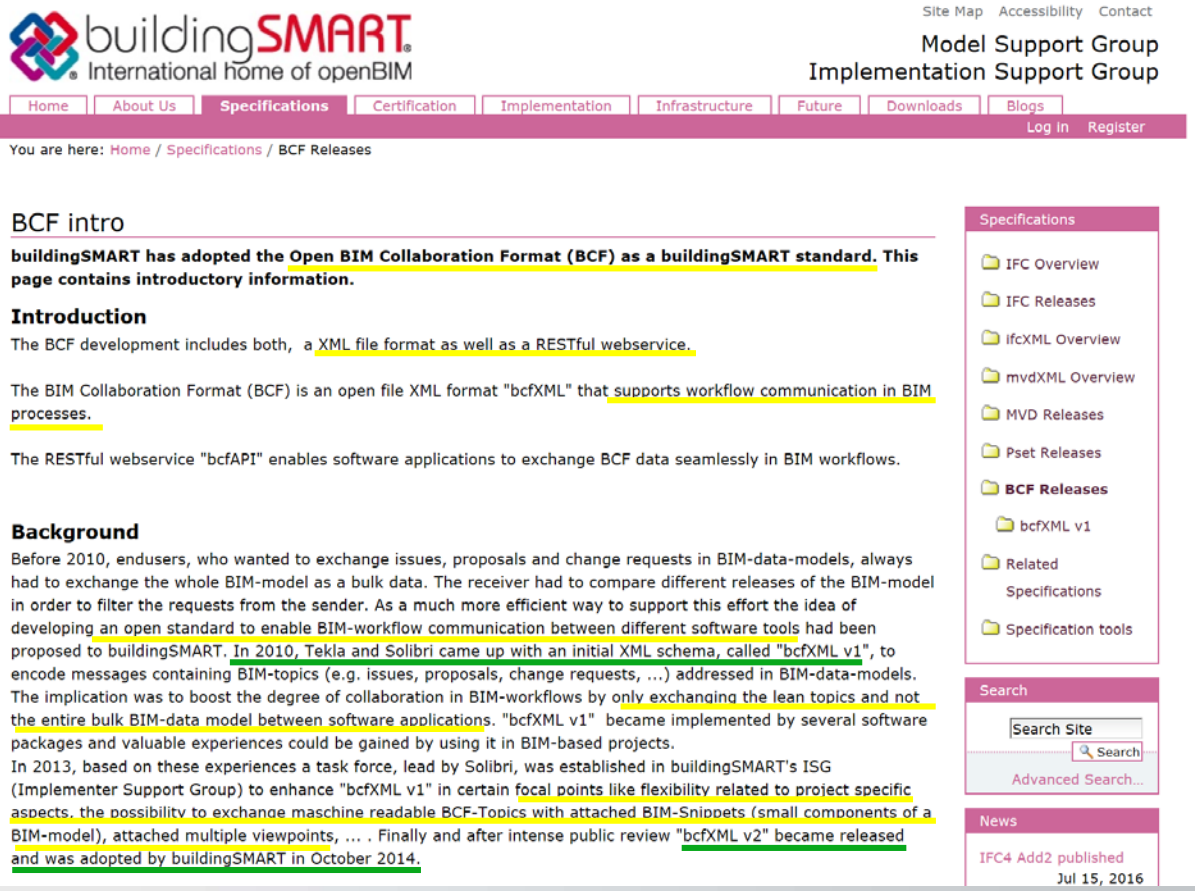


file

BIM Collaboration Format

KTH Architecture and the Built Environment

buildingSMART-standard BCF



buildingSMART International home of openBIM

Site Map Accessibility Contact

Model Support Group
Implementation Support Group

Home | About Us | Specifications | Certification | Implementation | Infrastructure | Future | Downloads | Blogs

Log in Register

You are here: Home / Specifications / BCF Releases

BCF intro

buildingSMART has adopted the Open BIM Collaboration Format (BCF) as a buildingSMART standard. This page contains introductory information.

Introduction

The BCF development includes both, a XML file format as well as a RESTful webservice.

The BIM Collaboration Format (BCF) is an open file XML format "bcfXML" that supports workflow communication in BIM processes.

