Industry Foundation Classes - Release 2.0

IFC Object Model Reference

Final -- 15-Mar-99

International Alliance for Interoperability
Enabling Interoperability in the AEC/FM Industry

Industry Foundation Classes - Release 2.0

IFC Object Model Reference

Enabling Interoperability in the AEC/FM Industry

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Content Overview

Content Detail

Interoperability Model Layer

Domain/Applications Model Layer

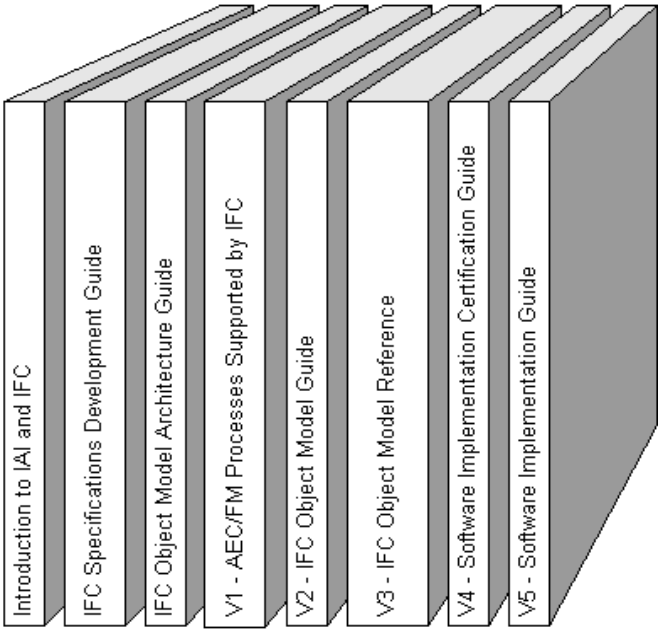
1. Introduction, Scope and Assumptions

1.1. Purpose of these documents

The purpose of this document suite is to provide a detailed specification of the Industry Foundation Classes (IFC) as defined by the Industry Alliance for Interoperability (IAI). The intended audience is the IAI membership, industry domain experts, and software developers interested in implementing IFC.

1.2. IFC Release Document Suite

IFC will be documented for two readers. The AEC professional and the software profession serving the AEC industry. Documents in this release include:



An Introduction to IAI and IFC

The "*An Introduction to IAI and IFC,"* as the name implies, provides AEC/FM industry professionals with an introduction to the organization, including its mission and organization. It also introduces the shared project model concept, end user benefits in using IFC compliant applications and summarizes the AEC Industry processes that are supported by this release of IFC. Finally, it provides a preview of what will be added in future releases.

IFC Specification Development Guide

The *"IFC Specification Development Guide"* defines the process used by the IAI in developing IFC. It also provides various references supporting parts of this process such as development of process diagrams, development of detailed requirement definitions and reading/creating EXPRESS (data model) definitions and EXPRESS-G diagrams.

IFC Object Model Architecture Guide

The *"IFC Object Model Architecture G*uide*"* defines the architecture used in the design of the IFC object model. This architecture is modular and layered which allows independent development and evolution of sub-schemata. This document is written for software developers who will develop applications supporting IFC.

Volume 1: AEC/FM Processes Supported by IFC

THIS DOCUMENT -- The "*AEC/FM Processes Supported by IFC"* volume documents the AEC/FM industry processes that the IFC Project Model in this release is designed to support. Therefore, this document effectively defines the scope of AEC project information included in this Release. Volumes 2 and 3 structure this information as software objects in AEC software. Note that this IFC release is limited to the information content of the foundation classes defined. Behavior for these objects, and thus the implementation of software that will support these AEC industry processes, will be defined by the implementing software vendors.

Volume 2: IFC Object Model Guide

The "*IFC Object Model Guide"* defines model design and use concepts for IFC object model. These key concepts include: an overview of model architecture, capturing design intent, sharing semantic relationships, model extension by application developers. It also describes some implementation strategies such as file based model exchange, Client-Server architectures and runtime interoperability supported through standard software interfaces of the IFC model. This includes an overview and example of the physical file format for file based model exchange.

Volume 3: IFC Object Model Reference

The "*IFC Object Model Reference"* provides detailed definitions for each of the classes and data types defined in the IFC object model. This includes all of the information required by the AEC processes defined in volume 1, structured in an information model detailing object class data, relationships, standard interfaces, type definitions and geometry schema use for shape representation. Additionally, it provides a data model view defined in EXPRESS and a standard interfaces view defined in IDL. Each of these code sets will be used by application developers as input into Computer Aided Software Engineering (CASE) tools to semi-automate development of applications intended to support IFC. Finally, a on-line version of this information is provided in an HTML document set that is cross linked for easy access to information related to or supporting a particular class or data type.

Volume 4: IFC Software Implementation Certification Guide

The "*IFC Software implementation Certification Guide"* provides detailed information about conformance certifications issues and the methodology that will be used by the IAI to certify applications for multiple levels of IFC conformance. This includes an overview of the concepts for conformance assessment and certification, definition of various "Exchange Set" subsets of the IFC model for which certification can be assessed and an overview of the testing suites that will be used for certification testing.

Volume 5: IFC Software Implementation Guide

The "*IFC Software implementation Guide"* provides detailed information addressing the issues of implementing the IFC object model in software products. In this release, it's content is limited to the topics of implementing property sets (previously called "Pset Guide") and the differences from the previous release (previously called "Migration Guide"). Over the next couple of IFC releases, many more topics will be addressed.

1.3. Scope

1.3.1. Scope for IFC Release 2.0

Enabling interoperability between applications by different software vendors is the ultimate goal of the IAI. This is a very ambitious goal and will be achieved through a series of incremental steps.

In general, the IAI is focused on providing three things in IFC:

1. Standard definitions for the attributes associated with entities comprising an AEC/FM project model (objects)
2. Structure and relationships between these entities from the point of view of various AEC/FM professionals
3. Standard formats/protocols for two methods of sharing this information:
   - *exchange via a standard file format*
   - *exchange via standard software interfaces*

It is important to note that the software interface specifications in this release will not include any application-specific behavior. Instead, these interfaces will be limited to get and set methods for the attribute and relationship information defined in the data model.

Release 1.5 of IFC provided the infrastructure that supports this release, plus reasonable models for architecture, some HVAC, estimating, scheduling and Facilities Management. This release will build on these foundations and extend the model in several areas.

The scope for this release of the IFC Specifications is limited to:

1. Six AEC/FM domains - Architecture, HVAC engineering, codes and standards, cost estimating, facilities management and simulation
2. Only a specific subset of the processes in these domains (defined in Volume 1 of these specifications).

These domains and processes are:

Architectural Design

- *Building 'shell' design*
- *Building 'core' design*
  - *Stair design*
  - *Public toilet design*
- *Roof design*
- *Fire Compartmentation*

HVAC Engineering

- *HVAC Duct System Design*
- *HVAC Piping System Design*
- *Pathway Design and Coordination*
- *Building Heating and Cooling Load Calculation*

Codes and Standards

- *Commercial and Residential Energy Code Compliance Checking*

Cost Estimating

- *Cost Estimating*
  - *Identify Objects*
  - *Identify Tasks Needed to Install Objects*
  - *Identify Resources Needed to Perform Tasks*
  - *Quantify*
  - *Costing and Cost Summarization*

Facilities Management

- *Property Management*
  - *Enabling the use of IFC objects in property management*
  - *Grouping IFC objects*
  - *Linking the maintenance objects to the IFC objects*
- *Occupancy Planning*
- *Design of Workstations*
- *Floor Layout of Workstations for an Open Office*

Simulation

- *Photo Accurate Visualization*

All AEC domains

- *Document references (from model to document only)*

1.3.2. Scope of this document

This document includes the following information:

1. **Introduction, Scope and Assumptions**

   This section provides the reader with an introduction to the set of seven documents comprising this release of the IFC Specifications. This section outlines the information included in this document versus related documents. It will also define the scope for this release and assumptions about knowledge of the reader.

2. **AEC/FM Process Framework**

   This section provides an overview of the AEC industry processes that are performed through out the design, engineer, build, and management of a built facility. The diagrams are meant to be a framework for the reader of these documents to provide an orientation for indicating where a process fits into the building lifecycle. Processes defined and supported in previous releases are indicated as gray shaded process boxes. Processes defined in this release are indicated with by shaded process boxes. The last sub-section provides a preview to work in progress on development of a reference AEC industry process model in which will provide a context in which future requirements can be positioned.

3. **Requirements Definition Project Summaries**

   This section provides the reader with an overview of the AEC/FM requirements definition projects that developed the requirements for this release. An description of the project team, and overview of the industry processes for which requirements are defined and an overview of the resources required for the project are provided.

4. **AEC Process Definitions and Usage Scenarios**

   This section includes the process definitions and usage scenarios which are the basis for the information requirements specified in the next section - and ultimately, for the extensions to the IFC model in this release. The specified processes were prioritized and selected as processes that would see significant improvements (efficiency, cost avoidance, etc.) if supported by IFC. There are a few criteria used to do this. First, IFC support for the process must provide an increase in productivity and must be concise enough to be completed in a single IFC release cycle. Second, the process should deliver a benefit to other domains in the building life cycle. Third, there must be a minimum of two software companies that have committed that they will implement support for the process and associated IFC objects in a shipping software product.

   Such processes obviously vary between companies and certainly between regions. The definitions specified represent the IAI domain groups' consensus on a generalized definition that sufficiently represents the diversity across companies and regions. It is anticipated that future releases of IFC will reflect some regional differences.

   Each process in this section contains three parts. The first provides an overview process description, written to AEC professionals, to indicate where the process fits into their overall processes. The second part is a process diagram which illustrates each task in the process and its informational input/output sources. The third part provides text book style task definitions and a running series of usage scenarios using real project graphics and data. These are organized according to the tasks in the process diagram.

5. **Information Requirement Analyses**

   This section provides a detailed analysis for all of the input information required and output information supplied by each of the process tasks defined in the previous section.

6. **Object Type Definition Tables**

   This section organizes information requirements by 'object type' and provides detailed information about data types, limits and defaults for all information.

1.4. Assumptions and Abbreviations

This document assumes the reader is reasonably familiar with the following:

- AEC/FM market and project terminology
- Software industry terminology
- Concepts and terminology associated with object oriented software

The following abbreviations are used throughout the IFC Specifications:

- AEC/FM Architectural, Engineering, Construction and Facilities Management
- IAI Industry Alliance for Interoperability
- AP Application Protocol
- Arch Architecture
- CM Construction Management
- CORBA Common Object Request Broker Architecture
- COM Microsoft's Component Object Model
- DCE Distributed Computing Environment
- DCOM Microsoft's Distributed Component Object Model
- DSOM IBM's Distributed System Object Model
- FM Facilities Management
- FTP File Transfer Protocol
- GUID Globally Unique Identifier
- HVAC Heating, Ventilating and Air Conditioning
- HTTP Hypertext Transport Protocol
- IAI International Alliance for Interoperability
- IDL Interface Definition Language
- IFC Industry Foundation Classes
- ISO International Standards Organization
- FM Facilities Management
- MIDL Microsoft's Interface Definition Language
- ODL Microsoft's Object Description Language
- OMG Object Management Group
- ORB Object Request Broker
- OSF Open Software Foundation
- RPC Remote Procedure Call
- SOM IBM's System Object Model
- STEP Standard for the Exchange of Product Model Data
- TCP/IP Transmission Control Protocol/Internet Protocol
- TQM Total Quality Management
- URL Universal Resource Location

1.5. International Alliance for Interoperability (IAI)

The IAI is a 'not for profit' industry alliance of companies. Its membership is comprised of visionary companies representing all sectors of the AEC industry worldwide.

The IAI was first formed in September of 1995, by 12 industry leading companies who, during the previous year had worked together to develop proof of concept prototypes demonstrating the viability of interoperability between AEC software applications. This demonstration was shown publicly at the AEC Systems '95 conference in Atlanta, Georgia. This is the third release of IFC since that time. There are currently 50 organizations implementing software to support IFC, a number that is growing quite rapidly now.

As of this printing, the IAI includes 9 international chapters with hundreds of member companies in the following regions:

- Australasian countries
- French speaking region of Europe
- German speaking region of Europe
- Japan
- Korea
- Nordic countries of Europe
- North America
- Singapore
- United Kingdom

The IAI stated Vision, Mission and Values can be summarized as:

VISION

Enabling Interoperability in the A/E/C/FM Industry

MISSION

To define, promote and publish specifications for the Industry Foundation Classes (IFC) as a basis for information sharing through the project life cycle, globally, across disciplines and technical applications.

VALUES

- Not for profit industry organization
- Action oriented (Alliance v. Association)
- Consensus based decision making
- Incremental delivery (rather than prolonged study)
- Global solution
- Industry to define IFC
- IFC to be "open" (for implementation/use by all software vendors)
- Design for IFC to be extensible
- IFC will evolve over time
- Membership open to any company working in construction industry

Resources Model Layer

2. IfcActorResource

The IfcActorResource schema defines the properties of persons and organizations whose services may be used within a project.

NOTE: New schema for R2.0. This schema was formerly part of the IfcPropertyResource schema.

2.1. Select IfcActorSelect

2.1.1. Select Semantic Definition

The actor select type allows a person and/or organization to be referenced.

2.1.2. Select

IfcOrganization
IfcPerson
IfcPersonAndOrganization

2.2. Type IfcRoleEnum

2.2.1. Type Semantic Definition

Roles which may be played by an actor.

2.2.2. Enumeration

Supplier
Manufacturer
Contractor
SubContractor
Architect
StructuralEngineer
ServicesEngineer
CostEngineer
Client
BuildingOwner
BuildingOperator
UserDefined
NotDefined

2.3. Class IfcActorRole

2.3.1. Class Semantic Definition

A role which is performed by an actor, either a person, an organization or a person and organization.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

2.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Role	The name of the role played by an actor.	IfcRoleEnum	Supplier	Other	Other
OPT	Description	A textual description relating the nature of the role played by an actor.	STRING	empty string	n/a	NIL

2.3.3. Interface Definitions

- I_ActorRole

2.3.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

2.4. Class IfcAddress

2.4.1. Class Semantic Definition

The place at which people and organizations are normally located.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

2.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	InternalLocation	An organization defined address for internal mail delivery.	STRING	empty string	n/a	NIL
	AddressLines	The postal address of the person or	LIST [0:?] OF STRING	n/a	n/a	empty list

		organization. NOTE - A postal address may occupy several lines when recorded. It is expected that normal usage will incorporate relevant elements of the following address concepts:- A location within a building (e.g. 3rd Floor) Building name (e.g. Interoperability House) Street number (e.g. 6400) Street name (e.g. Alliance Boulevard)				
OPT	Town	The name of a town.	STRING	empty string	n/a	NIL
OPT	Region	The name of a region. NOTE - The counties of the United Kingdom and the states of North America are examples of regions.	STRING	empty string	n/a	NIL
OPT	PostalCode	The code that is used by the country's postal service.	STRING	empty string	n/a	NIL
OPT	Country	The name of a country.	STRING	empty string	n/a	NIL
	FacsimileNumbers		LIST [0:?] OF STRING			
	TelephoneNumbers		LIST [0:?] OF STRING			
	ElectronicMailAddresses		LIST [0:?] OF STRING			
OPT	TelexNumber	The telex number at which telex messages may be received.	STRING	empty string	n/a	NIL
OPT	WWWHomePageURL	The world wide web address at which the preliminary page of information for the person or organization can be located. NOTE - Information on the world wide web for a person or organization may be separated into a number of pages and across a number of host sites, all of which may be linked together. It is assumed that all such information may be referenced from a single page that is termed the home page for that person or organization.	STRING	empty string	n/a	NIL
OPT	Description	Text that relates the nature of the address.	STRING	empty string	n/a	NIL
OPT	PostalBox	An address that is implied by an identifiable mail drop.	STRING	empty string	n/a	NIL
INV	OfPerson	Person to whom address is associated	SET [0:?] OF IfcPerson	n/a	n/a	empty list
INV	OfOrganization	Organization to whom address is associated	SET [0:?] OF IfcOrganization	n/a	n/a	empty list

Formal Propositions

WR1	At least one of the following has to be given: InternalLocation OR AddressLines OR Town OR Region OR PostalCode OR Country OR FacsimileNumbers OR TelephoneNumbers OR ElectronicMailAddresses OR TelexNumber OR WWWHomePage

2.4.3. Interface Definitions

- I_Address

2.4.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

2.5. Class IfcOrganization

2.5.1. Class Semantic Definition

A named and structured grouping with a corporate identity.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

2.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	The word, or group of words, by which the organization is referred to.	STRING	empty string	n/a	n/a
	Addresses	Place or places at which an organization may be located. NOTE - An organization may be located at several addresses.	LIST [0:?] OF IfcAddress	n/a	n/a	empty list
	Roles	Roles played by the organization.	LIST [0:?] OF IfcActorRole	n/a	n/a	empty list
OPT	Description	Text that relates the nature of the organization.	STRING	empty string	see type	NIL

2.5.3. Interface Definitions

- I_Organization

2.5.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

2.6. Class IfcPerson

2.6.1. Class Semantic Definition

An individual human being.

NOTE:

In order to comply with legal requirements in various places (such as the Data Protection Act of the United Kingdom), this class only allows for identification of a person by name.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

2.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	FamilyName	The name by which the family identity of the person may be recognized. NOTE - Depending on geographical location and culture, family name may appear either as the first or last component of a name.	STRING	empty string	n/a	NIL
OPT	GivenName	The name by which a person is known within a family and by which he or she may be familiarly recognized. NOTE - Depending on geographical location and culture, given name may appear either as the first or last component of a name.	STRING	empty string	n/a	NIL
OPT	MiddleNames	Additional names given to a person that enable their identification apart from others who may have the same or similar family and given names.	STRING	empty string	n/a	NIL
OPT	PrefixTitles	The word, or group of words, which specify the person's social and/or professional standing and appear before his/her names.	STRING	empty string	n/a	NIL
OPT	SuffixTitles	The word, or group of words, which specify the person's social and/or professional standing and appear after his/her names.	STRING	empty string	n/a	NIL
	Addresses	Place or places at which a person may be located. NOTE - A person may be located at several addresses.	LIST [0:?] OF IfcAddress	n/a	n/a	empty list
	Roles	Roles played by the person.	LIST [0:?] OF IfcActorRole	n/a	n/a	empty list

Formal Propositions

WR1	Either FamilyName or GivenName has to be given

2.6.3. Interface Definitions

- I_Person

2.6.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

2.7. Class IfcPersonAndOrganization

2.7.1. Class Semantic Definition

Identification of a person within an organization.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

2.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ThePerson	The person who is related to the organization.	IfcPerson	see type	see type	n/a
	TheOrganization	The organization to which the person is related.	IfcOrganization	see type	see type	n/a
	Roles	Roles played by the person and organization.	LIST [0:?] OF IfcActorRole	see type	see type	empty list

2.7.3. Interface Definitions

- I_PersonAndOrganization

2.7.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

3. IfcClassificationResource

The IfcClassificationResource schema defines the assignment of classification(s) to objects.

NOTE: New schema for R2.0. This schema was formerly part of the IfcPropertyResource schema.

3.1. Class IfcClassification

3.1.1. Class Semantic Definition

Used for the arrangement of objects into a class or category according to a common purpose or their possession of common characteristics.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

3.1.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Source	Source (or publisher) for this reference classification.	STRING	see type	see type	n/a
OPT	Table	Table from published reference.	STRING	see type	see type	NIL
	Notation	Notation used from published reference.	IfcClassificationNotation	see type	see type	n/a
	Description	Description of this published reference.	STRING	see type	see type	n/a
OPT	Edition	The edition or version of the classification system from which the classification is derived.	STRING	see type	see type	NIL

3.1.3. Interface Definitions

- I_Classification

3.1.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

3.2. Class IfcClassificationList

3.2.1. Class Semantic Definition

Data structure used to classify an element according to multiple classification systems.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

3.2.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Classifications	Published classifications referenced.	LIST [1:?] OF IfcClassification	n/a	n/a	n/a
	Priority	Priority index into list of classifications.	INTEGER	see type	see type	1

3.2.3. Interface Definitions

- I_ClassificationList

3.2.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

3.3. Class IfcClassificationNotation

3.3.1. Class Semantic Definition

Notation used from published reference.

NOTE: A classification notation may be developed using various classification facets. A facet is a part of the actual notation but which has a specific meaning. For instance, it may be appropriate to classify an item by owning discipline (actor) and by an entry from a classification table such as CI/SfB. In this case, an external wall might be classified as:

A210 or (using a separator character) A:210

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

3.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	NotationFacets	Alphanumeric characters in defined groups from which the classification notation is derived.	LIST [1:?] OF IfcNotationFacet	n/a	n/a	n/a

3.3.3. Interface Definitions

- I_ClassificationNotation

3.3.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

3.4. Class IfcNotationFacet

3.4.1. Class Semantic Definition

A group of alphanumeric characters used within a classification notation.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

3.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	NotationValue	The actual alphanumeric character group forming the notation STRING.	STRING	see type	see type	n/a
OPT	Purpose	The purpose of the notation STRING.	STRING	see type	see type	NIL

3.4.3. Interface Definitions

- I_NotationFacet

3.4.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

4. IfcCostResource

The IfcCostResource schema provides the means to identify the cost of an object or aggregation of objects.

NOTE: New schema for R2.0. This schema was formerly part of the IfcPropertyResource schema.

4.1. Type IfcCostEnum

4.1.1. Type Semantic Definition

4.1.2. Enumeration

LaborCost	The cost of human resources.
PlantCost	The cost for items of equipment rented or purchased for use on this project but which will not be embodied within the final product.
MaterialCost	The cost of materials purchased (or sold)
SubContractCost	A cost for work that is done by a third party under contract.
PreliminariesCost	Costs that describe work associated with a project but which do not form part of the completed product e.g. temporary construction works.
PrimeCost	A cost which is an amount to be included for work or services to be executed by a nominated actor.
BillOfMaterialsCost	A composite cost which is to be included within a formal bill of materials.
ProvisionalCost	A cost that is included for work that is foreseen but cannot be accurately specified at the time of costing.
OverheadCost	A cost that is included to account for administrative and non-productive work.
ProfitCost	A cost that is the difference between the selling price and the buying price of an artefact.

4.2. Type IfcCostOperatorEnum

4.2.1. Type Semantic Definition

A mathematical operator which determines how the cost modifier is to be applied to the cost to vary its value.

NOTE: Cost operators are specified as being by value or by percent.

If the operator is by value (add, subtract or multiply), this means that cost modifiers are applied directly according to the value attribute of the modifier. That is, for a selection of 'AddValue' with a value attribute of 20 on a cost of $120, the modified value would be determined by $120 + $20 = $140.

If the operator is by percent(add, subtract or multiply), this means that cost modifiers are applied by transforming the value attribute from a percentage to an actual value . That is, for a selection of 'AddPercent' with a value attribute of 20 on a cost of $120, the modified value would be determined by $120 + $(120 * 20/100) = $144.

4.2.2. Enumeration

AddValue
SubstractValue
MultiplyValue
AddPercent
SubstractPercent
MultiplyPercent

4.3. Type IfcModifierBasisEnum

4.3.1. Type Semantic Definition

The manner in which cost modifiers are applied to a cost.

NOTE: Cost modifiers may be applied to costs based either on the initial value of the cost or on the running total of cost after the application of a previous modifier. This attribute sets the basis upon which modifiers are applied.

Note that modifiers can only be applied on a single basis; it is not possible to mix the application of running and static modifiers to a single cost.

4.3.2. Enumeration

Running
Static

4.4. Class IfcCost

4.4.1. Class Semantic Definition

Amount to be paid for acquisition, installation, or assembly; associated with a product, process, or resource.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

4.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	CostType	Type of Cost specified.	IfcCostEnum	LaborCost	ProvisionalCost	LaborCost
OPT	BaseCostValue	Amount of this cost before the application of cost modifiers.	IfcMonetaryMeasure	n/a	n/a	NIL
OPT	FinalCostValue	Amount of this cost following the application of cost modifiers.	IfcMonetaryMeasure	n/a	n/a	NIL
	Currency	Currency for this cost amount. NOTE - Currencies are defined by standard three character designations as used by banks and financial institutions.	IfcCurrencyEnum	AED	ZWD	USD
OPT	ModifierBasis	The manner in which cost modifiers are applied to a cost. NOTE - Where cost modifiers are specified, the modifier basis must be asserted.	IfcModifierBasisEnum	Running	Static	NIL
	ModifierValues	Modifiers which may be applied to a cost to change its value.	LIST [0:?] OF IfcCostModifier	n/a	n/a	empty list
	UnitCostBasis	The number and unit of measure on which the unit cost is based. NOTE - As well as the normally expected units of measure such as length, area, volume etc., costs may be based on units of measure which need to be defined e.g. sack, drum, pallet etc. Unit costs may be based on quantities greater (or lesser) than a unitary value of the basis measure. For instance, timber may have a unit cost rate per X meters where X 1; similarly for cable, piping and many other items. The basis number may be either an integer or a real value.	IfcMeasureWithUnit	n/a	n/a	n/a
OPT	CostDate	The date at which the cost is applied.	IfcDateTimeSelect	n/a	n/a	NIL
	CostComponents	Costs that are components of another cost and from which that cost may be deduced. NOTE - Allows an estimator to roll up components (estimates or bids) into composite costs for assemblies.	LIST [0:?] OF IfcCost	n/a	n/a	empty list
INV	ComponentOf		SET [0:?] OF IfcCost			

4.4.3. Interface Definitions

- I_Cost

4.4.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

4.5. Class IfcCostModifier

4.5.1. Class Semantic Definition

Modifier which influences a cost.

NOTE: A cost modifier is given either as a value or as a percentage and is applied using the specified cost operator designation which indicates the action of the operator.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

4.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Purpose	The purpose for which a cost modifier is applied. NOTE - Each cost modifier may be assigned a purpose by which it may be recognized. Purposes might include trade discount, quantity discount, bulk purchase rebate, postage and packing cost, abnormal working conditions factor etc.	STRING	empty string	n/a	n/a
	CostValue	The value assigned to a cost factor.	REAL	0	n/a	1
	CostOperator	A mathematical operator that determines how the cost modifier is to be applied to the cost to vary its value.	IfcCostOperatorEnum	AddValue	MultiplyPercent	AddValue

4.5.3. Interface Definitions

- I_CostModifier

4.5.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

5. IfcDateTimeResource

The IfcDateTimeResource schema defines dates and times that may be applied. The date and times include specifying a calendar date, a local time with possible daylight saving offset compared to solar time, the local time offset to coordinated universal time, and complete specification of combined date and time.

NOTE: New schema for R2.0. This schema was formerly part of the IfcPropertyResource schema that is now superseded.
Parts of this schema are © ISO.

5.1. Type IfcDayInMonthNumber

5.1.1. Type Semantic Definition

An integer value of the day within a month.

History

This Defined Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.1.2. Type

INTEGER

5.2. Type IfcDaylightSavingNumber

5.2.1. Type Semantic Definition

The positive integer value by which clock time is offset from solar time at the particular location.

History

This Defined Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.2.2. Type

INTEGER

Formal Propositions

WR1	Daylight saving number is always positive and can take the maximum value of 2 (hours) ahead of local time. Depending on the locality and the time of year, the value may be 0, 1 or 2.

5.3. Type IfcHourInDay

5.3.1. Type Semantic Definition

An integer value of the hour within a day.

History

This Defined Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.3.2. Type

INTEGER

Formal Propositions

WR1	Although there are 24 hours in a day, hour designations are always from 0 to 23 (since hour 24 is the same as hour 0)

5.4. Type IfcMinuteInHour

5.4.1. Type Semantic Definition

An integer value of the minute within an hour.

History

This Defined Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.4.2. Type

INTEGER

Formal Propositions

WR1	Although there are 60 minutes in an hour, minute designations are always from 0 to 59 (since minute 60 is the same as minute 0)

5.5. Type IfcMonthInYearNumber

5.5.1. Type Semantic Definition

An integer value of the month within a year.

History

This Defined Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.5.2. Type

INTEGER

Formal Propositions

WR1	Months in a year are numbered from 1 to 12.

5.6. Type IfcSecondInMinute

5.6.1. Type Semantic Definition

A real number value of the second in a minute. Thus, decimals of a second are allowed.

History

This Defined Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.6.2. Type

REAL

Formal Propositions

WR1	Although there are 60 seconds in a minute, second designations are always from 0 to 59 (since second 60 is the same as second 0)

5.7. Type IfcYearNumber

5.7.1. Type Semantic Definition

Is the year in Gregorian calendar as defined by ISO 8601.

History

This Defined Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.7.2. Type

INTEGER

5.8. Select IfcDateTimeSelect

5.8.1. Select Semantic Definition

5.8.2. Select

IfcCalendarDate
IfcLocalTime
IfcDateAndTime

5.9. Type IfcAheadOrBehind

5.9.1. Type Semantic Definition

An enumeration type that is used to specify whether a local time is ahead or behind of the coordinated universal time. IfcAheadOrBehind can take values Ahead or Behind.

History

New Enumeration in IFC Release 2.0

5.9.2. Enumeration

Ahead
Behind

5.10. Class IfcCalendarDate

5.10.1. Class Semantic Definition

The date of interest expressed by the day in a month of a year.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	DayComponent	The day component of the calendar date.	IfcDayInMonthNumber	see type	see type	n/a
	MonthComponent	The month component of the calendar date.	IfcMonthInYearNumber	see type	see type	n/a
	YearComponent	The year component of the calendar date.	IfcYearNumber	see type	see type	n/a

Formal Propositions

WR21	Date must be a valid calendar date

5.10.3. Interface Definitions

- I_CalendarDate

5.11. Class IfcCoordinatedUniversalTimeOffset

5.11.1. Class Semantic Definition

The time by which local time is offset from the time basis (normally selected as Greenwich Mean Time - also referred to as Zulu).

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default

	HourOffset	The number of hours by which local time is offset from basis time.	IfcHourInDay	see type	see type	n/a
OPT	MinuteOffset	The number of minutes by which local time is offset from basis time.	IfcMinuteInHour	see type	see type	NIL
	Sense	The direction of the coordinated universal time offset. Note: The data type of the value is an enumeration - Ahead means positive offset; Behind means negative offset.	IfcAheadOrBehind	see type	see type	TRUE

5.11.3. Interface Definitions

- I_CoordinatedUniversalTimeOffset

5.12. Class IfcDateAndTime

5.12.1. Class Semantic Definition

A complete specification of date and time.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	DateComponent	The date component when date and time are both required.	IfcCalendarDate	see type	see type	n/a
	TimeComponent	The time component when date and time are both required.	IfcLocalTime	see type	see type	n/a

5.12.3. Interface Definitions

- I_DateAndTime

5.13. Class IfcLocalTime

5.13.1. Class Semantic Definition

The accepted time indicated by a normal time measuring device at the location of interest.

NOTE: Local time is indicated as clock time rather than solar time since, locally, clock time may be displaced from solar time by a daylight saving value.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

5.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	HourComponent	The hour component of the local time.	IfcHourInDay	see type	see type	n/a
OPT	MinuteComponent	The minute component of the local time.	IfcMinuteInHour	see type	see type	NIL
OPT	SecondComponent	The second component of the local time.	IfcSecondInMinute	see type	see type	NIL
OPT	Zone	The time zone in which local time is indicated as measured by the coordinated universal time offset.	IfcCoordinatedUniversalTimeOffset	see type	see type	n/a
OPT	DaylightSavingOffset	The offset of daylight saving time from basis time.	IfcDaylightSavingNumber	see type	see type	NIL

Formal Propositions

WR21	Local time must be valid.

5.13.3. Interface Definitions

- I_LocalTime

5.14. Function IfcLeapYear

5.14.1. Function Semantic Definition

Checks if the year is a leap year.

5.15. Function IfcValidCalendarDate

5.15.1. Function Semantic Definition

Checks that calendar date has a valid value.

5.16. Function IfcValidTime

5.16.1. Function Semantic Definition

Checks that local time has a valid value, i.e. checks that if second component is specified then also minute component is specified for the local time.

6. IfcDocumentResource

The IfcDocumentResource schema defines object types related to the documents and document management in AEC/FM industry projects.

Model/Document references: This release defines one way references, from the model to documents. These references include information about the document type, owner, creation date, last modified date, revision, location, etc.

6.1. Class IfcDocumentReference

6.1.1. Class Semantic Definition

Objectified model reference to a project document.

ISSUES: See IRD issues 476, 489, 516, 517.

History

New Entity in IFC Release 2.0

6.1.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	DocumentType	Describe the type of document referenced, providing a description, file extension and list of registered applications that can edit this document type.	IfcDocumentType	n/a	n/a	0
	DocumentName	File name or document name assigned by owner	STRING	n/a	n/a	empty string
OPT	DocumentDescription	Description of document	STRING	n/a	n/a	empty string
	Location	URL, pathname or physical location of the document	STRING	n/a	n/a	empty string
	DocumentOwner	Information about the person and/or organization acknowledged as the 'owner' of this document. In some contexts, the document owner determines who has access to or editing right to the document.	IfcActorSelect	n/a	n/a	n/a
	PreparedBy	List of people who have created this document	LIST [0:?] OF IfcActorSelect	n/a	n/a	n/a
	CreationDate	Date and time stamp when the document was originally created.	IfcDateAndTime	n/a	n/a	n/a
	Editors	List of people who have have permission to edit this document	LIST [0:?] OF IfcActorSelect	n/a	n/a	n/a
OPT	Revision	Document revision designation	STRING	n/a	n/a	empty string

OPT	DateOfRevision	Date and time stamp when this revision was registered	IfcDateAndTime	n/a	n/a	n/a
OPT	DocSectionReference	Optional reference to a section within the document.	STRING	n/a	n/a	empty string
OPT	DocumentScope	Scope for this document	STRING	n/a	n/a	empty string
OPT	DocumentPurpose	Purpose for this document	STRING	n/a	n/a	empty string
OPT	DocumentIntendedUse	Intended use for this document	STRING	n/a	n/a	empty string

6.1.3. Interface Definitions

- I_DocumentReference

6.2. Class IfcDocumentType

6.2.1. Class Semantic Definition

Defines a type of document, a standard file extension and a set of applications that can edit this document type.

ISSUES: See IRD issues 516, 517.

History

New Entity in IFC Release 2.0

6.2.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	FileExtension	File extension used by computer operating system.	STRING	n/a	n/a	n/a
	Description	Description of this document type (analogous to the "Product_data_type" in ISO 10303-41)	STRING	n/a	n/a	n/a
	EditingApplications	List of registered applications that can edit this document type.	SET [0:?] OF IfcApplication	n/a	n/a	empty list

6.2.3. Interface Definitions

- I_DocumentTypeDef

7. IfcGeometryResource

This part of the Industry Foundation Classes specifies the resources for the geometric and topological representation of the shape of a product. The specifications within the IfcGeometryResource include:

- explicit geometric and topological representation of the shape
- **attribute driven representation** of standard shapes and shape characteristics.

The **explicit geometric and topological representation** of the shape is defined following an adaptation of the ISO/CD 10303-42:1992, *Industrial Automation Systems and Integration: Product Data Representation and Exchange – Part 42: Integrated Generic Resources. Geometric and Topological Representation.* The type, class, and function semantic definition sections follow the adapted wording of the working draft, which is clearly indicated and quoted at each reference. The definitions on explicit geometric and topological representation are explicitly excluded from the copyright of the International Alliance of Interoperability

For more information on the definitions as defined in the formal ISO standard please refer to: ISO/IS 10303-42:1994, *Industrial Automation Systems and Integration: Product Data Representation and Exchange – Part 42: Integrated Generic Resources. Geometric and Topological Representation.* The formal standard can be obtained through the local publishers of standards in each individual country.

The following is within the scope of the explicit geometric and topological representation in IFC Release 2.0:

In Geometry:

- definition of points directly by their coordinate values
- definition of directions, vectors, and axis placements
- definition of parametric curves (subset of)
- definition of conic curves and elementary surfaces (subset of)
- definition of curves defined on a parametric surface (subset of)

In Topology:

- definition of fundamental topological entities, needed to define faceted B-rep's

In Geometric Shape Models:

- definition of faceted B-rep's
- definition of the creation of solid models by sweeping operations
- definition of half-spaces (subset of)
- definition of constructive solid geometry (CSG) models (subset of)

The **attribute driven representation** of standard shapes and shape characteristics is defined as the IFC enhancement of the geometry resource. It provides the definition of standard shapes, like extruded area segments or revolved area segments, and characteristics, in particular for the profile and path used within sweep operations to create solid models. The attributes of standard shape characteristics will later be linked to the semantic property definition of the product, so that the product's shape properties will drive the creation of the appropriate shape representation.

The following is within the scope of the attribute driven representation in IFC Release 2.0:

In Attribute Driven Geometric Shape Models:

- definition of two-dimensional bounded areas as profiles
- definition of the creation of solid models by sweeping operations, including multi segments, paths, profiles, tapering, morphing (limited) and cut-out's

7.1. Type IfcDimensionCount

7.1.1. Type Semantic Definition

Definition from ISO/CD 10303-42:1992: A dimension count is a positive integer used to define the coordinate space dimensionality.

NOTE Corresponding STEP type: *dimension_count*, please refer to ISO/IS 10303-42:1994, p. 14 for the final definition of the formal standard.

7.1.2. Type

INTEGER

Formal Propositions

WR1	The dimension count should be an integer between 1 and 3 NOTE: This is a further constraint by IFC, the upper limit does not exist in STEP

7.2. Select IfcAxis2Placement

7.2.1. Select Semantic Definition

Definition from ISO/CD 10303-42:1992: This select type collects together both versions of the placement as used in two dimensional or in three dimensional Cartesian space. This enables entities requiring this information to reference them without specifying the space dimensionality.

NOTE Corresponding STEP type: *axis2_placement,* please refer to ISO/IS 10303-42:1994, p. 19 for the final definition of the formal standard.

7.2.2. Select

IfcAxis2Placement2D
IfcAxis2Placement3D

7.3. Select IfcBooleanOperand

7.3.1. Select Semantic Definition

Definition from ISO/CD 10303-42:1992: This select type identifies all those types of entities which may participate in a Boolean operation to form a CSG solid.

Definition from IAI: CSG primitives are out of scope for the current IFC Release 1.5.1 & 2.0.

NOTE Corresponding STEP type: *boolean_operand,* please refer to ISO/IS 10303-42:1994, p.167 for the final definition of the formal standard. In IFC Release 1.5.1 & 2.0 only Boolean results (*IfcBooleanResult*), half space solids (*IfcHalfSpaceSolid*), faceted B-Rep, extruded solids and revolved solids (*IfcSolidModel*) are defined for being valid Boolean operands.

7.3.2. Select

IfcSolidModel
IfcHalfSpaceSolid
IfcBooleanResult

7.4. Select IfcCsgSelect

7.4.1. Select Semantic Definition

Definition from ISO/CD 10303-42:1992: This type identifies the types of entity which may be selected as the root of a CSG tree including a single CSG primitive as a special case (currently not in IFC).

Definition from IAI: In the current IFC Release 2.0 only Boolean result (*IfcBooleanResult*) is defined for being a root tree expression (at *IfcCsgSolid*). CSG primitives are out of scope for the current IFC Release 2.0.

NOTE Corresponding STEP type: *csg_select,* please refer to ISO/IS 10303-42:1994, p.168 for the final definition of the formal standard.

ISSUE: See I-330 for changes made in IFC Release 1.5.1

7.4.2. Select

IfcBooleanResult

7.5. Select IfcTrimmingSelect

7.5.1. Select Semantic Definition

Definition from ISO/CD 10303-42:1992: This select type identifies the two possible ways of trimming a parametric curve; by a Cartesian point on the curve, or by a REAL number defining a parameter value within the parametric range of the curve.

NOTE Corresponding STEP type: *trimming_select,* please refer to ISO/IS 10303-42:1994, p. 20 for the final definition of the formal standard.

7.5.2. Select

IfcCartesianPoint
IfcParameterValue

7.6. Select IfcVectorOrDirection

7.6.1. Select Semantic Definition

Definition from ISO/CD 10303-42:1992: This type is used to identify the types of entity which can participate in vector computations.

NOTE Corresponding STEP type: *vector_or_direction,* please refer to ISO/IS 10303-42:1994, p. 20 for the final definition of the formal standard.

7.6.2. Select

IfcVector
IfcDirection

7.7. Type IfcBooleanOperator

7.7.1. Type Semantic Definition

Definition from ISO/CD 10303-42:1992: This type defines the three Boolean operators used in the definition of CSG solids.

NOTE Corresponding STEP type: *boolean_operator,* please refer to ISO/IS 10303-42:1994, p.167 for the final definition of the formal standard.

ISSUE: See I-330 for changes made in IFC Release 1.5.1

7.7.2. Enumeration

Union	The operation of constructing the regularized set theoretic union of the volumes defined by two solids.
Intersection	The set theoretic difference between volumes defined by two solids.
Difference	The operation of constructing the regularized set theoretic intersection of the volumes defined by two solids.

7.8. Type IfcProfileTypeEnum

7.8.1. Type Semantic Definition

Definition from IAI: The enumeration defines whether the attribute driven definition of a profile shape shall be geometrically resolved into a curve or into a surface.

7.8.2. Enumeration

Curve	The resulting geometric item is of type IfcBoundedCurve and being closed. The resulting swept solid will then define only the bounding surfaces. This can be used to define shapes with thin sheets, such as ducts, where the thickness is not appropriate for geometric representation.
Area	The resulting geometric item is of type IfcCurveBoundedPlane. The resulting swept solid will be a three-dimensional body with defined volume.

7.9. Type IfcTransitionCode

7.9.1. Type Semantic Definition

Definition from ISO/CD 10303-42:1992: This type conveys the continuity properties of a composite curve or surface. The continuity referred to is geometric, not parametric continuity. For example, in *ContSameGradient* the tangent vectors of successive segments will have the same direction, but may have different magnitude.

NOTE Corresponding STEP type: *transition_code,* please refer to ISO/IS 10303-42:1994, p. 14 for the final definition of the formal standard.

7.9.2. Enumeration

Discontinuous	The segments do not join. This is permitted only at the boundary of the curve or surface to indicate that it is not closed.
Continuous	The segments join but no condition on their tangents is implied.
ContSameGradient	The segments join and their tangent vectors or tangent planes are parallel and have the same direction at the joint: equality of derivatives is not required.
ContSameGradientSameCurvature	For a curve, the segments join, their tangent vectors are parallel and in the same direction and their curvatures are equal at the joint: equality of derivatives is not required. For a surface this implies that the principle curvatures are the same and the principle directions are coincident along the common boundary.

7.10. Type IfcTrimmingPreference

7.10.1. Type Semantic Definition

Definition from ISO/CD 10303-42:1992: This type is used to describe the preferred way of trimming a parametric curve where the trimming is multiply defined.

NOTE Corresponding STEP type: *trimming_preference,* please refer to ISO/IS 10303-42:1994, p. 18 for the final definition of the formal standard.

7.10.2. Enumeration

Cartesian	Indicates that trimming by Cartesian point is preferred.
Parameter	Indicates the preference for the parameter value.
Unspecified	Indicates that no preference is communicated.

7.11. Class Ifc2DCompositeCurve

7.11.1. Class Semantic Definition

Definition from IAI: An Ifc2DCompositeCurve is an IfcCompositeCurve that is defined within the coordinate space of an IfcPlane. Therefore the dimensionality of the Ifc2DCompositeCurve has to be 2.

NOTE This class has been introduced to get a more straight forward definition of surface boundaries that its counterpart in STEP: *composite_curve_on_surface* and *boundary_curve*. Since the only basis elementary surface in IFC1.5 is the plane surface, a two dimensional composite curve provides enough capability to define the boundary.

7.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcBoundedCurve
IfcCompositeCurve
Ifc2DCompositeCurve

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR51	The composite curve shall be closed.
WR52	The dimensionality of the composite curve shall be 2

7.11.3. Interface Definitions

I_2DCompositeCurve

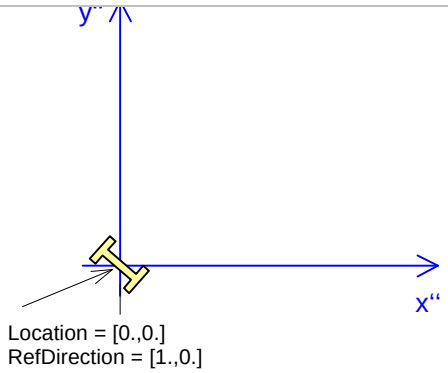
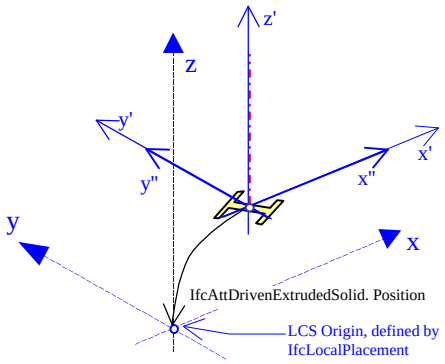
7.12. Class IfcArbitraryProfileDef

7.12.1. Class Semantic Definition

Definition from IAI: The IfcArbitraryProfileDef defines an arbitrary two-dimensional boundary to represent a profile for the use within the attribute driven geometry. It is given by an IfcBoundedCurve, from which the surface for extrusion or the surface of revolution can be constructed.

ISSUE: See issues I-239, I-291 for changes made in IFC Release 1.5.

ILLUSTRATION:

<table>
<tr>
<td> 
</td>
<td>Position
The Position attribute of the supertype for this class IfcAttDrivenProfileDef defines the 2D Placement of the Profile within the X''Y'' coordinate system, in which the bounded curve is defined. It is overwritten to Location [0.,0.] and RefDirection [1.,0.] as the ProfileDef shall not be subjected to an additional placement. Therefore the ProfileDef coordinate system (X''Y'') shall be identical with the XY plane of the coordinate system defined by the IfcAttDrivenExtrudedSegment or the IfcAttDrivenRevolvedSegment.</td>
</tr>
<tr>
<td> 
</td>
<td>The IfcArbitraryProfileDef is later positioned within the X'Y' Plane of the coordinate system defined by the
- IfcAttDrivenExtrudedSegment.Position, or by the
- IfcAttDrivenRevolvedSegment.Position.
The Position attribute defines a three dimensional placement coordinate system relative to the coordinate system, given by the IfcLocalPlacement of the semantic object for which it is the attribute driven geometric representation.
Within the X'Y' Plane as defined by the IfcAttDrivenExtrudedSegment or the IfcAttDrivenRevolvedSegment, the inherited two dimensional Position attribute defines a two-dimensional placement coordinate system (X''Y'') for the IfcBoundedCurve. The space dimensionality of the IfcBoundedCurve is therefore restricted to be 2. The location and the x- and y-axis directions are the same.</td>
</tr>
</table>

7.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcAttDrivenProfileDef
IfcArbitraryProfileDef

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	CurveForSurface	The definition of the closed boundary for the profile definition in terms of explicit geometry.	IfcBoundedCurve	n/a	n/a	n/a
	Position	Overwritten placement definition from the supertype IfcAttDrivenProfileDef. Always defines location [0.,0.] and RefDirection [1.,0.]	IfcAxis2Placement2D	n/a	n/a	0.,0. & (1.,0.), (0.,1.)

Formal Propositions

WR21	The IfcBoundedCurve used for curve for surface definition shall have the dimensionality of 2.

Informal Propositions

IP21	The IfcBoundedCurve used for curve for surface definition shall always be a closed bounded curve.

7.12.3. Interface Definitions

I_ArbitraryProfileDef

7.13. Class IfcAttDrivenClippedExtrudedSolid

7.13.1. Class Semantic Definition

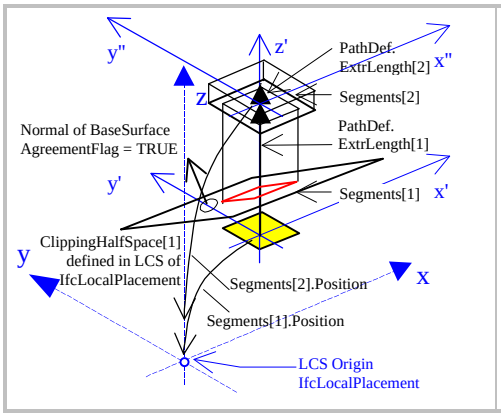
Definition from IAI: The IfcAttDrivenClippedExtrudedSolid defines a multi-segment extrusion solid by means of attribute driven geometric representation items. It is defined by

- list of extruded segments, each defining the placement coordinate system, the extrusion depth and the area of extrusion for this segment (inherited from supertype IfcAttDrivenExtrudedSolid), and
- list of half spaces, used to clip the extruded solids, that have been concatenated by a Boolean Union operation before. The half spaces are subtracted from the extruded solid in the order of their appearance in the list.

The half spaces are defined in the object coordinate system, as defined by the local placement of the semantic object.

ISSUE: See issue I-288 for changes made in IFC Release 1.5.

ILLUSTRATION:



Each IfcAttDrivenClippedExtrudedSolid additionally defines a list of half spaces, used to clip the multi-segment extruded solid. The Boolean operation "Difference" is applied between the union of Segments and each of the Clipping Half Spaces.
The result is an solid, defined by the union of all Segments and difference with each half space.

7.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcAttDrivenExtrudedSolid
IfcAttDrivenClippedExtrudedSolid

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ClippingHalfSpaces	Half spaces defined in Object	LIST [1:?] OF	1	N	1

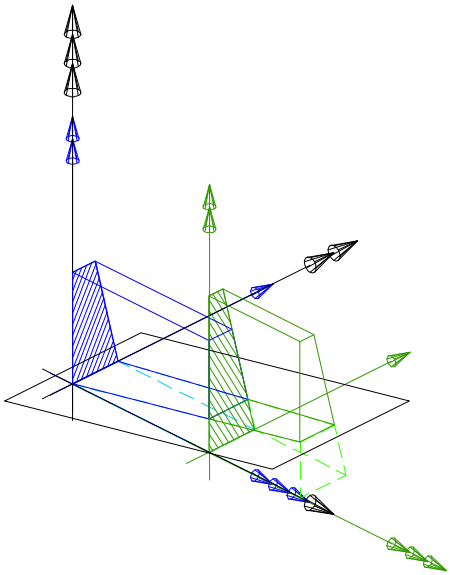
		Coordinate System of IfcLocalPlacement, that are used to clip the extruded solid.	IfcHalfSpaceSolid			

7.13.3. Interface Definitions

I_AttDrivenClippedExtrudedSolid

7.13.4. Geometry Use Definitions

Object Geometry in Context:



Example:
The figure shows the usage of IfcAttDrivenClippedExtrudedSolid to define a stepped trapezoidal solid with a sloping.

- Black arrows show LCS of IfcLocalPlacement (Object Coordinate System)
- Blue arrows show LCS of first IfcAttDrivenExtrudedSegment (defined by Position attribute)
- Green arrows show LCS of second IfcAttDrivenExtrudedSegment (defined by Position attribute)

The clipping Half Space (here unbounded) is defined in the LCS of IfcLocalPlacement (black arrows)

7.14. Class IfcAttDrivenClippedRevolvedSolid

7.14.1. Class Semantic Definition

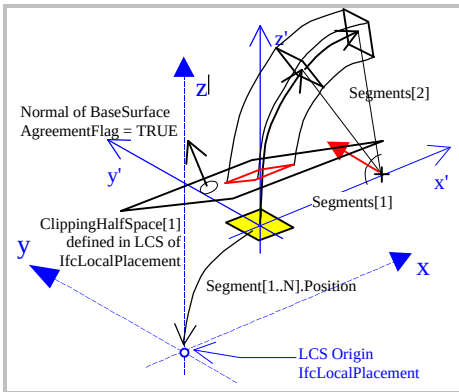
Definition from IAI: The IfcAttDrivenClippedRevolvedSolid defines a revolved solid by means of attribute driven geometric representation items. It is defined by

- list of revolved segments, each defining the start and sweep angle of revolution and the area of revolution for this segment, and
- list of half spaces, used to clip the extruded solids, that have been concatenated by a Boolean Union operation before. The half spaces are subtracted from the extruded solid in the order of their appearance in the list.

The half spaces are defined in the coordinate system, defined by the local placement of the semantic object.

ISSUE: See issue I-288 for changes made in IFC Release 1.5.

ILLUSTRATION:



Each IfcAttDrivenClippedRevolvedSolid additionally defines a list of half spaces, used to clip the multi-segment extruded solid. The Boolean operation "Difference" is applied between the union of Segments and each of the Clipping Half Spaces.
The result is an solid, defined by the union of all Segments and difference with each half space.

7.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcAttDrivenRevolvedSolid
IfcAttDrivenClippedRevolvedSolid

Attributes and Relationships

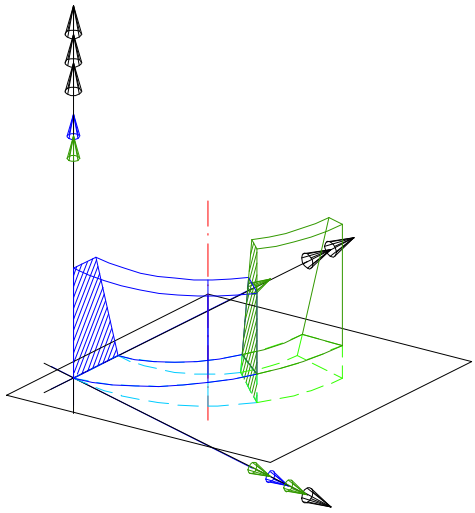
	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ClippingHalfSpaces	Half spaces defined in Object Coordinate System of IfcLocalPlacement, that are used to clip the extruded solid.	LIST [1:?] OF IfcHalfSpaceSolid	1	N	1

7.14.3. Interface Definitions

I_AttDrivenClippedRevolvedSolid

7.14.4. Geometry Use Definitions

Object Geometry in Context



Example:
The figure shows the usage of IfcAttDrivenClippedRevolvedSolid to define a stepped trapezoidal rotated solid with a sloping base.

- Black arrows show LCS of IfcLocalPlacement (Object Coordinate System)
- Blue arrows show LCS of first IfcAttDrivenRevolvedSegment (defined by Position attribute)
- Green arrows show LCS of second IfcAttDrivenRevolvedSegment (defined by Position attribute)

Both, first and second segment, refer to the same physical instance of LCS, IfcAxis2Placement3D. The clipping Half Space (here unbounded) is defined in the LCS of IfcLocalPlacement (black arrows)

7.15. Class IfcAttDrivenExtrudedSegment

7.15.1. Class Semantic Definition

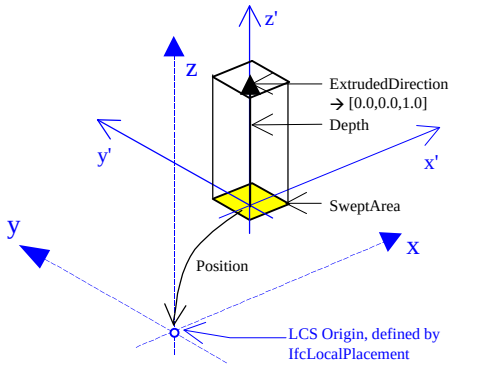
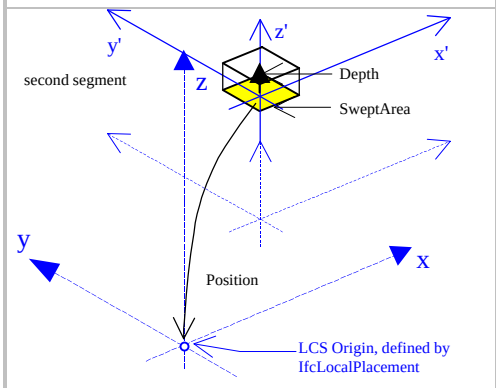
Definition from IAI: The IfcAttDrivenExtrudedSegment is the attribute driven definition of an extruded area solid segment of the multi-segment swept solid, the IfcAttDrivenExtrudedSolid. It is defined by a swept area, provided by the start profile definition, which remains unchanged over the extruded depth. This swept area is extruded along the extrusion direction, as given by the IfcAttDrivenExtrudedSolid.

The following parameter are specified:

- placement within a three dimensional coordinate system,
- profile definition, defines the extruded area by attributes according to standard forms, or by an arbitrary closed bounded curve,
- extruded area (inherited from supertype IfcSweptAreaSolid), derived by function IfcProfileIntoArea out of the profile definition,
- extruded direction (inherited from supertype IfcExtrudedAreaSolid), derived as being along the z- axis, defined by the position of the IfcAttDrivenExtrudedSolid,
- extruded depth (inherited from supertype IfcExtrudedAreaSolid)

ISSUE: See issues I-028, I-234, I-292 for changes made in IFC Release 1.5.

ILLUSTRATION:

	The IfcAttDrivenExtrudedSegment defines its own three-dimensional placement coordinate system relative to the coordinate system provided by the IfcLocalPlacement of the semantic object for which it is the attribute driven geometric representation. The IfcAttDrivenExtrudedSegment is defined by a start profile definition. From this profile definition the swept area is derived. The extrusion is always in the direction of the normal of the swept area. The swept area is provided as IfcCurveBoundedPlane with the basis surface of IfcPlane. The position of the IfcPlane, also defining the normal of the plane, is identical to the placement coordinate system, as defined by the IfcAttDrivenExtrudedSolid.
	Each segment is located by its own placement coordinate system relative to the coordinate system provided by the IfcLocalPlacement. A constraint applies to all placement coordinate systems of segments within one IfcAttDrivenExtrudedSolid. The Z' Axis of placement coordinate system of all segments shall be defined along a line.

7.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
  IfcSolidModel
    IfcSweptAreaSolid
      IfcExtrudedAreaSolid
        IfcAttDrivenExtrudedSegment

IfcAttDrivenTaperedExtrudedSegment
IfcAttDrivenMorphedExtrudedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Position	Placement of the extruded solid segment relative to the local coordinate system of the product.	IfcAxis2Placement3D	n/a	n/a	n/a
	ProfileDef	The attribute driven definition of the profile, from which the swept area can be derived.	IfcAttDrivenProfileDef	n/a	n/a	n/a
	SweptArea	The derived swept area, that specifies the surface defining the area to be swept. It is defined as a bounded planar surface, coplanar with the X'Y' plane of the placement coordinate system.	IfcCurveBoundedPlane	n/a	n/a	n/a
	ExtrudedDirection	The derived direction, in which the surface is to be swept. It is always in the direction of the z-axis of the placement coordinate system, as defined by the IfcAttDrivenExtrudedSolid, and thereby identical with the normal of the swept area.	IfcDirection	see type	see type	(0.0,0.0,1.0)
INV	PartOfSolid	The reference to the IfcAttDrivenExtrudedSolid, for which it defines a segment.	IfcAttDrivenExtrudedSolid	n/a	n/a	n/a

Formal Propositions

WR51	Only Profile Definitions, defining an area for extrusion are valid for ProfileDef.

7.15.3. Interface Definitions

I_AttDrivenExtrudedSegment

7.16. Class IfcAttDrivenExtrudedSolid

7.16.1. Class Semantic Definition

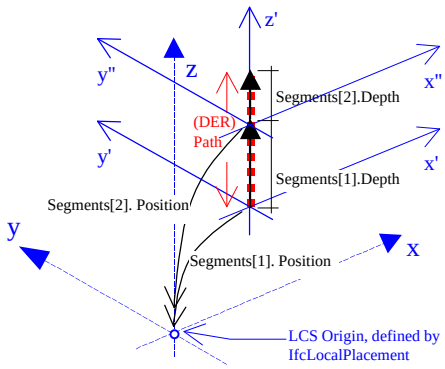
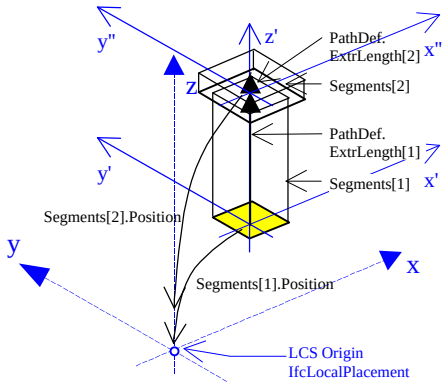
Definition from IAI: The IfcAttDrivenExtrudedSolid defines a multi-segment extrusion solid by means of attribute driven geometric representation items. It is defined by

- list of extruded segments, each defining the placement coordinate system, the extrusion depth and the area of extrusion for this segment.

The resulting solid is the union of all segments. The IfcAttDrivenExtrudedSolid also provides the derived definition of the extrusion path. The applied convention hereby is, that the extruded direction is always along the Z- Axis of the placement coordinate systems, defined by the Position attribute within all Segments. The extrusion depth parameter are defined for each Segment, therefore the path length is the sum of all extrusion depths as specified by the extruded segments.

ISSUE: See issue I-027, I-228, I-229, I-230, I-292 for changes made in IFC Release 1.5.

Example:

	The implied extrusion path is defined along the Z' axes of the placement coordinate systems of all Segments. For each extruded segment there is an extrusion depth definition provided. Those extrusion depths are defined consecutively. The complete extrusion path has the length of the sum of all extrusion depths defines in the Segment list. The IfcAttDrivenExtrudedSolid therefore allows for multiple segment solids. Since only multiple straight segments along the same line are allowed, there are no conflicts at the joints.
	Each IfcAttDrivenExtrudedSegment within the list of Segments defines an solid of linear extrusion. The IfcAttDrivenExtrudedSolid provides the formal and informal propositions to ensure, that a common extrusion direction is specified for all Segments. The result is an solid, defined by the union of all Segments.

7.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcAttDrivenExtrudedSolid
IfcAttDrivenClippedExtrudedSolid

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Segments	Definition of extruded segments, each segment has a start and can have a different end swept area, provided by an attribute driven profile definition. If the start profile is not identical with the end profile of the previous segment, that a stepped extrusion solid is generated.	LIST [1:?] OF IfcAttDrivenExtrudedSegment	1	N	1
	Path	The derived specification of the extrusion path, given by a polyline as explicit geometric representation.	IfcPolyline	n/a	n/a	n/a

Formal Propositions

WR31	The P[3] attribute (Z axis) of all Segments shall have the same direction.

Informal Propositions

IP31	The Location attribute of the Position for all Segments shall guarantee, that the Z-axis of all placement coordinate systems of all Segments shall be defined along a line.
IP32	The Location attribute of the Position for all Segments shall guarantee, that the start surface of the

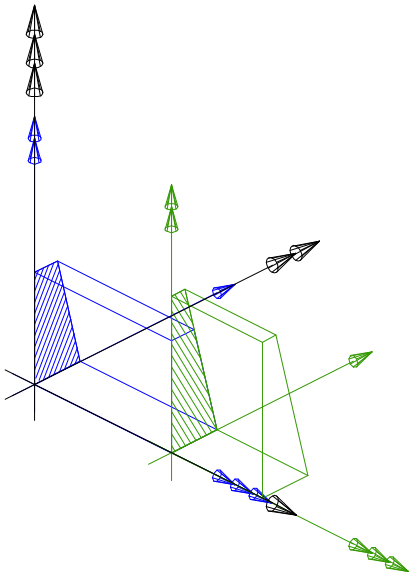
	next Segment is coplanar with the end surface of the previous Segment.

7.16.3. Interface Definitions

I_AttDrivenExtrudedSolid

7.16.4. Geometry Use Definitions

Object Geometry in Context



Example:
The figure shows the usage of IfcAttDrivenExtrudedSolid to define a stepped trapezoidal solid.

- Black arrows show LCS of IfcLocalPlacement (Object Coordinate System)
- Blue arrows show LCS of first IfcAttDrivenExtrudedSegment (defined by Position attribute)
- Green arrows show LCS of second IfcAttDrivenExtrudedSegment (defined by Position attribute)

7.17. Class IfcAttDrivenMorphedExtrudedSegment

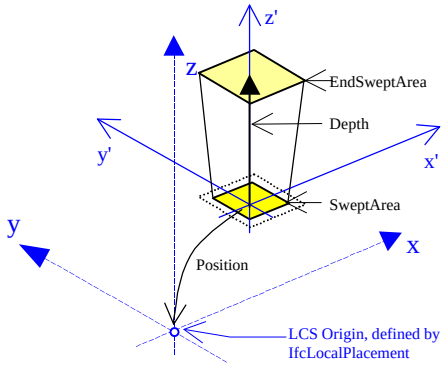
7.17.1. Class Semantic Definition

Definition from IAI: The IfcAttDrivenMorphedExtrudedSegment is the attribute driven definition of an extruded area solid segment of the multi-segment swept solid, the IfcAttDrivenExtrudedSolid. It is defined by a starting swept area, provided by the start profile definition and the ending swept area, provided by the end profile definition. The morphed extruded segment is restricted in the current release. A set of constrains apply to the definitions of start and end profile. In particular, they shall have the same number of points and the same type of segments between each two consecutive points.

The geometric resolution of the resulting surfaces and/or volume is left for the receiving application. The constraints applied in formal and informal propositions, however, limit results.

ISSUE: See issues I-031, I-237, I-293 for changes made in IFC Release 1.5

ILLUSTRATION:



The IfcAttDrivenMorphedExtrudedSegment provides an end profile definition from with the ending swept area is derived.
The start profile, extruded direction and depth are specified at the supertype IfcAttDrivenExtrudedSegment. The same conventions apply.

7.17.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcExtrudedAreaSolid
IfcAttDrivenExtrudedSegment
IfcAttDrivenMorphedExtrudedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	EndProfileDef	The attribute driven definition of the profile, from which the swept area can be derived.	IfcAttDrivenProfileDef	-	-	-
	EndSweptArea	The derived swept area, that specifies the surface defining the area to be swept.	IfcCurveBoundedPlane	-	-	-

Formal Propositions

WR61	The type of start profile definition shall be the same as the type of end profile definition.
WR62	The use of IfcArbitraryProfileDef is not allowed for morphing profiles.
WR63	The relative position of start and end profiles shall have the same orientation.

Informal Propositions

IP61	The configuration of start and end profile definition shall not generate a twisted sweep.
IP62	Corresponding straight edges of the starting and ending profiles shall be coplanar to ensure that the resulting side faces are planar.

7.17.3. Interface Definitions

I_AttDrivenMorphedExtrudedSegment

7.18. Class IfcAttDrivenMorphedRevolvedSegment

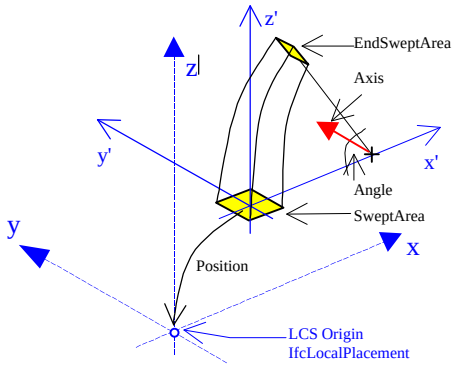
7.18.1. Class Semantic Definition

Definition from IAI: The IfcAttDrivenMorphedRevolvedSegment is the attribute driven definition of an revolved area solid segment of the multi-segment swept solid, the IfcAttDrivenRevolvedSolid. It is defined by a starting swept area, provided by the start profile definition and the ending swept area, provided by the end profile definition. The morphed revolved segment is restricted in the current release. A set of constrains apply to the definitions of start and end profile. In particular, they shall have the same number of points and the same type of segments between each points. This swept area is extruded around the axis.

The geometric resolution of the resulting surfaces and/or volume is left for the receiving application. The constraints applied in formal and informal propositions, however, limit results.

ISSUE: See issue I-031, I-238 for changes made in IFC Release 1.5

ILLUSTRATION:



The IfcAttDrivenMorphedRevolvedSegment provides an end profile definition from with the ending swept area is derived.
The start profile, axis and angle are specified at the supertype IfcAttDrivenRevolvedSegment. The same conventions apply.

7.18.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcRevolvedAreaSolid
IfcAttDrivenRevolvedSegment
IfcAttDrivenMorphedRevolvedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	EndProfileDef	The attribute driven definition of the profile, from which the swept area can be derived.	IfcAttDrivenProfileDef	n/a	n/a	n/a
	EndSweptArea	The derived swept area, that specifies the surface defining the area to be swept.	IfcCurveBoundedPlane	n/a	n/a	n/a

Formal Propositions

WR61	The type of start profile definition shall be the same as the type of end profile definition.
WR62	The use of IfcArbitraryProfileDef is not allowed for morphing profiles.
WR63	The relative position of start and end profiles shall have the same orientation.

Informal Propositions

IP61	The configuration of start and end profile definition shall not generate a twisted sweep.
IP62	Corresponding edges at the start and end profile shall be parallel.

7.18.3. Interface Definitions

I_AttDrivenMorphedRevolvedSegment

7.19. Class IfcAttDrivenProfileDef

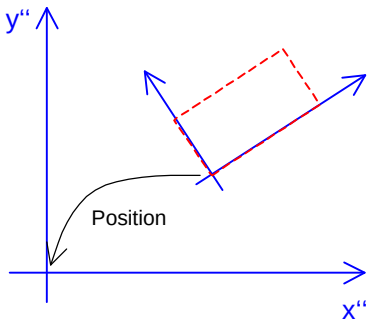
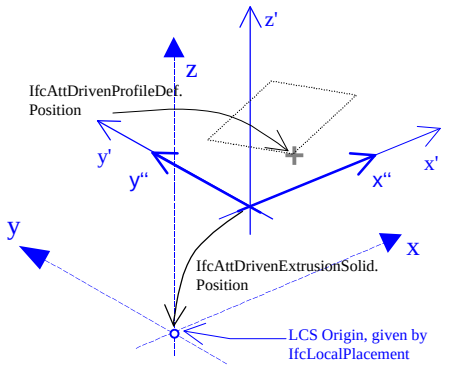
7.19.1. Class Semantic Definition

Definition from IAI: The IfcAttDrivenProfileDef is the supertype of all attribute driven definitions of the profile (or cross section) geometry in IFC. It is used to define a standard set of commonly used shapes of profiles including their attributes.

Currently all IfcAttDrivenProfileDef are treated as bounded areas, as they are used within the IfcAttDrivenExtrudedSegment or IfcAttDrivenRevolvedSegment for swept area solids. In other words, the inside of an IfcAttDrivenProfileDef is a part of the profile. The inside is defined in a way consistent with that for ISO 10303-42:1994 *curve_bounded_surface*.

ISSUE: See issues I-033, I-183, I-239 for changes made in IFC Release 1.5.

ILLUSTRATION:

	The IfcAttDrivenProfileDef defines a two-dimensional placement coordinate system for the attribute driven profile definitions of standard forms, relative to the coordinate system in which the resulting bounded curve is defined.
	In the later use of the IfcAttDrivenProfileDef within the - IfcAttDrivenExtrudedSolid or the - IfcAttDrivenRevolvedSolid the underlying coordinate system of the resulting bounded curve (X''Y'') is placed at the Location of the Position defined by the IfcAttDrivenExtrudedSegment or IfcAttDrivenRevolvedSegment (X'Y') and the x- and y- axis directions are the same.

7.19.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcAttDrivenProfileDef
IfcArbitraryProfileDef
IfcCircleProfileDef
IfcRectangleProfileDef
IfcTrapeziumProfileDef

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Position	Placement of the profile within the X'Y' plane defined by the Path Definition.	IfcAxis2Placement2D	see type	see type	0.,0. & (1.,0.), (0.,1.)
	ProfileType	Defines the type of geometry into which this profile definition shall be resolved, either bounded curve or bounded surface	IfcProfileTypeEnum	Curve	Area	Area

7.19.3. Interface Definitions

I_AttDrivenProfileDef

7.20. Class IfcAttDrivenRevolvedSegment

7.20.1. Class Semantic Definition

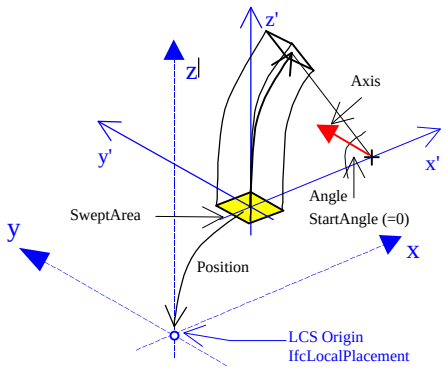
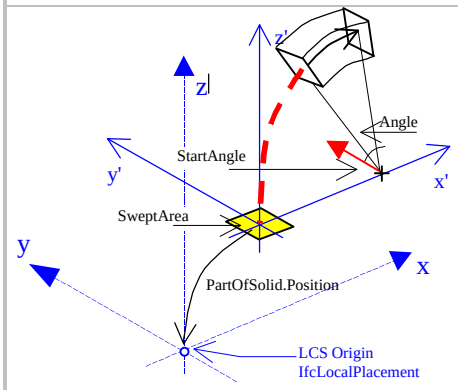
Definition from IAI: The IfcAttDrivenRevolvedSegment is the attribute driven definition of an revolved area solid segment of the multi-segment swept solid, the IfcAttDrivenRevolvedSolid. It is defined by a swept area, provided by the definition of the start profile, which is rotated over the revolved angle.

The following parameter are specified:

- placement within a three dimensional coordinate system, that defines the position of the normal of the first segment,
- profile definition, which defines the revolved,
- revolved area (inherited from supertype IfcSweptAreaSolid), derived by function IfcProfileIntoArea out of the profile definition,
- axis for revolution (inherited from supertype IfcRevolvedAreaSolid),
- sweep angle (inherited from supertype IfcRevolvedAreaSolid)
- start angle

ISSUE: See issues I-028, I-235, I-292 for changes made in IFC Release 1.5.

ILLUSTRATION:

	The IfcAttDrivenRevolvedSegment defines its own three-dimensional coordinate system relative to the coordinate provided by the IfcLocalPlacement of the semantic object for which it is the attribute driven geometric representation. The IfcAttDrivenRevolvedSegment is defined by a start profile definition. From this profile definition the swept area is derived. The revolution is always around the axis, which has to be identical for all Segments. The swept area is provided as IfcCurveBoundedPlane with the basis surface of IfcPlane. The position of the IfcPlane, also defining the normal of the plane, is identical to the placement coordinate system, as defined by the IfcAttDrivenRevolvedSolid.
	If the said IfcAttDrivenRevolvedSegment is not the first of the list of Segments at the IfcAttDrivenRevolvedSolid, i.e. the StartAngle <> 0.0, then the SweptArea is first rotated by the value of StartAngle.

7.20.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcRevolvedAreaSolid
IfcAttDrivenRevolvedSegment
IfcAttDrivenTaperedRevolvedSegment
IfcAttDrivenMorphedRevolvedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Position	Placement of the revolved solid relative to the local coordinate system of the product.	IfcAxis2Placement3D	-	-	-
	StartAngle	Angle by which the SweptArea is rotated first, before the revolution by the Angle.	IfcPlaneAngleMeasure	0	see IR1	p/2
	ProfileDef	The attribute driven definition of the profile, from which the swept area can be derived.	IfcAttDrivenProfileDef	-	-	-
	SweptArea	The derived swept area, that specifies the surface defining the area to be swept.	IfcCurveBoundedPlane	-	-	-
INV	PartOfSolid	The reference to the IfcAttDrivenExtrudedSolid, for which it defines a segment.	IfcAttDrivenRevolvedSolid	-	-	-

Formal Propositions

WR51	The Location of the sweep Axis shall always be defined at the X'Y' plane of the placement coordinate system.
WR52	

Informal Propositions

IP51	The sum of Start Angle and Angle (as defined in supertype IfcRevolvedAreaSolid) shall be between 0° and 360°, or 0 and 2p (depending on the unit type for Plane Angle Measure).

7.20.3. Interface Definitions

I_AttDrivenRevolvedSegment

7.21. Class IfcAttDrivenRevolvedSolid

7.21.1. Class Semantic Definition

Definition from IAI: The IfcAttDrivenRevolvedSolid defines a revolved solid by means of attribute driven geometric representation items. It is defined by

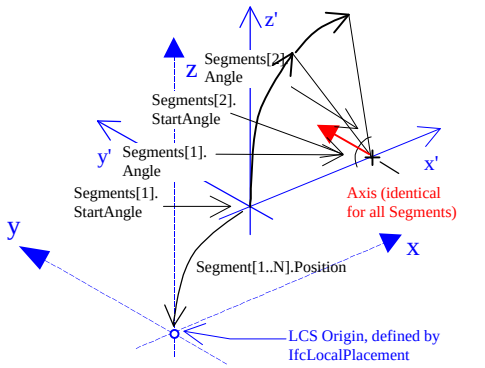
- list of revolved segments, each defining the start and sweep angle of revolution and the area of revolution for this segment.

The resulting solid is the union of all segments. The IfcAttDrivenRevolvedSolid also provides the derived definition of the arc defining the path of revolution. The arc starts in the origin, given by the location of the placement coordinate system of the first Segment. The angle of revolution parameters are defined at each Segment, where the start angle equals to the start angle + sweep angle of the previous Segment. The arc length of the path is therefore derived from the start angle + sweep angle at the last Segment.

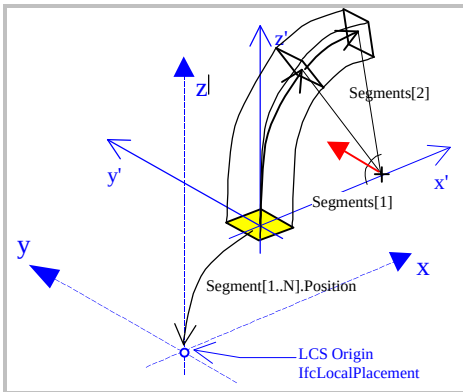
The IfcAttDrivenRevolvedSolid also provides constraints for the placement coordinate systems of the Segments, all shall refer to the same instance of IfcAxis2Placement3D. In addition, the Axis defined at all Segments shall be identical.

ISSUE: See issues I-027, I-231, I-232, I-233, I-292, I-294 for changes made in IFC Release 1.5.

ILLUSTRATION:

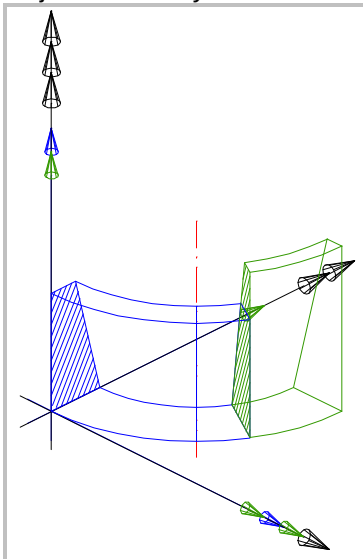


For each revolved Segment there is an start and sweep angle definition provided. The complete revolution arc has the arc length of the sum of all sweep angles defines in the Segment list.
The IfcAttDrivenRevolvedSolid therefore allows for multiple segment solids. Since all segments have the same axis, there are no conflicts at the joints.



Each IfcAttDrivenRevolvedSegment within the list of Segments defines an solid of revolution. The IfcAttDrivenRevolvedSolid ensures the use of a common placement coordinate system an a common axis for all Segments. The result is the union of all Segments.

Object Geometry in Context:



Example:
The figure shows the usage of IfcAttDrivenRevolvedSolid to define a stepped trapezoidal rotated solid.

- Black arrows show LCS of IfcLocalPlacement (Object Coordinate System)
- Blue arrows show LCS of first IfcAttDrivenRevolvedSegment (defined by Position attribute)
- Green arrows show LCS of second IfcAttDrivenRevolvedSegment (defined by Position attribute)

Both, first and second segment, refer to the same physical instance of LCS, IfcAxis2Placement3D.

7.21.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcAttDrivenRevolvedSolid
IfcAttDrivenClippedRevolvedSolid

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Segments	Definition of revolved segments, each segment has a start and can have a different end swept area, provided by an attribute driven profile definition. If the start profile is not identical with the end profile of the previous segment, that a stepped solid is generated.	LIST [1:?] OF IfcAttDrivenRevolvedSegment	1	N	1
	Path	The derived specification of the path of revolution, given by a trimmed curve as explicit geometric representation.	IfcTrimmedCurve	n/a	n/a	n/a

Formal Propositions

WR31	All Segments shall reference the same instance of the placement coordinate system.
WR32	All Segments shall define an identical Axis for revolution.

Informal Propositions

IP31	The StartAngle of the next Segment shall equal to the sum of sweep Angle of the previous Segments.

7.21.3. Interface Definitions

I_AttDrivenRevolvedSolid

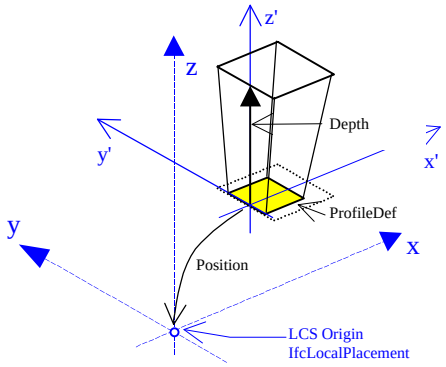
7.22. Class IfcAttDrivenTaperedExtrudedSegment

7.22.1. Class Semantic Definition

The IfcAttDrivenTaperedExtrudedSegment is the attribute driven definition of an extruded area solid segment of the multi-segment swept solid, the IfcAttDrivenExtrudedSolid. It is defined by a start swept area, provided by the start profile definition, which will be linearly changed during the sweep operation according to a tapering ratio. Therefore the implicitly defined end swept area is a scaled variant of the start swept area.

ISSUE: See issue I-296 for changes made in IFC Release 1.5

ILLUSTRATION:



The start profile, extruded direction and depth are specified at the supertype IfcAttDrivenExtrudedSegment. The same conventions apply. The end profile is implicitly calculated by applying the tapering ratio to the start profile. The tapering factor describes whether the profile increases (factor > 1.0) or decreases (1.0 > factor > 0.0). The position of the profile against the path is important, since the tapering factor takes this relative position into account.

7.22.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcExtrudedAreaSolid
IfcAttDrivenExtrudedSegment
IfcAttDrivenTaperedExtrudedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	TaperingFactor	The ratio that defines the increase/decrease of the profile along the extrusion vector.	IfcPositiveRatioMeasure	0.	see type	1

7.22.3. Interface Definitions

I_AttDrivenTaperedExtrudedSegment

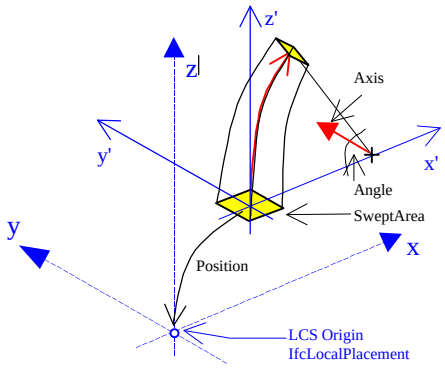
7.23. Class IfcAttDrivenTaperedRevolvedSegment

7.23.1. Class Semantic Definition

The IfcAttDrivenTaperedRevolvedSegment is the attribute driven definition of an revolved area solid segment of the multi-segment swept solid, the IfcAttDrivenExtrudedSolid. It is defined by a start swept area, provided by the start profile definition, which will be linearly changed during the sweep operation according to a tapering ratio factor. Therefore the implicitly defined end swept area is a scaled variant of the start swept area.

ISSUE: See issue I-296 for changes made in IFC Release 1.5

ILLUSTRATION:



The start profile, axis and angle are specified at the supertype IfcAttDrivenRevolvedSegment. The same conventions apply.
The end profile is implicitly calculated by applying the tapering ratio to the start profile. The tapering factor describes whether the profile increases (factor > 1.0) or decreases (1.0 > factor > 0.0). The position of the profile against the path is important, since the tapering factor takes this relative position into account.

7.23.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcRevolvedAreaSolid
IfcAttDrivenRevolvedSegment
IfcAttDrivenTaperedRevolvedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	TaperingFactor	The ratio that defines the increase/decrease of the profile along the extrusion vector.	IfcPositiveRatioMeasure	0.	see type	1

7.23.3. Interface Definitions

I_AttDrivenTaperedRevolvedSegment

7.24. Class IfcAxis1Placement

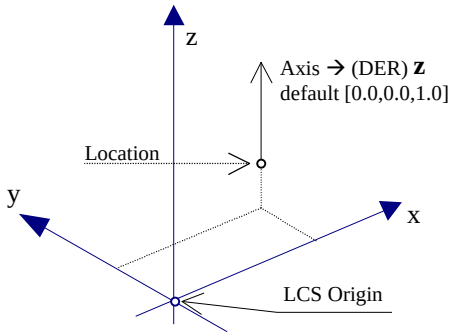
7.24.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The direction and location in three dimensional space of a single axis. An *IfcAxis1Placement* is defined in terms of a locating point (inherited from IfcPlacement supertype) and an axis direction: this is either the direction of *Axis* or defaults to (0.0,0.0,1.0). The actual direction for the axis placement is given by the derived attribute *Z*.

