



## IfcSlab

**Definition from buildingSMART:** A slab is a component of the construction that normally encloses a space vertically. The slab may provide the lower support (floor) or upper construction (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 slab. The upper finish (flooring, roofing) and the lower finish (ceiling, suspended ceiling) are considered to be coverings. A special type of slab is the landing, described as a floor section to which one or more stair flights or ramp flights connect. May or may not be adjacent to a building storey floor.

A slab may have openings, such as floor openings. They are defined by an *IfcOpeningElement* attached to the slab using the inverse relationship *HasOpenings* pointing to *IfcRelVoidsElement*.

A particular usage type for the *IfcSlab* can be given (if type information is available) by referring to the type object *IfcSlabType*, using the *IfcRelDefinesByType* relationship, or (if only occurrence information is given) by using the *PredefinedType* attribute. Values of the enumeration are 'Floor' (the default), 'Roof', 'Landing', 'Baseslab', 'Notdefined'. If the value 'Userdefined' is chosen, the user defined value needs to be given at the attribute *ObjectType*.

**HISTORY:** New entity in IFC Release 2.0, it is a merger of the two previous entities *IfcFloor*, *IfcRoofSlab*, introduced in IFC Release 1.0

### Type Use Definition

*IfcSlab* defines the occurrence of any slab, common information about slab types (or styles) is handled by *IfcSlabType*. The *IfcSlabType* (if present) may establish the common type name, usage (or predefined) type, common set of properties, common material layer set, and common shape representations (using *IfcRepresentationMap*). The *IfcSlabType* is attached using the *IfcRelDefinedByType.RelatingType* objectified relationship and is accessible by the inverse *IsDefinedBy* attribute.

### Property Set Use Definition:

The property sets relating to the *IfcSlab* are defined by the *IfcPropertySet* and attached by the *IfcRelDefinesByProperties* relationship. It is accessible by the inverse *IsDefinedBy* relationship. The following property set definitions specific to the *IfcSlab* are part of this IFC release:

- [Pset\\_SlabCommon](#): common property set for all slab occurrences

### Material Use Definition

The material of the *IfcSlab* is defined by *IfcMaterialLayerSet* or *IfcMaterial* and attached by the *IfcRelAssociatesMaterial.RelatingMaterial*. It is accessible by the inverse *HasAssociations* relationship. Material information can also be given at the *IfcSlabType*, defining the common attribute data for all occurrences of the same type. It is then accessible by the inverse *IsDefinedBy* relationship pointing to *IfcSlabType.HasAssociations* and via *IfcRelAssociatesMaterial.RelatingMaterial* to *IfcMaterial* or *IfcMaterialList*. If both are given, then the material directly assigned to *IfcSlab* overrides the material assigned to *IfcSlabType*.

### Quantity Use Definition:

The quantities relating to the *IfcSlab* are defined by the *IfcElementQuantity* and attached by the *IfcRelDefinesByProperties*. The following quantities are foreseen, but will be subjected to the local standard of measurement:

Name	Description	Value Type
NominalWidth	Total nominal (or average) width (or thickness) of the slab. The exact definition and calculation rules depend on the method of measurement used.	<i>IfcQuantityLength</i>
Perimeter	Perimeter measured along the outer boundaries of the slab. The exact definition and calculation rules depend on the method of measurement used.	<i>IfcQuantityLength</i>
GrossFootprintArea	Total area of the extruded area (or foot print) of the slab. The	<i>IfcQuantityArea</i>

	exact definition and calculation rules depend on the method of measurement used.	
NetFootprintArea	Total area of the extruded area (or foot print) of the slab, taking into account possible slab openings. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
GrossVolume	Total gross volume of the slab, not taking into account possible openings and recesses. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityVolume
NetVolume	Total net volume of the slab, taking into account possible openings and recesses. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityVolume
GrossWeight	Total gross weight of the slab, not taking into account possible openings and recesses or projections. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityWeight
NetWeight	Total net weight of the slab, taking into account possible openings and recesses or projections. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityWeight

### **Containment Use Definition**

The *IfcSlab*, as any subtype of *IfcBuildingElement*, may participate in two different containment relationships. The first (and in most implementation scenarios mandatory) relationship is the hierarchical spatial containment, the second (optional) relationship is the aggregation within an element assembly.

