bSI UML Model Report - Part 5

UML Model Report for Road Elements

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1. Complete contributor list for IfcRoad can be found in Appendix A

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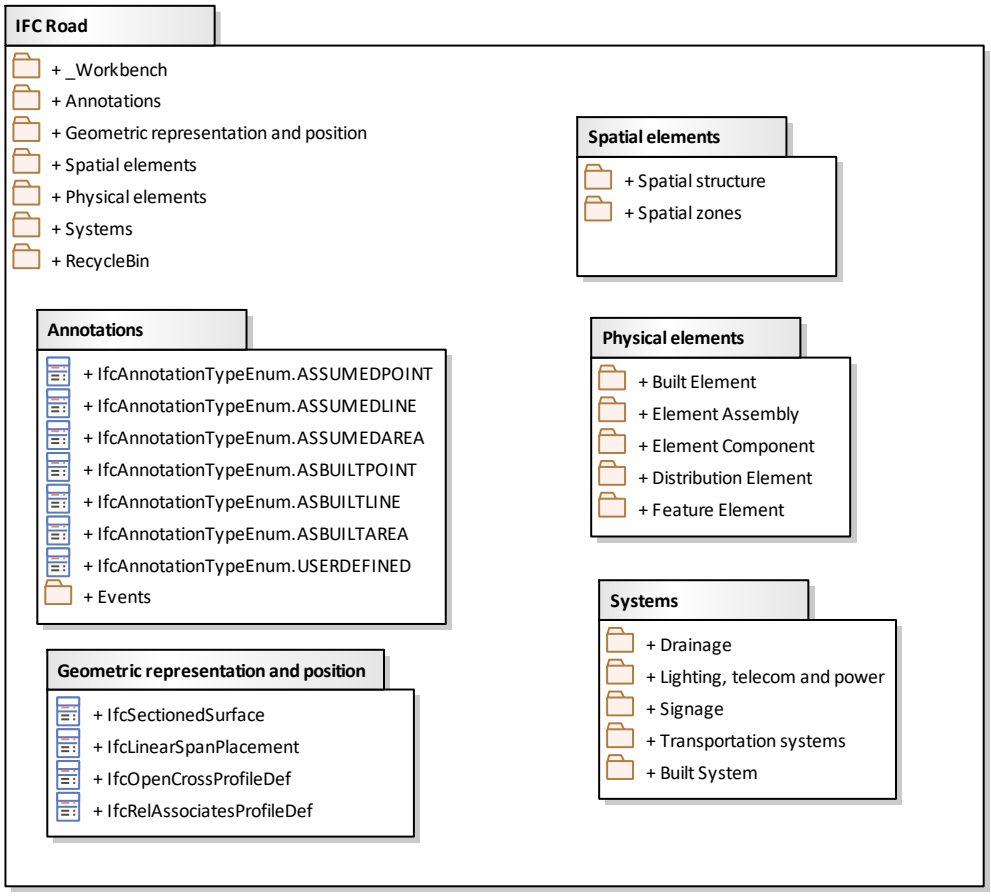


(from Projects)

Figure 1: IFC Road -

1.1 Package: Annotations

This package contains concepts that represent road specific annotations within a model. These elements are representations within the geometric (and spatial) context of a project, that add notes or meaning to the objects which constitutes the project model.

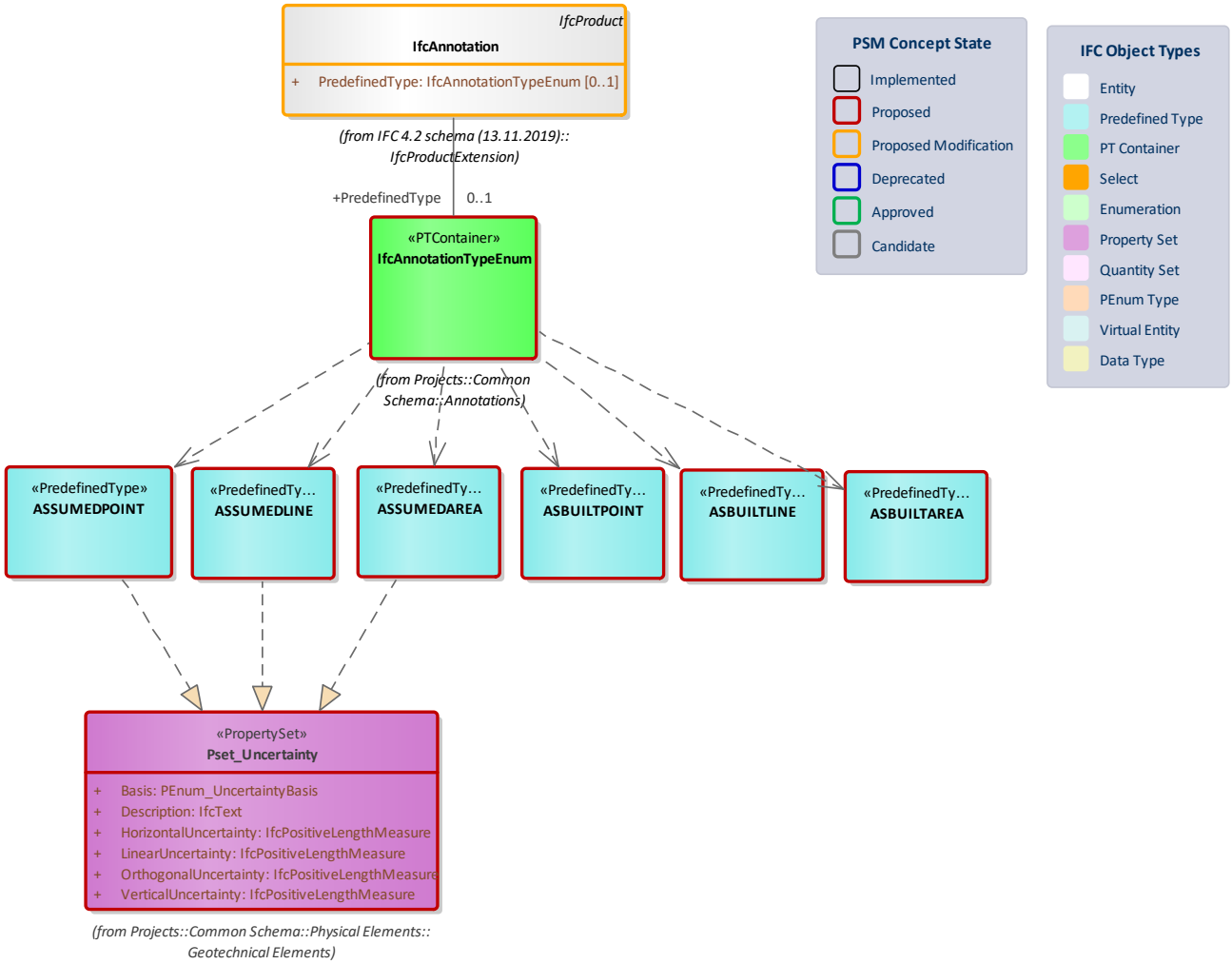


Figure 2: Annotations -

1.1.1 Class: IfcAnnotation

An annotation is an information element within the geometric (and spatial) context of a project, that adds a note or meaning to the objects which constitutes the project model. Annotations include additional points, curves, text, dimensioning, hatching and other forms of graphical notes. It also includes virtual or symbolic representations of additional model components, not representing products or spatial structures, such as event elements, survey points, contour lines or similar.

NOTE Additional presentation information (often 2D) such as tag number or hatching, that is directly related to a particular product representation is included within the IfcProductDefinitionShape having various IfcShapeRepresentation's of the IfcElement (and its subtypes). Only those presentation information, that cannot be directly related to a single product, have to be wrapped within the IfcAnnotation.

If available, the annotation should be related to the spatial context of the project, by containing the annotation within the appropriate level of the building structure (site, facility, facility part or building, storey, or space). This is handled by the IfcRelContainedInSpatialStructure relationship.

The IfcAnnotation can provide specific 0D, 1D, and 2D geometric items as representation of the annotation, offering annotation point, curves, and surfaces. In addition to the predefined type values in IfcAnnotationTypeEnum, the following values can be used for the ObjectType (with PredefinedType attribute value USERDEFINED).

'Annotation point' is an annotation provided by a point that has additional semantic. The inherited attribute ObjectType should be used to capture the type of point annotation, some suggested values are:

- **'SurveyPoint'**: A single survey point represented by a Cartesian point. A property set may add the conditions (method, accuracy, etc. to the survey point).
- **'SurveyArea'**: A set of survey points represented by Cartesian point. These coordinates are determined relative to the coordinates of a reference point, which acts as the datum for the survey. Properties attached apply equally to all points. The difference in elevation of the survey points enables terrain to be determined.

'**Annotation curve**' is an annotation provided by a curve that has additional semantic. The inherited attribute ObjectType should be used to capture the type of curve annotation, some suggested values are:

- **'ContourLine'**: A line of constant elevation typically used on geographic maps where the spacing of lines at constant intervals of elevation may be used as an indication of slope.
- **'IsoBar'**: A line of constant pressure typically used on weather maps or to show pressure gradient in spaces, chambers or externally.
- **'IsoLux'**: A line of constant illumination typically used to show the distribution of illumination levels and/or day lighting in a space or externally.
- **'IsoTherm'**: A line of constant temperature typically used to show the distribution and effect of heating or cooling within a space or to show temperature distribution on a geographic map.

'Annotation surface' is an annotation provided by a surface that has additional semantic. The inherited attribute ObjectType should be used to capture the type of surface annotation, some suggested values are:

- 'SurveyArea': A surface patch based on survey points.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcProduct	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcAnnotationTypeEnum	[0..1]	

1.1.2 PDT Container: IfcAnnotationTypeEnum

This enumeration defines the different types of Annotation elements an IfcAnnotation object can represent.

Status: **Proposed**

Package: **Annotations**

Container Properties			
Parent Entity	IfcAnnotation	**Stereotype**	«PTContainer»
Contains	**PROPOSED**		
	IfcAnnotationTypeEnum.NON_PHYSICAL_SIGNAL	IfcAnnotationTypeEnum.ASSUMEDAREA	
	IfcAnnotationTypeEnum.USERDEFINED	IfcAnnotationTypeEnum.ASSUMEDLINE	
	IfcAnnotationTypeEnum.ASBUILTAREA	IfcAnnotationTypeEnum.ASSUMEDPOINT	
	IfcAnnotationTypeEnum.ASBUILTLINE	IfcAnnotationTypeEnum.SUPERELEVATIONEVENT	
	IfcAnnotationTypeEnum.ASBUILTPOINT	IfcAnnotationTypeEnum.WIDTHEVENT	

1.1.3 Predefined Type: USERDEFINED

Full Identifier: **IfcAnnotationTypeEnum.USERDEFINED**

Status: **Proposed**

Package: **Annotations**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation

Stereotype	«PredefinedType»		
Property sets	Pset_RoadDesignCriteriaCommon		

1.1.4 Predefined Type: ASSUMEDPOINT

Full Identifier: **IfcAnnotationTypeEnum.ASSUMEDPOINT**

A single extra point (assumption or interpretation), used to complement survey data in initial state modelling.

Status: **Proposed**

Package: **Annotations**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets	Pset_Uncertainty		

1.1.5 Predefined Type: ASSUMEDLINE

Full Identifier: **IfcAnnotationTypeEnum.ASSUMEDLINE**

A set of extra points on a line (breakline) as an assumption or interpretation, used to complement survey data in initial state modelling.

Status: **Proposed**

Package: **Annotations**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets	Pset_Uncertainty		

1.1.6 Predefined Type: ASSUMEDAREA

Full Identifier: **IfcAnnotationTypeEnum.ASSUMEDAREA**

A set of extra points on a surface as an assumption or interpretation, used to complement survey data in initial state modelling.

Status: **Proposed**

Package: **Annotations**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets	Pset_Uncertainty		

1.1.7 Predefined Type: ASBUILTPOINT

Full Identifier: **IfcAnnotationTypeEnum.ASBUILTPOINT**

A single as-built survey point.

Status: **Proposed**

Package: **Annotations**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets			

1.1.8 Predefined Type: ASBUILTLINE

Full Identifier: **IfcAnnotationTypeEnum.ASBUILTLINE**

A set of as-built survey points on a line (e.g. breakline).

Status: **Proposed**

Package: **Annotations**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets			

1.1.9 Predefined Type: ASBUILTAREA

Full Identifier: **IfcAnnotationTypeEnum.ASBUILTAREA**

A set of as-built survey points on a surface.

Status: **Proposed**

Package: **Annotations**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets			

1.1.10 Property Set: Pset_Uncertainty

Property set capturing the geometric uncertainty regarding measurements including how the way that uncertainty was assessed.

Status: **Proposed**

Set Properties			
Applicable Entities	IfcAnnotationTypeEnum.ASSUMEDAREA IfcAnnotationTypeEnum.ASSUMEDLINE IfcAnnotationTypeEnum.ASSUMEDPOINT IfcGeotechnicalElement IfcGeotechnicalStratum IfcGeotechnicalAssembly	**stereotype**	«PropertySet»

Properties

Name	Type	Multipl	Definition
Basis	PEnum_UncertaintyBasis		Indication of the basis of the uncertainty
Description	IfcText		General description of the uncertainty associated to the element or feature, its source and implications.
HorizontalUncertainty	IfcPositiveLengthMeasure		Indicative (95%-100%) range diameter associated to the vertical shape and position in X, if different to the linear uncertainty.
LinearUncertainty	IfcPositiveLengthMeasure		Indicative (95%-100%) range diameter associated to the overall shape and position in XYZ.
OrthogonalUncertainty	IfcPositiveLengthMeasure		Indicative (95%-100%) range diameter associated to the horizontal shape and position in Y, if different to the horizontal uncertainty.
VerticalUncertainty	IfcPositiveLengthMeasure		Indicative (95%-100%) range diameter associated to the vertical shape and position in Z, if different to the linear uncertainty.

1.1.11 Package: Events

This package contains specific kinds of events that may occur along the alignment of a road.

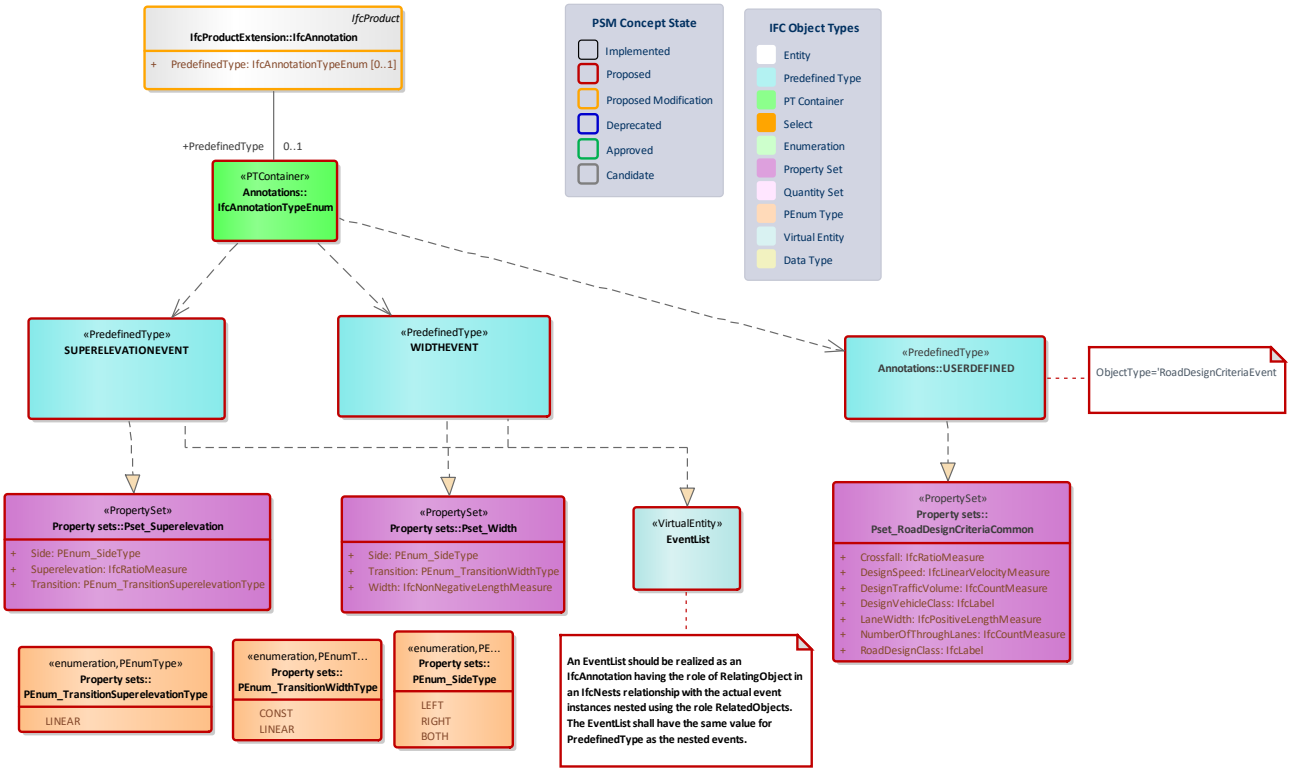


Figure 3: Events - Specifies the way that the superelevation shall be interpolated from the previous event.

1.1.11.1 Predefined Type: SUPERELEVATIONEVENT

Full Identifier: **IfcAnnotationTypeEnum.SUPERELEVATIONEVENT**

A kind of event that specifies the superelevation (cross slope) at a specific location along a road alignment, and the type of transition from the previous location. The locations are specified using an IfcLinearPlacement measured along the alignment axis curve.

The element(s) that are affected by the superelevation event is currently proposed to be specified by containing the event in a specific lateral breakdown element of the road spatial structure (e.g. a Lane).

Status: **Proposed**

Package: **Events**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets	Pset_Superelevation		

1.1.11.2 Predefined Type: WIDTHEVENT

Full Identifier: **IfcAnnotationTypeEnum.WIDTHEVENT**

A kind of event that specifies the width at a specific location along a road alignment, and the type of transition from the previous location. The locations are specified using an IfcLinearPlacement measured along the alignment axis curve.

The element(s) that are affected by the width event is currently proposed to be specified by containing the event in a specific lateral breakdown element of the road spatial structure (e.g. a Lane or the entire carriageway).

Status: **Proposed**

Package: **Events**

Predefined Type Properties			
Predefined Type Container	IfcAnnotationTypeEnum	**Parent Entity**	IfcAnnotation
Stereotype	«PredefinedType»		
Property sets	Pset_Width		

1.1.11.3 Virtual Entity: EventList

Specifies a list of events ordered in a useful fashion, normally in ascending or descending order along the curve to which the events are located.Formal proposition: The predefined type for an EventList shall match the predefined type of all nested events.

Entity Properties	
Realizing Parent	IfcAnnotationTypeEnum.WIDTHEVENT IfcAnnotationTypeEnum.SUPERELEVATIONEVENT
Notes	An EventList should be realized as an IfcAnnotation having the role of RelatingObject in an IfcNests relationship with the actual event instances nested using the role RelatedObjects. The EventList shall have the same value for PredefinedType as the nested events.

1.1.11.4 Property Set: Pset_RoadDesignCriteriaCommon

Road design criteria that may be attached to road parts.

Status: **Proposed**

Set Properties			
Applicable Entities	IfcAnnotationTypeEnum.USERDEFINED	**stereotype**	«PropertySet»

Properties

Name	Type	Multipl	Definition
Crossfall	IfcRatioMeasure		Specifies the nominal crossfall as a ratio measure (slope) at the location of the event.
DesignSpeed	IfcLinearVelocityMeasure		NOTE Definition from PIARC: Speed selected in designing a new road or in modernizing, strengthening or rehabilitating an existing road section, to determine the various geometric design features of the carriageway that allow a car to travel safely at that speed, under normal road surface and weather conditions. Note: the design speed is not constant, but may vary depending on the conditions of relief (plain, hill, mountain).
DesignTrafficVolume	IfcCountMeasure		The traffic volume used for planning and design purposes specified as the number of vehicles per day . Typically given as AADT - Average Annual Daily Traffic
DesignVehicleClass	IfcLabel		A vehicle designator with content according to local standards.
LaneWidth	IfcPositiveLengthMeasure		Standard nominal width of one trough lane.
NumberOfThroughLanes	IfcCountMeasure		The total number of through lanes on the segment. This excludes auxiliary lanes, parking and turning lanes, acceleration/deceleration lanes, toll collection lanes, shoulders etc.
RoadDesignClass	IfcLabel		A road design class designator with content according to local standards.

1.1.11.5 Property Set: Pset_Superelevation

Specifices the general properties for a Superelevation event.

Status: **Proposed**

Set Properties			
Applicable Entities	IfcAnnotationTypeEnum.SUPERELEVATIONEVENT	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
Side	PEnum_SideType		Specifies if the superelevation is measured to the RIGHT or to the LEFT of the curve referenced by the placement, or if the same value is applied to BOTH sides.
Superelevation	IfcRatioMeasure		Specifies the superelevation as a ratio measure (slope) at the location of the event.
Transition	PEnum_TransitionSuperelevationType		The type of transition of superelevation from previous event to this one.

1.1.11.6 Property Set: Pset_Width

Specifices the general properties for a Width event.

Status: **Proposed**

Set Properties			
Applicable Entities	IfcAnnotationTypeEnum.WIDTHEVENT	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
Side	PEnum_SideType		Specifies if the width is measured to the RIGHT or to the LEFT of the curve referenced by the placement, or if the same value is applied to BOTH sides.
Transition	PEnum_TransitionWidthType		The type of transition of width used between the previous event and this event.
Width	IfcNonNegativeLengthMeasure		The width measure at this location.

1.1.11.7 Enumeration: PEnum_SideType

Specifies a side in relation to some reference object (e.g. an Alignment) considering an explicit or implicit positive direction.

Status: **Proposed**

Package: **Property sets**

Enumerators

Name	Definition
LEFT	Left side
RIGHT	Right side
BOTH	Both sides

1.1.11.8 Enumeration: PEnum_TransitionSuperelevationType

Specifies how the transition shall occur between the previous and this event.

Status: **Proposed**

Package: **Property sets**

Enumerators

Name	Definition
LINEAR	Specifies that the transition of the superelevation between the previous superelevation event and this event shall be linearly interpolated.

1.1.11.9 Enumeration: PEnum_TransitionWidthType

Specifies how the transition shall occur between the previous and this event.

Status: **Proposed**

Package: **Property sets**

Enumerators

Name	Definition
CONST	Specifies that transition of the width between the previous width event and this event shall be constant and equal to the previously specified width meaning that the change in width shall occur instantaneously at the location of this event.
LINEAR	Specifies that the transition of the width between the previous width event and this event shall be linearly interpolated providing a gradual width change.

1.2 Package: Geometric representation and position

This package contains concepts that represent geometric shape and location.

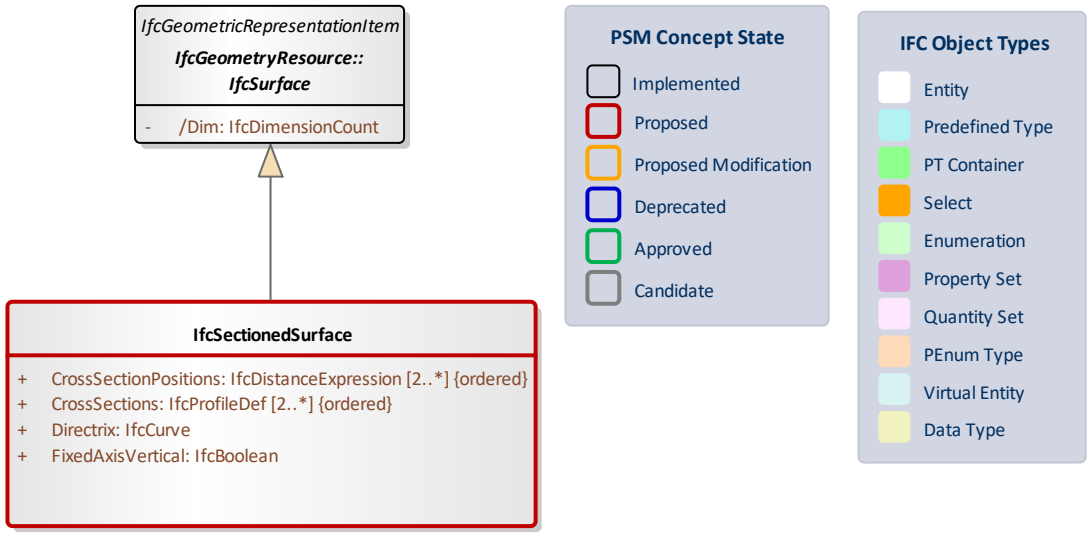


Figure 4: Geometry -

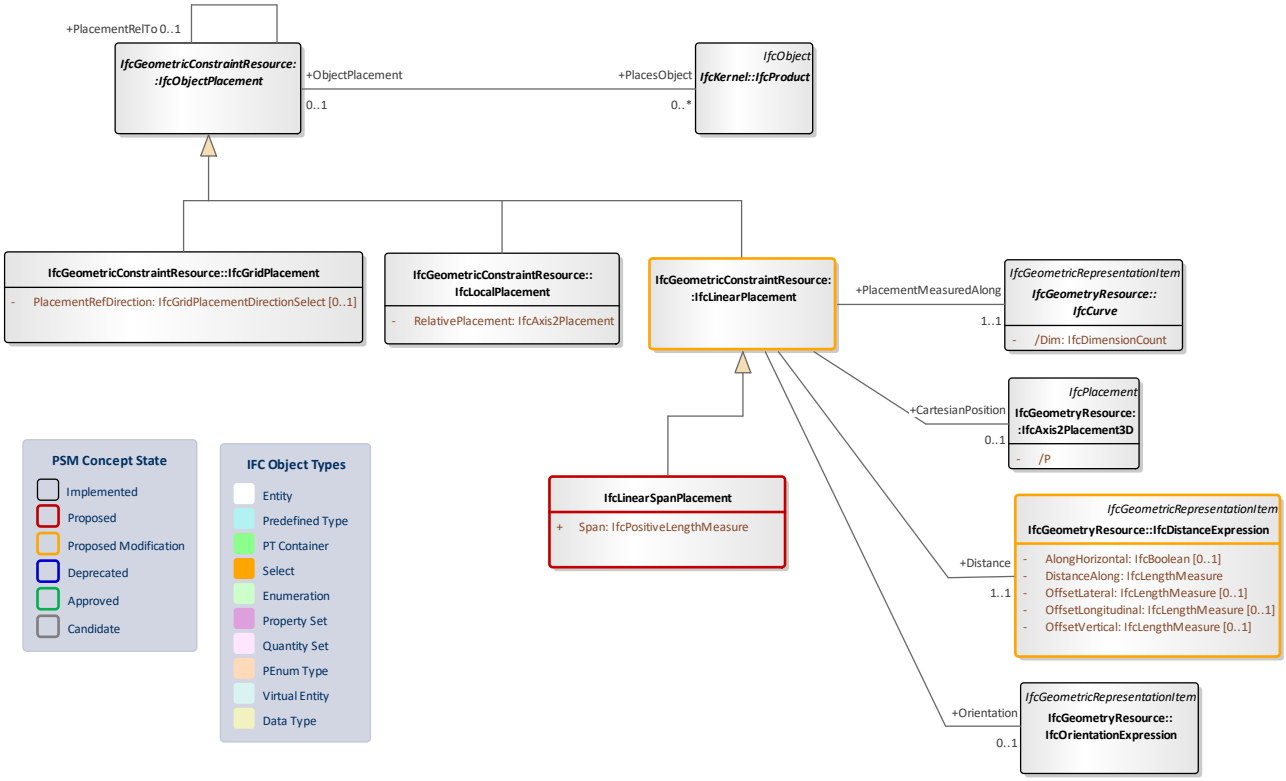


Figure 5: Placement -

1.2.1 Class: IfcLinearPlacement

IfcLinearPlacement provides a specialization of IfcObjectPlacement in which the placement and axis direction of the object coordinate system is defined by a reference to a curve such as IfcAlignmentCurve.

bSI Documentation

Status: **ProposedModification**

Package: **IfcGeometricConstraintResource**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcObjectPlacement	
Subtypes	**PROPOSED**	
	IfcLinearPlacementWithInclination	IfcLinearSpanPlacement

1.2.2 Class: IfcDistanceExpression

An IfcDistanceExpression describes a point relative to a basis curve according to distance along the basis curve in 3D or as projected onto the horizontal plane, offset lateral to the basis curve according to the horizontal orientation at the specified distance, offset vertical to the basis curve, and an optional additional offset parallel to the basis curve that may be used to address locations otherwise unreachable where the basis curve is tangentially discontinuous.

bSI Documentation

Status: **ProposedModification**

Package: **IfcGeometryResource**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcGeometricRepresentationItem	
Subtypes	EXISTING	PROPOSED

Class Attributes

Name	Type	Multiplicity	Definition
AlongHorizontal	IfcBoolean	[0..1]	Indicates whether DistanceAlong is measured according to horizontal projection of distance (if True), or 3D distance (if False or unset).
DistanceAlong	IfcLengthMeasure		The distance along the basis curve, measured according to projection in the horizontal plane if AlongHorizontal is True, or according to 3D distance otherwise. If the basis curve refers to _IfcAlignmentCurve_ and AlongHorizontal is True, then this measurement directly corresponds to _IfcAlignment2DHorizontal_.
OffsetLateral	IfcLengthMeasure	[0..1]	Offset horizontally perpendicular to the basis curve, where positive values indicate to the left of the basis curve as facing in the direction of the basis curve, and negative values indicate to the right. If DistanceAlong coincides with a point of tangential discontinuity (within precision limits), then the tangent of the previous segment governs.

