Chapter 9

Infra IFC Specifications with IfcRoad (Eng. To be revised) V0.6

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Korea Institute of Civil Engineering
and Building Technology

Infra BIM Schema Specification ver.0.6

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KICT KOREA INSTITUTE of CONSTRUCTION TECHNOLOGY

1 IfcProductionExtension

1.1 Schema Definition

These civil engineering spatial elements (IfcCivilSpatialElement_K) generalize all the spatial elements used to define the spatial structures of structural facilities, such as road linear facilities, bridges, and tunnels. These spatial structures are used to plan civil engineering projects. The spatial project structure defines as many division systems as needed for a civil engineering project. The elements of the spatial structure are defined as follows.

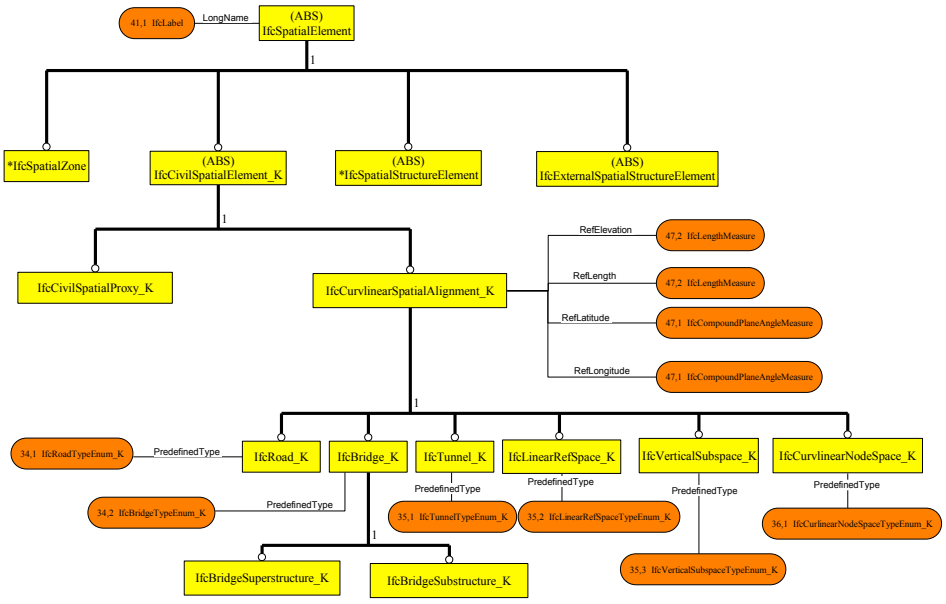
- site as IfcSite
- Civil Alignment as IfcCurvilinearSpatialAlignment_K
- Civil Structure as IfcCurvilinearNodeSpace_K
- Structures as IfcRoad_K or IfcBridge_K or IfcTunnel_K
- space as IfcSpace

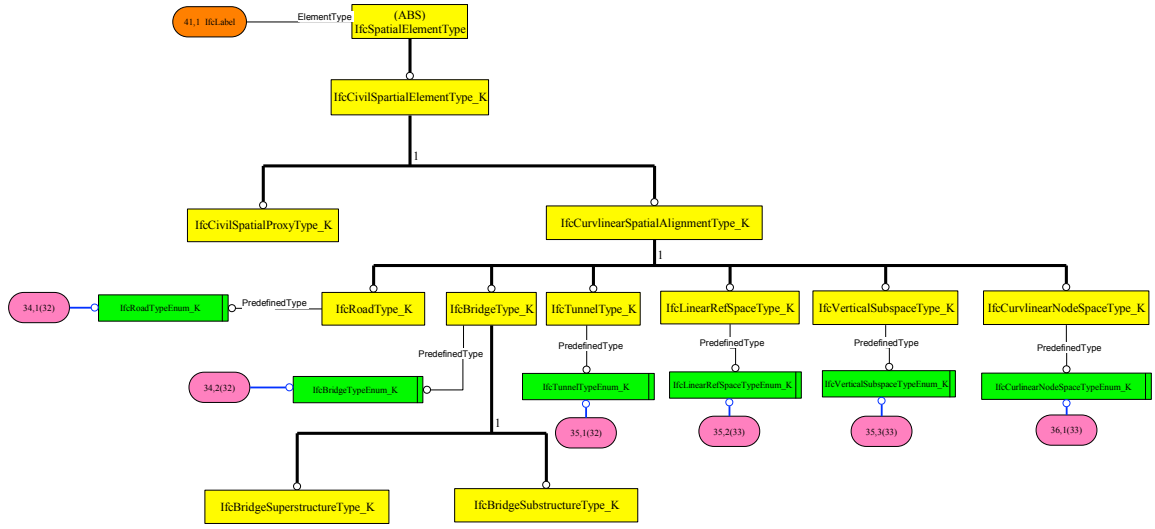
IfcRelAggregates is defined as a one-to-many relationship, and is used to accurately construct the relationship of the two levels within the spatial project structure. The highest level of a spatial structure is designated as IfcProject using IfcRelAggregates.

Relationship Use Definition

- Containment of elements : IfcRelContainedInSpatialStructure
- Reference of elements : IfcRelReferencedInSpatialStructure

EXPRESS-G diagram





1.2 Types

1.2.1 IfcRoadTypeEnum_K

This enumeration type defines the predefined types of the road's spatial structures of IfcRoad_K or IfcRoadType_K. It determines the top-level hierarchy according to the type of road use.

Enumerated Item Definitions:

- **RAMPROAD**
- **APPROACHROAD**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadTypeEnum_K = ENUMERATION OF
  (RAMPROAD,
   APPROACHROAD,
   USER_DEFINED,
   NOT_DEFINED);
END_TYPE;
```

1.2.2 IfcBridgeTypeEnum_K

This enumeration type defines the predefined types of the bridge's spatial structures of IfcBridge_K or IfcBridgeType_K. It determines the top-level hierarchy according to the bridge construction method and the type of shape use.

Enumerated Item Definitions:

- **ARCH_BRIDGE**
- **CABLE_STAYED_BRIDGE**
- **PREFLEX_GIRDER_BRIDGE**
- **PSC_BOX_GIRDER_BRIDGE**

- **PSC_HOLLOW_SLAB_BRIDGE**
- **PSC_I_GIRDER_BRIDGE**
- **PSC_SLAB_BRIDGE**
- **RAHMEN_BRIDGE**
- **RC_BOX_GIRDER_BRIDGE**
- **RC_HOLLOW_SLAB_BRIDGE**
- **RC_SLAB_BRIDGE**
- **RC_T_BEAM_GIRDER_BRIDGE**
- **STEEL_BOX_GIRDER_BRIDGE**
- **STEEL_PLATE_GIRDER_BRIDGE**
- **SUSPENSION_BRIDGE**
- **TRUSS_BRIDGE**
- **OVERPASS**
- **RAMPBRIDGE**
- **APPROACHBRIDGE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeTypeEnum_K = ENUMERATION OF
  (ARCH_BRIDGE,
   CABLE_STAYED_BRIDGE,
   PREFLEX_GIRDER_BRIDGE,
   PSC_BOX_GIRDER_BRIDGE,
   PSC_HOLLOW_SLAB_BRIDGE,
   PSC_I_GIRDER_BRIDGE,
   PSC_SLAB_BRIDGE,
   RAHMEN_BRIDGE,
   RC_BOX_GIRDDER_BRIDGE,
   RC_HOLLOW_SLAB_BRIDGE,
   RC_SLAB_BRIDGE,
   RC_T_BEAM_GIRDER_BRIDGE,
   STEEL_BOX_GIRDDER_BRIDGE,
   STEEL_PLATE_GIRDER_BRIDGE,
   SUSPENSION_BRIDGE,
   TRUSS_BRIDGE,
   OVERPASS,
   RAMPBRIDGE,
   APPROACHBRIDGE,
   USER_DEFINED,
   NOT_DEFINED);
END_TYPE;
```

1.2.3 IfcTunnelTypeEnum_K

This enumeration type defines the predefined types of the tunnel's spatial structures of IfcTunnel_K or IfcTunnelType_K. It determines the top-level hierarchy according to the tunnel construction method and the

type of shape use.

Enumerated Item Definitions:

- **NATM:** New Australian Tunneling Method
- **TBM_SHIELD:** Tunnel Boring Machine-Shield
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcTunnelTypeEnum_K = ENUMERATION OF
  (NATM,
   TBM_SHIELD,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

1.2.4 IfcLinearRefSpaceTypeEnum_K

This enumeration type defines the predefined types of spatial structures of IfcLinearRefSpace_K or IfcLinearRefSpaceType_K, which are classified according to the linear hierarchy of civil engineering structures. It determines the structure types, which are classified in the linear direction.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcLinearRefSpaceTypeEnum_K = ENUMERATION OF
  (USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

1.2.5 IfcVerticalSubspaceTypeEnum_K

This enumeration type defines the predetermined types of spatial structures of IfcVerticalSubspace_K or IfcVerticalSubspaceType_K, which are classified vertically in civil engineering structures. It is used to determine a structure's spatial hierarchy, which is classified in the vertical direction. It serves mainly as the criteria for determining the upper and lower spaces of bridges with multiple-layer structures.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcVerticalSubspaceTypeEnum_K = ENUMERATION OF
```

(USERDEFINED,
NOTDEFINED);
END_TYPE;

1.2.6 IfcCurvlinearNodeSpaceTypeEnum_K

This enumeration type distinguishes between individual structures according to the linear type of civil engineering structures and the user's defined spaces, and as such, defines the predefined types of IfcCurvlinearNodesSpace_K or IfcCurvlinearNodesSpaceType_K. It is used to determine the spatial hierarchy of structures, which are classified into special structure units and coordinates in the linear direction.

Enumerated Item Definitions:

- **TUNNEL_PITMOUTH**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcCurlinearNodeSpaceTypeEnum_K = ENUMERATION OF
  (TUNNEL_PITMOUTH,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

1.3 Entities

1.3.1 IfcCivilSpatialElement_K

Description

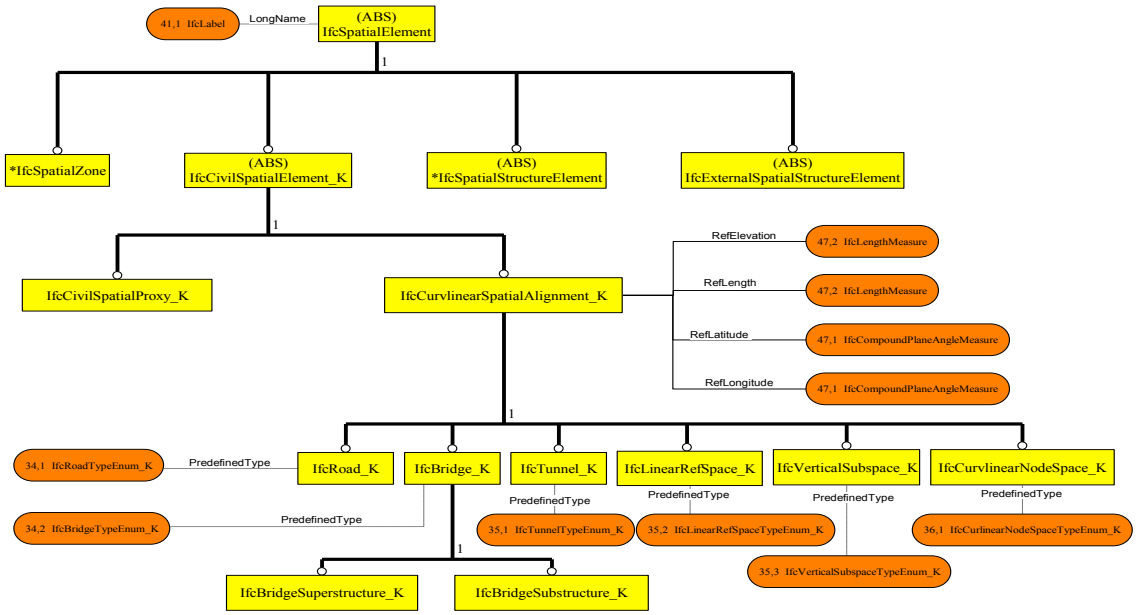
Civil engineering spatial elements (IfcCivilSpatialElement_K) are used to spatially manage all civil engineering facilities, and as such, are used as the top-level spatial structures of linear facilities and structural facilities. They are defined as abstract.

Civil engineering spatial elements have IfcSite, which is defined in architecture as the top-level space, and have IfcCivilSpatialElement_K's spatial structure appropriately located underneath according to the connection hierarchy.

EXPRESS Specification:

```
ENTITY IfcCivilSpatialElement_K
  ABSTRACT SUPERTYPE OF (ONEOF(IfcCivilSpatialProxy_K, IfcCurvlinearSpatialAlignment_K))
  SUBTYPE OF(IfcSpatialElement);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilSpatialElement_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy      :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares          :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy         :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy       :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement   :OPTIONAL IfcObjectPlacement;
  Representation    :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElement
  LongName              :OPTIONAL IfcLabel;
 INVERSE
  ContainsElements   :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
 ENTITY IfcCivilSpatialElement_K
END_ENTITY;
```

1.3.2 IfcCivilSpatialProxy_K

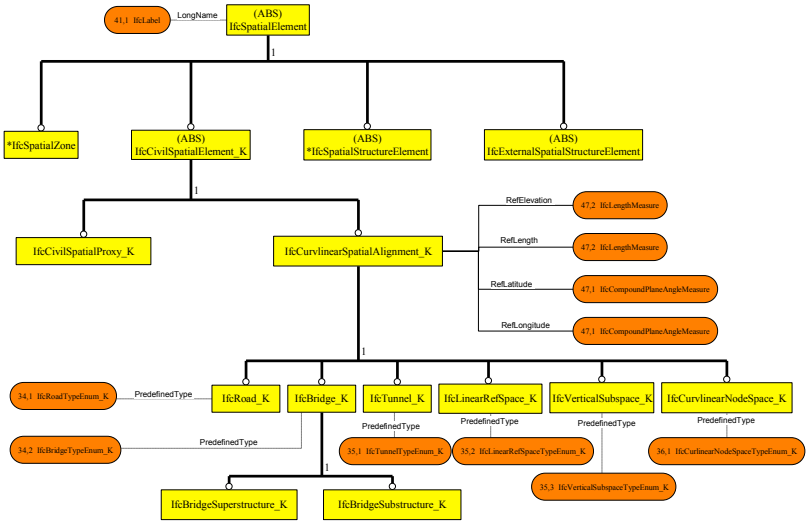
Description

This road space's proxy elements (IfcCivilSpatialProxy_K) express the types of shapes, except those already defined as civil engineering spaces.

EXPRESS Specification:

```
ENTITY IfcCivilSpatialProxy_K
  SUBTYPE OF(IfcCivilSpatialElement_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilSpatialProxy_K
 ENTITY IfcRoot
  GlobalId          :IfcGloballyUniqueId;
  OwnerHistory      :OPTIONAL IfcOwnerHistory;
  Name              :OPTIONAL IfcLabel;
  Description       :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType        :OPTIONAL IfcLabel;
 INVERSE
```

```
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElement
  LongName            :OPTIONAL IfcLabel;
 INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
 ENTITY IfcCivilSpatialElement_K
 ENTITY IfcCivilSpatialProxy_K
END_ENTITY;
```

1.3.3 IfcCurvlinearSpatialAlignment_K

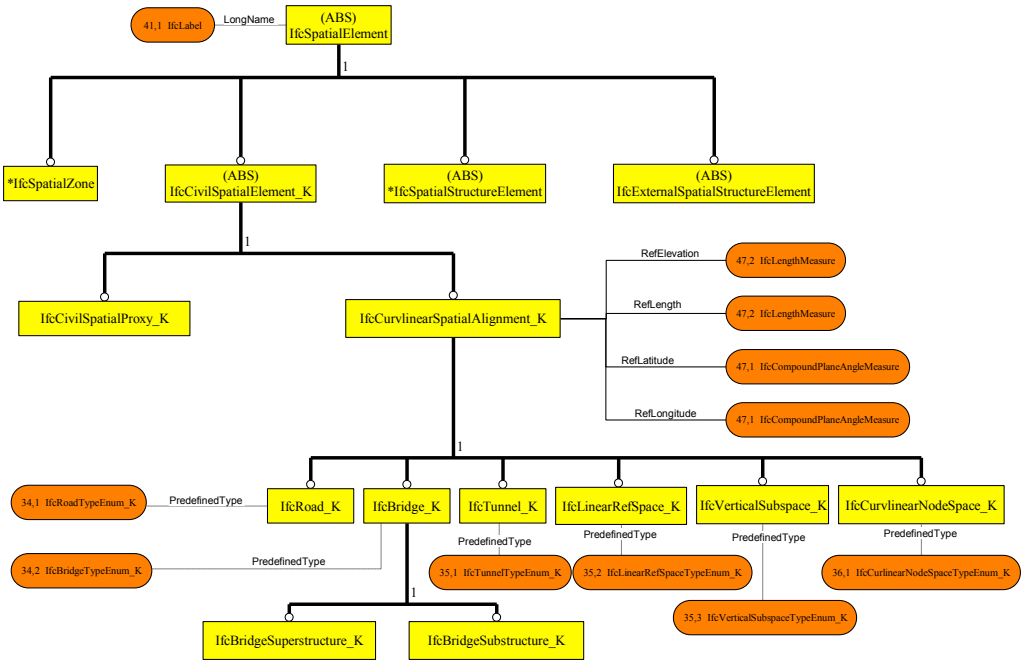
Description

The linear space (IfcCurvlinearSpatialAlignment_K) with this curved line section includes all civil engineering structures that have linear shapes, such as roads, bridges, and tunnels. This is defined as abstract, and as the top-level spatial structure of the substructure space and the reference space. It is located as the lower spatial structure of IfcSite, which was defined in the architectural space.

EXPRESS Specification:

```
ENTITY IfcCurvlinearSpatialAlignment_K
  SUPERTYPE OF (ONEOF(IfcRoad_K, IfcBridge_K, IfcTunnel_K, IfcLinearRefSpace_K,
IfcVerticalSubspace_K, IfcCurvlinearNodeSpace_K))
  SUBTYPE OF(IfcCivilSpatialElement_K);
    RefElevation : IfcLengthMeasure;
    RefLongitude : IfcCompoundPlaneAngleMeasure;
    RefLatitude  : IfcCompoundPlaneAngleMeasure;
    RefLength    : IfcLengthMeasure;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCurvelinearSpatialAlignment_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElement
  LongName              :OPTIONAL IfcLabel;
 INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
 ENTITY IfcCivilSpatialElement_K
```

```
 ENTITY IfcCivilCulvinearSpatialAlignment_K
   RefElevation :  OPTIONAL IfcLengthMeasure;
   RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
   RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
   RefLength :  OPTIONAL IfcLengthMeasure;
END_ENTITY;
```

1.3.4 IfcRoad_K

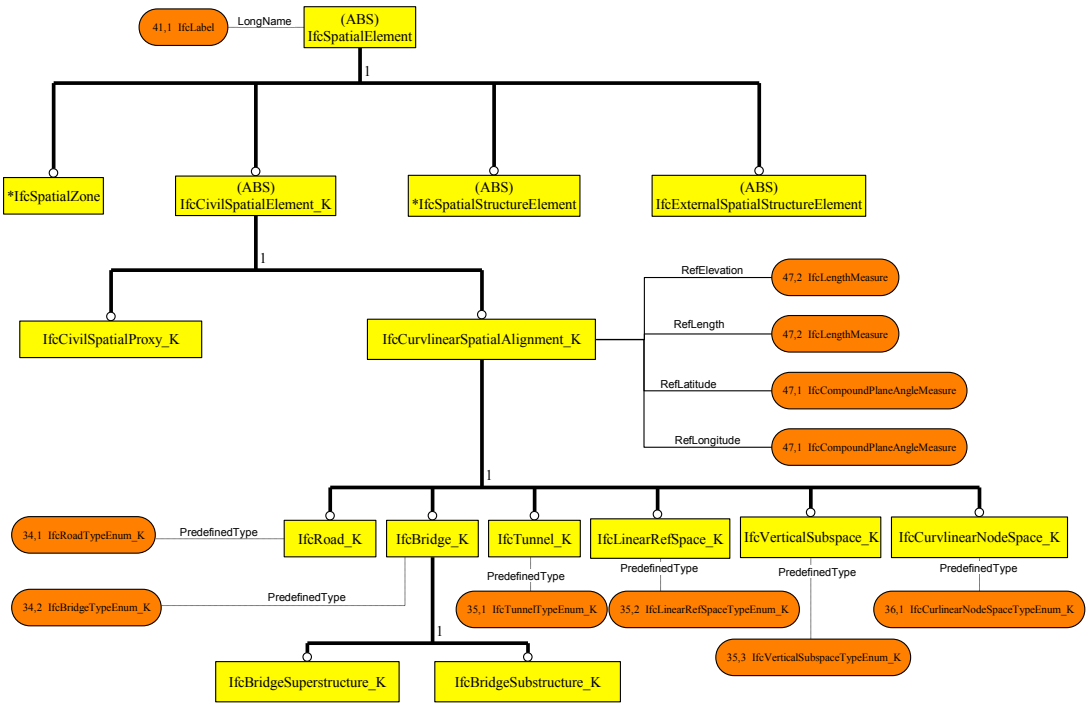
Description

The road space is located below the linear space (IfcCurvlinearSpatialAlignment_K) with curved sections, and is used together with the IfcCurvlinearNodeSpace_K of the same hierarchy. The road space spatially links all road facility elements defined in the lower level of IfcRoadElement_K. This is used as the project's hierarchical structure.

EXPRESS Specification:

```
ENTITY IfcRoad_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignment_K);
     PredefinedType : OPTIONAL IfcRoadTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoad_K
 ENTITY IfcRoot
```

```
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcSpatialElement
  LongName              :OPTIONAL IfcLabel;
INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
ENTITY IfcCivilSpatialElement_K
ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :  OPTIONAL IfcLengthMeasure;
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
ENTITY IfcRoad_K
  PredefinedType     :OPTIONAL IfcRoadTypeEnum;

END_ENTITY;
```

1.3.5 IfcBridge_K

Description

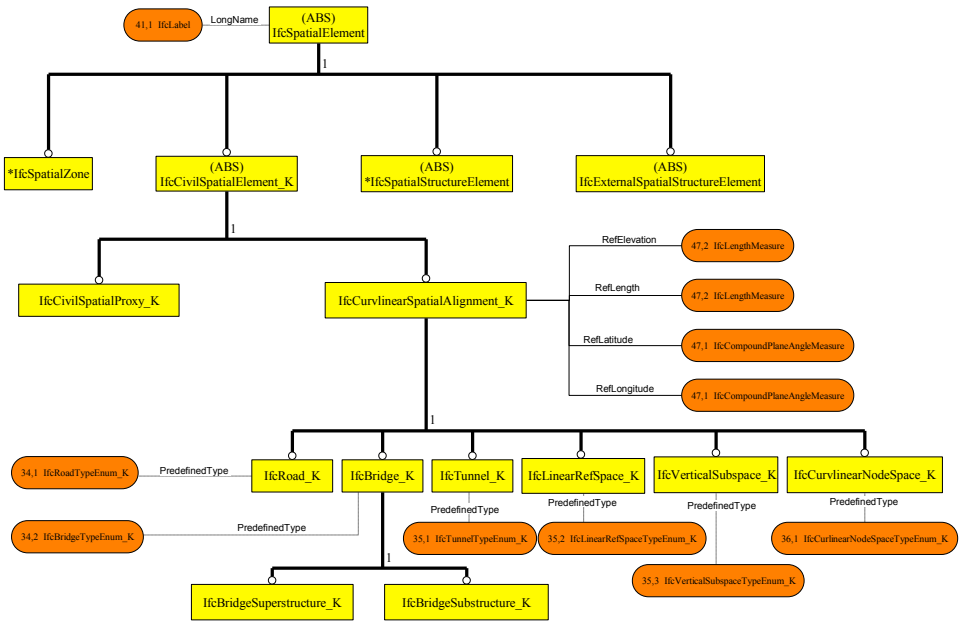
The bridge space is located below the linear space (IfcCurvlinearSpatialAlignment_K) with curved sections, and is used together with the IfcCurvlinearNodeSpace_K of the same hierarchy. The bridge space spatially links all bridge facility elements defined at the lower level of IfcBridgeElement_K. It is used as the project's hierarchical structure.

EXPRESS Specification:

```
ENTITY IfcBridge_K
  SUPERTYPE OF (ONEOF(IfcBridgeSuperstructure_K, IfcBridgeSubstructure_K))
  SUBTYPE OF(IfcCurvlinearSpatialAlignment_K);
```

PredefinedType : OPTIONAL IfcBridgeTypeEnum_K;
END_ENTITY;

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridge_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElement
  LongName              :OPTIONAL IfcLabel;
```

```
INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
ENTITY IfcCivilSpatialElement_K
ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :  OPTIONAL IfcLengthMeasure;
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
ENTITY IfcBridge_K
  PredefinedType      :OPTIONAL IfcBridgeTypeEnum;

END_ENTITY;
```

1.3.6 IfcBridgeSuperstructure_K

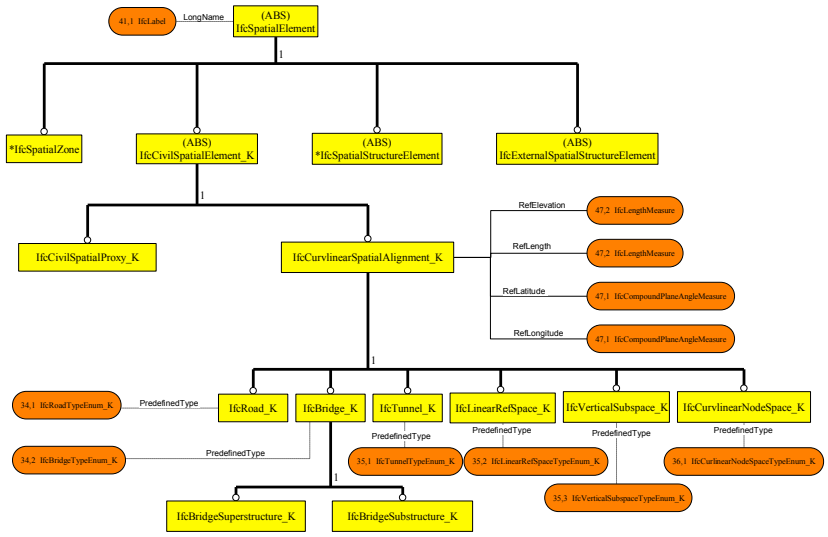
Description

The bridge's upper space is located below the linear space (IfcCurvlinearSpatialAlignment_K) with curved sections, and has a lower IfcBridge_K hierarchy. Detailed elements defined in IfcBridgeElement_K may be directly included in the IfcBridge_K space, and may be simultaneously referred to as IfcBridgeSuperstructure_K.

EXPRESS Specification:

```
ENTITY IfcBridgeSuperstructure_K
  SUBTYPE OF(IfcBridge_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeSuperstructure_K
 ENTITY IfcRoot
  GlobalId                :IfcGloballyUniqueId;
```

```
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElement
  LongName            :OPTIONAL IfcLabel;
 INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
 ENTITY IfcCivilSpatialElement_K
 ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :  OPTIONAL IfcLengthMeasure;
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
 ENTITY IfcBridge_K
  PredefinedType    :OPTIONAL  IfcBridgeTypeEnum;
 ENTITY IfcBridgeSuperstructure_K
END_ENTITY;
```

1.3.7 IfcBridgeSubstructure_K

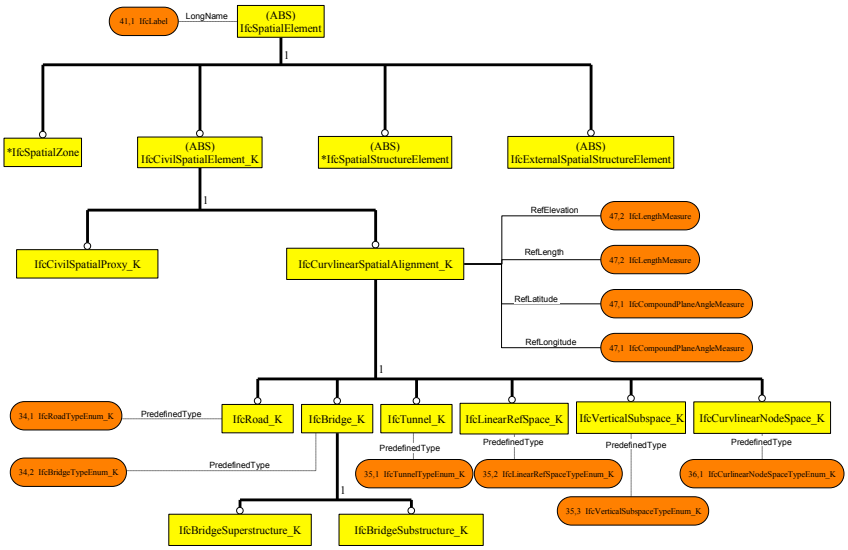
Description

The bridge's substructure space is located below the linear space (IfcCurvlinearSpatialAlignment_K) with curved sections, and has a lower IfcBridge_K hierarchy. Detailed elements defined in IfcBridgeElement_K may be directly included in the IfcBridge_K space, and may be simultaneously referred to as IfcBridgeSuperstructure_K.

EXPRESS Specification:

```
ENTITY IfcBridgeSubstructure_K
  SUBTYPE OF(IfcBridge_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeSubstructure_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElement
  LongName              :OPTIONAL IfcLabel;
 INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
 ENTITY IfcCivilSpatialElement_K
 ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :   OPTIONAL IfcLengthMeasure;
```

```
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
 ENTITY IfcBridge_K
  PredefinedType    :OPTIONAL  IfcBridgeTypeEnum;
 ENTITY IfcBridgeSubstructure_K
END_ENTITY;
```

1.3.8 IfcTunnel_K

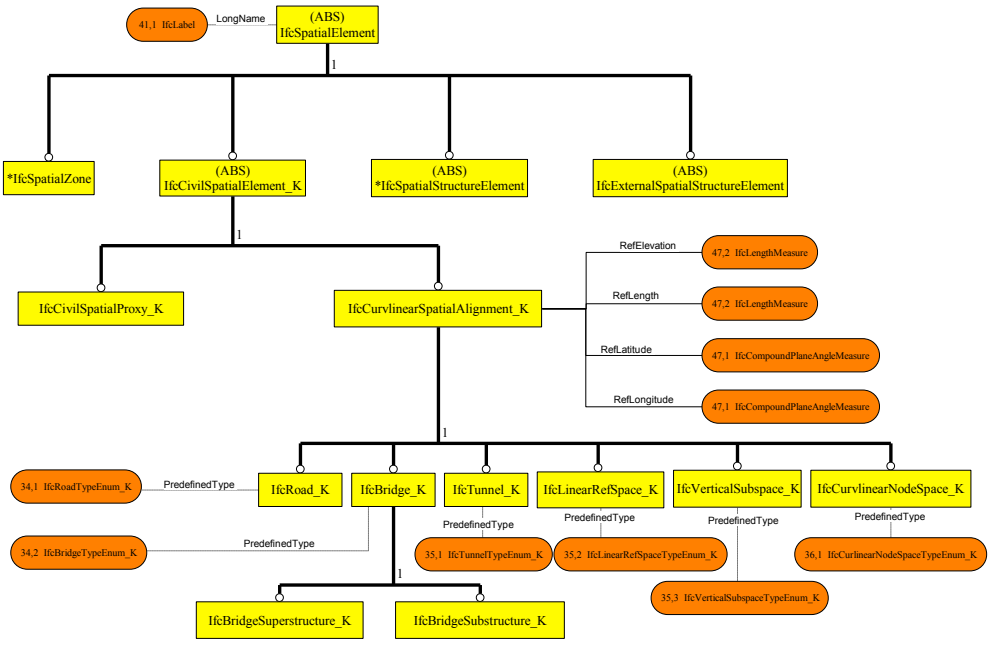
Description

The tunnel space is located below the linear space (IfcCurvlinearSpatialAlignment_K) with curved sections, and is used with the IfcCurvlinearNodeSpace_K of the same hierarchy. The tunnel space spatially links all the tunnel facility elements defined at the lower level of IfcTunnelElement_K. It is used as the project's hierarchical structure.

EXPRESS Specification:

```
ENTITY IfcTunnel_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignment_K);
    PredefinedType : OPTIONAL IfcTunnelTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcTunnel_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
```

```
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcSpatialElement
  LongName            :OPTIONAL IfcLabel;
INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
ENTITY IfcCivilSpatialElement_K
ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :  OPTIONAL IfcLengthMeasure;
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
ENTITY IfcTunnel_K
  PredefinedType    :OPTIONAL IfcTunnelTypeEnum;
END_ENTITY;
```

1.3.9 IfcLinearRefSpace_K

Description

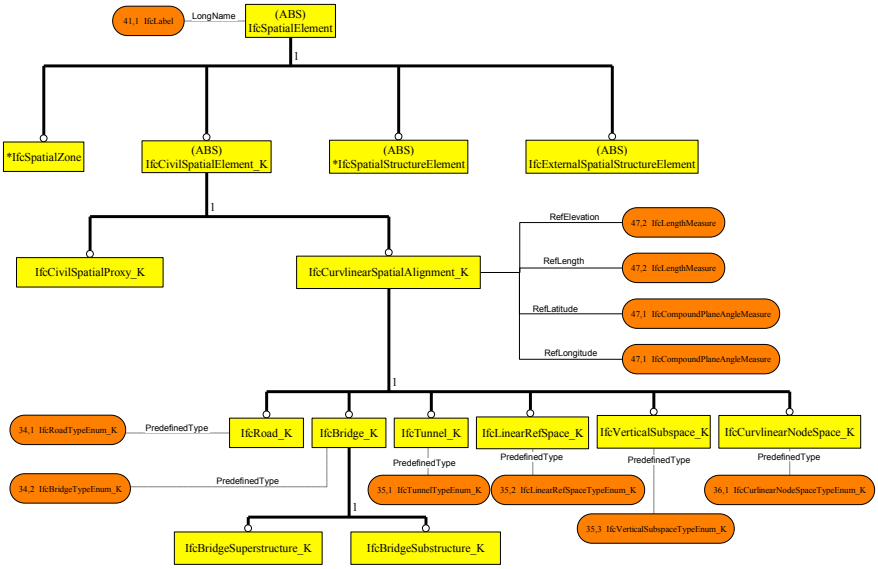
The linear reference space (IfcLinearRefSpace_K) expresses the spatial management hierarchy for structures classified based on road lines and their corresponding several reference lines. This is located below the linear space (IfcCurvlinearSpatialAlignment_K) with curved sections and structural spaces, and is used together with the IfcCurvlinearNodeSpace_K of the same hierarchy. For example, walking facilities may be defined as IfcRoadFootpaht_K, andall walking facilities constructed according to lines may be simultaneously referred to by the hierarchy of this linear reference space (IfcLinearRefSpace_K).

EXPRESS Specification:

```
ENTITY IfcLinearRefSpace_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignment_K);
    PredefinedType : OPTIONAL IfcLinearRefSpaceTypeEnum_K;
```

END_ENTITY;

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcLinearRefSpace_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElement
  LongName              :OPTIONAL IfcLabel;
 INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
```

```
 ENTITY IfcCivilSpatialElement_K
 ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :  OPTIONAL IfcLengthMeasure;
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
 ENTITY IfcLinearRefSpace_K
  PredefinedType    :OPTIONAL IfcLinearRefSpaceTypeEnum;
END_ENTITY;
```

1.3.10 IfcVerticalSubspace_K

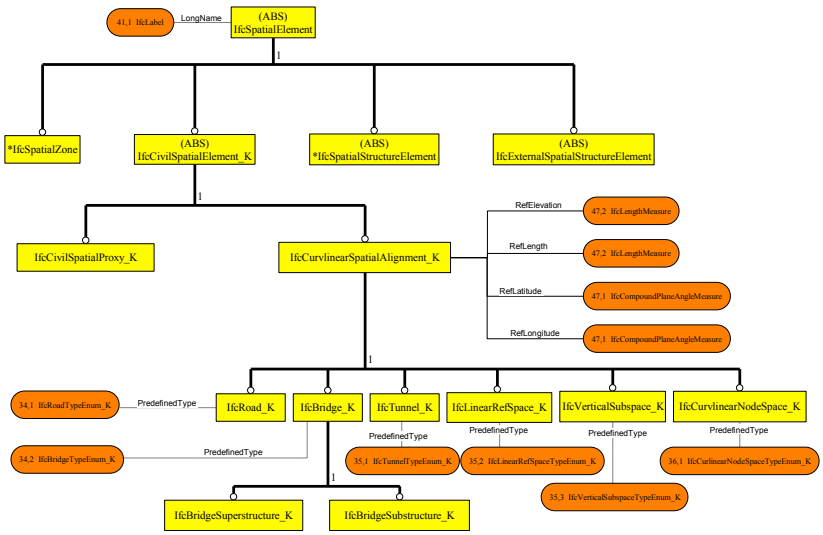
Description

The vertical reference space (IfcVerticalSubspace_K) expresses the spatial management hierarchy for the vertical structures of roads, bridges, and tunnels. For example, belonging to this category are tunnels with a two-story structure and multiple-layer bridges; and likewise, the upper space and the lower space are classified into a road and a railroad, respectively. The vertical reference space is located below the linear space (IfcCurvlinearSpatialAlignment_K) with curved sections and structural spaces, and is used with the IfcCurvlinearNodeSpace_K of the same hierarchy.

EXPRESS Specification:

```
ENTITY IfcVerticalSubspace_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignment_K);
    PredefinedType : OPTIONAL IfcVerticalSubspaceTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcVerticalSubspace_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
```

```
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcSpatialElement
  LongName            :OPTIONAL IfcLabel;
INVERSE
  ContainsElements    :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
ENTITY IfcCivilSpatialElement_K
ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :  OPTIONAL IfcLengthMeasure;
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
ENTITY IfcVerticalSubspace_K
  PredefinedType    :OPTIONAL IfcVerticalSubspaceTypeEnum;
END_ENTITY;
```

1.3.11 IfcCurvlinearNodeSpace_K

Description

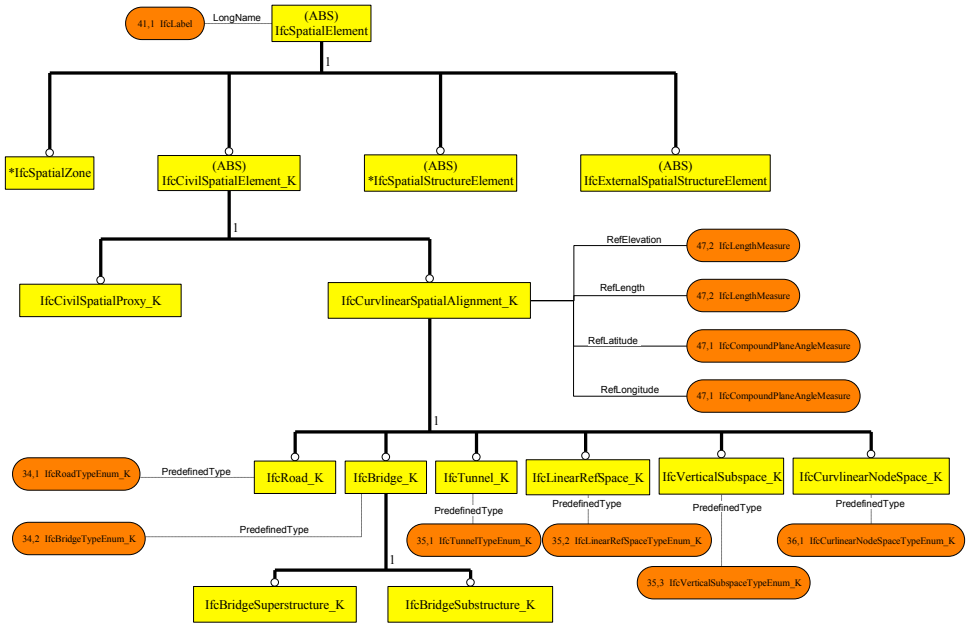
The linear node reference space (IfcCurvlinearNodeSpace_K), a conceptual space type, is information that is actually not used in design, but can be defined as an element for managing spaces by structure location unit in the construction stage. It expresses the hierarchy of spatial elements that can distinguish particular sections and portions, such as linear and structural spaces, from tunnels' gallery entries that can be classified according to the user's designated coordinates. It is located below the linear space IfcCurvlinearSpatialAlignment_K) and the curved sections, together with structural spaces, and is used with the IfcCurvlinearNodeSpace_K of the same hierarchy.

EXPRESS Specification:

```
ENTITY IfcCurvlinearNodeSpace_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignment_K);
```

PredefinedType : OPTIONAL IfcCurlinearNodeSpaceTypeEnum_K;
END_ENTITY;

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCurvilinearNodeSpace_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
```

```
ENTITY IfcSpatialElement
  LongName          :OPTIONAL IfcLabel;
INVERSE
  ContainsElements   :SET OF IfcRelContainedInSpatialStructure FOR RelatingStructure;
  ServicedBySystems :SET OF IfcRelServicesBuildings FOR RelatedBuildings;
  ReferencesElements:SET OF IfcRelReferencedInSpatialStructure FOR RelatingStructure;
ENTITY IfcCivilSpatialElement_K
ENTITY IfcCivilCulvinearSpatialAlignment_K
  RefElevation :  OPTIONAL IfcLengthMeasure;
  RefLongitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLatitude :  OPTIONAL IfcCompoundPlaneAngleMeasure;
  RefLength :  OPTIONAL IfcLengthMeasure;
ENTITY IfcCurvilinearNodeSpace_K
  PredefinedType    :OPTIONAL IfcCurvilinearNodeSpaceTypeEnum;
END_ENTITY;
```

1.3.12 IfcCivilSpatialElementType_K

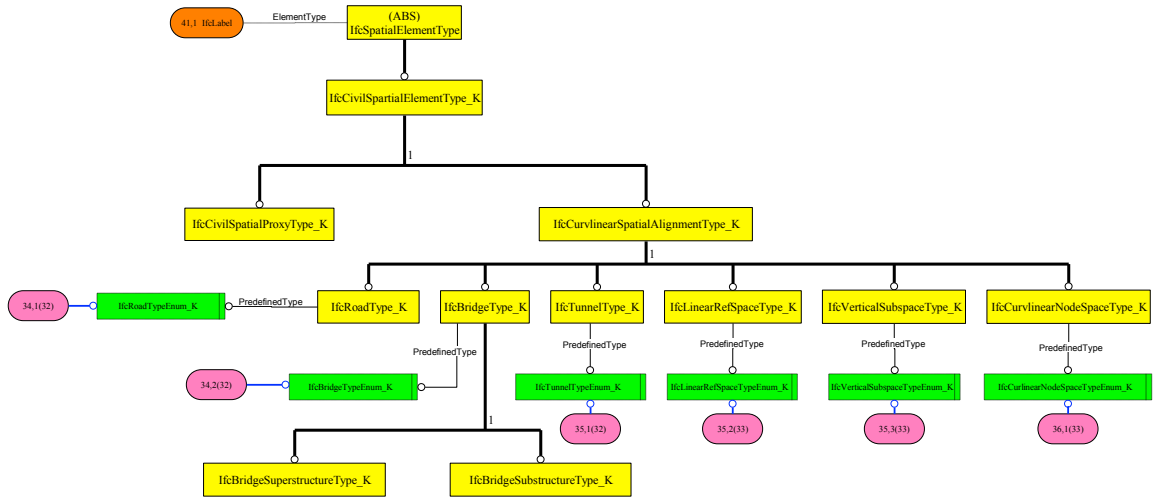
Description

IfcCivilSpatialElemetType_K defines conceptural spartial element types of entire civil structures.

