

IFC Rail Project

Storyline (SL) Implementation Report (IR)

New High-speed Line (NHL) –Track (TR)

Detailed Design Phase (DD)



SL-IR- NHL-Track-DD-CRBIM

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Room:	Railway Room	Date:	2021.10.28
Project/Activity:	IFC Rail Phase 2	Test Leader:	FENG Yan
Document Title:	WP1: Storyline (SL) Implementation Report	ID:	SL-IR-NHL-TR-DD-CRBIM
Version:	1.0	Stakeholder:	CRBIM

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1 Storyline documentation update

1.1 Work Organization

1.1.1 Test Team, SWV participation

Test Leaders	Technical Expert	Track	CS/SE	Infra	SWV
Feng Yan	Zhao Feifei& Feng Yan	Feng Yan+Yang Xukun+Su Ning+Kong Guoliang+ Mao Ning+Wang Kaijun+Zhang jian+Yao Yiming	Zhao Feifei	Liu Xiaolong+Zhang Chen+Liu Siming+Zhang Junda+Yao Fengfeng+Zhu Qingqing	Dassault/ CHEN Jianzhang

1.1.2 Organization in terms of periodic SL Meetings

No.	Meetings	Frequency	Participants
1	Test Leader Meeting	About Twice or three times a week	PMO, Test Leader
2	Domain Experts Meeting	About once a month	PMO, Domain Leader
3	Spring Summit, Autumn Summit	March, October	
4	Technical Service Meeting	About once a month	Zhang Chi, Test leader of CRBIM
5	SL Progress Meeting	About twice a month	Test leader, Technical Expert, SWV
6	Test Meeting	About once a month	Members of teams

1.1.3 Work progress of the SL test

No.	Work Phase	Content	Time Schedule
1	work plan and preparation	Test team establishment, Storyline, Process map, Exchange Scenarios 、 Exchange Requirements、 Dataset, Unit Test	2020.07~2020.12
2	Platform and software development	IFC file import and export, software secondary development	2021.01~2021.06
3	verification and validation	RDDM, ICM, QTO and 3DV	2021.07~2021.09
4	SL Implementation report	SL Implementation report	2021.10~2021.12

1.1.4 Stakeholder contribution and Test Team satisfaction

Although the software vendor did not provide software that supports the IFCX3 standard, the scheduled test tasks were basically completed, and the test team was satisfied with the results.


