

IFC Model View Definition Diagram : [VBL-001-Generic] Structural design to structural analysis

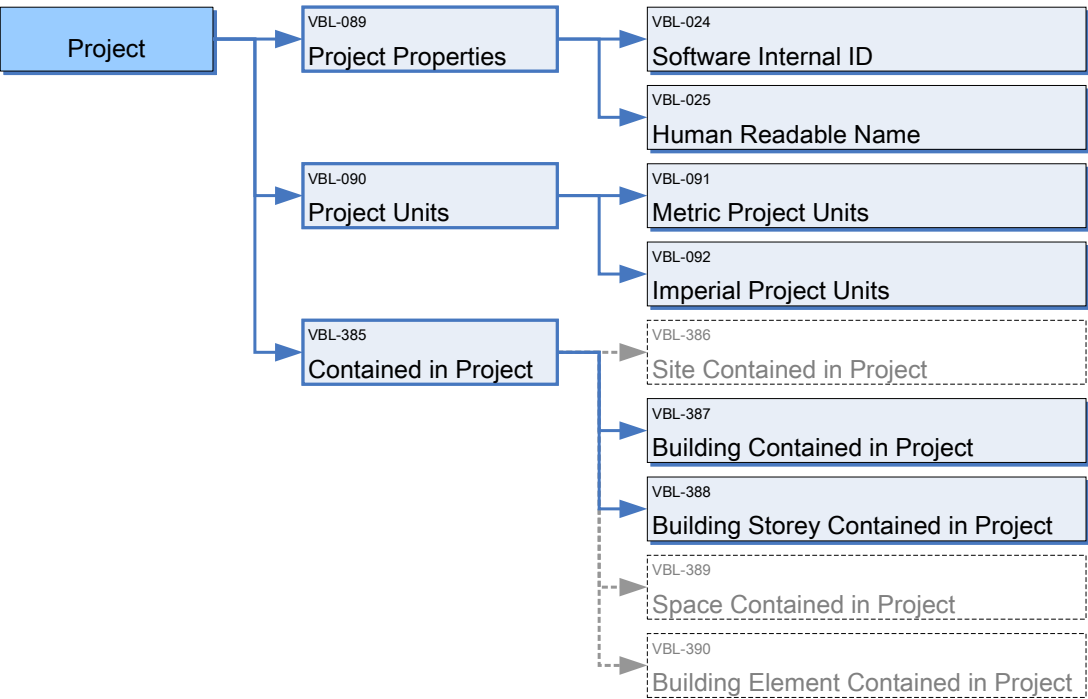
APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM AUTHORS			
Generic	N/A	Generic	Sakari Lehtinen			
Building	VBL-121 Applied Load	VBL-127 Linear Force Varying	VBL-114 Structural Analysis Model Attributes	VBL-151 Vertex Representation		
Building Storey	VBL-356 Arbitrary Curved Edge Profile Cross Section and Name	VBL-345 Material Name	VBL-354 Structural Analysis Model Contained in Building Storey			
Project	VBL-347 Arbitrary Straight Edge Profile Cross Section and Name	VBL-091 Metric Project Units	VBL-353 Structural Analysis Model Contained in Building			
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Structural Analysis Model	VBL-103 Building Properties	VBL-139 Planar Action Assignment	VBL-454 Structural Analysis Point Displacement Result			
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	VBL-385 Contained in Project	VBL-090 Project Units	VBL-116 Structural Loaded By			
	VBL-134 Curved Edge Representation	VBL-131 Related Building Element	VBL-355 Structural Object Placement			
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	VBL-143 Eccentric Curve Connection	VBL-125 Single Force	VBL-350 Structural Point Action Attributes			
	VBL-129 Eccentric Point Connection	VBL-024 Software Internal ID	VBL-149 Structural Point Connection Attributes			
	VBL-025 Human Readable Name	VBL-133 Straight Edge Representation	VBL-150 Structural Point Support Conditions			
	VBL-092 Imperial Project Units	VBL-147 Straight Edge Surface Representation	VBL-117 Structural Results			
	VBL-124 Linear Action Assignment	VBL-452 Structural Analysis Assigned Results	VBL-137 Structural Surface Member Type			
	VBL-126 Linear Force	VBL-120 Structural Analysis Curve Member Attributes	VBL-138 Structural Surface Thickness			

**Document owner Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)**

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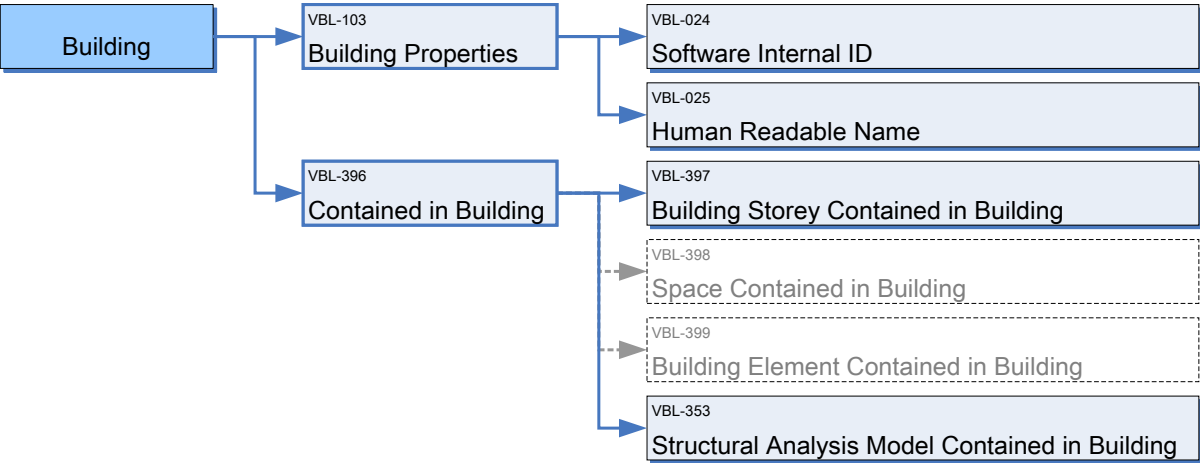
IFC Model View Definition Diagram : Project

VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Jiri Hietanen



IFC Model View Definition Diagram : Building

VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Jiri Hietanen



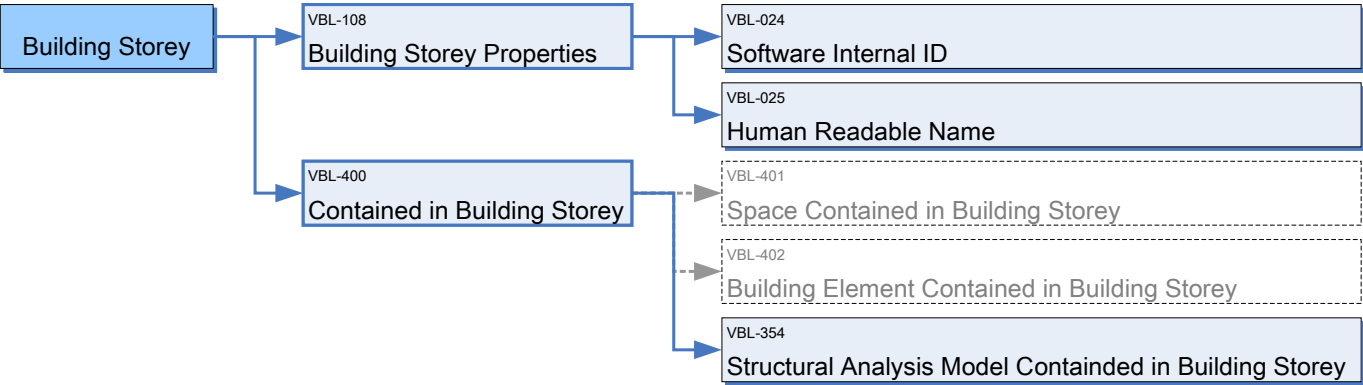
Document owner Virtual Building Laboratory @ TUT (jiri.hietanen@tut.fi)

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# IFC Model View Definition Diagram : Building Storey

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VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VBL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Jiri Hietanen

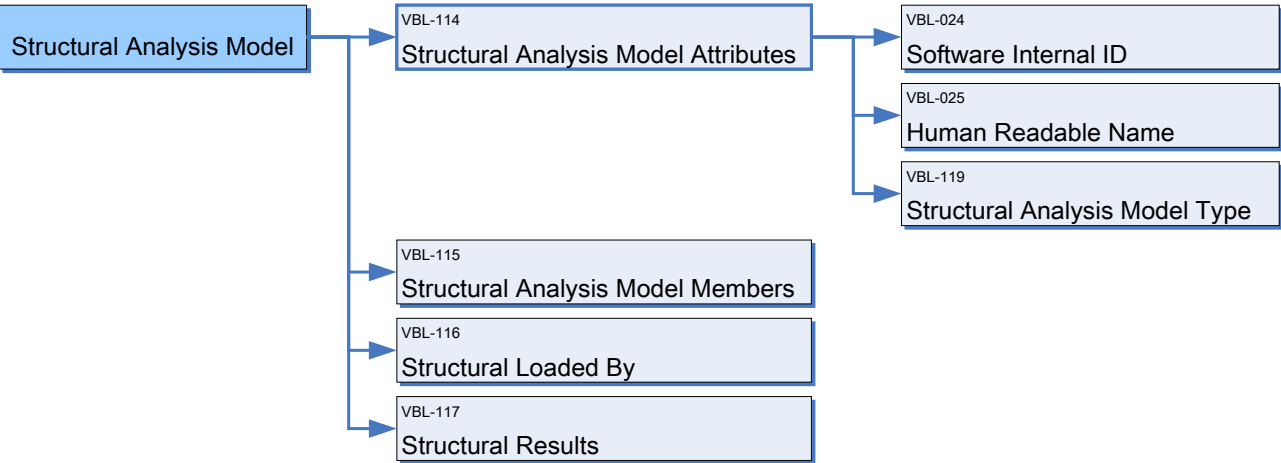


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IFC Model View Definition Diagram : Structural Analysis Model

