bSI UML Model Report

UML Model Report for Excavation, Support & Lining taxonomy and IFC mapping

Project/Publisher: IFC Tunnel Project

Work Package: IFC Tunnel – WP3 – Schema Extension

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Document Information

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IR-TUN-WP3-EXC	bSI UML Model Report – IFC Tunnel – Excavation, support and lining	LW	2022-10-20

Revision History

Version	Status	Date	Notes
V01	DRAFT	2021-12-20	First draft
V02	DRAFT	2022-02-28	Second draft - model updates
V10	FINAL	2022-06-28	Final version (Pset and Qto definitions excluded)
V11	FINAL	2022-10-20	Final version including changes after work with the IFC specification

Author List

IFC Tunnel

Contents

1 Introduction

The IFC Tunnel project extends the IFC data model into the domain of tunnels by describing the semantics and geometry for tunnels. The conceptual model documentation for IFC Tunnel is divided in these parts:

- **IR-TUN_ConceptualModelReport - Excavation, support and lining_v1.1 (this document).** Describes the domain taxonomy concepts specified within the excavation, support and lining domain and their mapping to existing, modified or proposed entities, predefined types or property sets in the IFC specification
- IR-TUN_ConceptualModelReport - Geotechnics_v1.1. Describes the domain taxonomy concepts in the geological and geotechnical domain and their mapping to existing, modified or proposed entities, predefined types or property sets in the IFC specification
- IR-TUN_ConceptualModelReport - Systems_v1.1. Describes the domain taxonomy concepts in the systems domain and their mapping to existing, modified or proposed entities, predefined types or property sets in the IFC specification
- IR-TUN_ConceptualModelReport – IFC Extension_v1.1. Describes the proposed extensions to the IFC schema based on the requirements from the three above documents.
- IR-TUN_ConceptualModelReport – Annex I – Reading guide_v1.0. Describes the UML notation used in the above documents.

The IFC Tunnel project has based the definition of tunnel concepts in taxonomies specified by the three domain expert teams and on the previously distributed requirements analysis report (IR-TUN_Requirement-Analysis-Report_v1.1).

2 Package: Excavation, support and lining

A package containing the excavation taxonomy concepts and their mappings towards existing or new IFC elements.

All classes stereotyped <<VirtualEntity>> represent the domain taxonomy concepts. The mappings towards IFC is made through UML Realization relationships. The IFC Entities are represented by classes with no stereotype. Property sets and Predefined types are represented by UML classes stereotyped as <<PropertySet>> and <<PredefinedType>>.

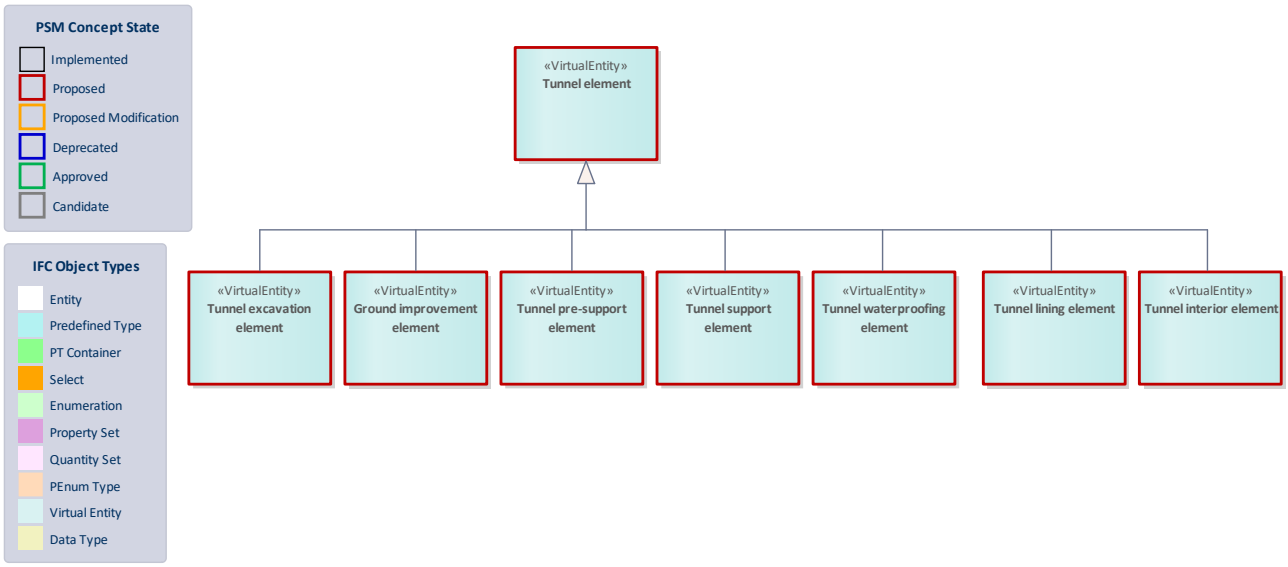

Figure 1: Excavation, support and lining – Taxonomy base classes

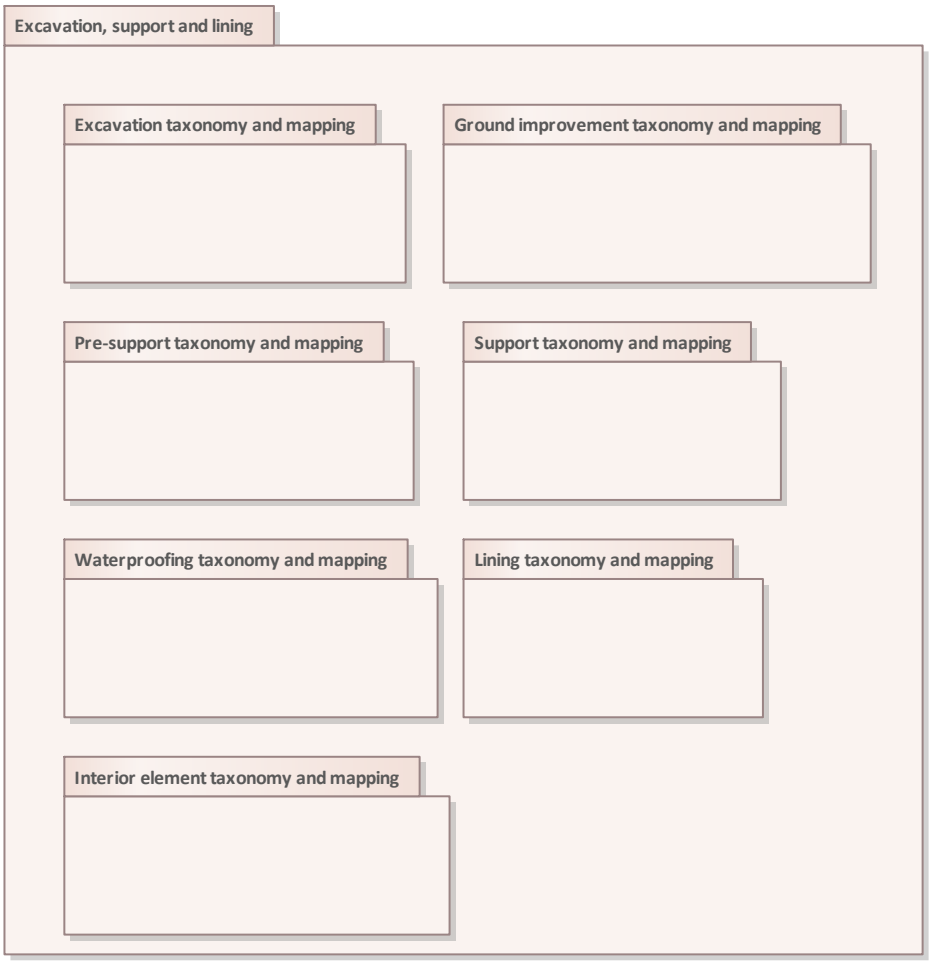

Figure 2: Excavation, support and lining – Package structure

2.1 Virtual Entity: Tunnel excavation element

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

Entity Properties	
Realizing Parent	
Notes	Mapping on subclasses.

2.2 Virtual Entity: Ground improvement element

An element that improves the physical and mechanical properties of the ground.

Entity Properties	
Realizing Parent	
Notes	Mapping on subclasses.

2.3 Virtual Entity: Tunnel interior element

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	Element contained in a tunnel spatial structure element.

2.4 Virtual Entity: Tunnel lining element

Entity Properties	
Realizing Parent	
Notes	Elements are grouped into a TUNNEL_LINING system to indicate this function.

2.5 Virtual Entity: Tunnel pre-support element

Rigid element installed before excavation at the tunnel face at the top perimeter of the tunnel section.

Entity Properties	
Realizing Parent	
Notes	Elements are grouped into a TUNNEL_PRESUPPORT system to indicate this function.

2.6 Virtual Entity: Tunnel support element

Element providing permanent support that is designed and installed to guarantee the long term stability of the underground structure.

Entity Properties	
Realizing Parent	
Notes	Elements are grouped into a TUNNEL_SUPPORT system to indicate this function.

2.7 Virtual Entity: Tunnel waterproofing element

Elements used to protect the tunnel construction against damage from moisture or the unintentional entry of water as well as the danger posed by aggressive water or soils and the effects of chemicals.

Entity Properties	
Realizing Parent	
Notes	Elements are grouped into a TUNNEL_WATERPROOFING system to indicate this function.

2.8 Virtual Entity: Tunnel element

A generalization of all elements occurring in tunnel construction.

Entity Properties	
Realizing Parent	
Notes	

2.9 Package: Excavation taxonomy and mapping

Taxonomy and mapping for the excavation part.

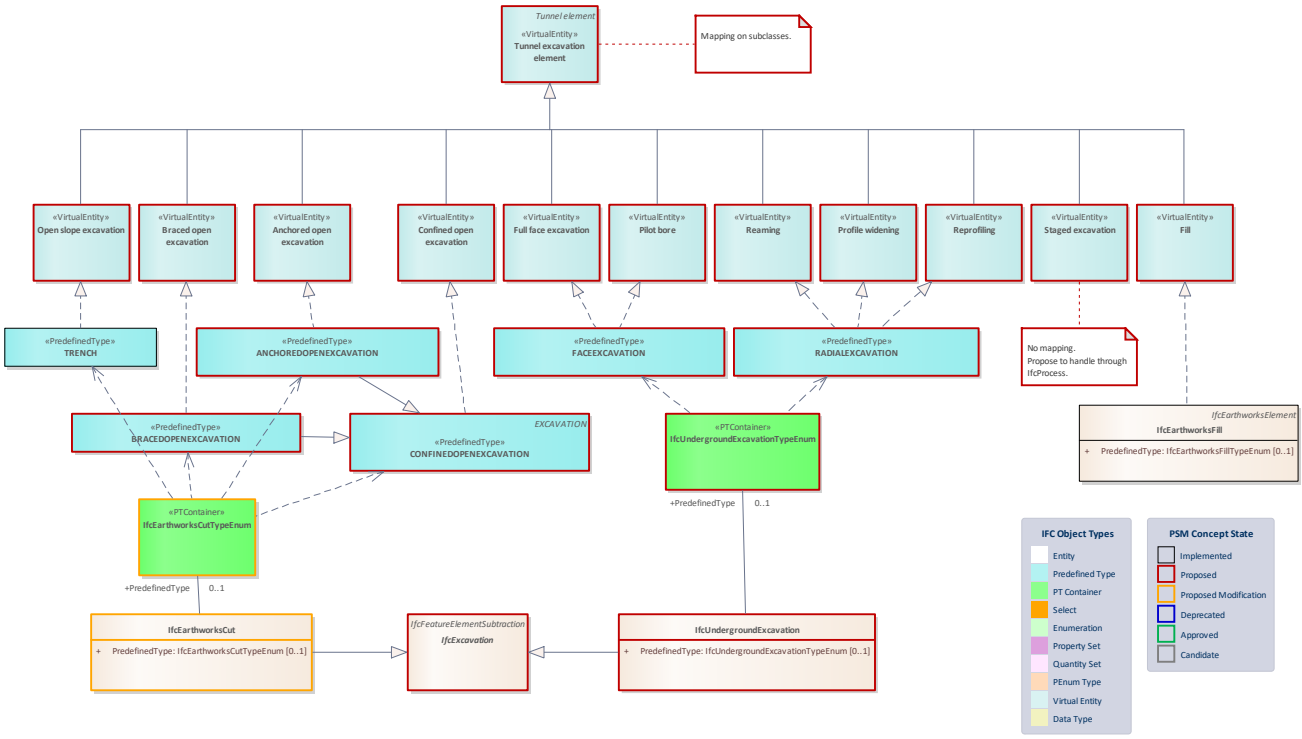

Figure 3: Excavation taxonomy and mapping -

2.9.1 PDT Container: IfcEarthworksCutTypeEnum

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

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcEarthworksCut	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
	IfcEarthworksCutTypeEnum.BASE_EXCAVATION IfcEarthworksCutTypeEnum.CUT IfcEarthworksCutTypeEnum.PAVEMENTMILLING IfcEarthworksCutTypeEnum.STEPEXCAVATION IfcEarthworksCutTypeEnum.TOPSOILREMOVAL IfcEarthworksCutTypeEnum.OVEREXCAVATION	IfcEarthworksCutTypeEnum.CONFINEDOPENEXCAVATION IfcEarthworksCutTypeEnum.BRACEDOPENEXCAVATION IfcEarthworksCutTypeEnum.ANCHOREDOPENEXCAVATION	

	IfcEarthworksCutTypeEnum.EXCAVATION IfcEarthworksCutTypeEnum.DREDGING IfcEarthworksCutTypeEnum.TRENCH	

2.9.2 Class: IfcEarthworksCut

The resulting void from modification of existing terrain or road structure by excavation of the surface 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: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

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

Inheritance Statement		
Subtype Of	IfcExcavation	
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.

2.9.3 Predefined Type: ANCHOREDOPENEXCAVATION

Full Identifier: **IfcEarthworksCutTypeEnum.ANCHOREDOPENEXCAVATION**

A confined open excavation where the vertical walls are anchored.

Status: **Proposed**

Package: **Earthworks and Excavation**

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

2.9.4 Predefined Type: BRACEDOPENEXCAVATION

Full Identifier: **IfcEarthworksCutTypeEnum.BRACEDOPENEXCAVATION**

A confined open excavation where the vertical walls are braced.

Status: **Proposed**

Package: **Earthworks and Excavation**

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

2.9.5 Predefined Type: CONFINEDOPENEXCAVATION

Full Identifier: **IfcEarthworksCutTypeEnum.CONFINEDOPENEXCAVATION**

An open slope excavation where the sides are vertical or near vertical

Status: **Proposed**

Package: **Earthworks and Excavation**

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

Property sets	

2.9.6 Class: IfcExcavation

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 and Excavation**

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

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

2.9.7 Class: IfcUndergroundExcavation

The resulting void from an underground excavation where the uppermost terrain surface is not affected

Status: **Proposed**

Package: **Earthworks and Excavation**

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

Inheritance Statement

Subtype Of	IfcExcavation	
Subtypes	**EXISTING**	**PROPOSED**

Class Attributes

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

2.9.8 PDT Container: IfcUndergroundExcavationTypeEnum

This enumeration defines the range of different types of underground excavation elements that can further specify an _IfcUndergroundExcavationTypeEnum_.

Status: **Proposed**

Package: **Earthworks and Excavation**

Container Properties			
Parent Entity	IfcUndergroundExcavation	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcUndergroundExcavationTypeEnum.RADIALEXCAVATION IfcUndergroundExcavationTypeEnum.FACEEXCAVATION	

2.9.9 Predefined Type: FACEEXCAVATION

Full Identifier: **IfcUndergroundExcavationTypeEnum.FACEEXCAVATION**

A longitudinal underground excavation either of the full face or parts of the full face.

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties

Predefined Type Container	IfcUndergroundExcavationTypeEnum	**Parent Entity**	IfcUndergroundExcavation
Stereotype	«PredefinedType»		
Property sets			

2.9.10 Predefined Type: RADIALEXCAVATION

Full Identifier: **IfcUndergroundExcavationTypeEnum.RADIALEXCAVATION**

A lateral underground excavation where the tunnel profile is changed, e.g. widened..

