



Co-funded by
the European Union

Rail Baltica: BIM Risinājumi un Izaicinājumi

2024-11-15
martins.millers@railbaltica.org

#RailBaltica

Dienas kārtība

- Rail Baltica progress
- Rail Baltica BIM prasības
- Darbaplūsma
- Secinājumi / ieteikumi



Martins Millers

BIM un AIM koordinators

- 2020 – šobrīd
RB RAIL
- 2014 – 2020 Arhitektūras tehniķis, BIM koordinators
MARK Arhitekti, Friis & Moltke, Henning Larsen Architects
- 2016 – 2018 Aalborg University
MSc Management in the Building Industry
- 2011 – 2015 KEA Copenhagen
Architectural Technology and Construction Management



Rail Baltica progress





7 internacionālas pasažieru stacijas
45 lokālas stacijas / pieturas punkti



3 tuneļi



> 90 būves (titi, pārvadi, tuneļi)



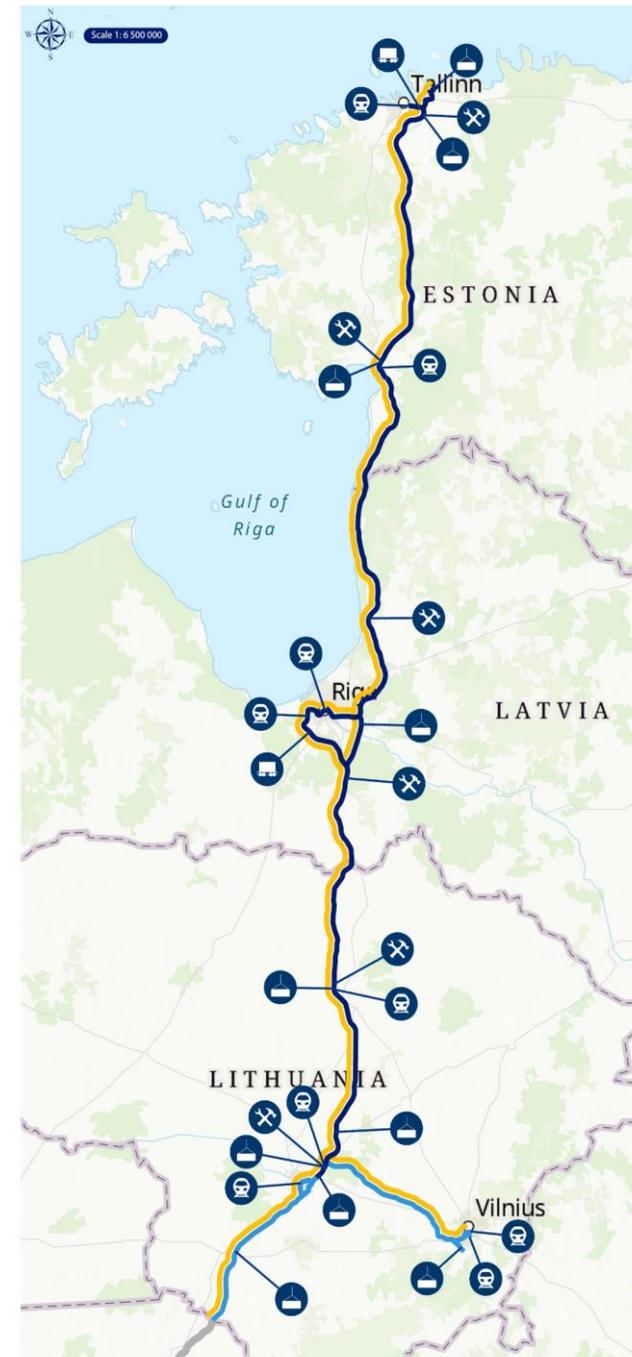
6 infrastruktūras uzturēšanas punkti



> 90 dzīvnieku šķērsojumi (ekodukti,
caurtekas, pārvadi)



14 kravu termināļi+ ostas savienojums



15% no pamatprasēs ir būvniecības stadijā

- Visā līnijā projektēšanas darbi tuvojas noslēgumam;
- 150km no pamatprasēs ir spēkā esoši būvniecības līgumi / iepirkuma rīkojumi;
- Konsolidētais materiālu iepirkums fināla fāzē;
- Elektrifikācijas un signalizācijas subsistēmu (870 km) projektē un būvē iepirkums progresā;
- Tiek gaidīti lēmumi par Rail Baltica 1. fāzi.



Latvija

Noslēgts pamatprasmes būvniecības līgums visiem LV 228 km, no kuriem 40km prioritārās sekcijas būvniecībai jā sākas šogad (dienvidu sekcija Lietuvas virzienā);

Projektēšana:

LT robeža – Misa: DTD izskatīšanas stadijā; prioritārās būvatļaujas iegūtas, atlikušās procesā.
 Misa – Vangaži: vairums no MD pabeigts; daļā aizķeršanās dēļ ietekmes uz vidi jautājumiem;
 Vangaži – EE robeža: MD apstiprināti, DTD procesā;
 Iecava: Projektēšana pabeigta.
 Skulte: Projektēšanas stadijā.
 Salaspils: Būvatļaujas nodrošinātas, projektēšanai jānoslēdzas šogad.

Zemes atsavināšana: 15% atsavināta, 23% procesā (kopā vairāk nekā 125 km); 98% no prioritārām sekcijām jāpabeidz līdz gada beigām.