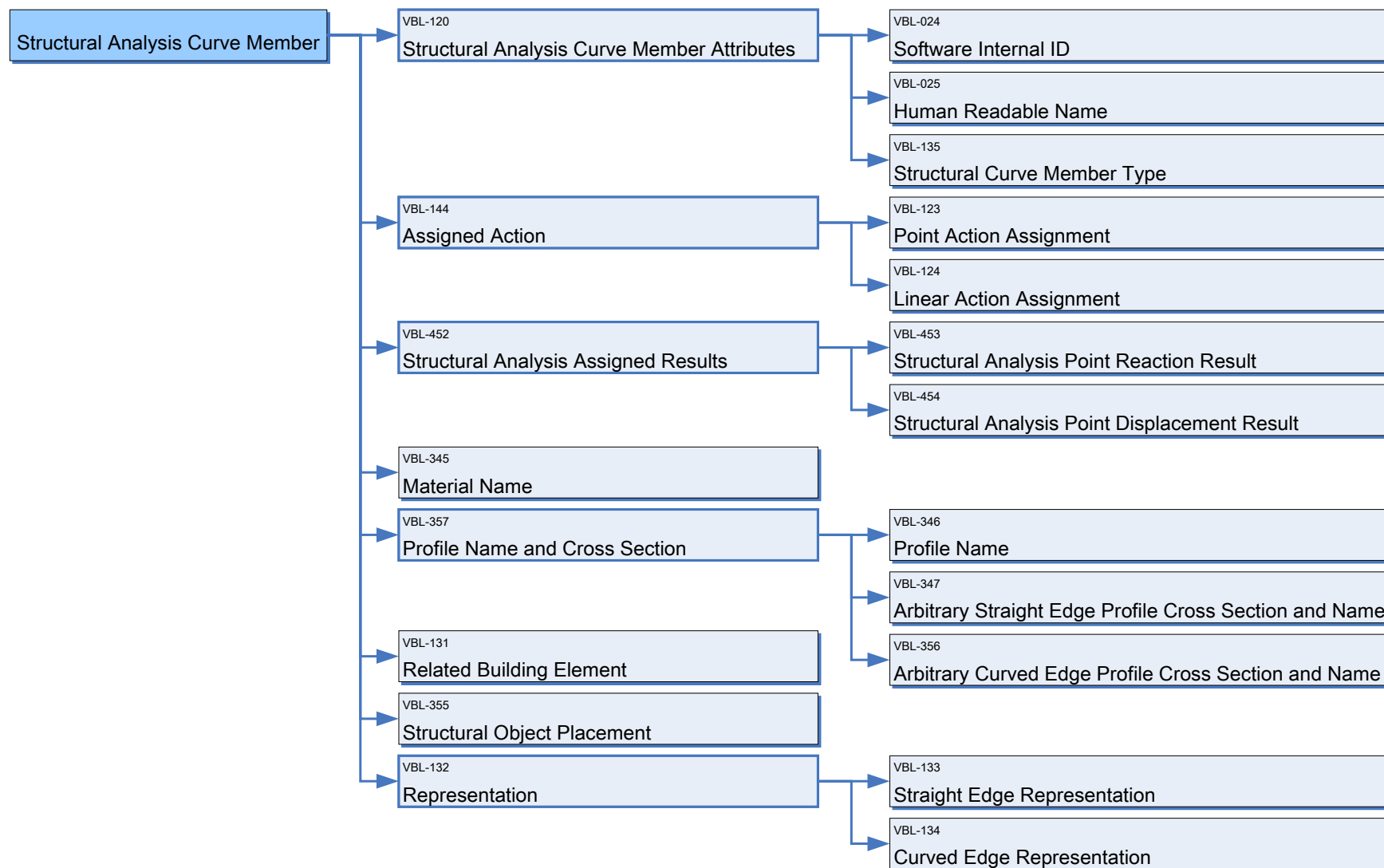
VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen



# IFC Model View Definition Diagram : Structural Analysis Curve Member

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VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen



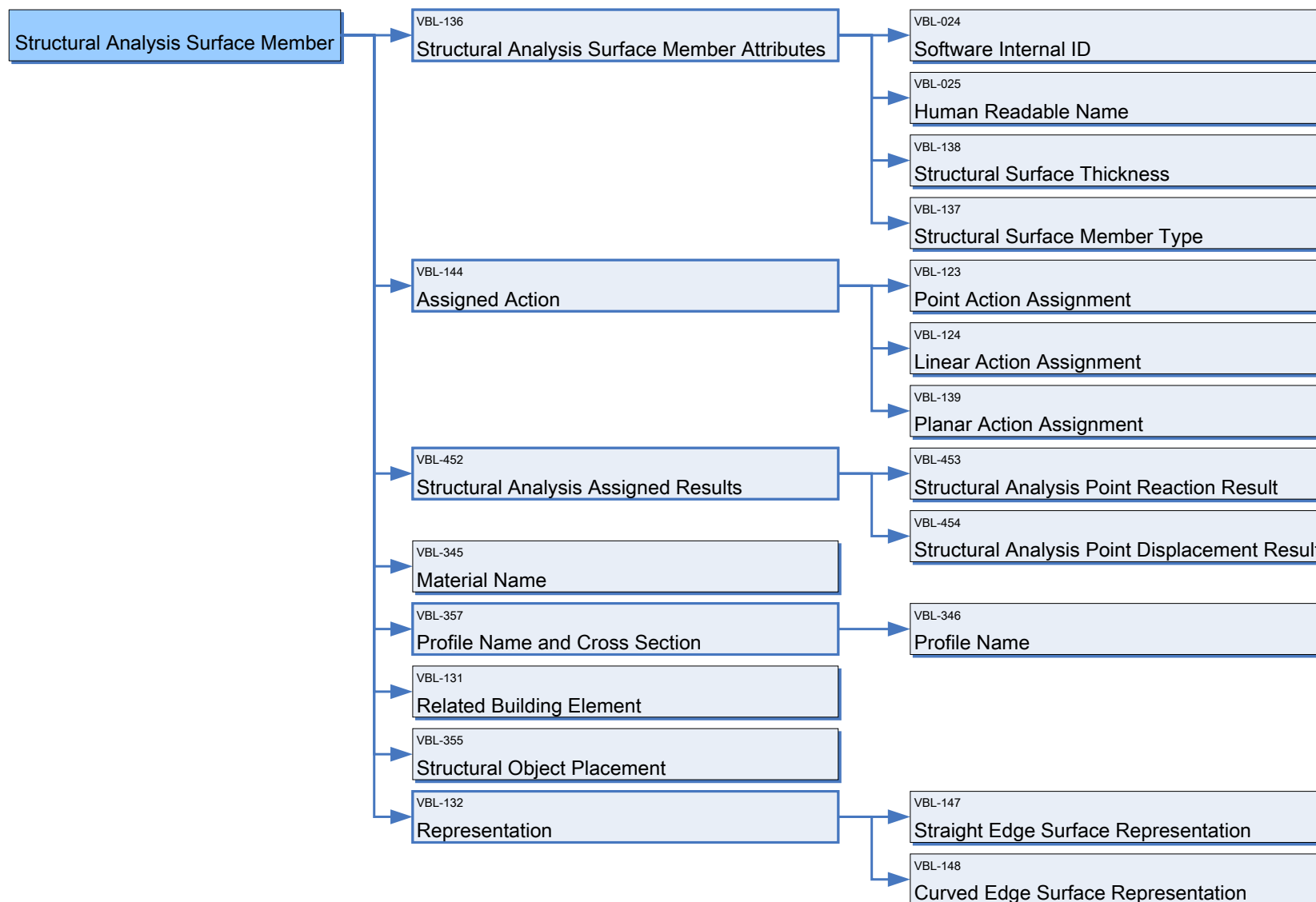
Document owner Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)

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# IFC Model View Definition Diagram : Structural Analysis Surface Member

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VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen



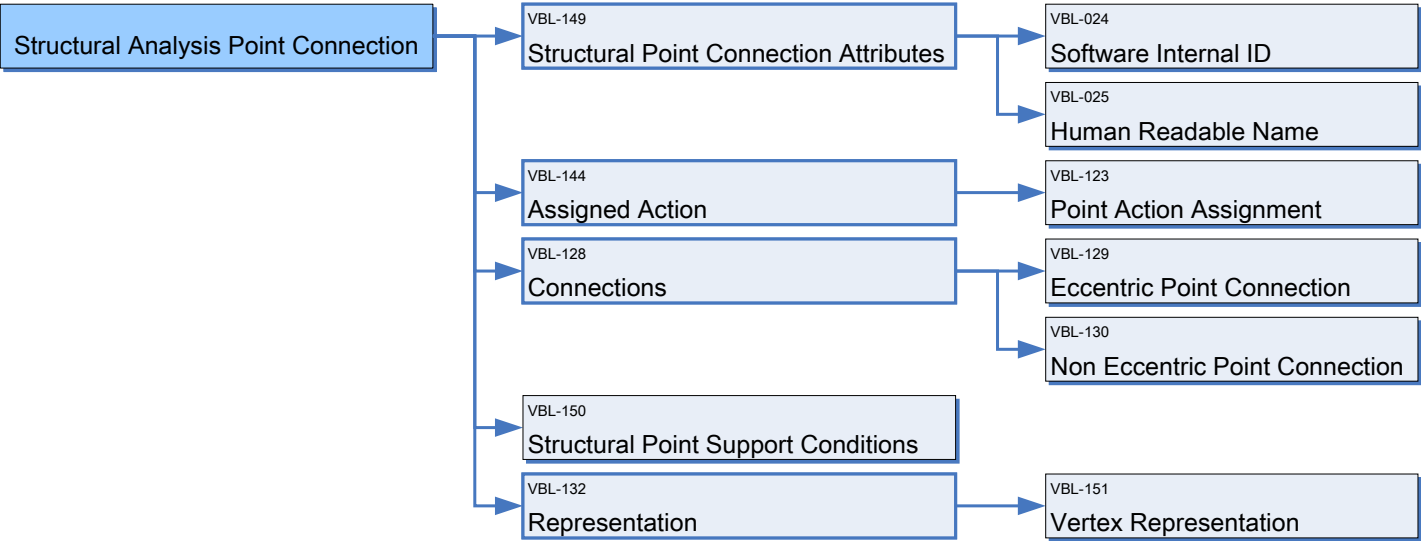
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IFC Model View Definition Diagram : Structural Analysis Point Connection