OffsetLongitudinal	IfcLengthMeasure	[0..1]	Offset parallel to the basis curve after applying DistanceAlong, OffsetLateral, and OffsetVertical to reach locations for the case of a tangentially discontinuous basis curve.
OffsetVertical	IfcLengthMeasure	[0..1]	Offset vertical to the basis curve where positive values indicate vertically upwards in global coordinates at DistanceAlong, regardless of the slope of the basis curve at such point.

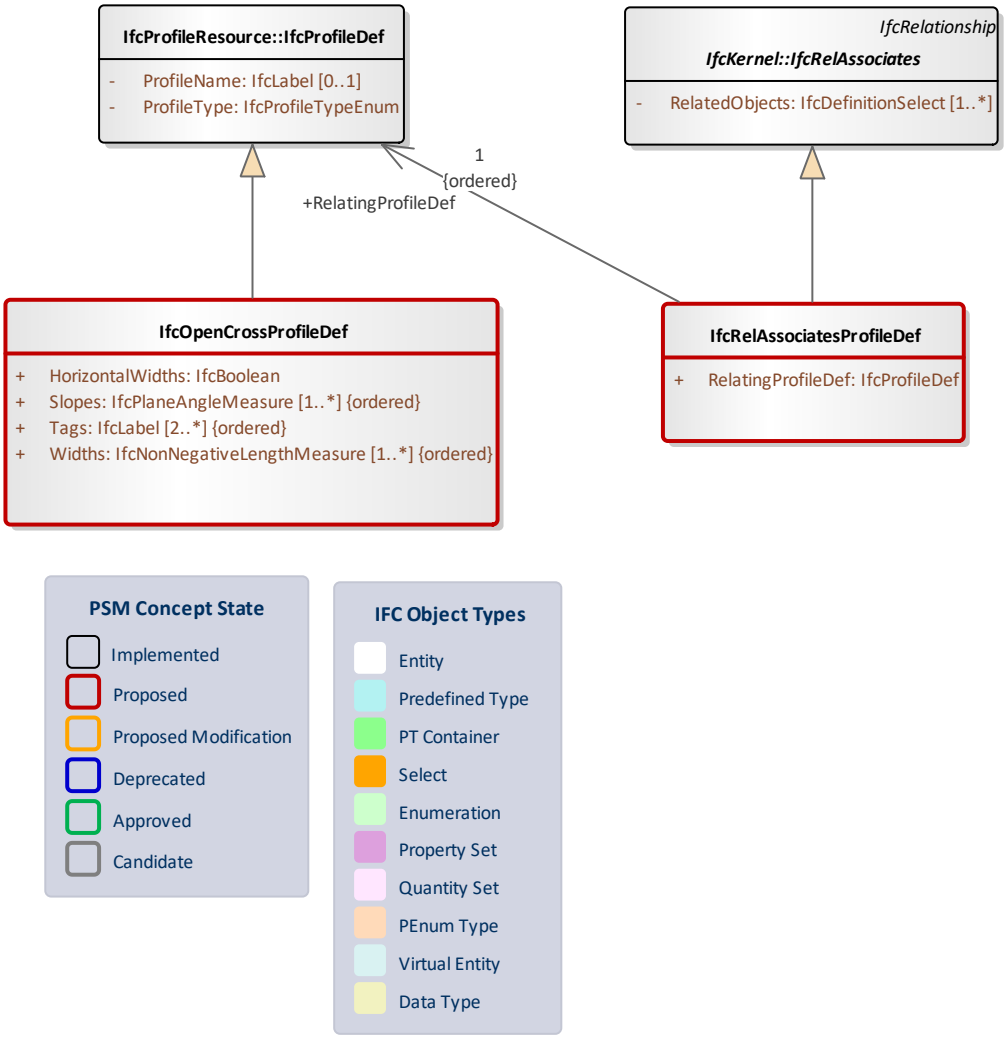


Figure 6: Profiles -

1.2.3 Class: IfcSectionedSurface

A kind of surface constructed by sweeping potentially varying open cross sections along a curve horizontally (or near horizontally). The surface is generated by sweeping the CrossSections between CrossSectionPositions; linear interpolation is assumed, unless transitions curves between cross section points are indicated by OpenCrossProfileDef.Tags.

The CrossSections are oriented with the Y axis of each profile facing upwards in +Z direction or vertically perpendicular to the Directrix, depending on the Attribute FixedAxisVertical value.

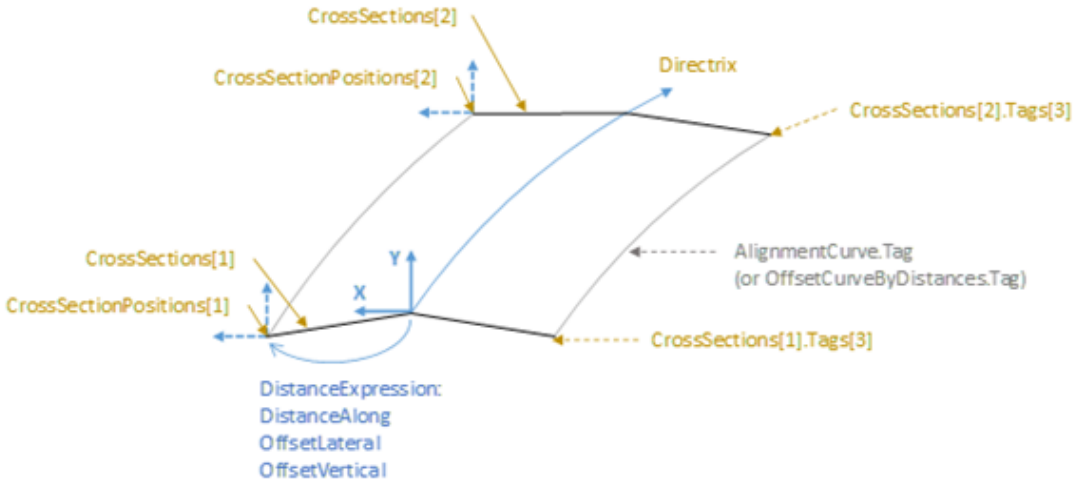


Figure 1 SectionSurface using OpenCrossProfileDef

In case of branching longitudinal breaklines, the SectionedSurface may use OpenCrossProfileDef instances with varying number of cross section points. In that case, the point in two consecutive cross sections that are connected are identified by the same tag value.

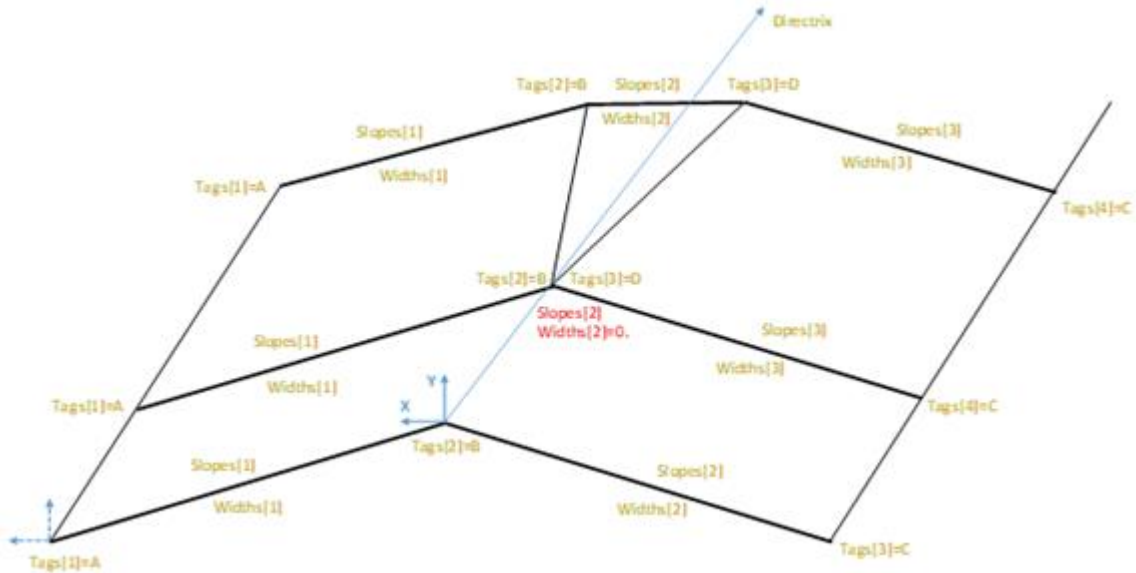


Figure 1 SectionedSurface with branching longitudinal breaklines

Formal propositions:

- The curve entity which is the underlying directrix shall have the dimensionality of 3.
- The profile type shall be CURVE within the list of the profiles defining the cross sections.
- The entity type for each section must be the same.
- The list of cross sections and the list of cross section positions shall be of the same size.

Informal Propositions:

- No two consecutive sections shall intersect.
- If the directrix is not tangent continuous, the resulting surface is created by a miter at half angle between the two segments.
- Very sharp edges may result in nearly impossible miter; implementer agreements may define acceptable limits for tangent discontinuity or require the directrix to be tangent continuous.
- The directrix shall not intersect

Status: **Proposed**

Package: **Geometric representation and position**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcSurface	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
CrossSectionPositions	IfcDistanceExpression	[2..*]	List of distance expressions in sequentially increasing order paired with CrossSections, indicating the position of the corresponding section along the Directrix.
CrossSections	IfcProfileDef	[2..*]	List of cross sections in sequential order along the Directrix
Directrix	IfcCurve		The curve used to define the sweeping operation
FixedAxisVertical	IfcBoolean		Indicates whether Sections are oriented with the Y axis of each profile facing upwards in +Z direction (True), or vertically perpendicular to the Directrix varying according to slope (False)

1.2.4 Class: IfcLinearSpanPlacement

A kind of linear placement that places an object along a linear section of a curve from Distance to Distance + Span.

Status: **Proposed**

Package: **Geometric representation and position**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcLinearPlacement	
Subtypes	EXISTING	PROPOSED

Class Attributes

Name	Type	Multipli	Definition
Span	IfcPositiveLengthMeasure		The length of the span.

1.2.5 Class: IfcOpenCrossProfileDef

A two-dimensional open profile defined by widths and slopes for the use within the swept surface geometry, in SectionedSurface in particular. The underlying coordinate system is defined by the swept surface that uses the profile definition; when used in SectionedSurface it is the XY plane of each list member of SectionedSurface.CrossSectionPositions where the profile X axis is oriented perpendicularly to the left of the Directrix (same direction as positive LateralOffset at IfcDistanceExpression) as facing forward along the directrix, and the profile Y axis is oriented upwards or vertically perpendicular to the Directrix depending on the usage in the SectionedSurface.

The behaviour of OpenCrossProfileDef in sweeping operation can be controlled by attribute Tags. Tags allow two consecutive cross sections to have different number of break points: points with the same tag value are connected either by assuming linear longitudinal breakline between them, or by a guide curve identified by the same Tag value as the cross section points.

Formal propositions:

- The profile type shall be CURVE.
- The list of slopes and the list of widths shall be of the same size, and the list of tags shall have one more member.

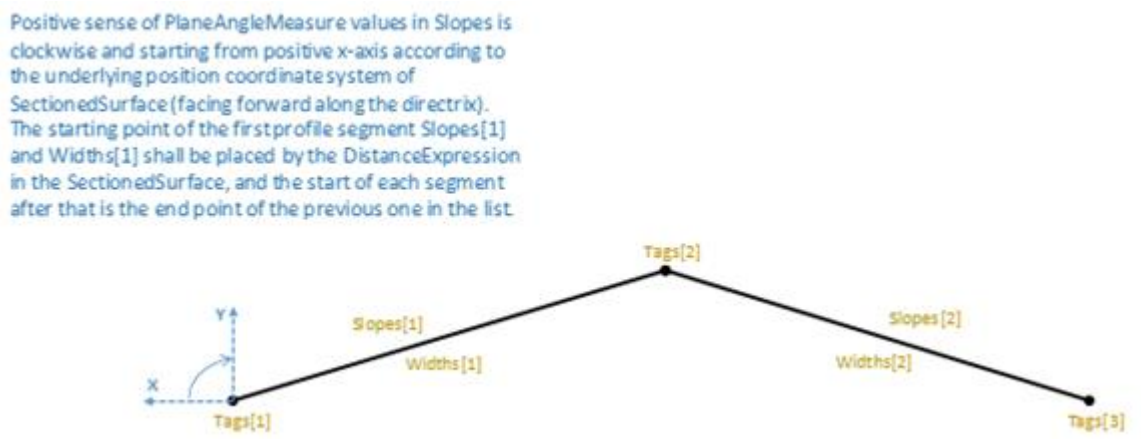


Figure 7 - Open cross profile definition example

Status: **Proposed**

Package: **Geometric representation and position**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcProfileDef	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
HorizontalWidths	IfcBoolean		Indicates if the widths shall be measured horizontally or along the slopes.
Slopes	IfcPlaneAngleMeasure	[1..*]	The slope measure.
Tags	IfcLabel	[2..*]	
Widths	IfcNonNegativeLength Measure	[1..*]	The horizontal widths (when HorizontalWidths=.T.) or distances along the Slope (when HorizontalWidths=.F.) for the segments in the profile. And if Horizontal=.T. the Slopes shall not be = +/- 90 deg.

1.2.6 Class: IfcRelAssociatesProfileDef

Associates Objects with a profile. In particular, may be used for indicating which SuperelevationEvent or WidthEvent has been used as basis for dimensioning a particular OpenCrossProfile.

Status: **Proposed**

Package: **Geometric representation and position**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

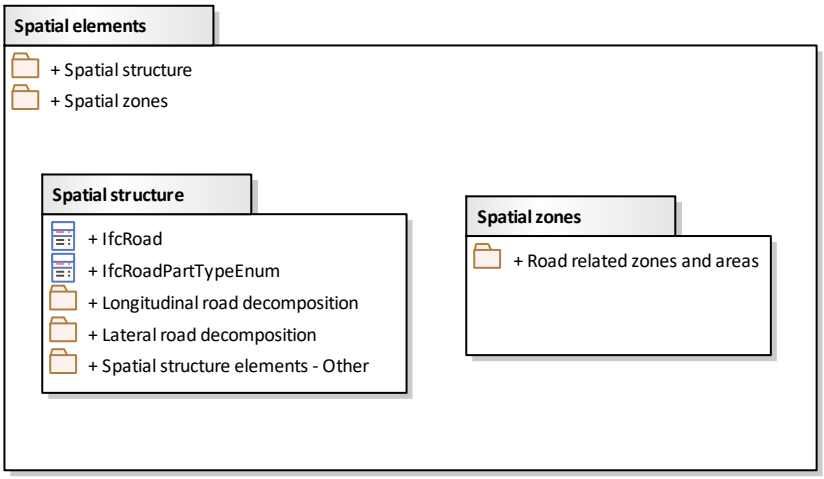
Inheritance Statement		
Subtype Of	IfcRelAssociates	
Subtypes	EXISTING	PROPOSED

Class Attributes

Name	Type	Multiplicity	Definition
RelatingProfileDef	IfcProfileDef		

1.3 Package: Spatial elements

All spatial elements that might be used to define a hierarchical project structure (spatial structure) or to define non-hierarchical spatial zones.



(from IFC Road)

Figure 8: Spatial elements -

1.3.1 Package: Spatial structure

Spatial elements that might be used to define a spatial structure. That spatial structure is often used to provide a project structure to organize a building project.

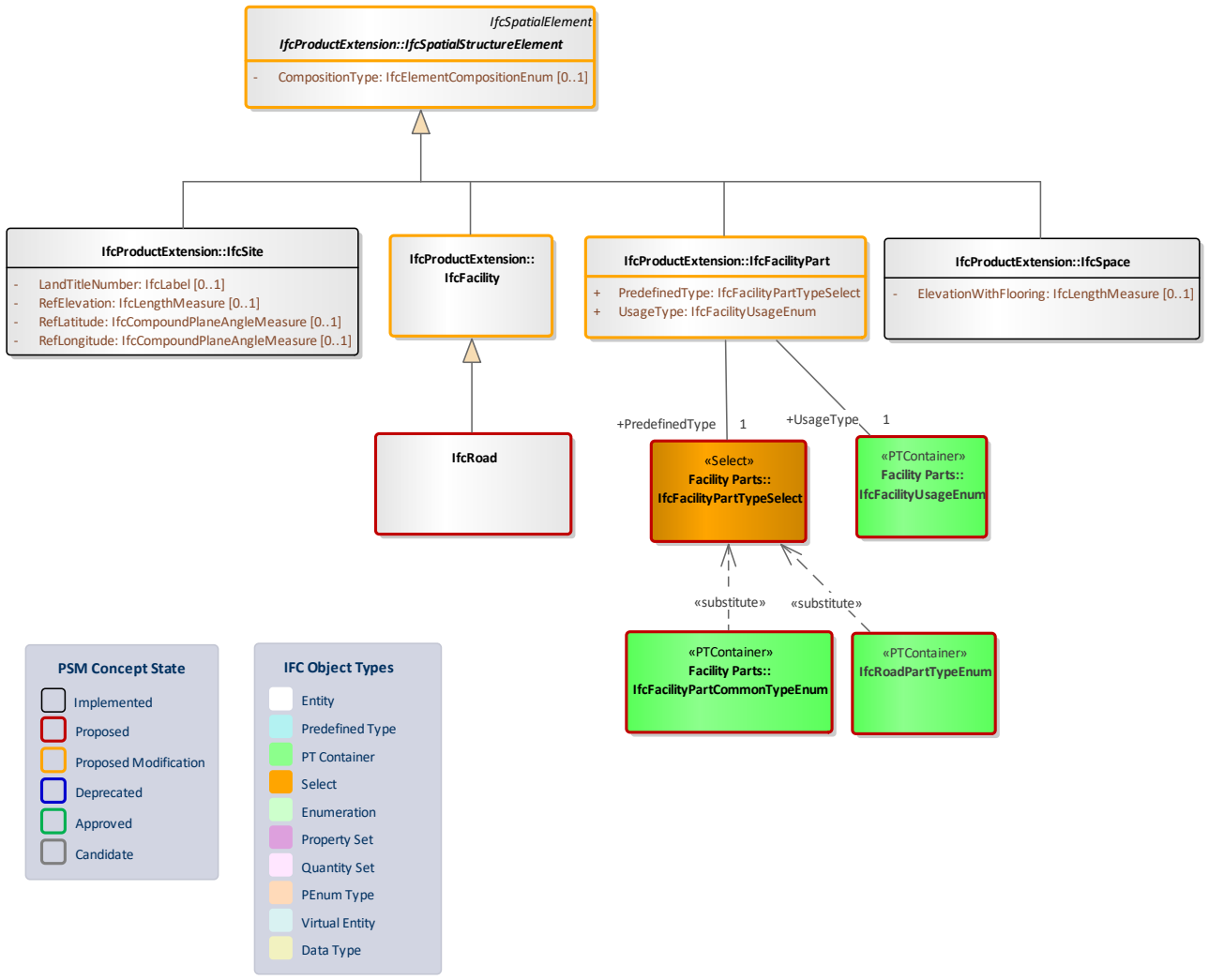


Figure 9: Spatial (project) structure -

1.3.1.1 Class: IfcSpatialStructureElement

A spatial structure element is the generalization of all spatial elements that might be used to define a spatial structure. That spatial structure is often used to provide a project structure to organize a building project.

A spatial project structure might define as many levels of decomposition as necessary for the building project. Elements within the spatial project structure are:

- site as IfcSite

- facility as _IfcFacility_, or any of its specific subtypes. REMOVE {specifically building as IfcBuilding bridge as IfcBridge }
- facility part as IfcFacilityPart, REMOVE { or specifically storey as IfcBuildingStorey bridge part as IfcBridgePart }
- space as IfcSpace

or aggregations or parts thereof. The composition type declares an element to be either an element itself, or an aggregation (complex) or a decomposition (part). The interpretation of these types is given at each subtype of IfcSpatialStructureElement.

The IfcRelAggregates is defined as an 1-to-many relationship and used to establish the relationship between exactly two levels within the spatial project structure. Finally the highest level of the spatial structure is assigned to IfcProject using the IfcRelAggregates.

The subtypes of IfcSpatialStructureElement relate to other elements and systems by establishing the following relationships:

- **Containment of elements**: IfcRelContainedInSpatialStructure by inverse attribute _ContainsElements_, used to assign any element, like building elements, MEP elements, etc. to the spatial structure element in which they are primarily contained.
- **Reference of elements**: IfcRelReferencedInSpatialStructure by inverse attribute ReferencesElements, used to reference any element, like building elements, MEP elements, etc. in spatial structure elements, other then the one, where it is contained.
- **Reference of systems**: REMOVE {IfcRelServicesBuildings by inverse attribute _ServicedBySystems_, used to reference a sytem,} IfcRelReferencedInSpatialStructure by inverse attribute ReferencesElements, used to reference a system, like a building service or electrical distribution system, a zonal system, or a structural analysis system, that is assigned to this spatial structure element.

The subtypes of IfcSpatialStructureElement relate to each other by using the IfcRelAggregates relationship to build the project spatial structure. Figure 1 shows the use of IfcRelAggregates to establish a spatial structure including site, building, building section and storey. More information is provided at the level of the subtypes.

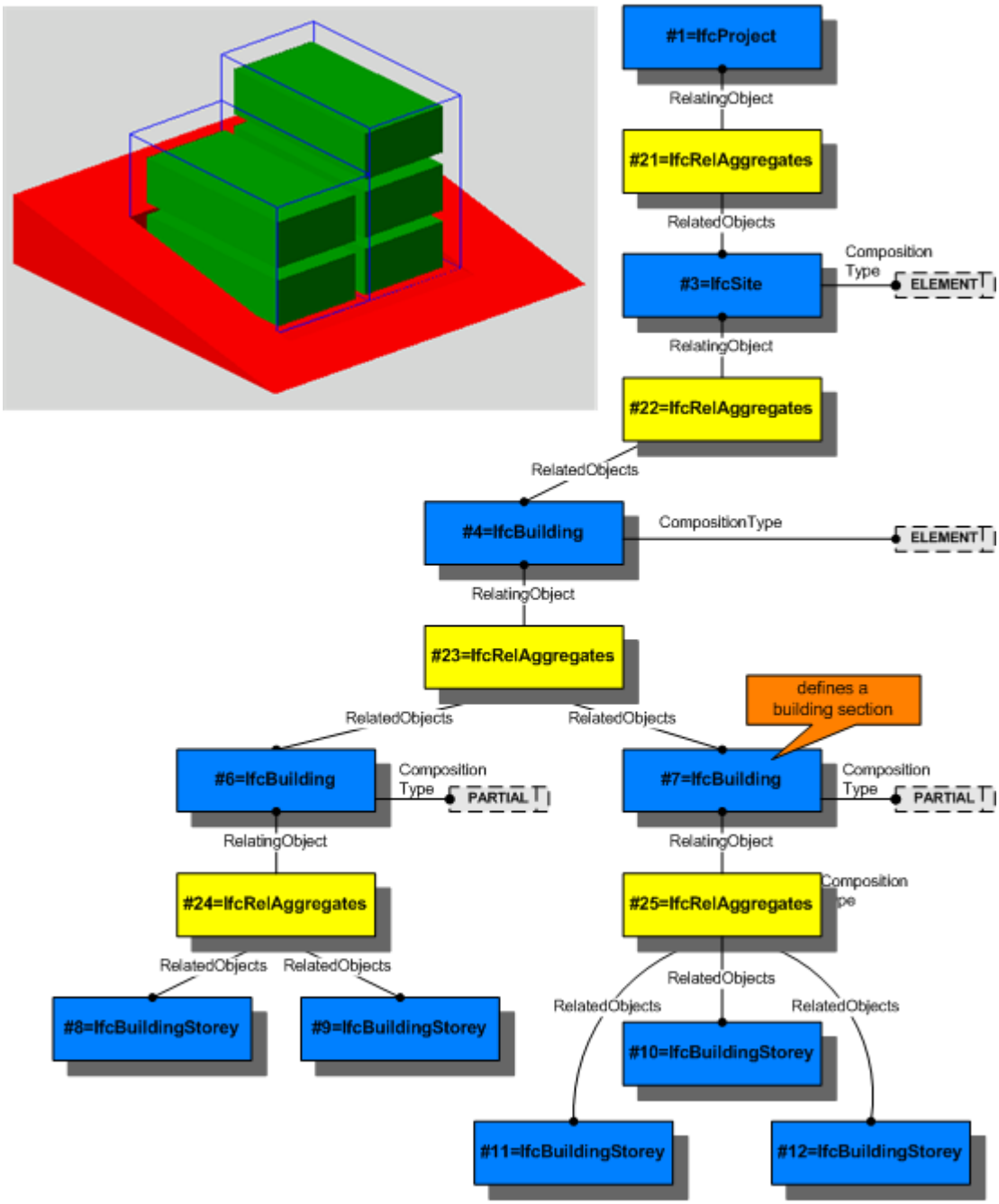


Figure — Spatial structure element composition

Informal Propositions:

1. The spatial project structure, established by the _IfcRelAggregates_, shall be acyclic.
2. A site should not be (directly or indirectly) associated to a building, storey or space.
3. A building should not be (directly or indirectly) associated to a storey or space.
4. A storey should not be (directly or indirectly) associated to a space.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Class Properties			
Status	ProposedModification	**Is Abstract**	Abstract
Property sets			

Inheritance Statement		
Subtype Of	IfcSpatialElement	
Subtypes	**EXISTING**	**PROPOSED**
	IfcSite IfcSpace	

Class Attributes

Name	Type	Multipli	Definition
CompositionType	IfcElementCompositionEnum	[0..1]	Denotes, whether the predefined spatial structure element represents itself, or an aggregate (complex) or a part (part). The interpretation is given separately for each subtype of spatial structure element. If no _CompositionType_ is asserted, the dafault value ''ELEMENT'' applies.

1.3.1.2 Class: IfcFacility

A Facility (derived from SpatialStructureElement) may be an IfcBuilding, an IfcBridge, an IfcRailway, an IfcRoad, an IfcMarineFacility (or any other type of built facility defined in the future, such as REMOVE{IfcRoad, IfcRailway and} IfcTunnel).

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement	
Subtype Of	IfcSpatialStructureElement

	EXISTING	PROPOSED
Subtypes	IfcBridge	IfcRailway IfcMarineFacility IfcRoad

1.3.1.3 Class: IfcFacilityPart

IfcFacilityPart provides for spatial breakdown of built facilities. It may be further specialised according to the type of facility being broken down.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcSpatialStructureElement	
Subtypes	EXISTING	PROPOSED

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcFacilityPartTypeSelect		
UsageType	IfcFacilityUsageEnum		

1.3.1.4 Class: IfcRoad

A route built on land to allow travel from one location to another, including highways, streets, cycle and foot paths, but excluding railways. As a type of Facility, Road provides the basic element in the project structure hierarchy for the components of a road project (i.e. any undertaking such as design, construction or maintenance).

NOTE Definition from ISO 6707-1: Way mainly for vehicles.

NOTE Definition from PIARC: Line of communication (travelled way) using a stabilized base other than rails or air strips, primarily for the use of road motor vehicles running on their own wheel.

Status: **Proposed**

Package: **Spatial structure**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcFacility	
Subtypes	**EXISTING**	**PROPOSED**

1.3.1.5 Select: IfcFacilityPartTypeSelect

This is a select of enumerations to provide the option of groups of predefined types for an IfcFacilityPart.