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties			
Predefined Type Container	IfcUndergroundExcavationTypeEnum	**Parent Entity**	IfcUndergroundExcavation
Stereotype	«PredefinedType»		
Property sets			

2.9.11 Virtual Entity: Anchored open excavation

A confined open excavation where the vertical walls are anchored.

Entity Properties	
Realizing Parent	IfcEarthworksCutTypeEnum.ANCHOREDOPENEXCAVATION
Notes	

2.9.12 Virtual Entity: Braced open excavation

A confined open excavation where the vertical walls are braced.

Entity Properties

Realizing Parent	IfcEarthworksCutTypeEnum.BRACEDOPENEXCAVATION
Notes	

2.9.13 Virtual Entity: Confined open excavation

An open slope excavation where the sides are vertical or near vertical

Entity Properties	
Realizing Parent	IfcEarthworksCutTypeEnum.CONFINEDOPENEXCAVATION
Notes	

2.9.14 Virtual Entity: Fill

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

Entity Properties	
Realizing Parent	IfcEarthworksFill
Notes	

2.9.15 Virtual Entity: Full face excavation

An underground excavation where the full face was excavated at a single stage.

Entity Properties	
Realizing Parent	IfcUndergroundExcavationTypeEnum.FACEEXCAVATION
Notes	

2.9.16 Virtual Entity: Open slope excavation

The resulting void from an excavation of a trench where the alignment is exposed from the surface

Entity Properties

Realizing Parent	IfcEarthworksCutTypeEnum.TRENCH
Notes	

2.9.17 Virtual Entity: Pilot bore

An underground excavation where only a part of the full face was excavated as an initial stage.

Entity Properties	
Realizing Parent	IfcUndergroundExcavationTypeEnum.FACEEXCAVATION
Notes	

2.9.18 Virtual Entity: Profile widening

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcUndergroundExcavationTypeEnum.RADIALEXCAVATION
Notes	

2.9.19 Virtual Entity: Reaming

An underground excavation stage following the pilot bore where the excavation is enlarged until it covers the full face.

Entity Properties	
Realizing Parent	IfcUndergroundExcavationTypeEnum.RADIALEXCAVATION
Notes	

2.9.20 Virtual Entity: Reprofiling

<<ToDo: Definition>>

Entity Properties

Realizing Parent	IfcUndergroundExcavationTypeEnum.RADIALEXCAVATION
Notes	

2.9.21 Virtual Entity: Staged excavation

<<ToDo: Definition>>

Entity Properties	
Realizing Parent	
Notes	No mapping. Propose to handle through IfcProcess.

2.9.22 Virtual Entity: Tunnel excavation element

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

Entity Properties	
Realizing Parent	
Notes	Mapping on subclasses.

2.10 Package: Ground improvement taxonomy and mapping

A package containing the ground improvement taxonomy elements and their mappings towards IFC elements.

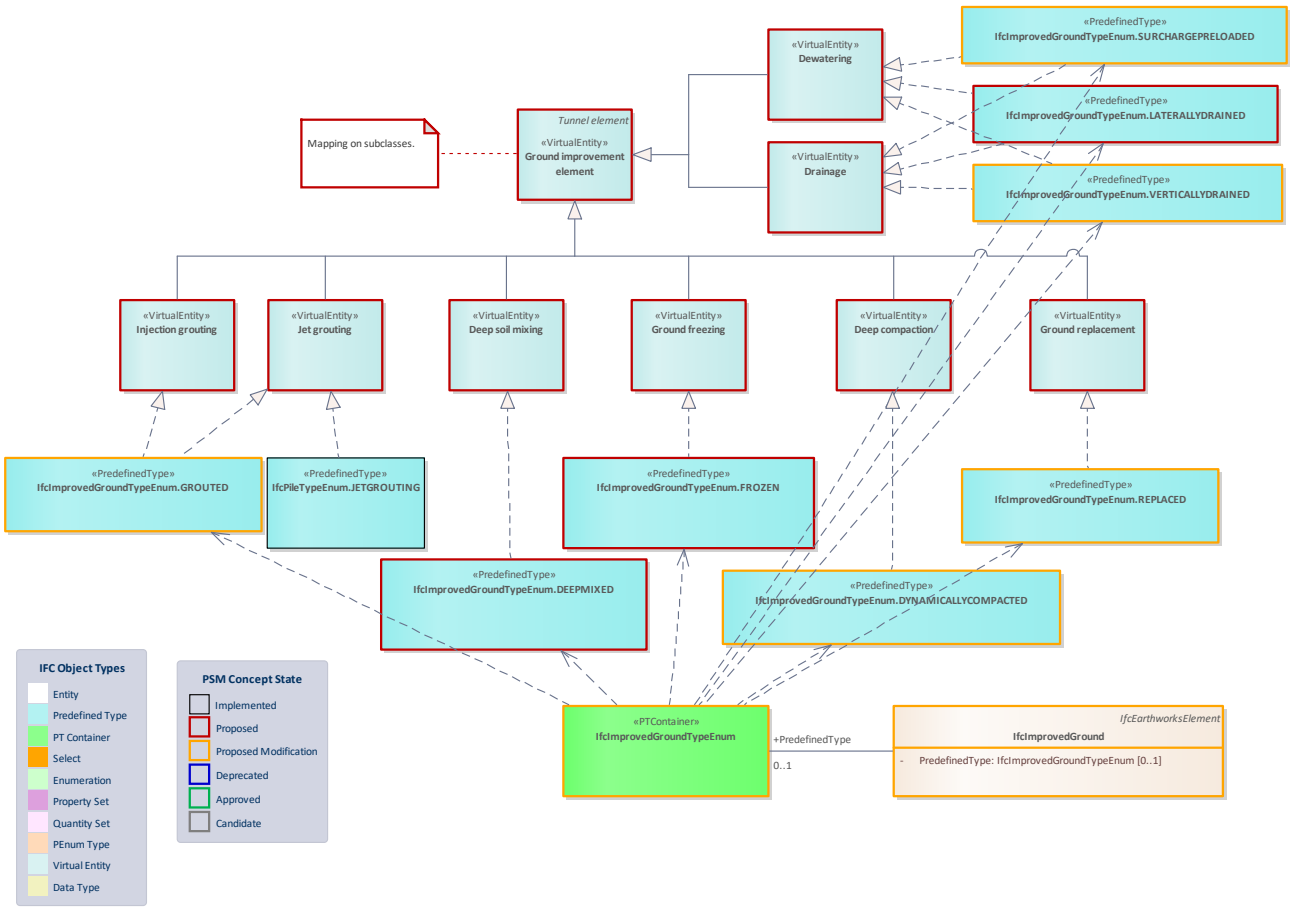

Figure 4: Ground improvement taxonomy and mapping -

2.10.1 Class: IfcImprovedGround

Ground stabilized by some mechanical or chemical method.

Note: Renamed IfcReinforcedSoil.

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

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

Inheritance Statement	
Subtype Of	IfcEarthworksElement

Subtypes	EXISTING	PROPOSED

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcImprovedGroundTypeEnum	[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.

2.10.2 PDT Container: IfcImprovedGroundTypeEnum

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

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcImprovedGround	**Stereotype**	«PTContainer»
Contains	**EXISTING** IfcImprovedGroundTypeEnum.GROUTED IfcIfcImprovedGroundTypeEnum.ROLLERCOMPACTED IfcImprovedGroundTypeEnum.REPLACED IfcImprovedGroundTypeEnum.DYNAMICALLYCOMPACTED IfcImprovedGroundTypeEnum.VERTICALLYDRAINED IfcImprovedGroundTypeEnum.SURCHARGEPRELOADED	**PROPOSED** IfcImprovedGroundTypeEnum.LATERALLYDRAINED IfcImprovedGroundTypeEnum.DEEPMIXED IfcImprovedGroundTypeEnum.FROZEN	

2.10.3 Predefined Type: DYNAMICALLYCOMPACTED

Full Identifier: **IfcImprovedGroundTypeEnum.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: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.4 Predefined Type: GROUTED

Full Identifier: **IfcImprovedGroundTypeEnum.GROUTED**

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

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.5 Predefined Type: REPLACED

Full Identifier: **IfcImprovedGroundTypeEnum.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: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.6 Predefined Type: SURCHARGEPRELOADED

Full Identifier: **IfcImprovedGroundTypeEnum.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: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.7 Predefined Type: VERTICALLYDRAINED

Full Identifier: **IfcImprovedGroundTypeEnum.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: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.8 Predefined Type: LATERALLYDRAINED

Full Identifier: **IfcImprovedGroundTypeEnum.LATERALLYDRAINED**

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

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.9 Predefined Type: DEEPMIXED

Full Identifier: **IfcImprovedGroundTypeEnum.DEEPMIXED**

A ground improvement technique that improves soft, high moisture clays, peats, and other weak soils, by mechanically mixing them with dry cementitious binder.

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.10 Predefined Type: FROZEN

Full Identifier: **IfcImprovedGroundTypeEnum.FROZEN**

Artificial ground freezing is used for waterproofing and/or temporary consolidation to support the excavation of underground structures under water in loose soils or in jointed rocks. It is suitable for any type of soil and fractured rock. Most used technologies are either direct method (liquid nitrogen) or indirect method (brine).

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties			
Predefined Type Container	IfcImprovedGroundTypeEnum	**Parent Entity**	IfcImprovedGround
Stereotype	«PredefinedType»		
Property sets			

2.10.11 Virtual Entity: Deep compaction

Dynamic compaction is a ground improvement technique that uses a drop weight to densify loose soils

Entity Properties	
Realizing Parent	IfcImprovedGroundTypeEnum.DYNAMICALLYCOMPACTED
Notes	

2.10.12 Virtual Entity: Deep soil mixing

A ground improvement technique that improves soft, high moisture clays, peats, and other weak soils, by mechanically mixing them with dry cementitious binder.

Entity Properties	
Realizing Parent	IfcImprovedGroundTypeEnum.DEEPMIXED
Notes	

2.10.13 Virtual Entity: Dewatering

Same as Drainage?

Entity Properties

Realizing Parent	IfcImprovedGroundTypeEnum.LATERALLYDRAINED IfcImprovedGroundTypeEnum.VERTICALLYDRAINED IfcImprovedGroundTypeEnum.SURCHARGEPRELOADED
Notes	

2.10.14 Virtual Entity: Drainage

A kind of ground improvement method where water is removed to lower water pressure in the ground, limit surface runoff from the tunnel face and facing and lowering the pore pressure in loose granular soils and very fractured rock masses.

Entity Properties	
Realizing Parent	IfcImprovedGroundTypeEnum.LATERALLYDRAINED IfcImprovedGroundTypeEnum.VERTICALLYDRAINED IfcImprovedGroundTypeEnum.SURCHARGEPRELOADED
Notes	

2.10.15 Virtual Entity: Ground freezing

Artificial ground freezing is used for waterproofing and/or temporary consolidation to support the excavation of underground structures under water in loose soils or in jointed rocks. It is suitable for any type of soil and fractured rock. Most used technologies are either direct method (liquid nitrogen) or indirect method (brine).

Entity Properties	
Realizing Parent	IfcImprovedGroundTypeEnum.FROZEN
Notes	

2.10.16 Virtual Entity: Ground improvement element

An element that improves the physical and mechanical properties of the ground.

Entity Properties	
Realizing Parent	
Notes	Mapping on subclasses.

2.10.17 Virtual Entity: Ground replacement

A method for ground improvement by replacement of the ground by using a cement grout at high pressure, forming contiguous columns of "soil-cement".

Entity Properties	
Realizing Parent	IfcImprovedGroundTypeEnum.REPLACED
Notes	

2.10.18 Virtual Entity: Injection grouting

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

Entity Properties	
Realizing Parent	IfcImprovedGroundTypeEnum.GROUTED
Notes	

2.10.19 Virtual Entity: Jet grouting

A method of ground reinforcement that unlike classical forms of grouting that permeate through the soil uses high kinetic energy in the form of a high velocity jet of grout to breakdown the soil structure and simultaneously mix cement grout with the in-situ soil.

Entity Properties	
Realizing Parent	IfcPileTypeEnum.JETGROUTING IfcImprovedGroundTypeEnum.GROUTED
Notes	

2.11 Package: Interior element taxonomy and mapping

A package containing the tunnel interior taxonomy elements and their mappings towards IFC elements.

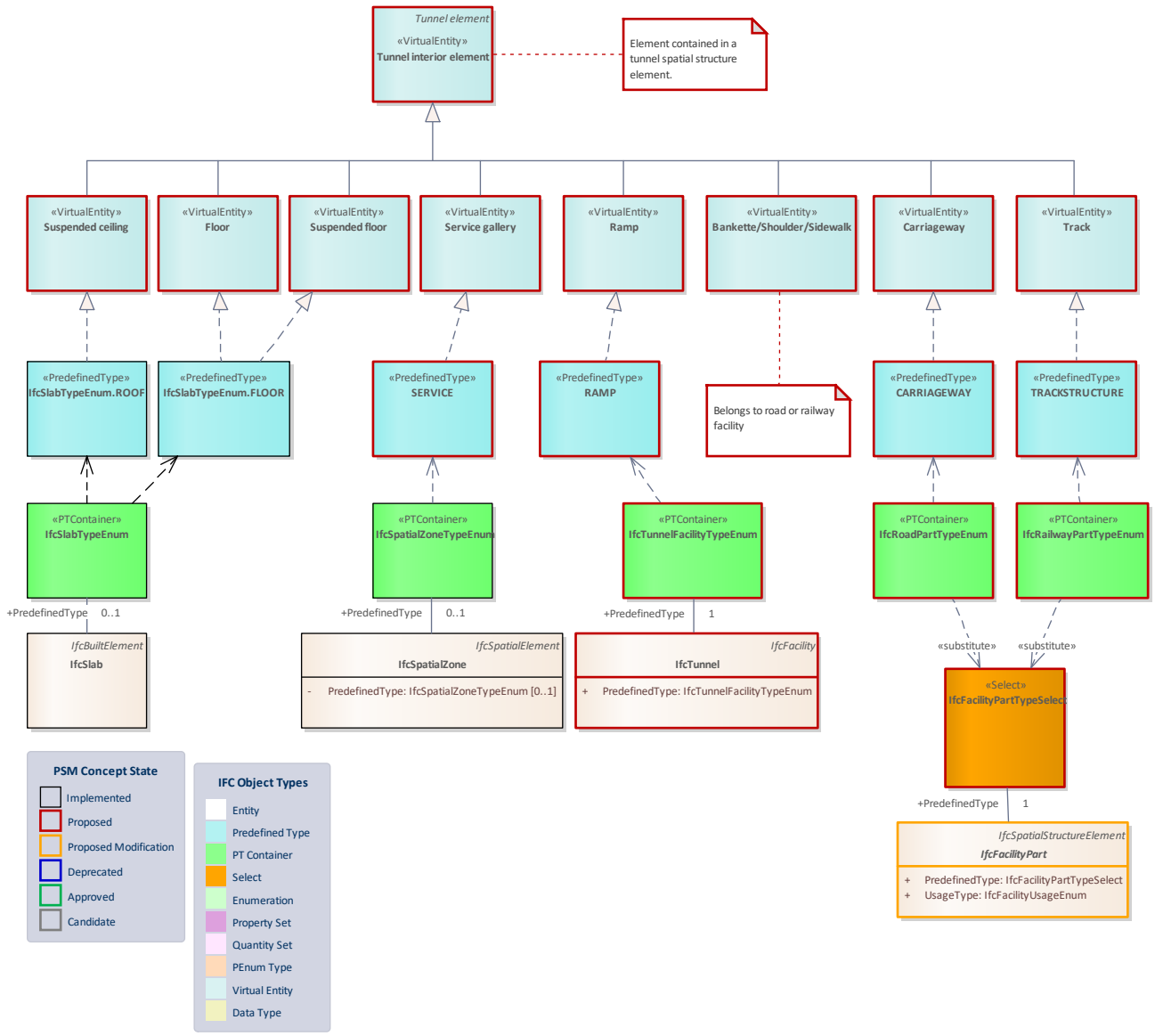

Figure 5: Interior element taxonomy and mapping - spatial concepts -

2.11.1 Class: IfcFacilityPart

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

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Status: **ProposedModification**

Package: **IfcProductExtension**

Class Properties

Status	ProposedModification	**Is Abstract**	Abstract
Property sets	Qto_FacilityPartBaseQuantities		

Inheritance Statement		
Subtype Of	IfcSpatialStructureElement	
Subtypes	**EXISTING**	**PROPOSED**
	IfcFacilityPartCommon IfcBridgePart IfcMarinePart IfcRoadPart IfcRailwayPart	IfcTunnelPart

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcFacilityPartTypeSelect		
UsageType	IfcFacilityUsageEnum		

2.11.2 PDT Container: IfcRailwayPartTypeEnum

The IfcRailwayPartTypeEnum defines the range of different types of railway part that can be specified.