NOTE Corresponding STEP name: *axis1_placement,* please refer to ISO/IS 10303-42:1994, p. 28 for the final definition of the formal standard.

ISSUE: See issue I-008 for changes made in IFC Release 1.5.
See issues I-332, I-344 for changes made in IFC Release 1.5.1

Illustration:



Definition of the IfcAxis1Placement within the three-dimensional coordinate system.

7.24.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
  IfcPlacement
    IfcAxis1Placement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Axis	The direction of the local Z axis	IfcDirection	n/a	n/a	NIL
	Z	The normalized direction of the local Z axis. It is either identical with the Axis value, if given, or it defaults to [0.,0.,1.]	IfcDirection	n/a	n/a	(0.,0.,1.)

Formal Propositions

WR31	The Axis when given should only reference a three-dimensional IfcDirection
WR32	The Cartesian point defining the Location shall have the dimensionality of 3.

7.24.3. Interface Definitions

I_Axis1Placement

7.25. Class IfcAxis2Placement2D

7.25.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The location and orientation in two dimensional space of two mutually perpendicular axes. An IfcAxis2Placement2D is defined in terms of a point, (inherited from the IfcPlacement supertype), and an axis. It can be used to locate and originate an object in two dimensional space and to define a Placement Coordinate System. The class includes a point which forms the origin of the Placement Coordinate System. A direction vector is required to complete the definition of the Placement Coordinate System. The reference direction defines the placement X axis direction, the placement Y axis is derived from this.

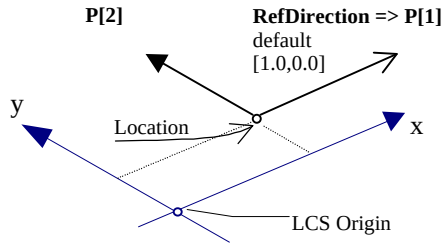
Definition from IAI: If the RefDirection attribute is not given, the placement defaults to P[1] (x-axis) as [1.,0.] and P[2] (y-axis) as [0.,1.].

NOTE Corresponding STEP name: *axis2_placement_2d,* please refer to ISO/IS 10303-42:1994, p. 28 for the final definition of the formal standard.

HISTORY New class in IFC Release 1.5, the IFC Release 1.0 entity IfcPlacement_2D was using two normalized and orthogonal axes. This definition is replaced in IFC Release 1.5 by the STEP definition of axis placement.

ISSUE: See issue I-008 for changes made in IFC Release 1.5.
See issues I-332, I-344 for changes made in IFC Release 1.5.1

Illustration:



Definition of the IfcAxis2Placement2D within the two-dimensional coordinate system.

7.25.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
  IfcPlacement
    IfcAxis2Placement2D

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	RefDirection	The direction used to determine the direction of the local X Axis	IfcDirection	n/a	n/a	NIL
	P	P[1]: The normalized direction of the placement X Axis. This is (1.0,0.0,0.0) if RefDirection is omitted. P[2]: The normalized direction of the placement Y Axis. This is a derived attribute and is orthogonal to P[1].	LIST [2:2] OF IfcDirection	n/a	n/a	(1.,0.), (0.,1.)

Formal Propositions

WR31	
WR32	

7.25.3. Interface Definitions

I_Axis2Placement2D

7.26. Class IfcAxis2Placement3D

7.26.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The location and orientation in three dimensional space of three mutually perpendicular axes. An *IfcAxis2Placement3D* is defined in terms of a point (inherited from IfcPlacement supertype) and two (ideally orthogonal) axes. It can be used to locate and originate an object in three dimensional space and to define a Placement Coordinate System. The class includes a point which forms the origin of the Placement Coordinate System. Two direction vectors are required to complete the definition of the Placement Coordinate System. The Axis is the placement Z axis direction and the *RefDirection* is an approximation to the placement X axis direction.

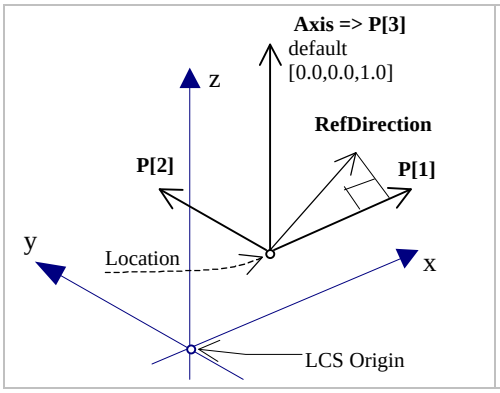
Definition from IAI: If the attribute values for Axis and RefDirection are not given, the placement defaults to P[1] (x-axis) as [1.,0.,0.], P[2] (y-axis) as [0.,1.,0.] and P[3] (z-axis) as [0.,0.,1.]

NOTE Corresponding STEP name: *axis2_placement_3d,* please refer to ISO/IS 10303-42:1994 for the final definition of the formal standard. The WR5 is added.

HISTORY New class in IFC Release 1.5, the IFC Release 1.0 entity IfcPlacement_3D was using three normalized and orthogonal axes. This definition is replaced in IFC Release 1.5 by the STEP definition of axis placement.

ISSUE: See issues I-008, I-311 for changes made in IFC Release 1.5.
See issue I-332 for changes made in IFC Release 1.5.1

Illustration:



Definition of the IfcAxis2Placement3D within the three-dimensional coordinate system.

7.26.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcPlacement
IfcAxis2Placement3D

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Axis	The exact direction of the local Z Axis	IfcDirection	n/a	n/a	NIL
OPT	RefDirection	The direction used to determine the direction of the local X Axis. If necessary an adjustment is made to maintain orthogonality to the Axis direction. If Axis and/or RefDirection is omitted, these directions are taken from the geometric coordinate system.	IfcDirection	n/a	n/a	NIL
	P	The normalized directions of the placement X Axis (P[1]) and the placement Y Axis (P[2]) and the placement Z Axis (P[3])	LIST [3:3] OF IfcDirection	n/a	n/a	(1.,0.,0.)(0.,1.,0.)(1.,0.,0.)

Formal Propositions

WR31	The dimensionality of the placement location shall be 3
WR32	The Axis when given should only reference a three-dimensional IfcDirection
WR33	The RefDirection when given should only reference a three-dimensional IfcDirection
WR34	The Axis and RefDirection shall not be parallel or anti-parallel
WR35	Either both (Axis and RefDirection) are not given and therefore defaulted, or both shall be given. This is a further constraint in IFC Release 1.5.

7.26.3. Interface Definitions

I_Axis2Placement3D

7.27. Class IfcBooleanResult

7.27.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A Boolean result is the result of a regularized operation on two solids to create a new solid. Valid operations are regularized union, regularized intersection, and regularized difference. For purpose of Boolean operations, a solid is considered to be a regularized set of points. The final Boolean result depends upon the operation and the two operands. In the case of the difference operator the order of the operands is also significant. The operator can be either union, intersection or difference. The effect of these operators is described below:

- Union on two solids is the new solid that is the regularization of the set of all points that are in either the first operand or the second operand or in both.
- Intersection on two solids is the new solid that is the regularization of the set of all points that are in both the first operand and the second operand.
- The result of the difference operation on two solids is the regularization of the set of all points which are in the first operand, but not in the second operand.

Definition from IAI: The following classes can be used as operands for the Boolean result:

- IfcExtrudedAreaSolid
- IfcRevolvedAreaSolid
- IfcFacetedBrep
- IfcFacetedBrepWithVoids
- IfcHalfSpaceSolid
- Boolean results of the above

NOTE Corresponding STEP entity: *boolean_result.* The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p.175 for the final definition of the formal standard.

ISSUE: See I-330 for changes made in IFC Release 1.5.1

7.27.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcBooleanResult

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Operator	The Boolean operator used in the operation to create the result.	IfcBooleanOperator	Union	Intersection	Union
	FirstOperand	The first operand to be operated upon by the Boolean operation.	IfcBooleanOperand	n/a	n/a	n/a
	SecondOperand	The second operand specified for the operation.	IfcBooleanOperand	n/a	n/a	n/a
	Dim	The space dimensionality of this entity.	IfcDimensionCount	2	3	3

Formal Propositions

WR21	The dimensionality of the first operand shall be the same as the dimensionality of the second operand.
WR22	Attribute driven geometry items shall not be used as the first operand
WR23	Attribute driven geometry items shall not be used as the second operand

7.27.3. Interface Definitions

I_BooleanResult

7.28. Class IfcBoundedCurve

7.28.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A bounded curve is a curve of finite arc length with identifiable end points.

NOTE Corresponding STEP name: *bounded_curve*, only the following subtypes have been incorporated into IFC: *polyline* as IfcPolyline, *trimmed_curve* as IfcTrimmedCurve, *composite_curve* as IfcCompositeCurve. The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 44 for the final definition of the formal standard.

7.28.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcBoundedCurve
IfcCompositeCurve

IfcPolyline
IfcTrimmedCurve

Attributes and Relationships

No attributes defined at this level.

Informal Propositions

IP31	A bounded curve has finite arc length.
IP32	A bounded curve has a start point and an end point.

7.28.3. Interface Definitions

I_BoundedCurve

7.29. Class IfcBoundingBox

7.29.1. Class Semantic Definition

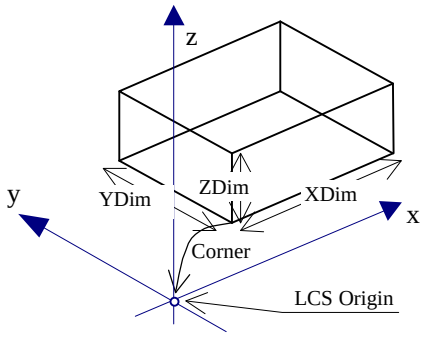
Definition from IAI: Every semantic object showing a physical extent will have a minimum default representation of a bounding box. The bounding box is the one representation that will always exist and be available. Even if more specific representations are associated with an object, the IfcBoundingBox should be updated and made consistent so that applications which may only want this minimal representation will have a valid view of the object geometry.

The general purpose bounding box is therefore used as minimal geometric representation for any geometrically represented object. Represents the minimal box which fully combines said object.

HISTORY New class in IFC Release 1.0

ISSUE: See issue I-021 for changes made in IFC Release 1.5.

Illustration:



The IfcBoundingBox is defined with an own location which can be used to place the IfcBoundingBox relative to the local coordinate system, given by the IfcLocalPlacement Class.
The IfcBoundingBox is defined by the lower left corner (Corner) and the upper right corner (XDim, YDim, ZDim measured within the parent co-ordinate system).

7.29.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcBoundingBox

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default

	Corner	Location of the bottom left corner (having the minimum values).	IfcCartesianPoint	see type	see type	[0.,0.,0.]
	XDim	Length attribute (measured along the edge parallel to the X Axis)	IfcPositiveLengthMeasure	0	see type	1
	YDim	Width attribute (measured along the edge parallel to the Y Axis)	IfcPositiveLengthMeasure	0	see type	1
	ZDim	Height attribute (measured along the edge parallel to the Z Axis)	IfcPositiveLengthMeasure	0	see type	1
	Dim	The space dimensionality of this class	IfcDimensionCount	3	3	3

7.29.3. Interface Definitions

I_BoundingBox

7.30. Class IfcBoxedHalfSpace

7.30.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: This entity is a subtype of the half space solid which is trimmed by a surrounding rectangular box. The box has its edges parallel to the coordinate axes of the geometric coordinate system.

NOTE Corresponding STEP entity : *boxed_half_space,* please refer to ISO/IS 10303-42:1994, p. 185 for the final definition of the formal standard. The IFC class IfcBoundingBox is used for the definition of the enclosure, providing the same definition as *box_domain*.

7.30.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcHalfSpaceSolid
IfcBoxedHalfSpace

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Enclosure	The box which bounds the half space for computational purposes only	IfcBoundingBox	see type	see type	-

Formal Propositions

WR31	The BaseSurface defining the half space shall not be a bounded surface.

7.30.3. Interface Definitions

I_BoxedHalfSpace

7.31. Class IfcCartesianPoint

7.31.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A point defined by its coordinates in a two or three dimensional rectangular Cartesian coordinate system, or in a two dimensional parameter space. The class is defined in a two or three dimensional space.

NOTE Corresponding STEP entity : *cartesian_point,* please refer to ISO/IS 10303-42:1994, p. 23 for the final definition of the formal standard. The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. The *WR1* was added to constrain the usage of IfcCartesianPoint in the context of IFC Geometry. For the purpose of defining geometry in IFC only two and three dimensional Cartesian points are used. This complies to the Note in ISO/IS 10303-42:1994.

7.31.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcPoint
IfcCartesianPoint

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Coordinates	The first, second, and third coordinate of the point location. If placed in a two or three dimensional rectangular Cartesian coordinate system, Coordinates[1] is the X coordinate, Coordinates[2] is the Y coordinate, and Coordinates[3] is the Z coordinate.	LIST [1:3] OF IfcLengthMeasure	see type	see type	(0.,0.,0.)
	Dim	The space dimensionality of this class, determined by the number of coordinates in the List of Coordinates.	IfcDimensionCount	2	3	3

Formal Propositions

WR31	Only two or three dimensional points shall be used for the purpose of defining geometry in this IFC Resource.

7.31.3. Interface Definitions

I_CartesianPoint

7.32. Class IfcCircle

7.32.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcCircle is defined by a radius and the location and orientation of the circle. Interpretation of data should be as follows:

C = SELF\IfcConic.Position.Location
X = SELF\IfcConic.Position.P[1]

y = SELF\IfcConic.Position.P[2]
z = SELF\IfcConic.Position.P[3]
R = Radius

and the circle is parameterized as

$$l(u) = \mathrm{C} + R((\cos u)\mathrm{x} + (\sin u)\mathrm{y})$$

The parameterization range is $0 \le u \le 2\pi$ (or $0 \le u \le 360$ degree). In the placement coordinate system defined above, the circle is the equation $C = 0$, where

$$C(x, y, z) = x^2 + y^2 - R^2$$

The positive sense of the circle at any point is in the tangent direction, **T**, to the curve at the point, where

$$\mathrm{T} = (-C_y, C_x, 0)$$

A circular arc is defined by using the IfcTrimmedCurve entity in conjunction with the IfcCircle entity as the *BasisCurve*.

NOTE Corresponding STEP entity: *circle,* please refer to ISO/IS 10303-42:1994, p. 38 for the final definition of the formal standard.

7.32.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcConic
IfcCircle

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Radius	The radius of the circle, which shall be greater than zero	IfcPositiveLengthMeasure	see type	see type	1

7.32.3. Interface Definitions

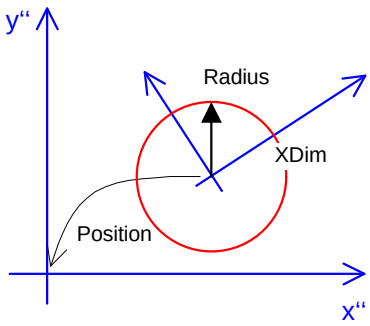
I_Circle

7.33. Class IfcCircleProfileDef

7.33.1. Class Semantic Definition

Definition from IAI: The IfcCircleProfileDef defines a circle as the profile definition used by the attribute driven geometric representation. It is given by its Radius attribute and placed within the local X'Y' plane.

ILLUSTRATION:



Position

The Position attribute of its supertype IfcAttDrivenProfileDef defines the 2D Placement of the Profile within the X''Y'' coordinate system, in which the derived bounded curve is defined.

Parameter

The location of the position coordinate system defines the center of the circle. The Radius attribute defines the radius of the circle.

7.33.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcAttDrivenProfileDef
IfcCircleProfileDef

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Radius	The radius of the circle.	IfcPositiveLengthMeasure	see type	see type	1
	CurveForSurface	Redefinition of the CurveForSurface defined in the supertype as being derived. A function is given that constructs an IfcTrimmedCurve out of the circle.	IfcTrimmedCurve	n/a	n/a	n/a

7.33.3. Interface Definitions

I_CircleProfileDef

7.34. Class IfcClosedShell

7.34.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A closed shell is a shell of the dimensionality 2 which typically serves as a bound for a region in R^3. A closed shell has no boundary, and has non-zero finite extent. If the shell has a domain with coordinate space R^3, it divides that space into two connected regions, one finite and the other infinite. In this case, the topological normal of the shell is defined as being directed from the finite to the infinite region.

The shell is represented by a collection of faces. The domain of the shell, if present, contains all those faces, together with their bounds. Associated with each face in the shell is a logical value which indicates whether the face normal agrees with (TRUE) or is opposed to (FALSE) the shell normal. The logical value can be applied directly as a BOOLEAN attribute of an oriented face, or be defaulted to TRUE if the shell boundary attribute member is a face without the orientation attribute.

Definition from IAI: In the current IFC Release 2.0 only poly loops (*IfcPolyLoop*) are defined for *Bounds* of face bound (*IfcFaceBound*). This will allow for faceted B-rep only.

NOTE Corresponding STEP entity: *closed_shell,* please refer to ISO/IS 10303-42:1994, p.149 for the final definition of the formal standard.

7.34.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcConnectedFaceSet
IfcClosedShell

Attributes and Relationships

No attributes defined at this level.

Informal Propositions

IP31	Every edge shall be referenced exactly twice by the loops of the face.
IP32	Each oriented edge shall be unique.
IP33	No edge shall be referenced by more than two faces.
IP34	Distinct faces of the shell do not intersect, but may share edges or vertices.
IP35	Distinct edges do not intersect but may share vertices.
IP36	Each face reference shall be unique.
IP37	The loops of the shell shall not be a mixture of poly loop and other loop types. Note: this is given, since only poly loop is defined as face bound definition.
IP38	The closed shell shall be an oriented arcwise connected 2-manifold.
IP39	The Euler equation shall be satisfied. Note: Please refer to ISO/IS 10303-42:1994, p.149 for the equation.

7.34.3. Interface Definitions

I_ClosedShell

7.35. Class IfcCompositeCurve

7.35.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcCompositeCurve is a collection of curves joined end-to-end. The individual segments of the curve are themselves defined as IfcCompositeCurveSegment. The parameterization of the composite curve is an accumulation of the parametric ranges of the referenced bounded curves. The first segment is parameterized from 0 to l_1, and, for $i \geq 2$, the i^{th} segment is parameterized from where l_k is the parametric length (i.e., difference between maximum and minimum parameter values) of the curve underlying the k^{th} segment.

NOTE Corresponding STEP entity: *composite_curve,* please refer to ISO/IS 10303-42:1994, p. 56 for the final definition of the formal standard. The *WR2* is added to ensure consistent *Dim* at all segments.

7.35.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve

IfcBoundedCurve
IfcCompositeCurve
Ifc2DCompositeCurve

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Segments	The component bounded curves, their transitions and senses. The transition attribute for the last segment defines the transition between the end of the last segment and the start of the first; this transition attribute may take the value discontinuous, which indicates an open curve.	LIST [1:?] OF IfcCompositeCurveSegment	1	N	1
	SelfIntersect	Indication of whether the curve intersects itself or not; this is for information only.	LOGICAL	see type	see type	FALSE
	NSegments	The number of component curves.	INTEGER	1	see type	1
	ClosedCurve	Indication whether the curve is closed or not; this is derived from the transition code of the last segment.	LOGICAL	see type	see type	TRUE

Formal Propositions

WR41	No transition code should be Discontinuous, except for the last code of an open curve.
WR42	Ensures, that all segments used in the curve have the same dimensionality.

Informal Propositions

IP41	The SameSense attribute of each segment correctly specifies the senses of the component curves. When traversed in the direction indicated by SameSense, the segments shall join end-to-end.

7.35.3. Interface Definitions

I_CompositeCurve

7.36. Class IfcCompositeCurveSegment

7.36.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcCompositeCurveSegment is a bounded curve together with transition information which is used to construct an IfcCompositeCurve.

NOTE Corresponding STEP entity: *composite_curve_segment*. The derived attribute *Dim* has been added at this level. Please refer to ISO/IS 10303-42:1994, p. 57 for the final definition of the formal standard.

7.36.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCompositeCurveSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Transition	The state of transition (i.e., geometric continuity from the last point of this segment to the first point of the next segment) in a composite curve.	IfcTransitionCode	Discontinuous	ContSameGradientSameCurvature	Continuous
	SameSense	An indicator of whether or not the sense of the segment agrees with, or opposes, that of the parent curve. If SameSense is false, the point with highest parameter value is taken as the first point of the segment.	BOOLEAN	see type	see type	TRUE
	ParentCurve	The bounded curve which defines the geometry of the segment.	IfcCurve	n/a	n/a	n/a
	Dim	The space dimensionality of this class, defined by the dimensionality of the first ParentCurve	IfcDimensionCount	2	3	3
INV	UsingCurves	The set of composite curves which use this composite curve segment as a segment. This set shall not be empty.	SET [1:?] OF IfcCompositeCurve	1	N	1

Formal Propositions

WR21	The parent curve shall be a bounded curve.

7.36.3. Interface Definitions

I_CompositeCurveSegment

7.37. Class IfcConic

7.37.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcConic is a planar curve which could be produced by intersecting a plane with a cone. A conic is defined in terms of its intrinsic geometric properties rather than being described in terms of other geometry. A conic class always has a Placement Coordinate System defined by a two or three dimensional placement. The parametric representation is defined in terms of this Placement Coordinate System.

NOTE Corresponding STEP entity: *conic,* only the following subtypes have been incorporated into IFC 1.0, 1.5 & 2.0: *circle* as IfcCircle, *ellipse* as IfcEllipse. The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 38 for the final definition of the formal standard.

7.37.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcConic
IfcCircle
IfcEllipse

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Position	The location and orientation of the conic.	IfcAxis2Placement	n/a	n/a	n/a

7.37.3. Interface Definitions

I_Conic

7.38. Class IfcConnectedFaceSet

7.38.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcConnectedFaceSet is a set of IfcFace such that the domain of faces together with their bounding edges and vertices is connected.

NOTE Corresponding STEP entity: *connected_face_set*, only the subtype *closed_shell* is included as IfcClosedShell. Please refer to ISO/IS 10303-42:1994, p. 144 for the final definition of the formal standard.

ISSUE: See issue I-227 for changes made in IFC Release 1.5.

7.38.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcConnectedFaceSet
IfcClosedShell

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	CfsFaces	The set of faces arcwise connected along common edges or vertices.	SET [1:?] OF IfcFace	1	N	1

Informal Propositions

IP21	The union of the domains of the faces and their bounding loops shall be arcwise connected.

7.38.3. Interface Definitions

I_ConnectedFaceSet

7.39. Class IfcCsgSolid

7.39.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A solid represented as a CSG model is defined by a collection of so-called primitive solids, combined using regularized Boolean operations. The allowed operations are intersection, union, and difference. As a special case a CSG solid can also consists of a single CSG primitive (not in IFC1.5). A CSG solid requires two kinds of information for its complete definition: geometric and structural:

- The geometric information is conveyed by solid models. These typically primitive volumes such as cylinders, wedges and extrusions, but can include general B-Rep models. There can also be solid replicas (not in IFC1.5) and half space solids.
- The structural information is in a tree (strictly an acyclic directed graph) of Boolean result and CSG solids, which represent a 'recipe' for building the solid. The terminal nodes are the geometric primitives and other solids. Every CSG solid has precisely one Boolean result associated with it which is the root of the tree that defines the solid. (There may be further Boolean results within the tree as operands). The significance of a CSG solid entity is that the solid defined by the associated tree is thus identified as a significant object itself, and in this way it is distinguished from other Boolean result entities representing intermediate results during the construction process.

Definition from IAI: The following primitive volumes can be parts of the CSG tree: solid models, i.e. faceted B-Rep (IfcFacetedBrep, IfcFacetedBrepWithVoids) or swept area solid (IfcExtrudedAreaSolid, IfcRevolvedAreaSolid). CSG primitives are out of scope for current IFC Release. The use of attribute driven extruded solids and segments, and attribute driven revolved solids and segments within a Boolean operation for the CSG tree is not foreseen for the current IFC Release.

NOTE Corresponding STEP entity: *csg_solid,* please refer to ISO/IS 10303-42:1994, p.174 for the final definition of the formal standard.

ISSUE: See I-330 for changes made in IFC Release 1.5.1

7.39.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcCsgSolid

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	TreeRootExpression	Boolean expression of regularized operators describing the solid. The root of the tree of Boolean expressions is given explicitly as an IfcBooleanResult (the only item in the Select IfcCsgSelect).	IfcCsgSelect	1	1	1

7.39.3. Interface Definitions

I_CsgSolid

7.40. Class IfcCurve

7.40.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A curve can be envisioned as the path of a point moving in its coordinate space.

NOTE Corresponding STEP entity: *curve*, only the following subtypes have been incorporated into IFC 1.5: *line* as IfcLine, *conic* as IfcConic, *bounded_curve* as IfcBoundedCurve. Please refer to ISO/IS 10303-42:1994, p. 37 for the final definition of the formal standard.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

7.40.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcBoundedCurve
IfcConic
IfcLine

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Dim	The space dimensionality of this abstract class, defined differently for all subtypes, i.e. for IfcLine, IfcConic and IfcBoundedCurve.	IfcDimensionCount			

Informal Propositions

IP21	A curve shall be arcwise connected.
IP22	A curve shall have an arc length greater than zero.

7.40.3. Interface Definitions

I_Curve

7.41. Class IfcCurveBoundedPlane

7.41.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The curve bounded surface is a parametric surface with curved boundaries defined by one or more boundary curves. The bounded surface is defined to be the portion of the basis surface in the direction of ***N x T*** from any point on the boundary, where **N** is the surface normal and **T** the boundary curve tangent vector at this point. The region so defined shall be arcwise connected.

Definition from IAI: The IfcCurveBoundedPlane is a specialized bounded surface class that deals only with bounding basis plane surfaces. The definition varies from STEP as outer and inner boundaries are separated attributes and reference the special IFC type Ifc2DCompositeCurve. Only basis surfaces of type IfcPlane are allowed, and the *implicit_outer* attribute has not been incorporated, since only unbounded surfaces are used as basis surface.

NOTE Corresponding STEP entity *curve_bounded_surface* has been changed to meet the specific requirements of an easy representation of curve bounded planes. Only curve bounded planes are allowed in swept area solid, therefore this entity meets the specific requirements of the swept area solid with an easy implementation.

ISSUE: See issue I-225 for changes made in IFC Release 1.5.
See issue I-333 for changes made in IFC Release 1.5.1

7.41.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSurface
IfcCurveBoundedPlane

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	BasisSurface	The surface to be bound	IfcPlane	n/a	n/a	n/a
	OuterBoundary	The outer boundary of the surface.	Ifc2DCompositeCurve	n/a	n/a	n/a
	InnerBoundaries	An optional set of inner boundaries. They shall not intersect each other or the outer boundary.	SET [0:?] OF Ifc2DCompositeCurve	0	N	empty
	Dim	The space dimensionality of this class, defined by the dimensionality of the basis surface.	IfcDimensionCount	3	3	3

7.41.3. Interface Definitions

I_CurveBoundedPlane

7.42. Class IfcDirection

7.42.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: This entity defines a general direction vector in two or three dimensional space. The actual magnitudes of the components have no effect upon the direction being defined, only the ratios X:Y:Z or X:Y are significant.

NOTE Corresponding STEP entity: *direction.* The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 26 for the final definition of the formal standard.

7.42.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcDirection

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	DirectionRatios	The components in the direction of X axis (DirectionRatios[1]), of Y axis (DirectionRatios[2]), and of Z axis (DirectionRatios[3])	LIST [2:3] OF REAL	2	3	3
	Dim	The space dimensionality of this class, defined by the number of real in the list of DirectionRatios	IfcDimensionCount	2	3	2

Formal Propositions

WR21	The magnitude of the direction vector shall be greater than zero.

7.42.3. Interface Definitions

I_Direction

7.43. Class IfcEdge

7.43.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An edge is the topological construct corresponding to the connection of two vertices. More abstractly, it may stand for a logical relationship between two vertices. The domain of an edge, if present (not in current IFC release), is a finite, non-self-intersecting open curve in R^M, that is, a connected 1-dimensional manifold. The bounds of an edge are two vertices, which need not be distinct. The edge is oriented by choosing its traversal direction to run from the first to the second vertex. If the two vertices are the same, the edge is a self loop. The domain of the edge does not include its bounds, and $0 \leq \Xi \leq \infty$.

An edge is a graph, so its multiplicity M and graph genus G^e may be determined by the graph traversal algorithm. Since $M = E = 1$, the Euler equation (1) reduces in the case to

$$V - \left(2 - G^e\right) = 0$$

where V = 1 or 2, and G^e = 1 or 0.

Specifically, the topological edge defining data shall satisfy:

- an edge has two vertices
$$\left|E[V]\right| = 2$$
- the vertices need not be distinct
$$1 \leq \left|E\{V\}\right| \leq 2$$
- Equation (2) shall hold.
$$\left|E\{V\}\right| - 2 + G^e = 0$$

NOTE Corresponding STEP entity: *edge.* Please refer to ISO/IS 10303-42:1994, p. 130 for the final definition of the formal standard.

History

New Entity in IFC Release 2.0

7.43.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcEdge
IfcOrientedEdge

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	EdgeStart	Start point (vertex) of the edge.	IfcVertex	n/a	n/a	n/a
	EdgeEnd	End point (vertex) of the edge. The same vertex can be used for both EdgeStart and EdgeEnd.	IfcVertex	n/a	n/a	n/a

Informal Propositions

IP21	The edge has dimensionality 1.
IP22	The extent of an edge dhall be finite and nonzero.

7.43.3. Interface Definitions

I_Edge

7.44. Class IfcElementarySurface

7.44.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcElementarySurface is a simple analytic surface with defined parametric representation.

NOTE Corresponding STEP entity: *elementary_surface.* Only the subtype *plane* is incorporated as IfcPlane. The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 69 for the final definition of the formal standard.

7.44.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSurface
IfcElementarySurface
IfcPlane

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Position	The position and orientation of the surface. This attribute is used in the definition of the parameterization of the surface.	IfcAxis2Placement3D	n/a	n/a	n/a
	Dim	The space dimensionality of this class, derived from the dimensionality of the Position	IfcDimensionCount	3	3	3

7.44.3. Interface Definitions

I_ElementarySurface

7.45. Class IfcEllipse

7.45.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcEllipse is a conic section defined by the lengths of the semi-major and semi-minor diameters and the position (center or mid point of the line joining the foci) and orientation of the curve. Interpretation of the data shall be as follows:

C = SELF\IfcConic.Position.Location
x = SELF\IfcConic.Position.P[1]
y = SELF\IfcConic.Position.P[2]
z = SELF\IfcConic.Position.P[3]
R_1 = SemiAxis1
R_2 = SemiAxis2

and the ellipse is parameterized as:

$$l(u) = \mathrm{C} + (R_1 \cos u)\mathrm{x} + (R_2 \sin u)\mathrm{y}$$

The parameterization range is $0 \le u \le 2\pi$ (or $0 \le u \le 360$ degree). In the placement coordinate system defined above, the ellipse is the equation $C = 0$, where

$$C(x, y, z) = x^2 / R_1^2 + y^2 / R_2^2 - 1$$

The positive sense of the ellipse at any point is in the tangent direction, T, to the curve at the point, where

$$\mathrm{T} = (-C_y, C_x, 0)$$

The inherited *Position.Location* from IfcConic is the center of the IfcEllipse, and the inherited *Position.P[1]* from IfcConic the direction of the *SemiAxis1*.

NOTE Corresponding STEP entity: *ellipse.* Please refer to ISO/IS 10303-42:1994, p. 39 for the final definition of the formal standard.

7.45.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
  IfcCurve
    IfcConic
      IfcEllipse

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	SemiAxis1	The first radius of the ellipse which shall be positive. Placement.Axes[1] gives the direction of the SemiAxis1	IfcPositiveLengthMeasure	0	see type	1
	SemiAxis2	The second radius of the ellipse which shall be positive.	IfcPositiveLengthMeasure	0	see type	1

7.45.3. Interface Definitions

I_Ellipse

7.46. Class IfcExtrudedAreaSolid

7.46.1. Class Semantic Definition

Definition from IAI: The IfcExtrudedAreaSolid is defined by sweeping a planar bounded plane. The direction of the extrusion is given by the ExtrudedDirection attribute and the length of the extrusion is given by the Depth attribute. The only allowed area type to be swept is an IfcCurveBoundedPlane, given by the inherited SweptArea attribute from the IfcSweptAreaSolid. If the IfcCurveBoundedPlane has inner boundaries, i.e. holes defined, then those holes shall be swept into holes of the solid.

NOTE Corresponding STEP entity: *extruded_area_solid.* Please refer to ISO/IS 10303-42:1994, p. 183 for the final definition of the formal standard. NOTE the data type of the inherited SweptArea attribute is different, i.e. of type IfcCurveBoundedPlane. This complies to *WR1* at the supertype *swept_area_solid*, defining that only planar bounded surfaces are allowed for swept area solids.

ISSUE: See issue I-019 for changes made in IFC Release 1.5.

7.46.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcExtrudedAreaSolid
IfcAttDrivenExtrudedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ExtrudedDirection	The direction in which the surface is to be swept.	IfcDirection	n/a	n/a	equal to normal
	Depth	The distance the surface is to be swept	IfcPositiveLengthMeasure	0	see type	1

Formal Propositions

WR41	The ExtrudedDirection shall not be perpendicular to the normal of the plane surface

7.46.3. Interface Definitions

I_ExtrudedAreaSolid

7.47. Class IfcFace

7.47.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A face is a topological entity of dimensionality 2 corresponding to the intuitive notion of a piece of surface bounded by loops. Its domain, if present, is an oriented, connected, finite 2-manifold in R^m. A face domain shall not have handles but it may have holes, each hole bounded by a loop. The domain of the underlying geometry of the face, if present, does not contain its bounds, and $0 < X < \infty$.

A face is represented by its bounding loops, which are defined as face bounds. A face has a topological normal **n** and the tangent to a loop is **t**. For a loop bounding a face with defined geometry, the cross product **n x t** points toward the interior of the face. That is, each loop runs counter-clockwise around the face when viewed from above, if we consider the normal n to point up. With each loop is associated a BOOLEAN flag to signify whether the loop direction is oriented with respect to the face normal (TRUE) or should be reversed (FALSE).

A face shall have at least one bound, and the loops shall not intersect. One loop is optionally distinguished as the *outer* loop of the face. If so, it establishes a preferred way of embedding the face domain in the plane, in which the other bounding loops of the face are *inside* the outer bound. Because the face domain is arcwise connected, no inner loop will contain any other loop. This is true regardless of which embedding in the plane is chosen.

NOTE Corresponding STEP entity: *face.* No subtypes of face have been incorporated into this IFC Release. Please refer to ISO/IS 10303-42:1994, p. 140 for the final definition of the formal standard. The *WR1* has not been incorporated, since it is always satisfied, due to the fact that only poly loops exist for face bounds.

7.47.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem

IfcFace

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Bounds	Boundaries of the face.	SET [1:?] OF IfcFaceBound	1	N	1

Formal Propositions

WR21	At most one of the bounds shall be of the type IfcFaceOuterBound

Informal Propositions

IP21	No edge shall be referenced by the face more than twice,
IP22	Distinct face bounds of the face shall have no common vertices.
IP23	If geometry is present, distinct loops of the same face shall not intersect.
IP24	The face shall satisfy the Euler Equation: (number of vertices) - (number of edges) - (number of loops) + (sum of genus for loops) = 0.

7.47.3. Interface Definitions

I_Face

7.48. Class IfcFaceBound

7.48.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A face bound is a loop which is intended to be used for bounding a face.

NOTE Corresponding STEP entity: *face_bound.* Please refer to ISO/IS 10303-42:1994, p. 139 for the final definition of the formal standard.

7.48.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcFaceBound
IfcFaceOuterBound

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Bound	The loop which will be used as a face boundary	IfcPolyLoop	n/a	n/a	n/a
	Orientation	This indicated whether (TRUE) or not (FALSE) the loop has the same sense when used to bound the face as when first defined. If sense is FALSE the senses of all its component oriented edges are implicitly reversed when used in the face.	BOOLEAN	see type	see type	TRUE

7.48.3. Interface Definitions

I_FaceBound

7.49. Class IfcFaceOuterBound

7.49.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A face outer bound is a special subtype of face bound which carries the additional semantics of defining an outer boundary on the face. No more than one boundary of a face shall be of this type.

NOTE Corresponding STEP entity: *face_outer_bound.* Please refer to ISO/IS 10303-42:1994, p. 139 for the final definition of the formal standard.

7.49.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcFaceBound
IfcFaceOuterBound

Attributes and Relationships

No attributes defined at this level.

7.49.3. Interface Definitions

I_FaceOuterBound

7.50. Class IfcFacetedBrep

7.50.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcFacetedBrep is a simple form of boundary representation model in which all faces are planar and all edges are straight lines. Unlike the B-rep model, edges and vertices are not represented explicitly in the model but are implicitly available through the IfcPolyLoop entity. A faceted B-rep has to meet the same topological constraints as the manifold solid Brep.

NOTE Corresponding STEP entity: *faceted_brep*. Please refer to ISO/IS 10303-42:1994, p. 173 for the final definition of the formal standard. NOTE In IFC Release 1.5 faceted B-rep with voids is represented by an own subtype and not defined via an implicit ANDOR supertype constraint as in ISO/IS 10303-42:1994. This change has been made due to the fact, that only ONEOF supertype constraint is allowed within the IFC object model.

ISSUE: See issue I-019 for changes made in IFC Release 1.5.

7.50.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem

IfcSolidModel
IfcManifoldSolidBrep
IfcFacetedBrep

Attributes and Relationships

No attributes defined at this level.

Informal Propositions

IP41	All the bounding loops of all the faces of all the shells in the IfcFacetedBrep shall be of type IfcPolyLoop.

7.50.3. Interface Definitions

I_FacetedBrep

7.51. Class IfcFacetedBrepWithVoids

7.51.1. Class Semantic Definition

Definition from IAI: The IfcFacetedBrepWithVoids is a specialization of a faceted B-rep which contains one or more voids in its interior. The voids are represented as closed shells which are defined so that the shell normal point into the void.

NOTE Corresponding STEP entity: *brep_with_voids* (see note above). Please refer to ISO/IS 10303-42:1994, p. 173 for the final definition of the formal standard. NOTE In IFC faceted B-rep with voids is represented by this subtype IfcFacetedBrepWithVoids and not defined via an implicit ANDOR supertype constraint as in ISO/IS 10303-42:1994 between an instance of *faceted_brep* AND *brep_with_voids*. This change has been made due to the fact, that only ONEOF supertype constraint is allowed within the IFC object model.

7.51.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcManifoldSolidBrep
IfcFacetedBrepWithVoids

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Voids	Set of closed shells defining voids within the solid	SET [1:?] OF IfcClosedShell	1	N	1

Informal Propositions

IP41	Each void shell shall be disjoint from the outer shell and from every other void shell
IP42	Each void shell shall be enclosed within the outer shell but not within any other void shell. In particular the outer shell is not in the set of void shells
IP43	Each shell in the IfcManifoldSolidBrep shall be referenced only once.
IP44	All the bounding loops of all the faces of all the shells in the IfcFacetedBrep shall be of type IfcPolyLoop.

7.51.3. Interface Definitions

I_FacetedBrepWithVoids

7.52. Class IfcGeometricRepresentationItem

7.52.1. Class Semantic Definition

Definition from ISO/CD 10303-43:1992: An geometric representation item is a representation item that has the additional meaning of having geometric position or orientation or both. This meaning is present by virtue of:

- being a Cartesian point of a direction
- referencing directly a Cartesian point or direction
- referencing indirectly a Cartesian point or direction

An indirect reference to a Cartesian point or direction means that a given geometric item references the Cartesian point or direction through one or more intervening geometry or topology items.

Definition from IAI: The derivation of the dimensionality of the IfcGeometricRepresentationItem is different to STEP, there is a specific derived attribute at each class that defines the dimensionality, whereas STEP does it for the *representation_context* and requires that all *geometric_representation_item* have the same dimensionality therein.

IfcGeometricRepresentationItem is the generalization of both, explicit geometric representation items and attribute driven representation items. Attribute Driven geometric representation was formerly known as implicit geometry in IFC, it was renamed to prevent naming conflicts with the usage of the term "implicit" in analytic geometry.

The attribute driven geometric representation makes use of two principles:

- Use a set of predefined geometry primitives, i.e. parameterize a set of geometry primitives widely supported in the industry
- Use of three geometry creation methods for defining geometry implicitly:
- extrusion: surfaces created through extrusion of a profile along a path
- revolution: surfaces created through rotating a profile about an axis, given by a circular arc
- composition: solids or surfaces created through the composition of multiple sub-parts

NOTE Corresponding STEP entity: *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 22 for the final definition of the formal standard. The following changes have been made: It does not inherit from ISO/IS 10303-43:1994 entity *representation_item*. The derived attribute *Dim* is demoted to the appropriate subtypes. The *WR1* has not been incorporated. Not all subtypes that are in ISO/IS 10303-42:1994 have been added to the IFC Release 1.5 & 2.0.

ISSUE: See issue GI-003, I-180, I-182 for changes made in IFC Release 1.5.

7.52.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcBooleanResult
IfcBoundingBox
IfcCompositeCurveSegment
IfcCurve
IfcDirection
IfcHalfSpaceSolid
IfcPlacement
IfcPoint
IfcPolyLoop

IfcSolidModel
IfcSurface
IfcVector

Attributes and Relationships

No attributes defined at this level.

7.52.3. Interface Definitions

I_GeometricRepresentationItem

7.53. Class IfcHalfSpaceSolid

7.53.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A half space solid is defined by the half space which is the regular subset of the domain which lies on one side of an unbounded surface. The side of the surface which is in the half space is determined by the surface normal and the agreement flag. If the agreement flag is TRUE, then the subset is the one the normal points away from. If the agreement flag is FALSE, then the subset is the one the normal points into.

For a valid half space solid the surface shall divide the domain into exactly two subsets. Also, within the domain the surface shall be manifold and all surface normals shall point into the same subset.

NOTE Corresponding STEP entity: *half_space_solid*. Please refer to ISO/IS 10303-42:1994, p. 185 for the final definition of the formal standard. The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*.

7.53.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcHalfSpaceSolid
IfcBoxedHalfSpace

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	BaseSurface	Surface defining side of half space	IfcSurface	n/a	n/a	n/a
	AgreementFlag	The agreement flag is TRUE if the normal to the BaseSurface points away from the material of the IfcHalfSpaceSolid. Otherwise it is FALSE	BOOLEAN	see type	see type	TRUE
	Dim	The space dimensionality of this class, always 3	IfcDimensionCount	3	3	3

7.53.3. Interface Definitions

I_HalfSpaceSolid

7.54. Class IfcLine

7.54.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A line is an unbounded curve with constant tangent direction. A line is defined by a point and a direction. The positive direction of the line is in the direction of the *Dir* vector.

The line is parameterized as follows:

P = *Pnt*
V = *Dir*
λ(*u*) = **P** + *u***V**

and the parametric range is $-\infty < u < \infty$.

NOTE Corresponding STEP entity: *line*. Please refer to ISO/IS 10303-42:1994, p. 37 for the final definition of the formal standard. The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*.

7.54.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcLine

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Pnt	The location of the line	IfcCartesianPoint	n/a	n/a	n/a
	Dir	The direction of the line, the magnitude and units of Dir affect the parameterization of the line.	IfcVector	n/a	n/a	n/a

Formal Propositions

WR31	The dimensionality of the location (IfcCartesianPoint) shall be the same as of the direction (IfcVector)

7.54.3. Interface Definitions

I_Line

7.55. Class IfcManifoldSolidBrep

7.55.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A manifold solid B-rep is a finite, arcwise connected volume bounded by one or more surfaces, each of which is a connected, oriented, finite, closed 2-manifold. There is no restriction on the genius of the volume, nor on the number of voids within the volume.

The Boundary Representation (B-rep) of a manifold solid utilizes a graph of edges and vertices embedded in a connected, oriented, finite, closed two manifold surface. The embedded graph divides the surface into arcwise connected areas known as faces. The edges and vertices, therefore, form the boundaries of the face and the domain of a face does not include its boundaries. The embedded graph may be disconnected and may be a pseudo graph. The graph is labeled; that is, each entity in the graph has a unique identity. The geometric surface definition used to specify the geometry of a face shall be 2-manifold embeddable in the

plane within the domain of the face. In other words, it shall be connected, oriented, finite, non-self-intersecting, and of surface genus 0.

Faces do not intersect except along their boundaries. Each edge along the boundary of a face is shared by at most one other face in the assemblage. The assemblage of edges in the B-rep do not intersect except at their boundaries (i.e., vertices). The geometry curve definition used to specify the geometry of an edge shall be arcwise connected and shall not self intersect or overlap within the domain of the edge. The geometry of an edge shall be consistent with the geometry of the faces of which it forms a partial bound. The geometry used to define a vertex shall be consistent with the geometry of the faces and edges of which it forms a partial bound.

A B-rep is represented by one or more closed shells which shall be disjoint. One shell, the outer, shall completely enclose all the other shells and no other shell may enclose a shell. The facility to define a B-rep with one or more internal voids is provided by a subtype. The following version of the Euler formula shall be satisfied:

$$x_{ms} = V - E + 2F - L_l - 2\left(S - G^s\right) = 0$$

where *V, E, F, L_l* and *S* are the numbers of unique vertices, edges, faces, loop uses and shells in the model and G^s is the sum of the genus of the shells. (*NOTE should be fractal type setting*).

Definition from IAI: In the IFC Release 1.5 all instances of type IfcManifoldSolidBrep shall be faceted B-rep, using only IfcPolyLoop for the bounds of IfcFaceBound.

NOTE Corresponding STEP entity: *manifold_solid_brep.* Please refer to ISO/IS 10303-42:1994, p. 170 for the final definition of the formal standard. Since only faceted B-rep (with and without voids) is in scope of IFC Release 1.5 & 2.0 the IfcManifoldSolidBrep is defined as ABSTRACT supertype to prevent it from direct instantiation.

7.55.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcManifoldSolidBrep
IfcFacetedBrep
IfcFacetedBrepWithVoids

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Outer	A closed shell defining the exterior boundary of the solid. The shell normal shall point away from the interior of the solid	IfcClosedShell	n/a	n/a	n/a

7.55.3. Interface Definitions

I_ManifoldSolidBrep

7.56. Class IfcOrientedEdge

7.56.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An oriented edge is an edge constructed from another edge and contains a BOOLEAN direction flag to indicate whether or not the orientation of the constructed edge agrees

with the orientation of the original edge. Except for perhaps orientation, the oriented edge is equivalent to the original edge.

NOTE Corresponding STEP entity: *oriented_edge.* Please refer to ISO/IS 10303-42:1994, p. 133 for the final definition of the formal standard.

History

New Entity in IFC Release 2.0

7.56.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcEdge
IfcOrientedEdge

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	EdgeElement	Edge entity used to construct this oriented edge.	IfcEdge			
	Orientation	BOOLEAN, If TRUE the topological orientation as used coincides with the orientation from start vertex to end vertex of the edge element. If FALSE otherwise.	BOOLEAN	FALSE	TRUE	n/a
	EdgeStart	The start vertex of the oriented edge. It derives from the vertices of the edge element after taking account of the orientation.	IfcVertex	n/a	n/a	n/a
	EdgeEnd	The end vertex of the oriented edge. It derives from the vertices of the edge element after taking account of the orientation.	IfcVertex	n/a	n/a	n/a

Formal Propositions

WR31	The edge element shall not be an oriented edge.

7.56.3. Interface Definitions

I_OrientedEdge

7.57. Class IfcPath

7.57.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A path is a topological entity consisting of an ordered collection of oriented edges, such that the edge start vertex of each edge coincides with the edge end of its predecessor. The path is ordered from the edge start of the first oriented edge to the edge end of the last edge. The BOOLEAN value sense in the oriented edge indicates whether the edge direction agrees with the direction of the path (TRUE) or is the opposite direction (FALSE).

An individual edge can only be referenced once by an individual path. An edge can be referenced by multiple paths. An edge can exist independently of a path.

NOTE Corresponding STEP entity: *path.* Please refer to ISO/IS 10303-42:1994, p. 133 for the final definition of the formal standard.

History

New Entity in IFC Release 2.0

7.57.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcPath

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	EdgeList	The list of oriented edges which are concatenated together to form this path.	LIST [1:?] OF IfcOrientedEdge	1	N	1

Formal Propositions

WR21	The end vertex of each edge shall be the same as the start vertex of its successor.

Informal Propositions

IP21	The path has dimensionality 1.
IP22	A path is arcwise connected.
IP23	The edges of the path do not intersect except at common vertices.
IP24	A path has a finite, non-zero extent

7.57.3. Interface Definitions

I_Path

7.58. Class IfcPlacement

7.58.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A placement entity defines the local environment for the definition of a geometry item. It locates the item to be defined and, in the case of the axis placement subtypes, gives its orientation.

NOTE Corresponding STEP entity: *placement,* in contrary to IFC Release 1.0 the IfcPlacement definition in IFC Release 1.5 strictly follows the STEP definition. Please refer to ISO/IS 10303-42:1994, p. 27 for the final definition of the formal standard.

7.58.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcPlacement
IfcAxis1Placement
IfcAxis2Placement2D
IfcAxis2Placement3D

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Location	The geometric position of a reference point, such as the center of a circle, of the item to be located.	IfcCartesianPoint	n/a	n/a	n/a
	Dim	The space dimensionality of this class, derived from the dimensionality of the location.	IfcDimensionCount	2	3	3

7.58.3. Interface Definitions

I_Placement

7.59. Class IfcPlane

7.59.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcPlane is an unbounded surface with a constant normal. An IfcPlane is defined by a point on the plane and the normal direction to the plane. The data is to be interpreted as follows:

C = SELF\IfcElementarySurface.Position.Location
x = SELF\IfcElementarySurface.Position.P[1]
y = SELF\IfcElementarySurface.Position.P[2]
z = SELF\IfcElementarySurface.Position.P[3] => normal to plane

and the surface is parameterized as:

$$s(u,v) = C + \mathrm{x}\,u + \mathrm{y}\,v$$

where the parametric range is $-\infty < u,v < \infty$. In the above parameterization the length unit for the unit vectors **x** and **y** is derived from the context of the plane.

NOTE Corresponding STEP entity: *plane.* Please refer to ISO/IS 10303-42:1994, p. 69 for the final definition of the formal standard.

7.59.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
  IfcSurface
    IfcElementarySurface
      IfcPlane

Attributes and Relationships

No attributes defined at this level.

7.59.3. Interface Definitions

I_Plane

7.60. Class IfcPoint

7.60.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcPoint is a location in some real Cartesian coordinate space R^m, for $m = 2$ or $m = 3$.

NOTE Corresponding STEP entity: *point.* Only the subtype *cartesian_point* has been incorporated as IfcCartesianPoint. Please refer to ISO/IS 10303-42:1994, p. 22 for the final definition of the formal standard.

ISSUE: See issue I-224 for changes made in IFC Release 1.5.

7.60.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcPoint
IfcCartesianPoint

Attributes and Relationships

No attributes defined at this level.

7.60.3. Interface Definitions

I_Point

7.61. Class IfcPolyLoop

7.61.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcPolyLoop is a loop with straight edges bounding a planar region in space. An IfcPolyLoop is a loop of genus 1 where the loop is represented by an ordered coplanar collection of points forming the vertices of the loop. The loop is composed of straight line segments joining a point in the collection to the succeeding point in the collection. The closing segment is from the last to the first point in the collection. The direction of the loop is in the direction of the line segments.

NOTE Corresponding STEP entity: *poly_loop*, in contrary to STEP the IfcPolyLoop only inherits from IfcGeometricRepresentationItem and therefore does not utilize multiple inheritance. The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 138 for the final definition of the formal standard.

7.61.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcPolyLoop

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Polygon	List of points defining the loop. There are no repeated points in the list. NOTE: All the points in the Polygon defining the polyloop shall be coplanar.	LIST [3:?] OF IfcCartesianPoint	3	N	3
	Dim	The space dimensionality of this class, derived from the dimensionality of the first point.	IfcDimensionCount	2	3	3

Formal Propositions

WR21	The space dimensionality of all Points shall be the same

Informal Propositions

IP21	All points in the polygon defining the poly loop shall be coplanar.

7.61.3. Interface Definitions

I_PolyLoop

7.62. Class IfcPolyline

7.62.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcPolyline is a bounded curve of n -1 linear segments, defined by a list of *n* points, P_1, P_2, … P_n.

The curve is parameterized as follows:

$$l(u) = \mathrm{P}_i(i-u) + \mathrm{P}_{i+1}(u+1-i)$$

for 1 £ *i* £ *n*-1, where *i-1* £ *u* £ *i* and with parametric range of *0* £ *u* £ *n-1.*

NOTE Corresponding STEP entity: *polyline.* The *WR1* is added to ensure consistent *Dim* of all points. Please refer to ISO/IS 10303-42:1994, p. 45 for the final definition of the formal standard.

7.62.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcBoundedCurve
IfcPolyline

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Points	The points defining the polyline	LIST [2:?] OF IfcCartesianPoint	2	N	2

Formal Propositions

WR41	The space dimensionality of all Points shall be the same

7.62.3. Interface Definitions

I_Polyline

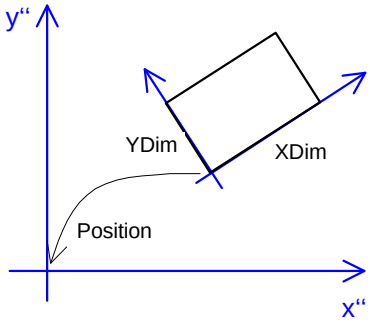
7.63. Class IfcRectangleProfileDef

7.63.1. Class Semantic Definition

Definition from IAI: The IfcRectangleProfileDef defines a rectangle as the profile definition used by the attribute driven geometric representation. It is given by its X extent and its Y extent, both defined in its local 2D coordinate system.

ISSUE: See issue I-035 for changes made in IFC Release 1.5.

ILLUSTRATION:



Position

The Position attribute of its supertype IfcAttDrivenProfileDef defines the 2D Placement of the Profile within the X''Y'' coordinate system, in which the derived bounded curve is defined.

Parameter

The IfcRectangleProfileDef is defined within the position coordinate system, where the XDim defines the length measure along the positive x-axis and the YDim defines the length measure along the positive y-axis.

7.63.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcAttDrivenProfileDef
IfcRectangleProfileDef

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	XDim	The extend on the implicit x-axis of the rectangle	IfcPositiveLengthMeasure	see type	see type	1
	YDim		IfcPositiveLengthMeasure			
	CurveForSurface	Redefinition of the CurveForSurface defined in the supertype as being derived. A function is given that constructs an IfcPolyline out of the rectangle.	IfcPolyline	n/a	n/a	n/a

7.63.3. Interface Definitions

I_RectangleProfileDef

7.64. Class IfcRevolvedAreaSolid

7.64.1. Class Semantic Definition

Definition from IAI: An IfcRevolvedAreaSolid is a solid created by revolving a planar bounded surface about an axis. Both, the *Axis* and planar bounded surface, *SweptArea*, inherited by the supertype IfcSweptAreaSolid, shall be in the same plane and the Axis shall not intersect the interior of *SweptArea*. If the *SweptArea* has inner boundaries, i.e. holes defined, then those holes shall be swept into holes of the solid.

NOTE Corresponding STEP entity: *revolved_area_solid.* Please refer to ISO/IS 10303-42:1994, p. 184 for the final definition of the formal standard. NOTE the data type of the inherited SweptArea attribute is different, i.e. of type IfcCurveBoundedPlane. This complies to *WR1* at the supertype *swept_area_solid*, defining that only planar bounded surfaces are allowed for swept area solids.

7.64.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcRevolvedAreaSolid
IfcAttDrivenRevolvedSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Axis	Axis about which revolution will take place	IfcAxis1Placement	n/a	n/a	n/a
	Angle	Angle through which the sweep will be made. This Angle is measured from the plane of the sweep face.	IfcPlaneAngleMeasure	0	<2p	p/2
	AxisLine	The line of the axis of revolution	IfcLine	n/a	n/a	n/a

Informal Propositions

IP41	The Axis Line shall lie in the plane of the Swept Area (as defined at supertype IfcSweptAreaSolid).
IP42	The Axis Line shall not intersect the interior of the Swept Area (as defined at supertype IfcSweptAreaSolid).
IP43	The Angle shall be between 0° and 360°, or 0 and 2p (depending on the unit type for Plane Angle Measure).

7.64.3. Interface Definitions

I_RevolvedAreaSolid

7.65. Class IfcSolidModel

7.65.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcSolidModel is a complete representation of the nominal shape of a product such that all points in the interior are connected. Any point can be classified as being inside, outside, or on the boundary of a solid. There are several different types of solid model representations.

Definition from IAI: In addition to ISO 10303-42 two new subtypes are defined, IfcAttDrivenExtrudedSolid and IfcAttDrivenRevolvedSolid. Both define multi segment swept area solids, where the definition of the area to be swept is defined by attribute driven profile definitions.

NOTE Corresponding STEP entity: *solid_model*, only three subtypes have been incorporated into IFC Release 1.5 & 2.0 - part of *manifold_solid_brep* (IfcManifoldSolidBrep, constraint to faceted B-rep), *swept_area_solid* (IfcSweptAreaSolid), and part of *csg_soli*d (IfcCsgSolid). The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 170 for the final definition of the formal standard.

ISSUE: See I-330 for changes made in IFC Release 1.5.1

7.65.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcCsgSolid
IfcManifoldSolidBrep
IfcSweptAreaSolid
IfcAttDrivenExtrudedSolid
IfcAttDrivenRevolvedSolid

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Dim	The space dimensionality of this class, it is always 3 within the scope of this IFC Release.	IfcDimensionCount	3	3	3

7.65.3. Interface Definitions

I_SolidModel

7.66. Class IfcSurface

7.66.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: An IfcSurface can be envisioned as a set of connected points in 3-dimensional space which is always locally 2-dimensional, but need not be a manifold.

NOTE Corresponding STEP entity: *surface*, only two subtypes have been incorporated into IFC Release 1.5 - elementary_surface (as IfcElementarySurface) and a limited adaptation of bounded_surface (as IfcCurveBoundedPlane). Please refer to ISO/IS 10303-42:1994, p. 68 for the final definition of the formal standard.

ISSUE: See issue I-226 for changes made in IFC Release 1.5.

7.66.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSurface

IfcCurveBoundedPlane
IfcElementarySurface

Attributes and Relationships

No attributes defined at this level.

Informal Propositions

IP21	A surface has non zero area.
IP22	A surface is arcwise connected.

7.66.3. Interface Definitions

I_Surface

7.67. Class IfcSweptAreaSolid

7.67.1. Class Semantic Definition

Definition from IAI: The IfcSweptAreaSolid collects the entities which are defined procedurally by a sweeping action on bounded planar surface. The position in space of the swept area solid will be dependent upon the position of the Swept Area. In case of an IfcAttDrivenExtrudedSegment or IfcAttDrivenRevolvedSegment additional constraints apply to the position of the Swept Area, the extrusion direction and depth, or the revolution axis and angle. The Swept Area will be an area of the IfcSweptAreaSolid, except for the case of a IfcRevolvedAreaSolid with angle equal to 2π (or 360 degrees).

NOTE Corresponding STEP entity: *swept_area_solid*, The data type of *SweptArea* is modified and thereby further constraint to IfcCurveBoundedPlane. Please refer to ISO/IS 10303-42:1994, p. 183 for the final definition of the formal standard.

ISSUE: See issue I-019 for changes made in IFC Release 1.5.

7.67.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcSolidModel
IfcSweptAreaSolid
IfcExtrudedAreaSolid
IfcRevolvedAreaSolid

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	SweptArea	The surface defining the area to be swept.	IfcCurveBoundedPlane	n/a	n/a	n/a

Formal Propositions

WR31	The surface being swept shall be a plane surface.

7.67.3. Interface Definitions

I_SweptAreaSolid

7.68. Class IfcTopologicalRepresentationItem

7.68.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The topological representation item is the supertype for all the topological representation items in the geometry resource.

NOTE Corresponding STEP entity: *topological_representation_item.* Please refer to ISO/IS 10303-42:1994, p.129 for the final definition of the formal standard.

ISSUE: See issue GI-003 for changes made in IFC Release 1.5.

7.68.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcConnectedFaceSet
IfcFace
IfcFaceBound
IfcVertex
IfcEdge
IfcPath

Attributes and Relationships

No attributes defined at this level.

7.68.3. Interface Definitions

I_TopologicalRepresentationItem

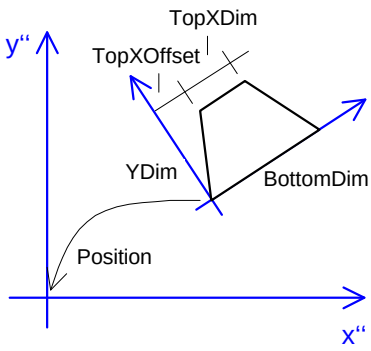
7.69. Class IfcTrapeziumProfileDef

7.69.1. Class Semantic Definition

Definition from IAI: The IfcTrapeziumProfileDef defines a trapezium as the profile definition used by the attribute driven geometric representation. It is given by its Top X and Bottom X extent and its Y extent as well as by the offset of the Top X extend, all measured against its implicit 2D coordinate system, after being placed by Position within the local coordinate system.

ISSUE: See issue I-035 for changes made in IFC Release 1.5.

ILLUSTRATION:



Position

The Position attribute of its supertype IfcAttDrivenProfileDef defines the 2D Placement of the Profile within the X''Y'' coordinate system, in which the derived bounded curve is defined.

Parameter

The IfcTrapeziumProfileDef is defined within the position coordinate system, where the BottomDim defines the length measure along the positive x-axis for the bottom line and the YDim defines the length measure along the positive y-axis for the parallel distance of bottom and top line. The top line starts with a distance of TopXOffset from [0,YDim] and has a length of TopXDim along the positive x-axis.

7.69.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcAttDrivenProfileDef
IfcTrapeziumProfileDef

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	BottomXDim	The extent of the bottom line measured along the implicit x-axis	IfcPositiveLengthMeasure	see type	see type	1
	TopXDim	The extent of the top line measured along the implicit x-axis	IfcPositiveLengthMeasure	see type	see type	1
	YDim	The extent of the distance between the parallel bottom and top lines measured along the implicit y-axis	IfcPositiveLengthMeasure	see type	see type	1
	TopXOffset	Offset from the beginning of the top line to the bottom line, measured along the implicit x-axis	IfcLengthMeasure	see type	see type	0
	CurveForSurface	Redefinition of the CurveForSurface defined in the supertype as being derived. A function is given that constructs an IfcPolyline out of the trapezium.	IfcPolyline	n/a	n/a	n/a

7.69.3. Interface Definitions

I_TrapeziumProfileDef

7.70. Class IfcTrimmedCurve

7.70.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A Trimmed Curve is a bounded curve which is created by taking a selected portion, between two identified points, of the associated basis curve. The basis curve itself is unaltered and more than one trimmed curve may reference the same basis curve. Trimming points for the curve may be identified by

- parametric value

- geometric position
- both of the above

At least one of these shall be specified at each end of the curve. The *SenseAgreement* makes it possible to unambiguously define any segment of a closed curve such as a circle. The combinations of sense and ordered end points make it possible to define four distinct directed segments connecting two different points on a circle or other closed curve. For this purpose cyclic properties of the parameter range are assumed; for example, 370 degrees is equivalent to 10 degrees.

The IfcTrimmedCurve has a parameterization which is inherited from the particular basis curve reference. More precisely the parameter *s* of the trimmed curve is derived from the parameter of the basis curve as follows:

- if SenseAgreement is TRUE: $s = t - t_1$
- if SenseAgreement is FALSE: $s = t_2 - t$

In the above equations t_1 is the value given by *Trim1* or the parameter value corresponding to point 1 and t_2 is the value given by *Trim2* or the parameter value corresponding to point 2. The resultant IfcTrimmedCurve has a parameter ranging from 0 at the first trimming point to $|t_2 - t_1|$ at the second trimming point.

NOTE Corresponding STEP entity: *trimmed_curve*; As a further IFC restriction, an IfcTrimmedCurve should only trim a IfcLine or IfcConic. Please refer to ISO/IS 10303-42:1994, p. 54 for the final definition of the formal standard.

7.70.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcCurve
IfcBoundedCurve
IfcTrimmedCurve

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	BasisCurve	The curve to be trimmed	IfcCurve	n/a	n/a	n/a
	Trim1	The first trimming point which may be specified as a Cartesian point, as a real parameter or both	SET [1:2] OF IfcTrimmingSelect	1	2	1
	Trim2	The second trimming point which may be specified as a cartesian point, as a rela parameter or both	SET [1:2] OF IfcTrimmingSelect	1	2	1
	SenseAgreement	Flag to indicate whether the direction of the trimmed curve agrees with or is opposed to the direction of the basis curve.	BOOLEAN	see type	see type	TRUE
	MasterRepresentation	Where both parameter and point are present at either end of the curve this indicates the prefered form.	IfcTrimmingPreference	Cartesian	Parameter	Parameter

Formal Propositions

WR41	Either a single value is specified for Trim1, or the two trimming values are of different type (point and parameter)
WR42	Either a single value is specified for Trim2, or the two trimming values are of different type (point and parameter)
WR43	Only line and conic curves should be trimmed, not other bounded curves. NOTE: This is an additional constraint of IFC.

Informal Propositions

IP41	Where both the parameter value and the Cartesian point exist for Trim1 and Trim2 they shall be consistent. (i.e., the Basis Curve evaluated at the parameter value shall coincide with the specified point.
IP42	When a Cartesian point is specified by Trim1 or by Trim2 it shall lie on the Basis Curve.
IP43	Except the case of a closed Basis Curve where both parameter 1 and parameter 2 exist they shall be consistent with the sense flag, i.e., (sense = parameter 1
IP44	If both parameter 1 and parameter 2 exist, than parameter 1 <> parameter 2.
IP45	When a parameter value is specified by Trim1 or Trim2 it shall lie within the parametric range of the Basis Curve.

7.70.3. Interface Definitions

I_TrimmedCurve

7.71. Class IfcVector

7.71.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The vector is defined in terms of the direction and magnitude of the vector. The value of the Magnitude attribute defines the magnitude of the vector.

Note, the magnitude of the vector can not be reliable calculated from the components of the Orientation attribute. This form of representation was selected to reduce problems with numerical instability. For example a vector of magnitude 2.0 mm and equally inclined to the coordinate axes could be represented with Orientation attribute of (1.0,1.0,1.0).

NOTE Corresponding STEP entity: *vector.* The derived attribute *Dim* has been added at this level and was therefore demoted from the *geometric_representation_item*. Please refer to ISO/IS 10303-42:1994, p. 27 for the final definition of the formal standard.

7.71.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcGeometricRepresentationItem
IfcVector

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Orientation	The direction of the vector	IfcDirection	n/a	n/a	n/a
	Magnitude	The magnitude of the vector	IfcLengthMeasure	see type	see type	1
	Dim	The space dimensionality of this class, it is derived from Orientation	IfcDimensionCount	2	3	3

Formal Propositions

WR21	The magnitude shall be positive or zero

7.71.3. Interface Definitions

I_Vector

7.72. Class IfcVertex

7.72.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A vertex is the topological construct corresponding to a point. It has dimensionality 0 and extent 0. The domain of a vertex, if present (not in current IFC release), is a point in m dimensional real space R^M.

NOTE Corresponding STEP entity: *vertex.* Please refer to ISO/IS 10303-42:1994, p. 129 for the final definition of the formal standard.

History

New Entity in IFC Release 2.0

7.72.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcTopologicalRepresentationItem
IfcVertex

Attributes and Relationships

No attributes defined at this level.

Informal Propositions

IP21	The vertex has dimensionality 0. This is a fundamental property of the vertex.
IP22	The extent of a vertex is defined to be zero.

7.72.3. Interface Definitions

I_Vertex

7.73. Function IfcBooleanChoose

7.73.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns one of two choices depending on the value of a Boolean input argument. The two choices are also input arguments.

NOTE Corresponding STEP function *boolean_choose*. Please refer to ISO/IS 10303-42:1994, p. 158 for the final definition of the formal standard.

History

New Function in IFC Release 2.0

7.74. Function IfcBuild2Axes

7.74.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns two orthogonal directions. U[1] is in the direction of RefDirection and U[2] is perpendicular to U[1]. A default value of (1.0,0.0,0.0) is supplied for RefDirection if the input data is incomplete.

NOTE Corresponding STEP function *build_2axes*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 100 for the final definition of the formal standard.

7.75. Function IfcBuildAxes

7.75.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function builds and returns three normalized orthogonal directions. U[3] is the direction of axis. U[1] is in the direction of the projection of RefDirection onto the plane normal to U[3] and U[2] is the cross product of U[3] and U[1]. Default values are supplied if input data is incomplete.

NOTE Corresponding STEP function *build_axes*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 100 for the final definition of the formal standard.

7.76. Function IfcCircleProfileIntoCurve

7.76.1. Function Semantic Definition

Definition from IAI: This function returns a bounded curve of type IfcTrimmedCurve from the input parameters of the attribute driven circular profile definition.

7.77. Function IfcCrossProduct

7.77.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns the vector (or cross) product of two input directions. The input directions must be three-dimensional. The result is always a vector which is unitless. If the input directions are either parallel or anti-parallel a vector of zero magnitude is returned.

NOTE Corresponding STEP function *cross_product*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 103 for the final definition of the formal standard.

7.78. Function IfcCurveDim

7.78.1. Function Semantic Definition

7.79. Function IfcDotProduct

7.79.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns the scalar (or dot) product of two directions. The input arguments can be directions in either two- or three-dimensional space. The returned scalar is undefined if the input directions have different dimensionality, or if either is undefined.

NOTE Corresponding STEP function *dot_product*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 104 for the final definition of the formal standard.

7.80. Function IfcExtrusionPath

7.80.1. Function Semantic Definition

Definition from IAI: This function returns a path definition, given as IfcPolyline. It takes an IfcAttDrivenExtrudedSolid as an input.

It is assumed that by virtue of the formal and informal propositions at IfcAttDrivenExtrudedSolid all of its Segments placement coordinate systems have their Z-Axis defines along a line.

7.81. Function IfcFirstProjAxis

7.81.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function produces a three dimensional direction which is, with fully defined input, the projection of Arg onto the plane normal to the ZAxis. With Arg defaulted the result is the projection of (1.0,0.0,0.0) onto this plane except that if ZAxis = (1.0,0.0,0.0) then (0.0,1.0,0.0) is used as initial value of Arg. A violation occurs if Arg is in the same direction as the input ZAxis.

NOTE Corresponding STEP function *first_proj_axis*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 102 for the final definition of the formal standard.

7.82. Function IfcNormalise

Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns a vector or direction whose components are normalized to have a sum of squares of 1.0. The output is of the same type (Direction or Vector, with the same units) as the input argument. If the input argument is not defined or of zero length then the output vector is undefined.

NOTE Corresponding STEP function *normalise*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 105 for the final definition of the formal standard.

7.83. Function IfcOrthogonalComplement

7.83.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns a direction which is the orthogonal complement of the input direction. The input direction must be a two-dimensional direction and the result is a vector of the same type and perpendicular to the input vector.

NOTE Corresponding STEP function *orthogonal_component,* new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 101 for the final definition of the formal standard.

7.84. Function IfcPathHeadToTail

7.84.1. Function Semantic Definition

History

New Function in IFC Release 2.0

7.85. Function IfcPointTranslation

7.85.1. Function Semantic Definition

Definition from IAI: This function returns a Cartesian Point that has been transformed by a vector based on the previous position of the Cartesian Point. The input vector shall use normalized axes for its orientation definition.

7.86. Function IfcProfileIntoArea

7.86.1. Function Semantic Definition

Definition from IAI: This function returns a bounded plane surface for extrusion or revolution into a solid from the bounded closed input curve.

7.87. Function IfcRectangleProfileIntoCurve

7.87.1. Function Semantic Definition

Definition from IAI: This function returns a bounded curve of type IfcPolyline from the input parameters of the attribute driven rectangular definition.

7.88. Function IfcRevolutionPath

7.88.1. Function Semantic Definition

Definition from IAI: This function computes and returns the trajectory of the IfcAttDrivenProfileDef origin as an IfcTrimmedCurve. It takes an IfcAttDrivenRevolvedSolid as an input.

It is assumed that by virtue of the formal and informal propositions at IfcAttDrivenRevolvedSolid all of its Segments refers to the same placement coordinate system and to the same Axis.

7.89. Function IfcScalarTimesVector

Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns the vector that is the scalar multiple of the input vector. It accepts as input a scalar and a 'vector' which may be either a Direction or a Vector. The output is a Vector of the same units as the input vector or unitless if a direction is input. If either input argument is undefined then the returned vector is also undefined.

NOTE Corresponding STEP function *scalar_times_vector*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 107 for the final definition of the formal standard.

7.90. Function IfcTrapeziumProfileIntoCurve

7.90.1. Function Semantic Definition

Definition from IAI: This function returns a bounded curve of type IfcPolyline from the input parameters of the attribute driven trapezium profile definition.

7.91. Function IfcVectorDifference

7.91.1. Function Semantic Definition

Definition from ISO/CD 10303-42:1992: This function returns the difference of the input arguments as (Arg1 - Arg2). The function returns as a vector the vector difference of the two input vectors. The input arguments shall both be of the same dimensionality but may be either directions or vectors. If both input arguments are vectors they must be expressed in the same units, if both are directions a unitless result is produced. A zero difference vector produces a vector of zero magnitude.

NOTE Corresponding STEP function *vector_difference*, new function in IFC Release 1.5. Please refer to ISO/IS 10303-42:1994, p. 109 for the final definition of the formal standard.

8. IfcMaterialResource

This schema contains the types and classes which are used to define and manipulate materials and their properties. Materials are defined generically, with references to the usage of materials being made from the relevant classes.

NOTE: The definitions in this schema were included in the IfcPropertyResource schema in Release 1.5.1.

8.1. Select IfcMaterialPropertySelect

8.1.1. Select Semantic Definition

Definition from IAI: Allows the selection of the various types of material property representations. IfcSimpleProperty and IfcSimplePropertyWithUnit were provided in previous versions. In Release 2.0 IfcTable was added to this schema to allow the storage of information where there are multiple values that need to be stored against a single attribute. For example, the acoustic absorption coefficients for materials have multiple

values depending on the frequency of the incident sound waves. The absorption coefficients for brick could be represented as follows:

Frequency (Hz)	Coefficient
125	0.05
500	0.02
2000	0.05

History

New Select Type in IFC Release 2.0

8.1.2. Select

IfcSimpleProperty
IfcSimplePropertyWithUnit
IfcTable

8.2. Select IfcMaterialSelect

8.2.1. Select Semantic Definition

Definition from IAI: Selection of whether a material, a material layer, a material layer set or a material list is used.

History

This Select Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

8.2.2. Select

IfcMaterial
IfcMaterialList
IfcMaterialLayer
IfcMaterialLayerSet

8.3. Class IfcMaterial

8.3.1. Class Semantic Definition

Definition from IAI: A homogenous substance that can be used to form elements.

ISSUE: See Issue I342 for IFC Release 1.5.1

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

8.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	MaterialName	Name of the material.	STRING	see type	see type	n/a
OPT	MaterialClassification	The material classifications identifying the type of material.	IfcClassificationList	see type	see type	NIL
	MaterialFinishes	Finishes that are appropriate for this material. These finishes can be obtained by direct treatment of the surface of the material. This does NOT store information on applied finishes, such as paints, etc	SET [0:?] OF IfcMaterialFinish			
	Properties	The list of material properties defined for this material.	SET [0:?] OF IfcMaterialPropertySelect	N/A	N/A	N/A

8.3.3. Interface Definitions

- I_Material

8.4. Class IfcMaterialFinish

8.4.1. Class Semantic Definition

Definition from IAI: The properties of a type of finish that can be applied to the material itself (as distinct from an applied finish such as paint).

NOTE: New in IFC Release 2.0

History

New Entity in IFC Release 2.0

8.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	FinishName	Name of the finish treatment	STRING	see type	see type	n/a
	Properties	List of the surface properties that result from the use of this finish on the material.	LIST [0:?] OF IfcMaterialPropertySelect			
INV	ForMaterial	Reference to the material to which this finish is applied. Note: each Material/Finish combination will have unique attributes	IfcMaterial	n/a	n/a	required

8.4.3. Interface Definitions

- I_MaterialFinish

8.5. Class IfcMaterialLayer

8.5.1. Class Semantic Definition

Definition from IAI: A single and identifiable part constructed from a single material of an element which is constructed from a number of layers. For example, a cavity wall with brick masonry used in each leaf would be modeled using three IfcMaterialLayers.

ISSUE: Issue I327 for IFC Release 1.5.1

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

8.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Material	Material from which the material layer is constructed.	IfcMaterial	see type	see type	n/a
	OffsetFromMLSBase	The dimensional offset from the datum point of the material layer.	IfcLengthMeasure	see type	see type	n/a
	LayerThickness	The thickness of this layer.	IfcPositiveLengthMeasure	see type	see type	n/a
INV	ToMaterialLayerSet	Reference to the material layer set, in which the material layer is included.	IfcMaterialLayerSet	n/a	n/a	n/a

8.5.3. Interface Definitions

- I_MaterialLayer

8.6. Class IfcMaterialLayerSet

8.6.1. Class Semantic Definition

Definition from IAI: A designation by which an element which is constructed from a number of material layers is known and through which the relative positioning of individual layers can be expressed. An cavity brick wall would be modeled as IfcMaterialLayerSet consisting of three IfcMaterialLayers – brick, air cavity and brick.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

8.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	HasMaterialLayers	Identification of the layers from which the material layer set is composed.	LIST [1:?] OF IfcMaterialLayer	see type	see type	n/a
	IsVentilated	Set to TRUE if there is air exchange from the cavity to the outside air.	BOOLEAN			

8.6.3. Interface Definitions

- I_MaterialLayerSet

8.7. Class IfcMaterialLayerSetUsage

8.7.1. Class Semantic Definition

Definition from IAI: Determines the usage of the material layer set in terms of its offset positioning relative to some baseline and the sense in which the material layers are measured. A cavity brick wall defined as an IfcMaterialLayerSet could be offset from a grid line by 100 mm.

ISSUE: See Issue I-327 for IFC Release 1.5.1

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

8.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ForLayerSet	Layer set to which the usage is applied.	IfcMaterialLayerSet	see type	see type	n/a
	MlsOffsetFromBaseline	Offset from some baseline of the layer set. NOTE: By default, the sense of measurement is left to right and this takes the value TRUE.	IfcLengthMeasure	see type	see type	n/a
	MlsSenseLtoR	The sense in which the layer set is measured.	BOOLEAN	see type	see type	TRUE
	TotalThickness	Total thickness of the material layer set is derived from the function IfcMlsTotalThickness	IfcLengthMeasure	see type	see type	n/a

8.7.3. Interface Definitions

- I_MaterialLayerSetUsage

8.8. Class IfcMaterialList

8.8.1. Class Semantic Definition

Definition from IAI: A list of materials that are used in a non-homogenous element.
This will normally be used where an element is described at a more abstract level. For example, for in an architectural specification writer, the only information that may be needed about a concrete column is that it contains concrete, reinforcing steel and mild steel ligatures.

8.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Materials	Materials used in a composition of substances.	LIST [1:?] OF IfcMaterial	see type	see type	n/a

8.8.3. Interface Definitions

- I_MaterialComposite

8.9. Function IfcMlsTotalThickness

8.9.1. Function Semantic Definition

Definition from IAI: Calculates the total thickness of a material layer set from the thicknesses of the material layers and their offset from the layer set base.

9. IfcMeasureResource

The IfcMeasureResource schema is adapted from the ISO 10303 part 41 Measure schema and specifies units and measures that may be assigned to quantities.

Additional measures have been added to this schema to meet particular domain requirements.

The fundamental unit type used in this schema is based on the SI system defined in ISO 1000. Units in measurement systems other than SI may be derived using this schema.

A number of units of measure are identified using their derived units which are specified in terms of fundamental units as follows:

- Joule [J] kg.deg K/sec [W/sec]
- Newton [N] kg.m/sec^2
- Pascal [Pa} kg/m.sec^2 [N/m^2]
- Watt [W] kg.deg K

Parts of this schema are © ISO.

9.1. Type IfcAmountOfSubstanceMeasure

9.1.1. Type Semantic Definition

An amount of substance measure is the value for the quantity of a substance when compared with the number of atoms in 0.012kilogram of carbon 12.

9.1.2. Type

REAL

9.2. Type IfcAngularVelocityMeasure

9.2.1. Type Semantic Definition

A measure of the velocity of a body measured in terms of angle subtended per unit time.

Usually measured in radians/s.

History

New Defined Type in IFC Release 2.0

9.2.2. Type

REAL

9.3. Type IfcAreaMeasure

9.3.1. Type Semantic Definition

An area measure is the value of the extent of a surface.

9.3.2. Type

REAL

9.4. Type IfcBoolean

9.4.1. Type Semantic Definition

A defined data type of simple data type Boolean. . (Required since a select type, i.e. IfcMeasureValue, cannot include directly simple types in its select list).

9.4.2. Type

BOOLEAN

9.5. Type IfcCompoundPlaneAngleMeasure

9.5.1. Type Semantic Definition

A compound measure of plane angle in degrees minutes and seconds of arc.

NOTE: IfcCompoundPlaneAngleMeasure is used where angles need to be described to an accuracy of less than one degree and expressed as parts of an arc. It may be used for angular measurement by surveyors or for other angular measurements where precision is required. It should not be used for angular measurements which may be expressed in decimal fractions of a degree; for which purpose the IfcPlaneAngleMeasure is provided.

9.5.2. Type

LIST [3:3] OF INTEGER

Formal Propositions

WR1	{ 0 <= SELF[1]
WR2	{ 0 <= SELF[2]
WR3	{ 0 <= SELF[3]

9.6. Type IfcContextDependentMeasure

9.6.1. Type Semantic Definition

A context dependent measure is a general purpose real number measure type.

9.6.2. Type

REAL

9.7. Type IfcCountMeasure

9.7.1. Type Semantic Definition

A count measure is the value of a count.

9.7.2. Type

NUMBER

9.8. Type IfcDescriptiveMeasure

9.8.1. Type Semantic Definition

A descriptive measure is a human interpretable definition of a quantifiable value.

9.8.2. Type

STRING

9.9. Type IfcDynamicViscosityMeasure

9.9.1. Type Semantic Definition

A measure of the viscous resistance of a medium.

Usually measured in Pascals second

History

New Defined Type in IFC Release 2.0

9.9.2. Type

REAL

9.10. Type IfcElectricCurrentMeasure

9.10.1. Type Semantic Definition

A standard unit of measure for electrical current, equal to one Coulomb per second.

9.10.2. Type

REAL

9.11. Type IfcElectricVoltageMeasure

9.11.1. Type Semantic Definition

A measure of electromotive force.

Usually measured in Volts.

History

New Defined Type in IFC Release 2.0

9.11.2. Type

REAL

9.12. Type IfcEnergyMeasure

9.12.1. Type Semantic Definition

A measure of energy required or used.

Usually measured in Joules.

History

New Defined Type in IFC Release 2.0

9.12.2. Type

REAL

9.13. Type IfcFrequencyMeasure

9.13.1. Type Semantic Definition

A measure of the number of times that an item revolves, vibrates etc. in unit time.

Usually measured in revolutions/second or Herz.

History

New Defined Type in IFC Release 2.0

9.13.2. Type

REAL

9.14. Type IfcHeatFluxDensityMeasure

9.14.1. Type Semantic Definition

A measure of the density of heat flux within a body.

Usually measured in Watts/meters2.

History

New Defined Type in IFC Release 2.0

9.14.2. Type

REAL

9.15. Type IfcInteger

9.15.1. Type Semantic Definition

A defined type of simple data type Integer. (Required since a select type, i.e. IfcMeasureValue, cannot include directly simple types in its select list).

In principle, the domain of IfcInteger (being an Integer) is all integer numbers. Here the number of bits used for the IfcInteger representation is unconstrained, but in practise it's implementation specific.

9.15.2. Type

INTEGER

9.16. Type IfcIntegerCountRateMeasure

9.16.1. Type Semantic Definition

A measure of the integer number of units flowing per unit time.

This measure may be used for measuring integer units per second or per hour. For example, it may be used to measure the number of books per hour passing along a part of a mechanical book handling system, the number of people per hour travelling along a moving walkway or the number of vehicles per hour travelling along a section of road.

History

New Defined Type in IFC Release 2.0

9.16.2. Type

INTEGER

9.17. Type IfcKinematicViscosityMeasure

9.17.1. Type Semantic Definition

A measure of the viscous resistance of a medium to a moving body.