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VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VLB-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen

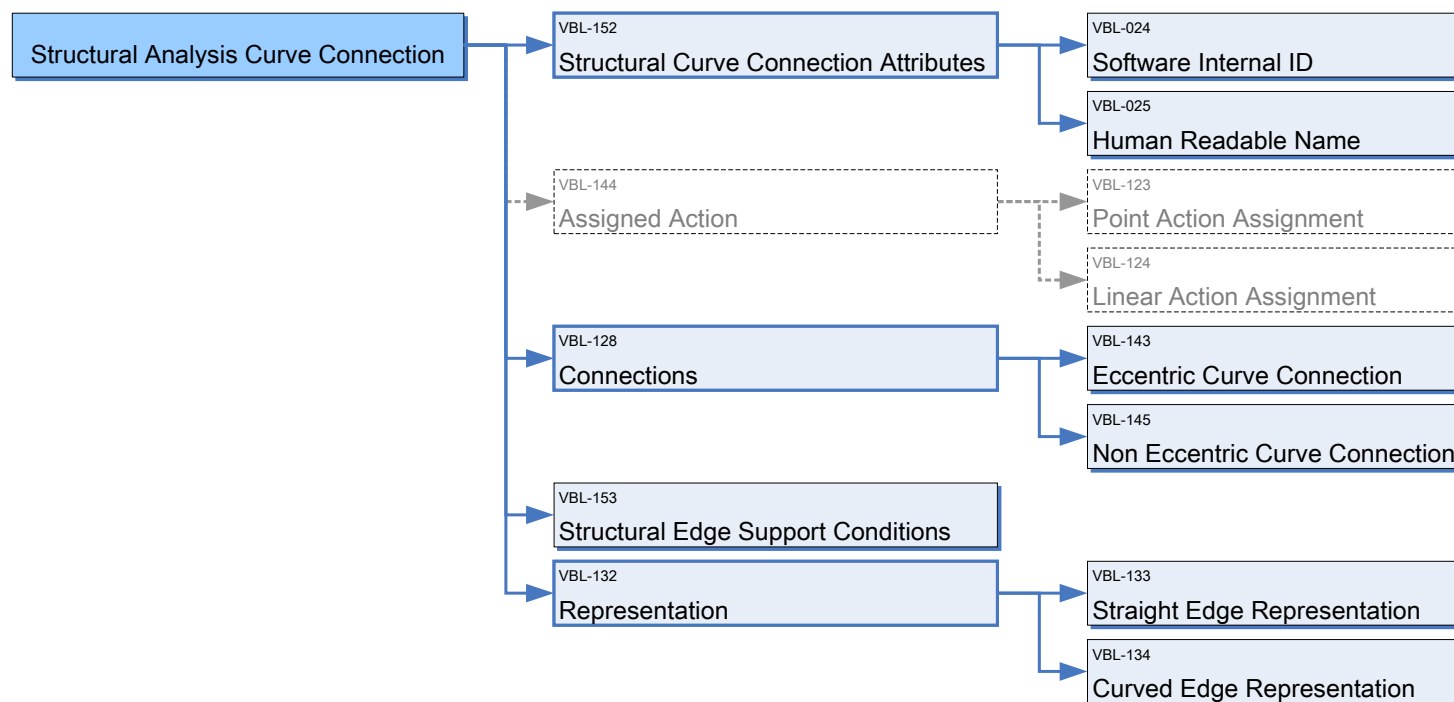




# IFC Model View Definition Diagram : Structural Analysis Curve Connection

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VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen

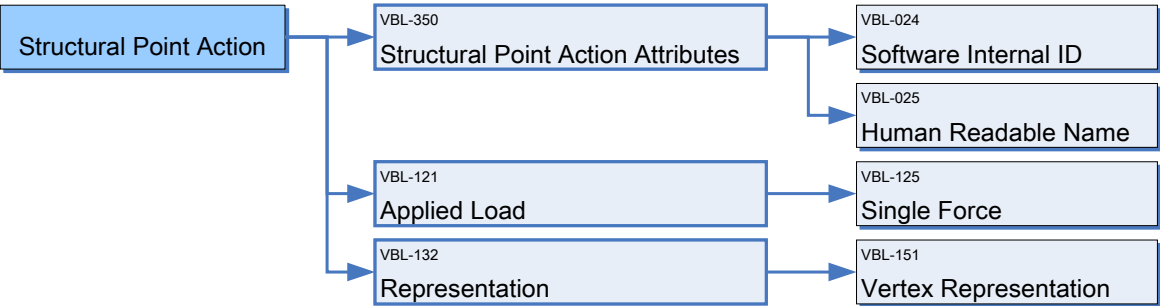


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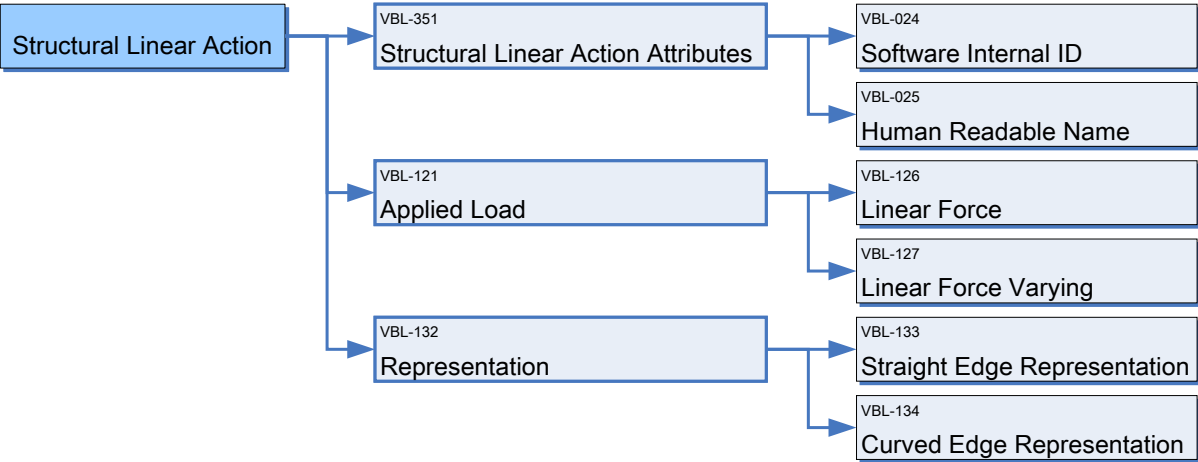
IFC Model View Definition Diagram : Structural Point Action

VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VBL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen



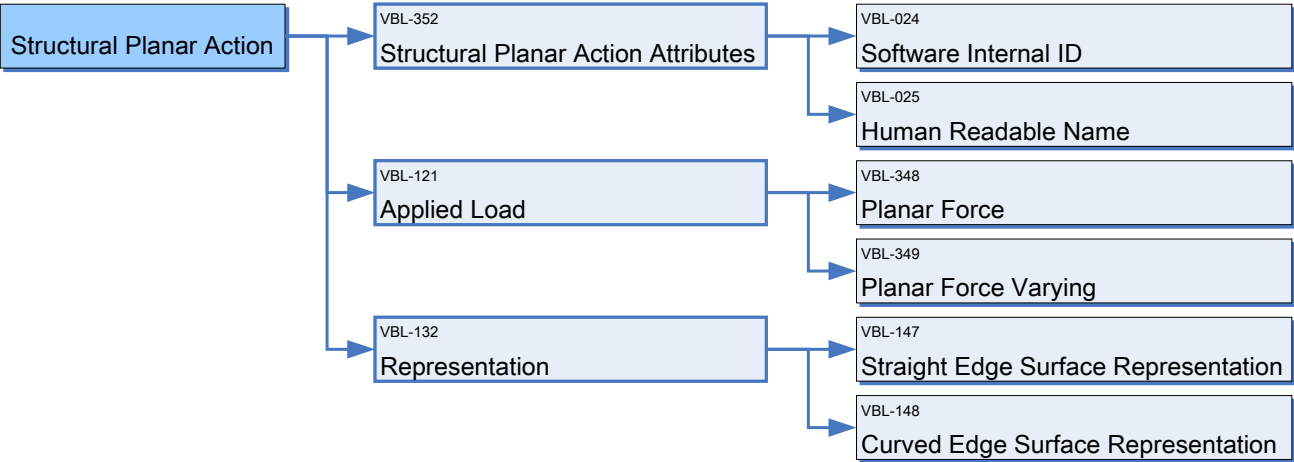
IFC Model View Definition Diagram : Structural Linear Action

VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen



IFC Model View Definition Diagram : Structural Planar Action

VIEW ID	VIEW NAME	APPLICATION NAME	APP. VERSION	EXCHANGE TYPE	DIAGRAM STATUS	DIAGRAM VERSION	DIAGRAM DATE	DIAGRAM AUTHORS
VL-001	Structural design to structural analysis	Generic	N/A	Generic	Proposal	2	03.10.2007	Sakari Lehtinen

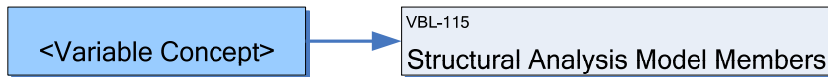


## Generic AEC/FM Concept Description

# Structural Analysis Model Members

Reference	VBL-115	Version	1.0	Status	Proposal
Relationships					
History	Created 27.3.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

Structural members are elements representing the structural behavior of building elements. A further differentiation is made to structural curve members and structural surface members.

