CIVIL WORKS PART SPECIFICATIONS

- for selected elements in civil works models

REV3

DiKon Digital Konvergens

Vejdirektoratet

BANEDANMARK

CONTENTS

INSTRUCTION

INTRODUCTION

As civil works elements (objects) and the associated information (properties) get an increasing significance for the participants in infrastructure projects, there is a demand for specifications of the contents of an infrastructure model in terms of reliability, geometric representation and the associated properties.

This demand will typically arise in two situations:

- When making agreements where there must be a precise mutual understanding of the reliability, geometrical representation and properties of construction elements at a given point in time. This is typically agreed and documented in a model delivery specification.

- Support of the project execution, where there is a need to establish when to deliver which information in the process and by whom.

This overview is a prerequisite for the use of the infrastructure model for specific purposes and clarification of the responsibility for the specific infrastructure components in the model.

To establish a simple method for describing the content in the civil works model at a given time, DiKon Infrastructure has prepared Civil Works Part Specifications.

This publication does not include infrastructure elements for the existing conditions.

WHAT IS DIKON INFRASTRUCTURE?

DiKon Infrastructure is a collaboration between the central players of the industry with representatives from the major consultancy companies and contractors working within the construction disciplines and representatives from client organisations.

Based on the Description of services for Civil Works, 2019, for selected components in models, BIMforum's Level Of Development (LOD), DiKon's material for civil works and material from BIM Infra.dk, a working group under DiKon Infrastructure has established a detailed definition of LOD, Civil Works Part Specifications and a Delivery Specification Civil Works. Together they form the basis for agreements on delivery of digital models on infrastructure projects.

LOD terminology is used in this publication to ensure future consistency with other international LOD standards and publications. This publication applies exclusively to information present in the infrastructure model and not to other project-related information.

SPECIFICATION OF CIVIL WORKS ELEMENTS VERSUS SPECIFICATION OF CONSTRUCTION ELEMENTS

The **Civil Works Part Specifications** shall be employed as a catalogue describing the LOD for the different civil works parts. Each part specification is used to describe a group of infrastructure elements with the same characteristics, e.g. the specification for supply, pipes in the ground – can be used for all types of pipes except gravity flow lines which have a separate specification. The purpose of the Civil Works Part Specifications is to improve the calibration of expectations in connection with the exchange of civil works models.

Construction Elements Specifications is used where these are more compatible e.g. for most structural parts.

DEFINITION OF LOD AND ASSOCIATED CONCEPTS

The Level of Development (LOD) gives an explicit specification of the information about civil works elements, which shall be present in the civil works model at different stages during the design and construction process.

LOD for civil works elements is comprised of:

Level of Reliability (LOR) specifies the reliability of the information provided for the infrastructure component and associated properties.

Level of Geometry (LOG) specifies the geometric representation of the infrastructure component as well as the extent of included component.

Level of Information (LOI) specifies the properties of the infrastructure component either contained in, linked to, or in some other way connected.

LOD LEVELS

A given LOD level specifies the required levels for geometrical representation and properties as well as the reliability of those.

To avoid confusion with other international LOD specifications the Danish specification uses the Danish country code DK as part of the LOD levels – for example LOD 200 DK. LOD levels includes a predefined set of matching levels for LOR, LOG and LOI, e.g., LOD 200 DK consists of LOR 200 DK, LOG 200 DK and LOI 200 DK.

A LOD 100 has been added to the definition of LOD levels. LOD 100 is used where there are no requirements of delivery of 3D objects.

It is possible to combine LOR, LOG and LOI from different levels, e.g., if there is a need for a more detailed geometric representation and range of properties. In this case the LOD level is specified using the following syntax: |200|325|300|, where the first number (200) specifies the LOR level, the next (325) specifies the LOG level and the last number (300) specifies the LOI level.

Note that the LOR level still determines the reliability of the LOG and LOI levels.

LOD levels are not bound to specific phases. This allows different civil works elements to be at different LOD levels in a specific project phase.

The BIMforum LOD levels use a level LOD 350 while DiKon and BIM7AA uses LOD325. This reflects the fact that the typical required deliverables in Denmark are structured differently from those in BIMforums LOD 350.

On the following page the overall definition of the individual LOD levels are described.

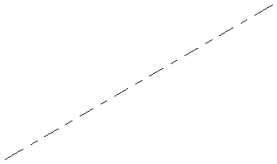
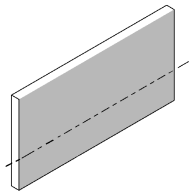
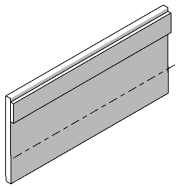
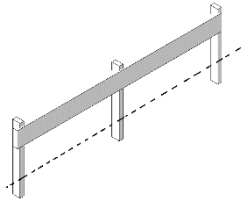
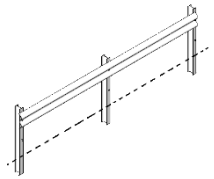
The **Delivery Specification Civil Works** is the form which must be filled in when concluding a contract. The purpose of the specification is to specify how the civil works elements/objects for the different discipline areas are to be modelled in terms of geometric representation, reliability and associated information.

CORRELATION WITH OTHER DANISH STANDARDS AND TERMS OF REFERENCE

The table below shows an approximate connection between the LOD DK levels and the Digital Design in the Description of Services for Civil Works, 2019 (YBA 2019).

LOD DK	LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
YBA 2019, Digital Design	-	Assumed geometry	Defined geometry	Final geometry	-

OVERALL DEFINITION OF LOD

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Civil works elements are specified on an overall level without further definition of volume, placement and properties.	EXPECTED Civil works elements geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	DEFINED Civil works elements geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	FINAL Civil works elements geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	FINAL DETAILED Civil works elements geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL 	GENERIC LEVEL 	TYPE-LEVEL 	DETAILED TYPE-LEVEL 	PRODUCT-LEVEL 
Civil works elements are represented geometrically by points, symbols, lines, polygons, faces or schematic diagrams.	Civil works elements are modelled as generic geometry that determine the maximum outer extent. The geometry is modelled as either recognisable objects or volumes for space reservation.	Civil works elements are modelled as specific types of objects with the maximum outer geometry.	Civil works elements are modelled as specific types of objects with correct and detailed outer geometry. Details required for coordination towards nearby/adjacent object are modelled at this level.	Civil works elements are modelled as product specific types of objects with correct and detailed geometry for production. Details and internal geometry are modelled e.g. nuts and bolts.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Refer to properties of the individual civil works specification corresponding to information on an assumed level.	PROPERTIES Refer to properties of the individual civil works specification corresponding to information on an expected level.	PROPERTIES Refer to properties of the individual civil works specification corresponding to information on a defined level.	PROPERTIES Refer to properties of the individual civil works specification corresponding to information on a final level.	PROPERTIES Refer to properties of the individual civil works specification corresponding to information on a final detailed level.

USE

For selected civil works elements in LOD Levels 200, 300, 325 and 400 there are specifications for LOR, LOG and LOI. In some cases, the specifications regard specific infrastructure components, in other cases the specifications apply to a group of infrastructure components.

LOD 200, 300 and 325 are directly linked to design services from YBL 2018, while LOD 400 is relevant to the production process for civil works elements. This is noted within each part specification.

If §94 Digital Design Services are selected from YBA 2019 and LOD DK are used then all of LOR, LOG and LOI levels are required for each civil works element.

The Civil Works Part Specifications is intended for use in its entirety. Changes and additions are not allowed in the catalogue. Changes and/or additions should be specified in the delivery specification or an individual attachment.

Note that requirements related to, for example, the extent of digital design services and use of classification and quantity take-off from the infrastructure model, must be defined in the contract between the parties.

ORGANIZATION OF THE WORK

DiKon Infrastructure is a group under the DiKon steering committee consisting of representatives from several consultancy companies and contractors in collaboration with representatives from BIM Infra.dk.

COMMENTS

The Civil Works Part Specifications are updated on a regular basis, comments and suggestions will be appreciated. They can be mailed to:

mail@dikon.info

WORKING GROUP

The following companies participate in working groups related to this publication:

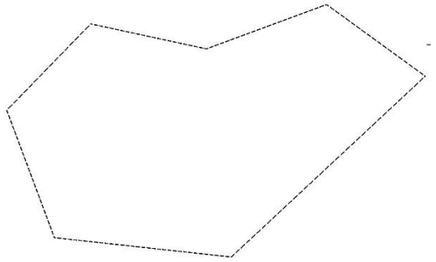
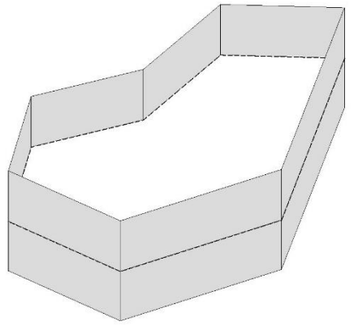
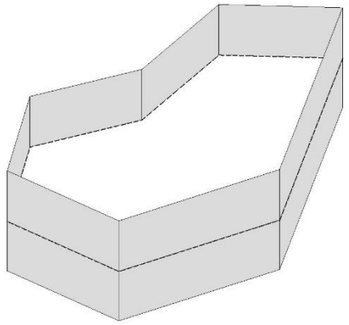
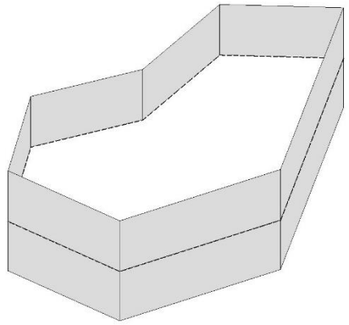
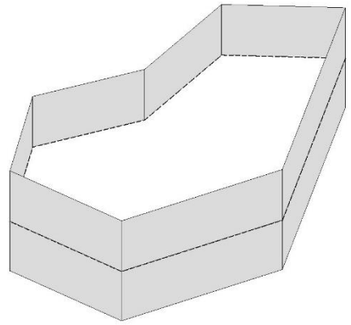
DiKon:
Aarsleff, COWI, Artelia, NCC, NIRAS, Rambøll and Sweco

Clients:
Banedanmark and Danish Road Directorate

SPECIFICATION FOR AREAS AND BOUNDARIES

Revision 3

APPLIES TO ALL TYPES OF EXPROPRIATION, VISIBILITY SPLAY, SAFETY ZONE, PROJECT BOUNDARY ETC.