- The *IfcSlab* is placed within the project spatial hierarchy using the objectified relationship *IfcRelContainedInSpatialStructure*, referring to it by its inverse attribute *SELF\IfcElement.ContainedInStructure*. Subtypes of *IfcSpatialStructureElement* are valid spatial containers, with *IfcBuildingStorey* being the default container.
- The *IfcSlab* may be aggregated into an element assembly using the objectified relationship *IfcRelAggregates*, referring to it by its inverse attribute *SELF\IfcObjectDefinition.Decomposes*. Any subtype of *IfcElement* can be an element assembly, with *IfcElementAssembly* as a special focus subtype.  
In this case it should not be additionally contained in the project spatial hierarchy, i.e. *SELF\IfcElement.ContainedInStructure* should be *NIL*.

The *IfcSlab* may also be an aggregate i.e. being composed by other elements and acting as an assembly using the objectified relationship *IfcRelAggregates*, referring to it by its inverse attribute *SELF\IfcObjectDefinition.IsDecomposedBy*. Components of a slab are described by instances of subtypes of *IfcBuildingElement*, with *IfcBuildingElementPart* as a special focus subtype that are aggregated to form a complex slab. In this case, the contained elements should not be additionally contained in the project spatial hierarchy, i.e. the inverse attribute *SELF\IfcElement.ContainedInStructure* of *IfcBuildingElementPart* (or other subtypes of *IfcBuildingElement*) should be *NIL*.

### **Geometry Use Definitions:**

The geometric representation of *IfcSlab* is given by the *IfcProductDefinitionShape*, allowing multiple geometric representation. Included are:

NOTE. If the *IfcSlab* is of type *Landing* and is used within an *IfcStair* or *IfcRamp*, the special agreements to handle stair and ramp geometry will also affect the geometric representation of the *IfcSlab*.

### **Local Placement**

The local placement for *IfcSlab* 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 (if given) to the placement of the local placement of the same *IfcSpatialStructureElement* that is used in the *ContainedInStructure* inverse attribute or to a referenced spatial structure element at a higher level.
- If the *IfcSlab* is of type *Landing* and is used by an *IfcStair* or *IfcRamp*, and this container class defines its own local placement, then the *PlacementRelTo* relationship of *IfcLocalPlacement* shall point (if given) to the local placement of the aggregate.
- If the relative placement is not used, the absolute placement is defined within the world coordinate system.

## Geometric Representations

Currently, the use of 'SweptSolid', 'Clipping', 'Brep' and 'MappedRepresentation' representations is supported. In addition the general representation type 'BoundingBox' is allowed. The geometry use definitions for 'BoundingBox', and 'Brep' are explained at *IfcBuildingElement*.

### SweptSolid Representation

The standard geometric representation of *IfcSlab* is defined using the swept solid representation. The following attribute values for the *IfcShapeRepresentation* holding this geometric representation shall be used:

- *RepresentationIdentifier* : 'Body'
- *RepresentationType* : 'SweptSolid'

The following additional constraints apply to the swept solid representation:

- Solid: *IfcExtrudedAreaSolid* is required,
- Profile: *IfcArbitraryClosedProfileDef* shall be supported.
- Extrusion: The profile shall be extruded vertically, i.e., in the direction of the z-axis of the coordinate system of the referred spatial structure element. It might be further constrained to be in the direction of the global z-axis in implementers agreements. The extrusion axis shall be perpendicular to the swept profile, i.e. pointing into the direction of the z-axis of the *Position* of the *IfcExtrudedAreaSolid*.

EXAMPLE for standard geometric representation.



NOTE The following interpretation of dimension parameter applies for polygonal slabs (in ground floor view):

- *IfcArbitraryClosedProfileDef .OuterCurve*: closed bounded curve interpreted as area (or foot print) of the slab.