Status: **Proposed**

Package: **Facility Parts**

Select Properties	
Stereotype	«Select»
Substitutions	IfcFacilityPartCommonTypeEnum IfcMarinePartTypeEnum IfcRailwayPartTypeEnum IfcBridgePartTypeEnum IfcRoadPartTypeEnum

1.3.1.6 PDT Container: IfcFacilityUsageEnum

Status: **Proposed**

Package: **Facility Parts**

Container Properties			
Parent Entity	IfcFacilityPart	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcFacilityUsageEnum.LONGITUDINAL IfcFacilityUsageEnum.LATERAL IfcFacilityUsageEnum.VERTICAL IfcFacilityUsageEnum.REGION	

1.3.1.7 PDT Container: IfcFacilityPartCommonTypeEnum

Status: **Proposed**

Package: **Facility Parts**

Container Properties			
Parent Entity	IfcFacilityPart	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
	IfcBridgePartTypeEnum.SUBSTRUCTURE IfcBridgePartTypeEnum.SUPERSTRUCTURE	IfcFacilityPartCommonTypeEnum.LEVELCROSSING IfcFacilityPartCommonTypeEnum.ABOVEGROUND IfcFacilityPartCommonTypeEnum.TERMINAL IfcFacilityPartCommonTypeEnum.SUPERSTRUCTURE IfcFacilityPartCommonTypeEnum.SUBSTRUCTURE IfcFacilityPartCommonTypeEnum.SEGMENT IfcFacilityPartCommonTypeEnum.JUNCTION IfcFacilityPartCommonTypeEnum.BELOWGROUND	

1.3.1.8 PDT Container: IfcRoadPartTypeEnum

Status: **Proposed**

Package: **Spatial structure**

Container Properties			
Parent Entity	IfcFacilityPart	**Stereotype**	«PTContainer»
Contains	**PROPOSED**		
	IfcRoadPartTypeEnum.SOFTSHOULDER	IfcRoadPartTypeEnum.LAYBY	
	IfcRoadPartTypeEnum.HARDSHOULDER	IfcRoadPartTypeEnum.CENTRALRESERVE	
	IfcRoadPartTypeEnum.ROADSIDEPART	IfcRoadPartTypeEnum.TRAFFICLANE	
	IfcRoadPartTypeEnum.ROADSIDE	IfcRoadPartTypeEnum.ROADWAYPLATEAU	
	IfcRoadPartTypeEnum.SIDEWALK	IfcRoadPartTypeEnum.CARRIAGEWAY	
	IfcRoadPartTypeEnum.SHOULDER	IfcRoadPartTypeEnum.TOLLPLAZA	
	IfcRoadPartTypeEnum.REFUGEISLAND	IfcRoadPartTypeEnum.ROADSEGMENT	
	IfcRoadPartTypeEnum.CENTRALISLAND	IfcRoadPartTypeEnum.ROUNDABOUT	
	IfcRoadPartTypeEnum.TRAFFICISLAND	IfcRoadPartTypeEnum.INTERSECTION	
	IfcRoadPartTypeEnum.PARKINGBAY	IfcRoadPartTypeEnum.PEDESTRIAN_CROSSING	
	IfcRoadPartTypeEnum.BUS_STOP	IfcRoadPartTypeEnum.BICYCLECROSSING	
	IfcRoadPartTypeEnum.PASSINGBAY	IfcRoadPartTypeEnum.RAILWAYCROSSING	

1.3.1.9 Package: Longitudinal road decomposition

This package contains the concepts that may occur in a longitudinal spatial decomposition of a road.

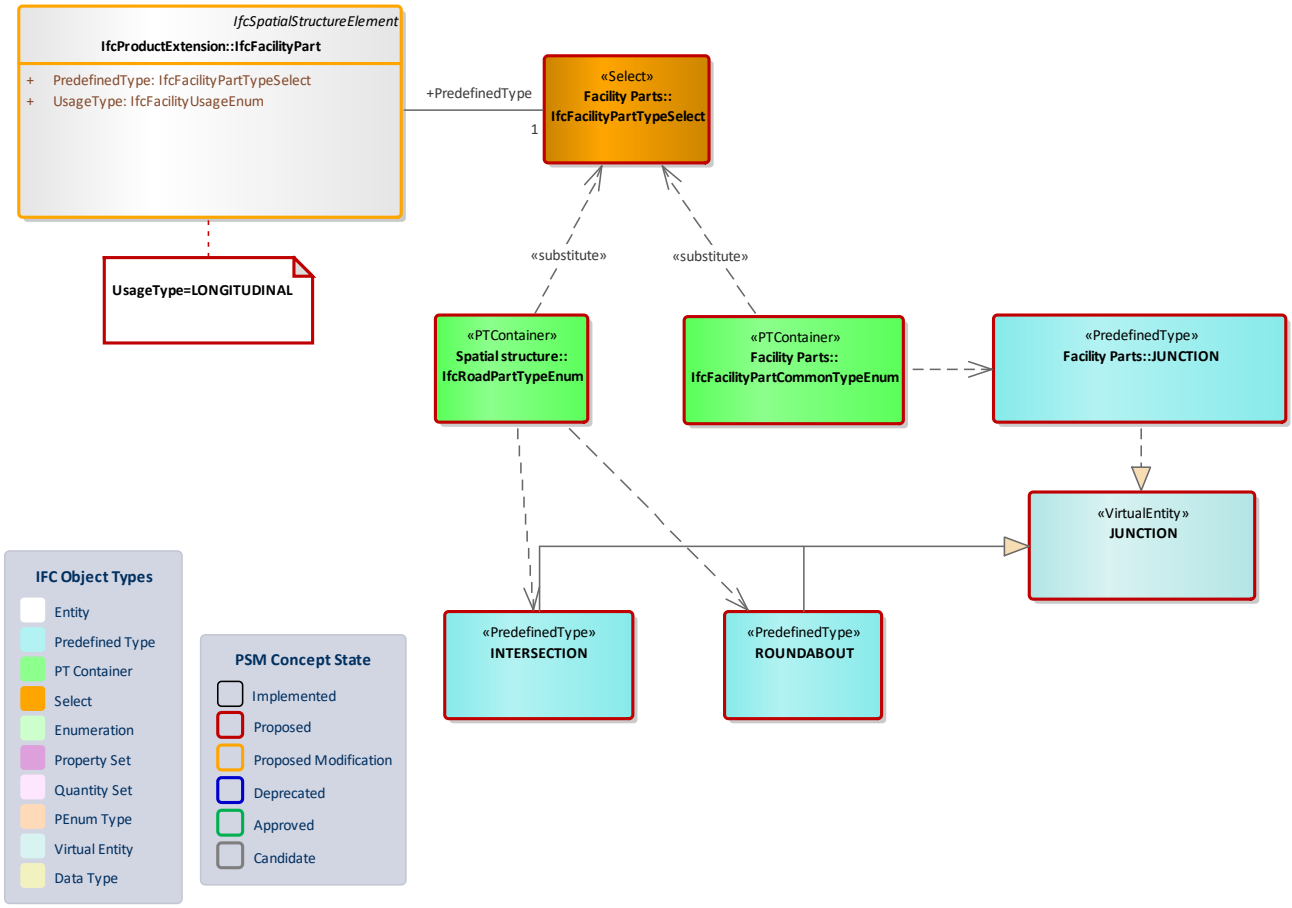


Figure 10: Longitudinal road decomposition - Junction –

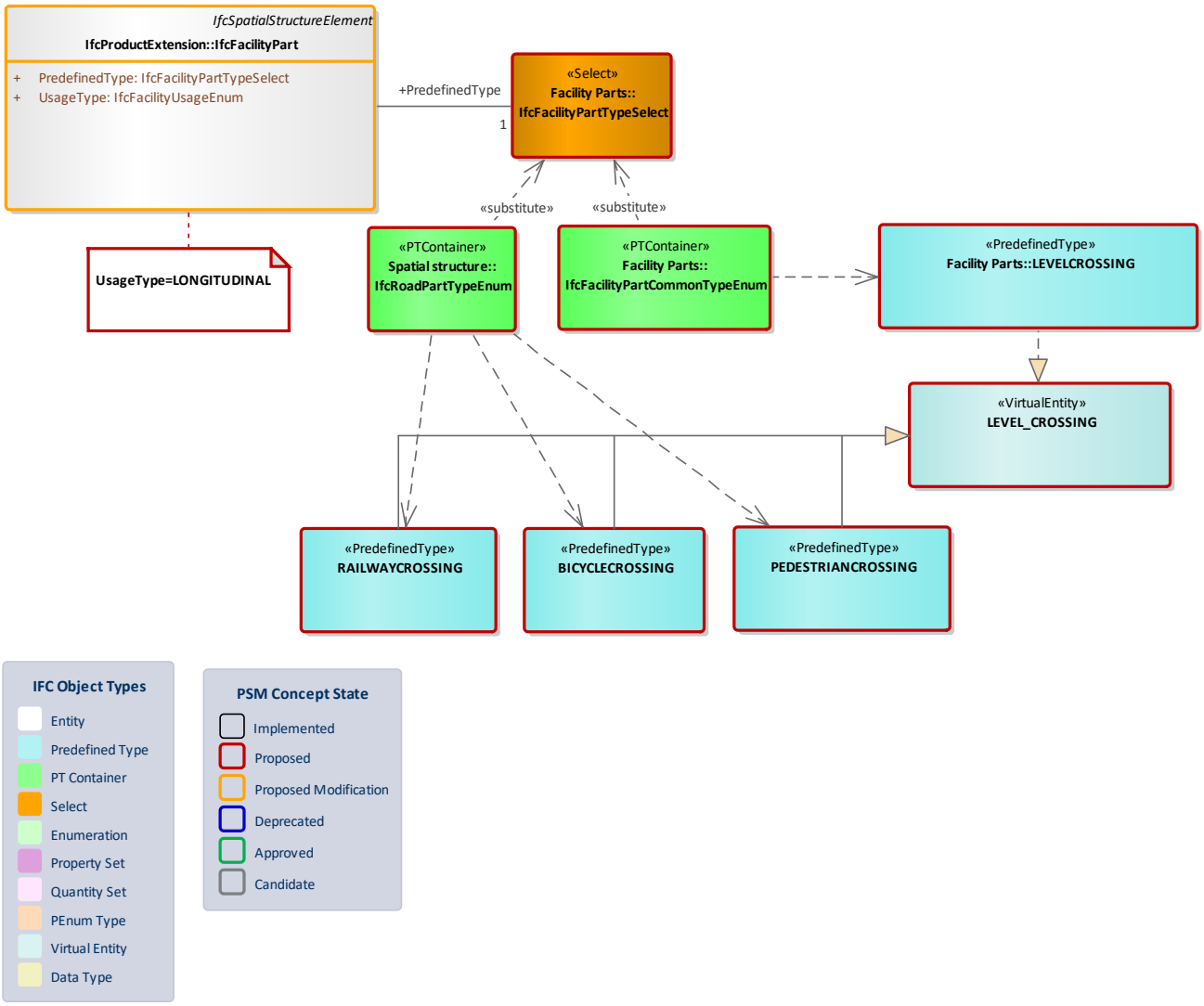


Figure 11: Longitudinal road decomposition - Level crossing -

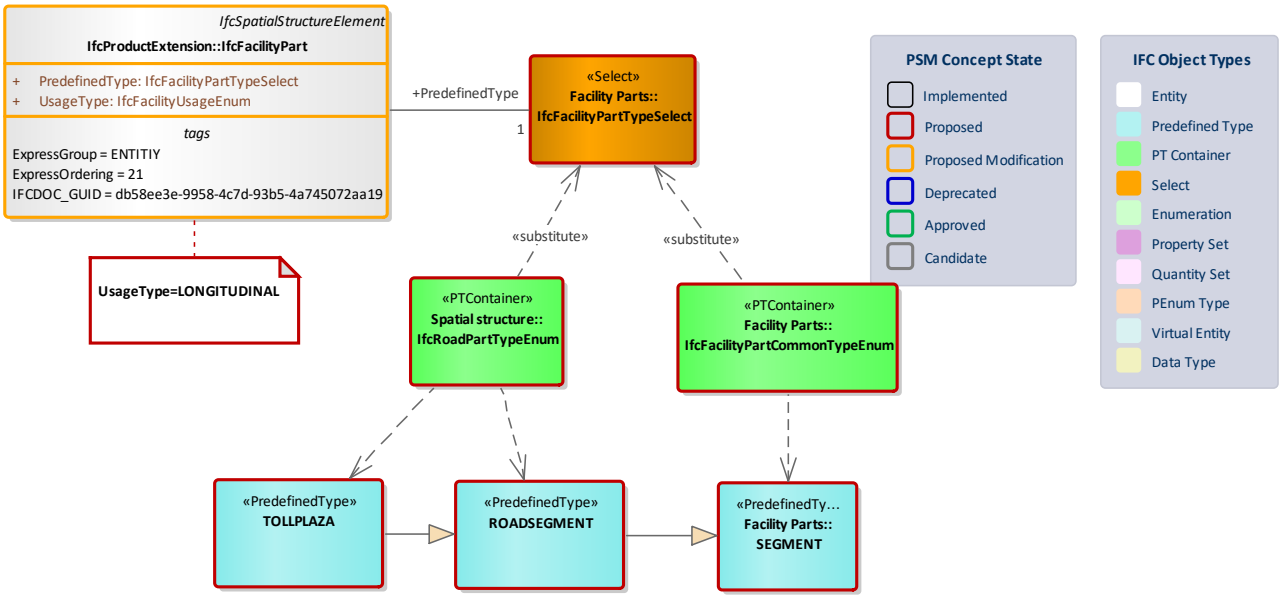


Figure 12: Longitudinal road decomposition - Road segment -

1.3.1.9.1 Predefined Type: INTERSECTION

Full Identifier: **IfcRoadPartTypeEnum.INTERSECTION**

At-grade junction where two or more roads meet or cross. Intersections may be further classified by number of road segments, traffic controls, and/or lane design.

Status: **Proposed**

Package: **Longitudinal road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.2 Predefined Type: JUNCTION

Full Identifier: **IfcFacilityPartCommonTypeEnum.JUNCTION**

A longitudinal facility part providing an at grade junction between two or more segments of longitudinal facilities usually of the same type.

Status: **Proposed**

Package: **Facility Parts**

Predefined Type Properties			
Predefined Type Container	IfcFacilityPartCommonTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.3 Predefined Type: ROUNDABOUT

Full Identifier: **IfcRoadPartTypeEnum.ROUNDABOUT**

Type of at-grade junction at which traffic streams are directed around a circle.

NOTE Definition from ISO 6707-1: portion of a road usually at a junction, on which traffic moves in one direction around a central element.

Status: **Proposed**

Package: **Longitudinal road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.4 Virtual Entity: IfcRoadPartTypeEnum.JUNCTION

A RoadPart providing at-grade junction between Segments belonging to two or more Roads.

NOTE Grade-separated junctions are handled by aggregating of RoadParts (Segments and Junctions), and refencing other types of Facility (Bridges).

Entity Properties	
Realizing Parent	IfcFacilityPartCommonTypeEnum.JUNCTION
Notes	

1.3.1.9.5 Predefined Type: BICYCLECROSSING

Full Identifier: **IfcRoadPartTypeEnum.BICYCLECROSSING**

Designated level crossing over a road for cyclists.

Status: **Proposed**

Package: **Longitudinal road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.6 Predefined Type: PEDESTRIANCROSSING

Full Identifier: **IfcRoadPartTypeEnum.PEDESTRIAN_CROSSING**

Designated level crossing over a road for pedestrians.

Status: **Proposed**

Package: **Longitudinal road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.7 Predefined Type: RAILWAYCROSSING

Full Identifier: **IfcRoadPartTypeEnum.RAILWAYCROSSING**

At-grade crossing between road and railway.

Status: **Proposed**

Package: **Longitudinal road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.8 Virtual Entity: IfcRoadPartTypeEnum.LEVEL_CROSSING

A location where a road is crossing or is crossed by some other mode of transport such as railway, bicycle or pedestrian on the same level.

Entity Properties	
Realizing Parent	IfcFacilityPartCommonTypeEnum.LEVELCROSSING
Notes	

1.3.1.9.9 Predefined Type: ROADSEGMENT

Full Identifier: **IfcRoadPartTypeEnum.ROADSEGMENT**

Longitudinal, linear segment of a road, either defined by uniform characteristics, or as a transition segment (e.g. number of lanes changing).

Status: **Proposed**

Package: **Longitudinal road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.10 Predefined Type: SEGMENT

Full Identifier: **IfcFacilityPartCommonTypeEnum.SEGMENT**

A longitudinal facility part encompassing a linear portion of the facility defined by some uniform characteristics, or a transition between segments of uniform characteristics.

Status: **Proposed**

Package: **Facility Parts**

Predefined Type Properties			
Predefined Type Container	IfcFacilityPartCommonTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.9.11 Predefined Type: TOLLPLAZA

Full Identifier: **IfcRoadPartTypeEnum.TOLLPLAZA**

A part of road facility where tolls are collected for use of toll road, tunnel or bridge.

Status: **Proposed**

Package: **Longitudinal road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10 Package: Lateral road decomposition

This package contains the concepts that may occur in a lateral spatial decomposition of a road.

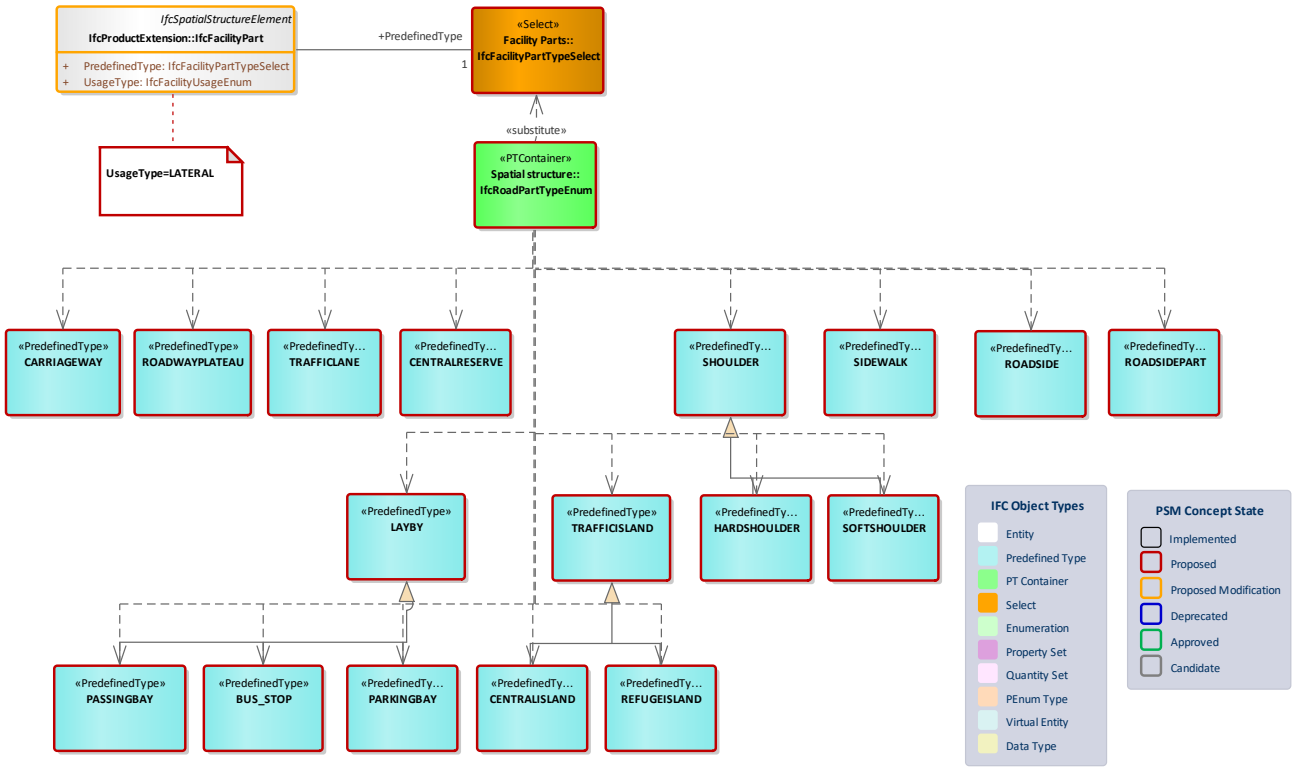


Figure 13: Lateral road decomposition -

1.3.1.10.1 Predefined Type: CARRIAGEWAY

Full Identifier: **IfcRoadPartTypeEnum.CARRIAGEWAY**

Unitary lateral part of Road built for traffic. Carriageway may comprise several kinds of traffic lanes and lay-bys, as well as traffic islands, and in case of dual carriageway road they are separated by central reserve.

NOTE Definition from ISO 6707-1: part of the road or highway constructed for use by vehicular traffic, including auxiliary traffic lanes, passing places, and lay-bys (US:Roadway).

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.2 Predefined Type: ROADWAYPLATEAU

Full Identifier: **IfcRoadPartTypeEnum.ROADWAYPLATEAU**

Lateral part of Road comprising the carriageway(s), shoulders and medians.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.3 Predefined Type: TRAFFICLANE

Full Identifier: **IfcRoadPartTypeEnum.TRAFFICLANE**

Lateral part of carriageway designated to vehicular traffic for a particular purpose.

NOTE Definition from ISO 6707-1: strip of carriageway intended to accommodate a single line of moving vehicles, frequently defined by road markings.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.4 Predefined Type: LAYBY

Full Identifier: **IfcRoadPartTypeEnum.LAYBY**

A lateral part of Road where vehicles can divert from ordinary stream of traffic.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.5 Predefined Type: PASSINGBAY

Full Identifier: **IfcRoadPartTypeEnum.PASSINGBAY**

A lateral part of Road that is a widening of an otherwise single lane road where a vehicle may move over to enable another vehicle to pass.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.6 Predefined Type: BUS_STOP

Full Identifier: **IfcRoadPartTypeEnum.BUS_STOP**

Lateral part of Road for stopping buses allowing them to draw out of the traffic lanes and wait for short periods.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.7 Predefined Type: PARKINGBAY

Full Identifier: **IfcRoadPartTypeEnum.PARKINGBAY**

Lateral part of Road for parking vehicles.

NOTE Definition from ISO 6707-1: Area intended, and usually designated and marked, for the parking of a vehicle.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.8 Predefined Type: CENTRALRESERVE

Full Identifier: **IfcRoadPartTypeEnum.CENTRALRESERVE**

Lateral RoadPart separating two carriageways of the same road or separating traffic lanes and sidewalk.

NOTE Definition from ISO 6707-1: area that separates the carriageways of a road with dual carriageways, (US:Median, UK:Central reservation).

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.9 Predefined Type: TRAFFICISLAND

Full Identifier: **IfcRoadPartTypeEnum.TRAFFICISLAND**

A central or subsidiary area raised or marked on the carriageway, generally at a road junction or level crossing, shaped and placed so as to direct traffic movement and/or provide refuge for pedestrians.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.10Predefined Type: CENTRALISLAND

Full Identifier: **IfcRoadPartTypeEnum.CENTRALISLAND**

The center of a roundabout not intended for traffic, can be painted or upraised.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.11Predefined Type: REFUGEISLAND

Full Identifier: **IfcRoadPartTypeEnum.REFUGEISLAND**

A raised platform or a guarded area so sited in the carriageway as to divide the streams of traffic and to provide a safety area for pedestrians.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.12Predefined Type: SHOULDER

Full Identifier: **IfcRoadPartTypeEnum.SHOULDER**

A lateral part of Road adjacent to, and usually at the same level as the Carriageway; not intended for vehicular traffic but may be used in case of emergency.

NOTE Definition from ISO 6707-1: part of a highway alongside a carriageway and at approximately the same level, exclusive of embankment or cutting slopes, (Shoulder, US).

NOTE Definition from PIARC: Part of the roadway between the carriageway and the ditch or the (cutting or embankment) slope, which gives the carriageway lateral support.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.13Predefined Type: HARDSHOULDER

Full Identifier: **IfcRoadPartTypeEnum.HARDSHOULDER**

A type of Shoulder that is surfaced, providing for safe use by vehicles in distress.

NOTE Definition from ISO 6707-1: surfaced strip, adjacent to and abutting a carriageway, intended for use by vehicles in the event of difficulty or during obstruction of the carriageway, (Emergency lane, Service lane, US).

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.14Predefined Type: SOFTSHOULDER

Full Identifier: **IfcRoadPartTypeEnum.SOFTSHOULDER**

A type of Shoulder that is not surfaced.

NOTE Definition from ISO 6707-1: strip alongside a carriageway not intended to support vehicular traffic.

NOTE Definition from PIARC: Shoulder not intended to support vehicular traffic.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.15Predefined Type: SIDEWALK

Full Identifier: **IfcRoadPartTypeEnum.SIDEWALK**

A footpath along the side of a road. May accommodate moderate changes in grade (elevation) and is normally separated from the vehicular section by a kerb. There may be a central reserve or road verge between the sidewalk and traffic lanes.

NOTE Definition from ISO 6707-1: portion of a road reserved exclusively for pedestrians, (Sidewalk, Walkway, US) (footway).

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.16Predefined Type: ROADSIDE

Full Identifier: **IfcRoadPartTypeEnum.ROADSIDE**

A lateral RoadPart located along the Road adjoining the outer edges of the Shoulders. A general concept comprising the areas outside RoadwayPlateau not intended for vehicles.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.10.17Predefined Type: ROADSIDEPART

Full Identifier: **IfcRoadPartTypeEnum.ROADSIDEPART**

A general concept for various parts of the Roadside.

NOTE Examples of roadside parts may be side slopes, roadside ditches, back slopes, bunds etc.

Status: **Proposed**

Package: **Lateral road decomposition**

Predefined Type Properties			
Predefined Type Container	IfcRoadPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		

1.3.1.11 Package: Spatial structure elements - Other

This package contains spatial structure elements with a lower priority for IFC Road.

Figure 14: Spatial structure elements - Other -

1.3.1.11.1 Virtual Entity: Parking garage

A type of building or a part of a building where vehicles can be parked on one or more storeys. Also: Multi-story car park.

NOTE Definition from ISO 6707-1: building in which motor vehicles are parked on different storeys

Entity Properties	
Realizing Parent	IfcBuilding
Notes	

1.3.1.11.2 Virtual Entity: Parking lot

An land area intended for parking vehicles usually divided into individual spaces,. Also: Vehicle park or Parking area.

NOTE Definition from ISO6707-1: area that is prepared and intended for the parking of a number of vehicles.

Entity Properties	
Realizing Parent	IfcFacility
Notes	

1.3.1.11.3 Virtual Entity: Service area

A place near a road providing services to road users and their vehicles.

NOTE Definition from ISO6707-1: land with access to and from a highway used for the provision of certain amenities and services.

Entity Properties	
Realizing Parent	IfcFacility
Notes	

1.3.2 Package: Spatial zones

This package contains elements participating in a non-hierarchical and potentially overlapping spatial decomposition of the project under some functional consideration.

1.3.2.1 Package: Road related zones and areas

Package for concepts covering other spaces not intended to be used by vehicles that are connected to a road, but not directly included in it (right-of-way).

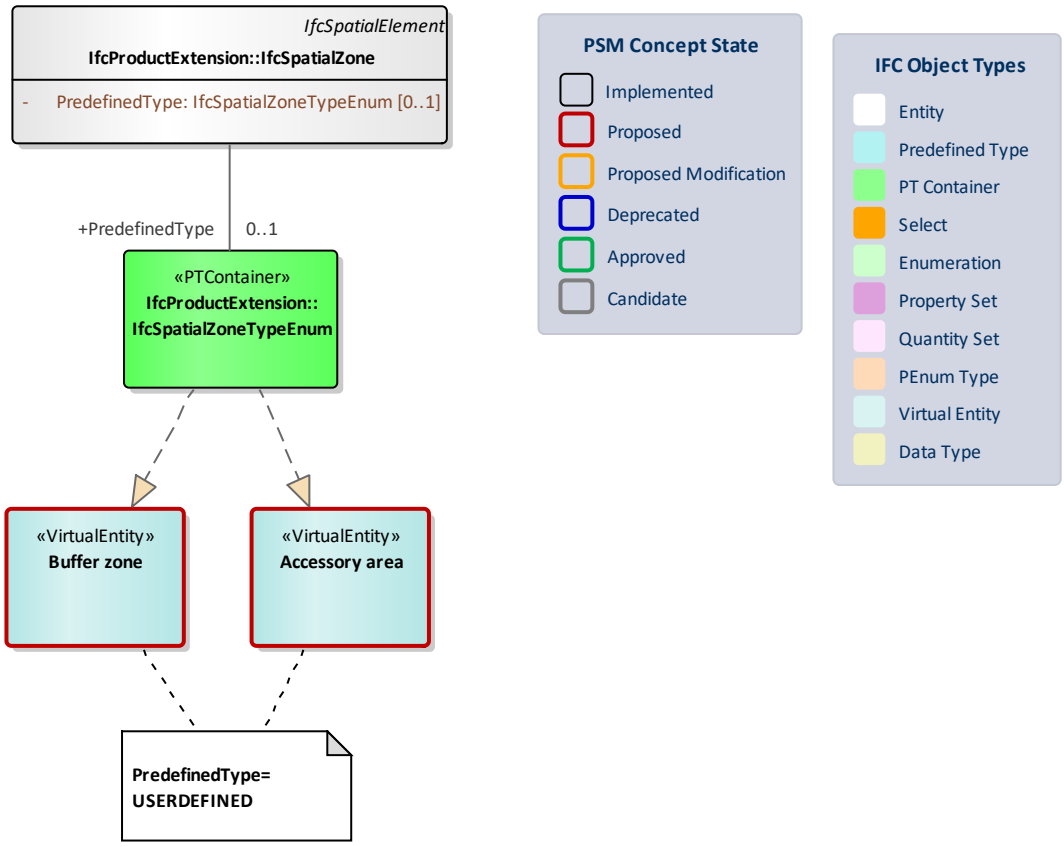


Figure 15: Road related zones and areas -

1.3.2.1.1 Virtual Entity: Accessory area

The accessory areas belonging to highways consist of borrow areas for road construction and maintenance materials outside the road area.