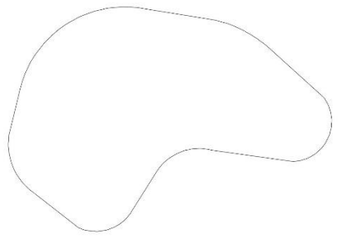
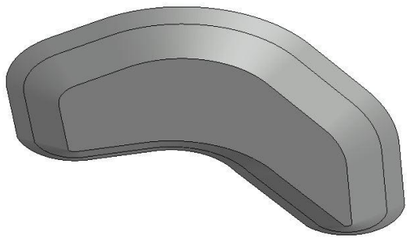
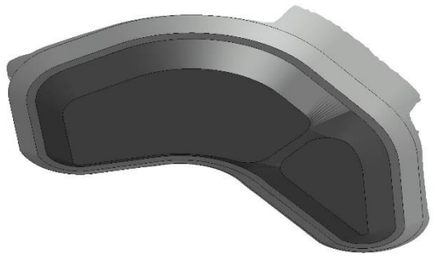
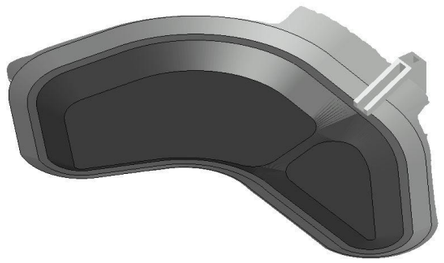
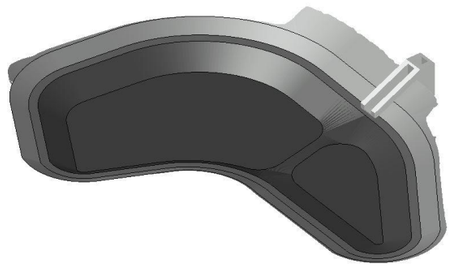
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Areas and boundaries are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Areas and boundaries geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in an appropriate extent.	**DEFINED** Areas and boundaries geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Areas and boundaries geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Areas and boundaries geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Areas and boundaries are drawn as 2D lines or polygons	Areas and boundaries are modelled as surfaces which indicate an area. A boundary is placed in relation to terrain if it does not have a specific vertical elevation.	Areas and boundaries are modelled as surfaces which indicate an area. A boundary is placed in relation to terrain if it does not have a specific vertical elevation.	Areas and boundaries are modelled as surfaces which indicate an area. A boundary is placed in relation to terrain if it does not have a specific vertical elevation.	Areas and boundaries are modelled as surfaces which indicate an area. A boundary is placed in relation to terrain if it does not have a specific vertical elevation.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name	**PROPERTIES** Type-/layer name	**PROPERTIES** Type-/layer name	**PROPERTIES** Type-/layer name

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR BASINS

APPLIES TO ALL TYPES OF BASINS

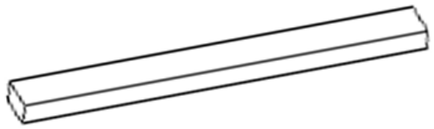
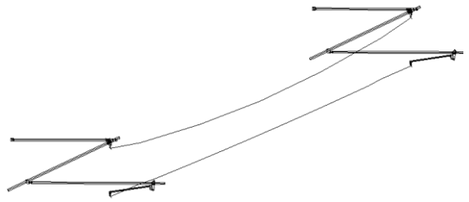
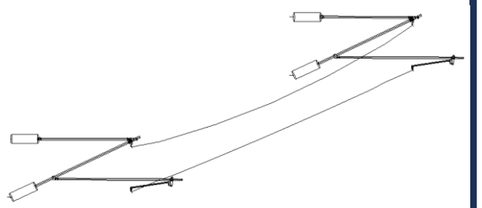
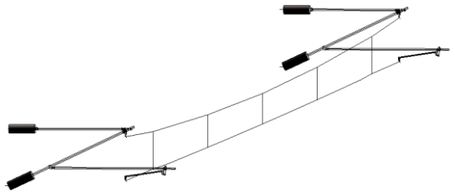
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Basins are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Basin geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Basin geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Basin geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Basin geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Basins are designed with maximum extent in 2D with basin number.	Basins are designed in 3D as a generic shape with definition of permanent water level and retention water level.	Basins are designed in the correct shape with definition of permanent water level and retention water level. Detail of for example sand traps and soil layers are designed.	Basins are designed in the correct shape, with definition of permanent water level and retention water level. Detail of for example sand traps and soil layers are designed. Terrain modelling at stairs and constructions are designed.	Basins are designed in the correct shape, with definition of permanent water level and retention water level. Detail of for example sand traps and soil layers are designed. Terrain modelling at stairs and constructions are designed.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name ID: Basin Level: Bottom	**PROPERTIES** Type-/layer name ID: Basin Level: Bottom Level: Permanent water surface Level: Retention water surface	**PROPERTIES** Type-/layer name ID: Basin Level: Bottom Level: Permanent water surface Level: Retention water surface Volume: Wet Volume: Retention	**PROPERTIES** Type-/layer name ID: Basin Level: Bottom Level: Permanent water surface Level: Retention water surface Volume: Wet Volume: Retention

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR CATENARY COMPONENTS

APPLIES TO ALL TYPES OF CATENARY COMPONENTS (CANTILEVERS, OVERHEAD CABLES, DISCONNECTORS, SECTION INSULATORS)

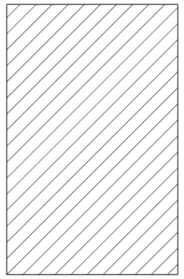
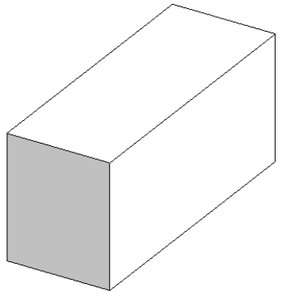
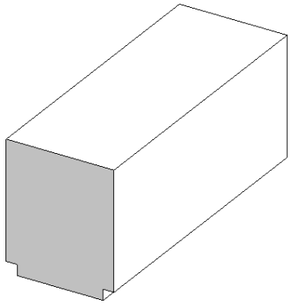
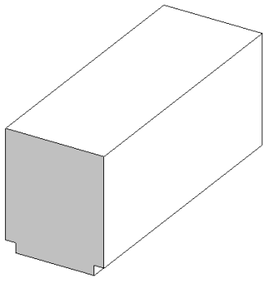
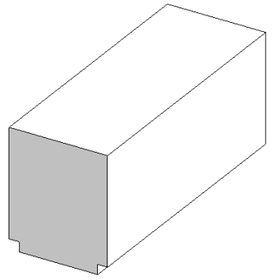
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED	**EXPECTED**	**DEFINED**	**FINAL**	**FINAL DETAILED**
Catenary components are specified on an overall level without further definition of volume, placement and properties.	Catenary components geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	Catenary components geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	Catenary components geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	Catenary components geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Catenary components are drawn as 2D model or schematic diagrams.	Catenary components are modelled as combined generic geometry that determine the maximum outer extent. The geometry is modelled as either recognisable objects or volumes for space reservation.	Catenary components are modelled as specific types of objects with the maximum outer geometry including reference lines for cables.	Catenary components are modelled with correct and detailed outer geometry counting smaller components including and reference lines for cables and hangers.	Catenary components are modelled as actual selected products. Nuts, bolts etc. are modelled.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES	**PROPERTIES**	**PROPERTIES**	**PROPERTIES**	**PROPERTIES**
Type-/layer name	Type-/layer name	Type-/layer name Material Placement: Chainage/Mileage	Type-/layer name Material Placement: Chainage/Mileage Type: Component	Type-/layer name Material Placement: Chainage/Mileage Type: Component

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR CLEARANCE PROFILES

APPLIES TO ALL TYPES OF CLEARANCE PROFILES

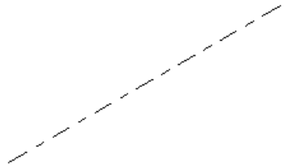
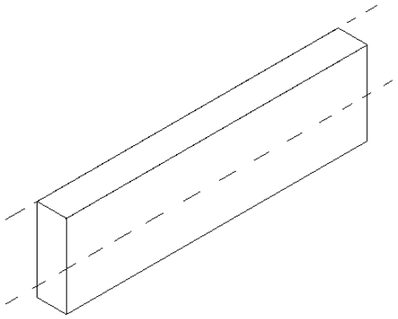
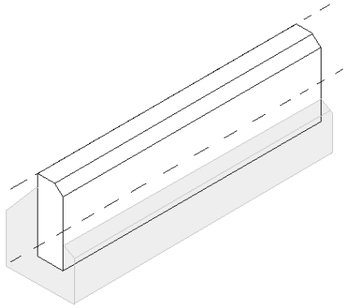
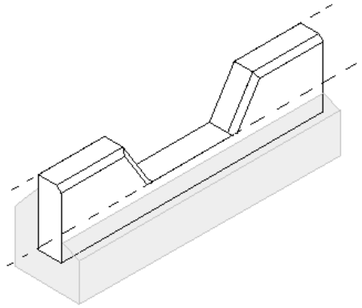
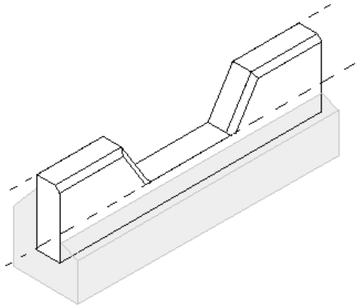
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Clearance profiles are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Clearance profile geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Clearance profile geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Clearance profile geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Clearance profile geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Clearance profiles are drawn in 2D with the assumed dimension of a cross section.	Clearance profiles are modelled as a generic volume object with a maximum outline.	Clearance profiles are modelled with maximum external extent similar to the chosen profile.	Clearance profiles are modelled in detailed external extent, to the detailed inner/outer delimitation.	Clearance profiles are modelled in detailed external extent, to the detailed inner/outer delimitation.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name	**PROPERTIES** Type-/layer name Type: Clearance	**PROPERTIES** Type-/layer name Type: Clearance	**PROPERTIES** Type-/layer name Type: Clearance

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR EDGE DELINEATION

APLIES TO ALL TYPES OF EDGE DELINEATION (KERB, BLOCK WALL, STEEL EDGE ETC.)

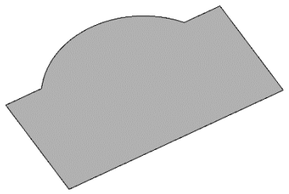
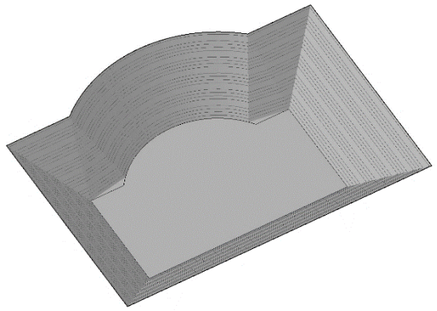
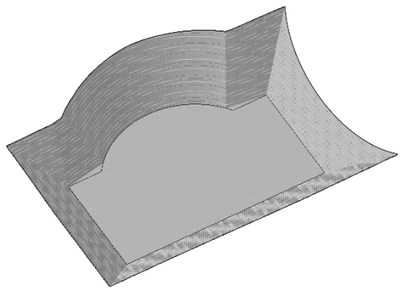
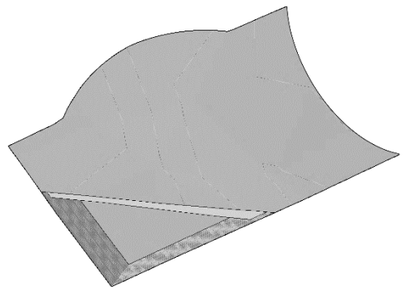
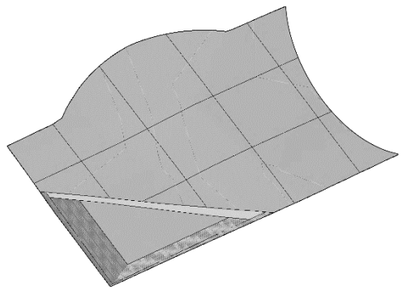
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Edge delineations are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Edge delineations geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Edge delineations geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Edge delineations geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Edge delineations geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Edge delineations are drawn as generic horizontal reference line in the leading edge.	Edge delineations are modeled as generic volume objects in maximum external extent including reference lines. Reference line in leading edge is following top side pavement, while the back side reference line follows top side edge delineation .	Edge delineations are modeled in maximum external extent divided into overall types including reference lines. Reference line in leading edge is following top side pavement, while the back side reference line follows top side edge delineation . Edge delimitations are modeled with chamfer, fillet, back casting, etc.	Edge delineations are modeled in detailed external extent divided into types including reference lines. Reference line in leading edge is following top side pavement, while the back side reference line follows top side edge delineation . Edge delimitations are modeled with chamfer, fillet, back casting, etc. including dive.	Edge delineations are modeled in dimensions based on actual selected products and production lengths including reference lines. Reference line in leading edge is following top side pavement, while the back side reference line follows top side edge delineation . Edge delimitations are modeled with all details.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m] Width Height	**PROPERTIES** Type-/layer name Length [m] Width Height Radius Material	**PROPERTIES** Type-/layer name Length [m] Width Height Radius Material	**PROPERTIES** Type-/layer name Length [m] Width Height Radius Material Manufacturer