EXPRESS Specification:

```
ENTITY IfcCivilSpartialElementType_K
  SUPERTYPE OF (ONEOF(IfcCivilSpatialProxyType_K, IfcCurvlinearSpatialAlignmentType_K))
  SUBTYPE OF(IfcSpatialElementType);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilSpatialElementType_K
 ENTITY IfcRoot
  GlobalId          :IfcGloballyUniqueId;
  OwnerHistory      :OPTIONAL IfcOwnerHistory;
```

```
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType        :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.13 IfcCivilSpatialProxyType_K

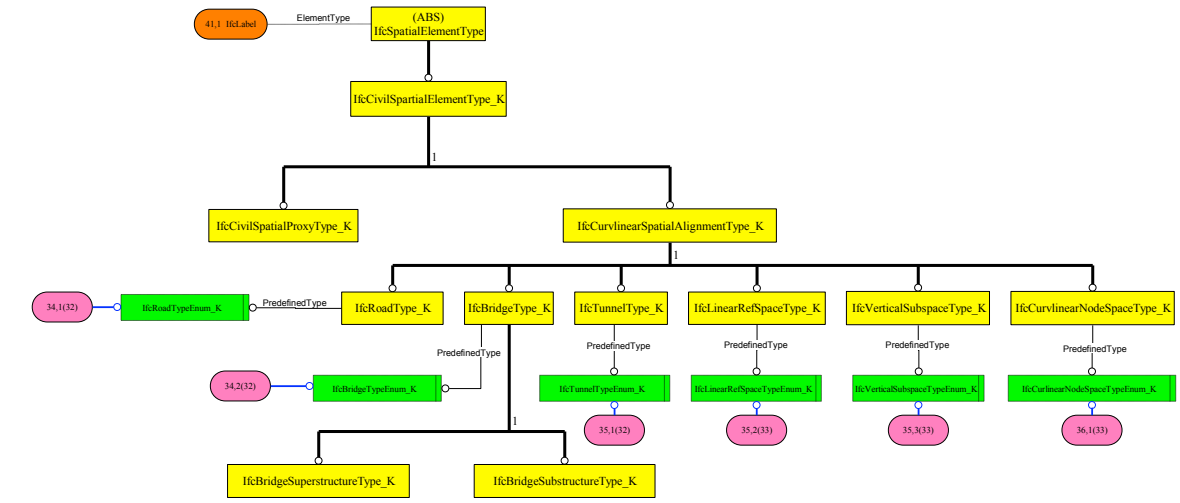
Description

This defines undefined conceptual civil engineering space structures, except the hierarchy of all civil engineering spaces. The elements of this subtype do not define shapes, but are used to link remuneration-type information.

EXPRESS Specification:

```
ENTITY IfcCivilSpatialProxyType_K
  SUBTYPE OF(IfcCivilSpartialElementType_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilSpatialProxyType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialProxyType_K
  ElementType      :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.14 IfcCurvilinearSpatialAlignmentType_K

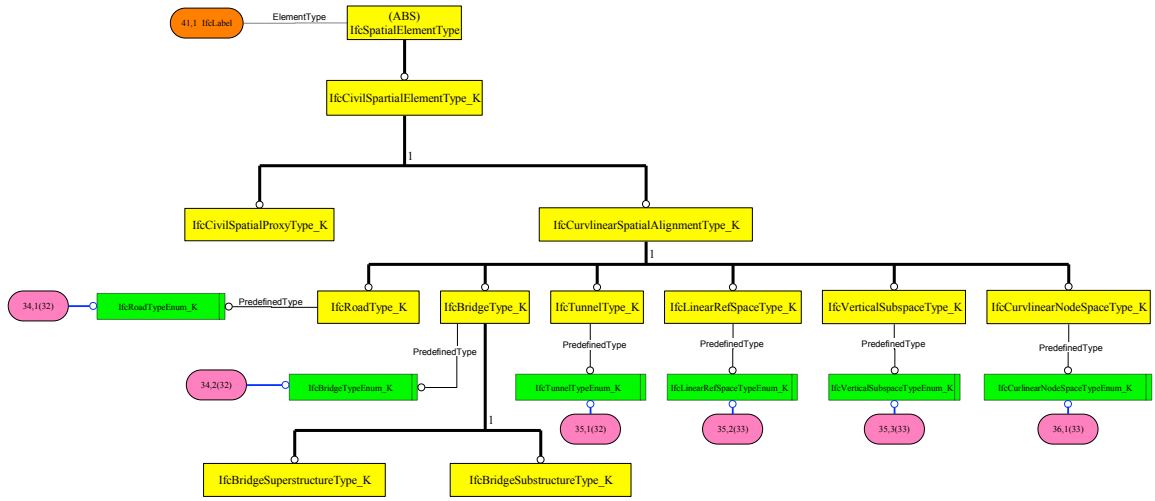
Description

This defines the lists of conceptual civil engineering spatial structures for linear spaces and structural spaces. The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcCurvlinearSpatialAlignmentType_K
  SUPERTYPE OF (ONEOF(IfcRoadType_K, IfcBridgeType_K, IfcTunnelType_K,
IfcLinearRefSpaceType_K, IfcVerticalSubspaceType_K, IfcCurvlinearNodeSpaceType_K))
  SUBTYPE OF(IfcCivilSpartialElementType_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCulvlinearSpatialAlignmentType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
```

```
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType         :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.15 IfcRoadType_K

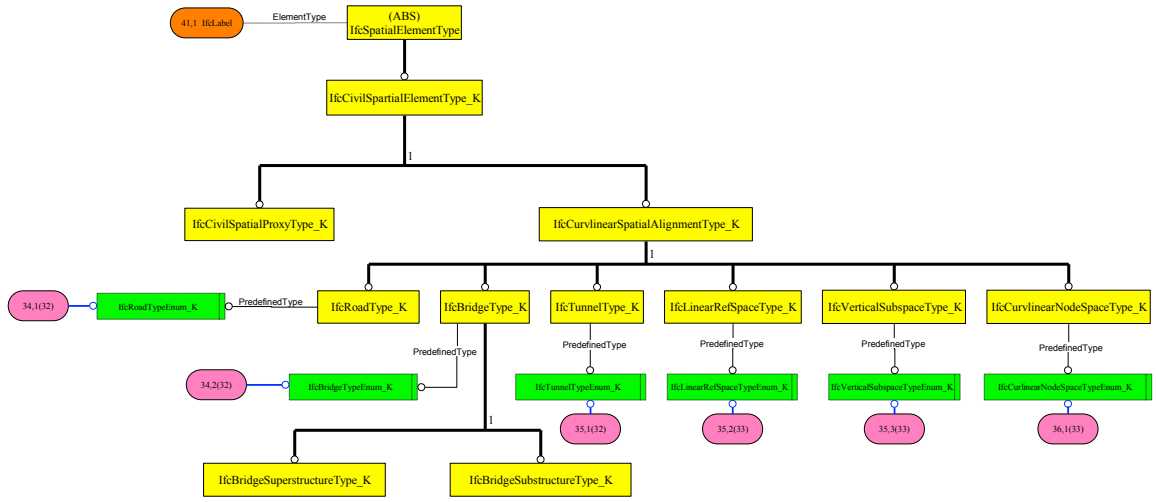
Description

This defines the lists of top-level civil engineering spatial structures that can conceptually group a road's linear spaces and structural spaces. The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcRoadType_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignmentType_K);
    PredefinedType : IfcRoadTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadType_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
```

```
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType        :OPTIONAL IfcLabel;
 ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcRoadType_K
  PredefinedType    :IfcRoadTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.16 IfcBridgeType_K

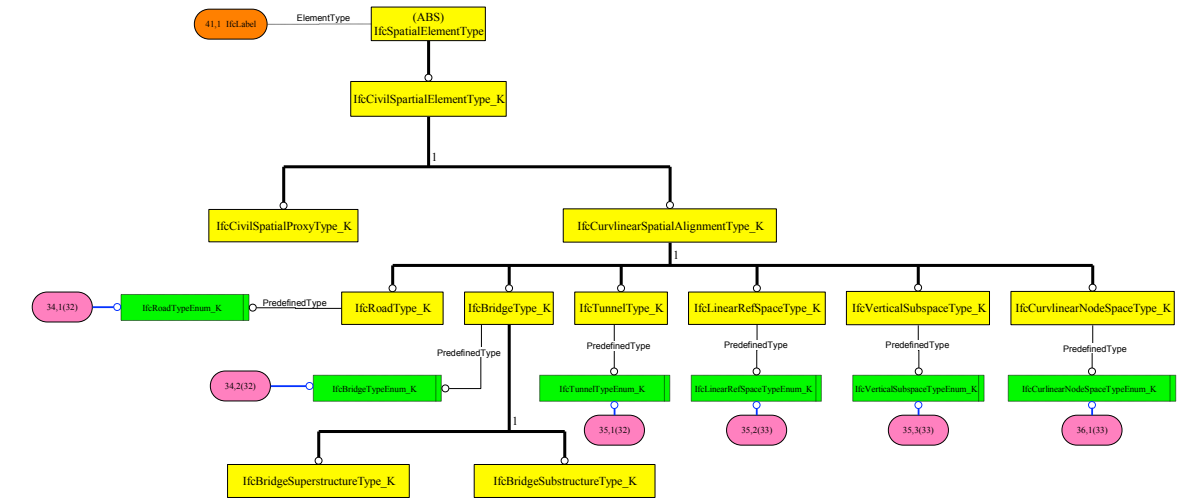
Description

This defines the lists of the top-level civil engineering spatial structure types that can conceptually group a bridge's structural spaces. The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcBridgeType_K
  SUPERTYPE OF (ONEOF(IfcBridgeSuperstructureType_K, IfcBridgeSubstructureType_K))
  SUBTYPE OF(IfcCurvlinearSpatialAlignmentType_K);
    PredefinedType : IfcBridgeTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType      :OPTIONAL IfcLabel;
 ENTITY IfcBridgeType_K
  PredefinedType   :IfcBridgeTypeEnum_K;
  LongName         :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.17 IfcBridgeSuperstructureType_K

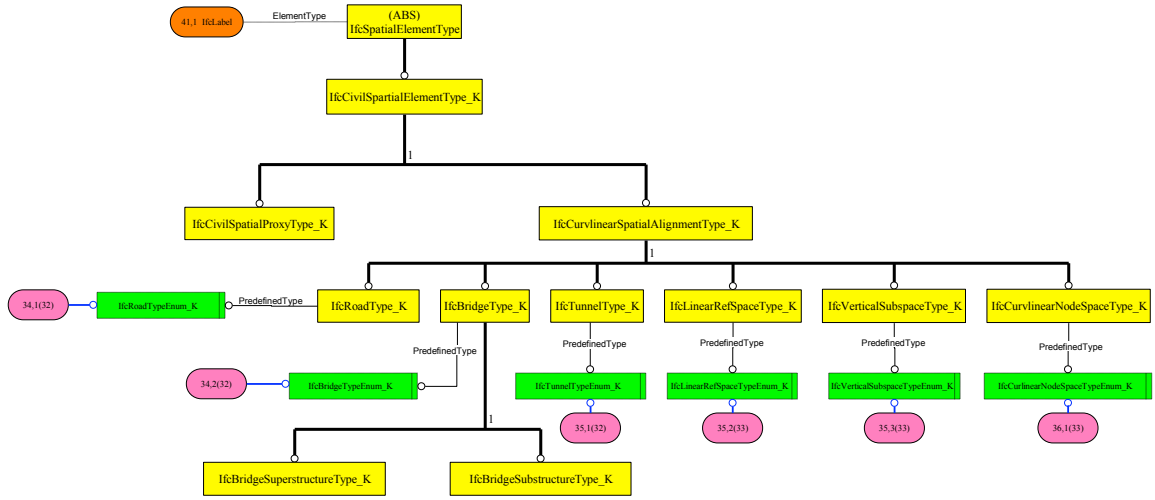
Description

This defines the lists of the top-level civil engineering spatial structure types that can conceptually group a bridge's upper structural spaces. The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcBridgeSuperstructureType_K
  SUBTYPE OF(IfcBridgeType_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeSuperstructureType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets       :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
```

```
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy       :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcSpatialElementType
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilSpatialElementType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcBridgeType_K
  PredefinedType    :IfcBridgeTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
ENTITY IfcBridgeSuperstructureType_K
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.18 IfcBridgeSubstructureType_K

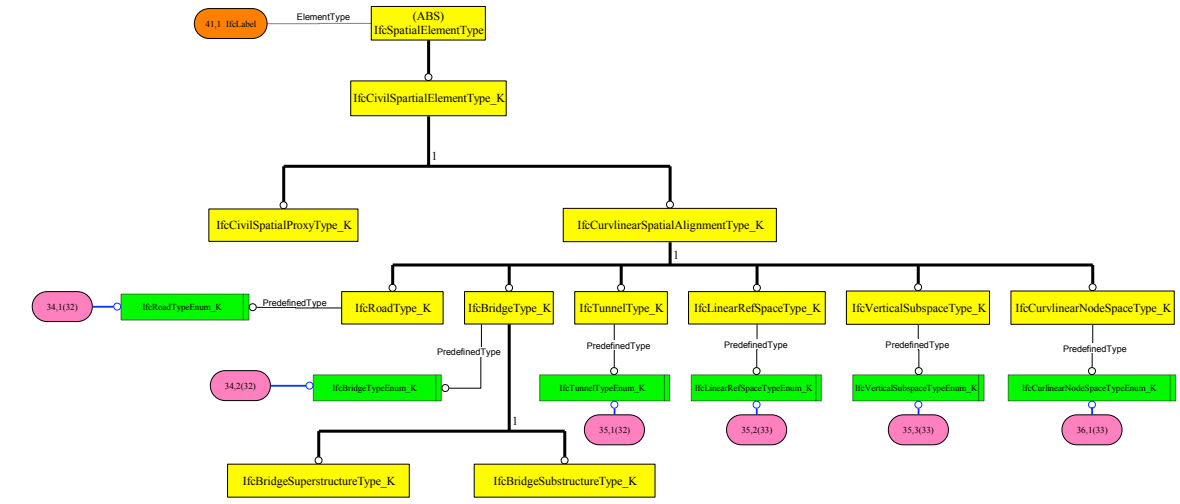
Description

This defines the lists of the top-level civil engineering spatial structure types that can conceptually group a bridge's substructure spaces. The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcBridgeSubstructureType_K
  SUBTYPE OF(IfcBridgeType_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeSubrstructureType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType           :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcBridgeType_K
  PredefinedType      :IfcBridgeTypeEnum_K;
  LongName            :OPTIONAL IfcLabel;
 ENTITY IfcBridgeSubstructureType_K
  LongName            :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.19 IfcTunnelType_K

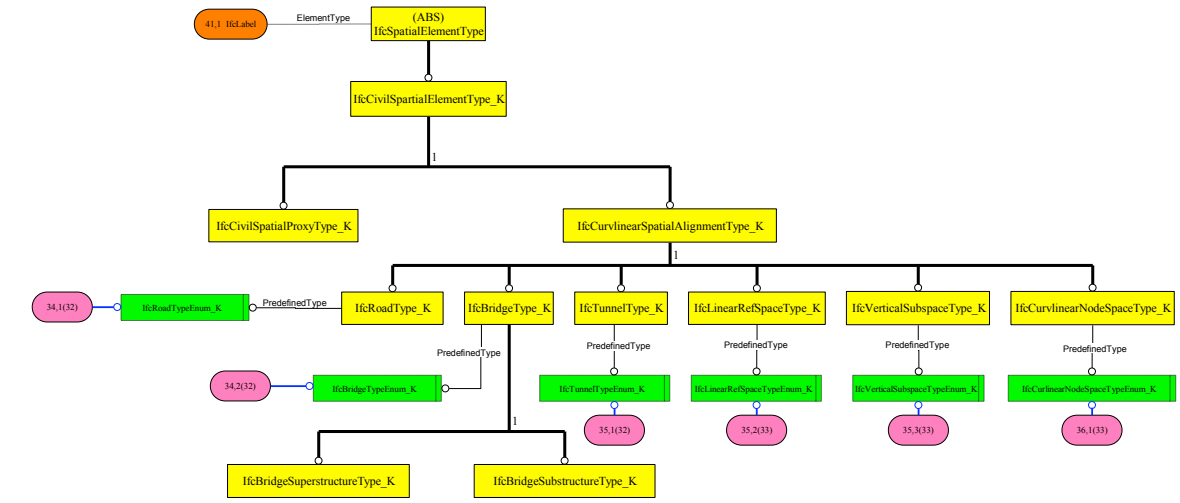
Description

This defines the lists of the top-level civil engineering spatial structure types that can conceptually group a tunnel's structural spaces. The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcTunnelType_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignmentType_K);
    PredefinedType : IfcTunnelTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcTunnelType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType      :OPTIONAL IfcLabel;
 ENTITY IfcTunnelType_K
  PredefinedType   :IfcTunnelTypeEnum_K;
  LongName         :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.20 IfcLinearRefSpaceType_K

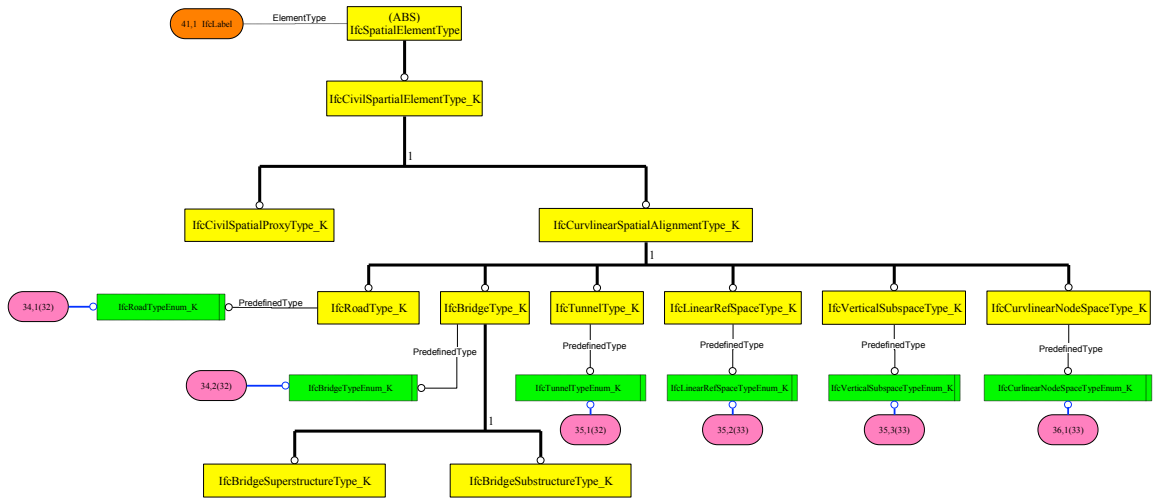
Description

This defines the lists of the top-level civil engineering spatial structure types that can conceptually group the structural spaces of selected reference spaces. The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcLinearRefSpaceType_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignmentType_K);
    PredefinedType : IfcLinearRefSpaceTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcLinearRefSpaceType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
```

```
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcSpatialElementType
  ElementType         :OPTIONAL IfcLabel;
ENTITY IfcCivilSpatialElementType_K
  ElementType         :OPTIONAL IfcLabel;
ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcLinearRefSpaceType_K
  PredefinedType    :IfcLinearRefSpaceTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.21 IfcVerticalSubspaceType_K

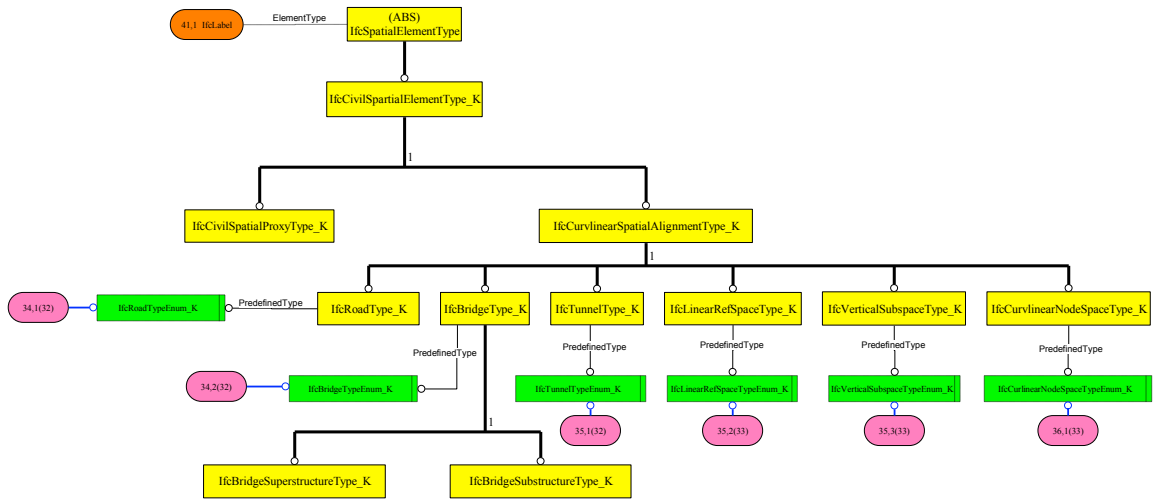
Description

This defines the lists of the top-level civil engineering spatial structure types that can conceptually group a structure's vertical lower spaces (IfcVerticalSubspace_K). The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcVerticalSubspaceType_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignmentType_K);
    PredefinedType : IfcVerticalSubspaceTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcVerticalSubspaceType_K
```

```
ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments     :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests              :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy         :SET OF IfcRelNests FOR RelatingObject;
  HasContext         :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy     :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes         :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations    :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types              :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy       :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcSpatialElementType
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilSpatialElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType      :OPTIONAL IfcLabel;
ENTITY IfcVerticalSubspaceType_K
  PredefinedType   :IfcVerticalSubspaceTypeEnum_K;
  LongName         :OPTIONAL IfcLabel;
END_ENTITY;
```

1.3.22 IfcCurvlinearNodeSpaceType_K

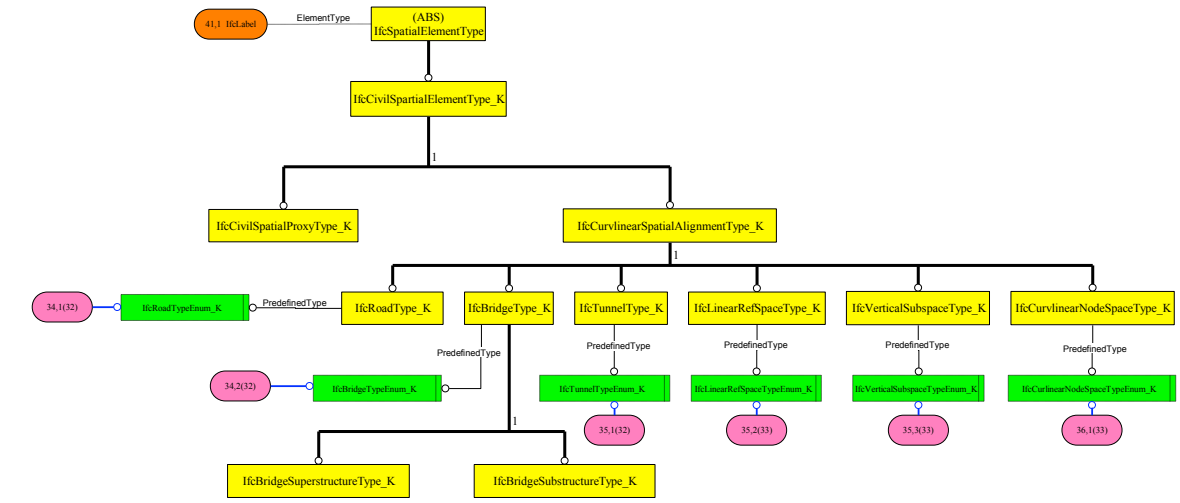
Description

This defines the lists of the top-level civil engineering spatial structure types that can conceptually group a road line's node spaces (IfcCurvinearNodeSpace). The elements of this subtype do not define shapes but are used to link enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcCurvlinearNodeSpaceType_K
  SUBTYPE OF(IfcCurvlinearSpatialAlignmentType_K);
    PredefinedType : IfcCurvlinearNodeSpaceTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCurvlinearNodeSpaceType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcSpatialElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilSpatialElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCurvlinearSpatialAlignmentType_K
  ElementType      :OPTIONAL IfcLabel;
 ENTITY IfcCurvlinearNodeSpaceType_K
  PredefinedType   :IfcCurvlinearNodeSpaceTypeEnum_K;
  LongName         :OPTIONAL IfcLabel;
END_ENTITY;
```

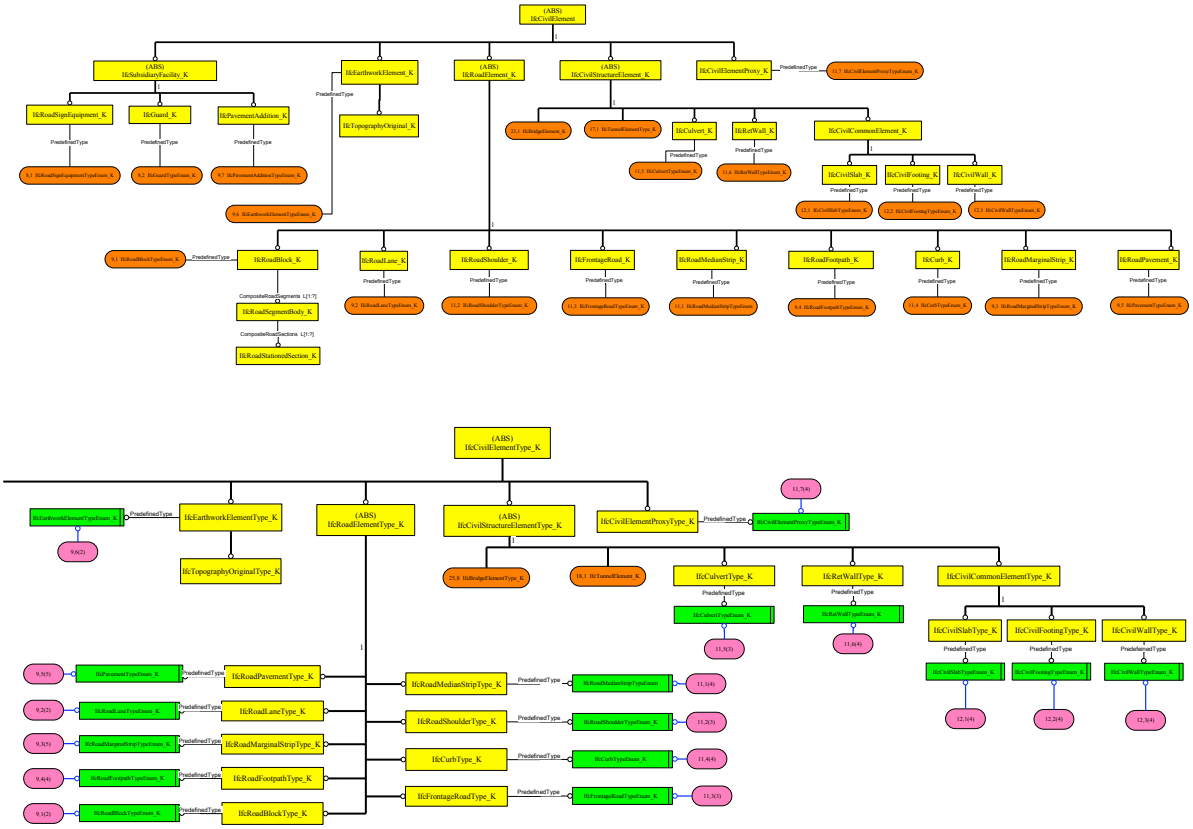
2 IfcSharedRoadElements

2.1 Schema Definition

These shared road elements (IfcSharedRoadElements) define the subtypes of IfcCivilElement defined in IfcProductExtension. These subtypes are the major elements of the shape designs of road structures.

These elements (the main road body, lanes, median strips, shoulders, frontage roads, marginal strips, walkways, curbs, and pavements) are the major components of road facilities that are exchanged with civil engineering project data. For each of these elements, the geometric use is defined to create the applicable methods for the proper expression of the shapes of individual elements.

EXPRESS-G diagram



2.2 Types

2.2.1 IfcCivilElementProxyTypeEnum_K

To further specify IfcCivilElementProxy or IfcCivilElementProxyType, this enumeration type defines civil engineering structure shape types that cannot be defined as shape elements. Given the proxy type, new shape elements can be defined in addition to the predefined types.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcCivilElementProxyTypeEnum_K = ENUMERATION OF
  (USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.2 IfcCulvertTypeEnum_K

With regard to IfcCulvert or IfcCulvertType, this enumeration type defines the different types of waterway and passage culvert structures and diverse drain culvert structures.

Enumerated Item Definitions:

- **ONEWAYWATERWAYCULVERT**
- **TWOWAYWATERWAYCULVERT**
- **THREEWAYWATERWAYCULVERT**
- **ONEWAYPASSAGEWAYCULVERT**
- **TWOWAYPASSAGEWAYCULVERT**
- **ONEWAYSKEWEDWATERWAYCULVERT**
- **TWOWAYSKEWEDWATERWAYCULVERT**
- **THREEWAYSKEWEDWATERWAYCULVERT**
- **ONEWAYSKEWEDPASSAGEWAYCULVERT**
- **TWOWAYSKEWEDPASSAGEWAYCULVERT**
- **STONEFILLEDCULVERTTYPE1**
- **STONEFILLEDCULVERTTYPE2**
- **STONEFILLEDCULVERTTYPE3**
- **STONEFILLEDCULVERTTYPE4**
- **STONEFILLEDCULVERTTYPE5**
- **COMMONDUCT**
- **CLOSED_CONDUIT**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcCulvertTypeEnum_K = ENUMERATION OF
  (ONEWAYWATERWAYCULVERT,
   TWOWAYWATERWAYCULVERT,
   THREEWAYWATERWAYCULVERT,
   ONEWAYPASSAGEWAYCULVERT,
   TWOWAYPASSAGEWAYCULVERT,
   ONEWAYSKEWEDWATERWAYCULVERT,
   TWOWAYSKEWEDWATERWAYCULVERT,
   THREEWAYSKEWEDWATERWAYCULVERT,
```

ONEWAYSKEWEDPASSAGEWAYCULVERT,
TWOWAYSKEWEDPASSAGEWAYCULVERT,
STONEFILLEDCULVERTTYPE1,
STONEFILLEDCULVERTTYPE2,
STONEFILLEDCULVERTTYPE3,
STONEFILLEDCULVERTTYPE4,
STONEFILLEDCULVERTTYPE5,
COMMONDUCT,
CLOSED_CONDUIT,
NOTDEFINED,
USERDEFINED);
END_TYPE;

2.2.3 IfcRetWallTypeEnum_K

With regard to IfcRetWall or IfcRetWallType, this enumeration type defines the different types of retention of wall structures that are constructed adjacent to earthwork, according to lines. This enumeration type is commonly used in linear facilities such as roads, bridges, and tunnels.

Enumerated Item Definitions:

- **GRAVITYTYPERETAININGWALL**
- **SEMIGRAVITYTYPERETAINGWALL**
- **NONSTANDINGRETAININGWALL**
- **REVERSEDTSHAPEDRETAININGWALL**
- **LSHAPEDRETAININGWALL**
- **REVERSEDLSHAPEDRETAININGWALL**
- **COUNTERFORTRETAININGWALL**
- **MASONARYRETAININGWALL**
- **REINFORCEDEARCHRETAININGWALL**
- **BLOCKTYPERETAININGWALL**
- **PANELTYPERETAININGWALL**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

TYPE IfcRetWallTypeEnum_K = ENUMERATION OF
(GRAVITYTYPERETAININGWALL,
SEMIGRAVITYTYPERETAINGWALL,
NONSTANDINGRETAININGWALL,
REVERSEDTSHAPEDRETAININGWALL,
LSHAPEDRETAININGWALL,
REVERSEDLSHAPEDRETAININGWALL,
COUNTERFORTRETAININGWALL,
MASONARYRETAININGWALL,
REINFORCEDEARCHRETAININGWALL,
BLOCKTYPERETAININGWALL,

PANELTYPERETAININGWALL,
USERDEFINED,
NOTDEFINED);
END_TYPE;

2.2.4 IfcCivilSlabTypeEnum_K

This enumeration type defines the predefined types of IfcCivilSlab or IfcCivilSlabType. This element does not apply to particular structures, but is commonly used in linear facilities such as roads, bridges, and tunnels.

Enumerated Item Definitions:

- **STRAIGHT_INVESTRAIGHT_INVERT**
- **CURVED_INVERT**
- **BASE_SLAB**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

TYPE IfcCivilSlabTypeEnum_K = ENUMERATION OF
(STRAIGHT_INVESTRAIGHT_INVERTRT,
CURVED_INVERT,
BASE_SLAB,
USERDEFINED,
NOTDEFINED);
END_TYPE;

2.2.5 IfcCivilFootingTypeEnum_K

This enumeration type defines the predefined types of IfcCivilFooting or IfcCivilFootingType. This element does not apply to particular structures, but is commonly used in linear facilities such as roads, bridges, and tunnels. Specifically, it can be used with a bridge's foundation, a tunnel's retaining wall foundation, a culvert's foundation, etc.

Enumerated Item Definitions:

- **BASE_FOOTING**
- **PITMOUTH_FOOTING**
- **CAISSON_FOUNDATION**
- **PSC_PILE_FOUNDATION**
- **RC_PILE_FOUNDATION**
- **SLURRY_WALL_FOUNDATION**
- **SPREAD_FOUNDATION**
- **STEEL_PILE_FOUNDATION**
- **STEEL_SHEET_PILE_FOUNDATION**
- **USERDEFINED**

- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcCivilFootingTypeEnum_K = ENUMERATION OF
  (BASE_FOOTING,
   PITMOUTH_FOOTING,
   CAISSON_FOUNDATION,
   PSC_PILE_FOUNDATION,
   RC_PILE_FOUNDATION,
   SLURRY_WALL_FOUNDATION,
   SPREAD_FOUNDATION,
   STEEL_PILE_FOUNDATION,
   STEEL_SHEET_PILE_FOUNDATION,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.6 IfcCivilWallTypeEnum_K

This enumeration type defines the predefined types of IfcCivilWall or IfcCivilWallType. This element does not apply to particular structures, but is commonly used in linear facilities such as roads, bridges, and tunnels. Specifically, it can be used with a culvert's wing walls, a retaining wall's body structure, a tunnel gallery's wing walls, a culvert tunnel's side walls, etc.

Enumerated Item Definitions:

- **CHESTWALL**
- **WINGWALL**
- **PITMOUTH_WINGWALL**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcCivilWallTypeEnum_K = ENUMERATION OF
  (CHESTWALL,
   WINGWALL,
   PITMOUTH_WINGWALL,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.7 IfcRoadBlockTypeEnum_K

This enumeration type defines the prededefined types of IfcRoadBlock or IfcRoadBlockType. It has the optional multiple list L[1:?] of IfcRoadSegementBody. IfcRoadSegmentBody also has the optional multiple list L[1:?] of IfcRoadStationedSection.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadBlockTypeEnum_K = ENUMERATION OF
  (USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.8 IfcRoadLaneTypeEnum_K

This enumeration type defines the predefined types of IfcRoadLane or IfcRoadLaneType. It expresses lists according to a car's line type, color type, and use type. These are defined as common shape elements, expressed on the pavement of linear structures, like the lanes of a road, the lanes on the pavement of a bridge's upper deck, and the lanes on a tunnel's pavement.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadLaneTypeEnum_K = ENUMERATION OF
  (USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.9 IfcRoadShoulderTypeEnum_K

This enumeration type defines the predefined types of IfcRoadShoulder or IfcRoadShoulderType. It mainly defines the types of shoulders of a road.

Enumerated Item Definitions:

- **FULLWIDTHROADSHOULDER**
- **HALFWIDTHROADSHOULDER**
- **NARROWWIDTHROADSHOULDER**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadShoulderTypeEnum_K = ENUMERATION OF
  (FULLWIDTHROADSHOULDER,
   HALFWIDTHROADSHOULDER,
   NARROWWIDTHROADSHOULDER,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.10 IfcFrontageRoadTypeEnum_K

This enumeration type defines the predefined types of IfcFrontageRoad or IfcFrontageRoadType.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcFrontageRoadTypeEnum_K = ENUMERATION OF
  (USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.11 IfcRoadMedianStripTypeEnum_K

This enumeration type defines the predefined types of IfcRoadMedianStrip or IfcRoadMedianStripType. The types vary according to the road use.

Enumerated Item Definitions:

- **GUARDFENCEOFCONCRETE**
- **GUARDRAIL**
- **GREENAREA**
- **CURBOFCONCRETE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadMedianStripTypeEnum = ENUMERATION OF
  (GUARDFENCEOFCONCRETE,
   GUARDRAIL,
   GREENAREA,
   CURBOFCONCRETE,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.12 IfcRoadFootpathTypeEnum_K

This enumeration type defines the predefined types of IfcRoadFootpath or IfcRoadFootpathType. It shows the enumeration types of spatial-type walkways.

Enumerated Item Definitions:

- **UNDERGROUND_FOOTPATH**
- **GENERAL**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadFootpathTypeEnum_K = ENUMERATION OF
  (UNDERGROUND_FOOTPATH,
   GENERAL,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.13 IfcRoadCurbTypeEnum_K

This enumeration type defines the predefined types of IfcRoadCurb or IfcRoadCurbType. Such types are classified into the factory-manufactured-type curbstones and the onsite continuous-placement curbstones.

Enumerated Item Definitions:

- **MOUNTABLECURB**
- **BARRIER1**
- **BARRIER2**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcCurbTypeEnum_K = ENUMERATION OF
  (MOUNTABLECURB,
   BARRIER1,
   BARRIER2,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.14 IfcRoadMarginalStripTypeEnum_K

This enumeration type defines the predefined types of IfcRoadMarginalStrip or IfcRoadMarginalStripType.

New marginal strips, if any, can be included in the enumeration-type elements.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadMarginalStripTypeEnum_K = ENUMERATION OF
  (USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.2.15 IfcRoadPavementTypeEnum_K

This enumeration type defines the predefined types of IfcRoadPavement or IfcRoadPavementType. It defines the types of payment layer, and IfcConstructionMaterialResourceType additionally defines the material type by layer.

Enumerated Item Definitions:

- **SURFACE**
- **INTERMEDIATECOURSE**
- **SUBBASE**
- **BASECOURSE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcPavementTypeEnum_K = ENUMERATION OF
  (SURFACE,
   INTERMEDIATECOURSE,
   SUBBASE,
   BASECOURSE,
   USERDEFINED,
   NOTDEFINED);
END_TYPE;
```

2.3 Entities

2.3.1 IfcRoadElement_K

Description

Road elements include all basic members needed for the construction of a road. For example, the road's structural members consist of onsite-placement members and factory-manufactured members. Major road types include pavements, curbstones, median strips, lanes, frontage roads, marginal strips, and walking facilities, as well as supplementary facilities that can be linearly connected.

IfcRoadElement inherits the common properties of its subordinate road elements. Also, the sets of lower-level road elements are grouped into IfcRoadElement, and are defined as spatial structures.

IfcRoadElement can refer to functional connection elements defined in IfcBuildingElement.It specifically refers to relationships between objects, and uses detailed functions through inverse properties. For example, it uses Grouping, Processes, Structural member reference, Aggregation, Material, Classification, Library, Documentation, Type, Properties, Connection, Realization, Assignment to a spatial structure, Reference to spatial structures, Boundary, Covering, Voids, Projection, and Filling. For road elements, the functions of Assignment to a referenced spatial structure and Referencing to a road alignment (IfcAlignment) apply.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadElementType_K

Table 1 — IfcRoadElementType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadElement_K.

PredefinedType	Name
	Pset_RoadProjectCodeGroup
	Pset_RoadProjectMgmtCommon
	Pset_RoadElementDesignParameters

Table 2 — IfcRoadElement_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

Structure
IfcRoad_K

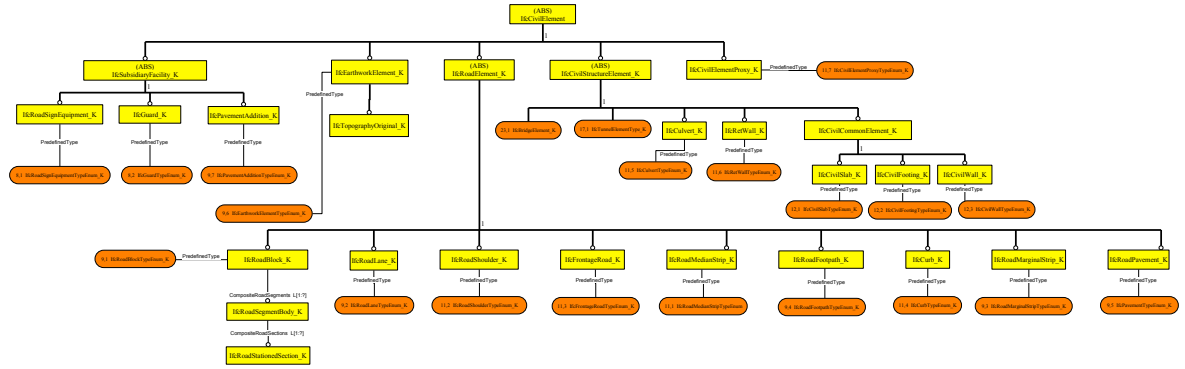
IfcCurvlinearNodeSpace_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table 3 — Spartial Containment of IfcRoadElement_K

EXPRESS Specification:

ENTITY IfcRoadElement_K
ABSTRACT SUPERTYPE OF (ONEOF(IfcRoadBlock_K, IfcRoadLane_K, IfcRoadMedianStrip_K, IfcRoadShoulder_K, IfcFrontageRoad_K, IfcRoadMarginalStrip_K, IfcRoadFootpath_K, IfcCurb_K, IfcRoadPavement_K))
SUBTYPE OF(IfcCivilElement);
END_ENTITY;

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadElement_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
```

```
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
  LongName           :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.2 IfcRoadElementType_K

Description

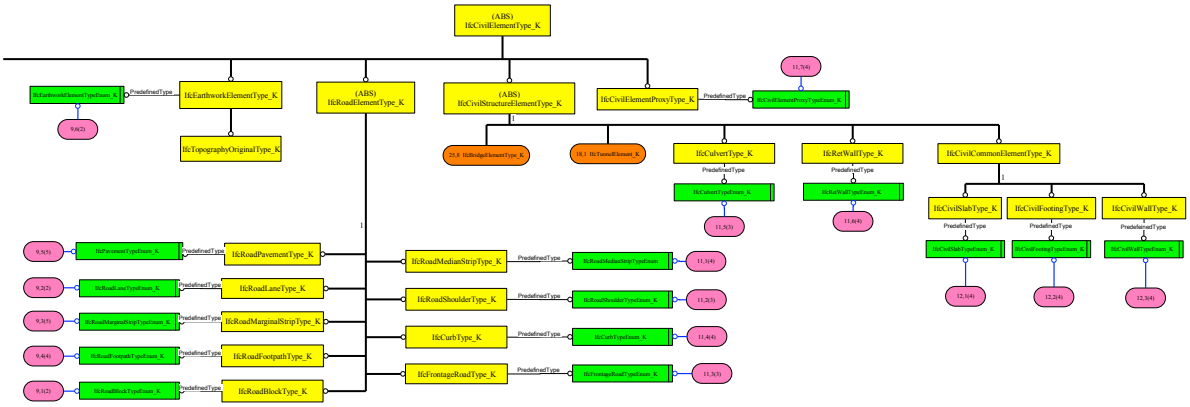
This element type (IfcRoadElementType_K) constitutes the selective list of structure expressions, and the definition list of the commonly shared property sets of road elements. It is used to define the element specifications (creation of particular member information member types). To determine the specific styles of relevant road type elements, the road element type is used to define the general properties of road elements that can be applied in diverse instances according to the characteristics of (the road elements?). The creation of the lower-level type of IfcRoadElementType is expressed with subtype instances of IfcRoadElement.