Entity Properties	
Realizing Parent	IfcSpatialZoneTypeEnum
Notes	PredefinedType = USERDEFINED

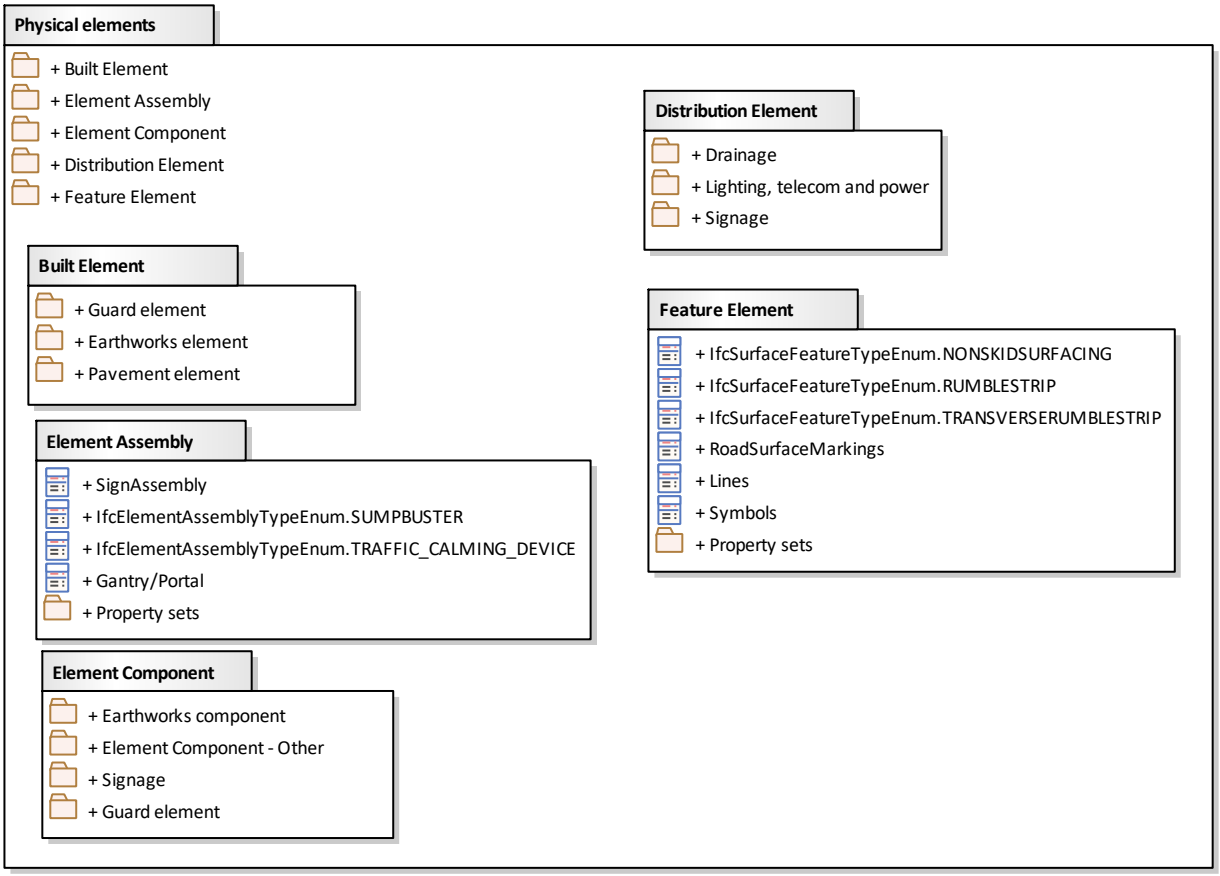
1.3.2.1.2 Virtual Entity: Buffer zone

Zone outside the road area where restrictions for building and installations may apply due to the road.

Entity Properties	
Realizing Parent	IfcSpatialZoneTypeEnum
Notes	PredefinedType = USERDEFINED

1.4 Package: Physical elements

This package contains concepts representing physical elements that makes up the road construction. These elements are logically contained in a spatial structure (see package Spatial elements). Typically, these physical elements have shape, location, material and other physical properties and provides the realization of some function.



(from IFC Road)

Figure 16: Physical elements -

1.4.1 Package: Built Element

This package addresses the modelling of elements that derive from IfcBuiltElement or IfcBuiltElementType. These comprise all elements that are primarily part of the construction of a built facility. Built elements are all physically existent and tangible things. Typical examples include walls, doors, beams or slabs.

1.4.1.1 Package: Earthworks element

This package addresses the modelling of earthworks elements.

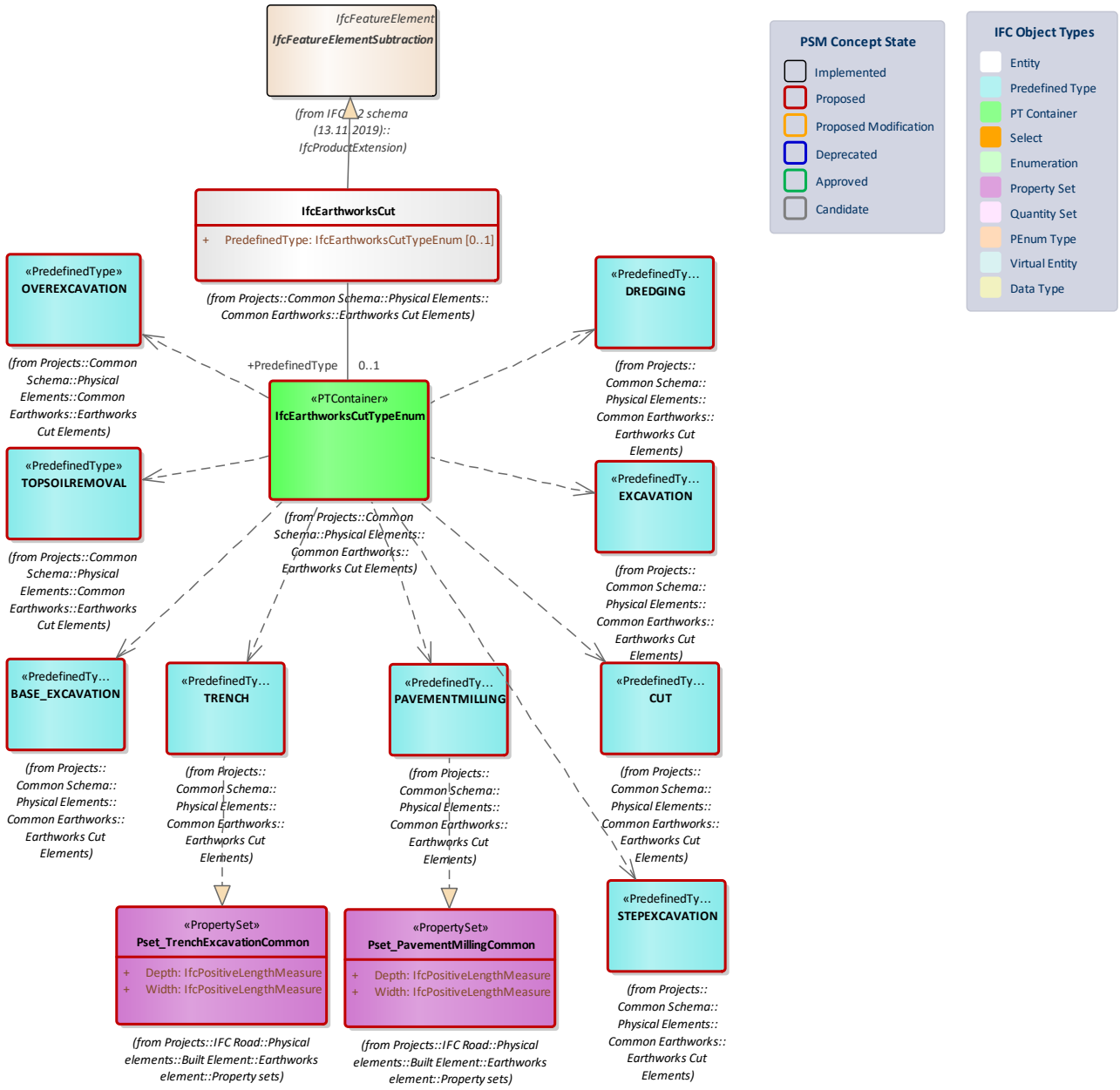


Figure 17: Earthworks element - Cut -

1.4.1.1.1 Predefined Type: STEPEXCAVATION

Full Identifier: **IfcEarthworksCutTypeEnum.STEPEXCAVATION**

Removal of the soft part of the existing road slope, where it is dug into steps, when widening a road.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		

1.4.1.1.2 Class: IfcEarthworksCut

The resulting void from modification of existing terrain or road structure by excavation or by other means of removing material.

NOTE Definition from ISO 6707-1: void that results from bulk excavation of material.

NOTE The material excavated and either used as fill or discarded as waste is not modelled as Cut, but may be handled as a different concept (Resource) in the future.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcFeatureElementSubtraction	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcEarthworksCutTypeEnum	[0..1]	Identifies the predefined type of a earthworks cut elements from which the type modelled, may be set. This type may associate additional specific property sets.

1.4.1.1.3 Predefined Type: EXCAVATION

Full Identifier: **IfcEarthworksCutTypeEnum.EXCAVATION**

General type of excavation when more accurate type is not specified.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		

1.4.1.1.4 Predefined Type: DREDGING

Full Identifier: **IfcEarthworksCutTypeEnum.DREDGING**

Underwater excavation to recover material or to create a greater depth of water.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		

1.4.1.1.5 Predefined Type: TOPSOILREMOVAL

Full Identifier: **IfcEarthworksCutTypeEnum.TOPSOILREMOVAL**

Excavation where the topmost layer of soil containing organic material is cut or stripped. The removed topsoil can be used as fill (EarthworksElement) e.g. where planting is planned.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		

1.4.1.1.6 Predefined Type: OVEREXCAVATION

Full Identifier: **IfcEarthworksCutTypeEnum.OVEREXCAVATION**

Excavation that goes beyond the depth required for construction, in order to replace unsuitable material.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		

1.4.1.1.7 Predefined Type: CUT

Full Identifier: **IfcEarthworksCutTypeEnum.CUT**

Excavation where soil or rock below topsoil is cut to the depth required for the construction of facilities such as roads and railways. The removed material can be used as fill (EarthworksElement) for embankments or to form a level surface on which to build.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		

1.4.1.1.8 Predefined Type: PAVEMENTMILLING

Full Identifier: **IfcEarthworksCutTypeEnum.PAVEMENTMILLING**

Removal of expired material from top of pavement to be replaced by new material.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		
Property sets	Pset_PavementMillingCommon		

1.4.1.1.9 Predefined Type: TRENCH

Full Identifier: **IfcEarthworksCutTypeEnum.TRENCH**

Excavation whose length greatly exceeds the depth and width. Trench is typically excavated for strip foundations or for buried services such as drainage or cabling.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		
Property sets	Pset_TrenchExcavationCommon		

1.4.1.1.10 Predefined Type: BASE_EXCAVATION

Full Identifier: **IfcEarthworksCutTypeEnum.BASE_EXCAVATION**

Excavation for basements of buildings, abutments of bridges or similar structures either partially or completely below ground level.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksCutTypeEnum	**Parent Entity**	IfcEarthworksCut
Stereotype	«PredefinedType»		
Property sets			

1.4.1.1.11 PDT Container: IfcEarthworksCutTypeEnum

This container defines the different predefined types of earthworks cut elements that can specify an IfcEarthworksCut.

Status: **Proposed**

Package: **Earthworks Cut Elements**

Container Properties			
Parent Entity	IfcEarthworksCut	**Stereotype**	«PTContainer»
Contains	**PROPOSED**		
	IfcEarthworksCutTypeEnum.BASE_EXCAVATION	IfcEarthworksCutTypeEnum.DREDGING	

	IfcEarthworksCutTypeEnum.OVEREXCAVATION IfcEarthworksCutTypeEnum.TRENCH IfcEarthworksCutTypeEnum.TOPSOILREMOVAL IfcEarthworksCutTypeEnum.EXCAVATION	IfcEarthworksCutTypeEnum.STEPEXCAVATION IfcEarthworksCutTypeEnum.CUT IfcEarthworksCutTypeEnum.PAVEMENTMILLING

1.4.1.1.12 Property Set: Pset_PavementMillingCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcEarthworksCutTypeEnum.PAVEMENTMILLING	**stereotype**	«PropertySet»

Properties

Name	Type	Multipl	Definition
Depth	IfcPositiveLengthMeasure		The nominal milling depth. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.
Width	IfcPositiveLengthMeasure		The nominal width of the milling. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.

1.4.1.1.13 Property Set: Pset_TrenchExcavationCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcEarthworksCutTypeEnum.TRENCH	**stereotype**	«PropertySet»

Properties

Name	Type	Multipl	Definition
Depth	IfcPositiveLengthMeasure		The nominal depth of the trench excavation. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.
Width	IfcPositiveLengthMeasure		The nominal width of the trench excavation. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the

			geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.

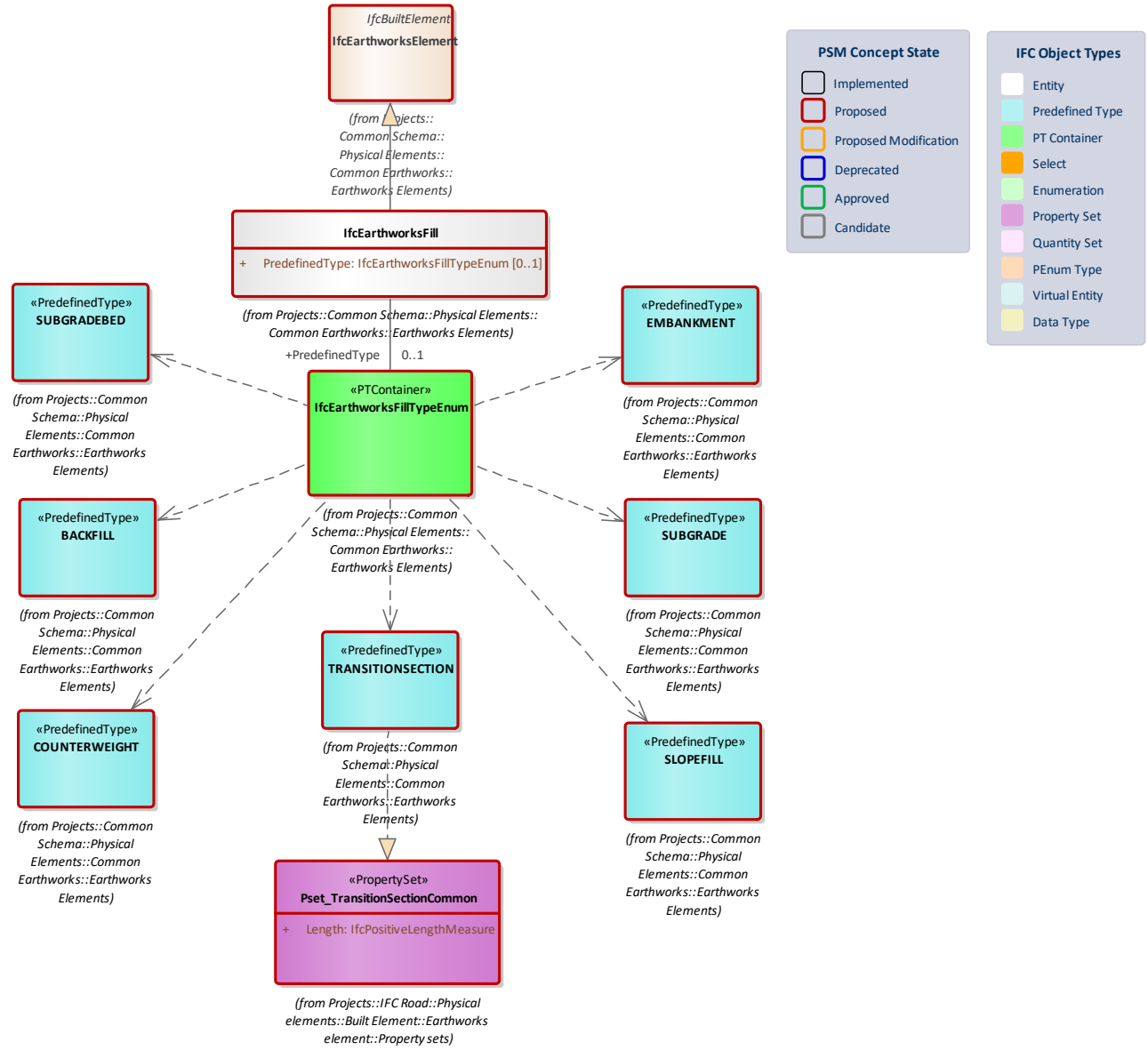


Figure 18: Earthworks element - Fill -

1.4.1.1.14 Class: IfcEarthworksElement

A type of built element created by earthwork activities to build subgrade, to raise the level of the ground in general or reinforce or stabilize soil by some mechanical or chemical method.

Status: **Proposed**

Package: **Earthworks Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcBuiltElement	
Subtypes	**EXISTING**	**PROPOSED**
		IfcReinforcedSoil IfcEarthworksFill

1.4.1.1.15 Class: IfcEarthworksFill

A type of earthworks element created by earthwork activities to build subgrade or to raise the level of the ground in general.

Status: **Proposed**

Package: **Earthworks Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcEarthworksElement	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
PredefinedType	IfcEarthworksFillTypeEnum	[0..1]	Identifies the predefined type of a earthworks fill elements from which the type modelled, may be set. This type may associate additional specific property sets.

1.4.1.1.16 PDT Container: IfcEarthworksFillTypeEnum

This container defines the different predefined types of earthworks fill elements that can specify an IfcEarthworksFill.

Status: **Proposed**

Package: **Earthworks Elements**

Container Properties			
Parent Entity	IfcEarthworksFill	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcEarthworksFillTypeEnum.TRANSITIONSECTION IfcEarthworksFillTypeEnum.SUBGRADEBED IfcEarthworksFillTypeEnum.EMBANKMENT IfcEarthworksFillTypeEnum.SUBGRADE IfcEarthworksFillTypeEnum.SLOPEFILL IfcEarthworksFillTypeEnum.COUNTERWEIGHT IfcEarthworksFillTypeEnum.BACKFILL	

1.4.1.1.17 Predefined Type: SUBGRADEBED

Full Identifier: **IfcEarthworksFillTypeEnum.SUBGRADEBED**

Upper part of the soil, natural or constructed, that supports the loads transmitted by the overlying structure of a road, runway, or similar hard surface.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksFillTypeEnum	**Parent Entity**	IfcEarthworksFill
Stereotype	«PredefinedType»		
Property sets			

1.4.1.1.18 Predefined Type: SUBGRADE

Full Identifier: **IfcEarthworksFillTypeEnum.SUBGRADE**

Type of earthworks element forming the structure below pavement and above natural soil.

NOTE Definition from ISO 6707-1: upper part of the soil, natural or constructed, that supports the loads transmitted by the overlying structure of a road, runway, or similar hard surface.

NOTE Definition from PIARC: Upper layer of the natural ground upon which the pavement is constructed.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksFillTypeEnum	**Parent Entity**	IfcEarthworksFill
Stereotype	«PredefinedType»		

1.4.1.1.19 Predefined Type: COUNTERWEIGHT

Full Identifier: **IfcEarthworksFillTypeEnum.COUNTERWEIGHT**

Embankment built on the side of the main road structure to reduce the settlement of the road.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksFillTypeEnum	**Parent Entity**	IfcEarthworksFill
Stereotype	«PredefinedType»		

1.4.1.1.20 Predefined Type: SLOPEFILL

Full Identifier: **IfcEarthworksFillTypeEnum.SLOPEFILL**

Side slope (batter) fill abutting the road structure or back slope fill.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksFillTypeEnum	**Parent Entity**	IfcEarthworksFill
Stereotype	«PredefinedType»		

1.4.1.1.21 Predefined Type: TRANSITIONSECTION

Full Identifier: **IfcEarthworksFillTypeEnum.TRANSITIONSECTION**

Section of subgrade to ensure the consistency of stiffness and prevent uneven settlement. Transition section may appear e.g. between: embankment and bridge abutment; embankment and transverse structure; cutting and tunnel; embankment and cutting.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksFillTypeEnum	**Parent Entity**	IfcEarthworksFill
Stereotype	«PredefinedType»		
Property sets	Pset_TransitionSectionCommon		

1.4.1.1.22 Predefined Type: EMBANKMENT

Full Identifier: **IfcEarthworksFillTypeEnum.EMBANKMENT**

Predominantly longitudinal type of earthworks element with no other particular assigned type according to its role in Pavement or Subgrade.

NOTE Definition from ISO6707-1: section of earthworks, often formed by cut or fill, where the finished ground level is above or below original ground level and whose length usually greatly exceeds its width.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksFillTypeEnum	**Parent Entity**	IfcEarthworksFill
Stereotype	«PredefinedType»		

1.4.1.1.23 Predefined Type: BACKFILL

Full Identifier: **IfcEarthworksFillTypeEnum.BACKFILL**

Fill behind retaining walls or other structures such as quays, behind abutments and bridges.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcEarthworksFillTypeEnum	**Parent Entity**	IfcEarthworksFill
Stereotype	«PredefinedType»		

1.4.1.1.24 Property Set: Pset_TransitionSectionCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcEarthworksFillTypeEnum.TRANSITIONSECTION	**stereotype**	«PropertySet»

Properties

Name	Type	Multipl	Definition
Length	IfcPositiveLengthMeasure		The nominal length of the transition section. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.

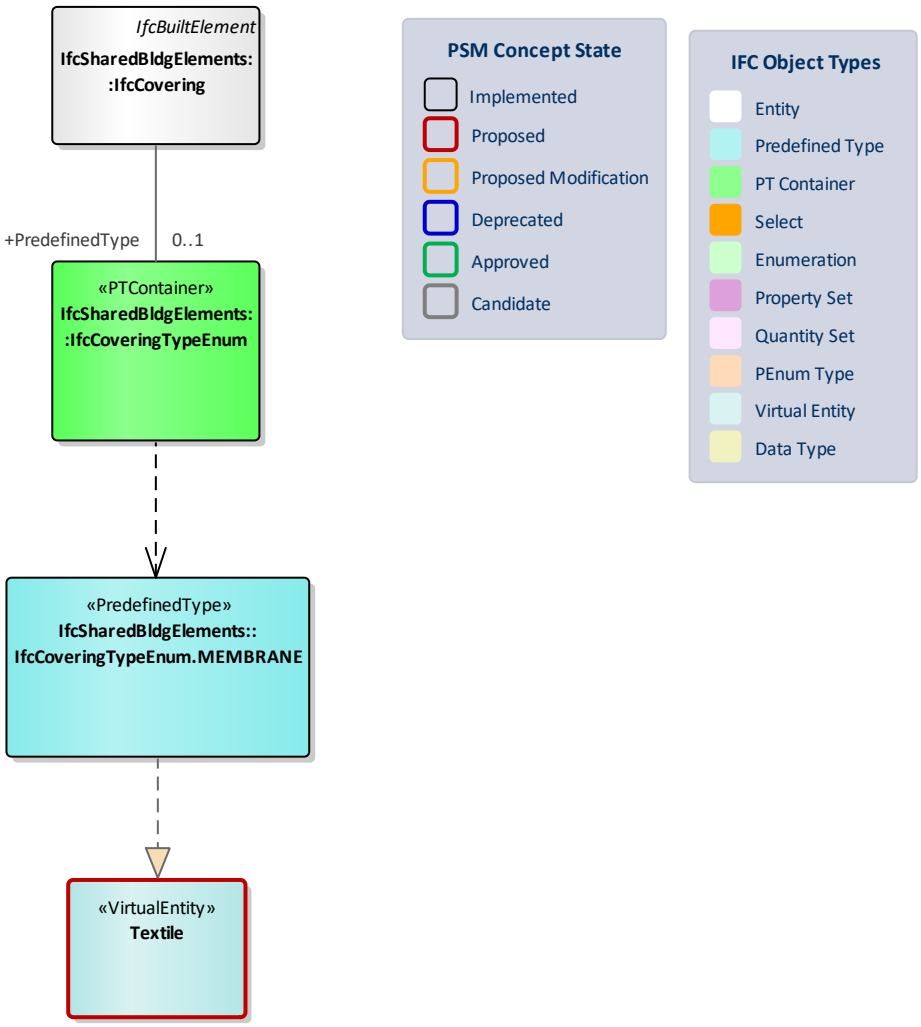


Figure 19: Earthworks element - Other -

1.4.1.1.25 Virtual Entity: Textile

Flexible sheet of material consisting of a network of natural or artificial fibres.

Entity Properties	
Realizing Parent	IfcCoveringTypeEnum.MEMBRANE
Notes	

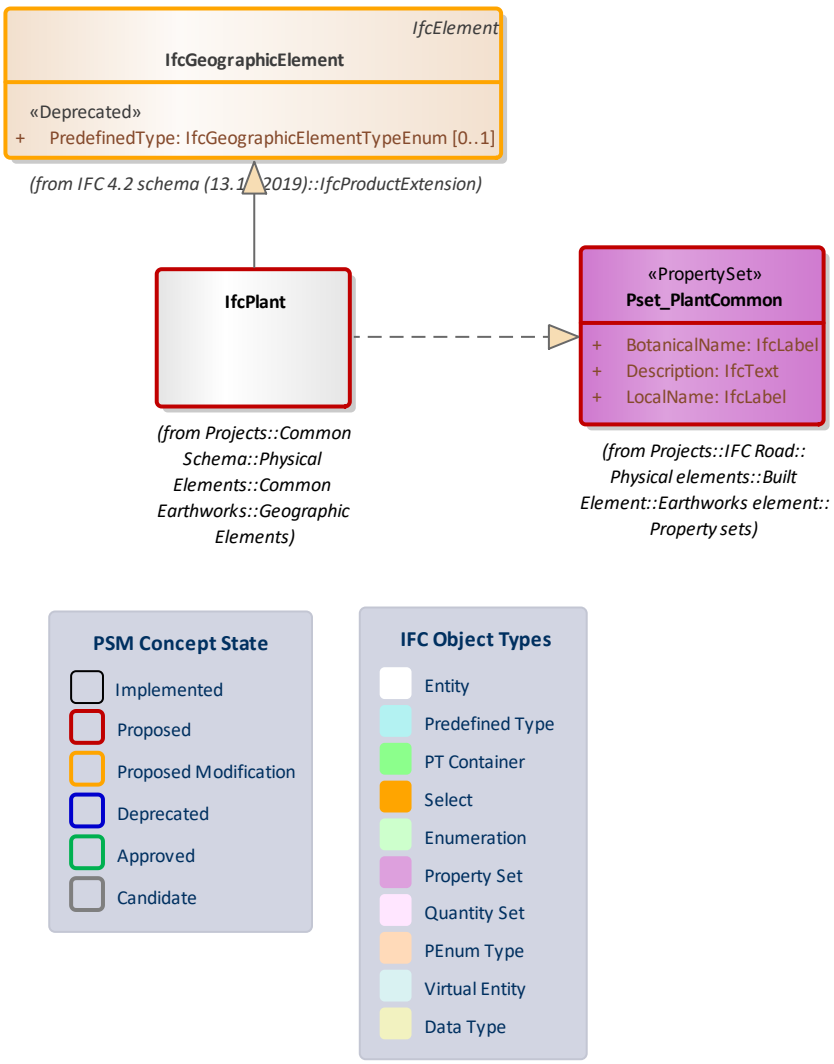


Figure 20: Earthworks element - Plant –

1.4.1.1.26 Class: IfcGeographicElement

An _IfcGeographicElement_ is a generalization of all elements within a geographical landscape. It includes occurrences of typical geographical elements, often referred to as features, such as trees or terrain. Common type information behind several occurrences of _IfcGeographicElement_ is provided by the _IfcGeographicElementType_.

REMOVE {> NOTE Roads are now represented by _IfcCivilElement_.}

> HISTORY New entity in IFC4.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcElement	
Subtypes	**EXISTING**	**PROPOSED**
		IfcPlant

Class Attributes

Name	Type	Multiplicity	Definition
«Deprecated» PredefinedType	IfcGeographicElementTypeEnum	[0..1]	

1.4.1.1.27 Class: IfcPlant

Trees, shrubs, herbs, grasses, ferns, and mosses.

NOTE: It is proposed to deprecate the PredefinedType attribute for existing IFC class IfcGeographicElement.

Status: **Proposed**

Package: **Geographic Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_PlantCommon		

Inheritance Statement		
Subtype Of	IfcGeographicElement	
Subtypes	**EXISTING**	**PROPOSED**

1.4.1.1.28 Property Set: Pset_PlantCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcPlant	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
BotanicalName	IfcLabel		Formal scientific name conforming to the International Code of Nomenclature for algae, fungi, and plants (ICN)
Description	IfcText		
LocalName	IfcLabel		The local name that the plant is known as.

