

Unveiling IFC2x4

the Next Generation of openBIM Interoperability

Highlights

New foundation for openBIM for the upcoming minimum five years

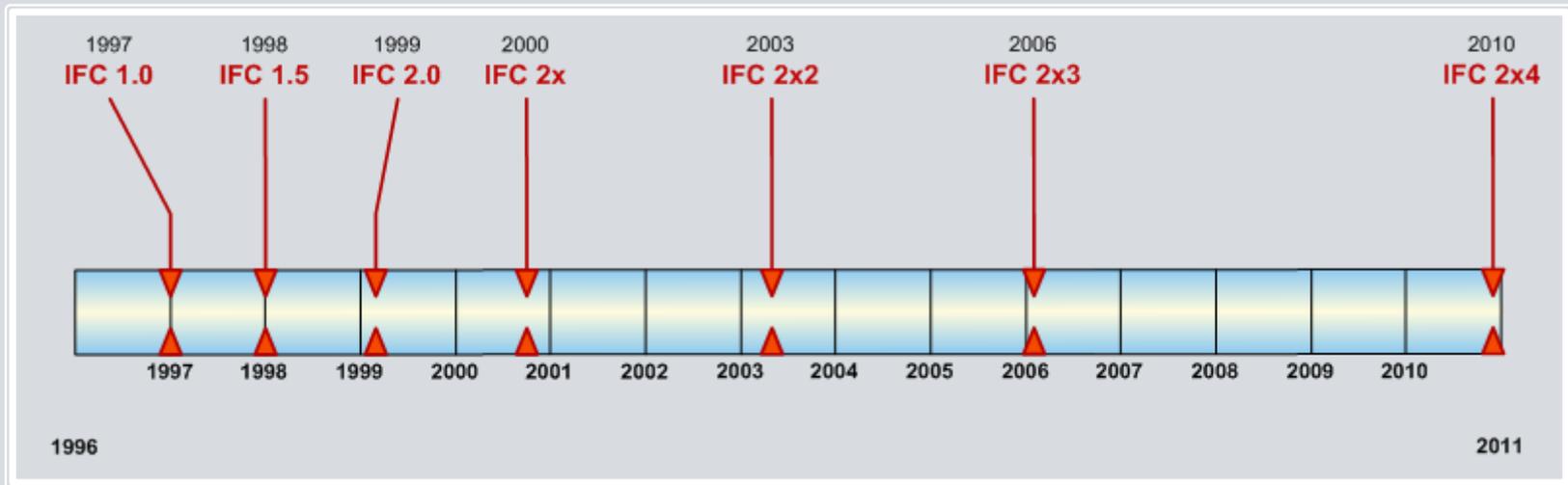
First major enhancement of IFC since 2003 (release of IFC2x2)

Longest development cycle and review period in IFC history

Quality over speed in release management

Targeted to be a full ISO standard

IFC development history



IFC2x4 release plan

Nr	Task	2007				2008				2009				2010				2011				Begin	End	% complete
		Q1	Q2	Q3	Q4																			
1	ISO16739																					16.07.2008	30.06.2011	0%
2	NWI																					16.07.2008	16.07.2008	100%
3	DIS																					07.06.2010	07.06.2010	0%
4	FDIS																					31.12.2010	31.12.2010	0%
5	IS																					30.06.2011	30.06.2011	0%
6	IFC2x4																					01.01.2007	29.11.2010	85,05%
7	Pre-Alpha																					01.01.2007	28.09.2007	100%
8	Alpha																					01.10.2007	17.06.2008	100%
9	Beta 1																					18.06.2008	08.05.2009	100%
10	Beta 2																					11.05.2009	28.09.2009	100%
11	Beta 3																					29.09.2009	29.01.2010	100%
12	RC 1																					01.02.2010	23.04.2010	100%
13	RC 2																					26.04.2010	06.09.2010	0%
14	Final																					13.09.2010	29.11.2010	0%

IFC2x4 as full ISO standard

Currently Publicly Available Specification ISO/PAS 16739

New work item NWI started in 2008 to transpose IFC2x4 as ISO/IS

IFC2x4 release candidate as input for draft international standard DIS

Rework according to ISO supplementary directive (documentation format)