Each structural analysis model is assigned with number of structural members. The *Structural Analysis Model Members* is a list of all the members assigned to specific Analysis Model. Each member can be assigned to any number of analysis models.

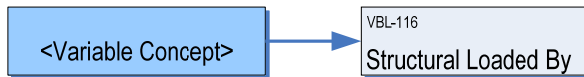
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## Generic AEC/FM Concept Description

# Structural Loaded by

Reference	VBL-116	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Tampere University of Technology				

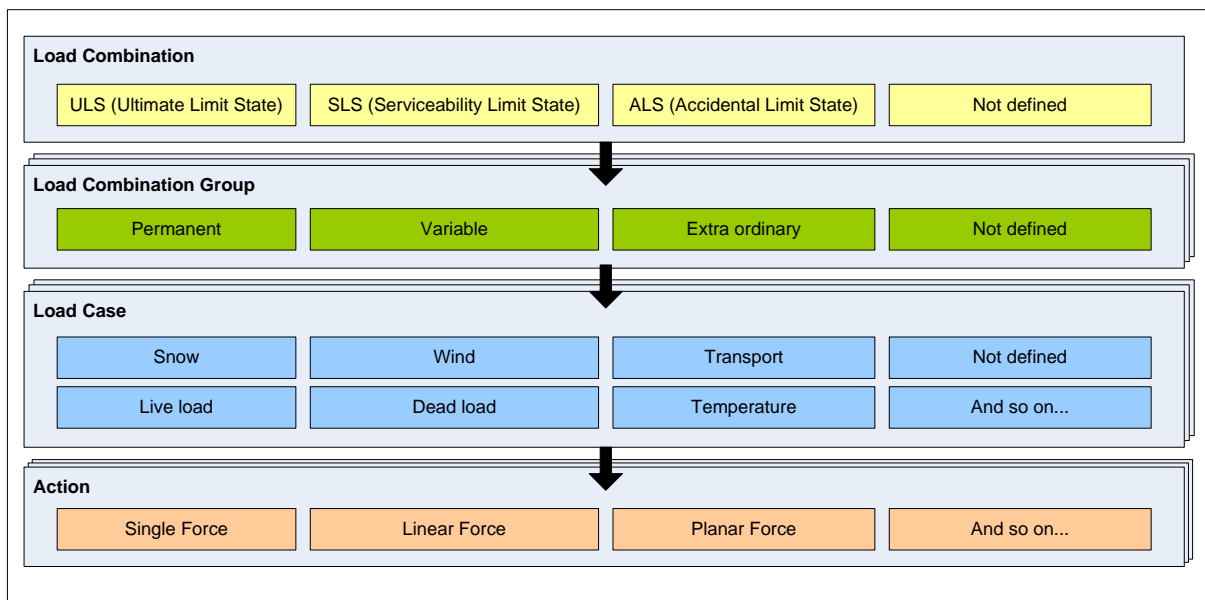
### Usage in view definition diagram



### Definition

There are number of load cases and load combinations that can be applied to structural analysis model. *Structural Loaded By* defines a list of all the load combinations assigned to a structural analysis model.

Load combinations have a three level hierarchy. Each *load combination* groups *combination groups*. *Combinations groups* group *load cases*. *Load cases* group *actions*.



Each level may have a load factor.

Load Combination sorts load combinations by their limit state type. There are different groups for ultimate limit state, serviceability limit state and accidental limit state.

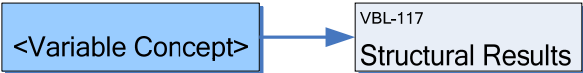
Load Combination Group sorts load combinations by their action types. There are different groups for permanent, variable, extraordinary and user defined groups.

Load Case sorts loads by their sources. There are different groups for example for dead load and live load, wind and snow etc.

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Generic AEC/FM Concept Description					
Structural Results					
Reference	VL-117	Version	1.0	Status	Proposal
Relationships					
History	Created 4.2.2008				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram



```
graph LR; A["<Variable Concept>"] --> B["VL-117 Structural Results"]
```

Definition

There are number of load cases and load combinations that can be applied to structural analysis model. For each load case the structural analysis results can be calculated. Structural Results concept defines a grouping mechanics for these analysis results.

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Generic AEC/FM Concept Description					
Related Physical Model					
Reference	VL-118	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VL-118 Related Physical Model</div></div>					
Definition					
<p><i>Related Physical Model</i> groups the static concepts that define a link between the analysis model and the actual physical model. The link may reference to the whole building or a building storey.</p>					
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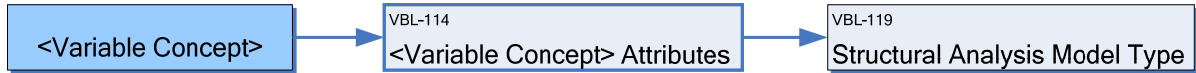


# Generic AEC/FM Concept Description

## Structural Analysis Model Type

<b>Reference</b>	VBL-119	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 27.3.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

The *Structural Analysis Model Type* is used to distinguish between different types of structural analysis models. The analysis models are differentiated by their dimensionality. Available types are

- in-plane loading 2D
- out-plane loading 2D
- loading 3D

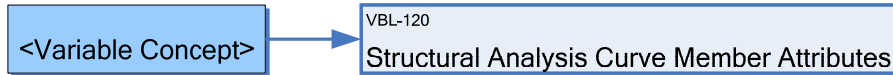
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## Generic AEC/FM Concept Description

# Structural Analysis Curve Member Attributes

<b>Reference</b>	VL-120	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

The *Structural Analysis Curve Member Attributes* concept groups together all the attributes directly related to the structural curve member. See the leaf node concepts for more information about the available attributes.

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Generic AEC/FM Concept Description					
Applied Load					
Reference	VBL-121	Version	1.0	Status	Proposal
Relationships					
History	Created 30.3.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-121  
Applied Load

Definition

The *Applied Load* groups the static concepts that in detail describe which kind of loads can be applied to the object in question.

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Generic AEC/FM Concept Description

Point Action Assignment

Reference	VBL-123	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-144  
Assigned Action

VBL-123  
Point Action Assignment

Definition

The *Point Action Assignment* attaches a point action to the object in question. For example a single force may be attached to a curve member.

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Generic AEC/FM Concept Description					
Linear Action Assignment					
Reference	VBL-124	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-144  
Assigned Action

VBL-124  
Linear Action Assignment

Definition

The *Linear Action Assignment* attaches a linear action to the object in question. For example a linear force may be attached to a curve member.

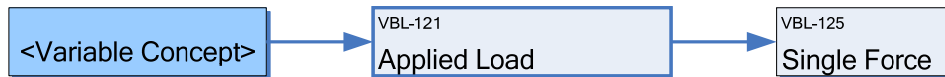
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## Generic AEC/FM Concept Description

# Single Force

<b>Reference</b>	VBL-125	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 30.3.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

A single force may have the following values:

- Force value in x-direction.
- Force value in y-direction.
- Force value in z-direction.
- Moment about the x-axis.
- Moment about the y-axis.
- Moment about the z-axis.

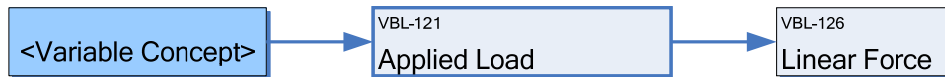
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## Generic AEC/FM Concept Description

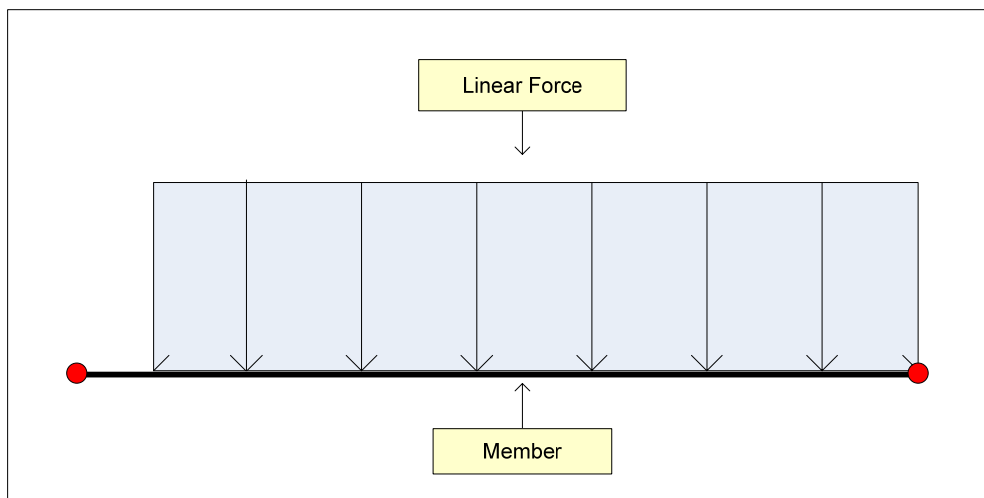
# Linear Force

<b>Reference</b>	VBL-126	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 30.3.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



A linear force may have the following values:

- Linear force value in x-direction.
- Linear force value in y-direction.
- Linear force value in z-direction.
- Linear moment about the x-axis.
- Linear moment about the y-axis.
- Linear moment about the z-axis.