Basically, road subtype elements, without the definition of shapes, are used to connect with enumeration-type information.

EXPRESS Specification:

ENTITY IfcRoadElementType_K
  ABSTRACT SUPERTYPE OF (ONEOF(IfcRoadMedianStripType_K, IfcRoadShoulderType_K, IfcCurbType_K, IfcRoadPavementType_K, IfcRoadLaneType_K, IfcRoadMarginalStripType_K, IfcRoadFootpathType_K, IfcRoadBlockType_K, IfcFrontageRoadType_K))
  SUBTYPE OF(IfcCivilElementType_K);
END_ENTITY;

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadElementType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType           :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType
 ENTITY IfcRoadElementType
  LongName              :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.3 IfcCivilStructureElement_K

Description

Civil engineering structural elements (IfcCivilStructureElement) include all basic members of single-structure subtypes linked to civil engineering lines. The functional structures of civil engineering elements include bridge and tunnel structures, which in turn include lower-level construction members. Also, in road linear facilities, they include road structures that do not belong to particular facilities but are commonly used.

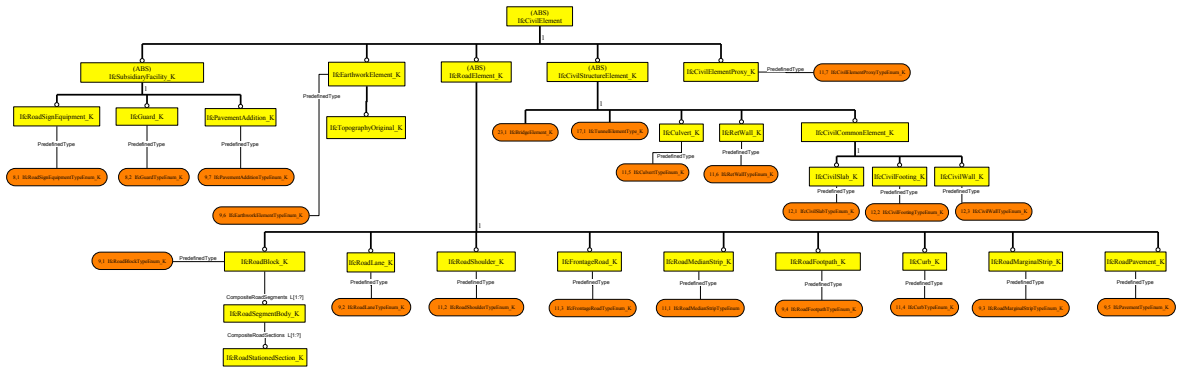
IfcCivilStructureElement is defined as abstract and inherits the common properties of the elements of its subordinate structures. Also, sets of individual elements of lower-level structures are grouped into the upper-level IfcCivilStructureElement_K, and are defined as spatial structures.

IfcCivilStructureElement_K can refer to the functional connection elements defined in IfcBuildingElement. In other words, by referring to relationships between objects, it uses detailed functions through inverse properties. Typically used are Grouping, Processes, Structural member reference, Aggregation, Material, Classification, Library, Documentation, Type, Properties, Connection, Realization, Assignment to a spatial structure, Reference to spatial structures, Boundary, Covering, Voids, Projection, and Filling. For civil engineering structural elements, the functions of Assignment to a referenced spatial structure and Referencing to a road alignment (IfcAlignment) are applied.

EXPRESS Specification:

```
ENTITY IfcCivilStructureElement_K
  ABSTRACT SUPERTYPE OF (ONEOF(IfcCulvert_K, IfcRetWall_K, IfcCivilCommonElement_K,
IfcTunnelElementType_K, IfcBridgeElement_K))
  SUBTYPE OF(IfcCivilElement);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilStructureElement_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
```

```
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
  LongName           :OPTIONAL IfcLabel;
END_ENTITY;
```

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

Structure
IfcBridge_K or IfcTunnel_K
IfcCurvlinearNodeSpace_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spartial Containment of IfcCivilStructureElement_K

2.3.4 IfcCivilStructureElementType_K

Description

This element type (IfcCivilStructureElementType_K) consists of the selective list of structure expressions and the definition list of the commonly shared property sets of elements of linear structures (bridges, tunnels, culverts, retaining walls, common structure foundations, wall bodies, and slabs). It is used to define the element specifications (the creation of particular member information and member types). To determine the specific styles of relevant structure shape elements, the structure element type is used to define the general properties of structure elements that can be applied in diverse instances according to their characteristics.

The lower-level-type creation of IfcCivilStructureElementType is expressed in subtype instances of IfcCivilStrucutreElement.

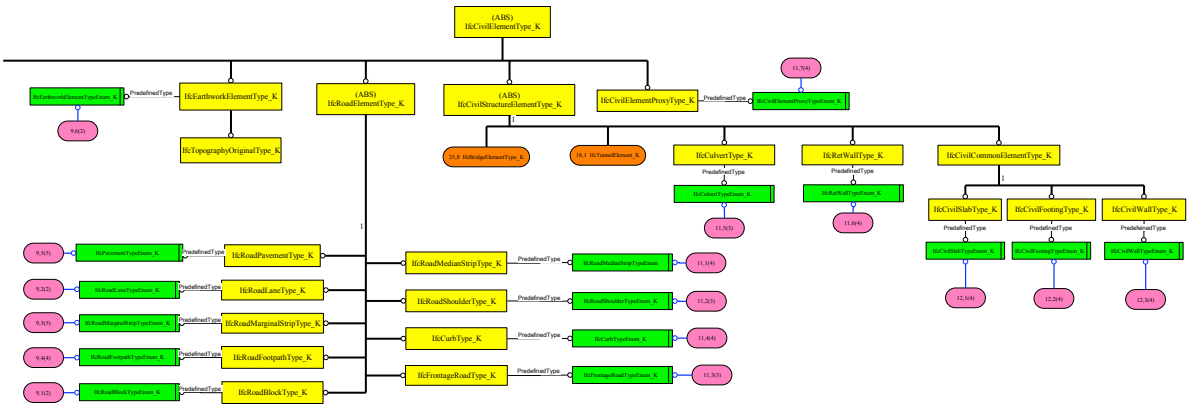
Basically, subtype elements of linear structures, without the definition of shapes, are used to connect enumeration-type information.

The particular-type specifications are defined by the inherited property of IfcElementType.ElementType, defined as IfcLabel.

EXPRESS Specification:

```
ENTITY IfcCivilStructureElementType_K
  ABSTRACT SUPERTYPE OF (ONEOF(IfcRetWallType_K, IfcCulvertType_K,
IfcCivilCommonElementType_K, IfcTunnelElement_K, IfcBridgeElementType_K))
  SUBTYPE OF(IfcCivilElementType_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilStructureElementType_K
 ENTITY IfcRoot
  GlobalId          :IfcGloballyUniqueId;
  OwnerHistory      :OPTIONAL IfcOwnerHistory;
  Name              :OPTIONAL IfcLabel;
```

```
  Description          :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments     :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests              :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy         :SET OF IfcRelNests FOR RelatingObject;
  HasContext         :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy     :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes         :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations    :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types              :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy       :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType
ENTITY IfcCivilStructureElementType
  LongName           :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.5 IfcCivilElementProxy_K

Description

This element type (IfcCivilElementProxy_K) defines diverse types of particular elements, except the already defined entity elements of roads and structures. Any shape element can be commonly assigned to IfcCivilElementProxy_K. This element's upper-level entity is IfcCivilElement, and can replace other civil engineering structures that are currently undefined. Such defined civil element proxy elements are defined as additional shape elements of other civil engineering facilities.

IfcCivilElementProxy_K does not constitute the predefined shapes of special types of roads and civil engineering structures that express it, but, as IfcCivilElement's subtype, is defined as the proxy that provides the same functions.

Common Use Definitions

Object Typing

본 Entity에 적용된 객체유형은 다음의 Type Entity에서 표현한다.

Type
IfcCivilElementProxyType_K

Table — IfcCivilElementProxyType_K Object Typing

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

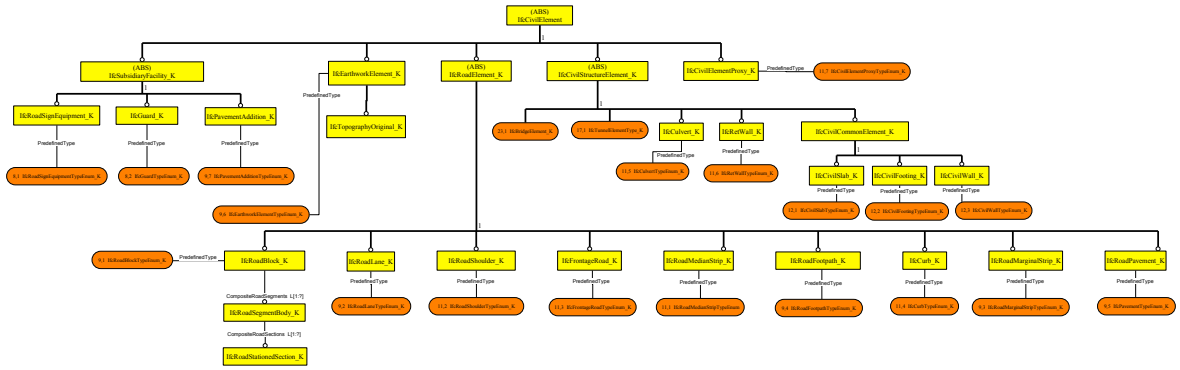
Structure
IfcCivilElementProxy_K
IfcCurvlinearNodeSpace_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcCivilElementProxy_K

EXPRESS Specification:

```
ENTITY IfcCivilElementProxy_K
  SUBTYPE OF(IfcCivilElement);
    PredefinedType : OPTIONAL IfcCivilElementProxyTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilElementProxy_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
```

```
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilElementProxy_K
  PredefinedType     :OPTIONAL IfcCivilElementProxyTypeEnum;
  LongName           :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.6 IfcCivilElementProxyType_K

Description

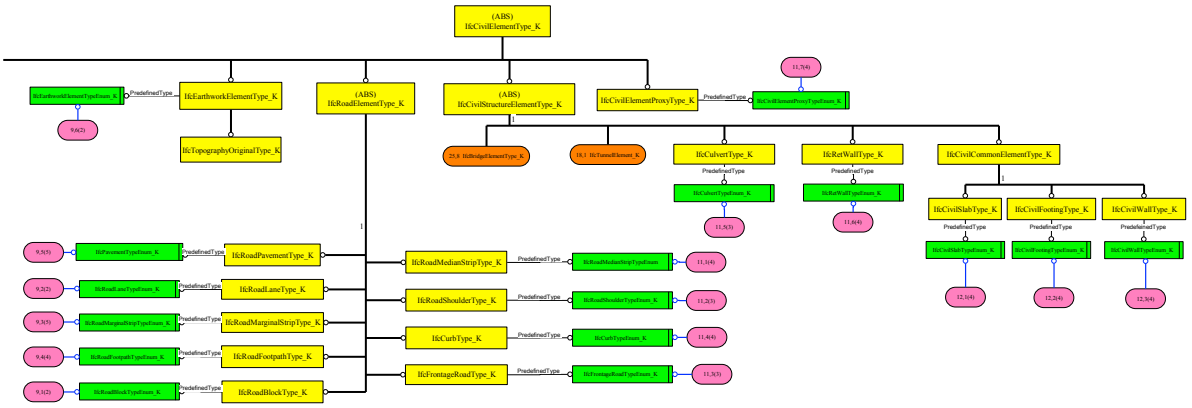
This element type (IfcCivilElementProxyType_K) constitutes the lists of elements used to allocate structures, member elements, and components that cannot be defined in this schema with regard to linear road facilities, bridges, and tunnel facilities. It is used to define the element specifications of particular members (creation of particular member information and member types). Proxy element types are used to determine undefined road and structure shape elements. Proxy types are defined as particular shape types, but are defined to classify new spatial elements.

Basically, proxy subtype elements of civil engineering structures, without the definition of shapes, are used to connect enumeration-type information. The creation of IfcCivilElementProxyType_K is expressed in instances of IfcCivilElementProxy_K.

EXPRESS Specification:

ENTITY IfcCivilStructureElementType_K
  ABSTRACT SUPERTYPE OF (ONEOF(IfcRetWallType_K, IfcCulvertType_K, IfcCivilCommonElementType_K, IfcTunnelElement_K, IfcBridgeElementType_K))
  SUBTYPE OF(IfcCivilElementType_K);
END_ENTITY;

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilElementProxyType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
 ENTITY IfcCivilElementProxyType_K
  PredefinedType    :IfcCivilElemetProxyTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.7 IfcCulvert_K

Description

Culverts (IfcCulvert_K) are seen as separate facility structures, such as roads and tunnels, among civil engineering facilities. Culverts are generally classified into waterway and passage culverts, into array 1 and array 2 according to the number of middle void areas, and into culverts with particular squares. Road culverts are installed in roadways and pedestrian passages, and for the movement of water. Culverts are installed mainly vertical to the lines, and for drains, may be installed according to the lines. Also, tunnel types may be classified into culvert types.

Culverts (IfCulvert_K) are shared with roads (IfcRoadElement_K). If the empty area of culverts is treated as a space, it may be classified as a spatial object in a void area.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcCulvertType_K

Table — IfcCulvertType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcCulvert_K.

PredefinedType	Name
	Pset_CulvertCodeGroup
	Pset_CulvertCommon

Table — IfcCulvert_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K

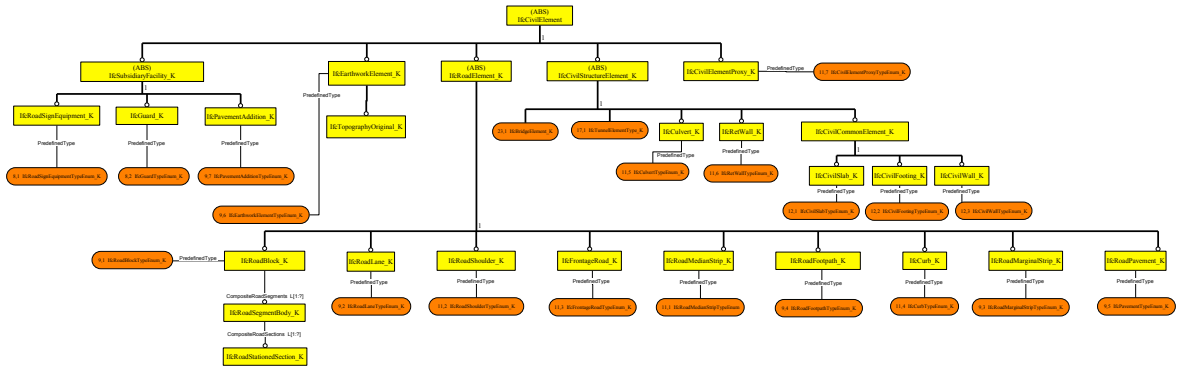
IfcSite

Table — Spatial Containment of IfcCulvert_K

EXPRESS Specification:

```
ENTITY IfcCulvert_K
  SUBTYPE OF(IfcCivilStructureElement_K);
    PredefinedType : OPTIONAL IfcCulvertTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCulvert_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids               :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo              :SET OF IfcRelConnectsElements FOR RelatingElement;
```

```
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcCulvert_K
  PredefinedType   :        IfcCulvertTypeEnum_K;
  LongName         :        OPTIONAL IfcLabel
END_ENTITY;
```

2.3.8 IfcCulvertType_K

Description

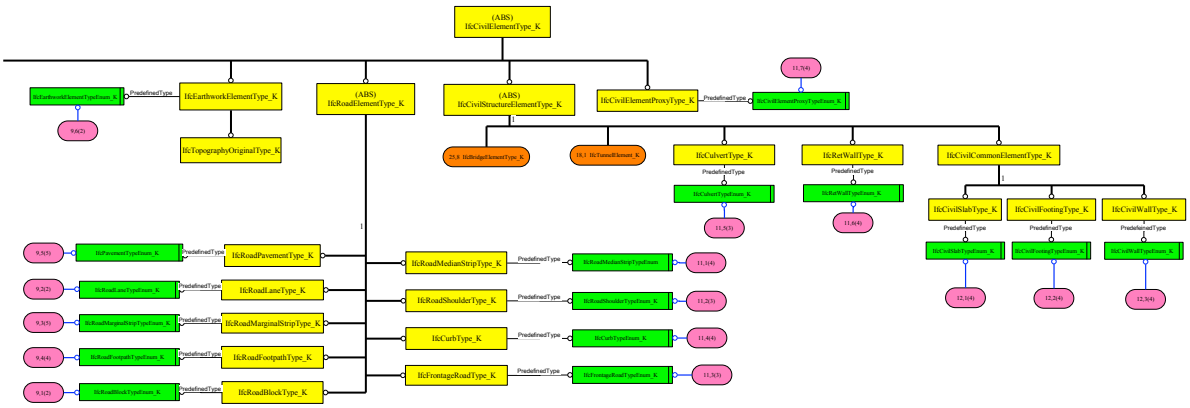
This element type (IfcCulvertType_K), the common facility element of roads and drain facilities, constitutes the list of elements used to determine diverse types, etc. It is used to define the element specifications (the creation of member information and member types) of culvert members.

Subtype elements of culvert structures, without the definition of shapes, are used to connect enumeration-type information. The creation of IfcCulvertType_K is expressed in instances of IfcCulvert_K.

EXPRESS Specification:

```
ENTITY IfcCulvertType_K
  SUBTYPE OF(IfcCivilStructureElementType_K);
    PredefinedType : IfcCulvertTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCulvertType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType           :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCivilStructureElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCulvertType_K
  PredefinedType        :IfcCulvertTypeEnum_K;
  LongName              :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.9 IfcRetWall_K

Description

Retaining walls (IfcRetWall_K) are facilities closely related to road lines and installed close to earthwork sections. They consist of foundations, walls, and wall wings, and share the elements (IfcCivilFooting_K and IfcCivilWall_K) defined in the schema.

IfcCivilStructureElement is defined as abstract and inherits the common properties of its subordinate structural elements. Also, the sets of individual elements of its subordinate structures are grouped into the higher-level IfcCivilStructureElement_K, and are defined as spatial structures.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRetWallType_K

Table — IfcRetWallType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRetWall_K.

PredefinedType	Name
	Pset_RetWallCodeGroup
	Pset_RetWallCommon

Table — IfcRetWall_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

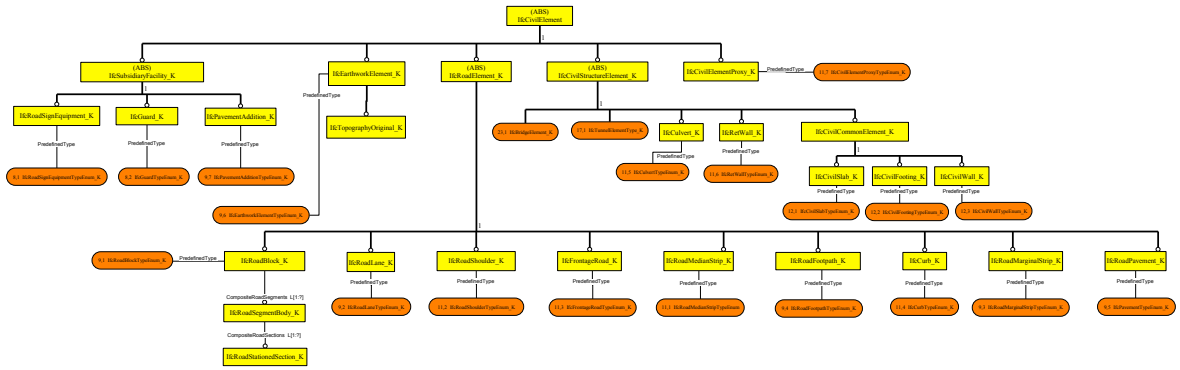
Structure
IfcRoad_K or IfcBridge_K or IfcTunnel_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRetWall_K

EXPRESS Specification:

```
ENTITY IfcRetWall_K
  SUBTYPE OF(IfcCivilStructureElement_K);
    PredefinedType : OPTIONAL IfcRetWallTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRetWall_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcRetWall_K
  PredefinedType   :        IfcRetWallTypeEnum_K;
  LongName         :        OPTIONAL IfcLabel
END_ENTITY;
```

2.3.10 IfcRetWallType_K

Description

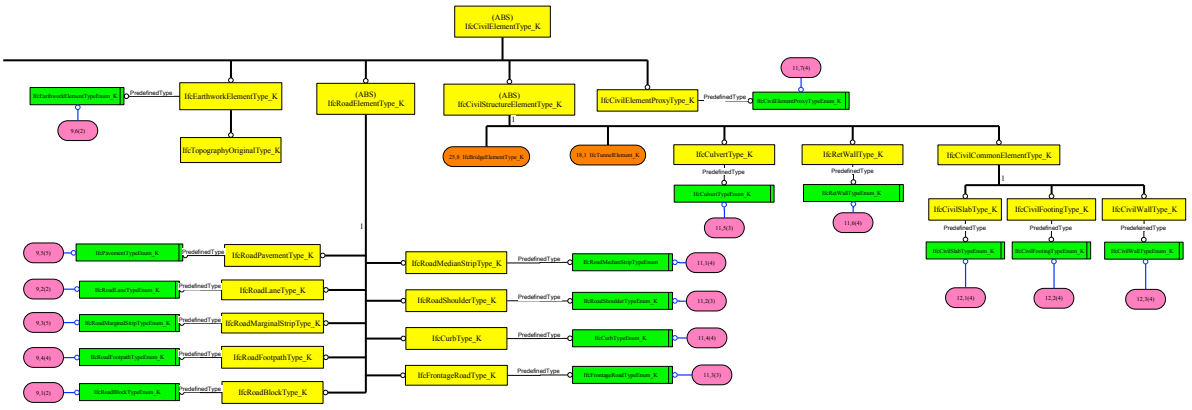
This element type (IfcRetWallType_K) constitutes the list of elements--i.e., the common facility elements of linear shape-linked road structures and drain facilities--used to determine diverse types, etc. It is used to define the element specifications (the creation of member information and member types) of the members of retaining walls.

Subtype elements of retaining wall structures, without the definition of shapes, are used to connect enumeration-type information. The creation of fcRetWallType_K is expressed in instances of IfcRetWallType_K.

EXPRESS Specification:

```
ENTITY IfcRetWallType_K
  SUBTYPE OF(IfcCivilStructureElementType_K);
    PredefinedType : IfcRetWallTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRetWallType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
```

```
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy       :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilStructureElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcRetWallType_K
  PredefinedType     :IfcRetWallTypeEnum_K;
  LongName           :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.11 IfcCivilCommonElement_K

Description

The civil engineering common facility (IfcCivilCommonElement_K) is defined as group elements commonly installed in linear road facilities and structures. It includes its subordinate elements--foundations (IfcCivilFooting_K), slabs (IfcCivilSlab_K), and walls (IfcCivilWall_K)--which are commonly utilized in roads, bridges, and tunnels.

IfcCivilCommonElement_K is defined as abstract, and inherits the common properties of elements of its subordinate structures. Also, individual elements of its subordinate structures are grouped into the higher-level IfcCivilCommonElement_K. New common facility elements, if required, are located at the lower level of IfcCivilCommonElement_K.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcCivilCommonElementType_K

Table — IfcCivilCommonElementType_K Object Typing

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

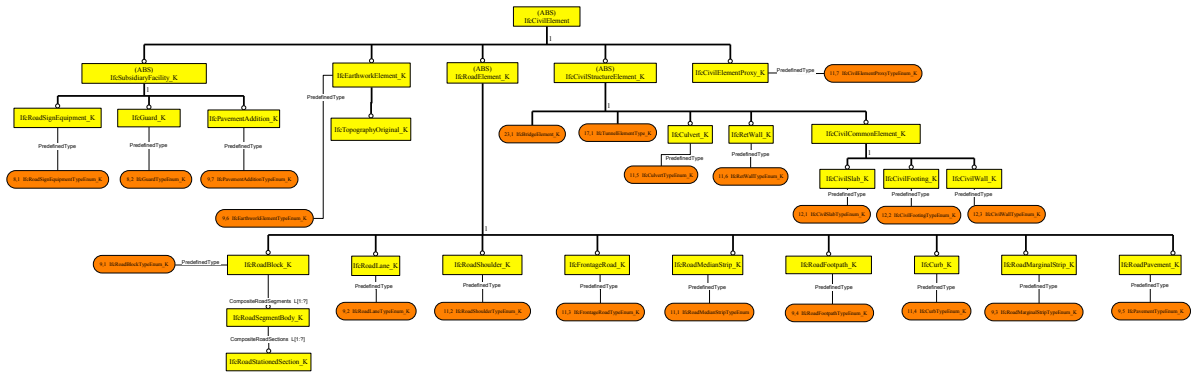
Structure
IfcRoad_K or IfcBridge_K or IfcTunnel_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcCivilCommonElement_K

EXPRESS Specification:

```
ENTITY IfcCivilCommonElement_K
  SUPERTYPE OF (ONEOF(IfcCivilSlab_K, IfcCivilFooting_K, IfcCivilWall_K))
  SUBTYPE OF(IfcCivilStructureElement_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilCommonElement_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
```

```
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcCivilCommonElement_K
END_ENTITY;
```

2.3.12 IfcCivilCommonElementType_K

Description

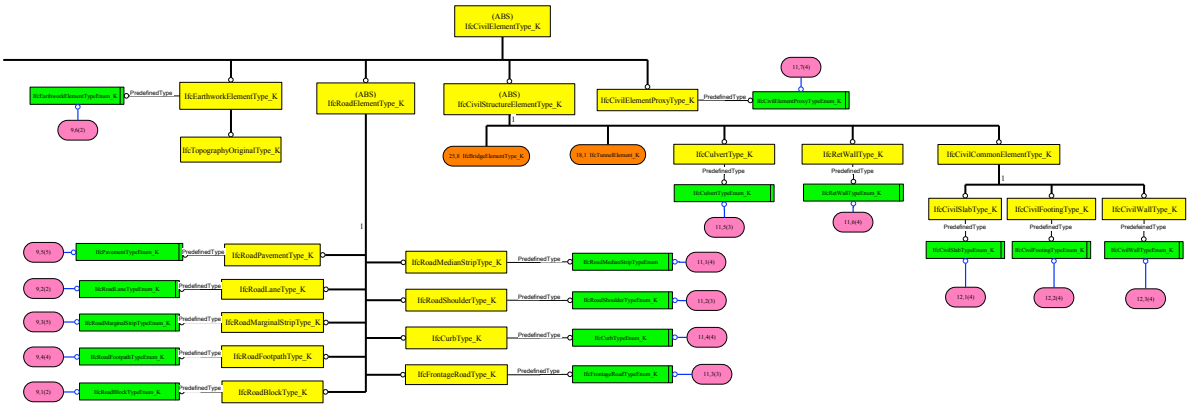
This element type (IfcCivilCommonElementType_K) is a common facility element often used in single structures of linear road structures, bridges, and tunnels. It constitutes the list of elements used to determine diverse types, etc. It is used to define the element specifications (the creation of member information and member types) of common civil engineering members.

Subtype elements of common civil engineering structures, without the definition of shapes, are used to connect enumeration-type information. The creation of IfcCivilCommonElementType_K is expressed in instances of IfcCivilCommonElement_K. This type groups type elements of subordinate common structures and does not define particular types, but can add types to inherit the subordinate common facility element types.

EXPRESS Specification:

```
ENTITY IfcCivilCommonElementType_K
  SUPERTYPE OF (ONEOF(IfcCivilSlabType_K, IfcCivilFootingType_K, IfcCivilWallType_K))
  SUBTYPE OF(IfcCivilStructureElementType_K);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilCommonElementType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilStructureElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilCommonElementType_K
  ElementType       :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.13 IfcCivilSlab_K

Description

Slabs (IfcCivilSlab_K), among the common civil engineering facilities, are defined as group elements commonly installed in linear road facilities, bridges, and tunnels. They express the shapes and characteristics of the foundation slabs of bridges and top floor slabs, the invert slabs of tunnels, and the floor slabs of roads.

The shapes of IfcCivilSlab_K may have single or multiple layers, and different types of materials. Slabs may be installed in concrete layers, and are constructed in linear site locations. Concrete pavements may be defined as the floor slabs of roads.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcCivilSlabType_K

Table — IfcCivilSlabType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcCivilSlab_K.

PredefinedType	Name
	Pset_CivilSlabCodeGroup
	Pset_CivilSlabCommon

Table — IfcCivilSlab_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

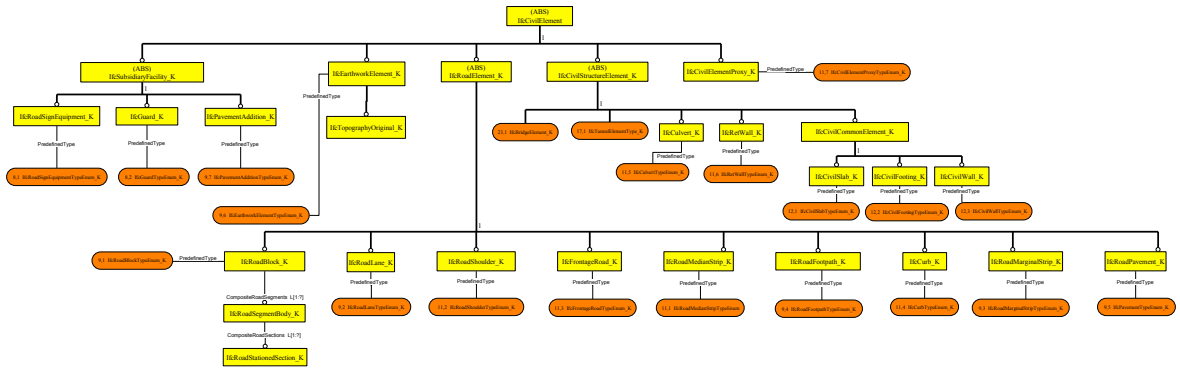
Structure
IfcRoad_K or IfcBridge_K or IfcTunnel_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcCivilSlab_K의 공간적 포함관계

EXPRESS Specification:

```
ENTITY IfcCivilSlab_K
  SUBTYPE OF(IfcCivilCommonElement_K);
    PredefinedType : OPTIONAL IfcCivilSlabTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilSlab_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements  :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
```

```
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcCivilCommonElement_K
 ENTITY IfcCivilSlab_K
  PredefinedType          :  OPTIONAL IfcCivilSlabTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel
END_ENTITY;
```

2.3.14 IfcCivilSlabType_K

Description

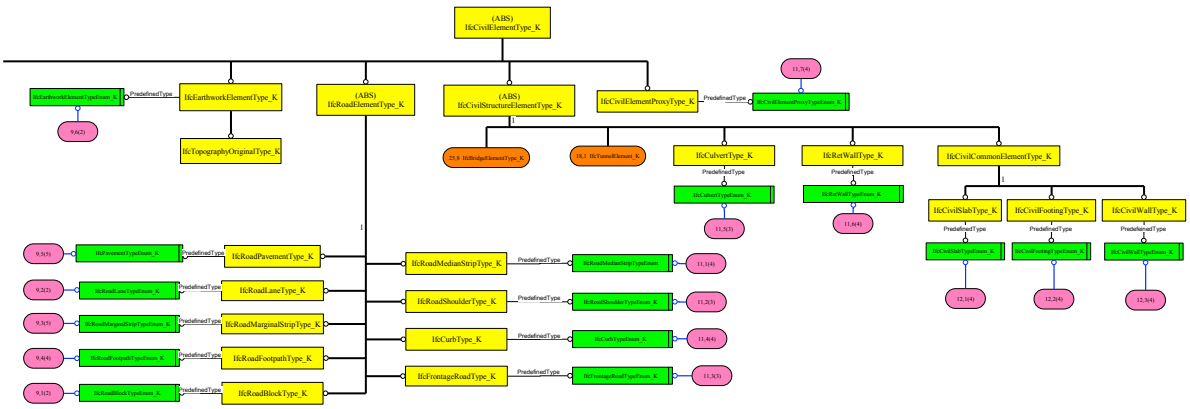
This element type (IfcCivilSlabType_K) is a common facility element often used in single structures of linear road structures, bridges, and tunnels. It constitutes the list of elements used to allocate diverse types, etc. to such elements. It is used to define the element specifications (the creation of member information and member types) of common civil engineering members.

Subtype elements of civil engineering slabs, without the definition of shapes, are used to connect the enumeration-type information. The creation of IfcCivilSlabType_K is expressed in instances of IfcCivilSlab_K.

EXPRESS Specification:

```
ENTITY IfcCivilSlabType_K
  SUBTYPE OF(IfcCivilCommonElementType_K);
    PredefinedType : IfcCivilSlabTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

ENTITY IfcCivilSlabType_K

```
ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType      :OPTIONAL IfcLabel;
ENTITY IfcCivilStructureElementType_K
  ElementType      :OPTIONAL IfcLabel;
ENTITY IfcCivilCommonElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilSlabType_K
  PredefinedType    :IfcCivilSlabTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.15 IfcCivilFooting_K

Description

Footings (IfcCivilFooting_K), among the common civil engineering facilities, are defined as group elements commonly installed in linear road facilities, bridges, and tunnels. It expresses the shapes and characteristics of a bridge's pier and abutment foundations, and of a tunnel's gallery entry foundations.

IfcCivilSlab_K's shapes may have single or multiple layers, and different types of materials. Slabs may be installed in concrete layers, and are constructed according to the site's linear locations. Concrete pavements may be defined as a road's floor slabs.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcCivilFootingType_K

Table — IfcCivilFootingType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to

PredefinedType	Name
	Pset_CivilFootingCodeGroup
	Pset_CivilFootingCommon

Table — IfcCivilFooting_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

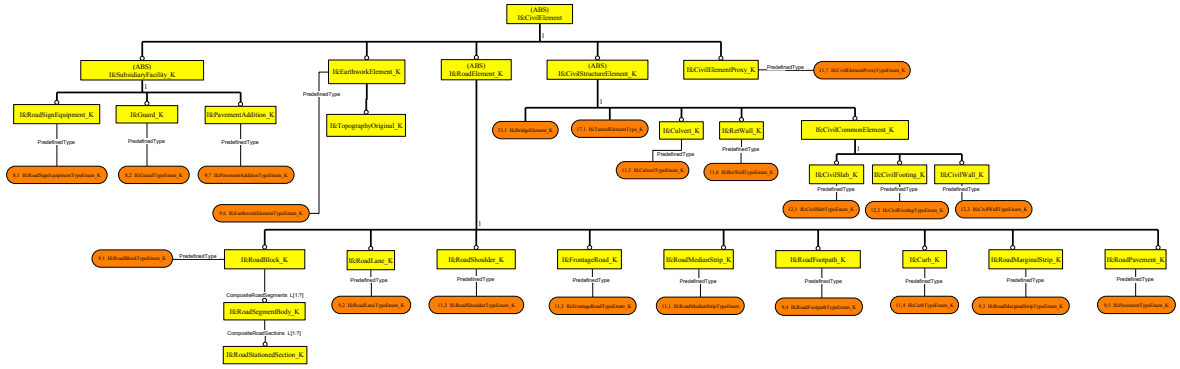
Structure
IfcRoad_K or IfcBridge_K or IfcTunnel_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcCivilFooting_K

EXPRESS Specification:

```
ENTITY IfcCivilFooting_K
  SUBTYPE OF(IfcCivilCommonElement_K);
    PredefinedType : OPTIONAL IfcCivilFootingTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilFootingb_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids               :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo              :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements       :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections           :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings              :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries       :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom            :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure     :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcCivilCommonElement_K
 ENTITY IfcCivilFooting_K
  PredefinedType          :  OPTIONAL IfcCivilFootingTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel
END_ENTITY;
```

2.3.16 IfcCivilFootingType_K

Description

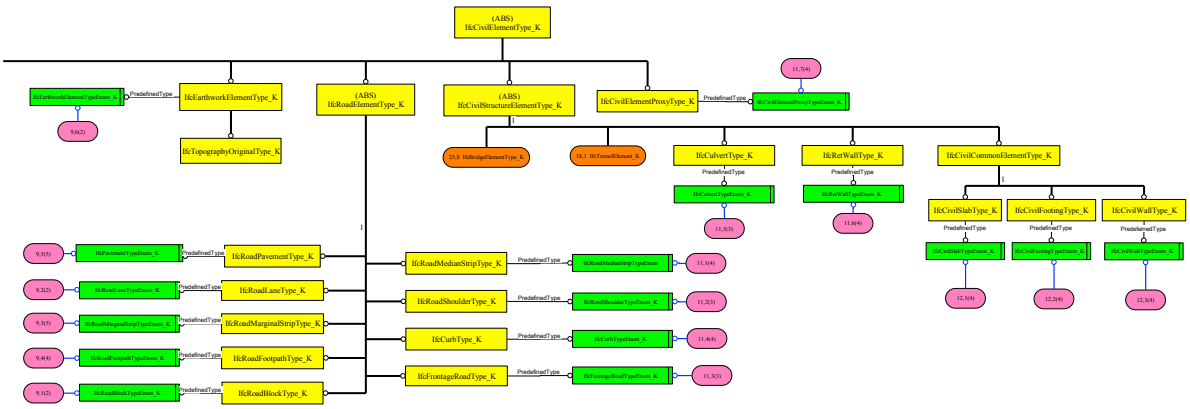
This element type (IfcCivilFootingType_K) is a common facility element often used in single structures of diverse road structures, bridges, and tunnels that need foundations, and constitutes the list of elements used to allocate diverse types etc. accordingly. It is used to define the element specifications (the creation of member information and member types) of common civil engineering members.

Subtype elements of civil engineering footings, without the definition of shapes, are used to connect the enumeration-type information. The creation of IfcCivilFootingType_K is expressed in instances of IfcCivilFooting_K.

EXPRESS Specification:

```
ENTITY IfcCivilFootingType_K
  SUBTYPE OF(IfcCivilCommonElementType_K);
    PredefinedType : IfcCivilFootingTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilFootingType_K
 ENTITY IfcRoot
  GlobalId          :IfcGloballyUniqueId;
  OwnerHistory      :OPTIONAL IfcOwnerHistory;
  Name              :OPTIONAL IfcLabel;
  Description       :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
```

```
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilStructureElementType_K
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilCommonElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCiviFootingType_K
  PredefinedType       :IfcCivilFootingTypeEnum_K;
  LongName             :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.17 IfcCivilWall_K

Description

Walls (IfcCivilFooting_K), among the common civil engineering facilities, are defined to group elements commonly installed in a road's single-structure walls, bridges, and tunnels. They express the shapes and characteristics of the bridge's abutment wing walls and parapet walls, and the tunnel's gallery entry wing walls.

IfcCivilWall_K's shapes may have single-wall shapes or may be installed along linear shapes through onsite placement. They may also have single or multiple layers and different types of materials. Walls may be installed in concrete layers.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcCivilWallType_K

Table — IfcCivilWallType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to

IfcCivilWall_K.