1.2 Updated Storyline Synthesis

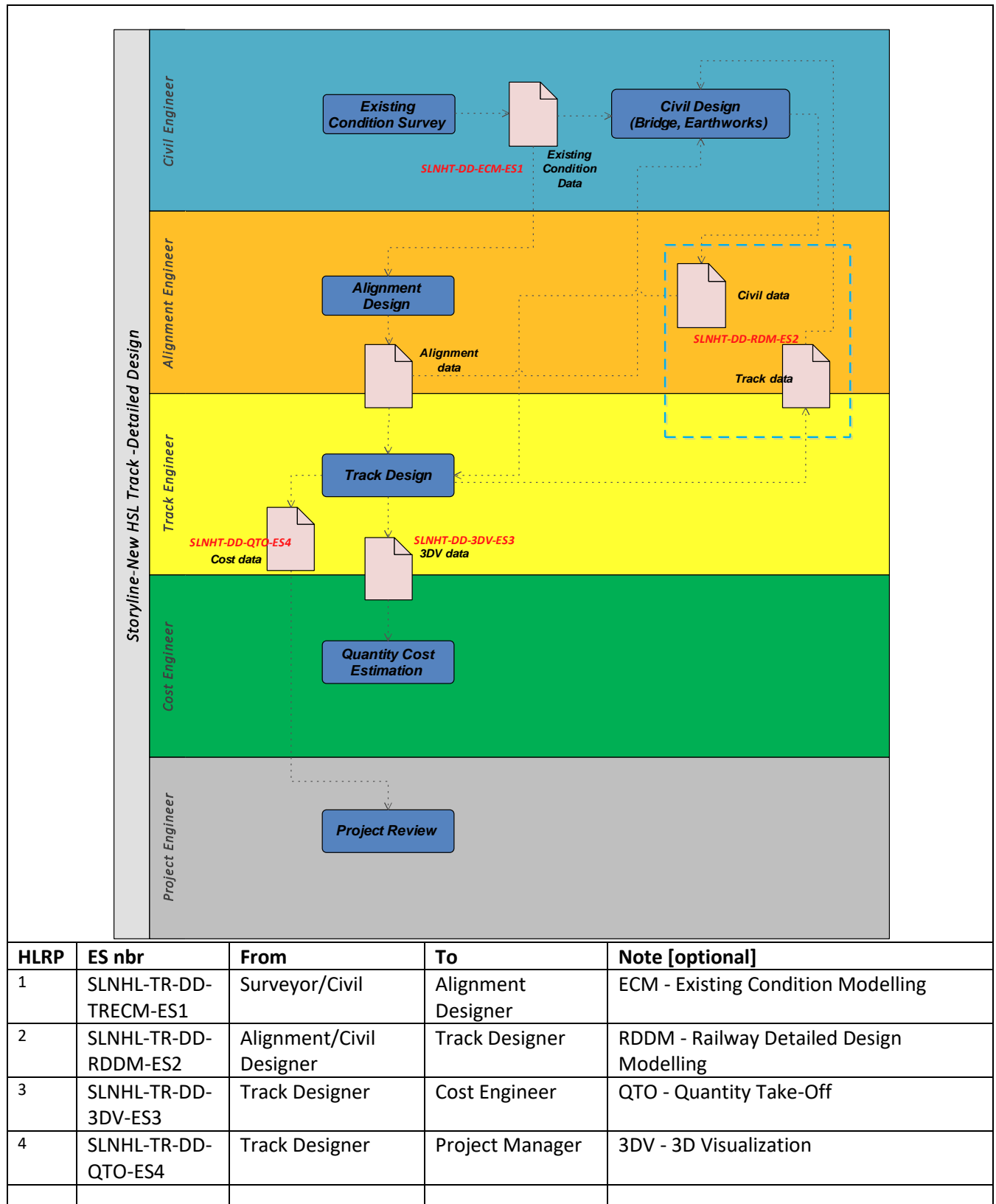
Room:	Railway Room	Author: Domain Expert	FENG Yan
Project/Activity:	IFC Rail Phase 2	Verification: Technical Expert	ZHAO Feifei& FENG Yan
Document Title:	Storyline: New High-Speed Line Design Track	Storyline: New High-Speed Line Design Telecom	
Version:	1.0	PMO checker:	Guy Pagnier
Date:	2021.10.28	ID:	SLNHL-TR-DD
Description (a)			
Project Phases (b)	<input type="checkbox"/> PL - Planning <input type="checkbox"/> Build <input type="checkbox"/> ID - Intermediate design <input type="checkbox"/> Operation & Maintenance <input checked="" type="checkbox"/> DD - Detailed design <input type="checkbox"/> Dismiss		
Use Cases (c)	<input checked="" type="checkbox"/> ECM - Existing Condition Modelling <input type="checkbox"/> RDM - Railway Design Modelling <input type="checkbox"/> RDM.DD - Feasibility Study for Railway <input type="checkbox"/> RDM.RIDM - Railway Intermediate Design Modelling <input checked="" type="checkbox"/> RDM.RDDM - Railway Detailed Design Modelling <input type="checkbox"/> ICM - Interference and Coordination Management <input checked="" type="checkbox"/> 3DV - 3D Visualization <input checked="" type="checkbox"/> QTO - Quantity Take-Off <input type="checkbox"/> INMP - Handover from Builder to Maintainer (Information Needed for Maintenance Perspective)		
Domains	<input checked="" type="checkbox"/> Track (*) <input type="checkbox"/> Signalling (*) <input type="checkbox"/> Energy (*) <input type="checkbox"/> Telecom (*) <input checked="" type="checkbox"/> Alignment (*) <input checked="" type="checkbox"/> Other (*) Earthworks, Bridge,...		
Tested Concepts (d)	Alignment, spatial structure, track elements (rail, track slab...), Railway Intermediate Design Modelling, 3D Visualization, Quantity Take-Off		
Test Leader TL (e)	FENG Yan(CRBIM) email : fengyan@crdc.com		
Domain Experts DE (e)	YANG Xukun, ZHAO Feifei, MAO Ning, KONG Guoliang, SU Ning, YAO Yiming.....		
Technical Experts TE (e)	FENG Yan		
Software Vendors SW (e)	Chen Jianzhang (Dassault)		
Test Dataset (e)	CRBIM_TRACK		

(a) 2 lines description (b) chose maxi 1 phase and 4 use cases (c) list only domains for the test (d) indicate Covered Unit Test Topics (e) specify names and companies

(*) specify further sub-disciplines

1.3 Updated Storyline Description

Description of the Business case	<p>During this Design phase, Track Engineers will exchange with all the other Domains but mainly with Alignment Engineers who modify the main alignment to place the track. The placement of all track elements depends on the alignment.</p> <p>Track Engineers will define the height of track structure and other interface information. The information will impact other rail domains, such as bridge, earthworks. All interface exchange data requested by track or to be provided to other rail domains should be exchanged.</p> <p>Project: Jakarta-Bandung High Speed Railway, speed: 350km/h with local speed limit.</p> <p>The length of main line is 142.3 km, the bridge length is 87.6 km, accounting for 61.6%; the tunnel length is 16.6 km, accounting for 11.7%; the roadbed length is 38.1 km, accounting for 26.7%. Only partial information of the line will be reflected in the later verification.</p>  <p>Since there is no commercial software supporting ifc4x3, after verification, we provided a model of about 1km, mainly including track, subgrade and bridge.</p>
Duration	<p>Plan: A few weeks after the software vendor can provide commercial software that supports ifc4.3.</p> <p>Actual: Since there is no commercial software supporting ifc4x3, we verified it by means of user-defined entities.</p>
Aim	<p>The aim of the study is to:</p> <ul style="list-style-type: none"> • Design a new line (alignment, radius, ...) • Define the track elements and properties which fit to high-speed railway • Place the track elements along the railway line depending on alignment • Define the exchange data between Track domain and other related domains • Produce datasets as Test Data based on the selected 4 Use cases <p>Some existing and projected information are also required:</p> <ul style="list-style-type: none"> • Previous data(or model) from Intermediate design phase • Existing layout & vertical Alignment Data <p>Existing data (or model) of Bridge, Earthworks and other related domains</p>
In Scope	<ul style="list-style-type: none"> • Physical track elements & properties covered by the 4 Use cases • The related exchange data from other domains which has interface with Track domain
Out of Scope	<ul style="list-style-type: none"> • Build and maintenance data
<p style="text-align: center;">Specific Detailed Process Map for this Storyline</p> <p><i>[process map that defines realistic exchange scenarios between software applications ; reference to general processes defined in the IFC Rail Requirements analysis report Chapter 2 : IFC Rail Process Map also called High-level Reference Process Map (HLRP)]</i></p>	