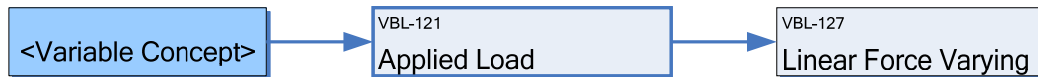
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## Generic AEC/FM Concept Description

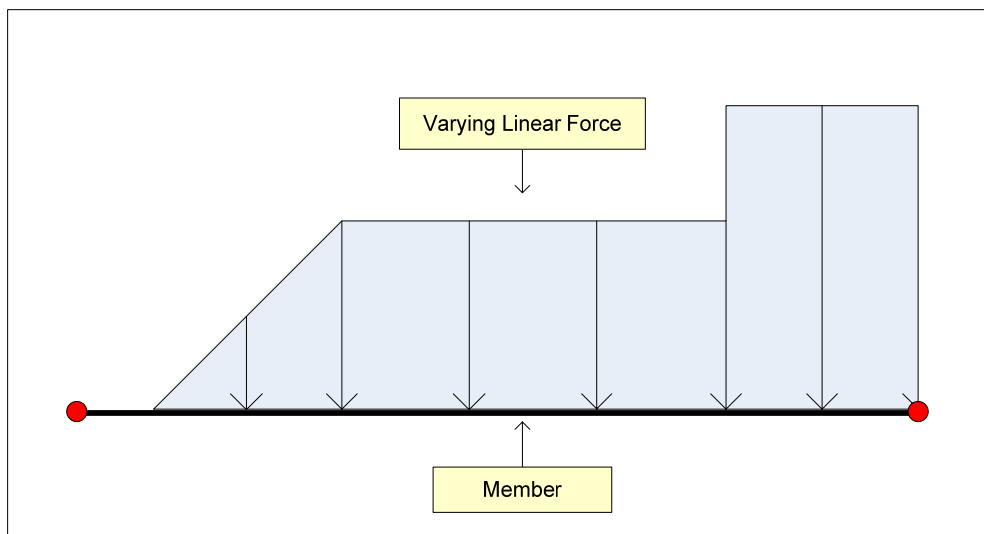
# Linear Force Varying

Reference	VBL-127	Version	1.0	Status	Proposal
Relationships					
History	Created 30.3.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Linear Force Varying* defines the values and changes of the values for a varying linear force. The alterations of the values may only be linear. Each defined point may have the following values:

- Linear force value in x-direction.
- Linear force value in y-direction.
- Linear force value in z-direction.
- Linear moment about the x-axis.
- Linear moment about the y-axis.
- Linear moment about the z-axis.

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Generic AEC/FM Concept Description					
Connections					
Reference	VBL-128	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VBL-128 Connections</div></div>					
Definition					
The <i>Connections</i> groups the static concepts that in detail describe which kind of connections can be exchanged for the object in question.					
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# Generic AEC/FM Concept Description

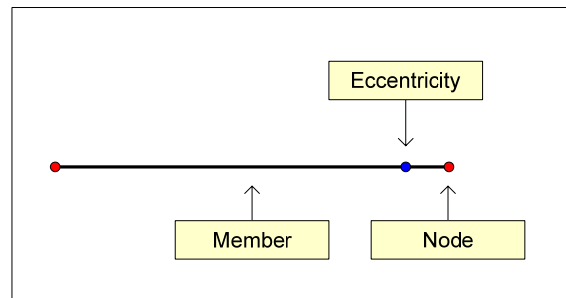
## Eccentric Point Connection

<b>Reference</b>	VBL-129	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 29.2.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Eccentric Point Connection* defines eccentricity for point connection of a structural analysis member.

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# Generic AEC/FM Concept Description

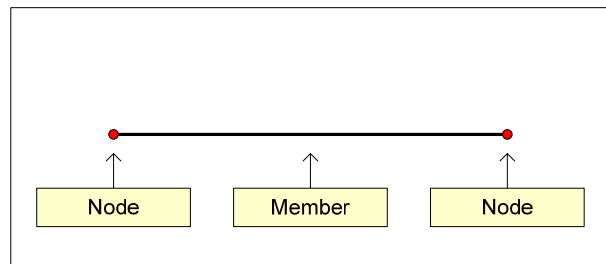
## Non Eccentric Point Connection

<b>Reference</b>	VLB-130	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 29.2.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Non Eccentric Point Connection* defines a node that the member is connected to.

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Generic AEC/FM Concept Description					
Related Building Element					
Reference	VBL-131	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VBL-131 Related Building Element</div></div>					
Definition					
<i>Related Building Element</i> defines a relation between a structural analysis model member and a physical building element.					
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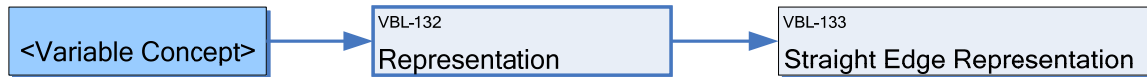
Generic AEC/FM Concept Description Representation					
Reference	VBL-132	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VBL-132 Representation</div></div>					
Definition					
The <i>Representation</i> groups the static concepts that in detail describe which kind of representations can be exchanged for the object in question.					
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# Generic AEC/FM Concept Description

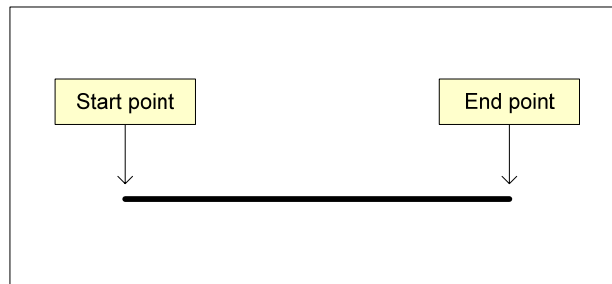
## Straight Edge Representation

<b>Reference</b>	VBL-133	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Straight Edge Representation* is a one segment straight edge representation for the object in question. It is defined with two three dimensional coordinate points.

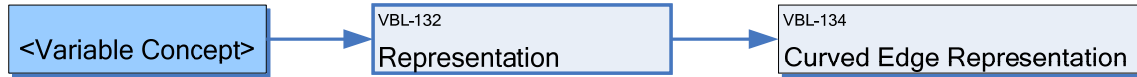
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# Generic AEC/FM Concept Description

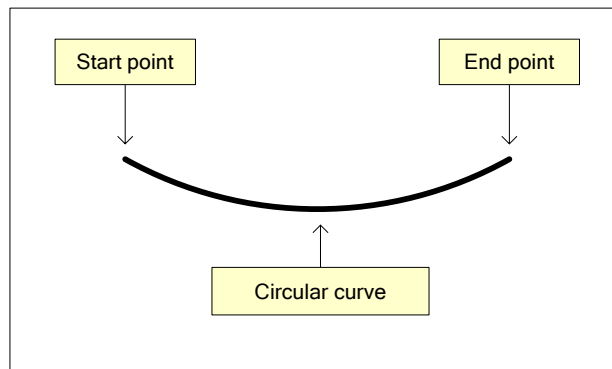
## Curved Edge Representation

<b>Reference</b>	VBL-134	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Curved Edge Representation* is a one segment curved edge representation for the object in question. It is defined with two three dimensional coordinate points and with a circular curve.

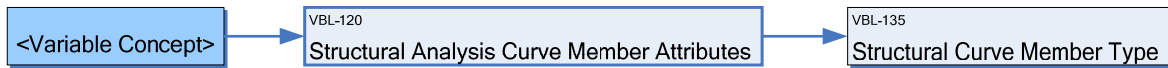
This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI ([www.iai-international.org](http://www.iai-international.org))  
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# Generic AEC/FM Concept Description

## Structural Curve Member Type

<b>Reference</b>	VL-135	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

The *Structural Curve Member Type* shall be used to distinguish between different types of structural curve members. The available types are:

- rigid joined member
- pin joined member
- cable
- tension member
- compression member
- used defined
- not defined

'Rigid joined members' are considered as beams and 'Pin joined members' as truss.

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## Generic AEC/FM Concept Description

# Structural Analysis Surface Member Attributes

<b>Reference</b>	VL-136	<b>Version</b>	1.0	<b>Status</b>	Proposal
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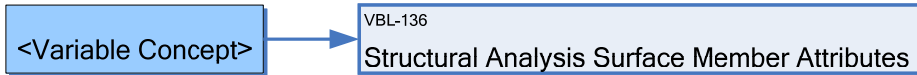
### Relationships

<b>History</b>	Created 20.10.2006
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<b>Authors</b>	Sakari Lehtinen
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<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)
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### Usage in view definition diagram



### Definition

The *Structural Analysis Surface Member Attributes* concept groups together all the attributes directly related to the structural surface member. See the leaf node concepts for more information about the available attributes.

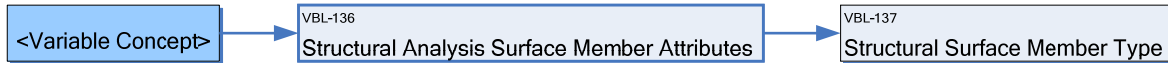
This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI ([www.iai-international.org](http://www.iai-international.org))  
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# Generic AEC/FM Concept Description

## Structural Surface Member Type

<b>Reference</b>	VL-137	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

The *Structural Surface Member Type* shall be used to distinguish between different types of structural surface members, such as the typical mechanical function of walls, slabs and shells. The types available are:

- bending element
- membrane element
- shell
- user defined
- not defined

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Generic AEC/FM Concept Description					
Structural Surface Thickness					
Reference	VLB-138	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>→</div><div>VLB-136 Structural Analysis Surface Member Attributes</div><div>→</div><div>VLB-138 Structural Surface Thickness</div></div>					
Definition					
The <i>Structural Surface Thickness</i> defines the thickness of a structural surface member.					
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Generic AEC/FM Concept Description					
Planar Action Assignment					
Reference	VLB-139	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VBL-144 Assigned Action</div><div>VBL-139 Planar Action Assignment</div></div>					
Definition					
The <i>Planar Action Assignment</i> attaches a planar action to the object in question. For example a planar force may be attached to a surface member.					
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Generic AEC/FM Concept Description					
Eccentric Curve Connection					
Reference	VBL-143	Version	2	Status	Proposal
Relationships					
History	Created 29.2.2007, Picture modified 1.17.2008				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-128  
Connections

VBL-143  
Eccentric Curve Connection

Definition

Eccentricity

Surface Member

Linear Node

The *Eccentric Curve Connection* defines the eccentricity of a linear connection.

