IFC Rail Project

Storyline (SL) Implementation Report (IR)

New High-speed Line (NHL) - Telecom

Detailed Design Phase (DD)

SL-IR- NHL-DD-CRBIM

Contents

1 Storyline documentation update 4

1.1 Work Organization 4

1.1.1 Test Team， SWV participation 4

1.1.2 Organization in terms of periodic SL Meetings 4

1.1.3 Work progress of the SL test 4

1.1.4 Stakeholder contribution and Test Team satisfaction 4

1.2 Updated Storyline Synthesis 5

1.3 Updated Storyline Description 6

2 Exchange Scenario (ES) and Tests 7

2.1 Exchange Scenario: SLNHL-DD-RDDM-ES1 7

2.1.1 Updated Exchange Scenario 7

2.1.2 ES Test description and results 8

2.2 Updated Exchange Scenario: SLNHLT-DD-ICM-ES2 9

2.2.1 Updated Exchange Scenario 9

2.2.2 ES Test description and results 10

2.3 Updated Exchange Scenario: SLNHLT-DD-QTO-ES3 10

2.3.1 Updated Exchange Scenario 10

2.3.2 ES Test description and results 11

2.4 Updated Exchange Scenario: SLNHLT-DD-3DV -ES4 11

2.4.1 Updated Exchange Scenario 11

2.4.2 ES Test description and results 12

3 Supporting Files and Storyline Archives 12

3.1 Exchange Requirements (ER) 12

3.2 SL Data archives 12

3.3 Test Dataset(s) 13

4 Appendices 13

4.1 Storyline Documentation 13

Room:	Railway Room	**Date:**	2021.10.28
Project/Activity:	IFC Rail Phase 2	**Test Leader:**	Liu Lihai & Zhong Qing
Document Title:	WP1: Storyline (SL) Implementation Report	**ID:**	SL-IR-NHL-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

Activities Storyline	Test Leaders	Technical Expert	Track	Telecom	Energy	Infra	SWV
New HSL Telecom	LiHai Liu + Qing Zhong	Qing Zhong + Ping Chen	Wan Ma	LiHai Liu + Qing Zhong +Sai Dai + Chao Cui	Xiao Geng	Xianbao Peng + Zechang Sun	Autodesk + Weigeying

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, Autumm Summit	March， October	
4	Technical Service Meeting	About once a month	Zhang Chi， Test leader of CRBIM
5	SL Pogress Meeting	About twice a month	Test leader, Technical Expert, SWV

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

The test team are satisfied with the test.

1.2 Updated Storyline Synthesis

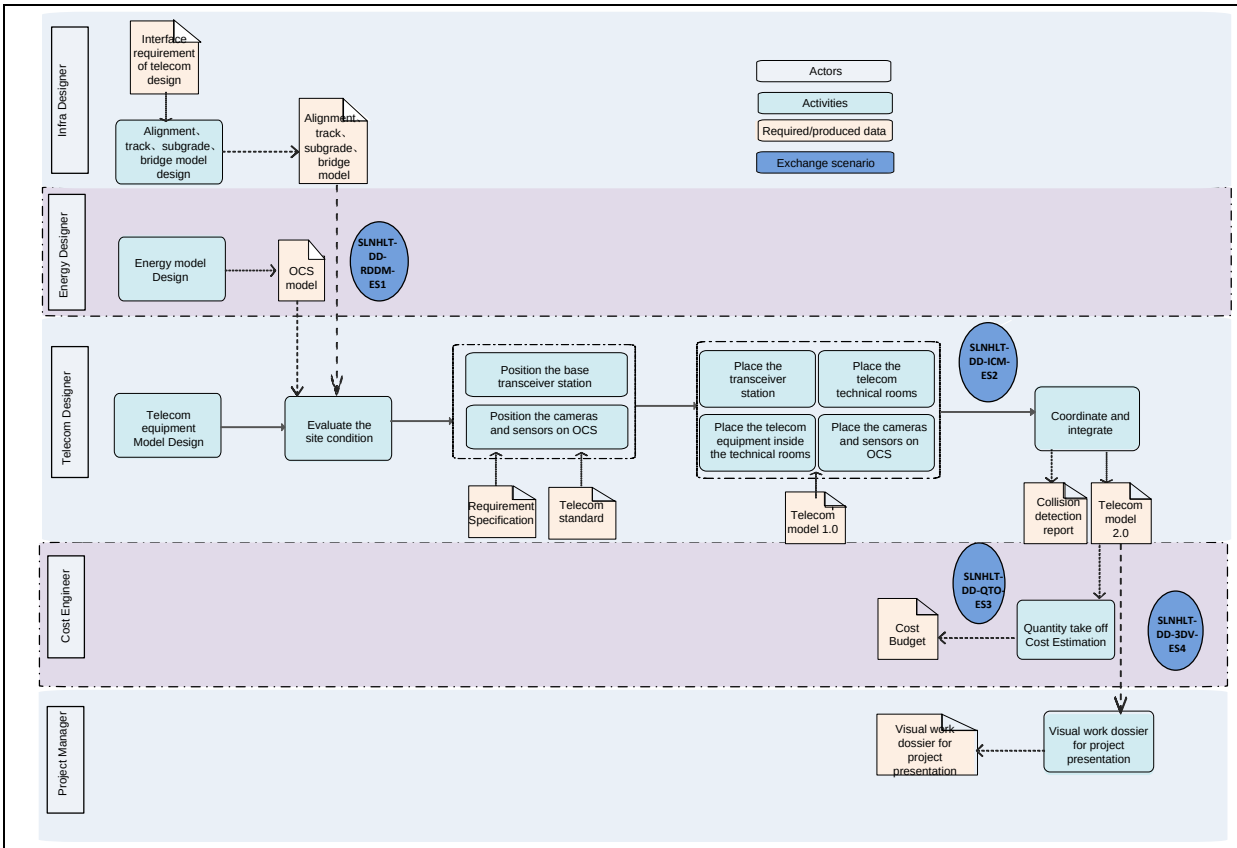
Room:	Railway Room	Author: Domain Expert	Lihai Liu & Qing Zhong
Project/Activity:	IFC Rail Phase 2	Verification: Technical Expert	Qing Zhong & Ping Chen
Document Title:	Storyline: New High-Speed Line Design Telecom	Storyline: New High-Speed Line Design Telecom	
Version:	1.0	PMO checker:	Guy Pagnier
Date:	2021.10.28	ID:	SLNHLT-DD
Description (a)	The storyline new high-speed line design telecommunication system includes telecom equipment of BTS part and trackside part during the detailed design of the telecommunication system.		
Project Phases (b)	☐ PL - Planning ☐ ID - Intermediate design ☒ DD - Detailed design	☐ Build ☐ Operation & Maintenance ☐ Dismiss	
Use Cases (c)	☐ ECM - Existing Condition Modelling ☐ RDM - Railway Design Modelling ☐ RDM.DD - Feasibility Study for Railway ☐ RDM.RIDM - Railway Intermediate Design Modelling ☒ RDM.RDDM - Railway Detailed Design Modelling ☒ ICM - Interference and Coordination Management ☒ 3DV - 3D Visualization ☒ QTO - Quantity Take-Off ☐ INMP - Handover from Builder to Maintainer (Information Needed for Maintenance Perspective)		
Domains	☒ Track (*)		
	☐ Signalling (*)		
	☒ Energy (*)	OCS pole	
	☒ Telecom (*)	BTS sites, Cameras, Sensors	
	☒ Alignment (*)		
	☒ Other (*)	Bridge and subgrade are not included, only the building（technical room）is considered.	
Tested Concepts (d)	Railway Spatial structure zone, Telecom elements breakdown, Linear Placement, Linear Placement (Point), Linear Placement(broken chainage).		
Test Leader TL (e)	Liu Lihai(CRBIM) email: isaacllh@hotmail.com Zhong Qing(CRBIM) email: 1013593864@qq.com		
Domain Experts DE (e)	Lihai Liu, Qing Zhong, Jinhan Li, Min Li, Yang Li		
Technical Experts TE (e)	Qing Zhong， Ping Chen		
Software Vendors SW (e)	Autodesk and Weigeying（Secondary development software company）		
Test Dataset (e)	CRBIM		