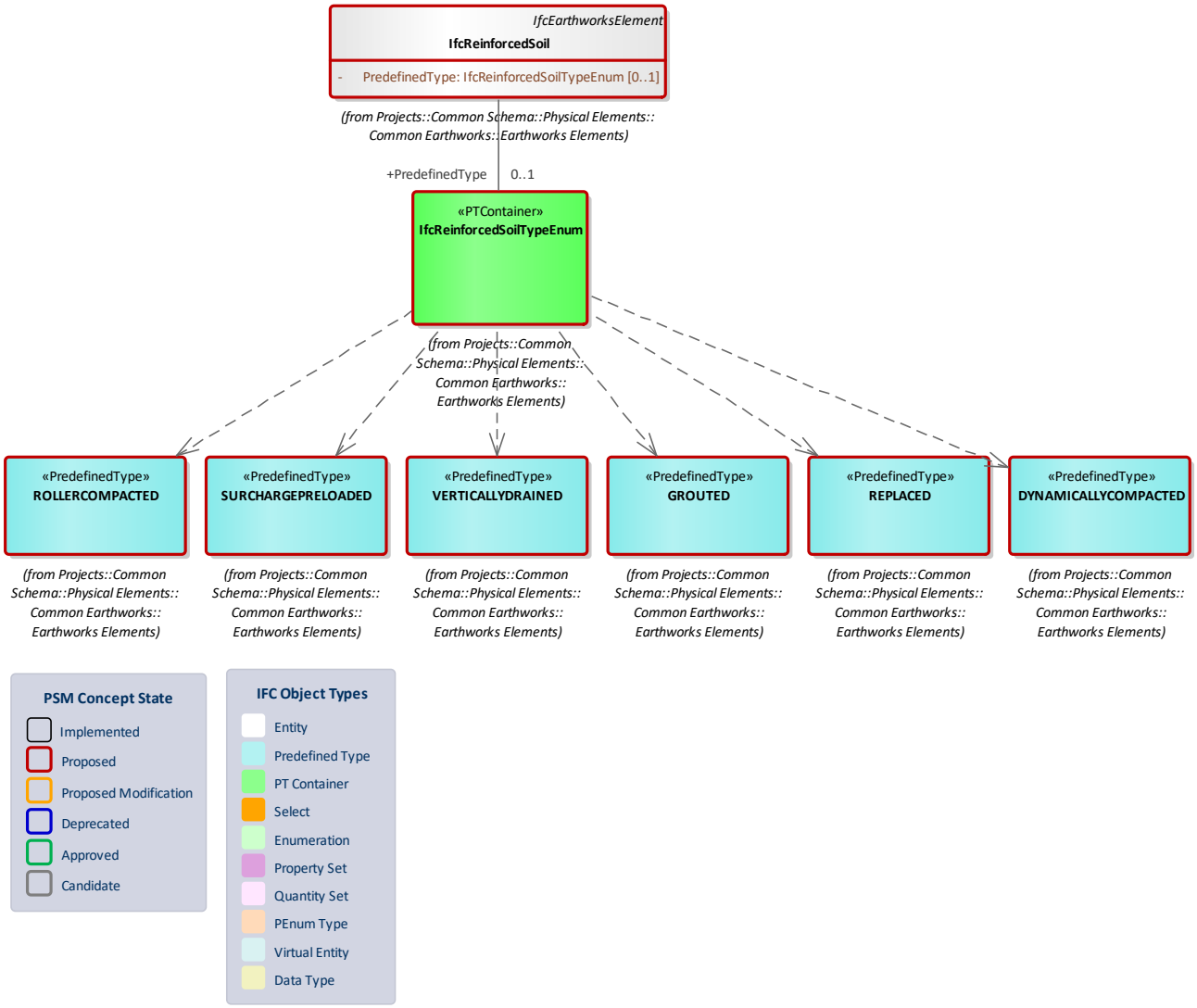


Figure 21: Earthworks element - Reinforced soil -

1.4.1.1.29 Class: IfcReinforcedSoil

Soil reinforced or stabilized by some mechanical or chemical method.

Status: **Proposed**

Package: **Earthworks Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcEarthworksElement	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcReinforcedSoilTypeEnum	[0..1]	Identifies the predefined type of a reinforced soil elements from which the type modelled, may be set. This type may associate additional specific property sets.

1.4.1.1.30 PDT Container: IfcReinforcedSoilTypeEnum

This container defines the different predefined types of soil reinforcement that can specify an IfcReinforcedSoil.

Status: **Proposed**

Package: **Earthworks Elements**

Container Properties			
Parent Entity	IfcReinforcedSoil	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcReinforcedSoilTypeEnum.VERTICALLYDRAINED IfcReinforcedSoilTypeEnum.SURCHARGEPRELOADED IfcReinforcedSoilTypeEnum.ROLLERCOMPACTED IfcReinforcedSoilTypeEnum.REPLACED IfcReinforcedSoilTypeEnum.GROUTED IfcReinforcedSoilTypeEnum.DYNAMICALLYCOMPACTED	

1.4.1.1.31 Predefined Type: DYNAMICALLYCOMPACTED

Full Identifier: **IfcReinforcedSoilTypeEnum.DYNAMICALLYCOMPACTED**

The method of using dynamic tamping machine to drop the heavy hammer freely from the high place, compacting the soil and quickly improving the bearing capacity of the foundation.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcReinforcedSoilTypeEnum	**Parent Entity**	IfcReinforcedSoil
Stereotype	«PredefinedType»		

1.4.1.1.32 Predefined Type: GROUTED

Full Identifier: **IfcReinforcedSoilTypeEnum.GROUTED**

A method of injecting some curable slurry into cracks or pores of a geotechnical foundation to improve its physical and mechanical properties.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcReinforcedSoilTypeEnum	**Parent Entity**	IfcReinforcedSoil
Stereotype	«PredefinedType»		

1.4.1.1.33 Predefined Type: REPLACED

Full Identifier: **IfcReinforcedSoilTypeEnum.REPLACED**

Dig out the soft soil in a certain range below the foundation ground and then backfill the area with high strength, low compressibility and no corrosive materials.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcReinforcedSoilTypeEnum	**Parent Entity**	IfcReinforcedSoil
Stereotype	«PredefinedType»		

1.4.1.1.34 Predefined Type: ROLLERCOMPACTED

Full Identifier: **IfcReinforcedSoilTypeEnum.ROLLERCOMPACTED**

A kind of compacting method that adopts rolling machinery, repeated rolling and vibration to make foundation soil compacted, strength increased and compressibility decreased.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcReinforcedSoilTypeEnum	**Parent Entity**	IfcReinforcedSoil
Stereotype	«PredefinedType»		

1.4.1.1.35 Predefined Type: SURCHARGEPRELOADED

Full Identifier: **IfcReinforcedSoilTypeEnum.SURCHARGEPRELOADED**

A method that applies load to the foundation to discharge pore water, and the foundation is consolidated to improve the foundation strength. Unloading when the carrying capacity reaches the required level.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcReinforcedSoilTypeEnum	**Parent Entity**	IfcReinforcedSoil
Stereotype	«PredefinedType»		

1.4.1.1.36 Predefined Type: VERTICALLYDRAINED

Full Identifier: **IfcReinforcedSoilTypeEnum.VERTICALLYDRAINED**

A method to set vertical drainage measures in the foundation, so that pore water in the soil is discharged and the foundation strength is improved.

Status: **Proposed**

Package: **Earthworks Elements**

Predefined Type Properties			
Predefined Type Container	IfcReinforcedSoilTypeEnum	**Parent Entity**	IfcReinforcedSoil
Stereotype	«PredefinedType»		

1.4.1.2 Package: Pavement element

Physical elements belonging to the road pavement.

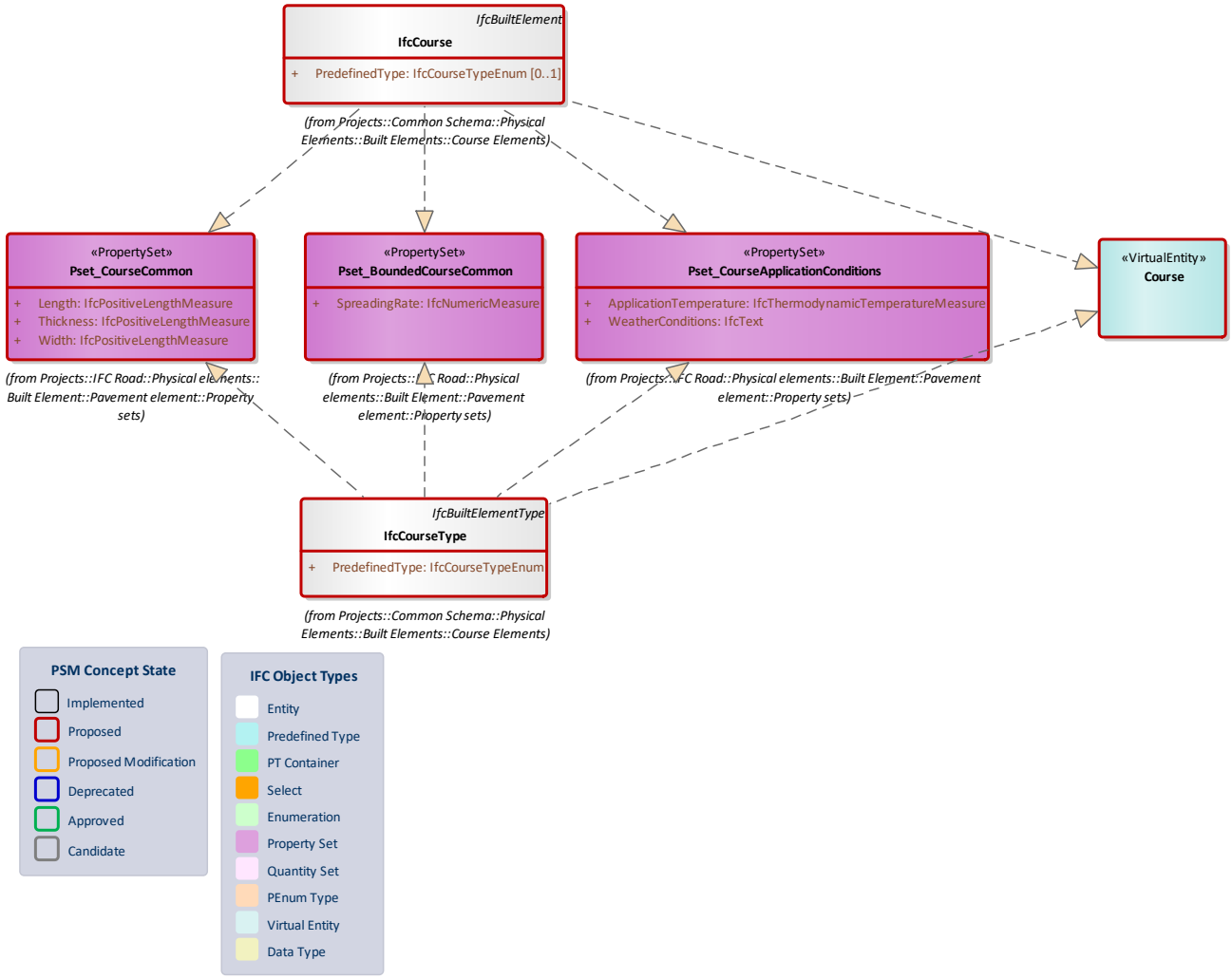


Figure 22: Course element -

1.4.1.2.1 Class: IfcCourse

A built element whose length greatly exceeds its thickness and often also its width, usually of a single material laid on site on top of another horizontal or nearly horizontal built element. A course is distinctive from a earthworks element in that a course is a graded granular (which can be bound or unbound) material that is generally processed in some fashion, where as earthworks elements are soil earthen based structure that can be formed by removal and transport of general ground material.

Structurally a course does not have capacity to carry loads over open span, or to be removed or replaced as a single unit. examples of courses include:

- Graded aggregate layers
- Graded sand layers
- Cement bounded material (CBM)
- Asphalt layers

Status: **Proposed**

Package: **Course Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_CourseApplicationConditions Pset_BoundedCourseCommon Pset_CourseCommon		

Inheritance Statement		
Subtype Of	IfcBuiltElement	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipl	Definition
PredefinedType	IfcCourseTypeEnum	[0..1]	Identifies the predefined type of a course element from which the type modelled, may be set. This type may associate additional specific property sets. NOTE The PredefinedType shall only be used, if no IfcCourseType is assigned, providing its own IfcCourseType.PredefinedType.

1.4.1.2.2 Class: IfcCourseType

The IfcCourseType provides the type information for IfcCourse occurrences.

A course is a built element whose length greatly exceeds its thickness and often also its width, usually of a single material laid on site on top of another horizontal or nearly horizontal built element. A course is distinctive from a earthworks element in that a course is a graded granular (which can be bound or unbound) material that is generally processed in some fashion, where as earthworks elements are soil earthen based structure that can be formed by removal and transport of general ground material.

Structurally a course does not have capacity to carry loads over open span, or to be removed or replaced as a single unit.

Status: **Proposed**

Package: **Course Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_CourseApplicationConditions Pset_BoundedCourseCommon Pset_CourseCommon		

Inheritance Statement		
Subtype Of	IfcBuiltElementType	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
PredefinedType	IfcCourseTypeEnum		Identifies the predefined types of a course element from which the type modelled, may be set.

1.4.1.2.3 Property Set: Pset_BoundedCourseCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcCourseType IfcCourse	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
SpreadingRate	IfcNumericMeasure		The nominal overall mass of material per area covered by the course.

1.4.1.2.4 Property Set: Pset_CourseApplicationConditions

Status: **Proposed**

Set Properties			
Applicable Entities	IfcCourseType IfcCourse	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
ApplicationTemperature	IfcThermodynamicTemperatureMeasure		Indicates the ambient temperature at which the course is applied
WeatherConditions	IfcText		Indicates the weather conditions during the application of the course

1.4.1.2.5 Property Set: Pset_CourseCommon

Common properties for courses.

Status: **Proposed**

Set Properties			
Applicable Entities	IfcCourseType IfcCourse	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
Length	IfcPositiveLengthMeasure		The nominal overall length of the course. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size...?
Thickness	IfcPositiveLengthMeasure		The nominal overall thickness of the course. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size...?
Width	IfcPositiveLengthMeasure		The nominal overall width of the course. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size...?

1.4.1.2.6 Virtual Entity: Course

A building element whose length greatly exceeds its thickness and often also its width, usually of a single material laid on site on top of another horizontal or nearly horizontal building element. Structurally a Course does not have capacity to carry loads over open span, or to be removed or replaced as a single unit

NOTE For IFC Road, the following types of courses have been identified but not added to the conceptual model due to the fact that the elements (including terms and definitions) can vary greatly between nations; instead, these would be typical values of the inherited attribute ObjectType:

- **Paving** : Type of Course directly in contact with traffic loads e.g. in gravel road (also Surface layer or Wearing course).
- **AnticapillaryLayer** : Type of Course, layer preventing capillary rise of water from underlying layers.

NOTE Definition from PIARC: Protective bottom layer with no fines, designed to prevent capillary rise of water from the subgrade soil or from underlying layers.

- **AntifreezingLayer** : Type of Course, layer intended to prevent frost from penetrating into the subgrade. Also: Frost blanket course.
- **BaseCourse** : A layer immediately beneath the surface of binder course providing additional load distribution and contributing to the sub-surface drainage.
- **BinderCourse** : A layer to distribute loads to the base course.
- **CappingLayer** : Top layer of subgrade to improve its load bearing capacity.

NOTE Definition from PIARC: Optional layer of granular or treated material on top of the subgrade and immediately below formation level, to provide improved foundation for the subbase layer [CEN].

- **DrainingCourse** : Layer of pervious material to relieve pore pressure or facilitate drainage of overlying layers.
- **TackCoat** : A thin coating of tar or asphalt applied before a road is laid to form an adhesive bond.
- **LayingCourse** : Type of Course, layer of material providing a bed for which block (stone) paving.
- **RegulatingCourse** : Type of Course, layer of variable thickness for adjusting a surface so meet specified even level. Also: Levelling course.

NOTE Definition from PIARC: Course of variable thickness applied to an existing course or surface to provide the necessary profile for a further course of constant thickness (CEN).

- **Sealing** : A layer of impermeable material.
- **SubBaseCourse** : A layer between subgrade and base course.

NOTE Definition from PIARC: Layer or layers of specified or selected material of designed thickness placed on a subgrade to support a base layer (or a cement concrete slab in the case of rigid pavements).

- **SeparationLayer** : A layer intended to prevent mixing of material from above layer with fine material or water in layer below.

NOTE Definition from PIARC: Layer of material designed to prevent the ascent of water or fines from a lower layer.

- **AnticrackingLayer** : A layer intended to isolate surface layers from cracking in lower layer.

NOTE Definition from PIARC Layer intended to prevent the reflection of cracks from a lower layer to the surface.

- **PrimeCoat** : An application of a low viscosity asphalt to a granular base in preparation for an initial layer of asphalt.
- **VergeFill** : Soft shoulder between paved surface and side slope.

Entity Properties	
Realizing Parent	IfcCourseType IfcCourse
Notes	

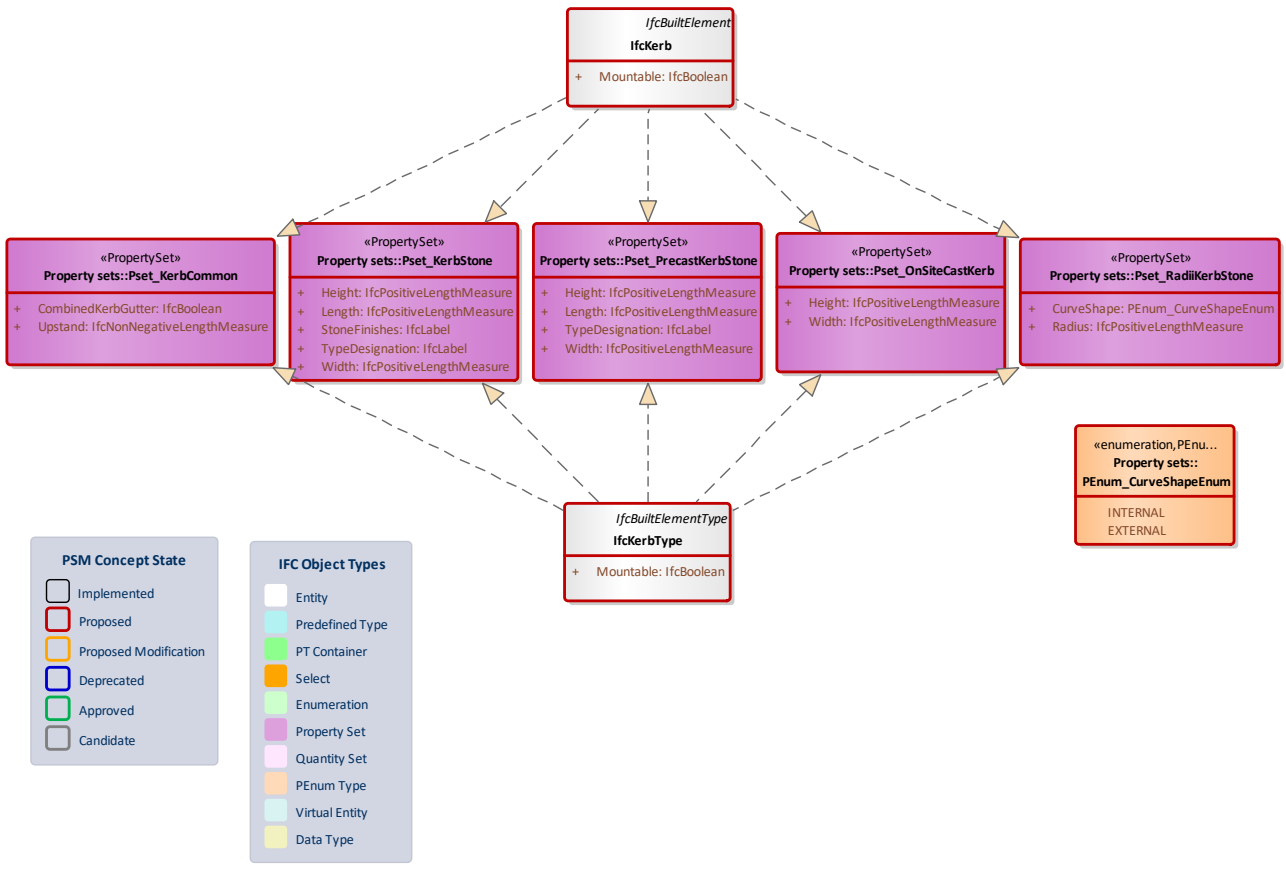


Figure 23: Kerb element -

1.4.1.2.7 Class: IfcKerb

A border of stone, concrete or other rigid material formed at the edge of the carriageway or footway.

NOTE Definition from ISO 6707-1: border, usually upstanding, at the edge of a carriageway, hard strip, hard shoulder, or footway, (Curb, US).

NOTE Definition from PIARC: Unit intended to separate surfacings of different surfaces and to provide physical delineation or containment [CEN].

Status: **Proposed**

Package: **Pavement element**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_RadiiKerbStone Pset_OnSiteCastKerb Pset_PrecastKerbStone	Pset_KerbStone Pset_KerbCommon	

Inheritance Statement		
Subtype Of	IfcBuiltElement	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multiplicity	Definition
Mountable	IfcBoolean		Specifies whether the kerb can be readily climbed by a vehicle or not.

1.4.1.2.8 Class: IfcKerbType

The IfcKerbType provides the type informaton for the IfcKerb element.

An IfcKerb is a border of stone, concrete or other rigid material formed at the edge of the carriageway or footway.

Status: **Proposed**

Package: **Pavement element**

Class Properties			
Status	Proposed	**Is Abstract**	

Property sets	Pset_RadiiKerbStone Pset_OnSiteCastKerb Pset_PrecastKerbStone	Pset_KerbStone Pset_KerbCommon

Inheritance Statement		
Subtype Of	IfcBuiltElementType	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multiplicity	Definition
Mountable	IfcBoolean		Specifies whether the kerb can be readily climbed by a vehicle or not.

1.4.1.2.9 Property Set: Pset_OnSiteCastKerb

Status: **Proposed**

Set Properties			
Applicable Entities	IfcKerb IfcKerbType	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
Height	IfcPositiveLengthMeasure		The height of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.
Width	IfcPositiveLengthMeasure		The width of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.

1.4.1.2.10 Property Set: Pset_PrecastKerbStone

Status: **Proposed**

Set Properties			
Applicable Entities	IfcKerb IfcKerbType	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
Height	IfcPositiveLength Measure		The height of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.
Length	IfcPositiveLength Measure		The length of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.
TypeDesignation	IfcLabel		Type designator for the element. The content depends on local standards. Eg. 'Bull nose', 'Half batter', 'Dropper', 'Chamfer' etc
Width	IfcPositiveLength Measure		The width of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.

1.4.1.2.11 Property Set: Pset_KerbCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcKerb IfcKerbType	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
CombinedKerbGutter	IfcBoolean		Indicating the use of a combined kerb and gutter.
Upstand	IfcNonNegativeLengthMeasure		The height difference between the two separated surfaces.

1.4.1.2.12 Property Set: Pset_KerbStone

Status: **Proposed**

Set Properties			
Applicable Entities	IfcKerb IfcKerbType	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
Height	IfcPositiveLength Measure		The height of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.
Length	IfcPositiveLength Measure		The length of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.
StoneFinishes	IfcLabel		Eg. 'Polished', 'Bush Hammered', 'Split', 'Sawn', 'Flamed'
TypeDesignation	IfcLabel		Type designator for the element. The content depends on local standards. Eg. 'Bull nose', 'Half batter', 'Dropper', 'Chamfer' etc
Width	IfcPositiveLength Measure		The nominal width of the object. The size information is provided in addition to the shape representation and the geometric parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.

1.4.1.2.13 Property Set: Pset_RadiiKerbStone

Status: **Proposed**

Set Properties			
Applicable Entities	IfcKerb IfcKerbType	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
CurveShape	PEnum_CurveShapeEnum		Shape according to CurveShapeEnum
Radius	IfcPositiveLengthMeasure		The radius of the object. The size information is provided in addition to the shape representation and the geometric

			parameters used within. In cases of inconsistency between the geometric parameters and the size properties, provided in the attached property set, the geometric parameters take precedence.

1.4.1.2.14 Enumeration: PEnum_CurveShapeEnum

Status: **Proposed**

Package: **Property sets**

Enumerators

Name	Definition
INTERNAL	a kerb that is curving inwards when you stand in front of the kerb (aka. Concave).
EXTERNAL	A kerb that is curving outwards when you stand in front of the kerb (aka. Convex).

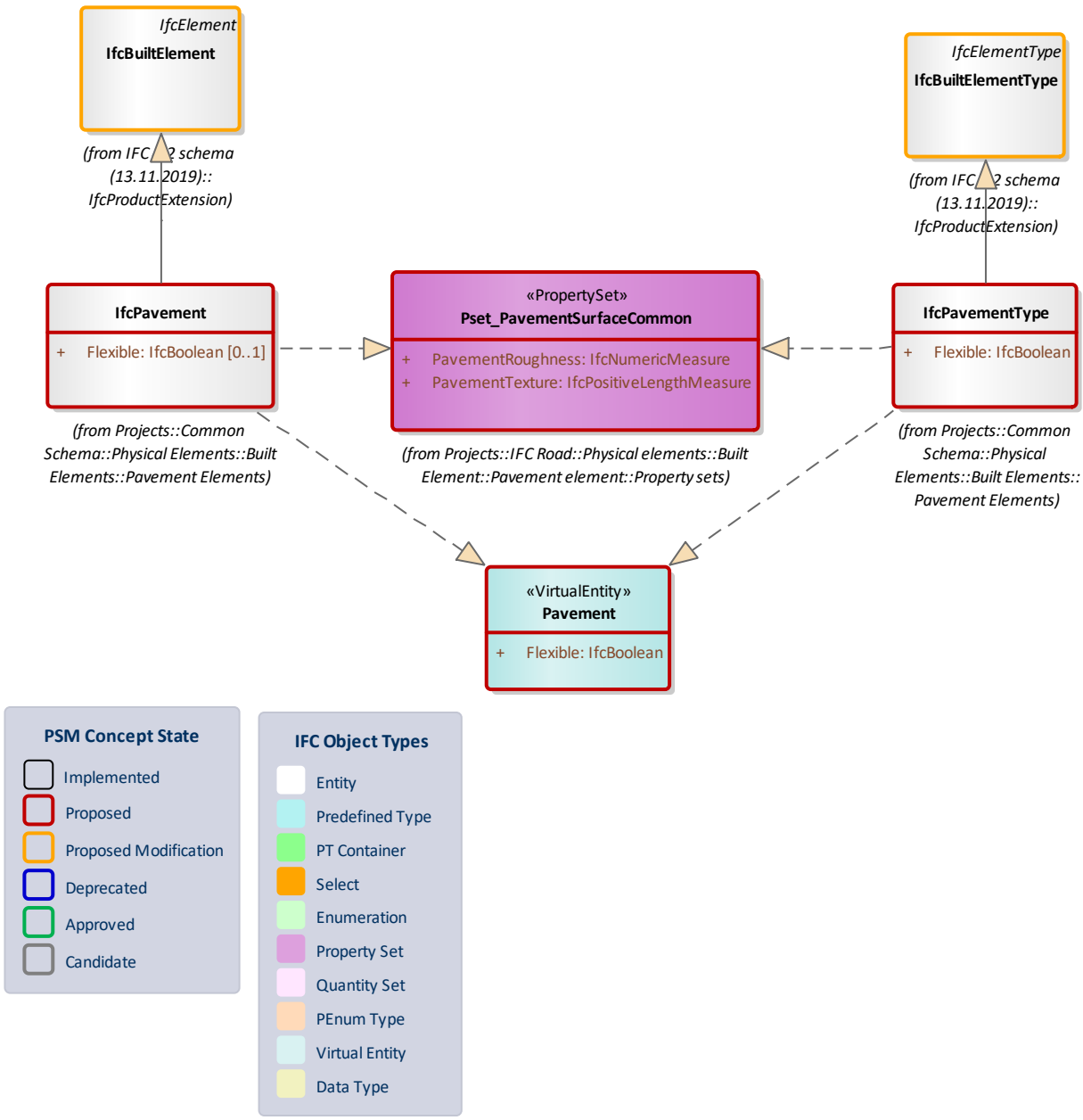


Figure 24: Pavement element -

1.4.1.2.15 Class: IfcPavement

Type of built element in a road or other paved area to provide an even surface sustaining loads from vehicles or pedestrians, usually comprising several courses.

NOTE Definition from ISO 6707-1: road, runway, or similar construction above the subgrade.

Status: **Proposed**

Package: **Pavement Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_PavementSurfaceCommon		

Inheritance Statement		
Subtype Of	IfcBuiltElement	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
Flexible	IfcBoolean	[0..1]	Boolean to identify the pavement type as a Flexible or Rigid structure.

1.4.1.2.16 Class: IfcPavementType

The IfcPavementType provides the type information for IfcPavement occurrences.

A pavement is a type of built element in a road or other paved area to provide an even surface sustaining loads from vehicles or pedestrians, usually comprising several courses.

Status: **Proposed**

Package: **Pavement Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_PavementSurfaceCommon		

Inheritance Statement		
Subtype Of	IfcBuiltElementType	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multiplicity	Definition
Flexible	IfcBoolean		Boolean to identify the pavement type as a Flexible or Rigid structure.