Submission for ballot by all national members of ISO TC184/SC4

Depending on results (1) rework, (2) submission as FDIS, (3) IS

Final target ISO/IS 16739 in 2011

Major input into IFC2x4 development

Multiple intensive reviews of previous developments + lessons learnt

First time to value quality over speedy release cycles

Lessons learnt from intensive IFC2x3 implementation and certification

External review by many domain and software teams in various chapters

buildingSMART IFC development projects

IFG – necessary BIM information to connect to GIS world

IFD – extension to enable external libraries and dictionaries

PM4 – standardized base quantities for spaces and building elements

EL2 – electrical installations in buildings

ST6 – CIS/2 to IFC harmonization (plus structural steel and pre-cast projects)

Some facts ...

4 years of development

~ 6 person/year direct development effort

Time spend in buildingSMART International Model Support Group (50% volunteered)

More spend by external reviewers, project development teams, bSI community

> 1100 issues / proposals / change requests handled

All are logged and are traceable at <http://www.iai-tech.org/jira>

Each contributing to better coverage, higher quality, more precise documentation

target: secure IFC to remain the true openBIM standard worldwide

New IFC2x4 specification layout

<ul style="list-style-type: none">architecture diagramalphabetical listinginheritance listingproperty setsbase quantitieschanges & deprecationswhat's new ?home	 <p>buildingSMART International Alliance for Interoperability</p> <p>Industry Foundation Classes IFC2x4 Edition 4 Release Candidate 1</p> <p>Walt Disney Concert Hall Los Angeles California Frank O. Gehry & Partners Photo KH 2009</p> <p>© buildingSMART 1998-2010 - This document is owned and copyrighted by buildingSMART International Limited By using the IFC2x4 specification you agree to the following copyright notice</p>
<p>The specification has been developed in 1999-2010 by the Model Support Group - MSG - of buildingSMART.</p> <p>Thomas Liebich - MSG Leader Yoshinobu Adachi, James Forester, Juha Hyvarinen, Stefan Richter, Tim Chipman, Matthias Weise, Jeffrey Wix†</p> <p>Comments, issues or any other feedback should be sent to: Thomas Liebich</p>	

Major improvements – an extract – 1

Consistency throughout the IFC schema

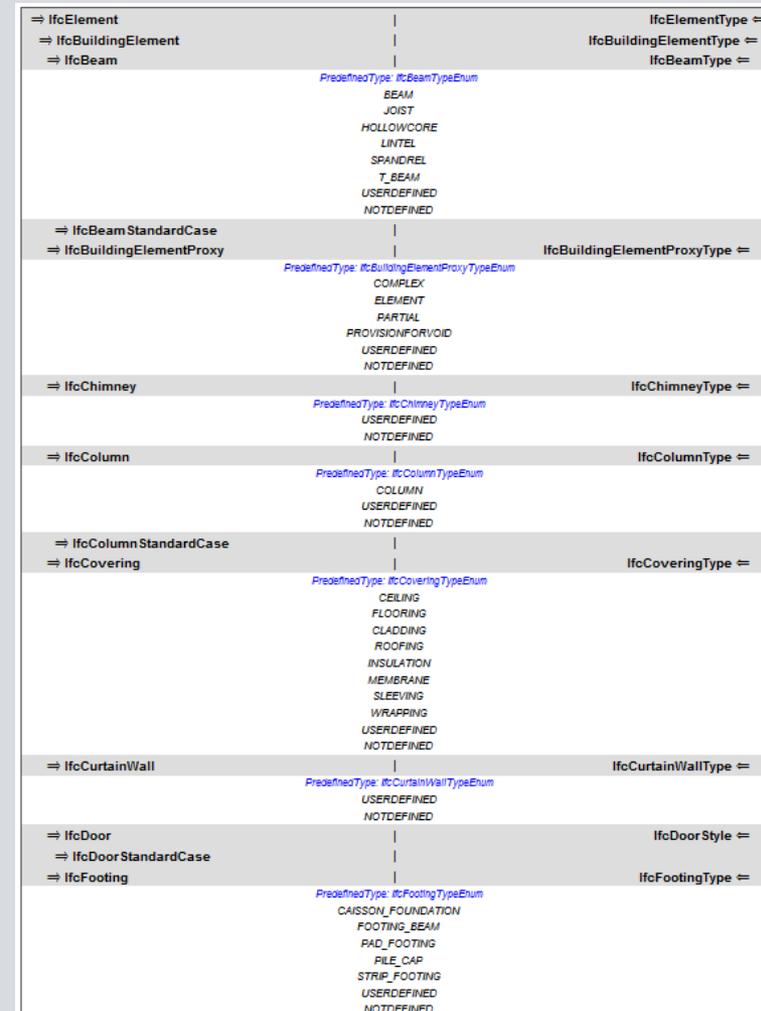
- Same concept, same modeling style
- Reduction of the “multiple ways to do”
- Symmetrical specialization trees