Usually measured in square meters/second.

History

New Defined Type in IFC Release 2.0

9.17.2. Type

REAL

9.18. Type IfcLengthMeasure

9.18.1. Type Semantic Definition

A length measure is the value of a distance.

9.18.2. Type

REAL

9.19. Type IfcLinearVelocityMeasure

9.19.1. Type Semantic Definition

A measure of the velocity of a body measured in terms of distance moved per unit time.

Usually measured in meters/second

History

New Defined Type in IFC Release 2.0

9.19.2. Type

REAL

9.20. Type IfcLuminousIntensityMeasure

9.20.1. Type Semantic Definition

A luminous intensity measure is the value for the brightness of a body.

9.20.2. Type

REAL

9.21. Type IfcMassDensityMeasure

9.21.1. Type Semantic Definition

A measure of the density of a medium.

Usually measured in kilograms/cubic meters.

History

New Defined Type in IFC Release 2.0

9.21.2. Type

REAL

9.22. Type IfcMassFlowRateMeasure

9.22.1. Type Semantic Definition

A measure of the mass of a medium flowing per unit time.

Usually measured in kilograms/second

History

New Defined Type in IFC Release 2.0

9.22.2. Type

REAL

9.23. Type IfcMassMeasure

9.23.1. Type Semantic Definition

A mass measure is the value of the amount of matter that a body contains.

9.23.2. Type

REAL

9.24. Type IfcMonetaryMeasure

9.24.1. Type Semantic Definition

A monetary measure is the value of an amount of money without regard to its currency.

History

New Defined Type in IFC Release 2.0

9.24.2. Type

REAL

9.25. Type IfcNumericMeasure

9.25.1. Type Semantic Definition

A numeric measure is the numeric value of a physical quantity.

9.25.2. Type

NUMBER

9.26. Type IfcParameterValue

9.26.1. Type Semantic Definition

A parameter value is the value which specifies the amount of a parameter in some parameter space.

9.26.2. Type

REAL

9.27. Type IfcPlaneAngleMeasure

9.27.1. Type Semantic Definition

A plane angle measure is the value of an angle in a plane.

IfcPlaneAngleMeasure is used where angles need to be described to an accuracy of less than one degree and expressed as decimal parts of an angle. It is widely used for angular measurement except for situations where accuracy needs to be defined using arc measurement; for which purpose the IfcCompoundPlaneAngleMeasure is provided.

9.27.2. Type

REAL

9.28. Type IfcPositiveLengthMeasure

9.28.1. Type Semantic Definition

A positive length measure is a length measure that is greater than zero.

9.28.2. Type

IfcLengthMeasure

Formal Propositions

WR1	SELF 0

9.29. Type IfcPositivePlaneAngleMeasure

9.29.1. Type Semantic Definition

A positive plane angle measure is a plane angle measure that is greater than zero.

9.29.2. Type

IfcPlaneAngleMeasure

Formal Propositions

WR1	SELF 0

9.30. Type IfcPositiveRatioMeasure

9.30.1. Type Semantic Definition

A positive ratio measure is a ratio measure that is greater than zero.

9.30.2. Type

IfcRatioMeasure

Formal Propositions

WR1	SELF 0

9.31. Type IfcPowerMeasure

9.31.1. Type Semantic Definition

A measure of power required or used.

Usually measured in Watts.

History

New Defined Type in IFC Release 2.0

9.31.2. Type

REAL

9.32. Type IfcPressureMeasure

9.32.1. Type Semantic Definition

A measure of the quantity of a medium acting on a unit area.

Usually measured in Pascals.

History

New Defined Type in IFC Release 2.0

9.32.2. Type

REAL

9.33. Type IfcRatioMeasure

9.33.1. Type Semantic Definition

A ratio measure is the value of the relation between two physical quantities that are of the same kind.

9.33.2. Type

REAL

9.34. Type IfcReal

9.34.1. Type Semantic Definition

A defined type of simple data type Real (required since a select type, i.e. IfcMeasureValue, cannot include directly simple types in its select list).

In principle, the domain of IfcReal (being a Real) is all rational, irrational and scientific real numbers. Here the precision is unconstrained, but in practise it's implementation specific.

9.34.2. Type

REAL

9.35. Type IfcSolidAngleMeasure

9.35.1. Type Semantic Definition

A solid angle measure is the value of an angle in a solid.

9.35.2. Type

REAL

9.36. Type IfcString

9.36.1. Type Semantic Definition

A defined type of simple data type String. (Required since a select type, i.e. IfcMeasureValue, cannot include directly simple types in its select list).

9.36.2. Type

STRING

9.37. Type IfcThermalAdmittanceMeasure

9.37.1. Type Semantic Definition

The measure of the ability of a surface to smooth out temperature variations.

Usually measured in Watt / square meters degrees Kelvin.

History

New Defined Type in IFC Release 2.0

9.37.2. Type

REAL

9.38. Type IfcThermalResistanceMeasure

9.38.1. Type Semantic Definition

A measure of the resistance offered by a body to the flow of energy.

Usually measured in square meters degrees Kelvin / Watt.

History

New Defined Type in IFC Release 2.0

9.38.2. Type

REAL

9.39. Type IfcThermalTransmittanceMeasure

9.39.1. Type Semantic Definition

A measure of the rate at which energy is transmitted through a body.

Usually measured in Watts/ square meters degrees Kelvin.

History

New Defined Type in IFC Release 2.0

9.39.2. Type

REAL

9.40. Type IfcThermodynamicTemperatureMeasure

9.40.1. Type Semantic Definition

A thermodynamic temperature measure is the value for the degree of heat of a body.

9.40.2. Type

REAL

9.41. Type IfcTimeMeasure

9.41.1. Type Semantic Definition

A time measure is the value of the duration of periods.

9.41.2. Type

REAL

9.42. Type IfcTimeStamp

9.42.1. Type Semantic Definition

An indication of date and time by measuring the number of seconds which have elapsed since the beginning of the year 1970.

9.42.2. Type

INTEGER

9.43. Type IfcVolumeMeasure

9.43.1. Type Semantic Definition

A volume measure is the value of the solid content of a body.

9.43.2. Type

REAL

9.44. Type IfcVolumetricFlowrateMeasure

9.44.1. Type Semantic Definition

A measure of the volume of a medium flowing per unit time.

Usually measured in cubic meters/second.

History

New Defined Type in IFC Release 2.0

9.44.2. Type

REAL

9.45. Select IfcMeasureValue

9.45.1. Select Semantic Definition

A measure value is a value as defined in ISO 31-0 (clause 2).

IfcMeasureValue is a select data type which includes in its select list all various type of defined data type measures.

History

This Select Type has changed after IFC Release 1.5.1, please see the Migration Guide for details

9.45.2. Select

IfcAmountOfSubstanceMeasure
IfcAngularVelocityMeasure
IfcAreaMeasure
IfcBoolean
IfcCompoundPlaneAngleMeasure
IfcContextDependentMeasure
IfcCountMeasure
IfcDescriptiveMeasure
IfcDynamicViscosityMeasure
IfcElectricCurrentMeasure
IfcElectricVoltageMeasure
IfcEnergyMeasure
IfcHeatFluxDensityMeasure
IfcInteger
IfcIntegerCountRateMeasure
IfcKinematicViscosityMeasure

IfcLengthMeasure
IfcLinearVelocityMeasure
IfcLuminousIntensityMeasure
IfcMassDensityMeasure
IfcMassFlowRateMeasure
IfcMassMeasure
IfcMonetaryMeasure
IfcNumericMeasure
IfcParameterValue
IfcPlaneAngleMeasure
IfcPositiveLengthMeasure
IfcPositivePlaneAngleMeasure
IfcPositiveRatioMeasure
IfcPowerMeasure
IfcPressureMeasure
IfcRatioMeasure
IfcReal
IfcFrequencyMeasure
IfcSolidAngleMeasure
IfcString
IfcThermalAdmittanceMeasure
IfcThermalResistanceMeasure
IfcThermalTransmittanceMeasure
IfcThermodynamicTemperatureMeasure
IfcTimeMeasure
IfcTimeStamp
IfcVolumeMeasure
IfcVolumetricFlowrateMeasure

9.46. Select IfcUnit

9.46.1. Select Semantic Definition

A unit is a physical quantity, with a value of one, which is used as a standard in terms of which other quantities are expressed.

9.46.2. Select

IfcDerivedUnit
IfcNamedUnit

9.47. Type IfcCurrencyEnum

9.47.1. Type Semantic Definition

An enumeration type of currencies of various countries.

9.47.2. Enumeration

AED	United Arab Emirates
AES	Argentina
ATS	Austria
AUD	Australia
BBD	Barbados
BEG	Belgium
BGL	Bulgaria
BHD	Bahrain
BMD	Bermuda
BND	Brunei
BRL	Brazil
BSD	Bahamas
BWP	Botswana
BZD	Belize
CAD	Canada
CBD	Carribean
CHF	Switzerland
CLP	Chile
CNY	China
CYS	Cyprus
CZK	Czech Republic
DDP	Dominican Republic
DEM	Germany
DKK	Denmark
EGL	Egypt
EST	Spain
EUR	A currency adopted by a number of countries within the European Union from January 1st 1999. The zone in which the currency operates is termed 'Euroland' in financial transactions
FAK	Faroe Islands
FIM	Finland
FJD	Fiji
FKP	Falkland Islands
FRF	France
GBP	United Kingdom
GIP	Gibraltar
GMD	Gambia
GRX	Greece
HKD	Hong Kong
HUF	Hungary
ICK	Iceland
IDR	Indonesia
ILS	Israel
INR	India
IRP	Ireland
ITL	Italy
JMD	Jamaica
JOD	Jordan

JPY	Japan
KES	Kenya
KRW	Republic of Korea
KWD	Kuwait
KYD	Cayman Islands
LKR	Sri Lanka
LUF	Luxembourg
MTL	Malta
MUR	Mauritius
MXN	Mexico
MYR	Malaysia
NLG	Netherlands
NZD	New Zealand
OMR	Oman
PGK	Papua New Guinea
PHP	Philipines
PKR	Pakistan
PLN	Poland
PTN	Portugal
QAR	Qatar
RUR	Russia
SAR	Saudi Arabia
SCR	Seychelles
SEK	Sweden
SGD	Singapore
SKP	St.Helena
THB	Thailand
TRL	Turkey
TTD	Trinidad and Tobago
TWD	Taiwan
USD	United States of America
VEB	Venezuela
VND	Viet-Nam
XEU	Europe (States of the European Union)
ZAR	South Africa
ZWD	Zimbabwe

9.48. Type IfcDerivedUnitEnum

9.48.1. Type Semantic Definition

An enumeration type for allowed types of derived units.

9.48.2. Enumeration

AngularVelocityUnit
DynamicViscosityUnit
ElectricVoltageUnit

EnergyUnit
HeatfluxDensityUnit
IntegerCountRateUnit
KinematicViscosityUnit
LinearVelocityUnit
MassDensityUnit
MassFlowrateUnit
PowerUnit
PressureUnit
RotationalFrequencyUnit
ThermalAdmittanceUnit
ThermalResistanceUnit
ThermalTransmittanceUnit
VolumetricFlowrateUnit
UserDefined
NotDefined

9.49. Type IfcSiPrefix

9.49.1. Type Semantic Definition

An SI prefix is the name of a prefix that may be associated with an si unit. The definitions of SI prefixes are specified in ISO 1000 (clause 3).

9.49.2. Enumeration

EXA
PETA
TERA
GIGA
MEGA
KILO
HECTO
DECA
DECI
CENTI
MILLI
MICRO
NANO
PICO
FEMTO
ATTO

9.50. Type IfcSiUnitName

9.50.1. Type Semantic Definition

An SI unit name is the name of an SI unit. The definitions of the names of SI units are specified in ISO 1000 (clause 2).

9.50.2. Enumeration

METRE
SQUARE_METRE
CUBIC_METRE
GRAM
SECOND
AMPERE
KELVIN
MOLE
CANDELA
RADIAN
STERADIAN
HERTZ
NEWTON
PASCAL
JOULE
WATT
COULOMB
VOLT
FARAD
OHM
SIEMENS
WEBER
TESLA
HENRY
DEGREE_CELSIUS
LUMEN
LUX
BECQUEREL
GRAY
SIEVERT

9.51. Type IfcUnitEnum

9.51.1. Type Semantic Definition

An enumeration type for allowed unit types of IfcNamedUnit.

9.51.2. Enumeration

LengthUnit
MassUnit
TimeUnit
DurationUnit
ElectricCurrentUnit
ThermodynamicTemperatureUnit
AmountOfSubstanceUnit
LuminousIntensityUnit
PlaneAngleUnit
SolidAngleUnit
AreaUnit
VolumeUnit
RatioUnit
Unspecified

9.52. Class IfcContextDependentUnit

9.52.1. Class Semantic Definition

An context dependent unit is a unit which is not related to the SI system.

NOTE: The number of parts in an assembly is a physical quantity measured in units that may be called “parts" but which cannot be related to an SI unit.

9.52.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcNamedUnit
IfcContextDependentUnit

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	The word, or group of words, by which the context dependent unit is referred to.	STRING	see type	see type	empty string

9.52.3. Interface Definitions

- I_ContextDependentUnit

9.53. Class IfcConversionBasedUnit

9.53.1. Class Semantic Definition

A conversion based unit is a unit that is defined based on a measure with unit.

NOTE: An inch is a converted unit. It is from the Imperial system, its name is “inch" and it can be related to the si unit, millimetre, through a measure with unit whose value is 25.4 millimetre. A foot is

also a converted unit. It is from the Imperial system, its name is “foot" and it can be related to an si unit, millimetre, either directly or through the unit called “inch".

9.53.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcNamedUnit
IfcConversionBasedUnit

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	The word, or group of words, by which the conversion based unit is referred to.	STRING	see type	see type	empty string
	ConversionFactor	The physical quantity from which the converted unit is derived.	IfcMeasureWithUnit	see type	see type	see type

9.53.3. Interface Definitions

- I_ConversionBasedUnit

9.54. Class IfcDerivedUnit

9.54.1. Class Semantic Definition

A derived unit is an expression of units.

NOTE: Newton per square millimetre is a derived unit.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

9.54.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Elements	The group of units and their exponents that define the derived unit.	SET [1:?] OF IfcDerivedUnitElement	1	N	see WR1
	UnitType	Name of the derived unit – selected from a predefined enumeration for use in IFC models.	IfcDerivedUnitEnum	VolumetricFlowrateUnit	Unspecified	Unspecified
	Dimensions	Dimensional exponents are derived using the function IfcDerivedDimensionalExponents using (SELF) as the input value.	IfcDimensionalExponents	see type	see type	n/a

Formal Propositions

WR1	There shall be either more than one member in the elements set or the value of the exponent of the

	single element of the elements set shall not be equal to one.

9.54.3. Interface Definitions

- I_DerivedUnit

9.55. Class IfcDerivedUnitElement

9.55.1. Class Semantic Definition

A derived unit element is one of the unit quantities which makes up a derived unit.

EXAMPLE: Newtons per square millimetre is a derived unit. It has two elements, Newton whose exponent has a value of 1 and millimetre whose exponent is -2.

9.55.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Unit	The fixed quantity which is used as the mathematical factor.	IfcNamedUnit	see type	see type	see type
	Exponent	The power that is applied to the unit attribute.	INTEGER	see type	see type	1

9.55.3. Interface Definitions

- I_DerivedUnitElement

9.56. Class IfcDimensionalExponents

9.56.1. Class Semantic Definition

The dimensionality of any quantity can be expressed as a product of powers of the dimensions of base quantities. The dimensional exponents entity defines the powers of the dimensions of the base quantities. All the physical quantities are founded on seven base quantities (ISO 31 (clause 2)).

NOTE: Length, mass, time, electric current, thermodynamic temperature, amount of substance, and luminous intensity are the seven base quantities.

EXAMPLE: A length of 2 millimetres has a length exponent of 1. The remaining exponents are equal to 0.

EXAMPLE: A velocity of 2 millimetres per second has a length exponent of 1 and a time exponent of -1. The remaining exponents are equal to 0.

9.56.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LengthExponent	The power of the length base quantity.	INTEGER	see type	see type	1
	MassExponent	The power of the mass base quantity.	INTEGER	see type	see type	0
	TimeExponent	The power of the time base quantity.	INTEGER	see type	see type	0
	ElectricCurrentExponent	The power of the electric current base quantity.	INTEGER	see type	see type	0
	ThermodynamicTemperatureExponent	The power of the thermodynamic temperature base quantity.	INTEGER	see type	see type	0
	AmountOfSubstanceExponent	The power of the amount of substance base quantity.	INTEGER	see type	see type	0
	LuminousIntensityExponent	The power of the luminous intensity base quantity.	INTEGER	see type	see type	0

9.56.3. Interface Definitions

- I_DimensionalExponents

9.57. Class IfcMeasureWithUnit

9.57.1. Class Semantic Definition

A measure with unit is the specification of a physical quantity as defined in ISO 31 (clause 2).

9.57.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ValueComponent	the value of the physical quantity when expressed in the specified units.	IfcMeasureValue	see type	see type	IfcLength Measure
	UnitComponent	the unit in which the physical quantity is expressed.	IfcUnit	see type	see type	IfcNamed Unit

9.57.3. Interface Definitions

- I_MeasureWithUnit

9.58. Class IfcNamedUnit

9.58.1. Class Semantic Definition

A named unit is a unit quantity associated with the word, or group of words, by which the unit is identified.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

9.58.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcNamedUnit
IfcConversionBasedUnit
IfcContextDependentUnit
IfcSiUnit

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Dimensions	The exponents of the base properties by which the named unit is defined.	IfcDimensionalExponents	see type	see type	1,0,0,0,0,0,0
	UnitType	Type of unit used.	IfcUnitEnum	see type	see type	LengthUnit

Formal Propositions

WR1	Correct dimensions are established through the function IfcCorrectDimensions. IfcCorrectDimensions (SELF.UnitType, Self.Dimensions)

9.58.3. Interface Definitions

- I_NamedUnit

9.59. Class IfcSiUnit

9.59.1. Class Semantic Definition

An SI unit is the fixed quantity used as a standard in terms of which items are measured as defined by ISO 1000 (clause 2).

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

9.59.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcNamedUnit
IfcSiUnit

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Prefix	The SI Prefix	IfcSiPrefix	EXA	ATTO	MILLI
	Name	The word, or group of words, by which the SI unit is referred to.	IfcSiUnitName	METRE	SIEVERT	METRE
	SELF\IfcNamedUnit.Dimensions		IfcDimensionalExponents			

9.59.3. Interface Definitions

- I_SiUnit

9.60. Class IfcUnitAssignment

9.60.1. Class Semantic Definition

A set of units which may be assigned.

NOTE: A project has a unit assignment which establishes the set of units which will be used. Other objects may have local unit assignments if there is a requirement for them to make use of units which do not fall within the project unit assignment.

9.60.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Units	Units to be included within a unit assignment.	SET [1:?] OF IfcUnit	1	N	1

9.60.3. Interface Definitions

- I_UnitAssignment

9.61. Function IfcCorrectDimensions

9.61.1. Function Semantic Definition

The correct dimensions function returns the dimensional exponents of the given unit type.

Argument definitions:

X: (input) the name of the unit type for which the dimensional exponents are tested.

9.62. Function IfcDeriveDimensionalExponents

9.62.1. Function Semantic Definition

This function determines the dimensional exponents of a unit. For named units the dimensions attribute is returned and for derived units the dimensional exponents are calculated from its elements.

Argument definitions:

X: (input) the unit that the dimensional exponents are being derived from.

9.63. Function IfcDimensionsForSiUnit

9.63.1. Function Semantic Definition

The dimensions for SI unit function returns the dimensional exponents of the given SI - unit.

Argument definitions:

N : (input) the name of the unit for which the dimensional exponents will be returned.

10. IfcPropertyResource

The IfcPropertyResource defines a set of basic property object types that can be associated with IFC objects through the IfcPropertySet (defined in the Kernel).

10.1. Select IfcObjectReferenceSelect

10.1.1. Select Semantic Definition

Definition from IAI: IfcObjectReferenceSelect is a select type which enables references to other objects from within property sets.

ISSUES: None.

History

New Select Type in IFC Release 2.0

10.1.2. Select

IfcPerson
IfcOrganization
IfcPersonAndOrganization
IfcClassification
IfcCost
IfcCalendarDate
IfcLocalTime
IfcDateAndTime
IfcDocumentReference
IfcMaterial
IfcMaterialLayer

IfcMaterialLayerSet
IfcMaterialList
IfcMaterialFinish
IfcGloballyUniqueId

10.2. Class IfcEnumeratedProperty

10.2.1. Class Semantic Definition

Definition from IAI: A value selected from an enumeration of defined string values (see IfcEnumeration). This enables applications to include an Enum value in occurrences of IfcPropertySet (defined in the IfcKernel schema).

ISSUES: none to date.

History

New Entity in IFC Release 2.0

10.2.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProperty
IfcEnumeratedProperty

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	EnumerationIndex	Index into the enumeration pointed to by "Enumeration"	INTEGER	1	see type	1
	EnumerationReference	Enumeration from which a value has been selected by "EnumerationIndex"	IfcEnumeration			

10.2.3. Interface Definitions

- I_EnumeratedProperty

10.3. Class IfcEnumeration

10.3.1. Class Semantic Definition

Definition from IAI: A collection of string values that define a prescribed set of alternatives from which 'enumeration values' are selected. This enables inclusion of Enum values in property sets (defined in the IfcKernel schema). IfcEnumeration provides a name for the Enum as well as a list of STRING values that are defined by the creating application at runtime.

ISSUES: none to date.

History

New Entity in IFC Release 2.0

10.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	Name of this enumeration	STRING			
	EnumerationValues		LIST [1:?] OF STRING			

10.3.3. Interface Definitions

- I_Enumeration

10.4. Class IfcLibrary

10.4.1. Class Semantic Definition

Definition from IAI: A structured store of information, normally organized in a manner which allows information lookup through an index or reference value. IfcLibrary provides the library name and location (a URL). It also provides optional version, version date and publisher attributes.

ISSUES: none to date.

History

New Entity in IFC Release 2.0

10.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	Library name	STRING			
OPT	Version	Identifier for reference version	STRING			
	Location	URL location string	STRING			
OPT	Publisher	Library publisher	IfcOrganization			
OPT	VersionDate	Date of the referenced version	IfcCalendarDate			

10.4.3. Interface Definitions

- I_Library

10.5. Class IfcLibraryReference

10.5.1. Class Semantic Definition

Definition from IAI: A reference into a library of information (see IfcLibrary). An optional "ReferencedItem" key is also provided to allow more specific references to library sections or tables.

ISSUES: none to date.

History

New Entity in IFC Release 2.0

10.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProperty
IfcLibraryReference

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ReferencedLibrary	Library being referenced	IfcLibrary			
OPT	ReferencedItem	Identifier for the referenced item in the library	STRING			

10.5.3. Interface Definitions

- I_LibraryReference

10.6. Class IfcObjectReference

10.6.1. Class Semantic Definition

Definition from IAI: IfcObjectReference allows property level references to other objects through the unique ID associated with that object (IfcGloballyUniqueId). IfcObjectReference enables runtime definition of such references (relationships) between objects. Capture of such relationships is important since not all cross object relationships can be predefined by IAI.

ISSUES: See issue I-252 for background on why it was added.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

10.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProperty
IfcObjectReference

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ObjectReference	Reference to another object through one of the types in IfcObjectSelect. The alternatives are other select types and reference by GUID value	IfcObjectReferenceSelect	n/a	n/a	value required

10.6.3. Interface Definitions

- I_ObjectReference

10.7. Class IfcProperty

10.7.1. Class Semantic Definition

Definition from IAI: An abstract generalization for all types of Properties that can be associated with IFC objects through the IfcPropertySet (defined in IfcKernel).

ISSUES: See issue I-080, I-081, GI-002 for background and changes made to this class.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

10.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProperty
- IfcObjectReference
- IfcSimplePropertyWithUnit
- IfcSimpleProperty
- IfcEnumeratedProperty
- IfcLibraryReference
- IfcPropertyList

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	Name for this property	STRING	n/a	n/a	value required
INV	PartOfPropertyList	Reference to the IfcPropertySet, in which the IfcProperty is contained.	SET [0:1] OF IfcPropertyList	n/a	n/a	NIL

10.7.3. Interface Definitions

- I_Property

10.8. Class IfcPropertyList

10.8.1. Class Semantic Definition

Definition from IAI: A list of IfcProperty objects. The included list may be a mixed or consistent collection of IfcProperty subtypes. This allows lists of properties to be included as a single 'property' entry in a property set (see IfcPropertySet in the IfcKernel schema).

ISSUES: none to date.

History

New Entity in IFC Release 2.0

10.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProperty
IfcPropertyList

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	UserMin	User defined minimum number of list items	INTEGER	0	see type	0
OPT	Max	Maximum number of list items	INTEGER	1	see type	
	Min	Derived minimum number of values in the list. If no user set min, then min is set to 0.	INTEGER			
	HasProperties	LIST of properties that can be used within properties, as referenced by a property set (defined in the Kernel).	LIST [Min:Max] OF IfcProperty	n/a	n/a	NIL

Formal Propositions

WR21	If Max value is spefified, it should be greater than the Min nalue and greater than zero
WR2	The derived Min value shall be greater than or equal to zero.

10.8.3. Interface Definitions

- I_PropertyList

10.9. Class IfcSimpleProperty

10.9.1. Class Semantic Definition

Definition from IAI: IfcSimpleProperty defines a property object, for which a *name -- value* pair is given. It should be used to define simple properties, where the unit is already implied by the type of IfcMeasureValue used and the IfcUnitAssignment defined at the project level (see IfcProject). For simple properties with measures that refer to more specific units, the IfcSimplePropertyWithUnit should be used.

ISSUES: See issue I-080 for changes made in IFC Release 1.5.

10.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProperty
IfcSimpleProperty

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ValueComponent	Value of this property. NOTE: By virtue of the defined data type, that is selected from the SELECT IfcMeasureValue the appropriate unit can be found within the unit assignment at the IfcProject.	IfcMeasureValue	see type	see type	n/a

10.9.3. Interface Definitions

- I_SimpleProperty

10.10. Class IfcSimplePropertyWithUnit

10.10.1. Class Semantic Definition

Definition from IAI: The IfcSimplePropertyWithUnit defines a property object that has a name, value, unit triplet (occurrence specific unit) using the name inherited from IfcProperty and a ValueWithUnit attribute of type IfcMeasureWithUnit (defined in IfcMeasureResource).

ISSUES: none to date.

10.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProperty
IfcSimplePropertyWithUnit

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ValueWithUnit	A measure value + a unit defined for this object occurrence.	IfcMeasureWithUnit	see type	see type	n/a

10.10.3. Interface Definitions

- I_SimplePropertyWithUnit

11. IfcRepresentationResource

This schema defines the representation of shape and topology as important definitional properties for products defined within the IFC Object Model. The representations characterize certain properties of a product, and any product can be defined by zero, one, or many of those properties.

The schema defines two ways to represent definitional properties of products:

topological representation
geometric shape representation

The geometric shape representation allows for

multiple shape representations for the same product definition shape of a product
separate shape representations for components or parts of the product definition shape by using shape aspects

The following parts of ISO10303, STEP, had been reviewed to provide input into the specification of the representation resource for the IFC Object Model:

Part 41, Integrated Generic Resources – Fundamental of Product Description and Support
- product_property_definition_schema
- product_property_representation_schema

Part 42, Integrated Generic Resources – Geometric and Topological Representation
- geometry_schema

Part 43, Integrated Generic Resources – Representation Structures
- representation_schema

Please note, that the above listed resources which are defined within Integrated Resources of STEP had been interpreted to fit into the IFC architecture.

11.1. Class IfcGeometricRepresentationContext

11.1.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A geometric representation context is a representation context in which the geometric representation items are geometrically founded. A geometric representation context is a distinct coordinate space, spatially unrelated to other coordinate spaces.

Definition from IAI: The IfcGeometricRepresentationContext defines the context that applies to several shape representations of a product. It defines the type of the context in which the shape representation is defined, that can be used to describe the level of detailing for which the shape representation is valid (inherited from the supertype), and the numeric precision applicable to the geometric representation items defined in this context.

NOTE: The definition of this class relates to the STEP entity *geometric_representation_context*. Please refer to ISO/IS 10303-42:1994 for the final definition of the formal standard.

ISSUE: No issues raised so far.

History

New Entity in IFC Release 2.0

11.1.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRepresentationContext
IfcGeometricRepresentationContext

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	CoordinateSpaceDimension	The integer dimension count of the coordinate space modeled in a	IfcDimensionCount	1	3	3

		geometric representation context.				
OPT	Precision	Value of the model precision for geometric models. It is a double value (REAL), typically in 1E-5 to 1E-8 range, that indicates the tolerance under which two given points are still assumed to be identical. The value can be used e.g. to sets the maximum distance from an edge curve to the underlying face surface in brep models.	REAL	see type	see type	0

Formal Propositions

WR21	The rule constrains the supported values of context type for this subtype in this release.

11.1.3. Interface Definitions

- I_GeometricRepresentationContext

11.2. Class IfcProductDefinitionShape

11.2.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A product definition shape identifies a product's shape as the conceptual idea of the form of a product.

Definition from IAI: The IfcProductDefinitionShape defines all shape relevant information about an IfcProduct. It allows for multiple geometric shape representations of the same product.

HISTORY: The definition of this class relates to the STEP entity *product_definition_shape*. Please refer to ISO/IS 10303-41:1994 for the final definition of the formal standard.

ISSUE: See issues I-041, I-044, I-047, I-048, GI-002, GI-003 for changes made in IFC Release 1.5. See issue I-330 for changes made in IFC Release 1.5.1.

11.2.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProductRepresentation
IfcProductDefinitionShape

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ShapeRepresentations	Contained list of shape representations. Each member defining a valid shape representation of a particular type (i.e. bounding box, standard, advance, and arbitrary) within a particular representation context.	LIST [1:?] OF IfcShapeRepresentation	see type	see type	n/a
INV	HasShapeAspects	Reference to the shape representation, explicitly indication aspects or components of the product shape.	SET [0:?] OF IfcShapeAspect	see type	see type	NIL

11.2.3. Interface Definitions

- I_ProductDefinitionShape

11.3. Class IfcProductDefinitionTopology

11.3.1. Class Semantic Definition

Definition from IAI: The IfcProductDefinitionTopology defines the topology of a product. The product definition topology is used for products that are defined within a network. The product definition topology then specifies the connectivity of that product. It does not allow for multiple topological representations of the product, only a single topology can be given.

ISSUE: See I-522 for changes made in IFC Release 2.0.

History

New Entity in IFC Release 2.0

11.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProductRepresentation
IfcProductDefinitionTopology

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	TopologyRepresentation	Contained topology representation representing the topology and connectivity of the product.	IfcTopologyRepresentation	see type	see type	n/a

11.3.3. Interface Definitions

- I_ProductDefinitionTopology

11.4. Class IfcProductRepresentation

11.4.1. Class Semantic Definition

Definition from IAI: The IfcProductRepresentation is a property that defines a property defining a product, including its (geometrical or topological) representation. A product can have zero, one or many of such product representations, and a single product representation can be shared among various products.

NOTE: The definition of this class relates to the STEP entity *property_definition*. The use of the term ‘property’ was avoided since it conflicts with the property, property type, and property set definitions elsewhere in the IFC Object Model.

ISSUE: No issues raised so far.

History

New Entity in IFC Release 2.0

11.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcProductRepresentation
IfcProductDefinitionShape
IfcProductDefinitionTopology

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	GlobalId	Assignment of a globally unique identifier that allows to ensure uniqueness in a global context.	IfcGloballyUniqueId	see type	see type	n/a
	OwnerHistory	Assignment of the information about the current ownership of that object, including owning actor, application, local identification and information captured about the recent changes of the object.	IfcOwnerHistory	see type	see type	n/a
OPT	Name	The word or group of words by which the product definition is known.	STRING	see type	see type	NIL
OPT	Description	The word or group of words that characterize the product definition. It can be used to add additional meaning the the name of the product definition.	STRING	see type	see type	NIL

11.4.3. Interface Definitions

- I_ProductRepresentation

11.5. Class IfcRepresentation

11.5.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A representation is one or more representation items that are related in a specified representation context as the representation of some concept.

Definition from IAI: The IfcRepresentation defines the general concept of representing product properties.

NOTE: The definition of this class relates to the STEP entity *representation*. Please refer to ISO/IS 10303-43:1994 for the final definition of the formal standard.

ISSUE: No issues raised so far.

History

New Entity in IFC Release 2.0

11.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRepresentation
IfcShapeRepresentation
IfcTopologyRepresentation

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ContextOfItems	Definition of the representation context for which the different subtypes of representation are valid.	IfcRepresentationContext	see type	see type	n/a
	RepresentationIdentifier	The representation identifier that may provide the primary identification of the representation.	STRING	see type	see type	NIL
	RepresentationType	The description of the type of a representation context. The supported values for context type are specified in a clause for each release.	STRING	see type	see type	NIL

11.5.3. Interface Definitions

- I_Representation

11.6. Class IfcRepresentationContext

11.6.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: A representation context is a context in which a set of representation items are related.

Definition from IAI: The IfcRepresentationContext defines the context to which the representations of product definition shape or product definition topology are related.

NOTE: The definition of this class relates to the STEP entity *representation_context*. Please refer to ISO/IS 10303-43:1994 for the final definition of the formal standard.

ISSUE: See issues I-049, I-051 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

11.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRepresentationContext
IfcGeometricRepresentationContext

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	GlobalId	Assignment of a globally unique identifier that allows to ensure uniqueness in a global context.	IfcGloballyUniqueId	see type	see type	n/a
	ContextIdentifier	The identifier of the representation context as used within a project.	STRING	see type	see type	n/a
	ContextType	The description of the type of a representation context. The supported values for context type are specified in a clause for each release.	STRING	see type	see type	n/a

INV	RepresentationsInContext	All shape representations that are defined in the same representation context.	SET [1:?] OF IfcRepresentation	see type	see type	n/a

11.6.3. Interface Definitions

- I_RepresentationContext

11.7. Class IfcShapeAspect

11.7.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The shape aspect is an identifiable element of the shape of a product.

Definition from IAI: The IfcShapeAspect allows for grouping of shape representation items that represent aspects (or components) of the shape of a product. Thereby shape representations of components of the product shape representing a distinctive part of a product that can be explicitly addressed.

NOTE: The definition of this class relates to the STEP entity *shape_aspect*. Please refer to ISO/IS 10303-41:1994 for the final definition of the formal standard.

ISSUE: See issues I-330 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

11.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	GlobalId	Assignment of a globally unique identifier that allows to ensure uniqueness in a global context.	IfcGloballyUniqueId	see type	see type	n/a
	ShapeRepresentations	Contained list of shape representations. Each member defining a valid shape representation of a particular type (i.e. bounding box, attribute driven, explicit) within a particular representation context.	LIST [1:?] OF IfcShapeRepresentation	see type	see type	n/a
OPT	Name	The word or group of words by which the shape_aspect is known. It is a tag to indicate the particular semantic of a component within the product definition shape, used to provide meaning. Example: use the tag "Glazing“ to define which component of a window shape defines the glazing area.	STRING	see type	see type	n/a
OPT	Description	The word or group of words that characterize the shape_aspect. It can be	STRING	see type	see type	n/a

		used to add additional meaning the the name of the aspect.				
	ProductDefinitional	An indication that the shape aspect is on the physical boundary of the product_definition_shape. If the value of this attribute is TRUE, it shall be asserted that the shape_aspect being identified is on such a boundary. If the value is FALSE, it shall be asserted that the shape_aspect being identified is not on such a boundary. If the value is UNKNOWN, it shall be asserted that it is not known whether or not the shape_aspect being identified is on such a boundary. EXAMPLE: Would be FALSE for a center line, identified as shape aspect, would be TRUE for a cantilever.	LOGICAL	FALSE	TRUE	UNKNOWN
	PartOfProductDefinitionShape	Reference to the product definition shape of which this class is an aspect.	IfcProductDefinitionShape	see type	see type	n/a

11.7.3. Interface Definitions

- I_ShapeAspect

11.8. Class IfcShapeRepresentation

11.8.1. Class Semantic Definition

Definition from ISO/CD 10303-42:1992: The shape representation is a specific kind of representation that represents a shape.

Definition from IAI: The IfcShapeRepresentation represents the concept of a particular geometric representation of a product or a product component within a special geometric representation context.

NOTE: The definition of this class relates to the STEP entity *shape_representation*. Please refer to ISO/IS 10303-41:1994 for the final definition of the formal standard.

ISSUE: See issues I-043, I-052, I-184, I-194 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

11.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRepresentation
IfcShapeRepresentation

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Items	Set of geometric representation items that are defined for this	SET [1:?] OF IfcGeometricRepresentationIt	see type	see type	n/a

		representation	em			
INV	OfProductDefinitionShape	Reference to the product shape, for which it is the shape representation	SET [0:1] OF IfcProductDefinitionShape	see type	see type	n/a
INV	OfShapeAspect	Reference to the shape aspect, for which it is the shape representation	SET [0:1] OF IfcShapeAspect	see type	see type	NIL

Formal Propositions

WR22	The IfcShapeRepresentation shall be either defined for a single product shape or for a single shape aspect.
WR23	The context to which the IfcShapeRepresentation is assign, shall be of type IfcGeometricRepresentationContext.
WR24	The rule constrains the supported values of representation type for this subtype in this release.
WR25	Constrains the valid Items for representation according to the Shape Representation Type (IfcShapeRepTypeEnum) BoundingBox

11.8.3. Interface Definitions

- I_ShapeRepresentation

11.9. Class IfcTopologyRepresentation

11.9.1. Class Semantic Definition

Definition from IAI: The IfcTopologyRepresentation represents all topologically relevant information about an product, including its connectivity.

ISSUE: See I-522 for changes made in IFC Release 2.0.

History

New Entity in IFC Release 2.0

11.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRepresentation
IfcTopologyRepresentation

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Items	Set of topological representation items that are defined for this representation.	SET [1:?] OF IfcTopologicalRepresentationItem	see type	see type	n/a
INV	OfProductDefinitionTopology	Reference to the product definition topology, for which it is the topological representation	IfcProductDefinitionTopology	see type	see type	n/a

11.9.3. Interface Definitions

- I_TopologyRepresentation

12. IfcUtilityResource

The resource schema IfcUtilityResource deals with general concepts – Identification, Ownership and History. It also includes a basic information construct – Tables. The classes of this schema are referenced throughout the whole IFC Object Model by all of its Model Layers as defined in the IFC Architecture Document. The IfcUtilityResource schema consequently contains model specifications for specifying the information content of a number of utility types.

The various types of registries were removed from this schema in Release 2.0 since the method used within applications to store those types of information could differ between different applications.

This schema contains the following concepts:

1. Identifier
2. Ownership
3. History
4. Table

Identifier

The identifier allows IFC classes to be uniquely identified within the scope of the whole software world. Classes that do not have independent existence, i.e. that are contained by other classes, do not have an independent identifier - their uniqueness is provided by the container class.

Ownership

Each object, relationship and type definition will provide information about their current ownership. Ownership information is the currently "owning" application and the owning (responsible) actor. This ownership information can be used for access and change permissions. Ownership can be transferred from one person to another through the life cycle of a project.

Note: the specification of access rights is not described in this IFC release.

History

The history of an IFC object is captured as an audit trail, where only the fact that a modification or transaction is kept, not the modification itself. For each modification, including the creation and deletion, a triple of date, user and application is stored.

Table

The specification of table is general purpose and may be used for any two dimensional matrix type document. It allows information to be recorded in rows and columns where each column is labeled with the type of information it contains. The model does not allow for any mathematical operations on the information content of a table (i.e. it does not function as a spreadsheet).

12.1. Type IfcGloballyUniqueId

12.1.1. Type Semantic Definition

Holds an identifier that is unique throughout the software world. This is also known as a Universal Unique Identifier by the Open Group. The identifier is generated using an algorithm published by the Object Management Group based on the IP address of the computer than generates the identifier. The algorithm is explained at http://www.opengroup.org/dce/info/draft-leach-uuids-guids-01.txt. The document as it exists on 13 March 1999 is included in the Development Guide as an appendix. In Release 1.5 the Microsoft Foundation Class function "CoCreateGuid" was used. The MFC function is an implementation of the above algorithm.

The identifier resulting from the application of the GUID algorithm is then compressed into 20 characters using an algorithm developed by Peter Muigg which maps the GUID bits onto a base 84 digit encoded from the following character set : "0123456789ABCDEFGHIJKLMNOPQRSTUV WXYZabcdefghijklmnopqrstuvwxyz!#$%&^|*+,-./:;<=>?~`@_". The index in this string determines the "value" for each character (0-84), e.g. "A" has a value of 10, "@" has a value of 83. Please note: the characters are case-sensitive! This is also explained in the Development Guide.

NOTE : IfcProjectUniqueID from R1.5 is no longer used.

12.1.2. Type

STRING(20) FIXED

12.2. Type IfcModifiedFlag

12.2.1. Type Semantic Definition

This flag is used to notify an application that is reading data about the state of dependent information. The bits considered in sequence define the following states:

First bit	Full Read/Write Access to unchanged object
Second bit	Dirty (contents of object have been changed by “somebody”)
Third bit	Object is Read Only
Fourth bit	Object is Locked. This allows a repository server to mark an object as being unavailable either because 1) its contents have been checked out to another process, 2) a commit is in process, etc.

Consequently, the following states can be given using bitwise operations under an octal numbering system:

0 = Clean read/write
1 = Dirty read/write
2 = Read Only
3 = Dirty read only
4 = Locked
5 = Dirty locked
6 = Locked Read only
7 = Dirty Locked Read only

Further explanation of this capability is given in Volume 2 of the IFC Specifications.

History

New Defined Type in IFC Release 2.0

12.2.2. Type

BINARY(3) FIXED

12.3. Class IfcApplication

12.3.1. Class Semantic Definition

The IfcApplication is an IFC compliant application developed by an application developer who is a member of the International Alliance of Interoperability. The IfcApplication gets an unique identification within the IFC development framework.

NOTE Added in IFC Release 1.5 .

ISSUE See issues I-003 for changes made in 1.5 final release. This object was called IfcRegistered Application in Release 1.5.1

12.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ApplicationIdentifier	Short, max. 16 character long identifying short name for the application, being registered and known to the IAI conformance program.	STRING(16)	see type	see type	n/a
	ApplicationFullName	The full name of the application as specified by the application developer.	STRING(255)	see type	see type	n/a
	Version	The version number of this software as specified by the developer of the application.	STRING(255)			
	ApplicationDeveloper	name of the application developer, being requested to be member of the IAI.	IfcOrganization	see type	see type	n/a

Unique Rules

UR1	Ensure that there are no duplications of application instances with the same registered identifier.
UR2	The combination of application name and version shall be unique.

12.3.3. Interface Definitions

- I_Application

12.4. Class IfcAuditTrail

12.4.1. Class Semantic Definition

The *IfcAuditTrail* maintains a limited history for an object instance. Currently, this history records the person responsible for and the application used to create, delete and modify objects. The deletion of an object is also captured as an object will most likely be marked as deleted, but not actually removed from the model file. This will facilitate “roll back” functionality in future releases of IFC.

NOTE This class is a revised version of the IFC Release 1.0 class IfcExtendedId.

ISSUE See issue I-004, I-215, I-216 for changes made in 1.5 final release. The WHERE rule which limited the audit trail length to one operation was removed in IFC Release 2.0.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

12.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	CreationDate	Date on which object was created	IfcTimeStamp	see type	see type	n/a
OPT	DeletionDate	Date this object was deleted from the model - NOTE: an deleted Object still needs to be communicated.	IfcTimeStamp	see type	see type	n/a
	CreatingUser	End User who created this object. The integer defines a pointer into the IfcProjectTeamRegistry.	IfcPersonAndOrganization	1	see type	1
OPT	DeletingUser	End User who deleted this object from the model. The integer defines a pointer into the IfcProjectTeamRegistry.	IfcPersonAndOrganization	1	see type	1
	CreatingApplication	Application used to create this object. The integer defines a pointer into the IfcProjectAppRegistry.	IfcApplication	1	see type	1
OPT	DeletingApplication	Application that deleted this object from the model. The integer defines a pointer into the IfcProjectAppRegistry.	IfcApplication	1	see type	1
	Transactions	Stored last transactions that affected the object. Currently only the last transaction is kept	LIST [0:?] OF IfcTransaction	0	AuditTrail Length	0
INV	ToOwnerHistory	Reference to the IfcOwnerHistory in which the IfcAuditTrail is defined (and contained).	IfcOwnerHistory	see type	see type	n/a

12.4.3. Interface Definitions

- I_AuditTrail

12.5. Class IfcOwnerHistory

12.5.1. Class Semantic Definition

The IfcOwnerHistory defines all history and identification related information. In order to provide fast access it is directly attached to all independent objects, relationships and properties.

The IfcOwnerHistory is used to identify the creating and owning application and user for the associated object. An optional description can also be provided by the owner. A reference to the audit trail of the object is also provided.

NOTE This class is a revised version of the IFC Release 1.0 class IfcOwnerId .

ISSUE See issues I-001, I-002 and I-003 for changes made in 1.5 final release.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

12.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	OwningUser	Direct reference to the end user who currently "owns" this object. Note that IFC includes the concept of ownership transfer from one user to another and therefore distinguishes between the Owning User and Creating User.	IfcPersonAndOrganization	1	see type	1
	OwningApplication	Direct reference to the application which currently "Owns" this object on behalf of the owning user, who uses this application. Note that IFC includes the concept of ownership transfer from one app to another and therefore distinguishes between the Owning Application and Creating Application.	IfcApplication	1	see type	1
	ModifiedFlag	Three bits that define the current state of the object. 0 indictes that the object is safe for that aspect (not yet final)	IfcModifiedFlag	%000	%111	%000
OPT	ApplicationId	Internal ID used by the Owning Application.	STRING	see type	see type	NIL
OPT	OwnerDescriptor	User or application descriptor for this object. This might be the user descriptor like "Molly's Room", or description of intended use like "Barge board for south facade siding", etc.	STRING	see type	see type	NIL
OPT	AuditTrail	Reference to the history related information, if given, it shows the latest transaction that leaded to modifications at the object.	IfcAuditTrail	see type	see type	NIL

12.5.3. Interface Definitions

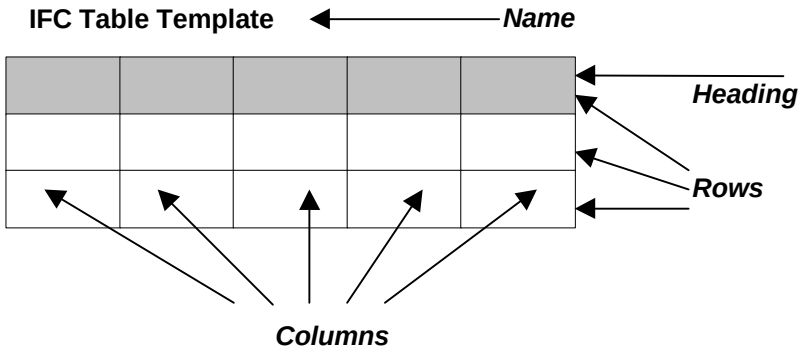
- I_OwnerHistory

12.6. Class IfcTable

12.6.1. Class Semantic Definition

A data structure for the provision of information in the form of rows and columns. Each instance may have a heading row, with titles or descriptions for each column. The rows of information are stored as a list of IfcTableRows.

Limitation: In this release of IFC the Rows of an IfcTable object are constrained to have the same number of Cells. The first Row of the Table provides the number of Cells. All other Rows are forced to include the same number of Cells. This is enforced by the WR2.



History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

12.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	GlobalId	Assignment of an unique identifier within the project that allows to ensure uniqueness in a project context.	IfcGloballyUniqueId	see type	see type	n/a
	Name	A unique name which is intended to describe the usage of the Table.	STRING	see type	see type	n/a
	Rows	Reference to information content of rows.	LIST [1:?] OF IfcTableRow	1	N	2
	NumberOfCellsInRow	The number of cells in each row, this complies to the number of columns in a table. See WR2 that ensures that each row has the same number of cells. The actual value is derived from the first member of the Rows list.	INTEGER	1	see type	2
	NumberOfHeadings	The number of headings in a table. This is restricted by WR3 to max. one.	INTEGER	0	1	1
	NumberOfDataRows	The number of rows in a table that contains data, i.e. total number of rows minus number of heading rows in table	INTEGER	1	see type	2

Formal Propositions

WR1	Ensures that each row defines the same number of cells. This restricts the available table styles in IFC Release 1.5. The rule compares whether all other rows of the IfcTable have the same number of cells as the first row. EXPRESS = SIZEOF(QUERY(Temp
WR2	Ensures that each row defines the same number of cells. This restricts the available table styles in IFC Release 1.5. The rule compares whether all other rows of the IfcTable have the same number of cells as the first row. EXPRESS = SIZEOF(QUERY(Temp
WR3	Ensures that there is one heading row as maximum. This restricts the allowed number of heading rows for this release. This limitation may be removed in future releases. EXPRESS = 0 <= NumberOfHeadings <= 1 }

12.6.3. Interface Definitions

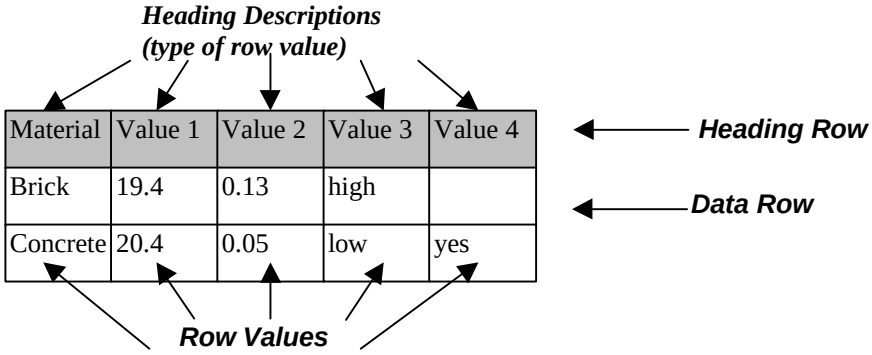
- I_Table

12.7. Class IfcTableRow

12.7.1. Class Semantic Definition

The information content of each row within the table (other than the heading row). A table contains a number of rows which record information concerning the instance of the type of information recorded within the table.

Limitation: There is the restriction within this release of IFC. All IfcTableRow objects referenced by an IfcTable shall have the same number of Row Cells. The actual number of Cells shall be taken from the number of cells of the first IfcTableRow for that table. The number of Cells is calculated by the derived attribute NumberOfCellsInRow in the associated IfcTable.



NOTE Added in IFC Release 1.5

ISSUE See issues I-153, I-218, I-219, I-220, I-221, I-222 for changes made in 1.5 final release

12.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RowCells	The value of information by row and column using the units defined. NOTE - The row value identifies both the actual value and the units in which it is recorded. Each cell (unique row and column) may have a different value AND different units. If the row is a heading row, then the row values are strings defined by the IfcString.	LIST [1:?] OF IfcMeasureValue	1	see type	2
	IsHeading	Flag which identifies if the row is a heading row or a row which contains row values. NOTE - If the row is a heading, the flag takes the value = TRUE.	BOOLEAN	see type	see type	FALSE

INV	OfTable	Reference to the IfcTable, in which the IfcTableRow is defined (or contained)	IfcTable	see type	see type	n/a

12.7.3. Interface Definitions

- I_TableRow

12.8. Class IfcTransaction

12.8.1. Class Semantic Definition

IfcTransaction currently captures the date, the application and the user who made a change. The change itself is not captured.

NOTE Added in IFC Release 1.5.

ISSUE See issues I-004 for changes made in 1.5 final release.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

12.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

This Class does not have any Superclasses or Subclasses

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	TransactionDate	Date and Time at which the transaction occurred.	IfcTimeStamp	see type	see type	n/a
	TransactingUser	User who carried out the transaction.	IfcPersonAndOrganization	1	see type	1
	TransactingApplication	Application being used to carry out the transaction.	IfcApplication	1	see type	1
INV	ToAuditTrail	Reference to the IfcAuditTrail in which context the transaction is captured	IfcAuditTrail	see type	see type	n/a

12.8.3. Interface Definitions

- I_Transaction

Core Model Layer

13. IfcKernel

The schema IfcKernel defines the most abstract part within the IFC architecture. It captures general constructs, that are basically founded by their different semantic meaning in common understanding of an object model, like object, property and relationship. Those are then specialized into non-AEC/FM specific constructs, like product, process, control and resource, which form the main entry points for the next level, the Core Extension layer.

The IfcKernel utilizes the translation of the IFC Meta model into IFC object model specification. It handles the basic functionality, such as relative location of products in space, sequence of processes in time, or general purpose grouping and nesting mechanism. It also lays the foundation of extensibility of IFC model by providing type driven property definition and property definition extension.

The specification of IfcKernel is not intended for independent implementation, however, all shared and domain models at lower levels within the IFC architecture are required to use the kernel definitions to root their definitions.

13.1. Select IfcObjectWithPlacementSelect

13.1.1. Select Semantic Definition

Definition from IAI: The IfcObjectWithPlacementSelect defines the three high level classes in IFC, that define their own placement. These objects can therefore provide the local (or in case of IfcProject -- global) coordinate system to which other object coordinate systems can refer.

ISSUE See issues I-212 and I-312 for changes made in IFC Release 1.5.

13.1.2. Select

IfcProduct
IfcModelingAid
IfcProject

13.2. Type IfcContainedOrReferencedEnum

13.2.1. Type Semantic Definition

Definition from IAI: This enumeration defines the whether the containment type is “Contained” or “Referenced”. Contained means a hierarchical relationship between the contained item and the container, where any item can only be contained once. Referenced means a non-hierarchical relationship between the referenced item and the referencing container, where any item can be referenced by one or many referencing containers.

The term “container” is used for any item in a logical structuring systems, to which an object is assigned to (either “Contained” or “Referenced”). A structuring system can be the project structure of site → building → building story → space, where each individual site, building, building story, or space object can act as an “container” for objects.

EXAMPLE A multi-story space is contained (i.e. in hierarchic relationship) to the building story, on which its ground level is. The same multi-story space is referenced by any building story, through which it spans.

ISSUE See Issues I-114 and I-116 for changes made in IFC Release 1.5.

History

New Enumeration in IFC Release 2.0

13.2.2. Enumeration

Contained
Referenced

13.3. Type IfcContainmentEnum

13.3.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different containment types, that further refine the containment relationship.

ISSUE See Issues I-114 and I-116 for changes made in IFC Release 1.5.

13.3.2. Enumeration

ProjectContainer
SiteContainer
BuildingContainer
BuildingStoreyContainer
SpaceContainer
ZoneContainer
NotDefined

13.4. Type IfcProxyEnum

13.4.1. Type Semantic Definition

Definition from IAI: This enumeration defines the high level categorization of an IfcProxy. It indicates to which subtype of IfcObject the Proxy would otherwise comply.

ISSUE See issue I-184 for changes made in IFC Release 1.5.

13.4.2. Enumeration

Product
Process
Control
Document
Resource
NotDefined

13.5. Type IfcResourceConsumptionEnum

13.5.1. Type Semantic Definition

Definition from IAI: This enumeration indicates how the resource is consumed during the use.

ISSUE See issue I-487 for changes made in IFC Release 2.0.

History

New Enumeration in IFC Release 2.0

13.5.2. Enumeration

Consumed
PartiallyConsumed
Occupied
PartiallyOccupied
NotOccupied
UserDefined
NotDefined

13.6. Type IfcSequenceEnum

13.6.1. Type Semantic Definition

Definition from IAI: : This enumeration defines the different ways, in which a time lag is applied to a sequence between two processes.

ISSUE See issue I-200 for changes made in IFC Release 1.5.

13.6.2. Enumeration

Start_Start
Start_Finish
Finish_Start
Finish_Finish
NotDefined

13.7. Class IfcActor

13.7.1. Class Semantic Definition

Definition from IAI: The IfcActor defines all actors or human agents involved in a project during its full life cycle. It facilitates the use of person and organization definitions in the resource part of the IFC object model.

ISSUE See issues I-478, I-516 for changes made in IFC Release 2.0.

History

New Entity in IFC Release 2.0

13.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcActor
      IfcOccupant

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	TheActor	Information about the actor	IfcActorSelect	n/a	n/a	n/a
INV	IsActingUpon	Reference to the relationship that associates the actor to an object.	SET [0:?] OF IfcRelActsUpon	0	N	1

13.7.3. Interface Definitions

- I_Actor

13.8. Class IfcControl

13.8.1. Class Semantic Definition

Definition from IAI: The IfcControl is the abstract generalization of all concepts that control or constrain Products or Processes in general. It can be seen as a specification, regulation, constraint or other requirement applied to a product or process whose requirements and provisions must be fulfilled.

Examples for Controls are space program, construction guides, etc. It is defined in the Kernel but will be reused and specialized in other schemas.

ISSUE See issue I-094 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcConnectionGeometry
      IfcSpaceProgram
      IfcFurnitureModel
      IfcOccupancySchedule
      IfcScheduleTimeControl
      IfcWorkPlan
      IfcProjectOrder
      IfcDistributionPortGeometry
      IfcConstraint
      IfcCMDocPackage
      IfcOccupancyScheduleElement

IfcWorkScheduleElement
IfcWorkSchedule
IfcCostElement
IfcCostSchedule
IfcApproval
IfcMaintenanceRecord
IfcMaintenanceType

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Classification	Reference to the access information for classified information. NOTE: not the classified information is referenced, only the unambiguous access to it.	IfcClassificationList	n/a	n/a	n/a
INV	Controls	Reference to the relationship that associates the control to the object(s) being controled.	SET [0:?] OF IfcRelControls	0	N	1

13.8.3. Interface Definitions

- I_Control

13.9. Class IfcExtensionPropertySet

13.9.1. Class Semantic Definition

Definition from IAI: Defines those dynamically extendable properties that are defined as extensions to the IFC Object model (see semantic definition of IfcObject). Extension property sets can form part of a regional flavor of IFC or can be project specific extensions to the actual content of an IFC release. The definition source (the body that defined the extension) has to be given.

History

New Entity in IFC Release 2.0

13.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcPropertyDefinition
    IfcPropertySet
      IfcExtensionPropertySet

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	DefinitionSource	The Source attribute specifies the source of the external definition. It can be either the name of a recognised country or region, which defines a national flavour of IFC, or the name of a project consortium, or the name of a group of implementers.	STRING	see type	see type	n/a

13.9.3. Interface Definitions

- I_ExternalPropertySet

13.10. Class IfcGroup

13.10.1. Class Semantic Definition

Definition from IAI: The generalization of any arbitrary group. A group is an aggregation of objects, which do not have any particular positioning relationship. Therefore a group is an aggregation under some non-geometrical/topological grouping aspects. An example for a group is the system, since it groups elements under the aspect of their role, regardless of their position in a building. A group can hold an aggregation of products, processes or other groups. Groups can therefore be nested.

The GroupPurpose attribute may assign a descriptor, that defines the purpose of the group. As an example, a complex of buildings will be generated by assigning the individual buildings through the IfcRelGroups relationship to an IfcGroup, which is further specified by the GroupPurpose descriptor “BuildingComplex”. Similarly the site complex is handled by an IfcGroup with the GroupPurpose descriptor “SiteComplex”.

ISSUE See issues I-088 and I-213 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcGroup
      IfcSystem
      IfcZone
      IfcSpaceProgramGroup
      IfcInventory

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	GroupPurpose	Description of the Purpose behind grouping.	STRING	n/a	n/a	NIL
INV	IsGroupedBy	Contains the relationship that assigns the group members to the group object.	IfcRelGroups	n/a	n/a	n/a

13.10.3. Interface Definitions

- I_Group

13.11. Class IfcLocalPlacement

13.11.1. Class Semantic Definition

Definition from IAI: The relative placement between two products. It defines that the related object is placed within the local coordinate system of the relating object. Rules to prevent cyclic relative placements have to be introduced on the application level.

The following conventions shall apply, if relative placement is used:

- IfcSite shall be placed relative to IfcProject (i.e. WCS)
- IfcBuilding shall be placed relative to IfcSite
- IfcBuildingStorey shall be placed relative to IfcBuilding
- IfcElement shall be placed relative:
- to its container (IfcSite, IfcBuilding, IfcBuildingStorey), or
- to the IfcElement to which it is tied by an element relationship (IfcRelVoidsElement, IfcRelFillsElement, IfcRelCoversBldgElements, IfcRelAssemblesElements), or
- to the modeling aid (Grid)

If the PlacementRelTo Relationship is not given, then it defaults to an absolute placement within the WCS, i.e. relative to the IfcProject.

ISSUE See issues I-212, I-255, I-260 and I-270 for changes made in IFC Release 1.5.

13.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcModelingAid
IfcLocalPlacement
IfcConstrainedPlacement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	PlacementRelTo	Reference to Object that provides the relative placement by its local coordinate system, if it is omitted, then the Local Placement is given to the WCS, established by the IfcProject.	IfcObjectWithPlacementSelect	n/a	n/a	not optional
	RelativePlacement	Geometric placement that defines the transformation from the related coordinate system into the relating. The placement can be either 2D or 3D, depending on the dimension count of the coordinate system.	IfcAxis2Placement	n/a	n/a	n/a

Formal Propositions

WR31	Either PlacementRelTo is not given, or it shall not refer to an IfcLocalPlacement directly.

13.11.3. Interface Definitions

- I_LocalPlacement

13.12. Class IfcModelingAid

13.12.1. Class Semantic Definition

Definition from IAI: An IfcModelingAid provides the general concept for constructs that support the creation of design artifact, in particular its geometric form. They are part of the project information set, but not part of the artifact itself. Most common example of a modeling aid are the local placement and the design grid. Both provide aid to place Products into the design space. The grid supports in addition the definition of elements' constraint location and sometimes form, but the grid is not part of the constructed building.

ISSUE See issues I-254 and I-255 for changes made in IFC Release 1.5.

13.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcModelingAid
IfcLocalPlacement
IfcDesignGrid
IfcGridAxis
IfcGridIntersection
IfcGridLevel
IfcPlacementConstraint
IfcReferenceGeometryAid
IfcLightSource
IfcPhotometricOutputSpace

Attributes and Relationships

No attributes defined at this level.

13.12.3. Interface Definitions

- I_ModelingAid

13.13. Class IfcObject

13.13.1. Class Semantic Definition

Definition from IAI: The generalization of any semantically treated things and processes within IFC. Examples of IfcObject include physically tangible items, such as wall, beam or covering, physically existing items, such as spaces, or conceptual items, such as grids or virtual boundaries. It also stands for processes, such as work tasks, as well as for controls, etc.

Objects are independent pieces of information that might contain or reference other pieces of information, most notably properties. Properties of objects can be of either of the following types:

- **Type driven properties**
  These define all properties that are associated to a single or multiple instance(s) of "object" class by virtue of a "type". The "type" denotes a special classification of an "object" class, not expressed by creating a subtype, but by attaching a particular set of properties. This is realized by the IfcRelAssignsTypedProperties class.
- **Non type driven properties**
  These define all properties that are associated to a single or multiple instance(s) of "object" class,

independently of its "type". Therefore (generally) no restriction is made to which particular "object" class, a non type driven property can be attached. This is realized by the IfcRelAssignsProperties class.

- **Occurrence properties**
  These define all properties that are associated to a single instance of "object" class only within a populated IFC Object model. This is realized by the IsShared attribute at IfcRelAssignsProperties.
- **Shared properties**
  These define all properties that are associated to two or more instances of "object" class within a populated IFC Object model. This is realized by the IsShared attribute at IfcRelAssignsProperties.
- **Dynamically extendable properties**
  These define properties for which the IFC Object model only provides a kind of "meta-model", to be further declared at runtime. This means no class definition of the properties exists within the IFC Object model. The declaration is done by assigning a significant string value to the "Name" attribute of the class as defined in the IFC Object model. This is realized by the IfcPropertySet and its subtype.
- **Statically defined properties**
  These define properties for which a class definition exist within the IFC Object model. The semantic meaning of each statically defined property is declared on compile time. This is realized by the subtypes of IfcPropertyDefinition, exept IfcPropertySet and its subtype.
- **Properties defined as part of the IFC Object model**
  These define properties that are specified as part of the IFC Object model specification, as issued by the International Alliance for Interoperability. The specification can be done either within the static part, i.e. the EXPRESS schema definition, or within the Property definition part, identifying the recognizable string values for the "Name" attribute. This is realized by any subtype of IfcPropertyDefinition except IfcExternalPropertySet.
- **Properties defined as extension to the IFC object model**
  These define properties that are agreed upon within a regional, national, or project-based context, using the capability of the IFC Object model to assign string values for the "Name" attribute, that are not recognizable by the specifications, as issued by the International Alliance for Interoperability. This is realized by IfcExternalPropertySet.

All of the concepts about object properties are incorporated into the IFC object model and allow for a clear distinction between an object definition and the associated property definitions.

ISSUE See issues I-079, I-085 for changes made in IFC Release 1.5.
See issue I-361 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcGroup
IfcProcess
IfcProduct
IfcProject
IfcProxy
IfcResource
IfcActor

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	UserDefinedType	User defined type, given for the	STRING	see type	see type	NIL

		instantiable subtypes of IfcObject. If for a given subtype, a predefined type exists (an attribute PredefinedType with the data type Enumaration, then the value for user defined is only valid, if the predefined value is set to UserDefined. Allows for the addition of regional extensions of IFC.				
	DocumentReferences	Reference to a document reference that holds the access information to an externally provided document.	SET [0:?] OF IfcDocumentReference	0	N	0
INV	PartOfGroups	References to the grouping relationships, which allows the object to be part of many groups	SET [0:?] OF IfcRelGroups	0	N	0
INV	Nests	Reference to the nesting relationship, that allows this object to be the nest of other nested objects	SET [0:1] OF IfcRelNests	0	1	0
INV	IsNestedBy	References to the nesting relationship, that allows this object to be nested within other objects	SET [0:?] OF IfcRelNests	0	N	0
INV	Contains	Set of Relationships to other Objects that are contained by this object.	SET [0:2] OF IfcRelContains	0	2	0
INV	IsContainedBy	Set of Relationships to other Objects in which this object is contained.	SET [0:?] OF IfcRelContains	0	N	0
INV	OperatedInProcesses	Set of Relationships to processes which operated on the object.	SET [0:?] OF IfcRelProcessOperatesOn	0	N	0
INV	IsDefinedBy	Set of Relationships to properties (statically or dynamically defined) that further define the object..	SET [0:?] OF IfcRelAssignsProperties	0	N	0
INV	IsActedUpon	Set of Relationships to actors which acts upon the object.	SET [0:?] OF IfcRelActsUpon	0	N	0
INV	IsControlledBy	Set of Relationships to controls which apply a control to the object.	SET [0:?] OF IfcRelControls	0	N	0

13.13.3. Interface Definitions

- I_Object

13.14. Class IfcProcess

13.14.1. Class Semantic Definition

Definition from IAI: An action taking place in building construction with the intent of acquiring or constructing products. Processes are placed in sequence (including overlapping for parallel tasks) in time.

ISSUE See issues I-200, I-201 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProcess
IfcWorkTask
IfcOccupancyTask

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Productivity	Productivity of the process (such as m^3 per hour)	IfcMeasureWithUnit	n/a	n/a	NIL
OPT	Classification	Reference to the access information for classified information. NOTE: not the classified information is referenced, only the unambiguous access to it.	IfcClassificationList	n/a	n/a	NIL
INV	IsSuccessorFrom	Relative placement in time, refers to the previous processes for which this process is successor.	SET [0:?] OF IfcRelSequence	0	N	0
INV	IsPredecessorTo	Relative placement in time, refers to the previous processes for which this process is predecessor.	SET [0:?] OF IfcRelSequence	0	N	0
INV	OperatesOn	Set of Relationships to objects that are operated on by the process	SET [0:?] OF IfcRelProcessOperatesOn	0	2	0

13.14.3. Interface Definitions

- I_Process

13.15. Class IfcProduct

13.15.1. Class Semantic Definition

Definition from IAI: Any object, manufactured, supplied or created for incorporation into an AEC/FM project. This also includes objects that are created indirectly by other products, as spaces are defined by bounding elements. Products can be designated for permanent use or temporary use, an example for the latter is formwork.

Products are defined by their properties and representations. Products occur at a specific location in space. They can be placed relatively to other products, but ultimately relative to the world coordinate system defined for this project.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject

IfcProduct
IfcBuilding
IfcBuildingStorey
IfcElement
IfcSite
IfcSpatialElement
IfcConstructionZoneAggregationProduct

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LocalPlacement	Contained relative placement in space, refers to the product that provides the local coordinate system for the Relative Placement and includes the transformation for the object coordinate system.	IfcLocalPlacement	0	2	1
	Representations	Reference to the representations of the product, being either geometric shape representations or topological representations, or both. The product definition shape provides for multiple representations of the shape property of the object. The product definition topology provides for basic topology and connectivity information.	SET [0:2] OF IfcProductRepresentation	n/a	n/a	NIL
OPT	Classification	Reference to the access information for classified information. NOTE: not the classified information is referenced, only the unambiguous access to it.	IfcClassificationList	n/a	n/a	NIL

13.15.3. Interface Definitions

- I_Product

13.16. Class IfcProject

13.16.1. Class Semantic Definition

Definition from IAI: The undertaking of some engineering activities leading towards a product. It acts as the top container for all objects defining a project. The Project also holds the units used for certain measures throughout the project and the central registry, currently only for team members, applications and materials. The IfcProject establishes the World Coordinate System, WCS.

ISSUE See issues I-084, I-001, I-003 for changes made in IFC Release 1.5.
See issues I-298, I-328 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot

IfcObject
IfcProject

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ReferenceName	Short name for the project as used for reference purposes.	STRING	n/a	n/a	empty string
OPT	Name	Long name for the project.	STRING	n/a	n/a	empty string
OPT	Phase	Current project phase, open to interpretation for all project partner, therefore given as IfcString.	STRING	n/a	n/a	empty string
	UnitsInContext	Defines the units of measure that will be referred by defined data types in the attribute values of all attributes and properties of objects and relationships, defined in the context of this project.	IfcUnitAssignment	n/a	n/a	n/a
OPT	Classification	Reference to the access information for classified information. NOTE: not the classified information is referenced, only the unambiguous access to it.	IfcClassificationList	n/a	n/a	NIL
	AbsolutePlacement	Establishment of the World Coordinate System for the Project	IfcAxis2Placement	n/a	n/a	0,0,0 and P1 1,0,0 P2 0,1,0 P3 0,0,1

13.16.3. Interface Definitions

- I_Project

13.17. Class IfcPropertyDefinition

13.17.1. Class Semantic Definition

Definition from IAI: Defines the generalization of all properties (dynamically defined and statically defined). It cannot be instantiated as it is an ABSTRACT class.

History

New Entity in IFC Release 2.0

13.17.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcPropertyDefinition
IfcOccupancyNumber
IfcSpaceUseCase
IfcManufactureInformation
IfcPropertySet
IfcMetricValue
IfcElectricalCharacteristics

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
INV	DefinitionOf	Reference to the relation to one or many objects that are characterized by the property definition.	IfcRelAssignsProperties	n/a	n/a	n/a

13.17.3. Interface Definitions

- I_PropertyDefinition

13.18. Class IfcPropertySet

13.18.1. Class Semantic Definition

Definition from IAI: Defines all dynamically extendable properties (see semantic definition of IfcObject). The IfcPropertySet is a container class that allows the definition of collections of IfcProperty, and the nesting of other IfcPropertySet.

ISSUES: See issues I-078, I-080, I-187, GI-003 for changes made in IFC Release 1.5.

History

New Entity in IFC Release 2.0

13.18.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcPropertyDefinition
    IfcPropertySet
      IfcExtensionPropertySet

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	Name of the property set as used within the project. The attribute is used to dynamically specify the type of the property definition. Directly instantiated at IfcPropertySet it provides for the properties defined as part of the IFC Object model (see semantic definition at IfcObject). The property set structure for that IfcPropertySet is given within the property set definition part of the IFC specification.	STRING	see type	see type	n/a
	HasProperties	Contained list of properties. For property sets defined as part of the IFC Object model, the property objects within a property set are defined as part of the standard. If a property is not contained within the list of predefined properties, ist value has not been set at this time.	LIST [1:?] OF IfcProperty	1	N	1

13.18.3. Interface Definitions

- I_PropertySet

13.19. Class IfcProxy

13.19.1. Class Semantic Definition

Definition from IAI: The IfcProxy is intended to be a kind of a container for wrapping up non-IFC objects for use within the persistent store. Given that we have only a limited number of constructs formally defined within IFC (and will never be able to define them all), we must provide a mechanism for capturing constructs (primarily geometric) that are not defined by IFC. These constructs may or may not have semantic meaning, depending on whether any representations or extended property sets are attached to the IfcProxy. Either way, a receiving system only has to ensure that they are maintained as part of the project model. Such a mechanism allows to exchange data that is part of the project but not necessarily part of the IFC model.

ISSUE See issue I-184 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.19.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProxy

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ProxyType	High level (and only) semantic meaning attached to the IfcProxy, defining the basic construct type behind the Proxy, e.g. Product or Process.	IfcProxyEnum	Product	Resource	Product
OPT	LocalPlacement	In case of a Product Proxy, the placement within the space of the Project is given.	IfcLocalPlacement	n/a	n/a	NIL
	Representations	In case of a Product Proxy, reference to the representations of the product, being either geometric shape representations or topological representations, or both. The product definition shape provides for multiple representations of the shape property of the object. The product definition topology provides for basic topology and connectivity information.	SET [0:2] OF IfcProductRepresentation	n/a	n/a	NIL

Formal Propositions

WR2	Either the proxy is a product, or it should not have geometric or topologic representations.
WR33	If the IfcProxy is a Product, then a local placement shall be given, otherwise no local placement shall be given.

13.19.3. Interface Definitions

- I_Proxy

13.20. Class IfcRelActsUpon

13.20.1. Class Semantic Definition

Definition from IAI: The IfcRelActsUpon objectified relationship defines a relationship between an actor and one or many objects. An particular role of the actor played in that relationship can be associated.

History

New Entity in IFC Release 2.0

13.20.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelActsUpon
      IfcRelOccupiesSpaces

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingActor	Reference to the actor.	IfcActor	n/a	n/a	n/a
	RelatedObjects	Reference to the objects (or single object) on which the actor acts upon in a certain role (if given)	LIST [1:?] OF IfcObject	1	N	1
OPT	ActingRole	Role of the actor played within the assignment to the object(s).	IfcActorRole	n/a	n/a	NIL

Formal Propositions

WR32	The relationship shall not define an actor to actor relationship.

Informal Propositions

IP31	The relationship shall be defined acyclic.

13.20.3. Interface Definitions

- I_RelActsUpon

13.21. Class IfcRelAssignsProperties

13.21.1. Class Semantic Definition

Definition from IAI: The IfcRelAssignsProperties class defines the light-weight relationships between properties and objects. Directly instantiated it provides for non-type driven property assignments (see semantic definition of IfcObject).

The IfcRelAssignsProperties is a N:M relationship, as it allows for the assignment of one to many (related) properties to a single or many objects.

History

New Entity in IFC Release 2.0

13.21.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelAssignsProperties
      IfcRelAssignsTypedProperties

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingPropertyDefinition	Reference to the property definition for that object or list of objects.	IfcPropertyDefinition	n/a	n/a	n/a
	RelatedObjects	Reference to the objects (or single object) to which the property definition applies.	LIST [1:?] OF IfcObject	1	N	1
OPT	DomainView	The attribute DomainView optionally defines the domain, to which the assigned IfcPropertyDefinition relates. If not present, the IfcPropertyDefinition is applicable to all domain views. The DomainView is given as STRING type to allow an easy upgrade for new releases and for assigning arbitrary domain view names for externally defined property sets.	STRING	see type	see type	NIL
	IsShared	The attribute IsShared reflects whether the property is assigned to a single object instance (FALSE = occurrence property,) or assigned to multiple object instances (TRUE = shared property, see semantic definition at IfcObject).	LOGICAL	FALSE	TRUE	n/a

13.21.3. Interface Definitions

- I_RelAssignsProperties

13.22. Class IfcRelAssignsTypedProperties

13.22.1. Class Semantic Definition

Definition from IAI: The IfcRelAssignsTypedProperties class defines the light-weight relationships between properties and objects for type-driven property assignments (see semantic definition of IfcObject). It is provided as specialization of IfcRelAssignsProperties.

History

New Entity in IFC Release 2.0

13.22.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelAssignsProperties
      IfcRelAssignsTypedProperties

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Name	The attributes Name defines the Name of the 'type' being defined, as given by the IFC specification. A 'type' is used to establish a standard of object property definitions, that may be used many times in a project. A given 'type' drives the assignment of one IfcPropertyDefinition instance (which might include other IfcPropertyDefinitions in case of nested property sets) to an IfcObject instance (occurrence type) or to many IfcObject instances (shared type).	STRING	see type	see type	NIL
OPT	TypedClass	The attribute TypedClass optionally defines the IfcObject, to which the assigned IfcPropertyDefinition relates. If not present, no instruction is given to which IfcObject the IfcPropertyDefinition is applicable.	STRING	see type	see type	n/a

13.22.3. Interface Definitions

- I_RelAssignsTypedProperties

13.23. Class IfcRelContains

13.23.1. Class Semantic Definition

Definition from IAI: This objectified relationship handles the general concept of containment, that can be either realized by reference or by value. Currently the concept of containment is used for buildings as a special kind of AEC/FM products.

A distinctions is made between the containment and the reference of Elements. A containment relationship shall lead to a hierarchical relationship, i.e. each element can only be contained by one instance of a element container (i.e. site, building, building storey, zone or space). It might however be referenced by many element containers. A multi-storey space is contained (or belongs to) the building storey at which its ground level is, but it is referenced by all the other building storeys, in which it spans. A lift shaft might be contained by the basement, but referenced by all storeys, through which it spans.

A reference relationship provides for non-hierarchical relationships.

ISSUE See issues GI-008, I-116 for changes made in IFC Release 1.5.
See issue I-310 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.23.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelContains

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingObject	Reference to the container object	IfcObject	n/a	n/a	n/a
	RelatedObjects	Reference to the contained objects	LIST [1:?] OF IfcObject	1	N	1
	RelationshipType	Defines the type of relationship from the relating side, i.e. following the container object, in which the other objects are contained.	IfcContainmentEnum	ProjectContainer	SpaceContainer	ProjectContainer
	ContainedOrReferenced	Defines whether the relationship is a hierarchical containment relationship (Contained) or a reference relationship (Referenced)	IfcContainedOrReferencedEnum	Contained	Referenced	Contained

Formal Propositions

WR31	The instance to which the RelatingObject relation points (container) shall not be contained in the List of RelatedObjects.

Informal Propositions

IP31	The IfcRelContains relationship shall be defined acyclic.

13.23.3. Interface Definitions

- I_RelContains

13.24. Class IfcRelControls

13.24.1. Class Semantic Definition

Definition from IAI: This objectified relationship handles the assignment of controls (subtypes of IfcControl) to other objects (subtypes of IfcObject, with the exception of controls).

History

New Entity in IFC Release 2.0

13.24.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelControls
IfcRelRelatesConstraints
IfcRelCostsObjects
IfcRelAssignsApprovals
IfcRelControlsMaintenance

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingControl	Reference to the control that applies an control about objects.	IfcControl	n/a	n/a	n/a
	RelatedObjects	Reference to the objects being controled.	LIST [1:?] OF IfcObject	1	N	1

Formal Propositions

WR31	Control shall not be applied to control objects.

Informal Propositions

IP31	The IfcRelControls relationship shall be defined acyclic.

13.24.3. Interface Definitions

- I_RelContains

13.25. Class IfcRelGroups

13.25.1. Class Semantic Definition

Definition from IAI: This objectified relationship handles the assignment of group members to group objects. It allows for grouping arbitrary objects within a group, including other groups. The grouping relationship can be applied in a recursive manner. The resulting group is of type IfcGroup.

ISSUE See issue I-310 for changes made in IFC Release 1.5.1.

13.25.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelGroups

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingGroup	Reference to group that finally contains all assigned group members.	IfcGroup	n/a	n/a	n/a
	RelatedObjects	References to Objects that will be	LIST [1:?] OF IfcObject	1	n/a	1

		contained in the group.				

Formal Propositions

WR31	The instance to with the relation points shall not be contained in the List of RelatedObjects.
WR32	The dependency flags shall be set so that the RelatedObjects always depend on the RelatingObject (the group)

Informal Propositions

IP31	The IfcRelGroups relationship shall be defined acyclic.

13.25.3. Interface Definitions

- I_RelGroups

13.26. Class IfcRelNests

13.26.1. Class Semantic Definition

Definition from IAI: The nesting relationship defines the general concept of elements being nested, so that the nest is of the same type (or supertype) as the nested elements. An example is, that a cost element is a nest of other cost elements. The nesting relationship can be applied in a recursive manner.

ISSUE See issue I-310 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.26.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelNests
IfcRelNestsProcesses
IfcRelNestsOccupancyScheduleElements
IfcRelNestsOccupancySchedules
IfcRelNestsWorkScheduleElements
IfcRelNestsWorkSchedules
IfcRelNestsCostElements
IfcRelNestsCostSchedules

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingObject	The object that represents the nest.	IfcObject	n/a	n/a	n/a
	RelatedObjects	The objects being nested.	LIST [1:?] OF IfcObject	1	N	1
OPT	NestingPurpose	Any description to explain the criteria about nesting those objects	STRING			

Formal Propositions

WR31	The instance to which the relation RelatingObject points shall not be contained in the List of RelatedObjects.

WR32	The type of the RelatingObject shall always be included in the type of each RelatedObject, i.e. the RelatingObject is of the same type of a common supertype
WR33	The dependency flags shall be set so that the RelatedObjects always depends on the RelatingObject (the nest)
WR34	Products shall not be nested (use aggregation relationships).

Informal Propositions

IP31	The IfcRelNests relationship shall be defined acyclic.

13.26.3. Interface Definitions

- I_RelNests

13.27. Class IfcRelProcessOperatesOn

13.27.1. Class Semantic Definition

Definition from IAI: This objectified relationship handles the assignment of an object as an item the process operates on. Process are related to the products that they operate on (input or output) through this relationship. Processes can operate on things other than products, and can operate in ways other than input and output. For example, it many be common defined processes during estimating or scheduling that describe design tasks (resulting in documents), procurement tasks (resulting in construction materials), planning tasks (resulting in processes), etc. Furthermore, the ways in which process can operate on something might include "installs", "finishes", "transports", "removes", etc. The ways are described as operation types.

ISSUE See issue I-310 for changes made in IFC Release 1.5.1.
See issues I-480, I-482 for changes made in IFC Release 2.0.

13.27.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelProcessOperatesOn

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingProcess	Reference to Process, that handles the Products as input or output.	IfcProcess	n/a	n/a	n/a
	RelatedObject	References to an object, which the process operates on.	IfcObject	n/a	n/a	n/a
	OperationType	Opertation type, defining the kind of operation on the object.	STRING	see type	see type	n/a
	OperationQuantity	Quantitiy of the object specific for the operation by this process.	IfcMeasureWithUnit	see type	see type	n/a

13.27.3. Interface Definitions

- I_RelProcessesProducts

13.28. Class IfcRelSequence

13.28.1. Class Semantic Definition

Definition from IAI: This objectified relationship handles the concatenation of processes over time. The Sequence is defined as relationship between two processes. The related object is the successor of the relating object, being the predecessor. A time lag is assigned to a sequence, and the sequence type defines the way in which the time lag applies to the sequence.

IfcRelSequence is defined as an one-to-one relationship, therefore it assigns one predecessor to one successor. However, each IfcProcess can have multiple predecessors and successors, the sequence relationship is truly N-to-M. Many instances of IfcRelSequence have to be created in order to cope with that.

ISSUE See issues I-093, I-200 for changes made in IFC Release 1.5.
See issue I-310 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.28.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelSequence

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingProcess	Reference to the Process, that is the predecessor.	IfcProcess	n/a	n/a	n/a
	RelatedProcess	Reference to the Process, that is the successor.	IfcProcess	n/a	n/a	n/a
	TimeLag	Time Duration of the sequence, it is the time lag between the predecessor and the successor as specified by the SequenceType.	IfcTimeMeasure	see type	see type	n/a
	SequenceType	The way in which the time lag applies to the sequence	IfcSequenceEnum	Start_Start	Finish_Finish	Finish_Start

Formal Propositions

WR31	The RelatingProcess shall not point to the same instance as the RelatedProcess.