Status: **Proposed**

Package: **IfcRail**

Container Properties			
Parent Entity		**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcRailwayPartTypeEnum.TURNOUTSUPERSTRUCTURE IfcRailwayPartTypeEnum.SUPERSTRUCTURE IfcRailwayPartTypeEnum.LINESIDESTRUCTURE IfcRailwayPartTypeEnum.PLAINTRACKSUPESTRUCTURE IfcRailwayPartTypeEnum.SUBSTRUCTURE	

		IfcRailwayPartTypeEnum.DILATATIONSUPERSTRUCTURE IfcRailwayPartTypeEnum.LINESIDESTRUCTUREPART IfcRailwayPartTypeEnum.TRACKSTRUCTUREPART IfcRailwayPartTypeEnum.TRACKSTRUCTURE

2.11.3 Predefined Type: TRACKSTRUCTURE

Full Identifier: **IfcRailwayPartTypeEnum.TRACKSTRUCTURE**

A spatial structure element that contains track-related elements.

Status: **Proposed**

Package: **IfcRail**

Predefined Type Properties			
Predefined Type Container	IfcRailwayPartTypeEnum	**Parent Entity**	IfcFacilityPart
Stereotype	«PredefinedType»		
Property sets			

2.11.4 PDT Container: IfcRoadPartTypeEnum

Status: **Proposed**

Package: **IfcRoad**

Container Properties			
Parent Entity		**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcRoadPartTypeEnum.TRAFFICISLAND IfcRoadPartTypeEnum.RAILWAYCROSSING IfcRoadPartTypeEnum.PARKINGBAY IfcRoadPartTypeEnum.SIDEWALK	

		IfcRoadPartTypeEnum.CENTRALRESERVE IfcRoadPartTypeEnum.TOLLPLAZA IfcRoadPartTypeEnum.REFUGEISLAND IfcRoadPartTypeEnum.ROADSIDE IfcRoadPartTypeEnum.ROADWAYPLATEAU IfcRoadPartTypeEnum.PASSINGBAY IfcRoadPartTypeEnum.INTERSECTION IfcRoadPartTypeEnum.HARDSHOULDER IfcRoadPartTypeEnum.BUS_STOP IfcRoadPartTypeEnum.ROADSIDEPART IfcRoadPartTypeEnum.CARRIAGEWAY IfcRoadPartTypeEnum.LAYBY IfcRoadPartTypeEnum.ROUNDABOUT IfcRoadPartTypeEnum.ROADSEGMENT IfcRoadPartTypeEnum.TRAFFICLANE IfcRoadPartTypeEnum.SHOULDER IfcRoadPartTypeEnum.CENTRALISLAND IfcRoadPartTypeEnum.BICYCLECROSSING IfcRoadPartTypeEnum.SOFTSHOULDER IfcRoadPartTypeEnum.PEDESTRIAN_CROSSING

2.11.5 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: **IfcRoad**

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

Property sets	

2.11.6 Select: IfcFacilityPartTypeSelect

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

Status: **Proposed**

Package: **IfcSharedInfrastructureElements**

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

2.11.7 Predefined Type: RAMP

Full Identifier: **IfcTunnelFacilityTypeEnum.RAMP**

A tunnel connecting tunnels at different levels or a tunnel with the above ground

Status: **Proposed**

Package: **Facilities**

Predefined Type Properties			
Predefined Type Container	IfcTunnelFacilityTypeEnum	**Parent Entity**	IfcTunnel
Stereotype	«PredefinedType»		
Property sets			

2.11.8 Class: IfcTunnel

An artificial underground passage, especially one built through a hill or under a building, road, or river.

NOTE Definition from PIARC : Long enclosed transport route.

Status: **Proposed**

Package: **Facilities**

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

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

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcTunnelFacilityTypeEnum		

2.11.9 PDT Container: IfcTunnelFacilityTypeEnum

Predefined types for IfcTunnel.

Status: **Proposed**

Package: **Facilities**

Container Properties			
Parent Entity	IfcTunnel	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcTunnelFacilityTypeEnum.SHAFT IfcTunnelFacilityTypeEnum.PEDESTRIAN IfcTunnelFacilityTypeEnum.ROAD IfcTunnelFacilityTypeEnum.RAILWAY IfcTunnelFacilityTypeEnum.MAINTENANCE IfcTunnelFacilityTypeEnum.UNDERGROUND_FACILITIES	

		IfcTunnelFacilityTypeEnum.METRO IfcTunnelFacilityTypeEnum.ACCESSTUNNEL IfcTunnelFacilityTypeEnum.BYPASS IfcTunnelFacilityTypeEnum.BICYCLE IfcTunnelFacilityTypeEnum.UTILITIES IfcTunnelFacilityTypeEnum.RAMP

2.11.10 Predefined Type: SERVICE

Full Identifier: **IfcSpatialZoneTypeEnum.SERVICE**

Status: **Proposed**

Package: **Spatial zones**

Predefined Type Properties			
Predefined Type Container	IfcSpatialZoneTypeEnum	**Parent Entity**	IfcSpatialZoneType IfcSpatialZone
Stereotype	«PredefinedType»		
Property sets			

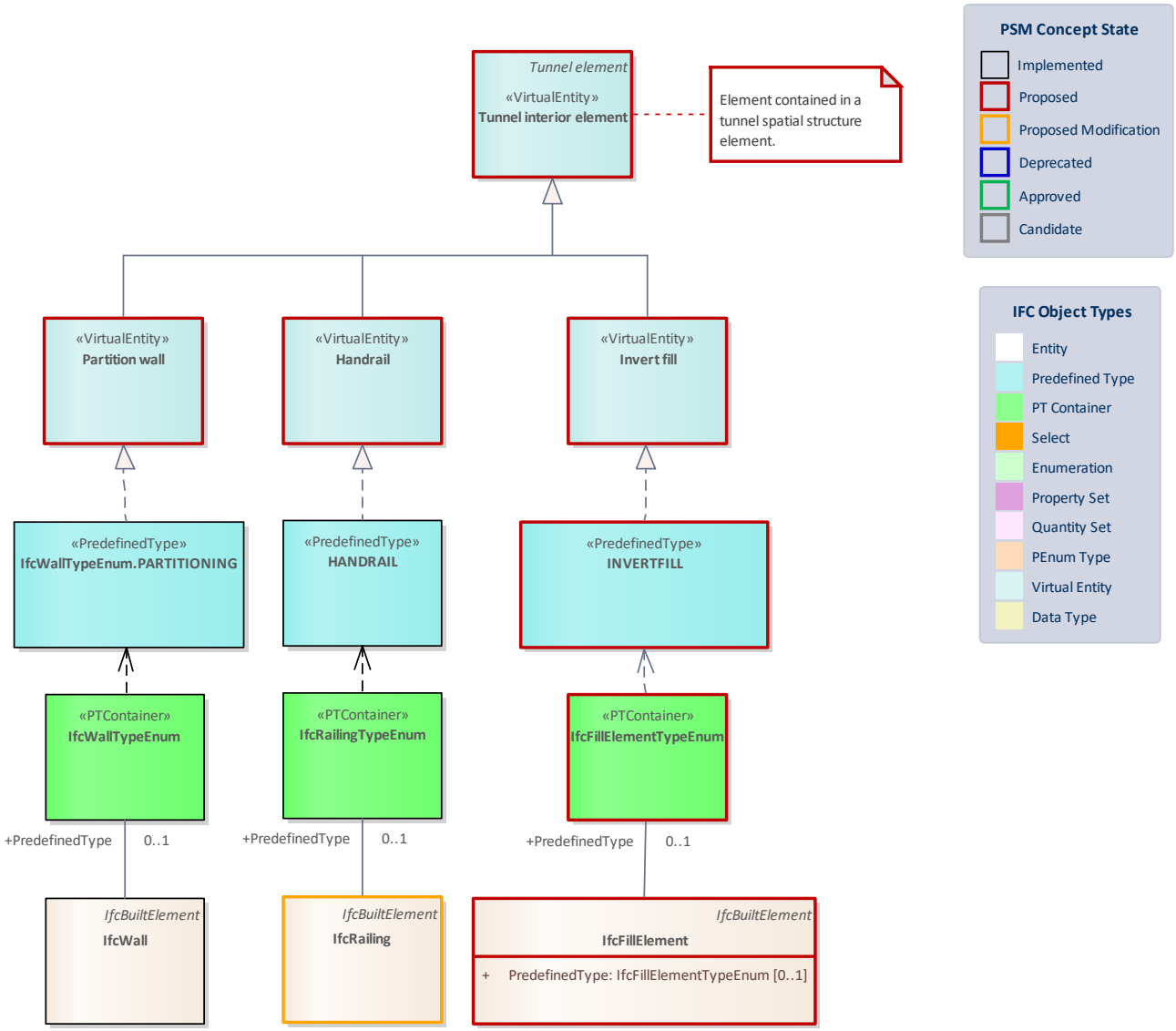

Figure 6: Interior element taxonomy and mapping part 1 -

2.11.11 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**

2.11.12 Predefined Type: INVERTFILL

Full Identifier: **IfcFillElementTypeEnum.INVERTFILL**

The fill element used to fill the tunnel invert, i.e. The lowest section of a tunnel, i.e., the floor.

Status: **Proposed**

Package: **Built elements**

Predefined Type Properties			
Predefined Type Container	IfcFillElementTypeEnum	**Parent Entity**	IfcFillElement
Stereotype	«PredefinedType»		
Property sets			

2.11.13 Class: IfcFillElement

An element with the purpose of filling gaps between other elements.

Status: **Proposed**

Package: **Built elements**

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

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

Class Attributes

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

2.11.14 PDT Container: IfcFillElementTypeEnum

This enumeration defines the range of different types of fill elements that can further specify an _IfcFillElementTypeEnum_.

Status: **Proposed**

Package: **Built elements**

Container Properties			
Parent Entity	IfcFillElement	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcFillElementTypeEnum.ANNULARGAPFILL IfcFillElementTypeEnum.INVERTFILL	

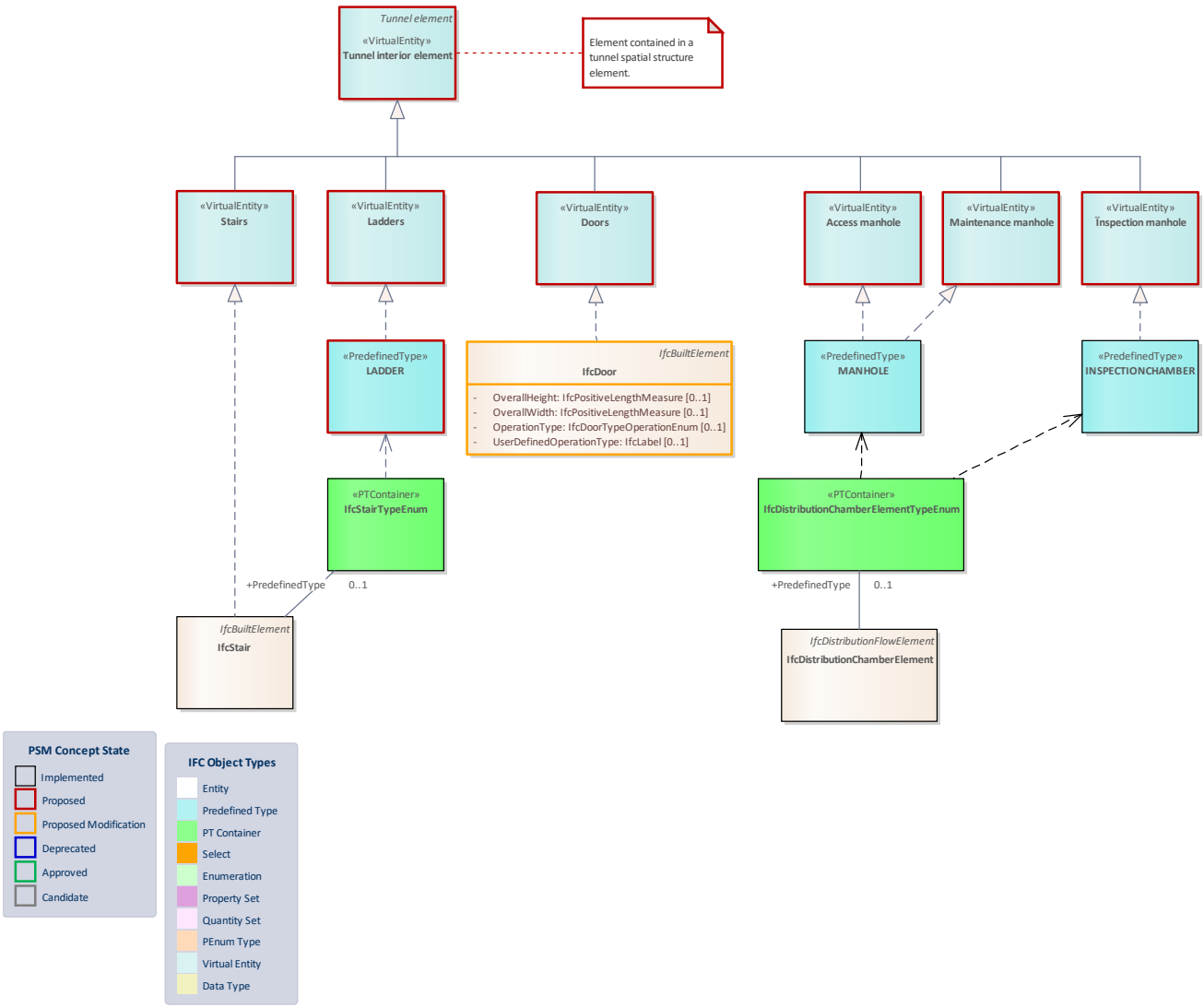

Figure 7: Interior element taxonomy and mapping part 2 -

2.11.15 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	Multiplicity	Definition

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 theE 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.
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_.
UserDefinedOperationType	IfcLabel	[0..1]	Designator for the user defined operation type, shall only be provided, if the value of _OperationType_ is set to USERDEFINED.