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR EXCAVATIONS

APPLIES TO ALL TYPES OF EXCAVATIONS

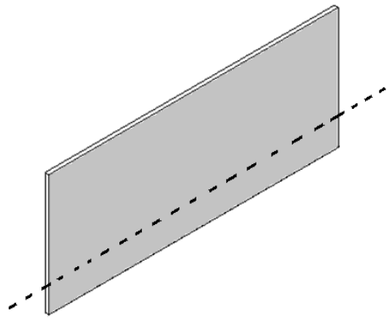
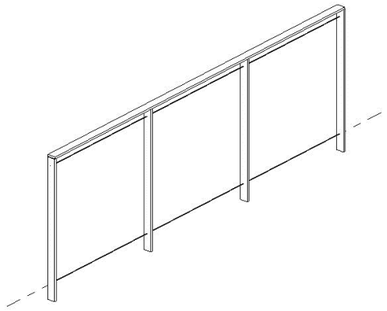
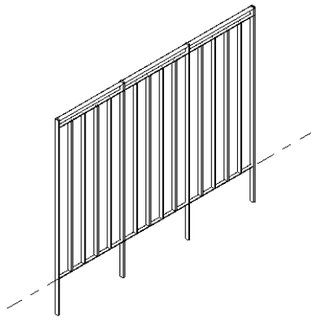
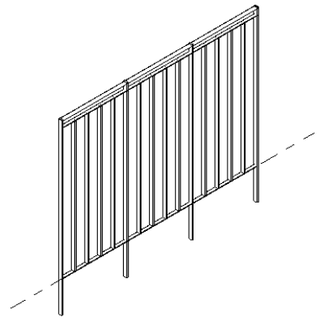
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Excavations are specified on an overall level without further definition of volume, placement and properties.	EXPECTED Excavations geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	DEFINED Excavations geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	FINAL Excavations geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	FINAL DETAILED Excavations geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	GENERIC LEVEL	TYPE-LEVEL	DETAILED TYPE-LEVEL	PRODUCT-LEVEL
				
Excavations are modelled as generic 2D shapes in maximum external extent.	Excavations are modelled as surfaces in expected geometry	Excavations are modelled as surfaces in defined geometry including breaklines and adjustments in respect to terrain. Surfaces are adapted to adjacent conditions such as sheet piles and structures.	Excavations are modelled as surfaces in final geometry including breaklines and adjustments in respect to terrain. A distinction is made between different soil layers. Surfaces are adapted to adjacent conditions such as sheet piles and structures.	Excavations are modelled as surfaces in final detailed geometry including breaklines and adjustments in respect to terrain. A distinction is made between different soil layers. Surfaces are adapted to adjacent conditions such as sheet piles and structures.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	PROPERTIES Type-/layer name Area	PROPERTIES Type-/layer name Area	PROPERTIES Type-/layer name Area Type: Soil	PROPERTIES Type-/layer name Area Type: Soil Volume Contamination class

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR FENCES AND RAILINGS

APPLIES TO ALL TYPES OF FENCES AND RAILINGS

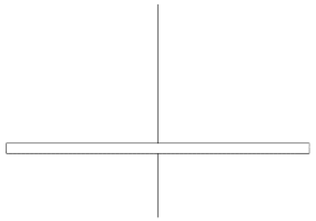
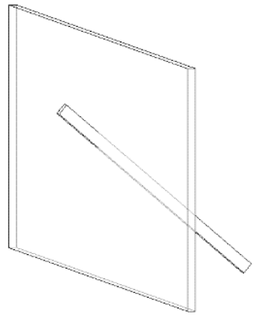
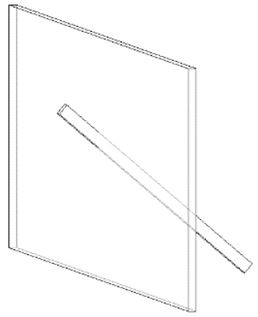
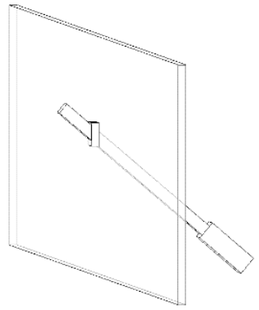
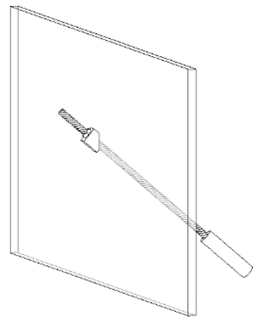
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Fences and railings are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Fences and railings geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Fences and railings geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Fences and railings geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Fences and railings geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Fences and railings are drawn as a generic horizontal reference line.	Fences and railings are modelled as generic volume objects in maximum external extent including reference line.	Fences and railings are modelled as generic volume objects in maximum external extent, divided into overall types including reference line, gates, deer leaps etc.	Fences and railings are modelled in detailed external extent and divided into types including the reference line, gates, deer leaps etc. Fences and railing are adapted towards adjacent structures.	Fences and railings are modelled in dimensions of actual selected products including reference line, gates, deer leaps etc. Fences and railing are adapted towards adjacent structures.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m] Height	**PROPERTIES** Type-/layer name Length [m] Height Material	**PROPERTIES** Type-/layer name Length [m] Height Material Type: Component

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR GROUND ANCHORS

APPLIES TO ALL TYPES OF GOUND ANCHORS

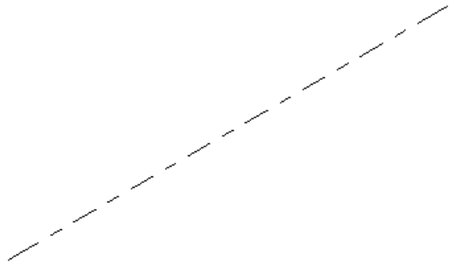
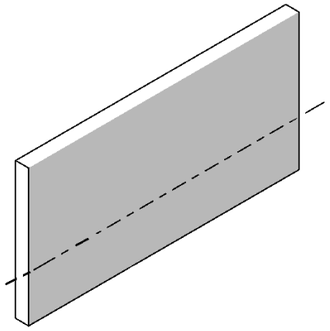
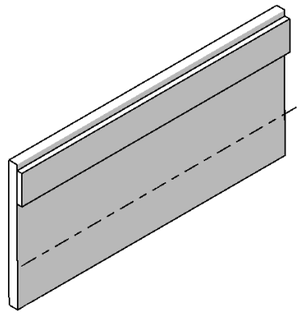
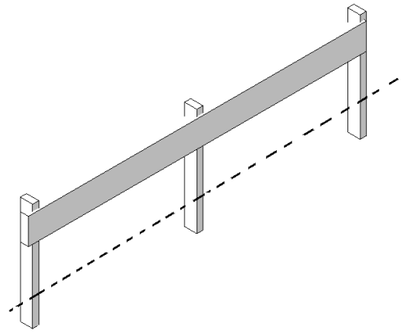
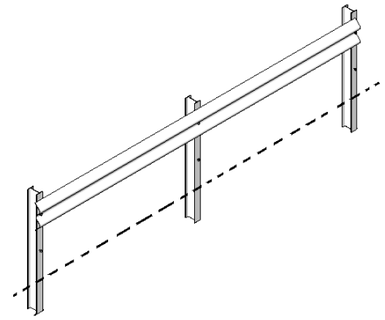
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Ground anchors are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Ground anchors geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Ground anchors geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Ground anchors geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Ground anchors geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Ground anchors are drawn as generic 2D centrelines.	Ground anchors are modelled as generic centrelines divided into overall types.	Ground anchors are modelled as objects in maximum external extent divided into overall types. Centrelines of ground anchors must be included in the objects.	Ground anchors are modelled with anchor head, anchor plate and wales. Injection zones are modelled as generics objects in expected maximum external extent. Centrelines of ground anchor must be included in the objects.	Ground anchors are modelled with assembly details of actual selected products. Injection zones are modelled as generics objects in expected maximum external extent. Centrelines of ground anchor must be included in the objects.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m] Level: Anchor head	**PROPERTIES** Type-/layer name Length [m] Level: Anchor head Dimension: Ø	**PROPERTIES** Type-/layer name Length [m] Level: Anchor head Dimension: Ø	**PROPERTIES** Type-/layer name Length [m] Level: Anchor head Dimension: Ø

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR GUARD RAIL

APPLIES TO ALL TYPES OF GUARD RAILS

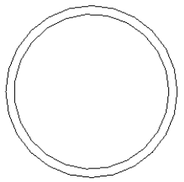
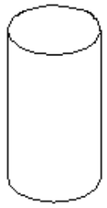
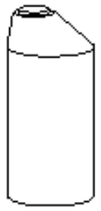
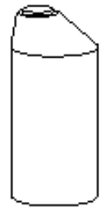
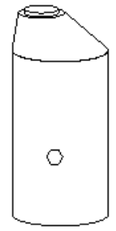
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Guard rails are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Guard rails geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Guard rails geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Guard rails geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Guard rails geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Guard rails are drawn as generic horizontal reference lines.	Guard rails are modelled as generic volume objects with a maximum outline and reference line in front edge of terrain.	Guard rails are modelled as objects with maximum outer dimensions divided into overall types with reference line in front edge of terrain.	Guard rails are modelled as objects with outer dimensions divided into types with reference line in front edge of terrain including reversing, downlead, crash cushion etc.	Guard rails are modelled in dimensions based on actual selected products with reference line in front edge of terrain including reversing, downlead, crash cushion etc.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m] Work width Strength class: Guard rail Safety class	**PROPERTIES** Type-/layer name Length [m] Work width Strength class: Guard rail Safety class Radius	**PROPERTIES** Type-/layer name Length [m] Work width Strength class: Guard rail Safety class Radius Type: Profile

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR MANHOLES AND WELLS

APLIES TO ALL TYPES OF MANHOLES AND WELLS (DRAINAGE AND SEWAGE MANHOLES, CABLE WELLS, INLETS ETC.)

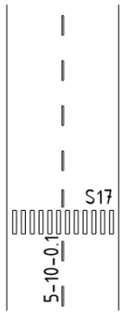
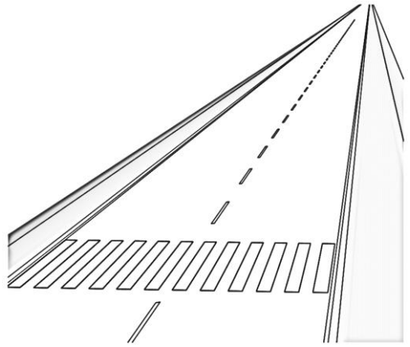
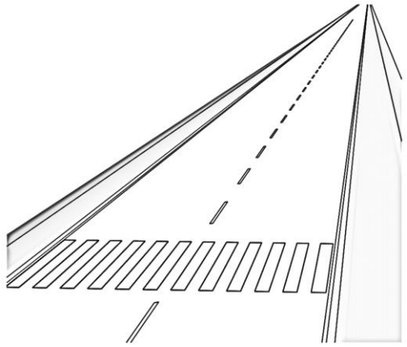
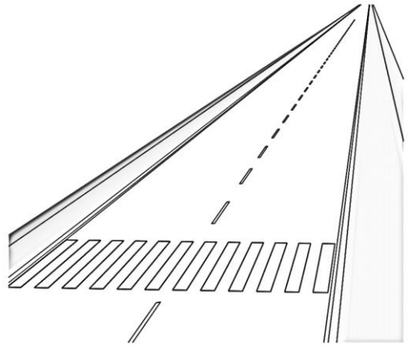
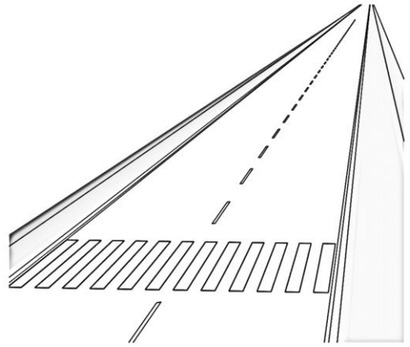
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED	**EXPECTED**	**DEFINED**	**FINAL**	**FINAL DETAILED**
Manholes and wells are specified on an overall level without further definition of volume, placement and properties.	Manholes and wells geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	Manholes and wells geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	Manholes and wells geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	Manholes and wells geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Manholes and wells are drawn as symbols in 2D.	Manholes and wells are modelled as generic volume objects in maximum outer extent.	Manholes and wells are modelled in maximum outer dimension incl. cone, cover etc.	Manholes and wells are modelled in detailed dimensions incl. cone, cover, frame etc.	Manholes and wells are modelled in detailed dimensions based on actual selected products.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES	**PROPERTIES**	**PROPERTIES**	**PROPERTIES**	**PROPERTIES**
Type-/layer name	Type-/layer name System Dimension: Ø, outer	Type-/layer name System Dimension: Ø, outer Level: Bottom Level: Cover	Type-/layer name System Dimension: Ø, outer Level: Bottom Level: Cover Type: Cover/Grate	Type-/layer name System Dimension: Ø, outer Level: Bottom Level: Cover Type: Cover/Grate Thickness: Wall