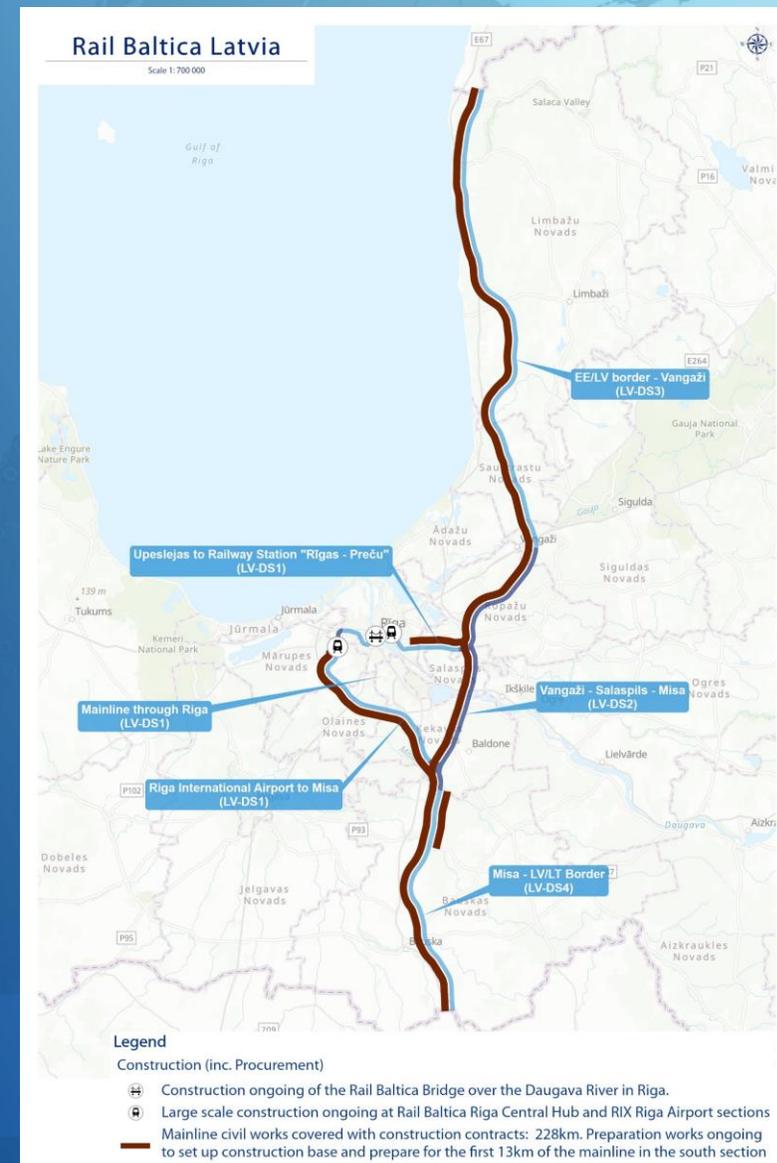
Būvniecība:

228 km no pamatprasmes būvniecības ar noslēgtu līgumu, būvniecība sāksies 40km prioritārā sekcijā Lietuvas virzienā.

Citi svarīgi projekti: RIX stāvvietu pārbūve pabeigta; RIX estakāde tuvojas noslēgumam, sliežu izbūve un signalizācija RCS.

Iecavas būvniecības bāze progresā

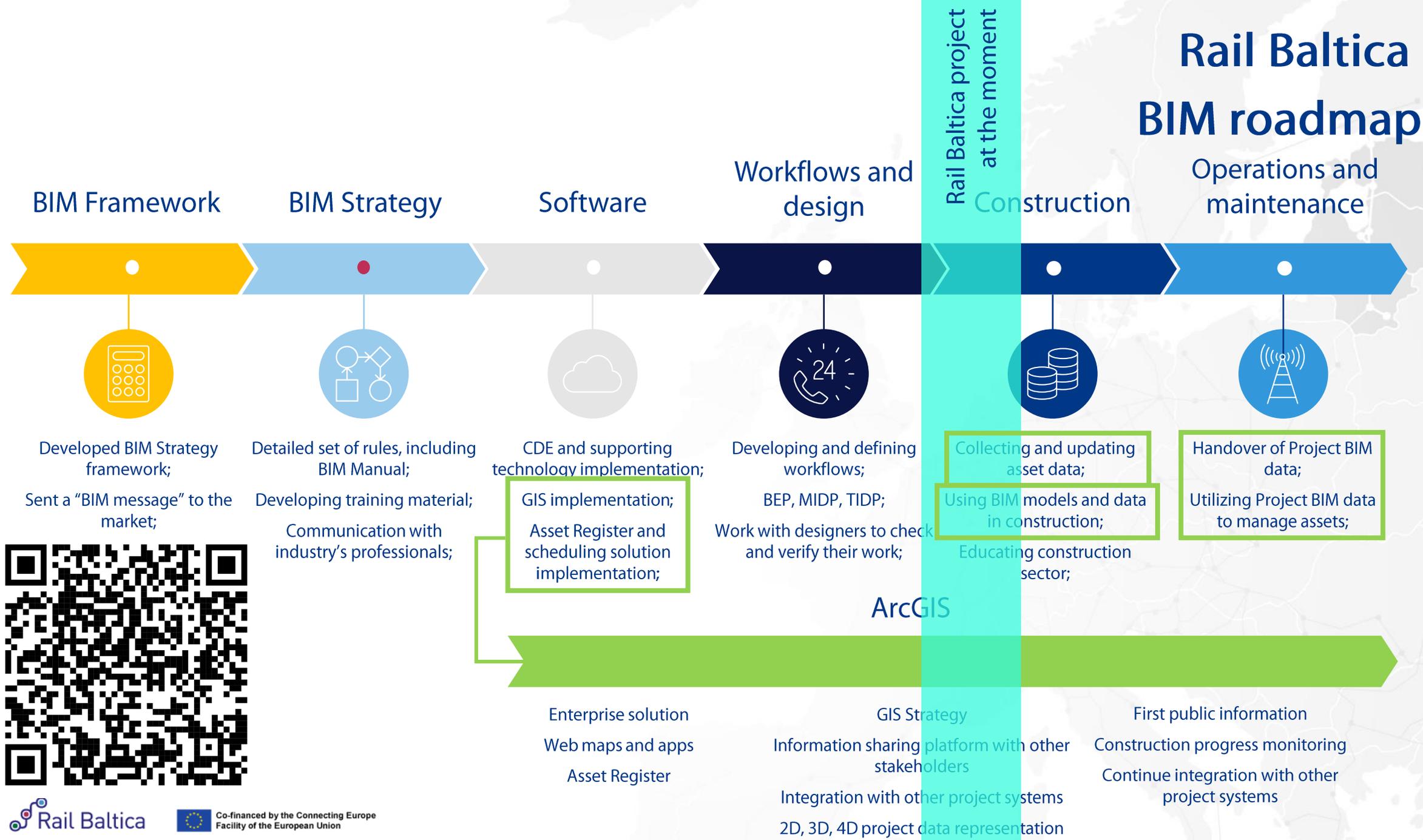
Noslēgts pamatprasmes būvuzraudzības līgums