The RESTful webservice "bcfAPI" enables software applications to exchange BCF data seamlessly in BIM workflows.

Background

Before 2010, endusers, who wanted to exchange issues, proposals and change requests in BIM-data-models, always had to exchange the whole BIM-model as a bulk data. The receiver had to compare different releases of the BIM-model in order to filter the requests from the sender. As a much more efficient way to support this effort the idea of developing an open standard to enable BIM-workflow communication between different software tools had been proposed to buildingSMART. In 2010, Tekla and Solibri came up with an initial XML schema, called "bcfXML v1", to encode messages containing BIM-topics (e.g. issues, proposals, change requests, ...) addressed in BIM-data-models. The implication was to boost the degree of collaboration in BIM-workflows by only exchanging the lean topics and not the entire bulk BIM-data model between software applications. "bcfXML v1" became implemented by several software packages and valuable experiences could be gained by using it in BIM-based projects.
In 2013, based on these experiences a task force, lead by Solibri, was established in buildingSMART's ISG (Implementer Support Group) to enhance "bcfXML v1" in certain focal points like flexibility related to project specific aspects, the possibility to exchange maschine readable BCF-Topics with attached BIM-Snippets (small components of a BIM-model), attached multiple viewpoints, ... Finally and after intense public review "bcfXML v2" became released and was adopted by buildingSMART in October 2014.

Specifications

- IFC Overview
- IFC Releases
- IfcXML Overview
- mvdXML Overview
- MVD Releases
- Pset Releases
- **BCF Releases**
  - bcfXML v1
- Related Specifications
- Specification tools

Search

Search Site

Search

Advanced Search...

News

IFC4 Add2 published
Jul 15, 2016

buildingSMART-standard BCF

KTH Architecture and the Built Environment

In 2014, as a second major objective of the BCF-task force, the BCF-webservice "bcfAPI" was introduced by iabi (Institute of applied Building Informatics). The idea behind this is to exchange BCF-Topics not only manually or by e-mail attachments via bcfXML-files, but seamlessly and automated via a standardized RESTful API "bcfAPI".

Released in March 2017, "bcfXML v2.1" and "bcfAPI v2.1" are the newest versions adopted by buildingSMART. BCF v2.0, which has a strong focus on maintaining backwards compatibility with the first version of BCF, did have some leftover elements present that were necessary for compliance with BCF v1.0 but did not fit right into the new standard. These also caused occasionally confusion with implementers and users. Such elements where removed or replaced in v2.1.

- The BCF XML and BCF APIs version numbers were harmonized.
- Implementer agreements on the viewpoints have been defined so that every viewer represents the viewpoint as closely to how the originating application created it as possible. An overhaul of the geometric components data structure is much more storage efficient regarding real life exchange scenarios.
- Instead of using a customized authentication process for the BCF API, industry standards were referenced and therefore should greatly reduce implementation efforts both for server and client developers.
- Resource authorization is now part of the API so that servers can clearly communicate which data a user has access to and which operations the user is permitted.
- Historical records to audit changes throughout a project have now been incorporated in the BCF API.

Links

bcfXML v2.1 GitHub
bcfAPI v2.1 GitHub

More news...

IFC Dev Blog

IFC4 Add2 published
Jul 15, 2016

More...

Registration

This site contains content which is only available to registered users. To get access to the content, you must be a registered user. Please log in or register if not already a member.

This site is the © 2008-2017 of **buildingSMART International Ltd.**
For **Terms and Conditions** associated with use of this web site please refer to the **Legal** notice.
buildingSMART ® and the buildingSMART logo are registered trademarks of buildingSMART International Ltd.

aconex | Five Star | Majestic — Mrs Patricia O'Leary | Logout

Tasks | BIM | Documents | Mail | Tenders | Workflows | Supplier Documents | Directory | Reports