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR MARKING

APPLIES TO ALL TYPES OF MARKING

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Markings are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Markings geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in an appropriate extent.	**DEFINED** Markings geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Markings geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Markings geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Markings are drawn as 2D lines, symbols or shapes. Text indicating the dimension of the road marking.	Markings are drawn as 3D lines, symbols or shapes. The marking is placed above the road surface to ensure that the road marking is visible if used in a visualization.	Markings are drawn as 3D lines, symbols or shapes. The marking is placed above the road surface to ensure that the road marking is visible if used in a visualization.	Markings are drawn as 3D lines, symbols or shapes. The marking is placed above the road surface to ensure that the road marking is visible if used in a visualization.	Markings are drawn as 3D lines, symbols or shapes. The marking is placed above the road surface to ensure that the road marking is visible if used in a visualization.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name Length: Marking Width: Marking Spacing: Markings	**PROPERTIES** Type-/layer name Length: Marking Width: Marking Spacing: Markings Area: Hatched marking	**PROPERTIES** Type-/layer name Length: Marking Width: Marking Spacing: Markings Area: Hatched marking Distance: Marking Colour Durability [Year] Plan/profiled Executive order number	**PROPERTIES** Type-/layer name Length: Marking Width: Marking Spacing: Markings Area: Hatched marking Distance: Marking Colour Durability [Year] Plan/profiled Executive order number

DESCRIPTION OF SERVICES FROM FRI
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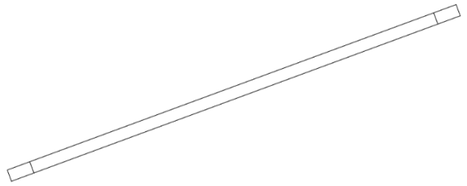
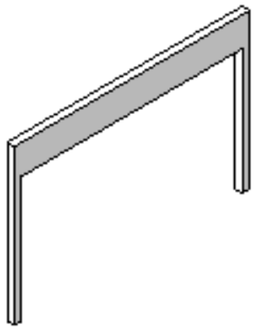
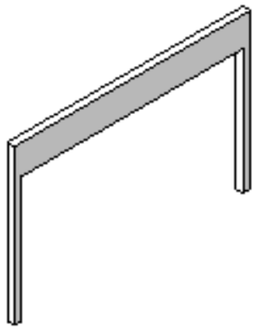
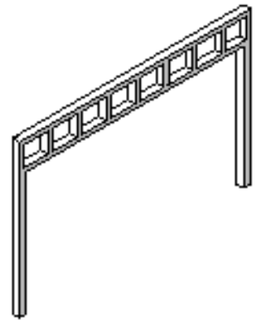
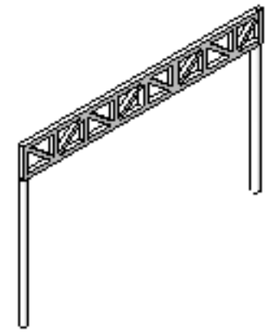
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR MASTS AND PORTALS

APPLIES TO ALL TYPES OF MASTS, PORTALS, STANDS, BACK TIES, GALLOWS ETC.

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Masts and portals are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Masts and portals geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Masts and portals geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Masts and portals geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Masts and portals geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Masts and portals are drawn as 2D model or schematic diagrams.	Masts and portals modelled as generic geometry in maximum external extent.	Masts and portals are modelled in maximum external dimensions including setting out points.	Masts and portals are modelled in correct dimensions including setting out points.	Masts and portals are modelled as actual selected products including setting out points. Nuts, bolts etc. are modelled.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name	**PROPERTIES** Type-/layer name Height [m] Type: Component	**PROPERTIES** Type-/layer name Height [m] Type: Component Placement: Chainage/Mileage	**PROPERTIES** Type-/layer name Height [m] Type: Component Placement: Chainage/Mileage

DESCRIPTION OF SERVICES FROM FRI
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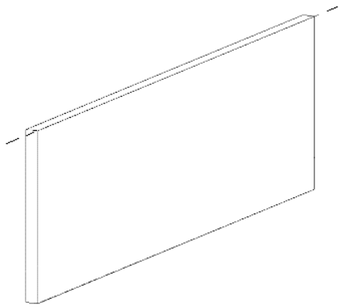
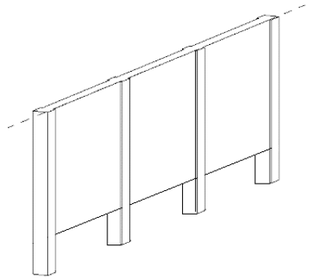
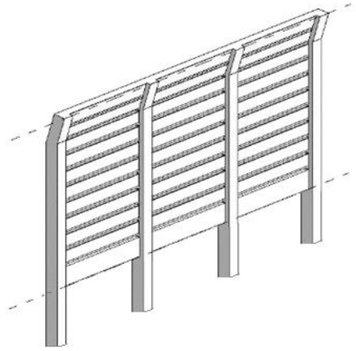
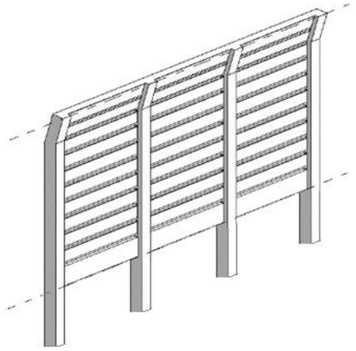
PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR NOISE BARRIERS

APPLIES TO ALL TYPES OF NOISE BARRIERS

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Noise barriers are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Noise barriers geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Noise barriers geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Noise barriers geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Noise barriers geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Noise barriers are drawn as a generic horizontal reference line.	Noise barriers are modelled as generic volume objects in maximum external extent including foundation and reference line representing top front edge of the noise barrier.	Noise barriers are modelled as volume objects in maximum external extent and divided into overall types including reference line representing top front edge of the noise barrier.	Noise barriers are modelled as volume objects in detailed external extent and divided into types including pillars, skirts and reference lines representing the top front edge as well as the bottom front edge of the noise barrier.	Noise barriers are modelled in dimensions of actual selected products including the reference lines representing the top front edge as well as the bottom front edge of the noise barrier.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m] Height Width	**PROPERTIES** Type-/layer name Length [m] Height Width Type: Noise barrier element	**PROPERTIES** Type-/layer name Length [m] Height Width Type: Noise barrier element Noise absorption/reflection Type: Post Type: Skirt	**PROPERTIES** Type-/layer name Length [m] Height Width Type: Noise barrier element Noise absorption/reflection Type: Post Type: Skirt Material: Noise barrier element Material: Post

DESCRIPTION OF SERVICES FROM FRI
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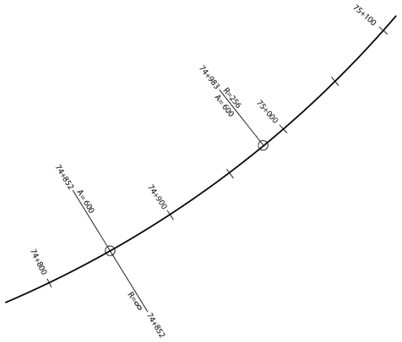
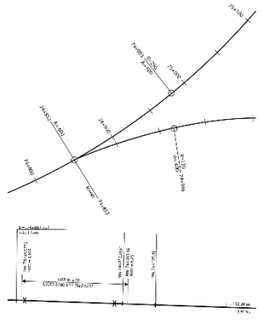
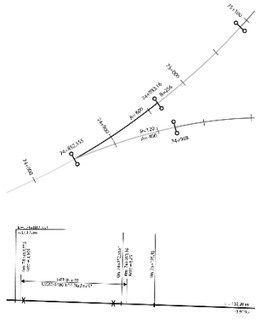
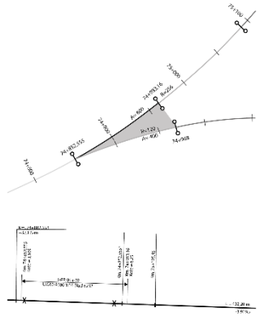
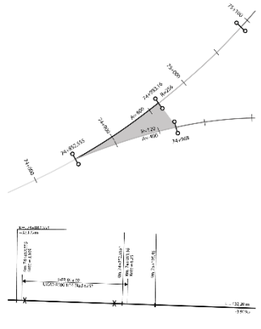
PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR RAILWAY ALIGNMENTS

APPLIES TO ALL TYPES OF ALIGNMENT PLANS AND LONGITUDINAL PROFILES FOR RAILWAY

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Railway alignments are specified on an overall level without further definition of volume, placement, and properties.	**EXPECTED** Railway alignments geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Railway alignments geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Railway alignments geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Railway alignments geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Railway alignments are drawn horizontally as lines, curves and/or schematic diagrams including associated annotation.	Railway alignments are modelled horizontally and vertically as lines and curves as well as a continuous 3D line including associated annotation.	Railway alignments are modelled horizontally and vertically as lines and curves as well as a continuous 3D line including associated annotation. Transition curves, cants and slews are included. Top of rail for right and left rail must be included. Position of turnouts, crossovers and route boards are defined.	Railway alignments are modelled horizontally and vertically as lines and curves as well as a continuous 3D line including associated annotation. Transition curves, cants and slews are included. Top of rail for right and left rail must be included. Type of rail and position of turnouts, crossovers, route boards and fouling point indicator are defined.	Railway alignments are modelled horizontally and vertically as lines and curves as well as a continuous 3D line including associated annotation. Transition curves, cants and slews are included. Top of rail for right and left rail must be included. Type of rail and position of turnouts, crossovers, route boards and fouling point indicator are defined.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m] Radius: Horizontal Placement: Chainage/Mileage	**PROPERTIES** Type-/layer name Length [m] Radius: Horizontal Placement: Chainage/Mileage Radius: Vertical	**PROPERTIES** Type-/layer name Length [m] Radius: Horizontal Placement: Chainage/Mileage Radius: Vertical Parameter: Transition curve Cant	**PROPERTIES** Type-/layer name Length [m] Radius: Horizontal Placement: Chainage/Mileage Radius: Vertical Parameter: Transition curve Cant Type: rail	**PROPERTIES** Type-/layer name Length [m] Radius: Horizontal Placement: Chainage/Mileage Radius: Vertical Parameter: Transition curve Cant Type: rail

DESCRIPTION OF SERVICES FROM FRI
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PRODUCTION
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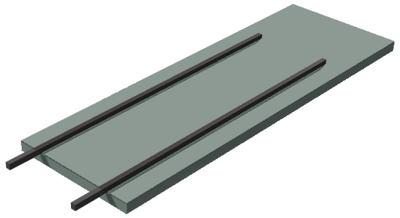
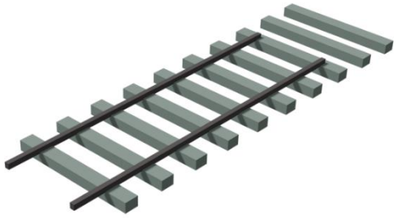
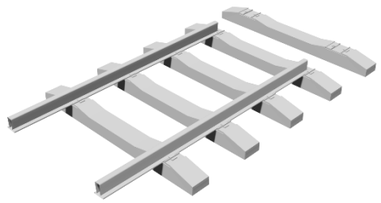
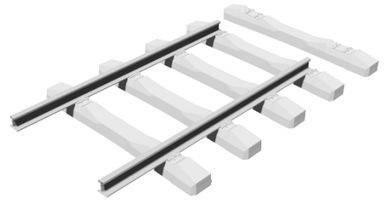
SPECIFICATION FOR RAIL COMPONENTS

APPLIES TO ALL TYPES OF RAIL COMPONENTS (RAILS, SLEEPERS, TURNOUTS, BUFFER STOPS ETC.)