Rail Baltica BIM prasības

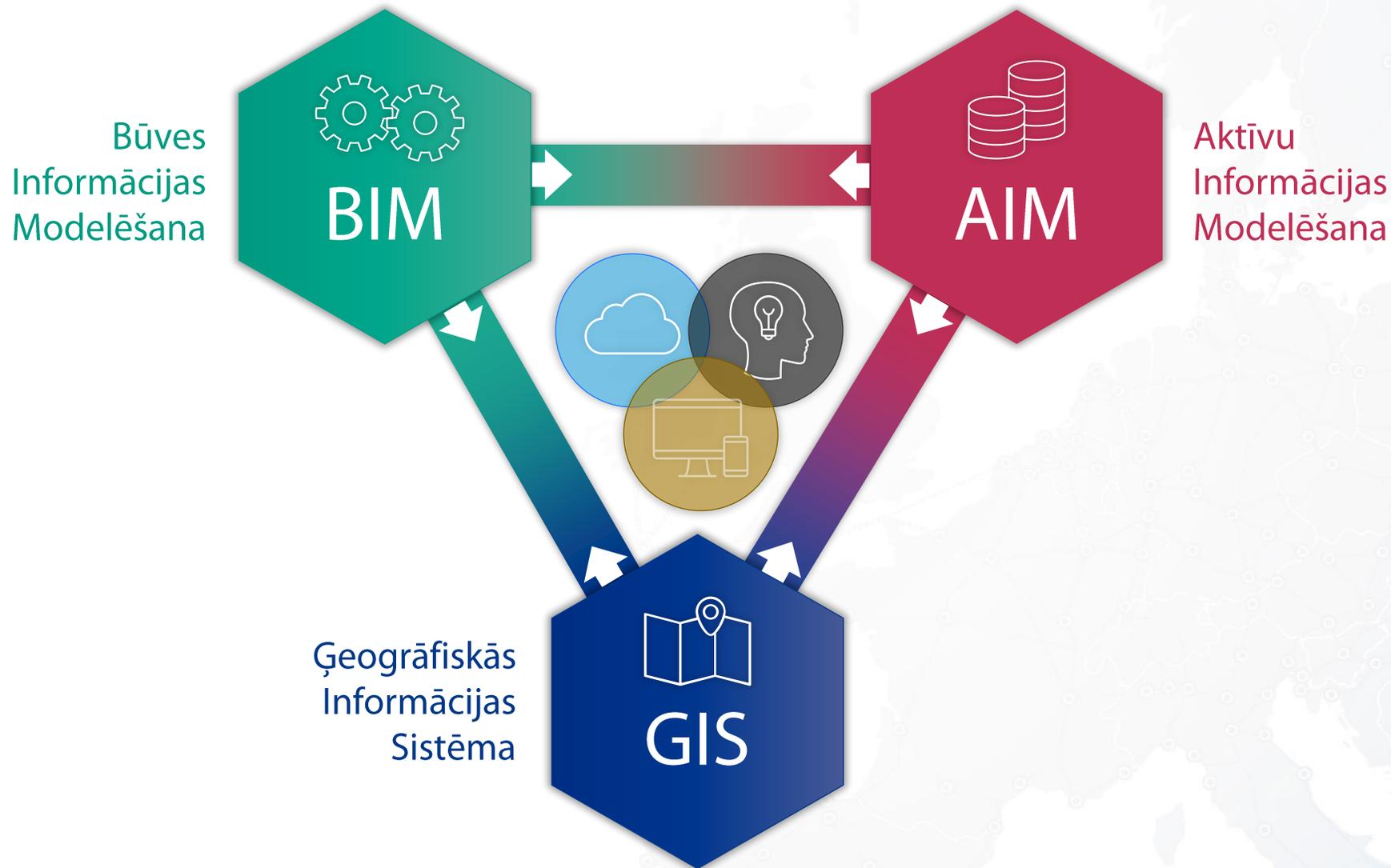


Rail Baltica BIM roadmap

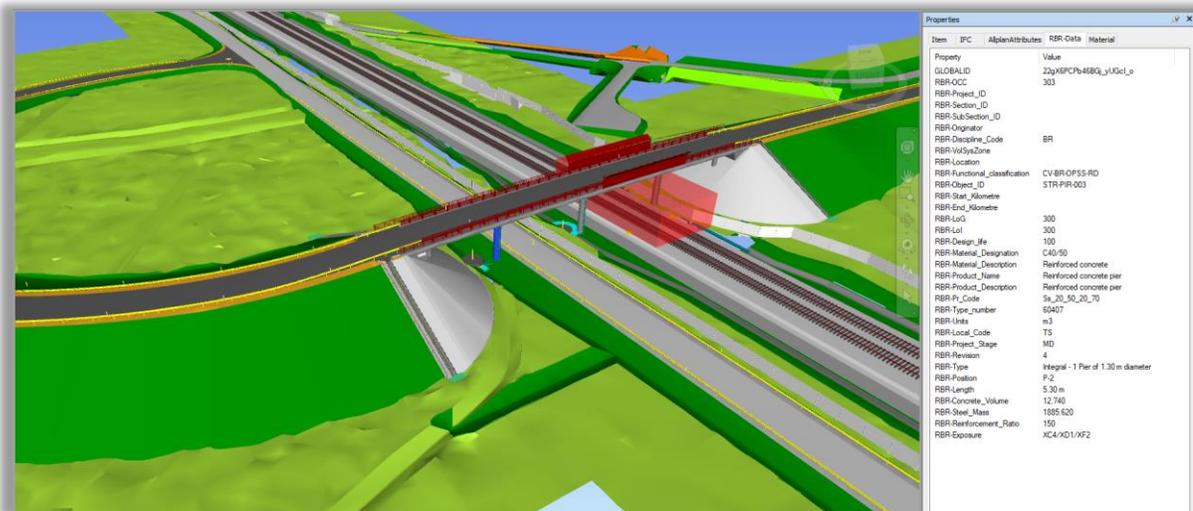


Projektēšanas vadlīnijas - pamatprincipi

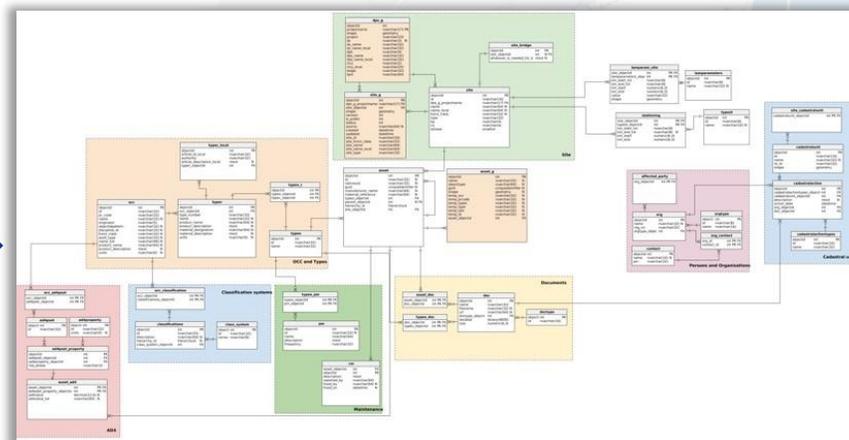
Mandatory (M) / Optional (O)	Site investigation (as input data)	Design Authoring (Collaboration)	Engineering Analysis	2D Drawing & Schedule Generation	Interference Management (Clash Checks)	Interactive Design Reviews	Structural Detailing	Quality Control	Visualisations	4D	Field Progress Tracking	Quantity Take-Off (5D)	