Complete the building / building service element catalogue

- Adding missing element types (like shading device, solar device, burner, communication appliance, or electric distribution board)
- General overhaul of the building service and control definitions, and of port connectivity

Separation between general element definitions and parametric definitions

- Adding standard case definitions for elements



Major improvements – an extract – 2

Structural steel and timber

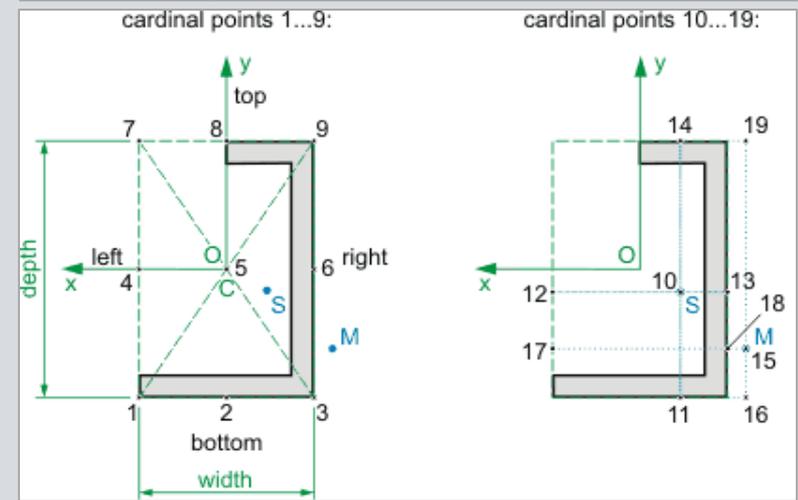
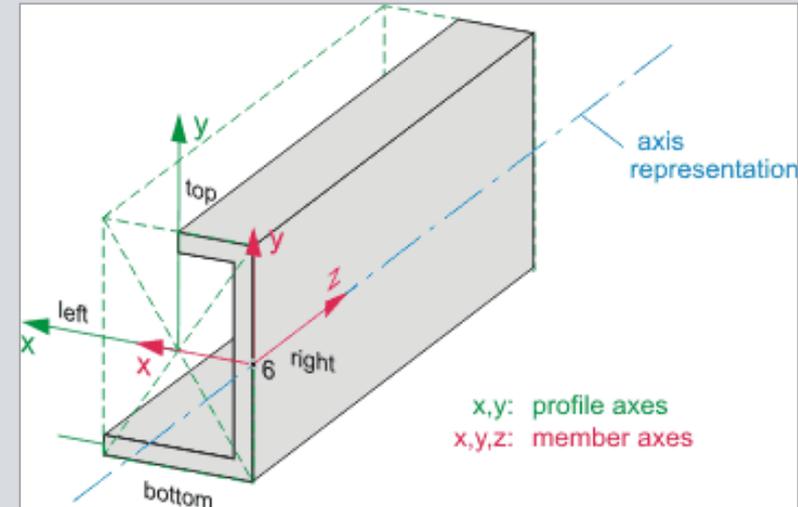
Definition of material profile association,
Alignment at a cardinal point, anisotropic
material properties