PredefinedType	Name

	Pset_CivilWallCodeGroup
	Pset_CivilWallCommon

Table — IfcCivilWall_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

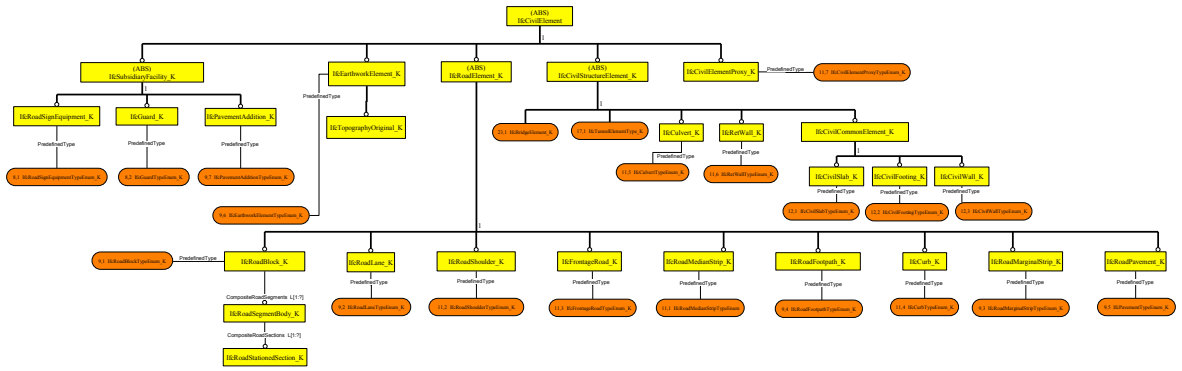
Structure
IfcRoad_K or IfcBridge_K or IfcTunnel_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcCivilWall_K

EXPRESS Specification:

```
ENTITY IfcCivilWall_K
  SUBTYPE OF(IfcCivilCommonElement_K);
    PredefinedType : OPTIONAL IfcCivilWallTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilWall_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
```

```
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcCivilCommonElement_K
 ENTITY IfcCivilWall_K
  PredefinedType          :  OPTIONAL IfcCivilWallTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel
END_ENTITY;
```

2.3.18 IfcCivilWallType_K

Description

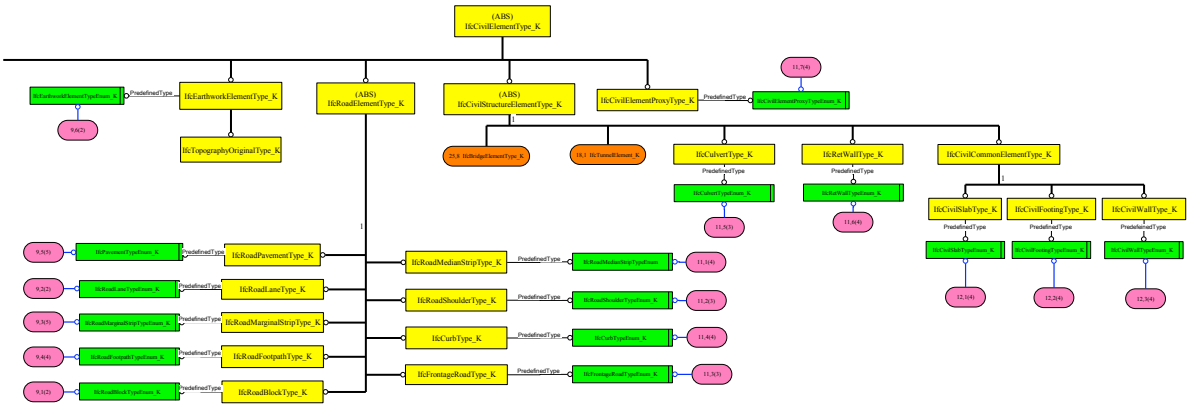
This element type (IfcCivilWallType_K) is a common facility element often used in single structures of diverse road structures, bridges, and tunnels that need walls, and constitutes the list of elements used to allocate diverse types etc. accordingly. It is used to define the element specifications (the creation of member information and member types) of common civil engineering members.

Subtype elements of walls, without the definition of shapes, are used to connect the enumeration-type information. The creation of IfcCivilWallType_K is expressed in instances of IfcCivilWall_K.

EXPRESS Specification:

```
ENTITY IfcCivilWallType_K
  SUBTYPE OF(IfcCivilCommonElementType_K);
    PredefeinedType : IfcCivilWallTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCivilWallType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilStructureElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilCommonElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilWallType_K
  PredefinedType    :IfcCivilWallTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.19 IfcRoadBlock_K

Description

A road's unit section (IfcRoadBlock_K) is used to express the shapes of the block, a section unit--which is divided within the road's line--and to express the properties thereof. The road's section shape includes all road facilities in the road's standard cross-section, and the diverse object facilities (road signs, supplementary facilities, etc.) installed in the relevant unit section.

IfcRoadBlock_K may include the road's multiple segments, which refer to the road unit sections, i.e., 20 m, 50 m, and 100 m. The relevant unit section groups are all subordinate road facility elements that constitute the road facility (IfcRoadElement_K).

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoaBlockType_K

Table — IfcRoadBlockType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadBlock_K.

PredefinedType	Name
	Pset_RoadBlockCodeGroup
	Pset_RoadAlignmentDesignCommon
	Pset_RoadBlockDesignParameters

Table — IfcRoadBlock_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

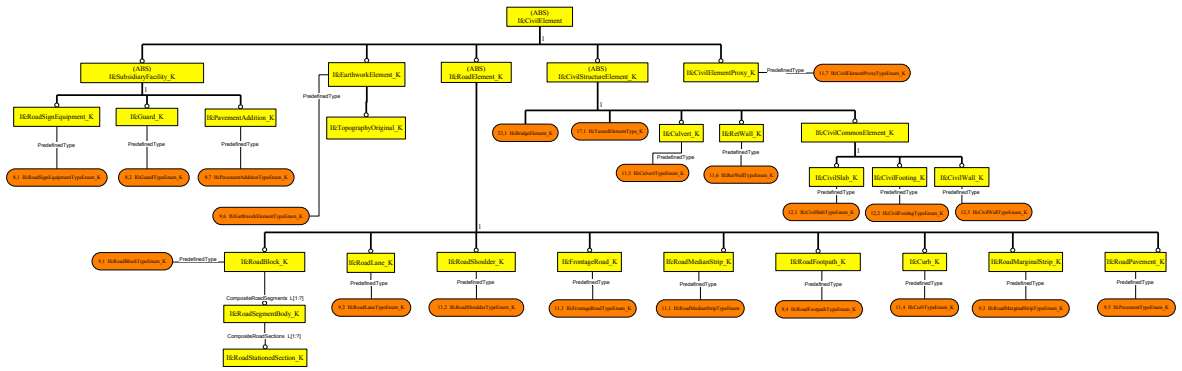
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadBlock_K

EXPRESS Specification:

```
ENTITY IfcRoadBlock_K
  SUBTYPE OF(IfcRoadElement_K);
    CompositeRoadSegments : OPTIONAL LIST [1:?] OF IfcRoadSegmentBody_K;
    PredefinedType        : OPTIONAL IfcRoadBlockTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadBlock_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
```

```
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadBlock_K
  CompositeRoadSegments    : OPTIONAL LIST [1:?] OF IfcRoadSegmentBody_K;
  PredefinedType          :  OPTIONAL IfcRoadBlockTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel
END_ENTITY;
```

2.3.20 IfcRoadBlockType_K

Description

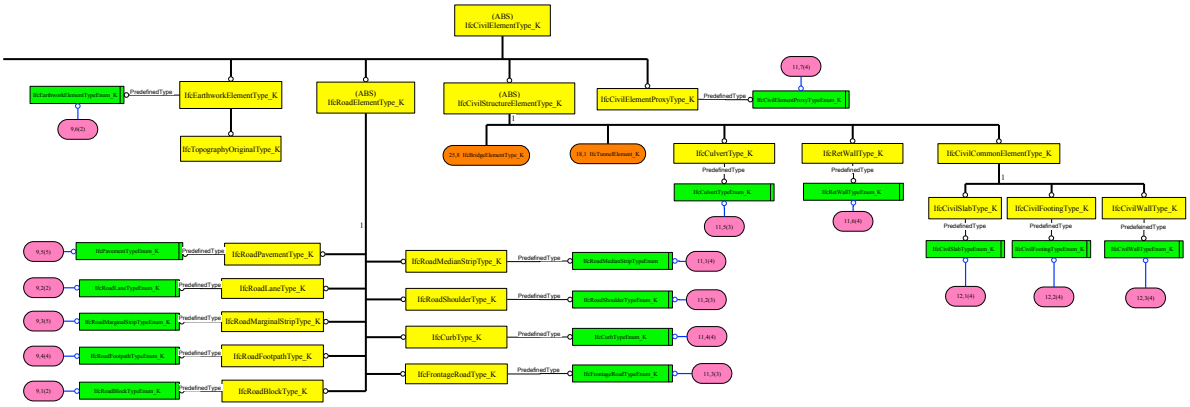
This element type (IfcCivilBlockType_K) defines the linear road unit and segment type, and constitutes the list of elements used to allocate diverse types etc. accordingly. It is used to define the element specifications (the creation of member information and member types) of road section shapes.

Subtype elements of IfcRoadBlockType_K, without the definition of shapes, are used to connect the enumeration-type information on the road's particular section type. The creation of IfcRoadBlockType_K is expressed in instances of IfcRoadBlock_K.

EXPRESS Specification:

```
ENTITY IfcRoadBlockType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcRoadBlockTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadBlockType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcRoadElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcRoadBlockType_K
  PredefinedType    :IfcRoadBlockTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.21 IfcRoadSegmentBody_K

Description

The road's detailed segment (IfcRoadSegmentBody_K) is used to express the shapes of the segment, the station section unit--which is divided within the unit section (IfcRoadBlock_K)--and to define the properties thereof. The road's segment shape includes all the road facilities in the road's standard cross-section, and the diverse object facilities (road signs, supplementary facilities, etc.) installed in the relevant segment.

IfcRoadSegmentBody_K may include the road's multiple stationed sections, which refer to the road unit sections, i.e., 20 m, 50 m, and 100 m. The relevant segment groups are all subordinate road facility elements that constitute the road facility (IfcRoadSegmentBody_K).

Common Use Definitions

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadSegmentBody_K

PredefinedType	Name
	Pset_RoadSegmentCodeGroup
	Pset_RoadSegmentCommon

Table — IfcRoadSegment_K Property Sets for Objects

Spatial Containment

Object types, applied in this entity, are expressed in the following entity type.

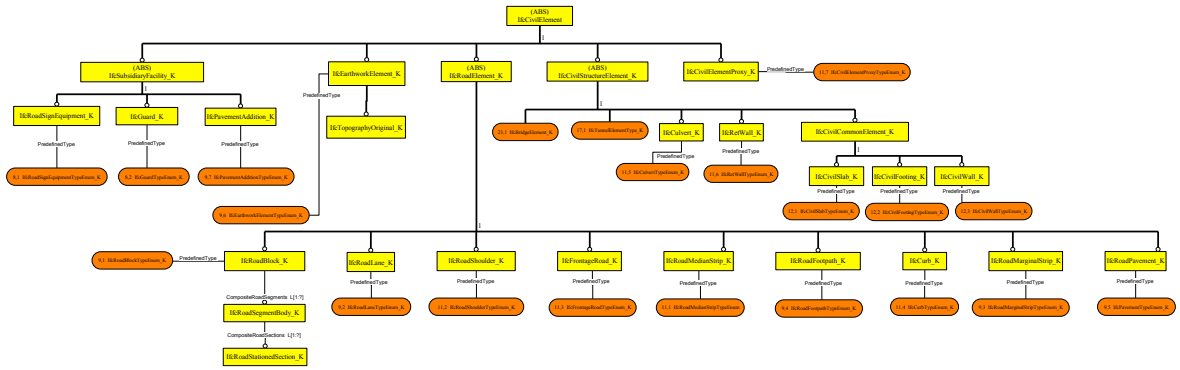
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadSegment_K

EXPRESS Specification:

```
ENTITY IfcRoadSegmentBody_K;
    CompositeRoadSections : OPTIONAL LIST [1:?] OF IfcRoadStationedSection_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadSegmentBody_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements  :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures  :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadBlock_K
  CompositeRoadSegments    : OPTIONAL LIST [1:?] OF IfcRoadSegmentBody_K;
  PredefinedType           :  OPTIONAL IfcRoadBlockTypeEnum_K;
  LongName                 :  OPTIONAL IfcLabel;
 ENTITY IfcRoadSegmentBody_K
  CompositeRoadSections    : OPTIONAL LIST [1:?] OF IfcRoadStationedSection_K;
  LongName                 :  OPTIONAL IfcLabel
```

```
END_ENTITY;
```

2.3.22 IfcRoadStationedSection_K

Description

The road's segment body (IfcRoadSegmentBody_K) is used to express the shapes of the segment defined through the classification of the station section unit--which is divided within the unit section (IfcRoadBlock_K)--and to define the properties thereof. The road's segment shapes include all road facilities in the road's two-dimensional standard segment.

Common Use Definitions

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadStationedSection_K.

PredefinedType	Name
	Pset_RoadStationedSectionCommon

Table — IfcRoadStationedSection_K Property Sets for Objects

Spatial Containment

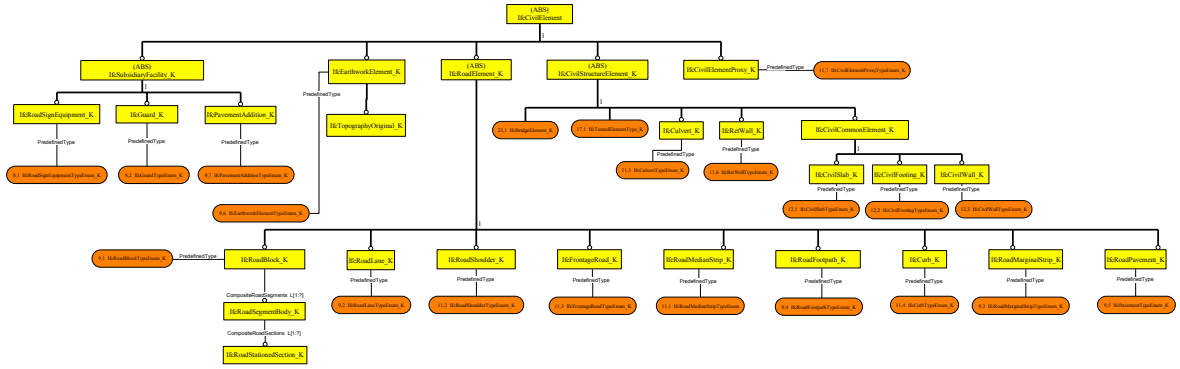
This entity's spatial containment concept applies to such entity, as shown in the following table.

Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadStationedSection_K

EXPRESS Specification:

ENTITY IfcRoadStationedSection_K;
END_ENTITY;
EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadSegmentBody_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements  :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures  :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadBlock_K
  CompositeRoadSegments    : OPTIONAL LIST [1:?] OF IfcRoadSegmentBody_K;
  PredefinedType           :  OPTIONAL IfcRoadBlockTypeEnum_K;
  LongName                 :  OPTIONAL IfcLabel;
 ENTITY IfcRoadSegmentBody_K
  CompositeRoadSections    : OPTIONAL LIST [1:?] OF IfcRoadStationedSection_K;
  LongName                 :  OPTIONAL IfcLabel
 ENTITY IfcRoadStationedSection_K
  LongName                 :  OPTIONAL IfcLabel
```

```
END_ENTITY;
```

2.3.23 IfcRoadLane_K

Description

The road lane (IfcRoadLane_K) is installed to ensure a travelling car's safety and used to express the shapes on roadway pavements of roads, bridges, and tunnels as well as to define the properties thereof. The road lane is indicated in the band shape according to its color and line shape, and is expressed to have a thickness enough to show a shape. It may be used as the common element of roads and bridges, like slabs, footings, and walls.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadLaneType_K

Table — IfcRoadLaneType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadLane_K

PredefinedType	Name
	Pset_RoadLaneCodeGroup
	Pset_RoadLaneCommon

Table — IfcRoadLane_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

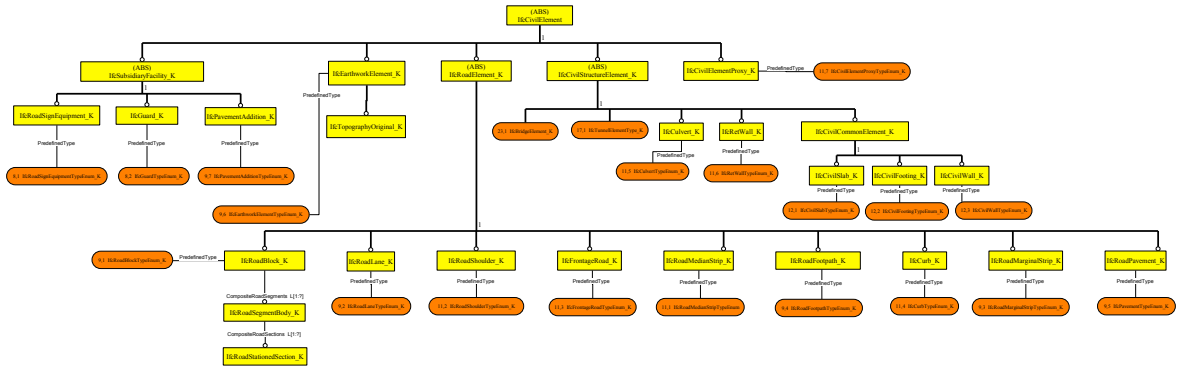
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadLane_K

EXPRESS Specification:

```
ENTITY IfcRoadLane_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcRoadLaneTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadLane_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids               :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo              :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections           :SET OF IfcRelProjectsElement FOR RelatingElement;
```

```
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadLane_K
  PredefinedType          :  OPTIONAL IfcRoadLaneTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.24 IfcRoadLaneType_K

Description

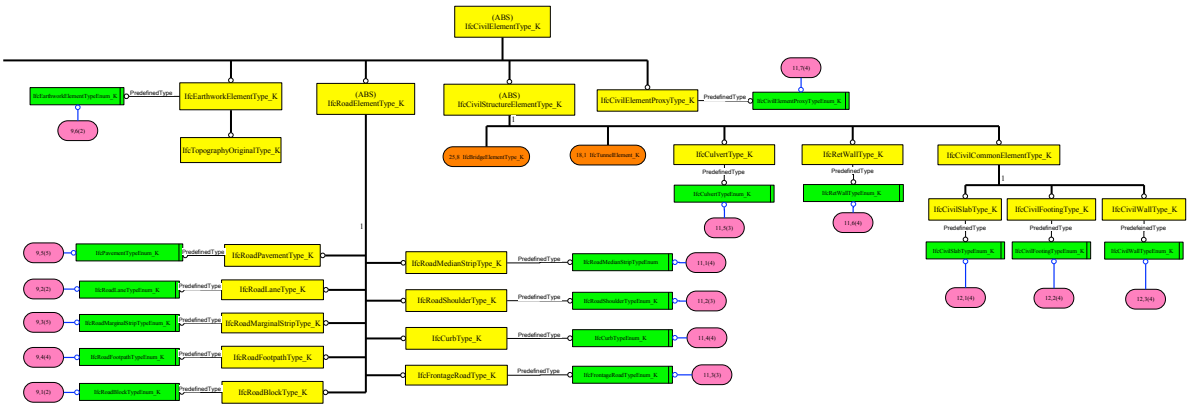
The lane type (IfcLaneType_K) constitutes the list of elements used to allot diverse types of lanes etc. that indicate the road surface. It is used to define the element specifications (the creation of member information and member types) of road lanes.

Subtype elements of IfcRoadLaneType_K, without the definition of shapes, are used to connect the enumeration-type information on the road lane type. The creation of IfcRoadLaneType_K is expressed in instances of IfcRoadLane_K.

EXPRESS Specification:

```
ENTITY IfcRoadLaneType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcRoadLaneTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadLaneType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
```

```
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType         :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcRoadElementType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcRoadLaneType_K
  PredefinedType      :IfcRoadLaneTypeEnum_K;
  LongName            :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.25 IfcRoadShoulder_K

Description

The road shoulder element type is a kind of idle section connected to the roadway, has an onsite-placed concrete shape, and is used to express the shape of the relevant object and to define the properties thereof. Road shoulders are installed mainly on both side ends of the road, and their standard shape is undefined. Also, a shoulder forms a linear section, and thus, is considered an onsite-placement object. It is also defined as a subordinate element of IfcRoadElement_.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadShoulderType_K

Table — IfcRoadShoulderType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadShoulder_K.

PredefinedType	Name
	Pset_RoadShoulderCodeGroup
	Pset_RoadShoulderCommon

Table — IfcRoadShoulder_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

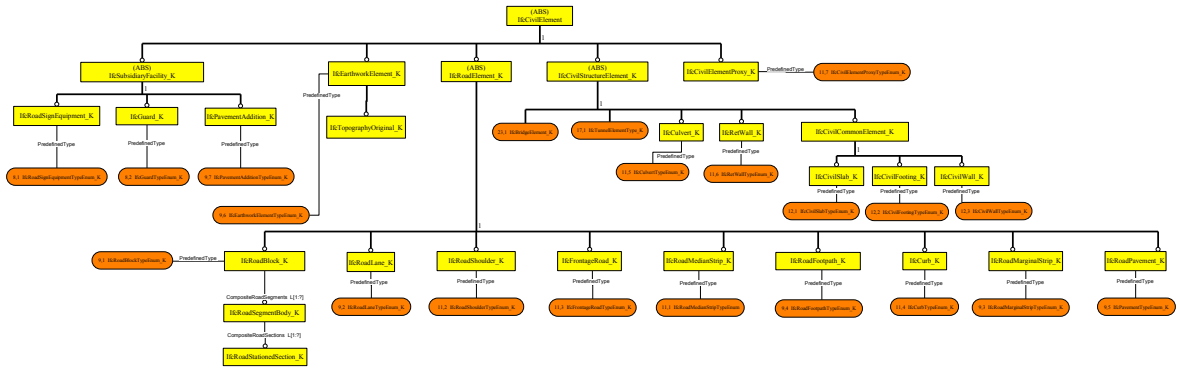
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadShoulder_K

EXPRESS Specification:

```
ENTITY IfcRoadShoulder_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcRoadShoulderTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadShoulder_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements  :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures  :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadShoulder_K
  PredefinedType           :  OPTIONAL IfcRoadShoulderTypeEnum_K;
  LongName                 :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.26 IfcRoadShoulderType_K

Description

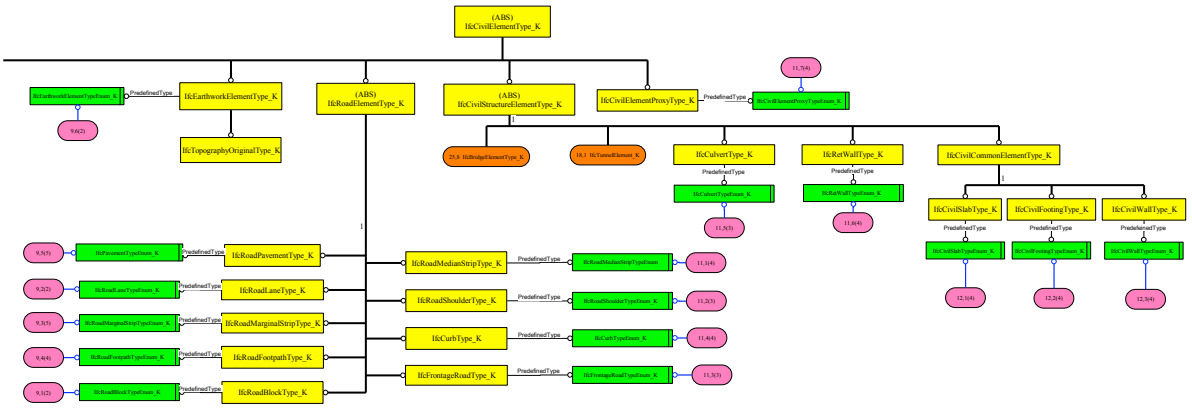
This element type (IfcRoadShoulderType_K) constitutes the list of elements used to allot the diverse types of road shoulders etc. It is used to define the element specifications (the creation of member information and member types) of shoulder members.

Subtype elements of IfcRoadShoulderType_K, without the definition of shapes, are used to connect the enumeration-type information on the road shoulder type. The creation of IfcRoadShoulderType_K is expressed in instances of IfcRoadShoulder_K.

EXPRESS Specification:

```
ENTITY IfcRoadShoulderType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcRoadShoulderTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadShoulderType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
```

```
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy       :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcRoadElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcRoadShoulderType_K
  PredefinedType     :IfcRoadShoulderTypeEnum_K;
  LongName           :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.27 IfcFrontageRoad_K

Description

A frontage road is a kind of road installed when the access from the road to its surroundings is restrained, and is used to express the shape of the relevant object and to define the properties thereof. The segment of a frontage road is similar to that of a general road, and its shape is defined to enable connection to the main road, as well as to be designed considering the linear shape (plane or longitudinal). It is also defined as a subordinate element of IfcRoadElement_K.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcFrontageRoadType_K

Table — IfcFrontageRoadType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcFrontageRoad_K

PredefinedType	Name
	Pset_FrontageRoadCodeGroup

	Pset_FrontageRoadCommon

Table — IfcFrontageRoad_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

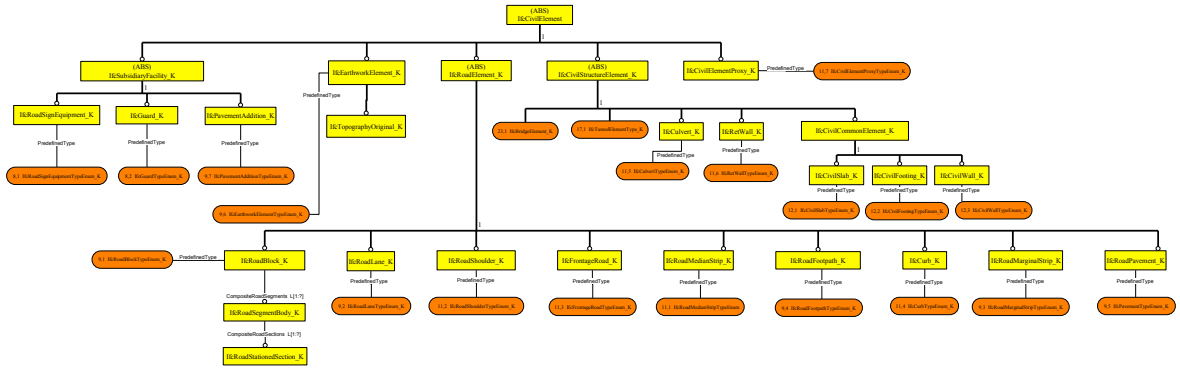
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcFrontage_K

EXPRESS Specification:

```
ENTITY IfcFrontageRoad_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcFrontageRoadTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcFrontageRoad_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
```

```
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcFrontageRoad_K
  PredefinedType          :  OPTIONAL IfcFrontageRoadTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.28 IfcFrontageRoadType_K

Description

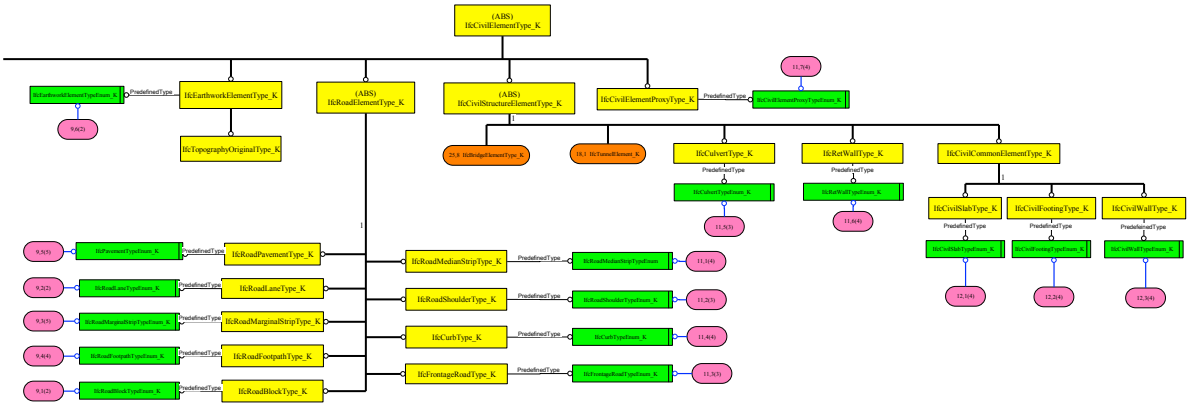
This element type (IfcFrontageRoadType_K) constitutes the list of elements used to allot the diverse types of frontage roads etc. It is used to define the element specifications (the creation of member information and member types) of a frontage road.

Subtype elements of IfcFrontageRoadType_K, without the definition of shapes, are used to connect the enumeration-type information on the frontage road type. The creation of IfcFrontageRoadType_K is expressed in instances of IfcFrontageRoad_K.

EXPRESS Specification:

```
ENTITY IfcFrontageRoadType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcFrontageRoadTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcFrontageRoadType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcRoadElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcFrontageRoadType_K
  PredefinedType    :IfcFrontageRoadTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.29 IfcRoadMedianStrip_K

Description

A road median strip (IfcRoadMedianStrip_K) expresses the center line of the road or is installed to spatially separate the road and bridge passage direction. It is used to express the median strip object shape and to define the properties thereof. According to its installation type, the median strip is defined as a single object if factory-manufactured, or is installed along a linear shape through field placement. It is defined as a subordinate element of IfcRoadElement_, and bridges or tunnels may refer to the relevant median strips according to their installation type.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadMedianStripType_K

Table — IfcRoadMedianStripType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadMedianStrip_K.

PredefinedType	Name
	Pset_RoadMedianStripCodeGroup
	Pset_RoadMedianStripManagement
	Pset_RoadMedianStripDesignCommon

Table — IfcRoadMedianStrip_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K

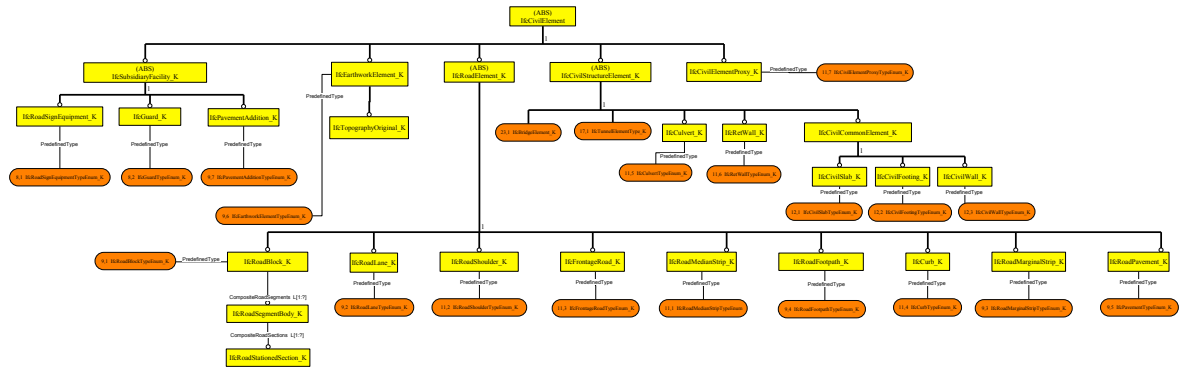
IfcSite

Table — Spatial Containment of IfcRoadMedianStrip_K

EXPRESS Specification:

```
ENTITY IfcRoadMedianStrip_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcRoadMedianStripTypeEnum;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadMedianStrip_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
```

```
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadMedianStrip_K
  PredefinedType          :  OPTIONAL IfcRoadMedianStripTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.30 IfcRoadMedianStripType_K

Description

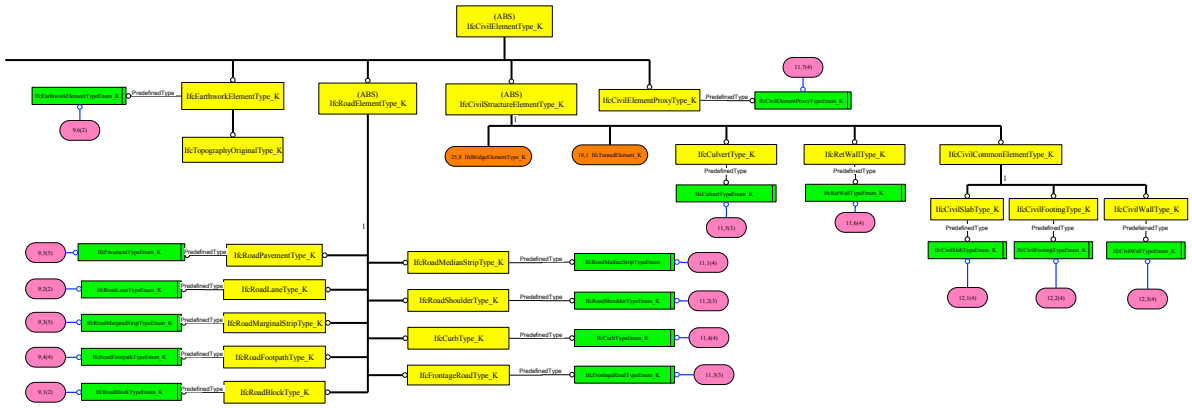
This element type (IfcRoadMedianStripType_K) constitutes the list of elements used to allot the diverse types of median strip shapes etc. It is used to define the element specifications (the creation of member information and member types) of the road median strip.

The subtype elements of IfcRoadMedianStripType_K, without the definition of shapes, are used to connect the enumeration-type information on the road median strip type. The creation of IfcRoadMedianStripType_K is expressed in instances of IfcRoadMedianStrip_K. To create member types, this type is used to express the particular member information and to define the specifications of the median strip type.

EXPRESS Specification:

```
ENTITY IfcRoadMedianStripType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcRoadMedianStripTypeEnum;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadMedianStripType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType           :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcRoadElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcRoadMedianStripType_K
  PredefinedType        :IfcRoadMedianStripTypeEnum_K;
  LongName              :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.31 IfcRoadFootpath_K

Description

A road's footpath (IfcRoadFootpath_K) is installed to separate a car's travelling area from the roadway, and to ensure safe pedestrian passage. It is used to express the shapes of such object and to define the properties thereof. Basically, it inherits the upper-level shared properties of IfcRoadElement_K. Roads are installed along linear shapes, and the relevant subordinate member elements are referred to as IfcElementComponent_K.

The road's footpath is defined as a subordinate element of IfcRoadElement, and bridges or tunnels may refer to the relevant footpaths according to their installation type.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadFootpathType_K

Table — IfcRoadFootpathType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadFootpaht_K.

PredefinedType	Name
	Pset_RoadFootpathCodeGroup
	Pset_RoadFootpathCommon

Table — IfcRoadFootpath_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

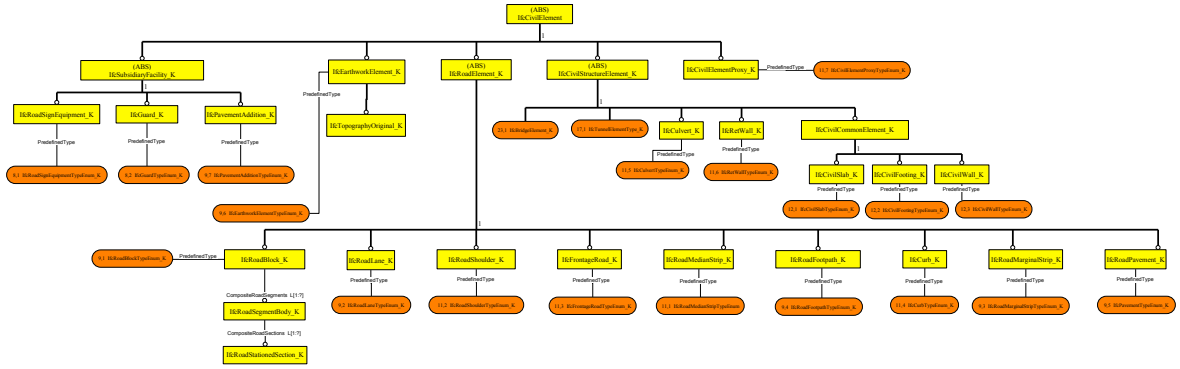
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadFootpath_K

EXPRESS Specification:

```
ENTITY IfcRoadFootpath_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcRoadFootpathTypeEnum;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadFootpath_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids               :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo              :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements       :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections           :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings              :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries       :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom            :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure     :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadFootpath_K
  PredefinedType           :  OPTIONAL IfcRoadFootpathTypeEnum_K;
  LongName                 :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.32 IfcRoadFootpathType_K

Description

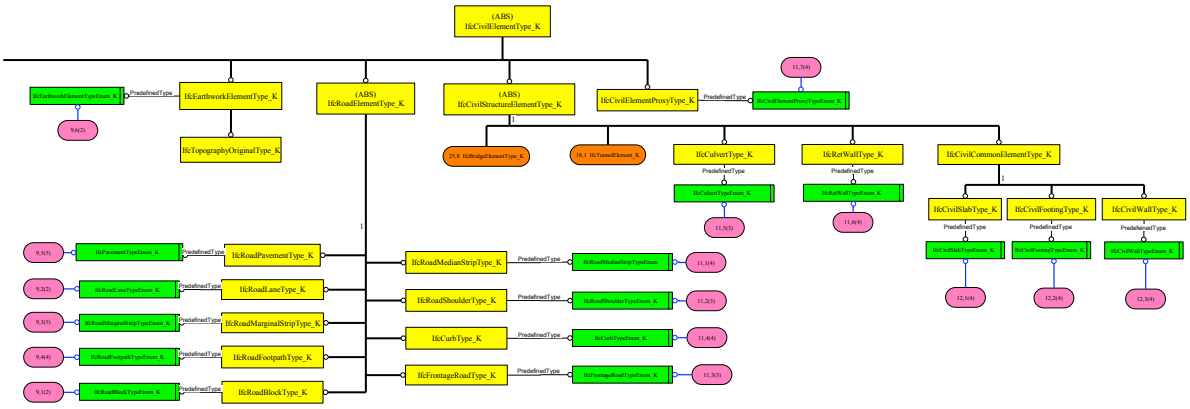
This element type (IfcRoadFootpathType_K) constitutes the list of elements used to allot the diverse types of footpath shapes of road facilities etc. It is used to define the element specifications (the creation of member information and member types) of the footpath section.

The subtype elements of IfcRoadFootpathType_K, without the definition of shapes, are used to connect the enumeration-type information on the road's footpath type. The creation of IfcRoadFootpathType_K is expressed in instances of IfcRoadFootpathStrip_K. To create member types, this type is used to express the particular member information and to define the specifications of the road's footpath type.

EXPRESS Specification:

```
ENTITY IfcRoadFootpathType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcRoadFootpathTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadFootpathType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
```

```
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType         :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcRoadElementType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcRoadFootpathType_K
  PredefinedType      :IfcRoadFootpathTypeEnum_K;
  LongName            :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.33 IfcCurb_K

Description

A road's curb (IfcCurb_K) is defined as a type of separator of a road from a footpath, or a type of median strip. It is used to express an object with a single-unit shape after it is placed along the road's linear shape at the site, or a shape with an individual object installed in the site after its manufacture, and to define the properties thereof. It is also defined as a subordinate element of IfcRoadElement_. The curb's cross-sectional shape has a standard shape, is configured in the library type, and is used as a design model. Likewise, the relevant library shape allots IfcCurb_K.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcCurbType_K

Table — IfcCurbType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcCurb_K

PredefinedType	Name

	Pset_RoadCurbCodeGroup
	Pset_RoadCurbCommon

Table — IfcRoadCurb_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

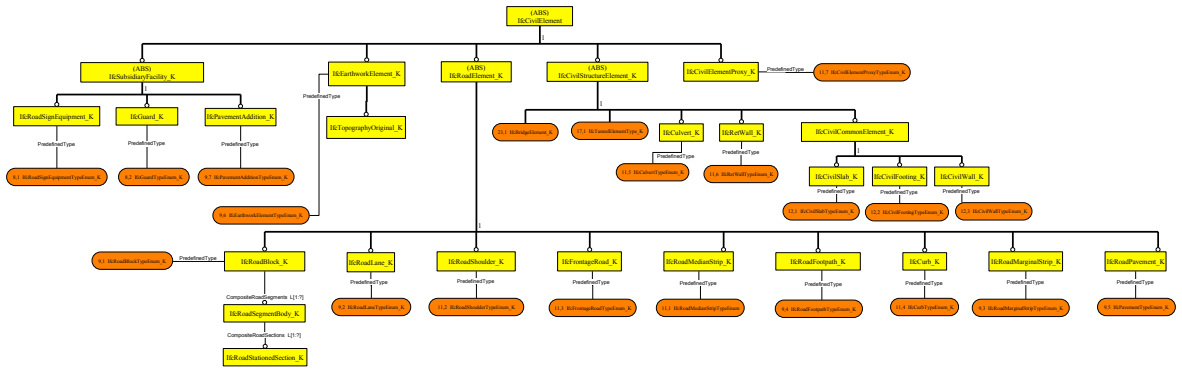
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcCurb_K

EXPRESS Specification:

```
ENTITY IfcCurb_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcCurbTypeEnum;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCurb_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
```

```
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcCurb_K
  PredefinedType           :  OPTIONAL IfcCurbTypeEnum_K;
  LongName                 :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.34 IfcCurbType_K

Description

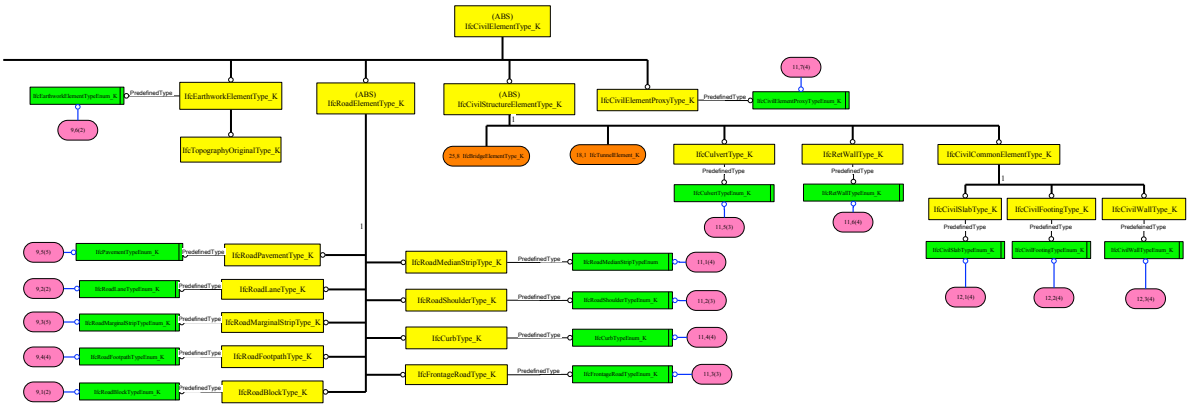
This element type (IfcCurbType_K) constitutes the list of elements used to allot the diverse types of curb shapes of road facilities etc. It is used to define the element specifications (the creation of member information and member types) of the curb.

Subtype elements of IfcCurbType_K, without the definition of shapes, are used to connect the enumeration-type information on the road curb type. The creation of IfcCurbType_K is expressed in instances of IfcCurb_K. To create member types, this type is used to express the particular member information and to define the specifications of the road's curb type.