Vendor Equipment Submittals	As-Built documentation	Operations & Maintenance Information
Site Investigations	M	M	-	M	O	M	-	M	O	-	O	-	-	M	-
Value Engineering LOD200	M	M	M	M	O	M	O	O	M	O	-	O	O	-	-
Master Design LOD300	M	M	M	M	M	M	M	M	M	M	-	M	O	-	-
DTD LOD400	M	M	M	M	M	M	M	M	O**	M	-	M	M*	-	O
Construction LOD400-LOD500	M	M	O***	M	M	M	M	M	O	M	M	M	M	-	-
As-Built LOD500	O	M	-	M	-	-	M	M	O	-	-	M	M	M	M
Operation	-	-	O	-	-	-	-	M	O	-	-	M	M	M	M



No BIM uz ĢIS = Aktīvu reģistrs

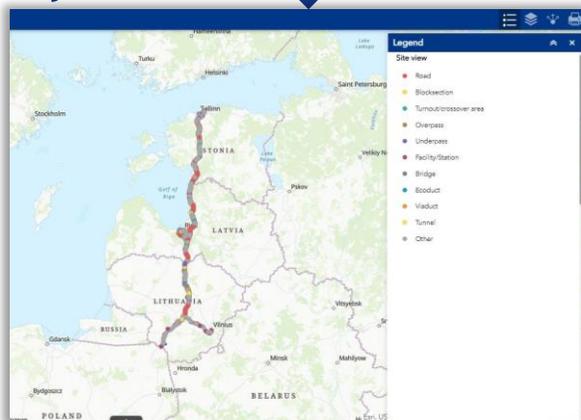


GIS Enterprise ģeodatubāze (SQL)