2.11.16 Predefined Type: LADDER

Full Identifier: **IfcStairTypeEnum.LADDER**

a piece of equipment consisting of a series of bars or steps between two upright elements used for climbing up or down something

Status: **Proposed**

Package: **IfcSharedBldgElements**

Predefined Type Properties			
Predefined Type Container	IfcStairTypeEnum	**Parent Entity**	IfcStairType IfcStair
Stereotype	«PredefinedType»		
Property sets			

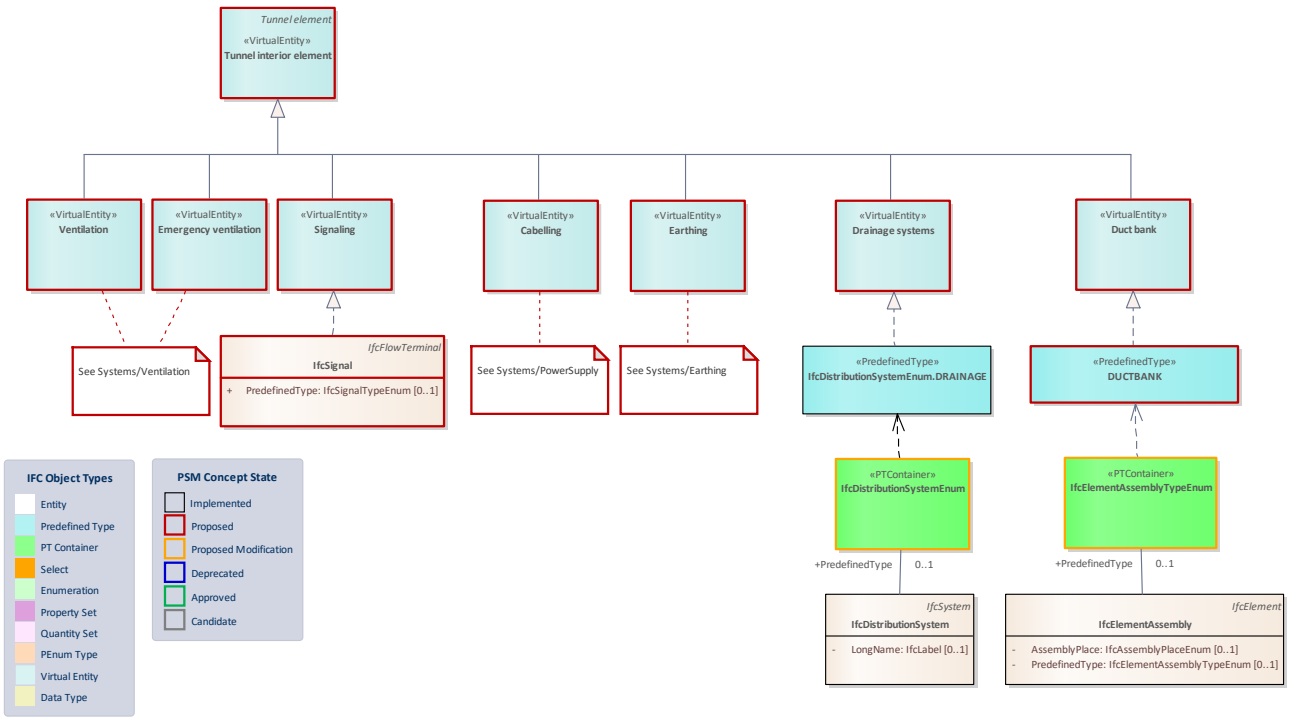

Figure 8: Interior element taxonomy and mapping part3 -

2.11.17 PDT Container: IfcElementAssemblyTypeEnum

This enumeration defines the basic configuration types for element assemblies.

> HISTORY New enumeration in IFC2x2.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Container Properties			
Parent Entity	IfcElementAssemblyType IfcElementAssembly	**Stereotype**	«PTContainer»
Contains	**EXISTING** IfcElementAssemblyTypeEnum.ABUTMENT IfcElementAssemblyTypeEnum.DECK IfcElementAssemblyTypeEnum.PYLON IfcElementAssemblyTypeEnum.ACCESSORY_ASSEMBLY IfcElementAssemblyTypeEnum.TRUSS IfcElementAssemblyTypeEnum.BRACED_FRAME IfcElementAssemblyTypeEnum.CROSS_BRACING IfcElementAssemblyTypeEnum.REINFORCEMENT_UNIT IfcElementAssemblyTypeEnum.BEAM_GRID IfcElementAssemblyTypeEnum.ARCH IfcElementAssemblyTypeEnum.SLAB_FIELD IfcElementAssemblyTypeEnum.PIER IfcElementAssemblyTypeEnum.RIGID_FRAME IfcElementAssemblyTypeEnum.GIRDER	**PROPOSED** IfcElementAssemblyTypeEnum.DUCTBANK IfcElementAssemblyTypeEnum.TRACKPANEL IfcElementAssemblyTypeEnum.DILATATIONPANEL IfcElementAssemblyTypeEnum.UMBRELLAVAULT IfcElementAssemblyTypeEnum.ENTRANCEWORKS IfcElementAssemblyTypeEnum.SUPPORTINGASSEMBLY IfcElementAssemblyTypeEnum.SUMPBUSTER IfcElementAssemblyTypeEnum.RAIL_MECHANICAL_EQUIPMENT_ASSEMBLY IfcElementAssemblyTypeEnum.MAST IfcElementAssemblyTypeEnum.TRACTION_SWITCHING_ASSEMBLY IfcElementAssemblyTypeEnum.SUSPENSIONASSEMBLY IfcElementAssemblyTypeEnum.SHELTER IfcElementAssemblyTypeEnum.TURNOUTPANEL IfcElementAssemblyTypeEnum.TRAFFIC_CALMING_DEVICE IfcElementAssemblyTypeEnum.GRID IfcElementAssemblyTypeEnum.SIGNALASSEMBLY	

2.11.18 PDT Container: IfcDistributionSystemEnum

This enumeration identifies different types of distribution systems. It is used to designate systems by their function as well as ports of devices within such systems to restrict connectivity to compatible connections.

> HISTORY New enumeration in IFC4.

Ports for cable carriers may be connected using _IfcCableCarrierSegment_ and _IfcCableCarrierFitting_. Type objects for cable carrier segments and fittings (_IfcCableCarrierSegmentType_ and

IfcCableCarrierFittingType that are not specific to a particular system type may have ports with _PredefinedType_ of NOTDEFINED which indicates that occurrences of such objects may connect to ports of any other cable-carrier based port. Valid enumerations for cable carriers are the same as that for cables, and may be asserted if ports of the contained cables are all of the same type.

bSI Documentation

Status: **ProposedModification**

Package: **IfcSharedBldgServiceElements**

Container Properties			
Parent Entity	IfcDistributionSystem IfcDistributionPort	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
	IfcDistributionSystemEnum.MONITORINGSYSTEM IfcDistributionSystemEnum.COMPRESSEDAIR IfcDistributionSystemEnum.EARTHING IfcDistributionSystemEnum.VENTILATION IfcDistributionSystemEnum.TELEPHONE IfcDistributionSystemEnum.HEATING IfcDistributionSystemEnum.DISPOSAL IfcDistributionSystemEnum.TV IfcDistributionSystemEnum.HAZARDOUS IfcDistributionSystemEnum.CONVEYING IfcDistributionSystemEnum.OIL IfcDistributionSystemEnum.EXHAUST IfcDistributionSystemEnum.REFRIGERATION IfcDistributionSystemEnum.LIGHTNINGPROTECTION IfcDistributionSystemEnum.DATA IfcDistributionSystemEnum.CHEMICAL IfcDistributionSystemEnum.DRAINAGE IfcDistributionSystemEnum.SEWAGE IfcDistributionSystemEnum.AIRCONDITIONING IfcDistributionSystemEnum.FIREPROTECTION IfcDistributionSystemEnum.OPERATIONAL IfcDistributionSystemEnum.CONDENSERWATER IfcDistributionSystemEnum.CONTROL IfcDistributionSystemEnum.SECURITY IfcDistributionSystemEnum.DOMESTICCOLDWATER	IfcDistributionSystemEnum.SAFETY IfcDistributionSystemEnum.CATENARY_SYSTEM IfcDistributionSystemEnum.OVERHEAD_CONTACTLINE_SYSTEM IfcDistributionSystemEnum.RETURN_CIRCUIT	

	IfcDistributionSystemEnum.DOMESTICHOTWATER IfcDistributionSystemEnum.VENT IfcDistributionSystemEnum.WASTEWATER IfcDistributionSystemEnum.ELECTRICAL IfcDistributionSystemEnum.LIGHTING IfcDistributionSystemEnum.FUEL IfcDistributionSystemEnum.AUDIOVISUAL IfcDistributionSystemEnum.VACUUM IfcDistributionSystemEnum.STORMWATER IfcDistributionSystemEnum.RAINWATER IfcDistributionSystemEnum.CHILLEDWATER IfcDistributionSystemEnum.COMMUNICATION IfcDistributionSystemEnum.ELECTROACOUSTIC IfcDistributionSystemEnum.WATERSUPPLY IfcDistributionSystemEnum.GAS IfcDistributionSystemEnum.SIGNAL IfcDistributionSystemEnum.POWERGENERATION IfcDistributionSystemEnum.MUNICIPALSOLIDWASTE	

2.11.19 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: **IfcSharedInfrastructureElements**

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

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

Class Attributes

Name	Type	Multiplicity	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.

2.11.20 Predefined Type: DUCTBANK

Full Identifier: **IfcElementAssemblyTypeEnum.DUCTBANK**

A Duct Bank is two or more ducts or conduits used as part of a system.

A duct bank is designed to protect and group or consolidate data and electrical cables to and from a facility. The cables are laid in PVC pipes or conduits. These conduit are bundled together and protected with either steel or reinforced concrete casings.

Duct banks are often located underground. They can carry cables for all electrical wiring and data requirements in the facility as well as extra cables that are not for immediate use, but may be valuable for future requirements.

Status: **Proposed**

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

2.11.21 Virtual Entity: Access 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	

2.11.22 Virtual Entity: Bankette/Shoulder/Sidewalk

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	Belongs to road or railway facility

2.11.23 Virtual Entity: Cabelling

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	See Systems/PowerSupply

2.11.24 Virtual Entity: 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.

Entity Properties	
Realizing Parent	IfcRoadPartTypeEnum.CARRIAGEWAY
Notes	

2.11.25 Virtual Entity: Doors

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.

Entity Properties	
Realizing Parent	IfcDoor
Notes	

2.11.26 Virtual Entity: Drainage systems

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcDistributionSystemEnum.DRAINAGE
Notes	

2.11.27 Virtual Entity: Duct bank

A Duct Bank is two or more ducts or conduits used as part of a system.

A duct bank is designed to protect and group or consolidate data and electrical cables to and from a facility. The cables are laid in PVC pipes or conduits. These conduit are bundled together and protected with either steel or reinforced concrete casings.

Duct banks are often located underground. They can carry cables for all electrical wiring and data requirements in the facility as well as extra cables that are not for immediate use, but may be valuable for future requirements.

Entity Properties	
Realizing Parent	IfcElementAssemblyTypeEnum.DUCTBANK
Notes	

2.11.28 Virtual Entity: Earthing

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	See Systems/Earthing

2.11.29 Virtual Entity: Emergency ventilation

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	See Systems/Ventilation

2.11.30 Virtual Entity: Floor

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcSlabTypeEnum.FLOOR
Notes	

2.11.31 Virtual Entity: Handrail

A type of railing designed to serve as an optional structural support for loads applied by human occupants (at hand height). Generally located adjacent to ramps and stairs. Generally floor or wall mounted.

Entity Properties	
Realizing Parent	IfcRailingTypeEnum.HANDRAIL
Notes	

2.11.32 Virtual Entity: Ïnspection manhole

Chamber constructed on a drain, sewer or pipeline with a removable cover that permits visble inspection.

Entity Properties	
Realizing Parent	IfcDistributionChamberElementTypeEnum.INSPECTIONCHAMBER
Notes	

2.11.33 Virtual Entity: Invert fill

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcFillElementTypeEnum.INVERTFILL
Notes	

2.11.34 Virtual Entity: Ladders

a piece of equipment consisting of a series of bars or steps between two upright elements used for climbing up or down something

Entity Properties	
Realizing Parent	IfcStairTypeEnum.LADDER
Notes	

2.11.35 Virtual Entity: Maintenance 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	

2.11.36 Virtual Entity: Partition wall

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcWallTypeEnum.PARTITIONING
Notes	

2.11.37 Virtual Entity: Ramp

??

Entity Properties	
Realizing Parent	IfcTunnelFacilityTypeEnum.RAMP
Notes	

2.11.38 Virtual Entity: Service gallery

A spatial zone used to house public and also electrical and mechanical facilities such as drainage pipes, fire mains, power supply and control systems within a facility, so that part of the daily maintenance work can be carried out at the same time as the operation.

Entity Properties	
Realizing Parent	IfcSpatialZoneTypeEnum.SERVICE
Notes	

2.11.39 Virtual Entity: Signaling

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.

Entity Properties	
Realizing Parent	IfcSignal
Notes	

2.11.40 Virtual Entity: Stairs

A stair is a vertical passageway allowing occupants to walk (step) from one floor level to another floor level at a different elevation. It may include a landing as an intermediate floor slab.

Entity Properties	
Realizing Parent	IfcStair
Notes	

2.11.41 Virtual Entity: Suspended ceiling

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcSlabTypeEnum.ROOF
Notes	

2.11.42 Virtual Entity: Suspended floor

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcSlabTypeEnum.FLOOR
Notes	

2.11.43 Virtual Entity: Track

A spatial structure element that contains track-related elements.

Entity Properties	
Realizing Parent	IfcRailwayPartTypeEnum.TRACKSTRUCTURE
Notes	

2.11.44 Virtual Entity: Tunnel interior element

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	Element contained in a tunnel spatial structure element. Element contained in a tunnel spatial structure element. Element contained in a tunnel spatial structure element.

2.11.45 Virtual Entity: Ventilation

Entity Properties	
Realizing Parent	
Notes	See Systems/Ventilation

2.12 Package: Lining taxonomy and mapping

A package containing the tunnel lining taxonomy elements and their mappings towards IFC elements.

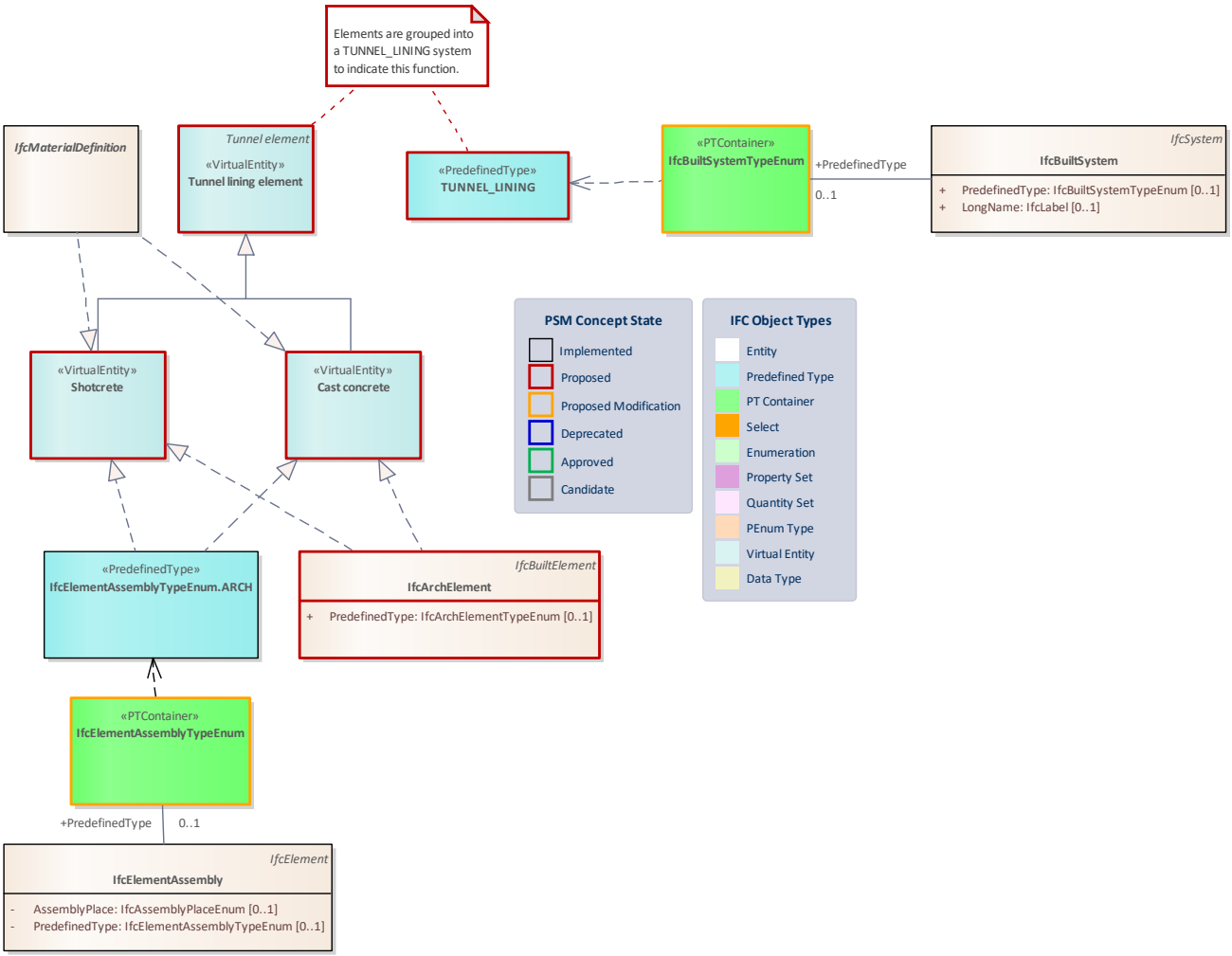

Figure 9: Lining - <<ToDo: definition>>

2.12.1 PDT Container: IfcElementAssemblyTypeEnum

This enumeration defines the basic configuration types for element assemblies.