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Rail components are specified on an overall level without further definition of volume, placement, and properties.	**EXPECTED** Rail components geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Rail components geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Rail components geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Rail components geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Rail components are drawn as lines, polygons and shapes in 2D.	Rail components are modelled in maximum external dimensions.	Rail components are modelled in correct external dimensions.	Rail components are modelled in detailed dimensions and contain both fixed and moving parts.	Rail components are modelled actual selected products. Bolts, screws and all fastening elements etc. are modelled.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name	**PROPERTIES** Type-/layer name	**PROPERTIES** Type-/layer name Type: Component Placement: Chainage/Mileage	**PROPERTIES** Type-/layer name Type: Component Placement: Chainage/Mileage

DESCRIPTION OF SERVICES FROM FRI
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PRODUCTION
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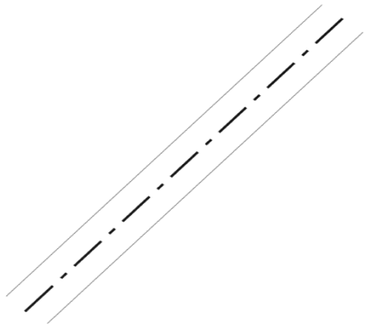
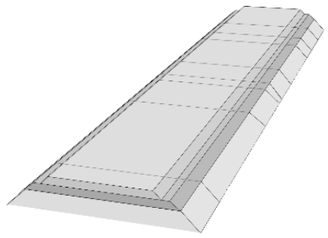
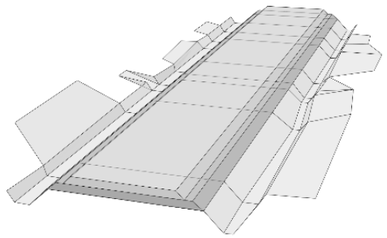
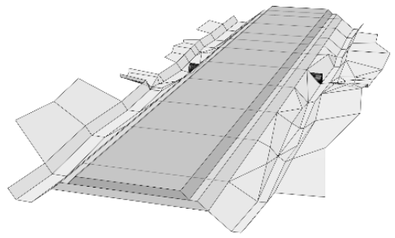
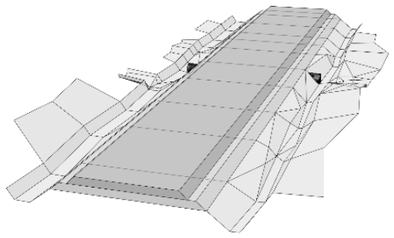
SPECIFICATION FOR RAIL CORRIDORS

APPLIES TO ALL TYPES OF RAIL CONSTRUCTIONS (LIGHTRAIL, METRO, RAILWAY ETC.)

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Rail corridors are specified on an overall level without further definition of volume, placement, and properties.	**EXPECTED** Rail corridors' geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Rail corridors' geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Rail corridors' geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Rail corridors' geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Rail corridors are drawn in 2D as lines polygons and surfaces.	Rail corridors are modelled with standard cross-section. Rail corridors consists of volume objects, surfaces, and break lines.	Rail corridors are modelled using detailed cross-sections. Overall types of material are differentiated in the cross-section. Rail corridors consists of volumes, surfaces, and break lines. Rail corridors are supplemented with boundaries, adjustments of the corridors overall extent and connection to existing terrain. Ditches are modelled according to the defined elevation of the drainage system.	Rail corridors are modelled using detailed cross-sections with actual cant. Materials are differentiated in the cross-section. Rail corridors consists of volumes, surfaces, and break lines. Rail corridors are supplemented with edge boundaries, adjustments of the corridors extent and connection to other systems, constructions, etc. Ditches are modelled according to the final elevation of the drainage system, and local conditions.	Rail corridors are modelled using detailed cross-sections with actual cant. Materials are differentiated in the cross-section. Rail corridors consists of volumes, surfaces, and break lines. Rail corridors are supplemented with edge boundaries, adjustments of the corridors extent and connection to other systems, constructions, etc. Ditches are modelled according to the final detailed elevation of the drainage system, and local conditions.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name Area: Surface	**PROPERTIES** Type-/layer name Area: Surface Volume Material	**PROPERTIES** Type-/layer name Area: Surface Volume Material Width: Top of layer [m]	**PROPERTIES** Type-/layer name Area: Surface Volume Material Width: Top of layer [m]

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PRODUCTION
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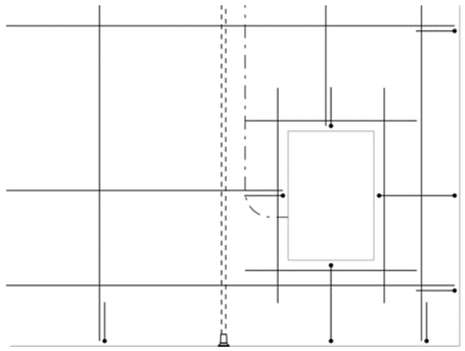
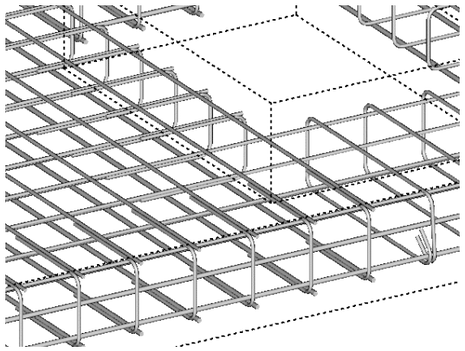
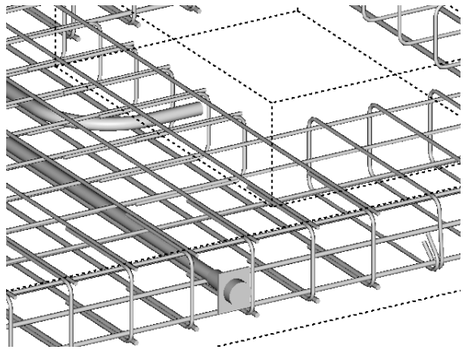
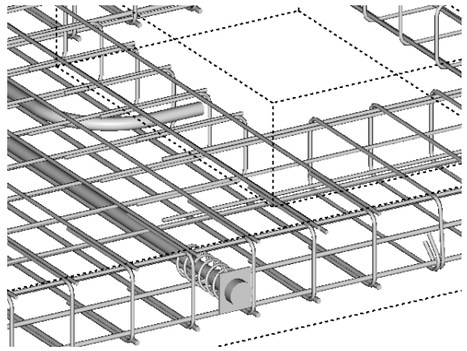
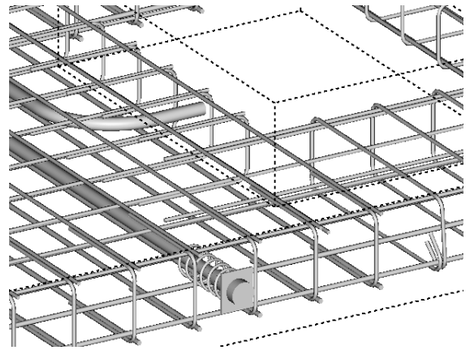
SPECIFICATION FOR REINFORCEMENT

APPLIES TO ALL TYPES OF REINFORCEMENT

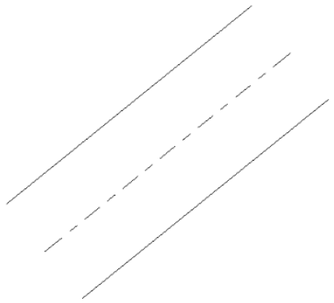
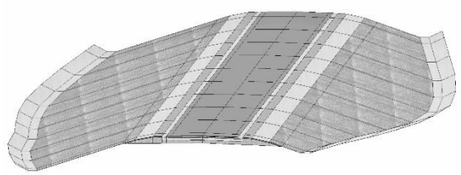
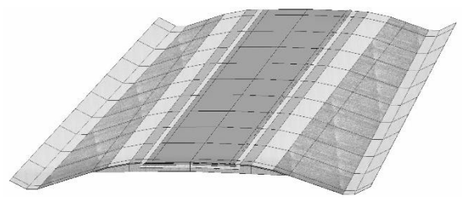
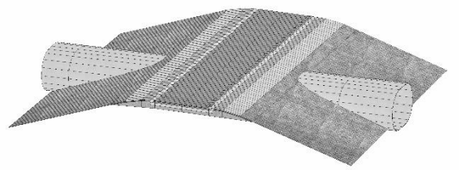
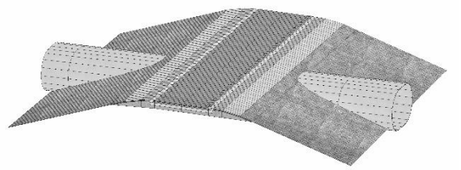
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Reinforcement is specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Reinforcement geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Reinforcement geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Reinforcement geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Reinforcement geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Reinforcement, reinforcement details and cast-in parts are drawn in 2D on plan and section as principle with underlying basis of a construction part.	Reinforcement is modelled in correct dimensions as principle with underlying basis of a construction part. Reinforcement details are drawn on 2D sections as principle with underlying basis of a construction part.	Reinforcement and cast-in parts are modelled in correct dimensions as principle with underlying basis of a construction part. Reinforcement details are drawn on 2D sections as principle with underlying basis of a construction part.	Reinforcement, reinforcement details and cast-in parts are modelled in correct dimensions as principle with underlying basis of a construction part. Post-tension cables and anchors etc. are modelled in correct dimensions.	Reinforcement, reinforcement details and cast-in parts are modelled in correct dimensions as principle with underlying basis of a construction part. Post-tension cables and anchors etc. are modelled in correct dimensions. Reinforcement is modelled with correct bend radiuses, lap lengths etc. for complete bar bending schedule.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name Dimension Length	**PROPERTIES** Type-/layer name Dimension Length	**PROPERTIES** Type-/layer name Dimension Length Steel grade Tension force: Pre/Post-tension cables	**PROPERTIES** Type-/layer name Dimension Length Steel grade Tension force: Pre/Post-tension cables ID: Bar bending schedule