2 Exchange Scenario (ES) and Tests

2.1 Exchange Scenario: SLNHL-TR-DD-ECM-ES1

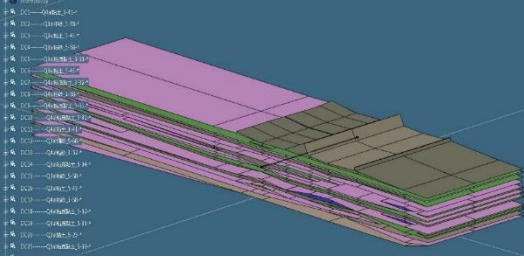
2.1.1 Updated Exchange Scenario

Id	SLNHL-TR-DD-ECM-ES1
Exchange Scenario Description <i>[please describe the ES and define In/Out of Scope topics]</i>	
<p>The overview of the existing project site. The Existing Condition Modelling provide data on which Alignment designer will define the new alignment for the main track and the deviated one. Provide data on which Civil designer will define new structure.</p> <p>•Model the existing terrain and geology that reflect the current situation.</p> <p>It's not work of track domain. Only the base data for other domains.</p>	
Geometry and positioning requirements <i>[General description / concepts => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> blank 	
Spatial requirements <i>[General description of spatial element requirements => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> blank 	
Physical and functional requirements <i>[General description of physical elements, functional elements and important information => specific on Excel sheets]</i>	
Reference model for railway	
Covered Unit Test: to be filled by Technical Expert(s)	
ID	Unit Test
	blank

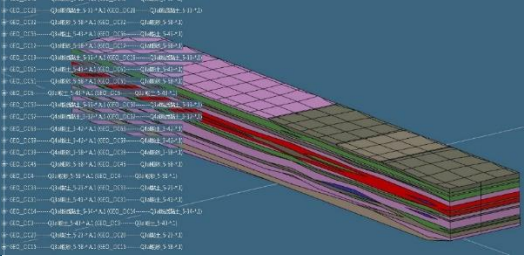
2.1.2 ES Test description and results

Test Completion <i>(Specify level of completion and if reserves/punchlist opened, additional TS works....)</i>
<p>An application was developed to create modes of drill hole and geology body.</p> <p>Step 1: according to the geological drill hole experimental data, sort out the drill hole information table.</p> <p>Step 2: importing in drill hole information data and directly generate geological drill hole model, including stratified geological drill hole segments.</p> <p>Step 3: generating a spatial topological model of strata based on information of geological drill hole model.</p> <p>Step 4:the geological body is generated according to the topological model information of stratigraphic space</p>