> HISTORY New enumeration in IFC2x2.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Container Properties

Parent Entity	IfcElementAssemblyType IfcElementAssembly	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
	IfcElementAssemblyTypeEnum.ABUTMENT IfcElementAssemblyTypeEnum.DECK IfcElementAssemblyTypeEnum.PYLON IfcElementAssemblyTypeEnum.ACCESSORY_ASSEMBLY IfcElementAssemblyTypeEnum.TRUSS IfcElementAssemblyTypeEnum.BRACED_FRAME IfcElementAssemblyTypeEnum.CROSS_BRACING IfcElementAssemblyTypeEnum.REINFORCEMENT_UNIT IfcElementAssemblyTypeEnum.BEAM_GRID IfcElementAssemblyTypeEnum.ARCH IfcElementAssemblyTypeEnum.SLAB_FIELD IfcElementAssemblyTypeEnum.PIER IfcElementAssemblyTypeEnum.RIGID_FRAME IfcElementAssemblyTypeEnum.GIRDER	IfcElementAssemblyTypeEnum.DUCTBANK IfcElementAssemblyTypeEnum.TRACKPANEL IfcElementAssemblyTypeEnum.DILATATIONPANEL IfcElementAssemblyTypeEnum.UMBRELLAVAULT IfcElementAssemblyTypeEnum.ENTRANCEWORKS IfcElementAssemblyTypeEnum.SUPPORTINGASSEMBLY IfcElementAssemblyTypeEnum.SUMPBUSTER IfcElementAssemblyTypeEnum.RAIL_MECHANICAL_EQUIPMENT_ASSEMBLY IfcElementAssemblyTypeEnum.MAST IfcElementAssemblyTypeEnum.TRACTION_SWITCHING_ASSEMBLY IfcElementAssemblyTypeEnum.SUSPENSIONASSEMBLY IfcElementAssemblyTypeEnum.SHELTER IfcElementAssemblyTypeEnum.TURNOUTPANEL IfcElementAssemblyTypeEnum.TRAFFIC_CALMING_DEVICE IfcElementAssemblyTypeEnum.GRID IfcElementAssemblyTypeEnum.SIGNALASSEMBLY	

2.12.2 PDT Container: IfcBuiltSystemTypeEnum

This enumeration identifies different types of built systems.

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcBuiltSystem	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcBuiltSystemTypeEnum.FIREPROTECTION	

		IfcBuiltSystemTypeEnum.SHADING IfcBuiltSystemTypeEnum.MOORINGSYSTEM IfcBuiltSystemTypeEnum.OUTERSHELL IfcBuiltSystemTypeEnum.TUNNEL_PRESUPPORT IfcBuiltSystemTypeEnum.TRANSPORT IfcBuiltSystemTypeEnum.FOUNDATION IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT IfcBuiltSystemTypeEnum.PRESTRESSING IfcBuiltSystemTypeEnum.LOADBEARING IfcBuiltSystemTypeEnum.TUNNEL_LINING IfcBuiltSystemTypeEnum.REINFORCING IfcBuiltSystemTypeEnum.EROSIONPREVENTION IfcBuiltSystemTypeEnum.TRACKCIRCUIT IfcBuiltSystemTypeEnum.WATERPROOFING IfcBuiltSystemTypeEnum.MOORING IfcBuiltSystemTypeEnum.FENESTRATION

2.12.3 Class: IfcArchElement

A unitary curved structure

Status: **Proposed**

Package: **Built elements**

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

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

Class Attributes

Name	Type	Multiplicity	Definition

PredefinedType	IfcArchElementTypeEnum	[0..1]	

2.12.4 Predefined Type: TUNNEL_LINING

Full Identifier: **IfcBuiltSystemTypeEnum.TUNNEL_LINING**

A functional grouping of tunnel lining elements.

Status: **Proposed**

Package: **Systems**

Predefined Type Properties			
Predefined Type Container	IfcBuiltSystemTypeEnum	**Parent Entity**	IfcBuiltSystem
Stereotype	«PredefinedType»		
Property sets			

2.12.5 Virtual Entity: Cast concrete

A concreting technique which is undertaken in situ or in the concrete component's finished position

Entity Properties	
Realizing Parent	IfcMaterialDefinition IfcElementAssemblyTypeEnum.ARCH IfcArchElement
Notes	

2.12.6 Virtual Entity: Shotcrete

A method of applying concrete projected at high velocity primarily on to a vertical or overhead surface

Entity Properties	
Realizing Parent	IfcMaterialDefinition IfcElementAssemblyTypeEnum.ARCH IfcArchElement

Notes	

2.12.7 Virtual Entity: Tunnel lining element

Entity Properties	
Realizing Parent	
Notes	Elements are grouped into a TUNNEL_LINING system to indicate this function.

2.13 Package: Pre-support taxonomy and mapping

A package containing the tunnel pre-support taxonomy elements and their mappings towards IFC elements.

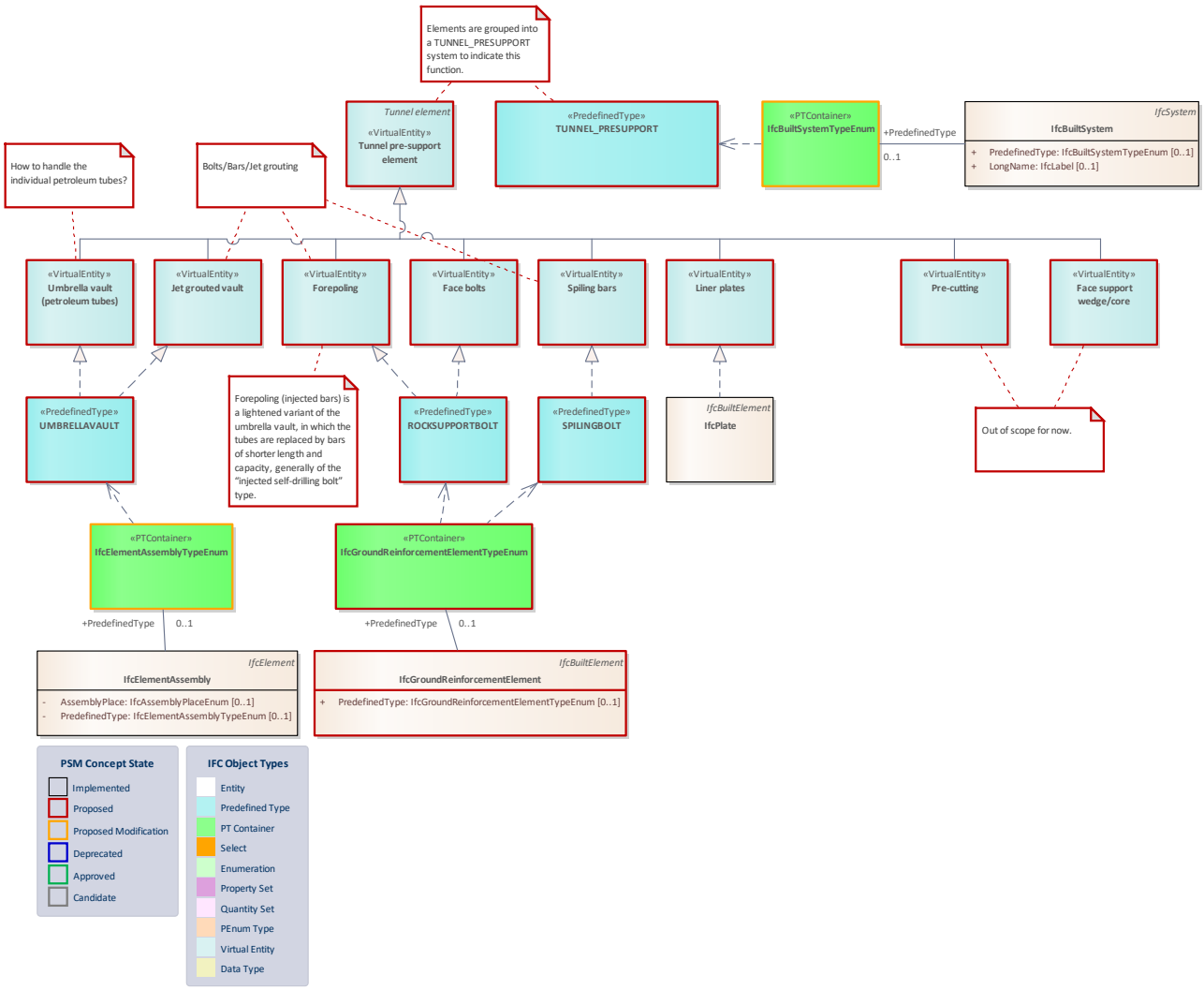

Figure 10: Pre-support taxonomy and mapping -

2.13.1 PDT Container: IfcElementAssemblyTypeEnum

This enumeration defines the basic configuration types for element assemblies.

> HISTORY New enumeration in IFC2x2.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Container Properties

Parent Entity	IfcElementAssemblyType IfcElementAssembly	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
	IfcElementAssemblyTypeEnum.ABUTMENT IfcElementAssemblyTypeEnum.DECK IfcElementAssemblyTypeEnum.PYLON IfcElementAssemblyTypeEnum.ACCESSORY_ASSEMBLY IfcElementAssemblyTypeEnum.TRUSS IfcElementAssemblyTypeEnum.BRACED_FRAME IfcElementAssemblyTypeEnum.CROSS_BRACING IfcElementAssemblyTypeEnum.REINFORCEMENT_UNIT IfcElementAssemblyTypeEnum.BEAM_GRID IfcElementAssemblyTypeEnum.ARCH IfcElementAssemblyTypeEnum.SLAB_FIELD IfcElementAssemblyTypeEnum.PIER IfcElementAssemblyTypeEnum.RIGID_FRAME IfcElementAssemblyTypeEnum.GIRDER	IfcElementAssemblyTypeEnum.DUCTBANK IfcElementAssemblyTypeEnum.TRACKPANEL IfcElementAssemblyTypeEnum.DILATATIONPANEL IfcElementAssemblyTypeEnum.UMBRELLAVAULT IfcElementAssemblyTypeEnum.ENTRANCEWORKS IfcElementAssemblyTypeEnum.SUPPORTINGASSEMBLY IfcElementAssemblyTypeEnum.SUMPBUSTER IfcElementAssemblyTypeEnum.RAIL_MECHANICAL_EQUIPMENT_ASSEMBLY IfcElementAssemblyTypeEnum.MAST IfcElementAssemblyTypeEnum.TRACTION_SWITCHING_ASSEMBLY IfcElementAssemblyTypeEnum.SUSPENSIONASSEMBLY IfcElementAssemblyTypeEnum.SHELTER IfcElementAssemblyTypeEnum.TURNOUTPANEL IfcElementAssemblyTypeEnum.TRAFFIC_CALMING_DEVICE IfcElementAssemblyTypeEnum.GRID IfcElementAssemblyTypeEnum.SIGNALASSEMBLY	

2.13.2 PDT Container: IfcBuiltSystemTypeEnum

This enumeration identifies different types of built systems.

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcBuiltSystem	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcBuiltSystemTypeEnum.FIREPROTECTION	

		IfcBuiltSystemTypeEnum.SHADING IfcBuiltSystemTypeEnum.MOORINGSYSTEM IfcBuiltSystemTypeEnum.OUTERSHELL IfcBuiltSystemTypeEnum.TUNNEL_PRESUPPORT IfcBuiltSystemTypeEnum.TRANSPORT IfcBuiltSystemTypeEnum.FOUNDATION IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT IfcBuiltSystemTypeEnum.PRESTRESSING IfcBuiltSystemTypeEnum.LOADBEARING IfcBuiltSystemTypeEnum.TUNNEL_LINING IfcBuiltSystemTypeEnum.REINFORCING IfcBuiltSystemTypeEnum.EROSIONPREVENTION IfcBuiltSystemTypeEnum.TRACKCIRCUIT IfcBuiltSystemTypeEnum.WATERPROOFING IfcBuiltSystemTypeEnum.MOORING IfcBuiltSystemTypeEnum.FENESTRATION

2.13.3 Class: IfcGroundReinforcementElement

A kind of element used for ground reinforcement.

Status: **Proposed**

Package: **Earthworks and Excavation**

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

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

Class Attributes

Name	Type	Multiplicity	Definition

PredefinedType	IfcGroundReinforcement ElementTypeEnum	[0..1]	

2.13.4 PDT Container: IfcGroundReinforcementElementTypeEnum

This enumeration defines the range of different types of ground reinforcement elements that can further specify an _IfcGroundReinforcementElementTypeEnum_.

Status: **Proposed**

Package: **Earthworks and Excavation**

Container Properties			
Parent Entity	IfcGroundReinforcementElement	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcGroundReinforcementElementTypeEnum.ROCKSUPPORTBOLT IfcGroundReinforcementElementTypeEnum.SPILINGBOLT	

2.13.5 Predefined Type: ROCKSUPPORTBOLT

Full Identifier: **IfcGroundReinforcementElementTypeEnum.ROCKSUPPORTBOLT**

<<ToDo: Definition – comes from the excavation domain requirements for face bolts, forepoling and anchors>>

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties			
Predefined Type Container	IfcGroundReinforcementElementTypeEnum	**Parent Entity**	IfcGroundReinforcement Element
Stereotype	«PredefinedType»		
Property sets			

2.13.6 Predefined Type: SPILINGBOLT

Full Identifier: **IfcGroundReinforcementElementTypeEnum.SPILINGBOLT**

<<ToDo: Definition – comes from the excavation domain requirements for spiling bars>>

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties			
Predefined Type Container	IfcGroundReinforcementElementTypeEnum	**Parent Entity**	IfcGroundReinforcementElement
Stereotype	«PredefinedType»		
Property sets			

2.13.7 Predefined Type: UMBRELLAVAULT

Full Identifier: **IfcElementAssemblyTypeEnum.UMBRELLAVAULT**

A set of boreholes armed with high inertia tubes resting, on the one hand, on the advancement core (part of the ground not yet excavated at the front) and on the other hand, on a rigid support, placed behind the face.

Status: **Proposed**

Package: **Element assemblies**

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

2.13.8 Predefined Type: TUNNEL_PRESUPPORT

Full Identifier: **IfcBuiltSystemTypeEnum.TUNNEL_PRESUPPORT**

A grouping of rigid elements installed before excavation at the tunnel face at the top perimeter of the tunnel section.

Status: **Proposed**

Predefined Type Properties			
Predefined Type Container	IfcBuiltSystemTypeEnum	**Parent Entity**	IfcBuiltSystem
Stereotype	«PredefinedType»		
Property sets			

2.13.9 Virtual Entity: Face bolts

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcGroundReinforcementElementTypeEnum.ROCKSUPPORTBOLT
Notes	

2.13.10 Virtual Entity: Face support wedge/core

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	Out of scope for now.

2.13.11 Virtual Entity: Forepoling

Forepoling (injected bars) is a lightened variant of the umbrella vault, in which the tubes are replaced by bars of shorter length and capacity, generally of the “injected self-drilling bolt” type.

Entity Properties	
Realizing Parent	IfcGroundReinforcementElementTypeEnum.ROCKSUPPORTBOLT

Notes	Forepoling (injected bars) is a lightened variant of the umbrella vault, in which the tubes are replaced by bars of shorter length and capacity, generally of the "injected self-drilling bolt" type. Bolts/Bars/Jet grouting

2.13.12 Virtual Entity: Jet grouted vault

Is there a difference between this and Jet grouting or umbrella vault in the ground improvement context?