Air Handling Unit too close t…

Error — Open

Please move the AHU with enough clearance from the door

Snapshot | Viewpoint

Linked models Structural, HVAC

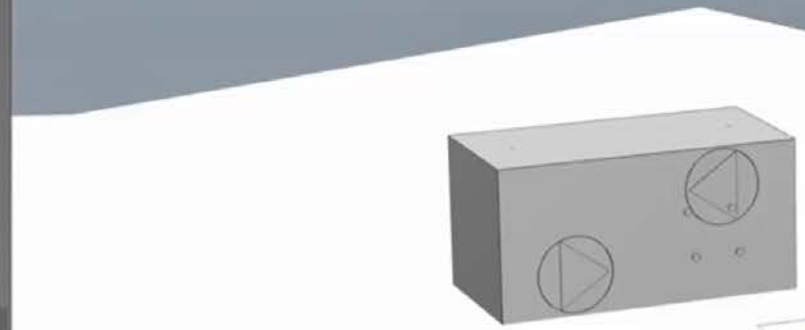
Assigned to ---

Show more

Replies: 0

Selected models: 2

BCF-exempel 2 min



BCF XML is a file format

markup.bcf

```
<?xml version="1.0" encoding="utf-8"?>
<Markup xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <Header>
    <File />
  </Header>
  <Topic Guid="ca545396-a7cc-4b5e-b4c2-363d8e2b7d7a" TopicType="Error">
    <ReferenceLink />
    <Title>Wrong material</Title>
    <BimSnippet SnippetType=".pdf" isExternal="true">
        <Reference>https://example.com/MaterialRequirements.pdf</Reference>
    </BimSnippet>
  </Topic>
  <Comment Guid="0618d78f-f49f-4639-933b-eb6602ce79fa">
    <VerbalStatus>Error</VerbalStatus>
    <Status>Error</Status>
    <Date>2015-01-24T14:47:00.3693677+01:00</Date>
    <Author>dangl@iabi.eu</Author>
    <Comment>Exterior walls should be concrete, see material
    Requiremenets.</Comment>
    <Topic Guid="ca545396-a7cc-4b5e-b4c2-363d8e2b7d7a" />
  </Comment>
</Markup>
</xml>
```

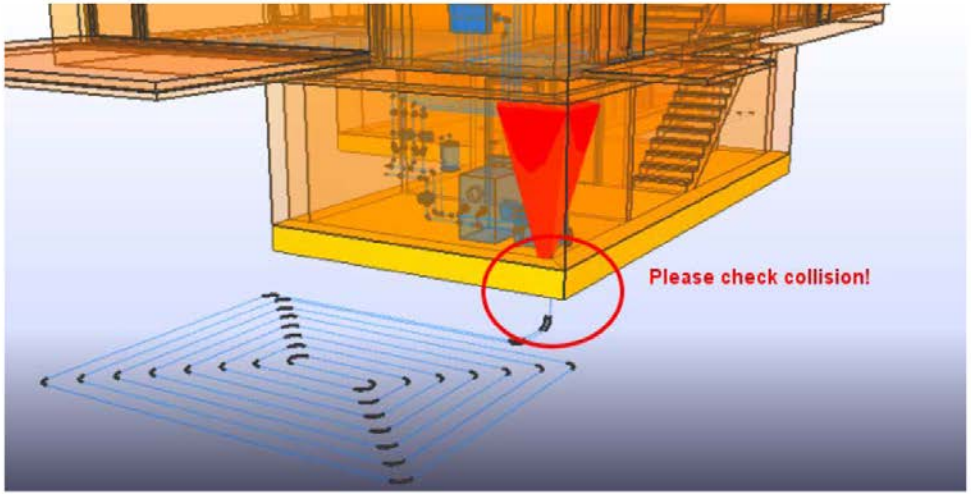
XML files describing issues, references and communication…