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Generic AEC/FM Concept Description					
Assigned Action					
Reference	VL-144	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>→</div><div>VL-144 Assigned Action</div></div>					
Definition					
The <i>Assigned Action</i> groups the static concepts that in detail describe the kind of actions which can be assigned to the object in question.					
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# Generic AEC/FM Concept Description

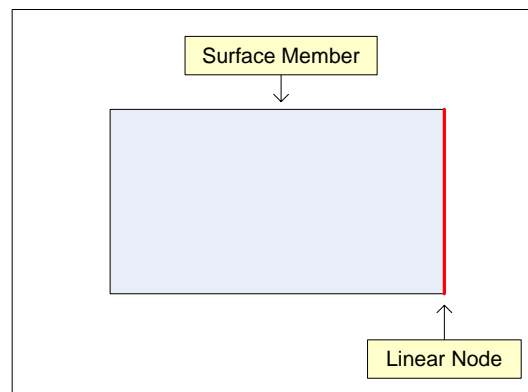
## Non Eccentric Curve Connection

<b>Reference</b>	VBL-145	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 29.2.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Non Eccentric Curve Connection* defines a relation between a surface member and a linear node.

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## Generic AEC/FM Concept Description

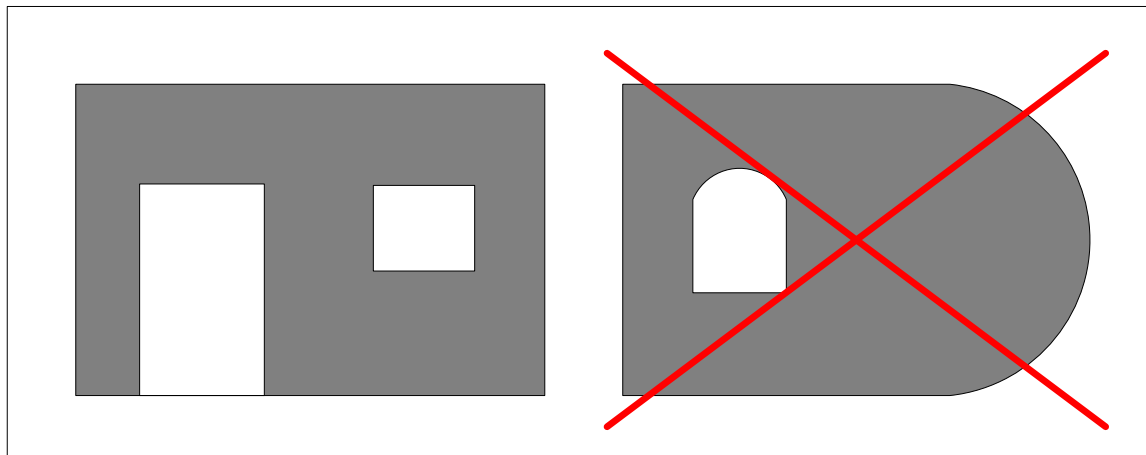
# Straight Edge Surface Representation

Reference	VL-147	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Straight Edge Surface Representation* defines a **straight** edge surface representation for the object in question. The vertices of the surface are defined with three dimensional coordinate points. The representation may have openings in it. The surface is defined in a single plane.

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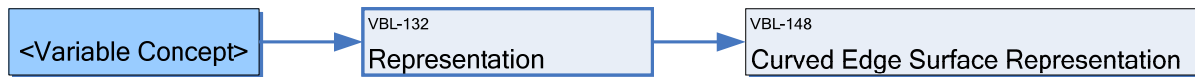


## Generic AEC/FM Concept Description

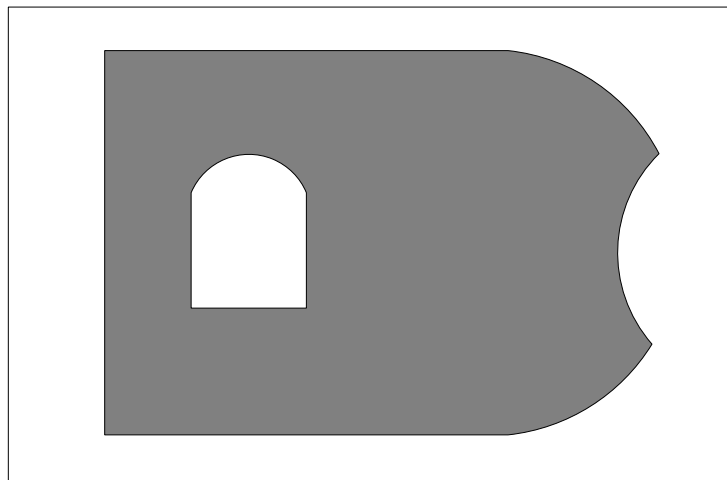
# Curved Edge Surface Representation

Reference	VLB-148	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Curved Edge Surface Representation* defines a **curved and/or straight** edge surface representation for the object in question. The vertices of the surface are defined with three dimensional coordinate points. The representation may have openings in it. The openings may also have curved edges. The surface is defined in a single plane.

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The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

Generic AEC/FM Concept Description

Structural Point Connection Attributes

Reference	VBL-149	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-149

Structural Point Connection Attributes

Definition

The *Structural Point Connection Attributes* concept groups together all the attributes directly related to the structural point connection. See the leaf node concepts for more information about the available attributes.

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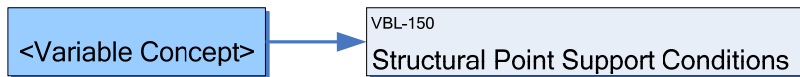
The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

## Generic AEC/FM Concept Description

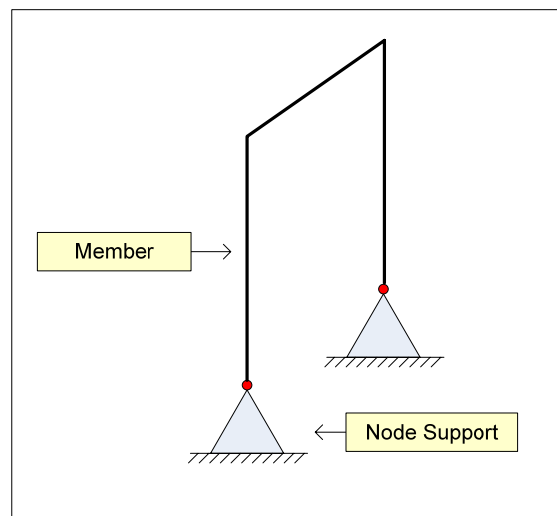
# Structural Point Support Conditions

Reference	VBL-150	Version	1.0	Status	Proposal
Relationships					
History	Created 29.2.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Structural Point Support Conditions* defines the conditions of a node, which represents a support. The exchanged conditions are:

- Linear stiffness value in x-direction.
- Linear stiffness value in y-direction.
- Linear stiffness value in z-direction.
- Rotational stiffness value about the x-axis.
- Rotational stiffness value about the y-axis.
- Rotational stiffness value about the z-axis.

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Generic AEC/FM Concept Description					
Vertex Representation					
Reference	VLB-151	Version	1.0	Status	Proposal
Relationships					
History	Created 30.3.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VBL-132 Representation</div><div>VBL-151 Vertex Representation</div></div>					
Definition					
The <i>Vertex Representation</i> represents a point defined by its coordinates in the three dimensional space.					
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Generic AEC/FM Concept Description					
Structural Curve Connection Attributes					
Reference	VBL-152	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-152  
Structural Curve Connection Attributes

Definition

The *Structural Curve Connection Attributes* concept groups together all the attributes directly related to the structural curve connection. See the leaf node concepts for more information about the available attributes.

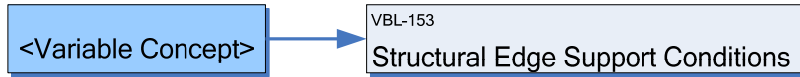
This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI ([www.iai-international.org](http://www.iai-international.org))  
The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

## Generic AEC/FM Concept Description

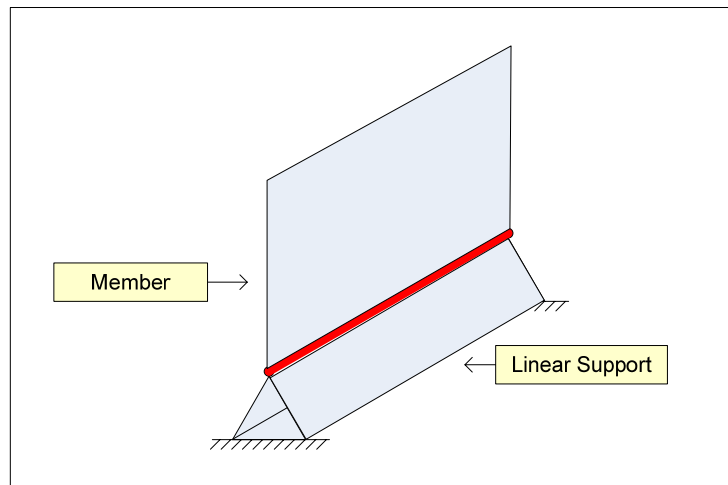
# Structural Edge Support Conditions

Reference	VBL-153	Version	1.0	Status	Proposal
Relationships					
History	Created 29.2.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Structural Edge Support Conditions* defines the conditions of a linear node, which represents a support. The exchanged conditions are:

- Linear stiffness value in the x-direction.
- Linear stiffness value in the y-direction.
- Linear stiffness value in the z-direction.
- Rotational stiffness value about the x-axis.
- Rotational stiffness value about the y-axis.
- Rotational stiffness value about the z-axis.