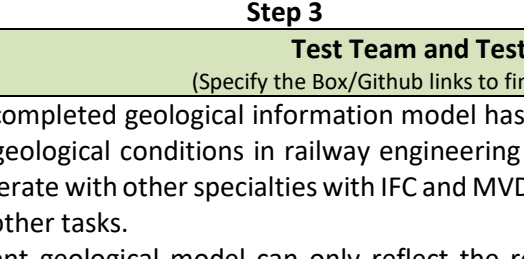
	A	B	C	D	E	F	G	H	I	J	K
1	钻孔编号	x	y	z	地质时代	地质成因	主层号	亚层号	岩土名称	次亚层号	3D Shape00911941 A.1
2	14-ZD-06(454404.3			4220462.1015.513					1 新黄土		Q4al粉土_3-41-3.79999995731628 A.1 (Q4al粉土_3-41-3.79999995731628.1)
3	14-ZD-06(454404.3			4220462.1014.113 Q3		dl+pl	3		12 泥岩	强风化	Q4al粉土_3-21-7.69999986026514 A.1 (Q4al粉土_3-21-7.69999986026514.1)
4	14-ZD-06(454404.3			4220462.1012.113 C2b			6		13 泥岩	中风化	Q4al粉土_3-41-9.69999980926514 A.1 (Q4al粉土_3-41-9.69999980926514.1)
5	14-ZD-06(454404.3			4220462.1005.713 C2b			6		73 石灰岩	中风化	Q4al粉土_3-21-11.69999980926514 A.1 (Q4al粉土_3-21-11.69999980926514.1)
6	14-ZD-06(454404.3			4220462.1003.513 C2b			6		6 煤层		Q4al粉土_3-42-14.8000001907349 A.1 (Q4al粉土_3-42-14.8000001907349.1)
7	14-ZD-06(454404.3			4220462.1002.813 C2b			6		73 石灰岩	中风化	Q4al粉土_3-32-17.6000003814697 A.1 (Q4al粉土_3-32-17.6000003814697.1)
8	14-ZD-06(454404.3			4220462.1001.813 C2b			6		33 粘土岩	中风化	Q4al粉土_3-42-20.5 A.1 (Q4al粉土_3-42-20.5.1)
9	14-ZD-06(454404.3			4220462.998.013 C2b			6		13 泥岩	中风化	Q4al粉土_3-32-23 A.1 (Q4al粉土_3-32-23.1)
10	14-ZD-06(454404.3			4220462.995.513 C2b			6		52 砂岩	强风化	Q4al粉土_3-22-25.1000003814697 A.1 (Q4al粉土_3-22-25.1000003814697.1)
11	14-ZD-06(454962.3			4220412.1003.493					1 新黄土		Q4al粉土_5-33-28.8999996185103 A.1 (Q4al粉土_5-33-28.8999996185103.1)
12	14-ZD-06(454962.3			4220412.1000.193 Q3		dl+pl	3		12 泥岩	强风化	Q4al粉土_5-43-32.5 A.1 (Q4al粉土_5-43-32.5.1)
13	14-ZD-06(454962.3			4220412.994.993 C2b			6		32 粘土岩	强风化	Q4al粉土_5-38-34 A.1 (Q4al粉土_5-38-34.1)
14	14-ZD-06(454962.3			4220412.991.793 C2b			6		12 泥岩	强风化	Q4al粉土_5-43-38 A.1 (Q4al粉土_5-43-38.1)
15	14-ZD-06(454962.3			4220412.988.293 C2b			6		52 砂岩	强风化	Q4al粉土_5-38-40 A.1 (Q4al粉土_5-38-40.1)
16	14-ZD-06(454962.3			4220412.987.693 C2b			6		53 砂岩	中风化	Q4al粉土_5-23-41.2000007629395 A.1 (Q4al粉土_5-23-41.2000007629395.1)
17	14-ZD-06(454962.3			4220412.985.493 C2b			6		53 砂岩	中风化	Q4al粉土_5-33-44.09999984741211 A.1 (Q4al粉土_5-33-44.09999984741211.1)
18	14-ZD-06(455165.1			4220393.1023.844							Q4al粉土_5-38-45 A.1 (Q4al粉土_5-38-45.1)



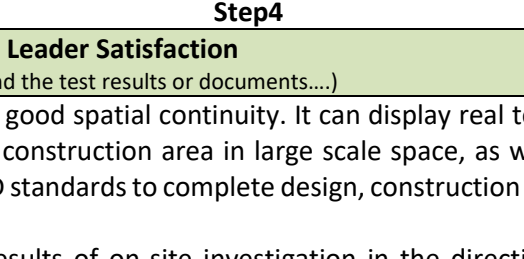
Step 1



Step 2



Step 3



Step 4

Test Team and Test Leader Satisfaction

(Specify the Box/Github links to find the test results or documents....)

The completed geological information model has good spatial continuity. It can display real terrain and geological conditions in railway engineering construction area in large scale space, as well as cooperate with other specialties with IFC and MVD standards to complete design, construction check and other tasks.

Current geological model can only reflect the results of on-site investigation in the direction of vertical section. It is difficult to realize the network modeling of cross-section. In addition, IFC standards need to be further improved.

Tests and Results Archives

(Specify the Box/Github links to find the test results or documents....)

BOX link: <https://app.boxcn.net/s/9f0ac64lwmg43lbzwhlfmi12ji1goue6>

Github link: [https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20\(SL\)/SL02_Design%20a%20New%20HS%20Line%20-%20Track](https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL02_Design%20a%20New%20HS%20Line%20-%20Track)

2.2 Updated Exchange Scenario: SLNHL-TR-DD-RDDM-ES2

2.2.1 Updated Exchange Scenario

Id	SLNHL-TR-DD-RDDM-ES2
	Exchange Scenario Description <i>[please describe the ES and define In/Out of Scope topics]</i>
	<ol style="list-style-type: none"> The Alignment designer will find out the best location according to domains requirements and project constraints. Then, the civil designer will complete the design of subgrade, bridge and others. They are the basic data for track design. And, it will be necessary for other Domains to define their Detail Design. The collaborative design and data exchange are needed for all domains. Create a railway line model with linear positioning (Horizontal Alignment, Vertical Alignment, Cant Alignment). The model meets the IfcRail (ifc4x3).