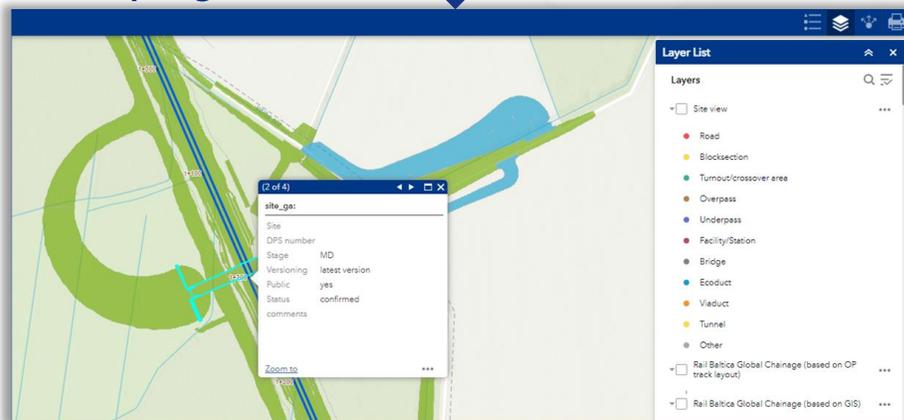


Web interfeiss

Objekti / zonas



2D poligoni



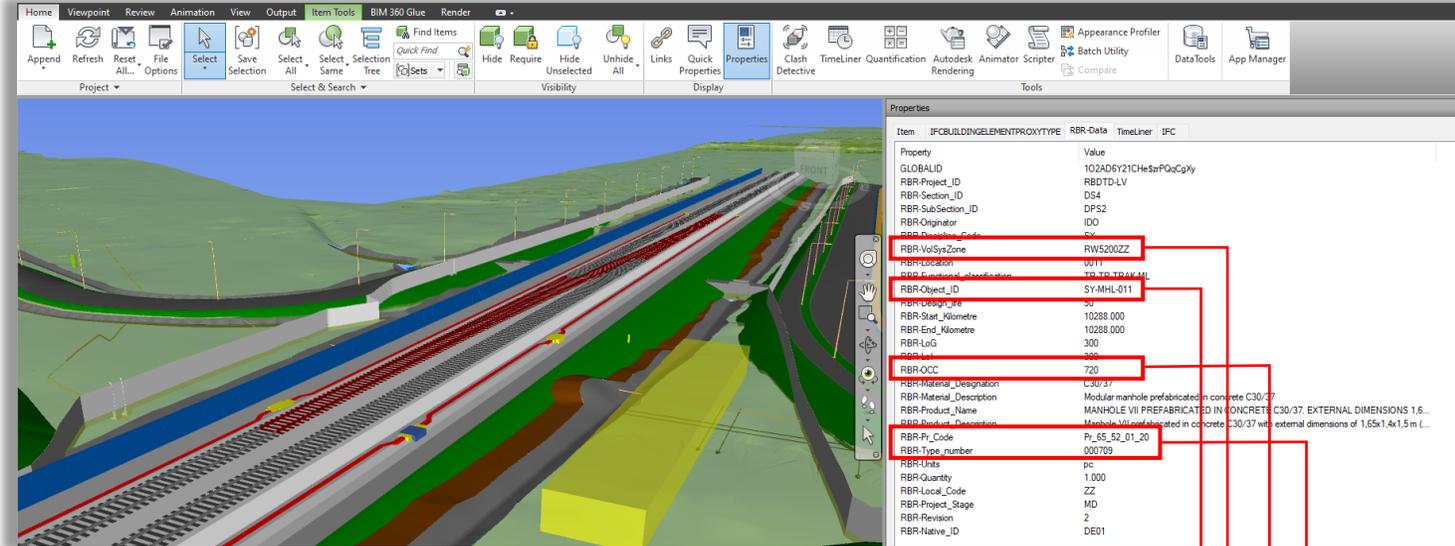
3D reprezentācija



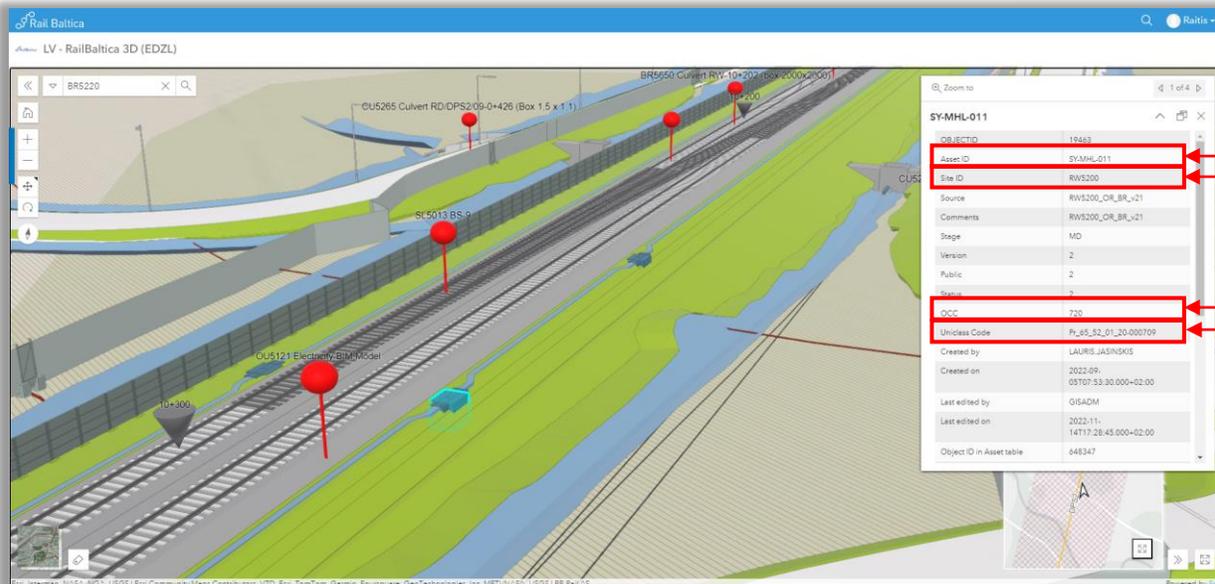
Elementu identifikācija

Federētais BIM modelis

	A	B	C	D	E	F	G
	TS Sector	Uniclass code	Type num	Code type ID	Work item	Unit	Work item includes
18	TS 2.9.5	Pr_15_31_26_26	000103	Pr_15_31_26_000103	EXCAVATION AND DISPOSING OFF SITE - SOFT SOIL EXCAVATION	Cubic metre (m3)	Excavating soft soil consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal fees, permissions, etc.) and
19	TS 2.9.5	Pr_15_31_26_36	000103	Pr_15_31_26_000103	EXCAVATION AND DISPOSING OFF SITE - HARD SOIL EXCAVATION	Cubic metre (m3)	Excavating hard soil consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal fees, permissions, etc.) and
20	TS 2.9.5	Pr_15_31_26_36	000104	Pr_15_31_26_000104	EXCAVATION AND DISPOSING OFF SITE - RIPPLE	Cubic metre (m3)	Excavating ripplable consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal fees, permissions, etc.) and
21	TS 4.9	Pr_66_60_36_27	000301	Pr_66_60_36_27-000301	EXCAVATION FOR STRUCTURES FOUNDATIONS	Cubic metre (m3)	Localized excavation for structure foundations consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment
22	TS 2.9.5	Pr_15_31_26_26	000601	Pr_15_31_26_000601	EXCAVATION IN TRENCHES WITH MECHANICAL MEANS IN ALL TYPES OF	Cubic metre (m3)	Excavation in trenches consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment
23	TS 2.9.5	Pr_15_31_26_26	000302	Pr_15_31_26_000302	EXCAVATION INSIDE COFFERDAM FOR STRUCTURE FOUNDATIONS	Cubic metre (m3)	Localized excavation inside cofferdam for structure foundations consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. dewatering of excavation inside cofferdam for foundation pits consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal fees, permissions, etc.) and