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Generic AEC/FM Concept Description					
Material Name					
Reference	VBL-345	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-345  
Material Name

Definition

The *Material Name* is a string value for a material's name. Currently there is no universal material library available. Usually the material name derives from the library of the sending application. In the advanced import functionalities the material name of the sending application may be mapped to the material of the receiving application.

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Generic AEC/FM Concept Description					
Profile Name					
Reference	VBL-346	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VBL-346 Profile Name</div></div>					
Definition					
<p>The <i>Profile Name</i> is a string value for a profile name. Currently there is no universal profile library available. Usually the profile name derives from the library of the sending application. In the advanced import functionalities the profile name of the sending application may be mapped to the profile of the receiving application.</p>					
This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI ( <a href="http://www.iai-international.org">www.iai-international.org</a> ) The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.					

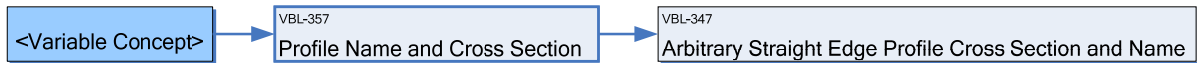


## Generic AEC/FM Concept Description

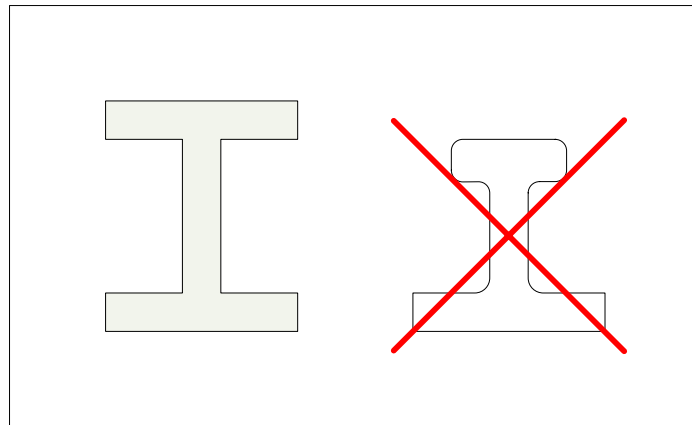
# Arbitrary Straight Edge Profile Cross Section and Name

Reference	VBL-347	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



An *arbitrary straight edge profile cross section* is made up only of straight segments. No curved segments are allowed.

In general the cross section may be used for example to calculate the profile properties. Also a name string for the profile is exchanged.

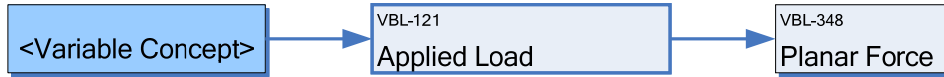
This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI ([www.iai-international.org](http://www.iai-international.org))  
The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

## Generic AEC/FM Concept Description

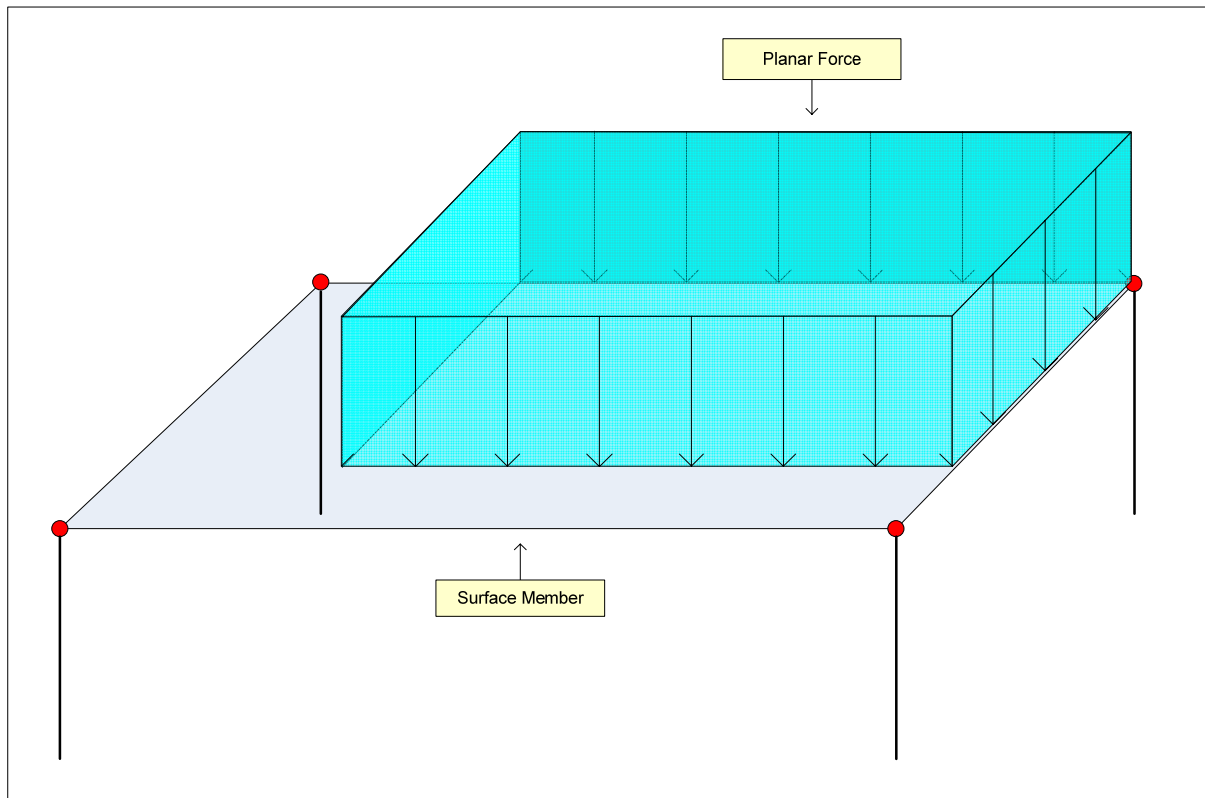
# Planar Force

<b>Reference</b>	VBL-348	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 30.3.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



A planar force may have the following values:

- Planar force value in x-direction.
- Planar force value in y-direction.
- Planar force value in z-direction.

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The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

## Generic AEC/FM Concept Description

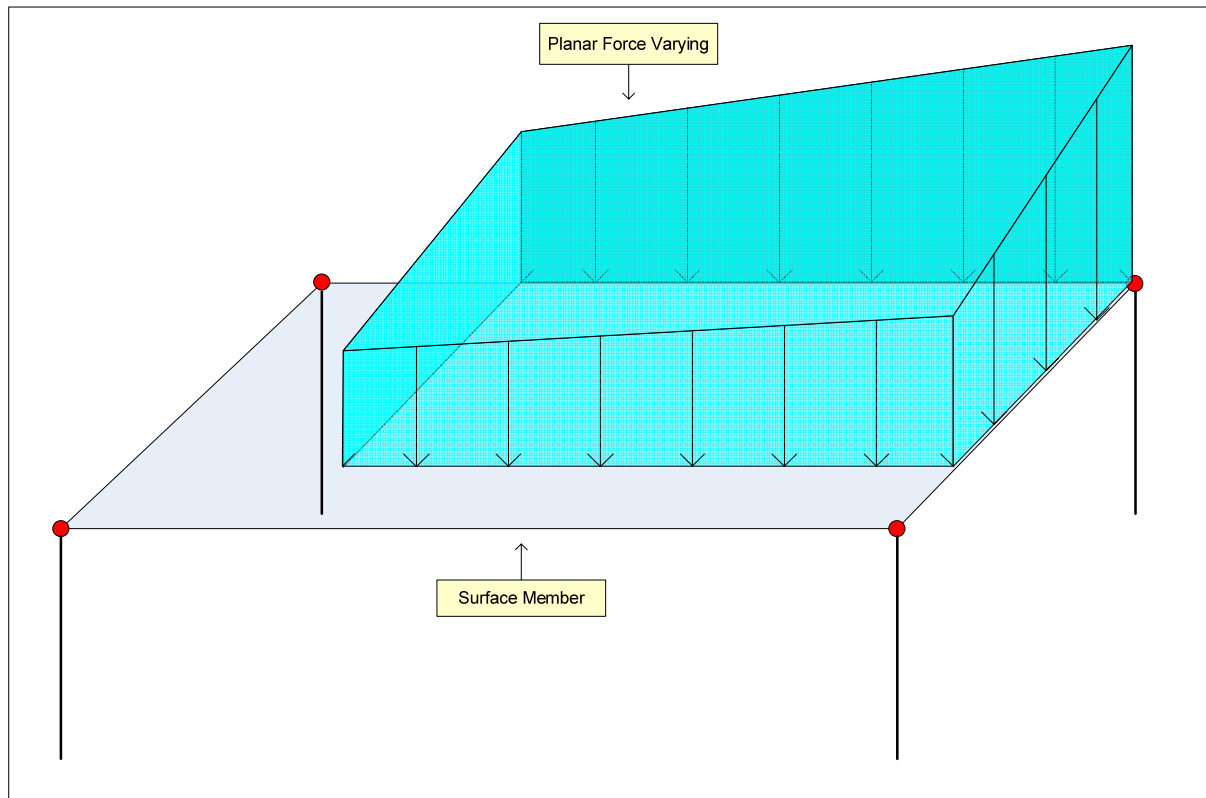
# Planar Force Varying

Reference	VBL-349	Version	1.0	Status	Proposal
Relationships					
History	Created 30.3.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



The *Planar Force Varying* defines the values and changes of the values for a varying planar force. The alterations of the values may only be linear. Each defined point may have the following values:

- Planar force value in x-direction.
- Planar force value in y-direction.
- Planar force value in z-direction.