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

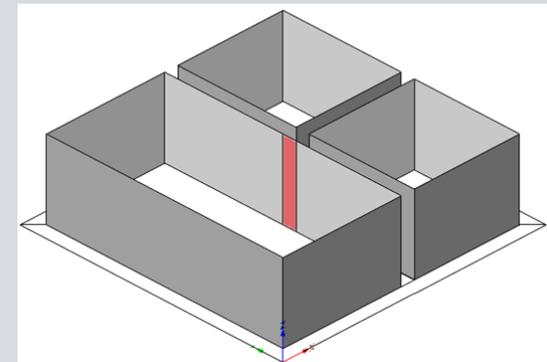
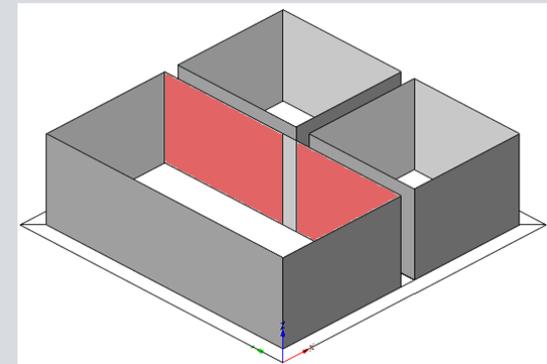
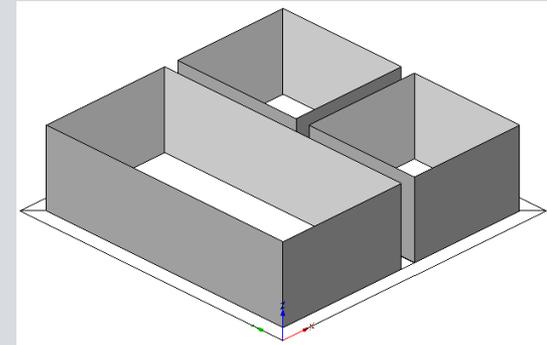
Adding environmental impact indicators and values to elements and element types

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 <ul style="list-style-type: none">• 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. <ul style="list-style-type: none">• 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 <ul style="list-style-type: none">• 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. <ul style="list-style-type: none">• 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 <ul style="list-style-type: none">• 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. <ul style="list-style-type: none">• 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.

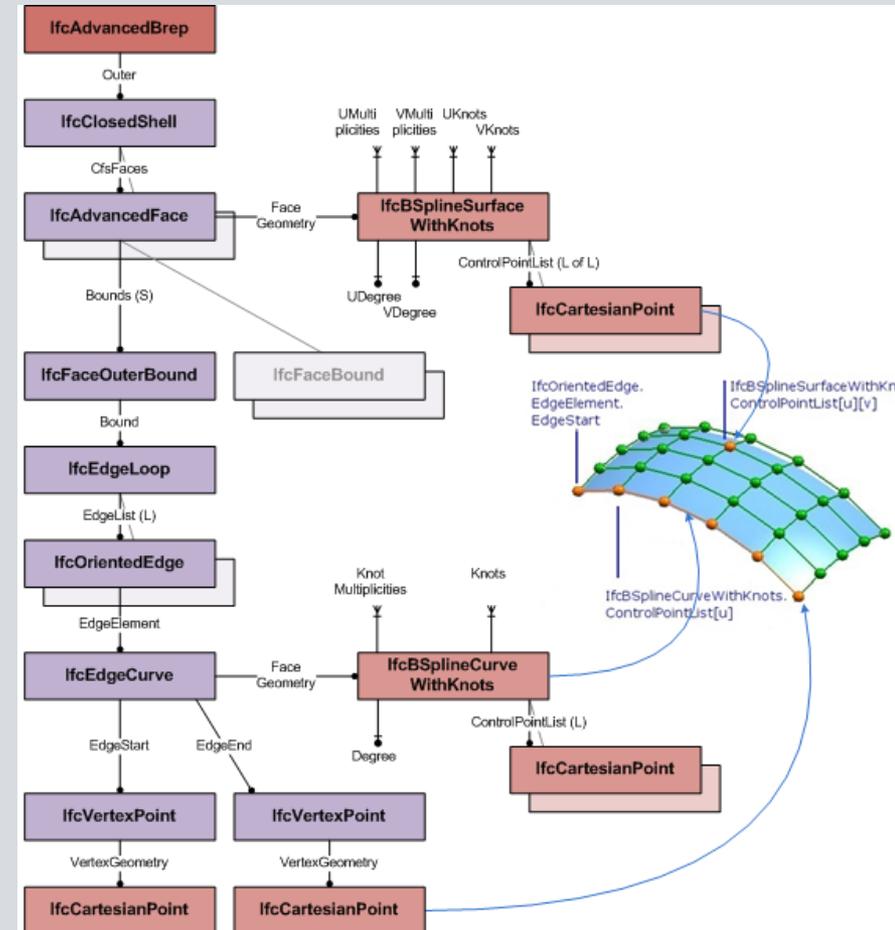
Major improvements – an extract – 5

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 understanding and readability of the spec