24	TS 5.13	Ss_30_12_85_70	000301	Ss_30_12_85_70-000301	DEWATERING OF EXCAVATION INSIDE COFFERDAM FOR FOUNDATION PITS	Cubic metre (m3)	Ditch excavation consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal fees, permissions, etc.) and
25	TS 2.9.5	Pr_15_31_26_26	000602	Pr_15_31_26_000602	DITCH EXCAVATION WITH MECHANICAL MEANS IN ALL TYPES OF GROUND	Cubic metre (m3)	Ditch excavation consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment
26	TS 2.9.5	Pr_15_31_26_36	000106	Pr_15_31_26_000106	EXCAVATION AND DISPOSING OFF SITE - BLASTING	Cubic metre (m3)	Blasting excavation consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal fees, permissions, etc.) and
27	TS 2.9.5	Pr_15_31_26_26	000603	Pr_15_31_26_000603	EXCAVATION OF TRIAL PIT FOR DRAINAGE PIPES SEARCH	Cubic metre (m3)	Excavation of trial pit for drainage pipes search consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment
28	TS 2.9.5	Pr_15_31_26_26	000303	Pr_15_31_26_000303	RIVERBED EXCAVATION FOR REUSING	Cubic metre (m3)	Localized excavation of natural soil in riverbed for reusing consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal fees, permissions, etc.) and
29	TS 2.9.5	Pr_15_31_26_26	00304	Pr_15_31_26_00304	EXCAVATION BETWEEN DIAPHRAGM WALLS OR CONCRETE WALLS IN ANY TYPE OF UNCOVERED TERRAIN	Cubic metre (m3)	Excavation between diaphragm walls or concrete walls in any type of uncovered terrain, consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment
30	TS 2.9.5	Pr_15_31_26_26	00305	Pr_15_31_26_00305	EXCAVATION BETWEEN DIAPHRAGM WALLS OR CONCRETE WALLS UNDER TOP SLAB	Cubic metre (m3)	Excavation between diaphragm walls or concrete walls under top slab consists of all works and expenses necessary to achieve the specified end result, e.g. workforce, equipment, applicable fees (e.g. disposal



Aktīvu reģistrs GIS DB



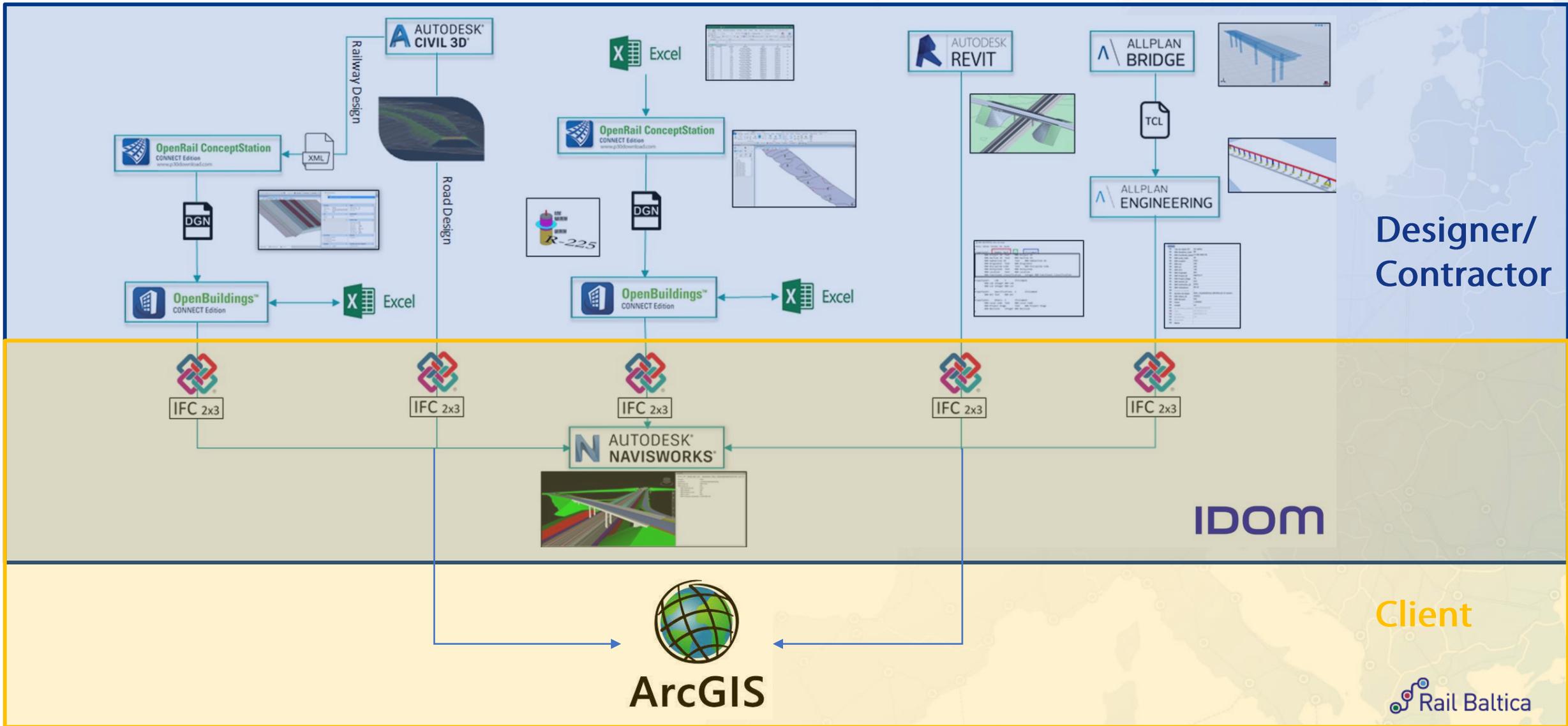
Site – BR3155

- RBR-VolSysZone = Site ID
- RBR-ObjectID = Asset ID
- RBR-PR_Code+RBR-Type_number = Uniclass2015 code