Entity Properties	
Realizing Parent	IfcElementAssemblyTypeEnum.UMBRELLAVAULT
Notes	Bolts/Bars/Jet grouting

2.13.13 Virtual Entity: Liner plates

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcPlate
Notes	

2.13.14 Virtual Entity: Pre-cutting

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	Out of scope for now.

2.13.15 Virtual Entity: Spiling bars

Bolts drilled along the tunnel perimeter in the direction of the tunnel axis. They are typically 20 – 25 meter long. This rock support is applied where the rock conditions are poor. The spiling bolts works as permanent support too. Then they are fixed to the rock surface by steel straps or fixed to arcs/sprayed ribs.

Entity Properties	
Realizing Parent	IfcGroundReinforcementElementTypeEnum.SPILINGBOLT
Notes	Bolts/Bars/Jet grouting

2.13.16 Virtual Entity: Tunnel pre-support element

Rigid element installed before excavation at the tunnel face at the top perimeter of the tunnel section.

Entity Properties	
Realizing Parent	
Notes	Elements are grouped into a TUNNEL_PRESUPPORT system to indicate this function.

2.13.17 Virtual Entity: Umbrella vault (petroleum tubes)

A set of boreholes armed with high inertia tubes resting, on the one hand, on the advancement core (part of the ground not yet excavated at the front) and on the other hand, on a rigid support, placed behind the face.

Entity Properties	
Realizing Parent	IfcElementAssemblyTypeEnum.UMBRELLAVAULT
Notes	How to handle the individual petroleum tubes?

2.14 Package: Support taxonomy and mapping

A package containing the tunnel support taxonomy elements and their mappings towards IFC elements.

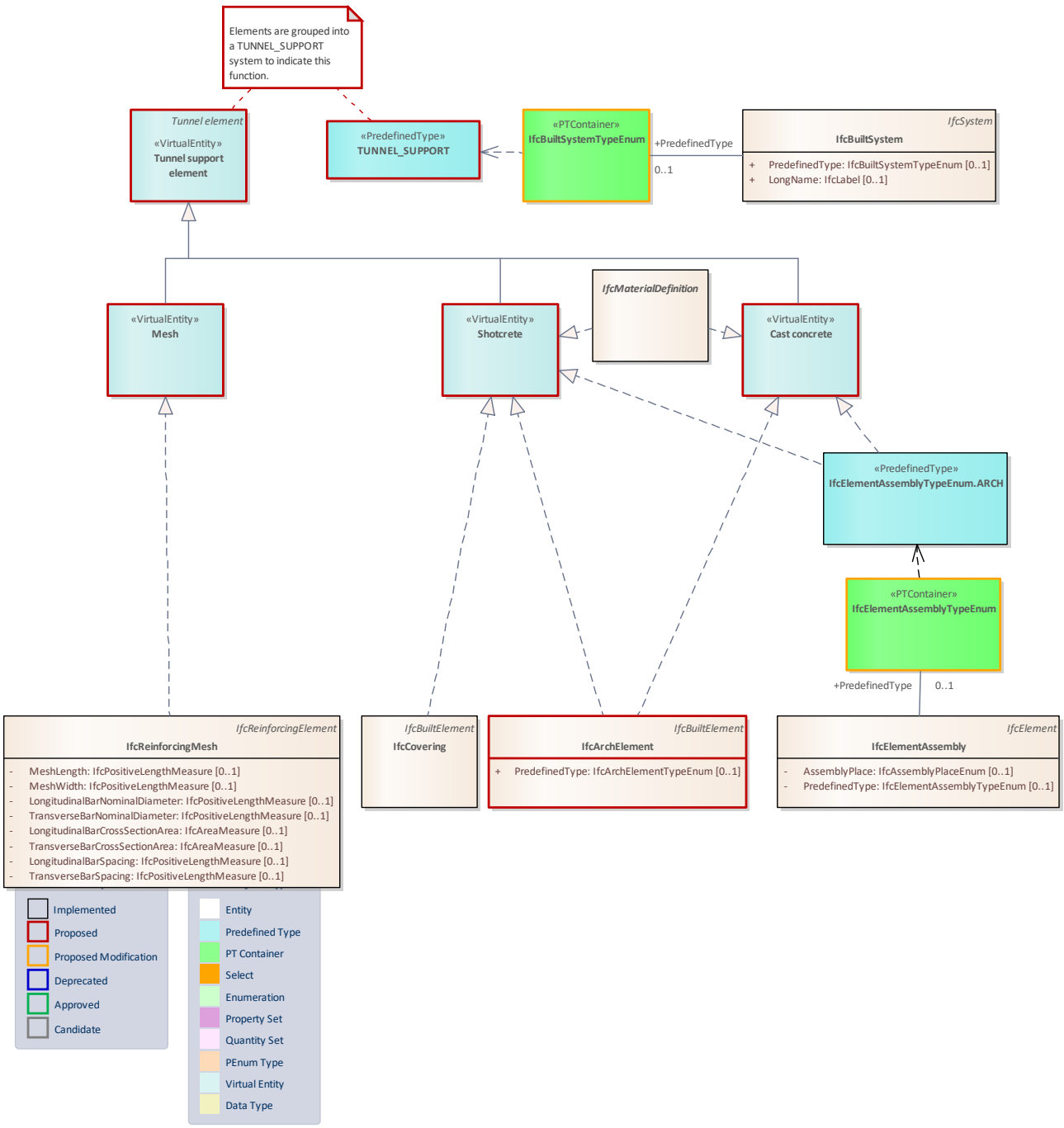

Figure 11: Support taxonomy and mapping part 1 -

2.14.1 PDT Container: IfcElementAssemblyTypeEnum

This enumeration defines the basic configuration types for element assemblies.

> HISTORY New enumeration in IFC2x2.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Container Properties			
Parent Entity	IfcElementAssemblyType IfcElementAssembly	**Stereotype**	«PTContainer»
Contains	**EXISTING** IfcElementAssemblyTypeEnum.ABUTMENT IfcElementAssemblyTypeEnum.DECK IfcElementAssemblyTypeEnum.PYLON IfcElementAssemblyTypeEnum.ACCESSORY_ASSEMBLY IfcElementAssemblyTypeEnum.TRUSS IfcElementAssemblyTypeEnum.BRACED_FRAME IfcElementAssemblyTypeEnum.CROSS_BRACING IfcElementAssemblyTypeEnum.REINFORCEMENT_UNIT IfcElementAssemblyTypeEnum.BEAM_GRID IfcElementAssemblyTypeEnum.ARCH IfcElementAssemblyTypeEnum.SLAB_FIELD IfcElementAssemblyTypeEnum.PIER IfcElementAssemblyTypeEnum.RIGID_FRAME IfcElementAssemblyTypeEnum.GIRDER	**PROPOSED** IfcElementAssemblyTypeEnum.DUCTBANK IfcElementAssemblyTypeEnum.TRACKPANEL IfcElementAssemblyTypeEnum.DILATATIONPANEL IfcElementAssemblyTypeEnum.UMBRELLAVAULT IfcElementAssemblyTypeEnum.ENTRANCEWORKS IfcElementAssemblyTypeEnum.SUPPORTINGASSEMBLY IfcElementAssemblyTypeEnum.SUMPBUSTER IfcElementAssemblyTypeEnum.RAIL_MECHANICAL_EQUIPMENT_ASSEMBLY IfcElementAssemblyTypeEnum.MAST IfcElementAssemblyTypeEnum.TRACTION_SWITCHING_ASSEMBLY IfcElementAssemblyTypeEnum.SUSPENSIONASSEMBLY IfcElementAssemblyTypeEnum.SHELTER IfcElementAssemblyTypeEnum.TURNOUTPANEL IfcElementAssemblyTypeEnum.TRAFFIC_CALMING_DEVICE IfcElementAssemblyTypeEnum.GRID IfcElementAssemblyTypeEnum.SIGNALASSEMBLY

2.14.2 PDT Container: IfcBuiltSystemTypeEnum

This enumeration identifies different types of built systems.

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcBuiltSystem	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcBuiltSystemTypeEnum.FIREPROTECTION IfcBuiltSystemTypeEnum.SHADING IfcBuiltSystemTypeEnum.MOORINGSYSTEM IfcBuiltSystemTypeEnum.OUTERSHELL IfcBuiltSystemTypeEnum.TUNNEL_PRESUPPORT IfcBuiltSystemTypeEnum.TRANSPORT IfcBuiltSystemTypeEnum.FOUNDATION IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT IfcBuiltSystemTypeEnum.PRESTRESSING IfcBuiltSystemTypeEnum.LOADBEARING IfcBuiltSystemTypeEnum.TUNNEL_LINING IfcBuiltSystemTypeEnum.REINFORCING IfcBuiltSystemTypeEnum.EROSIONPREVENTION IfcBuiltSystemTypeEnum.TRACKCIRCUIT IfcBuiltSystemTypeEnum.WATERPROOFING IfcBuiltSystemTypeEnum.MOORING IfcBuiltSystemTypeEnum.FENESTRATION	

2.14.3 Class: IfcArchElement

A unitary curved structure

Status: **Proposed**

Package: **Built elements**

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

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

Class Attributes

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

2.14.4 Predefined Type: TUNNEL_SUPPORT

Full Identifier: **IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT**

Grouping of elements designed and installed to guarantee the long term stability of the underground structure.

Status: **Proposed**

Package: **Systems**

Predefined Type Properties			
Predefined Type Container	IfcBuiltSystemTypeEnum	**Parent Entity**	IfcBuiltSystem
Stereotype	«PredefinedType»		
Property sets			

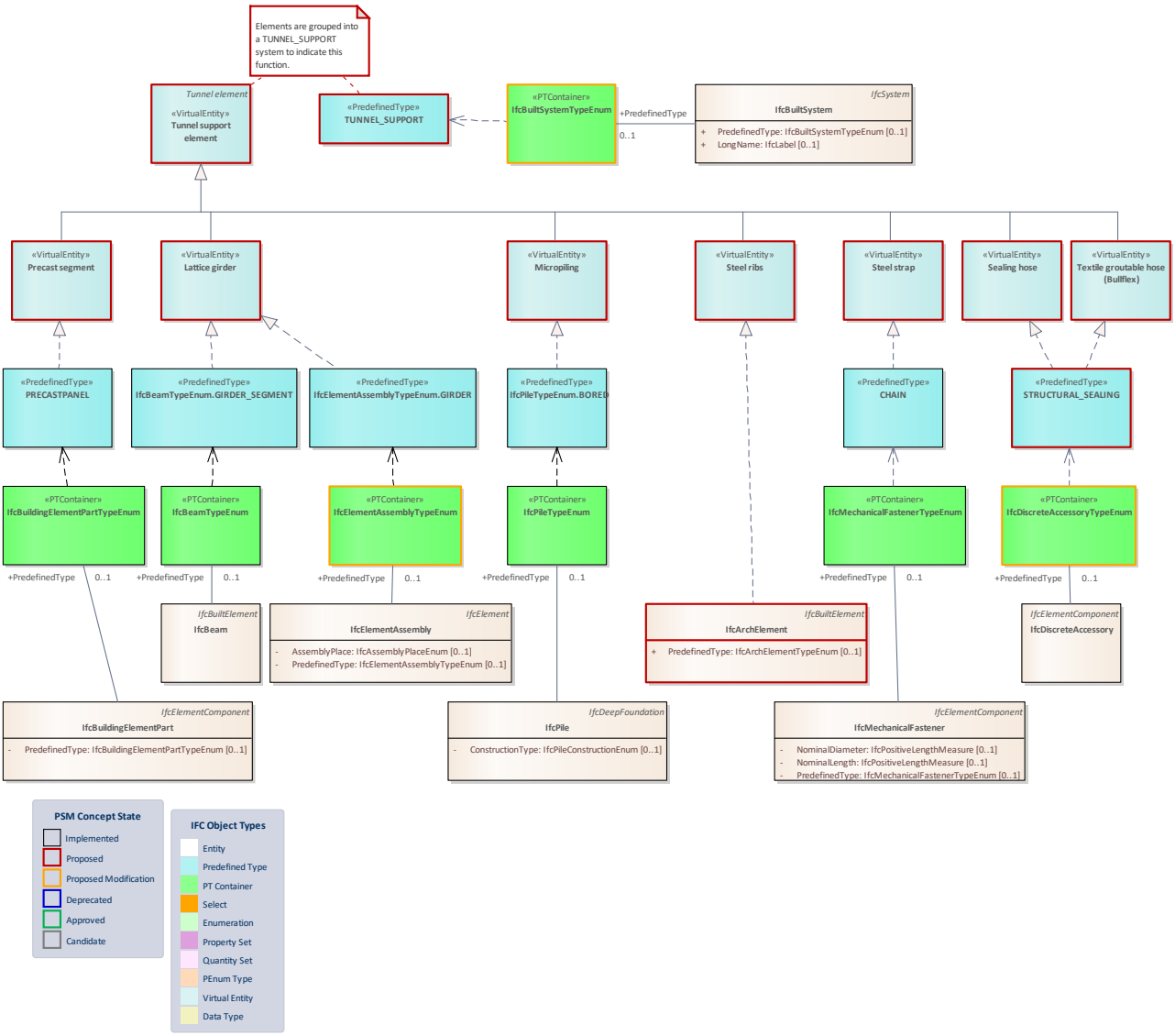

Figure 12: Support taxonomy and mapping part 2 -

2.14.5 PDT Container: IfcElementAssemblyTypeEnum

This enumeration defines the basic configuration types for element assemblies.

> HISTORY New enumeration in IFC2x2.

bSI Documentation

Status: **ProposedModification**

Package: **IfcProductExtension**

Container Properties

Parent Entity	IfcElementAssemblyType IfcElementAssembly	**Stereotype**	«PTContainer»
Contains	**EXISTING** IfcElementAssemblyTypeEnum.ABUTMENT IfcElementAssemblyTypeEnum.DECK IfcElementAssemblyTypeEnum.PYLON IfcElementAssemblyTypeEnum.ACCESSORY_ASSEMBLY IfcElementAssemblyTypeEnum.TRUSS IfcElementAssemblyTypeEnum.BRACED_FRAME IfcElementAssemblyTypeEnum.CROSS_BRACING IfcElementAssemblyTypeEnum.REINFORCEMENT_UNIT IfcElementAssemblyTypeEnum.BEAM_GRID IfcElementAssemblyTypeEnum.ARCH IfcElementAssemblyTypeEnum.SLAB_FIELD IfcElementAssemblyTypeEnum.PIER IfcElementAssemblyTypeEnum.RIGID_FRAME IfcElementAssemblyTypeEnum.GIRDER	**PROPOSED** IfcElementAssemblyTypeEnum.DUCTBANK IfcElementAssemblyTypeEnum.TRACKPANEL IfcElementAssemblyTypeEnum.DILATATIONPANEL IfcElementAssemblyTypeEnum.UMBRELLAVAULT IfcElementAssemblyTypeEnum.ENTRANCEWORKS IfcElementAssemblyTypeEnum.SUPPORTINGASSEMBLY IfcElementAssemblyTypeEnum.SUMPBUSTER IfcElementAssemblyTypeEnum.RAIL_MECHANICAL_EQUIPMENT_ASSEMBLY IfcElementAssemblyTypeEnum.MAST IfcElementAssemblyTypeEnum.TRACTION_SWITCHING_ASSEMBLY IfcElementAssemblyTypeEnum.SUSPENSIONASSEMBLY IfcElementAssemblyTypeEnum.SHELTER IfcElementAssemblyTypeEnum.TURNOUTPANEL IfcElementAssemblyTypeEnum.TRAFFIC_CALMING_DEVICE IfcElementAssemblyTypeEnum.GRID IfcElementAssemblyTypeEnum.SIGNALASSEMBLY	

2.14.6 PDT Container: IfcDiscreteAccessoryTypeEnum

This enumeration defines the different types of discrete accessories.