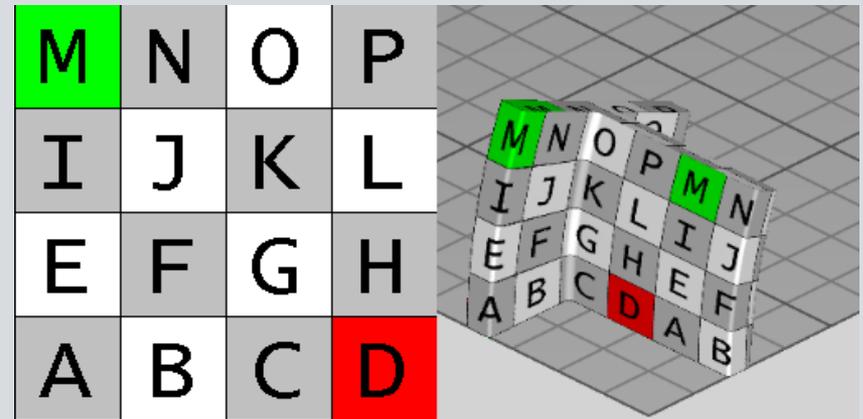
Major improvements – an extract – 7

Enhancement of lighting and shading component

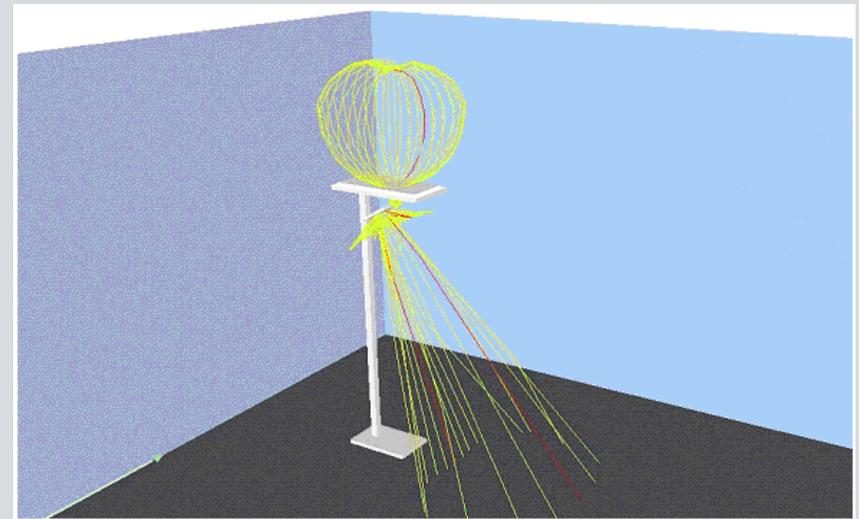
texturing, including multi-textures

lighting, including light distribution

following the X3D standard



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



Prospect

IFC2x4 – the next step to openBIM

More and better support for interoperability in construction

Additional use cases supported

Higher efficiency for the support of existing use cases

Will be available as EXPRESS and XML schema

full IFC schema used for general BIM exchange requirements

simplified IFC XML schema support added for simpler exchange requirements

Submitted for full ISO Standard 16739

Expect first implementations in 2011

Next – submit IFC2x4 as ISO 16739 DIS

The screenshot shows a Mozilla Firefox browser window with the address bar displaying 'file:///D:/3_Dokumente/1_buildingSMART/R2x4/Delivery/index.htm'. The browser's menu bar includes 'Datei', 'Bearbeiten', 'Ansicht', 'Chronik', 'Lesezeichen', 'ScrapBook', 'Extras', and 'Hilfe'. The address bar contains a search engine icon and the text 'Google'. Below the address bar, there are several search engines listed: 'Meistbesuchte Seiten', 'AEC3', 'buildingSMART GS', 'BSI general', 'BSI technical', 'IfcWiki', 'Certification server', and 'IFC2x3 TC1'. The main content area is titled 'Start Page of IFC2x4 RC2 Document...' and features a navigation menu with links for 'Cover page', 'Table of contents', 'Foreword', and 'Introduction'. The menu also includes a list of numbered items: 1. Scope, 2. Normative references, 3. Terms, definitions and abbreviated terms, 4. Information Requirements, 5. Core data schemas, 6. Shared element data schemas, 7. Domain specific data schemas, 8. Resource definition data schemas, A. Computer interpretable listings, B. EXPRESS construct alphabetical listing, C. EXPRESS entity inheritance listing, D. EXPRESS-G diagrams, E. Change and deprecation logs, and F. Example data sets. The main content area is titled '4.2 Fundamental Concepts and Assumptions' and contains several sub-sections: '4.2.1 Control', '4.2.1.1 Cost Control', '4.2.1.2 Time Control', and '4.2.1.3 Scope Control'. Each sub-section provides detailed information about the respective concept, including definitions, requirements, and associated entities. The '4.2.1.1 Cost Control' section discusses the indication of price requirements and the structure of cost items. The '4.2.1.2 Time Control' section discusses the indication of time requirements and the structure of work plans, calendars, and schedules. The '4.2.1.3 Scope Control' section discusses the indication of included products or work to be undertaken and the structure of orders, permits, and requests. The browser's status bar at the bottom shows the current time in various time zones: GMT/UTC: Mo, 10:51; Eastern Standard Time: Mo, 06:51; Pacific Standard Time: Mo, 03:51; Singapore: Mo, 18:51; Seoul: Mo, 19:51; and Done.

Start Page of IFC2x4 RC2 Documentation - Mozilla Firefox

file:///D:/3_Dokumente/1_buildingSMART/R2x4/Delivery/index.htm

Meistbesuchte Seiten AEC3 buildingSMART GS BSI general BSI technical IfcWiki Certification server IFC2x3 TC1