13.28.3. Interface Definitions

- I_RelSequence

13.29. Class IfcRelationship

13.29.1. Class Semantic Definition

Definition from IAI: The abstract generalization of all objectified relationships in IFC. Objectified relationships are the preferred way to handle relationships among objects. This allows to keep relationship specific properties directly at the relationship and opens the possibility to later handle relationship specific behavior.

ISSUE See issue I-289 for changes made in IFC Release 1.5.
See issue I-310 for changes made in IFC Release 1.5.1.

13.29.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelAssemblesElements
IfcRelAssemblesSpaces
IfcRelConnectsElements
IfcRelFillsElement
IfcRelSeparatesSpaces
IfcRelServicesBuildings
IfcRelVoidsElement
IfcRelAdjacencyReq
IfcRelContains
IfcRelNests
IfcRelGroups
IfcRelProcessOperatesOn
IfcRelSequence
IfcRelCoversBldgElements
IfcRelWorkInteraction
IfcRelAggregatesConstraints
IfcRelAssignsProperties
IfcRelAggregatesCrewResources
IfcRelUsesResource
IfcRelConnectsPorts
IfcRelActsUpon
IfcRelAttachesToBoundaries
IfcRelAttachesElements
IfcRelControls

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatedIsDependent	Defines whether both sides of the relationship (relating | related) are equal righted, or whether one depends on the other. TRUE means the related object (see naming convention in subtypes) depends on the relating object, FALSE otherwise. If both RelatingIsDependent and RelatedIsDependent are TRUE, then there is a bi-directional dependency.	BOOLEAN	FALSE	TRUE	TRUE
	RelatingIsDependent	TRUE means the relating object (see naming convention in subtypes)	BOOLEAN	FALSE	TRUE	FASLE

		depends on the related object, FALSE otherwise. If both RelatingIsDependent and RelatedIsDependent are TRUE, then there is a bi-directional dependency.				

13.29.3. Interface Definitions

- I_Relationship

13.30. Class IfcResource

13.30.1. Class Semantic Definition

Definition from IAI IfcResource contains the information needed to represent the costs, schedule, and other impacts from the use of a thing in a process. It is not intended to use IfcResource to model the general properties of the things themselves, while an optional linkage from IfcResource to the things to be used can be specified (i.e. the relationship from subtypes of IfcProductResource to IfcProduct).

There are two basic intended use of IfcResource. First, if the attributes of the thing are not needed for the purpose of the use of IfcResource, or the types of things are not explicitly modeled in IFC yet, then the linkage between the resource and the thing doesn't have to be instantiated in the system. That is, the attributes of IfcResource (or its subtypes) alone are sufficient to represent the use of the thing as a resource for the purpose of the project. For example, construction equipment such as earth-moving vehicles or tools are not currently modeled within the IFC. For the purpose of estimating and scheduling, these can be represented using IfcResource alone. Second, if the attributes of the thing are needed for the use of IfcResource objects, and they are modeled explicitly as objects (e.g. classes or properties), then the IfcResource instances can be linked to the instances of the type of the things being referenced. Things that might be used as resources and that are already modeled in the IFC include physical products, people and organizations, and materials.

The IfcResource is defined in the Kernel layer in IFC but are reused and specialized in other schemas.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.30.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcResource
      IfcProductResource
      IfcConstructionEquipmentResource
      IfcLaborResource
      IfcCrewResource
      IfcConstructionMaterialResource
      IfcSubcontractResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description	Semantic description of the Resource	STRING	n/a	n/a	NIL
	TypeReference	A textual code that identifies the resouce	STRING	n/a	n/a	empty

		type.				string
	TypeName	A textual name that referes to the resource type.	STRING	n/a	n/a	empty string
OPT	Classification	Reference to the access information for classified information. NOTE: not the classified information is referenced, only the unambiguous access to it.	IfcClassificationList	n/a	n/a	0
OPT	ResourceConsumption		IfcResourceConsumptionEnum			
OPT	BaseUnit		IfcMeasureWithUnit			

13.30.3. Interface Definitions

- I_Resource

13.31. Class IfcRoot

13.31.1. Class Semantic Definition

Definition from IAI: Most abstract and root class for all IFC Constructs that roots in the IfcKernel or subsequent levels. It assigns the globally unique ID, and the ownership and history information for the use in all classes defined at this IFC object model layer or at layers above.

ISSUE See issue I-082 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

13.31.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcModelingAid
IfcObject
IfcRelationship
IfcPropertyDefinition

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	GlobalId	Assignment of a globally unique identifier within the entire software wolrd.	IfcGloballyUniqueId	n/a	n/a	n/a
	OwnerHistory	Assignment of the information about the current ownership of that object, including owning actor, application, local identification and information captured about the recent changes of the object, NOTE: only the last modification in stored.	IfcOwnerHistory	n/a	n/a	n/a
OPT	Label	Optional label for arbitrary use by the participating software systems or users.	STRING	see type	see type	NIL

Unique Rules

UR1	The UniqueId shall be unique.

13.31.3. Interface Definitions

- I_Root

14. IfcControlExtension

The IfcControlExtension schema in the core layer defines basic concepts for capturing controls related to any object in the IFC model derived from IfcObject. At the present, the available types of IfcControl on IfcObjects are capturing information on general constraints, approvals and maintenance records.

14.1. Select IfcMetricValueSelect

14.1.1. Select Semantic Definition

History

New Select Type in IFC Release 2.0

14.1.2. Select

IfcMeasureWithUnit
IfcTable

14.2. Type IfcAggregatorEnum

14.2.1. Type Semantic Definition

Definition from IAI: Enumeration defining the logical operators for aggregation.

ISSUES: No issues to date.

History

New Enumeration in IFC Release 2.0

14.2.2. Enumeration

LogicalAND
LogicalOR
LogicalXOR
LogicalNOT

14.3. Type IfcApprovalStatusEnum

14.3.1. Type Semantic Definition

Definition from IAI: Enumeration defining the result or current status of the approval process.

ISSUES: No issues to date.

History

New Enumeration in IFC Release 2.0

14.3.2. Enumeration

Submitted
Processed
OnHold
UnDetermined
Approved
UserDefined
NotDefined

14.4. Type IfcBenchmarkEnum

14.4.1. Type Semantic Definition

Definition from IAI: This enumeration is used to qualify a benchmark values.

ISSUES: See I-500 for changes made in IFC Release 2.0 Beta 3.

History

New Enumeration in IFC Release 2.0

14.4.2. Enumeration

GreaterThan
GreaterThanOrEqualTo
LessThan
LessThanOrEqualTo
EqualTo
NotEqualTo
TargetWithTolerance
Range
Other
NotKnown
Unset

14.5. Type IfcConstraintEnum

14.5.1. Type Semantic Definition

Definition from IAI: This enumeration is used to qualify a constraint.

History

New Enumeration in IFC Release 2.0

14.5.2. Enumeration

Hard
Soft
Advisory
NotKnown
Unset

14.6. Type IfcConstraintRelationshipEnum

14.6.1. Type Semantic Definition

Definition from IAI: Enumeration defining the intent of the IfcRelRelatesConstraints relationship object with regard to its related IfcConstraint and IfcObject objects.

ISSUES: See I-498 for changes made in IFC Release 2.0 Beta 3.

History

New Enumeration in IFC Release 2.0

14.6.2. Enumeration

Rationale
ExpectedPerformance
Other
NotKnown
Unset

14.7. Type IfcElementConditionEnum

14.7.1. Type Semantic Definition

Definition from IAI: This enumeration defines the condition of the subject (IfcProduct) of maintenance.

History

New Enumeration in IFC Release 2.0

14.7.2. Enumeration

GoodCondition

RequiresMonitoring
RequiresRoutineMaintenance
RequiresService
RequiresRepair
RequiresReplacement
Other
UserDefined
NotDefined

14.8. Type IfcMaintenanceTypeEnum

14.8.1. Type Semantic Definition

Definition from IAI: This enumeration is used to identify the different types of maintenance performed on IfcProduct.

History

New Enumeration in IFC Release 2.0

14.8.2. Enumeration

Inspection
Service
Repair
Replace
UserDefined
NotDefined

14.9. Type IfcMetricDataEnum

14.9.1. Type Semantic Definition

Definition from IAI: This enumeration is used to identify the different data types for IfcMetric values.

ISSUES: See I-499 for changes made in IFC Release 2.0 Beta 3.

History

New Enumeration in IFC Release 2.0

14.9.2. Enumeration

Scalar
Vector
TimeSeries
Table
Graph
Distribution
UserDefined
NotDefined

14.10. Type IfcObjectiveEnum

14.10.1. Type Semantic Definition

Definition from IAI: This enumeration is used to qualify an objective.

History

New Enumeration in IFC Release 2.0

14.10.2. Enumeration

CodeCompliance
DesignIntent
Other
NotKnown
Unset

14.11. Class IfcApproval

14.11.1. Class Semantic Definition

This class represents information about approval processes for a plan, a design, a proposal, a change order, etc, in a construction or facilities management project. IfcApproval is a subtype of IfcControl and it can be related to IfcObjects through appropriate subtype of IfcRelControls.

History

New Entity in IFC Release 2.0

14.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcApproval

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Description	A general textural description of a design, work task, plan, etc. that is being approved for.	STRING	Empty string	N/a	Empty string
OPT	AuthorizingAgent	The person or organization that has the authority to issue and approve the request	IfcActorSelect	see type	see type	see type
	RequestFrom	Person who requests the approval	IfcActorSelect	see type	see type	see type
	RequestTo	Person who is asked for approval	IfcActorSelect	see type	see type	see type
	RequestingDate	The date issuing the request	IfcDateTimeSelect	see type	see type	see type
OPT	RequestedDate	The date requested that approval need to be determined	IfcDateTimeSelect	see type	see type	see type

OPT	ApprovalDate	Date that the result of the approval process is produced	IfcDateTimeSelect	see type	see type	see type
OPT	ApprovalStatus	The result or current status of the approval process	IfcApprovalStatusEnum	Submitted	Unknown	Submitted
OPT	ApprovalConstraint	Additional constraints on the approval	STRING	Empty string	N/a	Empty string

14.11.3. Interface Definitions

- I_Approval

14.12. Class IfcConstraint

14.12.1. Class Semantic Definition

Definition from IAI: This class is used to define general information appropriate for all constraints. IfcConstraint is a subtype of IfcControl and it can be related to IfcObjects through appropriate subtype of IfcRelControls.

History

New Entity in IFC Release 2.0

14.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcConstraint
        IfcObjective
        IfcMetric

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ConstraintGrade	Enumeration that qualifies the type of constraint.	IfcConstraintEnum	Hard	Unset	Hard
OPT	Description	A textual description of the constraint.	STRING	see type	see type	empty string
OPT	Source	Any source material, such as a code or standard, from which the constraint originated.	STRING	see type	see type	empty string
INV	Aggregates	Reference to the relationships that collect other constraints into this aggregate constraint.	SET [0:?] OF IfcRelAggregatesConstraints	n/a	n/a	NIL
INV	IsAggregatedIn	Reference to the relationships that relate this constraint into aggregate constraints.	SET [0:?] OF IfcRelAggregatesConstraints	n/a	n/a	NIL

14.12.3. Interface Definitions

- I_Constraint

14.12.4. Geometry Use Definitions

This class has no geometric representation.

14.13. Class IfcMaintenanceRecord

14.13.1. Class Semantic Definition

This class provides a mechanism to record detailed information about each maintenance task performed on an element in a building, if particular, IfcBuildingElement. For each maintenace occurence, an instance of IfcMaintenanceRecord should be created in the computer system and associated to the building elements that received the maintenance. This class also has the capability to track maintenance history by referencing the instance of the same class for the last maintenance on the same building element. IfcMaintenanceRecord is a subtype of IfcControl and it can be related to IfcObjects through appropriate subtype of IfcRelControls.

History

New Entity in IFC Release 2.0

14.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcMaintenanceRecord

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	MaintenanceDate	The date when this maintenance is performed.	IfcDateTimeSelect	See type	See type	See type
	MaintenanceType	The type of maintenance performed.	IfcMaintenanceTypeEnum	Inspectio n	Other	Inspectio n
	StandardMaintenanceT ypes	This attribute refers to a set of standard maintenace types defined by the manufacturer meaning that the task performed is based on the standard maintenance types.	SET [0:?] OF IfcMaintenanceType	N/a	N/a	N/a
OPT	LastRecord	This references to the maintenance record of the last maintenance task. This provides a mechanism to track maintenance history.	IfcMaintenanceRecord	See type	See type	See type
OPT	MaintenanceActor	The person or organization unit who is responsible for the maintenance task.	IfcActorSelect	See type	See type	See type
OPT	MaintenanceDuration	The time duration that the maintenance work actually take.	IfcTimeMeasure	See type	See type	See type
OPT	MaintenanceCost	This captures the detailed cost	IfcCostSchedule	See type	See type	See type

		information for the maintenance. Each item of the IfcCostSchedule represents the context of each sub-cost, such as parts, labor, tax, etc.				
OPT	CurrentCondition	This records the condition after the maintenance is performed.	IfcElementConditionEnum	GoodCondition	Unset	GoodCondition
OPT	Remark	This records any remark, comments made by the maintenance actor, or owner, etc.	STRING	Empty string	N/a	Empty string

14.13.3. Interface Definitions

- I_MaintenanceRecord

14.13.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

14.14. Class IfcMaintenanceType

14.14.1. Class Semantic Definition

This class represents a standard type of maintenance usually provided construction companies, suppliers or manufacturers of the elements that require the maintenance. It specifies the requirements of the standard maintenance required such as job description, normal period between each of such type of maintenance, etc. The IfcMaintenanceRecord can also reference to an instance of IfcMaintenanceType to indicates the type of the maintenance performed. IfcMaintenanceType is a subtype of IfcControl and it can be related to IfcObjects through appropriate subtype of IfcRelControls.

History

New Entity in IFC Release 2.0

14.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcMaintenanceType

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	MaintenanceTypeID	The ID of this type of standard maintenance given by the manufacturer	STRING	empty string	n/a	empty string
	MaintenanceTypeName	The name of this type of standard maintenance given by the manufacturer	STRING	empty string	n/a	empty string
OPT	MaintenanceObjectType	The class name of type of objects that this maintenance type applies.	STRING	empty string	n/a	empty string
OPT	MaintenanceDescription	Any descriptions, notes, requirements,	STRING	empty	n/a	empty

		methods, etc that the manufacturer stipulates for this type of standard maintenance.		string		string
OPT	Manufacturer	The manufacturer that has defined the type of this maintenance standard.	IfcOrganization	See type	See type	See type
OPT	MaintenancePeriod	The normally required period when such type of maintenance should be done once. This is stipulated by the manufacturer.	IfcTimeMeasure	see type	see type	see type
OPT	MaintenanceDuration	The normally required duration this type of maintenance work will take.	IfcTimeMeasure	See type	See type	See type

14.14.3. Interface Definitions

- I_MaintenanceType

14.14.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

14.15. Class IfcMetric

14.15.1. Class Semantic Definition

Definition from IAI: This class is used to capture quantitative resultant metrics that can be applied to objectives. IfcMetric is a subtype of IfcConstraint and it can be related to IfcObjects through appropriate subtype of IfcRelControls.

ISSUES: See I-501 for changes made in IFC Release 2.0 Beta 3.

History

New Entity in IFC Release 2.0

14.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcConstraint
IfcMetric
IfcMetricBenchmark

Attributes and Relationships

No attributes defined at this level.

14.15.3. Interface Definitions

- I_Metric

14.15.4. Geometry Use Definitions

This class has no geometric representation.

14.16. Class IfcMetricBenchmark

14.16.1. Class Semantic Definition

Definition from IAI: This class is used to capture quantitative benchmark metrics that can be applied to objectives. IfcMetricBenchmark is a subtype of IfcMetric and it can be related to IfcObjects through appropriate subtype of IfcRelControls.

ISSUES: See I-500 for changes made in IFC Release 2.0 Beta 3.

History

New Entity in IFC Release 2.0

14.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcConstraint
IfcMetric
IfcMetricBenchmark

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Benchmark	Enumeration that identifies the type of benchmark data.	IfcBenchmarkEnum	Target	Unset	Target

14.16.3. Interface Definitions

- I_MetricBenchmark

14.16.4. Geometry Use Definitions

This class has no geometric representation.

14.17. Class IfcMetricValue

14.17.1. Class Semantic Definition

Definition from IAI: This class is used to wrap the values, with datatype and source, used by IfcMetric and its subtypes. As IfcmetricValue is a subtype of IfcPropertyDefinition, the assignment of the metric values to IfcMetric and its subtypes is done by IfcRelAssignsProperties.

ISSUES: See I-501 for changes made in IFC Release 2.0 Beta 3.

History

New Entity in IFC Release 2.0

14.17.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcPropertyDefinition
    IfcMetricValue

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	DataType	Enumeration that identifies the data type of the DataValue attribute	IfcMetricDataEnum	Scalar	Unset	Scalar
	DataValue	Value with data type defined by the DataType enumeration.	IfcMetricValueSelect	n/a	n/a	NIL
	ValueSource	Reference source for data values	STRINGIfcString	see type	see type	empty string

14.17.3. Interface Definitions

- I_Metric

14.18. Class IfcObjective

14.18.1. Class Semantic Definition

Definition from IAI: This class is used to capture qualitative information for an objective-based constraint. IfcObjective is a subtype of IfcConstraint and it can be related to IfcObjects through appropriate subtype of IfcRelControls.

History

New Entity in IFC Release 2.0

14.18.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcConstraint
        IfcObjective

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Objective	Enumeration that qualifies the type of objective.	IfcObjectiveEnum	CodeCompliance	Unset	CodeCompliance
	BenchmarkValues	A list of any benchmark values used for	LIST [0:?] OF IfcMetric	n/a	n/a	NIL

		comparison purposes.				
	ResultValues	A list of any resultant values used for comparision purposes.	LIST [0:?] OF IfcMetric	n/a	n/a	NIL

14.18.3. Interface Definitions

- I_Objective

14.18.4. Geometry Use Definitions

This class has no geometric representation.

14.19. Class IfcRelAggregatesConstraints

14.19.1. Class Semantic Definition

Definition from IAI: An objectified relationship which allows IfcConstraints and their subtypes to be aggregated together logically.

ISSUES: See I-497 and I-580 for changes made in IFC Release 2.0 Beta 3.

History

New Entity in IFC Release 2.0

14.19.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelAggregatesConstraints

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LogicalAggregator	Enumeration that identifies the logical type of aggregation.	IfcAggregatorEnum	Scalar	Unset	Scalar
	RelatingConstraint	Constraint that is aggregated using the LogicalAggregator.	IfcConstraint	n/a	n/a	NIL
	RelatedConstraints	Constraints that are aggregated in using the LogicalAggregator.	LIST [1:?] OF IfcConstraint	n/a	n/a	NIL

Formal Propositions

WR31	The instance to which the relation RelatingConstraint points shall not be contained in the List of RelatedConstraints.

Informal Propositions

IP31	The IfcRelAggregatesConstraints relationship shall be defined acyclic.

14.19.3. Interface Definitions

- I_RelAggregatesConstraints

14.19.4. Geometry Use Definitions

This class has no geometric representation.

14.20. Class IfcRelAssignsApprovals

14.20.1. Class Semantic Definition

Definition from IAI: An objectified relationship which allows IfcApprovals to be related to any IfcObject.

History

New Entity in IFC Release 2.0

14.20.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelControls
IfcRelAssignsApprovals

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR41	This subtype of IfcRelControls shall be used to apply only approval kind of controls on IfcObjects.

14.20.3. Interface Definitions

- I_RelAssignsApprovals

14.20.4. Geometry Use Definitions

This class has no geometric representation.

14.21. Class IfcRelControlsMaintenance

14.21.1. Class Semantic Definition

Definition from IAI: An objectified relationship which allows controls of type IfcMaintenanceRecord or IfcMaintenanceType to be related to any IfcProduct.

ISSUES: See I-497 and I-580 for changes made in IFC Release 2.0 Beta 3.

History

New Entity in IFC Release 2.0

14.21.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelControls
IfcRelControlsMaintenance

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR41	This subtype of IfcRelControls shall be used to apply only maintenance record or maintenance type kind of controls on IfcProducts.

14.21.3. Interface Definitions

- I_RelControlsMaintenance

14.21.4. Geometry Use Definitions

This class has no geometric representation.

14.22. Class IfcRelRelatesConstraints

14.22.1. Class Semantic Definition

Definition from IAI: An objectified relationship which allows IfcConstraints and their subtypes to be related to any IfcObject, as well as defining the intent of the constraint.

ISSUES: See I-497 and I-580 for changes made in IFC Release 2.0 Beta 3.

History

New Entity in IFC Release 2.0

14.22.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelControls
IfcRelRelatesConstraints

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ConstraintRelationship	Enumeration that qualifies the type of relationship between constraints and objects in the model.	IfcConstraintRelationshipEnum	Rationale	Unset	Rationale

Formal Propositions

WR41	This subtype of IfcRelControls shall be used to apply only constraint kind of controls on IfcObjects.

14.22.3. Interface Definitions

- I_RelRelatesConstraints

14.22.4. Geometry Use Definitions

This class has no geometric representation.

15. IfcModelingAidExtension

Core extensions, as the name implies, provide extensions to concepts rooted in the kernel. Thus, Core extensions are the first refinement layer for abstract kernel constructs. Each core extension is a specialization of classes defined in the Kernel.

The IfcModelingAidExtension schema defines basic object concepts used as aids in the development of project models, particularly those related to geometric placement, alignment or constraint. Therefore, these “aids”, or helper objects, do not include primary elements defining the model, but provide references for the definition of such primary elements (which are generally defined in other Core Extension schemata).

15.1. Select IfcReferenceCurveSelect

15.1.1. Select Semantic Definition

Definition from IAI: IfcReferenceCurveSelect is a select type which enables selection of reference geometry curve alternatives. Such curves can be used as modeling aids in the placement and alignment of other objects.

15.1.2. Select

IfcReferenceCurve
IfcGridAxis

15.2. Select IfcReferencePointSelect

15.2.1. Select Semantic Definition

Definition from IAI: IfcReferencePointSelect is a select type which enables selection of reference geometry point alternatives. Such points can be used as modeling aids in the placement and alignment of other objects.

15.2.2. Select

IfcGridIntersection
IfcReferencePoint

15.3. Class IfcConstrainedPlacement

15.3.1. Class Semantic Definition

Definition from IAI: Provides a specialization of IfcLocalPlacement in which placement is limited (controlled) by one or more constraints. In this release, there is a single type of constraint introduced: IfcConstraintRelIntersection.

ISSUES: See I-139, IfcPlacementConstraint and IfcConstraintRelIntersection for related discussion.

15.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcLocalPlacement
      IfcConstrainedPlacement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PathEndPointsConstraint	A constraint on one or both ends of the path for an ExtrudedSolid	LIST [1:2] OF IfcPlacementConstraint	see type	see type	n/a

15.3.3. Interface Definitions

- I_ConstrainedPlacement

15.3.4. Geometry Use Definitions

This class has no geometry.

15.4. Class IfcConstraintRelIntersection

15.4.1. Class Semantic Definition

Definition from IAI: Objects of this type provide a constraint that can be used to control the local placement of Products, Modeling Aids and Proxy objects. Specifically, objects of this type constrain an end point of the path for an IfcAttDrivenExtrudedSolid by defining offsets from a Reference point on a reference Path. Generally this will be used to locate an endpoint for such paths relative to intersections in a Design Grid.

This is the only placement constraint introduced in this IFC Release. However, other constraints, relative to Reference Curves and Reference Surfaces are planned in future releases.

ISSUES: See I-139, IfcConstrainedPlacement and IfcPlacementConstraint for related discussion.

15.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcPlacementConstraint

IfcConstraintRelIntersection

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RefPointAt	Intersection, relative to which the Path endpoint will be located	IfcReferencePointSelect	n/a	n/a	NIL
	OffsetFromCurves	Reference curves from which fixed offsets are defined in OffsetDistances	LIST [0:3] OF IfcReferenceCurveSelect	n/a	n/a	NIL
	OffsetDistances	Fixed offset distances from reference lines. Note that if one offset is provided, there are two degrees of free movement; if two offsets are defined, there is still one degree of free movement; if all three offsets (and curves are defined, the placement is fully constrained	LIST [0:3] OF IfcLengthMeasure	n/a	n/a	NIL

15.4.3. Interface Definitions

- I_ConstraintRelIntersection

15.4.4. Geometry Use Definitions

This class has no geometry.

15.5. Class IfcDesignGrid

15.5.1. Class Semantic Definition

Definition from IAI: A 3D grid used as an aid in locating structural and design elements. An IfcDesignGrid contain a list of IfcGridLevels – which contain IfcGridAxes and IfcGridIntersections. All of these objects define a grid system, relative to which project objects will be placed.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

15.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcDesignGrid

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	GridPurpose	Descriptive purpose of the grid. NOTE: this grid can be orthogonal, angular, polar, and include different 2D grids on each level. It can be used for a structural grid, planning grid, or any type of grid to which objects will be aligned.	STRING	n/a	n/a	emptry string

	LocalPlacement	Origin and orientation for this grid - relative to another object. Establishes the Local Coordinate System relative to the Coordinate System referenced in "PlacementRelativeTo"	IfcLocalPlacement	n/a	n/a	NIL
INV	HasGridLevels	Set of inverse relationships to Grid Levels. Inverse for PartOfDesignGrid	SET [1:?] OF IfcGridLevel	n/a	n/a	NIL

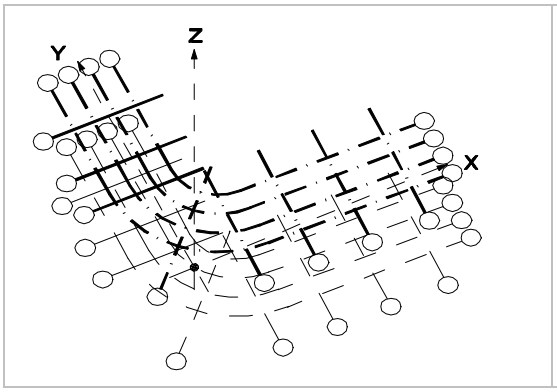
15.5.3. Interface Definitions

- I_DesignGridGeneral
- I_Placement

15.5.4. Geometry Use Definitions

The IfcDesignGrid does not include geometry directly, other than the coordinating reference geometry placement used by all grid elements contained (e.g. the contained IfcGridLevels (Axes and Intersections)).

Object Geometry in Context



Contained grid elements geometry example

Reference Geometry

The IfcAxis2Placement is used to define the common local object coordinate system for multiple shape representations for this class: The reference placement is defined by:

- Parameters IfcDesignGrid.LocalPlacement
- Type IfcLocalPlacement

Standard 3D Geometric Representation

All geometry for this object is defined in the contained objects (grid level and grid axes), all of which are placed relative to the reference geometry defined above.

15.6. Class IfcGridAxis

15.6.1. Class Semantic Definition

Definition from IAI: An individual Axis in a Design Grid. In this release, Axes use an IfcBoundedCurve for geometry.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

15.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcModelingAid
IfcGridAxis

Attributes and Relationships

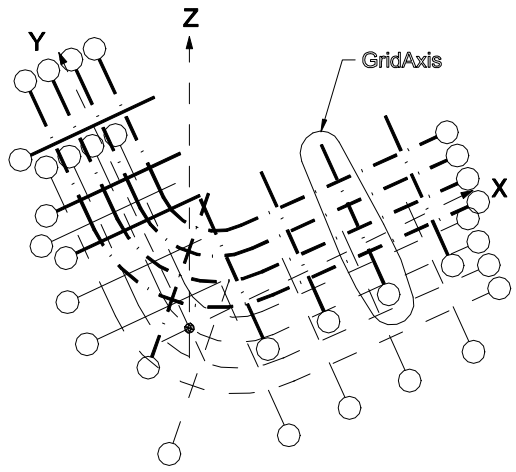
	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PartOfGridLevel	Elevation for this grid axis, relative to the origin for this grid	IfcGridLevel	see type	see type	n/a
OPT	AxisTag	The tag or name for this grid axis	STRING	see type	see type	empty string
	AxisCurve	BoundedCurve which provides the geometry for this Grid Axis	IfcBoundedCurve	see type	see type	Line from 0,0,0 to 1,1,0
	SameSenseAsBaseCurve	Defines whether the original sense of curve is used or whether it is reversed in the context of the grid	BOOLEAN	see type	see type	TRUE
INV	AlignedGridIntersections	Inverse relationship to Intersections aligned with this Axis. Inverse for AlignedWithAxes.	SET [0:?] OF IfcGridIntersection	see type	see type	NIL

15.6.3. Interface Definitions

- I_GridAxis

15.6.4. Geometry Use Definitions

Object Geometry in Context



IfcGridAxis – shown in context of complete IfcDesignGrid

Reference Geometry

This class does not define its own reference placement, it refers to the placement in the container IfcDesignGrid.

Standard 3D Geometric Representation

IfcGridAxis uses an IfcBoundedCurve entity for its geometry.

15.7. Class IfcGridIntersection

15.7.1. Class Semantic Definition

Definition from IAI: An Individual intersection of two or more Grid Axes at a 3D point in space. This point is represented by a Cartesian Point.

15.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcGridIntersection

Attributes and Relationships

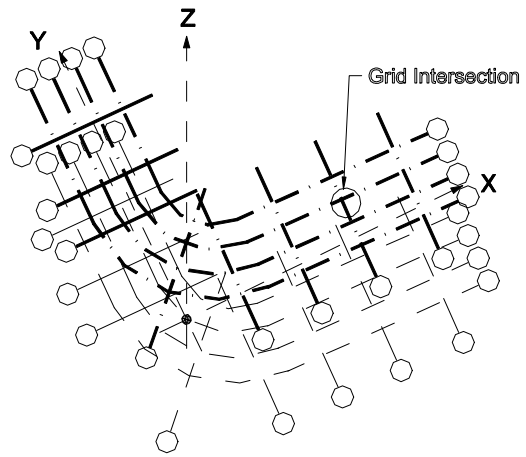
	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	AlignedWithAxes	Set of relationships to 2 or more grid axes for which this point is an intersection	SET [2:?] OF IfcGridAxis	see type	see type	n/a
	IntersectionPoint	3D geometric point at the intersection of 2 or more Grid Axes.	IfcCartesianPoint	see type	see type	0.,0.,0.

15.7.3. Interface Definitions

- I_GridIntersection

15.7.4. Geometry Use Definitions

Object Geometry in Context



IfcGridIntersection shown in the context of an IfcDesignGrid.

Reference Geometry

This class does not define its own reference placement, it refers to the placement in the container IfcDesignGrid.

Standard 3D Geometric Representation

IfcGridIntersection uses an IfcCartesianPoint entity for its geometry.

15.8. Class IfcGridLevel

15.8.1. Class Semantic Definition

Definition from IAI: An XY planar Level in a 3D Design Grid. IfcGridLevel contains a list of IfcGridAxes

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

15.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcGridLevel

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PartOfDesignGrid	Relationship of this Grid Level to the Design Grid for which it is a part	IfcDesignGrid	see type	see type	n/a
OPT	GridLevelHeight	Elevation for this grid level, relative to the origin for the IfcDesignGrid to which this level belongs	IfcLengthMeasure	see type	see type	0
OPT	GridLevelName	Description for this level in the grid (e.g. Floor 1, Floor 3-mechanical, Penthouse)	STRING	see type	see type	empty string
INV	HasGridAxes	Set of relationships to Grid Axes that are part of this grid level. Inverse for PartOfGridLevel	SET [1:?] OF IfcGridAxis	see type	see type	n/a

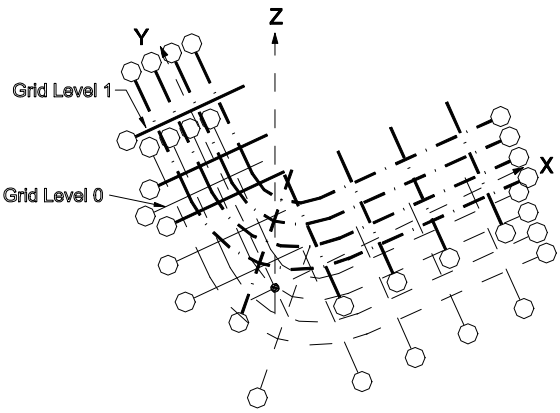
15.8.3. Interface Definitions

- I_GridLevel

15.8.4. Geometry Use Definitions

IfcGridLevel does not include geometry directly. However, it does contain a list of IfcGridAxis elements, each of which has geometry.

Object Geometry in Context

	IfcGridLevel shown in the context of an IfcDesignGrid.

Reference Geometry

This class does not define its own reference placement, it refers to the placement in the container IfcDesignGrid.

Standard 3D Geometric Representation

All geometry for this object is defined in the contained objects (grid axes and intersections).

15.9. Class IfcLightSource

15.9.1. Class Semantic Definition

Definition from IAI: An object representing a source of light (e.g. the Sun or an electrical light fixture). Note: geometry for that light source will be defined on the physical object which references this object (e.g. IfcLightFixture).

History

New Entity in IFC Release 2.0

15.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcLightSource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	SpectralPowerDistribution	List of Power/Wavelength value pairs	LIST [1:?] OF IfcMeasureWithUnit	n/a	n/a	n/a
	PhotometricOutputDistribution	List of Intensity/VolumeMeasure	LIST [1:?] OF IfcPhotometricOutputSpace	n/a	n/a	n/a

15.9.3. Interface Definitions

- I_Luminaire

Geometry Use Definitions

which contain it (e.g. IfcLightFixture).

15.10. Class IfcPhotometricOutputSpace

15.10.1. Class Semantic Definition

Definition from IAI: .

History

15.10.2.

Superclasses and Subclasses

IfcRoot
IfcModelingAid

Attributes and Relationships

		Definition	Data or Rel. Type		Max.	Default
	OutputSpace	3D space through which light is cast by relative to the placement of the light source.		n/a	n/a	
	OutputIntensity		IfcLuminousIntensityMeasure	n/a		n/a

15.10.3. Interface Definitions

- I_PhotometricOutputSpace

15.10.4. Geometry Use Definitions

Geometry for this object is defined by the contained space object.

	3D volume (space) in which luminous output intensity from the associated light source is equal.

Reference geometry for this object (placement) is provided by the light source object to which it is related (e.g. IfcLightFixture). This geometry is defined relative to the placement for this light source object.

An IfcSolidModel is used to represent the 3D volume.

15.11. Class IfcPlacementConstraint

15.11.1. Class Semantic Definition

Definition from IAI: Provides an abstract supertype for multiple types of constraints on placement definitions for Products, Modeling Aids and Proxys.

In this IFC release, there is only a single type of constraint introduced: IfcConstraintRelIntersection. However, this supertype has been provided for upward compatibility. This will enable the introduction of other constraints on placement (relative to curves and surfaces) in future releases.

ISSUES: See I-139 and IfcConstrainedPlacement for discussion.

15.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcPlacementConstraint
      IfcConstraintRelIntersection

Attributes and Relationships

No attributes defined at this level.

15.11.3. Interface Definitions

- I_PlacementConstraint

15.11.4. Geometry Use Definitions

15.12. Class IfcReferenceCurve

15.12.1. Class Semantic Definition

Definition from IAI: Objects of this type provide a reference IfcObject (a 3D curve) relative to which Products and Proxys can be placed. It will typically be used as a Curve (or line) in space that has some significance to the designer; a symmetry line for example. A curve which can be used to constrain the placement of primary model elements (IfcProducts) through the use of IfcConstrainedPlacement. Two other such reference object classes have been included in this IFC release: IfcReferencePoint and IfcReferenceSurface.

ISSUES: See I-138, IfcReferencePoint and IfcReferenceSurface for related discussion.

15.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcReferenceGeometryAid
      IfcReferenceCurve

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ReferenceCurve	3D geometric curve which can be used as a modeling Aid in the placement of other objects.	IfcBoundedCurve	see type	see type	Polyline from 0,0,0 to 1,1,0

15.12.3. Interface Definitions

- I_ReferenceCurve

15.12.4. Geometry Use Definitions

Standard 3D Geometric Representation

An IfcBoundedCurve is used as the geometry representation.

15.13. Class IfcReferenceGeometryAid

15.13.1. Class Semantic Definition

Definition from IAI: Supertype for various types of reference geometry entities with 'LocalPlacement' (provided by this class) that can be used to aid or constrain placement or alignment of other objects.

ISSUES: See I-138, IfcReferenceCurve and IfcReferenceSurface for related discussion.

15.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcModelingAid
    IfcReferenceGeometryAid
      IfcReferenceCurve
      IfcReferencePoint
      IfcReferenceSurface

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LocalPlacement	Placement, relative to another object in the project	IfcLocalPlacement	see type	see type	@0,0,0

15.13.3. Interface Definitions

- I_Placement

15.13.4. Geometry Use Definitions

This abstract class does not include geometry directly, other than the coordinating reference geometry placement inherited by all subtypes.

Reference Geometry

The IfcAxis2Placement is used to define the common local object coordinate system for multiple shape representations for this class: The reference placement is defined by:

- Parameters IfcReferenceGeometryAid.LocalPlacement
- Type IfcLocalPlacement

15.14. Class IfcReferencePoint

15.14.1. Class Semantic Definition

Definition from IAI: Objects of this type provide a reference IfcObject (a 3D point) relative to which Products and Proxys can be placed. It will typically be used as a point in space that has some significance to the designer. A point which can be used to constrain the placement of primary model elements (IfcProduct) through the use of IfcConstrainedPlacement. Two other such reference object classes have been included in this IFC release: IfcReferenceCurve and IfcReferenceSurface.

ISSUES: See I-138, IfcReferenceCurve and IfcReferenceSurface for related discussion.

15.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcModelingAid
IfcReferenceGeometryAid
IfcReferencePoint

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ReferencePoint	3D geometric point	IfcCartesianPoint	see type	see type	0,0,0

15.14.3. Interface Definitions

- I_ReferencePoint

15.14.4. Geometry Use Definitions

Standard 3D Geometric Representation

An IfcCartesianPoint is used as the geometry representation.

15.15. Class IfcReferenceSurface

15.15.1. Class Semantic Definition

Definition from IAI: Objects of this type provide a reference IfcObject (a 3D curve) relative to which Products and Proxys can be placed. It will typically be used as a surface in space that has some significance to the designer; a planar surface for example. A surface which can be used to constrain the placement of primary model elements (IfcProducts) through the use of IfcConstrainedPlacement. Two other such reference object classes have been included in this IFC release: IfcReferencePoint and IfcReferenceSurface.

ISSUES: See I-138, IfcReferenceCurve and IfcReferencePoint for related discussion.

Attribute and Relationship Definitions

IfcRoot

enceGeometryAid

Attributes and Relationships

		Definition	Data or Rel. Type		Max.	Default
	ReferenceSurface	3D geometric Surface		see type	see type	Position at 0,0,0. Normal 0,0,1

Interface Definitions

I_ReferenceSurface

Geometry Use Definitions

An IfcSurface is used as the geometry representation.

16. IfcProcessExtension

The models in the IfcProcessExtension schema allow for the capture of information concerning the work and

classes that represent work plans, work schedules and schedule elements. Relationships of these objects are also captured.

complete.

HISTORY:

16.1.

16.1.1.

History

New Enumeration in IFC Release 2.0

16.1.2. Enumeration

Multiplier
Divider

Type IfcWorkPlanPurposeEnum

Type Semantic Definition

New Enumeration in IFC Release 2.0

16.2.2. Enumeration

CostEstimating
UserDefined
NotDefined

Type IfcWorkTaskMilestoneEnum

Type Semantic Definition

New Enumeration in IFC Release 2.0

16.3.2. Enumeration

StartMilestone
ScheduledMilestone
ContractMilestone
SupplyMilestone
ManagementMilestone
UserDefined
NotDefined

Type IfcWorkTaskStatusEnum

Enumeration

Started
NotYetStarted

UserDefined

16.5.

16.5.1.

This class represents the relationships of a process (i.e. IfcProcess) that nests other processes as sub-processes. It stipulates that the nesting and nested objects must be of type IfcProcess.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

Attribute and Relationship Definitions

IfcRoot

IfcRelNestsProcesses

	Attribute / Relation		Data or Rel. Type	Min.		Default
OPT		The criteria of nesting processes.	STRING	string	N/a	string

Formal Propositions

	Nesting object must be of type IfcProcess.
WR42	

16.5.3.

-

16.5.4.

Instances of this class have no physical presence and therefore no geometric representation.

16.6. Class IfcRelNestsWorkScheduleElements

16.6.1. Class Semantic Definition

IfcRelNestsWorkScheduleElements class represents the nesting relationships of a work schedule element

nesting and nested items must be of type IfcWorkScheduleElement. IfcRelNestsWorkScheduleElements is a subtype of IfcRelNests.

History

New Entity in IFC Release 2.0

16.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelNests
IfcRelNestsWorkScheduleElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description	Any description that would be useful to understand the nesting of the schedules.	STRING	Empty string	N/a	Empty string

Formal Propositions

WR41	Nesting object must be of type IfcWorkScheduleElement.
WR42	Nesting objects must be of type IfcWorkScheduleElement.

16.6.3. Interface Definitions

- I_RelNestsWorkScheduleElements

16.6.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

16.7. Class IfcRelNestsWorkSchedules

16.7.1. Class Semantic Definition

IfcRelNestsWorkSchedule class represents the nesting relationships of a work schedule (i.e. IfcWorkSchedule) nesting other work schedules as sub-items. It stipulates that the nesting and nested objects must be of type IfcWorkSchedule. IfcRelNestsWorkSchedules is a subtype of IfcRelNests.

History

New Entity in IFC Release 2.0

16.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelNests
IfcRelNestsWorkSchedules

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description	Any description that would be useful to understand the nesting of the schedules.	STRING	Empty string	N/a	Empty string

Formal Propositions

WR41	Nesting object must be of type IfcWorkSchedule.
WR42	Nesting objects must be of type IfcWorkSchedule.

16.7.3. Interface Definitions

- I_RelNestsWorkSchedules

16.7.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

16.8. Class IfcRelUsesResource

16.8.1. Class Semantic Definition

IfcRelUsesResource represents the use of a construction resource in a process. It specifies the duration, the costs, the quantity, and the waste factor of the resource used in the process. It also specifies a value of the process productivity conversion rate in order to calculate the resource use costs. IfcRelUsesResource is a subtype of IfcRelRelationship.

History

New Entity in IFC Release 2.0

16.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelUsesResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingProcess	the process that requires the resource	IfcProcess	see type	see type	see type
	RelatedResource	the resources required by the process	IfcResource	see type	see type	see type
OPT	Duration	the time duration of the resource being used by the process	IfcTimeMeasure	see type	see type	see type
OPT	Quantity	The total quantity of resource used by the process	IfcMeasureWithUnit	see type	see type	see type
OPT	ProductivityConversionRate	The productivity conversion rate	IfcMeasureWithUnit	see type	see type	see type
OPT	ConverterMultiplierOrDivider	Indicates whether the productivity converstion rate serves a multiplier or divider.	IfcMultiplierOrDivider	TRUE	FALSE	TRUE

	ResourceUseCosts	The costs of the use of the resource in a process.	SET [0:?] OF IfcCostElement	n/a	n/a	n/a
OPT	WasteFactor	The waste factor in percentage of the resource when used in the process.	REAL	0	n/a	0

16.8.3. Interface Definitions

- I_RelUsesResource

16.8.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

16.9. Class IfcScheduleTimeControl

16.9.1. Class Semantic Definition

This class represents the time-related information about a process. It captures the different types (i.e. actual, or scheduled) of starting and ending times, duration, floating times, and so on. IfcScheduleTimeControl is a subtype of IfcControl.

History

1. Existing class in R1.5.1

2. Renamed to IfcScheduleTimeControl in R2.0

16.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcScheduleTimeControl

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ActualStart	The date on which a work task is actually started. NOTE - The scheduled start date must be greater than or equal to the earliest start date. No constraint is applied to the actual start date with respect to the scheduled start date since a work task may be started than had originally been scheduled if circumstances allow.	IfcDateTimeSelect	See type	See type	See type
OPT	EarlyStart	The earliest date on which a work task can be started	IfcDateTimeSelect	See type	See type	See type
OPT	LateStart	The latest date on which a work task can be started	IfcDateTimeSelect	See type	See type	See type
OPT	ScheduleStart	The date on which a work task is scheduled to be started. NOTE - The	IfcDateTimeSelect	See type	See type	See type

		scheduled start date must be greater than or equal to the earliest start date.				
OPT	ActualFinish	The date on which a work task is actually finished	IfcDateTimeSelect	See type	See type	See type
OPT	EarlyFinish	The earliest date on which a work task can be finishe	IfcDateTimeSelect	See type	See type	See type
OPT	LateFinish	The latest date on which a work task can be finished	IfcDateTimeSelect	See type	See type	See type
OPT	ScheduleFinish	The date on which a work task is scheduled to be finished. NOTE - The scheduled finish date must be greater than or equal to the earliest finish date.	IfcDateTimeSelect	See type	See type	See type
OPT	ScheduleDuration	The amount of time which is scheduled for completion of a work task. NOTE - Scheduled Duration may be calculated as the time from scheduled start date to scheduled finish date.	IfcTimeMeasure	See type	See type	See type
OPT	ActualDuration	The actual duration of the process that attaches the time control data.	IfcTimeMeasure			
OPT	RemainingTime	The amount of time remaining to complete a work task. NOTE - The time remaining in which to complete a work task may be determined both for tasks which have not yet started and those which have. Remaining time for a task not yet started has the same value as the scheduled duration. For a work task already started, remaining time is calculated as the difference between the scheduled finish and the point of analysis.	IfcTimeMeasure	See type	See type	See type
OPT	FreeFloat	The amount of time during which the start or finish of a work task may be varied without any effect on the overall programme of work	IfcTimeMeasure	See type	See type	See type
OPT	TotalFloat	The difference between the duration available to carry out a work task and the scheduled duration of the task. NOTE - Total Float time may be calculated as being the difference between the scheduled duration of a work task and the available duration from earliest start to latest finish. Float time may be either positive, zero or negative. Where it is zero or negative, the task becomes critical.	IfcTimeMeasure	See type	See type	See type
OPT	TaskStatus	Current status of the task. NOTE - A task may be not yet started, started (or partially complete) or completed. The actual value may be determined by comparison of the status time (which is the point at which analysis is undertaken) with start and finish dates as below. If StatusTime = ActualStart AND StatusTime <= ActualEnd THEN IfcTaskStatusEnum := Started. If	IfcWorkTaskStatusEnum	Completed	NotYetStarted	Completed

		StatusTime ActualEnd THEN IfcTaskStatusEnum := Completed				
OPT	IsCritical	A flag which identifies whether a scheduled task is a critical item within the programme. NOTE - A work task becomes critical when the float time becomes zero or negative.	BOOLEAN	FALSE	TRUE	FALSE
OPT	StatusTime	The date or time at which the status of the tasks within the programme is analysed.	IfcDateTimeSelect	See type	See type	See type

16.9.3. Interface Definitions

- I_ScheduleData

16.9.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

16.10. Class IfcWorkPlan

16.10.1. Class Semantic Definition

IfcWorkPlan class represents work plans in a construction or a facilities management project. A work plan contains a set of work schedules for different purposes. It also have references to all the activities (i.e. IfcWorkTask) and resources used in the work schedules. A work plan has information such as start date, finish date, total free float, and so on. IfcWorkPlan can also refer to the construction project represented by IfcProject through the IsContainedBy relationship to through IfcRelContains. IfcWorkPlan is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

16.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcWorkPlan

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PlanID	identifier of the work plan, given by user	STRING	empty string	n/a	empty string
	PlanName	Name of the work plan, given by user	STRING	empty string	n/a	empty string
OPT	Description	General description of the work plan	STRING	empty string	n/a	empty string
OPT	PlanPurpose	Indicates the purpose of this work plan being made for.	IfcWorkPlanPurposeEnum	CostEstimating	TaskScheduling	CostEstimating

	CreationDate	The date that the plan is created	IfcDateTimeSelect	see type	see type	see type
	Creators	The authors of the work plan	SET [0:?] OF IfcActorSelect	n/a	n/a	N/a
	Tasks	The set of work tasks contained in the work plan. This is a mandatory relationship.	SET [0:?] OF IfcWorkTask	N/a	N/a	N/a
OPT	RootTask	The root work task of the task hierarchy.	IfcWorkTask	see type	see type	see type
	Schedules	The set of work task schedules contained in the work plan.	SET [0:?] OF IfcWorkSchedule	n/a	n/a	n/a
	Resources	All the types of resources used in the work plan. In the case that both this relationship and 'Project' and/or 'ProjectPlan', the user is responsible for ensuring that the instances of IfcResource referenced by the 3 relationships are consistent.	SET [0:?] OF IfcResource	N/a	N/a	N/a

Formal Propositions

WR1	The work plan can be done for a particular project. Therefore a relationship to IfcProject is forseen by the IfcRelContains objectified relationship.

16.10.3. Interface Definitions

- I_WorkPlan

16.10.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

16.11. Class IfcWorkSchedule

16.11.1. Class Semantic Definition

This class represents a work task element in a work schedule (i.e. IfcWorkSchedule). It is associated with a work task (i.e. IfcWorkTask) and attaches it to time schedule information (i.e. IfcScheduleTimeControl). A work schedule element can also include other schedule elements as sub-items. IfcWorkSchduleElement is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

16.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcWorkSchedule

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default

	WorkScheduleID	The ID of the work schedule.	STRING	empty string	n/a	empty string
	WorkScheduleName	The name of the work schedule.	STRING	empty string	n/a	empty string
OPT	Description	A description of the work schedule	STRING	empty string	n/a	empty string
OPT	WorkSchedulePurpose	A description of the purpose of the work schedule	STRING	empty string	n/a	empty string
	CreationDate	The date that the schedule is created	IfcDateTimeSelect	see type	see type	see type
	Schedulers	The people who create the schedule	SET [0:?] OF IfcActorSelect	n/a	n/a	n/a
	ScheduleElements	A set of work schedule elemtns included in the schedule.	SET [1:?] OF IfcWorkScheduleElement	n/a	n/a	n/a
	TotalElements	The total number of schedule elements.	INTEGER	0	n/a	0
	Resources	References to all the resources used by the work tasks in the schedule	SET [0:?] OF IfcResource	see type	see type	see type
OPT	BaseSchedule	The reference to the base schedule	IfcWorkSchedule	see type	see type	see type
	StartTime	The start time of the schedule	IfcDateTimeSelect	see type	see type	see type
OPT	FinishTime	The finish time of the schedule	IfcDateTimeSelect	see type	see type	see type
OPT	Duration	The total duration of the entire work schedule	IfcTimeMeasure	see type	see type	see type
OPT	TotalFloat	The total time float of the entire work schedule	IfcTimeMeasure	see type	see type	see type
INV	WorkPlan	The work plan that the work schedule belongs to.	IfcWorkPlan	see type	see type	see type

Formal Propositions

WR41	Restrict the relationship 'Nests' inherited from IfcObject to IfcRelNestsWorkSchedules.
WR42	Restrict the relationship 'IsNestedBy' inherited from IfcObject to IfcRelNestsWorkSchedules.
WR3	The work schedule can be done for a particular project. Therefore a relationship to IfcProject is forseen by the IfcRelContains objectified relationship.

16.11.3. Interface Definitions

- I_WorkSchedule

16.11.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

16.12. Class IfcWorkScheduleElement

16.12.1. Class Semantic Definition

This class represents a work task element in a work schedule (i.e. IfcWorkSchedule). It is associated with a work task (i.e. IfcWorkTask) and attaches it to time schedule information (i.e. IfcScheduleTimeControl). A work schedule element can also include other schedule elements as sub-items. IfcWorkSchduleElement is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

16.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcWorkScheduleElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	WorkTask	The work task that the schedule element asigned to.	IfcWorkTask	See type	See type	See type
	TimeForSchedule	Contained object for the time related information for the work schedule element	IfcScheduleTimeControl	See type	See type	See type
OPT	Milestone	The milestone of the work schedule element in the work schedule.	IfcWorkTaskMilestoneEnum	StartMile stone	NotDefin ed	StartMile stone
INV	WorkSchedule	The work schedule that the element belongs to.	IfcWorkSchedule	see type	see type	see type

Formal Propositions

WR41	
WR42	

16.12.3. Interface Definitions

- I_WorkScheduleElement

16.12.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

16.13. Class IfcWorkTask

16.13.1. Class Semantic Definition

An identifiable unit of work to be carried out independently of any other units of work in a construction project. Work is identified as work tasks (i.e. IfcWorkTask) that are capable of either containing other work tasks or being sub-items of other work tasks.

A work task can be used to describe a process for the construction or installation of products and is given a name that is indicative of its content. EXAMPLE: The installation of a number of items of equipment within a particular space may be the subject of a single work task which is identified as ‘fix equipment in space 123’.

IfcWorkTask represents the occurrence of a work performance of a type of process in a construction plan, while work task types themselves are not handled in this version. Each work can nest other work tasks as sub-items; the nesting relationship is modeled by IfcRelNestsProcesses. For example, the construction of a stud wall may be designated as a nesting work task named ‘install wall #1’ including other work tasks such as ‘install dry wall’, ‘install studs’, ‘wall taping’, and ‘erect wall’ as sub-processes. Additionally, the sequential relationships between work tasks are represented by IfcRelSequence in IfcKernel schema. Resource uses of work tasks are represented by IfcRelUsesResources. IfcWorkTask is a subtype of IfcProcess.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

16.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProcess
      IfcWorkTask

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	WorkTaskID	An identifying designation given to a task.	STRING	Empty string	N/a	Emptye string
	WorkTaskName	The name of the work task.	STRING	Empty string	N/a	Emptye string
	WBSCode	The codes of the work breakdown structure implied to the type of the work task.	LIST [0:?] OF STRING	n/a	n/a	N/a
	WBSSource	The sources of the WBSs. The items in the list should be aligned to that of the WBSs	LIST [0:?] OF STRING	n/a	n/a	N/a
	Status	Current status of the task. NOTE - A task may be not yet started, started (or partially complete) or completed. The actual value may be determined by comparison of the status time (which is the point at which analysis is undertaken) with start and finish dates as below. If StatusTime = ActualStart AND StatusTime <= ActualEnd THEN IfcTaskStatusEnum := Started. If StatusTime ActualEnd THEN IfcTaskStatusEnum := Completed	IfcWorkTaskStatusEnum	Completed	NotYetStarted	Completed
	Milestones	Indicates the milestones that this work task serves. One work task could be a milestone of different purposes in different plans.	SET [0:?] OF IfcWorkTaskMilestoneEnum	n/a	n/a	n/a
OPT	WorkMethod	The method of work used in carrying out a task.	STRING	Empty string	N/a	Emptye string
OPT	InPlaceQuantity	The quantity that has been put in place by this work task.	IfcMeasureWithUnit	see type	see type	see type
OPT	EstimatedOuantity	The estimated quantity that this work task is originally planned to complete.	IfcMeasureWithUnit	see type	see type	see type
OPT	BudgetQuantity	The budget quantity that this work task is planned to complete based on actual resource available.	IfcMeasureWithUnit	see type	see type	see type
INV	ScheduleElements	The work schedule elements that associates with this work tasks.	SET [0:?] OF IfcWorkScheduleElement	n/a	n/a	N/a
INV	WorkPlans	The reference to the work plan that contains the task	SET [0:?] OF IfcWorkPlan	n/a	n/a	N/a

Formal Propositions

WR41	Restrict the relationship 'Nests' inherited from IfcObject to IfcRelNestsProcesses.
WR42	Restrict the relationship 'IsNestedBy' inherited from IfcObject to IfcRelNestsProcesses.

16.13.3. Interface Definitions

- I_WorkTask

16.13.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

17. IfcProductExtension

Core extensions, as the name implies, provide extensions to concepts rooted in the kernel. Core extensions are therefore the first refinement layer for abstract kernel constructs. Each core extension is a specialization of classes defined in the Kernel.

The IfcProductExtension schema at the core extension layer defines basic object concepts, used within the AEC/FM industry, basically Elements, Spaces, and a structuring hierarchy, which consists of Site, Building, and Building Storey. It also handles basic element connectivity and space boundaries.

17.1. Type IfcConnectionEnum

17.1.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of connection relationships between elements according to their path definition.

ISSUE See Issue 112 for changes made in IFC Release 1.5.

17.1.2. Enumeration

AtPath	Connection point is located at path of the element.
Start	Starting point of element's path is located at the Connection
AtEnd	End point of element's path is located at the Connection
NotDefined	The location of the connection point is not known.

17.2. Type IfcElectricCurrentEnum

17.2.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of available electrical current.

History

New Enumeration in IFC Release 2.0

17.2.2. Enumeration

Alternating
Direct
UserDefined
NotDefined

17.3. Type IfcInternalOrExternalEnum

17.3.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of spaces or space boundaries in terms of either being inside the building (Internal) or being in / facing to the outer space (External).

History

New Enumeration in IFC Release 2.0

17.3.2. Enumeration

Internal
External
NotDefined

17.4. Type IfcPhysicalOrVirtualEnum

17.4.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of space boundaries in terms of its physical manifestation. A space boundary can either be physically dividing (Physical) or can be a virtual divider (Virtual).

History

New Enumeration in IFC Release 2.0

17.4.2. Enumeration

Physical
Virtual
NotDefined

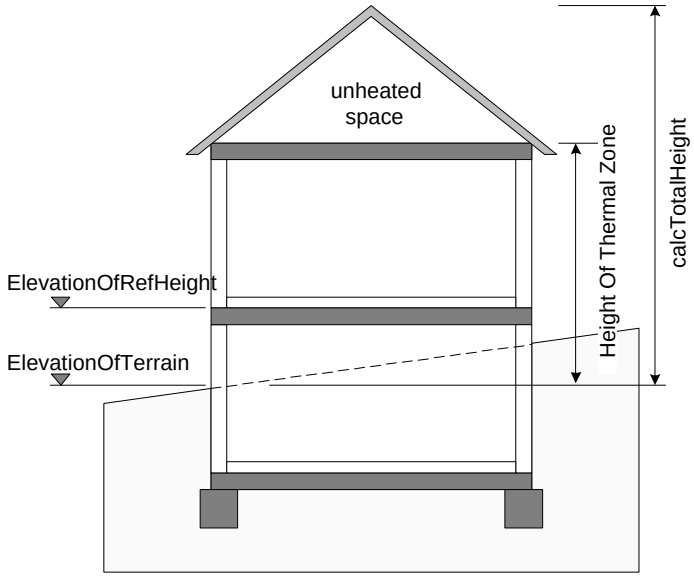
17.5. Class IfcBuilding

17.5.1. Class Semantic Definition

Definition from IAI: 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 structuring hierarchy for the components of a building construction project (together with Site, Storey, and Space).

Buildings can be grouped into a building complex by virtue of the general grouping mechanism (IfcRelGroups). The Building Complex is now handled by a direct instantiation of IfcGroup with the GroupPurpose attribute = 'BuildingComplex'.

Building Sections shall be handled by the IfcZone, which may be composed of all spaces that belong to the section. The heated space within a Building shall be handled by the IfcZone, including the property for overall height of the heated space in the Building. The following figure shall define the interpretation of building heights and elevations for IfcBuilding.



ISSUE See Issue I-108, I-122, I-116 for changes made in IFC Release 1.5.
See Issue GI-012 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

17.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcBuilding

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	BuildingReference	Short name for the building as used for reference purposes.	STRING	see type	see type	NIL
OPT	BuildingName	Long name for the building.	STRING	see type	see type	NIL
OPT	calcTotalHeight	Calculated Total (physical) Height of the Building. Exposed as an attribute by file-based exchange.	IfcLengthMeasure	0	see type	NIL
OPT	calcSiteCoverage	Calculated Coverage of the Building Site Area that is occupied by the Building (Footprint). Exposed as an attribute by file-based exchange.	IfcAreaMeasure	0	see type	NIL

OPT	calcTotalVolume	Calculated Total (Gross) Volume of all spaces enclosed by the Building. Exposed as an attribute by file-based exchange.	IfcVolumeMeasure	0	see type	NIL
OPT	ElevationOfRefHeight	Elevation above sea level of the reference height used for all storey elevation measures, equals to height 0.0. It is usually the ground floor level.	IfcLengthMeasure	see type	see type	NIL
OPT	ElevationOfTerrain	Elevation above the minimal terrain level around the foot print of the building, given in elevation above sea level.	IfcLengthMeasure	see type	see type	NIL
INV	ServicedBySystems	Set of relationships to Systems, that provides a certain service to the Building. The relationship is handled by the objectified relationship IfcRelServicesBuildings	SET [0:?] OF IfcRelServicesBuildings	n/a	n/a	NIL

Formal Propositions

WR41	There shall be exactly one instance of the IfcRelContains objectified relationship that defines a Project Container, i.e. referencing an IfcProject to contain this instance of IfcBuilding.
WR42	There shall be zero or one instance of the IfcRelContains objectified relationship that defines a Site Container, i.e. referencing an IfcSite to contain this instance of IfcBuilding.

Informal Propositions

IP41	Products being contained by IfcBuilding using the IfcRelContains objectified relationship shall be Building Storeys, Spaces or Elements.

17.5.3. Interface Definitions

- I_Building

17.5.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcBuilding is given by the IfcProductShape and IfcLocalPlacement, allowing multiple geometric representation. Included are:

Local Placement

The local placement for IfcBuilding is defined in its supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations. The PlacementRelTo relationship of IfcLocalPlacement shall point to the IfcSite, if the containing site is defined for this building and if relative placement is used for this Building.

Standard Geometric Representation

The standard geometric representation (if the building has an independent geometric representation) of IfcBuilding is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation. Since the building shape is usually described by the exterior building elements, an independent shape representation shall only be given, if the Building is exposed independently from its constituting Elements.

Currently, the usage of attribute driven geometry for IfcBuilding is not supported.

Advanced Geometric Representation

The advanced geometric representation (if the building has an independent geometric representation) of IfcBuilding is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcBuilding is not supported.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcBuilding is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

Currently, there is no difference in the usage of standard, advanced or arbitrary geometric representations for IfcBuilding.

17.6. Class IfcBuildingElement

17.6.1. Class Semantic Definition

Definition from IAI: The Building Element comprises all elements that are primarily part of the construction of a building, i.e., its structural and space separating system. Examples of Building Elements are walls, beams, or doors, they are all physically existent and tangible things. They are separated from other elements, since they are dealt with in separate AEC processes.

The IfcBuildingElement has an optional relationship to the IfcMaterialSelect, the select of Material definition types, either IfcMaterialComposite or IfcMaterialLayerSet. Where the IfcMaterialComposite just defines a list of Material used within the IfcBuildingElement, the IfcMaterialLayerSet also comprises the layout of layers (ordering and thickness). The type driven property sets, referenced by the subtypes of IfcBuildingElement, can be used to identify, which component uses what material.

ISSUE See issues I-105, I-120, I-190 for changes made in IFC Release 1.5

17.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcFurniture
          IfcBeam
          IfcBuiltIn
          IfcColumn
          IfcCovering
          IfcDoor
          IfcSlab
          IfcWall
          IfcWindow
          IfcElectricalAppliance
          IfcEquipment
          IfcDiscreteElement
          IfcDistributionElement
          IfcSystemFurnitureElement
          IfcRampFlight
          IfcRamp

IfcVisualScreen
IfcStair
IfcStairFlight
IfcRailing
IfcCurtainWall
IfcPermeableCovering
IfcRoof
IfcDoorPanel
IfcWindowPanel
IfcDoorLining
IfcWindowLining

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	HasMaterial	Reference to the Material Definition for that Building Element, can be either a single Material or a Material Layer Set	IfcMaterialSelect	n/a	n/a	NIL
INV	ProvidesBoundaries	Reference to Space Boundaries by virtue of the objectified relationship IfcRelSeparatesSpaces. It defines the concept of an Building Element bounding Spaces	SET [0:?] OF IfcRelSeparatesSpaces	n/a	n/a	NIL
INV	HasOpenings	Reference to the Voids Relationship that creates an opening in an element. An element can incorporate zero-to-many openings.	SET [0:?] OF IfcRelVoidsElement	n/a	n/a	NIL
INV	FillsVoids	Reference to the Fills Relationship that puts the Element into the Opening within another Element.	SET [0:?] OF IfcRelFillsElement	n/a	n/a	NIL

17.6.3. Interface Definitions

- I_BuildingElement

17.6.4. Geometry Use Definitions

There are no instances of this abstract class. However, subtypes of this class do have geometry defined.

17.7. Class IfcBuildingStorey

17.7.1. Class Semantic Definition

Definition from IAI: The Building Storey has an elevation and typically represents a (nearly) horizontal aggregation of spaces that are vertically bound. Building Sections shall be handled by the IfcZone, which may be composed of all spaces that belong to the section. This is a restriction of the IFC Release 1.5.

ISSUE See issues I-112, I-114, I-115, I-116, I-192 for changes made in IFC Release 1.5.
See Issue GI-012 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

17.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcBuildingStorey

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	BuildingStoreyReference	Short name for the building storey as used for reference purposes.	STRING	see type	see type	n/a
OPT	BuildingStoreyName	Long name for the building storey.	STRING	see type	see type	n/a
	Elevation	Elevation of the base of this storey, relative to the ElevationOfRefHeight attribute given at IfcBuilding.	IfcLengthMeasure	0	see type	0
OPT	calcTotalHeight	Calculated height of this storey, from the bottom surface of the floor, to the bottom surface of the floor or roof above. Will be exposed as an attribute by file-based exchange.	IfcLengthMeasure	0	see type	NIL
OPT	calcTotalArea	Calculated gross floor area for the floor plate of this storey (horizontal projections). Will be exposed as an attribute by file-based exchange.	IfcAreaMeasure	0	see type	NIL
OPT	calcTotalVolume	Calculated gross volume for this storey. Will be exposed as an attribute by file-based exchange.	IfcVolumeMeasure	0	see type	NIL

Formal Propositions

WR41	There shall be exactly one instance of the IfcRelContains objectified relationship that defines a ProjectContainer, i.e. referencing an IfcProject to contain this instance of IfcBuildingStorey.
WR42	There shall be exactly one instance of the IfcRelContains objectified relationship that defines a BuildingContainer, i.e. referencing an IfcBuilding to contain this instance of IfcBuildingStorey.

Informal Propositions

IP41	Products being contained by IfcBuildingStorey using the IfcRelContains objectified relationship shall be either Spaces or Elements.

17.7.3. Interface Definitions

- I_BuildingStorey

17.7.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcBuildingStorey is given by the IfcProductShape and IfcLocalPlacement, allowing multiple geometric representation. Included are:

Local Placement

The local placement for IfcBuildingStorey is defined in its supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations. The PlacementRelTo relationship of IfcLocalPlacement shall point to the IfcBuilding, if the containing building is defined for this building storey and if relative placement is used for this building storey.

Standard Geometric Representation

The standard geometric representation (if the building storey has an independent geometric representation) of IfcBuildingStorey is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation. Since the building storey shape is usually described by the exterior building elements, an independent shape representation shall only be given, if the building storey is exposed independently from its constituting Elements.

Currently, the usage of attribute driven geometry for IfcBuildingStorey is not supported.

Advanced Geometric Representation

The advanced geometric representation (if the building storey has an independent geometric representation) of IfcBuildingStorey is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcBuildingStorey is not supported.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcBuildingStorey is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

Currently, there is no difference in the usage of standard, advanced or arbitrary geometric representations for IfcBuildingStorey.

17.8. Class IfcConnectionGeometry

17.8.1. Class Semantic Definition

Definition from IAI: The IfcConnectionGeometry is used to describe the geometrical and topological constraints that facilitate the physical connection of two objects. It is envisioned as a control that applies to the IfcRelConnectsElements relationship. In the current IFC Release it is restricted to just geometrical constraints and to Point connection types only.

ISSUE See issue I-101, I-305 for changes made in IFC Release 1.5.

17.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcConnectionGeometry
        IfcLineConnectionGeometry
        IfcPointConnectionGeometry

Attributes and Relationships

No attributes defined at this level.

17.8.3. Interface Definitions

- I_ConnectionGeometry

17.8.4. Geometry Use Definitions

This abstract control does not carry additional geometry - there is no geometry use definition.

17.9. Class IfcElectricalCharacteristics

17.9.1. Class Semantic Definition

Definition from IAI: Common definition to capture electrical characteristics for use in building services and facilities management.

History

New Entity in IFC Release 2.0

17.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcPropertyDefinition
    IfcElectricalCharacteristics

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ElectricCurrentType	Type of electrical current applied	IfcElectricCurrentEnum	Alternating	NotDefined	NotDefined
OPT	InputVoltage	Input electrical potential	IfcElectricVoltageMeasure	see type	see type	NIL
OPT	InputPhase	Relative phase of input conductors	INTEGER	see type	see type	NIL
OPT	InputFrequency	Nominal frequency of input voltage wave form. It is an measur with unit, the SI unit is Hertz (s-1)	IfcFrequencyMeasure	see type	see type	NIL
OPT	FullLoadCurrent	Full load electrical current requirements	IfcElectricCurrentMeasure	see type	see type	NIL
OPT	LockedRotorCurrent	Input current when a motor armature is energized but not rotating	IfcElectricCurrentMeasure	see type	see type	NIL
OPT	InrushCurrent	The current the electrical device may be subjected to upon initial startup	IfcElectricCurrentMeasure	see type	see type	NIL
OPT	MinimumCircuitCurrent	Minimum current carrying capacity of the electrical circuit	IfcElectricCurrentMeasure	see type	see type	NIL
OPT	RatedPowerInput	Actual electrical input power of the electrical device at its rated capacity	IfcPowerMeasure	see type	see type	NIL
OPT	MaximumPowerInput	Maximum power input of the electrical device	IfcPowerMeasure	see type	see type	NIL
OPT	CircuitSizePowerInput	Electrical power input that should be used for circuit sizing	IfcPowerMeasure	see type	see type	NIL
OPT	FuseSize	Designation for fuse for this electrical device. It is a measure with unit, the SI unit is Ampere (A).	IfcElectricCurrentMeasure	see type	see type	NIL

OPT	Grounded	Does this element require electrical grounding? TRUE = Yes, FALSE = No.	BOOLEANIfcBoolean	see type	see type	NIL

17.9.3. Interface Definitions

- I_ElectricalCharacteristics

17.9.4. Geometry Use Definitions

This property definition does not carry additional geometry - there is no geometry use definition.

17.10. Class IfcElement

17.10.1. Class Semantic Definition

Definition from IAI: Generalization of all components that make up an AEC product. Those elements can be located logically by an element container in a structuring hierarchy (here: building), described by calculated quantities and assigned with one or many performed functions. The latter copes with multifunctional elements.

Elements are physically existent objects, although they might be void elements, such as holes. Elements either remain permanently in the AEC product, or only temporarily, as formwork does. Elements can be either assembled on site or pre-manufactured and built in on site. Examples of elements in a building construction context are walls, floors, windows and recesses.

An Element can also be defined as an Element Assembly that is a group of semantically and topologically related Elements that forms a higher level part of the AEC product. Examples for Element Assembly are complete Roof Structures, made by several Roof Areas, or a Stair, composed by Flights and Landings.

Elements that performs the same function may be grouped by an "Element Group By Function". It is realized by an instance of IfcGroup with the GroupPurpose = 'ElementGroupByFunction".

ISSUE See issues I-103, I-104 for changes made in IFC Release 1.5.
See issues GI-012, I-102 for changes made in IFC Release 1.5.1.

17.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcOpeningElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
INV	ConnectedTo	Reference to the element connection relationship. The relationship then refers to the other element to which this element is connected to.	SET [0:?] OF IfcRelConnectsElements	n/a	n/a	NIL
INV	ConnectedFrom	Reference to the element connection relationship. The relationship then refers to the other element that is connected to	SET [0:?] OF IfcRelConnectsElements	n/a	n/a	NIL

		this element.				
INV	IsAssemblyThrough	Reference to the assemble relationship, that creates element assemblies. It defines via the RelatingObject side this Element as the assembly of other Elements.	SET [0:1] OF IfcRelAssemblesElements	n/a	n/a	NIL
INV	PartOfAssembly	Reference to the assemble relationship, that creates element assemblies.	SET [0:1] OF IfcRelAssemblesElements	n/a	n/a	NIL

Formal Propositions

WR41	There shall be exactly one instance of the IfcRelContains objectified relationship that defines a ProjectContainer, i.e. referencing an IfcProject to contain this instance of IfcBuildingStorey.
WR42	The allowed subtypes of IfcProduct that can act as element containers are: IfcSpace, IfcSite, IfcBuilding, and IfcBuildingStorey. NOTE: This rule replaces the former SELECT type IfcElementContainer. There shall be only one instance of the IfcRelContains objectified relationship that contains (ContainedOrReferenced = TRUE) this instance of IfcElement. The relationship type shall therefore be SiteContainer, BuildingContainer, BuildingStoreyContainer, or SpaceContainer.

17.10.3. Interface Definitions

- I_Element

17.10.4. Geometry Use Definitions

There are no instances of this abstract class. However, subtypes of this class do have geometry defined.

17.11. Class IfcLineConnectionGeometry

17.11.1. Class Semantic Definition

Definition from IAI: The IfcLineConnectionGeometry is used to describe the geometrical constraints that facilitate the physical connection of two objects at a line (IfcPolyline). It is envisioned as a control that applies to the IfcRelConnectsElements relationship.

17.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcConnectionGeometry
        IfcLineConnectionGeometry

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LineOnRelatingElement	Line at which connected objects are aligned at the Relating Element, given in the LCS of the Relating Element.	IfcPolyline	n/a	n/a	see type
OPT	LineOnRelatedElement	Line at which connected objects are aligned at the Related Element, given in the LCS of the Related Element. If the	IfcPolyline	n/a	n/a	NIL

		information is omitted, than the Origin of the Related Element is used.				

17.11.3. Interface Definitions

- I_LineConnectionGeometry

17.11.4. Geometry Use Definitions

The Polyline defines the line segments, where the basic geometry items of the connected Element connects.

17.12. Class IfcManufactureInformation

17.12.1. Class Semantic Definition

Definition from IAI: This class defines the characteristic for manufactured and assembled products, given by the manufacturer of the product.

History

New Entity in IFC Release 2.0

17.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcPropertyDefinition
    IfcManufactureInformation

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description	A physical description of the manufactured item	STRING	n/a	n/a	NIL
OPT	ModelLabel	The model number and/or unit designator assigned by the manufacturer of the manufactured item	STRING	n/a	n/a	NIL
OPT	ModelReference	The name of the manufactured item as used by the manufacturer	STRING	n/a	n/a	NIL
OPT	Manufacturer	The organization that manufactured and/or assembled the item	IfcOrganization	n/a	n/a	NIL
OPT	ShippingWeight	Weight of this manufactured item when packaged for shipping to or from the project site	IfcMassMeasure	n/a	n/a	NIL
OPT	OperatingWeight	Weight of this manufactured item when installed and operating at the project site	IfcMassMeasure	n/a	n/a	NIL
OPT	WarrantyDuration	Length of warranty for this manufactured item	IfcTimeMeasure	n/a	n/a	NIL
	WarrantyTerms	A listing of description of the terms of warranty by the manufacturer	LIST [0:?] OF STRING	n/a	n/a	NIL

17.12.3. Interface Definitions

- I_ManufactureInformation

17.12.4. Geometry Use Definitions

This property definition does not carry additional geometry - there is no geometry use definition.

17.13. Class IfcOpeningElement

17.13.1. Class Semantic Definition

Definition from IAI: Opening Element stands for opening, recess or chase, all reflecting voids. It represents a void within any element that has physical manifestation. Openings must be handled by all sectors and disciplines in AEC/FM industry, therefore the interoperability for Opening Elements is provided at this high level.

ISSUE See Issue GI-012 for changes made in IFC Release 1.5.1.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

17.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcOpeningElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	calcOpeningArea	Total Gross (physical) Area of the opening area (front view). Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcAreaMeasure	0	see type	NIL
INV	VoidsElements	Reference to the Voids Relationship that uses this Opening Element to create a void within an Element. The Opening Element can only be used to create a single void within a single Element.	IfcRelVoidsElement	n/a	n/a	NIL
INV	HasFillings	Reference to the Filling Relationship that is used to assign Elements as Fillings for this Opening Element. The Opening Element can be filled with zero-to-many Elements.	SET [0:?] OF IfcRelFillsElement	n/a	n/a	NIL

17.13.3. Interface Definitions

- I_OpeningElement

17.13.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcOpeningElement is given by the IfcProductShape and IfcLocalPlacement allowing multiple geometric representations. Included are:

Local Placement

The Reference Geometry for IfcOpeningElement is defined in its supertype IfcProduct. It is defined by the

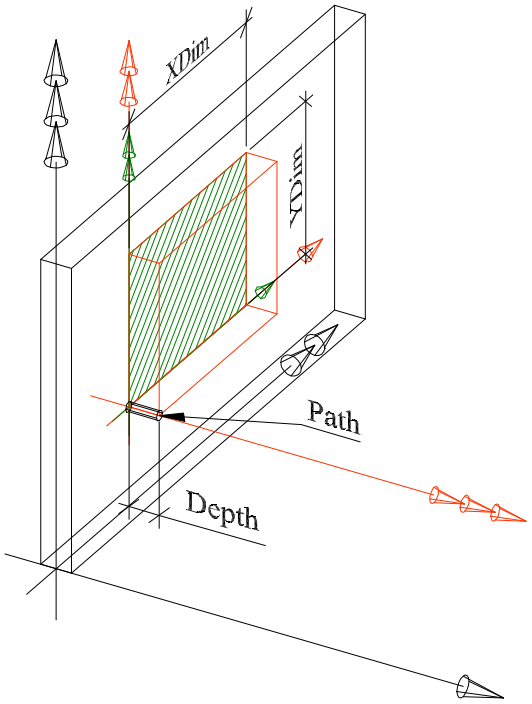
- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcOpeningElement is defined using the **attribute driven geometry**. The following constraints apply to the standard representation:

- *Solid*: IfcAttDrivenExtrudedSolid is required, referring to a single segment.
- *Segment*: IfcAttDrivenExtrudedSegment is required.
- *Profile*: IfcRectangleProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded horizontally, e.g. for wall openings, or vertically e.g., for floor openings.

Example for standard geometric representation:



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as Opening Height, XDim interpreted as Opening Width.

Extrusion Direction

The opening profile is extruded horizontally, i.e. in the direction of the thickness of the penetrated wall.

Placement

[Black arrows] The local placement of opening is placed relative to the co-ordinate system of the building element which is voided by the opening.
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

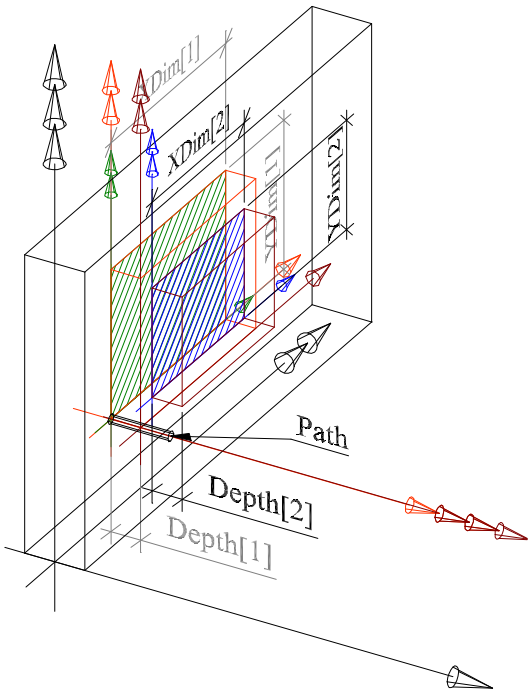
Advanced Geometric Representation

The advanced geometric representation of IfcOpeningElement is defined using the **attribute driven geometry**. The following constraints apply to the advanced representation:

- *Solid*: IfcAttDrivenExtrudedSolid is required, referring to a single or multiple segments.

- *Segment*: IfcAttDrivenExtrudedSegment is required.
- *Profile*: IfcRectangleProfileDef, IfcCircleProfileDef and IfcArbitraryProfileDef shall be supported.
- *Extrusion*: All extrusion directions shall be supported. This would provide support of openings in sloped building elements.

Example for advanced geometric representation:



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing multiple (here two) IfcAttDrivenExtrudedSegment. Hereby openings with shaped reveals are supported.
Default Type: Set of **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment[1..n].Depth, Extrusion paths defined by a positive length measure along the local z-axis.

Profile

Extrusion profile, for standard representation given by each IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as Opening Height, XDim interpreted as Opening Width.

Other Type: **IfcCircleProfileDef**

- Radius interpreted as the Opening radius.

Other Type: **IfcArbitraryProfileDef**

- IfcBoundedCurve (closed and 2D) defining an arbitrary opening shape.

Extrusion Direction

The opening profile is extruded in the direction of the thickness of the penetrated sloped roof slab, i.e. an arbitrary extrusion direction.

Placement

[Black arrows] The local placement of opening is placed relative to the co-ordinate system of the building element which is voided by the opening.
[Red and brown arrows] The segments are placed relative to the local placement.
[Green and blue arrows] The profiles are placed relative to the XY planes of the placement co-ordinate systems of the segments.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcOpeningElement is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

17.14. Class IfcPointConnectionGeometry

17.14.1. Class Semantic Definition

Definition from IAI: The IfcPointConnectionGeometry is used to describe the geometrical constraints that facilitate the physical connection of two objects at a point (IfcCartesianPoint). It is envisioned as a control that applies to the IfcRelConnectsElements relationship.

ISSUE See issue I-101, I-305 for changes made in IFC Release 1.5.

17.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcConnectionGeometry
        IfcPointConnectionGeometry

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PointOnRelatingElement	Point at which connected objects are aligned at the Relating Element, given in the LCS of the Relating Element.	IfcCartesianPoint	n/a	n/a	see type
OPT	PointOnRelatedElement	Point at which connected objects are aligned at the Related Element, given in the LCS of the Related Element. If the information is omitted, than the Origin of the Related Element is used.	IfcCartesianPoint	n/a	n/a	NIL

17.14.3. Interface Definitions

- I_PointConnectionGeometry

17.14.4. Geometry Use Definitions

The Cartesian Point defines the point, where the basic geometry items of the connected Element connects.

17.15. Class IfcRelAssemblesElements

17.15.1. Class Semantic Definition

Definition from IAI: Objectified Relationship that assembles various Elements (or other Element Assemblies) into an Element Assembly. The Elements shall have a strong semantic and topological relationship and shall make up a new component within the AEC product.

ISSUE See issue I-106 for changes made in IFC Release 1.5.
See Issue GI-012 for changes made in IFC Release 1.5.1.

17.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelAssemblesElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingElement	Element that is defined as Assembly by virtue of this relationship.	IfcElement	n/a	n/a	NIL
	RelatedElements	Elements being part of the assembly.	LIST [1:?] OF IfcElement	n/a	n/a	NIL

Formal Propositions

WR31	The instance to which the relation points shall not be contained in the List of RelatedObjects.

Informal Propositions

IP31	The IfcRelAssemblesElements relationship shall be defined acyclic.

17.15.3. Interface Definitions

- I_RelAssemblesElements

17.15.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry - there is no geometry use definition.

17.16. Class IfcRelAssemblesSpaces

17.16.1. Class Semantic Definition

Definition from IAI: Objectified Relationship that assembles various partial Spaces (or other Space Assemblies) into a Space Assembly. The Spaces shall have a strong semantic and topological relationship and shall make up a new Space with well defined boundaries. For non topological related Space groups use IfcZone.

ISSUE See issue I-106 for changes made in IFC Release 1.5.
See Issue I-310 for changes made in IFC Release 1.5.1.

17.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelAssemblesSpaces

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingSpace	Space that is defined as Assembly by virtue of this relationship.	IfcSpace	n/a	n/a	n/a
	RelatedSpaces	Spaces being part of the assembly.	LIST [1:?] OF IfcSpace	1	N	n/a

Formal Propositions

WR31	The instance to with the relation points shall not be contained in the List of RelatedObjects.

Informal Propositions

IP31	The IfcRelAssemblesElements relationship shall be defined acyclic.

17.16.3. Interface Definitions

- I_RelAssemblesSpaces

17.16.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry - there is no geometry use definition.

17.17. Class IfcRelConnectsElements

17.17.1. Class Semantic Definition

Definition from IAI: Generalization of the connectivity between Elements. Based on this special type of 1 to 1 relationship, the concept of two elements being physically or logically connected is described independently from the connecting elements.

Currently the connectivity is related to geometric entities on which the connection of the underlying basic geometry of the connecting elements occurs. This will be enhanced and/or replaced in later versions of the IFC model by a proper topological model. The geometrical constraints of the connection are provided by the optional relationship to the IfcConnectionGeometry control. If it is omitted then the connection is provided as a logical connection. Under this circumstance, the connection point, curve or surface has to be recalculated by the receiving application.