> HISTORY New enumeration in IFC4.

bSI Documentation

Status: **ProposedModification**

Package: **IfcSharedComponentElements**

Container Properties

Parent Entity	IfcDiscreteAccessoryType IfcDiscreteAccessory	**Stereotype**	«PTContainer»
Contains	**EXISTING** IfcDiscreteAccessoryTypeEnum.EXPANSION_JOINT_DEVICE IfcDiscreteAccessoryTypeEnum.ANCHORPLATE IfcDiscreteAccessoryTypeEnum.SHOE IfcDiscreteAccessoryTypeEnum.BRACKET	**PROPOSED** IfcDiscreteAccessoryTypeEnum.STRUCTURAL_SEALING IfcDiscreteAccessoryTypeEnum.WATER_BARRIER IfcDiscreteAccessoryTypeEnum.BIRDPROTECTION IfcDiscreteAccessoryTypeEnum.RAIL_MECHANICAL_EQUIPMENT IfcDiscreteAccessoryTypeEnum.TENSIONINGEQUIPMENT IfcDiscreteAccessoryTypeEnum.LOCK IfcDiscreteAccessoryTypeEnum.SOUNDABSORPTION IfcDiscreteAccessoryTypeEnum.RAIL_LUBRICATION IfcDiscreteAccessoryTypeEnum.CABLEARRANGER IfcDiscreteAccessoryTypeEnum.INSULATOR IfcDiscreteAccessoryTypeEnum.RAILBRACE IfcDiscreteAccessoryTypeEnum.POINT_MACHINE_LOCKING_DEVICE IfcDiscreteAccessoryTypeEnum.ELASTIC_CUSHION IfcDiscreteAccessoryTypeEnum.POINTMACHINEMOUNTINGDEVICE IfcDiscreteAccessoryTypeEnum.SLIDINGCHAIR IfcDiscreteAccessoryTypeEnum.RAILPAD IfcDiscreteAccessoryTypeEnum.PANEL_STRENGTHENING	

2.14.7 PDT Container: IfcBuiltSystemTypeEnum

This enumeration identifies different types of built systems.

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcBuiltSystem	**Stereotype**	«PTContainer»

	EXISTING	PROPOSED
Contains		IfcBuiltSystemTypeEnum.FIREPROTECTION IfcBuiltSystemTypeEnum.SHADING IfcBuiltSystemTypeEnum.MOORINGSYSTEM IfcBuiltSystemTypeEnum.OUTERSHELL IfcBuiltSystemTypeEnum.TUNNEL_PRESUPPORT IfcBuiltSystemTypeEnum.TRANSPORT IfcBuiltSystemTypeEnum.FOUNDATION IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT IfcBuiltSystemTypeEnum.PRESTRESSING IfcBuiltSystemTypeEnum.LOADBEARING IfcBuiltSystemTypeEnum.TUNNEL_LINING IfcBuiltSystemTypeEnum.REINFORCING IfcBuiltSystemTypeEnum.EROSIONPREVENTION IfcBuiltSystemTypeEnum.TRACKCIRCUIT IfcBuiltSystemTypeEnum.WATERPROOFING IfcBuiltSystemTypeEnum.MOORING IfcBuiltSystemTypeEnum.FENESTRATION

2.14.8 Class: IfcArchElement

A unitary curved structure

Status: **Proposed**

Package: **Built elements**

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

Inheritance Statement		
Subtype Of	IfcBuiltElement	
Subtypes	EXISTING	PROPOSED

Class Attributes

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

2.14.9 Predefined Type: TUNNEL_SUPPORT

Full Identifier: **IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT**

Grouping of elements designed and installed to guarantee the long term stability of the underground structure.

Status: **Proposed**

Package: **Systems**

Predefined Type Properties			
Predefined Type Container	IfcBuiltSystemTypeEnum	**Parent Entity**	IfcBuiltSystem
Stereotype	«PredefinedType»		
Property sets			

2.14.10 Predefined Type: STRUCTURAL_SEALING

Full Identifier: **IfcDiscreteAccessoryTypeEnum.STRUCTURAL_SEALING**

<<ToDo: Definition – comes from the sealing hose/Bullflex requirement from the excavation, support & lining domain>>

Status: **Proposed**

Package: **Accessories**

Predefined Type Properties			
Predefined Type Container	IfcDiscreteAccessoryTypeEnum	**Parent Entity**	IfcDiscreteAccessoryType IfcDiscreteAccessory
Stereotype	«PredefinedType»		
Property sets			

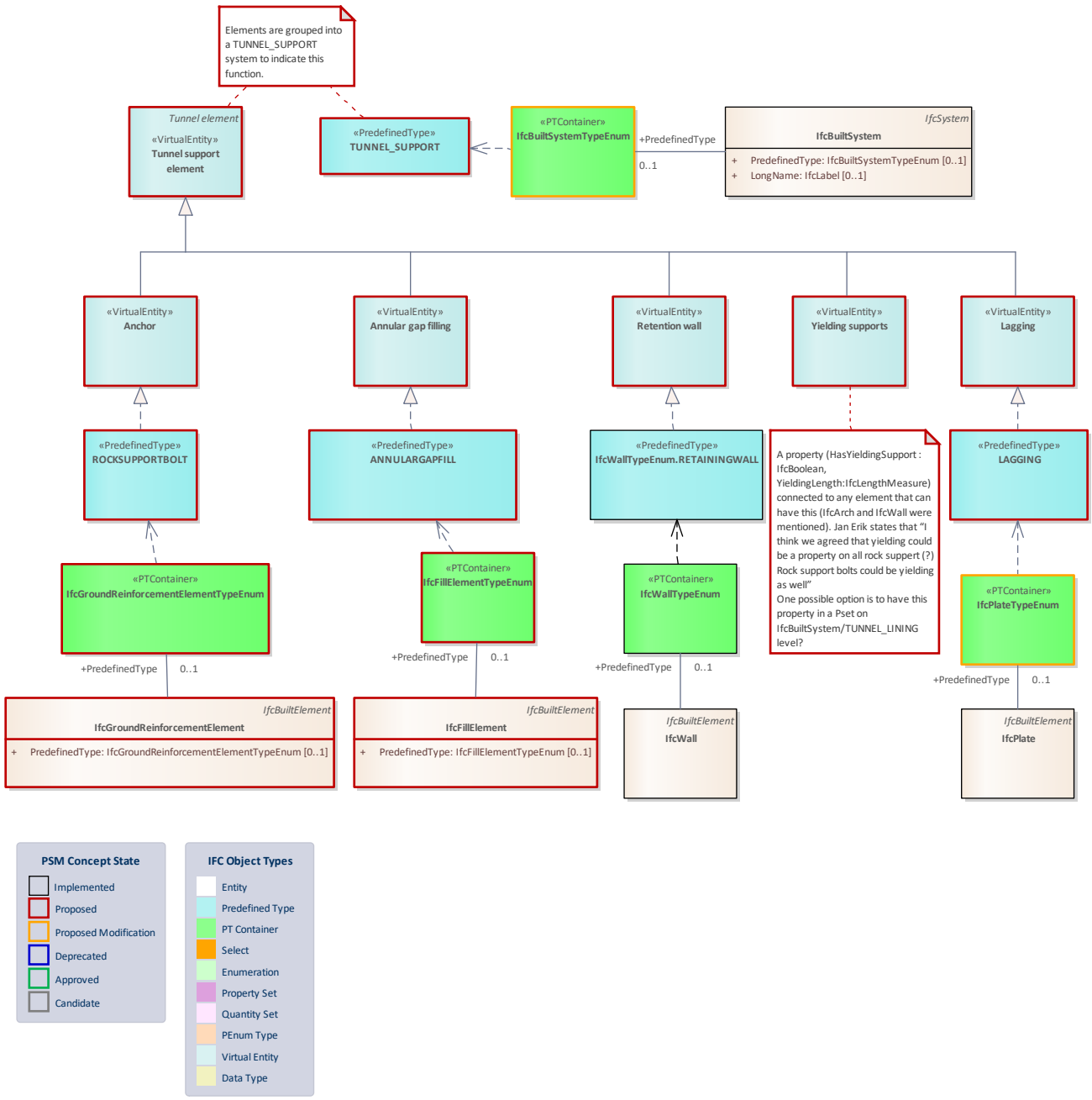

Figure 13: Support taxonomy and mapping part 3 -

2.14.11 PDT Container: IfcPlateTypeEnum

This enumeration defines the different types of planar elements an _IfcPlate_ or _IfcPlateType_ object can fulfill.

> HISTORY New Enumeration in IFC2x2.

{ .change-ifc2x3}

> IFC2x3 CHANGE The additional identifiers CURTAIN_PANEL, SHEET have been added.

bSI Documentation

Status: **ProposedModification**

Package: **IfcSharedBldgElements**

Container Properties			
Parent Entity	IfcPlateType IfcPlate	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
	IfcPlateTypeEnum.WEB_PLATE IfcPlateTypeEnum.COVER_PLATE IfcPlateTypeEnum.SPLICE_PLATE IfcPlateTypeEnum.GUSSET_PLATE IfcPlateTypeEnum.SHEET IfcPlateTypeEnum.CURTAIN_PANEL IfcPlateTypeEnum.BASE_PLATE IfcPlateTypeEnum.FLANGE_PLATE IfcPlateTypeEnum.STIFFENER_PLATE	IfcPlateTypeEnum.LAGGING	

2.14.12 PDT Container: IfcBuiltSystemTypeEnum

This enumeration identifies different types of built systems.

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcBuiltSystem	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcBuiltSystemTypeEnum.FIREPROTECTION IfcBuiltSystemTypeEnum.SHADING	

		IfcBuiltSystemTypeEnum.MOORINGSYSTEM IfcBuiltSystemTypeEnum.OUTERSHELL IfcBuiltSystemTypeEnum.TUNNEL_PRESUPPORT IfcBuiltSystemTypeEnum.TRANSPORT IfcBuiltSystemTypeEnum.FOUNDATION IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT IfcBuiltSystemTypeEnum.PRESTRESSING IfcBuiltSystemTypeEnum.LOADBEARING IfcBuiltSystemTypeEnum.TUNNEL_LINING IfcBuiltSystemTypeEnum.REINFORCING IfcBuiltSystemTypeEnum.EROSIONPREVENTION IfcBuiltSystemTypeEnum.TRACKCIRCUIT IfcBuiltSystemTypeEnum.WATERPROOFING IfcBuiltSystemTypeEnum.MOORING IfcBuiltSystemTypeEnum.FENESTRATION

2.14.13 Predefined Type: LAGGING

Full Identifier: **IfcPlateTypeEnum.LAGGING**

Lagging is the structural material (most often wood) that spans the distance between spars at an excavation site. Lagging, and the steel spars they connect to, provides temporary ground support as a safety measure during tunneling. The lagging is installed horizontally between vertically installed spars.

Status: **Proposed**

Package: **Built elements**

Predefined Type Properties			
Predefined Type Container	IfcPlateTypeEnum	**Parent Entity**	IfcPlateType IfcPlate
Stereotype	«PredefinedType»		
Property sets			

2.14.14 Class: IfcFillElement

An element with the purpose of filling gaps between other elements.

Status: **Proposed**

Package: **Built elements**

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

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

Class Attributes

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

2.14.15 PDT Container: IfcFillElementTypeEnum

This enumeration defines the range of different types of fill elements that can further specify an _IfcFillElementTypeEnum_.

Status: **Proposed**

Package: **Built elements**

Container Properties			
Parent Entity	IfcFillElement	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcFillElementTypeEnum.ANNULARGAPFILL IfcFillElementTypeEnum.INVERTFILL	

2.14.16 Predefined Type: ANNULARGAPFILL

Full Identifier: **IfcFillElementTypeEnum.ANNULARGAPFILL**

The fill element used to fill the annular gap, e.g. between the tunnel lining and the surrounding ground.

Status: **Proposed**

Package: **Built elements**

Predefined Type Properties			
Predefined Type Container	IfcFillElementTypeEnum	**Parent Entity**	IfcFillElement
Stereotype	«PredefinedType»		
Property sets			

2.14.17 Class: IfcGroundReinforcementElement

A kind of element used for ground reinforcement.

Status: **Proposed**

Package: **Earthworks and Excavation**

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

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

Class Attributes

Name	Type	Multiplicity	Definition
PredefinedType	IfcGroundReinforcement ElementTypeEnum	[0..1]	

2.14.18 PDT Container: IfcGroundReinforcementElementTypeEnum

This enumeration defines the range of different types of ground reinforcement elements that can further specify an _IfcGroundReinforcementElementTypeEnum_.

Status: **Proposed**

Package: **Earthworks and Excavation**

Container Properties

Parent Entity	IfcGroundReinforcementElement	**Stereotype**	«PTContainer»
Contains	**EXISTING**	**PROPOSED**	
		IfcGroundReinforcementElementTypeEnum.ROCKSUPPORTBOLT IfcGroundReinforcementElementTypeEnum.SPILINGBOLT	

2.14.19 Predefined Type: ROCKSUPPORTBOLT

Full Identifier: **IfcGroundReinforcementElementTypeEnum.ROCKSUPPORTBOLT**

<<ToDo: Definition – comes from the excavation domain requirements for face bolts, forepoling and anchors>>

Status: **Proposed**

Package: **Earthworks and Excavation**

Predefined Type Properties			
Predefined Type Container	IfcGroundReinforcementElementTypeEnum	**Parent Entity**	IfcGroundReinforcementElement
Stereotype	«PredefinedType»		
Property sets			

2.14.20 Predefined Type: TUNNEL_SUPPORT

Full Identifier: **IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT**

Grouping of elements designed and installed to guarantee the long term stability of the underground structure.

Status: **Proposed**

Package: **Systems**

Predefined Type Properties

Predefined Type Container	IfcBuiltSystemTypeEnum	**Parent Entity**	IfcBuiltSystem
Stereotype	«PredefinedType»		
Property sets			

2.14.21 Virtual Entity: Anchor

A special bolt which is anchored into concrete, stone, or brickwork.

Entity Properties	
Realizing Parent	IfcGroundReinforcementElementTypeEnum.ROCKSUPPORTBOLT
Notes	

2.14.22 Virtual Entity: Annular gap filling

Filling with "suitable material" of the clearance between the segment ring and the sides (edges?) of the excavation. Generalize?

Entity Properties	
Realizing Parent	IfcFillElementTypeEnum.ANNULARGAPFILL
Notes	

2.14.23 Virtual Entity: Cast concrete

A concreting technique which is undertaken in situ or in the concrete component's finished position

Entity Properties	
Realizing Parent	IfcMaterialDefinition IfcArchElement IfcElementAssemblyTypeEnum.ARCH
Notes	

2.14.24 Virtual Entity: Lagging

Lagging is the structural material (most often wood) that spans the distance between spars at an excavation site. Lagging, and the steel spars they connect to, provides temporary ground support as a safety measure during tunneling. The lagging is installed horizontally between vertically installed spars.

Entity Properties	
Realizing Parent	IfcPlateTypeEnum.LAGGING
Notes	

2.14.25 Virtual Entity: Lattice girder

An iron or steel structure consisting of two horizontal beams connected by diagonal struts.

Entity Properties	
Realizing Parent	IfcBeamTypeEnum.GIRDER_SEGMENT IfcElementAssemblyTypeEnum.GIRDER
Notes	

2.14.26 Virtual Entity: Mesh

A reinforcing mesh is a series of longitudinal and transverse wires or bars of various gauges, arranged at right angles to each other and welded at all points of intersection; usually used for concrete slab reinforcement. It is also known as welded wire fabric. In scope are plane meshes as well as bent meshes

Entity Properties	
Realizing Parent	IfcReinforcingMesh
Notes	

2.14.27 Virtual Entity: Micropiling

Small-diameter drilled piles

Entity Properties	
Realizing Parent	IfcPileTypeEnum.BORED
Notes	

2.14.28 Virtual Entity: Precast segment

Concrete that is cast in the form of a structural element (such as a panel or beam) before being placed in final position.

Entity Properties	
Realizing Parent	IfcBuildingElementPartTypeEnum.PRECASTPANEL
Notes	

2.14.29 Virtual Entity: Retention wall

A supporting wall used to protect against soil layers behind. Special types of a retaining wall may be e.g. Gabion wall and Grib wall. Examples of retaining walls are wing wall, headwall, stem wall, pierwall and protecting wall.