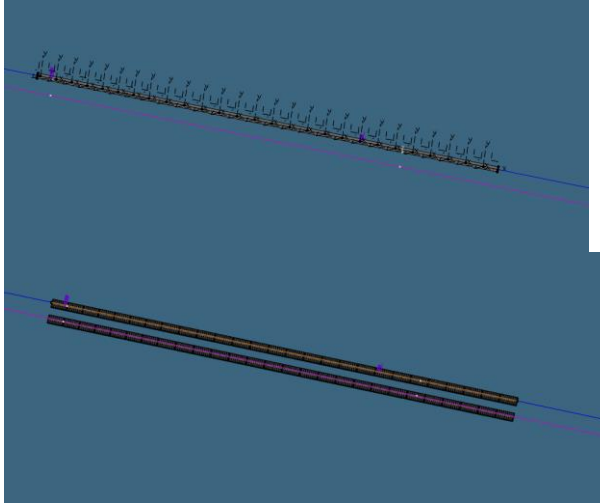
3. Import the civil (bridge, substructure etc.) reference model	
4. Based on the alignment data/model, create spatial structures and physical models of tracks, rails, fastenings, sleepers, track slabs, turnouts, etc. All objects shall comply with IfcRail (ifc4x3).	
5. Physical elements & properties covered by the 4 Use cases (exchange scenarios)	
Geometry and positioning requirements <i>[General description / concepts => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> Alignment (existing and proposed): Horizontal Alignment, Vertical Alignment, Cant Alignment, ... Linear Reference Swept Area Solid Geometry 	
Spatial requirements <i>[General description of spatial element requirements => specific on Excel sheets]</i>	
Linear placement, spatial structure(Railway spatial structure), Domain equipment position(track elements) and reference	
Physical and functional requirements <i>[General description of physical elements, functional elements and important information => specific on Excel sheets]</i>	
Line requirements: main line and deviated track <ul style="list-style-type: none"> Model of Alignment (Linear Reference) Information Data of the new railway line, Line name/ID and nbr, speed (limit and commercial), key Line characteristics, Traffic axle loads and type, etc. Specific Project Design Criteria Civil requirements: <ul style="list-style-type: none"> Model of Station yard, Subgrade, Bridge, etc. Location information of turnouts in the station Track elements (from track breakdown structure): existing and proposed sleepers, rails, track slab, etc....	
Covered Unit Test: to be filled by Technical Expert(s)	
ID	Unit Test
1	Cant Alignment
2	Linear placement with Cant
3	Swept solid geometry with cant
4	Railway spatial structure/spatial zone
5	Track elements breakdown
6	Earthworks, Bridge

2.2.2 ES Test description and results

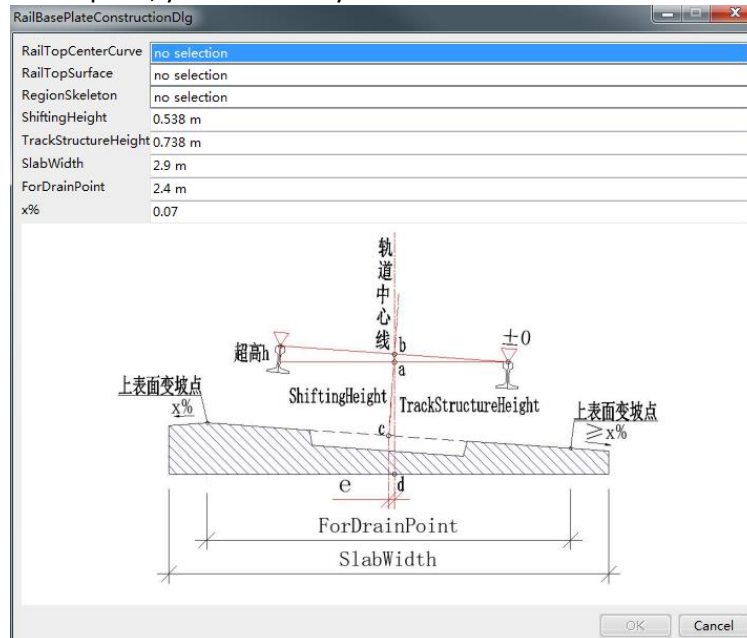
Test Completion <i>(Specify level of completion and if reserves/punchlist opened, additional TS works....)</i>	
1. The Alignment designer will find out the best location according to domains requirements and project constraints. 2. Create a railway alignment model (Horizontal Alignment, Vertical Alignment, Cant Alignment). 3. Import the infra models of alignment, bridge, subgrade. 4. Create the first-level skeleton line of the track specialty according to the center line of the line, and pay attention to the curve section to enter the super-elevation value according to the super-elevation formula. 5. Create the rails. 6. Assembly of track slab and self-compacting concrete: first complete the track slab layout table, modify the existing track slab layout table according to the layout of the work site, insert the	

layout table into the software after completing the layout table, and read the layout table to produce the track slab Position the coordinate set and assemble the track plate.