ISSUE See issue I-189, I-304 for changes made in IFC Release 1.5.
See Issue I-310 for changes made in IFC Release 1.5.1.

17.17.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelConnectsElements
IfcRelConnectsPathElements
IfcRelJoinsElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ConnectionGeometry	Relationship to the control class, that provides the geometrical constraints of the connection.	IfcConnectionGeometry	n/a	n/a	NIL
	RelatingElement	Reference to an Element that is connected by the objectified relationship.	IfcElement	n/a	n/a	see type
	RelatedElement	Reference to an Element that is connected by the objectified relationship.	IfcElement	n/a	n/a	see type

Formal Propositions

WR31	The instance of the relating element shall not be the same instance as the related element.

17.17.3. Interface Definitions

- I_RelConnectsElements

17.17.4. Geometry Use Definitions

No geometric information about the connection is defined at the supertype.

17.18. Class IfcRelConnectsPathElements

17.18.1. Class Semantic Definition

Definition from IAI: The IfcRelConnectsPathElements provides the connectivity information between two Elements. The objectified relationship provides all additional information requirements to describe the connection between two path based elements that might have single or multiple layers of material.

ISSUE See issue I-189, I-304 for changes made in IFC Release 1.5

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

17.18.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelConnectsElements
IfcRelConnectsPathElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingPriorities	Priorities for connection. It refers to the layers of the RelatingObject.	LIST [0:RelatingLayerCount] OF INTEGER	0	Relating Layer Count	0
	RelatedPriorities	Priorities for connection. It refers to the layers of the RelatedObject	LIST [0:RelatedLayerCount] OF INTEGER	0	Related Layer Count	0
	RelatingConnectionType	Indication of the connection type in relation to the path of the RelatingObject.	IfcConnectionEnum	AtPath	NotKnown	AtEnd
	RelatedConnectionType	Indication of the connection type in relation to the path of the RelatingObject.	IfcConnectionEnum	AtPath	NotKnown	Start
	RelatingLayerCount	No of layers of the RelatingObject	INTEGER	1	see type	1
	RelatedLayerCount	No of layers of the RelatedObject	INTEGER	1	see type	1

17.18.3. Interface Definitions

- I_RelConnectsPathElements

17.18.4. Geometry Use Definitions

No geometric information about the connection is defined at the supertype.

17.19. Class IfcRelFillsElement

17.19.1. Class Semantic Definition

Definition from IAI: Objectified relationship between an opening element and building elements that fill (or partially fill) the opening element.

ISSUE See Issue I-310 for changes made in IFC Release 1.5.1.

17.19.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelFillsElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingOpeningElement	Opening Element being filled by virtue of this relationship	IfcOpeningElement	n/a	n/a	see type
	RelatedBuildingElement	Element that occupy fully or partially the associated opening	IfcBuildingElement	n/a	n/a	see type

17.19.3. Interface Definitions

- I_RelFillsElement

17.19.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry - there is no geometry use definition.

17.20. Class IfcRelSeparatesSpaces

17.20.1. Class Semantic Definition

Definition from IAI: Objectified relationship that handles the Element to Space relationship by objectifying the relationship between an Element and a Space Boundary.

ISSUE See issue I-120 for changes made in IFC Release 1.5.
See Issue I-310 for changes made in IFC Release 1.5.1.

17.20.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelSeparatesSpaces

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingBuildingElement	Reference to Building Element, that defines the Space Boundaries	IfcBuildingElement	n/a	n/a	NIL
	RelatedSpaceBoundaries	Reference to a set of Space Boundaries that are defined by the relating Element.	LIST [1:?] OF IfcSpaceBoundary	n/a	n/a	NIL

17.20.3. Interface Definitions

- I_RelSeparatesSpaces

17.20.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry - there is no geometry use definition.

17.21. Class IfcRelServicesBuildings

17.21.1. Class Semantic Definition

Definition from IAI: Objectified Relationship that defines the relationship between a System and the Buildings it serves.

ISSUE See issues I-089, I-111 for changes made in IFC Release 1.5.
See Issue I-310 for changes made in IFC Release 1.5.1.

17.21.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelServicesBuildings

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingSystem	System that services the Buildings.	IfcSystem	n/a	n/a	see type
	RelatedBuildings	Buildings that are serviced by the System	LIST [1:?] OF IfcBuilding	n/a	n/a	see type

17.21.3. Interface Definitions

- I_RelServicesBuildings

17.21.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry - there is no geometry use definition.

17.22. Class IfcRelVoidsElement

17.22.1. Class Semantic Definition

Definition from IAI: Objectified Relationship between an building element and one opening element that creates a void in the element. This relationship implies a Boolean Operation of subtraction for the geometric bodies of Element and Opening Element.

ISSUE See Issue I-310 for changes made in IFC Release 1.5.1.

17.22.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelVoidsElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingBuildingElement	Element in which a void is created by associated Opening Elements	IfcBuildingElement	n/a	n/a	see type
	RelatedOpeningElement	Opening Elements which define voids in the associated Element	IfcOpeningElement	n/a	n/a	see type

17.22.3. Interface Definitions

- I_RelVoidsElement

17.22.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry - there is no geometry use definition.

17.23. Class IfcSite

17.23.1. Class Semantic Definition

Definition from IAI: A defined area of land, possibly covered with water, on which the project construction is to be completed. A site may be used to erect Building(s) or other AEC products.

Site may include a definition of the single geographic reference point for this site (global position using Longitude, Latitude and Elevation) for the project. This definition is given for informational purposes only; it is not intended to provide an absolute placement in relation to the world. The geometrical placement of the Site, defined by the IfcLocalPlacement is always relative to the Project if the PlacementRelTo attribute is specified.

A project may span over several connected or disconnected sites. Therefore Site Complex provides for a collection of Sites included in a project. The Site Complex is handled by an IfcGroup having a Group Purpose of 'SiteComplex'.

ISSUE See issues I-125, I-194 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

17.23.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcSite

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	RefLatitude	World Latitude at Reference point (most likely defined in legal description). Defined as Real values for Degrees, minutes, seconds.	IfcCompoundPlaneAngleMeasure	0	see type	0
OPT	RefLongitude	World Longitude at Reference point (most likely defined in legal description). Defined as Real values for Degrees, minutes, seconds.	IfcCompoundPlaneAngleMeasure	0	see type	0
OPT	RefElevation	Datum elevation relative to sea level	IfcLengthMeasure	0	see type	0
OPT	TrueNorth	Direction of the true north for the site, given within the local co-ordinate system of site, as specified by the local placement.	IfcDirection	see type	see type	n/a
OPT	calcSitePerimeter	Perimeter of the Site boundary. Exposed as attribute in file-based exchange.	IfcPositiveLengthMeasure	0	see type	0
OPT	calcSiteArea	Gross area for this site (horizontal projections). Exposed as attribute in file-based exchange.	IfcAreaMeasure	0	see type	0

Formal Propositions

WR41	There shall be exactly one instance of the IfcRelContains objectified relationship that defines a ProjectContainer, i.e. referencing an IfcProject to contain this instance of IfcSite.

Informal Propositions

IP41	Products being contained by IfcSite using the IfcRelContains objectified relationship shall be either Buildings, Building Storeys, Spaces or Elements.

17.23.3. Interface Definitions

- I_Site

17.23.4. Geometry Use Definitions

The geometric representation of IfcSite is given by the IfcProductShape and IfcLocalPlacement allowing multiple geometric representations. Included are:

Local Placement

The local placement for IfcSite is defined in its supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations. The PlacementRelTo relationship of IfcLocalPlacement shall point to the IfcProject, if relative placement is used for this Building.

Standard Geometric Representation

The standard geometric representation of IfcSite is defined using **explicit geometry.** The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation of the site contour.

Currently, the usage of attribute driven geometry for IfcSite is not supported.

Advanced Geometric Representation

The advanced geometric representation of IfcSite is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation of the site contour.

Currently, the usage of attribute driven geometry for IfcSite is not supported.

Arbitrary Geometric Representation

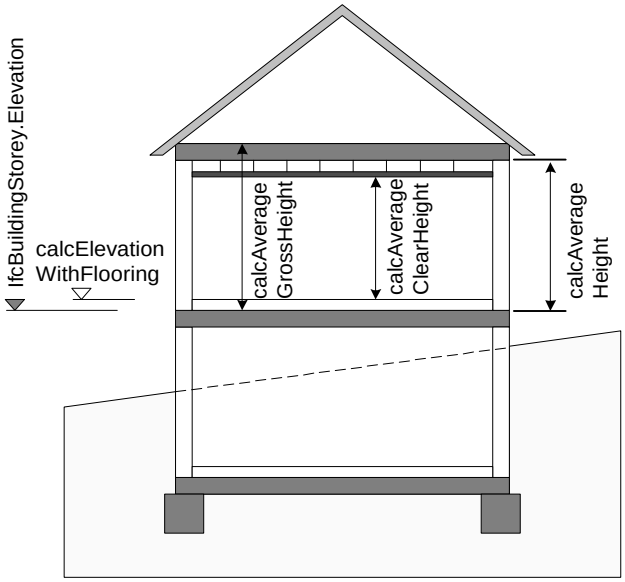
The arbitrary geometric representation of IfcSite is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

Currently, there is no difference in the usage of standard, advanced or arbitrary geometric representations for IfcSite.

17.24. Class IfcSpace

17.24.1. Class Semantic Definition

Definition from IAI: A Space represents an area or volume bounded actually or theoretically. Spaces are areas or volumes that provide for certain functions within a building. The following figure describes the height attributes of the IfcSpace.



ISSUE See issue I-119, I-193 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

17.24.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcSpatialElement
IfcSpace
IfcWorkstation
IfcFireCompartment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	BoundedBy	Reference to Set of Space Boundaries that defines the physical or virtual delimitation of that Space.	LIST [1:?] OF IfcSpaceBoundary	n/a	n/a	n/a
	InteriorOrExteriorSpace	Defines, whether the Space is interior (Internal), or exterior (External), i.e. part of the outer space.	IfcInternalOrExternalEnum	Internal	NotDefined	NotDefined
OPT	SpaceReference	Short name for the space as used for reference purposes.	STRING	see type	see type	n/a
OPT	SpaceName	Long name for the space.	STRING	see type	see type	n/a
OPT	calcTotalPerimeter	Total Gross (physical) Perimeter of that Space. Exposed as an attribute by file-based exchange.	IfcPositiveLengthMeasure	0	see type	1
OPT	calcTotalArea	Total Gross (physical) Area of the floor level of that Space. Exposed as an attribute by file-based exchange.	IfcAreaMeasure	0	see type	1
OPT	calcTotalVolume	Total Gross (physical) Volume of that Space. Exposed as an attribute by file-based exchange.	IfcVolumeMeasure	0	see type	1
OPT	calcAverageHeight	Floor Height (without flooring) to Ceiling height (without suspended ceiling) for this space (measured from top of slab of this space to the bottom of slab of space above); the average shall be taken if room shape is not prismatic.	IfcPositiveLengthMeasure	see type	see type	1
OPT	calcAverageGrossHeight	Floor Height to Floor Height for this space (measured from top of slab of this space to top of slab of space above); the average shall be taken if room shape is not prismatic.	IfcPositiveLengthMeasure	see type	see type	1
OPT	calcAverageClearHeight	Clear Height between floor level (including finish) and ceiling level (including finish and sub construction) of this space; the average shall be taken if room shape is not prismatic.	IfcPositiveLengthMeasure	see type	see type	1
OPT	calcElevationWithFlooring	Level of flooring of this space; the average shall be taken, if the space ground surface is sloping or if there are level differences within this space.	IfcLengthMeasure	see type	see type	1
INV	IsAssemblyThrough	Reference to the assembly relationship that creates spaces that	SET [0:1] OF IfcRelAssemblesSpaces	n/a	n/a	NIL

		are assemblies. It defines via the RelatingObject side this Space as the assembly of other Spaces.				
INV	PartOfAssembly	Reference to the assemble relationship, that creates space assembly in which the actual space is defined as a partial space.	SET [0:1] OF IfcRelAssemblesSpaces	n/a	n/a	NIL

Formal Propositions

WR52	There shall be exactly one instance of the IfcRelContains objectified relationship that defines a ProjectContainer, i.e. referencing an IfcProject to contain this instance of IfcSpace.
WR53	The allowed subtypes of IfcProduct that can act as space containers are: IfcSite and IfcBuildingStorey. NOTE: This rule replaces the former SELECT type IfcSpaceContainer. There shall be only one instance of the IfcRelContains objectified relationship that contains (ContainedOrReferenced = TRUE) this instance of IfcSpace. The relationship type shall therefore be either SiteContainer, or BuildingStoreyContainer.

17.24.3. Interface Definitions

- I_Space

17.24.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcSpace is given by the IfcProductShape and IfcLocalPlacement allowing multiple geometric representations.

NOTE If the surrounding instances of IfcSpaceBoundary define a complete geometric representation of a particular representation view, than this view shall be omitted at the ProductShape of IfcSpace.

Included are:

Local Placement

The local placement for IfcSpace is defined in its supertype IfcProduct. It is defined by the

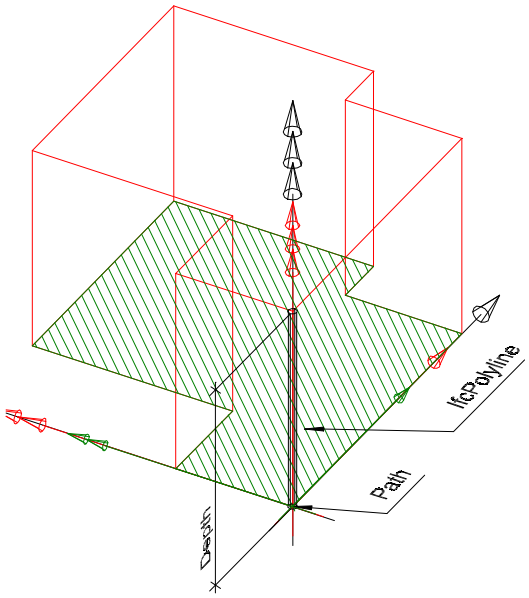
- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations. The PlacementRelTo relationship of IfcLocalPlacement shall point to the IfcBuildingStorey, if the containing building storey is defined for this space and if relative placement is used for this space.

Standard Geometric Representation

The standard geometric representation of IfcSpace is defined using the **attribute driven geometry**. The following constraints apply to the standard representation:

- *Solid*: IfcAttDrivenExtrudedSolid is required, referring to a single segment,
- *Segment*: IfcAttDrivenExtrudedSegment is required,
- *Profile*: IfcRectangleProfileDef and IfcArbitraryProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded vertically, i.e., along the positive Z Axis of the co-ordinate system of the element container, i.e. site or building storey

Example for standard geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, it equals to the semantic attribute: MaximumHeight of the IfcSpace.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: IfcArbitraryProfileDef

- IfcBoundedCurve (closed and 2D), defining the foot print of the Space, here IfcPolyline.

Extrusion Direction

The space foot print is extruded vertically, i.e. perpendicular to the ground surface, which is supposed to be horizontal.

Placement

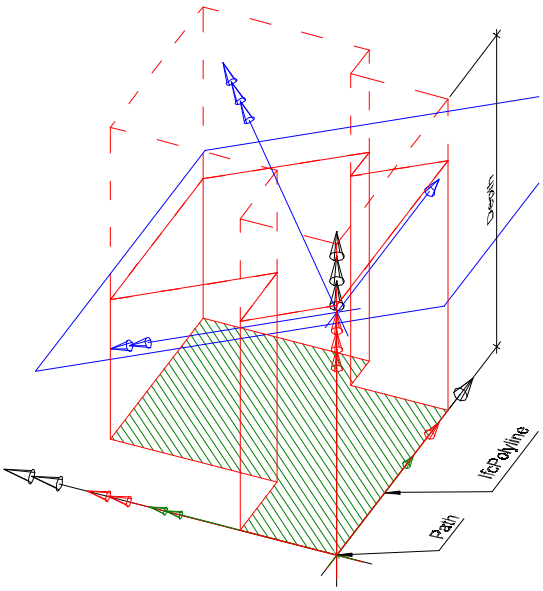
[Black arrows] The local placement of space is placed relative to the co-ordinate system of the containing element (Building Storey).
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment. It defaults to location [0.,0.] and P ([1.,0.],[0.,1.]).

Advanced Geometric Representation

The advanced geometric representation of IfcSpace is defined using the **attribute driven geometry**. The following constraints apply to the advanced representation:

- *Solid*: IfcAttDrivenExtrudedSolid and IfcAttDrivenClippedExtrudedSolid is required, referring to a single or multiple segments,
- *Segment*: IfcAttDrivenExtrudedSegment is required,
- *Profile*: IfcRectangleProfileDef and IfcArbitraryProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded vertically, i.e., along the positive Z Axis of the co-ordinate system of the element container, i.e. site or building storey

Example for advanced geometric representation



Extrusion

Extrusion path for advanced representation here given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, it equals to the semantic attribute: MaximumHeight of the IfcSpace.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: IfcArbitraryProfileDef

- IfcBoundedCurve (closed and 2D), defining the foot print of the Space, here IfcPolyline.

Extrusion Direction

The space foot print is extruded vertically, i.e. perpendicular to the ground surface, which is supposed to be horizontal.

Solid

For allowing sloped room ceilings the IfcAttDrivenClippedExtrudedSolid has to be supported for advanced geometric representation. Therefore clipping half spaces (bounded and unbounded) shall be supported.
Default Type: IfcHalfSpaceSolid

- IfcHalfSpaceSolid defined in the local co-ordinate system of the space.

Placement

[Black arrows] The local placement of space is placed relative to the co-ordinate system of the containing element (Building Storey).
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment. It defaults to location [0.,0.] and P ([1.,0.],[0.,1.]).
[Blue arrow] The placement co-ordinate system of the clipping half space is placed relative to the local placement.

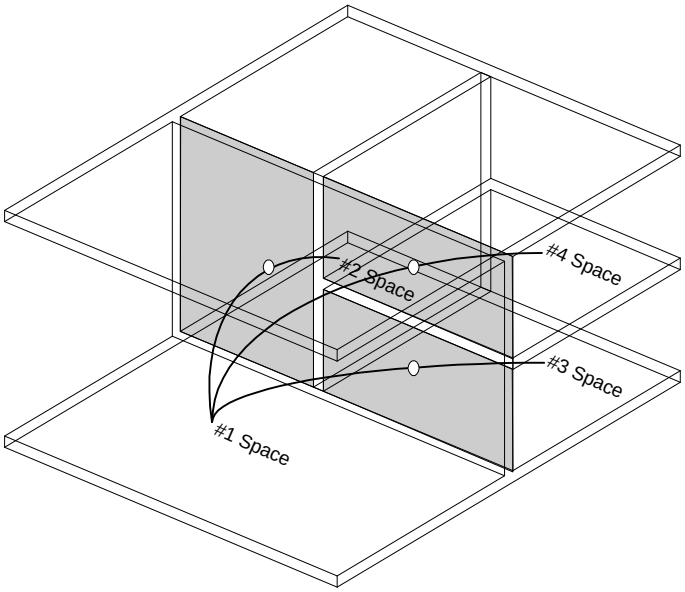
Arbitrary Geometric Representation

The arbitrary geometric representation of IfcSpace is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

17.25. Class IfcSpaceBoundary

17.25.1. Class Semantic Definition

Definition from IAI: The Space Boundary defines the physical or virtual delimiter of a Space. In case of physical Space Boundary, the Place and Shape is determined by the Element that provides the Space Boundary by virtue of the IfcRelSeparatesSpaces Relationship. In the case of virtual Space Boundary, the Place and Shape is given using the shape representation property defined for all Products. The following figure describes the area attribute (gray area) of the each IfcSpaceBoundary between two adjacent spaces.



ISSUE See issue I-193 for changes made in IFC Release 1.5.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

17.25.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcSpatialElement
IfcSpaceBoundary

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PhysicalOrVirtualBoundary	Defines, whether the Space Boundary is physical (Physical) or virtual (Virtual)	IfcPhysicalOrVirtualEnum	Physical	NotDefined	NotDefined
	InternalOrExternalBoundary	Defines, whether the Space Boundary is internal (Internal), or external, i.e. adjacent to open space (that can be an partially enclosed space, such as terrace (External).	IfcInternalOrExternalEnum	Internal	NotDefined	NotDefined
OPT	calcBoundarySurfaceArea	Total Gross (physical) Area of the boundary surface area facing the space. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcAreaMeasure	0	see type	0
INV	Bounds	Reference to one or two spaces that are delimited by this Boundary	SET [1:2] OF IfcSpace	n/a	n/a	NIL
INV	ProvidedBy	Reference to the objectified relationship that manages the	SET [0:1] OF IfcRelSeparatesSpaces	n/a	n/a	NIL

		Element to Space Boundary relationship, i.e. defines which Element provides the Space Boundary for a particular Space				

Formal Propositions

WR51	If the Space Boundary is physical, it shall be provided by an Element by virtue of the objectified relationship IfcRelSeparatesSpaces.

17.25.3. Interface Definitions

- I_SpaceBoundary

17.25.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcSpaceBoundary is given by the IfcProductShape and IfcLocalPlacement allowing multiple geometric representations. Included are:

Local Placement

The local placement for IfcSpaceBoundary is defined in its supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations. The PlacementRelTo relationship of IfcLocalPlacement shall point to the IfcBuildingStorey, if the containing building storey is defined for the space that is separated by the space boundary, and if relative placement is used for this IfcSpaceBoundary.

Standard Geometric Representation

The standard geometric representation of IfcSpaceBoundary is defined using **explicit geometry**. The IfcPolyLoop is the required geometric representation for IfcSpaceBoundary.

Currently, the usage of attribute driven geometry for IfcSpaceBoundary is not supported.

Advanced Geometric Representation

The advanced geometric representation of IfcSpaceBoundary is defined using **explicit geometry**. The IfcPolyLoop is the required geometric representation for IfcSpaceBoundary.

Currently, the usage of attribute driven geometry for IfcSpaceBoundary is not supported.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcSpaceBoundary is defined using **explicit geometry**. The IfcPolyLoop is the required geometric representation for IfcSpaceBoundary.

Currently, there is no difference in the usage of standard, advanced or arbitrary geometric representations for IfcSpaceBoundary.

17.26. Class IfcSpatialElement

17.26.1. Class Semantic Definition

Definition from IAI: Abstract Supertype for all space related entities. These are either Spaces or Space Boundaries.

17.26.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcSpatialElement
IfcSpace
IfcSpaceBoundary

Attributes and Relationships

No attributes defined at this level.

17.26.3. Interface Definitions

- I_SpatialElement

17.26.4. Geometry Use Definitions

There are no instances of this abstract class. However, subtypes of this class do have geometry defined.

17.27. Class IfcSystem

17.27.1. Class Semantic Definition

Definition from IAI: Organized combination of related parts within an AEC product, composed for a common purpose or function or to provide a service. System is essentially a functional related aggregation of products. The aggregation relationship to IfcProduct is handled by IfcRelGroups.

17.27.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcGroup
IfcSystem

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
INV	ServicesBuildings	Reference to the building via the objectified relationship IfcRelServicesBuildings, which is serviced by the system	SET [0:1] OF IfcRelServicesBuildings	n/a	n/a	NIL

17.27.3. Interface Definitions

- I_System

17.27.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation. However, they do contain other elements that do have geometry.

17.28. Class IfcZone

17.28.1. Class Semantic Definition

Definition from IAI: Modular or non-modular space between modular planes, which is provided for a component or a group of components which do not necessarily fill the space, or which may be left empty.

IfcZone is essentially an aggregation of Spaces, Partial Spaces or other Zones. It is view based delimited volume for the purpose of analysis and calculation. They cannot overlap with respect to that analysis. The IfcZone is also used to represent building sections by grouping the spaces of that section within a special zone.

17.28.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcGroup
      IfcZone

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR41	A Zone is grouped by the objectified relationship IfcRelGroups, Only objects of type IfcSpace or IfcZone are allowed as RelatedObjects at referencing IfcRelGroups.

17.28.3. Interface Definitions

- I_Zone

17.28.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation. However, they do contain other elements, which do have geometry.

17.29. Function IfcNoOfLayers

17.29.1. Function Semantic Definition

Definition IAI: This function returns the actual number of layers within an assigned material or material layer set.

17.30. PropertySet Pset_Asset

17.30.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all objects regards as assets.

17.30.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
OwnedNotLeased	Indication whether the asset is owned (TRUE) or leased (FALSE)	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
Owner	The owner/user of this asset (one of the building tenants)	IfcObjectReference	IfcPersonAndOrganization	n/a	n/a	NIL
Type	More specific description about the type of the asset	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Description	General description of the asset type	IfcSimpleProperty	IfcString	n/a	n/a	empty string
CurrentEstimatedValue	The current 'book' value of the asset	IfcObjectReference	IfcCost	0	see type	0

17.31. PropertySet Pset_BuildingCommon

17.31.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcBuilding.

17.31.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	General description of the building	IfcSimpleProperty	IfcString	n/a	n/a	empty string

17.32. PropertySet Pset_BuildingStoreyCommon

17.32.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcBuildingStorey.

17.32.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description for this type of the building storey	IfcSimpleProperty	IfcString	see type	see type	empty string

17.33. PropertySet Pset_ElementQuantities

17.33.1. PropertySet Semantic Definition

17.33.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
QuantityCalcStandard	The standard by which the quantities in this Pset are calculated. If not specified, measures are simple geometry calculations	IfcSimpleProperty	IfcString	see type	see type	empty string
LengthQuantity	The 1D length of this element (measured according to the standard). If standard not specified, then simple calculation of 1D length.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
AreaQuantity	The 2D area of this element (measured according to the standard). If standard not specified, then simple calculation of 2D surface area.	IfcSimpleProperty	IfcAreaMeasure	0	see type	0
VolumeQuantity	The 3D volume of this element (measured according to the standard). If standard not specified, then simple 3D volume calculation.	IfcSimpleProperty	IfcVolumeMeasure	0	see type	0
WeightQuantity	The weight of this element (measured according to the standard). If standard not specified, then physical weight as calculated from volumne and density.	IfcSimpleProperty	IfcMassMeasure	0	see type	0
CountQuantity	The count (number) of the element (measured according to the standard).	IfcSimpleProperty	IfcCountMeasure	0	see type	1
LengthQuantityDescription	Description for or about the length quantity value extraction	IfcSimpleProperty	IfcString	see type	see type	empty string
AreaQuantityDescription	Description for or about the area quantity value extraction	IfcSimpleProperty	IfcString	see type	see type	empty string
VolumeQuantityDescription	Description for or about the volume quantity	IfcSimpleProperty	IfcString	see type	see type	empty string

	value extraction					
WeightQuantityDescription	Description for or about the weight quantity value extraction	IfcSimpleProperty	IfcString	see type	see type	empty string
CountQuantityDescription	Description for or about the count quantity value extraction	IfcSimpleProperty	IfcString	see type	see type	empty string
Azimuth	Azimuth of the element as derived from the placement of the element shape, by convention: North = 0' and measurement is done clockwise (i.e. south = 90', if unit is grad) – the calculation procedure will be specific for each type of element. The following translations apply: G: Himmelsrichtung des Bauteils, J: HOUI-KAKU	IfcSimpleProperty	IfcPositivePlaneAngleMeasure	0	see type	0
Inclination	Azimuth of the element as derived from the placement of the element shape, by convention: Vertical = 0', horizontal = 90', if unit is grad) – the calculation procedure will be specific for each type of element. The following translations apply: G: Bauteilneigung, J: KEISHA-KAKU	IfcSimpleProperty	IfcPositivePlaneAngleMeasure	0	see type	0

17.34. PropertySet Pset_ManufactureOccurrence

17.34.1. PropertySet Semantic Definition

Definition from IAI: Properties about the occurrence specific manufacturer information. Can be attached to all IfcElement.

17.34.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
SerialNumber	The serial number assigned to the individual manufactured item	IfcSimpleProperty	IfcString	see type	see type	empty string
AcquisitionDate	The date that the manufactured item was purchased	IfcObjectReference	IfcCalendarDate	see type	see type	0

17.35. PropertySet Pset_OpeningElementCommon

17.35.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all generic opening types 'Recess' of IfcOpeningElement.

17.35.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description of this opening.	IfcSimpleProperty	IfcString	n/a	n/a	empty string

17.36. PropertySet Pset_SiteCommon

17.36.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcSite.

17.36.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description for this type of Site (note name is captured in the TypeDef object that references this PropertySet)	IfcSimpleProperty	IfcString	see type	see type	empty string
BuildableArea	Area of site that can be covered by buildings - according to local building codes.	IfcSimpleProperty	IfcAreaMeasure	0	see type	0
BuildingHeightLimit	Calculated maximum height of buildings on this site - according to local building codes.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	1

17.37. PropertySet Pset_SpaceCommon

17.37.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcSpace.

17.37.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description for this type of Space	IfcSimpleProperty	IfcString	see type	see type	empty string
CodeUseType	Occupancy type, as defined in the presiding building code.	IfcSimpleProperty	IfcString	see type	see type	empty string
SpaceCatalogue	Description of the space catalogue	IfcSimpleProperty	IfcString	see type	see type	empty string

ReqSommerSpace Temperature	Temperature for the hot (summer) period, that is required from user/designer view point.	IfcSimplePropertyWithUnit	IfcReal, ThermodynamicTemperature Unit	n/a	n/a	n/a
ReqSummerSpace Humidity	Humidity for the hot (summer) period, that is required from user/designer view point.	IfcSimplePropertyWithUnit	IfcReal, ThermodynamicHumidityUnit	n/a	n/a	n/a
ReqWinterSpaceTemperature	Temperature for the cold (winter) period, that is required from user/designer view point.	IfcSimplePropertyWithUnit	IfcReal, ThermodynamicTemperature Unit	n/a	n/a	n/a
ReqWinterSpaceHumidity	Humidity for the cold (winter) period, that is required from user/designer view point.	IfcSimplePropertyWithUnit	IfcReal, ThermodynamicHumidityUnit	n/a	n/a	n/a
ReqIntermediateSpaceTemperature	Temperature for the intermediate (spring, autumn) period, that is required from user/designer view point.	IfcSimplePropertyWithUnit	IfcReal, ThermodynamicTemperature Unit	n/a	n/a	n/a
ReqIntermediateSpaceHumidity	Humidity for the intermediate (spring, autumn) period, that is required from user/designer view point.	IfcSimplePropertyWithUnit	IfcReal, ThermodynamicHumidityUnit	n/a	n/a	n/a
ReqDiscontinuedHeating	True if discontinued heating is required/desirable from user/designer view point.	IfcSimpleProperty	IfcBoolean	TRUE	FALSE	FALSE
MainFireUse	Main fire use for the space which is assigned from the Fire Use Classification.	IfcSimpleProperty	IfcString	see type	see type	empty string
AncillaryFireUse	Ancillary fire use for the space which is assigned from the Fire Use Classification.	IfcSimpleProperty	IfcString	see type	see type	empty string
FireRiskFactor	Fire Risk factor assigned to the space	IfcSimpleProperty	IfcInteger	see type	see type	1
NaturalVentilation	Indication whether the space is ventilated natural (true) or mechanical (false).	IfcSimpleProperty	IfcBoolean	see type	see type	TRUE
SprinklerProtection	Indication whether the space is sprinkler protected (true) or not (false).	IfcSimpleProperty	IfcBoolean	see type	see type	FALSE

17.38. PropertySet Pset_SystemCommon

17.38.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcSystem.

17.38.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description for this type of System	IfcSimpleProperty	IfcString	see type	see type	empty string

17.39. PropertySet Pset_ZoneCommon

17.39.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcZone.

17.39.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description for this type of Zone	IfcSimpleProperty	IfcString	see type	see type	empty string
maxCeilingHeight	maximal height of the ceiling in the highest storey that is included in the zone.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	n/a
maxFlooringHeight	maximal height of the flooring in the highest storey that is included in the zone.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	n/a

18. IfcProjectMgmtExtension

The models in IfcProjectManagementExtension schema are abstract concepts used in project management processes in the general sense. They represent ways, conventions, methods, functions, and tools of how project management is generally performed. Most of the concepts in this schema don't have physical appearances. These models also support both construction management and facilities management, while the latter two schemas focus on more specific domain processes.

In IFC R2.0, the IfcProjectManagementExtension schema contains models that represent concepts such as budgets, cost estimates (or cost schedules), and project orders including change orders, purchase orders, and work orders.

HISTORY: new schema in IFC Release 2.0
IfcApproval is moved to IfcControlExtension

18.1. Type IfcChangeOrderStatusEnum

18.1.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

18.1.2. Enumeration

Proposing
Proposed
Requested
BeingApproved
Planning
WorkStarted
WorkDelayed

WorkDone
UserDefined
NotDefined

18.2. Type IfcCostUseEnum

18.2.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

18.2.2. Enumeration

ExtensionOnly
ElementOnly
ElementSetExtensionCalc
ExtensionSetElementCalc
UserDefined
NotDefined

18.3. Type IfcPurchaseOrderStatusEnum

18.3.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

18.3.2. Enumeration

Requested
BeingApproved
Issued
Received
ItemsReceived
UserDefined
NotDefined

18.4. Type IfcWorkOrderStatusEnum

18.4.1. Type Semantic Definition

History New Enumeration in IFC Release 2.0

18.4.2. Enumeration

Requested

BeingApproved
Planning
WorkStarted
WorkDelayed
WorkDone
UserDefined
NotDefined

18.5. Class IfcBudget

18.5.1. Class Semantic Definition

This classes represents a cost budget (i.e. an amount of money available from a source) available for projects. This class also allows tracking the history of the budget uses. The details of budget assignment and usage for multiple projects or plans are not handled in this class. IfcBudget is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

18.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcCostSchedule
        IfcBudget

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	BudgetNumber	The code number for the budget, given by user	STRING	empty string	n/a	empty string
OPT	Description	General description of the budget	STRING	empty string	n/a	empty string
OPT	BudgetSource	Description of the source of the budget	STRING	empty string	n/a	empty string
	Balance	the balance available on the budget. This value can also be calculated or derived from its base type IfcCost Schdule attribute values.	IfcCost	see type	see type	see type
	AvailableDate	The date that the budget becomes available	IfcDateTimeSelect	see type	see type	see type
OPT	AvailableDuration	The time longevity of the budget	IfcTimeMeasure	see type	see type	see type
OPT	BaseBudget	This allows tracking of the current budget status to date compared to the last previous budget.	IfcBudget	see type	see type	see type
	UpdateDate	The date that this budet is updated; this allows tracking the budget usage history	IfcDateTimeSelect	see type	see type	see type

18.5.3. Interface Definitions

- I_Budget

18.5.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

18.6. Class IfcChangeOrder

18.6.1. Class Semantic Definition

IfcChangeOrder represents a change order in a construction project. A change order can reference to the building elements such as walls to be changed through the control relationship (IfcRelControl) provided through IfcObject. A change order can also reference to the design documents that are to be changed. The document(s) that represents the change order itself can also be referenced through the IfcDocumentReference from IfcObject. It also specifies the cost estimate and work plan for the work requested by the change order. In addition to the properties provided by IfcProjectOrder, it also specify information such as change description, reasons for change, requested start time and requested finish time. IfcChangeOrder is a subtype of IfcProjectOrder.

History

New Entity in IFC Release 2.0

18.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcProjectOrder
IfcChangeOrder

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ChangeDescription	A general description of the change	STRING	empty string	n/a	empty string
OPT	ReasonForChange	A description of the problem for why a change is needed	STRING	empty string	n/a	empty string
OPT	RequestedStartTime	the start date requested for the work of change	IfcDateTimeSelect	see type	see type	see type
OPT	RequestedFinishTime	the finish date requested for the work of change	IfcDateTimeSelect	see type	see type	see type
	DocumentsForChange	The design, specification, or plan documents that the change needs to be made for.	SET [0:?] OF IfcDocumentReference	n/a	n/a	n/a
OPT	CostEstimate	The cost estimate for the change.	IfcCostSchedule	see type	see type	see type
OPT	WorkPlan	The work plan for the change.	IfcWorkPlan	see type	see type	see type
	Status	The status of the change order.	IfcChangeOrderStatusEnum	Proposing	WorkDone	Proposing

18.6.3. Interface Definitions

- I_ChangeOrder

18.6.4. Geometry Use Definitions

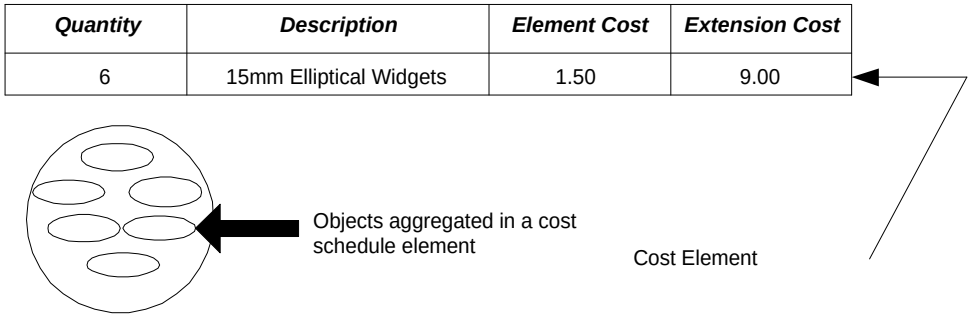
Instances of this class have no physical presence and therefore no geometric representation.

18.7. Class IfcCostElement

18.7.1. Class Semantic Definition

IfcCostElement is a cost with context information. It represents goods, services, or the execution of works of a described elemental nature in given conditions. This entity also has the capability of nesting other elements of the same type (i.e. IfcCostElement) through its relationships to IfcRelNestsCostElements.

The relationship to IfcObject through IfcRelCostsObjects specifies the objects to be costed by IfcCostElement instances. The following figure shows a cost element:



History

New Entity in IFC Release 2.0

18.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcCostElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description	General description of the cost element.	STRING	empty string	n/a	empty string
	ContextDescription	The contextual information of the cost such as purchase cost, installation cost, consulting cost, etc.	STRING	empty string	n/a	empty string
OPT	ElementCost	The cost of a single item of each 'Quantity'. It can be either a unit cost or an item cost depending on the context of the cost element.	IfcCost	see type	see type	see type

OPT	ExtensionCost	The summarized the cost of this cost element.	IfcCost	see type	see type	see type
	CostUse	Indicates how the value of the ElementCost and ExtensionCost is provided and thus how they should be used.	IfcCostUseEnum	ExtensionOnly	NoteDefined	ExtensionOnly
OPT	PreparedOn	The date that the cost is provided.	IfcDateTimeSelect	see type	see type	see type
OPT	Quantity	Indicates the quantity of the items refered by the cost element.	IfcMeasureWithUnit	see type	see type	see type
INV	CostSchedule	A reference to the cost schedule that the cost element belongs to.	IfcCostSchedule	see type	see type	see type

Formal Propositions

WR41	Restrict the relationship 'Nests' inherited from IfcObject to IfcRelNestsCostElement.
WR42	Restrict the relationship 'IsNestedBy' inherited from IfcObject to IfcRelNestsCostElement.
WR43	

18.7.3. Interface Definitions

- I_CostElement

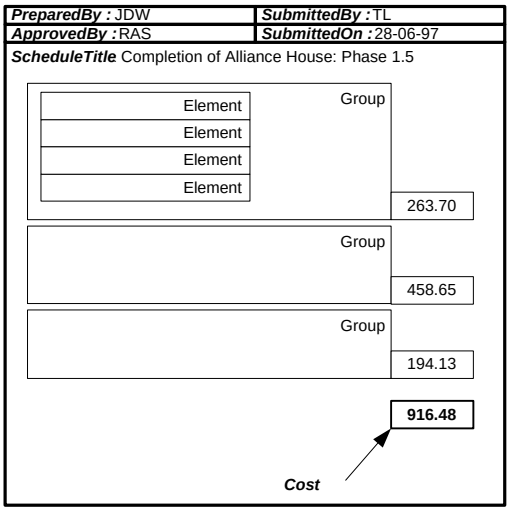
18.7.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

18.8. Class IfcCostSchedule

18.8.1. Class Semantic Definition

IfcCostSchedule is a class that contains a list of cost elements. It provides information such as a total cost, description and title of the cost schedule, a date when it is prepared and persons who prepared it. In IFC R2.0, it is used to represent a cost estimate and provide a super-type for IfcBudget. The following figure shows how a cost schedule would be used to present cost data.



History

New Entity in IFC Release 2.0

18.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcCostSchedule
IfcBudget

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Title		STRING	empty string	n/a	empty string
OPT	SubmittedBy		IfcActorSelect	see type	see type	see type
	ApprovedBy		SET [0:?] OF IfcActorSelect	see type	see type	see type
	PreparedBy		IfcActorSelect	see type	see type	see type
OPT	SubmittedOn		IfcDateTimeSelect	see type	see type	see type
	TotalCost	the total cost on the schedule	IfcCost	see type	see type	see type
	CostElements		LIST [0:?] OF IfcCostElement	n/a	n/a	n/a

Formal Propositions

WR1	Restrict the relationship 'Nests' inherited from IfcObject to IfcRelNestsCostSchedules.
WR2	Restrict the relationship 'IsNestedBy' inherited from IfcObject to IfcRelNestsCostSchedules.

18.8.3. Interface Definitions

- I_CostSchedule

18.8.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

18.9. Class IfcProjectOrder

18.9.1. Class Semantic Definition

This class represents common properties for project orders issued in a construction or facilities management project. The types of properties include a project order number, a general description, issuing date and company, the person who issued the project order, etc. The types of project orders handled in this release are change orders, purchase orders, and work orders. IfcProjectOrder is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

18.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcProjectOrder
IfcChangeOrder
IfcPurchaseOrder
IfcWorkOrder

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	OrderNo	The identification ID of the purchase order	STRING	empty string	n/a	empty string
OPT	Description	A general description of the project order	STRING	empty string	n/a	empty string
OPT	TransactionCode	Transaction code	STRING	empty string	n/a	empty string
	IssuingDate	The date that the order is issued	IfcDateTimeSelect	see type	see type	see type
	IssuingCompany	the compancy that issues the project order	IfcOrganization	see type	see type	see type
	IssuedBy	the person who issued the change order	IfcActorSelect	see type	see type	see type
	IssuedTo	the persons or companies that receives the orders. E.g. for purchase order, this represents the suppliers or dealers.	SET [0:?] OF IfcActorSelect	n/a	n/a	N/a
	AdditionalContacts	Additional contact person regarding the request.	SET [0:?] OF IfcActorSelect	n/a	n/a	N/a
OPT	Remark	Any general remark comment	STRING	empty string	n/a	empty string

18.9.3. Interface Definitions

- I_ProjectOrder

18.9.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

18.10. Class IfcPurchaseOrder

18.10.1. Class Semantic Definition

IfcChangeOrder represents a change order in a construction project. A change order can reference to the building elements such as walls to be changed through the control relationship (IfcRelControl) provided through IfcObject. A change order can also reference to the design documents that are to be changed. The document(s) that represents the change order itself can also be referenced through the IfcDocumentReference from IfcObject. It also specifies the cost estimate and work plan for the work requested by the change order. In addition to the properties provided by IfcProjectOrder, it also specify information such as change description, reasons for change, requested start time and requested finish time. IfcChangeOrder is a subtype of IfcProjectOrder.

History

New Entity in IFC Release 2.0

18.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcProjectOrder
IfcPurchaseOrder

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	RequiredDate	the required date of receiving the requested items	IfcDateTimeSelect	see type	see type	see type
OPT	ScheduledDate	the scheduled date of receiving the requested items	IfcDateTimeSelect	see type	see type	see type
OPT	ActualDate	actual date of receiving the purchased items	IfcDateTimeSelect	see type	see type	see type
OPT	IsFOB	is Free of Board?; True means 'yes'; False means 'not'	BOOLEAN	TRUE	FALSE	TRUE
OPT	ShipMethod	method of shipping	STRING	empty string	n/a	empty string
OPT	PurchaseItems	Use a cost schedule to handle the list of items with both item description and cost of each cost element in the cost schedule.	IfcCostSchedule	see type	see type	see type
OPT	TotalCost	total cost of the purchase. It is derived value from 'PurchaseItems'	IfcCost	see type	see type	see type
	Status	The status of the purchase order	IfcPurchaseOrderStatusEnum	Requested	ItemsReceived	Requested
OPT	BudgetSource	The source of the budget the costs will be out from for the purchase	IfcBudget	see type	see type	see type

18.10.3. Interface Definitions

- I_PurchaseOrder

18.10.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

18.11. Class IfcRelCostsObjects

18.11.1. Class Semantic Definition

This entity establishes a one-to-many relationship between IfcCostElement and IfcObject, so that an instance of IfcCostElement can be associated with instances of IfcObject. In IFCs all object cost information is provided through this objectified relationship. IfcRelCostsObjects is a subtype of IfcRelControls.

History

New Entity in IFC Release 2.0

18.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelControls
IfcRelCostsObjects

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR41	The relating control object shall be of type IfcCostElement.

18.11.3. Interface Definitions

- I_RelCostsObjects

18.11.4. Geometry Use Definitions

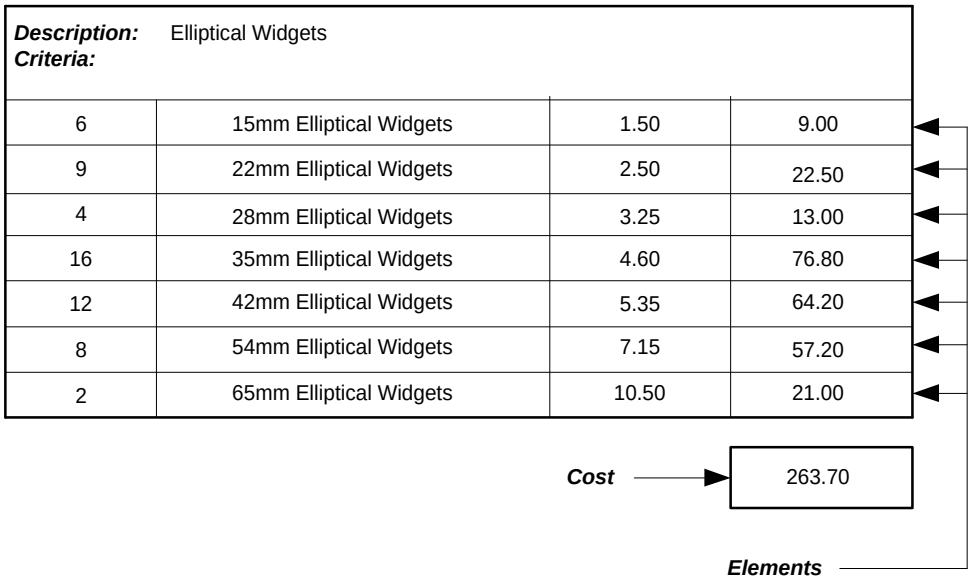
This class has no geometry representation.

18.12. Class IfcRelNestsCostElements

18.12.1. Class Semantic Definition

This entity provides a model mechanism to allow IfcCostElement to contain other items of the same type. It provides the relationships between the nesting IfcCostElement and nested IfcCostElement(s). It is a subtype of IfcRelNests.

The next figure shows how cost elements can be grouped into one element, represented by cost elements being nested within another cost element (using the IfcRelNestsCostElements objectified relationship).



Description: Elliptical Widgets ***Criteria:***			
6	15mm Elliptical Widgets	1.50	9.00
9	22mm Elliptical Widgets	2.50	22.50
4	28mm Elliptical Widgets	3.25	13.00
16	35mm Elliptical Widgets	4.60	76.80
12	42mm Elliptical Widgets	5.35	64.20
8	54mm Elliptical Widgets	7.15	57.20
2	65mm Elliptical Widgets	10.50	21.00
		Cost	263.70

History

New Entity in IFC Release 2.0

18.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelNests
      IfcRelNestsCostElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description		STRING	empty string	n/a	empty string
OPT	Criteria	Criteria for nesting the cost elements.	STRING			

Formal Propositions

WR41	Nesting item must be of type IfcCostElement
WR42	Nested items must be of type IfcCostElement

18.12.3. Interface Definitions

- I_RelNestsCostElements

18.12.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

18.13. Class IfcRelNestsCostSchedules

18.13.1. Class Semantic Definition

History

New Entity in IFC Release 2.0

18.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelNests
      IfcRelNestsCostSchedules

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description		STRING			
OPT	Criteria	Criteria for nesting cost schedules.	STRING			

Formal Propositions

WR1	Nesting object must be of type IfcCostSchedule.
WR2	Nesting objects must be of type IfcCostSchedule.

18.13.3. Interface Definitions

- I_RelNestsCostSchedules

18.14. Class IfcWorkOrder

18.14.1. Class Semantic Definition

IfcWorkOrder represents a work order requested to accomplish a construction or a maintenance work. It contains information about the building components that require the work (by the control relationship, i.e. IfcRelControl, through IfcObject), descriptions of the job, work type, contractual type, requested or actual start and finish time, a cost estimate to the work order, a work plan for the work required, and a budget source for the work. IfcWorkOrder is a subtype of IfcProjectOrder.

History

New Entity in IFC Release 2.0

18.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcProjectOrder

IfcWorkOrder

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ProductDescription	A textual description of the products that require the work.	STRING	empty sting	n/a	empty string
	ShortJobDescription	short description of the job requested	STRING	empty sting	n/a	empty string
OPT	LongJobDescription	description of the job requested	STRING	empty sting	n/a	empty string
OPT	WorkTypeRequested	work task type requested	STRING	empty sting	n/a	empty string
OPT	ContractualType	the contractual type of the work	STRING	empty sting	n/a	empty string
OPT	IfNotAccomplished	comments if the job is not accomplished	STRING	empty sting	n/a	empty string
OPT	RequestedStartTime		IfcDateTimeSelect	see type	see type	see type
OPT	RequestedFinishTime		IfcDateTimeSelect	see type	see type	see type
OPT	ActualStartTime		IfcDateTimeSelect	see type	see type	see type
OPT	ActualFinishTime		IfcDateTimeSelect	see type	see type	see type
OPT	CostEstimate	Total estimated cost. Use IfcCostSchedule to handle the detailed contexts of each cost item.	IfcCostSchedule	see type	see type	see type
OPT	WorkPlan	The work plan made for the work required by the work order	IfcWorkPlan	see type	see type	see type
OPT	BudgetSource	the budget source requested	IfcBudget	see type	see type	see type
	Status	the status of the work order in relation to work required	IfcWorkOrderStatusEnum	Requested	WorkDone	Requested

18.14.3. Interface Definitions

- I_WorkOrder

Interoperability Model Layer

19. IfcSharedBldgElements

The Schema IfcSharedBldgElements is defined at the Interoperability Layer and covers the definition of building elements that are shared among several IFC domain or application type models.

19.1. Type IfcCoveringTypeEnum

19.1.1. Type Semantic Definition

Definition from IAI: This enumeration defines the available Generic Types for IfcCovering.

History

This Enumeration has changed after IFC Release 1.5.1, please see the Migration Guide for details

19.1.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcCovering

19.1.3. Enumeration

Ceiling
Flooring
Cladding
CoveringMillwork
UserDefined
NotDefined

19.2. Type IfcDoorPanelTypeEnum

19.2.1. Type Semantic Definition

Definition from IAI: This enumeration defines the available Generic Types for IfcDoorPanel.

History

New Enumeration in IFC Release 2.0

19.2.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcDoorPanel

19.2.3. Enumeration

Swinging
Sliding

Revolving
Rollingup
UserDefined
NotDefined

19.3. Type IfcJointEnum

19.3.1. Type Semantic Definition

Definition from IAI: This enumeration defines the basic ways to describe the joining of elements.

History

New Enumeration in IFC Release 2.0

19.3.2. Enumeration

ExpansionJoint
EdgeJoint
ControlJoint
NotDefined

19.4. Type IfcPermeableCoveringTypeEnum

19.4.1. Type Semantic Definition

Definition from IAI: This enumeration defines the available Generic Types for IfcPermeableOpeningCover.

History

New Enumeration in IFC Release 2.0

19.4.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcPermeableCovering

19.4.3. Enumeration

Grill
Louver
Screen
UserDefined
NotDefined

19.5. Type IfcSlabTypeEnum

19.5.1. Type Semantic Definition

Definition from IAI: This enumeration defines the available Generic Types for IfcSlab.

19.5.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcSlab

19.5.3. Enumeration

Floor
Roof
UserDefined
NotDefined

19.6. Type IfcWindowPanelOperationEnum

19.6.1. Type Semantic Definition

Definition from IAI: This enumeration defines the basic ways to describe how window panels operate.

History

New Enumeration in IFC Release 2.0

19.6.2. Enumeration

SideHungRightHand
SideHungLeftHand
TiltAndTurnRightHand
TiltAndTurnLeftHand
TopHung
BottomHung
PivotHorizontal
PivotVertical
SlidingHorizontal
SlidingVertical
RemovableCasement
FixedCasement
OtherOperation
NotDefined

19.7. Type IfcWindowPanelTypeEnum

19.7.1. Type Semantic Definition

Definition from IAI: This enumeration defines the available Generic Types for IfcWindowPanel.

History

New Enumeration in IFC Release 2.0

19.7.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcWindowPanel

19.7.3. Enumeration

FixedPanel
Sliding
Swinging
Pivoting
UserDefined
NotDefined

19.8. Class IfcBeam

19.8.1. Class Semantic Definition

Definition from IAI:: IfcBeam is defined in the Architecture Domain and possibly reused by other domains. It represents a horizontal, or nearly horizontal structural member designed to carry loads.

ISSUE See issues I-330, I-365 for changes made in IFC Release 1.5.1

19.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcBeam

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	calcBeamSectionArea	Total Gross (physical) Area of the cross section (or profile) of the beam. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcAreaMeasure	see type	see type	NIL
OPT	calcBeamVolume	Total Gross (physical) Volume of the beam. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcVolumeMeasure	see type	see type	NIL

Formal Propositions

WR62	The material attribute of a beam shall use IfcMaterialComposite as the proper select type.

19.8.3. Interface Definitions

- I_Beam

19.8.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcBeam is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The definition of the object coordinate system for IfcBeam is defined in it's supertype IfcProduct. It is defined by the

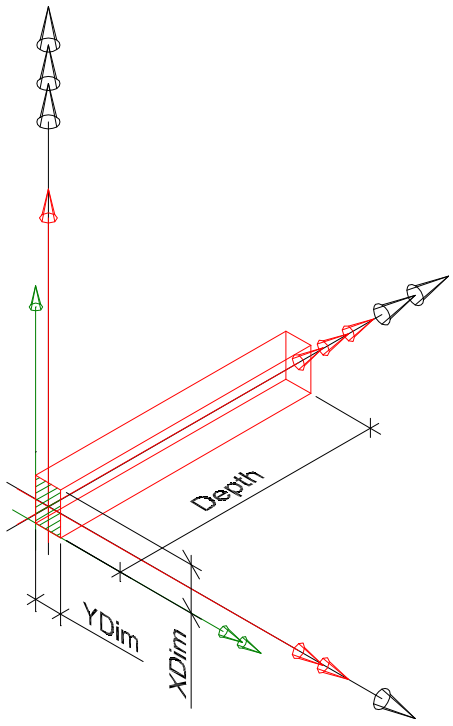
- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcBeam is defined using the **attribute driven geometry**. The following constraints apply to the standard representation:

- *Solid*: IfcAttDrivenExtrudedSolid is required, referring to a single segment,
- *Segment*: IfcAttDrivenExtrudedSegment is required,
- *Profile*: IfcRectangleProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded horizontally, i.e., coplanar to the XY plane of the co-ordinate system of element container, i.e. site, building or building storey)

Example for standard geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as beam length

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as beam width, XDim interpreted as beam height.

Extrusion Direction

The beam profile is extruded horizontally, i.e. coplanar to the XY plane of the co-ordinate system of the building storey.

Placement

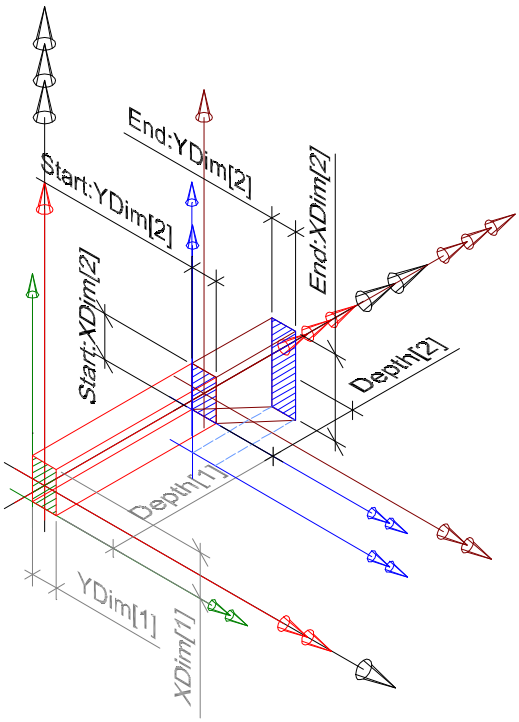
[Black arrows] The local placement of beam is placed relative to the co-ordinate system of the element container object, here IfcBuildingStorey.
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

Advanced Geometric Representation

The advanced geometric representation of IfcBeam is defined using the **attribute driven geometry**. The following constraints apply to the advanced representation:

- *Solid*: IfcAttDrivenExtrudedSolid and IfcAttDrivenClippedExtrudedSolid is required, referring to a single or multiple segments,
- *Segment*: IfcAttDrivenExtrudedSegment, IfcAttDrivenTaperedExtrudedSegment, and IfcAttDrivenMorphedExtrudedSegment is required,
- *Profile*: IfcRectangleProfileDef, IfcCircleProfileDef and IfcArbitraryProfileDef shall be supported.
- *Extrusion*: All extrusion directions shall be supported

Example for advanced geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid or IfcAttDrivenClippedExtrudedSolid referencing multiple (here two) IfcAttDrivenExtrudedSegment.
Default Type: Set of **IfcAttDrivenExtrudedSegment** and/or of **IfcAttDrivenMorphedExtrudedSegment** and/or **IfcAttDrivenTaperedExtrudedSegment** (Hereby haunched beams are supported)

- IfcAttDrivenExtrudedSegment[1..n].Depth, Extrusion paths defined by a positive length measure along the local z-axis.
- In case of IfcAttDrivenMorphedExtrudedSegment start and end profiles are given (see type for constraints on morphing)

Profile

Extrusion profile, for standard representation given by each IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as beam width, XDim interpreted as beam heigth.

Other Types: **IfcCircleProfileDef**

- Radius interpreted as beam radius.

Other Types: **IfcArbitraryProfileDef**

- IfcBoundedCurve (closed and 2D) defining an arbitrary beam shape

Extrusion Direction

The beam profile is extruded in any direction.

Placement

[Black arrows] The local placement of beam is placed relative to the co-ordinate system of the element container (e.g. the building storey).
[Red and brown arrows] The segments are placed relative to the local placement.
[Green and blue arrows] The profiles are placed relative to the XY planes of the placement co-ordinate systems of the segments.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcBeam is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

19.9. Class IfcBuiltIn

19.9.1. Class Semantic Definition

Definition from IAI:: Generalization for elements that are assembled on site; built-in and attached to the building permanently (e.g. built-in cabinets, countertops, railings, etc.).

ISSUE See issue I-159 for changes made in IFC Release 1.5.

19.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject

IfcProduct
IfcElement
IfcBuildingElement
IfcBuiltIn
IfcCabinet
IfcCounterOrShelf
IfcBuiltInAccessory

Attributes and Relationships

No attributes defined at this level.

19.9.3. Interface Definitions

- I_BuiltIn

19.9.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcBuiltIn is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Position

The Reference Geometry for IfcBuiltIn is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcBuiltIn is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcBuiltIn is not supported.

Advanced Geometric Representation

The advanced geometric representation of IfcBuiltIn is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcBuiltIn is not supported.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcBuiltIn is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, there is no difference in the usage of standard, advanced and arbitrary geometric representations for IfcBuiltIn.

19.10. Class IfcColumn

19.10.1. Class Semantic Definition

Definition from IAI: A vertical structural member which often is aligned with a structural grid intersection. IfcColumn is defined in the Architecture Domain and possibly reused by other domains. It represents a vertical, or nearly vertical structural member designed to transfer loads to its base.

ISSUE See issues I-330, I-365 for changes made in IFC Release 1.5.1

19.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcColumn

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	calcColumnSectionArea	Total Gross (physical) Area of the cross section (or profile) of the column. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcAreaMeasure	see type	see type	NIL
OPT	calcColumnVolume	Total Gross (physical) Volume of the column. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcVolumeMeasure	see type	see type	NIL

Formal Propositions

WR62	The material attribute of a beam shall use IfcMaterialComposite as the proper select type.

19.10.3. Interface Definitions

- I_Column

19.10.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcColumn is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The Reference Geometry for IfcColumn is defined in it's supertype IfcProduct. It is defined by the

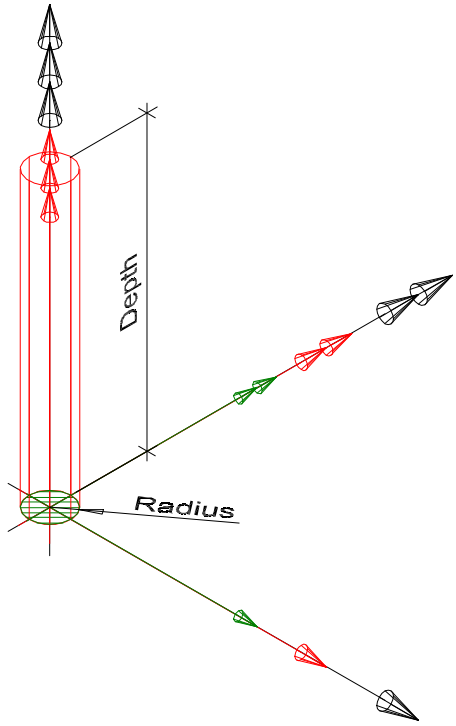
- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcColumn is defined using the **attribute driven geometry**. The following constraints apply to the standard representation:

- *Solid*: IfcAttDrivenExtrudedSolid is required, referring to a single segment,
- *Segment*: IfcAttDrivenExtrudedSegment is required,
- *Profile*: IfcRectangleProfileDef and IfcCircleProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded vertically, i.e., along the positive Z Axis of the co-ordinate system of element container, i.e. site, building or building storey)

Example for standard geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as column height

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as column width, XDim interpreted as column height.

Other Type: **IfcCircleProfileDef** (used in example)

- Radius is interpreted as column radius.

Extrusion Direction

The column profile is extruded vertically, i.e. along the z-axis of the co-ordinate system of the building storey.

Placement

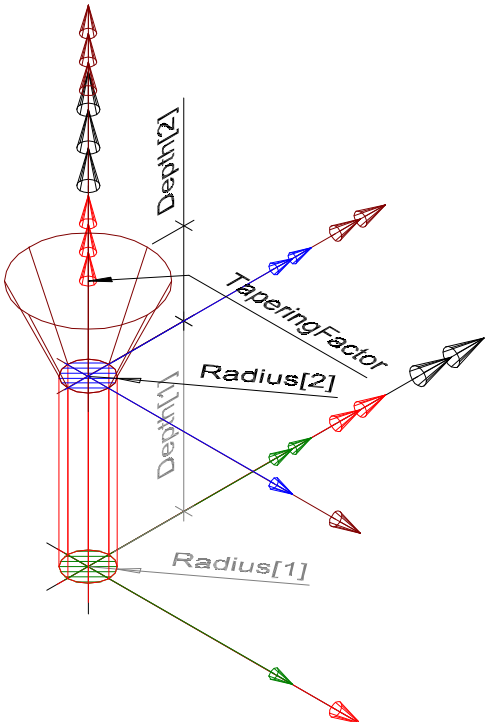
[Black arrows] The local placement of beam is placed relative to the co-ordinate system of the element container object, here IfcBuildingStorey.
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

Advanced Geometric Representation

The advanced geometric representation of IfcColumn is defined using the **attribute driven geometry**. The following constraints apply to the advanced representation:

- *Solid*: IfcAttDrivenExtrudedSolid and IfcAttDrivenClippedExtrudedSolid is required, referring to a single or multiple segments,
- *Segment*: IfcAttDrivenExtrudedSegment, IfcAttDrivenTaperedExtrudedSegment and IfcAttDrivenMorphedExtrudedSegment is required,
- *Profile*: IfcRectangleProfileDef, IfcCircleProfileDef and IfcArbitraryProfileDef shall be supported.
- *Extrusion*: All extrusion directions shall be supported

Example for advanced geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing multiple (here two) IfcAttDrivenExtrudedSegment.
Default Type: Set of **IfcAttDrivenExtrudedSegment** and/or of **IfcAttDrivenMorphedExtrudedSegment** and/or **IfcAttDrivenTaperedExtrudedSegment** (Hereby "mushroom" columns are supported)

- IfcAttDrivenExtrudedSegment[1..n].Depth, Extrusion paths defined by a positive length measure along the local z-axis.
- In case of IfcAttDrivenMorphedExtrudedSegment start and end profiles are given (see type for constraints on morphing)

Profile

Extrusion profile, for standard representation given by each IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as column width, XDim interpreted as column depth.

Other Types: **IfcCircleProfileDef** (used in example)

- Radius interpreted as column radius.

Other Types: **IfcArbitraryProfileDef**

- IfcBoundedCurve (closed and 2D) defining an arbitrary column shape

Extrusion Direction

The column profile is extruded in any direction.

Placement

[Black arrows] The local placement of column is placed relative to the co-ordinate system of the element container, e.g. the building storey.
[Red and brown arrows] The segments are placed relative to the local placement.
[Green and blue arrows] The profiles are placed relative to the XY planes of the placement co-ordinate systems of the segments.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcColumn is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

19.11. Class IfcCovering

19.11.1. Class Semantic Definition

Definition from IAI: Supertype for any object which covers some part of and is fully dependent on another. Additionally, the geometry for this object is determined by the 'owning' object. Examples include wall, floor and ceiling coverings, finish trim, and base molding.

ISSUE See issue I-195 for changes made in IFC Release 1.5.
See issues I-330, I-365 for changes made in IFC Release 1.5.1

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

19.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement

IfcBuildingElement
IfcCovering

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType		IfcCoveringTypeEnum			
	LayerInformation	Relationship to the Material Layer Set Usage Information, that defines the offset, direction sense, and total thickness against the path definition of the attribute driven shape representation.	IfcMaterialLayerSetUsage	see type	see type	n/a
OPT	calcCoveringArea	Total Gross (physical) Area of the covering facing. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcAreaMeasure	see type	see type	NIL
	HasMaterial	Ensures that the inherited HasMaterial relationship points to the same instance of IfcMaterialLayerSet as the referenced IfcMaterialLayerSetUsage.	IfcMaterialSelect	see type	see type	n/a
INV	Covers	Reference to the objectified relationship that handles the relationship of the Covering to the covered Building Element.	IfcRelCoversBldgElements	see type	see type	n/a
INV	AttachedTo	Reference to the objectified relationship that handles the relationship of the Covering to the space boundary to which the covering is attached to.	SET [0:?] OF IfcRelAttachesToBoundaries	see type	see type	n/a

Formal Propositions

WR63	
WR62	The material attribute of a covering shall use IfcMaterialLayerSet as the proper select type.

19.11.3. Interface Definitions

- I_Covering

19.11.4. Type Definitions

Common PropertySet

Pset_CoveringCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
Ceiling	Pset_CoveringCeiling
Flooring	Pset_CoveringFlooring
Cladding	Pset_CoveringCladding
CoveringMillwork	Pset_CoveringMillwork
NotDefined	
UserDefined	

19.11.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcCovering is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The Reference Geometry for IfcCovering is defined in it's supertype IfcProduct. It is defined by the

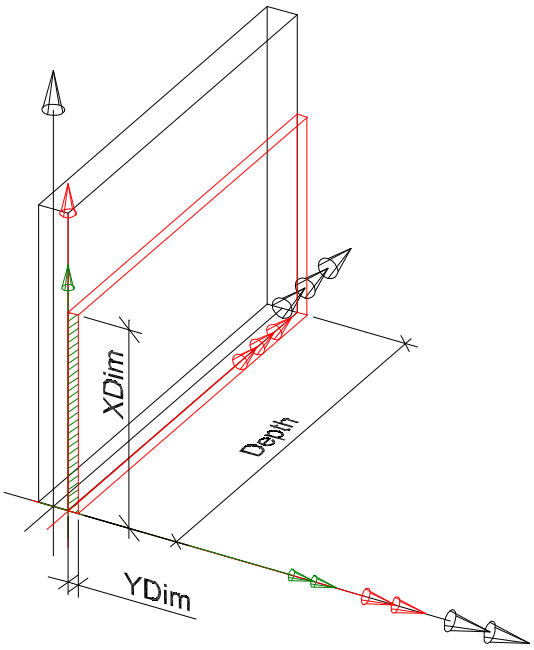
- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcCovering is defined using the **attribute driven geometry**. The following constraints apply to the standard representation:

- *Solid*: only IfcAttDrivenExtrudedSolid is required, referring to a single segment,
- *Segment*: only IfcAttDrivenExtrudedSegment is required,
- *Profile*: only IfcRectangleProfileDef shall be supported.
- *Extrusion*: the profile shall be extruded along the z-axis of the local co-ordinate system of the building element which is covered (using the IfcRelCoversBldgElements relationship).

Example for standard geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as the length of the covering along the building element.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as covering thickness, XDim interpreted as height.

Extrusion Direction

The covering profile is extruded horizontally, i.e. along the z-axis of the co-ordinate system of the building element, which is covered.

Placement

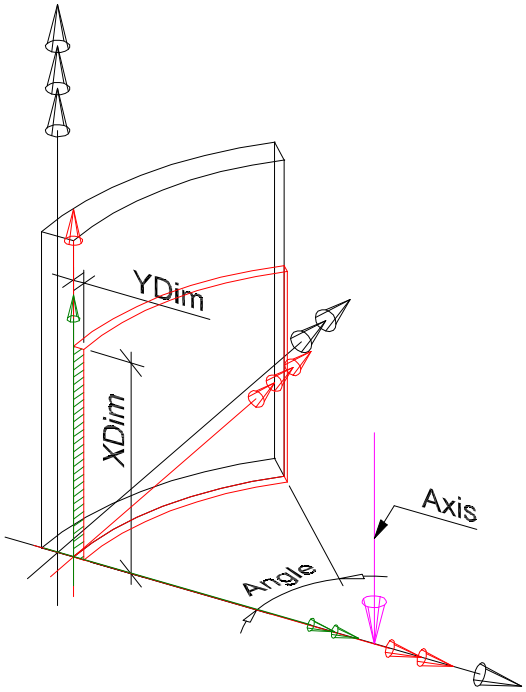
[Black arrows] The local placement of beam is placed relative to the co-ordinate system of the building element which is covered.
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

Advanced Geometric Representation

The advanced geometric representation of IfcCovering is defined using the **attribute driven geometry**. The following constraints apply to the advanced representation:

- *Solid*: IfcAttDrivenExtrudedSolid, IfcAttDrivenClippedExtrudedSolid and IfcAttDrivenRevolvedSolid, IfcAttDrivenClippedRevolvedSolid is required, referring to a single segment,
- *Segment*: IfcAttDrivenExtrudedSegment and IfcAttDrivenRevolvedSolid is required,
- *Profile*: IfcRectangleProfileDef and IfcArbitraryProfileDef shall be supported,
- *Extrusion*: the profile shall be extruded along the z-axis of the local co-ordinate system of the building element which is covered (using the IfcRelCoversBldgElements relationship).

Example for advanced geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid, IfcAttDrivenClippedExtrudedSolid and IfcAttDrivenRevolvedSolid, IfcAttDrivenClippedRevolvedSolid referencing a single IfcAttDrivenExtrudedSegment or IfcAttDrivenRevolvedSolid.
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as the length of the covering along the building element.

Other Type: **IfcAttDrivenRevolvedSegment** (used in example)

- IfcAttDrivenRevolvedSegment.Axis, IfcAxis1Placement defining the axis for revolution (shall be the same as for the covered building element); IfcAttDrivenRevolvedSegment.Angle plane angle measure defining the arc length of the covering along the building element.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- YDim interpreted as covering thickness, XDim interpreted as covering height

Other Type: **IfcArbitraryProfileDef**

- CurveForSurface: closed bounded curve interpreted as covering area of the covering

Extrusion Direction

The covering profile is extruded horizontally, i.e. along the z-axis of the co-ordinate system of the building element, which is covered.

Placement

[Black arrows] The local placement of beam is placed relative to the co-ordinate system of the building element which is covered.
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcColumn is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

19.12. Class IfcCurtainWall

19.12.1. Class Semantic Definition

Definition from IAI: Exterior wall of a building which is an assembly of components, hung from the edge of the floor/roof structure rather than bearing on a floor. Curtain wall is represented as an building element assembly and implemented as subtype of IfcBuildingElement that uses an IfcRelAssembliesElement relationship.

History

New Entity in IFC Release 2.0

19.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement

IfcCurtainWall

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR61	Either the curtain wall is not decomposed into its curtain wall elements (the curtain wall can have independent geometry), or the geometry shall not be given at IfcCurtainWall directly.

19.12.3. Interface Definitions

- I_CurtainWall

19.12.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcCurtainWall is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Independent geometric representations, as described below, should only be used when the IfcCurtainWall is not defined as an aggregate. If defined as an aggregate, the geometric representation is the sum of the representation of the components within the aggregate.

Local Position

The Reference Geometry for IfcCurtainWall is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcCurtainWall is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcCurtainWall is not supported.

Advanced Geometric Representation

The advanced geometric representation of IfcCurtainWall is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcCurtainWall is not supported.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcCurtainWall is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, there is no difference in the usage of standard, advanced and arbitrary geometric representations for IfcCurtainWall.

19.13. Class IfcDoor

19.13.1. Class Semantic Definition

Definition from IAI: IfcDoor is defined in the Architecture Domain and possibly reused by other domains. It represents a construction for closing an opening, intended primarily for access.

ISSUE See issue I-303, I-330 for changes made in IFC Release 1.5.1.

19.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDoor

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR61	Either the door handles the geometric representation (if not subdivided into ist components by IfcRelAssemblesElements) or it is handled by the constituent parts - door frame and door panel.

19.13.3. Interface Definitions

- I_Door

19.13.4. Geometry Use Definitions

The geometric representation of IfcDoor is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Independent geometric representations, as described below, should only be used when the IfcCurtainWall is not defined as an aggregate. If defined as an aggregate, the geometric representation is the sum of the representation of the components within the aggregate.

Included are:

Local Placement

The Reference Geometry for IfcDoor is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Geometric Representation

The standard geometric representation of IfcDoor is defined as agreed by the implementers agreement for IFC Release 1.5.1. Eventual changes for Release 2.0 still needs to be defined.

19.14. Class IfcDoorLining

19.14.1. Class Semantic Definition

Definition from IAI: A description of the door lining.

History

New Entity in IFC Release 2.0

See AR-1 for requirements for IFC Release 2.0

19.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcDoorLining

Attributes and Relationships

No attributes defined at this level.

19.14.3. Interface Definitions

- I_DoorFrame

19.14.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcDoorLining is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The Reference Geometry for IfcDoorLining is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Geometric Representation

The standard geometric representation of IfcDoorLining is defined as agreed for handling the door lining by the implementers agreement for IFC Release 1.5.1. Eventual changes for Release 2.0 still needs to be defined.

19.15. Class IfcDoorPanel

19.15.1. Class Semantic Definition

Definition from IAI: A description of the door panel.

History

New Entity in IFC Release 2.0

19.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement

IfcBuildingElement
IfcDoorPanel

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enum. Type driven Psets are defined for each generic type (as the required attributes differ). The GenericType for a given instance drives determines the type of Pset attached at runtime throug the associated TypeDefinitions relationship (defined at the IfcObject supertype).	IfcDoorPanelTypeEnum	Swinging	NotDefined	Swinging

Formal Propositions

WR62	
WR61	The material attribute of a door panel shall use IfcMaterialList as the proper select type.

Informal Propositions

IP61	The material assigned for glazing (if given) shall be part of the material composite list assigned by the HasMaterial attribute as defined at the supertype.

19.15.3. Interface Definitions

- I_DoorPanel

19.15.4. Type Definitions

Common PropertySet

Pset_DoorPanelCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
Swinging	Pset_DoorPanelSwinging
Sliding	Pset_DoorPanelSliding
Revolving	Pset_DoorPanelRevolving
Rollingup	Pset_DoorPanelRollingup
NotDefined	
UserDefined	

19.15.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcDoorPanel is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The Reference Geometry for IfcDoorPanel is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Geometric Representation

The standard geometric representation of IfcDoorPanel is defined as agreed for handling the door lining by the implementers agreement for IFC Release 1.5.1. Eventual changes for Release 2.0 still needs to be defined.

19.16. Class IfcPermeableCovering

19.16.1. Class Semantic Definition

Definition from IAI: Permeable cover for an opening which allows airflow (definition BS 6100).

History

New Entity in IFC Release 2.0

19.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcPermeableCovering

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enum. Type driven Psets are defined for each generic type (as the required attributes differ). The GenericType for a given instance drives determines the type of Pset attached at runtime throug the associated TypeDefinitions relationship (defined at the IfcObject supertype).	IfcPermeableCoveringTypeEnum	Grate	Screen	Screen

Formal Propositions

WR61	

19.16.3. Interface Definitions

- I_PermeableOpeningCover

19.16.4. Type Definitions

Common PropertySet

Pset_PermeableCoveringCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
Grill	Pset_PermeableCoveringGrill
Louver	Pset_PermeableCoveringLouver
Screen	Pset_PermeableCoveringScreen
UserDefined	
NotDefined	

19.16.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcPermeableCovering is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Position

The Reference Geometry for IfcPermeableCovering is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcPermeableCovering is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcPermeableCovering is not supported.

Advanced Geometric Representation

The advanced geometric representation of IfcPermeableCovering is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcPermeableCovering is not supported.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcPermeableCovering is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, there is no difference in the usage of standard, advanced and arbitrary geometric representations for IfcPermeableCovering.

19.17. Class IfcRelAttachesToBoundaries

19.17.1. Class Semantic Definition

Definition from IAI: Objectified relationship between a space boundary and one to many coverings, which are attached to the space boundary.

History

New Entity in IFC Release 2.0

19.17.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelAttachesToBoundaries

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingSpaceBoundary	Relationship to the space boundary to which the covering is attached to.	IfcSpaceBoundary	see type	see type	n/a
	RelatedCoverings	Relationship to the list of coverings that are attached to the space boundary.	LIST [1:?] OF IfcCovering	1	N	1

19.17.3. Interface Definitions

- I_RelCoversBldgElements

19.17.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry – there is no geometry use definition.

19.18. Class IfcRelCoversBldgElements

19.18.1. Class Semantic Definition

Definition from IAI: Objectified relationship between a building element and one to many coverings, which do cover the building element.

19.18.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelCoversBldgElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingBuildingElement	Relationship to the Building Element that is covered.	IfcBuildingElement	see type	see type	n/a
	RelatedCoverings	Relationship to the List of Coverings at this Building Element.	LIST [1:?] OF IfcCovering	1	N	1

19.18.3. Interface Definitions

- I_RelCoversBldgElements

19.18.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry – there is no geometry use definition.

19.19. Class IfcRelJoinsElements

19.19.1. Class Semantic Definition

Definition from IAI: Describes either an expansion joint, edge condition, control joint.

History

New Entity in IFC Release 2.0

19.19.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelConnectsElements
IfcRelJoinsElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	JointElements	Objects that make up the joint (fill the gap)	LIST [0:?] OF IfcBuildingElement	n/a	n/a	empty list
	JoinType	Purpose of the joint	IfcJointEnum	Control	Expansion	NotDefined
OPT	RangeOfMovement	Distance the joint can open before failing	IfcPositiveLengthMeasure	0	n/a	NIL
OPT	FireRating	Time duration for fire resistence the roof assembly is rated	IfcTimeMeasure	0	n/a	NIL
	WaterProofingRequired	Flag that indicates that the joint should be waterproof or not	LOGICAL	FALSE	TRUE	UNKNOWN
	VentilationRequired	Is ventilation required for this joint?	LOGICAL	FALSE	TRUE	UNKNOWN

19.19.3. Interface Definitions

- I_RelJoinsElements

19.19.4. Geometry Use Definitions

This objectified relationship does not carry additional geometry – there is no geometry use definition.

19.20. Class IfcRoof

19.20.1. Class Semantic Definition

Definition from IAI: A description of the total roof.

History

New Entity in IFC Release 2.0

19.20.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcRoof

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	calcTotalRoofSurfaceArea	Total surface area of the roof. Note: this is a calculated value, based on all of the roofslabs included in this roof.	IfcAreaMeasure	n/a	n/a	NIL

Formal Propositions

WR61	Either the roof is not decomposed into its roof slabs (the roof can have independent geometry), or the geometry shall not be given at IfcRoof directly.

19.20.3. Interface Definitions

- I_Roof

19.20.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcRoof is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Independent geometric representations, as described below, should only be used when the IfcCurtainWall is not defined as an aggregate. If defined as an aggregate, the geometric representation is the sum of the representation of the components within the aggregate.

Local Position

The Reference Geometry for IfcRoof is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcRoof is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcRoof is not supported.

Advanced Geometric Representation

The advanced geometric representation of IfcRoof is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcRoof is not supported.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcRoof is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, there is no difference in the usage of standard, advanced and arbitrary geometric representations for IfcRoof.

19.21. Class IfcSlab

19.21.1. Class Semantic Definition

Definition from IAI: Slab (shape) component of the construction that normally encloses a space vertically. Construction that provides the lower surface (floor) or upper surface (roof slab) in any space in a building. It shall be noted, that only the core or constructional part of this construction is considered to be a slap. The upper finish (flooring, roofing) and the lower finish (ceiling) are considered to be coverings.

ISSUE See issues I-155, I-156, I-157 for changes made in IFC Release 1.5.
See issues I-330, I-365 for changes made in IFC Release 1.5.1

19.21.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcSlab
IfcLanding

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enum. Type driven Psets are defined for each generic type (as the required attributes differ). The GenericType for a given instance drives determines the type of Pset attached at runtime throug the associated TypeDefinitions relationship (defined at the IfcObject supertype).	IfcSlabTypeEnum	SolidSlab	ElementedSlab	NotDefined
	LayerInformation	Relationship to the Material Layer Set Usage Information, that defines the offset, direction sense, and total thickness against the path definition of the attribute driven shape representation.	IfcMaterialLayerSetUsage	see type	see type	n/a
OPT	calcSlabArea	Total Gross (physical) Area of the slab. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcAreaMeasure	see type	see type	NIL
OPT	calcSlabVolume	Total Gross (physical) Volume of the	IfcVolumeMeasure	see type	see type	NIL

		slab. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.				
	HasMaterial	Ensures that the inherited HasMaterial relationship points to the same instance of IfcMaterialLayerSet as the referenced IfcMaterialLayerSetUsage.	IfcMaterialSelect	see type	see type	n/a

Formal Propositions

WR63	
WR62	The material attribute of a slab shall use IfcMaterialLayerSet as the proper select type.

19.21.3. Interface Definitions

- I_RoofSlab

19.21.4. Type Definitions

Common PropertySet

Pset_SlabCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
Floor	Pset_SlabFloor
Roof	Pset_SlabRoof
NotDefined	
UserDefined	

19.21.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcSlab is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The Reference Geometry for IfcSlab is defined in it's supertype IfcProduct. It is defined by the

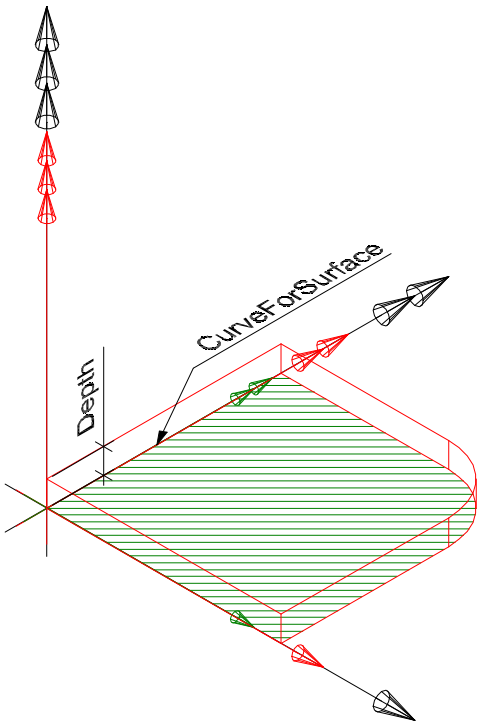
- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcSlab is defined using the **attribute driven geometry**. The following constraints apply to the standard representation:

- *Solid*: IfcAttDrivenExtrudedSolid is required, referring to a single segment.
- *Segment*: IfcAttDrivenExtrudedSegment is required.
- *Profile*: IfcRectangleProfileDef and IfcArbitraryProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded vertically, i.e., along the positive Z Axis of the co-ordinate system of the element container, i.e. site, building or building storey

Example for standard geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as the thickness of the roof slab.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- XDim interpreted as length of roof slab, YDim interpreted as width of roof slab.