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR ROADS AND SQUARES

APPLIES TO ALL TYPES OF ROADS, PATHS AND SQUARES

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Roads and Squares are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Road and Square geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Road and Square geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Road and Square geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Road and Square geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Roads and squares are modelled generic in 2D as lines or surfaces.	Roads and squares are modelled in standard cross-section or as generic surfaces in maximum external extent including breaklines. A distinction is made between paved and non-paved surfaces.	Roads and squares are modelled with defined cross section build-up and connection to terrain. A distinction is made between materials in the cross-section build-up. The road surface is adjusted to adjacent roads. Roads and squares are supplemented with edge delimitations, tilts and local adjustments of the width of the corridor in relation to other works. Ditches are modelled in accordance to defined elevations of the drainage system.	Roads and squares are modelled with final cross-section build-up and connection to terrain. A distinction is made between materials in the cross-section build-up. The road surface is adjusted to adjacent roads. Roads and squares are supplemented with edge delimitations, tilts and local adjustments of the width of the corridor in relation to other works, structures etc. Ditches are modelled in accordance to final elevations of the drainage system and local conditions.	Roads and squares are modelled with final detailed cross-section build-up and connection to terrain. A distinction is made between materials in the cross-section build-up. The road surface is adjusted to adjacent roads. Roads and squares are supplemented with edge delimitations, tilts and local adjustments of the width of the corridor in relation to other works, structures etc. Ditches are modelled in accordance to final detailed elevations of the drainage system and local conditions.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name Area	**PROPERTIES** Type-/layer name Area Thickness Volume	**PROPERTIES** Type-/layer name Area Thickness Volume	**PROPERTIES** Type-/layer name Area Thickness Volume

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
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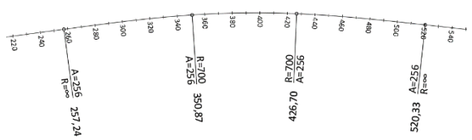
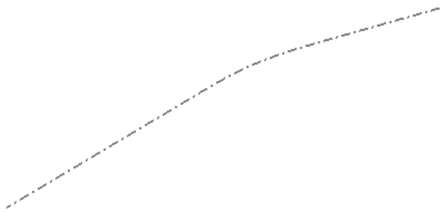
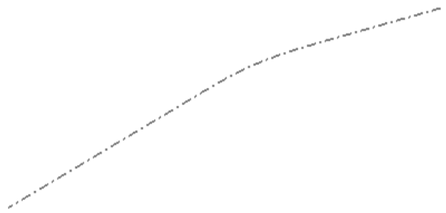
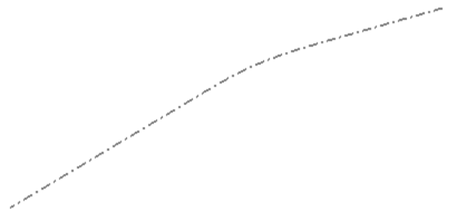
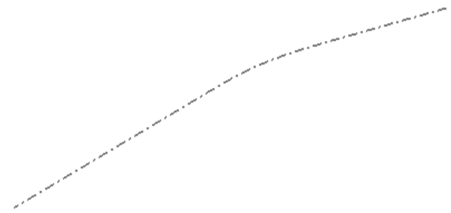
PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR ROAD ALIGNMENTS

APPLIES TO ALL TYPES OF HORIZONTAL AND VERTICAL ALIGNMENTS FOR ROADS AND PATHS

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Road alignments are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Road alignments geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Road alignments geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Road alignments geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Road alignments geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Road alignments are modelled as continuous horizontal lines via lines, clothoids and radius including associated annotation.	Road alignments are modelled as continuous horizontal line by lines, clothoids and radius including associated annotation. The alignment is supplemented with vertical geometry via lines and radius.	Road alignments are modelled as continuous horizontal line by lines, clothoids and radius including associated annotation. The alignment is supplemented with vertical geometry via lines and radius.	Road alignments are modelled as continuous horizontal line by lines, clothoids and radius including associated annotation. The alignment is supplemented with vertical geometry via lines and radius.	Road alignments are modelled as continuous horizontal line by lines, clothoids and radius including associated annotation. The alignment is supplemented with vertical geometry via lines and radius.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length Radius: Horizontal Clothoid parameter	**PROPERTIES** Type-/layer name Length Radius: Horizontal Clothoid parameter Radius: Vertical	**PROPERTIES** Type-/layer name Length Radius: Horizontal Clothoid parameter Radius: Vertical	**PROPERTIES** Type-/layer name Length Radius: Horizontal Clothoid parameter Radius: Vertical	**PROPERTIES** Type-/layer name Length [m] Radius: Horizontal Clothoid parameter Radius: Vertical

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
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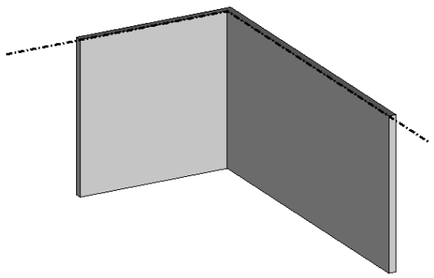
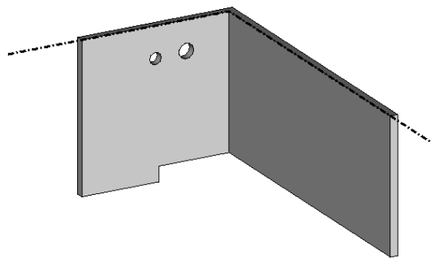
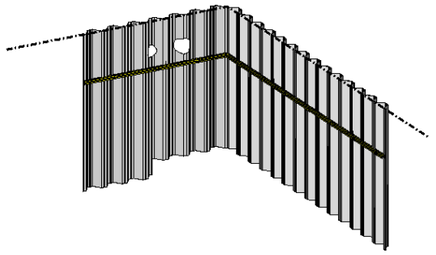
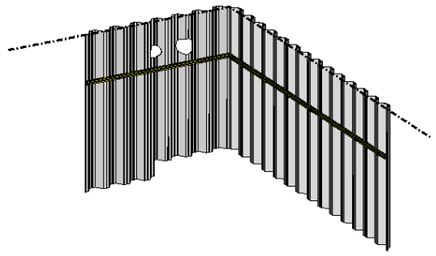
PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR SHEET PILES

APPLIES TO ALL TYPES OF SHEET PILES

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Sheet piles are specified on an overall level without further definition of volume, placement and properties.	EXPECTED Sheet piles geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	DEFINED Sheet piles geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	FINAL Sheet piles geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	FINAL DETAILED Sheet piles geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	GENERIC LEVEL	TYPE-LEVEL	DETAILED TYPE-LEVEL	PRODUCT-LEVEL
				
Sheet piles are drawn as a generic 2D reference line.	Sheet piles are modelled as generic objects in maximum external extent divided into overall types including reference line at front edge.	Sheet piles are modelled with simplified geometry and depth including reference line at front edge. Sheet piles are modelled with openings and larger holes for main penetrations.	Sheet piles are modelled with profile and depth including reference line at front edge Sheet piles are modelled with openings and holes with a diameter or edge length over 150 mm of penetrations. Wales and struts are modelled.	Sheet piles are modelled with correct profile, depth, openings and holes for penetrations including reference line at front edge Wales, struts, corner assemblies, joint details for wales etc. are modelled.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m]	PROPERTIES Type-/layer name Length [m] Height [m] Width	PROPERTIES Type-/layer name Length [m] Height [m] Width Level: Top Level: Toe	PROPERTIES Type-/layer name Length [m] Height [m] Width Level: Top Level: Toe Type: Profile	PROPERTIES Type-/layer name Length [m] Height [m] Width Level: Top Level: Toe Type: Profile

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
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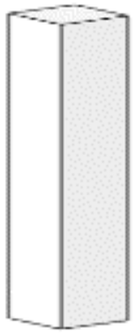
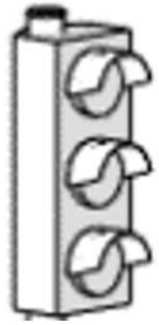
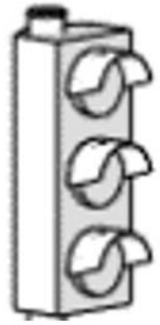
PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR SIGNAL LANTERNS

APPLIES TO ALL TYPES OF SIGNAL LANTERNS

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Signal lanterns are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Signal lanterns geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Signal lanterns geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Signal lanterns geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Signal lanterns geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Signal lanterns are drawn as 2D symbols.	Signal lanterns are modelled as generic volume objects in maximum external extent.	Signal lanterns are modelled as overall types in maximum external dimensions.	Signal lanterns are modelled as objects in detailed external geometry including number as well as shape of light signal.	Signal lanterns are modelled as actual selected products including number of lights, shape of light signal, pedestrian buttons etc.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name Type: Signal	**PROPERTIES** Type-/layer name Type: Signal	**PROPERTIES** Type-/layer name Type: Signal	**PROPERTIES** Type-/layer name Type: Signal Light source Dimension: Light opening Material Back plate Arrow direction Mounting: Mast

DESCRIPTION OF SERVICES FROM FRI
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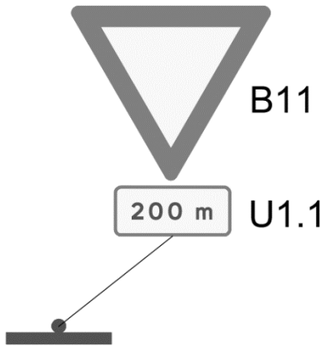
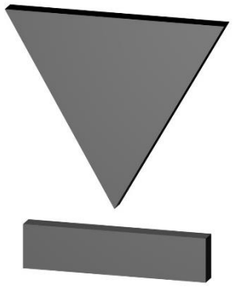
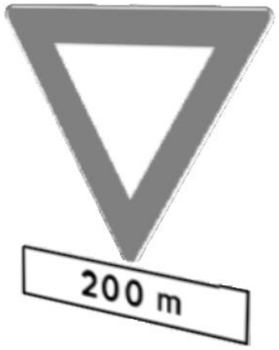
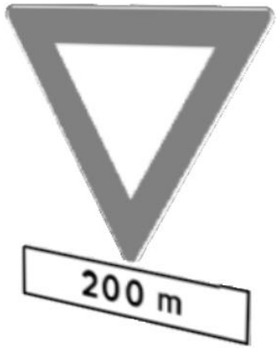
PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR SIGNS

APPLIES TO ALL TYPES OF SIGNS AND EDGE MARKERS

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Signs are specified on an overall level without further definition of volume, placement and properties.	EXPECTED Sign geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	DEFINED Sign geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	FINAL Sign geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	FINAL DETAILED Sign geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	GENERIC LEVEL	TYPE-LEVEL	DETAILED TYPE-LEVEL	PRODUCT-LEVEL
				
Signs are placed as symbols in 2D.	Signs are modelled with their generic size.	Signs are modelled as volume objects in maximum external extent and divided into signs and sub-signs. Signs are placed in relation to the surroundings.	Signs are modelled with their full geometry and display of the type of sign including text. Sub-signs are modelled. Signs are placed in relation to the surroundings.	Signs are modelled with their full geometry and display of the type of sign including text. Sub-signs are modelled. Signs are placed in relation to the surroundings. Mountings, bolts, screws etc. for fitting are modelled.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	PROPERTIES Type-/layer name Type: Sign	PROPERTIES Type-/layer name Type: Sign Dimension: Sign	PROPERTIES Type-/layer name Type: Sign Dimension: Sign	PROPERTIES Type-/layer name Type: Sign Dimension: Sign Height: Text, capital Type: Reflexion Type: Mount