viewpoint.bcfv

```
<?xml version="1.0" encoding="UTF-8"?>
<VisualizationInfo>
    <Components>
        <Component IfcGuid="2Azo4miOD9B84By1NOJja5">
        </Component>
        <Component IfcGuid="32ZOkEuDcJGuqA2F89i1d7" Selected="true">
        </Component>
        <Component IfcGuid="3ldrnWN0wgHhTsiefHtKPp">
        </Component>
        <Component IfcGuid="3w1MgpXIT6U8u4qlxKu2sF" Selected="true">
        </Component>
    </Components>
    <PerspectiveCamera>
        <CameraViewPoint>
            <X>15.80562710392240</X>
            <Y>4.19635611453430</Y>
            <Z>7.90620706183190</Z>
        </CameraViewPoint>
        <CameraDirection>
            <X>0.43339237177743</X>
            <Y>0.40764911231111</Y>
            <Z>-0.80373705483641</Z>
        </CameraDirection>
        <CameraUpVector>
            <X>0.58544956094423</X>
            <Y>0.55067419124860</Y>
            <Z>0.59498466088035</Z>
        </CameraUpVector>
        <FieldOfView>65.00000000000000</FieldOfView>
    </PerspectiveCamera>
</VisualizationInfo>
```

KTH Architecture and the Built Environment

BCF XML is a file format



… thumbnails to describe a problem,
viewports like camera positioning and IfcEntity highlighting.

BIM Collaboration Format
BCF is...

https://github.com/BuildingSMART/BCF

BCF XML

A ZIP-container with BCF-Data represented as aphysical file format

https://github.com/BuildingSMART/BCF-API

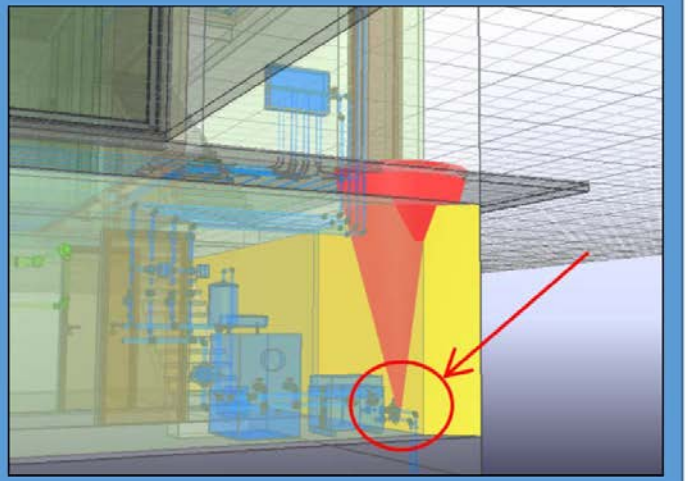
BCF API

A webservice supporting the direct exchange of BCF-data between applications

BCF REST API via HTTP

BCF Workflow example – User view

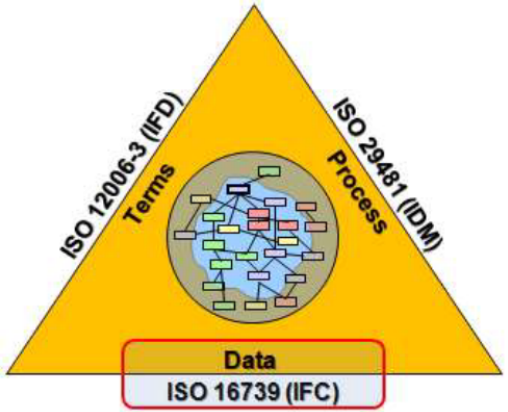
Author	john@doe-construction.com
Date	Friday, March 13th, 2015
Title	Clash in HVAC installation
Priority	High
Message	Dear partners, I noticed a clash in the HVAC installation. Please see the thumbnail for a simple sketch. Geometric information is included in the Viewpoint. Fix ASAP. I'm attaching the clashing entities.
BIM Snippet	Problem.simpleIfcXML



IDM och MVD

KTH Architecture and the Built Environment

IFC•IDM•MVD



IDM (Information Delivery Manual):