Entity Properties	
Realizing Parent	IfcWallTypeEnum.RETAININGWALL
Notes	

2.14.30 Virtual Entity: Sealing hose

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcDiscreteAccessoryTypeEnum.STRUCTURAL_SEALING
Notes	

2.14.31 Virtual Entity: Shotcrete

A method of applying concrete projected at high velocity primarily on to a vertical or overhead surface

Entity Properties

Realizing Parent	IfcElementAssemblyTypeEnum.ARCH IfcMaterialDefinition IfcCovering IfcArchElement
Notes	

2.14.32 Virtual Entity: Steel ribs

Reinforcement cages or steel profiles are shaped as arcs along the rock perimeter of the tunnel

Entity Properties	
Realizing Parent	IfcArchElement
Notes	

2.14.33 Virtual Entity: Steel strap

Definition??

Entity Properties	
Realizing Parent	IfcMechanicalFastenerTypeEnum.CHAIN
Notes	

2.14.34 Virtual Entity: Textile groutable hose (Bullflex)

Patented textile groutable hoses made of high-strength fabric, which are subsequently filled with cement-bonded construction material, featuring an excellent load-bearing capacity

Entity Properties	
Realizing Parent	IfcDiscreteAccessoryTypeEnum.STRUCTURAL_SEALING
Notes	

2.14.35 Virtual Entity: Tunnel support element

Element providing permanent support that is designed and installed to guarantee the long term stability of the underground structure.

Entity Properties	
Realizing Parent	
Notes	Elements are grouped into a TUNNEL_SUPPORT system to indicate this function. Elements are grouped into a TUNNEL_SUPPORT system to indicate this function.

2.14.36 Virtual Entity: Yielding supports

<<ToDo: definition>>

Entity Properties	
Realizing Parent	
Notes	A property (HasYieldingSupport : IfcBoolean, YieldingLength:IfcLengthMeasure) connected to any element that can have this (IfcArch and IfcWall were mentioned). Jan Erik states that “I think we agreed that yielding could be a property on all rock suppert (?) Rock support bolts could be yielding as well” One possible option is to have this property in a Pset on IfcBuiltSystem/TUNNEL_LINING level?

2.15 Package: Waterproofing taxonomy and mapping

A package containing the waterproofing support taxonomy elements and their mappings towards IFC elements.

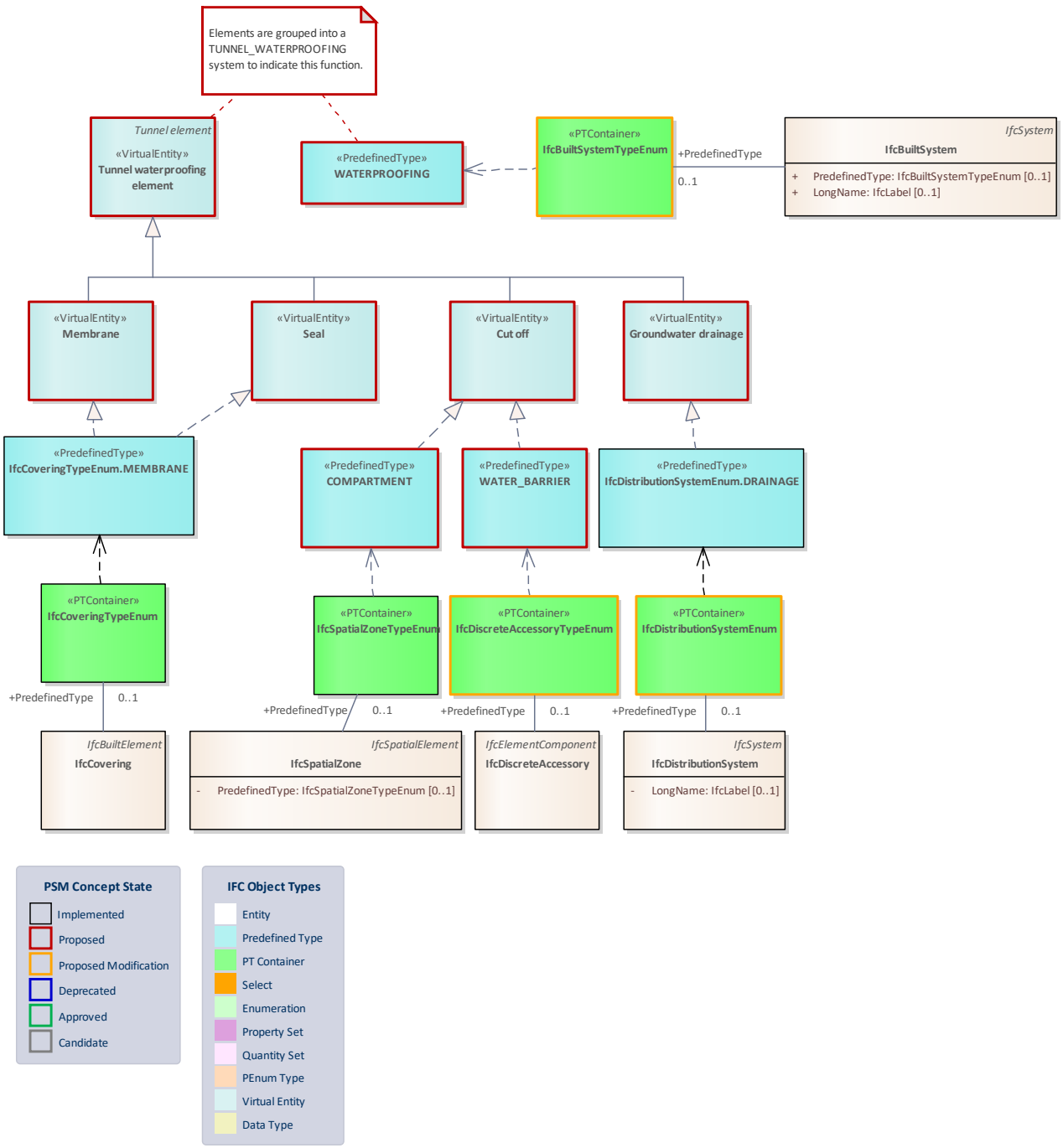

Figure 14: Waterproofing taxonomy and mapping -

2.15.1 PDT Container: IfcDistributionSystemEnum

This enumeration identifies different types of distribution systems. It is used to designate systems by their function as well as ports of devices within such systems to restrict connectivity to compatible connections.

> HISTORY New enumeration in IFC4.

Ports for cable carriers may be connected using _IfcCableCarrierSegment_ and _IfcCableCarrierFitting_. Type objects for cable carrier segments and fittings (_IfcCableCarrierSegmentType_ and _IfcCableCarrierFittingType_ that are not specific to a particular system type may have ports with _PredefinedType_ of NOTDEFINED which indicates that occurrences of such objects may connect to ports of any other cable-carrier based port. Valid enumerations for cable carriers are the same as that for cables, and may be asserted if ports of the contained cables are all of the same type.

bSI Documentation

Status: **ProposedModification**

Package: **IfcSharedBldgServiceElements**

Container Properties			
Parent Entity	IfcDistributionSystem IfcDistributionPort	**Stereotype**	«PTContainer»
Contains	**EXISTING** IfcDistributionSystemEnum.MONITORINGSYSTEM IfcDistributionSystemEnum.COMPRESSEDAIR IfcDistributionSystemEnum.EARTHING IfcDistributionSystemEnum.VENTILATION IfcDistributionSystemEnum.TELEPHONE IfcDistributionSystemEnum.HEATING IfcDistributionSystemEnum.DISPOSAL IfcDistributionSystemEnum.TV IfcDistributionSystemEnum.HAZARDOUS IfcDistributionSystemEnum.CONVEYING IfcDistributionSystemEnum.OIL IfcDistributionSystemEnum.EXHAUST IfcDistributionSystemEnum.REFRIGERATION IfcDistributionSystemEnum.LIGHTNINGPROTECTION IfcDistributionSystemEnum.DATA IfcDistributionSystemEnum.CHEMICAL IfcDistributionSystemEnum.DRAINAGE IfcDistributionSystemEnum.SEWAGE IfcDistributionSystemEnum.AIRCONDITIONING IfcDistributionSystemEnum.FIREPROTECTION	**PROPOSED** IfcDistributionSystemEnum.SAFETY IfcDistributionSystemEnum.CATENARY_SYSTEM IfcDistributionSystemEnum.OVERHEAD_CONTACTLINE_SYSTEM IfcDistributionSystemEnum.RETURN_CIRCUIT	

	IfcDistributionSystemEnum.OPERATIONAL IfcDistributionSystemEnum.CONDENSERWATER IfcDistributionSystemEnum.CONTROL IfcDistributionSystemEnum.SECURITY IfcDistributionSystemEnum.DOMESTICCOLDWATER IfcDistributionSystemEnum.DOMESTICHOTWATER IfcDistributionSystemEnum.VENT IfcDistributionSystemEnum.WASTEWATER IfcDistributionSystemEnum.ELECTRICAL IfcDistributionSystemEnum.LIGHTING IfcDistributionSystemEnum.FUEL IfcDistributionSystemEnum.AUDIOVISUAL IfcDistributionSystemEnum.VACUUM IfcDistributionSystemEnum.STORMWATER IfcDistributionSystemEnum.RAINWATER IfcDistributionSystemEnum.CHILLEDWATER IfcDistributionSystemEnum.COMMUNICATION IfcDistributionSystemEnum.ELECTROACOUSTIC IfcDistributionSystemEnum.WATERSUPPLY IfcDistributionSystemEnum.GAS IfcDistributionSystemEnum.SIGNAL IfcDistributionSystemEnum.POWERGENERATION IfcDistributionSystemEnum.MUNICIPALSOLIDWASTE	

2.15.2 PDT Container: IfcDiscreteAccessoryTypeEnum

This enumeration defines the different types of discrete accessories.

> HISTORY New enumeration in IFC4.

bSI Documentation

Status: **ProposedModification**

Package: **IfcSharedComponentElements**

Container Properties

Parent Entity	IfcDiscreteAccessoryType IfcDiscreteAccessory	**Stereotype**	«PTContainer»
Contains	**EXISTING** IfcDiscreteAccessoryTypeEnum.EXPANSION_JOINT_DEVICE IfcDiscreteAccessoryTypeEnum.ANCHORPLATE IfcDiscreteAccessoryTypeEnum.SHOE IfcDiscreteAccessoryTypeEnum.BRACKET	**PROPOSED** IfcDiscreteAccessoryTypeEnum.STRUCTURAL_SEALING IfcDiscreteAccessoryTypeEnum.WATER_BARRIER IfcDiscreteAccessoryTypeEnum.BIRDPROTECTION IfcDiscreteAccessoryTypeEnum.RAIL_MECHANICAL_EQUIPMENT IfcDiscreteAccessoryTypeEnum.TENSIONINGEQUIPMENT IfcDiscreteAccessoryTypeEnum.LOCK IfcDiscreteAccessoryTypeEnum.SOUNDABSORPTION IfcDiscreteAccessoryTypeEnum.RAIL_LUBRICATION IfcDiscreteAccessoryTypeEnum.CABLEARRANGER IfcDiscreteAccessoryTypeEnum.INSULATOR IfcDiscreteAccessoryTypeEnum.RAILBRACE IfcDiscreteAccessoryTypeEnum.POINT_MACHINE_LOCKING_DEVICE IfcDiscreteAccessoryTypeEnum.ELASTIC_CUSHION IfcDiscreteAccessoryTypeEnum.POINTMACHINEMOUNTINGDEVICE IfcDiscreteAccessoryTypeEnum.SLIDINGCHAIR IfcDiscreteAccessoryTypeEnum.RAILPAD IfcDiscreteAccessoryTypeEnum.PANEL_STRENGTHENING	

2.15.3 PDT Container: IfcBuiltSystemTypeEnum

This enumeration identifies different types of built systems.

Status: **ProposedModification**

Package: **IfcSharedInfrastructureElements**

Container Properties			
Parent Entity	IfcBuiltSystem	**Stereotype**	«PTContainer»

	EXISTING	PROPOSED
Contains		IfcBuiltSystemTypeEnum.FIREPROTECTION IfcBuiltSystemTypeEnum.SHADING IfcBuiltSystemTypeEnum.MOORINGSYSTEM IfcBuiltSystemTypeEnum.OUTERSHELL IfcBuiltSystemTypeEnum.TUNNEL_PRESUPPORT IfcBuiltSystemTypeEnum.TRANSPORT IfcBuiltSystemTypeEnum.FOUNDATION IfcBuiltSystemTypeEnum.TUNNEL_SUPPORT IfcBuiltSystemTypeEnum.PRESTRESSING IfcBuiltSystemTypeEnum.LOADBEARING IfcBuiltSystemTypeEnum.TUNNEL_LINING IfcBuiltSystemTypeEnum.REINFORCING IfcBuiltSystemTypeEnum.EROSIONPREVENTION IfcBuiltSystemTypeEnum.TRACKCIRCUIT IfcBuiltSystemTypeEnum.WATERPROOFING IfcBuiltSystemTypeEnum.MOORING IfcBuiltSystemTypeEnum.FENESTRATION

2.15.4 Predefined Type: COMPARTMENT

Full Identifier: **IfcSpatialZoneTypeEnum.COMPARTMENT**

<<ToDo: Definition. Comes from teh need to describe the different compartments achieved in tunneling using cut-off>>

Status: **Proposed**

Package: **Spatial zones**

Predefined Type Properties			
Predefined Type Container	IfcSpatialZoneTypeEnum	**Parent Entity**	IfcSpatialZoneType IfcSpatialZone
Stereotype	«PredefinedType»		
Property sets			

2.15.5 Predefined Type: WATERPROOFING

Full Identifier: **IfcBuiltSystemTypeEnum.WATERPROOFING**

Grouping of elements used to protect the facility against damage from moisture or the unintentional entry of water as well as the danger posed by aggressive water or soils and the effects of chemicals.

Status: **Proposed**

Package: **Systems**

Predefined Type Properties			
Predefined Type Container	IfcBuiltSystemTypeEnum	**Parent Entity**	IfcBuiltSystem
Stereotype	«PredefinedType»		
Property sets			

2.15.6 Predefined Type: WATER_BARRIER

Full Identifier: **IfcDiscreteAccessoryTypeEnum.WATER_BARRIER**

<<ToDo: Definition – comes from the cut-off requirement from the excavation, support & lining domain>>

Status: **Proposed**

Package: **Accessories**

Predefined Type Properties			
Predefined Type Container	IfcDiscreteAccessoryTypeEnum	**Parent Entity**	IfcDiscreteAccessoryType IfcDiscreteAccessory
Stereotype	«PredefinedType»		
Property sets			

2.15.7 Virtual Entity: Cut off

A device aiding in compartmentalization of water in tunneling.

Entity Properties	
Realizing Parent	IfcDiscreteAccessoryTypeEnum.WATER_BARRIER IfcSpatialZoneTypeEnum.COMPARTMENT
Notes	

2.15.8 Virtual Entity: Groundwater drainage

Elements used to to stop the ground from being waterlogged. The ground can be waterlogged due to excess water and rainfall or due to impermeable types of soil such as clay.

Entity Properties	
Realizing Parent	IfcDistributionSystemEnum.DRAINAGE
Notes	

2.15.9 Virtual Entity: Membrane

An impervious layer that could be used for e.g. roof covering (below tiling - that may be known as sarking etc.) or as a damp proof course membrane; also, waterproofing material on a bridge structure (typically on top of bridge slab).

Entity Properties	
Realizing Parent	IfcCoveringTypeEnum.MEMBRANE
Notes	

2.15.10 Virtual Entity: Seal

<<ToDo: definition>>

Entity Properties	
Realizing Parent	IfcCoveringTypeEnum.MEMBRANE
Notes	

2.15.11 Virtual Entity: Tunnel waterproofing element

Elements used to protect the tunnel construction against damage from moisture or the unintentional entry of water as well as the danger posed by aggressive water or soils and the effects of chemicals.

Entity Properties	
Realizing Parent	

Notes	Elements are grouped into a TUNNEL_WATERPROOFING system to indicate this function.