1.4.1.2.17 Property Set: Pset_PavementSurfaceCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcPavementType IfcPavement	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
PavementRoughness	IfcNumericMeasure		An assessment of the functional condition of the pavement surface indicated as an index according to the International Roughness Index (IRI).
PavementTexture	IfcPositiveLengthMeasure		Characterization of pavement texture by mean profile depth (ISO 13473-1:2019)

1.4.1.2.18 Virtual Entity: Pavement

Type of BuildingElement in Road or other paved area to provide an even surface sustaining loads from vehicles or pedestrians, usually comprising several courses.

NOTE Definition from ISO 6707-1: road, runway, or similar construction above the subgrade.

NOTE Definition from PIARC: Part of the road structure above the capping layer or improved subgrade.

Entity Properties	
Realizing Parent	IfcPavementType IfcPavement
Notes	

1.4.1.3 Package: Guard element

Physical elements which provide protection for either traffic or the surrounding environment

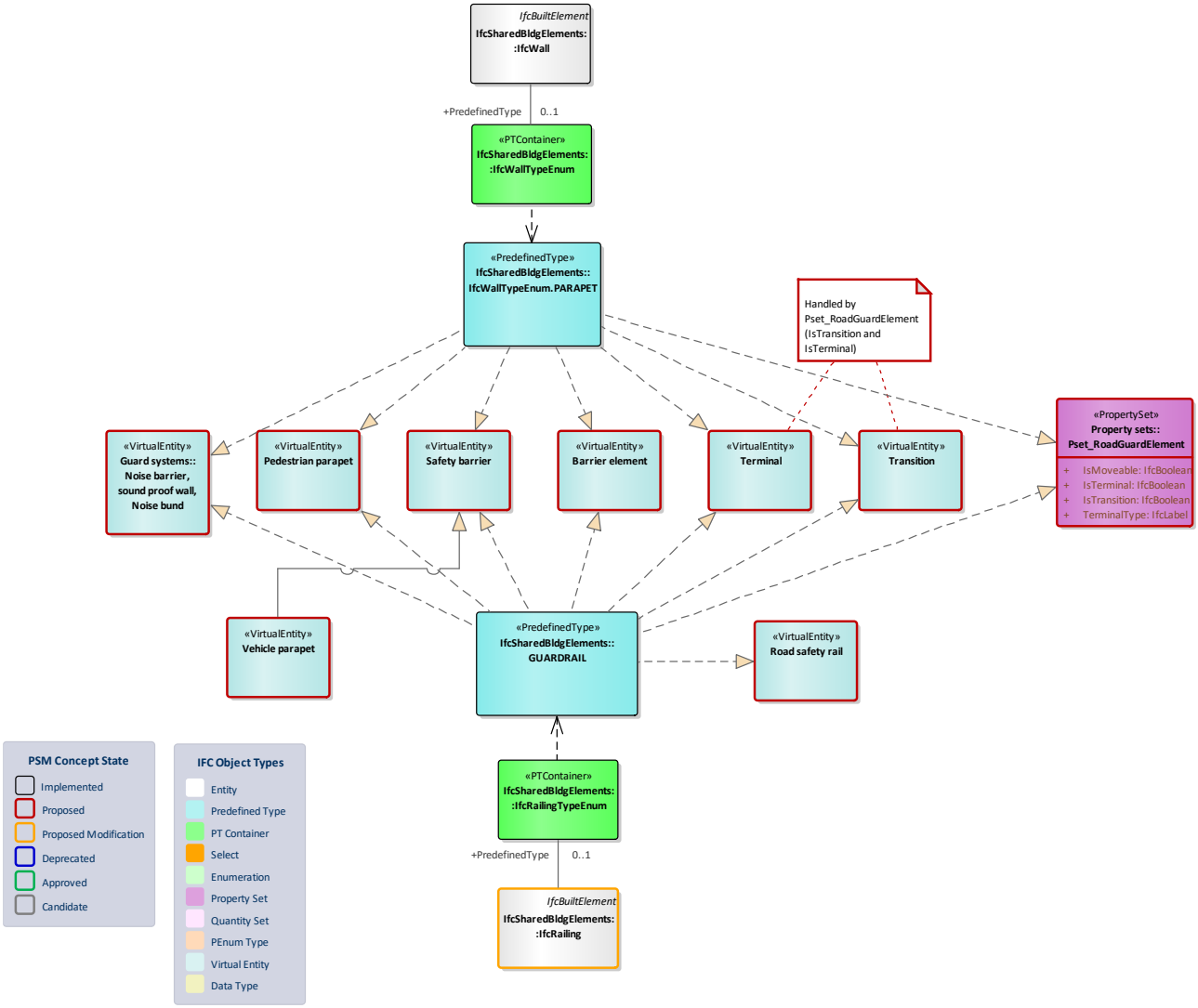


Figure 25: Guard element -

1.4.1.3.1 Property Set: Pset_RoadGuardElement

Properties assigned to IfcWall/PARAPET or IfcRailing/GUARDRAIL.

Status: **Proposed**

Set Properties			
Applicable Entities	IfcWallTypeEnum.PARAPET IfcRailingTypeEnum.GUARDRAIL	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
IsMoveable	IfcBoolean		True if element is moveable.
IsTerminal	IfcBoolean		True if element is a terminal. See class Terminal.
IsTransition	IfcBoolean		True if element is a transition. See class Transition.
TerminalType	IfcLabel		Specifies the kind of terminal if IsTerminal is true.

1.4.1.3.2 Class: IfcRailing

The railing is a frame assembly adjacent to human or vehicle circulation spaces and at some space boundaries where it is used in lieu of walls or to complement walls. REMOVE{ Designed to aid humans, either as an optional physical support, or to prevent injury or damage, either by falling or collision.} Designed as an optional physical support, or to prevent injury or damage, either by falling or collision.

> HISTORY New entity in IFC2.0

bSI Documentation

Status: **ProposedModification**

Package: **IfcSharedBldgElements**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcBuiltElement	
Subtypes	**EXISTING**	**PROPOSED**

1.4.1.3.3 Virtual Entity: Noise barrier, sound proof wall, Noise bund

NOTE Definition from ISO6707-1: structure provided to deflect and absorb noise

Bund: noise barrier in the form of an embankment, (Noise barrier, Sound barrier, US)

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL IfcWallTypeEnum.PARAPET IfcBuiltSystem IfcEarthworksFillTypeEnum.EMBANKMENT

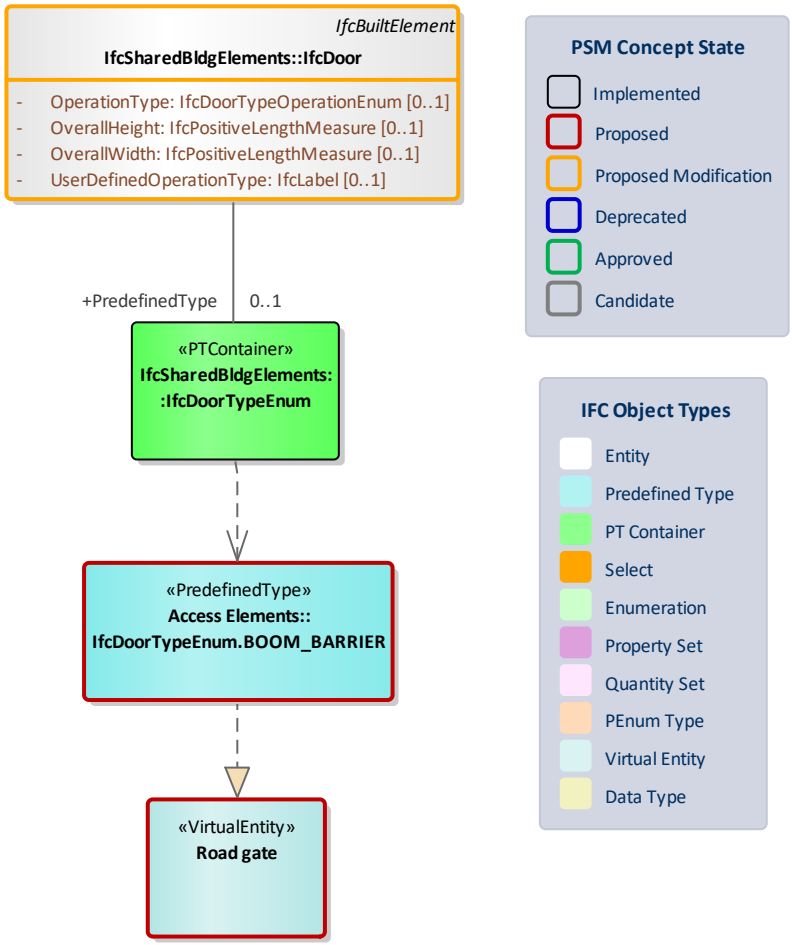


Figure 26: Guard element - Road gate -

1.4.1.3.4 Class: IfcDoor

The door is a built element that is predominately used to provide controlled access for people, goods, animals and vehicles. It includes constructions with hinged, pivoted, sliding, and additionally revolving and folding operations. REMOVE: A door consists of a lining and one or several panels.

NOTE Definition according to ISO 6707-1: construction for closing an opening, intended primarily for access with hinged, pivoted or sliding operation.

The _IfcDoor_ defines a particular occurrence of a door inserted in the spatial context of a project. A door can:

- be inserted as a filler in an opening using the _IfcRelFillsElement_ relationship, then the _IfcDoor_ has an inverse attribute _FillsVoids_ provided;
  NOTE View definitions or implementer agreements may restrict the relationship to only include one door into one opening

- be part of an element assembly, in general an _IfcCurtainWall_, using the _IfcRelAggregates_ relationship, then the _IfcDoor_ has an inverse attribute _Decomposes_ is provided;
- be a "free standing" door, then the _IfcDoor_ has no inverse attributes _FillsVoids_ or _Decomposes_ provided.

This specification provides two entities for door occurrences:

- IfcDoorStandardCase used for all occurrences of doors, that have a ''Profile'' shape representation defined to which a set of shape parameters for lining and framing properties apply. Additionally it requires the provision of an _IfcDoorType_ that references one IfcDoorLiningProperties and on to many IfcDoorPanelProperties;
  NOTE see IfcDoorStandardCase for all specific constraints imposed by this subtype.

- IfcDoor used for all other occurrences of doors, particularly for doors having only ''Brep'', or ''SurfaceModel'' geometry without applying shape parameters.

The actual parameters of the door and/or its shape are defined by the _IfcDoor_ as the occurrence definition (or project instance), or by the _IfcDoorType_ as the specific definition (or project type). The following parameters are given:

at the IfcDoor or IfcDoorStandardCase for occurrence specific parameters. The IfcDoor specifies:

- the door width and height
- the door opening direction (by the y-axis of the ObjectPlacement)* at the _IfcDoorType_, to which the IfcDoor is related by the inverse relationship IsTypedBy pointing to IfcRelDefinesByType, for type parameters common to all occurrences of the same type.

at the IfcDoorType, to which the IfcDoor is related by the inverse relationship IsTypedBy pointing to IfcRelDefinesByType, for type parameters common to all occurrences of the same type.

- the operation type (single swing, double swing, revolving, etc.)
- the door hinge side (by using two different styles for right and left opening doors)
- the construction material type
- the particular attributes for the lining by the IfcDoorLiningProperties
- the particular attributes for the panels by the IfcDoorPanelProperties

The geometric representation of _IfcDoor_ is given by the IfcProductDefinitionShape, allowing multiple geometric representations. The _IfcDoor_ may get its parameter and shape from the _IfcDoorType_. If an IfcRepresentationMap (a block definition) is defined for the IfcDoorType, then the IfcDoor inserts it through the IfcMappedItem.

The geometric representation of _IfcDoor_ is defined using the following (potentially multiple) IfcShapeRepresentation's for its IfcProductDefinitionShape:

- **'Profile'**: A''Curve3D'' consisting of a single losed curve defining the outer boundary of the door (lining). The door parametric representation uses this profile in order to apply the door lining and panel parameter. If not provided, the profile of the _IfcOpeningElement_ is taken.
- '**FootPrint**': A ''GeometricCurveSet'', or ''Annotation2D'' representation defining the 2D shape of the door
- '**Body**': A ''SweptSolid'', ''SurfaceModel'', or ''Brep'' representation defining the 3D shape of the door.

In addition the parametric representation of a (limited) door shape is available by applying the parameters from IfcDoorType referencing IfcDoorLiningProperties and IfcDoorPanelProperties. The purpose of the parameter is described at those entities and below (door opening operation by door type).

The overall size of the _IfcDoor_ to be used to apply the lining or panel parameter provided by the IfcDoorType is determined by the IfcShapeRepresentation with the RepresentationIdentifier = ''Profile''.

bSI Documentation

Status: **ProposedModification**

Package: **IfcSharedBldgElements**

Class Properties			
Status	ProposedModification	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcBuiltElement	
Subtypes	**EXISTING**	**PROPOSED**
	IfcDoorStandardCase	

Class Attributes

Name	Type	Multipli	Definition
OperationType	IfcDoorTypeOperationEnum	[0..1]	Type defining the general layout and operation of the door type in terms of the partitioning of panels and panel operations. NOTE The OperationType shall only be used, if no type object IfcDoorType is assigned, providing its own IfcDoorType.OperationType.

OverallHeight	IfcPositiveLengthMeasure	[0..1]	Overall measure of the height, it reflects the Z Dimension of a bounding box, enclosing the body of the door opening. If omitted, the OverallHeight should be taken from the geometric representation of the IfcOpening in which the door is inserted. NOTE The body of the door might be taller then the door opening (e.g. in cases where the door lining includes a casing). In these cases the OverallHeight shall still be given as the door opening height, and not as the total height of the door lining.
OverallWidth	IfcPositiveLengthMeasure	[0..1]	Overall measure of the width, it reflects the X Dimension of a bounding box, enclosing the body of the door opening. If omitted, the OverallWidth should be taken from the geometric representation of the IfcOpening in which the door is inserted. NOTE The body of the door might be wider then the door opening (e.g. in cases where the door lining includes a casing). In these cases the OverallWidth shall still be given as the door opening width, and not as the total width of the door lining.
UserDefinedOperationType	IfcLabel	[0..1]	Designator for the user defined operation type, shall only be provided, if the value of OperationType is set to USERDEFINED.

1.4.1.3.5 Predefined Type: BOOM BARRIER

Full Identifier: **IfcDoorTypeEnum.BOOM_BARRIER**

A boom barrier (also known as a boom gate) is a bar, or pole pivoted to allow the boom to block vehicular or pedestrian access through a controlled point.

Status: **Proposed**

Package: **Access Elements**

Predefined Type Properties			
Predefined Type Container	IfcDoorTypeEnum	**Parent Entity**	IfcDoor IfcDoorType
Stereotype	«PredefinedType»		

1.4.1.3.6 Virtual Entity: Barrier element

NOTE Definition from ISO 6707-1: Road safety barrier: vehicle restraint system alongside a carriageway in the form of a continuous low wall or similar construction (Barricade, US)

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL IfcWallTypeEnum.PARAPET
Notes	

1.4.1.3.7 Virtual Entity: Road gate

A hinged barrier used to close the access to a road / tunnel etc

Entity Properties	
Realizing Parent	IfcDoorTypeEnum.BOOM_BARRIER
Notes	

1.4.1.3.8 Virtual Entity: Road safety rail

NOTE Definition from ISO6707-1: vehicle restraint system installed alongside or on a central reserve or a road in the form of one or more horizontal members mounted on posts (UK Road safety fence)

syn:Safety Barrier: A continuous barrier erected alongside a road to prevent traffic from accidentally leaving the carriageway or verge or from crossing the central reserve

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL
Notes	

1.4.1.3.9 Virtual Entity: Pedestrian parapet

NOTE Definition from EN1317-1:2010: pedestrian or "other user" restraint system along the edge of a footway or footpath intended to restrain pedestrians and other users from stepping onto or crossing a road or other area likely to be hazardous

NOTE "Other users" include provision for equestrians, cyclists and livestock.

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL IfcWallTypeEnum.PARAPET
Notes	

1.4.1.3.10 Virtual Entity: Safety barrier

NOTE Definition from EN1317-1:2010: continuous vehicle restraint system installed alongside, or on the central reserve, of a road

Note: This can include a vehicle parapet.

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL IfcWallTypeEnum.PARAPET
Notes	

1.4.1.3.11 Virtual Entity: Vehicle parapet

NOTE Definition from EN1317-1:2010: safety barrier installed on the side of a bridge or on a retaining wall or similar structure where there is a vertical drop and which can include additional protection and restraint for pedestrians and other road users (combined

vehicle/pedestrian parapet)

Entity Properties	
Realizing Parent	
Notes	

1.4.1.3.12 Virtual Entity: Terminal

NOTE Definition from EN1317-1:2010: end treatment of a safety barrier

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL IfcWallTypeEnum.PARAPET
Notes	Handled by Pset_RoadGuardElement (IsTransition and IsTerminal)

1.4.1.3.13 Virtual Entity: Transition

NOTE Definition from EN1317-1:2010: connection of two safety barriers of different designs and/or performances

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL IfcWallTypeEnum.PARAPET
Notes	Handled by Pset_RoadGuardElement (IsTransition and IsTerminal)

1.4.2 Package: Element Assembly

This package addresses the built elements that represent assemblies. Assemblies are aggregations of other elements and components to form a larger manufactured unit that can be built on site or prefabricated off-site.

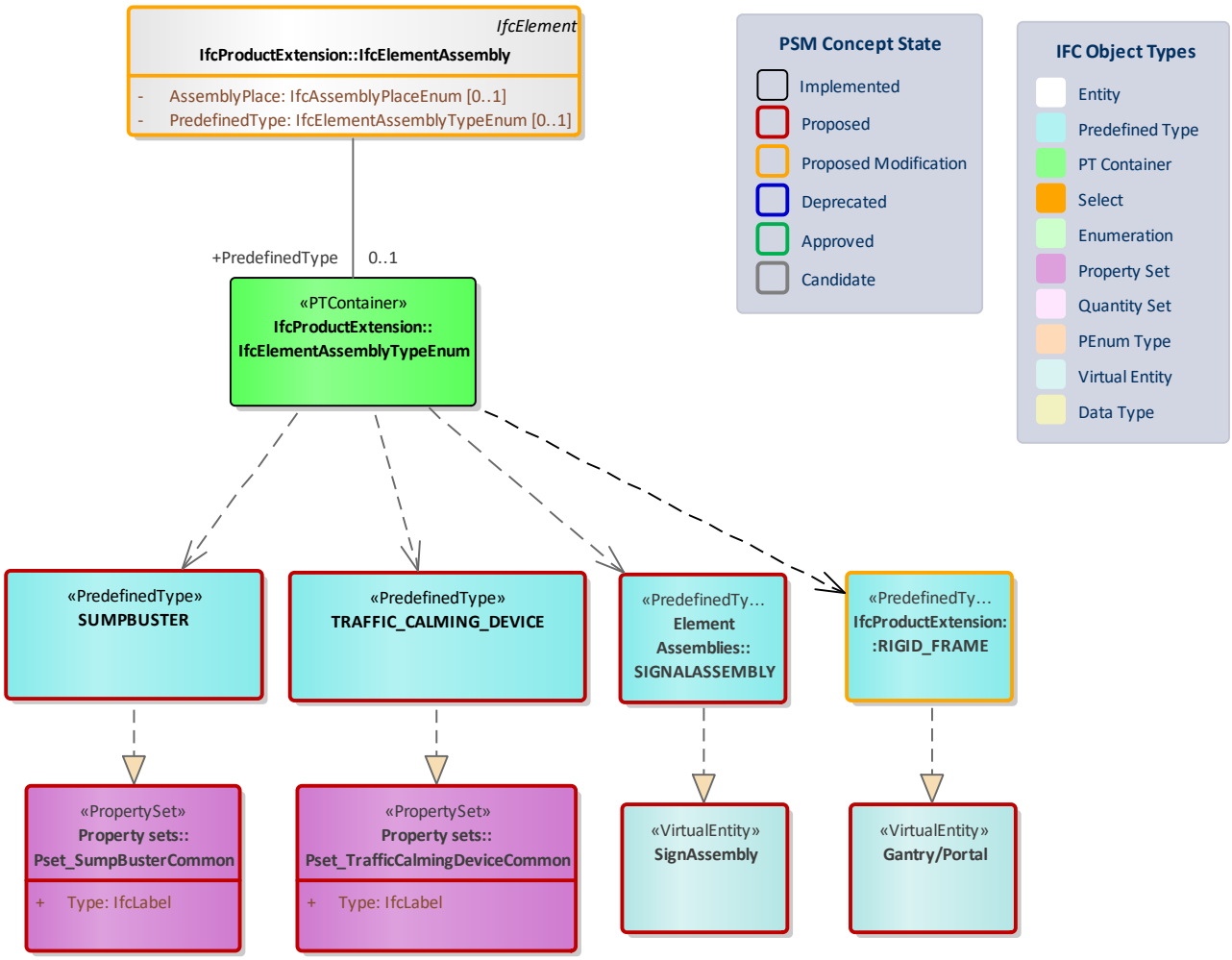


Figure 27: Element Assembly -

1.4.2.1 Predefined Type: RIGID_FRAME

Full Identifier: **IfcElementAssemblyTypeEnum.RIGID_FRAME**

A structure built up of beams, columns, etc. with moment-resisting joints, such as gantry.

Status: **ProposedModification**

Package: **IfcProductExtension**

Predefined Type Properties			
Predefined Type Container	IfcElementAssemblyTypeEnum	**Parent Entity**	IfcElementAssemblyType IfcElementAssembly
Stereotype	«PredefinedType»		

1.4.2.2 Predefined Type: SIGNALASSEMBLY

Full Identifier: **IfcElementAssemblyTypeEnum.SIGNALASSEMBLY**

An assembly to physically aggregate together one or more signal instances (and also sign instances) including any supporting structural elements such as a simple pole or a rigid frame gantry.

Status: **Proposed**

Package: **Element Assemblies**

Predefined Type Properties			
Predefined Type Container	IfcElementAssemblyTypeEnum	**Parent Entity**	IfcElementAssemblyType IfcElementAssembly
Stereotype	«PredefinedType»		

1.4.2.3 Predefined Type: SUMPBUSTER

Full Identifier: **IfcElementAssemblyTypeEnum.SUMPBUSTER**

An obstacle (with oil catchment basin) installed typically in a bus lane to prevent other traffic with lower ground clearance from using it. Also Sump breaker or Sump trap.

Status: **Proposed**

Package: **Element Assembly**

Predefined Type Properties			
Predefined Type Container	IfcElementAssemblyTypeEnum	**Parent Entity**	IfcElementAssemblyType IfcElementAssembly
Stereotype	«PredefinedType»		
Property sets	Pset_SumpBusterCommon		

1.4.2.4 Predefined Type: TRAFFIC_CALMING_DEVICE

Full Identifier: **IfcElementAssemblyTypeEnum.TRAFFIC_CALMING_DEVICE**

A structure on the carriageway to control the speed of vehicles.

NOTE Definition from ISO 6707-1: Encouragement of restrained and considerate behaviour by means such as road humps and reductions in width of the travelled way (US:traffic restraint, UK:speed bump).

NOTE Definition from PIARC: Local carriageway layout (staggered section, choker) or physical device (central island, round- or flat-top road hump, speed bump, rumble strips, etc.) to control the speed of road vehicles.

Status: **Proposed**

Package: **Element Assembly**

Predefined Type Properties			
Predefined Type Container	IfcElementAssemblyTypeEnum	**Parent Entity**	IfcElementAssemblyType IfcElementAssembly
Stereotype	«PredefinedType»		
Property sets	Pset_TrafficCalmingDeviceCommon		

1.4.2.5 Property Set: Pset_SumpBusterCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcElementAssemblyTypeEnum.SUMPBUSTER	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
Type	IfcLabel		Sump buster designator according to local standards

1.4.2.6 Property Set: Pset_TrafficCalmingDeviceCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcElementAssemblyTypeEnum.TRAFFIC_CALMING_DEVICE	**stereotype**	«PropertySet»

Properties

Name	Type	Multiplicity	Definition
Type	IfcLabel		Traffic Calming Device designator according to local standards

1.4.2.7 Virtual Entity: Gantry/Portal

NOTE Definition from PIARC: Fixed structure comprising two columns linked at their tops by a beam spanned across the carriageway and permitting the installation of traffic signs above the lanes.

Entity Properties	
Realizing Parent	IfcElementAssemblyTypeEnum.RIGID_FRAME
Notes	

1.4.2.8 Virtual Entity: SignAssembly

Assembly of one or more traffic signs, and the supporting structure they are mounted on, such as a pole or a portal, possibly with footing(s).

Entity Properties	
Realizing Parent	IfcElementAssemblyTypeEnum.SIGNALASSEMBLY
Notes	

1.4.3 Package: Element Component

This package addresses the modelling of minor items included in, added to or connecting to or between elements, which usually are not of interest from the overall building structure viewpoint. However, these small parts may have vital and load carrying functions within the construction. These items do not provide any actual space boundaries. Typical examples of components include different kinds of fasteners and various accessories.

1.4.3.1 Package: Earthworks component

Components mainly used in Earthworks activities.

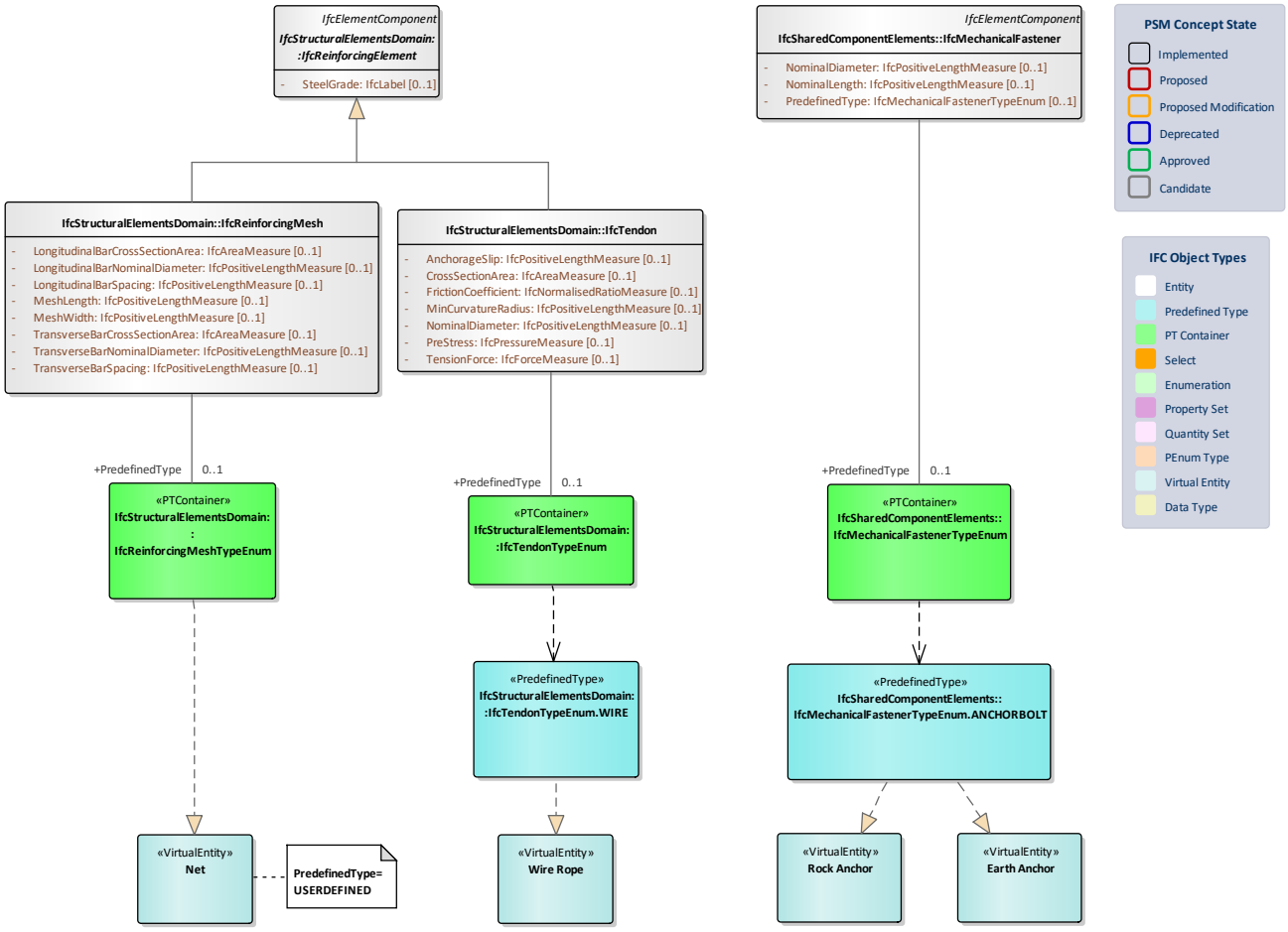


Figure 28: Earthworks component -

1.4.3.2 Package: Element Component - Other

Other element components.