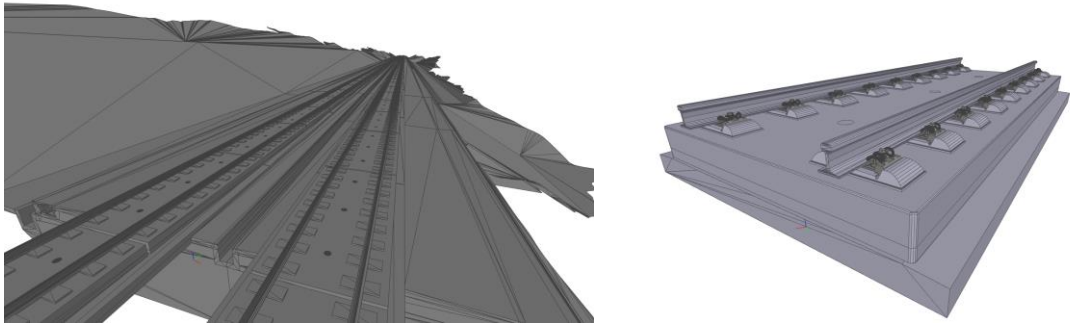
序号	轨道板 型号	轨道板 长度 (mm)	标准板 缝 (m)	调整板 缝 (m)	实设板后板缝 (mm)	轨道板第一定位点 距3D线起点距离 (m)	轨道板第二定位点 距3D线起点距离 (m)
1	PB4925	4925	70	4.2222	74.22222222	0.98500	4.13500
2	PA4925	4925	70	4.2222	74.22222222	6.00922	9.15922
3	PB4925	4925	70	4.2222	74.22222222	10.98344	14.13344
4	PA4925	4925	70	4.2222	74.22222222	16.00767	19.15767
5	PB4925	4925	70	4.2222	74.22222222	20.98189	24.13189
6	PA4925	4925	70	4.2222	74.22222222	25.98111	29.13111
7	PB4925	4925	70	4.2222	74.22222222	31.00533	34.15533
8	P5600	5600	70	4.2222	74.22222222	36.01456	39.79456
9	P5600	5600	70	4.2222	74.22222222	41.68878	45.46878
10	P5600	5600	70	4.2222	74.22222222	47.36300	51.14300



7. Create a whole base plate, you can modify the value of the base thickness and drainage slope.




8. Export the whole model of the into the ifc 4*3 file.
9. Import the ifc 4*3 into the software.

	
Test Team and Test Leader Satisfaction (Specify the Box/Github links to find the test results or documents....)	
Due to software support issues, the current user-defined method has been used to verify the standard. The plan is feasible. The latest version depends on the degree of support for the standard in the software.	
Tests and Results Archives (Specify the Box/Github links to find the test results or documents....)	
BOX link: https://app.boxcn.net/s/9f0ac64lwmg43lbzwhlfmi12ji1goue6 Github link: https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL02_Design%20a%20New%20HS%20Line%20-%20Track	

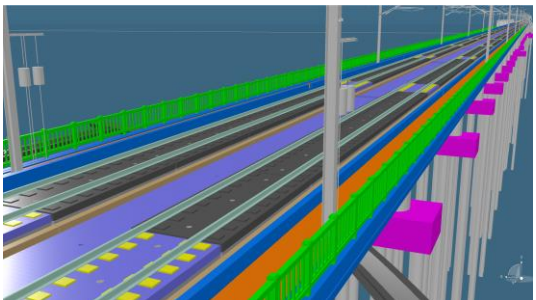
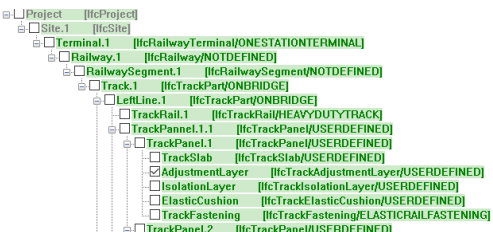
2.3 Updated Exchange Scenario: SLNHL-TR-DD-3DV-ES3

2.3.1 Updated Exchange Scenario

Id	SLNHL-TR-DD-3DV-ES3
Exchange Scenario Description <i>[please describe the ES and define In/Out of Scope topics]</i>	
<p>Railway engineering construction is a systematic project involving multiple professional fields. The project participants include design, construction, construction, operation and maintenance, industry supervisors and other railway professional related departments, as well as the Land and Resources Bureau, environmental protection, agriculture and forestry, funders, and intra-regional Non-professionals such as local governments and residents participate.</p> <p>The Chinese government and the public attach great importance to environmental protection, safety, energy conservation, and aesthetics of project construction. Railway projects must be coordinated with the overall environment in the region. Virtual visualization of the project can effectively improve the efficiency of communication and coordination between all participants.</p> <p>Import the model from the 3D Experience design platform to the rendering software, and render a realistic high-definition video file for communication with related parties.</p>	
	
Geometry and positioning requirements <i>[General description / concepts => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> Alignment (existing and proposed): Horizontal Alignment, Vertical Alignment, Cant Alignment, ... Swept Area Solid Geometry Model of all domains 	

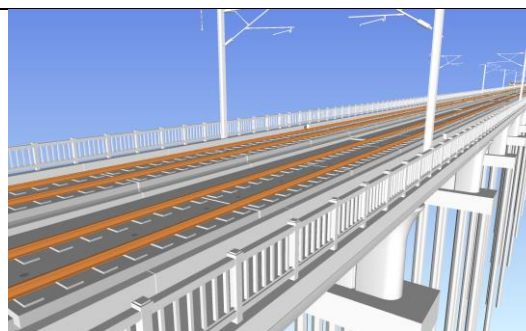
Spatial requirements	
<i>[General description of spatial element requirements => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> blank 	
Physical and functional requirements	
<i>[General description of physical elements, functional elements and important information => specific on Excel sheets]</i>	
Line requirements: main line Model of Alignment (Linear Reference) Civil requirements: <ul style="list-style-type: none"> Subgrade, Bridge, etc. Track elements: sleepers, rails, ballast, track slab, etc....	
Covered Unit Test: to be filled by Technical Expert(s)	
ID	Unit Test
1	blank