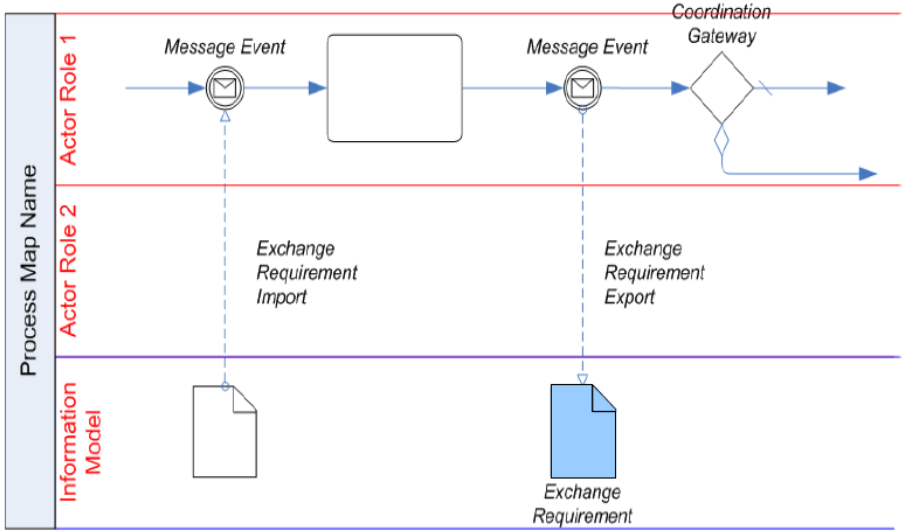
The ISO 29481-1:2010 "Building information modelling - Information delivery manual - Part 1: Methodology and format" standard has been developed by buildingSMART in order to have a methodology to capture and specify processes and information flow during the lifecycle of a facility.

MVD (Model View Definition):

An IFC View Definition, or **Model View Definition**, **MVD**, defines a subset of the IFC schema, that is needed to satisfy one or many **Exchange Requirements** of the AEC industry. The method used and propagated by buildingSMART to define such Exchange Requirements is the **Information Delivery Manual**, IDM (also ISO 29481).

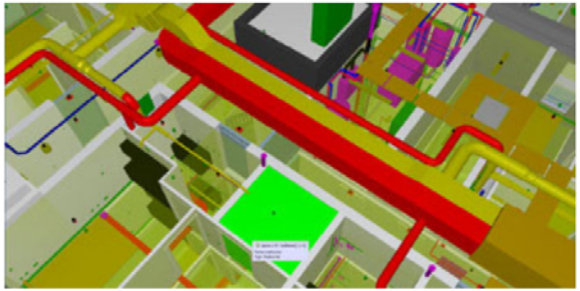
From: http://www.buildingsmart-tech.org/

Showing an Exchange Requirement



An 'Exchange Requirement' is always shown in a process map as a data object within the Information Model swimlane.

Model View Definition Summary



Model View Definitions

Official buildingSMART Model View definitions, MVD's, are published here.

Quick links for developers:

- IFC2x3 Coordination View V2.0
- IFC4 Reference View 1.0
- IFC4 Design Transfer View 1.0

buildingSMART Model View Definitions

An IFC View Definition, or **Model View Definition**, **MVD**, defines a subset of the IFC schema, that is needed to satisfy one or many **Exchange Requirements** of the AEC industry. The method used and propagated by buildingSMART to define such Exchange Requirements is the **Information Delivery Manual**, IDM (also ISO 29481).

The official Model View Definitions are published by buildingSMART using the neutral mvdXML format, the mvdXML delivery is integrated into the documentation package of the MVD accessible through this website. buildingSMART has develeoped the software tool ifcDoc for defining and documenting MVD's.

Specifications

- IFC Overview
- IFC Releases
- ifcXML Overview
- mvdXML Overview
- **MVD Releases**
  - IFC4 Reference View
  - IFC4 Design Transfer View
  - IFC2x3 Coord. View Version 2.0
  - Space boundary Addon View
  - Basic FM

official Model View Definitions developed by buildingSMART

The following Model View Definitions are currently developed and are available as official buildingSMART Model View Definition:

Model View Definitions for IFC4

The two successors of the IFC2x3 Coordination View V2.0 designed for IFC4 are buildingSMART final standards.

- the **IFC4 Reference View**
- the **IFC4 Design Transfer View**

The main difference of mvdXML-based definitions of IFC4 MVD's to earlier publications of MVD's in general is the publication as:

- a full documentation and schema definition subset for human reference (so no need to look into different documentations to find MVD relevant information)
- a computer readable publication as mvdXML and as EXPRESS & XSD sub schemas (so MVD's can be parsed, filtered and later validated)

Model View Definitions for IFC2x3

These are the MVD's that are currently in place and supported by software tools.