EXPRESS Specification:

```
ENTITY IfcCurbType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcCurbTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcCurbType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcRoadElementType_K
  ElementType       :OPTIONAL IfcLabel;
 ENTITY IfcCurbType_K
  PredefinedType    :IfcCurbTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.35 IfcRoadMarginalStrip_K

Description

A road's marginal strip (IfcRoadMarginalStrip_K) is installed on both sides of the median strip, and on both ends of the road, and is used mainly to express shapes included in the shoulder section and to define the properties thereof. It does not have a separate individual shape, but is defined according to its connection or non-connection with other adjacent facilities in the relevant section, and to the road shoulder section as an idle area. The road shoulder area includes the shoulder body section and the marginal strip area, and the media strip includes the median strip structure and both ends of the marginal strip sections. It is also defined as a subordinate element of IfcRoadElement_K.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadMarginalStripType_K

Table — IfcRoadMarginalStripType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadMarginalStrip_K.

PredefinedType	Name
	Pset_RoadMarginalStripCodeGroup
	Pset_RoadMarginalStripCommon

Table — IfcRoadMarginalStrip_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

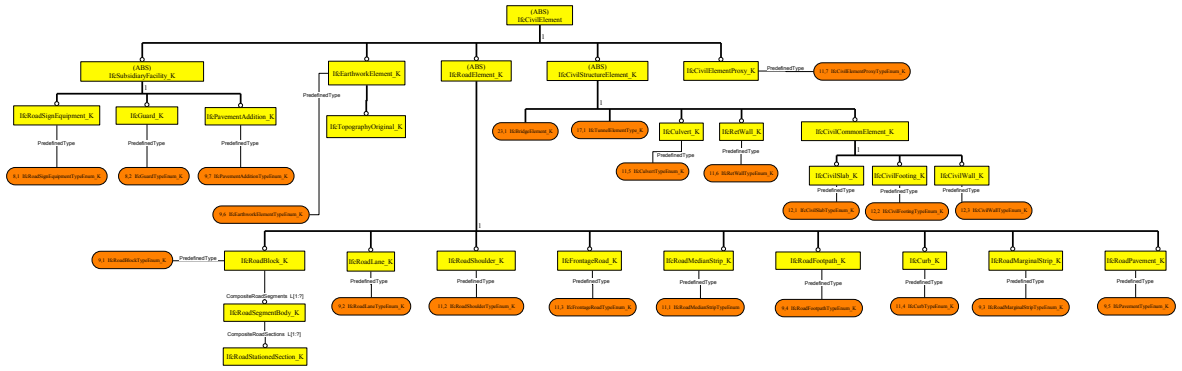
Structure
IfcRoad_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadMarginalStrip_K

EXPRESS Specification:

```
ENTITY IfcRoadMarginalStrip_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcRoadMarginalStripTypeEnum;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadMarginalStrip_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements  :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures  :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
```

```
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadMarginalStrip_K
  PredefinedType          :  OPTIONAL IfcRoadMarginalStripTypeEnum_K;
  LongName                :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.36 IfcRoadMarginalStripType_K

Description

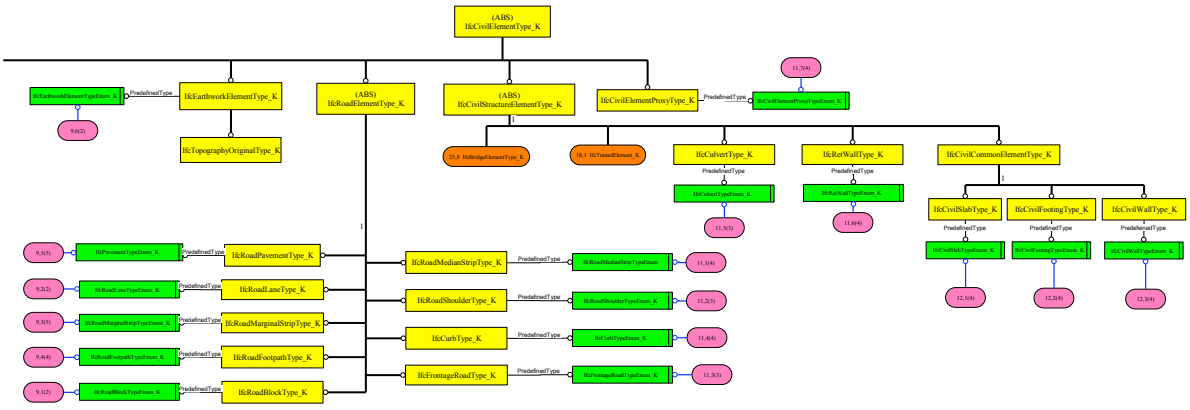
This element type (IfcRoadMarginalStripType_K) constitutes the list of elements used to allot the diverse types of shapes of marginal strips, which are idle areas between road facilities etc. It is used to define the element specifications (the creation of member information and member types) of the marginal strip.

The subtype elements of IfcRoadMarginalStripType_K, without the definition of shapes, are used to connect the enumeration-type information on the road marginal strip type. The creation of IfcRoadMarginalStripType_K is expressed in instances of IfcRoadMarginalStrip_K. To create member types, this type is used to express the particular member information and to define the specifications of the road's marginal strip type.

EXPRESS Specification:

```
ENTITY IfcRoadMarginalStripType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcRoadMarginalStripTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadMarginalStripType_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
```

```
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcRoadElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcRoadMarginalStripType_K
  PredefinedType    :IfcRoadMarginalStripTypeEnum_K;
  LongName          :OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.37 IfcRoadPavement_K

Description

A road pavement (IfcRoadPavement_K), as the upper slab type of road, bridge, or tunnel, is used to express a shape with different material characteristics and multiple layers, and to define the properties thereof. Road payment layers are classified into four layers, and the name of each layer is listed as an enumeration type. The pavement section is linked mainly to the earth cut section in earthwork, and refers to the upper section, except for the road surface and body. The materials of each payment layer refer to the existing material types, or add the list of new raw-material characteristics for road facilities, such as asphalt, to the existing material type (IfcConstructionMaterialResourceType) as a new material type.

Pavements, subordinate elements of IfcRoadElement_K, IfcBridgeElement_K, and IfcTunnelElement_K, are commonly referred to according to their installation targets.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type

IfcRoadPavementType_K

Table — IfcRoadPavementType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcRoadPavement_K.

PredefinedType	Name
	Pset_RoadPavementCodeGroup
	Pset_RoadPavementCommon

Table — IfcRoadPavement_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

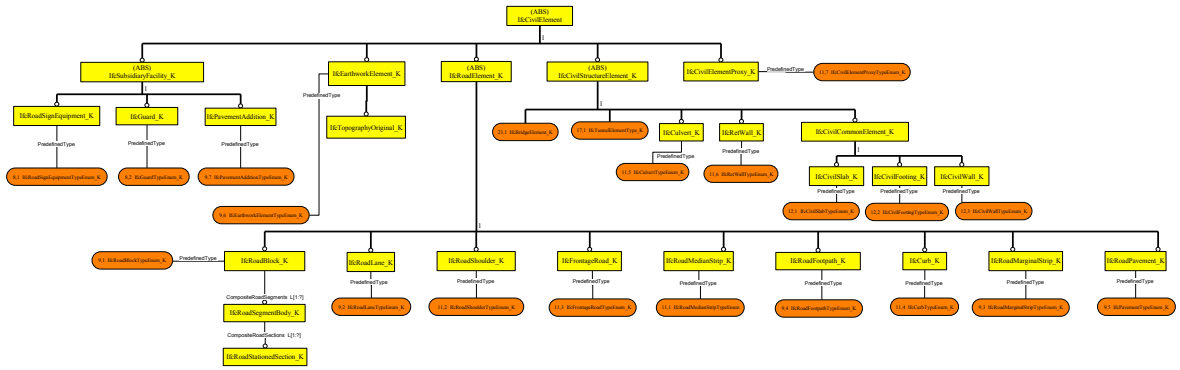
Structure
IfcRoad_K or IfcBridge_K or IfcTunnel_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcRoadPavement_K

EXPRESS Specification:

```
ENTITY IfcRoadPavement_K
  SUBTYPE OF(IfcRoadElement_K);
    PredefinedType : OPTIONAL IfcRoadPavementTypeEnum;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadPavement_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements  :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures  :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcRoadElement_K
 ENTITY IfcRoadPavement _K
  PredefinedType           :  OPTIONAL IfcRoadPavementTypeEnum_K;
  LongName                 :  OPTIONAL IfcLabel;
END_ENTITY;
```

2.3.38 IfcRoadPavementType_K

Description

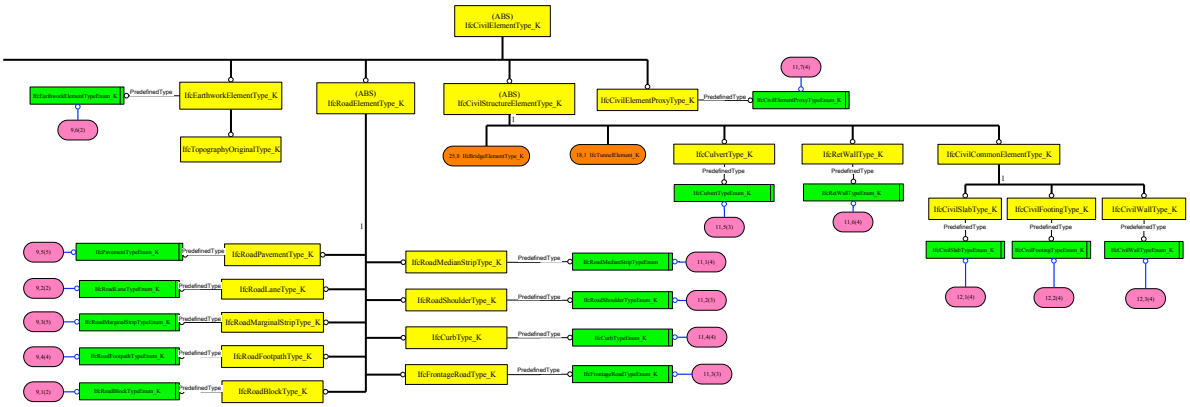
This element type (IfcRoadPavementType_K) constitutes the list of elements used to allot the diverse types of pavement shapes etc. commonly installed in roads, bridges, and tunnels. It is used to define the element specifications (the creation of member information and member types) of pavements. Here, each pavement type includes the instances information of each layer--which constitutes the pavement--not as a type but as an enumeration type.

The subtype elements of IfcRoadPavementType_K, without the definition of shapes, are used to connect the enumeration-type information on the road pavement type. The creation of IfcRoadPavementType_K is expressed in instances of IfcRoadPavement_K. To create member types, this type is used to express the particular member information and to define the specifications of the pavement type.

EXPRESS Specification:

```
ENTITY IfcRoadPavementType_K
  SUBTYPE OF(IfcRoadElementType_K);
    PredefinedType : IfcPavementTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadPavementType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
```

```
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType        :OPTIONAL IfcLabel;
 ENTITY IfcRoadElementType_K
  ElementType        :OPTIONAL IfcLabel;
 ENTITY IfcRoadPavementType_K
  PredefinedType      :IfcRoadPavementTypeEnum_K;
  LongName            :OPTIONAL IfcLabel;
END_ENTITY;
```

2.4 Property Sets

2.4.1 Pset_RoadProjectCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadElement_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.2 Pset_RoadProjectMgmtCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadElement_K

- **ProjectName**
  - P_SINGLEVALUE / IfcLabel
- **FacilityManagementNumber**
  - P_SINGLEVALUE / IfcLabel
- **RoadName**
  - P_SINGLEVALUE / IfcLabel
- **SectionName**

- P_SINGLEVALUE / IfcLabel
- **ManagementAuthority**
  - P_SINGLEVALUE / IfcLabel
- **RoadType**
  - P_SINGLEVALUE / IfcLabel
- **RoadLaneType**
  - P_SINGLEVALUE / IfcLabel
- **ConstructionDuration**
  - P_SINGLEVALUE / IfcDuration
- **LocationAddress**
  - P_SINGLEVALUE / IfcLabel
- **StartDate**
  - P_SINGLEVALUE / IfcDate
- **FinishDate**
  - P_SINGLEVALUE / IfcDate
- **Owner**
  - P_SINGLEVALUE / IfcLabel
- **Contractor(Construction)**
  - P_SINGLEVALUE / IfcLabel
- **SubContractor1(Engineering)**
  - P_SINGLEVALUE / IfcLabel
- **SubContractor2(Supervision)**
  - P_SINGLEVALUE / IfcLabel
- **TotalProjectCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure
- **DesignCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure
- **ConstructionCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure
- **SupervisionCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.3 Pset_RoadElementDesignParameters

PSET_TYPEDRIVENOVERRIDE / IfcRoadElement_K

- **StartingPoint**
  - P_SINGLEVALUE / IfcLabel
- **EndPoint**
  - P_SINGLEVALUE / IfcLabel
- **RoadWidth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **RoadNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **Station**
  - P_SINGLEVALUE / IfcLabel

- **LengthBetweenStations**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **Chainage**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **DesignSpeed**
  - P_SINGLEVALUE / IfcLinearVelocityMeasure
- **FacilityLimit**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **AverageDrivingSpeed**
  - P_SINGLEVALUE / IfcLinearVelocityMeasure
- **PlannedElevation**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **GroundElevation**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **EarthworkElevation**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **Superelevation**
  - P_SINGLEVALUE / IfcPlaneAngleMeasure
- **RoadExtensionLength**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.4 Pset_RoadBlockCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadBlock_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space:**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.5 Pset_RoadAlignmentDesignCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadBlock_K

- **StartingPoint**
  - P_SINGLEVALUE / IfcLabel
- **EndPoint**
  - P_SINGLEVALUE / IfcLabel
- **PlaneAlignmentLength**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **PlaneCurveRadius**

    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **PlaneCurveLength**
    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **ClothoidCurveLength**
    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **WideningWidthOfPlaneCurve**
    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **SuperelevationOfPlaneCurve**
    - P_SINGLEVALUE / IfcPlaneAngleMeasure
- **VerticalSlope**
    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **DistanceOfVerticalAlignment**
    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LimitedDistanceOfVercalSlope**
    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **ChangingRatioOfVerticalSlope**
    - P_SINGLEVALUE / IfcPositiveRatioMeasure
- **DistanceOfVerticalCurve**
    - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **VerticalCurveType**
    - P_SINGLEVALUE / IfcLabel
- **CrossSectionGrade**
    - P_SINGLEVALUE / IfcPlaneAngleMeasure

2.4.6 Pset_RoadBlockDesignParameter

PSET_TYPEDRIVENOVERRIDE / IfcRoadBlock_K

- **CompositeRoadSegments**
  - P_ENUMERATEDVALUE / CompositeRoadSegments L[1:?]
- **StopingSightDistance**
  - P_SINGLEVALUE / IfcPositveLengthMeasure
- **PassingSightDistance**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **DecisionSightDistance**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **SideFrictionFactor**
  - P_SINGLEVALUE / IfcLabel
- **RoadLaneWidth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **FacilityLimitOfRoad**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **DesignSectionDistance**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LevelOfService**
  - P_SINGLEVALUE / IfcLabel
- **LateralClearance**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **MarginalStripWidth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **MaximumSuperelevation**
  - P_SINGLEVALUE / IfcPlaneAngleMeasure
- **InstallationDistanceOfUpwardRoad**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **WidthOfUpwardRoad**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **SuperelevationOfUpwardRoad**
  - P_SINGLEVALUE / IfcPlaneAngleMeasure
- **RoadTrafficVolume**
  - P_SINGLEVALUE / IfcTrafficVolumeMeasure
- **DistanceOfHorizontalAlignment**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **CrossSectionGradeOfRoad**
  - P_SINGLEVALUE / IfcPlaneAngleMeasure
- **LengthOfDecelerationLane**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LengthOfAccelerationLane**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LengthOfTransitionSection**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.7 Pset_RoadSegmentCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadSegmentBody_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.8 Pset_RoadSegmentCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadSegmentBody_K

- **RoadSegmentID**
  - P_SINGLEVALUE / IfcIdentifier
- **CompositeRoadSections**
  - P_ENUMERATEDVALUE / CompositeRoadSections L[1:?]
- **StartingPoint**
  - P_SINGLEVALUE / IfcLabel
- **EndPoint**
  - P_SINGLEVALUE / IfcLabel
- **HasAlignment**
  - P_SINGLEVALUE / IfcBoolean

2.4.9 Pset_RoadStationedSectionCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadStationedSection_K

- **Reference**
  - P_SINGLEVALUE / IfcIdentifier
- **SectionNumber**
  - P_SINGLEVALUE / IfcLabel
- **SectionProfileName**
  - P_SINGLEVALUE / IfcLabel
- **StartingPoint**
  - P_SINGLEVALUE / IfcLabel
- **EndPoint**
  - P_SINGLEVALUE / IfcLabel
- **SectionArea**
  - P_SINGLEVALUE / IfcAreaMeasure

2.4.10 Pset_RoadLaneCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadLane_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.11 Pset_RoadLaneCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadLane_K

- **LaneID**
  - P_SINGLEVALUE / IfcIdentifier
- **LaneType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_LaneType: USERDEFINED, NOTDEFINED
- **LaneColor**
  - P_SINGLEVALUE / IfcLabel
- **LaneInstallationStandard**
  - P_SINGLEVALUE / IfcLabel
- **LineTypeOfLane**
  - P_SINGLEVALUE / IfcLabel
- **LengthOfLaneMarker**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LengthOfVoidMarker**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LaneWidth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LaneOffset**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **LaneConstructionMethod**
  - P_SINGLEVALUE / IfcLabel
- **DistanceBetweenCenterLines**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.12 Pset_RoadMedianstripCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadMedianstrip_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.13 Pset_RoadMedianstripManagement

PSET_TYPEDRIVENOVERRIDE / IfcRoadMedianstrip_K

- **MedianstripID**
  - P_SINGLEVALUE / IfcIdentifier
- **MedianstripType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_MedianstripType: GUARDFENCEOFCONCRETE, GUARDRAIL, GREENAREA, CURBOFCONCERTE, USERDEFINED, NOTDEFINED
- **ReferedDesignStandard**
  - P_SINGLEVALUE / IfcText
- **FacilityManagementNumber**
  - P_SINGLEVALUE / IfcNumericMeasure
- **FacilityDegree**
  - P_SINGLEVALUE / IfcLabel
- **InstallationDate**
  - P_SINGLEVALUE / IfcDate
- **Materials**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_ConstructionMaterialResourceType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.14 Pset_RoadMedianstripDesignCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadMedianstrip_K

- **WidthOfMedianstrip**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **HeightOfMedianstrip**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **WidthOfLateralClearance**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **RoadShoulderWidthOfMedianstrip**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **LengthOfMedianstrip**

- P_SINGLEVALUE / IfcPostiveLengthMeasure
- **MarginalstripWidthOfMedianstrip**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **FacilityLimitOfMedianstrip**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **BuriedDepthOfPost**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **CrossSectionAreaOfMedianstrip**
  - P_SINGLEVALUE / IfcAreaMeasure
- **GrossSectionVolumeOfMedianstrip**
  - P_SINGLEVALUE / IfcVolumeMeasure
- **ExtensionLength**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure

2.4.15 Pset_RoadShoulderCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadShoulder_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.16 Pset_RoadShoulderCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadShoulder_K

- **RoadShoulderID**
  - P_SINGLEVALUE / IfcIdentifier
- **WidthOfRightRoadShoulder**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **WidthOfLeftRoadShoulder**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **RoadShoulderType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_RoadShoulderType: FULLWIDTHROADSHOULDER, HALFWIDTHROADSHOULDER, NARROWWIDTHROADSHOULDER, USERDEFINED, NOTDEFINED
- **CrossSectionSlopeOfRoadShoulder**
  - P_SINGLEVALUE / IfcPlaneAngleMeasure
- **MarginalstripWidthOfRoadShoulder**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **WideningWidthOfRoadShoulder**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure

- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4..17 Pset_FrontageRoadCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcFrontageRoad_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.18 Pset_FrontageRoadCommon

PSET_TYPEDRIVENOVERRIDE / IfcFrontageRoad_K

- **FrontageRoadID**
  - P_SINGLEVALUE / IfcIdentifier
- **FrontageRoadType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_FrontageRoadType: USERDEFINED, NOTDEFINED
- **WidthOfFrontageRoad**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **ThicknessOfFrontage**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **ExtensionLengthOfFrontageRoad**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **PavementTypeOfFrontageRoad**
  - P_SINGLEVALUE / IfcLabel
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.19 Pset_RoadMarginalstripCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadMarginalstrip_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel

- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.20 Pset_RoadMarginalstripCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadMarginalstrip_K

- **RoadMarginalstripID**
  - P_SINGLEVALUE / IfcIdentifier
- **MarginalstripType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_MarginalstripType: USERDEFINED, NOTDEFINED
- **WidthOfMarginalstrip**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **Materials**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_ConstructionMaterialResourceType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.21 Pset_RoadFootpathCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadFootpath_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.22 Pset_RoadFootpathCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadFootpath_K

- **FootpathID**
  - P_SINGLEVALUE / IfcIdentifier
- **FootpathType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_FootpathType: UNDERGROUND_FOOTPATH, GENERAL, USERDEFINED, NOTDEFINED
- **WidthOfFootpath**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **CurbHeightOfFootpath**

- P_SINGLEVALUE / IfcPostiveLengthMeasure
- **FacilityLimitOfFootpath**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **HeightOfFootpathBase**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **CrossSectionSlopeOfFootpath**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **RequiredTrafficVolume**
  - P_SINGLEVALUE / IfcTrafficVolumeMeasure
- **ServiceLevelOfFootpath**
  - P_SINGLEVALUE / IfcLabel
- **FootpathDesignStandard**
  - P_SINGLEVALUE / IfcLabel
- **UndergroundFacilityStatus**
  - P_SINGLEVALUE / IfcBoolean
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.23 Pset_RoadCurbCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadCurb_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.24 Pset_RoadCurbCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadCurb_K

- **CurbID**
  - P_SINGLEVALUE / IfcIdentifier
- **CurbType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CurbType: MOUNTABLECURB, BARRIER1, BARRIER2, USERDEFINED, NOTDEFINED
- **LengthOfCurb**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.25 Pset_RoadPavementCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRoadPavement_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.26 Pset_RoadPavementCommon

PSET_TYPEDRIVENOVERRIDE / IfcRoadPavement_K

- **PavementID**
  - P_SINGLEVALUE / IfcIdentifier
- **PavementType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_PavementType: SURFACE, INTERMEDIATECOURSE, SUBBASE, BASECOURSE, USERDEFINED, NOTDEFINED
- **PavementMaterial**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_PavementMaterialType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **ConstructionMethod**
  - P_SINGLEVALUE / IfcLabel
- **AggregateSize**
  - P_SINGLEVALUE / IfcPostiveLengthMeasure
- **PerformancePeriod**
  - P_SINGLEVALUE / IfcDuration
- **DesignGrade**
  - P_SINGLEVALUE / IfcLabel
- **HasReinforcingBar**
  - P_SINGLEVALUE / IfcBoolean
- **ElasticModulus**
  - P_SINGLEVALUE / IfcModulusOfElasticityMeasure
- **IsSeperatorDesign**
  - P_SINGLEVALUE / IfcBoolean

2.4.27 Pset_RetWallCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcRetWall_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**

- P_SINGLEVALUE / IfcLabel

- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.28 Pset_RetWallCommon

PSET_TYPEDRIVENOVERRIDE / IfcRetWall_K

- **RetWallID**
  - P_SINGLEVALUE / IfcIdentifier
- **ManagementAuthority**
  - P_SINGLEVALUE / IfcLabel
- **FacilityManagementNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **RetWallType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_RetWallType: GRAVITYTYPERETAININGWALL, SEMIGRAVITYTYPERETAININGWALL, NONSTANDINGRETAININGWALL, REVERSEDTSHAPEDRETAININGWALL, LSHAPERETAININGWALL, REVERSEDLSHAPEDRETANINGWALL, COUNTERFORTRETAININGWALL, MASONARYRETAININGWALL, REINFORCEDARCHRETAININGWALL, BLOCKTYPERETAININGWALL, PANELTYPERETAININGWALL, USERDEFINED, NOTDEFINED
- **RetWallFoundationType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilFootingType: BASE_FOOTING, PITMOUTH_FOOTING, CAISSON_FOUNDATION, PSC_PILE_FOUNDATION, RC_PILE_FOUNDATION, SLURRY_WALL_FOUNDATION, SPREAD_FOUNDATION, STEEL_PILE_FOUNDATION, STEEL_SHEET_PILE_FOUNDATION, USERDEFINED, NOTDEFINED
- **RetWallDesignStandard**
  - P_SINGLEVALUE / IfcLabel
- **RetWallMaterial**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_RetWallMaterialType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.29 Pset_CulvertCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcCulvert_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity:**
  - P_SINGLEVALUE / IfcLabel

2.4.30 Pset_CulvertCommon

PSET_TYPEDRIVENOVERRIDE / IfcCulvert_K

- **CulvertID**
  - P_SINGLEVALUE / IfcIdentifier
- **ManagementAuthority**
  - P_SINGLEVALUE / IfcLabel
- **FacilityManagementNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **CulvertType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CulvertType: ONEWAYWATERWAYCULVERT, TWOWAYWATERWAYCULVERT, THREEWAYWATERWAYCULVERT, ONEWAYPASSAGEWAYCULVERT, TWOWAYPASSAGEWAYCULVERT, ONEWAYSKEWEDWATERWAYCULVERT, TWOWAYSKEWEDWATERWAYCULVERT, THREEWAYSKEWEDWATERWAYCULVERT, ONEWAYSKEWEDPASSAGEWAYCULVERT, TWOWAYSKEWEDPASSAGEWAYCULVERT, STONEFILLEDCULVERTTYPE1, STONEFILLEDCULVERTTYPE2, STONEFILLEDCULVERTTYPE3, STONEFILLEDCULVERTTYPE4, STONEFILLEDCULVERTTYPE5, COMMONDUCT, CLOSED_CONDUIT, NOTDEFINED, USERDEFINED
- **CulvertFoundationType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CulvertFoundationType: BASE_FOOTING, PITMOUTH_FOOTING, CAISSON_FOUNDATION, PSC_PILE_FOUNDATION, RC_PILE_FOUNDATION, SLURRY_WALL_FOUNDATION, SPREAD_FOUNDATION, STEEL_PILE_FOUNDATION, STEEL_SHEET_PILE_FOUNDATION, USERDEFINED, NOTDEFINED
- **CulvertWingWallType**
  - P_SINGLEVALUE / IfcLabel
- **HasCulvertWingWall**
  - P_SINGLEVALUE / IfcBoolean
- **CulvertUtilizationType**
  - P_SINGLEVALUE / IfcLabel
- **CulvertDesignStandard**
  - P_SINGLEVALUE / IfcLabel
- **CulvertMaterial**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CulvertMaterialType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **CulvertSpanLength**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **CulvertSize**
  - P_SINGLEVALUE / IfcLabel
- **CulvertCrossSectionArea**
  - P_SINGLEVALUE / IfcAreaMeasure
- **ThicknessOfCulvertCoverConcrete**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **GrossVolumeOfCulvert**
  - P_SINGLEVALUE / IfcVolumeMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.31 Pset_CivilFootingCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcCivilFooting_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.32 Pset_CivilFootingCommon

PSET_TYPEDRIVENOVERRIDE / IfcCivilFooting_K

- **CivilFootingID**
  - P_SINGLEVALUE / IfcIdentifier
- **ManagementAuthority**
  - P_SINGLEVALUE / IfcLabel
- **FacilityManagementNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **CivilFootingType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilFootingType: BASE_FOOTING, PITMOUTH_FOOTING, CAISSON_FOUNDATION, PSC_PILE_FOUNDATION, RC_PILE_FOUNDATION, SLURRY_WALL_FOUNDATION, SPREAD_FOUNDATION, STEEL_PILE_FOUNDATION, STEEL_SHEET_PILE_FOUNDATION, USERDEFINED, NOTDEFINED
- **CivilFootingDesignStandard**
  - P_SINGLEVALUE / IfcLabel
- **CivilFootingMaterial**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilFootingMaterialType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **CivilFootingPileType**
  - P_SINGLEVALUE / IfcLabel
- **ThicknessOfCivilFooting**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **BuriedDepthOfCivilFooting**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **CivilFootingArea**
  - P_SINGLEVALUE / IfcAreaMeasure
- **GrossVolumeOfCivilFooting**
  - P_SINGLEVALUE / IfcVolumeMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.33 Pset_CivilWallCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcCivilWall_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.34 Pset_CivilWallCommon

PSET_TYPEDRIVENOVERRIDE / IfcCivilWall_K

- **CivilWallID**
  - P_SINGLEVALUE / IfcIdentifier
- **ManagementAuthority**
  - P_SINGLEVALUE / IfcLabel
- **FacilityManagementNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **CivilWallType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilWallType: CHESTWALL, WINGWALL, PITMOUTH_WINGWALL, USERDEFINED, NOTDEFINED
- **CivilWallDesignStandard**
  - P_SINGLEVALUE / IfcLabel
- **CivilWallMaterial**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilWallMaterialType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **ThicknessOfCivilWall**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **AreaOfCivilWall**
  - P_SINGLEVALUE / IfcAreaMeasure
- **GrossVolumeOfCivilWall**
  - P_SINGLEVALUE / IfcVolumeMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

2.4.35 Pset_CivilSlabCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcCivilSlab_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

2.4.36 Pset_CivilSlabCommon

PSET_TYPEDRIVENOVERRIDE / IfcCivilSlab_K

- **CivilSlabID**
  - P_SINGLEVALUE / IfcIdentifier
- **ManagementAuthority**
  - P_SINGLEVALUE / IfcLabel
- **FacilityManagementNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **CivilSlabType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilSlabType: STRAIGHT_INVESTRAIGHT_INVERT, CURVED_INVERT, BASE_SLAB, USERDEFINED, NOTDEFINED
- **CivilSlabDesignStandard**
  - P_SINGLEVALUE / IfcLabel
- **CivilSlabMaterial**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilSlabMaterialType: AGGREGATES, CONCRETE, DRYWALL, FUEL, GYPSUM, MASONRY, PLASTIC, WOOD, ASPHALT_k, NOTDEFINED, USERDEFINED
- **ThicknessOfCivilSlab**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **AreaOfCivilSlab**
  - P_SINGLEVALUE / IfcAreaMeasure
- **GrossVolumeOfCivilSlab**
  - P_SINGLEVALUE / IfcVolumeMeasure
- **Others**
  - P_SINGLEVALUE / IfcLabel

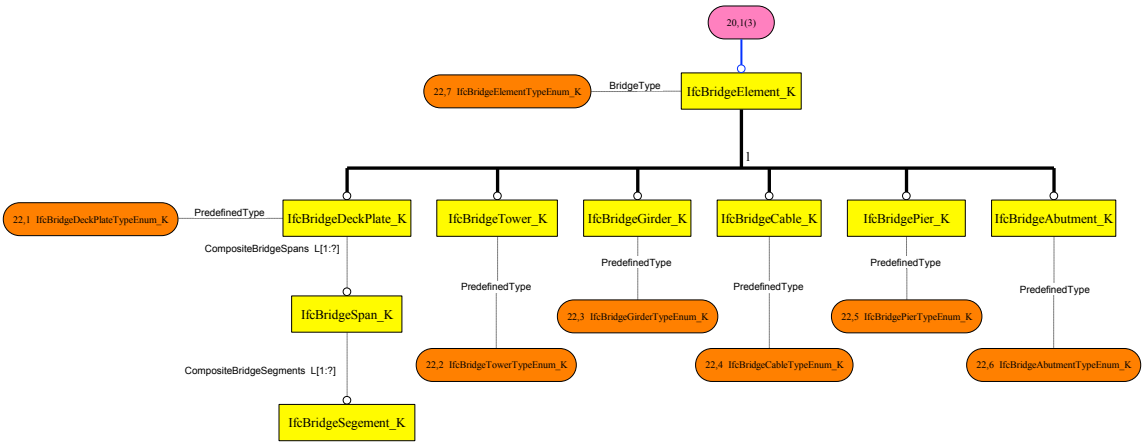
3 IfcSharedBridgeElements

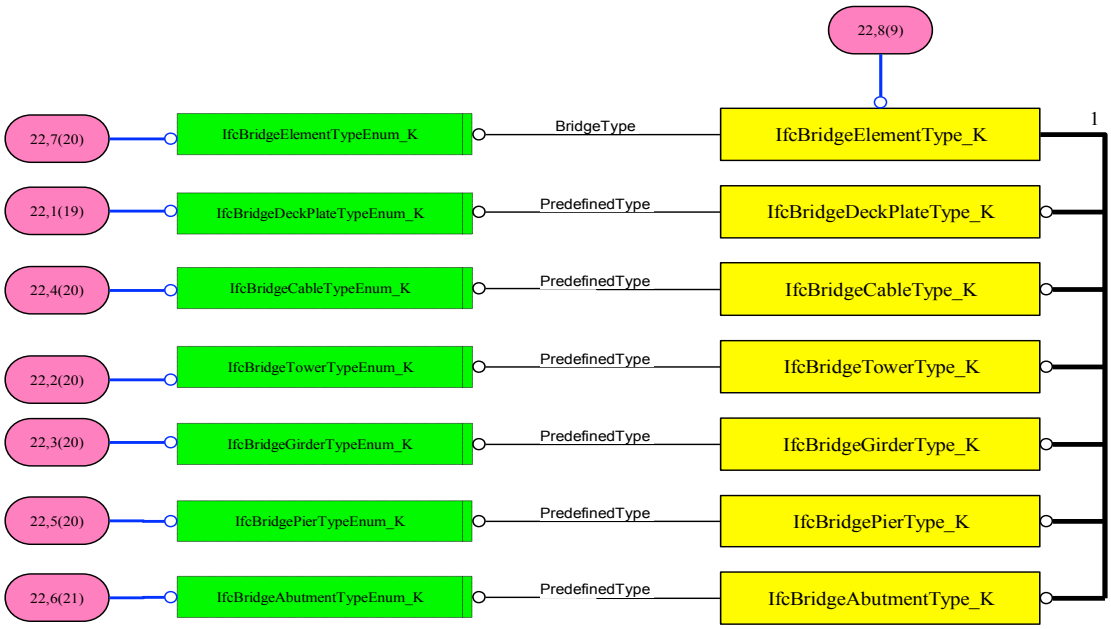
3.1 Schema Definition

Shared bridge elements (IfcSharedBridgeElements) define the subtypes of IfcCivilElement in IfcProductExtension. Such subtypes are major elements of the design of bridge structure shapes.

Such elements (bridge plates, towers, girders, cables, piers, and abutments) are the major components of bridge facilities for exchange with civil engineering project data. The geometric use of such elements is each defined to constitute the proper shape expression application methods for individual elements.

EXPRESS-G diagram





3.2 Types

3.2.1 IfcBridgeElementTypeEnum_K

With regard to IfcBridgeElement or IfcBridgeElementType, this enumeration type defines the predetermined types of diverse bridge types.

Enumerated Item Definitions:

- **ARCH_BRIDGE**
- **CABLE_STAYED_BRIDGE**
- **PREFLEX_GIRDER_BRIDGE**
- **PSC_BOX_GIRDER_BRIDGE**
- **PSC_HOLLOW_SLAB_BRIDGE**
- **PSC_I_GIRDER_BRIDGE**
- **PSC_SLAB_BRIDGE**
- **RAHMEN_BRIDGE**
- **RC_BOX_GIRDER_BRIDGE**
- **RC_HOLLOW_SLAB_BRIDGE**
- **RC_SLAB_BRIDGE**
- **RC_T_BEAM_GIRDER_BRIDGE**
- **STEEL_BOX_GIRDER_BRIDGE**
- **STEEL_PLATE_GIRDER_BRIDGE**
- **SUSPENSION_BRIDGE**
- **TRUSS_BRIDGE**
- **OVERPASS**
- **USERDEFINE**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeElementTypeEnum_K = ENUMERATION OF
  (ARCH_BRIDGE,
   CABLE_STAYED_BRIDGE,
   PREFLEX_GIRDER_BRIDGE,
   PSC_BOX_GIRDER_BRIDGE,
   PSC_HOLLOW_SLAB_BRIDGE,
   PSC_I_GIRDER_BRIDGE,
   PSC_SLAB_BRIDGE,
   RAHMEN_BRIDGE,
   RC_BOX_GIRDDER_BRIDGE,
   RC_HOLLOW_SLAB_BRIDGE,
   RC_SLAB_BRIDGE,
   RC_T_BEAM_GIRDER_BRIDGE,
   STEEL_BOX_GIRDDER_BRIDGE,
   STEEL_PLATE_GIRDER_BRIDGE,
   SUSPENSION_BRIDGE,
   TRUSS_BRIDGE,
   OVERPASS,
   USER_DEFINED,
   NOT_DEFINED);
```

END_TYPE;

3.2.2 IfcBridgeDeckPlateTypeEnum_K

With regard to IfcBridgeDeckPlate or IfcBridgeDeckPlateType, this enumeration type defines the predetermined types of entire bridge upper-plates.

Enumerated Item Definitions:

- **APPROACH_SLAB**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeDeckPlateTypeEnum_K = ENUMERATION OF
  (APPROACH_SLAB,
   USER_DEFINED,
   NOT_DEFINED);
END_TYPE;
```

3.2.3 IfcBridgeTowerTypeEnum_K

With regard to IfcBridgeTower or IfcBridgeTowerType, this enumeration type defines the predetermined types of bridge towers. The types are not yet specified, but they can be listed and defined.

Enumerated Item Definitions:

- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeTowerTypeEnum_K = ENUMERATION OF
  (NOT_DEFINED,
   USER_DEFINED);
END_TYPE;
```

3.2.4 IfcBridgeGirderTypeEnum_K

With regard to IfcBridgeGirder or IfcBridgeGirderType, this enumeration type defines the predetermined types of bridge girders. The girder defines the list of a bridge's upper structures that are laid longitudinally between piers, and is classified according to its material type.

Enumerated Item Definitions:

- **BEAM**

- **RC**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeGirderTypeEnum_K = ENUMERATION OF
  (BEAM,
   RC,
   NOT_DEFINED,
   USER_DEFINED);
END_TYPE;
```

3.2.5 IfcBridgeCableTypeEnum_K

With regard to IfcBridgeCable or IfcBridgeCableType, this enumeration type defines the predetermined types of cables used in bridges. Cables include tower cables for suspension bridges and cable-stayed bridges, and tensioning cables for girders.

Enumerated Item Definitions:

- **SUSPENDER**
- **SUSPENSION_CABLE**
- **TENSION_CABLE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeCableTypeEnum_K = ENUMERATION OF
  (SUSPENDER,
   SUSPENSION_CABLE,
   USER_DEFINED,
   NOT_DEFINED,
   TENSION_CABLE);
END_TYPE;
```

3.2.6 IfcBridgePierTypeEnum_K

With regard to IfcBridgePier or IfcBridgePierType, this enumeration type defines the predetermined types of piers that support a bridge's upper structures.

Enumerated Item Definitions:

- **ARCH_TYPE**
- **GRAVITY_TYPE**

- **RAHMEN_ABUT_TYPE**
- **RAHMEN_PIER_TYPE**
- **SEMI_GRAVITY_TYPE**
- **T_SHAPED_TYPE**
- **V_SHAPED_TYPE**
- **WALL_TYPE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgePierTypeEnum_K = ENUMERATION OF
  (ARCH_TYPE,
   GRAVITY_TYPE,
   RAHMEN_ABUT_TYPE,
   RAHMEN_PIER_TYPE,
   SEMI_GRAVITY_TYPE,
   T_SHAPED_TYPE,
   V_SHAPED_TYPE,
   WALL_TYPE,
   USER_DEFINED,
   NOT_DEFINED);
END_TYPE;
```

3.2.7 IfcBridgeAbutmentTypeEnum_K

With regard to IfcBridgeAbutment or IfcBridgeAbutmentType, this enumeration type defines the predetermined types of abutments that support both ends (start and end points) of a bridge's upper structures.

Enumerated Item Definitions:

- **BOX_TYPE**
- **COUNTERFORT_TYPE**
- **GRAVITY_TYPE**
- **RAHMEN_ABUT_TYPE**
- **RAHMEN_TYPE**
- **REVERSED_T_SHAPED_TYPE**
- **SEMI_GRAVITY_TYPE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeAbutmentTypeEnum_K = ENUMERATION OF
  (BOX_TYPE,
   COUNTERFORT_TYPE,
   GRAVITY_TYPE,
   RAHMEN_ABUT_TYPE,
```

```
    RAHMEN_TYPE,
    REVERSED_T_SHAPED_TYPE,
    SEMI_GRAVITY_TYPE,
    USER_DEFINED,
    NOT_DEFINED);
END_TYPE;
```

3.3 Entities

3.3.1 IfcBridgeElement_K

Description

The bridge element includes all basic members needed to construct a bridge. For example, a bridge's structural members include its onsite-placement members and factory-manufactured members. A bridge's major functional portions include its deck plates, towers, piers, abutments, and cables, and supplementary bridge facilities that can be linearly interlinked. The bridge's upper structures are installed according to their linear shape. The bridge includes multiple members with single objects, and these are given relevant properties through the library-type definition.

IfcBridgeElement_K inherits the common properties of the subordinate elements of the bridge. Also, a set of subordinate bridge elements is grouped into IfcBridgeElement, and is defined as a spatial bridge structure.

IfcBridgeElement may refer to the functional linkage elements defined in IfcBuildingElement. In other words, it refers to relationships between objects, and uses detailed functions through inverse properties. Typically used are Grouping, Processes, Structural member reference, Aggregation, Material, Classification, Library, Documentation, Type, Properties, Connection, Realization, Assignment to a spatial structure, Reference to spatial structures, Boundary, Covering, Voids, Projection, and Filling. For bridge elements, the functions of Assignment to a referenced spatial structure and Referencing to a road alignment (IfcAlignment) are applied.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcBridgeElementType_K

Table — IfcBridgeElementType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcBridgeElement_K.

PredefinedType	Name
	Pset_BridgeElementCodeGroup

	Pset_BridgeElementManagement
	Pset_BridgeElementCommon

Table — IfcBridgeElement_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

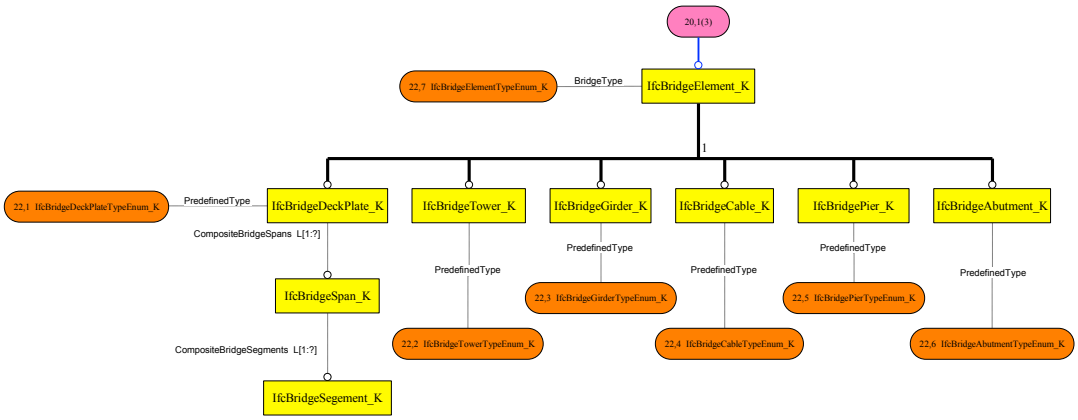
Structure
IfcBridge_K
IfcCurvlinearNodeSpace_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeElement_K

EXPRESS Specification:

```
ENTITY IfcBridgeElement_K
  SUPERTYPE OF (ONEOF(IfcBridgeDeckPlate_K, IfcBridgeTower_K, IfcBridgeGirder_K, IfcBridgeCable_K, IfcBridgePier_K, IfcBridgeAbutment_K))
  SUBTYPE OF(IfcCivilStructureElement_K);
    BridgeType : OPTIONAL IfcBridgeElementTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeElement_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
END_ENTITY;
```

3.3.2 IfcBridgeElementType_K

Description

This element type (IfcBridgeElementType_K) constitutes the selective list of bridge structure expressions and the list of definitions of the commonly shared property sets of bridge elements. It is used to define the element specifications (the creation of particular member information and member types).