2.3.2 ES Test description and results

Test Completion	
(Specify level of completion and if reserves/punchlist opened, additional TS works....)	
<ol style="list-style-type: none"> In order to achieve the purpose of clear expression and easy identification of engineering design elements, the design model is set to different design colors according to different attributes such as function, material, model, and specialty in the 3D Experience platform. The design color is not consistent with the natural material color of the model. The IFC classification used strictly in modeling, taking the track as an example, part of the model structure and classification are as follows: 	
	
	
<ol style="list-style-type: none"> The existing 3D Experience version software does not provide for exporting commonly used FBX format model files, and the exported IFC format file does not include materials and textures. It is necessary to further set the texture and material in the rendering software. Rendering software generally selects graphics in batches with model colors and then assigns different textures and materials. In order to achieve rapid batch selection of models, through software development, the models are toned according to the model type, and the models with the same texture and material are set to the same color, And then output as FBX format file. 	

Name	Colour
ItcTrackBase	228,228,228
ItcTrackBase/USERDEFINED	228,228,228
ItcTrackBase/NOTDEFINED	228,228,228
ItcTrackAdjustmentLayer	168,168,168
ItcTrackAdjustmentLayer/USERDEFINED	168,168,168
ItcTrackAdjustmentLayer/NOTDEFINED	168,168,168
ItcTrackSlab	210,210,210
ItcTrackSlab/NONPRESTRESSEDTRACKSLAB	210,210,210
ItcTrackSlab/UNIDIRECTIONALPRESTRESSEDTRACKSLAB	210,210,210
ItcTrackSlab/BIDIRECTIONALPRESTRESSEDTRACKSLAB	210,210,210
ItcTrackSlab/USERDEFINED	210,210,210
ItcTrackSlab/NOTDEFINED	210,210,210
ItcTrackRail	238,145,68
ItcTrackRail/HEAVYDUTYTRACK	238,145,68
ItcTrackRail/LIGHTDUTYTRACK	238,145,68
ItcTrackRail/USERDEFINED	238,145,68
ItcTrackRail/NOTDEFINED	238,145,68
ItcPile/User Defined	0,192,192
ItcPile/Not Defined	192,192,192
ItcBridgeBedstone	255,0,0
ItcBridgeBedstone/UserDefined	255,0,0
ItcBridgeBedstone/NotDefined	255,0,0
ItcRailing	228,228,228

Model adjustment color table



Model after color adjustment

- In the rendering software, select models in batches according to uniform colors, and assign corresponding materials and textures to increase train motion paths, greening, lighting and scene animation.



The rendered picture (see the video for more information).

Test Team and Test Leader Satisfaction

(Specify the Box/Github links to find the test results or documents....)

At present, most BIM software IFC interfaces have poor support for model materials and textures, and rendering software basically does not support IFC standards. From BIM models to high-quality rendering effect expression requires a lot of manpower input. It is recommended that buildingSMART international cooperate with BIM and rendering software manufacturers to promote Realize the transfer of models between the two types of software in a unified IFC format, and improve the visualization effect of BIM.

Tests and Results Archives

(Specify the Box/Github links to find the test results or documents....)

A video can be found in BOX link: <https://app.boxcn.net/folder/150850637657>

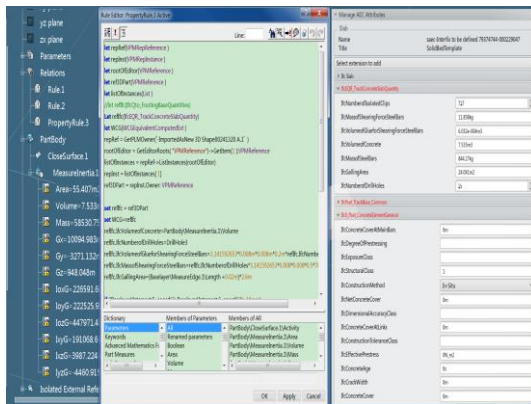
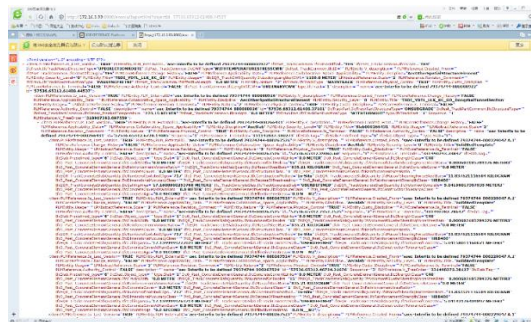
2.4 Updated Exchange Scenario: SLNHL-TR-DD-QTO-ES4

2.4.1 Updated Exchange Scenario

Id	SLNHL-TR-DD-QTO-ES4
Exchange Scenario Description <i>[please describe the ES and define In/Out of Scope topics]</i>	
<p>The number of projects is important information for the decision-making and management of railway projects, and an important part of the results of railway design. Traditional design projects are generally responsible for the calculation and classification of the number of projects after the completion of each professional design. This wastes manpower and cannot guarantee the accuracy of the number, and it is often revised repeatedly.</p> <p>In this detailed-design phase, the global cost of the construction should be calculated based on the design export of quantities.</p> <p>The Quantity Take-Off will provide:</p>	