Darbaplūsma



Nodevumu izskatīšana



Designer/
Contractor

IDOM

Client

IFC darbapļūsma



Please enter filter

- Object Classes
 - Beam: 70
 - Building: 1
 - Building Element Proxy: 1118
 - Building Storey: 1
 - Column: 222
 - Member: 1
 - Model Information: 1
 - Plate: 4
 - Project: 1
 - Site: 1
 - Slab: 20
- Object Groups
 - Generic Group

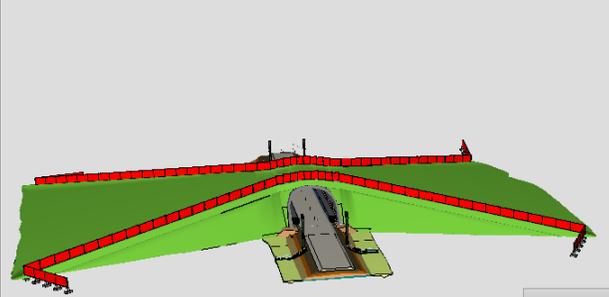
Object Classification Systems

Objects: Containment

Properties: Building Element Proxy (1118)

rbr Property Set

- RBR-Minimum_depth: <5 different values>
- RBR-Model_Reference: -
- RBR-Northing: <902 different values>
- RBR-Object_ID: <all different values>
- RBR-OCC: <20 different values>
- RBR-Originator: EDO
- RBR-Pr_Code: <20 different values>
- RBR-Product_Description: <28 different values>
- RBR-Product_Name: <33 different values>
- RBR-Project_ID: RBOTD-LV
- RBR-Project_Stage: DTD
- RBR-Quantifiable: <2 different values>
- RBR-Revision: 1
- RBR-Room_Name: -
- RBR-Route_code: 201K
- RBR-Section_ID: DS2
- RBR-Serial number: -



Select is ON



Selection Tree

- Standard
 - IDO-EW-301-Slope_Support_Beam
 - IDO-EW-130-Slope_Protection_Layer
 - IDO-EW-120-Fill_Technical_Block_Granular
 - IDO-EW-301-Slope_Support_Beam
 - IDO-EW-130-Slope_Protection_Layer
 - IDO-EW-130-Slope_Protection_Layer
 - IDO-EW-120-Fill_Technical_Block_Granular
 - IDO-EW-301-Slope_Support_Beam
 - IDO-EW-130-Slope_Protection_Layer
 - IDO-EW-120-Fill_Technical_Block_Granular

Properties

Item: IDO-EW-130-Slope_Protection_Layer

Item	IFC	IFCBUILDINGELEMENTPROXYTYPE
Quantities		RBR-Data
Property		Value
GLOBALID		0W6vhBfNVrZfPmhIMG36
RBR-Area		55,066
RBR-Design_life		100
RBR-Discipline_Code		EW
RBR-End_Kilometre		30515,620
RBR-Functional_classif...		CV-BR-RWOP-00
RBR-Length		0,000
RBR-Local_Code		ZZ
RBR-Location		0031
RBR-Log		300