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The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

Generic AEC/FM Concept Description					
Structural Point Action Attributes					
Reference	VBL-350	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-350  
Structural Point Action Attributes

Definition

The *Structural Point Action Attributes* concept groups together all the attributes directly related to a point action. See the leaf node concepts for more information about the available attributes.

This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI ([www.iai-international.org](http://www.iai-international.org))  
The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

Generic AEC/FM Concept Description

Structural Linear Action Attributes

Reference	VBL-351	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-351

Structural Linear Action Attributes

Definition

The *Structural Linear Action Attributes* concept groups together all the attributes directly related to a linear action. See the leaf node concepts for more information about the available attributes.

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## Generic AEC/FM Concept Description

# Structural Planar Action Attributes

<b>Reference</b>	VL-352	<b>Version</b>	1.0	<b>Status</b>	Proposal
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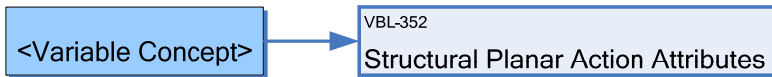
### Relationships

<b>History</b>	Created 20.10.2006
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<b>Authors</b>	Sakari Lehtinen
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<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)
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### Usage in view definition diagram



### Definition

The *Structural Planar Action Attributes* concept groups together all the attributes directly related to a planar action. See the leaf node concepts for more information about the available attributes.

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## Generic AEC/FM Concept Description

# Structural Analysis Model Contained in Building

<b>Reference</b>	VL-353	<b>Version</b>	1	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

The *Structural Analysis Model Contained in Building* defines a link between the structural analysis model and a building.

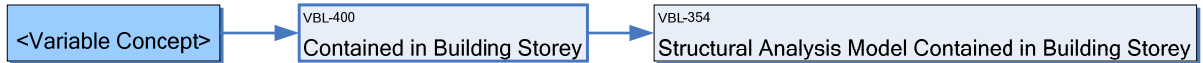
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## Generic AEC/FM Concept Description

# Structural Analysis Model Contained in Building Storey

<b>Reference</b>	VBL-354	<b>Version</b>	1	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

The *Structural Analysis Model Contained in Building Storey* defines a link between the structural analysis model and a building storey.

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Generic AEC/FM Concept Description					
Structural Object Placement					
Reference	VBL-355	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006, Modified to structural object placement 11.11.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-355  
Structural Object Placement

Definition

The *Structural Object Placement* defines the orthogonal local coordinate system for the object in question.

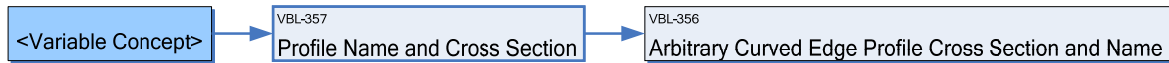
This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI ([www.iai-international.org](http://www.iai-international.org))  
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## Generic AEC/FM Concept Description

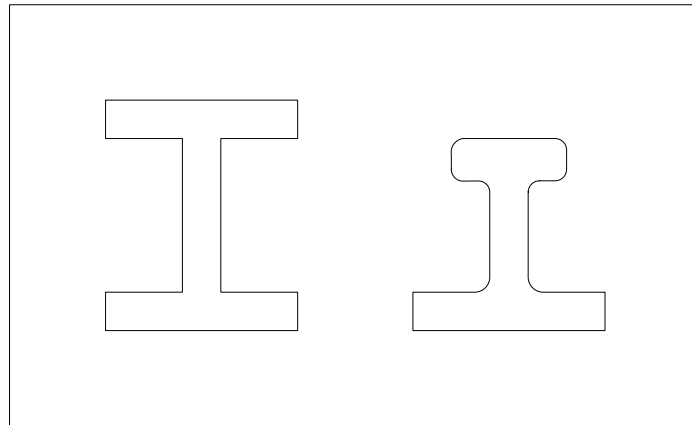
# Arbitrary Curved Edge Profile Cross Section and Name

<b>Reference</b>	VBL-356	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 20.10.2006				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition



An *arbitrary curved edge profile cross section* is made up of straight and/or curved segments. The cross section may be used for example to calculate the profile properties.

Also a name string for the profile is exchanged.

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Generic AEC/FM Concept Description

Profile Name and Cross Section

Reference	VBL-357	Version	1.0	Status	Proposal
Relationships					
History	Created 20.10.2006				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

Usage in view definition diagram

<Variable Concept>

VBL-357  
Profile Name and Cross Section

Definition

The *Profile Name and Cross Section* groups the static concepts that in detail describe which kind of cross sections and their names can be exchanged.

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The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.

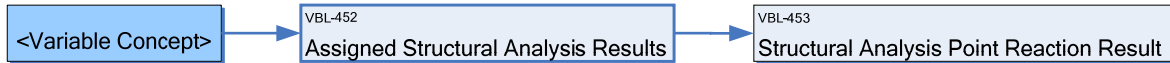
Generic AEC/FM Concept Description					
Assigned Structural Analysis Results					
Reference	VLB-452	Version	1	Status	Proposal
Relationships					
History	Created 4.2.2008				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>VLB-452 Assigned Structural Analysis Results</div></div>					
Definition					
Assigned Structural Analysis Results groups the analysis result concepts. For more information see the leaf concepts.					
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## Generic AEC/FM Concept Description

# Structural Analysis Point Reaction Results

<b>Reference</b>	VL-453	<b>Version</b>	1	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 4.2.2008				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

Structural Analysis Point Reaction Result defines the resultants of internal forces and moments in a point of a structural member.

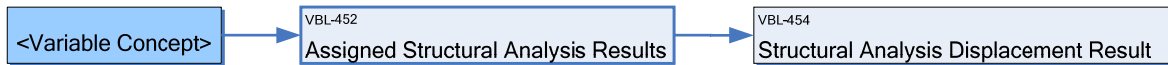
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## Generic AEC/FM Concept Description

# Structural Analysis Displacement Result

<b>Reference</b>	VL-454	<b>Version</b>	1	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 4.2.2008				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

### Usage in view definition diagram



### Definition

Structural Analysis Displacement Result defines displacements and rotations in three directions in a point of a structural member.

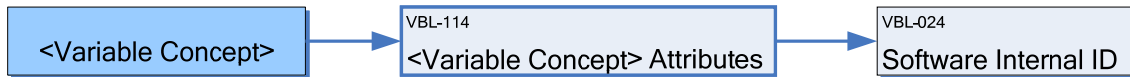
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## Generic AEC/FM Concept Description

### Software Internal ID

<b>Reference</b>	VL-024	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 27.3.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

#### Usage in view definition diagram



#### Definition

The Software Internal ID is a software's internal ID, which is used by software for identifying the object. This ID is globally unique, i.e. it is extremely unlikely that the same ID would appear on another object in any construction project ever.

Although the user never sees this ID it is important for e.g. managing changes between versions of the model. The user can maintain this ID by modifying the properties of an existing object instead of deleting the object and replacing it with a new one. Sometimes this is not the easiest way to use design software, but it is important from this viewpoint.

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Generic AEC/FM Concept Description					
Human Readable Name					
Reference	VL-025	Version	1.0	Status	Proposal
Relationships					
History	Created 27.3.2007				
Authors	Sakari Lehtinen				
Document Owner	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				
Usage in view definition diagram					
<div><div>&lt;Variable Concept&gt;</div><div>→</div><div>VBL-114 &lt;Variable Concept&gt; Attributes</div><div>→</div><div>VBL-025 Human Readable Name</div></div>					
Definition					
<p>The Name is a human interpretable string identifier for an object. In general the name can be used to filter and group objects in the receiving modeling applications. Otherwise there are no general rules how to use it.</p>					
<p>This document uses the official IFC Model View Definition Format version 1.1.0. of the IAI (<a href="http://www.iai-international.org">www.iai-international.org</a>) The content of this document has to be certified by the IAI before becoming part of an official IFC Model View Definition.</p>					

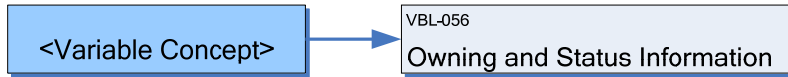


## Generic AEC/FM Concept Description

### Owning and Status Information

<b>Reference</b>	VL-056	<b>Version</b>	1.0	<b>Status</b>	Proposal
<b>Relationships</b>					
<b>History</b>	Created 27.3.2007				
<b>Authors</b>	Sakari Lehtinen				
<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)				

#### Usage in view definition diagram



#### Definition

Generally the Owning and Status Information is not used.

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## Generic AEC/FM Concept Description

# Structural Analysis Model Attributes

<b>Reference</b>	VL-114	<b>Version</b>	1.0	<b>Status</b>	Proposal
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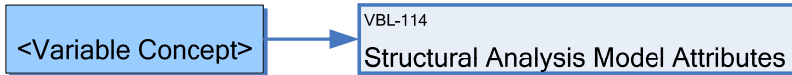
### Relationships

<b>History</b>	Created 20.10.2006
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<b>Authors</b>	Sakari Lehtinen
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<b>Document Owner</b>	Virtual Building Laboratory @ TUT (sakari.lehtinen@tut.fi)
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### Usage in view definition diagram



### Definition

The *Structural Analysis Model Attributes* concept groups together all the attributes directly related to the analysis model. See the leaf node concepts for more information about the available attributes.

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