<ul style="list-style-type: none"> The length of the design track part. The type and properties of the new track elements. 	
Geometry and positioning requirements <i>[General description / concepts => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> blank 	
Spatial requirements <i>[General description of spatial element requirements => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> blank 	
Physical and functional requirements <i>[General description of physical elements, functional elements and important information => specific on Excel sheets]</i>	
Track equipment: <ul style="list-style-type: none"> Length of the new track Nb of Fastening, Sleeper according to the type and properties Length of the Rail Concrete of Track Bed 	
Covered Unit Test: to be filled by Technical Expert(s)	
ID	Unit Test
1	blank

2.4.2 ES Test description and results

Test Completion (Specify level of completion and if reserves/punchlist opened, additional TS works....)	
<ol style="list-style-type: none"> In the modelling process, add attribute values related to the model geometry, calculate the length of the rail, the number of concrete works of the monolithic track bed, etc. <div data-bbox="552 1209 1085 1610" data-label="Image">  </div> Use the modelling software to export the XML file that needs to calculate the quantity model of the project. <div data-bbox="552 1680 1085 2000" data-label="Image">  </div> Use the Python language to write calculation rules for counting the number of projects in EXCEL. 	

4. Import the XML file and the EXCEL rule file into the project quantity summary program, select the work point you want to calculate, and then you can count the number of projects at that work point.
5. Export the calculation result table of the project quantity.
6. Through research, automatic calculation and automatic assignment of engineering quantities related to some models can be realized, and automatic aggregation of engineering quantities at division points can be realized through Python language and summary programs.

Quantities of Track				
Objects of Project		Unit	Quantities	Notes
1.Rail、Fastener、Track Slab	Rail	km	1.962	60kg/m, 50m fixed-length U71MnG rail without bolt hole
	WJ-8-type Fastener	group	6240	Each node is a set, Elastic fasteners for ballastless track of high-speed railway
	P5600Track Slab	block	240	
	P4925Track Slab	block	60	
	P4856Track Slab	block	60	
2.Self-compacting Concrete layer	Self-compacting Concrete	m ³	491.76	C40
	Rebar	kg	73.09	
	plastic insulating clamp	piece	255120	
3.Track Base	Concrete	m ³	255120	C40
	rebar	kg	54287.64	BjTS420B
4.Isolation layer	Geotextile	m ³	4837.53	thickness 4mm
5.Elastic cushion	A3 elastic pad	piece	1440	900×60×8mm
	A4 elastic pad	piece	1440	600×60×8mm
	Foam Board	m ²	115.824	thickness 8mm, polystyrene foam

Test Team and Test Leader Satisfaction

(Specify the Box/Github links to find the test results or documents....)

Based on IFC international standards, the established BIM model is highly structured data. The project quantity calculation is directly based on the BIM model. The template is automatically calculated during the design process and given to each entity project quantity information. The project quantity follows the model. The design is formed directly after the design is completed, and the number of projects is automatically summarized and output through the development of software application project structure information and model classification information and attributes. It can not only ensure the accuracy of the number of projects, but also reduce the manpower input.

This method is feasible, but the number of some projects cannot be directly derived from the model, and a certain amount of manual intervention is required to obtain results that meet the needs of project construction.

Tests and Results Archives

(Specify the Box/Github links to find the test results or documents....)

BOX link: <https://app.boxcn.net/folder/150850637657>

Github link: [https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20\(SL\)/SL02_Design%20a%20New%20HS%20Line%20-%20Track](https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL02_Design%20a%20New%20HS%20Line%20-%20Track)

3 Supporting Files and Storyline Archives

3.1 Exchange Requirements (ER)

The Exchange Requirements are available in BOX at the following link:

BOX link: <https://app.boxcn.net/s/il5b7iypow04sum6esai1p9xiotfk79w>

3.2 SL Data archives

Storyline Report: <https://app.boxcn.net/s/j37wl9a6f0kv521e8g4m553izacap97o>

Storyline Implementation Report: <https://app.boxcn.net/s/jqczp00sf2lh7mmb3mfy5ujqhb3vgb75>

IFC files:

BOX link: <https://app.boxcn.net/folder/150850637657>

Github link: [https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20\(SL\)/SL02_Design%20a%20New%20HS%20Line%20-%20Track](https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL02_Design%20a%20New%20HS%20Line%20-%20Track)

3.3 Test Dataset(s)

All the Test Datasets utilized in this Storyline to achieve the SL Tests.

Dataset Title
Dataset for storyline of High Speed Line Track
Dataset description
The data results of the test have been described in detail in this document. 3DV video and IFC files during the test have been uploaded.
Dataset links
BOX link: https://app.boxcn.net/s/9f0ac64lwmg43lbzwhlfmi12ji1goue6

4 Appendices

4.1 Storyline Documentation

See Appendix 4.1

The storyline documentation for track has been well documented, and the documentations are available in the following BOX directories:

- **Storyline documentation :**
<https://app.boxcn.net/s/j37wl9a6f0kv521e8g4m553izacap97o>

4.2 Business and business process related findings

See Appendix 4.2

The Track process is available in the following BOX directories:

- **Process map:**
<https://app.boxcn.net/s/z7z0pww8nggfkreliszzm9ky90bbbykc>