- the **IFC2x3 Coordination View Version 2.0** (available - supersedes IFC2x3 Coordination View) (currently in process of finalization and providing the basis for IFC2x3 Coordination View Certifications from 2010 onwards)

  The IFC2x3 Coordination View Version 2.0 can be extended by the following add-on model view definitions. An add-on view extends a base MVD by some small concepts that need to supported in addition to support additional exchange requirements. The currently defined add-on views include:

  - the Quantity Take-off add-on view - it adds the ability to transmit base quantities for all spatial, building, building service and structural elements.
  - the Space boundary add-on view - it supports the use case of using BIM in thermal and energy analysis by adding building element to space relationships.
  - the 2D Annotation add-on view - it supports the exchange of additional 2D element representations and annotations of building models

KTH Architecture and the Built Environment

Model View Definitions developed outside of buildingSMART International

Several other Model View Definitions are currently under development by organizations or development teams outside of buildingSMART International. They may be submitted to and accepted by buildingSMART International to become official buildingSMART International MVD's at a later point. Once accepted, those MVD's will be published here.

MVD development resources

buildingSMART International develops the ifcDoc tool to streamline the IFC and MVD development process. See MVD overview about news and how to download or join the development program.

The official buildingSMART software certification center, http://gtds.buildingsmart.com, also has the capability to create MVD documentation, link it to the certification test cases and rule checking and to export the mvdXML definitions.

Purpose of the IFC4 Reference View

The main purpose of the IFC4 Reference View is to define a standardized subset of the IFC4 schema, a Model View Definition MVD, that is particularly suitable for all BIM work flows that are based on reference models, where the exchange is mainly one-directional. Here requested modifications of the BIM data, mainly of the shape representation, are handled by a change request to the original author, and changes not executed upon the imported IFC data to be sent back to the original source.

Examples of this reference workflow are:

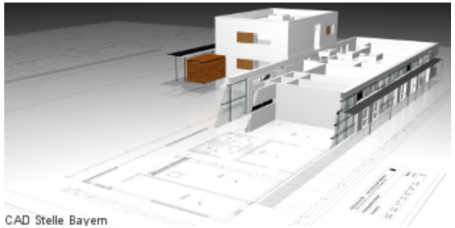
- Coordination planning (combining different discipline specific IFC models for visual checking)
- Clash detection (finding clashes between different discipline specific IFC models)
- Background reference (loading an IFC model, usually from a different discipline) as a linked model
- Quantity take-off (determine the quantities of the various model elements with the IFC model)
- Construction sequencing (taking the IFC model and associating it to a construction schedule)
- Visual presentation (for presenting the IFC model to a broad audience)

Common characteristics of the workflow using reference models are:

- The source of the BIM information remains with the originator
- The full parametric behaviour, and thereby the intellectual engineering property, remains with the originator
- The ownership of the model, and responsibility for its correctness, remains with the originator
- The original model is published as IFC4 Reference View model reflecting the as-is status
- The receiver of the IFC4 Reference View model has access to the full model content
- The receiver of the IFC4 Reference View is not supposed to modify the model
- The receiver of the IFC4 Reference View can analyse and extract the information of the model
- If the receiver demands a change, it has to be communicated as a change request to the originator
- The buildingSMART standard BCF is developed to efficiently support these change requests.

The Level of Detail of the shape representation and the Level of Information for the property content of the actual reference models depends on the source model. The buildingSMART standard IDM (Information Delivery Manual) can be used to determine the minimum content for a particular workflow support. The IFC4 Reference View allows rich content to be published, see next chapter Objective for more details.

IFC4 RV Objective



CAD Stelle Bayern

IFC4 Reference View

The IFC4 Reference View targets all work flows that are based on reference models. Read more:

- Objective
- Workflow support
- Compatibility concern

Objective of the IFC4 Reference View

The main objective of the IFC Reference View is the widest possible proliferation of IFC BIM data across a big range of software application types supporting different communication and collaboration workflows.