### Clipping representation

The advanced geometric representation of *IfcSlab* is defined using the swept area geometry with additional clippings applied. The following attribute values for the *IfcShapeRepresentation* holding this geometric representation shall be used:

- *RepresentationIdentifier* : 'Body'
- *RepresentationType* : 'Clipping'

The following constraints apply to the advanced representation:

- Solid: see standard geometric representation,
- Profile: see standard geometric representation,
- Extrusion: All extrusion directions shall be supported.
- Boolean result: The *IfcBooleanClippingResult* shall be supported, allowing for Boolean differences between the swept solid (here *IfcExtrudedAreaSolid*) and one or several *IfcHalfSpaceSolid*.

EXAMPLE for advanced geometric representation.



Definition of a roof slab using advanced geometric representation. The profile is extruded non-perpendicular and the slab body is clipped at the eave.

**EXPRESS specification:**

```

ENTITY IfcSlab
  SUBTYPE OF (IfcBuildingElement);
  PredefinedType : OPTIONAL IfcSlabTypeEnum;
  WHERE
    WR2 : (PredefinedType <> IfcSlabTypeEnum.USERDEFINED) OR ((PredefinedType =
      IfcSlabTypeEnum.USERDEFINED) AND EXISTS(SELf\IfcObject.ObjectType));
END_ENTITY;

```

**Attribute definitions:**

**PredefinedType** : Predefined generic types for a slab that are specified in an enumeration. There may be a property set given for the predefined types.

NOTE: The use of the predefined type directly at the occurrence object level of *IfcSlab* is only permitted, if no type object *IfcSlabType* is assigned.

IFC2x PLATFORM CHANGE: The attribute has been changed into an OPTIONAL attribute.

**Formal Propositions:**

**WR2** : The attribute UserDefinedType shall be given, if the predefined type is set to USERDEFINED.

**Inheritance graph**

```

ENTITY IfcSlab;
  ENTITY IfcRoot;
    GlobalId : IfcGloballyUniqueId;
    OwnerHistory : IfcOwnerHistory;
    Name : OPTIONAL IfcLabel;
    Description : OPTIONAL IfcText;
  ENTITY IfcObjectDefinition;
  INVERSE
    HasAssignments : SET OF IfcRelAssigns FOR RelatedObjects;
    IsDecomposedBy : SET OF IfcRelDecomposes FOR RelatingObject;
    Decomposes : SET [0:1] OF IfcRelDecomposes FOR RelatedObjects;
    HasAssociations : SET OF IfcRelAssociates FOR RelatedObjects;
  ENTITY IfcObject;
    ObjectType : OPTIONAL IfcLabel;
  INVERSE
    IsDefinedBy : SET OF IfcRelDefines FOR RelatedObjects;
  ENTITY IfcProduct;
    ObjectPlacement : OPTIONAL IfcObjectPlacement;
    Representation : OPTIONAL IfcProductRepresentation;
  INVERSE
    ReferencedBy : SET OF IfcRelAssignsToProduct FOR RelatingProduct;
  ENTITY IfcElement;
    Tag : OPTIONAL IfcIdentifier;
  INVERSE
    FillsVoids : SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
    ConnectedTo : SET OF IfcRelConnectsElements FOR RelatingElement;
    HasCoverings : SET OF IfcRelCoversBldgElements FOR RelatingBuildingElement;
    HasProjections : SET OF IfcRelProjectsElement FOR RelatingElement;
    HasStructuralMember : SET OF IfcRelConnectsStructuralElement FOR RelatingElement;
    ReferencedInStructures : SET OF IfcRelReferencedInSpatialStructure FOR
      RelatedElements;
    HasPorts : SET OF IfcRelConnectsPortToElement FOR RelatedElement;
    HasOpenings : SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
    IsConnectionRealization : SET OF IfcRelConnectsWithRealizingElements FOR
      RealizingElements;
    ProvidesBoundaries : SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
    ConnectedFrom : SET OF IfcRelConnectsElements FOR RelatedElement;
    ContainedInStructure : SET [0:1] OF IfcRelContainedInSpatialStructure FOR
      RelatedElements;
  ENTITY IfcBuildingElement;
  ENTITY IfcSlab;

```

```
    PredefinedType : OPTIONAL IfcSlabTypeEnum;  
END_ENTITY;
```