AL16	W	X	Y	Z	AA/AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	
1	0	N/A	400	400	02	5	Polypropylene (PP) SN16 drain pipe, slotted 3600, diameter 300 mm	In accorda	287721,01	287747,28	613	DR-PIPE-PP-757	EDO	Pr_65_52_07_66	Polypropylene (PP) SN16 drain PP pipe, slotted	RBDOTD-LV DTD	Yes			
57	0	N/A	400	400	02	9	Fence base plate	In accorda	287772,07	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceBasePlate	RBDOTD-LV DTD	No		
58	0	4,7	400	400	02	9	FencePanel	In accorda	287853,67	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FencePanel	RBDOTD-LV DTD	Yes		
59	0	N/A	400	400	02	9	Fence base plate	In accorda	287764,96	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceBasePlate	RBDOTD-LV DTD	No		
60	0	N/A	400	400	02	9	Concrete C12/15	In accorda	287749	None	None	509	STR-LEA-FND-6E	EDO	Ss_20_05_15	Cast in-situ blinding concrete CBlinding concrete	RBDOTD-LV DTD	Yes		
61	0	N/A	400	400	02	9	Concrete C12/15	In accorda	287793,91	None	None	509	STR-LEA-FND-6E	EDO	Ss_20_05_15	Cast in-situ blinding concrete CBlinding concrete	RBDOTD-LV DTD	Yes		
62	0	N/A	400	400	02	9	Aggregate layer	In accorda	287763,73	None	None	120	FILL-660146	EDO	Pr_15_31_26_34	Soil replacement from import SoilReplacement	RBDOTD-LV DTD	Yes		
63	0	N/A	400	400	02	9	FenceWoodenPost	N/A	287691,2	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceWoodenPost	RBDOTD-LV DTD	No		
64	0	N/A	400	400	02	9	FenceWoodenPost	N/A	287781,05	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceWoodenPost	RBDOTD-LV DTD	No		
65	0	N/A	400	400	02	9	Reinforced concrete C30/37	In accorda	287815,81	None	None	507	STR-FND-66110	EDO	Ss_20_05_15	Cast-in-situ reinforced concrete FenceFoundationBto	RBDOTD-LV DTD	Yes		
66	0	N/A	400	400	02	9	FenceWoodenPost	N/A	287766,58	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceWoodenPost	RBDOTD-LV DTD	Yes		
67	0	N/A	400	400	02	9	Reinforced concrete C30/37	In accorda	287731,07	None	None	507	STR-FND-66059	EDO	Ss_20_05_15	Cast-in-situ reinforced concrete FenceFoundationBto	RBDOTD-LV DTD	Yes		
68	0	N/A	400	400	02	9	Reinforced concrete C30/37	In accorda	287772,43	None	None	507	STR-FND-66119	EDO	Ss_20_05_15	Cast-in-situ reinforced concrete FenceFoundationBto	RBDOTD-LV DTD	Yes		
69	0	N/A	400	400	02	9	FencePost	In accorda	287795,9	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FencePost	RBDOTD-LV DTD	No		
70	0	N/A	400	400	02	9	Reinforced concrete C45/55	In accorda	287770,86	None	None	318	STR-PCV-66090	EDO	Ss_30_16_10	Cast-in-situ reinforced concrete FenceFoundationBto	RBDOTD-LV DTD	Yes		
71	0	N/A	400	400	02	9	Fence base plate	In accorda	287769,39	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceBasePlate	RBDOTD-LV DTD	No		
72	0	N/A	400	400	02	9	Sub base mix	In accorda	287801,63	None	None	122	FL-SUBG-66061	EDO	Pr_20_31_04_06	Aggregate layer	RBDOTD-LV DTD	Yes		
73	0	N/A	400	400	02	9	Reinforced concrete C30/37	In accorda	287820,8	None	None	520	EL-POLE-66132	EDO	Pr_20_29_10_13	IP	RBDOTD-LV DTD	No		
74	0	N/A	400	400	02	9	FencePost	In accorda	287747,01	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FencePost	RBDOTD-LV DTD	No		
75	0	N/A	400	400	02	9	Aggregate layer	In accorda	287834,06	None	None	120	FILL-661367	EDO	Pr_15_31_26_34	Soil replacement from import SoilReplacement	RBDOTD-LV DTD	Yes		
76	0	N/A	400	400	02	9	Cement mortar	In accorda	287768,66	None	None	542	STR-MOR-66008	EDO	Ss_20_05_15	La	RBDOTD-LV DTD	Yes		
77	0	N/A	400	400	02	9	Polystyrene	N/A	287761,17	None	None	405	STR-EXP-660174	EDO	Pr_25_71_29_37	La	RBDOTD-LV DTD	Yes		
78	0	N/A	400	400	02	9	Cement mortar	In accorda	287699,21	None	None	542	STR-MOR-66048	EDO	Ss_20_05_15	La	RBDOTD-LV DTD	Yes		
79	0	4,7	400	400	02	9	FencePanel	N/A	287768,93	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FencePanel	RBDOTD-LV DTD	Yes		
80	0	N/A	400	400	02	9	Cement mortar	In accorda	287770,62	None	None	542	STR-MOR-66071	EDO	Ss_20_05_15	La	RBDOTD-LV DTD	Yes		
81	0	N/A	400	400	02	9	Cement mortar	In accorda	287766,85	None	None	542	STR-MOR-66071	EDO	Ss_20_05_15	La	RBDOTD-LV DTD	Yes		
82	0	N/A	400	400	02	9	FenceWoodenPost	N/A	287765,48	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceWoodenPost	RBDOTD-LV DTD	No		
83	0	N/A	400	400	02	9	Fence base plate	In accorda	287723,11	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceBasePlate	RBDOTD-LV DTD	No		
84	0	N/A	400	400	02	9	FenceWoodenPost	N/A	287767,85	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FenceWoodenPost	RBDOTD-LV DTD	No		
85	0	4,7	400	400	02	9	FencePanel	N/A	287771,98	None	None	120	ANIM-FENCE-6E	EDO	Ss_25_14_63_95	Wooden fence over bridge or s FencePanel	RBDOTD-LV DTD	Yes		



```
for root, dirs, files in os.walk(directory_path):
    # Loop through all files in the current subfolder
    for file in files:
        # Check if the file has a .ifc extension
        if file.endswith('.ifc'):
            # Print the name of the file and the path
            file_path = os.path.join(root, file)
            print(file_path)
            file_count += 1
            file_names.append(file)

ifc_file = ifcopenshell.open(file_path)

# Get the list of all entities in the file
entities = ifc_file.by_type("IfcProduct")

for entity in entities:
    # Extract all properties from the entity, if present
    if hasattr(entity, 'IsDefinedBy'):
        for definition in entity.IsDefinedBy:
            # To support IFC2X3, we need to filter our results.
            # If definition is a ('IfcRelDefinesByProperties'):
            property_set = definition.RelatingPropertyDefinition

            # Check if the entity has any properties defined
            if hasattr(property_set, 'HasProperties'):
                for property in property_set.HasProperties:
```



Biežākie klupšanas akmeņi

- Interpretējamas un neskaidras prasības
- Liekas prasības
- 2D un 3D
- Atribūtu sintakse, nesāc ar nulli
- Sadursmju tolerances, sevišķi zemes darbiem
- Tvērums

Secinājumi / ieteikumi



01



Saproti vajadzības

Lietošanas veidi

Viss ir saprotamāks, ja ir skaidrs, kas beigās ir nepieciešams

02



Neprasi par daudz

Detalizācija

Katra prasība (LOD vai LOI) prasa resursus un palielina kļūdu iespējamību – neprasi vairāk kā nepieciešams

03



Kodifikācija-klasifikācija

Viena valoda

Loģiska kodifikācija un klasifikācija atvieglo jebkura BIM lietošanas veida piemērošanu, samazina kļūdu iespējamību un iespējo automatizāciju

04



BIP

«Dzīvs» dokumenti

Regulāri atjauno un papildini, lai visiem viss ir skaidrs

05



Neatsaisti!

Disciplīna

2D un 3D atsaiste ir dārga. Dēļ projekta nesakritībām, būvniecības laikā kļūdas būs jālabo

06



Standartizē!

Automatizācija

Izslēdz cilvēcisko kļūdu un ietaupa resursus

07



Uzlabo!

Atgriezeniskā saite

Ja kaut kas nestrādā, izlabo

08



Neslēpies

Atklātība

Vadības atbalsts palīdz neizmērojami

09



BIM par visiem

Visi par BIM

Vadības atbalsts vairo rezultātu

10



Iespēja

Mācies

Neskaties uz BIM kā apgrūtinājumu, bet iespēju mācīties un uzlabot procesus

 Rail Baltica



Co-funded by
the European Union



Paldies!

2024-11-15
martins.millers@railbaltica.org