The IFC Reference View is characterized by the ability to publish BIM data following that subset of IFC definitions that enables semantically rish content of building data, and to some degree also other built environment data, to be exchanges with a streamlined geometric representation that is optimized for analysis and display, but excludes dimension-driven geometric parameters. The geometric representation is therefore suitable for all workflow scenarios, where the imported IFC model is displayed, analysed, compared, clashed, but not parametricly modified for futher work processes.

Semantic building data models being exchanged using the IFC4 Reference View would typically include:

- physical elements with explicit geometry, properties, quantities, material, and classification
- types of elements with associated physical elements to group common definitions (geometry, properties, material, and classification)
- spatial elements (spaces, zones) with explicit geometry, properties, quantities, and classification
- spatial structure elements (site, building, story), but also spatial zones for non-vertical construction
- element breakdown structure between physical elements (assemblies, sub-assemblies, parts)
- spatial breakdown structure between spatial elements (spatial decomposition of building, story or zones)
- spatial containment structure between spatial elements and physical elements (elements in spatial zone)
- logical system structure and assignment (physical elements assigned to systems and sub systems)
- topological structure of system networks (element to port, and port to port, relationship)
- common context of the building model, providing units, coordinate system and GIS positions
- general object identification using globally unique identifier

Additional capabilities for enriching the semantic information exposed by the IFC4 Reference View can be defined as an Add-on Model View Definition. Forseeable examples are capturing 4D models with the addition of the work schedule related entities, or 5D models with the addition of construction resource related entities.

KTH Architecture and the Built Environment

© 1996-2015 buildingSMART International Ltd.

Cover page
Contents
Foreword
Introduction

1. Scope
2. Normative references
3. Terms, definitions, and abbreviated terms
4. Fundamental concepts and assumptions

5. Core data schemas
6. Shared element data schemas
7. Domain specific data schemas
8. Resource definition data schemas

A. Computer interpretable listings
B. Alphabetical listings
C. Inheritance listings
D. Diagrams

E. Examples
F. Change logs
Bibliography
Index

C. Inheritance listings

C.1 Reference View
C.1.1 All entities
C.1.2 Rooted entities
C.1.3 Object types

IfcWorkPlan	
IfcWorkSchedule	
IfcGroup	X
IfcAsset	
IfcInventory	
IfcStructuralLoadGroup	
IfcStructuralLoadCase	
IfcStructuralResultGroup	
IfcSystem	X
IfcBuildingSystem	X
IfcDistributionSystem	X
IfcDistributionCircuit	X
IfcStructuralAnalysisModel	
IfcZone	X
IfcProcess	
IfcEvent	
IfcProcedure	
IfcTask	
IfcProduct	X
IfcAnnotation	
IfcElement	X
IfcBuildingElement	X
IfcBeam	X
IfcBeamStandardCase	
IfcBuildingElementProxy	X
IfcChimney	X
IfcColumn	X
IfcColumnStandardCase	

Planerade projekt

	Begrepp	Processer	Dataformat
Tillämpning	1 2 3 4	1 4 9 10	1 5 6 7 8
Nationella regelverk	1 2 3 4 9	1 4 9 10	1 5 6 7 8
Internationella ramverks-standarder	2 3	4	1 5 6 7 8

Projekt	
1	Nationella riktlinjer för BIM
2	Utveckling av klassifikation för BIM
3	Samordning av informationsstrukturer för BIM och GIS
4	Informationsleveranser med egenskapsredovisningar
5	Applikationsgränssnitt mot gemensamma informationskällor
6	Formatstandarder och deras tillämpning – internationellt och nationellt
7	Utveckling och sammanslagning av IFC och LandXML, till både hus och anläggning
8	Utveckling och tillämpning av oBCF – open BIM Collaboration Format
9	Utveckling av digitala begreppsbestäm-ningar i standardavtal, förstudie
10	Offentlig upphandling med krav på BIM-leveranser

IDM

IFC

BCF

Indelning av standarder

Tillämpning		**IDM, BCF**	**IFC**
Nationella Regelverk		**IDM, BCF**	**IFC**
Internationella ramverks-standarder		**IDM, BCF**	**IFC**
	Begrepp	**Processer**	**Dataformat**