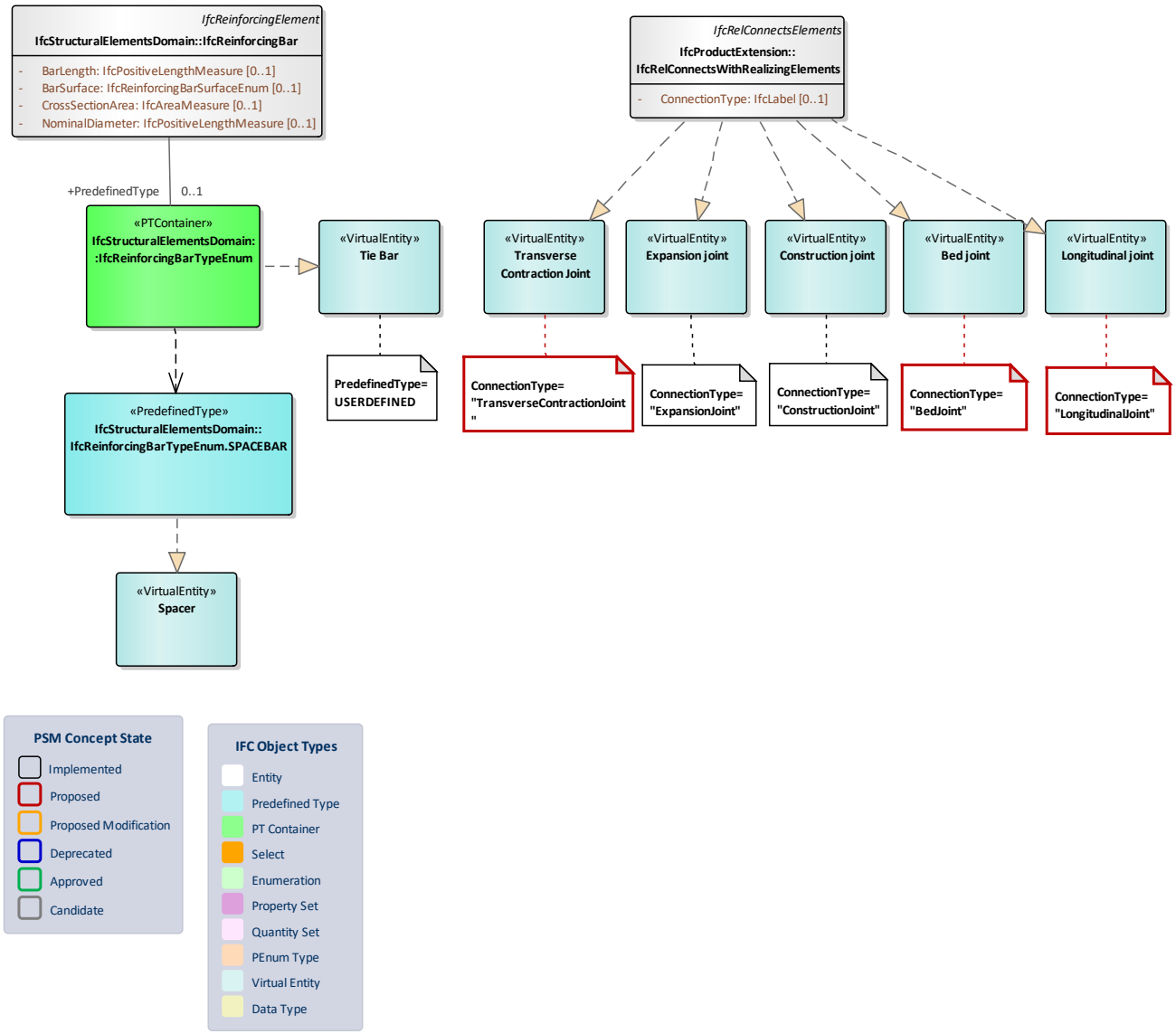


Figure 29: Element Component - Other -

1.4.3.3 Package: Guard element

Element components which provide protection for either traffic or the surrounding environment

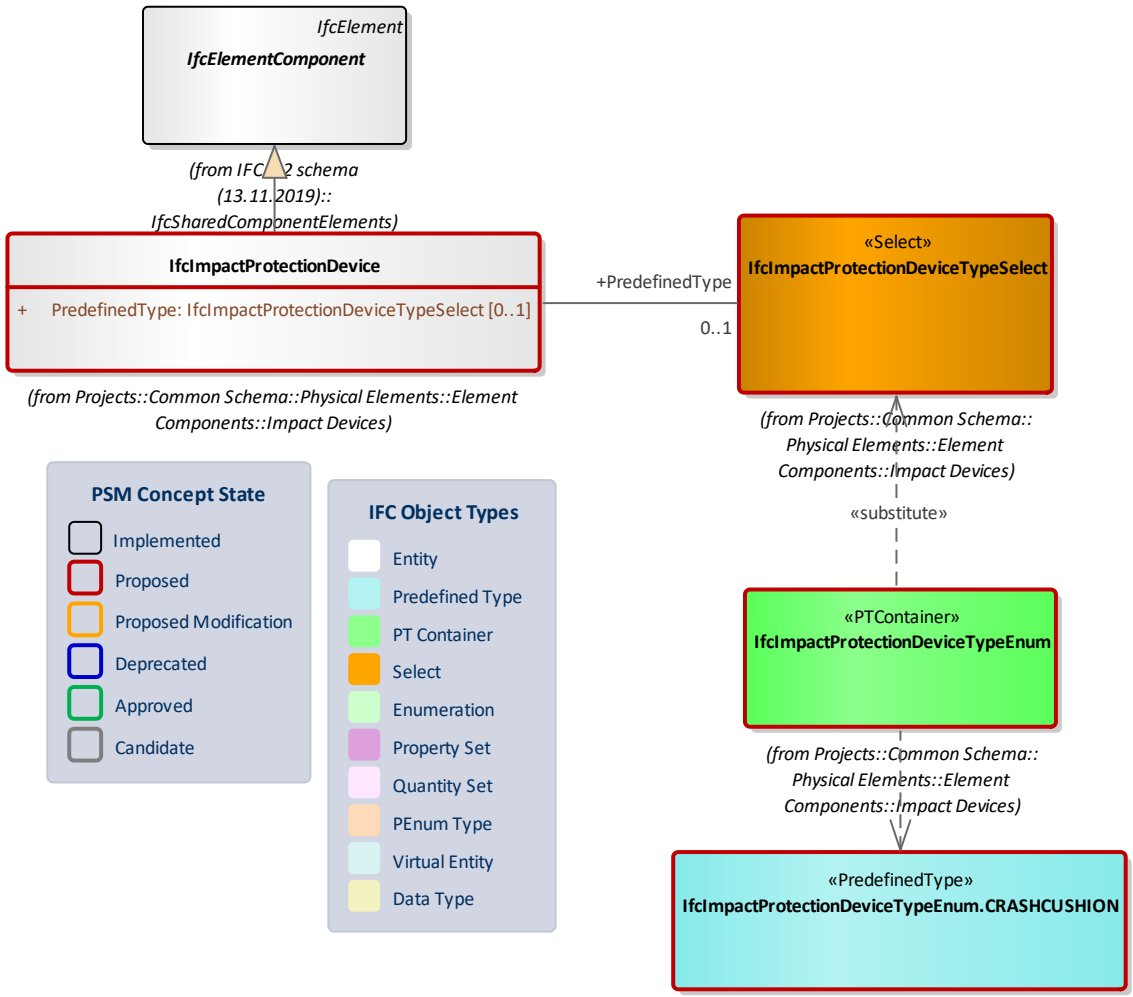


Figure 30: Guard element - Crash cushion -

1.4.3.3.1 Class: IfcImpactProtectionDevice

A impact protection device is a component used to protect other built elements from kinetic damage. impact protection devices currently come in 3 different varieties:

- A vibration damper used to minimize the effects of vibration in a structure by dissipating kinetic energy. The damper may be passive (elastic, frictional, inertia) or active (in a system using sensors and actuators).

- A vibration isolator is a device used to minimize the effects of vibration transmissibility in a structure.
- Impact devices that dissipate kinetic energy from impacting elements (such as vehicles) by deformation or elastic mechanics.

Status: **Proposed**

Package: **Impact Devices**

Class Properties			
Status	Proposed	**Is Abstract**	

Inheritance Statement		
Subtype Of	IfcElementComponent	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
PredefinedType	IfcImpactProtectionDeviceTypeSelect	[0..1]	Identifies the predefined type of a impact device from which the type modelled, may be set. This type may associate additional specific property sets. NOTE The PredefinedType shall only be used, if no IfcImpactProtectionDeviceType is assigned, providing its own IfcImpactProtectionDeviceType .PredefinedType.

1.4.3.3.2 PDT Container: IfcImpactProtectionDeviceTypeEnum

This container defines the different predefined types of kinetic impact protectors that can specify an IfcImpactProtectionDevice or IfcImpactProtectionDeviceType.

Status: **Proposed**

Package: **Impact Devices**

Container Properties			
Parent Entity	IfcImpactProtectionDeviceType IfcImpactProtectionDevice	**Stereotype**	«PTContainer»
Contains	**PROPOSED**		
	IfcImpactProtectionDeviceTypeEnum.DAMPINGSYSTEM	IfcImpactProtectionDeviceTypeEnum.CRASHCUSHION	
	IfcImpactProtectionDeviceTypeEnum.FENDER	IfcImpactProtectionDeviceTypeEnum.BUMPER	

1.4.3.3.3 Select: IfcImpactProtectionDeviceTypeSelect

This is a select of enumerations to provide the option of groups of predefined types for an IfcImpactProtectionDevice or IfcImpactProtectionDeviceType.

Status: **Proposed**

Package: **Impact Devices**

Select Properties	
Stereotype	«Select»
Substitutions	IfcVibrationIsolatorTypeEnum IfcImpactProtectionDeviceTypeEnum IfcVibrationDamperTypeEnum

1.4.3.3.4 Predefined Type: CRASHCUSHION

Full Identifier: **IfcImpactProtectionDeviceTypeEnum.CRASHCUSHION**

NOTE Definition from EN1317-1:2010: road vehicle energy absorption device installed in front of one or more hazards to reduce the severity of impact

NOTE Definition from ISO6707-1: energy-absorbing device installed in front of a rigid object to reduce the severity of impact of a vehicle, (Impact barrier, US)

Status: **Proposed**

Package: **Guard element**

Predefined Type Properties			
Predefined Type Container	IfcImpactProtectionDeviceTypeEnum	**Parent Entity**	IfcImpactProtectionDeviceType IfcImpactProtectionDevice
Stereotype	«PredefinedType»		

1.4.3.4 Package: Signage

Physical elements that provide visual guidance for vehicular traffic or pedestrians.

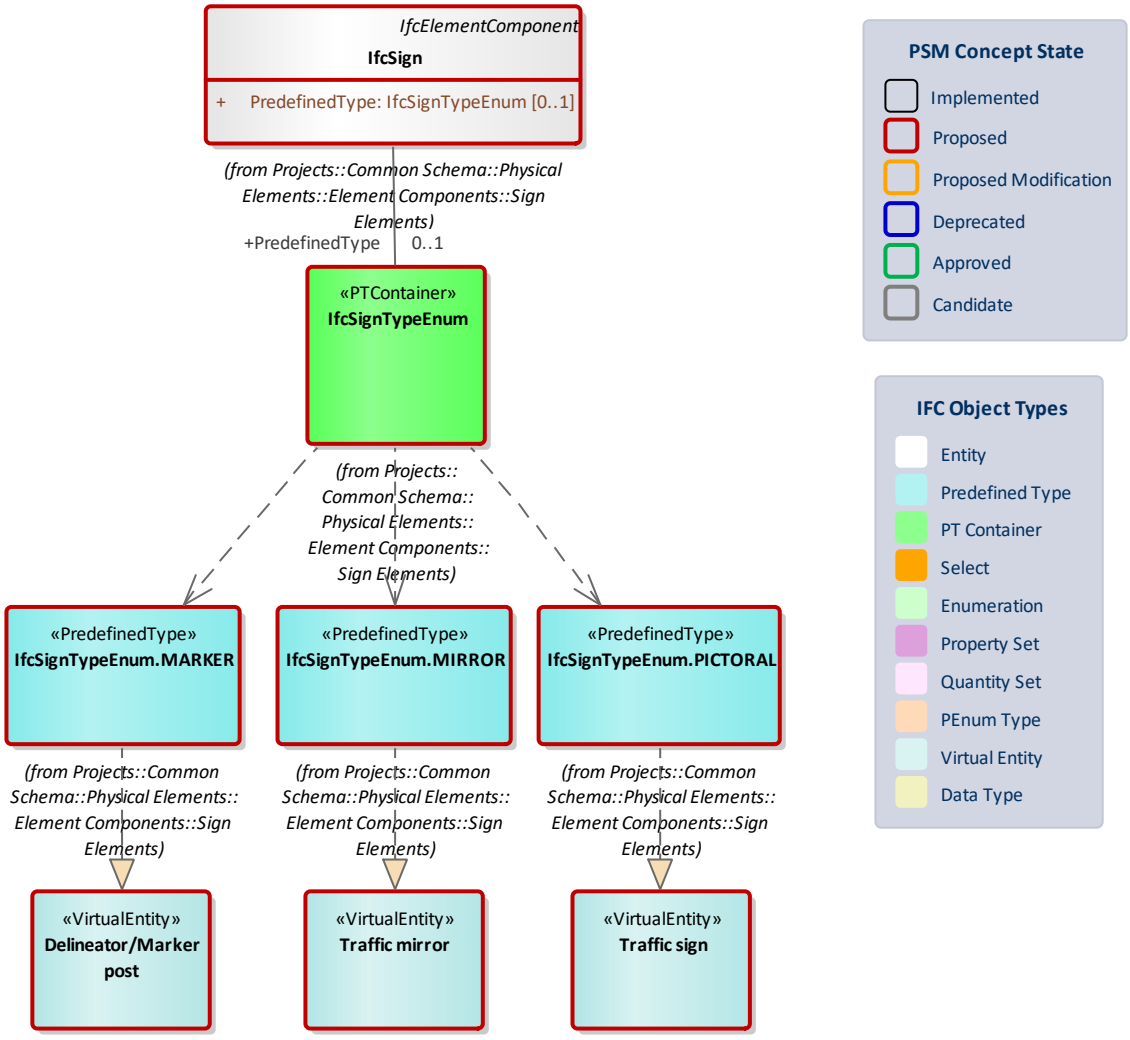


Figure 31: Signage -

1.4.3.4.1 Class: IfcSign

A sign is a notice on display that gives information or instructions in a written, symbolic or other form. Signs are passive with the most common form of a pictorial panel. An instance of IfcSign refers to the occurrence of an individual panel which can be applied to a surface such as a wall or be aggregated within a Signal Assembly which can include multiple sign occurrences and the associated supporting structural elements (see Signal Assembly for examples).

Status: **Proposed**

Package: **Sign Elements**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_RailwaySignGeneral		

Inheritance Statement		
Subtype Of	IfcElementComponent	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
PredefinedType	IfcSignTypeEnum	[0..1]	Identifies the predefined type of a signs from which the type modelled, may be set. This type may associate additional specific property sets. NOTE The PredefinedType shall only be used, if no IfcSignType is assigned, providing its own IfcSignType .PredefinedType.

1.4.3.4.2 PDT Container: IfcSignTypeEnum

This container defines the different predefined types of signs that can specify an IfcSign or IfcSignType.

Status: **Proposed**

Package: **Sign Elements**

Container Properties			
Parent Entity	IfcSignType IfcSign	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcSignTypeEnum.MIRROR IfcSignTypeEnum.MARKER IfcSignTypeEnum.PICTORAL	

1.4.3.4.3 Predefined Type: MARKER

Full Identifier: **IfcSignTypeEnum.MARKER**

A Sign type formed of a vertical post (possibly with some lettering or symbols) usually used to delimitate distance or the location of some equipment.

Status: **Proposed**

Package: **Sign Elements**

Predefined Type Properties			
Predefined Type Container	IfcSignTypeEnum	**Parent Entity**	IfcSignType IfcSign
Stereotype	«PredefinedType»		

1.4.3.4.4 Predefined Type: MIRROR

Full Identifier: **IfcSignTypeEnum.MIRROR**

A sign type that provides information via a reflective mirror surface.

Status: **Proposed**

Package: **Sign Elements**

Predefined Type Properties			
Predefined Type Container	IfcSignTypeEnum	**Parent Entity**	IfcSignType IfcSign
Stereotype	«PredefinedType»		

1.4.3.4.5 Predefined Type: PICTORAL

Full Identifier: **IfcSignTypeEnum.PICTORAL**

A Sign type formed of a flat plate with some written or symbolic images on it.

Status: **Proposed**

Package: **Sign Elements**

Predefined Type Properties			
Predefined Type Container	IfcSignTypeEnum	**Parent Entity**	IfcSignType IfcSign
Stereotype	«PredefinedType»		

1.4.3.4.6 Virtual Entity: Delineator/Marker post

NOTE Definition from PIARC: Marker post with a retroreflector

NOTE Definition from PIARC: Post erected alongside the carriageway to give warning or guidance.

Entity Properties	
Realizing Parent	IfcSignTypeEnum.MARKER
Notes	

1.4.3.4.7 Virtual Entity: Traffic mirror

Convex mirror used for Blind Spots

Entity Properties	
Realizing Parent	IfcSignTypeEnum.MIRROR
Notes	

1.4.3.4.8 Virtual Entity: Traffic sign

NOTE Definition from ISO6707-1: message conveyed utilizing pictorial or textual media or both

NOTE Definition from PIARC: used to inform road users, ensure their safety and facilitate traffic

Entity Properties	
Realizing Parent	IfcSignTypeEnum.PICTORAL
Notes	

1.4.4 Package: Distribution Element

Elements that participate in a distribution system

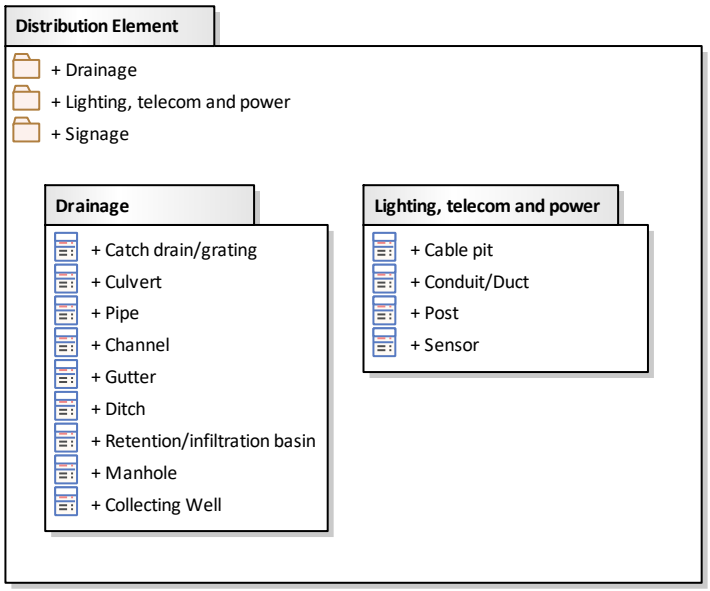


Figure 32: Distribution elements -

1.4.4.1 Package: Drainage

Elements that participate in drainage systems

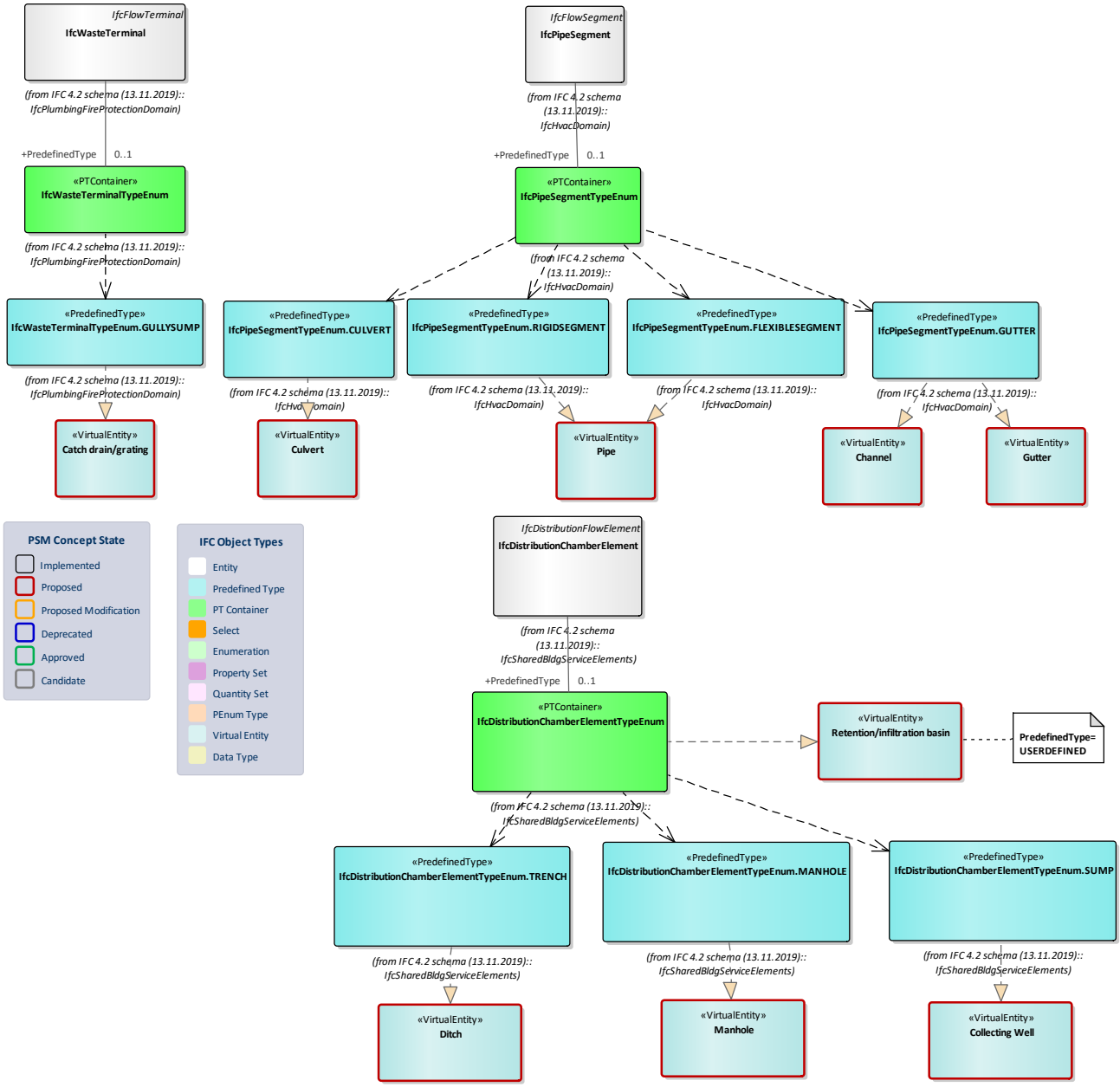


Figure 33: Drainage –

1.4.4.1.1 Virtual Entity: Catch drain/grating

Pipe fitting or assembly of fittings to receive surface water or waste water, fitted with a grating or sealed cover.

Entity Properties	
Realizing Parent	IfcWasteTerminalTypeEnum.GULLYSUMP
Notes	

1.4.4.1.2 Virtual Entity: Culvert

A covered channel or large pipe that forms a watercourse below ground level, usually under a road or railway.

Entity Properties	
Realizing Parent	IfcPipeSegmentTypeEnum.CULVERT
Notes	

1.4.4.1.3 Virtual Entity: Pipe

A rigid segment is continuous linear segment of pipe that cannot be deformed. A flexible segment is a continuous non-linear segment of pipe that can be deformed and change the direction of flow.

Entity Properties	
Realizing Parent	IfcPipeSegmentTypeEnum.RIGIDSEGMENT IfcPipeSegmentTypeEnum.FLEXIBLESEGMENT
Notes	

1.4.4.1.4 Virtual Entity: Channel

A gutter segment is a continuous open-channel segment of pipe.

Entity Properties	
Realizing Parent	IfcPipeSegmentTypeEnum.GUTTER
Notes	

1.4.4.1.5 Virtual Entity: Gutter

A gutter segment is a continuous open-channel segment of pipe.

Entity Properties	
Realizing Parent	IfcPipeSegmentTypeEnum.GUTTER

1.4.4.1.6 Virtual Entity: Ditch

Excavated chamber, the length of which typically exceeds the width.

Entity Properties	
Realizing Parent	IfcDistributionChamberElementTypeEnum.TRENCH
Notes	

1.4.4.1.7 Virtual Entity: Retention/infiltration basin

Area of land used to manage stormwater runoff, prevent flooding and downstream erosion, and improve water quality in an adjacent river, stream, lake or bay

Entity Properties	
Realizing Parent	IfcDistributionChamberElementTypeEnum
Notes	PredefinedType = USERDEFINED

1.4.4.1.8 Virtual Entity: Manhole

Chamber constructed on a drain, sewer or pipeline with a removable cover that permits the entry of a person.

Entity Properties	
Realizing Parent	IfcDistributionChamberElementTypeEnum.MANHOLE
Notes	

1.4.4.1.9 Virtual Entity: Collecting Well

Recessed or small chamber into which liquid is drained to facilitate its collection for removal.

Entity Properties	
Realizing Parent	IfcDistributionChamberElementTypeEnum.SUMP
Notes	

1.4.4.2 Package: Lighting, telecom and power

Elements that participate in lighting, telecom or power systems

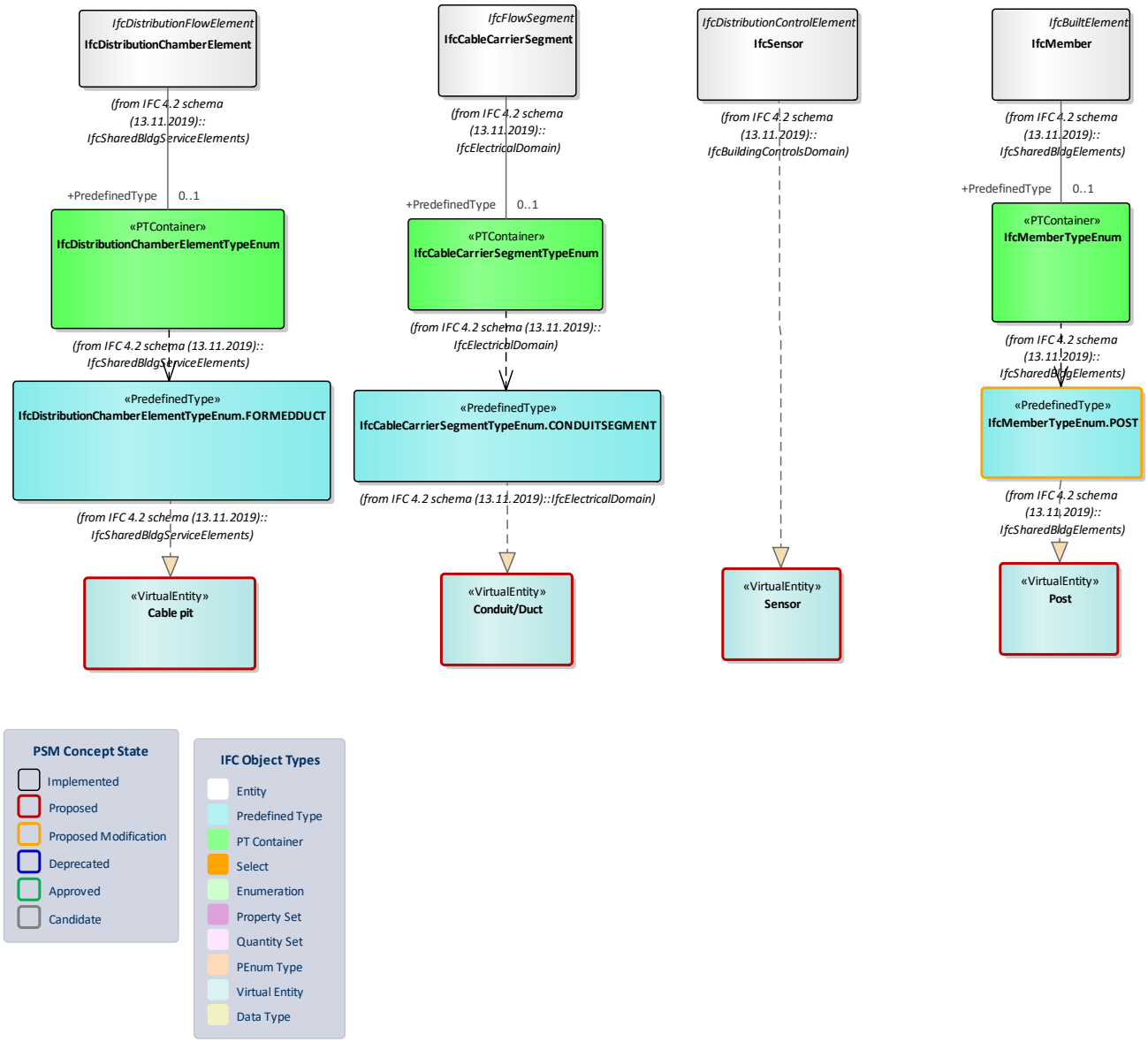


Figure 34: Lighting, telecom and power -

1.4.4.2.1 Predefined Type: POST

Full Identifier: **IfcMemberTypeEnum.POST**

FORMER: A linear member (usually used vertically) within a roof structure to support purlins.