Start Page of IFC2x4 RC2 Document...

Industry Foundation Classes Release 2x4 (IFC2x4) © buildingSMART International Council 1996-2010

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4.2 Fundamental Concepts and Assumptions

Paragraph content

4.2.1 Control

A control describes requirements and constraints on objects. Controls can be generalized into controlling cost, time, scope, or quality.

4.2.1.1 Cost Control

Cost control involves the indication of price requirements or agreements. A cost schedule describes a set of cost information, such as for a bid, invoice, or estimate. A cost schedule consists of a hierarchy of cost items (or rows) where each cost item may be split into multiple categories (or columns). Cost items may indicate conditional components, variable costs over time, and established currency exchange rates. Cost items may be derived from quantities at products, processes, or resources, and from originating or incurred costs defined at resource objects.

Cost control generally imposes requirements on Resources (such as labor) and may have associated constraints such as not-to-exceed cost requirements.

Types and entities associated to cost control include the following:

- o IfcCostItem
- o IfcCostSchedule

4.2.1.2 Time Control

Time control involves the indication of time requirements or agreements. Three types of time control are defined: work plans, work calendars, and work schedules. A work plan describes a phase of work, and assigned resources available to carry out such work. A work plan may be composed into work calendars and work schedules. A work calendar describes recurring work hours and availability of resources over time. A work schedule describes a set of tasks within a work plan.

Time control generally imposes requirements on Processes (such as tasks) and may have associated constraints such as must-finish-before or must-start-after time requirements.

Types and entities associated to time control include the following:

- o IfcWorkCalendar
- o IfcWorkPlan
- o IfcWorkSchedule

4.2.1.3 Scope Control

Scope control involves the indication of included products or work to be undertaken. Three types of scope control are defined: orders, permits, and requests. An order is a directive to do something such as a work order, purchase order, or change order. A permit is permission to do something such as a building permit or operating permit. A request is asking to do something such as maintenance work or requesting information.

Scope control may be composed into cost control or time control entities to indicate agreed price, timeframe, and/or other metrics. Scope control generally imposes requirements on products (such as building elements) and may have associated approvals indicating particular actors approve or reject an item.

Types and entities associated to scope control include the following:

- o IfcActionRequest
- o IfcPermit
- o IfcProjectOrder

The specification has been developed in 1999-2010 by the Model Support Group - MSG - of buildingSMART.

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 sent to: [Thomas Liebich](#)

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Feedback

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or contact tl@aec3.com