Other Type: **IfcArbitraryProfileDef**

- CurveForSurface: closed bounded curve interpreted as area (or foot print) of the roof slab.

Extrusion Direction

The slab profile is extruded vertically, i.e. along the z-axis of the co-ordinate system of the element container (e.g., the building storey).

Placement

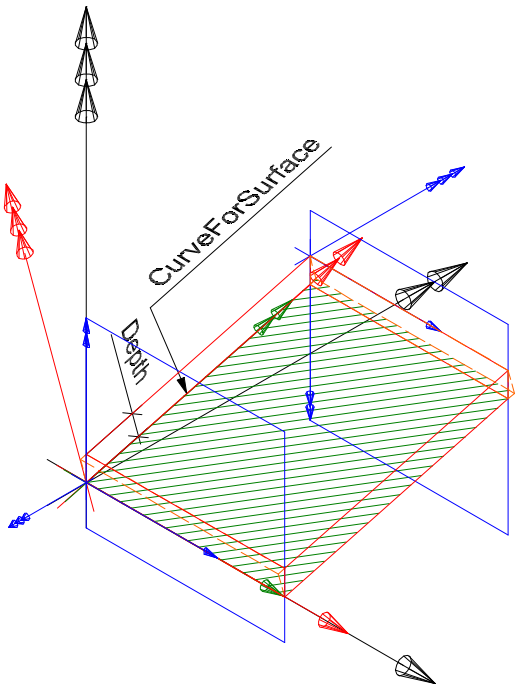
[Black arrows] The local placement of slab is placed relative to the co-ordinate system of the element container, e.g., the building storey.
[Red arrows] The segment is placed relative to the local placement.
*[*Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

Advanced Geometric Representation

The advanced geometric representation of IfcSlab is defined using the **attribute driven geometry**. The following constraints apply to the advanced representation:

- *Solid*: IfcAttDrivenExtrudedSolid and IfcAttDrivenClippedExtrudedSolid is required, referring to a single or multiple segments.
- *Segment*: IfcAttDrivenExtrudedSegment is required.
- *Profile*: IfcRectangleProfileDef and IfcArbitraryProfileDef shall be supported.
- *Extrusion*: All extrusion directions shall be supported.

Example for advanced geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid or IfcAttDrivenClippedExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as the thickness of the roof slab.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

- XDim interpreted as length of roof slab, YDim interpreted as width of roof slab.

Other Type: **IfcArbitraryProfileDef**

- CurveForSurface: closed bounded curve interpreted as area (or foot print) of roof slab.

Extrusion Direction

The slab profile shall be extruded into any direction.

Placement

[Black arrows] The local placement of slab is placed relative to the co-ordinate system of the element container, e.g., the building storey.
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcSlab is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

19.22. Class IfcWall

19.22.1. Class Semantic Definition

Definition from IAI: IfcWall represents a vertical construction that bounds or subdivides Spaces. It is the common concept of a wall that will be later specialized in the various domains.

ISSUE See issue I-155, I-156, I-157 for changes made in IFC Release 1.5.
See issues I-288, I-330, I-365 for changes made in IFC Release 1.5.1

19.22.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcWall

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LayerInformation	Relationship to the Material Layer Set Usage Information, that defines the offset, direction sense, and total	IfcMaterialLayerSetUsage	see type	see type	n/a

		thickness against the path definition of the attribute driven shape representation.				
OPT	calcWallArea	Total Gross (physical) Area of the wall. Measured as vertical wall face, perpendicular to the center line of the wall. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcAreaMeasure	see type	see type	NIL
OPT	calcWallVolume	Total Gross (physical) Volume of the wall. Exposed as an attribute by file-based exchange, particularly for receiving applications with limited (or not existing) geometric capabilities.	IfcVolumeMeasure	see type	see type	NIL
	HasMaterial	Ensures that the inherited HasMaterial relationship points to the same instance of IfcMaterialLayerSet as the referenced IfcMaterialLayerSetUsage.	IfcMaterialSelect	see type	see type	n/a

Formal Propositions

WR62	The material attribute of a wall shall use IfcMaterialLayerSet as the proper select type.

19.22.3. Interface Definitions

- I_Wall

19.22.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcWall is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The Reference Geometry for IfcWall is defined in it's supertype IfcProduct. It is defined by the

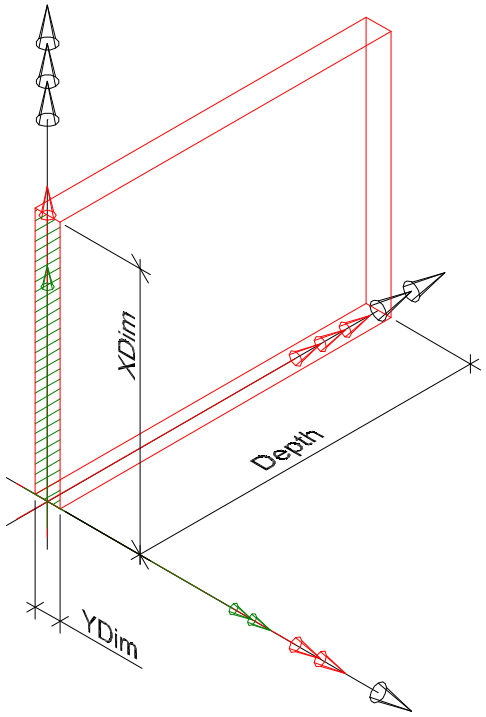
- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcWall is defined using the **attribute driven geometry**. The following constraints apply to the standard representation:

- *Solid*: IfcAttDrivenExtrudedSolid is required, referring to a single segment.
- *Segment*: IfcAttDrivenExtrudedSegment is required.
- *Profile*: IfcRectangleProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded horizontally, i.e., coplanar to the XY Plane of the co-ordinate system of the element container
- *Connection*: The IfcRelConnectsPathElements relationship shall be used at least for both horizontal ends of the IfcWall, if those ends connect to other building elements. The connection geometry shall not be specified to allow for logical connections using the priorities only. Only single layer walls can be connected.

Example for standard geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid referencing a single IfcAttDrivenExtrudedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as the length of the wall.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

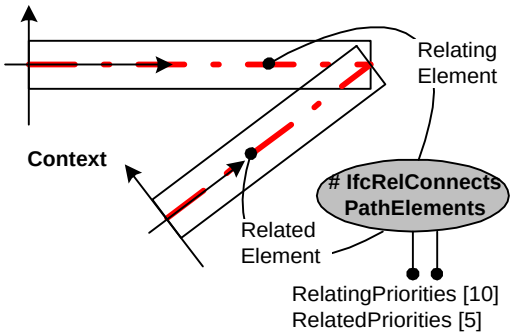
- YDim interpreted as wall thickness, XDim interpreted as wall height.

Extrusion Direction

The wall profile is extruded horizontally, i.e. co-planar to the XY plane of the co-ordinate system of the element container, e.g. the building storey.

Placement

[Black arrows] The local placement of beam is placed relative to the co-ordinate system of the building element which is covered.
[Red arrows] The segment is placed relative to the local placement.
[Green arrows] The profile is placed relative to the XY plane of the placement co-ordinate system of the segment.

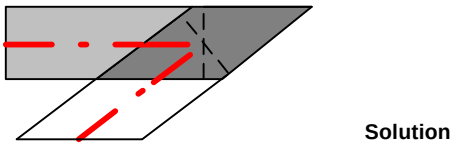


Connection

The walls are connected using the IfcRelConnectsPathElements logical relationship, i.e. no connection geometry is given. The intersection of both lengthened walls (when viewed in ground view) shall be added to the wall with higher priorities (as given by the RelatingPriorities and RelatedPriorities attributes. If the priorities are equal, the intersection shall be added to the RelatingElement.

The following additional propositions for standard geometric representation (with standard connectivity) apply:

- Both walls shall be single layer walls
- Both walls shall have the same height (XDim attribute)

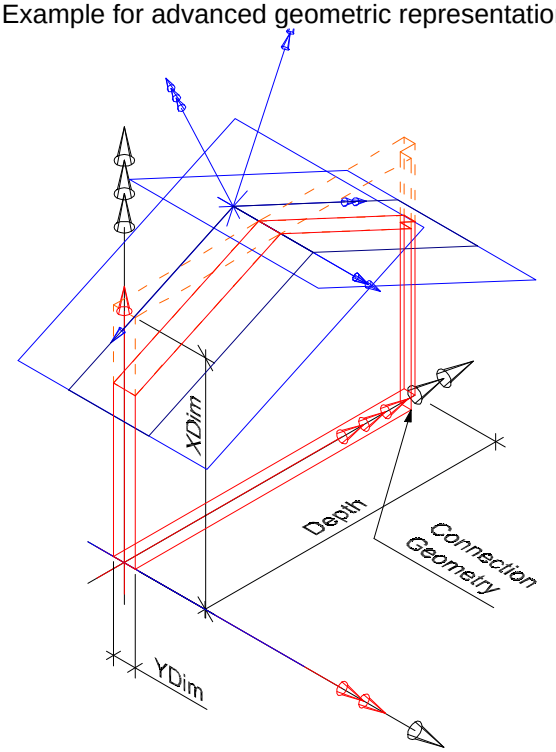


Advanced Geometric Representation

The advanced geometric representation of IfcWall is defined using the **attribute driven geometry**. The following constraints apply to the advanced representation:

- *Solid*: IfcAttDrivenExtrudedSolid, IfcAttDrivenClippedExtrudedSolid and IfcAttDrivenRevolvedSolid, IfcAttDrivenClippedRevolvedSolid is required, referring to a single or multiple segments.
- *Segment*: IfcAttDrivenExtrudedSegment, IfcAttDrivenRevolvedSegment is required.
- *Profile*: IfcRectangleProfileDef shall be supported.
- *Extrusion*: The profile shall be extruded horizontally, i.e., coplanar to the XY Plane of the co-ordinate system of the element container i.e. site, building or building storey.
- *Connection*: The IfcRelConnectsPathElements relationship shall be used at least for both horizontal ends of the IfcWall, if those ends connect to other building elements. The connection geometry shall be specified as IfcLineConnectionGeometry to allow for an explicit definition of the shape for the wall ends. Single and multiple layer walls shall be connected.

Example for advanced geometric representation



Extrusion

Extrusion path, for standard representation given by IfcAttDrivenExtrudedSolid IfcAttDrivenClippedExtrudedSolid and IfcAttDrivenRevolvedSolid, IfcAttDrivenClippedRevolvedSolid referencing a single or multiple IfcAttDrivenExtrudedSegment and/or IfcAttDrivenRevolvedSegment
Default Type: **IfcAttDrivenExtrudedSegment**

- IfcAttDrivenExtrudedSegment.Depth, Extrusion path defined by a positive length measure along the local z-axis, interpreted as the length of the wall.

Other Type: **IfcAttDrivenRevolvedSegment** (used in example)

- IfcAttDrivenRevolvedSegment.Axis, IfcAxis1Placement defining the axis for revolution; IfcAttDrivenRevolvedSegment.Angle plane angle measure defining the arc length of the wall.

Profile

Extrusion profile, for standard representation given by IfcAttDrivenExtrudedSegment referencing IfcAttDrivenProfileDef
Default Type: **IfcRectangleProfileDef**

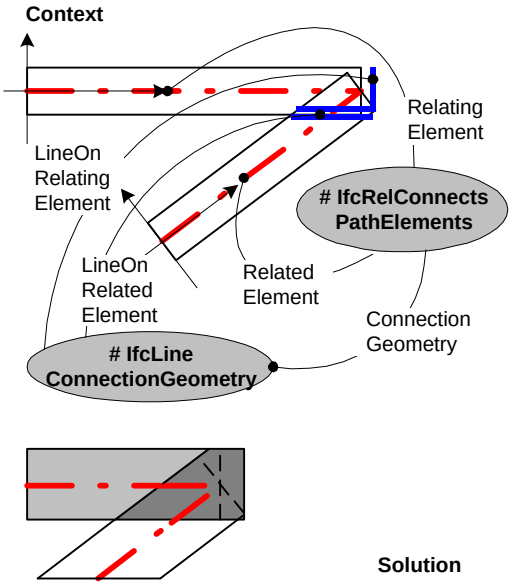
- YDim interpreted as wall thickness, XDim interpreted as wall height.

Extrusion Direction

The wall profile is extruded horizontally, i.e. co-planar to the XY plane of the co-ordinate system of the element container, e.g. the building storey.

Placement

[Black arrows] The local placement of wall is placed relative to the co-ordinate system of the element container (e.g. the building storey).
[Red and brown arrows] The segments are placed relative to the local placement.
[Green and blue arrows] The profiles are placed relative to the XY planes of the placement co-ordinate systems of the segments.



Solution

Connection

The walls are connected using the IfcRelConnectsPathElements relationship, with connection geometry given by IfcLineConnectionGeometry. The LineOnRelatingElement cuts the shape of the relating wall (possible after lengthening the wall extrusion) and the LineOnRelatedElement cuts the shape of the related wall (possible after lengthening the wall extrusion). The RelatingPriorities and RelatedPriorities are not used in this case.

Arbitrary Geometric Representation

The arbitrary geometric representation of IfcWall is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for arbitrary representation.

19.23. Class IfcWindow

19.23.1. Class Semantic Definition

Definition from IAI: Construction for closing a vertical or near vertical opening in a wall or pitched roof that will admit light and may admit fresh air into the adjacent building space.

ISSUE See issue I-303, I-330 for changes made in IFC Release 1.5.1.

19.23.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcWindow

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR61	Either the door handles the geometric representation (if not subdivided into ist components by IfcRelAssemblesElements) or it is handled by the constituent parts - door frame and door panel.

19.23.3. Interface Definitions

- I_Window

19.23.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcWindow is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Independent geometric representations, as described below, should only be used when the IfcCurtainWall is not defined as an aggregate. If defined as an aggregate, the geometric representation is the sum of the representation of the components within the aggregate.

Included are:

Local Placement

The Reference Geometry for IfcWindow is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Geometric Representation

The standard geometric representation of IfcWindow is defined as agreed by the implementers agreement for IFC Release 1.5.1. Eventual changes for Release 2.0 still needs to be defined.

19.24. Class IfcWindowLining

19.24.1. Class Semantic Definition

Definition from IAI: A description of the window frame.

History

New Entity in IFC Release 2.0

See AR-1 for requirements for IFC Release 2.0

19.24.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcWindowLining

Attributes and Relationships

No attributes defined at this level.

19.24.3. Interface Definitions

- I_WindowFrame

19.24.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcWindowLining is given by the IfcProductDefinitionShape, allowing multiple geometric representation. Included are:

Local Placement

The Reference Geometry for IfcWindowLining is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Geometric Representation

The standard geometric representation of IfcWindowLining is defined as agreed for window lining by the implementers agreement for IFC Release 1.5.1. Eventual changes for Release 2.0 still needs to be defined.

19.25. Class IfcWindowPanel

19.25.1. Class Semantic Definition

Definition from IAI: A description of the window panel.

History

New Entity in IFC Release 2.0

See AR-1 for requirements for IFC Release 2.0

19.25.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcWindowPanel

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enum. Type driven Psets are defined for each generic type (as the required attributes differ). The GenericType for a given instance drives determines the type of Pset attached at runtime throug the associated TypeDefinitions relationship (defined at the IfcObject supertype).	IfcWindowPanelTypeEnum	FixedPanel	SwingPanel	FixedPanel
	OperationType	Types of window panel operations. Also used to assign standard symbolic presentations according to national building standards.	IfcWindowPanelOperationEnum	SideHungRightHand	OtherOperation	NotDefined

Formal Propositions

WR1	

19.25.3. Interface Definitions

- I_WindowPanel

19.25.4. Type Definitions

Common PropertySet

Pset_WindowPanelCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
FixedPanel	Pset_WindowPanelFixed
Sliding	Pset_WindowPanelSliding
Swinging	Pset_WindowPanelSwinging
Pivoting	Pset_WindowPanelPivoting
NotDefined	
UserDefined	

19.25.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcWindowPanel is given by the IfcProductDefinitionShape, allowing multiple geometric representation.

Included are:

Local Placement

The Reference Geometry for IfcWindowPanel is defined in it's supertype IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Geometric Representation

The standard geometric representation of IfcWindowPanel is defined as agreed for window panels by the implementers agreement for IFC Release 1.5.1. Eventual changes for Release 2.0 still needs to be defined.

19.26. PropertySet Pset_BeamCommon

19.26.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcBeam.

19.26.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	Reference ID for this beam type in this project (e.g. type "B-1")	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Description	Textual description for this type of beam.	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Depth	Specified or derived depth of the beam.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	1
Width	Specified or derived witdth of the beam.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	1
Span	Clear span for this beam.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	1
Camber	Measure that design of beam rises in the center in order to prevent beam sagging under loading and over time.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	1
SectionModulus	Calculated section modulus for this beam	IfcSimpleProperty	IfcReal	0	see type	0
Slope	Slope for this stringer - relative to horizontal (0.0 degrees).	IfcSimpleProperty	IfcPlaneAngleMeasure	0	see type	0

19.27. PropertySet Pset_BuiltInCommon

19.27.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcBuiltIn.

19.27.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	Reference ID for this built-in type in this project (e.g. type "B-1")	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Description	Textual description for this type of built-in.	IfcSimpleProperty	IfcString	n/a	n/a	n/a

19.28. PropertySet Pset_ColumnCommon

19.28.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcColumn.

19.28.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	Reference ID for this column type in this project (e.g. type "C-1")	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Description	Textual description for this type of column.	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Length	Specified or derived length of the Column.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	0
Width	Specified or derived witdth of the Column.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	0
Height	Specified or derived Height of the Column.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	0
SlendernessRatio	Calculated slenderness ratio for this column	IfcSimpleProperty	IfcReal	0	see type	0

19.29. PropertySet Pset_CoveringCeiling

19.29.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Ceiling” of IfcCovering.

19.29.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCoveringProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_CoveringCommon			

CeilingTileLength	Length of ceiling tiles	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
CeilingTileWidth	Width of ceiling tiles	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0

19.30. PropertySet Pset_CoveringCladding

19.30.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Cladding” of IfcCovering.

19.30.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCovering Properties		IfcObjectReference	IfcGloballyUniqueId, Pset_CoveringCommon			

19.31. PropertySet Pset_CoveringCommon

19.31.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcCovering.

19.31.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	Reference ID for this ceiling type in this project (e.g. type 'A-1').	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Description	Textual description for this type of ceiling.	IfcSimpleProperty	IfcString	n/a	n/a	empty string
FireRating	Rating indicating the time duration before fire would penetrate this ceiling	IfcSimpleProperty	IfcTimeMeasure	n/a	n/a	0
AcousticRating	Rating indicating the sound transmission resistance of this ceiling	IfcSimpleProperty	IfcReal	n/a	n/a	see type

19.32. PropertySet Pset_CoveringFlooring

19.32.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Flooring” of IfcCovering.

19.32.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCovering Properties		IfcObjectReference	IfcGloballyUniqueId, Pset_CoveringCommon			

19.33. PropertySet Pset_CoveringMillwork

19.33.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Millwork” of IfcCovering.

19.33.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCovering Properties		IfcObjectReference	IfcGloballyUniqueId, Pset_CoveringCommon			

19.34. PropertySet Pset_DoorCommon

19.34.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcDoor.

19.34.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	User defined reference for this door type in this project (e.g. type 'D-1')	IfcSimpleProperty	IfcString	see type	see type	empty string
Description	Specific description for this type of door within this project.	IfcSimpleProperty	IfcString	see type	see type	empty string
NominalHeight	Nominal Door Height as usually specified in the product information (rounded actual height)	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	2000
NominalWidth	Nominal Door Width as usually specified in the product information (rounded actual width)	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	1000
HardwareGroup	Reference to the hardware group used for this door type. It is implemented as a reference to the simple property list (Pset_HardwareGroup) which defines information about the door hardware.	IfcObjectReference	IfcGloballyUniqueId, Pset_HardwareGroup	n/a	n/a	NIL
Shading	Reference to the shading device information used for this door type. It is implemented as a reference to the simple property list (Pset_OpeningShadingType) which defines information about the shading.	IfcObjectReference	IfcGloballyUniqueId, Pset_OpeningShadingType	n/a	n/a	NIL
IsExterior	Indication whether the door	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

	type is designed for use in exterior walls (TRUE) or not (FALSE)					
ParameterTakesPrecedence	Indicates whether the parameter, given by the property type information of the door should take precedence (TRUE) over the standard shape representation using explicit geometry (see geometric use case at IfcDoor), or not (FALSE). Only valid, if the ArbitraryShapeRepresentation property is set to FALSE.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
ArbitraryShapeRepresentation	Indicates whether the shape of the door is defined using the arbitrary shape representation type (see geometric use case at IfcDoor) - (TRUE), or not (FALSE). If TRUE than all parameters given by the property type information of the door, if present, only reflect abbrevations for the convenience of non CAD applications.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
OrientationToExterior	Indicates whether the the orientation of the window to the exterior space is as given by the local x-axis of the placement coordinate system (see geometric use case at IfcWindow) - (TRUE), or should be reversed (FALSE). If TRUE the x-axis points to the exterior, if FALSE the x-axis points to the interior. Only valid for external windows.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
Infiltration	Infiltration flowrate of outside air for the filler object based on the area of the filler object at a pressure level of 50 Pascals. It shall be used, if the length of all joints in unknown. The usual unit (if pressure is taken into consideration) is m3/(hPa2/3). The following translations apply: G: Fugendurchlässigkeit	IfcSimplePropertyWithUnit	IfcReal, InfiltatationUnit			
ThermalTransmittanceCoefficient	Overall thermal transmittance coefficient (U-Value) of the composite materials used by the filler object. It includes	IfcSimplePropertyWithUnit	IfcReal, IfcThermalTransmittanceMeasure			

	internal and external surface coefficient. The usual unit is W/m²K. The following translations apply: G: Gesamtwärmedurchgangskoeffizient					
FireRating	Fire rating of complete door assembly. Given according to the national fire safety classification.	IfcSimpleProperty	IfcString	see type	see type	0
AcousticRating	Rating for acoustic transmisivity (Sound Transference Factor =STF) for the complete door assembly.	IfcSimpleProperty	IfcReal	see type	see type	0
SecurityRating	Index based rating system indicating security level.	IfcSimpleProperty	IfcString	n/a	n/a	empty string

19.35. PropertySet Pset_DoorLiningCommon

19.35.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcDoorLining.

19.35.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
LiningDepth	Depth (dimension in plane perpendicular to door leaf) of the door lining.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	NIL
LiningThickness	Thickness (width in plane parallel to door leaf) of the door lining.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	NIL
ThresholdDepth	Depth (dimension in plane perpendicular to door leaf) of the door threshold. Only given, if door lining includes threshold and parameter is known.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	NIL
ThresholdThickness	Thickness (width in plane parallel to door leaf) of the door threshold. Only given, if door lining includes threshold and parameter is known.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	NIL

19.36. PropertySet Pset_DoorPanelCommon

19.36.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcDoorPanel.

19.36.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
PanelThickness	Thickness of the door panel.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	50
PanelToLiningOffset	Offset of the inner panel face from the inner lining face (measured along the x-axis of the placement co-ordinate system).	IfcSimpleProperty	IfcLengthMeasure	0	see type	0
PanelHeight	Overall height of this panel. Should be included for convinience use by applications that cannot derive this from the geometric representation.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	1800
PanelWidth	Overall width of this panel. Should be included for convinience use by applications that cannot derive this from the geometric representation.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	900
CrackLenght	Length of the joints of this door panel (usually the perimeter of the panel) that have to be considered for natural ventilation and heat losses.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	NIL
InfiltrationCoefficient	Infiltration Coefficient per length unit of joints. Used in conjunction with the LenghtOfJoints property in Pset_WindowPanel or Pset_DoorPanel.. The usual unit (if pressure is taken into consideration) is m3/(mhPa2/3). The following translations apply: G: Fugendurchlaßkoeffizient, J: JYOINTO BUBUN NO KUUKI TOUKARITU	IfcSimplePropertyWithUnit	IfcReal, InfiltatationUnit			
StandardPanelType	Description of the standard operating type of the panel, according to the national classification system.	IfcSimpleProperty	IfcString	see type	see type	empty string
PanelHasOpenings	Indication whether the door panel has openings (TRUE) or not (FALSE). Only solid panels are supported by the advanced geometric representation using geometry parameters given by the property set (see property ParameterTakesPrecedence).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
GlazingAreaFraction	Fraction of the glazing area relative to the total area of	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	1

	the filling element. It shall be used, if the glazing area is not given in the Pset_DoorWinPanelOpening as OpeningArea. The following translations apply: G: Glasflächenanteil, J: MADO MENSEKI HIRITU					
Glazing	Reference to the property set for the glazing, given as reference to the 'nested' property set (Pset_GlazingType).	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, Pset_GlazingType	n/a	n/a	n/a
Finish	Finish selection for this panel	IfcSimpleProperty	IfcString	see type	see type	empty string
Color	Color selection for this panel	IfcSimpleProperty	IfcString	see type	see type	empty string

19.37. PropertySet Pset_DoorPanelRevolving

19.37.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Revolving” of IfcDoorPanel.

19.37.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonDoorPanel Properties		IfcObjectReference	IfcGloballyUniqueId, Pset_DoorPanelCommon			

19.38. PropertySet Pset_DoorPanelRollingup

19.38.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Rollingup” of IfcDoorPanel.

19.38.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonDoorPanel Properties		IfcObjectReference	IfcGloballyUniqueId, Pset_DoorPanelCommon			

19.39. PropertySet Pset_DoorPanelSliding

19.39.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Sliding” of IfcDoorPanel.

19.39.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonDoorPanel Properties		IfcObjectReference	IfcGloballyUniqueId, Pset_DoorPanelCommon			

19.40. PropertySet Pset_DoorPanelSwinging

19.40.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Swinging” of IfcDoorPanel.

19.40.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonDoorPanel Properties		IfcObjectReference	IfcGloballyUniqueId, Pset_DoorPanelCommon			
LeftNotRightSwing	Indication whether the door panel swings left hand (TRUE) or right hand (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
SwingStartAngle	As viewed in the 'XY' plane of the Door's LCS, where zero angle is aligned to the positive 'Y' axis.	IfcSimpleProperty	IfcPlaneAngleMeasure	-360	360	0
IncludedSwingAngle	Measure of arc the panel is designed to swing. Note that positive angle denotes counterclockwise arc, negative angle denotes clockwise arc.	IfcSimpleProperty	IfcPlaneAngleMeasure	-360	360	-90

19.41. PropertySet Pset_GlazingType

19.41.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all glazing as referred to by other property sets.

19.41.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
NumberOfGlasses	Number of glass layers within the frame. E.g. "2" for double glazing.	IfcSimpleProperty	IfcCountMeasure	see type	see type	2
Thickness	Thickness of the glass.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	4
FillGas	Name of the gas by which the gap between two glass layers is filled.	IfcSimpleProperty	IfcString	see type	see type	n/a
Color	Color (tint) selection for this glazing.	IfcSimpleProperty	IfcString	see type	see type	n/a
IsTempered	Indication whether the glass is	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

	tempered (TRUE) or not (FALSE)					
IsLaminated	Indication whether the glass is layered with other materials (TRUE) or not (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
IsCoated	Indication whether the glass is coated with a material (TRUE) or not (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
IsWired	Indication whether the glass includes a contained wire mesh to prevent break-in (TRUE) or not (FALSE)	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
ImpactResistance	Description of the resistance to shatter. Either given by description or by a numeric value of a scale (1..10) accoridng to regional classifications.	IfcSimpleProperty	IfcString	see type	see type	n/a
Translucency	Fraction of the visible light that passes the glazing at normal incidence. It is a value without unit.	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	1
Reflectivity	Fraction of the visible light that is reflected by the glazing at normal incidence. It is a value without unit.	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	0
BeamRadiationTransmittance	Direct solar radiation tarnsmittance that passes the glazing at normal incidence. It is a value without unit, often refered to as (Tsol).	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	0
SolarHeatGain	Total solar heat transmittance that passes the glazing at normal incidence. It is a value without unit, often refered to as (SHGC):	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	0
ThermalTransmittanceSummerShaded	Summer shaded thermal transmittance coefficient, often refered to as (U-value)	IfcSimplePropertyWithUnit	IfcReal, IfcThermalTransmittanceMeasure			
ThermalTransmittanceSummerUnshaded	Summer unshaded thermal transmittance coefficient, often refered to as (U-value)	IfcSimplePropertyWithUnit	IfcReal,IfcThermalTransmittanceMeasure			
ThermalTransmittanceWinter	Winter thermal transmittance coefficient, often refered to as (U-value)	IfcSimplePropertyWithUnit	IfcReal,IfcThermalTransmittanceMeasure			

19.42. PropertySet Pset_HardwareGroup

19.42.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all hardware groups as referred to by other property sets.

19.42.2. Attribute and Relationship Definitions

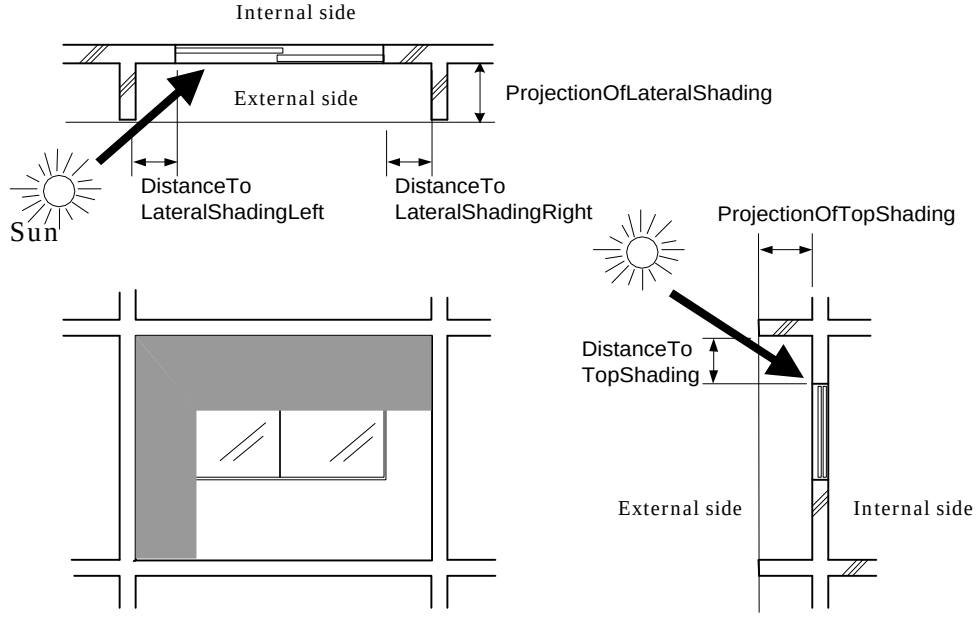
Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	User defined reference for this standard collection of hardware elements within this project.	IfcSimpleProperty	IfcString	see type	see type	empty string
Description	Specific description for this type of hardware within this project.	IfcSimpleProperty	IfcString	see type	see type	empty string
Manufacturer	The organization that manufactured or assembled the item.	IfcObjectReference	IfcOrganization	n/a	n/a	n/a
ModelLabel	The model number and/or unit designator assigned by the manufacturer of the manufactured item.	IfcSimpleProperty	IfcString	see type	see type	empty string
ModelDescription	A physical description of the manufactured item as provided by the manufacturer of the munufactured item.	IfcSimpleProperty	IfcString	see type	see type	empty string
Finish	Finish applied to hardware	IfcSimpleProperty	IfcString	see type	see type	empty string

19.43. PropertySet Pset_OpeningShadingType

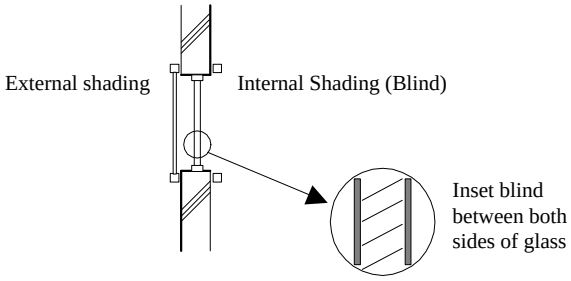
19.43.1. PropertySet Semantic Definition

Definition from IAI*:* Properties common to the definition of all shading types as referred to by other property sets

The following figure shall define the interpretation of overhang measures for Pset_OpeningShadingType.



The following figure shall define the interpretation of shading types for Pset_OpeningShadingType.



19.43.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ExternalShadingCoefficient	radiation transmission coefficient of the outside shading device. It is a value without unit. The following translations apply: G: Durchlaßfaktor Sonnenschutz außen, JA: GAIBU SHAHEI-KEISU	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	see type
InternalShadingCoefficient	radiation transmission coefficient of the inside shading device, symbol "b-value". It is a value without unit. The following translations apply: G: Durchlaßfaktor Sonnenschutz innen, JA: NAIBU SHAHEI-KEISU	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	see type
InsetShadingCoefficient	radiation transmission coefficient of the shading device inside the glazing, symbol "b-value". It is a value without unit. The following translations apply: G: Durchlaßfaktor Sonnenschutz innerhalb der Verglasung, JA: KUMIKOMI SHAHEI-KEISU	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	see type
DistanceToLateralShadingLeft	Distance between the lateral shading device and the window or door opening as shown in the figure.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
DistanceToLateralShadingRight	Distance between the lateral shading device and the window or door opening as shown in the figure.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
ProjectionOfLateralShading	Projection of the lateral shading device from the facade (outer surface of the building element, in which the door or window is located)	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
DistanceToTopShading	Distance between the shading device on top and the window or door opening as shown in the figure.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type

ProjectionOfTopShading	Projection of the shading device on the top from the facade (outer surface of the building element, in which the door or window is located)	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type

19.44. PropertySet Pset_PermeableCoveringCommon

19.44.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcPermeableCovering.

19.44.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
RequiredOpening Height	Overall Height of the required opening for this louver. Note this can be derived from the 'ProductShape' and is included for convenience use by applications that cannot derive this from the shape.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
RequiredOpening Width	Overall Width of the required opening for this louver. Note this can be derived from the 'ProductShape' and is included for convenience use by applications that cannot derive this from the shape.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
FrameWidth	Average length measure, when viewed from the finished face, from the edge of the louver to fins.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	1
FrameDepth	Measure of the frame depth (front to back)	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	1
Orientation	Orientation angle, when facing the finished side of installed louvers. Horzontal is taken to be zero ("0") angle. Angle is positive in counter-clockwise rotation.	IfcSimpleProperty	IfcPlaneAngleMeasure	0	<360.0	0
FreeAreaVentilation	Actual usable Area.	IfcSimpleProperty	IfcAreaMeasure	0	see type	0
ClearanceSpace	Distance needed for correct operation/air flow	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	NIL
Operable	Designation of operability of this cover	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

19.45. PropertySet Pset_PermeableCoveringGrill

19.45.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Grill” of all IfcPermeableCovering.

19.45.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPermeableCoveringProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_PermeableCoveringCommon			
HorizontalSpacing	Spacing of the screening wire at the angle set by Orientation.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0
VerticalSpacing	Spacing of the screening wire at the angle perpendicular to that set by Orientation.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0
FinWidth	Width (when viewed from finished side) of the fins in this grill.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0
FinDepth	Depth (finished side to back side) of the fins in this grill.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0

19.46. PropertySet Pset_PermeableCoveringLouver

19.46.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Louver” of all IfcPermeableCovering.

19.46.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPermeableCoveringProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_PermeableCoveringCommon			
FinSpacing	Distance between adjacent fins.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0
FinAngle	Slope angle of the fins, in cross-sectional view with finished (or exterior) face on the right side of the section. Horizontal fin angle is taken to be zero ("0") angle.	IfcSimpleProperty	IfcPlaneAngleMeasure	0	<360.0	0
FinDepth	Fin depth measure, in cross-sectional view.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0

19.47. PropertySet Pset_PermeableCoveringScreen

19.47.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Screen” of all IfcPermeableCovering.

19.47.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPermeableCoveringProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_PermeableCoveringCommon			
HorizontalSpacing	Spacing of the screening wire at the angle set by Orientation.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0
VerticalSpacing	Spacing of the screening wire at the angle perpendicular to that set by Orientation.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	0
ScreenThickness	Thickness of the screening wire	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	1

19.48. PropertySet Pset_RoofCommon

19.48.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcRoof.

19.48.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	Reference ID for this roof type in this project (e.g. type 'A-1')	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Description	Textual description for this roof type	IfcSimpleProperty	IfcString	n/a	n/a	empty string
FireRating	Time duration for fire resistence the roof assembly is rated	IfcSimpleProperty	IfcTimeMeasure	n/a	n/a	0

19.49. PropertySet Pset_SlabCommon

19.49.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcSlab.

19.49.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	Reference ID for this slab type in this project (e.g. type	IfcSimpleProperty	IfcString	n/a	n/a	empty string

	'A-1')					
Description	Textual description for this floor type.	IfcSimpleProperty	IfcString	n/a	n/a	empty string
FireRating	Fire rating of slab.	IfcSimpleProperty	IfcTimeMeasure	n/a	n/a	0
ThermalRating	Rating for thermal transmisivity ('U' value).	IfcSimpleProperty	IfcReal	n/a	n/a	0
AcousticRating	Rating for sound protection (Sound Transference Factor =STF).	IfcSimpleProperty	IfcReal	n/a	n/a	0

19.50. PropertySet Pset_SlabFloor

19.50.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Roof” of all IfcSlab.

19.50.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonSlabProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_SlabCommon			

19.51. PropertySet Pset_SlabRoof

19.51.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Roof” of all IfcSlab.

19.51.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonSlabProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_SlabCommon			
RequiredSlope	Sloping angle of the roof slab as required by either building regulations or roofing material.	IfcSimpleProperty	IfcPlaneAngleMeasure	see type	see type	empty string

19.52. PropertySet Pset_WallCommon

19.52.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcWall.

19.52.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	Reference ID for this wall type in this project (e.g. type 'A-1')	IfcSimpleProperty	IfcString	n/a	n/a	empty string

Description	Textual description for this wall type.	IfcSimpleProperty	IfcString	n/a	n/a	empty string
ExtendToStructure	Does the Wall extend to the structure above	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
ExternalWall	Boolean value indicating if this wall is exterior	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
FireRating	Fire rating of wall assembly.	IfcSimpleProperty	IfcTimeMeasure	n/a	n/a	0
ThermalRating	Rating for thermal transmisivity ('U' value).	IfcSimpleProperty	IfcReal	n/a	n/a	0
AcousticRating	Rating for sound protection (Sound Transference Factor =STF) for wall assembly.	IfcSimpleProperty	IfcReal	n/a	n/a	0

19.53. PropertySet Pset_WindowCommon

19.53.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcWindow.

19.53.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Reference	User defined reference for this window type in this project (e.g. type "W-1")	IfcSimpleProperty	IfcString	see type	see type	empty string
Description	Specific description for this type of window within this project.	IfcSimpleProperty	IfcString	see type	see type	empty string
NominalHeight	Nominal window height as usually specified in the product information (often: rounded actual height)	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	2000
NominalWidth	Nominal window width as usually specified in the product information (often: rounded actual width)	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	1000
HardwareGroup	Reference to the hardware group used for this door type. It is implemented as a reference to the simple property list (Pset_HardwareGroup) which defines information about the window hardware.	IfcObjectReference	IfcGloballyUniqueId, Pset_HardwareGroup	n/a	n/a	NIL
Shading	Reference to the shading device information used for this door type. It is implemented as a reference to the simple property list (Pset_OpeningShadingType) which defines information about the shading.	IfcObjectReference	IfcGloballyUniqueId, Pset_OpeningShadingType	n/a	n/a	NIL
IsExterior	Window is an exterior window	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE

	(TRUE) or interior window (FALSE)					
ParameterTakesPrecedence	Indicates whether the parameter, given by the property type information of the window should take precedence (TRUE) over the standard shape representation using explicit geometry (see geometric use case at IfcWindow), or not (FALSE). Only valid, if the ArbitraryShapeRepresentation property is set to FALSE.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
ArbitraryShapeRepresentation	Indicates whether the shape of the window is defined using the arbitrary shape representation type (see geometric use case at IfcWindow) - (TRUE), or not (FALSE). If TRUE than all parameters given by the property type information of the window, if present, only reflect abbrevations for the convenience of non CAD applications.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
OrientationToExterior	Indicates whether the the orientation of the window to the exterior space is as given by the local x-axis of the placement coordinate system (see geometric use case at IfcWindow) - (TRUE), or should be reversed (FALSE). If TRUE the x-axis points to the exterior, if FALSE the x-axis points to the interior. Only valid for external windows.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
Infiltration	Infiltration flowrate of outside air for the filler object based on the area of the filler object at a pressure level of 50 Pascals. It shall be used, if the length of all joints in unknown. The usual unit (if pressure is taken into consideration) is m3/(hPa2/3). The following translations apply: G: Fugendurchlässigkeit	IfcSimplePropertyWithUnit	IfcReal, InfiltatationUnit			
ThermalTransmittanceCoefficient	Overall thermal transmittance coefficient (U-Value) of the composite materials used by the filler object. It includes internal and external surface	IfcSimplePropertyWithUnit	IfcReal, IfcThermalTransmittanceMeasure			

	coefficient. The usual unit is W/m²K. The following translations apply: G: Gesamtwärmedurchgangskoeffizient					
FireRating	Fire rating of complete window assembly. Given according to the national fire safety classification.	IfcSimpleProperty	IfcString	see type	see type	
AcousticRating	Rating for acoustic transmisivity (Sound Transference Factor =STF) for the complete window assembly.	IfcSimpleProperty	IfcReal	see type	see type	0
SecurityRating	Index based rating system indicating security level.	IfcSimpleProperty	IfcString	n/a	n/a	empty string

19.54. PropertySet Pset_WindowLiningCommon

19.54.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcWindowLining.

19.54.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
calcLiningDepth	Depth (dimension in plane perpendicular to door leaf) of the window lining.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	NIL
calcLiningThickness	Thickness (width in plane parallel to door leaf) of the window lining.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	n/a	NIL

19.55. PropertySet Pset_WindowPanelCommon

19.55.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcWindowPanel.

19.55.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FrameWidth	Width of panel frame, measured from inside of panel (at glazing) to outside of panel (at lining)	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	70
FrameDepth	Depth of panel frame, measured from front face to back face horizontally.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	35
FrameToLiningOffset	Offset measured horizontally (perpendicular	IfcSimpleProperty	IfcLengthMeasure	0	see type	0

	to the panel and glazing plane) between the inner surface of the frame and the inner surface of the lining.					
PanelHeight	Overall height of this panel. Should be included for convinience use by applications that cannot derive this from the geometric representation.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	1800
PanelWidth	Overall width of this panel. Should be included for convinience use by applications that cannot derive this from the geometric representation.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	900
StileDepth	Depth (dimension in plane perpendicular to glazing) of the stiles dividing any glass panes	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	NIL
StileThickness	Thickness (width in plane parallel to glazing) of the stiles dividing any glass panes	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	NIL
CrackLenght	Length of the joints of this window panel (usually the perimeter of the panel) that have to be considered for natural ventilation and heat losses.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	NIL
InfiltrationCoefficient	Infiltration Coefficient per length unit of joints. Used in conjunction with the LenghtOfJoints property in Pset_WindowPanel or Pset_DoorPanel.. The usual unit (if pressure is taken into consideration) is m3/(mhPa2/3). The following translations apply: G: Fugendurchlaßkoeffizient, J: JYOINTO BUBUN NO KUUKI TOUKARITU	IfcSimplePropertyWithUnit	IfcReal, InfiltatationUnit			
GlazingAreaFraction	Fraction of the glazing area relative to the total area of the filling element. It shall be used, if the glazing area is not given in the Pset_DoorWinPanelOpening as OpeningArea. The following translations apply: G: Glasflächenanteil, J: MADO MENSEKI HIRITU	IfcSimpleProperty	IfcPositiveRatioMeasure	see type	see type	1

StandardPanelType	Description of the standard operating type of the panel, according to the national classification system.	IfcSimpleProperty	IfcString	n/a	n/a	n/a
Glazing	Reference to the property set for the glazing, given as reference to the 'nested' property set (Pset_GlazingType).	IfcSimpleProperty	Pset_GlazingType	n/a	n/a	n/a

19.56. PropertySet Pset_WindowPanelFixed

19.56.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Fixed” of all IfcWindowPanel.

19.56.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonWindowPanelProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_WindowPanelCommon			

19.57. PropertySet Pset_WindowPanelPivoting

19.57.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Pivoting” of all IfcWindowPanel.

19.57.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonWindowPanelProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_WindowPanelCommon			
PivotsVertically	Boolean indicating if the window panel pivots vertically (rotation axis in the middle of width)	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
PivotsHorizontally	Boolean indicating if the window panel pivots horizontally (rotation axis in the middle of height). If both, PivotsVertically and PivotsHorizontally, is set to TRUE, then the window pivots in both directions.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

19.58. PropertySet Pset_WindowPanelSliding

19.58.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Sliding” of all IfcWindowPanel.

19.58.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonWindowPanelProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_WindowPanelCommon			
PanelFixed	Boolean indicating if the panel is fixed (TRUE), or slides (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
HorizontalNotVerticalSliding	Boolean indicating if the panel slides horizontally (TRUE), or slides vertically (is in double hung) (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
CounterBalanced	Boolean value indicating if the window hardware includes counter balancing weights for lower panel. Applies only if HorizontalNotVerticalSliding is set to FALSE.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

19.59. PropertySet Pset_WindowPanelSwinging

19.59.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all types “Swinging” of all IfcWindowPanel.

19.59.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonWindowPanelProperties		IfcObjectReference	IfcGloballyUniqueId, Pset_WindowPanelCommon			
LeftNotRightHinged	Boolean indicating if the panel has its hing at the left side (TRUE) or at the right side (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
PanelSwingAngle	Measure of arc the panel is designed to swing. Note: "0" is taken to be when the window panel is closed.	IfcSimpleProperty	IfcPlaneAngleMeasure	0	<180.0	90

20. IfcSharedBldgServiceElements

The IfcSharedBldgServiceElements schema in the interoperability layer defines basic object concepts required for interoperability between Building Service domain extensions (notably HVAC) and other domain extensions defined in the current IFC model. This schema includes concepts such as Equipment, Fixture, and Electrical Appliance.

The following items have been removed or renamed in this schema for this release of the IFC model from earlier IFC model releases:

- IfcDiscreteElementTypeEnum: This enumeration was originally provided as an empty stub in R1.5 so that it could be expanded in R2.0. This enumeration has been removed in R2.0 because the IfcDistributionElement class has been subtyped and is no longer a type-driven leaf-node in the object model.
- IfcEquipment: This class has been split into two classes: IfcEquipment and IfcFlowEquipment to accommodate equipment participating in a distribution system.
- IfcFixtureTypeEnum: This enumeration was originally provided in IFC R1.0 to elaborate two generic types of fixtures: electrical and plumbing. This enumeration has been removed in R2.0 because the IfcFixture class has been divided into two classes called IfcElectricalFixture and IfcPlumbingFixture, each of which has their own enumerations defining type (IfcElectricalFixtureTypeEnum and IfcPlumbingFixtureTypeEnum).
- IfcFixture: This class has been removed in IFC R2.0 with its contents divided into two classes called IfcElectricalFixture and IfcPlumbingFixture.

20.1. Type IfcDiscreteElementTypeEnum

20.1.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of discrete elements an IfcDiscreteElement object can fulfill.

History

This Enumeration has changed after IFC Release 1.5.1, please see the Migration Guide for details

20.1.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcDiscreteElement

20.1.3. Enumeration

Insulation	Materials with low heat conductance
UserDefined	
NotDefined	

20.2. Type IfcDistributionFlowElementTypeEnum

20.2.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of discrete elements an IfcDistributionFlowElement object can fulfill.

History

New Enumeration in IFC Release 2.0

20.2.2. Enumeration

FluidFlow
UserDefined

NotDefined

20.3. Type IfcDistributionPortTypeEnum

20.3.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of discrete elements an IfcDistributionPort object can fulfill.

History

New Enumeration in IFC Release 2.0

20.3.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcDistributionPortGeometry

20.3.3. Enumeration

RoundDuctPort	Properties of a round duct connection.
RectangularDuctPort	Properties of a rectangular duct connection.
OvalDuctPort	Properties of an oval duct connection.
RoundPipePort	Properties of a round pipe connection.
UserDefined	
NotDefined	

20.4. Type IfcElectricalApplianceTypeEnum

20.4.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of Electrical Appliances an IfcElectricalAppliance object can fulfill.

History

This Enumeration has changed after IFC Release 1.5.1, please see the Migration Guide for details

20.4.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcElectricalAppliance

20.4.3. Enumeration

Computer	Computer Electrical Appliance Type
Copier	Copier Electrical Appliance Type
Facsimile	Facsimile Electrical Appliance Type
Printer	Printer Electrical Appliance Type
Telephone	Telephone Electrical Appliance Type
UserDefined	
NotDefined	

20.5. Type IfcElectricalFixtureTypeEnum

20.5.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of electrical fixtures an IfcElectricalFixture object can fulfill.

History

New Enumeration in IFC Release 2.0

20.5.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcElectricalFixture

20.5.3. Enumeration

LightFixture
PowerOutlet
RadiantHeater
UserDefined
NotDefined

20.6. Type IfcEquipmentTypeEnum

20.6.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of Equipment an IfcEquipment object can fulfill.

History

This Enumeration has changed after IFC Release 1.5.1, please see the Migration Guide for details

20.6.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcEquipment

20.6.3. Enumeration

WindowCleaning
UserDefined
NotDefined

20.7. Type IfcFlowDirectionEnum

20.7.1. Type Semantic Definition

Definition from IAI: This enumeration the flow direction at a connection point as either a Source, Sink, or both SourceAndSink.

History

New Enumeration in IFC Release 2.0

20.7.2. Enumeration

Source
Sink
SourceAndSink
UserDefined
NotDefined

20.8. Type IfcFlowEquipmentTypeEnum

20.8.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of Equipment an IfcFlowEquipment object can fulfill.

History

New Enumeration in IFC Release 2.0

20.8.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcFlowEquipment

20.8.3. Enumeration

AirFilter	Apparatus used to remove particulate or gaseous matter from air. This property set is typically used in conjunction with another piece of equipment, such as an AirHandler or PackagedACUnit
AirHandler	Equipment which modifies the psychrometric properties of a controlled air stream. It typically consists of an arrangement of Fans, Coils and AirFilters
Boiler	Equipment which converts stored energy to heat which is added to a fluid; typically used to heat water.
Chiller	Equipment used to implement a refrigeration cycle for cooling a fluid
Coil	Equipment used to provide heat transfer between non-mixing media. This is typically used in conjunction with an AirHandler or PackagedACUnit and uses a TubeBundle
Compressor	Equipment that compresses a fluid typically used in a refrigeration circuit
Convector	Equipment which adds heat to a space utilizing natural convection
CoolingTower	Equipment which rejects heat to ambient air.
Fan	Equipment which imparts mechanical work on a gas
HeatExchanger	Equipment used to provide heat transfer between non-mixing media such as both plate and shell and tube heat exchangers
Motor	Equipment used to convert electrical power to rotational mechanical power
PackagedACUnit	Equipment which utilizes an integral refrigeration cycle for cooling a fluid (typically air)
Pump	Equipment which imparts mechanical work on a liquid
TubeBundle	Tube and bundles of tubes properties used within equipment
UnitHeater	Equipment which adds heat to a space
Elevator	
Escalator	
UserDefined	

NotDefined	

20.9. Type IfcFlowFittingTypeEnum

20.9.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of fittings an IfcFlowFitting object can fulfill.

History

New Enumeration in IFC Release 2.0

20.9.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcFlowFitting

20.9.3. Enumeration

DuctFitting
PipeFitting
UserDefined
NotDefined

20.10. Type IfcFlowSegmentTypeEnum

20.10.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of flow segments an IfcFlowSegment object can fulfill.

History

New Enumeration in IFC Release 2.0

20.10.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcFlowSegment

20.10.3. Enumeration

DuctSegment
PipeSegment
GutterSegment
UserDefined
NotDefined

20.11. Type IfcFlowTerminalTypeEnum

20.11.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of flow terminals an IfcFlowTerminal object can fulfill.

History

New Enumeration in IFC Release 2.0

20.11.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcFlowTerminal

20.11.3. Enumeration

AirTerminal
RoofDrain
Scupper
UserDefined
NotDefined

20.12. Type IfcPlumbingFixtureTypeEnum

20.12.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of plumbing fixtures an IfcPlumbingFixture object can fulfill.

History

New Enumeration in IFC Release 2.0

20.12.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcPlumbingFixture

20.12.3. Enumeration

Faucet
Sink
Toilet
Urinal
Shower
UserDefined
NotDefined

20.13. Type IfcPrimaryFittingEnum

20.13.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

20.13.2. Enumeration

Entry
Exit
Elbow
Transition
Junction
Obstruction
UserDefined
NotDefined

20.14. Class IfcDiscreteElement

20.14.1. Class Semantic Definition

Definition from IAI: This class defines elements in a building services system that do not participate as either equipment or distribution elements, such as insulation or attaching elements. This class will be more fully elaborated in future IFC versions.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

20.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDiscreteElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcDiscreteElementTypeEnum	Insulation	Insulation	Insulation
INV	Attaches	Inverse relationship to a related distribution element to which this	IfcRelAttachesElements	n/a	n/a	NIL

		discrete element is attached.				

Formal Propositions

WR61	

20.14.3. Interface Definitions

- I_DiscreteElement

20.14.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
Insulation	Pset_Insulation
UserDefined	
NotDefined	

20.14.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcDiscreteElement is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcDiscreteElement is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcDiscreteElement is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcDiscreteElement is not supported.

20.15. Class IfcDistributionControlElement

20.15.1. Class Semantic Definition

Definition from IAI: This class defines elements of a distribution system that are used to impart control over other elements of the distribution system.

History

New Entity in IFC Release 2.0

20.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject

IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionControlElement
IfcActuator
IfcController
IfcSensor

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ControlElementID	The ControlElement Point Identification assigned to this control element by the Building Automation System.	STRING	see type	see type	empty string
INV	FlowElement	Inverse relationship to a distribution flow element	SET [0:1] OF IfcDistributionFlowElement	n/a	n/a	NIL

20.15.3. Interface Definitions

- I_DistributionControlElement

20.15.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcDistributionControlElement is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcDistributionControlElement is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcDistributionControlElement is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcDistributionControlElement is not supported.

20.16. Class IfcDistributionElement

20.16.1. Class Semantic Definition

Definition from IAI: This class defines elements that participate in a distribution system.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

20.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcDistributionControlElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
INV	AttachedBy	Inverse relationship to a related discrete element which might be attached to this distribution element.	SET [0:?] OF IfcRelAttachesElements	n/a	n/a	NIL

20.16.3. Interface Definitions

- I_DistributionElement

20.16.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcDistributionElement is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcDistributionElement is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcDistributionElement is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcDistributionElement is not supported.

20.17. Class IfcDistributionFlowElement

20.17.1. Class Semantic Definition

Definition from IAI: This class defines elements of a distribution system that facilitate the distribution of energy or matter, such as air, water or power.

History

New Entity in IFC Release 2.0

20.17.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcElectricalFixture
IfcPlumbingFixture
IfcFlowTerminal
IfcFlowController
IfcFlowSegment
IfcFlowFitting
IfcFlowEquipment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	FlowElementType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcDistributionFlowElementTypeEnum	FluidFlow	Scupper	FluidFlow
	ControlElements	References control elements which may be used to impart control on the Distribution Element.	SET [0:?] OF IfcDistributionControlElement	n/a	n/a	NIL
INV	ToRelatingPort	Inverse relationship to the port that is being connected to.	SET [0:?] OF IfcRelConnectsPorts	n/a	n/a	NIL
INV	ToRelatedPort	Inverse relationship to the port that is being connected from.	SET [0:?] OF IfcRelConnectsPorts	n/a	n/a	NIL

20.17.3. Interface Definitions

- I_DistributionFlowElement

20.17.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcDistributionFlowElement is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcDistributionFlowElement is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcDistributionFlowElement is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcDistributionFlowElement is not supported.

20.18. Class IfcDistributionPortGeometry

20.18.1. Class Semantic Definition

Definition from IAI: This class defines the geometric location and configuration of a port on a distribution element. This information can be used to determine how to physically connect distribution elements.

History

New Entity in IFC Release 2.0

20.18.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcDistributionPortGeometry

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcDistributionPortTypeEnum	RoundDuctPort	RoundPipePort	RoundDuctPort
	PortLocation	Local placement of the port relative to its distribution element's local placement	IfcLocalPlacement	n/a	n/a	NIL
	PortShape	Profile that defines the port connection geometry	IfcAttDrivenProfileDef	n/a	n/a	NIL

Formal Propositions

WR71	

20.18.3. Interface Definitions

- I_DistributionPort

20.18.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
RoundDuctPort	Pset_RoundDuctPort
RectangularDuctPort	Pset_RectangularDuctPort
OvalDuctPort	Pset_OvalDuctPort
RoundPipePort	Pset_RoundPipePort
UserDefined	

NotDefined	

20.18.5. Geometry Use Definitions

This class has no geometric representation.

20.19. Class IfcElectricalAppliance

20.19.1. Class Semantic Definition

Definition from IAI: This class defines common electrical appliances found in a typical AEC/FM project. Electrical Appliances generally consist of electrical devices which are not a fixed part of the building but instead can be moved from one space to another and powered with electricity.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

20.19.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcElectricalAppliance

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcElectricalApplianceTypeEnum	Computer	Telephone	Telephone

Formal Propositions

WR61	

20.19.3. Interface Definitions

- I_ElectricalAppliance

20.19.4. Type Definitions

Common PropertySet

Pset_ElectricalApplianceCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
Computer	Pset_Computer
Copier	Pset_Copier
Facsimile	Pset_Facsimile
Printer	Pset_Printer
Telephone	Pset_Telephone
UserDefined	
NotDefined	

20.19.5. Geometry Use Definitions

The geometric representation of IfcElectricalAppliance is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local for IfcElectricalAppliance is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcElectricalAppliance is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcElectricalAppliance is not supported.

20.20. Class IfcElectricalFixture

20.20.1. Class Semantic Definition

Definition from IAI: Permanently attached appendage, appliance, or device that requires electrical power and is connected to a building electrical system (e.g. lighting fixtures).

History

New Entity in IFC Release 2.0

20.20.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcElectricalFixture
IfcLightFixture

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcElectricalFixtureTypeEnum	Light	RadiantHeater	Light

Formal Propositions

WR81	

20.20.3. Interface Definitions

- I_Fixture

20.20.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
LightFixture	Pset_LightFixture
PowerOutlet	Pset_PowerOutlet
RadiantHeater	Pset_RadiantHeater
UserDefined	
NotDefined	

20.20.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcElectricalFixture is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcElectricalFixture is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcElectricalFixture is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcElectricalFixture is not supported.

20.21. Class IfcEquipment

20.21.1. Class Semantic Definition

Definition from IAI: Equipment is an apparatus used to perform conveyance, work, energy conversion or heat transfer. This class is used to capture the characteristics of equipment that does not participate in a distribution system.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

20.21.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcEquipment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcEquipmentTypeEnum	Motor	WindowCleaning	Motor

Formal Propositions

WR61	

20.21.3. Interface Definitions

- I_Equipment

20.21.4. Type Definitions

Common PropertySet

Pset_EquipmentCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
WindowCleaning	Pset_WindowCleaning
UserDefined	
NotDefined	

20.21.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcEquipment is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local position for IfcEquipment is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcEquipment is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcEquipment is not supported.

20.22. Class IfcFlowController

20.22.1. Class Semantic Definition

Definition from IAI: This class defines elements of a distribution system that affect flow through a distribution system.

History

New Entity in IFC Release 2.0

20.22.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcFlowController
IfcAirTerminalBox
IfcDamper
IfcValve

Attributes and Relationships

No attributes defined at this level.

20.22.3. Interface Definitions

- I_FlowController

20.22.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcFlowController is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcFlowController is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcFlowController is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcFlowController is not supported.

20.23. Class IfcFlowEquipment

20.23.1. Class Semantic Definition

Definition from IAI: FlowEquipment is an apparatus used to perform conveyance, work, energy conversion or heat transfer. This class is used to capture the characteristics of equipment that is participating in a distribution system.

History

New Entity in IFC Release 2.0

20.23.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcDistributionElement
            IfcDistributionFlowElement
              IfcFlowEquipment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcFlowEquipmentTypeEnum	AirFilter	UnitHeater	AirFilter

Formal Propositions

WR81	

20.23.3. Interface Definitions

- I_Equipment

20.23.4. Type Definitions

Common PropertySet

Pset_EquipmentCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
AirFilter	Pset_AirFilter
AirHandler	Pset_AirHandler
Boiler	Pset_Boiler
Chiller	Pset_Chiller
Coil	Pset_Coil
Compressor	Pset_Compressor
Convector	Pset_Convector
CoolingTower	Pset_CoolingTower
Fan	Pset_Fan
HeatExchanger	Pset_HeatExchanger
PackagedACUnit	Pset_PackagedACUnit
Pump	Pset_Pump
TubeBundle	Pset_TubeBundle
UnitHeater	Pset_UnitHeater
Elevator	Pset_Elevator
Escalator	Pset_Escalator
Motor	Pset_Motor
UserDefined	
NotDefined	

20.23.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcFlowEquipment is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local position for IfcFlowEquipment is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcFlowEquipment is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcFlowEquipment is not supported.

20.24. Class IfcFlowFitting

20.24.1. Class Semantic Definition

Definition from IAI: A junction or transition in a flow distribution system (e.g., elbow, tee, etc.).

History

New Entity in IFC Release 2.0

20.24.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcFlowFitting

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcFlowFittingTypeEnum	DuctFitting	PipeFitting	DuctFitting
	PrimaryFittingType	Enumeration that identifies the primary type of fitting (i.e., elbow, transition, junction, etc.)	IfcPrimaryFittingEnum	Entry	Unset	Elbow

Formal Propositions

WR81	

20.24.3. Interface Definitions

- I_FlowFitting

20.24.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
DuctFitting	Pset_DuctFitting
PipeFitting	Pset_PipeFitting
UserDefined	
NotDefined	

20.24.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcFlowFitting is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local position for IfcFlowFitting is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcFlowFitting is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcFlowFitting is not supported.

20.25. Class IfcFlowSegment

20.25.1. Class Semantic Definition

Definition from IAI: A segment of a flow distribution system that is typically straight, contiguous and has only two ports (e.g., a section of pipe or duct).

History

New Entity in IFC Release 2.0

20.25.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcFlowSegment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcFlowSegmentTypeEnum	DuctSegment	PipeSegment	DuctSegment

Formal Propositions

WR81	

20.25.3. Interface Definitions

- I_FlowSegment

20.25.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
DuctSegment	Pset_DuctSegment
PipeSegment	Pset_PipeSegment
GutterSegment	Pset_GutterSegment
UserDefined	
NotDefined	

20.25.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcFlowSegment is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local position for IfcFlowSegment is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcFlowSegment is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcFlowSegment is not supported.

20.26. Class IfcFlowTerminal

20.26.1. Class Semantic Definition

Definition from IAI: A terminus or beginning of a distribution system (e.g., air outlet, drain, etc.).

History

New Entity in IFC Release 2.0

20.26.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcDistributionElement
            IfcDistributionFlowElement
              IfcFlowTerminal

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default

	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcFlowTerminalTypeEnum	DuctSegment	PipeSegment	DuctSegment

Formal Propositions

WR81	

20.26.3. Interface Definitions

- I_FlowSegment

20.26.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
AirTerminal	Pset_AirTerminal
RoofDrain	Pset_RoofDrain
Scupper	Pset_Scupper
UserDefined	
NotDefined	

20.26.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcFlowTerminal is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local position for IfcFlowTerminal is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcFlowTerminal is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcFlowTerminal is not supported.

20.27. Class IfcLightFixture

20.27.1. Class Semantic Definition

Definition from IAI: Electrically powered fixture that provides illuminence.

History

New Entity in IFC Release 2.0

20.27.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcElectricalFixture
IfcLightFixture

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LuminousProperties	Luminous properties for this light fixture	IfcLightSource	n/a	n/a	NIL

20.27.3. Interface Definitions

- I_LightFixture

20.27.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcLightFixture is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcLightFixture is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcLightFixture is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcLightFixture is not supported.

20.28. Class IfcPlumbingFixture

20.28.1. Class Semantic Definition

Definition from IAI: Permanently attached appendage, appliance, or device that requires plumbing services and is connected to a building plumbing system (e.g. water closets, sinks, etc.).

History

New Entity in IFC Release 2.0

20.28.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcPlumbingFixture

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcPlumbingFixtureTypeEnum	Faucet	Dishwasher	Faucet

Formal Propositions

WR81	

20.28.3. Interface Definitions

- I_Fixture

20.28.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
Faucet	Pset_Faucet
Sink	Pset_Sink
Toilet	Pset_Toilet
Urinal	Pset_Urinal
Shower	Pset_Shower
UserDefined	
NotDefined	

20.28.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcPlumbingFixture is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcPlumbingFixture is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcPlumbingFixture is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcPlumbingFixture is not supported.

20.29. Class IfcRelAttachesElements

20.29.1. Class Semantic Definition

Definition from IAI: This class is used to define the location and shape of an attachment between an IfcDistributionElement and an IfcDiscreteElement.

History

New Entity in IFC Release 2.0

20.29.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelAttachesElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingDiscreteElement	The related discrete element that is attached to a distribution element	IfcDiscreteElement	n/a	n/a	NIL
	RelatedDistributionElements	The relating distribution elements that have discrete elements attachmented to them	LIST [1:?] OF IfcDistributionElement	n/a	n/a	NIL
	AttachmentLocation	Local placement of the attachment	IfcLocalPlacement	n/a	n/a	NIL

20.29.3. Interface Definitions

- I_RelAttachesElements

20.29.4. Geometry Use Definitions

This class has no geometric representation.

20.30. Class IfcRelConnectsPorts

20.30.1. Class Semantic Definition

Definition from IAI: This class is used to define the physical shapes of two connected ports within a distribution system.

History

New Entity in IFC Release 2.0

20.30.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelConnectsPorts

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingElement	The IfcDistributionFlowElement that is being connected to.	IfcDistributionFlowElement	n/a	n/a	NIL
	RelatedElement	The IfcDistributionFlowElement that is being connected from.	IfcDistributionFlowElement	n/a	n/a	NIL
	FlowDirection	Enumeration that identifies if this port is a Sink (inlet), a Source (outlet) or both a SinkAndSource.	IfcFlowDirectionEnum	Source	SourceAndSink	Source
OPT	ConnectionGeometry	The geometric definition of the port and as well as any specific connection characteristics	IfcDistributionPortGeometry	n/a	n/a	NIL

20.30.3. Interface Definitions

- I_RelConnectsPorts

20.30.4. Geometry Use Definitions

This class has no geometric representation.

20.31. PropertySet Pset_24HourSchedule

20.31.1. PropertySet Semantic Definition

Definition from IAI: Schedule of usage for a 24-hour period. This property set is typically used for defining schedules of operation (e.g., lighting, occupancy, etc.) for use in calculating thermal loads.

20.31.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Name	Name of schedule	IfcSimpleProperty	IfcString	see type	see type	empty string
UsageList	List of decimal fractions between 0 and 1 reflecting hourly usage intensity. The first value in the list represents the hour between midnight and 1 AM, the second value in the list represents the hour between 1 and 2 AM, etc. NOTES: 1) this will be implemented as a shared	IfcPropertyList	IfcSimpleProperty, IfcReal	0	1	0

	Pset_ScheduleUsageList - which contains a list of IfcReal properties					
Duration	Schedule start and end dates and times	IfcSimpleProperty	IfcTimeMeasure	see type	see type	0

20.32. PropertySet Pset_AggregateLoadInformation

20.32.1. PropertySet Semantic Definition

Definition from IAI: The aggregated thermal loads experienced by one or many spaces or zones. This aggregate load information is typically addressed by a system or plant.

20.32.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
TotalCoolingLoad	The peak total cooling load for the building (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
TotalHeatingLoad	The peak total heating load for the building (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
LightingDiversity	Lighting diversity. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
InfiltrationDiversitySummer	Diversity factor for Summer infiltration. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
InfiltrationDiversityWinter	Diversity factor for Winter infiltration. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
ApplianceDiversity	Diversity of applicance load. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
LoadSafetyFactor	Load safety factor. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0

20.33. PropertySet Pset_AirFilter

20.33.1. PropertySet Semantic Definition

Definition from IAI: Apparatus used to remove particulate or gaseous matter from air. This property set is typically used in conjunction with another piece of equipment, such as an AirHandler or PackagedACUnit.

20.33.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a

	for all types of equipment.					
MaximumAirFlowrate	Maximum listed air flow rate of the filter based on the manufacturer. Note that rating filters is varied and not exact per ASHRAE S-24.5. (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
Efficiency	Efficiency of the air filter at the MaximumAirFlowrate per ASHRAE Systems and Equipment Handbook 1996 S-24.5, Figure 3. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
CleanPressureDrop	Pressure drop at the MaximumAirFlowrate across the filter when the filter is new per ASHRAE Standard 52.1. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
DirtyPressureDrop	Pressure drop at the MaximumAirFlowrate across the filter when the filter needs replacement per ASHRAE Standard 52.1. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0

20.34. PropertySet Pset_AirHandler

20.34.1. PropertySet Semantic Definition

Definition from IAI: Equipment which modifies the psychrometric properties of a controlled air stream. It typically consists of an arrangement of Fans, Coils and AirFilters.

20.34.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
AirHandlerConstruction	Enumeration defining how the air handler might be fabricated.	IfcEnumeratedProperty	Pset_AirHandlerConstructionEnum(ManufacturedItem, ConstructedOnSite, Other, NotKnown, Unset)			
AirHandlerFanCoilArrangement	Enumeration defining the arrangement of the supply air fan and the cooling coil.	IfcEnumeratedProperty	Pset_AirHandlerFanCoilArrangementEnum(BlowThrough, DrawThrough, Other, NotKnown, Unset)			

DualDeck	Does the AirHandler have a dual deck? TRUE = Yes, FALSE = No.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
Fans	Bag of one or more references to an IfcFlowEquipment object of type Fan that defines the supply, return or exhaust air fan(s) that are used by the AirHandler	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
Coils	Bag of one or more references to an IfcFlowEquipment object of type Coil that defines the coil(s) that are used by the AirHandler	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
AirFilters	Bag of one or more references to an IfcFlowEquipment object of type AirFilter that defines the air filter(s) that are used by the AirHandler	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a

20.35. PropertySet Pset_AirSideSystemInformation

20.35.1. PropertySet Semantic Definition

Definition from IAI: Attributes that apply to an air side HVAC system.

20.35.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Name	The name of the air side system	IfcSimpleProperty	IfcString	see type	see type	empty string
Description	The description of the air side system	IfcSimpleProperty	IfcString	see type	see type	empty string
AirSideSystemType	This enumeration specifies the basic types of possible air side systems (e.g., Constant Volume, Variable Volume, etc.)	IfcEnumeratedProperty	Pset_AirSideSystemTypeEnum(ConstantVolume, ConstantVolumeSingleZone, ConstantVolumeMultipleZoneReheat, ConstantVolumeBypass, VariableAirVolume, VariableAirVolumeReheat, VariableAirVolumeInduction, VariableAirVolumeFanPowered, VariableAirVolumeDualConduit, VariableAirVolumeVariableDiffusers, VariableAirVolumeVariableTemperature, Other, NotKnown, Unset)			
AirSideSystemDistributionType	This enumeration defines the basic types of air side systems (e.g., SingleDuct,	IfcEnumeratedProperty	Pset_AirSideSystemDistributionTypeEnum(SingleDuct, DualDuct, Multizone, Other,			

	DualDuct, Multizone, etc.)		NotKnown, Unset)			
TotalAirflow	The total design supply air flowrate required for the system for either heating or cooling conditions, whichever is greater (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
EnergyGainTotal	The total amount of energy gains for the spaces served by the system during the peak cooling conditions, plus any system-level total energy gains (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
AirflowSensible	The air flowrate required to satisfy the sensible peak loads (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
EnergyGainSensible	The sum of total energy gains for the spaces served by the system during the peak cooling conditions, plus any system-level sensible energy gains (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
CoolingCoilEnteringDryBulb	The system cooling coil entering dry bulb temperature at the peak	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CoolingCoilEnteringWetBulb	The system cooling coil entering wet bulb temperature at the peak	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CoolingCoilLeavingDryBulb	The system cooling coil entering dry bulb temperature at the peak	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CoolingCoilLeavingWetBulb	The system cooling coil entering wet bulb temperature at the peak	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
EnergyLoss	The sum of energy losses for the spaces served by the system during the peak heating conditions (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
LightingDiversity	Lighting diversity. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
InfiltrationDiversitySummer	Diversity factor for Summer infiltration. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
InfiltrationDiversityWinter	Diversity factor for Winter infiltration. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0

ApplianceDiversity	Diversity of applicance load. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
LoadSafetyFactor	Load safety factor. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
HeatingTemperatureDelta	Heating temperature difference for calculating space air flow rates	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CoolingTemperatureDelta	Cooling temperature difference for calculating space air flow rates	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
Ventilation	Required outside air ventilation (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
FanPower	Fan motor loads contributing to the cooling load (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
DuctHeatFactor	Duct heat factor	IfcSimpleProperty	IfcReal	see type	see type	0
Fans	List of references to IfcFlowEquipment objects typically of type Fan, AirHandler or PackagedACUnit which are participating in the movement of air in the system.	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	NIL

20.36. PropertySet Pset_AirTerminal

20.36.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define characteristics of an air terminal. Air terminals used to supply air are called registers, and typically have an integral damper. If there is no means of adjusting airflow, they are called grilles and are typically used for return air and exhaust. Note that this property set currently makes no distinction between these semantic definitions.

20.36.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
AirFlowType	Enumeration defining the functional type of Air Terminal	IfcEnumeratedProperty	Pset_AirFlowTypeEnum(Supply, Return, Exhaust, Other, NotKnown, Unset)			
MaximumFlowrate	Maximum air flowrate for the terminal device (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
PressureLoss	Pressure loss through the terminal device at the MaximumFlowrate (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
Throw	The distance the air terminal	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0

	throws the air at the MaximumFlowrate					
SoundLevel	Reference to a property set Pset_SoundPowerLevels which contains sound power level data	IfcObjectReference	IfcGloballyUniqueId, Pset_SoundPressureLevels	n/a	n/a	n/a
ADPI	Air diffusion performance index	IfcSimpleProperty	IfcReal	see type	see type	0
FinishType	Enumeration that identifies the type of finish for the air terminal	IfcEnumeratedProperty	Pset_FinishTypeEnum(Annodize, Paint, None, Other, NotKnown, Unset)			
FinishColor	The finish color for the air terminal	IfcSimpleProperty	IfcString	see type	see type	empty string
MountingType	Enumeration that identifies the way the terminal is mounted	IfcEnumeratedProperty	Pset_MountingTypeEnum(Surface, FlatFlush, Surface, LayIn, Other, NotKnown, Unset)			
FaceType	Enumeration that identifies the how the terminal face is constructed	IfcEnumeratedProperty	Pset_FaceTypeEnum(FourWayPattern, SingleDeflection, DoubleDeflection, SightProof, EggCrate, Perforated, Louvered, Other, NotKnown, Unset)			
CoreType	Enumeration that identifies the way the terminal core is constructed	IfcEnumeratedProperty	Pset_CoreTypeEnum(None, ShutterBlade, CurvedBlade, Removable, Reversible, Other, NotKnown, Unset)			
CoreSetHorizontal	Degree of blade set from the centerline	IfcSimpleProperty	IfcPlaneAngleMeasure	see type	see type	0
CoreSetVertical	Degree of blade set from the centerline	IfcSimpleProperty	IfcPlaneAngleMeasure	see type	see type	0
IntegralDamper	Reference to a damper object that is integral to the terminal device	IfcObjectReference	IfcGloballyUniqueId, IfcDamper	n/a	n/a	NIL
IntegralControl	Self powered temperature control	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

20.37. PropertySet Pset_ApplianceThermalProperties

20.37.1. PropertySet Semantic Definition

Definition from IAI: Appliances or office equipment which contribute thermal loads to a space.

20.37.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Additional information about the appliance or equipment that might be useful to the HVAC design	IfcSimpleProperty	IfcString	see type	see type	empty string
MaximumSensibleLoad	Maximum or Peak sensible thermal load contributed by equipment (Data type =	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0

	PowerMeasure)					
MaximumLatentLoad	Maximum or Peak latent thermal load contributed by equipment (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
StandbySensibleLoad	Sensible thermal load contributed by equipment when it is idle (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
StandbyLatentLoad	Latent thermal load contributed by equipment when it is idle (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
SensibleLoadToRadiant	Percent of sensible thermal load to radiant heat (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0

20.38. PropertySet Pset_Boiler

20.38.1. PropertySet Semantic Definition

Definition from IAI: Equipment which converts stored energy to heat which is added to a fluid; typically used to heat water, utilizing a single input fuel source.

20.38.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
BoilerType	This enumeration defines boiler types by heat transfer medium.	IfcEnumeratedProperty	Pset_BoilerTypeEnum(HotWater, GasFired, Steam, Other, NotKnown, Unset)			
HeatOutput	Total nominal boiler heat output as listed by the Boiler manufacturer. (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
PressureRating	Nominal pressure rating of the boiler as rated by ASME Boiler and Pressure Vessel Code Section IV, Rules for Construction of Heating Boilers, and Section I, Rules for Construction of Power Boilers. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
ThermalEfficiency	Overall energy efficiency of the boiler at full load conditions. Overall Efficiency is defined as gross energy	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0

	output (e.g., steam or water leaving the boiler) divided by the energy input. (Data type = PercentMeasure)					
TubeBundle	Reference to an IfcFlowEquipment object of type TubeBundle which cointains information about the Boiler's TubeBundle	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
EnergySource	This enumeration identifies the primary energy source the boiler is using.	IfcEnumeratedProperty	Pset_EnergySourceEnum(Electricity, NaturalGas, Oil, LiquifiedPetroleumGas, Propane, Steam, Other, NotKnown, Unset)			
EnergyInputRate	Nominal fuel consumption rate required to produce the total boiler heat output (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0

20.39. PropertySet Pset_BoundaryThermalProperties

20.39.1. PropertySet Semantic Definition

Definition from IAI: This property set contains thermal properties for boundary elements. This property set is therefore attached to Architectural elements such as a wall, roof, floor, etc.

20.39.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
BoundaryDescription	A boundary description that is used by the HVAC engineer (e.g. ASHRAE component type); this may or may not be the same material description provided by the architect.	IfcSimpleProperty	IfcString	see type	see type	empty string
BoundaryThermalTransmittanceCoefficient	Overall thermal transmittance coefficient (U-Value) of the composite materials used by the boundary element (Data type = ThermalTransmittanceMeasure)	IfcSimplePropertyWithUnit	IfcReal, IfcThermalTransmittanceMeasure	see type	see type	0
BoundaryColor	Color of the boundary (i.e. light, medium, or dark for roofs)	IfcSimpleProperty	IfcString	see type	see type	empty string

20.40. PropertySet Pset_Chiller

20.40.1. PropertySet Semantic Definition

Definition from IAI: Equipment used to implement a refrigeration cycle for cooling a fluid.

20.40.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipment Properties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
ChillerType	This enumeration defines the typical types of chillers (e.g., air-cooled, water-cooled, etc.)	IfcEnumeratedProperty	Pset_ChillerTypeEnum(AirCooled, WaterCooled, HeatRecovery, Other, NotKnown, Unset)			
NominalCoolingCapacity	Nominal cooling capacity of chiller at standardized conditions per ARI Standards 550-92, Centrifugal and Rotary Screw Water-Chilling Packages, and ARI Standards 590-92, Positive Displacement Compressor (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
ThermalEfficiency	Coeficient of Performance defined as the ratio of cooling energy output to energy input under full load operating conditions per ARI Standards 550-92, Centrifugal and Rotary Screw Water-Chilling Packages, and ARI Standards 590-92, Positive Displacement C	IfcSimpleProperty	IfcReal	see type	see type	0
Refrigerant	Reference to Pset_Fluid property set for information about the properties of the refrigerant used by the Chiller.	IfcObjectReference	IfcGloballyUniqueId, Pset_Fluid	n/a	n/a	n/a
Compressors	Bag of references to IfcFlowEquipment objects of type Compressor that are used by the Chiller to perform work on the refrigerant.	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
Evaporator	Reference to an IfcFlowEquipment object of type TubeBundle which cointains information about the Evaporator TubeBundle	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
Condensor	Reference to an IfcFlowEquipment object of	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a

	type TubeBundle which cointains information about the Condenser TubeBundle					

20.41. PropertySet Pset_Coil

20.41.1. PropertySet Semantic Definition

Definition from IAI: Equipment used to provide heat transfer between non-mixing media. This is typically used in conjunction with an AirHandler or PackagedACUnit and uses a TubeBundle.

20.41.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipment Properties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
CoilType	This enumeration defines typical types of coils (e.g., Cooling, Heating, etc.)	IfcEnumeratedProperty	Pset_CoilTypeEnum(PreCooling, Cooling, ReCooling, PreHeating, Heating, ReHeating, Other, NotKnown, Unset)			
HeatTransferRate	Rate at which energy is transferred from one mediium to another (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerMeasure	see type	see type	0
TubeBundle	Reference to an IfcFlowEquipment object of type TubeBundle which cointains information about the Coil TubeBundle	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
NumberOfRows	Number of tube rows in the coil assembly	IfcSimpleProperty	IfcInteger	see type	see type	1
TubeFlowArrangement	The configuration of flow through coil tubes	IfcSimpleProperty	IfcString	see type	see type	empty string
FinMaterial	Reference to a material used to construct the fins on a coil tube	IfcObjectReference	IfcMaterial	n/a	n/a	n/a
FinSpacing	Interval between the fins on a coil tube	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
BypassFactor	Coil bypass factor (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
FaceVelocity	Air velocity through coil face (Data type = LinearVelocityMeasure)	IfcSimplePropertyWithUnit	IfcReal, LinearVelocityUnit	see type	see type	0

20.42. PropertySet Pset_Compressor

20.42.1. PropertySet Semantic Definition

Definition from IAI: Equipment that compresses a fluid typically used in a refrigeration circuit.

20.42.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
CompressorType	This enumeration defines the typical types of compressors (e.g., hermetic, reciprocating, etc.)	IfcEnumeratedProperty	Pset_CompressorTypeEnum(Hermetic, Reciprocating, Screw, Other, NotKnown, Unset)			
NominalCapacity	Nominal capacity of the compressor at standard conditions (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
ThermalEfficiency	Energy efficiency of compressor at standard operating conditions (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
Refrigerant	Reference to Pset_Fluid property set for information about the properties of the refrigerant used in the compressor	IfcObjectReference	IfcGloballyUniqueId, Pset_Fluid	n/a	n/a	n/a
HotGasBypass	Whether or not hot gas bypass is provided for the compressor. TRUE = Yes, FALSE = No.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
Motor	Reference to an IfcEquipment object of type Motor which cointains information about the Compressor Motor.	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a

20.43. PropertySet Pset_Computer

20.43.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalAppliancePropertie	Reference to the 'parent' SharedPropertySet (Pset_ElectricalApplianceCommon). Contains the shared values for this type -- properties that are stored for	IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalApplianceCommon	n/a	n/a	n/a

	all types of ElectricalAppliances.					

20.44. PropertySet Pset_Convector

20.44.1. PropertySet Semantic Definition

Definition from IAI: Equipment which adds heat to a space utilizing natural convection.