PROPOSED: A linear (usually vertical) member used to support something or to mark a point.

Status: **ProposedModification**

Package: **IfcSharedBldgElements**

Predefined Type Properties			
Predefined Type Container	IfcMemberTypeEnum	**Parent Entity**	IfcMember IfcMemberType
Stereotype	«PredefinedType»		
Property sets	Pset_PostProtectionAndSafety		

1.4.4.2.2 Virtual Entity: Cable pit

Recess or chamber formed to permit access for inspection of substructure and services.

Entity Properties	
Realizing Parent	IfcDistributionChamberElementTypeEnum.FORMEDDUCT
Notes	

1.4.4.2.3 Virtual Entity: Conduit/Duct

A cable carrier segment is a flow segment that is specifically used to carry and support cabling.

NOTE Definition from ISO6707-1: pipe, channel or tunnel used for carrying and protectning electric wires or cables.

Entity Properties	
Realizing Parent	IfcCableCarrierSegmentTypeEnum.CONDUITSEGMENT
Notes	

1.4.4.2.4 Virtual Entity: Post

NOTE Definition from PIARC: Support intended to hold one or more lanterns, consisting of one or more parts: a post, possibly an extension piece and, if necessary, a bracket.

for carrying light, camera, signal, etc.

Synonyms : lighting mast, lighting pole, lamppost, streetlamp, luminaire support (US)

Entity Properties	
Realizing Parent	IfcMemberTypeEnum.POST
Notes	

1.4.4.2.5 Virtual Entity: Sensor

A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument.

Entity Properties	
Realizing Parent	IfcSensor
Notes	

1.4.4.3 Package: Signage

Elements that participate in signage systems

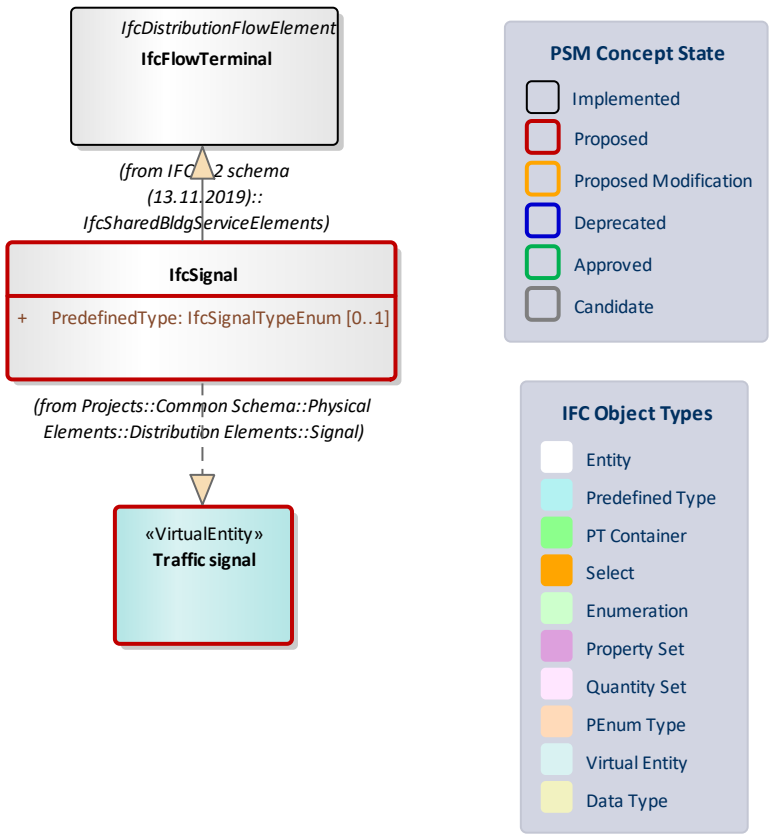


Figure 35: Signage -

1.4.4.3.1 Class: IfcSignal

A signal is an active device that conveys information or instructions to users, by means of an audio, visual signal or a combination of both.

The primary distinction from an IfcSign is that a signal is active and therefore a subtype of IfcFlowTerminal usually requiring power and data connections for its operation.

An instance of IfcSignal represents a singular signalling device in a larger assembled unit or connected system, such as an individual frame within a railway signal, a single light unit in a traffic light system or an audio signal or light mounted on a navigational buoy.

Signals can be physically aggregated together into an assembly which can include multiple signal instances (and also sign instances) and the associated supporting structural elements such as a simple pole or a rigid frame gantry (see Signal Assembly for examples).

Signals can be logically (functionally) grouped together into a signalling system (a type of distribution system) to represent a connected group of signals for example a group of traffic lights controlling an road intersection.

Status: **Proposed**

Package: **Signal**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets	Pset_RailwaySignalGeneral		

Inheritance Statement		
Subtype Of	IfcFlowTerminal	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multipli	Definition
PredefinedType	IfcSignalTypeEnum	[0..1]	Identifies the predefined type of a signal from which the type modelled, may be set. This type may associate additional specific property sets. NOTE The PredefinedType shall only be used, if no IfcSignalType is assigned, providing its own IfcSignType .PredefinedType.

1.4.4.3.2 Virtual Entity: Traffic signal

NOTE Definition from PIARC: System which controls traffic by e.g. red, yellow and green lights, arrows or similar [NVF-ITS]

Entity Properties	
Realizing Parent	IfcSignal
Notes	

1.4.5 Package: Feature Element

Elements which modify the shape and appearance of the associated master element.

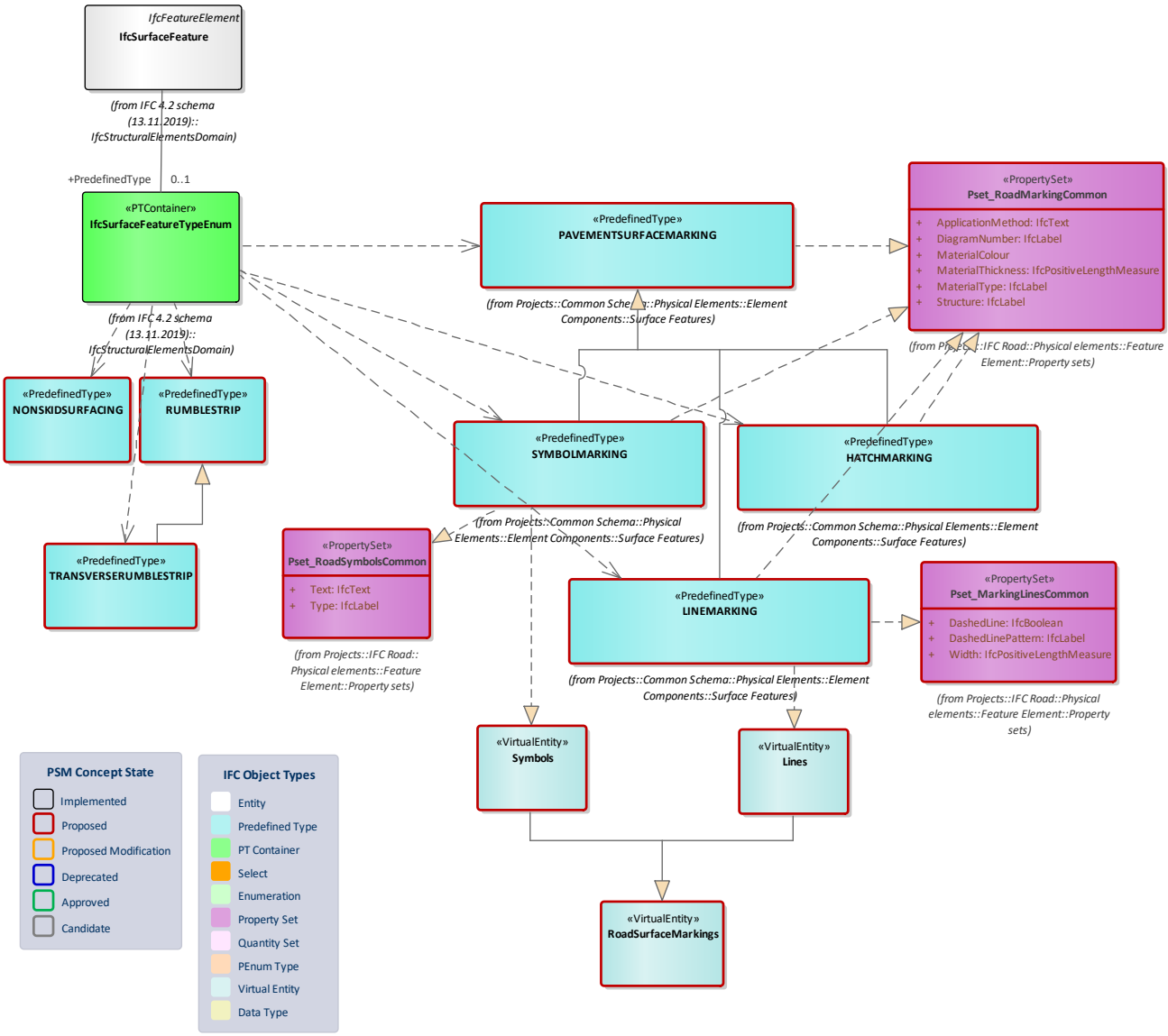


Figure 36: Feature Element -

1.4.5.1 Predefined Type: HATCHMARKING

Full Identifier: **IfcSurfaceFeatureTypeEnum.HATCHMARKING**

surface markings defined by enclosed 2d shape with defined hatch fillings.

Status: **Proposed**

Package: **Surface Features**

Predefined Type Properties			
Predefined Type Container	IfcSurfaceFeatureTypeEnum	**Parent Entity**	IfcSurfaceFeature
Stereotype	«PredefinedType»		
Property sets	Pset_RoadMarkingCommon		

1.4.5.2 Predefined Type: LINEMARKING

Full Identifier: **IfcSurfaceFeatureTypeEnum.LINEMARKING**

2D lines painted on pavement surfaces to form boundaries, centrelines and edge markings.

Status: **Proposed**

Package: **Surface Features**

Predefined Type Properties			
Predefined Type Container	IfcSurfaceFeatureTypeEnum	**Parent Entity**	IfcSurfaceFeature
Stereotype	«PredefinedType»		
Property sets	Pset_RoadMarkingCommon Pset_MarkingLinesCommon		

1.4.5.3 Predefined Type: NONSKIDSURFACING

Full Identifier: **IfcSurfaceFeatureTypeEnum.NONSKIDSURFACING**

Paint or surfacing to prevent sliding or skidding.

Status: **Proposed**

Package: **Feature Element**

Predefined Type Properties			
Predefined Type Container	IfcSurfaceFeatureTypeEnum	**Parent Entity**	IfcSurfaceFeature
Stereotype	«PredefinedType»		

1.4.5.4 Predefined Type: PAVEMENTSURFACEMARKING

Full Identifier: **IfcSurfaceFeatureTypeEnum.PAVEMENTSURFACEMARKING**

Painted or chemical lines or symbols on the surface of pavements (a road or paved area)

Status: **Proposed**

Package: **Surface Features**

Predefined Type Properties			
Predefined Type Container	IfcSurfaceFeatureTypeEnum	**Parent Entity**	IfcSurfaceFeature
Stereotype	«PredefinedType»		
Property sets	Pset_RoadMarkingCommon		

1.4.5.5 Predefined Type: RUMBLESTRIP

Full Identifier: **IfcSurfaceFeatureTypeEnum.RUMBLESTRIP**

Raised and often textured strips on road center line or on shoulder, or across lanes to alert drivers by vibration and noise. Also Jiggle bars.

NOTE Definition from PIARC: Narrow raised and often specially textured strips across or alongside the carriageway, generating noise and vibrations through vehicles in order to alert drivers and encourage them to slow down for particular hazards.

Status: **Proposed**

Package: **Feature Element**

Predefined Type Properties			
Predefined Type Container	IfcSurfaceFeatureTypeEnum	**Parent Entity**	IfcSurfaceFeature
Stereotype	«PredefinedType»		

1.4.5.6 Predefined Type: SYMBOLMARKING

Full Identifier: **IfcSurfaceFeatureTypeEnum.SYMBOLMARKING**

Surface markings that convey information in the form of symbols and shapes such as arrows, text or pictorial symbols.

Status: **Proposed**

Package: **Surface Features**

Predefined Type Properties			
Predefined Type Container	IfcSurfaceFeatureTypeEnum	**Parent Entity**	IfcSurfaceFeature
Stereotype	«PredefinedType»		
Property sets	Pset_RoadSymbolsCommon Pset_RoadMarkingCommon		

1.4.5.7 Predefined Type: TRANSVERSERUMBLESTRIP

Full Identifier: **IfcSurfaceFeatureTypeEnum.TRANSVERSERUMBLESTRIP**

Type of rumble strip running across lane(s).

Status: **Proposed**

Package: **Feature Element**

Predefined Type Properties			
Predefined Type Container	IfcSurfaceFeatureTypeEnum	**Parent Entity**	IfcSurfaceFeature
Stereotype	«PredefinedType»		

1.4.5.8 Property Set: Pset_MarkingLinesCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcSurfaceFeatureTypeEnum.LINEMARKING	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
DashedLine	IfcBoolean		State if the line is dashed or continuous
DashedLinePattern	IfcLabel		Indicates the pattern for dashed line types e.g. '3+9'
Width	IfcPositiveLengthMeasure		The nominal width for each single line

1.4.5.9 Property Set: Pset_RoadMarkingCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcSurfaceFeatureTypeEnum.LINEMARKING IfcSurfaceFeatureTypeEnum.HATCHMARKING IfcSurfaceFeatureTypeEnum.SYMBOLMARKING IfcSurfaceFeatureTypeEnum.PAVEMENTSURFACEMARKING	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
ApplicationMethod	IfcText		State the application method used... e.g. spray, extruded
DiagramNumber	IfcLabel		A designator with content according to local standards, e.g. M25.
MaterialColour			Actual colour on the road marking material
MaterialThickness	IfcPositiveLengthMeasure		Nominal thickness of the applied material
MaterialType	IfcLabel		Material type used... e.g. paint, tape, thermoplastic, stone
Structure	IfcLabel		State if marking is Structured or not, and what type... e.g. Kamflex, Longflex, Dropflex

1.4.5.10 Property Set: Pset_RoadSymbolsCommon

Status: **Proposed**

Set Properties			
Applicable Entities	IfcSurfaceFeatureTypeEnum.SYMBOLMARKING	**stereotype**	«PropertySet»

Properties

Name	Type	Multipli	Definition
Text	IfcText		Text content
Type	IfcLabel		A symbol designator with content according to local standards, e.g. 'BycycleCrossing', 'RoadStuds', 'SpeedBump', 'TransverseBar', 'BusStop', 'Chevron', 'Hatched', 'KeepClear', 'BoxJunction', 'EmergencyExit', 'Intersection', 'Junction'

1.4.5.11 Virtual Entity: RoadSurfaceMarkings

Painted Lines or Symbols on a surface of a road.

Entity Properties	
Realizing Parent	
Notes	

1.4.5.12 Virtual Entity: Lines

Painted on the surface of the road to indicate a boundary: centreline, lane, edge etc.

Entity Properties	
Realizing Parent	IfcSurfaceFeatureTypeEnum.LINEMARKING
Notes	

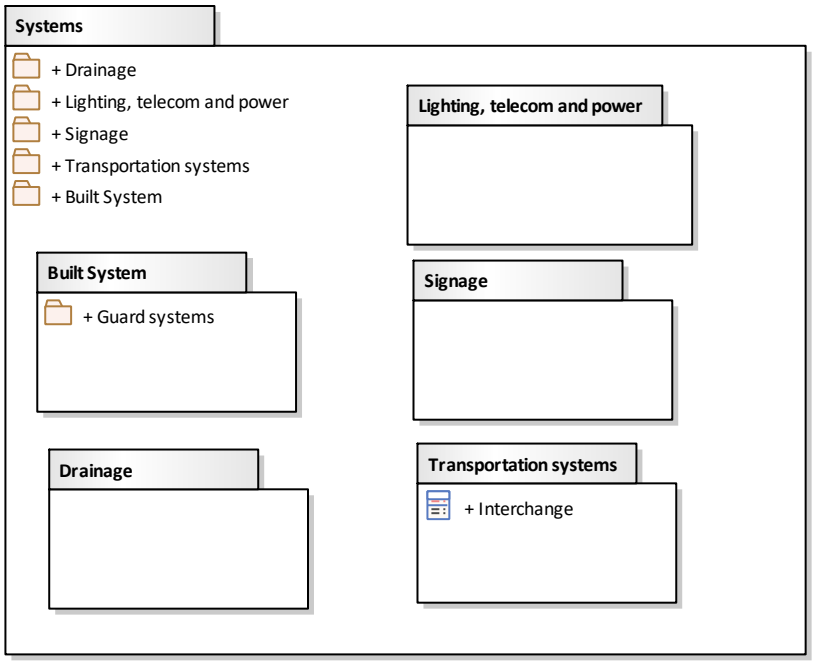
1.4.5.13 Virtual Entity: Symbols

painted on the surface of the road to indicate road use: arrows, buslane, give way etc

Entity Properties	
Realizing Parent	IfcSurfaceFeatureTypeEnum.SYMBOLMARKING
Notes	

1.5 Package: Systems

This package contains systems that organize related parts which are composed for a common purpose or function or to provide a service. Systems are functionally related aggregations of products.



(from IFC Road)

Figure 37: Systems -

1.5.1 Package: Built System

Groups by which building elements are grouped according to a common function within the facility.

1.5.1.1 Package: Guard systems

Systems which provide protection for either traffic or the surrounding environment.

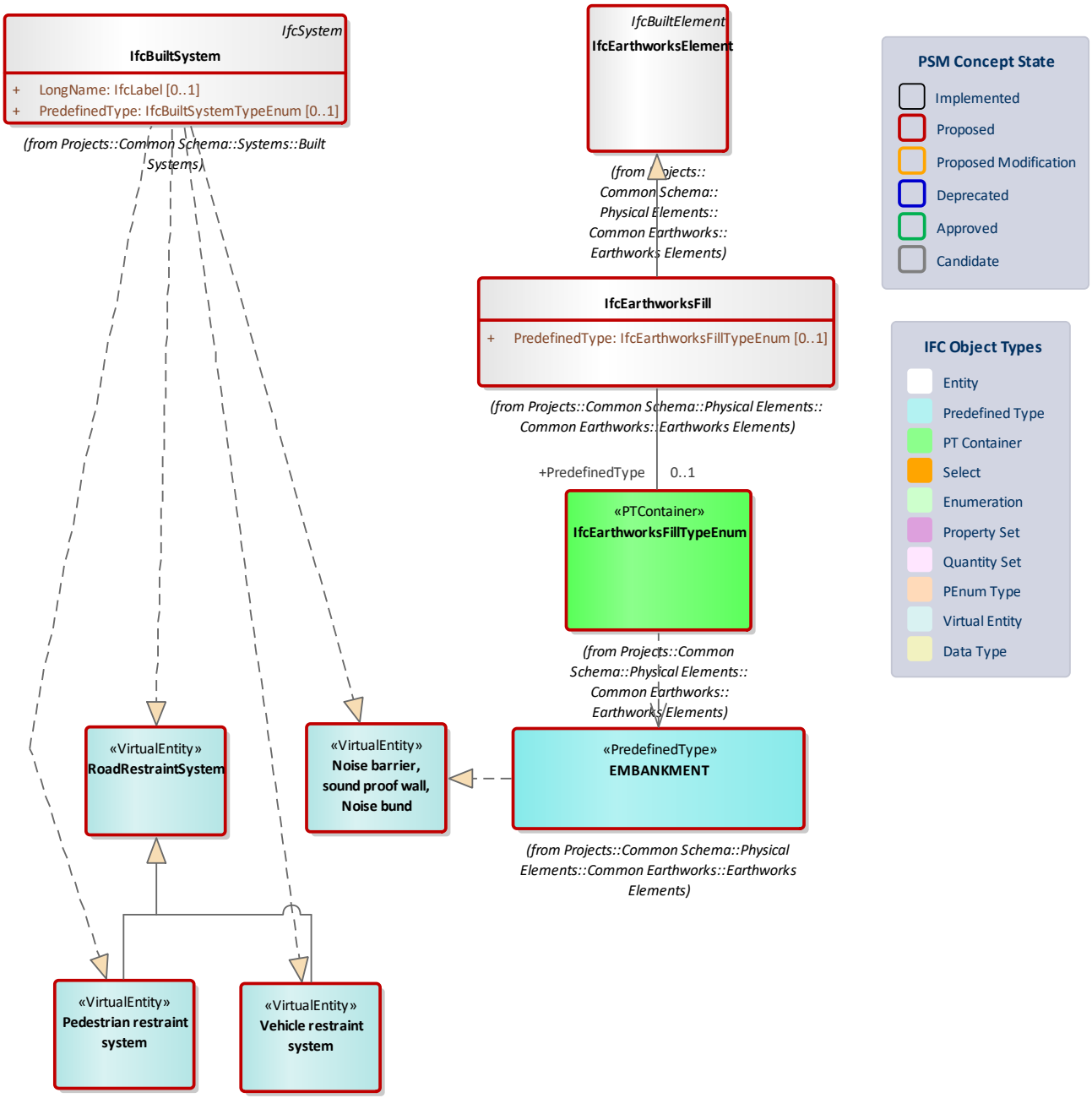


Figure 38: Guard systems -

1.5.1.1.1 Class: IfcBuiltSystem

A built system is a group by which built elements are grouped according to a common function within the facility.

The group IfcBuiltSystem defines the occurrence of a specialized system for use within the context of a facilities physical or finishing fabric. Important functionalities for the description of a built system are derived from supertypes:

- From IfcSystem it inherits the ability to couple the built system via IfcRelReferencedInSpatialStructure to one or more IfcSpatialElement subtypes as necessary.
- From IfcGroup it inherits the inverse attribute IsGroupedBy, pointing to the relationship class IfcRelAssignsToGroup . This allows the grouping of built elements (instances of IfcBuiltElement subtypes, IfcFurnishingElement subtypes, IfcElementAssembly and IfcTransportElement).
- From IfcObjectDefinition it inherits the inverse attribute IsDecomposedBy pointing to the relationship class IfcRelAggregates. It provides the hierarchy between the separate (partial) building systems.

Status: **Proposed**

Package: **Built Systems**

Class Properties			
Status	Proposed	**Is Abstract**	
Property sets			

Inheritance Statement		
Subtype Of	IfcSystem	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

Name	Type	Multiplicity	Definition
LongName	IfcLabel	[0..1]	Long name for a built system, used for informal purposes. It should be used, if available, in conjunction with the inherited Name attribute. NOTE In many scenarios the Name attribute refers to the short name or number of a built system, and the LongName refers to a descriptive name.
PredefinedType	IfcBuiltSystemTypeEnum	[0..1]	Predefined types of built systems.

1.5.1.1.2 Virtual Entity: Noise barrier, sound proof wall, Noise bund

NOTE Definition from ISO6707-1: structure provided to deflect and absorb noise

Bund: noise barrier in the form of an embankment, (Noise barrier, Sound barrier, US)

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.GUARDRAIL IfcWallTypeEnum.PARAPET IfcBuiltSystem IfcEarthworksFillTypeEnum.EMBANKMENT
Notes	

1.5.1.1.3 Virtual Entity: RoadRestraintSystem

NOTE Definition from EN1317-1:2010: vehicle restraint system and pedestrian restraint system used on the road

Entity Properties	
Realizing Parent	IfcBuiltSystem
Notes	

1.5.1.1.4 Virtual Entity: Pedestrian restraint system

NOTE Definition from EN1317-1:2010: system installed to provide restraint for pedestrians

Entity Properties	
Realizing Parent	IfcBuiltSystem
Notes	

1.5.1.1.5 Virtual Entity: Vehicle restraint system

NOTE Definition from EN1317-1:2010: system installed on the road to provide a level of containment for an errant vehicle

NOTE Definition from ISO6707-1: structure that provides a system of containment for errant vehicles so as to limit damage or injury, (Guardrail, Barricade, US) & Protection wall

Entity Properties	
Realizing Parent	IfcBuiltSystem
Notes	

1.5.2 Package: Transportation systems

This package contains systems related to transportation.

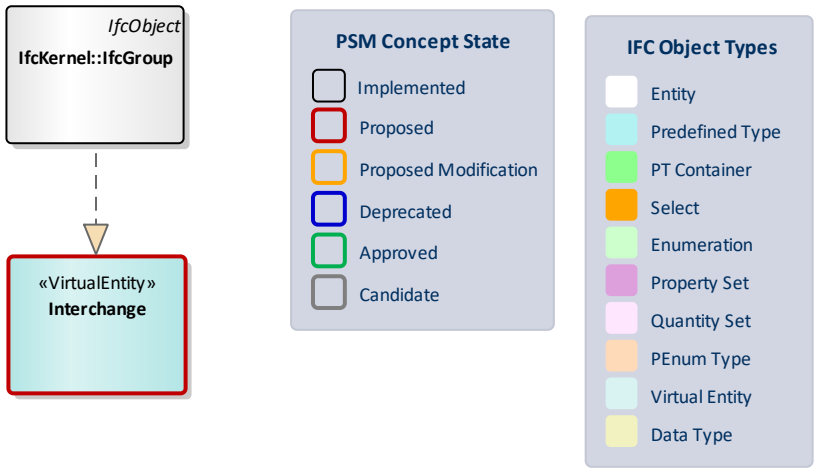


Figure 39: Transportation systems - Interchange -

1.5.2.1 Virtual Entity: Interchange

Road junction that uses grade separation, with one or more ramps, to permit traffic on at least one carriageway to pass through the junction without directly crossing any other traffic stream.

Entity Properties	
Realizing Parent	IfcGroup
Notes	

Appendix A – IFC Road Contributor List

Company	Name
Stakeholders, bSI InfraRoom Project Steering Committee (IRPSC)	
Apogea, *Spain*	Jesús Valderrama
APLITOP, *Spain*	Francisco Navarette
AutoDesk, *global*	Marek Suchocki
Bundesministerium für Verkehr und digitale Infrastruktur, **BMVI**, *Germany*	Gerd Kellermann
China railway BIM alliance, **CRBIM**, *China*	Sheng Liming
The Danish Road Directorate, *Denmark*	Svend Kold Johansen
The Finnish Transport and Infrastructure Agency, *Finland*	Tarmo Savolainen
Korea Institute of civil engineering and building technology, **KICT**, *Korea*	Dr Hyunseok Moon
MIDAS, *Korea*	Sangyoon Kim
Modélisation des informations interopérables pour les infrastructures durable, **MINnD**, *France*	Christophe Castaing
The Norwegian Public Roads Administration, *Norway*	Hanne Hermanrud
Nye Veier, *Norway*	Per Qvalben
The Swedish Transport Administration, *Sweden*	Peter Axelsson
Trimble, *Global*	Duane Gleason

Company	Name
Team members	
Apogea, *Spain*	Joaquim Narcis Moya Sala, Antonio Marquez
AEC3	Thomas Liebich
APLITOP, *Spain*	Salvador Marin, Javier Nadal
AutoDesk, *global*	Yoshihiko Fukuchi, Heiko Meyerdirks, Tim Yarris, Sebastian Esser (TUM)
BMVI, *Germany*	Štefan Jaud (TUM), André Borrmann (TUM)
CRBIM, *China*	Zhao FeiFei, Dongxu Yan, Tianhua Zhu, Hanbin
The Finnish Transport and Infrastructure Agency, *Finland*	Juho Santala, Jenna Johansson
KICT, *Korea*	Dr Hyunseok Moon, Jaeyoung Shin, Jisun Won, Xiumei Zheng
MINnD, *France*	Pauline Gauthier, Nolwenn Lancien,
The Swedish Transport Administration, *Sweden*	Karin Anderson Lars Wikström (Triona)
Technical University of Munich, TUM, *Germany*	Štefan Jaud (TUM), André Borrmann (TUM), Sebastian Esser (TUM)
Trimble, *Global*	Johnny Jensen
Project Organisation and core team	
Project leader:	Dr Hyunseok Moon
Co-project leader:	Karin Anderson
Administration:	Andrew Sheil, *Ramböll*, Laura Vaessen-Mol, *Gobar*
Technical lead:	Juha Hyvärinen, Jhy OY
IFC lead:	Sergej Muhič, Siemens
Conceptual model lead:	Lars Wikström (Triona) STA
Validation lead:	Štefan Jaud (TUM) BMVI
Property lead/OGC Liaison:	Johnny Jensen, Trimble
WP5, Prototypical implementation, Participating software vendors	
Aplitop, Autodesk, Bentley, KICT / Midas IT, TUM, Autodesk, TUM, Obermeyer/ProVI, 12D, Trimble, AKG, Tool, Card-1, CGS-Labs, Istram, SierraSoft, Catenda	

Note: names and companies are simply listed alphabetically