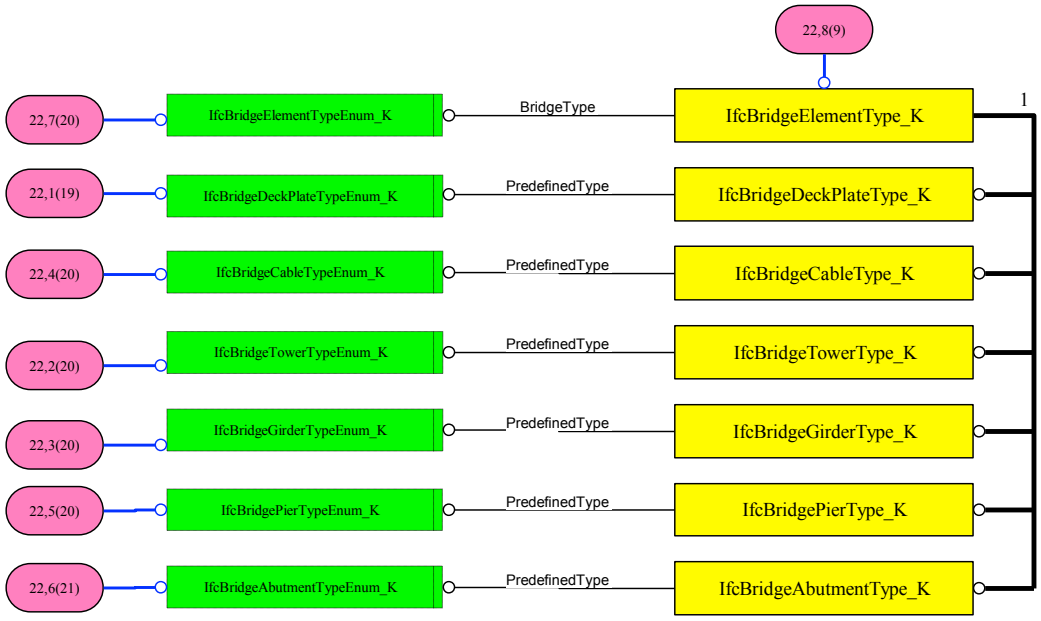
To allocate the specific styles of relevant bridge shape elements, the bridge element type is used to define the general properties of bridge elements that can be applied as diverse instances according to their characteristics. The creation of subordinate types of IfcBridgeElementType is expressed in instances of subtypes.

Basically, subtype elements of bridges, without the definition of shapes, are used to connect the enumeration-type information.

EXPRESS Specification:

```
ENTITY IfcBridgeElementType_K
  SUPERTYPE OF (ONEOF(IfcBridgeDeckPlateType_K, IfcBridgeCableType_K,
IfcBridgeTowerType_K, IfcBridgeGirderType_K, IfcBridgePierType_K, IfcBridgeAbutmentType_K))
  SUBTYPE OF(IfcCivilStructureElementType_K);
    BridgeType : IfcBridgeElementTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeElementType_K
 ENTITY IfcRoot
  GlobalId          :IfcGloballyUniqueId;
  OwnerHistory      :OPTIONAL IfcOwnerHistory;
```

```
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType         :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilStructureElementType_K
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcBridgeElementType_K
  PredefinedType      :IfcBridgeElementTypeEnum_K;
END_ENTITY;
```

3.3.3 IfcBridgeDeckPlate_K

Description

A bridge's entire deck plate section (IfcBridgeDeckPlate_K) is used to express the shapes of the deck plate section and is installed between the bridge's start and end points within the linear section to define the properties thereof. The bridge's entire deck plate shape includes all the facilities in the bridge's standard cross-section, and the diverse object facilities (road signs, traffic facilities, supplementary facilities, etc.) installed in the relevant deck plate section.

IfcBridgeDeckPlate_K includes multiple bridge spans. This is explained by the division of multiple piers. Within the relevant entire deck-plate section, the deck-plate structure elements of the bridge facility (IfcBridgeElement_K) are grouped.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcBridgeDeckPlateType_K

Table — IfcBridgeDeckPlateType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcBridgeDeckPlate_K.

PredefinedType	Name
	Pset_BridgeDeckPlateCodeGroup
	Pset_BridgeDeckPlateCommon

Table — IfcBridgeDeckPlate_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

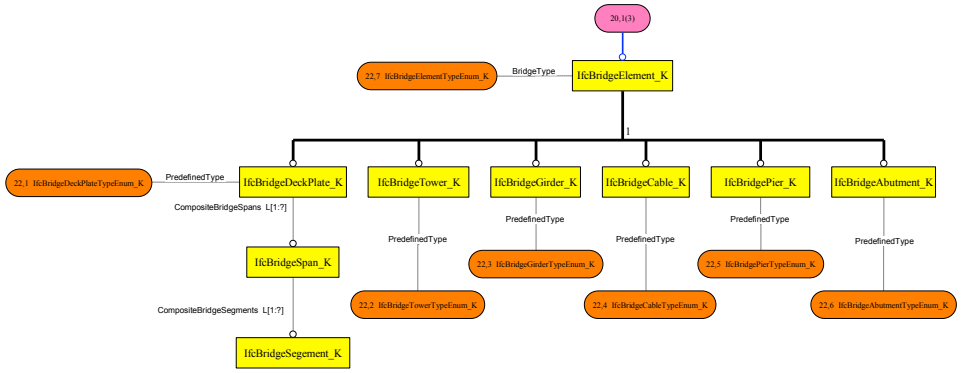
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeDeckPlate_K

EXPRESS Specification:

```
ENTITY IfcBridgeDeckPlate_K
  SUBTYPE OF(IfcBridgeElement_K);
    CompositeBridgeSpans : OPTIONAL LIST [1:?] OF IfcBridgeSpan_K;
    PredefinedType       : OPTIONAL IfcBridgeDeckPlateTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeDeckPlate_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgeDeckPlate_K
  CompositeBridgeSpans    :  OPTIONAL LIST [1:?] OF IfcBridgeSpan_K;
  PredefinedType          :  OPTIONAL IfcBridgeDeckPlateTypeEnum_K;
END_ENTITY;
```

3.3.4 IfcBridgeDeckPlateType_K

Description

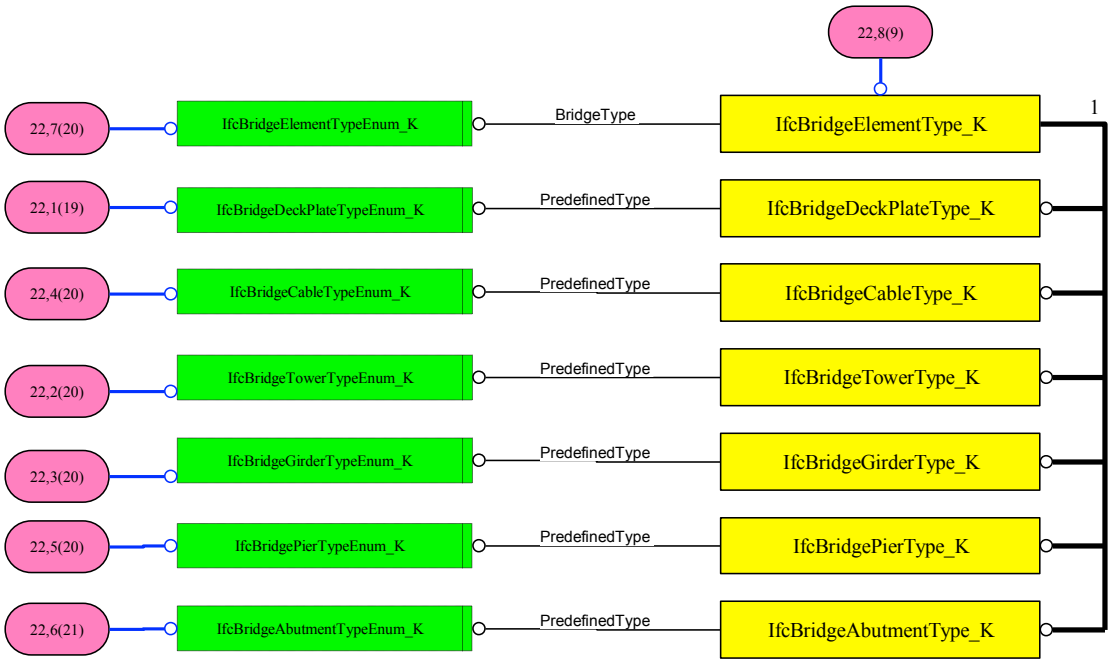
This element type (IfcBridgeDeckPlateType_K) constitutes the list of elements used to define the bridge deck-plate type and to allot its diverse types. It is used to define the element specifications (the creation of member information and member types) of the bridge deck plate.

The subtype elements of IfcBridgeDeckPlateType_K, without the definition of shapes, are used to connect the enumeration-type information on the particular types of bridge deck plates. The creation of IfcBridgeDeckPlateType_K is expressed in instances of IfcBridgeDeckPlate_K.

EXPRESS Specification:

```
ENTITY IfcBridgeDeckPlateType_K
  SUBTYPE OF(IfcBridgeElementType_K);
    PredefinedType : IfcBridgeDeckPlateTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeDeckPlateType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType           :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCivilStructureElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcBridgeDeckPlateType_K
  PredefinedType        :IfcBridgeDeckplateTypeEnum_K;
END_ENTITY;
```

3.3.5 IfcBridgeSpan_K

Description

The bridge span (IfcBridgeSpan_K) is used to express the section unit of a span--which is divided within the entire bridge deck plate (IfcBridgeDeckPlate_K)--and to define the properties thereof. The bridge span shape includes all bridge facilities in the standard cross-section, and the diverse object facilities (road signs, supplementary facilities, etc.) installed in the relevant section.

IfcBridgeSpan_K may include multiple bridge segments with a particular length, and explains the cross-section by segment. Within the relevant span, all subordinate facility elements that constitute the bridge span (IfcBridgeSpan_K) are grouped together.

Common Use Definitions

Property Sets for Objects

Object types, applied in this entity, are expressed in the following entity type.

PredefinedType	Name
	Pset_BridgeSpanCodeGroup
	Pset_BridgeSpanCommon

Table — IfcBridgeSpan_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

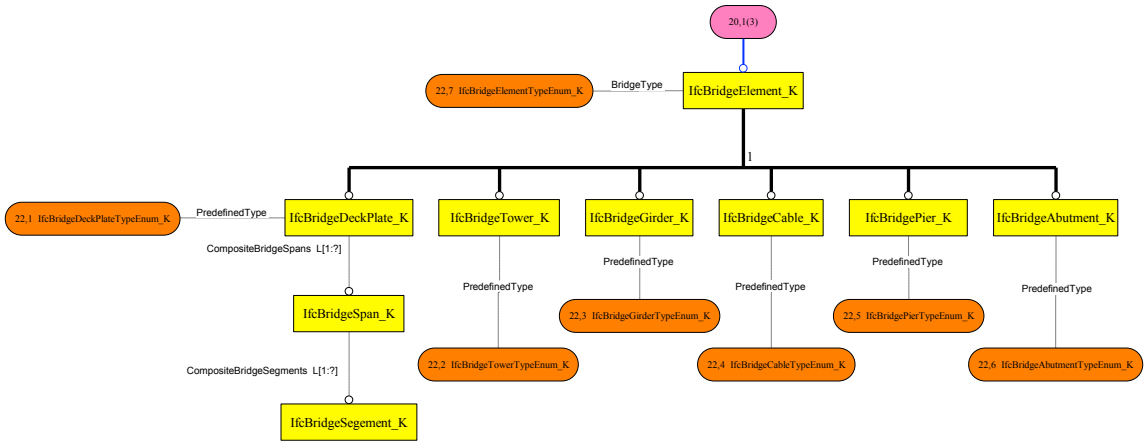
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeSpan_K

EXPRESS Specification:

```
ENTITY IfcBridgeSpan_K;
    CompositeBridgeSegments : OPTIONAL LIST [1:?] OF IfcBridgeSegement_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeSpan_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
```

```
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgeDeckPlate_K
  CompositeBridgeSpans    :  OPTIONAL LIST [1:?] OF IfcBridgeSpan_K;
  PredefinedType          :  OPTIONAL IfcBridgeDeckPlateTypeEnum_K;
 ENTITY IfcBridgeSpan_K
  CompositeBridgeSegments    :  OPTIONAL LIST [1:?] OF IfcBridgeSegments_K;
END_ENTITY;
```

3.3.6 IfcBridgeSegment_K

Description

The bridge unit segment (IfcBridgeSegment_K) is used to express the shape of the unit segment--which is divided within the bridge's span (IfcBridgeSpan_K)--and to define the properties thereof. The bridge segment shape includes all bridge facilities in the standard cross-section, and the diverse object facilities (road signs, supplementary facilities, etc.) installed in the relevant segment. (IfcBridgeSpan_K) may include multiple bridge segments with a particular length, and constitutes the cross-section by segment.

Common Use Definitions

Property Sets for Objects

Object types, applied in this entity, are expressed in the following entity type.

PredefinedType	Name
	Pset_BridgeSegmentCodeGroup
	Pset_BridgeSegmentCommon

Table — IfcBridgeSegment_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

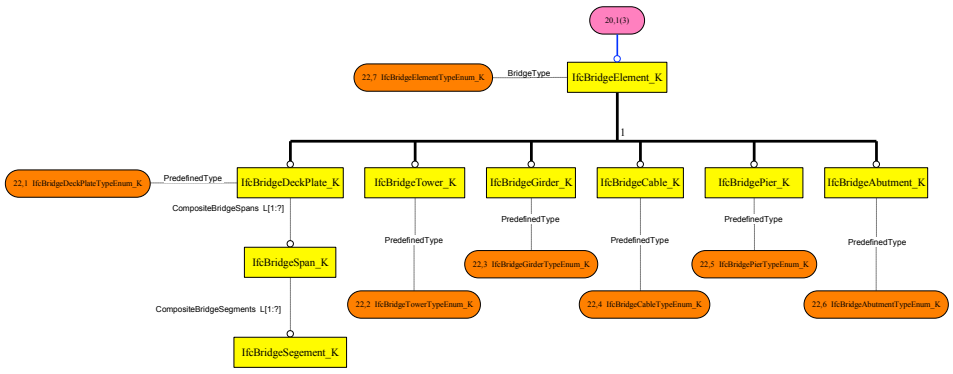
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeSegment_K

EXPRESS Specification:

```
ENTITY IfcBridgeSegement_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeSegment_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
```

```
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgeDeckPlate_K
  CompositeBridgeSpans    :  OPTIONAL LIST [1:?] OF IfcBridgeSpan_K;
  PredefinedType          :  OPTIONAL IfcBridgeDeckPlateTypeEnum_K;
 ENTITY IfcBridgeSpan_K
  CompositeBridgeSegments    :  OPTIONAL LIST [1:?] OF IfcBridgeSegments_K;
 ENTITY IfcBridgeSegment_K
END_ENTITY;
```

3.3.7 IfcBridgeTower_K

Description

A bridge tower (IfcBridgeTowen_K) is a structure installed in suspension bridges, cable-stayed bridges, extradosed bridges, etc. It is used to express the tower shape and to define the properties thereof. The top of the tower is difficult to distinguish from its bottom, but the tower is divided into the footing portion and the tower portion. The components of the tower portion are those that connect cables, and the tower portion is connected to the deck plate structure via cable elements. It is used only in suspension bridges, cable-stayed bridges, and extradosed bridges, and not in bridge structures with a general deck plate structure.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcBridgeTowerType_K

Table — IfcBridgeTowerType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcBridgeTowerType_K.

PredefinedType	Name
	Pset_BridgeTowerCodeGroup
	Pset_BridgeTowerCommon

Table — IfcBridgeTower_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

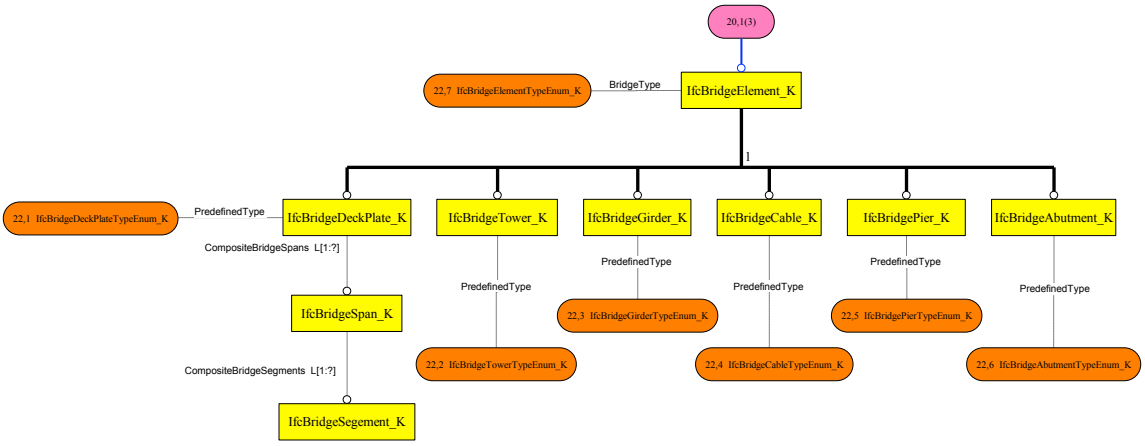
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeTower_K

EXPRESS Specification:

```
ENTITY IfcBridgeTower_K
  SUBTYPE OF(IfcBridgeElement_K);
    PredefinedType : OPTIONAL IfcBridgeTowerTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeTower_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgeTower_K
  PredefinedType          :  OPTIONAL IfcBridgeTowerTypeEnum_K;
END_ENTITY;
```

3.3.8 IfcBridgeTowerType_K

Description

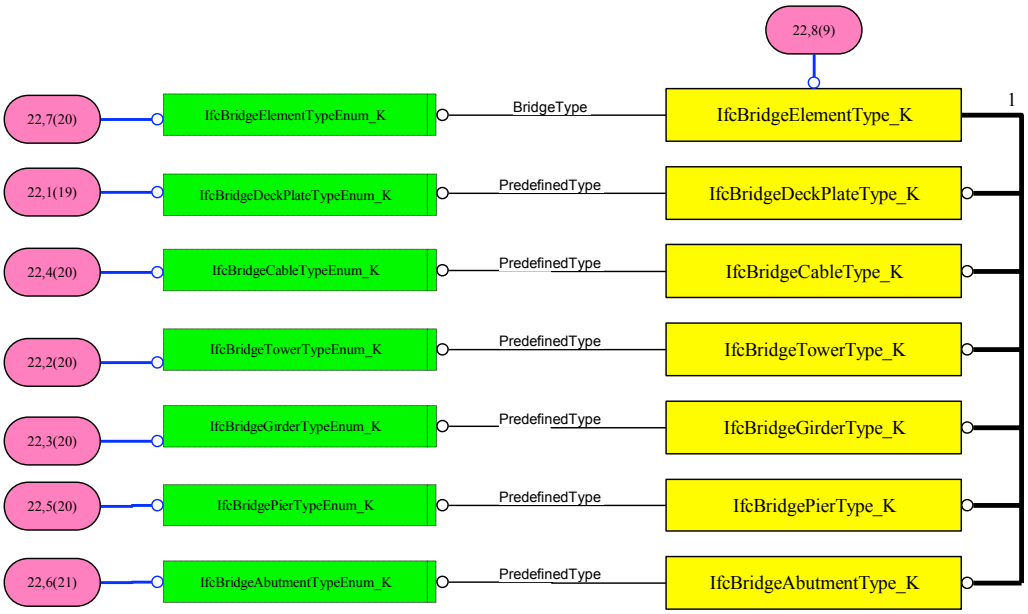
The bridge tower type (IfcBridgeTowerType_K) defines the list of elements used to allot the diverse types of central tower of suspension bridges, cable-stayed bridges, and extradosed bridges. It is used to define the element specifications (the creation of member information and member types) of the bridge tower.

The subtype elements of IfcBridgeTowerType_K, without the definition of shapes, are used to connect the enumeration-type information on the bridge tower type. The creation of IfcBridgeTowerType_K is expressed in instances of IfcBridgeTower_K.

EXPRESS Specification:

```
ENTITY IfcBridgeTowerType_K
  SUBTYPE OF(IfcBridgeElementType_K);
    PredefinedType : IfcBridgeTowerTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeTowerType_K
 ENTITY IfcRoot
  GlobalId          :IfcGloballyUniqueId;
  OwnerHistory      :OPTIONAL IfcOwnerHistory;
  Name              :OPTIONAL IfcLabel;
  Description       :OPTIONAL IfcText;
```

```
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments    :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests             :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy        :SET OF IfcRelNests FOR RelatingObject;
  HasContext        :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy    :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes        :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations   :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types             :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy      :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilStructureElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcBridgeTowerType_K
  PredefinedType    :IfcBridgeTowerTypeEnum_K;
END_ENTITY;
```

3.3.9 IfcBridgeGirder_K

Description

A bridge girder (IfcBridgeGirder_K) is used to express the shape of a structure installed in the upper structure between a bridge's piers or between abutments for a single span, and to define the properties thereof. The bridge girder includes multiple girder structures, and may be used to define a single type or to group and use multiple girders. It is created mainly according to materials such as steep boxes and PSC girders, and to cross-section types.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcBridgeGirderType_K

Table — IfcBridgeGirderType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcBridgeGirderType_K

PredefinedType	Name
	Pset_BridgeGirderCodeGroup
	Pset_BridgeGirderCommon

Table — IfcBridgeGirder_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

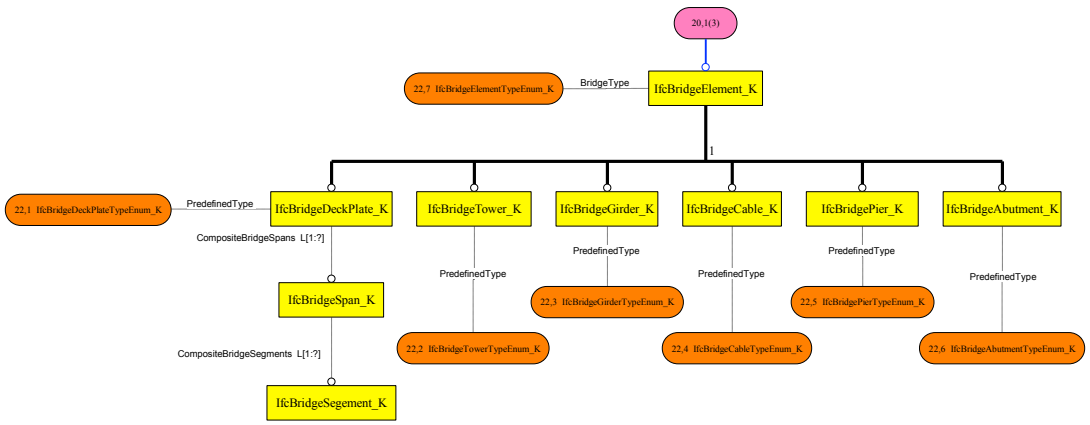
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeGirder_K

EXPRESS Specification:

```
ENTITY IfcBridgeGirder_K
  SUBTYPE OF(IfcBridgeElement_K);
    PredefinedType : OPTIONAL IfcBridgeGirderTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeGirder_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgeGirder_K
  PredefinedType          :  OPTIONAL IfcBridgeGirderTypeEnum_K;
END_ENTITY;
```

3.3.10 IfcBridgeGirderType_K

Description

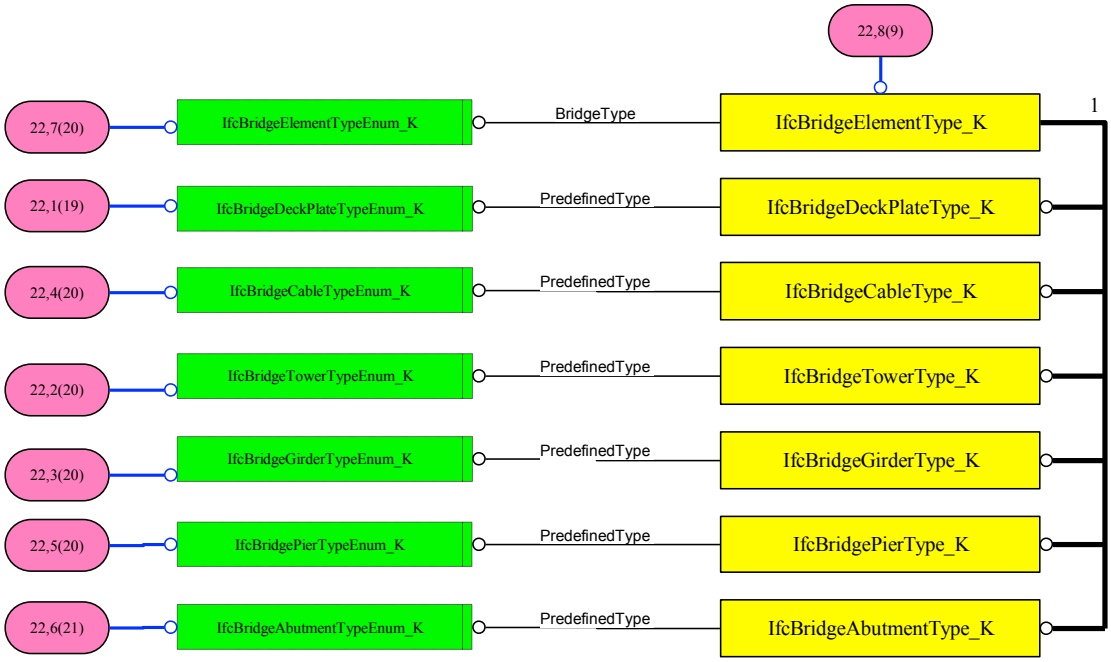
The bridge girder type (IfcBridgeGirderType_K) defines the list of elements used to allot the diverse girder types to determine the bridge type etc. It is used to define the element specifications (the creation of member information and member types) of the bridge girder.

The subtype elements of IfcBridgeGirderType_K, without the definition of shapes, are used to connect the enumeration-type information on the bridge girder type. The creation of IfcBridgeGirderType_K is expressed in instances of IfcBridgeGirder_K.

EXPRESS Specification:

```
ENTITY IfcBridgeGirderType_K
  SUBTYPE OF(IfcBridgeElementType_K);
    PredefinedType : IfcBridgeGirderTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeGirderType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets       :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                   :OPTIONAL IfcLabel;
 INVERSE
```

```
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilStructureElementType_K
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcBridgeGirderType_K
  PredefinedType      :IfcBridgeGirderTypeEnum_K;
END_ENTITY;
```

3.3.11 IfcBridgeCable_K

Description

The bridge cable (IfcBridgeCable_K) is used to express the shape of the connection material between the bridge and the deck plate, or the shape of the cable installed as a tensioning cable for the girder, and to define the properties thereof. The bridge cable can be expressed by grouping a large number of cable strands. Instead of being used as a single material type, it should be used with diverse combination materials and anchorage materials.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcBridgeCableType_K

Table — IfcBridgeCableType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcBridgeCableType_K.

PredefinedType	Name
	Pset_BridgeCableCodeGroup
	Pset_BridgeCableCommon

Table — IfcBridgeCable_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

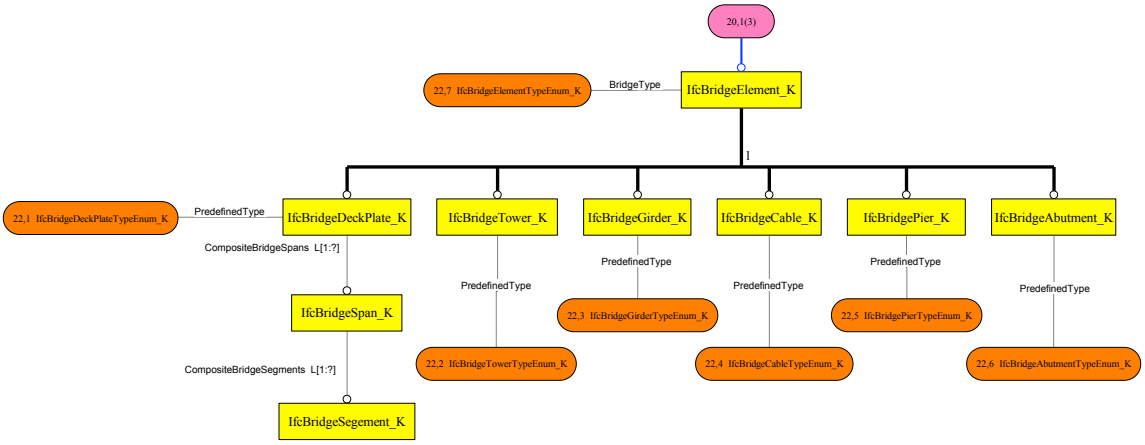
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeCable_K

EXPRESS Specification:

```
ENTITY IfcBridgeCable_K
  SUBTYPE OF(IfcBridgeElement_K);
    PredefinedType : OPTIONAL IfcBridgeCableTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeCable_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
```

```
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgeCable_K
  PredefinedType          :  OPTIONAL IfcBridgeCableTypeEnum_K;
END_ENTITY;
```

3.3.12 IfcBridgeCableType_K

Description

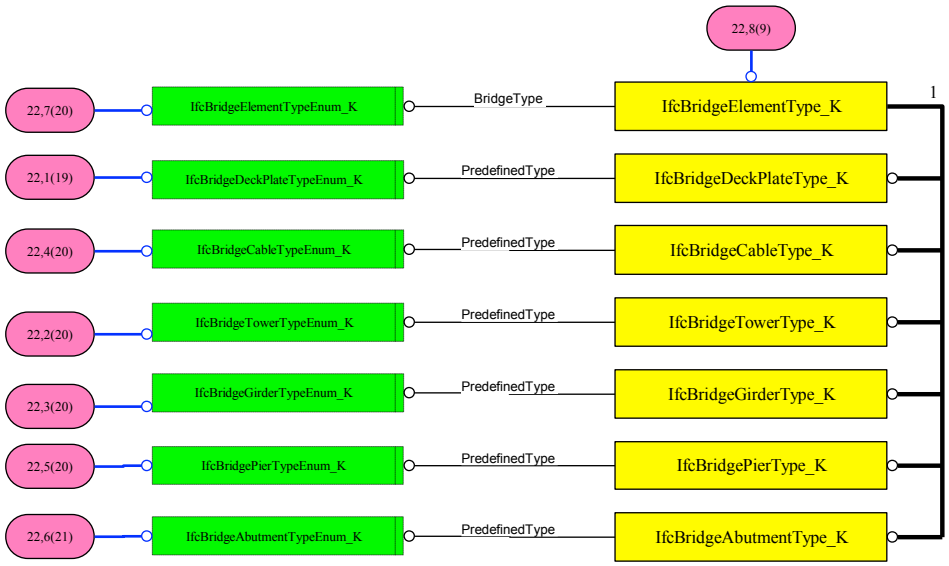
The bridge cable type (IfcBridgeGirderType_K) defines the list of elements used to allot diverse cable types, such as cables connecting the tower, deck plate, and tensioning cables for girders. It is used to define the element specifications (the creation of member information and member types) of the bridge cable.

The subtype elements of IfcBridgeCableType_K, without the definition of shapes, are used to connect the enumeration-type information on the bridge cable type. The creation of IfcBridgeCableType_K is expressed in instances of IfcBridgeCable_K.

EXPRESS Specification:

```
ENTITY IfcBridgeCableType_K
  SUBTYPE OF(IfcBridgeElementType_K);
    PredefinedType : IfcBridgeCableTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeCableType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType           :OPTIONAL IfcLabel;
 ENTITY IfcCivilElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCivilStructureElementType_K
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcBridgeCableType_K
  PredefinedType        :IfcBridgeCableTypeEnum_K;
END_ENTITY;
```

3.3.13 IfcBridgePier_K

Description

A bridge pier (IfcBridgePier_K) is a major structure that determines a bridge's substructure. It consists of foundations, columns, and a coping portion, and allows the deployment of shoes in the coping portion. It is used to express the relevant structure's shape and to define the properties thereof. The pier structure may be connected hierarchically to the space's IfcBridgeSubstructure or be directly connected to IfcBridge_K.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcBridgePierType_K

Table — IfcBridgePierType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcBridgePierType_K.

PredefinedType	Name
	Pset_BridgePierCodeGroup
	Pset_BridgePierCommon

Table — IfcBridgePier_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

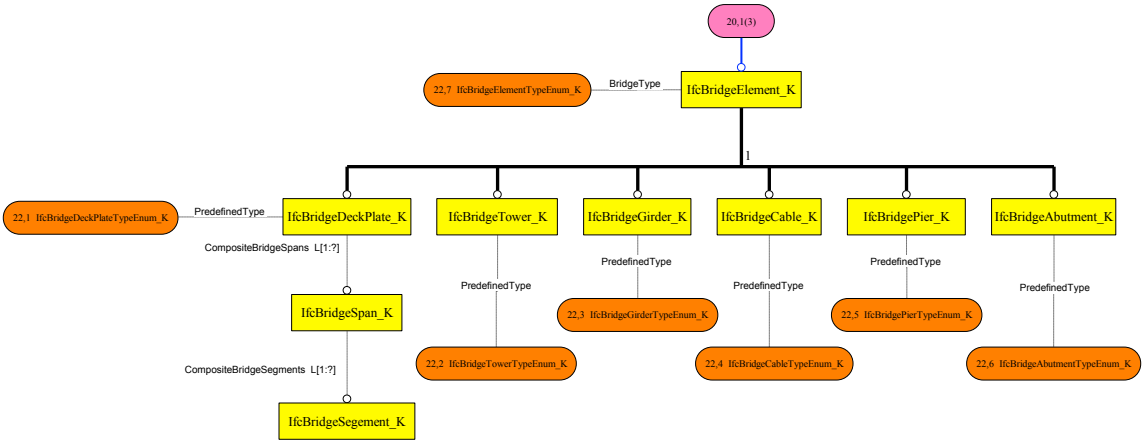
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgePier_K

EXPRESS Specification:

ENTITY IfcBridgePier_K
  SUBTYPE OF(IfcBridgeElement_K);
    PredefinedType : OPTIONAL IfcBridgePierTypeEnum_K;
END_ENTITY;

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgePier_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements  :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures  :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
```

```
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgePier_K
  PredefinedType          :  OPTIONAL IfcBridgePierTypeEnum_K;
END_ENTITY;
```

3.3.14 IfcBridgePierType_K

Description

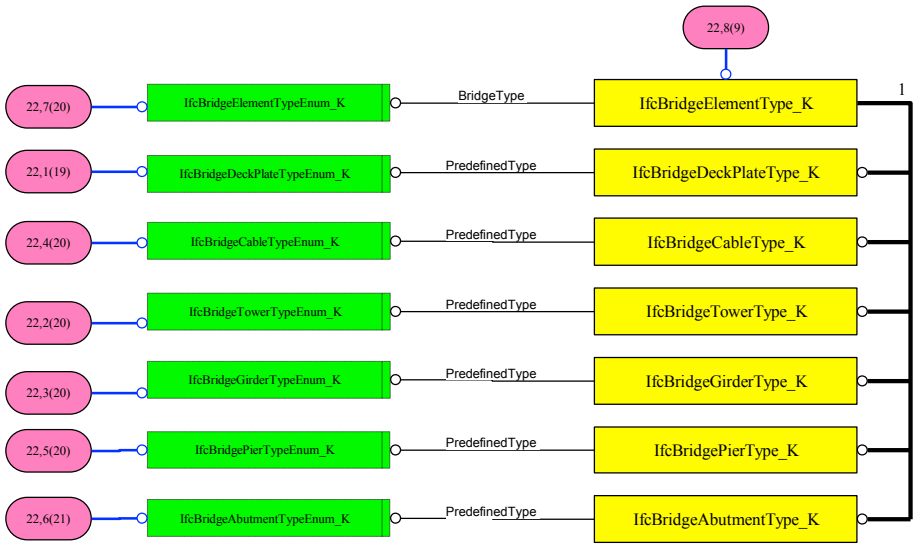
The bridge pier type (IfcBridgeGirderType_K), a major column of a bridge, defines the list of elements used to allot the types of substructures etc. It is used to define the element specifications (the creation of member information and member types) of the bridge pier.

The subtype elements of IfcBridgePierType_K, without the definition of shapes, are used to connect the enumeration-type information on the bridge pier type. The creation of IfcBridgePierType_K is expressed in instances of IfcBridgePier_K.

EXPRESS Specification:

```
ENTITY IfcBridgePierType_K
  SUBTYPE OF(IfcBridgeElementType_K);
    PredefinedType : IfcBridgePierTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

ENTITY IfcBridgePierType_K

```
ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments     :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests              :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy         :SET OF IfcRelNests FOR RelatingObject;
  HasContext         :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy     :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes         :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations    :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types              :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy       :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilStructureElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcBridgePierType_K
  PredefinedType     :IfcBridgePierTypeEnum_K;
END_ENTITY;
```

3.3.15 IfcBridgeAbutment_K

Description

A bridge abutment (IfcBridgeAbutment_K) is installed on both ends of a bridge, and is used to express the shape of the key structure that disperses and supports the major upper structure load, and to define the properties thereof. The abutment structure may be connected hierarchically to the space's IfcBridgeSubstructure or be directly connected to IfcBridge_K. This structure consists of foundations, walls, wing walls, and spheres, like abutments, and these can be grouped into one IfcBridgeAbutment_K.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcBridgeAbutmentType_K

Table — IfcBridgeAbutmentType_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to IfcBridgeAbutmentType_K.

PredefinedType	Name
	Pset_BridgeAbutmentCodeGroup
	Pset_BridgeAbutmentCommon

Table — IfcBridgeAbutment_K Property Sets for Objects

Spatial Containment

This entity's spatial containment concept applies to such entity, as shown in the following table.

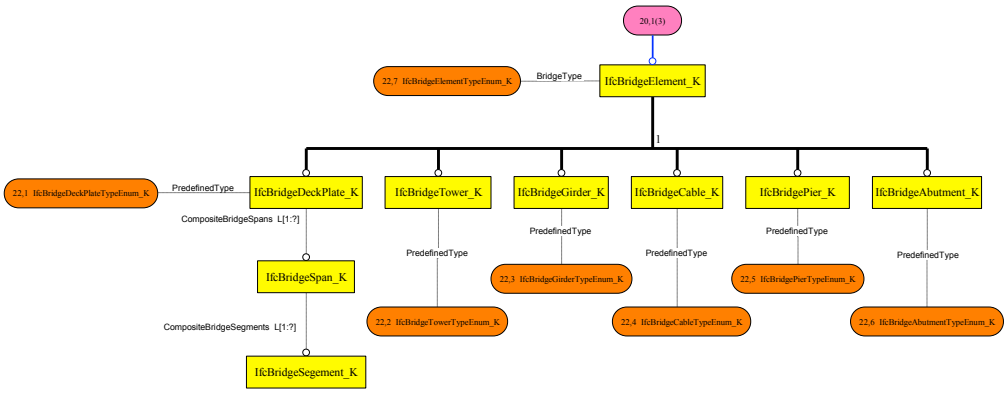
Structure
IfcBridge_K
IfcCurvlinearSpatialAlignment_K
IfcSite

Table — Spatial Containment of IfcBridgeAbutment_K

EXPRESS Specification:

```
ENTITY IfcBridgeAbutment_K
  SUBTYPE OF(IfcBridgeElement_K);
    PredefinedType : OPTIONAL IfcBridgeAbutmentTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeAbutment_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcCivilElement
 ENTITY IfcCivilStructureElement_K
 ENTITY IfcBridgeElement_K
  PredefinedType          :  OPTIONAL IfcBridgeElementTypeEnum_K;
 ENTITY IfcBridgeAbutment_K
  PredefinedType          :  OPTIONAL IfcBridgeAbutmentTypeEnum_K;
END_ENTITY;
```

3.3.16 IfcBridgeAbutmentType_K

Description

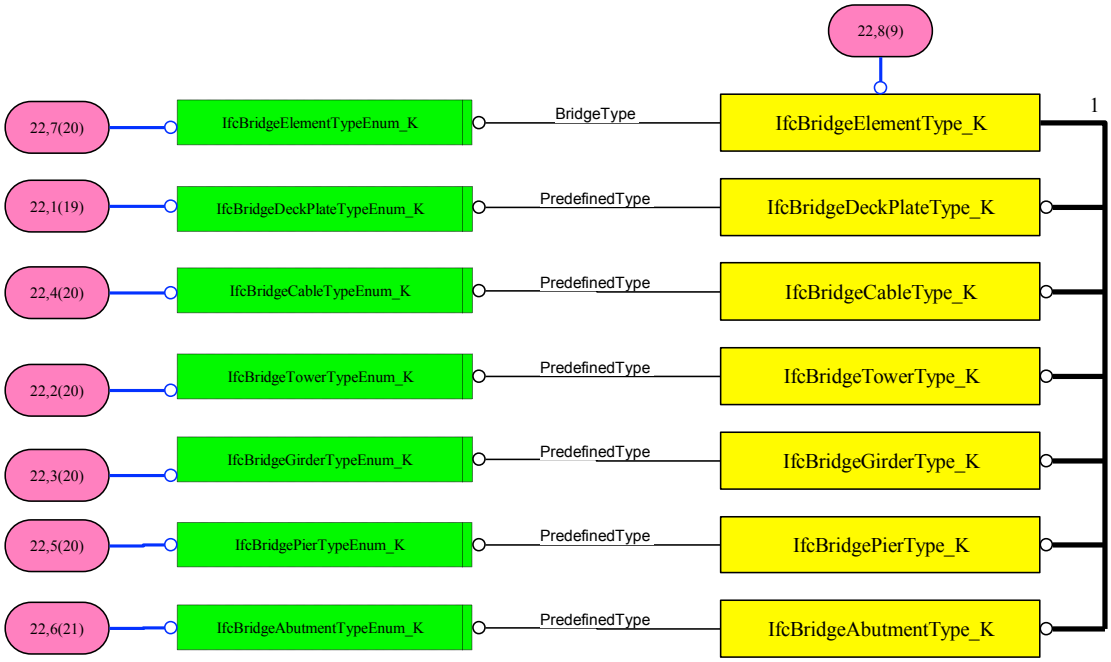
The bridge abutment type (IfcBridgeAbutmentType_K) defines the list of elements used to allot the substructure types of an abutment installed at both ends of the deck plate at the bridge start and end points and that supports the deck plate. It is used to define the element specifications (the creation of member information and member types) of the bridge abutment.