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
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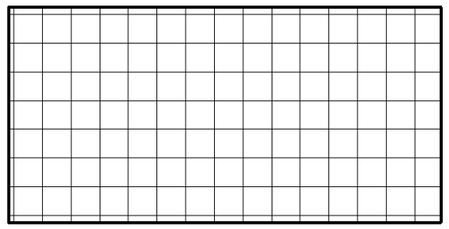
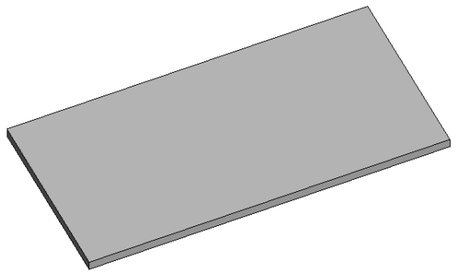
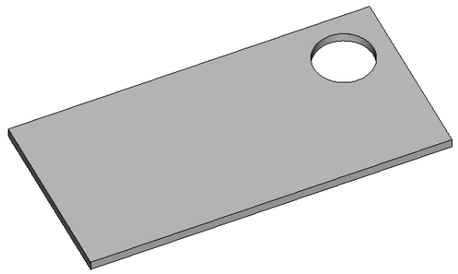
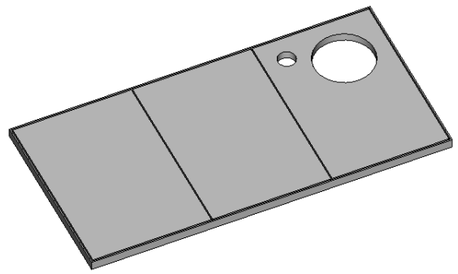
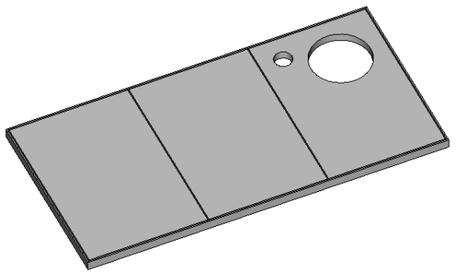
PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR STEEL SLABS

APPLIES TO ALL TYPES OF STEEL SLABS AND PLATES

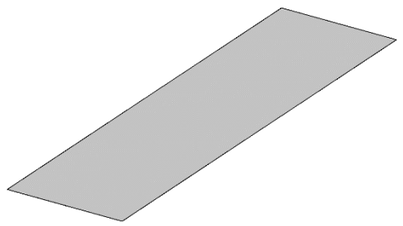
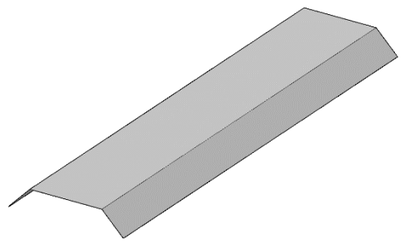
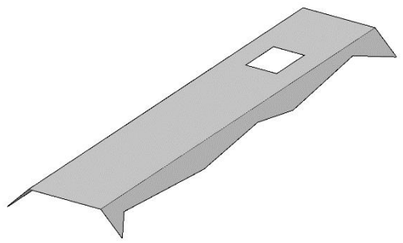
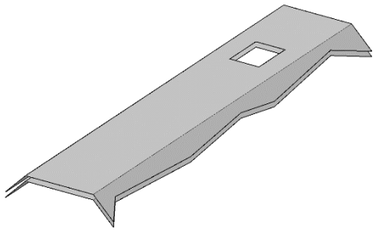
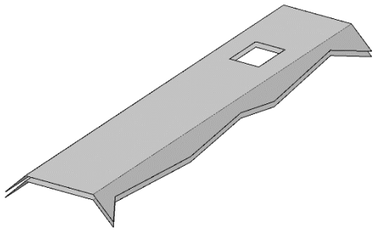
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Steel slabs are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Steel slabs geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Steel slabs geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Steel slabs geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Steel slabs geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Steel slabs are drawn in 2D by use of polygons.	Steel slabs are modelled as generic volume objects in maximum external extent divided into overall types.	Steel slabs are modelled as overall plates with openings and larger holes for main penetrations.	Steel slabs are modelled as overall plates in producible sizes with frames and connection plates Steel slabs are modelled with openings and holes with a diameter or edge length over 150 mm of penetrations. Fire insulation is modelled when it is crucial for interdisciplinary coordination.	Steel slabs are modelled as overall plates in correct sizes for production with frames, connection plates, openings and holes for penetrations. Bolts, welding seams and fire insulation are modelled.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Area	**PROPERTIES** Type-/layer name Area	**PROPERTIES** Type-/layer name Area Type: Plate	**PROPERTIES** Type-/layer name Area Type: Plate Load bearing	**PROPERTIES** Type-/layer name Area Type: Plate Load bearing Steel grade

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR TERRAIN REGULATION

APPLIES TO ALL TYPES OF EARTHWORKS, TERRAIN, FILL ECT.

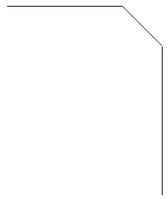
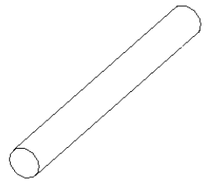
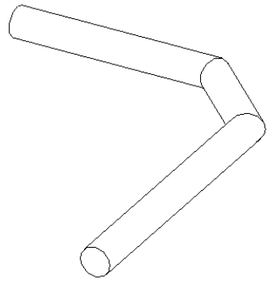
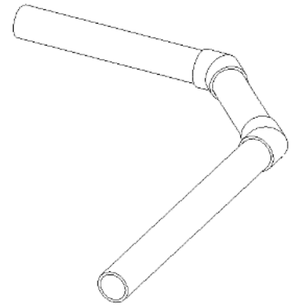
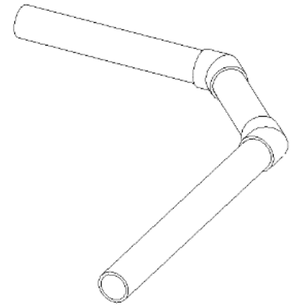
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Terrain regulations are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Terrain regulations geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Terrain regulations geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Terrain regulations geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Terrain regulations geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Terrain regulations are modelled as generic 2D shapes in maximum external extent.	Terrain regulations are modelled as surfaces in expected geometry.	Terrain regulations are modelled as surfaces in defined geometry including breaklines and adjustments in respect to terrain. Surfaces are adapted to adjacent conditions such as sheet piles and structures.	Terrain regulations are modelled as surfaces in final geometry including breaklines and adjustments in respect to terrain. A distinction is made between different soil layers. Surfaces are adapted to adjacent conditions such as sheet piles and structures.	Terrain regulations are modelled as surfaces in final detailed geometry including breaklines and adjustments in respect to terrain. A distinction is made between different soil layers. Surfaces are adapted to adjacent conditions such as sheet piles and structures.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	**PROPERTIES** Type-/layer name Area	**PROPERTIES** Type-/layer name Area	**PROPERTIES** Type-/layer name Area Volume	**PROPERTIES** Type-/layer name Area Volume

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR UTILITIES, GRAVITATIONAL PIPES IN TERRAIN

APPLIES TO ALL TYPES OF UTILITIES, GRAVITATIONAL PIPES IN TERRAIN

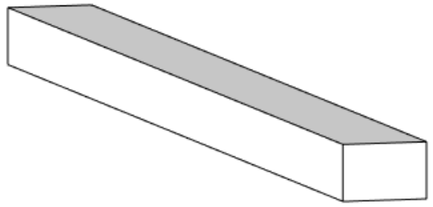
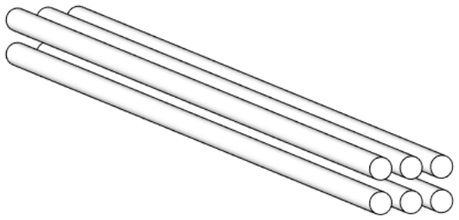
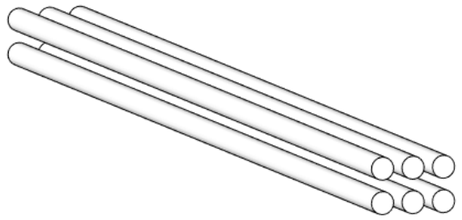
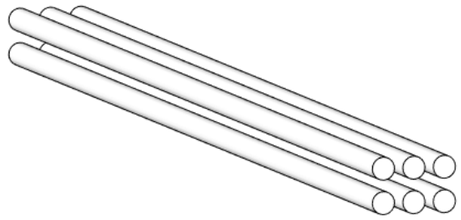
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Pipes are specified on an overall level without further definition of volume, placement and properties.	**EXPECTED** Pipe geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	**DEFINED** Pipe geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	**FINAL** Pipe geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	**FINAL DETAILED** Pipe geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	**GENERIC LEVEL**	**TYPE-LEVEL**	**DETAILED TYPE-LEVEL**	**PRODUCT-LEVEL**
				
Pipes are drawn as 2D lines with approximated location.	Pipes are modelled as generic volume objects in max. outer extent incl. reference line in the bottom (internal) of the cross-section.	Pipes are modelled in maximum outer extent incl. reference line in the bottom (internal) of the cross-section.	Pipes are modelled in detailed dimensions with fittings incl. reference line in the bottom (internal) of the cross-section.	Pipes are modelled in detailed dimensions based on actual selected products incl. fittings, pipe wall thickness and reference line in the bottom (internal) of the cross-section.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name Length [m]	**PROPERTIES** Type-/layer name Length [m] System Level: Upstream Level: Downstream Slope	**PROPERTIES** Type-/layer name Length [m] System Level: Upstream Level: Downstream Slope Dimension: Ø, outer Material	**PROPERTIES** Type-/layer name Length [m] System Level: Upstream Level: Downstream Slope Dimension: Ø, outer Material Strength class: Pipe	**PROPERTIES** Type-/layer name Length [m] System Level: Upstream Level: Downstream Slope Dimension: Ø, outer Material Strength class: Pipe Thickness: Wall

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR UTILITIES, PIPES AND CABLES IN TERRAIN

APPLIES TO ALL TYPES OF UTILITIES, PIPES AND CABLES IN TERRAIN (EXCEPT FOR GRAVITATIONAL PIPES)

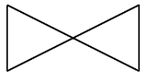
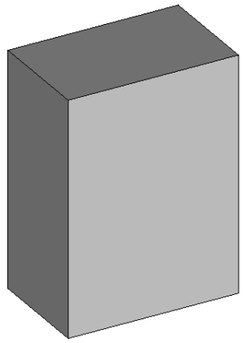
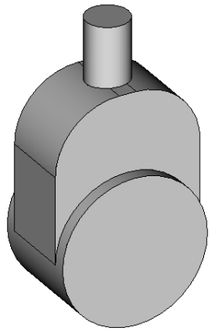
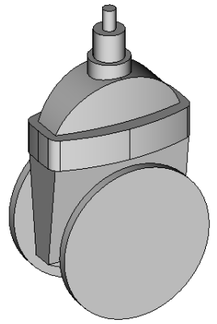
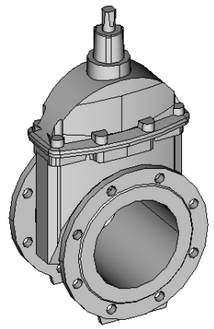
LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED	EXPECTED	DEFINED	FINAL	FINAL DETAILED
Pipe and cables are specified on an overall level without further definition of volume, placement and properties.	Pipe and cables geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	Pipe and cables geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	Pipe and cables geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	Pipe and cables geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	GENERIC LEVEL	TYPE-LEVEL	DETAILED TYPE-LEVEL	PRODUCT-LEVEL
				
Pipes and cables are drawn as 2D lines with approximated location.	Pipes and cables are modelled as generic volume objects in max. outer extent incl. reference line in the center of the cross-section.	Pipes and cables are modelled in maximum outer extent incl. reference line in the center of the cross-section.	Pipes and cables are modelled in detailed dimensions with fittings incl. reference line in the center of the cross-section.	Pipes and cables are modelled in detailed dimensions based on actual selected products incl. fittings, thickness (pipe wall) and reference line in the center of the cross-section.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES	PROPERTIES	PROPERTIES	PROPERTIES	PROPERTIES
Type-/layer name Length [m]	Type-/layer name Length [m] System	Type-/layer name Length [m] System Dimension: Ø, outer Material	Type-/layer name Length [m] System Dimension: Ø, outer Material Pressure/Strength class: Pipe	Type-/layer name Length [m] System Dimension: Ø, outer Material Pressure/Strength class: Pipe Thickness: Wall

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
By selecting the §9.4 Digital Design Service in YBA 2019 as well as the LOD DK levels above, the LOR, LOG and LOI for the LOD DK are mandatory for each civil works/construction element.
Please refer to the instruction for this publication.

PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

SPECIFICATION FOR UTILITY COMPONENTS

APPLIES TO ALL TYPES OF COMPONENTS FOR UTILITIES (VALVES, WATER TRAPS, STOPCOCK, OIL SEPARATOR, PUMPS ETC.)

LOD 100 DK	LOD 200 DK	LOD 300 DK	LOD 325 DK	LOD 400 DK
LOR 100	**LOR 200**	**LOR 300**	**LOR 325**	**LOR 400**
ASSUMED Utility components are specified on an overall level without further definition of volume, placement and properties.	EXPECTED Utility components geometry and placement are coordinated and illustrated to form the basis for a collective space disposition. Properties are associated in appropriate extent.	DEFINED Utility components geometry and placement are settled and coordinated to form the basis for decision making. A detailed and final processing, coordination and association of properties remains.	FINAL Utility components geometry and placement are detailed and coordinated to form the basis for production preparation and construction. Properties as basis for construction are associated.	FINAL DETAILED Utility components geometry, placement and properties are defined for production and construction according to the actual products.
LOG 100	**LOG 200**	**LOG 300**	**LOG 325**	**LOG 400**
2D LEVEL	GENERIC LEVEL	TYPE-LEVEL	DETAILED TYPE-LEVEL	PRODUCT-LEVEL
				
Utility components are drawn as symbols in 2D.	Utility components are modelled as generic volume objects in maximum external extent.	Utility components are modelled in maximum external extent.	Utility components are modelled in detailed external extent.	Utility components are modelled in dimensions of actual selected products.
LOI 100	**LOI 200**	**LOI 300**	**LOI 325**	**LOI 400**
PROPERTIES Type-/layer name	PROPERTIES Type-/layer name System	PROPERTIES Type-/layer name System	PROPERTIES Type-/layer name System	PROPERTIES Type-/layer name System

DESCRIPTION OF SERVICES FROM FRI
The delivery requirements above shall be seen in relation to selected services in the Description of services for Civil Works 2019 (EN) (YBA 2019).
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PRODUCTION
The delivery requirements above must be seen in conjunction with services related to contractor / supplier design.

PROPERTIES

Below is a complete list of the properties, that appears in the individual civil works part specifications. The list contains the basic metadata for the properties, to ensure a uniform setup across software.

The IFC-properties refer to IFC4.3.

Property name	Example	Property set	Property	Data type	Unit
Area		IfcElementQuantity	NetArea	Number	m²
Area: Hatched marking		Qto_SurfaceFeatureBaseQuantities	Area	Number	m²
Area: Surface		IfcElementQuantity	NetArea	Number	m²
Arrow direction		Add_SignalCommon	ArowDirection	List	Right/Left
Back plate		Pset_SignalFrame	BackboardType	True/False	True/False
Cant		IfcAlignmentCant	RailHeadDistance	Number	mm
Clothoid parameter		IfcClothoid	ClothoidConstant	Number	-
Colour		IfcColourSpecification	Name	Text	-
Contamination class		Add_MaterialEarthwork	ContaminationClass	List	(0-4)
Dimension: Light opening		Profile	Diameter	Number	mm
Dimension: Sign	*150x150*	ifcRoot	Description	Text	mm
Dimension: Ø		IfcReinforcingBar	NominalDiameter	Number	mm
Dimension: Ø, outer		Pset_PipeFittingTypeCommon Pset_PipeSegmentTypeCommon	OuterDiameter	Number	mm
Distance: Marking		Add_SurfaceFeatureCommon	Distance	Number	m
Durability [Year]		Pset_ServiceLife	ServiceLifeDuration	Number	År
Executive order number		IfcRoot	Name	Number	-
Height		IfcElementQuantity	NominalHeight	Number	mm
Height [m]		IfcElementQuantity	NominalHeight	Number	m
Hight: Text, capital		Add_SignCommon	TextHeight	Number	mm
ID: Bar bending schedule		IfcRoot	Name	Text	-
ID: Basin		IfcRoot	Name	Number	-
Layer name		IfcPresentationLayerAssignment	Name	Text	-
Length		IfcElementQuantity	NominalLength	Number	mm
Length [m]		IfcElementQuantity	NominalLength	Number	m
Length: Marking		Qto_SurfaceFeatureBaseQuantities	Length	Number	m
Level: Anchor head		Add_Levels	AnchorHeadLevel	Number	m
Level: Bottom		Add_Levels	BottomLevel	Number	m
Level: Cover		Add_Levels	CoverLevel	Number	m
Level: Downstream		Add_Levels	DownStreamLevel	Number	m
Level: Permanent water surface		Add_Levels	PermanentWaterLevel	Number	m
Level: Retention water surface		Add_Levels	RetentionWaterLevel	Number	m
Level: Toe		Add_Levels	ToeLevel	Number	m

Level: Top		Add_Levels	TopLevel	Number	m
Level: Upstream		Add_Levels	UpStreamLevel	Number	m
Light source		IfcLightSource	Name	List	LED/lavvolt
Load bearing		Pset_SlabCommon	LoadBearing	True/False	True/False
Manufacturer		Pset_ManufacturerTypeInformation	Manufacturer	Text	-
Material		IfcMaterial	Name	Text	-
Material: Noise barrier element		IfcMaterial	Name	Text	-
Material: Post		IfcMaterial	Name	Text	-
Mounting: Mast		Add_SignalCommon	MountingMast	List	1 punkt top/ 1punkt bund/ 2 punkt)
Noise absorption/reflection		Add_NoiseBarrierCommon	AbsorptionReflection	Text	-
Parameter: Transition curve		IfcGradientCurve	BaseCurve	Number	-
Placement: Chainage/Mileage		Pset_Stationing	Station	Number	km
Plan/profiled		Add_SteelMaterial	SurfaceStucture	Text	-
Pressure class: Pipe		Add_PipeSegmentTypeCommon	PressureClass	Text	
Radius		IfcCircleProfileDef	Radius	Number	m
Radius: Horizontal		IfcAlignmentHorizontalSegment	StartRadiusOfCurvature	Number	m
Radius: Vertical		IfcAlignmentVerticalSegment	RadiusOfCurvature	Number	m
Safety class		Add_GuardRail_Common	SafetyClass	List	A/B/C
Slope		Add_PipeSegmentTypeCommon	Slope	Number	‰
Spacing: Marking		Pset_RoadMarkingCommon	Distance	Number	mm
Steel grade		IfcMaterial	Name	Text	-
Strength class: Guard rail		Add_GuardRail_Common	StrengthClass	List	-
Strength class: Pipe		Pset_PipeSegmentTypeCommon	PressureClass	Text	-
Superelevation		Pset_Superelevation	Superelevation	Number	mm
System		IfcRoot	Name	Text	-
Tension force: Pre/Post-tension cables		Pset_ConcreteElementGeneral	ReinforcementStrengthClass	Number	kN
Thickness		IfcElementQuantity	NominalWidth	Number	mm
Thickness: Wall		IfcCircleHollowProfileDef	WallThickness	Number	mm
Type name		IfcEntity	ObjectType	Text	-
Type: Clearance		Add_Type	ClearanceType	Text	-
Type: Component		Add_Type	ComponentType	Text	-
Type: Cover/Grate		Add_ManholeCommon	CoverGrateType	Text	-
Type: Mount		Add_Type	MountType	Text	-
Type: Noise barrier element		Add_Type	NoiseBarrierTdype	Text	-
Type: Plate		Add_Type	PlateType	Text	-
Type: Post		Add_Type	PostType	Text	-
Type: Profile		Add_Type	ProfileType	Text	-
Type: Rail		Add_Type	RailType	Text	-

Type: Reflexion		Add_Type	ReflextionType	Text	-
Type: Sign		Pset_RoadSymbolsCommon	TypeDesignation	Text	-
Type: Signal		Pset_RailwaySignalType	RailwaySignalType	Text	-
Type: Skirt		Add_Type	SkirtType	Text	-
Type: Soil		Add_Type	SoilType	Text	-
Volume		IfcQuantityVolume	VolumeValue	Number	m^3
Volume: Retention		Add_BassinQuantities	RetentionVolume	Number	m^3
Volume: Wet		Add_BassinQuantities	PermanentVolume	Number	m^3
Widht: Top of layer [m]		Pset_Width	NominalWidth	Number	m
Width		IfcElementQuantity	NominalWidth	Number	mm
Width: Marking		Pset_RoadMarkingCommon	NominalWidth	Number	m
Work width		Add_GuardRail_Common	WorkWidth	Number	m
Classification					
Type-ID	*[L]§Y02.AA01.NAC02.05*	CCS_Administrative	CCIMultiLevelTypeID	Text	-
Type-ID, Functional system	*[L]%Y02*	CCS_Administrative	CCILevel2ParentTypeID	Text	-
Type-name, Functional system	*Hovedvej*	CCS_Administrative	CCILevel2ParentTypeName	Text	-
Type-ID, Technical system	*[L]%AA01*	CCS_Administrative	CCILevel1ParentTypeID	Text	-
Type-name, Technical system	*Vejopbygning, Type 1*	CCS_Administrative	CCILevel1ParentTypeName	Text	-
Type-ID, Component	*[L]%NAC02.05*	CCS_Administrative	CCITypeID	Text	-
Type-name, Component	*Asfaltbeton (AB), AB11å*	CCS_Administrative	CCITypeName	Text	-
Type-ID, Component, main type	*[L]%NAC02*	CCS_Administrative	CCIMainTypeID	Text	-
Type-name, Component, main type	*Asfaltbeton (AB)*	CCS_Administrative	CCIMainTypeName	Text	-
Type-ID, Component, sub type	*05*	CCS_Administrative	CCISubTypeID	Integer	-
Type-name, Component, sub type	*AB11å*	CCS_Administrative	CCISubTypeName	Text	-
Location-ID	*+CDA06.1280-1432.P01*	CCS_Administrative	CCIMultiLevelLocationID	Text	-
Location-ID, Main location	*CDA06*	CCS_Administrative	CCILevel2ParentLocationID	Text	-
Location-name, Main location	*Motorvej, E47*	CCS_Administrative	CCILevel2ParentLocationName	Text	-
Location-ID, Sub location	*1280-1432*	CCS_Administrative	CCILevel1ParentLocationID	Text	-
Location-name, Sub location	*Stationering, interval*	CCS_Administrative	CCILevel1ParentLocationName	Text	-
Location-ID, Orientation	*P01*	CCS_Administrative	CCILocationID	Text	-
Location-name, Orientation	*Profil/Korridor*	CCS_Administrative	CCILocationName	Text	-
Function-ID	*[L]=G07.JB01*	CCS_Administrative	CCIFunctionalID	Text	-
Function-ID, Functional system	*[L]G07*	CCS_Administrative	CCILevel2ParentFunctionalID	Text	-
Function-name, Functional system	*Afvandings system, tilløb til udløbspunkt 27*	CCS_Administrative	CCILevel2ParentFunctionalName	Text	-
Function-ID, Technical system	*[L]JB01*	CCS_Administrative	CCILevel1ParentFunctionalID	Text	-
Function-name, Technical system	*Vejafvanding, Østergade*	CCS_Administrative	CCILevel1ParentFunctionalName	Text	-
Product-ID	*[L]#NAC142*	CCS_Administrative	CCISingleLevelID	Text	-

CHANGE LOG

Revision	Date	Changes
1	-	First edition (English version not published)
2	2023-12-22	- Illustrations for Areas and boundaries, Utilities, gravitational pipes in terrain, Fences and railings, Catenary components, Rail components and Signs updated. - Missing text for Rail corridor updated. - LOI for Basins, LOI325 for Manholes and wells adjusted. - Properties aligned across all types.
3	2025-02-21	- Alignment of property data towards IFC - Addition of the section: Properties