20.44.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipment Properties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
Length	Nominal length of convector	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
HeatOutput	Nominal heat transfer rate of convector (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
FinConstruction	Material used for construction of convector tube fin	IfcSimpleProperty	IfcString	see type	see type	empty string
FinSize	Size of tube fins	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
FinSpacing	Interval between tube fins	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
EnclosureType	Nominal type of enclosure around convector	IfcSimpleProperty	IfcString	see type	see type	empty string
EnclosureConfiguration	Configuration of enclosure around convector	IfcSimpleProperty	IfcString	see type	see type	empty string

20.45. PropertySet Pset_CoolingTower

20.45.1. PropertySet Semantic Definition

Definition from IAI: Equipment which rejects heat to ambient air.

20.45.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipment Properties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
CoolingTowerType	This enumeration defines the typical types of cooling towers (e.g., OpenTower,	IfcEnumeratedProperty	Pset_CoolingTowerTypeEnum(OpenTower, ClosedTower, WoodFill, Ceramic,			

	ClosedTower, CrossFlow, etc.).		CrossFlow, Other, NotKnown, Unset)			
DesignWetBulbTemperature	Ambient wet bulb temperature used for selecting the cooling tower	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
DesignDryBulbTemperature	Ambient dry bulb temperature used for selecting the cooling tower	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
DesignEnteringWaterTemperature	Temperature of liquid entering the cooling tower	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
DesignLeavingWaterTemperature	Temperature of liquid leaving the cooling tower	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
WaterFlowRate	Design liquid flow rate through the cooling tower (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
AirFlowRate	Air flow rate through the cooling tower (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
Fans	Bag of one or more references to an IfcFlowEquipment object of type Fan that defines properties of any fan(s) that are used by the CoolingTower.	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a

20.46. PropertySet Pset_Copier

20.46.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalAppliancePropertiesReference to the 'parent' SharedPropertySet (Pset_ElectricalApplianceCommon). Contains the shared values for this type -- properties that are stored for all types of ElectricalAppliances.		IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalApplianceCommon	n/a	n/a	n/a

20.47. PropertySet Pset_DistributionFluidFlow

20.47.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
MaximumFlowrate	Maximum fluid flowrate through all the inlets for the distribution flow element (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
DesignFlowrate	Design fluid flowrate through	IfcSimplePropertyW	IfcReal,	see type	see type	0

	all the inlets for the distribution flow element (Data type = VolumetricFlowrateMeasure)	ithUnit	VolumetricFlowrateUnit			
MinimumFlowrate	Minimum fluid flowrate through all the inlets for the distribution flow element (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
PressureLoss	Pressure loss or drop through the distribution flow element at the MaximumFlowrate. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
WorkingPressure	The actual working pressure at the primary inlet for the distribution flow element. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
DesignPressureRating	The design pressure rating for the distribution flow element. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0

20.48. PropertySet Pset_DuctDesignCriteria

20.48.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the general characteristics of the duct design parameters. This property set is typically attached to an instance of an IfcSystem, however, it may also be attached to individual elements within a duct distribution system where individual design parameters overrule those of the system. Related property sets include Pset_Fluid and Pset_Insulation.

20.48.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
DesignName	A name for the design values	IfcSimpleProperty	IfcString	see type	see type	empty string
DuctSizingMethod	Enumeration that identifies the methodology to be used to size system components	IfcEnumeratedProperty	Pset_DuctSizingMethodEnum (ConstantFriction, ConstantPressure, StaticRegain, Other, NotKnown, Unset)			
PressureClass	Nominal pressure rating of the system components. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
LeakageClass	Nominal leakage rating for the system components. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
FrictionLoss	The pressure loss due to friction per unit length. (Data type = PressureMeasure/LengthMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit/LengthUnit	see type	see type	0

LiningType	The insulating lining type to be used	IfcObjectReference	IfcGloballyUniqueId, Pset_Insulation	n/a	n/a	NIL
InsulationType	The insulation type to be used	IfcObjectReference	IfcGloballyUniqueId, Pset_Insulation	n/a	n/a	NIL
ScrapFactor	Sheet metal scrap factor	IfcSimpleProperty	IfcReal	see type	see type	0
DuctSealant	Type of sealant used on the duct and fittings	IfcSimpleProperty	IfcString	see type	see type	empty string
MaximumVelocity	The maximum design velocity of the air in the duct or fitting. (Data type = LinearVelocityMeasure)	IfcSimplePropertyWithUnit	IfcReal, LinearVelocityUnit	see type	see type	0
AspectRatio	The default aspect ratio	IfcSimpleProperty	IfcReal	see type	see type	0
MinimumHeight	The minimum duct height for rectangular, oval or round duct	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
MinimumWidth	The minimum duct width for oval or rectangular duct	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0

20.49. PropertySet Pset_DuctFitting

20.49.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a duct fitting. Related property sets include Pset_DuctDesignCriteria.

20.49.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FittingSubType	Subtype of fitting (i.e., 5-gore, pleated, stamped, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string

20.50. PropertySet Pset_DuctSegment

20.50.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a duct segment. Related property sets include Pset_DuctDesignCriteria.

20.50.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FinishedLength	The finished length of the duct segment	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
LongitudinalSeam	The type of seam to be used along the longitudinal axis of the duct segment	IfcSimpleProperty	IfcString	see type	see type	empty string
Reinforcement	The type of reinforcement used for the duct segment	IfcSimpleProperty	IfcString	see type	see type	empty string
ReinforcementSpacing	The spacing between reinforcing elements	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0

20.51. PropertySet Pset_DuctSystemDesignCriteria

20.51.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the general characteristics of the duct system and is typically attached to an instance of an IfcSystem. Related property sets include Pset_Fluid and Pset_Insulation.

20.51.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
DuctSystemType	Enumeration that identifies the type of system	IfcEnumeratedProperty	Pset_DuctSystemTypeEnum(VariableAirVolume, ConstantVolume, DoubleDuct, Other, NotKnown, Unset)			
SystemDescription	System description	IfcSimpleProperty	IfcString	see type	see type	empty string
SystemLocation	Physical description of the part of the building the system serves	IfcSimpleProperty	IfcString	see type	see type	empty string

20.52. PropertySet Pset_ElectricalApplianceCommon

20.52.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	String description of the configuration for this appliance type. Note: name is included in the TypeDefinition.	IfcSimpleProperty	IfcString	see type	see type	empty string
AssetInformation	Reference to an OccurrencePropertySet (Pset_Asset) containing Information about this asset. This property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.	IfcObjectReference	IfcGloballyUniqueId, Pset_Asset	n/a	n/a	n/a
ManufactureInformation	Reference to property set Pset_ManufactureInformation, which defines information about the manufacture of this appliance.	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	n/a
ElectricalCharacteristics	Reference to an OccurrencePropertySet (Pset_ElectricalCharacteristics) containing information about the electrical requirements for this Electrical Appliance. This	IfcObjectReference	IfcGloballyUniqueId, IfcElectricalCharacteristics	n/a	n/a	n/a

	property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.					
MaintenanceInformation	References to IfcMaintenanceRecord objects containing maintenance history	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcMaintenanceRecord	n/a	n/a	NIL

20.53. PropertySet Pset_ElectricalFixtureCommon

20.53.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description of this fixture type. Note: name is included in the TypeDefinition.	IfcSimpleProperty	IfcString	see type	see type	empty string
AssetInformation	Reference to an OccurrencePropertySet (Pset_Asset) containing Information about this asset. This property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.	IfcObjectReference	IfcGloballyUniqueId, Pset_Asset	n/a	n/a	n/a
ManufactureInformation	Reference to property set Pset_ManufactureInformation, which defines information about the manufacture of this fixture.	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	n/a
ElectricalCharacteristics	Reference to an OccurrencePropertySet (Pset_ElectricalCharacteristics) containing information about the electrical requirements for this fixture. This property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.	IfcObjectReference	IfcGloballyUniqueId, IfcElectricalCharacteristics	n/a	n/a	n/a
MaintenanceInformation	References to IfcMaintenanceRecord objects containing maintenance history	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcMaintenanceRecord	n/a	n/a	NIL

20.54. PropertySet Pset_ElementAccess

20.54.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
AccessSpaceRequired	Space required to service this element	IfcObjectReference	IfcGloballyUniqueId, IfcSpace	n/a	n/a	n/a
SupplySpaceRequired	Space adjacent to the element used to reach the access space	IfcObjectReference	IfcGloballyUniqueId, IfcSpace	n/a	n/a	n/a

20.55. PropertySet Pset_Elevator

20.55.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to a SharedPropertySet (Pset_EquipmentCommon) which defines properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	NIL
Occupancy	Number of occupants	IfcSimpleProperty	IfcInteger	0	see type	0
ManufactureInformation	reference to Pset_ManufactureInformation	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL
LoadCapacity	Weight capacity of elevator	IfcSimpleProperty	IfcMassMeasure	see type	see type	0
ClientBrief	Reference to program to gain requirements for occupancy	IfcObjectReference	IfcGloballyUniqueId, IfcSpaceProgram	n/a	n/a	NIL

20.56. PropertySet Pset_EquipmentCommon

20.56.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	String description of the configuration for this equipment type. Note: name is included in the TypeDefinition.	IfcSimpleProperty	IfcString	see type	see type	empty string
OccurenceInformation	Reference to an OccurrencePropertySet (Pset_EquipmentOccurrence) containing information stored for all types of equipment. This property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentOccurence	n/a	n/a	n/a
ManufactureInform	Reference to property set	IfcObjectReference	IfcGloballyUniqueId,	n/a	n/a	n/a

ation	Pset_ManufactureInformation, which defines information about the manufacture of this equipment.		IfcManufactureInformation			
AccessSpace	Reference to an OccurrencePropertySet (Pset_ElementAccess) containing information describing access space required for this equipment. This property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElementAccess	n/a	n/a	n/a
MaintenanceInformation	References to IfcMaintenanceRecord objects containing maintenance history	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcMaintenanceRecord	n/a	n/a	NIL
ElectricalCharacteristics	Reference to an OccurrencePropertySet (Pset_ElectricalCharacteristics) containing information about the electrical requirements for this equipment. This property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.	IfcObjectReference	IfcGloballyUniqueId, IfcElectricalCharacteristics	n/a	n/a	n/a

20.57. PropertySet Pset_EquipmentOccurence

20.57.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
TagIdentifier	User-Defined identifier for this equipment instance	IfcSimpleProperty	IfcString	see type	see type	empty string

20.58. PropertySet Pset_Escalator

20.58.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to a SharedPropertySet (Pset_EquipmentCommon) which defines properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	NIL
Capacity	number of people that can be	IfcSimpleProperty	IfcInteger	0	see type	0

	moved from the top to the bottom					
ManufactureInformation	reference to Pset_ManufactureInformation	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL
ClientBrief	Link to program to gain requirements for occupancy	IfcObjectReference	IfcGloballyUniqueId, IfcSpaceProgram	n/a	n/a	NIL

20.59. PropertySet Pset_Facsimile

20.59.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalAppliance Properties	Reference to the 'parent' SharedPropertySet (Pset_ElectricalApplianceCommon). Contains the shared values for this type -- properties that are stored for all types of ElectricalAppliances.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalApplianceCommon	n/a	n/a	n/a

20.60. PropertySet Pset_Fan

20.60.1. PropertySet Semantic Definition

Definition from IAI: Equipment which imparts mechanical work on a gas.

20.60.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipment Properties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
AirFlowType	This enumeration defines the basic flow function that the fan performs (e.g., supply, return, exhaust, etc.).	IfcEnumeratedProperty	Pset_AirFlowTypeEnum(Supply, Return, Exhaust, Other, NotKnown, Unset)			
FluidMover	Reference to the Pset_FluidMover property set which contains fluid flow characteristics for the fan	IfcObjectReference	IfcGloballyUniqueId, Pset_FluidMover	n/a	n/a	n/a
StaticPressure	The static amount of pressure within the air stream system that the fan must overcome to insure designed circulation of air (Note that this is different from the total pressure contained in IfcFluidMover)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0

	(Data type = PressureMeasure)					
FanPressureClass	This enumeration defines the Pressure Class of the fan used for identifying the thickness and types of materials required for the construction of the fan assembly.	IfcEnumeratedProperty	Pset_FanPressureClassEnum (Class1, Class2, Class3, Class4, Other, NotKnown, Unset)			
MinimumTemperature	The minimum design temperature of the air passing through the fan	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
MaximumTemperature	The maximum design temperature of the air passing through the fan	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
FanWheelType	This enumeration defines the types of wheels typically utilized in fans.	IfcEnumeratedProperty	Pset_FanWheelTypeEnum(ForwardCurved, BackwardCurved, AirFoil, Propeller,VaneAxial, Plug, Other, NotKnown, Unset)			
WheelConstruction	The material used to construct the fan wheel	IfcObjectReference	IfcMaterial	n/a	n/a	NIL
WheelTipSpeed	The linear speed of the tip of the fan blade furthest from the shaft (Data type = LinearVelocityMeasure)	IfcSimplePropertyWithUnit	IfcReal, LinearVelocityUnit	0	see type	0
HousingConstruction	The material used to construct the fan housing	IfcObjectReference	IfcMaterial	n/a	n/a	NIL
DischargeVelocity	The speed at which air discharges from the fan through the fan housing discharge opening (Data type = LinearVelocityMeasure)	IfcSimplePropertyWithUnit	IfcReal, LinearVelocityUnit	see type	see type	0
DischargePressureLoss	Fan discharge pressure losses associated with the discharge arrangement (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
FanDischarge	This enumeration identifies the types of discharge arrangements from the fan housing discharge opening, which is used to determine the DischargePressureLoss	IfcEnumeratedProperty	Pset_FanDischargeEnum(Duct, Screen, None, Other, NotKnown, Unset)			
FanArrangement	This enumeration identifies the types of fan arrangements for centrifugal fans.	IfcEnumeratedProperty	Pset_FanArrangementEnum(TopHorizontal, TopAngularDown, DownBlast, BottomAngularDown, BottomHorizontal, BottomAngularUp, UpBlast, TopAngularUp, Other, NotKnown, Unset)			
FanRotation	This enumeration defines the types of fan rotation for centrifugal fans.	IfcEnumeratedProperty	Pset_FanRotationEnum(Clockwise, CounterClockwise, Other, NotKnown, Unset)			
FanDriveArrangem	This enumeration defines the	IfcEnumeratedProp	Pset_FanDriveArrangementE			

ent	fan and motor drive arrangement as defined by AMCA.	erty	num(Arrangement1, Arrangement2, Arrangement3, Arrangement4, Arrangement5, Arrangement6, Arrangement7, Arrangement8, Arrangement9, Arrangement10, Other, NotKnown, Unset)			
DrivePowerLoss	Fan drive power losses associated with the type of connection between the motor and the fan wheel (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
MotorDriveType	This enumeration identifies the type of connection between the motor shaft and the fan wheel.	IfcEnumeratedProperty	Pset_MotorDriveTypeEnum(DirectDrive, BeltDrive, Coupling, Other, NotKnown, Unset)			
DriveInAirstream	Boolean value to identify if the fan drive is in the airstream. TRUE = Yes, FALSE = No.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
FanMountingType	This enumeration identifies different methods of mounting a fan in a building.	IfcEnumeratedProperty	Pset_FanMountingTypeEnum (ManufacturedCurb, FieldErectedCurb, ConcretePad, Suspended, Other, NotKnown, Unset)			
SoundPowerLevel	Reference to a property set Pset_SoundPowerLevels which contains sound power level data	IfcObjectReference	IfcGloballyUniqueId, Pset_SoundPressureLevels	n/a	n/a	n/a
Motor	Reference to an IfcEquipment object of type Motor which cointains information about the Fan Motor.	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	NIL

20.61. PropertySet Pset_Faucet

20.61.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPlumbingFixtureProperties	Reference to the SharedPropertySet (Pset_PlumbingFixtureCommon). Contains the shared values for this type -- of properties that are stored for all types of Plumbing Fixtures.	IfcObjectReference	IfcGloballyUniqueId, Pset_PlumbingFixtureCommon	n/a	n/a	NIL

20.62. PropertySet Pset_Fluid

20.62.1. PropertySet Semantic Definition

Definition from IAI: A fluid typically utilized within HVAC systems.

20.62.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Name	The name of the fluid	IfcSimpleProperty	IfcString	see type	see type	empty string
Description	A description of the fluid	IfcSimpleProperty	IfcString	see type	see type	empty string
BoilingPoint	The boiling point of the fluid	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
FreezingPoint	The freezing point of the fluid	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
Density	The density of the fluid (Data type = MassDensityMeasure)	IfcSimplePropertyWithUnit	IfcReal, MassDensityUnit	see type	see type	0
Viscosity	The viscosity of the fluid (Data type = DynamicViscosityMeasure)	IfcSimplePropertyWithUnit	IfcReal, DynamicViscosityUnit	see type	see type	0
HeatCapacity	The heat capacity of the fluid (Data type = HeatCapacityMeasure)	IfcSimplePropertyWithUnit	IfcReal, HeatCapacityMeasure	see type	see type	0
LatentHeat	The latent heat of the fluid (Data type = LatentHeatMeasure)	IfcSimplePropertyWithUnit	IfcReal, LatentHeatMeasure	see type	see type	0

20.63. PropertySet Pset_FluidMover

20.63.1. PropertySet Semantic Definition

Definition from IAI: A fluid mover is equipment that imparts mechanical work on a fluid (e.g., pump, fan).

20.63.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Fluid	Reference to the Pset_Fluid property set which contains information about the fluid	IfcObjectReference	IfcGloballyUniqueId, Pset_Fluid	n/a	n/a	n/a
FluidFlowrate	Nominal fluid flow rate (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
WorkingPressure	Working total pressure differential (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
OperatingEfficiency	Operating efficiency of the fluid mover at the design flow rate (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0

MinimumEfficiency	Minimum efficiency of the fluid mover throughout the operating range (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
OperatingPower	Power input at rated performance (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
MaximumPower	Maximum power input (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
Speed	Rotational speed of the fluid mover. (Data type = RotationalFrequencyMeasure)	IfcSimplePropertyWithUnit	IfcReal, RotationalFrequencyUnit	see type	see type	0

20.64. PropertySet Pset_GutterSegment

20.64.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManufactureInformation	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL
Slope	Angle of the gutter to allow for drainage	IfcSimpleProperty	IfcPlaneAngleMeasure	0	see type	0
FlowRating	Actual flow capacity for the gutter. Value of 0.00 means this value has not been set. (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	0	see type	0
ConstructionDetail	References to construction detail drawings	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	NIL
SpecifcationSection	References to specification sections	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	NIL

20.65. PropertySet Pset_HeatExchanger

20.65.1. PropertySet Semantic Definition

Definition from IAI: Equipment used to provide heat transfer between non-mixing media such as both plate and shell and tube heat exchangers.

20.65.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
HeatExchangerType	This enumeration identifies	IfcEnumeratedProp	Pset_HeatExchangerTypeEn			

	the basic types of heat exchangers (e.g., plate, shell and tube, etc.).	erty	um(Plate, ShellAndTube, Other, NotKnown, Unset)			
HeatExchangerArrangement	This enumeration identifies the basic flow arrangements for the heat exchanger (e.g., Counterflow, Crossflow, etc.).	IfcEnumeratedProperty	Pset_HeatExchangerArrangementEnum(CounterFlow, CrossFlow, ParallelFlow, MultiPass, Other, NotKnown, Unset)			
HeatTransferRate	Rate at which energy is transferred from one mediium to another (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
TubeBundle	Reference to an IfcFlowEquipment object of type TubeBundle which cointains information about the Heat Exchanger TubeBundle	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
PlateMaterial	Referenct to a material used to construct the plates in a Plate Heat Exchanger	IfcObjectReference	IfcMaterial	n/a	n/a	n/a
NumberOfPlates	Number of plates used for the plate and frame heat exchanger	IfcSimpleProperty	IfcInteger	see type	see type	0

20.66. PropertySet Pset_Insulation

20.66.1. PropertySet Semantic Definition

Definition from IAI: Materials with low heat conductance.

20.66.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
InsulationType	This enumeration defines different types of insulation (i.e., InorganicFibrous, InorganicCellular, OrganicFibrous, OrganicCellular, etc.) as defined by ASHRAE 1997 Fundamenatals Section 22.2 Basic Materials.	IfcEnumeratedProperty	Pset_InsulationTypeEnum(InorganicFibrous, InorganicCellular, OrganicFibrous, OrganicCellular, Metallic,MetallizedOrganicReflectiveMembranes, Other, NotKnown, Unset)			
Thickness	Insulation Thickness	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
Density	Insulation density (Data type = MassDensityMeasure)	IfcSimplePropertyWithUnit	IfcReal, MassDensityUnit	see type	see type	0
SpecificHeat	Specific heat of the insulation (Data type = SpecificHeatMeasure)	IfcSimplePropertyWithUnit	IfcReal, SpecificHeatMeasure	see type	see type	0
JacketType	Jacket material type of the insulation	IfcObjectReference	IfcMaterial	n/a	n/a	n/a

FlamabilityRating	Insulation flammability rating	IfcSimpleProperty	IfcString	see type	see type	empty string
ThermalResistance	Insulation thermal resistance or R-Value (Data type = ThermalResistanceMeasure)	IfcSimplePropertyWithUnit	IfcReal, ThermalResistanceUnit	see type	see type	0

20.67. PropertySet Pset_LightFixture

20.67.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalFixtureProperties	Reference to the SharedPropertySet (Pset_ElectricalFixtureCommon). Contains the shared values for this type -- of properties that are stored for all types of Electrical Fixtures.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalFixtureCommon	n/a	n/a	NIL

20.68. PropertySet Pset_LightingThermalProperties

20.68.1. PropertySet Semantic Definition

Definition from IAI: Information about light fixtures which contribute to thermal loads.

20.68.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Additional information about the light fixture that might be useful to the HVAC design	IfcSimpleProperty	IfcString	see type	see type	empty string
MaximumSpaceSensibleLoad	Maximum or Peak sensible thermal load contributed to the conditioned space by the light fixture (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
MaximumPlenumSensibleLoad	Maximum or Peak sensible thermal load contributed to return air plenum by the light fixture (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
SensibleLoadToRadiant	Percent of sensible thermal load to radiant heat (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0

20.69. PropertySet Pset_LoadDesignCriteria

20.69.1. PropertySet Semantic Definition

Definition from IAI: Building thermal load design data such as occupancy, appliance, and lighting criteria that are used for calculating thermal loads in a space or building.

20.69.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
OccupancyType	This enumeration identifies types of occupancy or space usage (e.g., Theater, Office, Hotel, Apartment, etc.) as defined by Table 3, Chapter 28, of the 1997 ASHRAE Handbook of Fundamentals.	IfcEnumeratedProperty	Pset_OccupancyTypeEnum (Theater, Office, Hotel, Apartment, RetailStore, DrugStore, Bank, Restaurant, Factory, DanceHall, BowlingAlley, Gymnasium, Other, NotKnown, Unset)			
AreaPerPerson	Design occupancy loading for this type of usage	IfcSimpleProperty	IfcAreaMeasure	see type	see type	0
PeopleSensibleLoad	Sensible thermal load contributed per person (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
PeopleLatentLoad	Latent thermal load contributed per person (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
PeopleSensibleLoadToRadiant	Percent of sensible thermal load contributed by people to radiant heat (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
OccupancyDiversity	Diversity factor that may be applied to the number of people in the space (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
OutsideAirPerPerson	Design quantity of outside air to be provided per person in the space (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
ReceptacleLoadIntensity	Average power use intensity of appliances and other non-HVAC equipment.in the space per unit area.	IfcSimplePropertyWithUnit	IfcReal, PowerMeasure/IfcAreaMeasure			
AppliancePercentLoadToRadiant	Percent of sensible load to radiant heat (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
LightingLoadIntensity	Average lighting load intensity in the space per unit area	IfcSimplePropertyWithUnit	IfcReal, PowerMeasure/IfcAreaMeasure			

LightingPercentLoadToReturnAir	Percent of lighting load to the return air plenum (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0

20.70. PropertySet Pset_Material

20.70.1. PropertySet Semantic Definition

Definition from IAI: Thermal properties of a material.

20.70.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
SpecificMass	Specific mass of a material (Data type = MassDensityMeasure)	IfcSimplePropertyWithUnit	IfcReal, MassDensityUnit	see type	see type	0
SpecificHeat	Sepecific heat of a material (Data type = SpecificHeatMeasure)	IfcSimplePropertyWithUnit	IfcReal, SpecificHeatMeasure	see type	see type	0
ThermalTransmittanceCoefficient	Thermal transmittance coefficient (U-Value) of a material (Data type = ThermalTransmittanceMeasure)	IfcSimplePropertyWithUnit	IfcReal, IfcThermalTransmittanceMeasure	see type	see type	0

20.71. PropertySet Pset_Motor

20.71.1. PropertySet Semantic Definition

Definition from IAI: Equipment used to convert electrical power to rotational mechanical power.

20.71.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
Speed	Rate of rotation of the motor shaft: a measurement of revolutions per period of time (Data type = RotationalFrequencyMeasure)	IfcSimplePropertyWithUnit	IfcReal, RotationalFrequencyUnit	see type	see type	0
Efficiency	Elelctrical efficiency of the motorper NEMA Standards MG10 and MG11. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
PowerOutput	Nominal electrical power	IfcSimplePropertyW	IfcReal, PowerUnit	see type	see type	0

	output of the motor per NEMA Standards MG10 and MG11. (Data type = PowerMeasure)	ithUnit				
FrameConfiguration	Motor frame designation	IfcSimpleProperty	IfcString	see type	see type	empty string
InsulationRating	Nominal rating of the motor wiring insulation	IfcSimpleProperty	IfcString	see type	see type	empty string
MotorHousingType	This enumeration identifies whether the motor housing is sealed or open.	IfcEnumeratedProperty	Pset_MotorHousingTypeEnum(Sealed, Open, Other, NotKnown, Unset)			
MotorWindingType	This enumeration identifyies the type of winding used for the motor.	IfcEnumeratedProperty	Pset_MotorWindingTypeEnum(Synchronous, Asynchronous, SeriesWound, ParallelWound, Other, NotKnown, Unset)			

20.72. PropertySet Pset_OutsideDesignCriteria

20.72.1. PropertySet Semantic Definition

Definition from IAI: Outside air conditions used as the basis for calculating thermal loads at peak conditions.

20.72.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
HeatingDryBulb	Outside dry bulb temperature for heating design	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
HeatingWetBulb	Outside wet bulb temperature for heating design	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CoolingDryBulb	Outside dry bulb temperature for cooling design	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CoolingWetBulb	Outside wet bulb temperature for cooling design	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0

20.73. PropertySet Pset_OvalDuctPort

20.73.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
NominalWidth	Nominal width of oval duct measured along the X-Axis of the IfcLocalPlacement's direction vector.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
NominalHeight	Nominal height of oval duct measured along the Y-Axis of the IfcLocalPlacement's direction vector.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
ConnectionType	Enumeration that identifies the type of connection	IfcEnumeratedProperty	Pset_OvalDuctConnectionTypeEnum(BeadedSleeve, Drawband, OutsideSleeve, Flange, Crimp, Swedge,			

			Other, NotKnown, Unset)			

20.74. PropertySet Pset_PackagedACUnit

20.74.1. PropertySet Semantic Definition

Definition from IAI: Equipment which utilizes an integral refrigeration cycle for cooling a fluid (typically air).

20.74.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
SensibleCoolingCapacity	Sensible cooling capacity of the PackagedACUnit per ARI Standards 210/240, 270, 275, 360, 340 and 365. (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	
LatentCoolingCapacity	Latent cooling capacity of the PackagedACUnit per ARI Standards 210/240, 270, 275, 360, 340 and 365. (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
CoolingEfficiency	Coeficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions per ARI Standards 210/240, 270, 275, 360, 340 and 365. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
HeatingCapacity	Heating capacity of the PackagedACUnit per ARI Standards 210/240, 270, 275, 360, 340 and 365 for heat pumps, AFUE for fuel burning and NEMA for electric heat. (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
HeatingEfficiency	Heating efficiency of the PackagedACUnit under full load heating conditions per ARI Standards 210/240, 270, 275, 360, 340 and 365 for heat pumps, AFUE for fuel burning and NEMA for electric heat. (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
Compressors	Bag of references to IfcFlowEquipment objects of type Compressor that are	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a

	used by the PackagedACUnit to perform work on the refrigerant.					
CondenserFans	Bag of references to IfcFlowEquipment object of type Fan which defines properties of the condenser fan(s) used by the PackagedACUnit.	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a
CondenserFlowrate	Flow rate of fluid through the condenser per manufacturer's listing (if available) (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
CondenserEnteringTemperature	Temperature of fluid entering condenser per manufacturer's listing (if available)	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CondenserLeavingTemperature	Termperature of fluid leaving condenser per manufacturer's listing (if available)	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
HeatingEnergySource	This enumeration identifies the primary energy source used for heating.	IfcEnumeratedProperty	Pset_EnergySourceEnum(Electricity, NaturalGas, Oil, LiquifiedPetroleumGas, Propane, Steam, Other, NotKnown, Unset)			
OutsideAirFlowrate	Flow rate of outside air entering the PackagedACUnit per the manufacturer's listing (if available) (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
SoundPowerLevel	Reference to a property set Pset_SoundPowerLevels which contains sound power level data	IfcObjectReference	IfcGloballyUniqueId, Pset_SoundPressureLevels	n/a	n/a	n/a

20.75. PropertySet Pset_PipeDesignCriteria

20.75.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the general characteristics of the pipe design parameters. This property set is typically attached to an instance of an IfcSystem, however, it may also be attached to individual elements within a pipe distribution system where individual design parameters overrule those of the system. Related property sets include Pset_Fluid and Pset_Insulation.

20.75.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
DesignName	A name for the design values	IfcSimpleProperty	IfcString	see type	see type	empty string
PipeSizingMethod	Enumeration that identifies the sizing method to be used if different from the system design criteria	IfcEnumeratedProperty	Pset_PipeSizingMethodEnum(MaximumVelocity, MaximumPressureDrop, Other, NotKnown, Unset)			
PressureClass	Nominal pressure rating of the	IfcSimplePropertyW	IfcReal, PressureUnit	see type	see type	0

	piping system components (i.e., 125, 250, etc.) (Data type = PressureMeasure)	ithUnit				
MaximumVelocity	The maximum allowable fluid velocity (Data type = LinearVelocityMeasure)	IfcSimplePropertyWithUnit	IfcReal, LinearVelocityUnit	see type	see type	0
InsulationType	The insulation type to be used	IfcObjectReference	IfcGloballyUniqueId, Pset_Insulation	n/a	n/a	NIL

20.76. PropertySet Pset_PipeFitting

20.76.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a pipe fitting. Related property sets include Pset_PipeDesignCriteria.

20.76.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FittingSubtype	This enumeration identifies the fitting subtype.	IfcEnumeratedProperty	Pset_PipeFittingSubtypeEnum(45DegreeElbow, 90DegreeElbow, Cap, Cock, Crossover, DoubleBranchElbow, Flange, Lateral, PipeJoint, Plug, Reducer, ReducingElbow, Sleeve, StreetElbow, Tee, Union, Other, NotKnown, Unset)			

20.77. PropertySet Pset_PipeSegment

20.77.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a pipe segment. Related property sets include Pset_PipeDesignCriteria.

20.77.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FinishedLength	The finished length of the pipe segment	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0

20.78. PropertySet Pset_PipeSystemDesignCriteria

20.78.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the general characteristics of the duct system and is typically attached to an instance of an IfcSystem. Related property sets include Pset_Fluid and Pset_Insulation.

20.78.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
PipeSystemType	Enumeration that identifies the type of system	IfcEnumeratedProperty	Pset_PipeSystemTypeEnum(DomesticHotWater, ChilledWater, CondenserWater, HeatingHotWater, Steam, Other, NotKnown, Unset)			
SystemDescription	System description	IfcSimpleProperty	IfcString	see type	see type	empty string
SystemLocation	Physical description of the part of the building the system serves	IfcSimpleProperty	IfcString	see type	see type	empty string
FluidSourcePressure	Pressure in main for domestic water, sprinklers, system pressure for hydronic systems, etc. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
FluidLiftHeight	Lift that may be required on open systems with dense fluids. (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0

20.79. PropertySet Pset_PlumbingFixtureCommon

20.79.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Description of this fixture type. Note: name is included in the TypeDefinition.	IfcSimpleProperty	IfcString	see type	see type	empty string
AssetInformation	Reference to an OccurrencePropertySet (Pset_Asset) containing Information about this asset. This property set will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.	IfcObjectReference	IfcGloballyUniqueId, Pset_Asset	n/a	n/a	n/a
ManufactureInformation	Reference to property set Pset_ManufactureInformation, which defines information about the manufacture of this fixture.	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	n/a
ElectricalCharacteristics	Reference to an OccurrencePropertySet (Pset_ElectricalCharacteristics) containing information about the electrical requirements for this fixture. This property set will be	IfcObjectReference	IfcGloballyUniqueId, IfcElectricalCharacteristics	n/a	n/a	n/a

	attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype.					
MaintenanceInformation	References to IfcMaintenanceRecord objects containing maintenance history	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcMaintenanceRecord	n/a	n/a	NIL
CleanWaterSystem	Boolean value to identify if this is a component in the clean water system (water supply). If the value is FALSE, then it is assumed to be a component in the waste water system.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
FunctionalHeight	Height from floor to functional opening. Value of 0.0 means this property not set.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
MountingHeight	height at which the item gets connect to the wall. Value of 0.0 means this property not set.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
MountingType	Description of the method for mounting	IfcSimpleProperty	IfcString	n/a	n/a	empty string
WasteConnectPoint	Reference to the connection object relating this plumbing fixture to the waste connection	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcRelConnectsElements	n/a	n/a	NIL
HotWaterConnectPoint	Reference to the connection object relating this plumbing fixture to the hot water supply plumbing system.	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcRelConnectsElements	n/a	n/a	NIL
ColdWaterConnectPoint	Reference to the connection object relating this plumbing fixture to the cold water supply plumbing system	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcRelConnectsElements	n/a	n/a	NIL
ElectricalConnectPoint	Reference to the connection object relating this plumbing fixture to the electrical power system	IfcObjectReference	IfcGloballyUniqueId, IfcRelConnectsElements	n/a	n/a	NIL
ConstructionDetails	List of references to construction detail drawings	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	empty list
SpecificationSections	Reference to a section of the construction specification	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	NIL
OperationalSpace	Space around fixture required for proper use by occupants or as mandated by code requirements	IfcObjectReference	IfcGloballyUniqueId, IfcSpace	n/a	n/a	NIL
ManufacturerMaterial	Material selection from the manufacturer's material options for this fixture type	IfcSimpleProperty	IfcString	see type	see type	empty string
ManufacturerColor	Color selection from the manufacturer's color options for this fixture type	IfcSimpleProperty	IfcString	see type	see type	empty string

ManufacturerFinish	Finish selection from the manufacturer's finish options for this fixture type	IfcSimpleProperty	IfcString	see type	see type	empty string

20.80. PropertySet Pset_PowerOutlet

20.80.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalFixtureProperties	Reference to the SharedPropertySet (Pset_ElectricalFixtureCommon). Contains the shared values for this type -- of properties that are stored for all types of Electrical Fixtures.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalFixtureCommon	n/a	n/a	NIL

20.81. PropertySet Pset_Printer

20.81.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalAppliancesProperties	Reference to the 'parent' SharedPropertySet (Pset_ElectricalApplianceCommon). Contains the shared values for this type -- properties that are stored for all types of ElectricalAppliances.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalApplianceCommon	n/a	n/a	n/a

20.82. PropertySet Pset_Pump

20.82.1. PropertySet Semantic Definition

Definition from IAI: Equipment which imparts mechanical work on a liquid.

20.82.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
PumpType	This enumeration identifies the types of centrifugal pumps typically used in building services	IfcEnumeratedProperty	Pset_PumpTypeEnum(Circulator, EndSuction, SplitCase, VerticalInline, VerticalTurbine, Other, NotKnown, Unset)			

FluidMover	Reference to the Pset_FluidMover property set which contains fluid flow characteristics for the pump	IfcObjectReference	IfcGloballyUniqueId, Pset_FluidMover	n/a	n/a	n/a
WorkingPressure	Nominal working pressure (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
NetPositiveSuctionHead	Minimum liquid pressure at pump inlet to prevent cavitation (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
FluidTemperature	Nominal termperature of pumped liquid	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
ImpellerSize	Dimension of pump impeller	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
ImpellerSealMaterial	Reference to the material used for the impeller shaft seals	IfcObjectReference	IfcMaterial	n/a	n/a	n/a
PumpBaseType	This enumeration identifies the types of bases used for centrifugal pumps.	IfcEnumeratedProperty	Pset_PumpBaseTypeEnum(Frame, Base, Inline, Other, NotKnown, Unset)			
MotorDriveType	This enumeration identifies the type of connection between the motor shaft and the pump impeller.	IfcEnumeratedProperty	Pset_MotorDriveTypeEnum(DirectDrive, BeltDrive, Coupling, Other, NotKnown, Unset)			
Motor	Reference to an IfcEquipment object of type Motor which cointains information about the Pump Motor.	IfcObjectReference	IfcGloballyUniqueId, IfcFlowEquipment	n/a	n/a	n/a

20.83. PropertySet Pset_RadiantHeater

20.83.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalFixtureProperties	Reference to the SharedPropertySet (Pset_ElectricalFixtureCommon). Contains the shared values for this type -- of properties that are stored for all types of Electrical Fixtures.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalFixtureCommon	n/a	n/a	NIL

20.84. PropertySet Pset_RectangularDuctPort

20.84.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
NominalWidth	Nominal width of rectangular duct measured along the X-Axis of the IfcLocalPlacement's direction vector.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0

NominalHeight	Nominal height of rectangular duct measured along the Y-Axis of the IfcLocalPlacement's direction vector.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
ConnectionType	Enumeration that identifies the type of connection	IfcEnumeratedProperty	Pset_RectangularDuctConnectionTypeEnum(DriveSlip, S-Slip, Flange, SlipOn, StandingSeam, Angle, Other, NotKnown, Unset)			

20.85. PropertySet Pset_RoofDrain

20.85.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManufactureInformation	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL
TributaryAreaDrained	Area that is allocated to this drain if it is a primary drain. Value of 0.00 means this value has not been set or it is a secondary drain.	IfcSimpleProperty	IfcAreaMeasure	0	see type	0
FlowRating	Actual flow capacity for the drain. Value of 0.00 means this value has not been set. (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	0	see type	0
ConstructionDetail	References to construction detail drawings	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	NIL
SpecifcationSection	References to specification sections	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	NIL

20.86. PropertySet Pset_RoundDuctPort

20.86.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
NominalDiameter	Nominal diameter of round duct measured along the X-Axis of the IfcLocalPlacement's direction vector.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
ConnectionType	Enumeration that identifies the type of connection	IfcEnumeratedProperty	Pset_RoundDuctConnectionTypeEnum(BeadedSleeve, Drawband, OutsideSleeve, Flange, Crimp, Swedge, Other, NotKnown, Unset)			

20.87. PropertySet Pset_RoundPipePort

20.87.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
NominalDiameter	Nominal diameter of round pipe measured along the X-Axis of the IfcLocalPlacement's direction vector.	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
ConnectionType	Enumeration that identifies the type of connection	IfcEnumeratedProperty	Pset_RoundPipeConnectionTypeEnum(Flange, Screw, Weld, BellAndSpigot, Thread, Other, NotKnown, Unset)			

20.88. PropertySet Pset_Scupper

20.88.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManufactureInformation	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL
ConstructionDetail	References to construction detail drawings	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	NIL
SpecifcationSection	References to specification sections	IfcPropertyList	IfcObjectReference, IfcDocumentReference	n/a	n/a	NIL

20.89. PropertySet Pset_Shower

20.89.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPlumbingFixtureProperties	Reference to the SharedPropertySet (Pset_PlumbingFixtureCommon). Contains the shared values for this type -- of properties that are stored for all types of Plumbing Fixtures.	IfcObjectReference	IfcGloballyUniqueId, Pset_PlumbingFixtureCommon	n/a	n/a	NIL

20.90. PropertySet Pset_Sink

20.90.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPlumbingFixtureProperties	Reference to the SharedPropertySet (Pset_PlumbingFixtureCommon). Contains the shared	IfcObjectReference	IfcGloballyUniqueId, Pset_PlumbingFixtureCommon	n/a	n/a	NIL

	values for this type -- of properties that are stored for all types of Plumbing Fixtures.					

20.91. PropertySet Pset_SiteWeatherData

20.91.1. PropertySet Semantic Definition

Definition from IAI: Provides access to weather data appropriate to the site and is used for calculating thermal loads.

20.91.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	The site weather data station description or reference to the data source from which weather data was obtained for use in calculations.	IfcSimpleProperty	IfcString	see type	see type	empty string
Date	The date for which the weather data was gathered.	IfcObjectReference	IfcCalendarDate	see type	see type	NULL

20.92. PropertySet Pset_SoundPressureLevels

20.92.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
63Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave band frequency centered around 63 Hertz (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
125Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave band frequency centered around 125 Hertz (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
250Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave band frequency centered around 250 Hertz (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
500Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0

	band frequency centered around 500 Hertz (Data type = PressureMeasure)					
1000Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave band frequency centered around 1000 Hertz (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
2000Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave band frequency centered around 2000 Hertz (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
4000Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave band frequency centered around 4000 Hertz (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
8000Herz	Sound Pressure Level measured in decibels at a reference pressure of 20 microPascals for the octave band frequency centered around 8000 Hertz (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0

20.93. PropertySet Pset_SpaceElementInformation

20.93.1. PropertySet Semantic Definition

Definition from IAI: Space or zone thermal properties and desgn constraints.

20.93.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CoolingDesignAirflow	The air flowrate required during the peak cooling conditions (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
HeatingDesignAirflow	The air flowrate required during the peak heating conditions, but could also be determined by minimum ventilation requirement or minimum air change requirements. (Data type =	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0

	VolumetricFlowrateMeasure)					
TotalSensibleHeatGain	The total sensible heat or energy gained by the space during the peak cooling conditions (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
TotalHeatGain	The total amount of heat or energy gained by the space at the time of the space's peak cooling conditions (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
TotalHeatLoss	The total amount of heat or energy lost by the space at the time of the space's peak heating conditions (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
HeatingDryBulb	Inside dry bulb temperature for heating design	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
HeatingRelativeHumidity	Inside relative humidity for heating design (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
CoolingDryBulb	Inside dry bulb temperature for cooling design	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
CoolingRelativeHumidity	Inside relative humidity for cooling design (Data type = PercentMeasure)	IfcSimplePropertyWithUnit	IfcReal, PercentMeasure	see type	see type	0
VentilationAirFlowrate	Ventilation outside air requirement (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
ExhaustAirFlowrate	Exhaust air flow rate for the space (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0
CeilingRAPlenum	Ceiling plenum used for return air or not. TRUE = Yes, FALSE = No.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
BoundaryAreaHeatLoss	Heat loss per unit area for the boundary object. This is a design input value for use in the absence of calculated load data (Data type = HeatfluxDensityMeasure)	IfcSimplePropertyWithUnit	IfcReal, HeatFluxDensityUnit	see type	see type	0

20.94. PropertySet Pset_Telephone

20.94.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonElectricalAppliancePropertiesReference to the 'parent' SharedPropertySet (Pset_ElectricalApplianceCommon). Contains the shared values for this type -- properties that are stored for all types of ElectricalAppliances.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElectricalApplianceCommon	n/a	n/a	n/a

20.95. PropertySet Pset_Toilet

20.95.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPlumbingFixturePropertiesReference to the SharedPropertySet (Pset_PlumbingFixtureCommon). Contains the shared values for this type -- of properties that are stored for all types of Plumbing Fixtures.	IfcObjectReference	IfcGloballyUniqueId, Pset_PlumbingFixtureCommon	n/a	n/a	NIL

20.96. PropertySet Pset_TubeBundle

20.96.1. PropertySet Semantic Definition

Definition from IAI: Tube and bundles of tubes properties used within equipment.

20.96.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentPropertiesReference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
Fluid	Reference to the Pset_Fluid property set for information about the properties of the fluid used in the TubeBundle	IfcObjectReference	IfcGloballyUniqueId, Pset_Fluid	n/a	n/a	n/a
TubeSize	Nominal diameter of tubes in the bundle	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
TubeMaterial	Reference to the material used for construction of the	IfcObjectReference	IfcMaterial	n/a	n/a	n/a

	tubes					
Length	Nominal length of tubes	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
Spacing	Spacing between tubes	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
FluidFlowrate	Design fluid flow rate through the tube bundle (Data type = VolumetricFlowrateMeasure)	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateMeasure	see type	see type	0
FluidVelocity	Design Velocity of the fluid through an individual tube (Data type = LinearVelocityMeasure)	IfcSimplePropertyWithUnit	IfcReal, LinearVelocityMeasure	see type	see type	0
FluidEnteringTemperature	List of design temperatures of entering conditions; for air the list consists of dry bulb followed by wet bulb	IfcPropertyList	IfcSimpleProperty, IfcThermodynamicTemperatureMeasure	see type	see type	0
FluidLeavingTemperature	List of design temperatures of leaving conditions; for air the list consists of dry bulb followed by wet bulb	IfcPropertyList	IfcSimpleProperty, IfcThermodynamicTemperatureMeasure	see type	see type	0
FluidPressureDrop	Pressure drop of the fluid through the TubeBundle at the design fluid flow rate (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
FluidEnteringPressure	Design pressure of the fluid entering the tube bundle (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
FluidLeavingPressure	Design pressure of the fluid leaving the tube bundle (Data type = PressureMeasure)	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
FoulingFactor	Fouling factor of the tubes	IfcSimpleProperty	IfcReal	see type	see type	0

20.97. PropertySet Pset_UnitHeater

20.97.1. PropertySet Semantic Definition

Definition from IAI: Equipment which adds heat to a space.

20.97.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to the 'parent' SharedPropertySet (Pset_EquipmentCommon). Contains the shared values for this type -- of properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	n/a
HeatCapacity	Nominal heat transfer capacity of the unit heater (Data type = PowerMeasure)	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0
Coil	Bag of one or more references to an	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId,	n/a	n/a	n/a

	IfcFlowEquipment object of type Coil that defines the coil(s) that are used by the UnitHeater		IfcFlowEquipment			

20.98. PropertySet Pset_Urinal

20.98.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonPlumbingFixtureProperties	Reference to the SharedPropertySet (Pset_PlumbingFixtureCommon). Contains the shared values for this type -- of properties that are stored for all types of Plumbing Fixtures.	IfcObjectReference	IfcGloballyUniqueId, Pset_PlumbingFixtureCommon	n/a	n/a	NIL

20.99. PropertySet Pset_WindowCleaning

20.99.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonEquipmentProperties	Reference to a SharedPropertySet (Pset_EquipmentCommon) which defines properties that are stored for all types of equipment.	IfcObjectReference	IfcGloballyUniqueId, Pset_EquipmentCommon	n/a	n/a	NIL
WindowCleaningElementType	Enumeration of the various	IfcEnumeratedProperty	Pset_WindowCleaningElementTypeEnum(Apparatus, Carriage, Rails, Rigging, Tracks, Other, NotKnown, Unset)			

21. IfcSharedSpatialElements

The Schema IfcSharedSpatialElements is defined at the Interoperability Layer and covers the definition of spatial elements that are shared among several IFC domain or application type models. It enhances the definition of space as specified at the IfcProductExtension schema.

21.1. Type IfcLossOrGainEnum

21.1.1. Type Semantic Definition

Definition from IAI: This enumeration defines the thermal use cases as either being a loss or a gain to the space.

History

New Enumeration in IFC Release 2.0

21.1.2. Enumeration

Loss
Gain
NotDefined

21.2. Type IfcOccupantTypeEnum

21.2.1. Type Semantic Definition

Definition from IAI: This enumeration defines the available Generic Types for IfcOccupant.

History

New Enumeration in IFC Release 2.0

21.2.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcOccupant

21.2.3. Enumeration

Owner
Lessee
Tenant
Assignee
UserDefined
NotDefined

21.3. Type IfcRequirementOrCriteriaEnum

21.3.1. Type Semantic Definition

Definition from IAI: This enumeration defines whether the thermal use case is a requirement for a particular thermal space quality or a criteria.

History

New Enumeration in IFC Release 2.0

21.3.2. Enumeration

Requirement
Criteria
NotDefined

21.4. Type IfcResidentEnum

21.4.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different categories under which residents of a space or building can be classified.

History

New Enumeration in IFC Release 2.0

21.4.2. Enumeration

Intermittent
Regular
Permanent
NotDefined

21.5. Type IfcUseCaseSourceEnum

21.5.1. Type Semantic Definition

Definition from IFC: This enumeration defines the various sources of thermal loads or gains for spaces, derived from various use cases.

History

New Enumeration in IFC Release 2.0

21.5.2. Enumeration

Person
Lighting
Machine
VentilationInnerAir
VentilationOuterAir
ExhaustAir
AirExchangeRate
DryBulbTemperature
RelativeHumidity

21.6. Type IfcVisitorEnum

21.6.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different categories under which visitors of a space or building can be classified.

History

New Enumeration in IFC Release 2.0

21.6.2. Enumeration

Intermittent
Regular
NotDefined

21.7. Class IfcFireCompartment

21.7.1. Class Semantic Definition

Definition from IAI: The Fire Compartment class (IfcFireCompartment) is considered as a specialization of Space (IfcSpace) for fire compartmentation purposes. It is an aggregate of spaces under this view, using the IfcRelAssemblesSpaces objectified relationship. It defines the geometric information about the fire compartment, the fire use classification, fire risk factors and information, whether this compartment is ventilated or sprinkler protected.

History

New Entity in IFC Release 2.0

21.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcSpatialElement
IfcSpace
IfcFireCompartment

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	calcHeightAboveGrade	Height of floor of top storey of Fire Compartment above accessible horizontal surface external to the Fire Compartment.	IfcLengthMeasure	see type	see type	1
OPT	MainFireUse	Main fire use for the space which is assigned from the Fire Use Classification.	IfcClassification	see type	see type	see type
OPT	AncillaryFireUse	Ancillary fire use for the space which is assigned from the Fire Use Classification.	IfcClassification	see type	see type	see type
OPT	FireRiskFactor	Fire Risk factor assigned to the space	INTEGER	see type	see type	see type
	HasNaturalVentilation	Indication whether the space is ventilated natural (true) or mechanical (false).	LOGICAL	FALSE	TRUE	TRUE
	HasSprinklerProtection	Indication whether the space is sprinkler protected (true) or not (false).	LOGICAL	FALSE	TRUE	FALSE

Formal Propositions

WR61	The fire compartment class can only exists as an assembly of spaces
WR62	The fire compartment shall not assemble other fire compartments

21.7.3. Interface Definitions

- I_FireCompartment

21.7.4. Geometry Use Definitions

The geometric use cases for IfcFireCompartment are defined at its supertype IfcSpace.

21.8. Class IfcOccupancyNumber

21.8.1. Class Semantic Definition

Definition from IAI: The Occupancy Number Class (IfcOccupancyNumber) contains all information about the actual and planned, internal and cumulative occupancy numbers and occupancy rate. In addition more detailed information about the physical ability, the type of occupiers (residents or visitors), and the type of occupancy (intermittent, regular, permanent) are captured.

History

New Entity in IFC Release 2.0

21.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcPropertyDefinition
    IfcOccupancyNumber

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ActualOccupancyNumber	The actual number of persons housed in a space, zone or building at a given time, usually in an existing accommodation.	INTEGER	0	see type	1
OPT	DesignIntentOccupancyNumber	The number of persons housed in a space, zone or building as specified in the Design Brief.	INTEGER	0	see type	1
OPT	ActualCumulativeOccupancyNumber	The actual number of occupants in a space, zone, or building, plus that arriving from adjacent evacuated spaces.	INTEGER	0	see type	1
OPT	DesignIntentCumulativeOccupancyNumber	The design intent number of occupants in a space, zone, or building, plus that arriving from adjacent evacuated spaces.	INTEGER	0	see type	1
OPT	OccupancyRate	Occupancy per Area Measure as specified for a specific function of the space, usually given by a recognized standard. The usually used unit is Person/m².	IfcMeasureWithUnit	0	see type	1
OPT	ActualNumberOfResidents	The actual number of residents housed in a space.	INTEGER	0	see type	1

OPT	DesignIntentNumberOfResidents	The number of residents housed in a space as specified in the Design Brief.	INTEGER	0	see type	1
OPT	ResidentsOccupancyType	Resident, those who either live or work in the space under consideration, occupy the space.	IfcResidentEnum	Intermittent	Undefined	Intermittent
OPT	ActualNumberOfVisitors	The actual number of visitors occupying a space in a given time.	INTEGER	0	see type	0
OPT	DesignIntentNumberOfVisitors	The number of visitors occupying a space in a given time as specified in the Design Brief.	INTEGER	0	see type	0
OPT	VisitorsOccupancyType	Visitors - coming into the space for the purpose of visiting, viewing; but do not come to carryout any duties, normally performed, within the space by the residents; or for the residents.	IfcVisitorEnum	Intermittent	Undefined	Intermittent
OPT	ActualPercentageRequiringAssistance	Actual percentage of all occupance, that require assistence in case of fire escaping, e.g. disabled people or youngsters.	IfcPositiveRatioMeasure	0	see type	0
OPT	DesignIntentPercentageRequiringAssistance	Design intent percentage of all occupance, that require assistence in case of fire escaping, e.g. disabled people or youngsters.	IfcPositiveRatioMeasure	0	see type	0

21.8.3. Interface Definitions

- I_OccupancyNumber

21.8.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

21.9. Class IfcOccupant

21.9.1. Class Semantic Definition

Definition from IAI: The Occupant Class (IfcOccupant) contains all information about the occupancy owner, tenant, or lessee for the referenced space, zone, or building. An occupant is an actor within the project, characterized by its ownership relation to spaces.

The sum of all IfcOccupant instances assigned to a space, zone or building, combines all information about the occupancy aspect for spaces, zones, or buildings. In particular:

- *ownership*, who owns the space, zone, building, land?
- *rental*, who rents (tenant) the space, zone, building from whom (landlord)
- *leasing*, who leases (lessee) the space, zone, building, land from whom (lessor)
- *rental details*: duration of tenancy, rent frequency period
- *leasing details*: lease period, lease dates
- *assignee*: to whom is the space assigned?

History

New Entity in IFC Release 2.0

21.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcActor
IfcOccupant

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined types are specified in an enumeration. A Property Type Definition is available for each predefined type .	IfcOccupantTypeEnum	Owner	NotDefined	Owner

Formal Propositions

WR41	The user defined type has only to be given, if the value of the predefined type is UserDefined
WR42	The occupant shall play an occupancy role as expressed by the IfcRelOccupiesSpaces relationship.

21.9.3. Interface Definitions

- I_Occupant

21.9.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
Owner	Pset_OccupantOwner
Lessee	Pset_OccupantLeesee
Tenant	Pset_OccupantTenant
Assignee	Pset_OccupantAssignee
NotDefined	
UserDefined	

21.9.5. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

21.10. Class IfcRelOccupiesSpaces

21.10.1. Class Semantic Definition

Definition from IAI: The relationship object IfcRelOccupiesSpaces further constrains the parent relationship IfcRelActsUpon to a relationship between occupants (IfcOccupant) and either a space (IfcSpace), a collection of spaces (IfcZone), a building story (IfcBuildingStorey), or a building (IfcBuilding).

History

New Entity in IFC Release 2.0

21.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelActsUpon
IfcRelOccupiesSpaces

Attributes and Relationships

No attributes defined at this level.

Formal Propositions

WR41	The actor in the occupancy relationship shall by of type IfcOccupant
WR42	The objects in the occupancy relationship shall be of type IfcSpace

21.10.3. Interface Definitions

- I_SpaceOccupancy

21.11. Class IfcSpaceUseCase

21.11.1. Class Semantic Definition

Definition from IFC: The space use case defines all thermal losses and gains occurring within a space or zone. Those losses or gains can either be requirements (desired values) or criteria (actual values). The source attribute defines the source of loss or gain, and the maximum value and applicable value ratio are interpreted according to the source (see definition of IfcUseCaseSourceEnum).

History

New Entity in IFC Release 2.0

21.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcPropertyDefinition
IfcSpaceUseCase

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	LossOrGain	Indicated whether the source causes a loss (TRUE) or gain (FALSE) for the space.	IfcLossOrGainEnum	FALSE	TRUE	TRUE
	RequirementOrCriteria	Indicated whether the source values describe a desired value as requirement (TRUE) or an actual value as criteria (FALSE) for the space.	IfcRequirementOrCriteriaEnum	FALSE	TRUE	TRUE
	Source	Source of the use or load characteristic, depending on the source, the maximum	IfcUseCaseSourceEnum			

		value has to be interpreted				
OPT	SourceDescription	Further specification for the source, which might be specific for a region or project. E.g. whether the heat gain from Person is caused by specific activities.	STRING	see type	see type	see type
	MaximumValue	Maximum value of the Gain or Loss for the use requirement or criteria, interpretation and unit depends on the source type	IfcMeasureWithUnit	see type	see type	see type
OPT	ApplicableValueRatio	Percentage of use requirement or criteria applicable to the space, interpretation depends on the source type	IfcPositiveRatioMeasure	see type	see type	see type
	ConstantLoad	Indication, whether the use requirement or load is constant during the hours of a day (TRUE) or not (FALSE). If not, a Pset_H24Schedule has to be referenced by ExtendedProperties	BOOLEAN	FALSE	TRUE	TRUE

21.11.3. Interface Definitions

- I_SpaceUseCase

21.11.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

21.12. PropertySet Pset_OccupantAssignee

21.12.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcOccupant with the generic type 'Assignee'.

21.12.2. Attribute and Relationship Definitions

No attributes defined for this Property Set

21.13. PropertySet Pset_OccupantLeesee

21.13.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcOccupant with the generic type 'Leesee'.

21.13.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
LeaseDate	Date when of the leasing contract starts	IfcObjectReference	IfcCalendarDate	see type	see type	see type
LeasePeriod	Period for leasing the property	IfcSimpleProperty	IfcTimeMeasure	see type	see type	see type
UnlimitedPeriod	Indication whether the lease	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

	contract is unlimited (true) or time limited (false). In the latter case, the LeasePeriod attribute specifies the duration of the contract.					

21.14. PropertySet Pset_OccupantOwner

21.14.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcOccupant with the generic type 'Owner'.

21.14.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FreeholdLandOwner	Is owner the land owner?	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
FreeholdBuildingOwner	Is owner the building owner?	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE

21.15. PropertySet Pset_OccupantTenant

21.15.1. PropertySet Semantic Definition

Definition from IAI: Properties common to the definition of all IfcOccupant with the generic type 'Tenant'.

21.15.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
TenancyDate	Date when of the tenancy contract starts	IfcObjectReference	IfcCalendarDate	see type	see type	see type
TenancyPeriod	Period for renting the property	IfcSimpleProperty	IfcTimeMeasure	see type	see type	see type
UnlimitedPeriod	Indication whether the tenancy contract is unlimited (true) or time limited (false). In the latter case, the TenancyPeriod attribute specifies the duration of the contract.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

Domain/Applications Model Layer

22. IfcArchitectureDomain

Domain Models, as the name implies, provide a model tailored to the point of view for a particular AEC industry domain or application type. They adapt concepts in the Core and Interoperability layers to this point of view.

The IfcArchitectureDomain schema defines basic object concepts used in Architectural CAD applications that have not been generalized and push lower in the model (e.g. shared with other domains or application types).

Relevant Concepts Modeled Elsewhere in IFC

1. Concepts modeled in the Core layer schemas

- Model structuring objects - Project, site, building, building storey, space, building element – all of these fundamental objects, which are shared across all domains in an AEC project are defined in the IFC core model. Please see the containment discussion in the Object Model Guide for discussion of these objects.
- Fundamental properties - Costs, classification, placement, shape, materials and documents – all of these concepts are related to most of the objects used by architects through the object supertypes at in the IFC core model. See notes in the class definitions of this schema for examples where these should be considered.

- Actors – people and/or organizations involved in the project. Actors are important in the IFC model as they concepts such as ownership, responsibility, approval and workflow.
- Assemblies – of elements. This concept is modeled using the objectified relationship IfcRelAssembles. Examples in architecture include stairs, ramps, curtain walls and roofs. The distinction from Nesting is that elements in an assembly can be of various types. Please see the IFC Model Guide for more discussion on this subject.
- Connections – between elements in a project. This concept is modeled in IFC using the objectified relationship IfcRelConnects. Architects are interested many different types of connections because they must design construction details for them. Examples include wall to wall, wall to floor, wall to ceiling and column to beam connections. See IfcRelConnectsElements, its subtypes, IfcConnectionGeometry, its subtypes and the IFC Model Guide for more discussion on this subject.
- Containment – elements that contained in others. This concept is modeled using the objectified relationship IfcRelContains. Examples of interest to architects include the relationships between project, site, building, building storey, spaces and building elements. Please see the IFC Model Guide for more discussion on this subject.
- Controls – conceptual objects that determine or constrain other objects. IFC includes several examples of such controls (constraints, budgets, design program). These are related to the objects which they 'control' through the IfcRelControls objectified relationship. Examples that are of interest to architects include budgets, building code constraints, geometric alignment constraints and space programs (client brief information).
- Groups – of objects, related for some group purpose. Object collections are related to a group object (which defines the purpose) through the IfcRelGroups objectified relationship. Please see the IFC Model Guide for more discussion on this subject.
- Modeling Aids – grids and other concepts which aid in developing a design model. For the architect, the design grid objects are essential. Additionally, reference geometry points, lines and faces are provided as aids in locating design elements. See the Model Guide discussion of the IfcModelingAidExtension schema.
- Nesting – elements that contain other, like elements. This concept is modeled in IFC using the objectified relationship, IfcRelNests. An example of interest to architects is spaces. Architects think or spaces such that they can contain other spaces. That is, they need to be able to 'nest'

spaces inside of other (larger) spaces. Please see the IFC Model Guide for more discussion on this subject.

- Processes and resources – which process products (building elements), resulting in other products (assembly, refined or modified building elements, etc.). The most common examples of are construction processes.
- Proxy objects – surrogates for types of objects that are not yet included in IFC. Proxies are included in IFC in the recognition that IFC will never fully elaborate all of the objects, concepts and processes in the AEC industry. This surrogate allows enables a basic representation of the 'foreign object type' so that the project model is a complete (if not totally accurate) representation. Architects will be most interested in product proxies. Surrogates for real world, physical objects. A shape representation and placement are included for such proxies. This allows architects to understand the shape, location and orientation of the real world object represented by the proxy.
- Runtime assigned properties – properties that are attached to objects depending on a runtime defined "type" or on life cycle stage. For example, some properties only make sense after construction is complete. This concept is handled through use of the objectified relationship IfcRelAssignsProperties. Examples of interest to architects include Walls, Doors and Windows – all of which are typed by architects. Generally, this 'typing' is done at some point after conceptual design. That is, the decision about what 'type' of wall, door or window is deferred until the decision is needed. When the 'type' is determined, a number of additional properties can be set. In IFC, these properties are not added to the object until they are needed – by relating one or more 'Property Sets' to the object through the IfcRelAssignsProperties relationship object. Please see the IFC Model Guide for more discussion on this subject.
- Space Boundaries – both physical and virtual elements which bound a space. Architects deal extensively with finishes in spaces and often specify such 'interior finishes' for the walls, floor(s) and ceilings that bound a space. IFC includes a special list of relationships from spaces to space boundaries. See IfcSpace and IfcSpaceBoundary in the IfcProductExtension schema.

2. Concepts modeled in IfcSharedBldgElements

- Walls, doors, windows, columns, beams, floors, roofs – All of these objects types, essential to architectural design are defined in the shared building elements schema because other disciplines also deal with them. Most of these allow specification of 'types' and association of more detailed properties associated with those types.
- Coverings – that cover other building elements. These objects have a special relationship (IfcRelCoversBldgElements) to other building elements which they 'cover'. Examples include floor and wall coverings, protective coverings (base molding, chair railing) and ceilings. There is also a special relationship (IfcRelAttachesToBoundaries) to space boundaries, which allows specification of finishes by space.
- Curtain walls – assemblies of various elements attached to building structure. Elements of a curtain walls are related to the 'assembly' object through the IfcRelAssembles relationship.
- Joints – where two or more building elements come together and 'joined' by more than a connection relationship. Generally, other materials are involved in the construction details for the 'joint.' Examples germane to architects include expansion joints and control joints.
- Screens, louvers, grates and grills – these elements are generalized as permeable opening covers. They can be incorporated into any assembly type (wall, floor, ceiling, curtain wall, etc.) through the IfcRelAssembles relationship.

3. Concepts modeled in IfcSharedSpatialElements

- Fire compartments – this new subtype of IfcSpace allows architects to compartmentize buildings in order to meet requirements of fire codes.
- Occupant and Occupancy – architects deal with these concepts in the design and permit phases of projects. Facilities managers use them through the operations phase.
- Space usage profile – this occupancy profile supports design and operation of building systems like HVAC, lighting and shading.

4. Concepts modeled in IfcSharedBldgServiceElements

- Equipment, electrical appliances – architects deal with many types of equipment. Examples supported in this release of IFC include: elevators, escalators, and window washing equipment.

Architects and interior designers also deal with many types of electrical appliances. Examples supported in this release of IFC include: copiers, phones, facsimiles, computers and printers.

- Fixtures and distribution objects – for ducting, plumbing and electrical systems. Examples of distribution objects supported in this release of IFC (and used by architects) include: ducting, piping, drains, scuppers. Examples of plumbing fixtures used by architects include: faucet, sink, toilet, shower, urinal. Examples of electrical fixtures used by architects include: lights, power outlets and radiant heaters.

5. Concepts modeled in IfcFacilitiesMgmtDomain

- Furniture – both standalone and systems furniture are available in this release of IFC.

22.1. Type IfcBuiltInAccessoryTypeEnum

22.1.1. Type Semantic Definition

Definition from IFC: Enumeration defining the valid types of Built-In Accessories that can be modeled in this release.

History

New Enumeration in IFC Release 2.0

22.1.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcBuiltInAccessory

22.1.3. Enumeration

DoorOrWindowHardware
PublicRestroom
Unspecified
UserDefined
NotDefined

22.2. Type IfcCabinetTypeEnum

22.2.1. Type Semantic Definition

Definition from IFC: Enumeration defining the valid types of Built-In cabinets that can be modeled in this release.

History

New Enumeration in IFC Release 2.0

22.2.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcCabinet

22.2.3. Enumeration

Office

Restroom
Storage
Unspecified
UserDefined
NotDefined

22.3. Type IfcCounterOrShelfTypeEnum

22.3.1. Type Semantic Definition

Definition from IFC: Enumeration defining the valid types of Counters/shelves that can be modeled in this release.

History

New Enumeration in IFC Release 2.0

22.3.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcCounterOrShelf

22.3.3. Enumeration

CounterTop
Shelf
UserDefined
NotDefined

22.4. Type IfcRailingTypeEnum

22.4.1. Type Semantic Definition

Definition from IFC: Enumeration defining the valid types of Railings that can be modeled in this release.

History

New Enumeration in IFC Release 2.0

22.4.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcRailing

22.4.3. Enumeration

Handrail
Guardrail
Balustrade
UserDefined
NotDefined

22.5. Type IfcRampTypeEnum

22.5.1. Type Semantic Definition

Definition from IFC: Enumeration defining the valid types of ramp that can be modeled in this release.

History

New Enumeration in IFC Release 2.0

22.5.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcRamp

22.5.3. Enumeration

Elemented
Layered
Solid
UserDefined
NotDefined

22.6. Type IfcSpaceProgramTypeEnum

22.6.1. Type Semantic Definition

Definition from IFC: This enumeration defines the available Generic Types for IfcSpaceProgram.

History

This Enumeration has changed after IFC Release 1.5.1, please see the Migration Guide for details

22.6.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcSpaceProgram

22.6.3. Enumeration

CirculationSpaceProgram
OccupiedSpaceProgram
OccupiedSpaceProgramStandard
TechnicalSpaceProgram
UserDefined
NotDefined

22.7. Type IfcStairTypeEnum

22.7.1. Type Semantic Definition

Definition from IFC: Enumeration defining the valid types of stair that can be modeled in this release.

History

New Enumeration in IFC Release 2.0

22.7.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcStair

22.7.3. Enumeration

FireStair
OrnamentalStair
StandardAccessStair
UserDefined
NotDefined

22.8. Type IfcVisualScreenTypeEnum

22.8.1. Type Semantic Definition

Definition from IFC: This enumeration defines the available Generic Types for IfcVisualScreen.

History

New Enumeration in IFC Release 2.0

22.8.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcVisualScreen

22.8.3. Enumeration

VisualScreenAssembly
VisualScreenDoorOrGate
VisualScreenPost
VisualScreenPanel
VisualScreenRestroomPartition
VisualScreenRestroomPartitionDoor
UserDefined
NotDefined

22.9. Class IfcBuiltInAccessory

22.9.1. Class Semantic Definition

Building hardware or attached occupant accessory - attached to one or more building elements

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set. Three properties in the Pset_AccessoryCommon allow specification of material, color and finish selections from a manufacturer prescribed list.
- Assembly – any other objects considered to be integral to this accessory should be related through the IfcRelAssembles relationship – defining an assembly.

History

New Entity in IFC Release 2.0

22.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcBuiltIn
IfcBuiltInAccessory

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcBuiltInAccessoryTypeEnum	DoorsAndWindows	CounterOrShelfHW	Bathroom
OPT	calcMountingHeight	height at which the item gets connect to the wall. Value of 0.0 means this property not set.	IfcPositiveLengthMeasure	0	see type	0
OPT	MountingType	Description of the method for mounting	STRING	n/a	n/a	empty string

Formal Propositions

WR61	

22.9.3. Interface Definitions

I_BuiltInAccessory

22.9.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
DoorOrWindowHardware	Pset_AccessoryDoorOrWindowHardware
PublicRestroom	Pset_AccessoryPublicRestroom
Unspecified	Pset_AccessoryUnspecified
UserDefined	
NotDefined	

22.9.5. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.10. Class IfcCabinet

22.10.1. Class Semantic Definition

Storage enclosure, normally attached to a wall and/or floor. Typically includes doors and internal shelves.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set.
- Assembly – any other objects like rails, brackets, enclosed power boxes, lights, etc., considered to be integral to this cabinet should be related through the IfcRelAssembles relationship – defining a cabinet assembly.

History

New Entity in IFC Release 2.0

22.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcBuiltIn
IfcCabinet

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcCabinetTypeEnum	Bathroom	Office	Bathroom
	CabinetHardware	List of references to accessory hardware for this cabinet.	LIST [0:?] OF IfcBuiltInAccessory	n/a	n/a	empty list

Formal Propositions

WR71	

22.10.3. Interface Definitions

I_Cabinet

22.10.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
Office	Pset_CabinetOffice
Restroom	Pset_CabinetRestroom
Storage	Pset_CabinetStorage
Unspecified	Pset_CabinetUnspecified
UserDefined	
NotDefined	

22.10.5. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.11. Class IfcCounterOrShelf

22.11.1. Class Semantic Definition

Horizontal work or storage surface attached to a wall or covering the top of a cabinet.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set.
- Assembly – any other objects like backslashes, beams, support brackets and rails, built-in power boxes, built-in appliances, etc., considered to be integral to this counter or shelf should be related through the IfcRelAssembles relationship – defining a counter or shelf assembly.

History

New Entity in IFC Release 2.0

22.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcBuiltIn
            IfcCounterOrShelf

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default

	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcCounterOrShelfTypeEnum	BathroomCounter	Shelf	Shelf
	CounterOrShelfHardware	List of references to accessory hardware for this counter or shelf.	LIST [0:?] OF IfcBuiltInAccessory	n/a	n/a	empty list

Formal Propositions

WR71	

22.11.3. Interface Definitions

I_CounterOrShelf

22.11.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
CounterTop	Pset_Counter
Shelf	Pset_Shelf
UserDefined	
NotDefined	

22.11.5. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.12. Class IfcLanding

22.12.1. Class Semantic Definition

Floor section to which one or more stair flights or ramp flights connects. May or may not be adjacent to a building storey floor.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set.
- Assembly – any supporting structural elements (beams, joists, etc.) considered to be integral to this landing should be related through the IfcRelAssembles relationship – defining a landing assembly. Railings and connected stair or ramp flights will be related through an overall stair or ramp assembly (see those classes for more discussion).

History

New Entity in IFC Release 2.0

22.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcSlab
IfcLanding

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	calcHeadRoom	Headroom clearence	IfcPositiveLengthMeasure	0	see type	0
OPT	calcWidth	Width of this landing	IfcPositiveLengthMeasure	0	see type	0
OPT	calcLength	Length of this landing (direction of travel)	IfcPositiveLengthMeasure	0	see type	0

22.12.3. Interface Definitions

I_StairOrRampLanding

22.12.4. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric

representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.13. Class IfcRailing

22.13.1. Class Semantic Definition

Frame assembly adjacent to human circulation spaces and at some space boundaries where in lieu of walls or to compliment walls. Designed to aid humans, either as an optional physical support, or to prevent injury by falling.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set. The MaterialList should be used for this object type. The property 'RailingMaterial' in the Pset_RailingCommon provides an integer index into this material list to indicate the material for the railing stiles. The property 'HandrailMaterial' in Pset_RailingHandrail provides an integer index to indicate the handrail material.
- Assembly – Associated brackets, anchors, posts, beams, ornamental attachments or other objects considered to be integral to this railing should be related through the IfcRelAssembles relationship – defining a railing assembly.

History

New Entity in IFC Release 2.0

22.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcRailing

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcRailingTypeEnum	Handrail	Balustrade	Handrail
	RailingHardware	List of references to accessory/mounting hardware for this railing.	LIST [0:?] OF IfcBuiltInAccessory	n/a	n/a	empty list

Formal Propositions

WR61	

22.13.3. Interface Definitions

I_Railing

22.13.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
Handrail	Pset_RailingHandrail
Guardrail	Pset_RailingGuardrail
Balustrade	Pset_RailingBalustrade
UserDefined	
NotDefined	

22.13.5. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.14. Class IfcRamp

22.14.1. Class Semantic Definition

An assembly of IfcRampFlight, IfcLanding, IfcRailing and other objects which provide a human circulation link between different slabs (floors, landings, walkways, etc.) in a project.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set. The MaterialList should be used for this object type as is will almost always involve multiple materials.
- Assembly – Ramp flights, landings, railings, supporting structural elements (beams, joists, etc.), or other objects considered to be part of this ramp should be related through the IfcRelAssembles relationship – defining the ramp assembly.

History

New Entity in IFC Release 2.0

22.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcRamp

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcRampTypeEnum	Elemented	Solid	Layered
	VerticallyConnects		LIST [0:?] OF IfcSlab			

Formal Propositions

WR61	

22.14.3. Interface Definitions

I_Ramp

22.14.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
Elemented	Pset_RampElemented
Layered	Pset_RampLayered
Solid	Pset_RampSolid
UserDefined	
NotDefined	

22.14.5. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.15. Class IfcRampFlight

22.15.1. Class Semantic Definition

Inclined slab segment, normally providing a human circulation link between two landings, floors or slabs at different elevations.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set. The MaterialList should be used for this object type as is will almost always involve multiple materials.
- Assembly – any supporting structural elements (beams, joists, etc.) considered to be integral should be related through the IfcRelAssembles relationship – defining an assembly.

History

New Entity in IFC Release 2.0

22.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcRampFlight

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	VerticallyConnects		LIST [0:2] OF IfcSlab			
OPT	calcLength	length of ramp	IfcPositiveLengthMeasure	0	see type	0
OPT	calcWidth	width of ramp	IfcPositiveLengthMeasure	0	see type	0
OPT	calcRise	rise of ramp	IfcPositiveLengthMeasure	0	see type	0
OPT	calcSlope	slope of ramp - relative to horizontal (non-sloping) floor	IfcPlaneAngleMeasure	0	see type	0

22.15.3. Interface Definitions

I_RampFlight

22.15.4. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.16. Class IfcRelAdjacencyReq

22.16.1. Class Semantic Definition

Objectified Relationship defines requirements for the adjacency of two spaces in the architectural program. The Adjacency required is encoded as an integer value between 0 and 256, where 0 means the spaces must be immediately adjacent and 256 means that they should be as far apart as possible.

ISSUES: No issues to date.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- None specified at this time.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

22.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelAdjacencyReq

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingSpaceProgram	Architectural program for the first Space.	IfcSpaceProgram	n/a	n/a	NIL
	RelatedSpaceProgram	Architectural program for the second Space.	IfcSpaceProgram	n/a	n/a	NIL
	AdjacencyImportanceRating	Integer value (between 0 and 256) for the required adjacency between these two spaces. 0=immediate adjacency required, 256=spaces should be as far apart as possible.	INTEGER	0	256	0

22.16.3. Interface Definitions

I_RelAdjacencyReq

22.16.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

22.17. Class IfcSpaceProgram

22.17.1. Class Semantic Definition

Definition from IFC: Architectural program for a space in the building or facility being designed; essentially the requirements definition for such a building space. Note that this 'program' defined the client requirements for the space before the building in designed. Space programs can change over the life cycle of a building, after the building is occupied. Changes to space programs take place in the facilities management/operations phase of the building life cycle.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like client briefing documents, conceptual space drawings, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Client brief", "Conceptual space drawing", etc.).

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

22.17.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcSpaceProgram

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	SpaceProgramName		STRING			
	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcSpaceProgramTypeEnum	CirculationSpaceProgram	TechnicalSpaceProgram	OccupiedSpaceProgram
INV	HasAdjacencyReqsTo	Set of inverse relationships to Space adjacency objects (FOR RelatingObject).	SET [0:?] OF IfcRelAdjacencyReq	n/a	n/a	NIL
INV	HasAdjacencyReqFrom	Set of inverse relationships to Space adjacency objects (FOR RelatedObject).	SET [0:?] OF IfcRelAdjacencyReq	n/a	n/a	NIL

Formal Propositions

WR41	

22.17.3. Interface Definitions

I_SpaceProgram

22.17.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
CirculationSpaceProgram	Pset_SpaceProgramCirculation
OccupiedSpaceProgram	Pset_SpaceProgramOccupied
OccupiedSpaceProgramStandard	Pset_SpaceProgramOccupiedStandard
TechnicalSpaceProgram	Pset_SpaceProgramTechnical
UserDefined	
NotDefined	

22.17.5. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

22.18. Class IfcSpaceProgramGroup

22.18.1. Class Semantic Definition

Definition from IFC: A collection of building spaces that will be used by a single functional group within the occupying organization.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like client briefing documents, conceptual space drawings, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Client brief", "Conceptual space drawing", etc.).

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

22.18.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcGroup
IfcSpaceProgramGroup

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	RequiredGroupArea	Total area required by this group. NOTE: this should be satisfied by the list of associated spaces, but may not be.	IfcAreaMeasure	0	see type	0
OPT	GroupRole	Role of this group in the Program	STRING	n/a	n/a	empty string
OPT	GroupAssignment	Definition of an individual or organization in the Architectural Program	IfcActorSelect	n/a	n/a	NIL

Formal Propositions

WR41	Ensure that only space programs (IfcSpaceProgram) get grouped by virtue of the general grouping mechanism (IfcRelGroups).

22.18.3. Interface Definitions

I_SpaceProgramGroup

22.18.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

22.19. Class IfcStair

22.19.1. Class Semantic Definition

Assembly of building components allowing occupants to walk (step) from Floor (or Landing) to another at a different elevation.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set. The MaterialList should be used for this object type as is will almost always involve multiple materials.
- Assembly – Stair flights, landings, railings, supporting structural elements (beams, joists, etc.), or other objects considered to be part of this stair should be related through the IfcRelAssembles relationship – defining the stair assembly.

History

New Entity in IFC Release 2.0

22.19.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcStair

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcStairTypeEnum	FireStair	Standard AccessStair	Standard AccessStair
	VerticallyConnects	List of Floors to which this stair assembly connects. Through these relationships, one can determine which building storey's are served by this stair	LIST [0:?] OF IfcSlab	n/a	n/a	empty list

Formal Propositions

WR61	

22.19.3. Interface Definitions

I_Stair

22.19.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
FireStair	Pset_StairFire
OrnamentalStair	Pset_StairOrnamental
StandardAccessStair	Pset_StairAccess

UserDefined	
NotDefined	

22.19.5. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.20. Class IfcStairFlight

22.20.1. Class Semantic Definition

Assembly of building components in a single "run" of stair steps (not interrupted by a landing). The Stair steps and any stringers are included in this object.

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set. The MaterialList should be used for this object type as is will almost always involve multiple materials.

- Assembly – any supporting structural elements (beams, joists, etc.) considered to be integral should be related through the IfcRelAssembles relationship – defining an assembly.

History

New Entity in IFC Release 2.0

22.20.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcStairFlight

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	VerticallyConnects	List of relationships - Floors or Stair Landings (subtype of floor) to which this flight connects.	LIST [0:2] OF IfcSlab	n/a	n/a	empty list
OPT	StepTreadMaterial	Buiding material used in the step treads	IfcMaterial	n/a	n/a	NIL
OPT	StepNosingMaterial	Buiding material used in the step nosings	IfcMaterial	n/a	n/a	NIL
OPT	calcStepRise	Vertical distance from tread to tread	IfcPositiveLengthMeasure	0.0	300 mm	200 mm
OPT	calcStepTread	Horizontal distance from the front to the back of the tread	IfcPositiveLengthMeasure	0.0	see type	300 mm
OPT	calcFlightHeadRoom	Headroom clearence for this flight	IfcPositiveLengthMeasure	0.0	see type	1 cm
OPT	calcTotalFlightRise	Total "rise" in this stair flight assembly	IfcPositiveLengthMeasure	0.0	see type	1 cm
OPT	calcTotalFlightRun	Total "run" in this stair flight assembly	IfcPositiveLengthMeasure	0.0	see type	1 cm

22.20.3. Interface Definitions

I_StairFlight

22.20.4. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.21. Class IfcVisualScreen

22.21.1. Class Semantic Definition

Physical barrier to block visual connection. An element or assembly whose purpose is to "screen" an area from human view

Relevant Concepts Modeled Elsewhere in IFC

For concepts relevant to architecture, but not specific to this class, see the 'Relevant Concepts' section at the beginning of this schema.

- Document references – for things like detail drawings, specification sections, cost estimates, etc. There is a list of such references at IfcObject. DocumentReferences (a supertype for this object type) Set 'DocumentPurpose' on the IfcDocumentReference object to declare the purpose of the referenced document (e.g. "Construction detail", "Construction specification", etc.).
- Materials – see IfcBuildingElement.HasMaterial. This is a material select, which supports an individual material, a list of materials or a material layer set. Three properties in the Pset_VisualScreenCommon allow specification of material, color and finish selections from a manufacturer prescribed list.
- Assembly – Visual screen posts, panels, doors, gates and other objects considered to be part of a Visual Screen object typed as "VisualScreenAssembly" should be related through the IfcRelAssembles relationship – defining the visual screen assembly.

History

New Entity in IFC Release 2.0

22.21.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcVisualScreen

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Determines which type defining PropertySet will be attached to this object	IfcVisualScreenTypeEnum	ScreenAssembly	ScreenDoorOrGate	ScreenPanel

Formal Propositions

WR61	

22.21.3. Interface Definitions

I_VisualScreen

22.21.4. Type Definitions

Common PropertySet

Pset_VisualScreenCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
VisualScreenAssembly	Pset_VisualScreenAssembly
VisualScreenDoorOrGate	Pset_VisualScreenDoorOrGate
VisualScreenPost	Pset_VisualScreenPost
VisualScreenPanel	Pset_VisualScreenPanel
VisualScreenRestroomPartition	Pset_VisualScreenRestroomPartition
VisualScreenRestroomPartitionDoor	Pset_VisualScreenRestroomPartitionDoor
UserDefined	
NotDefined	

22.21.5. Geometry Use Definitions

Context for Geometric Representations

The geometric representation of this object type is given by one or more of the 'Representations' on the IfcProduct supertype. Specifically, those of type IfcProductDefinitionShape. Multiple geometric representations are supported. These representations are coordinated by a shared reference geometry. For this object type the referenced geometry consists of a local placement only.

Reference Geometry

The definition of the object coordinate system for this object type is defined in it's supertype IfcProduct. It is defined by the following:

- IfcLocalPlacement -- which defines the local coordinate system that is referenced by all geometric representations.

Geometry Representations:

There are no attribute driven geometry representations defined for this object type in this release. Therefore, explicit geometry must be used in all cases.

Standard 3D Geometric Representation

The standard geometric representation for this object type is defined using **explicit geometry**. A faceted boundary representation (faceted BRep) should be used. These can include voids (IfcFacetedBrepWithVoids) or exclude them (IfcFacetedBrep).

Advanced 3D Geometric Representation

There is no advanced geometry representation defined for this object type in this release.

Arbitrary 3D Geometric Representation

There is no arbitrary geometry representation defined for this object type in this release, since the standard representation can be arbitrary.