The subtype elements of IfcBridgeAbutmentType_K, without the definition of shapes, are used to connect the enumeration-type information on the bridge abutment type. The creation of IfcBridgeAbutmentType_K is expressed in instances of IfcBridgeAbutment_K.

EXPRESS Specification:

```
ENTITY IfcBridgeAbutmentType_K
  SUBTYPE OF(IfcBridgeElementType_K);
    PredefinedType : IfcBridgeAbutmentTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

ENTITY IfcBridgeAbutmentType_K

```
ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
  HasAssignments     :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests              :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy         :SET OF IfcRelNests FOR RelatingObject;
  HasContext         :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy     :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes         :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations    :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
  Types              :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
  RepresentationMaps:OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
INVERSE
  ReferencedBy       :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
  ElementType        :OPTIONAL IfcLabel;
ENTITY IfcCivilElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcCivilStructureElementType_K
  ElementType       :OPTIONAL IfcLabel;
ENTITY IfcBridgeAbutmentType_K
  PredefinedType     :IfcBridgeAbutmentTypeEnum_K;
END_ENTITY;
```

3.4 Property Sets

3.4.1 Pset_BridgeElementCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeElement_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.2 Pset_BridgeElementManagement

PSET_TYPEDRIVENOVERRIDE / IfcBridgeElement_K

- **BridgeElementID**
  - P_SINGLEVALUE / IfcIdentifier
- **BridgeElementType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_BridgeElementType: ARCH_BRIDGE, CABLE_STAYED_BRIDGE, PREFLEX_GIRDER_BRIDGE, PSC_BOX_GIRDER_BRIDGE, PSC_HOLLOW_SLAB_BRIDGE, PSC_I_GIRDER_BRIDGE, PSC_SLAB_BRIDGE, RAHMEN_BRIDGE, RC_BOX_GIRDDER_BRIDGE, RC_HOLLOW_SLAB_BRIDGE, RC_SLAB_BRIDGE, RC_T_BEAM_GIRDER_BRIDGE, STEEL_BOX_GIRDDER_BRIDGE, STEEL_PLATE_GIRDER_BRIDGE, SUSPENSION_BRIDGE, TRUSS_BRIDGE, OVERPASS, USER_DEFINED, NOT_DEFINED
- **ManagementAuthority**
  - P_SINGLEVALUE / IfcLabel
- **ConstructionDuration**
  - P_SINGLEVALUE / IfcDuration
- **LocationAddress**
  - P_SINGLEVALUE / IfcLabel
- **StartDate**
  - P_SINGLEVALUE / IfcDate
- **FinishDate**
  - P_SINGLEVALUE / IfcDate
- **Owner**
  - P_SINGLEVALUE / IfcLabel
- **Constractor**
  - P_SINGLEVALUE / IfcLabel
- **SubConstractor1**
  - P_SINGLEVALUE / IfcLabel
- **SubConstractor2**
  - P_SINGLEVALUE / IfcLabel
- **TotalProjectCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure
- **DesignCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure
- **ConstructionCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure
- **SupervisionCost**
  - P_SINGLEVALUE / IfcMonetaryMeasure

3.4.3 Pset_BridgeElementCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeElement_K

- **BridgeLength**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **BridgeHeight**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **OverallWidth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **RoadLaneWidth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure

- **SidewalkWidth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **GoingUPRoadLaneNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **GoingDownRoadLaneNumber**
  - P_SINGLEVALUE / IfcCountMeasure
- **StartingPoint**
  - P_SINGLEVALUE / IfcLabel
- **EndPoint**
  - P_SINGLEVALUE / IfcLabel

3.4.4 Pset_BridgeDeckPlateCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeDeckPlate_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.5 Pset_BridgeDeckPlateCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeDeckPlate_K

- **BridgeDeckPlateID**
  - P_SINGLEVALUE / IfcIdentifier
- **DeckPlateType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_BridgeDeckPlateType: APPROACH_SLAB, USER_DEFINED, NOT_DEFINED
- **CompositeBridgeSpans**
  - P_SINGLEVALUE / IfcLabel / CompositeBridgeSpance L[1:?]
- **Others**
  - P_SINGLEVALUE / IfcLabel

3.4.6 Pset_BridgeSpanCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeSpan_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel

- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.7 Pset_BridgeSpanCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeSpan_K

- **BridgeSpanID**
  - P_SINGLEVALUE / IfcIdentifier
- **BridgeSpanNumber**
  - P_SINGLEVALUE / IfcLabel
- **BridgeSpanLangth**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **CompositeBridgeSegments**
  - P_SINGLEVALUE / IfcLabel / CompositeBridgeSegments L[1:?]

3.4.8 Pset_BridgeSegmentCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeSegment_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space:**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.9 Pset_BridgeSegmentCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeSegment_K

- **BridgeSegmentID**
  - P_SINGLEVALUE / IfcIdentifier
- **CastInPlaceStatus**
  - P_SINGLEVALUE / IfcBoolean
- **BridgeSegmentNumber**
  - P_SINGLEVALUE / IfcLabel

3.4.10 Pset_BridgeTowerCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeTower_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.11 Pset_BridgeTowerCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeTower_K

- **BridgeTowerID**
  - P_SINGLEVALUE / IfcIdentifier
- **BridgeTowenType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_BridgeTowerType: USERDEFINED, NOTDEFINED
- **ConstructionMethod**
  - P_SINGLEVALUE / IfcLabel
- **HeightOfBridgeTower**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **FoundationTypeOfBridge**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilFootingType: BASE_FOOTING, PITMOUTH_FOOTING, CAISSON_FOUNDATION, PSC_PILE_FOUNDATION, RC_PILE_FOUNDATION, SLURRY_WALL_FOUNDATION, SPREAD_FOUNDATION, STEEL_PILE_FOUNDATION, STEEL_SHEET_PILE_FOUNDATION, USERDEFINED, NOTDEFINED

3.4.12 Pset_BridgeGirderCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeGirder_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.13 Pset_BridgeGirderCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeGirder_K

- **BridgeGirderID**
  - P_SINGLEVALUE / IfcIdentifier
- **BridgeGirderType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_BridgeGirderType: BEAM, RC, NOT_DEFINED, USER_DEFINED
- **ConstructionMethod**
  - P_SINGLEVALUE / IfcLabel
- **HasCable**
  - P_SINGLEVALUE / IfcBoolean

3.4.14 Pset_BridgeCableCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeCable_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.15 Pset_BridgeCableCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeCable_K

- **BridgeCableID**
  - P_SINGLEVALUE / IfcIdentifier
- **BridgeCableType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_BridgeCableType: SUSPENDER, SUSPENSION_CABLE, USER_DEFINED, NOT_DEFINED, TENSION_CABLE
- **ConstructionMethod**
  - P_SINGLEVALUE / IfcLabel
- **CableMaterial**
  - P_SINGLEVALUE / IfcLabel

3.4.16 Pset_BridgePierCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgePier_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**

- P_SINGLEVALUE / IfcLabel

- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.17 Pset_BridgePierCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgePier_K

- **BridgePierID**
  - P_SINGLEVALUE / IfcIdentifier
- **BridgePierType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_BridgePierType: ARCH_TYPE, GRAVITY_TYPE, RAHMEN_ABUT_TYPE, RAHMEN_PIER_TYPE, SEMI_GRAVITY_TYPE, T_SHAPED_TYPE, V_SHAPED_TYPE, WALL_TYPE, USER_DEFINED, NOT_DEFINED
- **ConcreteBatchPourStatus**
  - P_SINGLEVALUE / IfcBoolean
- **PierConstructionMethod**
  - P_SINGLEVALUE / IfcLabel
- **PierMaterial**
  - P_SINGLEVALUE / IfcLabel
- **PierFoundationType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilFootingType: BASE_FOOTING, PITMOUTH_FOOTING, CAISSON_FOUNDATION, PSC_PILE_FOUNDATION, RC_PILE_FOUNDATION, SLURRY_WALL_FOUNDATION, SPREAD_FOUNDATION, STEEL_PILE_FOUNDATION, STEEL_SHEET_PILE_FOUNDATION, USERDEFINED, NOTDEFINED
- **AntiCollisionBlockInstallationStatus**
  - P_SINGLEVALUE / IfcBoolean

3.4.18 Pset_BridgeAbutmentCodeGroup

PSET_TYPEDRIVENOVERRIDE / IfcBridgeAbutment_K

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

3.4.19 Pset_BridgeAbutmentCommon

PSET_TYPEDRIVENOVERRIDE / IfcBridgeAbutment_K

- **BridgeAbutmentID**
  - P_SINGLEVALUE / IfcIdentifier
- **BridgeAbutmentType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_BridgeAbutmentType: BOX_TYPE, COUNTERFORT_TYPE, GRAVITY_TYPE, RAHMEN_ABUT_TYPE, RAHMEN_TYPE, REVERSED_T_SHAPED_TYPE, SEMI_GRAVITY_TYPE, USER_DEFINED, NOT_DEFINED
- **ConcreteBatchPourStatus**
  - P_SINGLEVALUE / IfcBoolean
- **AbutmentConstructionMethod**
  - P_SINGLEVALUE / IfcLabel
- **AbutmentMaterial**
  - P_SINGLEVALUE / IfcLabel
- **AbutmentFoundationType**
  - P_ENUMERATEDVALUE / IfcLabel / PEnum_CivilFootingType: BASE_FOOTING, PITMOUTH_FOOTING, CAISSON_FOUNDATION, PSC_PILE_FOUNDATION, RC_PILE_FOUNDATION, SLURRY_WALL_FOUNDATION, SPREAD_FOUNDATION, STEEL_PILE_FOUNDATION, STEEL_SHEET_PILE_FOUNDATION, USERDEFINED, NOTDEFINED
- **AntiCollisionBlockInstallationStatus**
  - P_SINGLEVALUE / IfcBoolean

4 IfcSharedCivilTunnelElements

4.1 Schema Definition

This shared civil tunnel element schema defines tunnels in civil engineering.

4.2 Types

4.2.1 IfcTunnelLiningTyepEnum_K

This enumeration defines the different predefined types of tunnel lining that can further specify an IfcTunnelLining _K.

Enumerated Item Definitions:

- **FOOTING_SEGMENT**
- **PRECAST_CONCRETE_SEGMENT**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcTunnelLiningTyepEnum_K = ENUMERATION OF (
  FOOTING_SEGMENT
  PRECAST_CONCRETE_SEGMENT
  USERDEFINED,
  NOTDEFINED);
```

```
END_TYPE;
```

4.2.2 IfcTunnelInvertTypeEnum_K

This enumeration defines the different predefined types of tunnel invert that can further specify an IfcTunnelInvert_K..

Enumerated Item Definitions:

- **STRAIGHT**
- **CURVED**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcTunnelInvertTypeEnum_K = ENUMERATION OF (
  STRAIGHT
  CURVED
  USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

4.2.3 IfcTunnelPitMouthTypeEnum_K

This enumeration defines the different predefined types of tunnel pit mouth that can further specify an IfcTunnelPitMouth_K.

Enumerated Item Definitions:

- **GRAVITY**
- **WING**
- **PARAPET**
- **CYLIDRICALSECTION**
- **BELLMOUTH**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcTunnelPitMouthTypeEnum_K = ENUMERATION OF (
  GRAVITY
  WIN
  PARAPET
  CYLIDRICALSECTION
  BELLMOUTH USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

4.2.4 IfcTunnelLiningSegmentTypeEnum_K

This enumeration defines the different predefined types of tunnel lining segment that can further specify an IfcTunnelLining_K.

Enumerated Item Definitions:

- **GRAVAL**
- **SAND**
- **SILT**
- **CLAY**
- **ORGANIC_CLAY**
- **PEAPING_ROCK**
- **BLASTING_ROCK_SOFT**
- **BLASTING_ROCK_NORMAL**
- **BLASTING_ROCK_HARD**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcTunnelLiningSegmentTypeEnum_K = ENUMERATION OF (
  GRAVAL
  SAND
  SILT
  CLAY
  ORGANIC_CLAY
  PEAPING_ROCK
  BLASTING_ROCK_SOFT
  BLASTING_ROCK_NORMAL
  BLASTING_ROCK_HARD
  USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

4.3 Entities

4.3.1 IfcTunnelElement_K

Description

A subordinate entity of IfcSharedCivilTunnelElements is an entity that expresses tunnel elements in civil engineering.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type

IfcTunnelElementType_K

Table — IfcTunnelElement_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

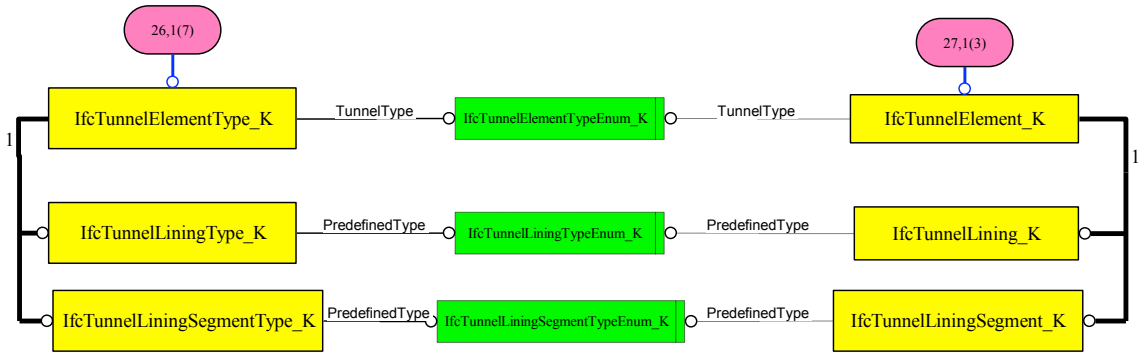
PredefinedType	Name
	Pset_TunnelElementCodeGroup
	Pset_TunnelElementManagement
	Pset_TunnelElementCommon

Table — IfcTunnelElement_K Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcTunnelElement_K
  SUBTYPE OF(IfcSharedCivilTunnelElements);
    PredefinedType : OPTIONAL IfctunnelElementTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcTunnelElement_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
```

```
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcTunnelElement_K
  PredefinedType          :OPTIONAL IfcTunnelElementTypeEnum_K;
END_ENTITY;
```

4.3.2 IfcTunnelLining_K

Description

A subordinate entity of IfcSharedCivilTunnelElements is an entity that expresses the tunnel lining in civil engineering.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcTunnelLiningType_K

Table — IfcTunnelLining_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

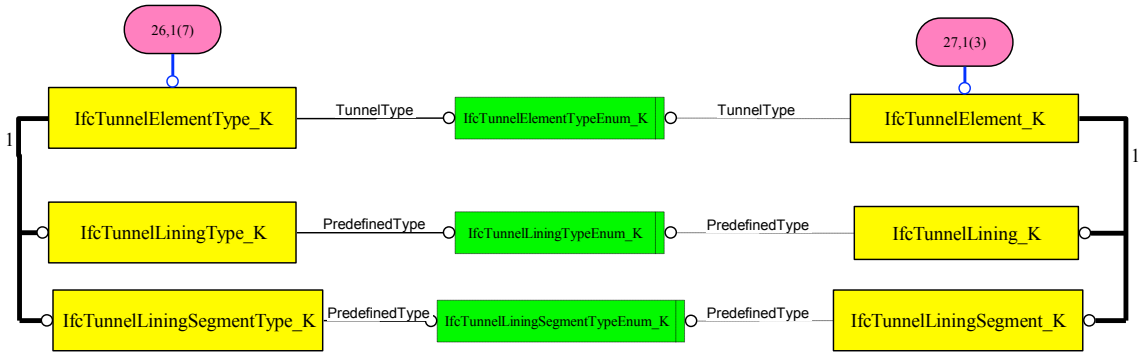
PredefinedType	Name
	Pset_TunnelLiningCodeGroup
	Pset_TunnelLiningCommon

Table — IfcTunnelLining_K Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcTunnelLining_K
  SUBTYPE OF(IfcSharedCivilTunnelElements);
    PredefinedType : OPTIONAL IfcTunnelLiningType_Enum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcTunnelLining_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
```

```
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcTunnelLining_K
  PredefinedType         : OPTIONAL IfcTunnelLiningTypeEnum_K;
END_ENTITY;
```

4.3.3 IfcTunnelLiningSegment_K

Description

A subordinate entity of IfcSharedCivilTunnelElements is an entity that expresses a tunnel lining segment in civil engineering.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcTunnelLiningSegment Type_K

Table — IfcTunnelLiningSegment_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

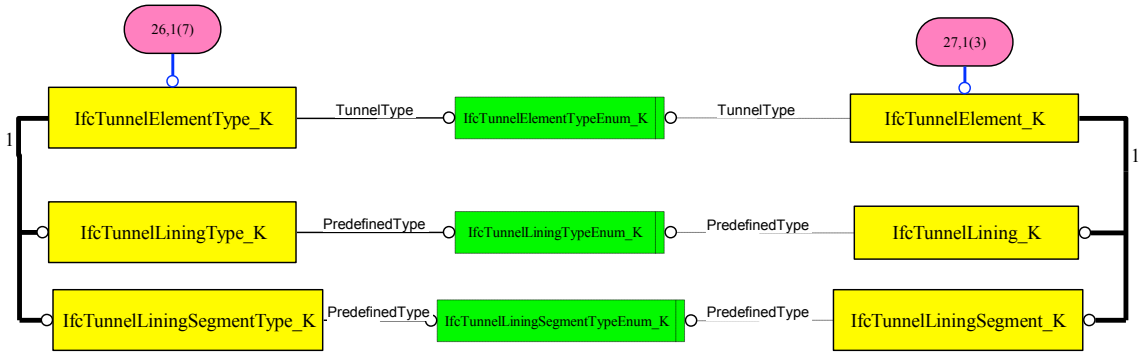
PredefinedType	Name
	Pset_TunnelLiningSegmentCodeGroup
	Pset_TunnelLiningSegmentCommon

Table — IfcTunnelLiningSegment_K Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcTunnelLiningSegment_K
  SUBTYPE OF(IfcSharedCivilTunnelElements);
    PredefinedType : OPTIONAL IfcTunnelLiningSegmentType_Enum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcTunnelLiningSegment_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcTunnelLiningSegment_K
  PredefinedType         : OPTIONAL IfcTunnelLiningSegmentTypeEnum_K;
END_ENTITY;
```

5 IfcSharedCivilEarthworkElements

5.1 Schema Definition

This shared civil earthwork element schema defines earthwork in civil engineering.

5.2 Types

5.2.1 IfcEarthworkElementTypeEnum_K

This enumeration defines the different predetermined types of earthwork elements that can further specify an IfcEarthworkElement_K.

Enumerated Item Definitions:

- **TOPOGRAPHYBASE**
- **CUTTING**
- **FILLING**
- **APPROACHSECTION**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcEarthworkElementTypeEnum_K = ENUMERATION OF (
  TOPOGRAPHYBASE
  CUTTING
  FILLING
  APPROACHSECTION
  USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

5.2.2 IfcTopographyOriginalTypeEnum_K

This enumeration defines the different predetermined types of original topographic elements that can further specify an IfcTopographyOriginal_K.

Enumerated Item Definitions:

- **GRAVAL**
- **SAND**
- **SILT**
- **CLAY**
- **ORGANIC_CLAY**
- **PEAPING_ROCK**
- **BLASTING_ROCK_SOFT**
- **BLASTING_ROCK_NORMAL**
- **BLASTING_ROCK_HARD**
- **USERDEFINED**

- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcTopographyOriginalTypeEnum_K = ENUMERATION OF (
  GRAVAL
  SAND
  SILT
  CLAY
  ORGANIC_CLAY
  PEAPING_ROCK
  BLASTING_ROCK_SOFT
  BLASTING_ROCK_NORMAL
  BLASTING_ROCK_HARD
  USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

5.3 Entities

5.3.1 IfcEarthWorkElement_K

Description

A subordinate entity of IfcSharedCivilTunnelElements is an entity that expresses an earthwork element in civil engineering.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcEarthWorkElementType_K

Table — IfcEarthWorkElement_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

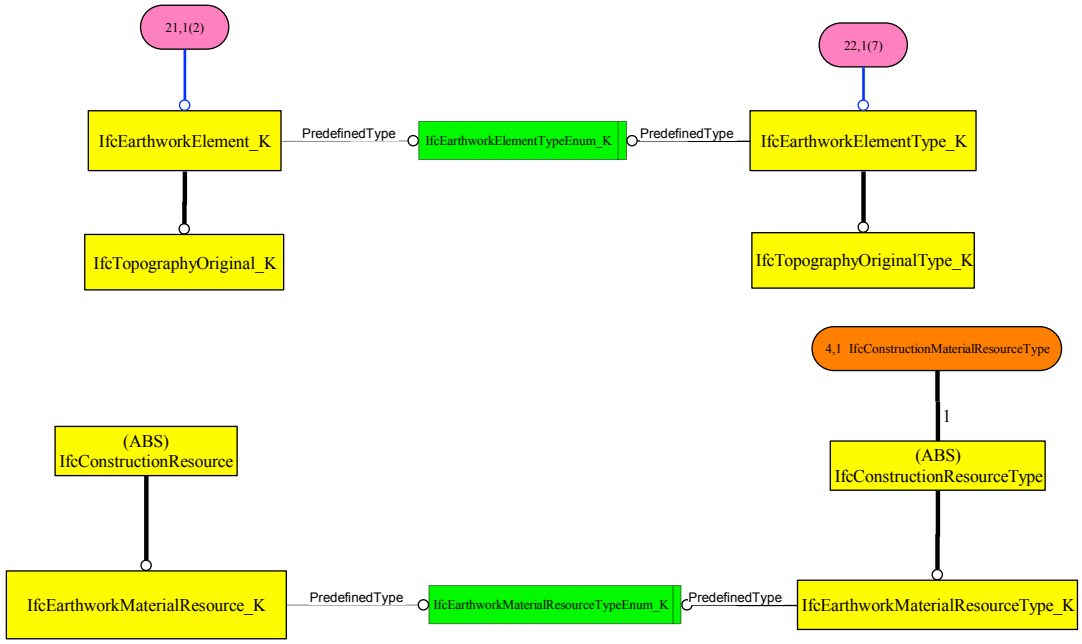
PredefinedType	Name
	Pset_IfcEarthworkElementCommon
	Pset_IfcEarthworkElementCommon

Table — IfcEarthWorkElement_K Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcEarthWorkElement_K
  SUBTYPE OF(IfcSharedCivilEarthworkElements);
    PredefinedType : OPTIONAL IfcEarthWorkElementTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcEarthWorkElement_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
```

```
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcEarthWorkElement_K
  PredefinedType          :OPTIONAL IfcEarthWorkElementTypeEnum_K;
END_ENTITY;
```

5.3.2 IfcTopographyOriginal_K

Description

A subordinate entity of IfcSharedCivilTunnelElements is an entity that expresses the original topography in civil engineering.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcTopographyOriginalType_K

Table — IfcTopographyOriginal_K Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

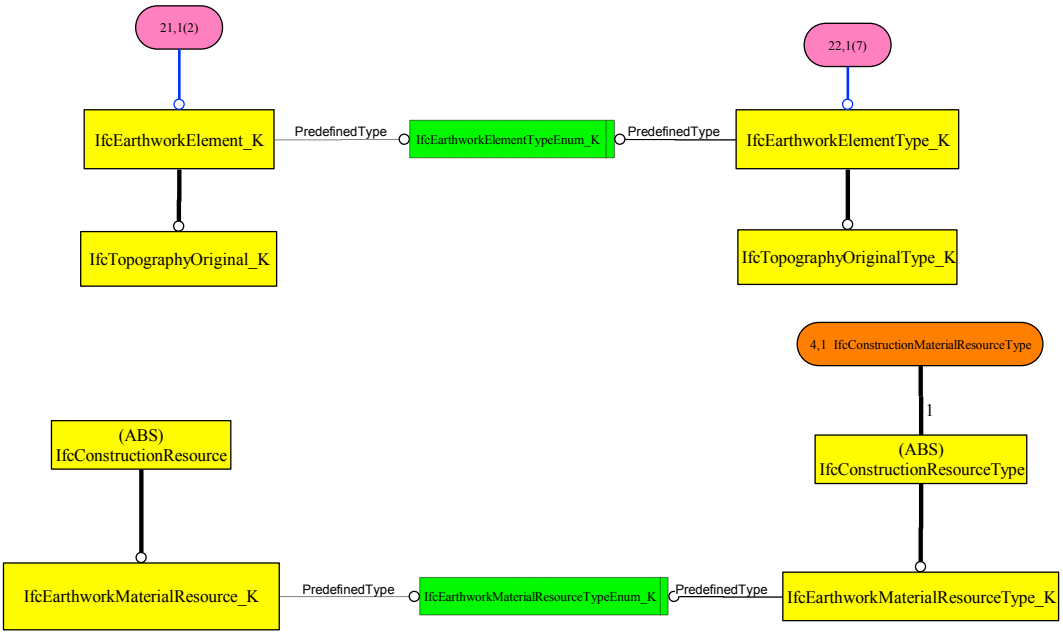
PredefinedType	Name
	Pset_TopographyOriginalCodeGroup
	Pset_TopographyOriginalCommon

Table — IfcTopographyOriginal_K Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcTopographyOriginal_K
  SUBTYPE OF(IfcEarthWorkElement_K);
    PredefinedType : OPTIONAL IfcTopographyOriginalType_Enum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcTopographyOriginal_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
```

```
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcTopographyOriginal_K
  PredefinedType         : OPTIONAL IfcTopographyOriginalTypeEnum_K;
END_ENTITY;
```

6 IfcSharedCivilServiceElements

6.1 Schema Definition

The IfcSharedCivilServiceElement schema conceptually defines elements of service facilities in civil engineering that can be generally applied and used in various civil engineering facilities.

6.2 Types

6.2.1 IfcRoadSignEquipmentTypeEnum_K

The IfcSharedCivilServiceElement schema conceptually defines elements of service facilities in civil engineering that can be generally applied and used in various civil engineering facilities.

Enumerated Item Definitions:

- **DELINEATOR**
- **TRAFFIC_SIGN**
- **REFLECTING_MIRROR**
- **TRAFFIC_SIGNAL**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadSignEquipmentTypeEnum_K = ENUMERATION OF (
  DELINEATOR,
  TRAFFIC_SIGN,
  REFLECTING_MIRROR,
  TRAFFIC_SIGNAL,
  USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

6.2.2 IfcRoadProtectionTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcRoadProtection_K or IfcRoadProtectionType_K, as the already defined type of road visual facility.

Enumerated Item Definitions:

- **GUARD_RAIL**
- **GUARD_FENCE**
- **CRASH_CUSHION**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadSignEquipmentTypeEnum_K = ENUMERATION OF (
  GUARD_RAIL,
  GUARD_FENCE,
  CRASH_CUSHION,
  USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

6.2.3 IfcPavementAdditionTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcPavementAddition_K or IfcPavementAdditionType_K, as the already defined type of additional road pavement facility.

Enumerated Item Definitions:

- **PEDESTRIAN_CROSSWALK**
- **ROADMARKER**
- **SPEEDHUMP**
- **ANTISLIDING**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcPavementAdditiontTypeEnum_K = ENUMERATION OF (
  PEDESTRIAN_CROSSWALK,
  ROADMARKER,
  SPEEDHUMP,
  ANTISLIDING,
  USERDEFINED,
  NOTDEFINED);
END_TYPE;
```

6.3 Entities

6.3.1 IfcSubsidiaryFacility_K

Description

IfcSubsidiaryFacility_K expresses the facilities installed to secure traffic and ensure safe passage or convenience, as elements that express supplementary road facilities installed to ensure safe and smooth clearance of road traffic and efficient road operation, as well as the facilities installed to reduce damage in areas that obstruct traffic or that may damage roads due to falling rocks, collapses, waves, winds, or snow cover. The subordinate entities of IfcSubsidiartFacility_K comprise IfcRoadSignEquipment_K, which expresses a visual road facility; IfcGuard_K, which expresses a road protection facility; and IfcRoadPavementAddition_K, which expresses a facility additionally attached to a pavement.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

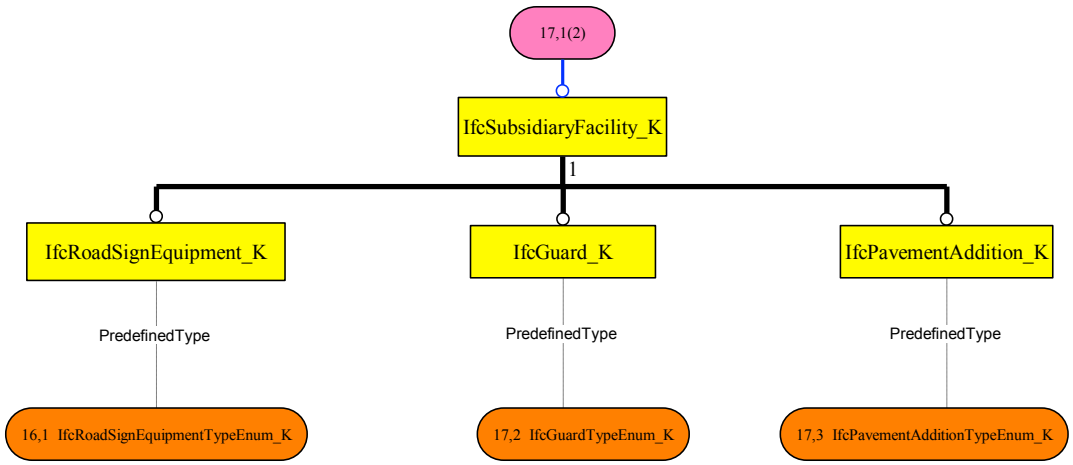
Type
IfcSubsidiaryFacilityType_K

Table — IfcSubsidiaryFacilityType_K Object Typing

EXPRESS Specification:

```
ENTITY IfcSubsidiaryFacilty_K
  SUBTYPE OF(IfcCivilElement);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcSubsidiaryFacility_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
```

```
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares              :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy             :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy           :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement       :OPTIONAL IfcObjectPlacement;
  Representation        :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy          :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                   :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcSubsidiaryFacility_K
END_ENTITY;
```

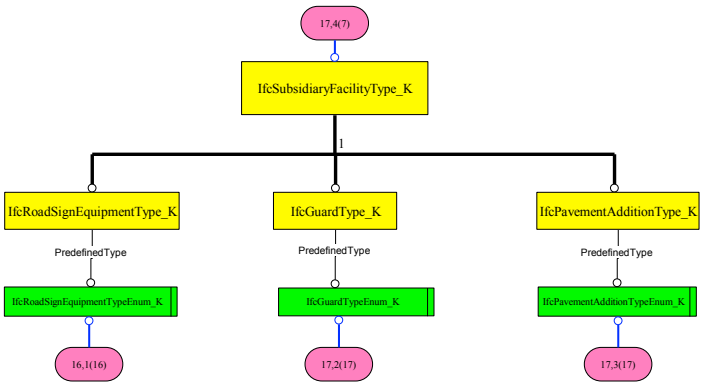
6.3.2 IfcSubsidiaryFacilityType_K

IfcSubsidiaryFacilityType_K, an entity that defines the type of supplementary road facility, comprises the subordinate entities, i.e., IfcRoadSignEquipment_K, which expresses the type of visual road facility; IfcGuardType_K, which expresses the type of road protection facility; and IfcPavementAddition_K, which expresses the type of additional pavement facility. IfcSubsidiaryFacilityType_K is the upper-level concept that can commonly express such types.

EXPRESS Specification:

```
ENTITY IfcSubsidiaryFacilityType_K
  SUBTYPE OF(IfcCivilELementType);
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcSubsidiaryFacilitytType_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps  :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilElemtType
 ENTITY IfcSubsidiaryFacilityType_K
 END_ENTITY;
```

6.3.3 IfcRoadSignEquipment_K

Description

IfcRoadSignEquipment_K defines the facilities that provide visual information to ensure the safety of drivers and pedestrians on roads.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadSignEquipmentType

Table — IfcRoadSignEquipment Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

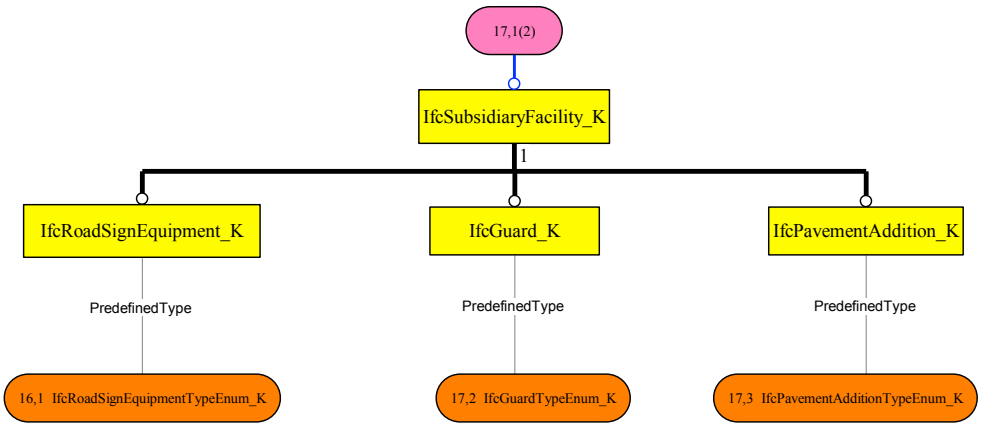
PredefinedType	Name
	Pset_RoadSignEquimentCodeGroup
	Pset_RoadSignEquimentCommon

Table — IfcRoadSignEquipment Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcRoadSignEquipment_K
  SUBTYPE OF(IfcSubsidiaryFacility_K);
    PredefinedType : OPTIONAL IfcRoadSignEquipmentTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfRoadSignEquipment_K
 ENTITY IfcRoot
```

```
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy         :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement     :OPTIONAL IfcObjectPlacement;
  Representation      :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                 :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcSubsidiaryFacility_K
 ENTITY IfRoadSignEquipment_K
  PredefinedType         :OPTIONAL IfcRoadSignEquipmentTypeEnum_K;
END_ENTITY;
```

6.3.4 IfcRoadSignEquipmentType_K

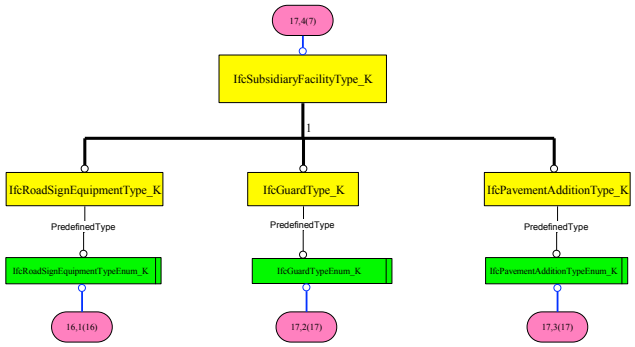
Description

fcRoadSignEquipmentType_K expresses the type of facility that provides visual information to ensure the safety of drivers and pedestrians on the road. It includes visual guide facilities, road signs, road reflectors, and traffic lights.

EXPRESS Specification:

```
ENTITY IfcRoadSignEquipmentType_K
  SUBTYPE OF(IfcSubsidiaryFacilityType_K);
    PredefinedType : IfcRoadSignEquipmentTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadSignEquipmentType_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps  :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType         :OPTIONAL IfcLabel;
 ENTITY IfcCivilElemtType
 ENTITY IfcSubsidiaryFacilityType_K
 ENTITY IfcRoadSignEquipmentType_K
 PredefinedType      :IfcRoadSignEquipmentTypeEnum_K
 END_ENTITY;
```

6.3.5 IfcGuard_K

Description

IfcGuard_K defines facilities installed to prevent roads and supplementary road facilities, from being damaged, and to protect drivers.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcGuardType

Table — IfcRoadPavement Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

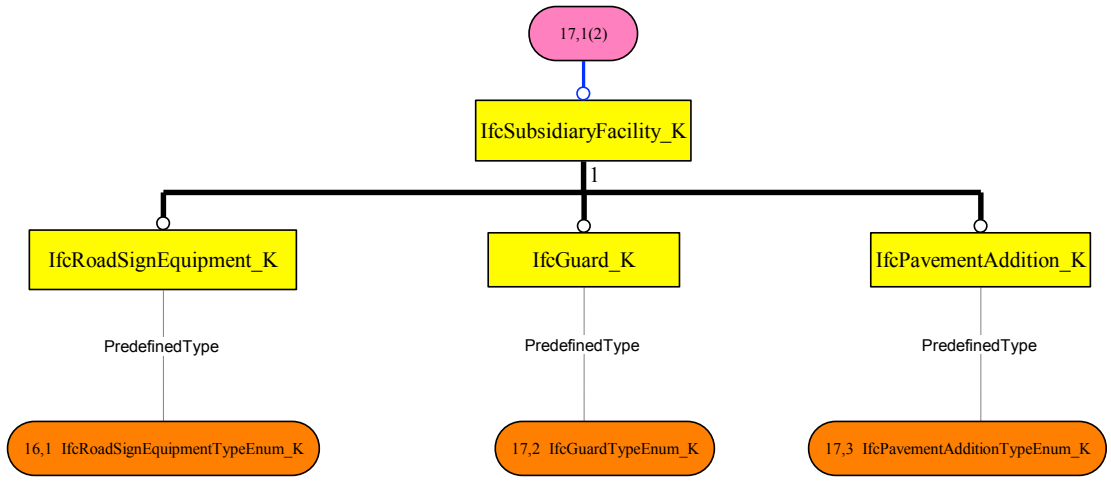
PredefinedType	Name
	Pset_GuardCodeGroup
	Pset_GuardCommon

Table — IfcRoadPavement Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcGuard_K
  SUBTYPE OF(IfcSubsidiaryFacility_K);
    PredefinedType : OPTIONAL IfcGuardTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcGuard_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcSubsidiaryFacility_K
 ENTITY IfcGuard_K
  PredefinedType          :OPTIONAL IfcGuardTypeEnum_K;
END_ENTITY;
```

6.3.6 IfcGuardType_K

Description

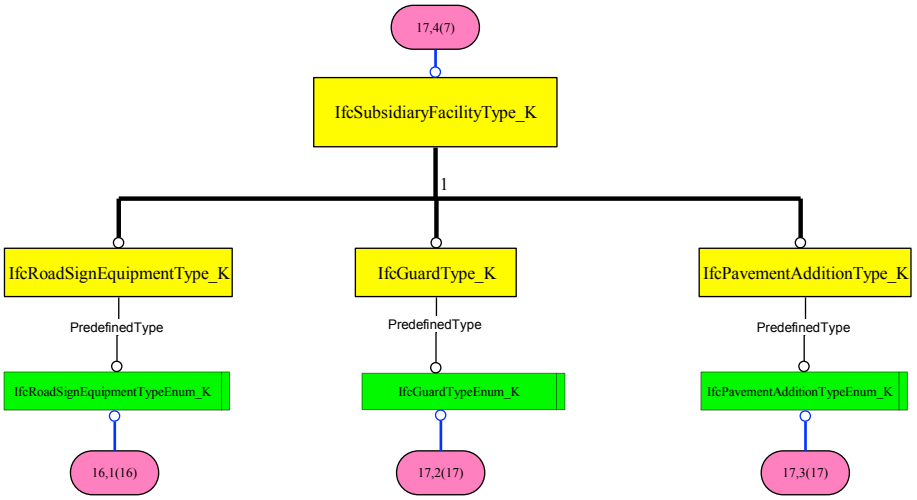
IfcGuardType_K is an entity that expresses the type of facility, i.e., a supplementary road facility, installed to prevent a road from being damaged and to protect drivers. It includes road protection facilities, guardrails, and shock-prevention facilities.