22.22. PropertySet Pset_AccessoryCommon

22.22.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all Built-In Accessories.

22.22.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManuafactureInfo	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL
ManufacturerMaterial	Material selection - from the manufacturer's material options for this fixture type	IfcSimpleProperty	IfcString	n/a	n/a	empty string
ManufacturerColor	Color selection - from the manufacturer's color options for this fixture type	IfcSimpleProperty	IfcString	n/a	n/a	empty string
ManufacturerFinish	Finish selection - from the manufacturer's finish options for this fixture type	IfcSimpleProperty	IfcString	n/a	n/a	empty string

22.23. PropertySet Pset_AccessoryDoorOrWindowHardware

22.23.1. PropertySet Semantic Definition

Definition from IAI: Commonly referred to as "Door hardware" and "Window hardware".

22.23.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonAccessory Properties	Nested PropertySet - that defines properties common to all types of Accessories	IfcObjectReference	IfcGloballyUniqueId, Pset_AccessoryCommon	n/a	n/a	NIL
ProjectHwGroupRe ference	Project reference ID for this standard collection of hardware elements for doors	IfcSimpleProperty	IfcString	see type	see type	empty string

TypeDescription	Description for this type of frame (note name is captured in the TypeDef object that references this PropertySet)	IfcSimpleProperty	IfcString	see type	see type	empty string
DoorHardwareElementList	A LIST enumeration values - referencing an IfcEnumeratedProperty that defines IfcDoorHardwareElementEnum.	IfcPropertyList	IfcEnumeratedProperty, Pset_DoorHardwareElementEnum (Hingeset, Lockset, Handset, Deadbolt, Kickplate, Pushplate, Peephole, Knocker, DoorStop, Passthrough)			

22.24. PropertySet Pset_AccessoryPublicRestroom

22.24.1. PropertySet Semantic Definition

Definition from IAI: These are what are commonly referred to as "Restroom Accessories".

22.24.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonAccessoryProperties	Nested PropertySet - that defines properties common to all types of Accessories	IfcObjectReference	IfcGloballyUniqueId, Pset_AccessoryCommon	n/a	n/a	NIL

22.25. PropertySet Pset_AccessoryUnspecified

22.25.1. PropertySet Semantic Definition

Definition from IAI: All other types of accessories (not specified in other types).

22.25.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonAccessoryProperties	Nested PropertySet - that defines properties common to all types of Accessories	IfcObjectReference	IfcGloballyUniqueId, Pset_AccessoryCommon	n/a	n/a	

22.26. PropertySet Pset_CabinetCommon

22.26.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all cabinets.

22.26.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManuafactureInfo	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL

22.27. PropertySet Pset_CabinetOffice

22.27.1. PropertySet Semantic Definition

Definition from IAI: Cabinet designed for use in a commercial office space.

22.27.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCabinet Properties	Nested PropertySet - that defines properties common to all types of Cabinets	IfcObjectReference	IfcGloballyUniqueId, Pset_CabinetCommon	n/a	n/a	NIL

22.28. PropertySet Pset_CabinetRestroom

22.28.1. PropertySet Semantic Definition

Definition from IAI: Cabinet designed for use in a Restroom (Toilet).

22.28.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCabinet Properties	Nested PropertySet - that defines properties common to all types of Cabinets	IfcObjectReference	IfcGloballyUniqueId, Pset_CabinetCommon	n/a	n/a	NIL

22.29. PropertySet Pset_CabinetStorage

22.29.1. PropertySet Semantic Definition

Definition from IAI: Cabinet designed for storage.

22.29.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCabinet Properties	Nested PropertySet - that defines properties common to all types of Cabinets	IfcObjectReference	IfcGloballyUniqueId, Pset_CabinetCommon	n/a	n/a	NIL

22.30. PropertySet Pset_CabinetUnspecified

22.30.1. PropertySet Semantic Definition

Definition from IAI: All other types of cabinets (not specified in other types).

22.30.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default

CommonCabinetProperties	Nested PropertySet - that defines properties common to all types of Cabinets	IfcObjectReference	IfcGloballyUniqueId, Pset_CabinetCommon	n/a	n/a	NIL

22.31. PropertySet Pset_Counter

22.31.1. PropertySet Semantic Definition

Definition from IAI: Horizontal work surface, generally on top of a built-in cabinet.

22.31.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCounterOrShelfProperties	Nested PropertySet - that defines properties common to all types of counters and shelves	IfcObjectReference	IfcGloballyUniqueId, Pset_CounterOrShelfCommon	n/a	n/a	NIL

22.32. PropertySet Pset_CounterOrShelfCommon

22.32.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all Counters and shelves.

22.32.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManuafactureInfo	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL

22.33. PropertySet Pset_RailingBalustrade

22.33.1. PropertySet Semantic Definition

Definition from IAI: Similar to Guardrail except the location is at the edge of a floor..

22.33.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonRailingProperties	Nested PropertySet - that defines properties common to all types of railings	IfcObjectReference	IfcGloballyUniqueId, Pset_RailingCommon	n/a	n/a	NIL
RepeatingElements	reference to definition of repeating rail stiles - defined in a referenced Pset.	IfcObjectReference	IfcGloballyUniqueId, Pset_RepeatingElement	n/a	n/a	NIL

22.34. PropertySet Pset_RailingCommon

22.34.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all types of railings.

22.34.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManuafactureInfo	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL
RailingMaterial	Index into the IfcMaterialList defined in the IfcBuildingElement supertype	IfcObjectReference	IfcInteger	1	MaterialList length	1
Height	Height to the top of the railing - from stair, landing or floor	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0

22.35. PropertySet Pset_RailingGuardrail

22.35.1. PropertySet Semantic Definition

Definition from IAI: Railings designed to guard human occupants from falling off a stair, ramp or landing where there is a vertical drop at the edge of such floors/landings of 1/2 meter or more..

22.35.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonRailingProperties	Nested PropertySet - that defines properties common to all types of railings	IfcObjectReference	IfcGloballyUniqueId, Pset_RailingCommon	n/a	n/a	NIL
RepeatingElements	reference to definition of repeating rail stiles - defined in a referenced Pset.	IfcObjectReference	IfcGloballyUniqueId, Pset_RepeatingElement	n/a	n/a	NIL
MountedHandrail	Reference to any handrail mounted on this guardrail	IfcObjectReference	IfcGloballyUniqueId, IfcRailing	n/a	n/a	NIL

22.36. PropertySet Pset_RailingHandrail

22.36.1. PropertySet Semantic Definition

Definition from IAI: Railing designed to serve as an optional structural support for loads applied by human occupants (at hand height). Generally located adjacent to ramps and stairs. Generally floor or wall mounted..

22.36.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonRailingProperties	Nested PropertySet - that defines properties common to all types of railings	IfcObjectReference	IfcGloballyUniqueId, Pset_RailingCommon	n/a	n/a	NIL
HandrailMaterial	Index into the IfcMaterialList	IfcSimpleProperty	IfcInteger	1	MaterialL	1

	defined in the IfcBuildingElement supertype				ist length	
HandrailHeight	Height to top of handrail - from stair, landing or floor	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
MaxDistanceFrom Wall	Distance from the wall to the handrail surface furthest from the wall. Value of 0.0 means value not set.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0

22.37. PropertySet Pset_RampCommon

22.37.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all types of ramps.

22.37.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
RampPurpose	Purpose of primary use for this ramp	IfcSimpleProperty	IfcString	n/a	n/a	empty string
HandicapAccessible	Is this ramp rated as handicap accessible - according the local building codes.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

22.38. PropertySet Pset_RampElemented

22.38.1. PropertySet Semantic Definition

Definition from IAI: Ramp constructed using repeating elements..

22.38.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonRampProperties	Nested PropertySet - that defines properties common to all types of ramps	IfcObjectReference	IfcGloballyUniqueId, Pset_RampCommon	n/a	n/a	NIL
RepeatingElements	reference to definition of repeating elements in this ramp assembly.	IfcObjectReference	IfcGloballyUniqueId, Pset_RepeatingElement	n/a	n/a	NIL

22.39. PropertySet Pset_RampLayered

22.39.1. PropertySet Semantic Definition

Definition from IAI: Ramp constructed using layered elements.

22.39.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonRampProperties	Nested PropertySet - that defines properties common to all types of ramps	IfcObjectReference	IfcGloballyUniqueId, Pset_RampCommon	n/a	n/a	NIL

22.40. PropertySet Pset_RampSolid

22.40.1. PropertySet Semantic Definition

Definition from IAI: Ramp constructed using a single layer of solid material.

22.40.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonRampProperties	Nested PropertySet - that defines properties common to all types of ramps	IfcObjectReference	IfcGloballyUniqueId, Pset_RampCommon	n/a	n/a	NIL

22.41. PropertySet Pset_Shelf

22.41.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonCounterOrShelfProperties	Nested PropertySet - that defines properties common to all types of counters and shelves	IfcObjectReference	IfcGloballyUniqueId, Pset_CounterOrShelfCommon	n/a	n/a	NIL

22.42. PropertySet Pset_SpaceProgramCirculation

22.42.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonSpaceProgramProperties	Nested PropertySet - that defines properties common to all types of SpacePrograms	IfcObjectReference	IfcGloballyUniqueId, Pset_SpaceProgramCommon	n/a	n/a	NIL
SpacesServed	List of references to the spaces served by this circulation space	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcSpace	n/a	n/a	NIL
CirculationLoad	Maximum number of occupants per minute this space must accommodate (as in escape from Fire). Zero means the value has not been calculated.	IfcSimpleProperty	IfcInteger	0	see type	0
RequiredFFETypes	Furniture, Fixtures and Equipment for this space	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcBuildingElement	n/a	n/a	empty set

22.43. PropertySet Pset_SpaceProgramCommon

22.43.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all types of Space Programs.

22.43.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ProgramSpaceDescription	Description for this space in the Architectural Program (client brief)	IfcSimpleProperty	IfcString	see type	see type	empty string
RoomNumber	Number assigned to this space	IfcSimpleProperty	IfcString	see type	see type	empty string
RoomName	Name assigned to a room space	IfcSimpleProperty	IfcString	see type	see type	empty string
ProgrammedFloorArea	The floor area programmed for this space (according to client requirements)	IfcSimpleProperty	IfcAreaMeasure	0	see type	0
RequestedLocations	Location requested by client	IfcObjectReference	IfcGloballyUniqueId, IfcSpatialElement	n/a	n/a	NIL
GeneralLocationDescription	General description of location (e.g. "third floor south")	IfcSimpleProperty	IfcString	n/a	n/a	empty string
Function	How is this space to be used	IfcSimpleProperty	IfcString	n/a	n/a	empty string
SecurityRequirements	Client requirements for security	IfcSimpleProperty	IfcString	n/a	n/a	empty string
SpecialRequirements	Client special requirements	IfcSimpleProperty	IfcString	n/a	n/a	empty string
BudgetLimits	Multiple budgets for managing this space	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcCostElement	n/a	n/a	NIL
InteractWith	List of workspace interactions in which this space participates.	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcRelWorkInteraction	n/a	n/a	NIL

22.44. PropertySet Pset_SpaceProgramOccupied

22.44.1. PropertySet Semantic Definition

Definition from IAI: Space program for a space to be occupied by humans.

22.44.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonSpaceProgramProperties	Nested PropertySet - that defines properties common to all types of SpacePrograms	IfcObjectReference	IfcGloballyUniqueId, Pset_SpaceProgramCommon	n/a	n/a	NIL
OccupiedSpaceProgramStandard	Nested PropertySet - that defines properties for any	IfcObjectReference	IfcGloballyUniqueId, Pset_SpaceProgramOccupie	n/a	n/a	NIL

	Space Standard used		dStandard			
Occupants	List of persons who will occupy this space	IfcPropertyList	IfcObjectReference, IfcPerson	n/a	n/a	NIL
OccupantOrganizataion	Client organizaiton that will charged for this space	IfcObjectReference	IfcOrganization	n/a	n/a	NIL
OccupancyTargetDate	Target date of occupancy.	IfcObjectReference	IfcDateAndTime	see type	see type	see type
BldgCodeOccupancyType	Occupancy type according to the building code for this project	IfcSimpleProperty	IfcString	n/a	n/a	empty string
ProgrammedOccupantCount	Programmed number of occupants for this space. Zero means the value has not been set.	IfcSimpleProperty	IfcInteger	0	see type	0
RequiredFFETypes	Furniture, Fixtures and Equipment for this space	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcBuildingElement	n/a	n/a	empty set
PrivacyRequirements	Client requirements for privacy	IfcSimpleProperty	IfcString	n/a	n/a	empty string
WeeklyOccupiedHours	Hours per week that this space is programmed for occupants	IfcSimpleProperty	IfcTimeMeasure	see type	see type	0

22.45. PropertySet Pset_SpaceProgramOccupiedStandard

22.45.1. PropertySet Semantic Definition

Definition from IAI: Standard (repeating) program for multiple, like spaces to be occupied by humans.

22.45.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonSpaceProgramProperties	Nested PropertySet - that defines properties common to all types of SpacePrograms	IfcObjectReference	IfcGloballyUniqueId, Pset_SpaceProgramCommon	n/a	n/a	NIL
EmployeeType	Examples: manager, programmer, secretary, etc. IFCs don't define standardized employee types. The user should provide the company based terms for employee types.	IfcSimpleProperty	IfcString	n/a	n/a	empty string
FurnitureStyle	The style of furniture for the space or workstation designed	IfcSimpleProperty	IfcString	n/a	n/a	empty string
CostLimit	The maximum cost limit for the space such as its interiors, furniture, etc. The context of the cost is provided through IfcCostSchedule.	IfcObjectReference	IfcGloballyUniqueId, IfcCostSchedule	n/a	n/a	NIL
StandardArea	The area programmed for this space standard	IfcSimpleProperty	IfcAreaMeasure	0	see type	0
MinimumArea	Minimum area for such a	IfcSimpleProperty	IfcAreaMeasure	0	see type	0

	space					
MaximumArea	Maximum area for such a space	IfcSimpleProperty	IfcAreaMeasure	0	see type	0
StandardLength	Standard length for spaces of this type	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
StandardWidth	Standard width for spaces of this type	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0

22.46. PropertySet Pset_SpaceProgramTechnical

22.46.1. PropertySet Semantic Definition

Definition from IAI: Space program for a space designed to house building systems, equipment or maintenance elements.

22.46.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonSpaceProgramProperties	Nested PropertySet - that defines properties common to all types of SpacePrograms	IfcObjectReference	IfcGloballyUniqueId, Pset_SpaceProgramCommon	n/a	n/a	NIL

22.47. PropertySet Pset_StairAccess

22.47.1. PropertySet Semantic Definition

Definition from IAI: Functional stair - for access to between different floor levels.

22.47.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonStairProperties	Nested PropertySet - that defines properties common to all types of stairs	IfcObjectReference	IfcGloballyUniqueId, Pset_StairCommon	n/a	n/a	NIL

22.48. PropertySet Pset_StairCommon

22.48.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all types of Stairs.

22.48.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
StairPurpose	Purpose of primary use for this stair	IfcSimpleProperty	IfcString	n/a	n/a	empty string
FireRating	Fire survival rating = length of time the stair enclosure/assembly will	IfcSimpleProperty	IfcTimeMeasure	see type	see type	0

	survive in case of fire					
ExitStair	Is this stair counted as an exit stair in case of fire	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE

22.49. PropertySet Pset_StairFire

22.49.1. PropertySet Semantic Definition

Definition from IAI: Stair designed for escape in case of fire.

22.49.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonStairProperties	Nested PropertySet - that defines properties common to all types of stairs	IfcObjectReference	IfcGloballyUniqueId, Pset_StairCommon	n/a	n/a	NIL

22.50. PropertySet Pset_StairOrnamental

22.50.1. PropertySet Semantic Definition

Definition from IAI: Stair which is also a significant building design element.

22.50.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonStairProperties	Nested PropertySet - that defines properties common to all types of stairs	IfcObjectReference	IfcGloballyUniqueId, Pset_StairCommon	n/a	n/a	NIL

22.51. PropertySet Pset_VisualScreenAssembly

22.51.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all types of Visual Screens.

22.51.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonScreenProperties	Nested PropertySet - that defines properties common to all types of visual screen elements	IfcObjectReference	IfcGloballyUniqueId, Pset_VisualScreenCommon	n/a	n/a	NIL
ManuafactureInfo	reference to Manufacturer information	IfcObjectReference	IfcGloballyUniqueId, IfcManufactureInformation	n/a	n/a	NIL

22.52. PropertySet Pset_VisualScreenCommon

22.52.1. PropertySet Semantic Definition

Definition from IAI: Set of properties common to all types of Visual Screens.

22.52.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ScreenElementHeight	Height of the partition panel. Value of 0.0 means property not set.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
ScreenElementWidth	Width of the partition panel. Value of 0.0 means property not set.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
ScreenElementThickness	Thickness of the partition panel. Value of 0.0 means property not set.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
AssembledTopOfElementHeight	Height, from finish floor, to the top of this partition panel. Value of 0.0 means property not set.	IfcSimpleProperty	IfcPositiveLengthMeasure	0	see type	0
ManufacturerMaterial	Material selection - from the manufacturer's material options for this fixture type	IfcSimpleProperty	IfcString	n/a	n/a	empty string
ManufacturerColor	Color selection - from the manufacturer's color options for this fixture type	IfcSimpleProperty	IfcString	n/a	n/a	empty string
ManufacturerFinish	Finish selection - from the manufacturer's finish options for this fixture type	IfcSimpleProperty	IfcString	n/a	n/a	empty string

22.53. PropertySet Pset_VisualScreenDoorOrGate

22.53.1. PropertySet Semantic Definition

Definition from IAI: Door/Gate element in a visual screen assembly.

22.53.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonScreenProperties	Nested PropertySet - that defines properties common to all types of visual screen elements	IfcObjectReference	IfcGloballyUniqueId, Pset_VisualScreenCommon	n/a	n/a	NIL

22.54. PropertySet Pset_VisualScreenPanel

22.54.1. PropertySet Semantic Definition

Definition from IAI: Panel element in a visual screen assembly.

22.54.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonScreenProperties	Nested PropertySet - that defines properties common to all types of visual screen elements	IfcObjectReference	IfcGloballyUniqueId, Pset_VisualScreenCommon	n/a	n/a	NIL

22.55. PropertySet Pset_VisualScreenPost

22.55.1. PropertySet Semantic Definition

Definition from IAI: Post element in a visual screen assembly.

22.55.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonScreenProperties	Nested PropertySet - that defines properties common to all types of visual screen elements	IfcObjectReference	IfcGloballyUniqueId, Pset_VisualScreenCommon	n/a	n/a	NIL

22.56. PropertySet Pset_VisualScreenRestroomPartition

22.56.1. PropertySet Semantic Definition

Definition from IAI: Specialization of visual screen panel -- for privacy partitions in public restrooms.

22.56.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonScreenElementProperties	Nested PropertySet - that defines properties common to all types of visual screen elements	IfcObjectReference	IfcGloballyUniqueId, Pset_VisualScreenCommon	n/a	n/a	NIL

22.57. PropertySet Pset_VisualScreenRestroomPartitionDoor

22.57.1. PropertySet Semantic Definition

Definition from IAI: Specialization of visual screen Door/Gate -- for doors used in privacy partitions for public restrooms.

22.57.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonScreenElementProperties	Nested PropertySet - that defines properties common to	IfcObjectReference	IfcGloballyUniqueId, Pset_VisualScreenCommon	n/a	n/a	NIL

	all types of visual screen elements					
HingeSideLeft	Indicates the hinged side of the door - when viewed from outside the partition enclosure. TRUE=left, FALSE=right.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE
SwingDirectionIn	Indicates whether this door swings into or out of the partition enclosure. TRUE=swings in, FALSE=swings out.	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE

23. IfcConstructionMgmtDomain

The IfcConstructionManagement Schema contains defined types and classes that capture concepts and data requirements for construction management processes. They, together with models defined in IfcProcessExtension and IfcProjectMangementExtension, provide a set of model elements that support typical construction management applications and their integration.

In R2.0, most of the classes included in this schema are used to represent different types of construction resources that can support both cost estimating and work planning, and their integration.

HISTORY: renamed from schema IfcCostEstimatingDomain in R1.5.1.

23.1. Class IfcCMDocPackage

23.1.1. Class Semantic Definition

IfcCMDocPackage is a class that represents a collection of construction management related objects (e.g. construction documents) in one place. It gathers all of the related construction objects of different types as one package. It can be used to track and allocation a specific construction management object quickly. An instance of IfcCMDocPackage doesn't contain the objects directly; rather, it keeps all the references of the objects and maintain the linages to the objects. IfcCMDocPackage is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

23.1.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcCMDocPackage

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	DocPackageID	The identifier of the construction management project package given by user.	STRING	empty string	n/a	empty string

	DocPackageName	The name of the construction management project package given by user.	STRING	empty string	n/a	empty string
OPT	Description	General description of the construction management project package.	STRING	empty string	n/a	empty string
	CreationDate	The date that the package is created.	IfcDateTimeSelect	see type	see type	see type
	Authors	The authors of the package	SET [0:?] OF IfcActorSelect	N/a	n/a	N/a
	Approvals	References to the relevant instances of IfcApproval that relate to construction management in the project	SET [0:?] OF IfcApproval	see type	see type	see type
	WorkPlans	The task schedules for the project project	SET [0:?] OF IfcWorkPlan	N/a	n/a	N/a
	CostEstimates	The cost estimates for the project project	SET [0:?] OF IfcCostSchedule	N/a	n/a	N/a
	WorkOrders	Work orders generated in the project	SET [0:?] OF IfcWorkOrder	N/a	n/a	N/a
	PurchaseOrders	Purchase orders generated in the project	SET [0:?] OF IfcPurchaseOrder	N/a	n/a	N/a
	ChangeOrders	Change orders generated in the project for change of work.	SET [0:?] OF IfcChangeOrder	N/a	n/a	N/a
	Documents	All the file documents required and generated for the project	SET [0:?] OF IfcDocumentReference	N/a	n/a	N/a
	BudgetSources		SET [0:?] OF IfcBudget	N/a	n/a	N/a

23.1.3. Interface Definitions

- I_CMDocPackage

23.1.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation

23.2. Class IfcConstructionEquipmentResource

23.2.1. Class Semantic Definition

IfcConstructionEquipmentResource represents types of construction equipment which occurrances are used as resources in a construction process. Equipment resources are wholly or partially consumed, or occupied (i.e. used) in the performance of construction processes (i.e. IfcWorkTask).
IfcConstructionEquipmentResource is not the same as IfcEquipment; the former represents a type of construction equipment that can be used to aid in perfoming a work task, while the latter represents equipment pieces that are part of the building as a final product of building element.
IfcConstructionEquipmentResource is a subtype of IfcResource.

History

New Entity in IFC Release 2.0

23.2.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot

IfcObject
IfcResource
IfcConstructionEquipmentResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	EquipmentModel	The model of the type of equipment.	STRING	empty string	n/a	empty string
OPT	Manufacturer	The manufacturer that produces this type of equipment.	IfcOrganization	see type	see type	see type

23.2.3. Interface Definitions

- I_ConstructionEquipmentResource

23.2.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

23.3. Class IfcConstructionMaterialResource

23.3.1. Class Semantic Definition

IfcConstructionMaterialResource represents material resource types in a construction project. Their occurrences are consumed (wholly or partially), or occupied during a construction work task (i.e. IfcWorkTask).

Similar to IfcProductResource, sometimes things such as 5 tons of gravals are already instantiated as an IfcProduct because it is a result of a work task e.g. 'transporting gravals'. In this case, the instance of resource IfcConstructionMaterialResource can be associated with the product instance '5 tons of gravals' to provide more information for resource uses. Nevertheless, IfcConstructionMaterialResource should only be used to represent resource types, e.g. 'graval', but not product substances, e.g. '5 tons of graval'. IfcConstructionMaterialResource is a subtype of IfcResource.

Note that this class is not the same as IfcMaterial; the former can typically represent the type of bulk materials such as sand, gravals, nails and so on (note these can be instantiated from IfcProduct as well depending their uses in the system) used in a construction process. The latter is about physical materials used in a physical building element typically with detailed positioning (e.g. offset) and layering information.

History

New Entity in IFC Release 2.0

23.3.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcResource
IfcConstructionMaterialResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default

	Suppliers	Possible suppliers of the type of materials.	SET [0:?] OF IfcOrganization	N/a	n/a	N/a
OPT	OrderQuantity	The basic quantity for ordering.	IfcMeasureWithUnit	See type	See type	See type
	MaterialProducts	The products that are produced from other work tasks, but used as the materials.	SET [0:?] OF IfcProduct	N/a	n/a	N/a
	DesignMaterial	the materials specified by the design process that needs to be procured in the construction processes as the resource.	SET [0:?] OF IfcMaterial	N/a	n/a	N/a

23.3.3. Interface Definitions

- I_ConstructionMaterialResource

23.3.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

23.4. Class IfcConstructionZoneAggregationProduct

23.4.1. Class Semantic Definition

IfcConstructionZoneAggregationProduct can be used to represent two concepts: one is a construction zone, and the other is a construction aggregation area. It is defined for use by construction cost estimating and scheduling.

A construction zone allows for the grouping of products into a single product element. A defined zone that includes multiple products (i.e. IfcProduct), to which a work task or a group of work tasks takes place or a cost estimate is calculated. In particular, where work may need to be planned to e.g. build all the columns on the 2nd floor. For its intended use (i.e. cost estimating and work planning), IfcConstructionZoneAggregationProduct should be a type of product since it must be considered to be an output result of a process that requires resources to produce this ‘product’.

A construction aggregation is a defined area on a product (i.e. IfcProduct) representing a part of the product, to which a work task or a group of work tasks takes place or a cost estimate is calculated.

The construction aggregation allows for the breakdown of work into more atomic elements for costing. In particular, where work may need to be done in several parts e.g. the building of a single wall which may be done in several 'lifts' or the casting of a slab where the slab may comprise several regional casts. It should be a type of product since it must be considered to be an output result of a process that requires certain resources.

History

New Entity in IFC Release 2.0

23.4.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcConstructionZoneAggregationProduct

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ID	The identity given to a construction zone or aggregation product.	STRING	empty string	n/a	empty string
OPT	Name	The name of the construction zone or aggregation.	STRING	empty string	n/a	empty string
OPT	Description	The description of the construction zone or aggregation.	STRING	empty string	n/a	empty string
	ZoneNotAggregation	Indicates whether the object is a zone product or aggregation product. If the value is TRUE, it means it is a zone; otherwise it is an aggregation product type.	BOOLEAN	TRUE	FALSE	TRUE
OPT	SelectionCriteria	Specification requirements applying to a construction zone or aggregation.	STRING	empty string	n/a	empty string
OPT	PartOfProduct	The reference product that the aggregation is part of.	IfcProduct	see type	see type	see type
	CoveredProducts	The references of products that the construction zone covers.	SET [0:?] OF IfcProduct	N/a	N/a	N/a

23.4.3. Interface Definitions

- I_ConstructionZoneAggregationProduct

23.5. Class IfcCrewResource

23.5.1. Class Semantic Definition

IfcCrewResource represents a type of resource used in construction processes, i.e. construction crew resource. A construction crew resource typically includes labor resource, equipment resource, material resource, subcontractor resource, as well as other crew resources. Construction crew resources are partially or wholly consumed, or occupied in a construction process (i.e. IfcWorkTask). Since IfcCrewResource represents the resource types, individual persons are not required to be identified and linked to the crew resource, while they can be associated if needed. IfcCrewResource is a subtype of IfcResource.

Note that the IfcCrewResource is enabled to contain other crew resource types (i.e. crew resource type nesting) through its relationship to IfcRelCrewContainsResources. The WHERE constraints of the entity define the mechanism of how this nesting can be achieved.

Also note that in practice, when defining a crew resource type, a set of process types that the crew type is suitable for, are also identified. Since IFC R2.0 doesn't handle process types (IfcProcess represents process occurrences) explicitly, this relationship is not handled in R2.0.

Additionally, the term 'crew resource' is used as a standard term for the kind of resources described in North America. This requirement is based on the IAI project 'Cost Estimating' defined in North America Project Management Domain committee. It is acknowledged that this term may not be a popular term in the construction management industries in other countries. The class can be considered to be renamed when more projects are defined to provide such requirements.

History

New Entity in IFC Release 2.0

23.5.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcResource
IfcCrewResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
INV	RequiresResources	Any other resources required in the crew resource.	IfcRelAggregatesCrewResources	see type	see type	see type

23.5.3. Interface Definitions

- I_CrewResource

23.5.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation

23.6. Class IfcLaborResource

23.6.1. Class Semantic Definition

IfcLaborResource represents labor resource types used in a construction work task (i.e. IfcWorkTask). It implies a type of labor with particular skills or crafts required to perform certain type of construction or management related work. Therefore, labor resource types typically do not identify individual persons (i.e. IfcActors) for cost estimating purpose. IfcLaborResource is a subtype of IfcResource.

History

New Entity in IFC Release 2.0

23.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcResource
IfcLaborResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	Title	The title of the type of labor such as carpenter, crane operator, superintendent, etc.	STRING	empty string	n/a	empty string
	SkillSet	The skill set required for this type of labor.	SET [0:?] OF STRING	N/a	n/a	N/a

23.6.3. Interface Definitions

- I_LaborResource

23.6.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

23.7. Class IfcProductResource

23.7.1. Class Semantic Definition

IfcProductResource represents a type of construction resource, that is, product resources. Product resources are roles of products that are consumed (wholly or partially), or occupied (i.e. used) in the performance of a construction work task. Occurrences of products that are used as product resources are onece instances of IfcProduct since they are resulted from some processes. For instance, formworks can be instantiated as products resulted from process 'constructing formwork'. However, they become to be used as resources in process 'pouring concrete' in a later stage of the project.

IfcProductResource is modeled as a type of resource (i.e. subtype of IfcResource) that identifies a product linked and that describes how it can be used as a resource through IfcRelResourceUse in a process.

History

New Entity in IFC Release 2.0

23.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcResource
      IfcProductResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	ResourceProduct	This identifies the product that is being used as the resource	IfcProduct	see type	see type	see type

23.7.3. Interface Definitions

- I_ProductResource

23.7.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

23.8. Class IfcRelAggregatesCrewResources

23.8.1. Class Semantic Definition

IfcRelRelAggregatesCrewResources is class that enables a construction crew resource type (i.e. IfcCrewResource) to contain other resource types. It specifies the quantity of the included resources in the crew resource. It can also specify the conversion rate of the resource when being included in the resource. IfcRelRelAggregatesCrewResources is a subtype of ifcRelationship.

History

New Entity in IFC Release 2.0

23.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelAggregatesCrewResources

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingCrewResource		IfcCrewResource			
	RelatedResources		LIST [1:?] OF IfcResource			
	RequiredQuantity		REAL	0	n/a	1
OPT	ConversionRate	The conversion rate for the resource when being included in the crew resource.	IfcMeasureWithUnit	see type	see type	see type

23.8.3. Interface Definitions

- I_RelAggregatesCrewResources

23.8.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation

23.9. Class IfcSubcontractResource

23.9.1. Class Semantic Definition

History

New Entity in IFC Release 2.0

23.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot

IfcObject
IfcResource
IfcSubcontractResource

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	SubcontractResourceID	The id to identify the subcontract.	STRING	empty string	n/a	empty string
OPT	Company	The company that the subcontract is signed with.	IfcOrganization	see type	see type	see type
OPT	JobDescription	The description of the jobs that this subcontract should complete.	STRING	empty string	n/a	empty string

23.9.3. Interface Definitions

- I_SubcontractResource

24. IfcFacilitiesMgmtDomain

The IfcFacilitiesMgmtDomain Schema defines basic concepts in the facilities management (FM) domain. This schema, along with IfcProcessExtension and IfcProjectManagementExtension, provide a set of models that can be used by typical facilities management applications.

In R2.0, these models can be used to support FM processes such as furniture and equipment scheduling, occupancy and space planning, move management, and workstation design and layout, etc. When the objects defined in these schemas are generated by these processes, their values can be made available based on IFC data structure for other FM processes to use.

HISTORY: existing schema from R1.5.1.

24.1. Type IfcFurnitureElementTypeEnum

24.1.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

24.1.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcSystemFurnitureElement

24.1.3. Enumeration

Panel
Worksurface
Storage
UserDefined
NotDefined

24.2. Type IfcFurnitureTypeEnum

24.2.1. Type Semantic Definition

History

This Enumeration has changed after IFC Release 1.5.1, please see the Migration Guide for details

24.2.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcFurniture

24.2.3. Enumeration

Table
Chair
Desk
FileCabinet
UserDefined
NotDefined

24.3. Type IfcInventoryTypeEnum

24.3.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

24.3.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcInventory

24.3.3. Enumeration

AssetInventory
SpaceInventory
UserDefined
NotDefined

24.4. Type IfcOccupancyMoveTypeEnum

24.4.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

24.4.2. Enumeration

MoveIn
MoveOut
MoveInOut
UserDefined
NotDefined

24.5. Type IfcWorkstationEnum

24.5.1. Type Semantic Definition

History

New Enumeration in IFC Release 2.0

24.5.2. Enumeration

Workstation
Workstationgroup
UserDefined
NotDefined

24.6. Class IfcFurniture

24.6.1. Class Semantic Definition

It represents a piece of furniture (e.g. office furniture such as table, desk, chair, file cabinet etc). IfcFurniture represents the type of furniture that is not usually fixed to the building or assembled as system or modular furniture such as workstations (i.e. office cubes) as well as their components such as panels, work surfaces, etc.

ISSUE: New attributes and relationships are required for IFC R2.0 as shown in the following table (existing attributes and relationships are not shown.)

The data type of AssignedTo is changed from ‘Ref. IfcActor’ to ‘SET [0:?] Ref. IfcActorSelect.

History

This Entity has changed after IFC Release 1.5.1, please see the Migration Guide for details

24.6.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProduct
      IfcElement
        IfcBuildingElement
          IfcFurniture

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	4 predefined generic types are possible. Use Type Definition corresponding to this generic type	IfcFurnitureTypeEnum	Chair	Table	Chair
	AssignedTo	Persons, Departments, Organizations to which this piece of furniture is assigned	SET [0:?] OF IfcActorSelect	N/a	N/a	N/a
	FurnitureModel		IfcFurnitureModel	see type	see type	see type

Formal Propositions

WR61	

24.6.3. Interface Definitions

- I_Furniture

24.6.4. Type Definitions

Common PropertySet

Pset_FurnitureCommon

Type driven PropertySets

PreDefined Type	Associated PropertySet
Table	Pset_Table
Chair	Pset_Chair
Desk	Pset_Desk
FileCabinet	Pset_FileCabinet
UserDefined	
NotDefined	

24.6.5. Geometry Use Definitions

Geometric use of IfcFurniture follows that of IfcProduct.

24.7. Class IfcFurnitureModel

24.7.1. Class Semantic Definition

This class represents features captured from the feature listing of a 'type' or 'model' of furniture defined in a furniture catalog of a furniture manufacturer. The features described through the values of the attributes of IfcFurnitureModel are furniture features that generally apply to all the specific pieces of furniture of the model. These features are manufacturer-dependent and thus must be provided by the manufacturer that makes and/or supplies the furniture. The use of IfcFurnitureModel to IfcFurniture is in form of a reference, that is, an instance of IfcFurnitureModel in a computer system should be referenced (e.g. through the instance id, or memory pointer) by one or more pieces of instances of the furniture of the same model. Note that this class can enable the direct linkage between the furniture and the furniture model data handled within the manufacturer's catalog in the manufacturer's computer systems, if these systems are IFC compliant and understand the semantics of IfcFurnitureModel. This class is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

24.7.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcFurnitureModel

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	ModelID	An id for the model given by the manufacturer	STRING	Empty string	N/a	Empty string
	ModelName	A textual short description of the name of the model	STRING	Empty string	N/a	Empty string
	Manufacturer	The manufacturer that provides the furniture model and that makes the pieces of furniture referring to the model.	IfcOrganization	see type	see type	see type
OPT	CatalogName	The name of the catalog that the model belongs to and that maintained by the manufacturer	STRING	Empty string	N/a	Empty string
OPT	BasicDescription	The basic description of the model provided by the manufacturer	STRING	Empty string	N/a	Empty string
	BasicFeatures	The list of features in textural form provided by the manufacturer	LIST [0:?] OF STRING	N/a	N/a	N/a
	AdjustableFeatures	The list of adjustable features in textual form provided by the manufacturer. An adjustable feature is a function that allows some part of furniture to be adjustable to better meet the use needs, e.g. adjustable arms of a chair.	LIST [0:?] OF STRING	N/a	N/a	N/a
	Options	The list of options that the model comes with in textual form provided by the manufacturer. An option can be in terms of colors, sizes, etc.	LIST [0:?] OF STRING	N/a	N/a	N/a
OPT	MaintenanceManual	A reference to a document (e.g. document name), a file (e.g. file name), or a manufacturer defined id referring to the version of the manual.	STRING	Empty string	N/a	Empty string
OPT	WarrantyDetails	A reference to a document (e.g. document name), a file (e.g. file name), or a manufacturer defined id referring to the version of the warranty policy document.	STRING	Empty string	N/a	Empty string

24.7.3. Interface Definitions

- I_FurnitureModel

24.7.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.8. Class IfcInventory

24.8.1. Class Semantic Definition

IfcInventory represents information about an inventory – data about a collection of items for an enterprise. Two types of inventory are handled in this release-the space inventory and asset inventory (i.e. inventory for furniture, fixture and equipment). The links between the assets and spaces are handled through the object relationships of the IfcSpace, IfcFurniture, and IfcEquipment. IfcInventory is a subtype of IfcGroup.

History

New Entity in IFC Release 2.0

24.8.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcGroup
      IfcInventory

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	The type of inventory such as space or asset, with enum value of SpaceInventory, or AssetInventory, respectively	IfcInventoryTypeEnum	AssetInventory	SpaceInventory	AssetInventory
	Jurisdiction	The organizational unit of the inventory	IfcOrganization	see type	see type	see type
	Responsible	Persons who are responsible for the inventory	SET [0:?] OF IfcActorSelect	N/a	N/a	N/a
	LastUpdateDate	The date of last update	IfcDateTimeSelect	see type	see type	see type
	CurrentValue	An estimate cost value of the inventory. Cost contexts such as re-sell value are provided through IfcCostSchedule.	SET [0:?] OF IfcCostElement	N/a	N/a	N/a
	OriginalValue	Original cost value of the total inventory. Cost contexts such as purchase costs, installation costs, etc. are provided through IfcCostSchedule.	SET [0:?] OF IfcCostElement	N/a	N/a	N/a

Formal Propositions

WR41	

24.8.3. Interface Definitions

- I_Inventory

24.8.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
AssetInventory	Pset_AssetInventory
SpaceInventory	Pset_SpaceInventory
UserDefined	
NotDefined	

24.8.5. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.9. Class IfcOccupancySchedule

24.9.1. Class Semantic Definition

IfcOccupancySchedule represents a plan for activities to move people and FF&E from spaces to spaces. IfcOccupanySchedule contains a list of elements (i.e. IfcOccupanyScheduleElement) linked with an occupancy task with their logical relationships. This class also contains references to a set of spaces to be occupied, emptied, and re-occupied. An instance of IfcOccupancySchedule can also contain other schedule instances through IfcRelNestsOccupancySchedules. IfcOccupancySchedule is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

24.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcControl
      IfcOccupancySchedule

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	SpaceProgramsToMove	All the space programs to be moved in this plan	SET [0:?] OF IfcSpaceProgram	N/a	N/a	N/a
	NewlyOccupiedSpaces	Spaces that are occupied in this plan	SET [0:?] OF IfcSpace	N/a	N/a	N/a
	NewlyEmptiedSpaces	Spaces that are emptied in this plan	SET [0:?] OF IfcSpace	N/a	N/a	N/a
	ReoccupiedSpaces	Spaces that are occupied by new tenants in this plan	SET [0:?] OF IfcSpace	N/a	N/a	N/a
	OccupantsToMove	People or organizations that are moving out or in the spaces	SET [0:?] OF IfcActorSelect	N/a	N/a	N/a
	ScheduleElements	The occupany activities involved in this plan	SET [0:?] OF IfcOccupancyScheduleElement	N/a	N/a	N/a

Formal Propositions

WR41	Containing processes are IfcOccupancyActivity

WR42	

24.9.3. Interface Definitions

- I_OccupancySchedule

24.9.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.10. Class IfcOccupancyScheduleElement

24.10.1. Class Semantic Definition

IfcOccupancyScheduleElement is an occupancy task element in an occupancy schedule (i.e. IfcOccupancySchedule). It represents an occupancy task by linking an IfcOccupancyTask instance providing task time control information through IfcScheduleTimeControl defined in IfcProcessExtension schema. An instance of IfcOccupancyScheduleElement can include other elements through IfcRelNestsOccupancyScheduleElements. IfcOccupancyScheduleElement is a subtype of IfcControl.

History

New Entity in IFC Release 2.0

24.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcControl
IfcOccupancyScheduleElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	OccupancyTask	The work task that the schedule element asigned to.	IfcOccupancyTask	See type	See type	See type
	TimeForSchedule		IfcScheduleTimeControl	See type	See type	See type

Formal Propositions

WR41	
WR42	

24.10.3. Interface Definitions

- I_OccupancyScheduleElement

24.10.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.11. Class IfcOccupancyTask

24.11.1. Class Semantic Definition

IfcOccupancyTask represents an activity to move people around office spaces along with furniture and equipment, etc. It is represented by IfcOccupancyScheduleElement that provides time control data in an occupany plan (i.e. IfcOccupancySchedule). An instance of IfcOccupancyTask can also contain other instances of the same type through the nesting capability provided by IfcProcess. IfcOccupancyTask is a subtype of IfcProcess.

History

New Entity in IFC Release 2.0

24.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject
    IfcProcess
      IfcOccupancyTask

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	OccupantsToMove	People or organizations that are moving out or in the spaces	SET [0:?] OF IfcActorSelect	N/a	N/a	N/a
	FFEtoMove	The furniture, fixture and equipment that are moved out or in the spaces	SET [0:?] OF IfcBuildingElement	N/a	N/a	N/a
OPT	MoveType	Indicates whether this occupancy activity is to move in to space(s), or out from space(s), or to involve both. The relations in 'MoveFrom' and 'MoveTo' must be set by the user to ensure consistency. That is: if MoveIn, 'MoveFrom' should be empty; if MoveOut, 'MoveIn' should be empty; if Both, neither should be empty.	IfcOccupancyMoveTypeEnum	MoveIn	MoveOut	MoveIn
	MoveFrom	The spaces from which people or FF&E are moving out from.	SET [0:?] OF IfcSpace	N/a	N/a	N/a
	MoveTo	The spaces to which people or FF&E are moving into.	SET [0:?] OF IfcSpace	N/a	N/a	N/a
OPT	ConstraintType	The activity constraint for timing. The type of the constraint such as 'as soon as possible', 'not start before', 'must start on', 'must finish on', must start before', 'must finish before', 'may start after', 'must move out by', etc. The value of 'ConstaintType' and 'ConstraintDate' makes a meanful constraint.	STRING	empty string	n/a	empty string
OPT	ConstraintTime	the date requriement for certain constrainttype such as must move out by 'date', etc.	IfcDateTimeSelect	see type	see type	see type
INV	ScheduleElements	The work schedule elements that associates with this work tasks.	SET [0:?] OF IfcOccupancyScheduleEleme	See type	See type	See type

			nt			

Formal Propositions

WR41	

24.11.3. Interface Definitions

- I_OccupancyTask

24.11.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.12. Class IfcRelNestsOccupancyScheduleElements

24.12.1. Class Semantic Definition

IfcRelNestsOccupancyScheduleElements is an objectified relationship enabling a mechanism to allow one occupancy schedule element to include other elements of the same type.
IfcRelNestsOccupancyScheduleElements is a subtype of IfcRelNests.

History

New Entity in IFC Release 2.0

24.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelNests
      IfcRelNestsOccupancyScheduleElements

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description	Any description that would be useful to understand the nesting of the schedules.	STRING	Empty string	N/a	Empty string

Formal Propositions

WR41	Nesting object must be of type IfcOccupancyScheduleElement.
WR42	Nesting objects must be of type IfcOccupancyScheduleElement.

24.12.3. Interface Definitions

- I_RelNestsOccupancyScheduleElements

24.12.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.13. Class IfcRelNestsOccupancySchedules

24.13.1. Class Semantic Definition

IfcRelNestsOccupancySchedules is an objectified relationship enabling a mechanism to allow one occupancy schedule to include other schedules of the same type. IfcRelNestsOccupancySchedules is a subtype of IfcRelNests.

History

New Entity in IFC Release 2.0

24.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcRelationship
    IfcRelNests
      IfcRelNestsOccupancySchedules

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
OPT	Description	Any description that would be useful to understand the nesting of the schedules.	STRING	Empty string	N/a	Empty string

Formal Propositions

WR41	Nesting object must be of type IfcWorktaskSchedule.
WR42	Nesting objects must be of type IfcWorktaskSchedule.

24.13.3. Interface Definitions

- I_RelNestsOccupancySchedules

24.13.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.14. Class IfcRelWorkInteraction

24.14.1. Class Semantic Definition

IfcRelWorkInteraction is an objectified relationship. It represents an interaction relationship between two parties, such as employees, organizations, or space programs (interaction relations between workstations, workstation groups, floor blocks, or spaces, are defined through their associated space programs). The work interaction relationship can be used for defining the adjacency between space programs as well as spaces. In work interection instance can be created by an architectural space design program or an facilities management space planning program. By storing the work intereaction instances in the central model of the building project suppported by IFCs, it can be reused when spaces need to be re-designed, re-modeled, or people need to move offices, etc. IfcRelWorkInteraction is a subtype of IfcRelationship.

History

New Entity in IFC Release 2.0

24.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcRelationship
IfcRelWorkInteraction

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	RelatingActor	One of the two parties involved in the interaction. 'RelatingActor' and 'RelatedActor' must be two different parties.	IfcActor	see type	see type	see type
	RelatedActor	One of the two parties involved in the interaction. 'RelatingActor' and 'RelatedActor' must be two different parties.	IfcActor	see type	see type	see type
OPT	RelatingSpaceProgram	One of the two space programs involved in the interaction. If RelatingActor or RelatedActor is also used, the user is responsible for make sure the the space program referenced is consistent with that associated by RelatingActor. RelatingSpaceProgram and RelatedSpaceProgram must refer to two different instances of IfcSpaceProgram.	IfcSpaceProgram	see type	see type	see type
OPT	RelatedSpaceProgram	See RelatingSpaceProgram.	IfcSpaceProgram	see type	see type	see type
OPT	Description	General description of the interaction	STRING	empty sting	n/a	empty sting
OPT	DailyFrequency	Number of interactions daily	INTEGER	0	see type	0
OPT	ImportanceRating	Represents the level of importance of interaction	INTEGER	0	see type	0
OPT	AverageDuration	Average time duration of each interaction	IfcTimeMeasure	see type	see type	see type
OPT	Location	The location where this interaction happens.	IfcSpace	see type	see type	see type

24.14.3. Interface Definitions

- I_WorkInteraction

24.14.4. Geometry Use Definitions

Instances of this class have no physical presence and therefore no geometric representation.

24.15. Class IfcSystemFurnitureElement

24.15.1. Class Semantic Definition

This class represents a component (i.e. modular element) of systems furniture (i.e. modular furniture) such as a vertical panel, a work surface, and storage which must be used in assembly of a system furniture unit such as a workstation or workstation group. IfcSystemFurnitureElement doesn't provide the functions for people to use as a type of furniture, but it is typically used in assembling the systems furniture as an integrated part. IfcSystemFurnitureElement is a subtype of IfcBuildingElement.

History

New Entity in IFC Release 2.0

24.15.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcSystemFurnitureElement

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Panel, Worksurface, Storage.	IfcFurnitureElementTypeEnum	Panel	Storage	Panel
INV	ElementOf	The workstation that this element is used in.	SET [0:?] OF IfcWorkstation	n/a	n/a	N/a

Formal Propositions

WR61	

24.15.3. Interface Definitions

- I_SystemFurnitureElement

24.15.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
Panel	Pset_Panel
Worksurface	Pset_Worksurface
Storage	Pset_Storage
NotDefined	
UserDefined	

24.15.5. Geometry Use Definitions

Geometric use of IfcSystemFurnitureElement follows IfcBuildingElement.

24.16. Class IfcWorkstation

24.16.1. Class Semantic Definition

A unit of an office working area that is bounded by modular vertical panels and that is assembled by a set of modular system furniture elements such as work surfaces, file storage, etc. It can also have free stand furniture such as desks, chairs, and bookshelves. Office equipment such as fixture lighting and computers, printers, etc can be included in a workstation through IfcRelContains with ContainmentType=SpaceContainer of IfcObject. A workstation can be considered to be a spatial element, i.e. a space, since it is a place that provides an office space; it however also has characteristics of a type of furniture since it is made by a furniture manufacturer as a product. In IFCs, IfcWorkstation is modeled as a subtype of IfcSpace with properties matched to a manufactured furniture product using Pset_FurnitureCommon property set that can be attached through IfcExtensionPropertySet at IfcObject level.

In IFCs, a workstation group is also modeled by IfcWorkstation that consists of a set of workstations connected with modular vertical panels. A workstation group is a workplace and can be physically viewed as a bigger and complex workstation that is usually for a group of people who work, in the individual workstations, as a functional team or a departmental unit. A workstation group can contain FF&E that don't belong to any individual workstations and are shared by all the personnel and workstations within the group. Like normal workstation, a workstation group also possesses both spatial and furniture characteristics.

History

New Entity in IFC Release 2.0

24.16.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcSpatialElement
IfcSpace
IfcWorkstation

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	WorkstationType	To indicate whether the workstation represents a single office cube or a workstation group which includes a set of cubes.	IfcWorkstationEnum	Workstation	Workstationgroup	Workstation
	FurntureModel	To reference an instance of IfcFurnitureModel that represents a list of features or options that apply to this workstation provided by the manufacturer.	IfcFurnitureModel	See type	See type	See type
	ModuleElements	list of worksurfaces and storage, excluding the vertical panels.	SET [0:?] OF IfcSystemFurnitureElement	n/a	n/a	n/a
OPT	TotalWorkTaskZone	The total value of work task area within the workstation	IfcAreaMeasure	See type	See type	See type
OPT	TotalChairClearence	The total value of chair clearence area within the workstation	IfcAreaMeasure	See type	See type	See type
OPT	TotalCirculation	The total value of circulation area within the workstation	IfcAreaMeasure	See type	See type	See type

OPT	TotalCubes	If the number is greater than 0, it indicates that the workstation is a workstation group. The number indicates the total number of the workstations contained in the workstation group.	INTEGER	0	n/a	0

Informal Propositions

IP1	FurnitureElementType of IfcSystemFurnitureElement of ModuleElements must be either Worksurface or Storage, but not panels
IP2	Vertical Panels that bound the workstaion are referenced through 'BoundedBy' of IfcSpace
IP3	The workstatiion group that assembles the workstation is refereneced in the 'PartOfAssembly' of IfcSpace

24.16.3. Interface Definitions

- I_Workstation

24.16.4. Geometry Use Definitions

Geometric use of IfcWorkstation follows that of IfcSpace.

24.17. PropertySet Pset_AssetInventory

24.17.1. PropertySet Semantic Definition

A set of specific properties for asset (i.e FF&E) inventory.

24.17.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
TotolOriginalValue	the original total value of all the assets	IfcObjectReference	IfcCost	see type	see type	see type
TotalCurrentValue	the current total value of all the assets	IfcObjectReference	IfcCost	see type	see type	see type
TotalItems	total items in the inventory	IfcSimpleProperty	IfcInteger	0	n/a	0

24.18. PropertySet Pset_Chair

24.18.1. PropertySet Semantic Definition

A set of specific properties for furniture type chair.

24.18.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonFurniture Properties	Reference to a nested SharedPropertySet, containing properties common to all types of furniture objects.	IfcObjectReference	IfcGloballyUniqueId, Pset_FurnitureCommon	see type	see type	see type

SeatingHeight	The value of seating height if the chair height is not adjustable.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
HighestSeatingHeight	The value of seating height of high level if the chair height is adjustable.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
LowestSeatingHeight	The value of seating height of low level if the chair height is adjustable.	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type

24.19. PropertySet Pset_Desk

24.19.1. PropertySet Semantic Definition

A set of specific properties for furniture type desk.

24.19.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonFurnitureProperties	Reference to a nested SharedPropertySet, containing properties common to all types of furniture objects.	IfcObjectReference	IfcGloballyUniqueId, Pset_FurnitureCommon	see type	see type	see type
WorksurfaceArea	The value of the work surface area of the desk.	IfcSimpleProperty	IfcAreaMeasure	see type	see type	see type

24.20. PropertySet Pset_FileCabinet

24.20.1. PropertySet Semantic Definition

A set of specific properties for furniture type file cabinet.

24.20.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonFurnitureProperties	Reference to a nested SharedPropertySet, containing properties common to all types of furniture objects.	IfcObjectReference	IfcGloballyUniqueId, Pset_FurnitureCommon	see type	see type	see type
WithLock	Indicates whether the file cabinet is lockable or not.	IfcSimpleProperty	IfcBoolean	Yes	No	Yes

24.21. PropertySet Pset_FurnitureCommon

24.21.1. PropertySet Semantic Definition

Common properties for all types of furniture such as chair, desk, table, and file cabinet.

24.21.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Description	Specific description of this type of furniture.	IfcSimpleProperty	IfcString	empty string	n/a	empty string
AssetInformation	Information about this asset. A String containing the name of the IfcOccurrencePropertySet - Pset_Asset. Empty string means that this information not yet set.	IfcObjectReference	IfcGloballyUniqueId, Pset_Asset	empty string	n/a	empty string
ManufactureInformation	Reference to a SharedPropertySet (Pset_ManufactureInformation) containing information about the manufacture of this furniture type.	IfcObjectReference	IfcGloballyUniqueId, Pset_ManufactureInformation	see type	see type	see type
ElementMaintenance	Information about the condition and maintenance of this furniture. A object reference to the OccurrencePropertySet ("Pset_ElementMaintenance"). This Pset will be attached to the subject object - in the list of OccurrencePropertysets defined in the IfcObject supertype. An empty reference means that this information is not yet set.	IfcObjectReference	IfcGloballyUniqueId, Pset_ElementMaintenance	empty string	n/a	empty string
Style	Description of the furniture style	IfcSimpleProperty	IfcString	empty string	n/a	empty string
Height	The nominal height of the furniture of this type	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
Length	The nominal length or width of the furniture of this type	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
Depth	The nominal depth of the furniture of this type	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
MainColor	The main color of the furniture of this type	IfcSimpleProperty	IfcString	empty string	n/a	empty string
Material	the main material the furniture of this type is made of, e.g. walnut, etc.	IfcObjectReference	IfcGloballyUniqueId, Pset_MaterialSet	see type	see type	see type
Finishing	e.g. walnut, fabric	IfcObjectReference	IfcGloballyUniqueId, Pset_MaterialSet	see type	see type	see type

24.22. PropertySet Pset_FurnitureElementCommon

24.22.1. PropertySet Semantic Definition

Common properties for all systems furniture (i.e. modular furniture) element types (e.g. vertical panels, work surfaces, and storage).

24.22.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
IsUsed	indicates whether the element is being used in a workstation or not.	IfcSimpleProperty	IfcBoolean	Yes	No	Yes
GroupCode	e.g. panels, worksurfaces, storage, etc.	IfcSimpleProperty	IfcString	empty	n/a	empty string
Width	i.e. nominal width	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
Height	i.e. nominal length	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
Finishing	e.g. walnut, fabric	IfcSimpleProperty	IfcString	empty string	n/a	empty string

24.23. PropertySet Pset_Panel

24.23.1. PropertySet Semantic Definition

A set of specific properties for vertical panels that assembly workstations.

24.23.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonProperties	The common property values shared by many penel instances.	IfcObjectReference	IfcGloballyUniqueId, Pset_FurnitureElementCommon	see type	see type	see type
Shape	the vertical boundary shape of the panel	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcProductDefinitionShape	see type	see type	see type
HasOpening	indicates whether the panel has an opening or not.	IfcSimpleProperty	IfcBoolean	Yes	No	Yes
PanelType	e.g. Acoustical, Horz_Seg, Monolithic, Glazed, Open, Ends, Door, Screen, etc.	IfcSimpleProperty	IfcString	empty string	n/a	empty string
Thickness	the thickness of the panel	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type

24.24. PropertySet Pset_SpaceInventory

24.24.1. PropertySet Semantic Definition

A set of specific properties for space inventory.

24.24.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
TotalSpaces	total number of spaces in the inventory	IfcSimpleProperty	IfcInteger	0	n/a	0
TotalNetArea	total net area of all the spaces; can be calculated from each space	IfcSimpleProperty	IfcAreaMeasure	see type	see type	see type

24.25. PropertySet Pset_Storage

24.25.1. PropertySet Semantic Definition

A set of specific properties for storage used in workstations.

24.25.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonProperties	The common property values shared by many storage instances.	IfcObjectReference	IfcGloballyUniqueId, Pset_FurnitureElementCommon	see type	see type	see type
IsOverhead	is overhead storage or not	IfcSimpleProperty	IfcBoolean	YES	NO	YES
SupportType	i.e. Freestanding or supported	IfcSimpleProperty	IfcString	empty string	n/a	empty string
UsePurpose	e.g. shelf, stationary, office supplies, personal items, etc.	IfcSimpleProperty	IfcString	empty string	n/a	empty string
NumberOfDrawers	number of drawers	IfcSimpleProperty	IfcInteger	0	n	0
HungingHeight	hanging height if IsOverhead	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
Depth	depth of the storage	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type

24.26. PropertySet Pset_Table

24.26.1. PropertySet Semantic Definition

A set of specific properties for furniture type table.

24.26.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonFurnitureProperties	Reference to a nested SharedPropertySet, containing properties common to all types of furniture objects.	IfcObjectReference	IfcGloballyUniqueId, Pset_FurnitureCommon	n/a	n/a	n/a
WorksurfaceArea	The value of the work surface area of the desk.	IfcSimpleProperty	IfcAreaMeasure	see type	see type	see type
NumberOfChairs	Maximum number of chairs that can fit with the table for normal use.	IfcSimpleProperty	IfcInteger	1	n/a	1

24.27. PropertySet Pset_Worksurface

24.27.1. PropertySet Semantic Definition

A set of specific properties for work surfaces used in workstations.

24.27.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
CommonProperties	The common property values shared by many work surface instances.	IfcObjectReference	IfcGloballyUniqueId, Pset_FurnitureElementCommon	see type	see type	see type
UsePurpose	e.g. writing/reading, computer, meeting, printer, reference files, etc.	IfcSimpleProperty	IfcString	empty string	n/a	empty string
SupportType	i.e. Freestanding or supported	IfcSimpleProperty	IfcString	empty string	n/a	empty string
HungingHeight	the hanging height of the worksurface	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
Thickness	the thickness of the worksurface	IfcSimpleProperty	IfcPositiveLengthMeasure	see type	see type	see type
ShapeDescription	corner square, rectangle, etc.	IfcSimpleProperty	IfcString	empty string	n/a	empty string

25. IfcHvacDomain

The IfcHvacDomain schema in the domain layer defines basic object concepts required for interoperability between Building Service domain extensions (notably HVAC) and other domain extensions defined in the current IFC model. This schema is new in IFC R2.0.

25.1. Type IfcActuatorFailPositionEnum

25.1.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different states for failure for an instance of IfcActuator.

History

New Enumeration in IFC Release 2.0

25.1.2. Enumeration

FailOpen
FailClosed
UserDefined
NotDefined

25.2. Type IfcActuatorTypeEnum

25.2.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of discrete elements an IfcActuator object can fulfill.

History

New Enumeration in IFC Release 2.0

25.2.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcActuator

25.2.3. Enumeration

ElectricActuator
PneumaticActuator
HydraulicActuator
HandOperatedActuator
UserDefined
NotDefined

25.3. Type IfcAirTerminalBoxTypeEnum

25.3.1. Type Semantic Definition

Definition from IAI: This enumeration identifies different types of air terminal boxes. Note that this enumeration does not define type: it is informational only.

ISSUES: See I-472 for changes made in IFC Release 2.0 Beta 3

History

New Enumeration in IFC Release 2.0

25.3.2. Enumeration

VariableAirVolume
ConstantVolume
VariableAirVolumeReheat
ConstantVolumeReheat
VariableAirVolumeDualDuct
ConstantVolumeDualDuct
FanPowered
UserDefined
NotDefined

25.4. Type IfcControllerTypeEnum

25.4.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of discrete elements an IfcController object can fulfill.

History

New Enumeration in IFC Release 2.0

25.4.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcController

25.4.3. Enumeration

HvacController
UserDefined
NotDefined

25.5. Type IfcDamperSizingMethodEnum

25.5.1. Type Semantic Definition

Definition from IAI: This enumeration defines the sizing methods used for an instance of IfcDamper.

History

New Enumeration in IFC Release 2.0

25.5.2. Enumeration

Nominal
Exact
UserDefined
NotDefined

25.6. Type IfcDamperTypeEnum

25.6.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of discrete elements an IfcDamper object can fulfill.

History

New Enumeration in IFC Release 2.0

25.6.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcDamper

25.6.3. Enumeration

FireDamper
SmokeDamper
FireSmokeDamper
BackdraftDamper
ControlDamper
Louver
UserDefined
NotDefined

25.7. Type IfcSensorTypeEnum

25.7.1. Type Semantic Definition

Definition from IAI: This enumeration defines the different types of discrete elements an IfcSensor object can fulfill.

History

New Enumeration in IFC Release 2.0

25.7.2. PreDefined Type

This enumeration defines the available PreDefined Types for IfcSensor

25.7.3. Enumeration

HvacSensor
UserDefined
NotDefined

25.8. Type IfcValveEnum

25.8.1. Type Semantic Definition

Definition from IAI: This enumeration identifies different types of valves. Note that this enumeration does not define type: it is informational only.

History

New Enumeration in IFC Release 2.0

25.8.2. Enumeration

Automated
Angle

AWWA
Ball
Butterfly
Check
Diverter
Gate
Globe
Nace
Needle
Plug
Pipeline
Safety
Threeway
ULFM
UserDefined
NotDefined

25.9. Class IfcActuator

25.9.1. Class Semantic Definition

Definition from IAI: This class defines properties of an actuating device typically used in a control system such as a building automation control system.

History

New Entity in IFC Release 2.0

25.9.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionControlElement
IfcActuator

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcActuatorTypeEnum	ElectricActuator	HandOperatedActuator	ElectricActuator
	FailPosition	Enumeration defining the types of fail positions for the actuator	IfcActuatorFailPositionEnum	FailOpen	Unset	FailOpen

Formal Propositions

WR81	

25.9.3. Interface Definitions

- I_Actuator

25.9.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
ElectricActuator	Pset_ElectricActuator
PneumaticActuator	Pset_PneumaticActuator
HydraulicActuator	Pset_HydraulicActuator
HandOperatedActuator	Pset_HandOperatedActuator
UserDefined	
NotDefined	

25.9.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcActuator is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcActuator is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcActuator is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcActuator is not supported.

25.10. Class IfcAirTerminalBox

25.10.1. Class Semantic Definition

Definition from IAI: This class defines properties of an air terminal box, which participates in an HVAC duct distribution system. An air terminal box is typically used to control or modulate the amount of air delivered to its downstream ductwork.

History

New Entity in IFC Release 2.0

25.10.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcFlowController
IfcAirTerminalBox

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	TerminalBoxType	Enumeration that identifies the type of terminal box (e.g., VariableAirVolume, ConstantVolume, VariableAirVolumeReheat, ConstantVolumeReheat, FanPowered, VariableAirVolumeDualDuct, etc.)	IfcAirTerminalBoxTypeEnum	Variable AirVolume	Unset	Variable AirVolume
	SoundLevel	Design sound power level	STRING	see type	see type	empty string

25.10.3. Interface Definitions

- I_AirTerminalBox

25.10.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcAirTerminalBox is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcAirTerminalBox is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcAirTerminalBox is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcAirTerminalBox is not supported.

25.11. Class IfcController

25.11.1. Class Semantic Definition

Definition from IAI: This class defines properties of a controller which interacts with other devices in a control system such as a building automation control system.

History

New Entity in IFC Release 2.0

25.11.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionControlElement
IfcController

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcControllerTypeEnum	HvacController	HvacController	HvacController

Formal Propositions

WR81	

25.11.3. Interface Definitions

- I_Controller

25.11.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
HvacController	Pset_HvacController
UserDefined	
NotDefined	

25.11.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcController is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcController is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcController is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcController is not supported.

25.12. Class IfcDamper

25.12.1. Class Semantic Definition

Definition from IAI: This class defines elements of a damper, which typically is used in an HVAC air distribution system to control or modulate the flow of air.

History

New Entity in IFC Release 2.0

25.12.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcFlowController
IfcDamper

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcDamperTypeEnum	FireDamper	Louver	FireDamper
	FrameDepth	The length (or depth) of the damper frame	IfcLengthMeasure	see type	see type	0
	SizingMethod	Enumeration that identifies whether the damper is sized nominally or with exact measurements.	IfcDamperSizingMethodEnum	Nominal	Exact	Nominal
	CloseOffRating	Close off rating - IfcMeasureWithUnit (IfcPressureMeasure)	IfcMeasureWithUnit	see type	see type	0
	LeakageAirFlowrate	Leakage air flow rate - IfcMeasureWithUnit (IfcVolumetricFlowrateMeasure)	IfcMeasureWithUnit	see type	see type	0

Formal Propositions

WR91	

25.12.3. Interface Definitions

- I_Damper

25.12.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
FireDamper	Pset_FireDamper
SmokeDamper	Pset_SmokeDamper
FireSmokeDamper	Pset_FireSmokeDamper
BackdraftDamper	Pset_BackdraftDamper
ControlDamper	Pset_ControlDamper
Louver	Pset_Louver
UserDefined	
NotDefined	

25.12.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcDamper is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcDamper is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcDamper is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcDamper is not supported.

25.13. Class IfcSensor

25.13.1. Class Semantic Definition

Definition from IAI: This class defines properties of a sensor which is used for detection in a control system such as a building automation control system.

History

New Entity in IFC Release 2.0

25.13.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
  IfcObject

IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionControlElement
IfcSensor

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	PredefinedType	Predefined generic types are specified in an Enumeration. A TypeDefinition is available for each generic type (as the required attributes differ). Use Type Definition corresponding to this generic type.	IfcSensorTypeEnum	HvacSensor	HvacSensor	HvacSensor

Formal Propositions

WR81	

25.13.3. Interface Definitions

- I_Sensor

25.13.4. Type Definitions

Type driven PropertySets

PreDefined Type	Associated PropertySet
HvacSensor	Pset_HvacSensor
UserDefined	
NotDefined	

25.13.5. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcSensor is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcSensor is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcSensor is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcSensor is not supported.

25.14. Class IfcValve

25.14.1. Class Semantic Definition

Definition from IAI: This class defines elements of a valve, which typically is used in an HVAC piping distribution system to control or modulate the flow of the fluid.

History

New Entity in IFC Release 2.0

25.14.2. Attribute and Relationship Definitions

Superclasses and Subclasses

IfcRoot
IfcObject
IfcProduct
IfcElement
IfcBuildingElement
IfcDistributionElement
IfcDistributionFlowElement
IfcFlowController
IfcValve

Attributes and Relationships

	Attribute / Relation	Definition	Data or Rel. Type	Min.	Max.	Default
	CloseOffRating	Close off rating	IfcMeasureWithUnit	see type	see type	0
	ValveCv	Cv value for the valve	REAL	see type	see type	0
	ValveType	Type of valve	IfcValveEnum	Automated	Unset	Gate

25.14.3. Interface Definitions

- I_Valve

25.14.4. Geometry Use Definitions

Object Geometry in Context

The geometric representation of IfcValve is given by the IfcProductShape, allowing multiple geometric representations. Included are:

Local Position

The local placement for IfcValve is defined in its supertype, IfcProduct. It is defined by the

- IfcLocalPlacement, which defines the local coordinate system that is referenced by all geometric representations.

Standard Geometric Representation

The standard geometric representation of IfcValve is defined using **explicit geometry**. The faceted B-Rep capabilities (with or without voids) shall be supported for standard representation.

Currently, the usage of attribute driven geometry for IfcValve is not supported.

25.15. PropertySet Pset_AnalogInput

25.15.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of an analog input.

25.15.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
HighLimit	The high limit value for the analog input.	IfcSimplePropertyWithUnit	IfcReal, Unspecified	see type	see type	0
LowLimit	The low limit value for the analog input.	IfcSimplePropertyWithUnit	IfcReal, Unspecified	see type	see type	0
Deadband	The deadband value for the analog input.	IfcSimplePropertyWithUnit	IfcReal, Unspecified	see type	see type	0
HighLimitEnable	Is HighLimit validation enabled (TRUE) or not (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
LowLimitEnable	Is LowLimit validation enabled (TRUE) or not (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
EventEnable	Enumeration that defines the type of event enabling	IfcEnumeratedProperty	Pset_EventEnableEnum(To-OffNormal, To-Fault, To-Normal, Other, NotKnown, Unset)			
NotifyTypeEnum	Enumeration that defines the notification type	IfcEnumeratedProperty	Pset_NotifyTypeEnum(Alarm, Event, AcknowledgeNotification, Other, NotKnown, Unset)			

25.16. PropertySet Pset_AnalogOutput

25.16.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of an analog output.

25.16.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
HighLimit	The high limit value for the analog output.	IfcSimplePropertyWithUnit	IfcReal, Unspecified	see type	see type	0
LowLimit	The low limit value for the analog output.	IfcSimplePropertyWithUnit	IfcReal, Unspecified	see type	see type	0
Deadband	The deadband value for the analog output.	IfcSimplePropertyWithUnit	IfcReal, Unspecified	see type	see type	0
HighLimitEnable	Is HighLimit validation enabled (TRUE) or not (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
LowLimitEnable	Is LowLimit validation enabled (TRUE) or not (FALSE).	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
EventEnable	Enumeration that defines the type of event enabling	IfcEnumeratedProperty	Pset_EventEnableEnum(To-OffNormal, To-Fault, To-			

			Normal, Other, NotKnown, Unset)			
NotifyTypeEnum	Enumeration that defines the notification type	IfcEnumeratedProperty	Pset_NotifyTypeEnum(Alarm, Event, AcknowledgeNotification, Other, NotKnown, Unset)			

25.17. PropertySet Pset_BackdraftDamper

25.17.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a backdraft damper.

25.17.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FrameType	The type of frame used by the damper (e.g., Standard, Single Flange, Single Reversed Flange, Double Flange, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
Actuator	Actuator references an IfcActuator object which contains the actuator information, if an actuator is part of the damper assembly	IfcObjectReference	IfcGloballyUniqueId, IfcActuator	n/a	n/a	NIL

25.18. PropertySet Pset_BinaryInput

25.18.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a binary input.

25.18.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Polarity	Enumeration defining the polarity	IfcEnumeratedProperty	Pset_PolarityEnum(Normal, Reverse, Other, NotKnown, Unset)			
InactiveText	String value to be displayed in an inactive, off, or idle state	IfcSimpleProperty	IfcString	see type	see type	empty string
ActiveText	String value to be displayed in an active, on, or running state	IfcSimpleProperty	IfcString	see type	see type	empty string
AlarmValue	Enumeration defining the operating state of the control system element	IfcEnumeratedProperty	Pset_AlarmValueEnum(Inactive, Active, Other, NotKnown, Unset)			
EventEnable	Enumeration that defines the type of event enabling	IfcEnumeratedProperty	Pset_EventEnableEnum(To-OffNormal, To-Fault, To-Normal, Other, NotKnown, Unset)			
AckedTransitions	Enumeration that defines the	IfcEnumeratedProp	Pset_AckedTransitionsEnum(			

	type of transition acknowledgement	erty	To-OffNormal, To-Fault, To-Normal, Other, NotKnown, Unset)			

25.19. PropertySet Pset_BinaryOutput

25.19.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a binary output.

25.19.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Polarity	Enumeration defining the polarity	IfcEnumeratedProperty	Pset_PolarityEnum(Normal, Reverse, Other, NotKnown, Unset)			
InactiveText	String value to be displayed in an inactive, off, or idle state	IfcSimpleProperty	IfcString	see type	see type	empty string
ActiveText	String value to be displayed in an active, on, or running state	IfcSimpleProperty	IfcString	see type	see type	empty string
MinimumOffTime	Minimum Off Time	IfcObjectReference	IfcLocalTime	see type	see type	0
MinimumOnTime	Minimum On Time	IfcObjectReference	IfcLocalTime	see type	see type	0
FeedbackValue	Enumeration defining the feedback value from the control system element	IfcEnumeratedProperty	Pset_FeedbackValueEnum(Inactive, Active, Other, NotKnown, Unset)			
EventEnable	Enumeration that defines the type of event enabling	IfcEnumeratedProperty	Pset_EventEnableEnum(To-OffNormal, To-Fault, To-Normal, Other, NotKnown, Unset)			
AckedTransitions	Enumeration that defines the type of transition acknowledgement	IfcEnumeratedProperty	Pset_AckedTransitionsEnum(To-OffNormal, To-Fault, To-Normal, Other, NotKnown, Unset)			

25.20. PropertySet Pset_ControlDamper

25.20.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a control damper.

25.20.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
DesignAirVelocity	The design air velocity for the damper assembly	IfcSimplePropertyWithUnit	IfcReal, LinearVelocityUnit	see type	see type	0
BladeAction	Enumeration that identifies the blade closing action for the damper	IfcEnumeratedProperty	Pset_DamperBladeActionEnum(Parallel, Opposed, Other, NotKnown, Unset)			
BladeType	The type of blade used in the damper (e.g., Triple Vee, Fabricated Airfoil, Extruded	IfcSimpleProperty	IfcString	see type	see type	empty string

	Airfoil, etc.)					
BladeMaterial	The primary material used to construct the damper blade	IfcObjectReference	IfcMaterial	n/a	n/a	NIL
BladeThickness	The thickness of the damper blade	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
FrameType	The type of frame used by the damper (e.g., Standard, Single Flange, Single Reversed Flange, Double Flange, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
FrameMaterial	The primary material used to construct the damper frame	IfcObjectReference	IfcMaterial	n/a	n/a	NIL
FrameThickness	The thickness of the damper frame	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
Actuator	Actuator references an IfcActuator object set which contains the actuator information, if an actuator is part of the damper assembly	IfcObjectReference	IfcGloballyUniqueId, IfcActuator	n/a	n/a	NIL

25.21. PropertySet Pset_ElectricActuator

25.21.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of an electric actuator.

25.21.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManualOverride	Identifies whether hand-operated operation is provided as an override	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
InputPower	Maximum input power requirement	IfcSimplePropertyWithUnit	IfcReal, PowerUnit	see type	see type	0

25.22. PropertySet Pset_FireDamper

25.22.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a fire damper.

25.22.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
BladeType	Enumeration that identifies the different types of blades in the fire damper	IfcEnumeratedProperty	Pset_FireDamperBladeTypeEnum(ParallelBlade, FoldingCurtain, Other, NotKnown, Unset)			
ActuationType	Enumeration that identifies the different types of dampers	IfcEnumeratedProperty	Pset_FireDamperActuationTypeEnum(Gravity, Spring, Other, NotKnown, Unset)			

ClosureRating	Enumeration that identifies the closure rating for the damper	IfcEnumeratedProperty	Pset_FireDamperClosureRatingEnum(Dynamic, Static, Other, NotKnown, Unset)			
FireResistanceRating	Measure of the fire resistance rating in hours (e.g., 1.5 hours, 2 hours, etc.).	IfcSimpleProperty	IfcReal	0	see type	2
MountingPosition	Enumeration that identifies how the damper is mounted in the building	IfcEnumeratedProperty	Pset_DamperMountingPositionEnum(Horizontal, Vertical, Other, NotKnown, Unset)			
FusibleLinkTemperature	The temperature that the fusible link melts	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
SleeveLength	The length of the damper sleeve	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
SleeveThickness	The thickness of the damper sleeve	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
DamperLocationInSleeve	The location within the sleeve where the damper is mounted (e.g., Center)	IfcSimpleProperty	IfcString	see type	see type	empty string

25.23. PropertySet Pset_FireSmokeDamper

25.23.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a combination fire and smoke damper.

25.23.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FrameThickness	The thickness of the damper frame	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
FireResistanceRating	Measure of the fire resistance rating in hours (e.g., 1.5 hours, 2 hours, etc.).	IfcSimpleProperty	IfcReal	0	see type	2
BladeType	The type of blade used in the damper (e.g., Triple Vee, Fabricated Airfoil, Extruded Airfoil, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
MountingPosition	Enumeration that identifies how the damper is mounted in the building	IfcEnumeratedProperty	Pset_DamperMountingPositionEnum(Horizontal, Vertical, Other, NotKnown, Unset)			
FusibleLinkTemperature	The temperature that the fusible link melts	IfcSimpleProperty	IfcThermodynamicTemperatureMeasure	see type	see type	0
ControlType	The type of control used to operate the damper (e.g., Open/Closed Indicator, Resetable Temperature Sensor, Temperature Override, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
SleeveLength	The length of the damper sleeve	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
SleeveThickness	The thickness of the damper sleeve	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0

DamperLocationInSleeve	The location within the sleeve where the damper is mounted (e.g., Center)	IfcSimpleProperty	IfcString	see type	see type	empty string
Actuator	Actuator references an IfcActuator object which contains the actuator information, if an actuator is part of the damper assembly	IfcObjectReference	IfcGloballyUniqueId, IfcActuator	n/a	n/a	NIL

25.24. PropertySet Pset_HandOperatedActuator

25.24.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a hand-operated actuator.

25.24.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManualOverride	Identifies whether hand-operated operation is provided as an override	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	TRUE

25.25. PropertySet Pset_HvacController

25.25.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the general characteristics of a controller used in an HVAC control system.

25.25.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
Sensors	IfcSensor objects related to the controller	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcSensor	n/a	n/a	NIL
Actuators	IfcActuator objects related to the controller	IfcPropertyList	IfcObjectReference, IfcGloballyUniqueId, IfcActuator	n/a	n/a	NIL

25.26. PropertySet Pset_HvacSensor

25.26.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the general characteristics of a sensor used in an HVAC control system.

25.26.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default

SensorType	Enumeration that identifies the type of HVAC sensor	IfcEnumeratedProperty	Pset_SensorTypeEnum(Flow, Pressure, Temperature, Gas, Concentration, Volts, Amps, Density, Viscosity, Energy, Humidity, Other, NotKnown, Unset)			
Range	The range of the sensor	IfcSimpleProperty	IfcReal	see type	see type	0
Accuracy	The accuracy of the sensor	IfcSimpleProperty	IfcReal	see type	see type	0

25.27. PropertySet Pset_HydraulicActuator

25.27.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a hydraulic actuator.

25.27.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManualOverride	Identifies whether hand-operated operation is provided as an override		IfcBoolean	FALSE	TRUE	FALSE
InputPressure	Maximum design pressure for the actuator	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
InputFlowrate	Maximum hydraulic flowrate requirement	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0

25.28. PropertySet Pset_LinearActuator

25.28.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a linear actuator.

25.28.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FailDirection	Enumeration that identifies the behavior of the actuator in case of power failure	IfcEnumeratedProperty	Pset_LinearActuatorFailDirectionEnum(FailIn, FailOut, Other, NotKnown, Unset)			
Force	Indicates the maximum close-off force for the actuator	IfcSimplePropertyWithUnit	IfcReal, ForceMeasure	see type	see type	0
Stroke	Indicates the maximum distance the actuator must traverse	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0

25.29. PropertySet Pset_Louver

25.29.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a louver.

25.29.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FrameType	The type of frame used by the louver (e.g., Standard, Drainable, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
FrameThickness	The thickness of the louver frame	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
BladeType	The type of blade used in the louver (e.g., "J", "K", Cheveron, Sightproof, Drainable, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
BladeThickness	The thickness of the louver blade	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
ScreenType	The type of screen used in the louver (e.g., Birdscreen, Insect Screen, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
Actuator	Actuator references an IfcActuator object which contains the actuator information, if an actuator is part of the louver assembly	IfcObjectReference	IfcGloballyUniqueId, IfcActuator	n/a	n/a	NIL

25.30. PropertySet Pset_MultiStateInput

25.30.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a multi-state input.

25.30.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
NumberOfStates	Number of states for the MultiState Input	IfcSimpleProperty	IfcInteger	see type	see type	0
StateText	String value to identify the state condition. Upper limit of the list is equal to the NumberOfStates.	IfcPropertyList	IfcSimpleProperty, IfcString	see type	see type	empty string
AlarmValues	Specifies any states the present value must equal before an EventEnable shall occur. Upper limit of the list is equal to the NumberOfStates.	IfcPropertyList	IfcSimpleProperty, IfcInteger	see type	see type	0
EventEnable	Enumeration that defines the type of event enabling	IfcEnumeratedProperty	Pset_EventEnableEnum(To-OffNormal, To-Fault, To-Normal, Other, NotKnown, Unset)			
NotifyTypeEnum	Enumeration that defines the notification type	IfcEnumeratedProperty	Pset_NotifyTypeEnum(Alarm, Event, AcknowledgeNotification, Other, NotKnown, Unset)			

25.31. PropertySet Pset_MultiStateOutput

25.31.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a multi-state output.

25.31.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
NumberOfStates	Number of states for the MultiState Output	IfcSimpleProperty	IfcInteger	see type	see type	0
StateText	String value to identify the state condition. Upper limit of the list is equal to the NumberOfStates.	IfcPropertyList	IfcSimpleProperty, IfcString	see type	see type	empty string
EventEnable	Enumeration that defines the type of event enabling	IfcEnumeratedProperty	Pset_EventEnableEnum(To-OffNormal, To-Fault, To-Normal, Other, NotKnown, Unset)			
NotifyTypeEnum	Enumeration that defines the notification type	IfcEnumeratedProperty	Pset_NotifyTypeEnum(Alarm, Event, AcknowledgeNotification, Other, NotKnown, Unset)			

25.32. PropertySet Pset_PneumaticActuator

25.32.1. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
ManualOverride	Identifies whether hand-operated operation is provided as an override	IfcSimpleProperty	IfcBoolean	FALSE	TRUE	FALSE
InputPressure	Maximum input control air pressure requirement	IfcSimplePropertyWithUnit	IfcReal, PressureUnit	see type	see type	0
InputFlowrate	Maximum input control air flowrate requirement	IfcSimplePropertyWithUnit	IfcReal, VolumetricFlowrateUnit	see type	see type	0

25.33. PropertySet Pset_RotationalActuator

25.33.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a rotational actuator.

25.33.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FailDirection	Enumeration that identifies the behavior of the actuator in case of power failure	IfcEnumeratedProperty	Pset_RotationalActuatorFailDirectionEnum(FailClockwise, FailCounterClockwise, Other, NotKnown, Unset)			

Torque	Indicates the maximum close-off torque for the actuator	IfcSimplePropertyWithUnit	IfcReal, TorqueMeaure	see type	see type	0
Range	Indicates the maximum rotation the actuator must traverse	IfcSimpleProperty	IfcPlaneAngleMeasure	see type	see type	0

25.34. PropertySet Pset_SmokeDamper

25.34.1. PropertySet Semantic Definition

Definition from IAI: This property set is used to define the characteristics of a smoke damper.

25.34.2. Attribute and Relationship Definitions

Property Name	Definition	Property Type	Data or Rel. Type	Min.	Max.	Default
FrameThickness	The thickness of the damper frame	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
BladeType	The type of blade used in the damper (e.g., Triple Vee, Fabricated Airfoil, Extruded Airfoil, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
MountingPosition	Enumeration that identifies how the damper is mounted in the building	IfcEnumeratedProperty	Pset_DamperMountingPositionEnum(Horizontal, Vertical, Other, NotKnown, Unset)			
ControlType	The type of control used to operate the damper (e.g., Open/Closed Indicator, Resetable Temperature Sensor, Temperature Override, etc.)	IfcSimpleProperty	IfcString	see type	see type	empty string
SleeveLength	The length of the damper sleeve	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
SleeveThickness	The thickness of the damper sleeve	IfcSimpleProperty	IfcLengthMeasure	see type	see type	0
DamperLocationInSleeve	The location within the sleeve where the damper is mounted (e.g., Center)	IfcSimpleProperty	IfcString	see type	see type	empty string
Actuator	Actuator references an IfcActuator object which contains the actuator information, if an actuator is part of the damper assembly	IfcObjectReference	IfcGloballyUniqueId, IfcActuator	n/a	n/a	NIL