EXPRESS Specification:

```
  ENTITY IfcGuardType_K
    SUBTYPE OF(IfcSubsidiaryFacilityType_K);
      PredefinedType : IfcGuardTypeEnum_K;
```

```
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcGuardType_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps   :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCivilElemtType
 ENTITY IfcSubsidiaryFacilityType_K
 ENTITY IfcGuardType_K
 PredefinedType       :IfcGuardTypeEnum_K
 END_ENTITY;
```

6.3.7 IfcPavementAddition_K

Description

IfcPavementAddition_K defines the type of facility combined with road pavements, to constitute the road surface in the 3D model.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcRoadPavementType

Table — IfcRoadPavement Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

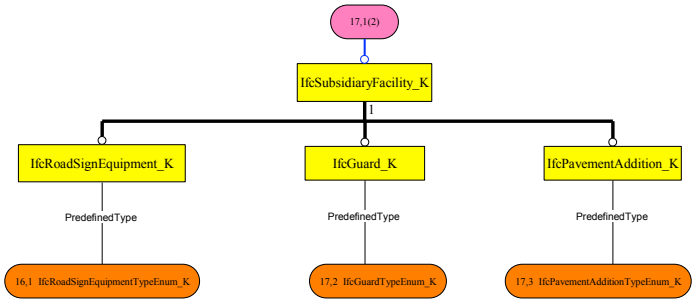
PredefinedType	Name
	Pset_PavementAdditionCodeGroup
	Pset_PavementAdditionCommon

Table — IfcRoadPavement Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcPavementAddition_K
    SUBTYPE OF(IfcSubsidiaryFacility_K);
      PredefinedType : OPTIONAL IfcPavementAdditionTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcPavementAddition_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;

 ENTITY IfcCivilElement
 ENTITY IfcSubsidiaryFacility_K
 ENTITY IfcPavementAddition_K
  PredefinedType          :OPTIONAL IfcPavementAdditionTypeEnum_K;
END_ENTITY;
```

6.3.8 IfcPavementAdditionType_K

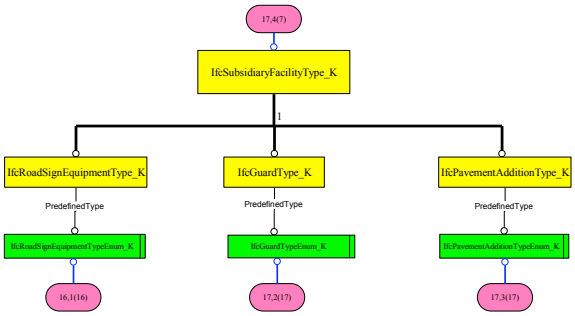
Description

IfcPavementAdditionType_K expresses the type of facility combined with road pavements, and includes crosswalks, road signs, overspeed prevention facilities, and slippery surface prevention facilities.

EXPRESS Specification:

```
ENTITY IfcPavementAdditionType_K
    SUBTYPE OF(IfcSubsidiaryFacilityType_K);
      PredefinedType : IfcPavementAdditionTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcPavementAdditionType_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps   :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
  ElementType          :OPTIONAL IfcLabel;
 ENTITY IfcCivilElemtType
 ENTITY IfcSubsidiaryFacilityType_K
 ENTITY IfcPavementAdditionType_K
 PredefinedType       :IfcPavementAdditionTypeEnum_K
```

```
END_ENTITY;
```

6.4 Properties

6.4.1 Pset_RoadSignEquimentCodeGroup

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

6.4.2 Pset_RoadSignEquimentCommon

- **RoadSignID**
  - P_SINGLEVALUE / IfcIdentifier
- **RoadSignType:**
  - P_ENUMERATEDVALUE/ IfcRoadSignEquipmentTypeEnum_K
- **Spacing**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **Text**
  - P_SINGLEVALUE / IfcLabel
- **InstallationAngle**
  - P_SINGLEVALUE / IfcPositivePlaneAngleMeasure

6.4.3 Pset_GuardCodeGroup

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

6.4.4 Pset_GuardCommon

- **GuardID**
  - P_SINGLEVALUE / IfcLabel
- **GuardType**
  - P_ENUMERATEDVALUE/ IfcGuardTypeEnum_K
- **Strength**
  - P_SINGLEVALUE / IfcPressureMeasure
- **Rate**

- P_SINGLEVALUE / IfcLabel

6.4.5 Pset_PavementAdditionCodeGroup

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel
- **Activity**
  - P_SINGLEVALUE / IfcLabel

6.4.6 Pset_PavementAdditionCommon

- **PavementAdditionID**
  - P_SINGLEVALUE / IfcLabel
- **PavementAdditionType**
  - P_ENUMERATEDVALUE/ IfcPavementAdditionTypeEnum_K
- **Spacing**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **FrictionCoefficient**
  - P_SINGLEVALUE / IfcLabel
- **Color**
  - P_SINGLEVALUE / IfcLabel

7 IfcConstructionMgmtDomain

7.1 Schema Definition

7.2 Types

7.2.1 IfcConstructionResourceTypeEnum

Added recently to the existing IfcConstructionResourceTypeEnum is the road pavement material asphalt.

Enumerated Item Definitions:

- **Asphalt**

EXPRESS Specification:

```
TYPE IfcConstructionMaterialResourceTypeEnum = ENUMERATION OF (
  AGGREGATES,
  CONCRETE,
  DRYWALL,
  FUEL,
  GYPSUM,
```

```
    MASONRY,
    METAL,
    PLASTIC,
    WOOD,
    ASPHALT_K
    NOTDEFINED,
    USERDEFINED);
END_TYPE;
```

7.3 Entities

7.4 Properties

8 IfcHvacDomain

8.1 Schema Definition

8.2 Types

8.2.1 IfcPipeSegmentTypeEnum

Hume pipes and perforated pipes, which are drain elements, were recently added to the type of IfcPipeSegment of the flow segment defined in the existing IfcHvacDomain.

Enumerated Item Definitions:

- **HUMESEGMENT_K**
- **PERFORATED_K**

EXPRESS Specification:

```
TYPE IfcPipeSegmentTypeEnum = ENUMERATION OF (
    CULVERT,
    FLEXIBLESEGMENT,
    RIGIDSEGMENT,
    GUTTER,
    SPOOL,
    USERDEFINED,
    NOTDEFINED);
END_TYPE;
```

8.2.2 IfcGutterSegmentTypeEnum_K

The list of this type, the IfcPipeSegment element of the flow segment defined in the existing IfcHvacDomain, defines a more detailed type of facility expressed as IfcGutterSegment_K or IfcGutterSegmentType_K as the already defined type of gutter.

Enumerated Item Definitions:

- **V_TYPE**

- **L_TYPE**
- **U_TYPE**
- **CANAL_TYPE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcGutterTypeEnum_K = ENUMERATION OF
    (V_TYPE,
     L_TYPE,
     U_TYPE,
     CANAL_TYPE,
     USERDEFINED,
     NOTDEFINED);
END_TYPE;
```

8.3 Entities

8.3.1 IfcGutterSegment_K

Description

IfcGutterSegment_K is an entity that expresses a gutter for road surface drainages, among road drainage facilities. A gutter is a ditch installed at a road end or at the border of a walkway and a roadway to drain water from the road surface. As such, it has V, L, and U shapes, and the water collected in the ditch flows into the drain pipe via water-collection tanks installed at appropriate intervals.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcGutterSegmentType_K

Table — IfcGutterSegmentType_K, Object Typing

Property Sets for Objects

The following table shows the sets of properties that the concept of "Property Sets for Objects" applies to this entity.

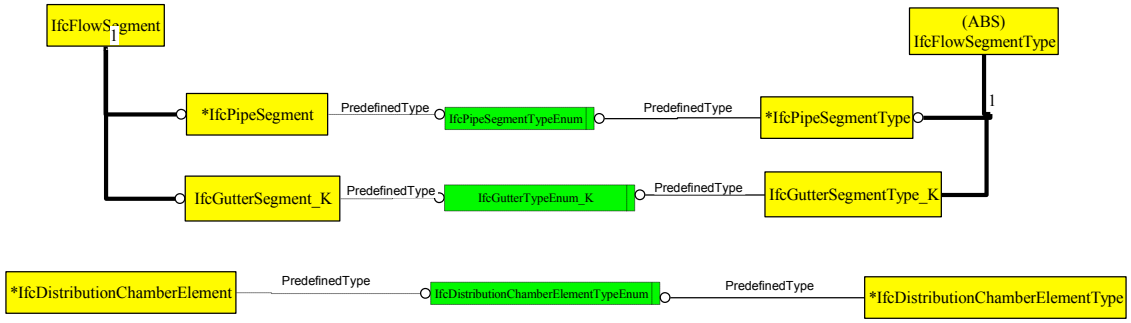
PredefinedType	Name
	Pset_GutterSegmentCodeGroup
	Pset_GutterSegmentCommon

Table — IfcRoadPavement Property Sets for Objects

EXPRESS Specification:

```
ENTITY IfcGutterSegment_K
    SUBTYPE OF(IfcFlowSegment);
      PredefinedType : OPTIONAL IfcGutterTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcGutterSegment_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
```

```
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcDistributionElement
 INVERSE
  HasPorts               :SET OF IfcRelConnectsPortToElement FOR RelatedElement;
 ENTITY IfcDistributionFlowElement
 INVERSE
  HasControlElements     :SET [0:1] OF IfcRelFlowControlElements FOR RelatingFlowElement;
 ENTITY IfcFlowSegment
 ENTITY IfcGutterSegment_K
PredefinedType           :OPTIONAL IfcGutterSegmentTypeEnum_K;
END_ENTITY;
```

8.3.2 IfcGutterSegmentType_K

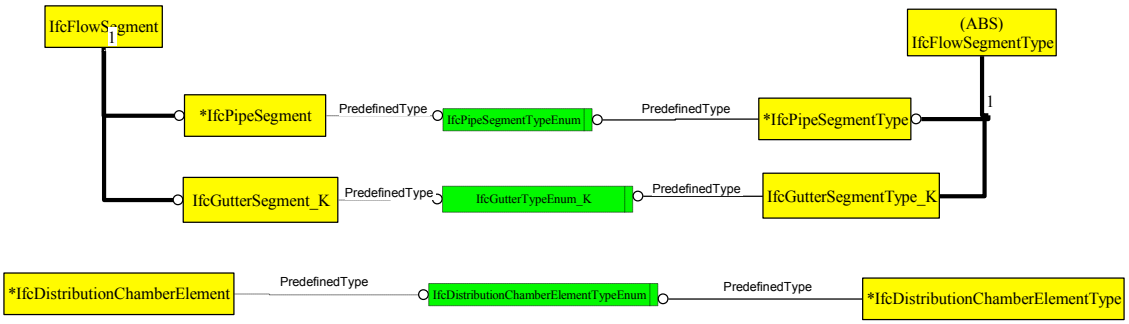
Description

IfcGutterSegment_K is an entity, i.e., a road drainage facility, that defines the type of gutter needed to drain water from the road surface. It has V, L, and U shapes and conduits.

EXPRESS Specification:

```
ENTITY IfcGutterSegmentType_K
    SUBTYPE OF(IfcFlowSegmentType);
      PredefinedType : IfcGutterTypeEnum_K;
END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcGutterSegmentType_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps   :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
 ENTITY IfcDistributionElementType
 ENTITY IfcDistributionFlowElementType
 ENTITY IfcFlowSegmentType
 ENTITY IfcGutterSegmentType_K
 PredefinedType       :IfcGutterSegmentTypeEnum_K;
 END_ENTITY;
```

8.4 Properties

8.4.1 Pset_GutterSegmentCodeGroup

- **Facility**
  - P_SINGLEVALUE / IfcLabel
- **Space**
  - P_SINGLEVALUE / IfcLabel
- **Element**
  - P_SINGLEVALUE / IfcLabel

- **Activity**
  - P_SINGLEVALUE / IfcLabel

8.4.2 Pset_GutterSegmentCommon

- **GutterSegmentID**
  - P_SINGLEVALUE / IfcIdentifier
- **GutterType**
  - P_ENUMERATEDVALUE/ IfcGutterTypeEnum_K
- **DrainCapacity**
  - P_SINGLEVALUE / IfcVolumetricFlowRateMeasure
- **Gradient**
  - P_SINGLEVALUE / IfcCompoundPlaneAngleMeasure
- **Spacing**
  - P_SINGLEVALUE / IfcPositiveLengthMeasure
- **DrainSpeed**
  - P_SINGLEVALUE / IfcLinearVelocityMeasure

9 IfcSharedBldgServiceElements

9.1 Schema Definition

9.2 Types

9.2.1 IfcDistributionChamberElementTypeEnum

Collecting wells and catch drains, which are parts of road facilities, were recently added to IfcDistributionChamberElementTypeEnum, which expresses the type of distribution chamber among the object elements in the field of IfcSharedBldgServiceElements that defines the architectural MEP elements.

Enumerated Item Definitions:

- **COLLECTING WELL**
- **CATCH DRAIN**

EXPRESS Specification:

```
TYPE IfcDistributionChamberElementTypeEnum = ENUMERATION OF (
  FORMEDDUCT,
  INSPECTIONCHAMBER,
  INSPECTIONPIT,
  MANHOLE,
  METERCHAMBER,
  SUMP,
  TRENCH,
  VALVECHAMBER,
  COLLECTINGWELL,
  CATCHDRAIN,
  USERDEFINED,
  NOTDEFINED);
```

```
END_TYPE;
```

10 IfcSharedComponentElements

10.1 Schema Definition

In the IfcSharedComponentElements schema that defines the component member elements in the architectural field, the parts and members-level components used in civil engineering are newly defined. Added thereto are entities and corresponding types of elements of IfcWaterProofingElement, IfcSlopeProtectionElement, IfcRoadElementPart, IfcBridgeElementPart, IfcTunnelElementPart, and IfcGroundReinforcingElement.

10.2 Types

10.2.1 IfcWaterProofingElementTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcWaterProofingElement_K or IfcWaterProofingElementType_K as the already defined type of anti-humidity and waterproof member.

Enumerated Item Definitions:

- **SHEET**
- **FLUID_APPLIED**
- **ASPHALT**
- **SEALING**
- **CAULKING**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcWaterProofElementTypeEnum_K = ENUMERATION OF
    (SHEET,
     FLUID_APPLIED,
     ASPHALT,
     SEALING,
     CAULKING,
     USER_DEFINED,
     NOT_DEFINED);
  END_TYPE;
```

10.2.2 IfcSlopeProtectionElementTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcSlopeProtectionElement_K or IfcSlopeProtectionElementType_K as the already defined type of slope protection member.

Enumerated Item Definitions:

- **BLOCK**
- **SHOTCRETE**

- **CONCRETE**
- **PLANTING**
- **STONE**
- **TEXTILE**
- **NET**
- **COUNTERWEIGHT_FILL**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcSlopeProtectionElementTypeEnum_K = ENUMERATION OF
    (BLOCK,
     SHOTCRETE,
     CONCRETE,
     PLANTING,
     STONE,
     TEXTILE,
     NET,
     COUNTERWEIGHT_FILL,
     NOT_DEFINED);
  END_TYPE;
```

10.2.3 IfcRoadElementPartTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcRoadElementPart_K or IfcRoadElementPartType_K as the already defined type of road element member.

Enumerated Item Definitions:

- **STABILIZATIONFILTER**
- **SPACER**
- **RAILJOINT**
- **EXPANSIONJOINT**
- **TRANSVERSECONTRACTIONKOINT**
- **LONGITUDINALJOINT**
- **CONSTRUCTIONJOINT**
- **STYROFOAM**
- **WIREMESH**
- **PRIMECOAT**
- **TACKCOAT**
- **GEOTEXTILE**
- **DOWERBAR**
- **TIEBAR**
- **SLIPBAR**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcRoadElementPartTypeEnum_K = ENUMERATION OF
    (STABILIZATIONFILTER,
     SPACER,
     RAILJOINT,
```

```
    EXPANSIONJOINT,
    TRANSVERSECONTRACTIONKOINT,
    LONGITUDINALJOINT,
    CONSTRUCTIONJOINT,
    STYROFOAM,
    WIREMESH,
    PRIMECOAT,
    TACKCOAT,
    GEOTEXTILE,
    DOWERBAR,
    TIEBAR,
    SLIPBAR,
    USERDEFINED);
END_TYPE;
```

10.2.4 IfcBridgeElementPartTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcBridgeElementPart_K or IfcBridgeElementPartType_K as the already defined type of bridge element member.

Enumerated Item Definitions:

- **FLANGE**
- **OVERHANG**
- **FLOORING**
- **VERTICAL_STIFFENER**
- **FLOORING**
- **LONGITUDINAL_STIFFENER**
- **WEB**
- **RIB**
- **PLATE**
- **BRACING**
- **GIRDERLINKAGE**
- **ANCHORAGE**
- **EXPANSION_JOINT**
- **PIER_SCOUR_PROTECTION**
- **SHIP_IMPACT_PROTECTION**
- **SHOE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcBridgeElementPartTypeEnum_K = ENUMERATION OF
    (FLANGE,
     OVERHANG,
     FLOORING,
     VERTICAL_STIFFENER,
     LONGITUDINAL_STIFFENER,
     WEB,
     RIB,
     PLATE,
     STREND,
     BRACING,
     GIRDERLINKAGE,
     ANCHORAGE,
     EXPANSION_JOINT,
     PIER_SCOUR_PROTECTION,
     SHIP_IMPACT_PROTECTION,
     SHOE,
     USERDEFINED,
     NOTDEFINED);
END_TYPE;
```

10.2.5 IfcTunnelElementPartTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcTunnelElementPart_K or IfcTunnelElementPartType_K as the already defined type of tunnel element member.

Enumerated Item Definitions:

- **SEGMENT_JOINT**
- **RING_JOINT**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcTunnelElementPartTypeEnum_K = ENUMERATION OF
       (SEGMENT_JOINT,
        RING_JOINT,
        USER_DEFINED,
        NOTDEFINED);
     END_TYPE;
```

10.2.6 IfcGroundReinforcingElementTypeEnum_K

The list of this type defines more detailed types of facilities expressed as IfcGroundReinforcingElement_K or IfcGroundReinforcingElementType_K as the already defined type of ground reinforcement element member.

Enumerated Item Definitions:

- **EARTH_ANCHOR**
- **ROCK_BOLT**
- **ROCK_ANCHOR**
- **SHOTCRETE**
- **STEEL_RIB**

- **SOIL_NAILING**
- **FOREPOLING**
- **STEEL_FIBER**
- **SYNTHETIC_FIBER**
- **PILE**
- **WIREROPE**
- **USERDEFINED**
- **NOTDEFINED**

EXPRESS Specification:

```
TYPE IfcGroundReinforcingElementyTypeEnum_K = ENUMERATION OF
    (EARTH_ANCHOR,
     ROCK_BOLT,
     ROCK_ANCHOR,
     SHOTCRETE,
     STEEL_RIB,
     SOIL_NAILING,
     FOREPOLING,
     STEEL_FIBER,
     SYNTHETIC_FIBER,
     PILE,
     WIREROPE,
     USERDEFINED
     NOT_DEFINED);
  END_TYPE;
```

10.3 Entities

10.3.1 IfcWaterProofingElement_K

Description

IfcWaterProofingElement_K is an entity of a damp-proofing and waterproofing member used in construction and civil engineering work, and represents the materials for sheet waterproofing, liquid-applied membrane waterproofing, asphalt waterproofing, sealing, and caulking.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

Type
IfcWaterProofingElementType_K

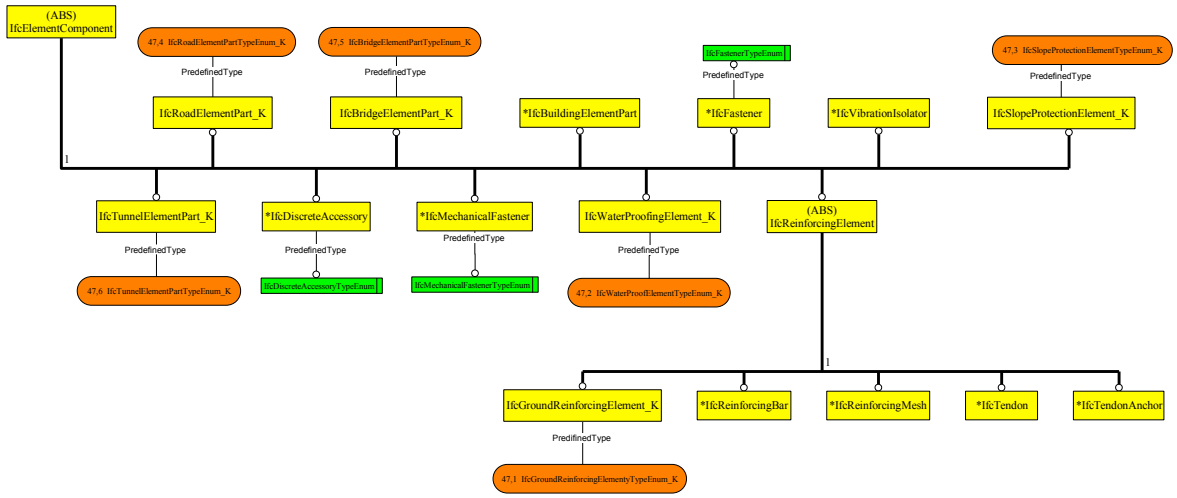
Table — IfcWaterProofingElementType_K Object Typing

EXPRESS Specification:

```
ENTITY IfcWaterProofingElement_K
    SUBTYPE OF(IfcElementComponent);
```

```
      PredefinedType : OPTIONAL IfcWaterProofElementTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcWaterProofingElement_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids              :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo             :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements      :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections          :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings             :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries      :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom           :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure    :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcElementComponent
 ENTITY IfcWaterProofingElement_K
```

```
PredefinedType          :OPTIONAL IfcWaterProofingElementTypeEnum_K;
END_ENTITY;
```

10.3.2 IfcWaterProofingElementType_K

Description

IfcWaterProofingElementType_K is an entity that defines the type of damp-proofing and waterproofing member, and expresses and defines the type of sheet waterproofing, liquid-applied membrane waterproofing, asphalt waterproofing, sealing, and caulking.

EXPRESS Specification:

```
ENTITY IfcWaterProofingElementType_K
    SUBTYPE OF(IfcElementComponentType);
      PredefinedType : IfcWaterProofElementTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram

Inheritance Graph:

```
ENTITY IfcWaterProofingElementType_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets       :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                 :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps    :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
```

```
 Tag                 :OPTIONAL IfcLabel;
INVERSE
 ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
ENTITY IfcElementComponentType
ENTITY IfcWaterProofingElementType_K
PredefinedType       :IfcWaterProofingElementTypeEnum_K;
END_ENTITY;
```

10.3.3 IfcSlopeProtectionElement_K

Description

IfcSlopeProtectionElement_K is the protection material for preventing slopes from eroding and collapsing due to natural weathering and rainfall, and as such, is the entity that defines concrete blocks, planting, artificial fiber, and other materials.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

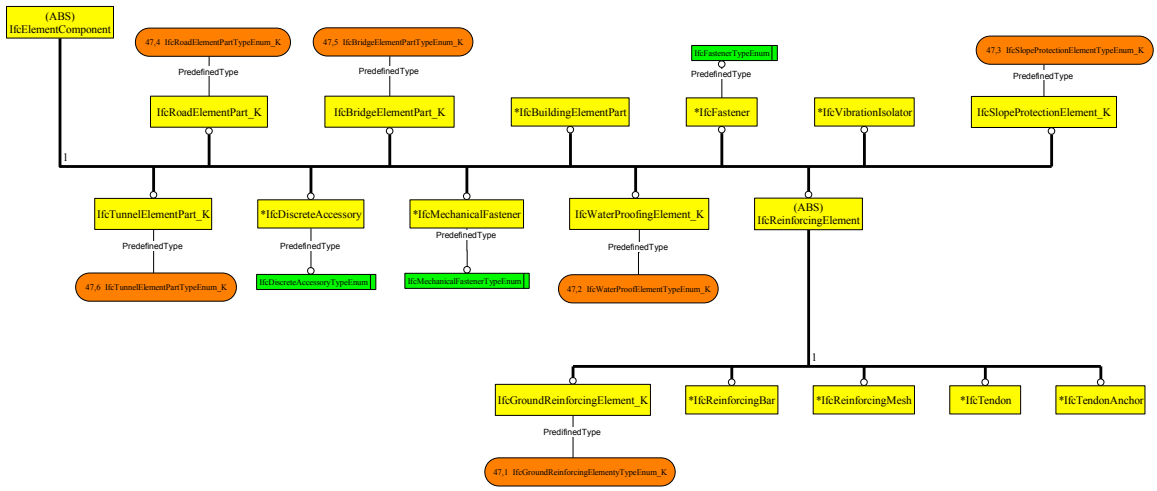
Type
IfcSlopeProtectionElementType_K

Table — IfcSlopeProtectionElementType_K, Object Typing

EXPRESS Specification:

```
ENTITY IfcSlopeProtectionElement_K
    SUBTYPE OF(IfcElementComponent);
      PredefinedType : OPTIONAL IfcSlopeProtectionElementTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcSlopeProtectionElement_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcElementComponent
 ENTITY IfcSlopeProtectionElement_K
PredefinedType           :OPTIONAL IfcSlopeProtectionElementTypeEnum_K;
END_ENTITY;
```

10.3.4 IfcSlopeProtectionElementType_K

Description

IfcSlopeProtectionElementType_K defines the type of material used to protect slopes, and expresses concrete blocks, planting, artificial fibers, etc.

EXPRESS Specification:

```
ENTITY IfcSlopeProtectionElementType_K
    SUBTYPE OF(IfcElementComponentType);
      PredefinedType : IfcSlopeProtectionElementTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram

Inheritance Graph:

```
ENTITY IfcSlopeProtectionElementType_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps   :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
 ENTITY IfcElementComponentType
 ENTITY IfcSlopeProtectionElementType_K
 PredefinedType       :IfcSlopeProtectionElementTypeEnum _K;
 END_ENTITY;
```

10.3.5 IfcRoadElementPart_K

Description

IfcRoadElementPart_K is the entity that expresses the detailed elements of parts and material units of road component elements.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

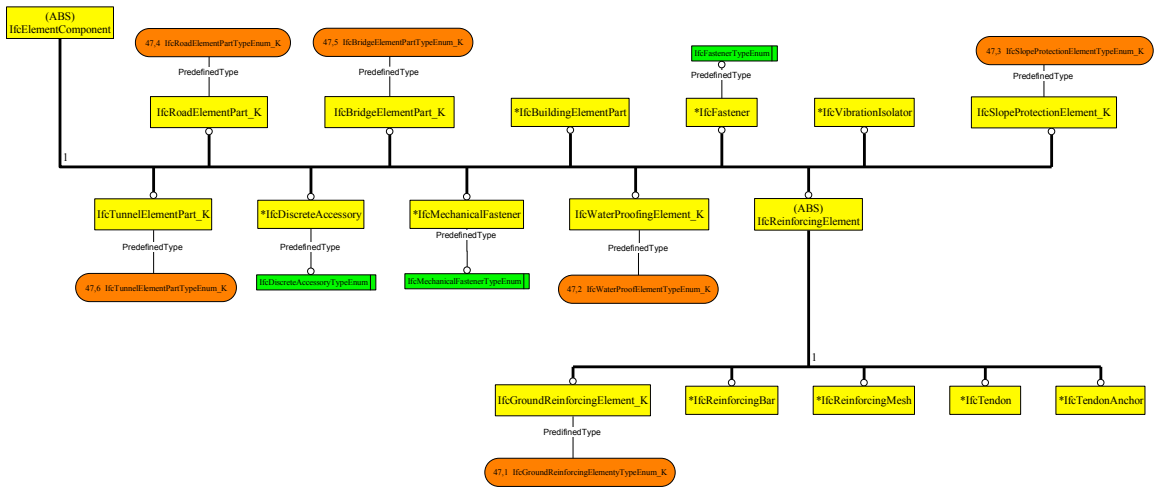
Type
IfcRoadElementPartType_K

Table — IfcRoadElementPartType_K, Object Typing

EXPRESS Specification:

```
ENTITY IfcRoadElementPart_K
    SUBTYPE OF(IfcElementComponent);
      PredefinedType : OPTIONAL IfcRoadElementPartTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadElementPart_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType          :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy        :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares            :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy           :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
```

```
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcElementComponent
 ENTITY IfcRoadElementPart_K
PredefinedType           :OPTIONAL IfcRoadElementPartTypeEnum_K;
END_ENTITY;
```

10.3.6 IfcRoadElementPartType_K

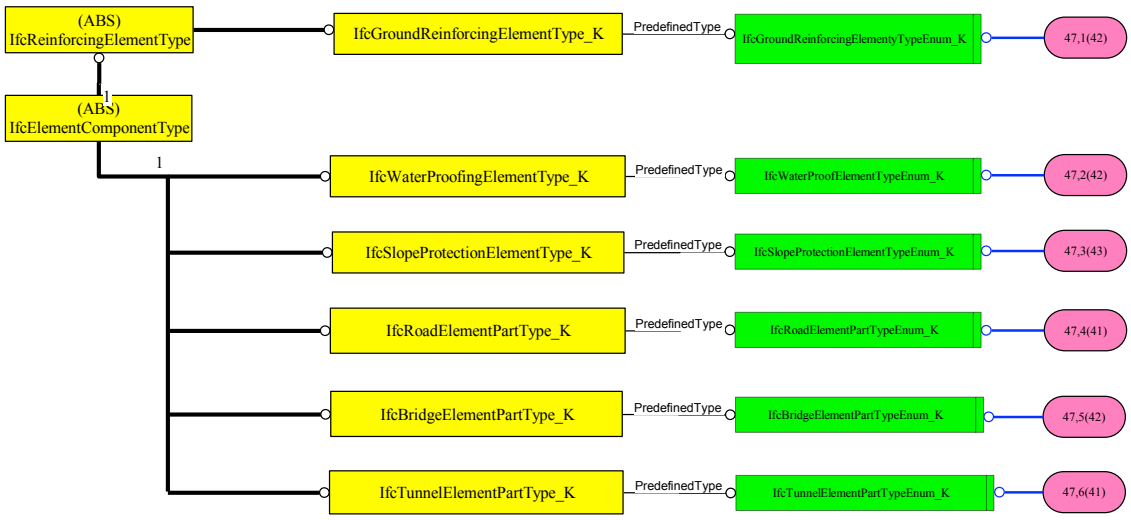
Description

IfcRoadElementPartType_Kn defines the detailed elements of parts and material units of road component elements, and includes elements such as spacers, expansion joint, joints, and prime coats.

EXPRESS Specification:

```
ENTITY IfcRoadElementPartType_K
    SUBTYPE OF(IfcElementComponentType);
      PredefinedType : IfcRoadElementPartTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcRoadElementPartType_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps  :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
 ENTITY IfcElementComponentType
 ENTITY IfcRoadElementPartType_K
 PredefinedType      :IfcRoadElementPartTypeEnum_K;
 END_ENTITY;
```

10.3.7 IfcBridgeElementPart_K

Description

IfcBridgeElementPart_K is the entity that expresses the detailed elements of parts and material units of bridge component elements.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

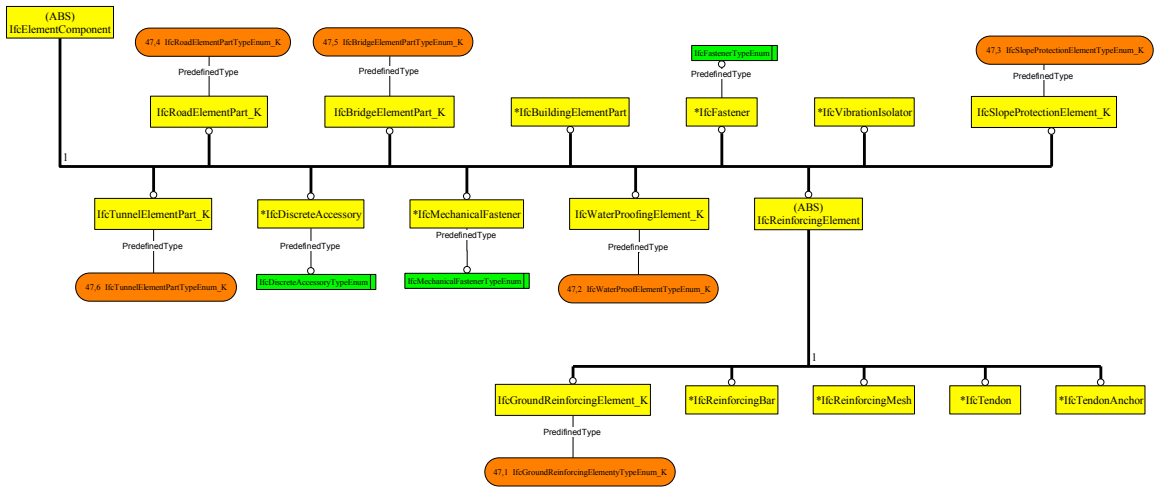
Type
IfcBridgeElementPartType_K

Table — IfcBridgeElementPartType_K, Object Typing

EXPRESS Specification:

```
ENTITY IfcBridgeElementPart_K
    SUBTYPE OF(IfcElementComponent);
      PredefinedType : OPTIONAL IfcBridgeElementPartTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcBridgeElementPart_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcElementComponent
 ENTITY IfcBridgeElementPart_K
PredefinedType           :OPTIONAL IfcBridgeElementPartTypeEnum_K;
END_ENTITY;
```

10.3.8 IfcBridgeElementPartType_K

Description

IfcBridgeElementPartType_K is the entity that expresses the type of detailed elements of parts and material units of bridge component elements, and includes flanges, overhangs, stiffeners, bracings, webs, ribs, and shoes.

EXPRESS Specification:

```
ENTITY IfcBridgeElementPartType_K
    SUBTYPE OF(IfcElementComponentType);
      PredefinedType : IfcBridgeElementPartTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram

Inheritance Graph:

```
ENTITY IfcBridgeElementPartType_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
  OwnerHistory        :OPTIONAL IfcOwnerHistory;
  Name                :OPTIONAL IfcLabel;
  Description         :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
  HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps  :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                 :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
 ENTITY IfcElementComponentType
```

```
ENTITY IfcGutterSegmentType_K
PredefinedType      :IfcBridgeElementPartTypeEnum_K;
END_ENTITY;
```

10.3.9 IfcTunnelElementPart_K

Description

IfcTunnelElementPart_K is the entity that expresses the detailed elements of parts and material units of tunnel component elements.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

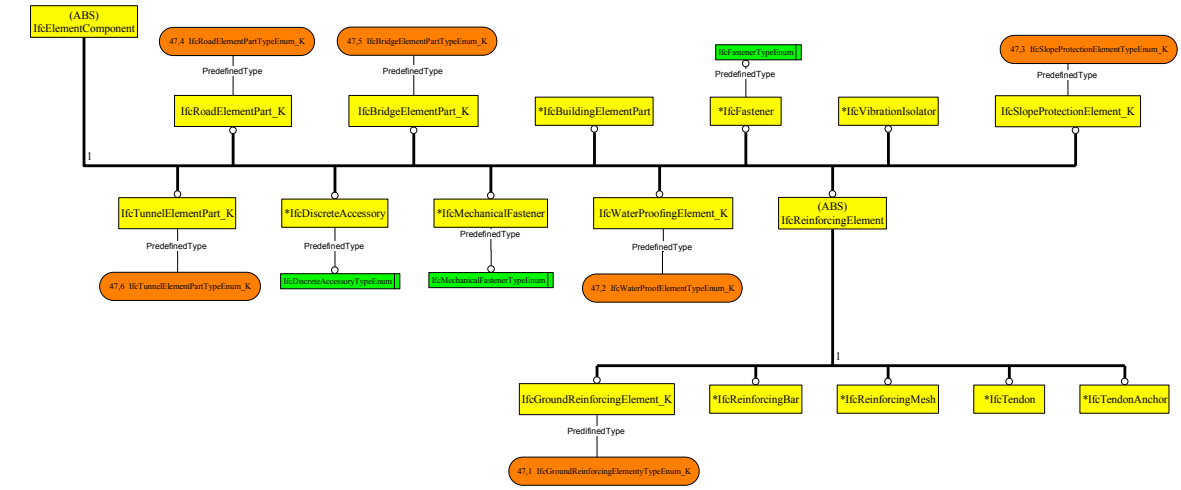
Type
IfcTunnelElementPartType_K

Table — IfcTunnelElementPartType_K, Object Typing

EXPRESS Specification:

```
ENTITY IfcTunnelElementPart_K
    SUBTYPE OF(IfcElementComponent);
      PredefinedType : OPTIONAL IfcTunnelElementPartTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcTunnelElementPart_K
 ENTITY IfcRoot
  GlobalId            :IfcGloballyUniqueId;
```

```
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType           :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy         :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcElementComponent
 ENTITY IfcTunnelElementPart_K
PredefinedType           :OPTIONAL IfcTunnelElementPartTypeEnum_K;
END_ENTITY;
```

10.3.10 IfcTunnelElementPartType_K

Description

IfcTunnelElementPartType_K is the entity that expresses the type of detailed elements of parts and material units of tunnel component elements, and includes flanges, overhangs, stiffeners, bracings, webs, ribs, and shoes.

EXPRESS Specification:

```
  ENTITY IfcTunnelElementPartType_K
      SUBTYPE OF(IfcElementComponentType);
        PredefinedType : IfcTunnelElementPartTypeEnum_K;
    END_ENTITY;
```

EXPRESS-G diagram

Inheritance Graph:

```
ENTITY IfcTunnelElementPartType_K
 ENTITY IfcRoot
  GlobalId             :IfcGloballyUniqueId;
  OwnerHistory         :OPTIONAL IfcOwnerHistory;
  Name                 :OPTIONAL IfcLabel;
  Description          :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments       :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy           :SET OF IfcRelNests FOR RelatingObject;
  HasContext           :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy       :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes           :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations      :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcTypeObject
  ApplicableOccurrence:OPTIONAL IfcIdentifier;
  HasPropertySets      :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
 INVERSE
  Types                :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
 ENTITY IfcTypeProduct
  RepresentationMaps   :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
  Tag                  :OPTIONAL IfcLabel;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElementType
 ENTITY IfcElementComponentType
 ENTITY IfcTunnelElementPartType_K
 PredefinedType       :IfcTunnelElementPartTypeEnum_K;
 END_ENTITY;
```

10.3.11 IfcGroundReinforcingElement_K

Description

IfcGroundReinforcingElement_K is the entity that expresses the ground reinforcement materials used in civil engineering work.

Common Use Definitions

Object Typing

Object types, applied in this entity, are expressed in the following entity type.

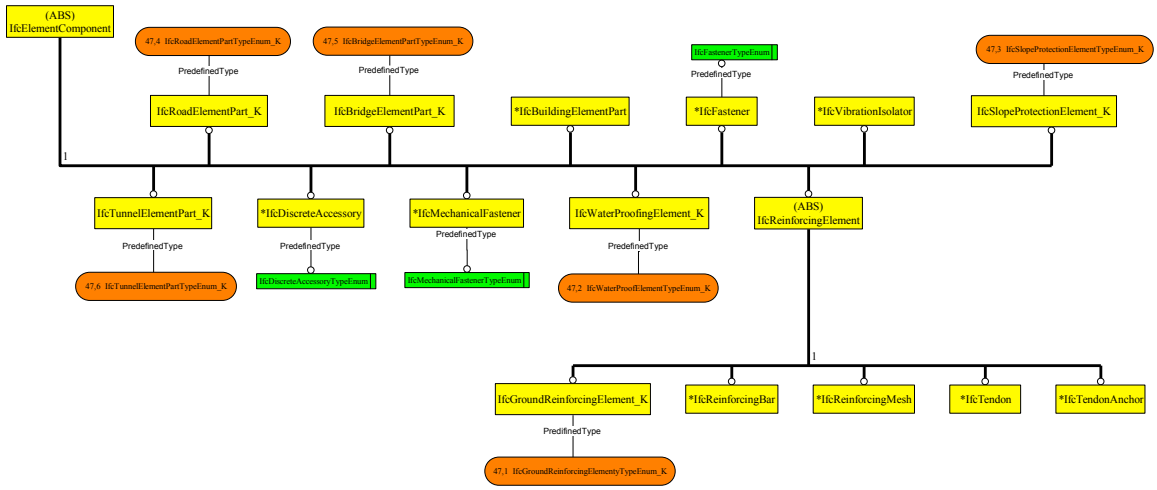
Type
IfcGroundReinforcingElementType_K

Table — IfcGroundReinforcingElementType_K Object Typing

EXPRESS Specification:

```
ENTITY IfcGroundReinforcingElement_K
    SUBTYPE OF(IfcReinforcingElement);
      PredefinedType : OPTIONAL IfcGroundReinforcingElementyTypeEnum_K;
  END_ENTITY;
```

EXPRESS-G diagram



Inheritance Graph:

```
ENTITY IfcGroundReinforcingElement_K
 ENTITY IfcRoot
  GlobalId              :IfcGloballyUniqueId;
  OwnerHistory          :OPTIONAL IfcOwnerHistory;
  Name                  :OPTIONAL IfcLabel;
  Description           :OPTIONAL IfcText;
 ENTITY IfcObjectDefinition
 INVERSE
  HasAssignments        :SET OF IfcRelAssigns FOR RelatedObjects;
  Nests                 :SET [0:1] OF IfcRelNests FOR RelatedObjects;
  IsNestedBy            :SET OF IfcRelNests FOR RelatingObject;
  HasContext            :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
  IsDecomposedBy        :SET OF IfcRelAggregates FOR RelatingObject;
  Decomposes            :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
  HasAssociations       :SET OF IfcRelAssociates FOR RelatedObjects;
 ENTITY IfcObject
  ObjectType            :OPTIONAL IfcLabel;
 INVERSE
  IsDeclaredBy          :SET [0:1] OF IfcRelDefinesByObject FOR RelatedObjects;
```

```
  Declares             :SET OF IfcRelDefinesByObject FOR RelatingObject;
  IsTypedBy            :SET [0:1] OF IfcRelDefinesByType FOR RelatedObjects;
  IsDefinedBy          :SET OF IfcRelDefinesByProperties FOR RelatedObjects;
 ENTITY IfcProduct
  ObjectPlacement      :OPTIONAL IfcObjectPlacement;
  Representation       :OPTIONAL IfcProductRepresentation;
 INVERSE
  ReferencedBy         :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
 ENTITY IfcElement
  Tag                  :OPTIONAL IfcIdentifier;
 INVERSE
  FillsVoids             :SET [0:1] OF IfcRelFillsElement FOR RelatedBuildingElement;
  ConnectedTo            :SET OF IfcRelConnectsElements FOR RelatingElement;
  IsInterferedByElements :SET OF IfcRelInterferesElements FOR RelatedElement;
  InterferesElements     :SET OF IfcRelInterferesElements FOR RelatingElement;
  HasProjections         :SET OF IfcRelProjectsElement FOR RelatingElement;
  ReferencedInStructures :SET OF IfcRelReferencedInSpatialStructure FOR RelatedElements;
  HasOpenings            :SET OF IfcRelVoidsElement FOR RelatingBuildingElement;
  IsConnectionRealization:SET OF IfcRelConnectsWithRealizingElements FOR RealizingElements;
  ProvidesBoundaries     :SET OF IfcRelSpaceBoundary FOR RelatedBuildingElement;
  ConnectedFrom          :SET OF IfcRelConnectsElements FOR RelatedElement;
  ContainedInStructure   :SET [0:1] OF IfcRelContainedInSpatialStructure FOR RelatedElements;
 ENTITY IfcElementComponent
 ENTITY IfcGroundReinforcingElement_K
PredefinedType           :OPTIONAL IfcGroundReinforcingElementTypeEnum_K;
END_ENTITY;
```

10.3.12 IfcGroundReinforcingElementType_K

Description

IfcGroundReinforcingElementType_K is the entity that expresses the type of ground reinforcement material used in civil engineering work, and includes earth anchors, lock bolts, lock anchors, shotcrete, and steel ribs.

EXPRESS Specification:

```
  ENTITY IfcGroundReinforcingElementType_K
      SUBTYPE OF(IfcElementComponentType);
        PredefinedType : IfcGroundReinforcingElementyTypeEnum_K;
    END_ENTITY;
```

EXPRESS-G diagram

Inheritance Graph:

```
ENTITY IfcGroundReinforcingElementType_K
 ENTITY IfcRoot
```

```
 GlobalId            :IfcGloballyUniqueId;
 OwnerHistory        :OPTIONAL IfcOwnerHistory;
 Name                :OPTIONAL IfcLabel;
 Description         :OPTIONAL IfcText;
ENTITY IfcObjectDefinition
INVERSE
 HasAssignments      :SET OF IfcRelAssigns FOR RelatedObjects;
 Nests               :SET [0:1] OF IfcRelNests FOR RelatedObjects;
 IsNestedBy          :SET OF IfcRelNests FOR RelatingObject;
 HasContext          :SET [0:1] OF IfcRelDeclares FOR RelatedDefinitions;
 IsDecomposedBy      :SET OF IfcRelAggregates FOR RelatingObject;
 Decomposes          :SET [0:1] OF IfcRelAggregates FOR RelatedObjects;
 HasAssociations     :SET OF IfcRelAssociates FOR RelatedObjects;
ENTITY IfcTypeObject
 ApplicableOccurrence:OPTIONAL IfcIdentifier;
 HasPropertySets     :OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
INVERSE
 Types               :SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
ENTITY IfcTypeProduct
 RepresentationMaps  :OPTIONAL LIST [1:?] OF UNIQUE IfcRepresentationMap;
 Tag                 :OPTIONAL IfcLabel;
INVERSE
 ReferencedBy        :SET OF IfcRelAssignsToProduct FOR RelatingProduct;
ENTITY IfcElementType
ENTITY IfcElementComponentType
ENTITY IfcGroundReinforcingElementType_K
PredefinedType      :IfcGroundReinforcingElementTypeEnum_K;
END_ENTITY;
```