(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	The storyline will be based on the existing BIM project of China Wuhan- Xiangyang-Shiyan high-speed railway. Due to the large volume of 8km model, it takes a long time to import and export the ifc files. Therefore, the detailed design model is simplified and only one section of the 8km model is selected for the test. During this detailed design phase, telecom engineers will design both BTS(Base Transceiver station) site and trackside part of telecom system. The BTS site includes BTS, rack, transport equipment, power supply, feeder, antenna, tower. The trackside part includes cameras and sensors which are installed on the OCS pole. The sensors mainly include the anemograph and rain gauge. The Telecom domain leader will evaluate the condition of alignment to complete site selection of BTS and the placement of technical room and telecom equipment. Also, the cameras and sensors will be placed on the OCS pole. All interface exchange data requested by Telecom or to be provided to other rail domains should be exchanged.
Duration	The HSL telecom can last a year depending on the project requirements
Aim	The aim of the study is to: ● Define the telecom equipments of BTS site and trackside part; ● Positioning the telecom equipments of BTS site and trackside part; ● Placement of BTS site and the telecom technical room ● Placement of telecom equipment inside the technical room; ● Placement of cameras and sensors on the OCS pole; ● Import and export IFC file of telecom equipment from or to different software and check whether the required information is enough. ● Define the exchange data between Telecom domain and other related domains of 4 exchange scenario including Railway detailed design modelling, coordination and integration, 3D visualization, quantity take off; ● Produce datasets as Test Data based on the selected 4 Use cases Some existing and projected information are also required: ● Telecom Standards and specific requirement; ● Existing horizontal& vertical Alignment Data; ● Existing data (or model) of infra models.
In Scope	Physical telecom elements of BTS site and trackside parts. BTS site includes BTS, rack, transport equipment, power supply, feeder, antenna, tower and etc. Trackside parts includes cameras and sensors which are installed on the OCS pole. The sensors mainly includes the anemograph and rain gauge.
Out of Scope	Cables Non-physical elements Build and maintenance data
Specific Detailed Process Map for this Storyline *[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)]*	



HLRP	ES nbr	From	To	Note [optional]
103	SLNHLT-DD-ICM-ES1	Infra Designer /Energy Designer	Telecom Designer	RDDM-Railway detailed design model
104	SLNHLT-DD-ICM-ES2	Telecom Designer /Infra Designer /Energy Designer	Coordinator	ICM - Interference and Coordination Management
116	SLNHLT-DD-3DV-ES3	Telecom Designer	Cost Engineer	QTO - Quantity Take-Off
105	SLNHLT-DD-QTO-ES4	Telecom Designer	Project Manager	3DV - 3D Visualization

2 Exchange Scenario (ES) and Tests

2.1 Exchange Scenario: SLNHL-DD-RDDM-ES1

2.1.1 Updated Exchange Scenario

Id	**SLNHLT-DD-RDDM-ES1**
Exchange Scenario Description *[please describe the ES and define In/Out of Scope topics]*	
1. Create the 3D models of Telecom equipment including BTS (Base Transceiver station) site and trackside part of telecom system. The BTS site includes BTS, rack, transport equipment, power supply, feeder, antenna, tower. The trackside part includes cameras and sensors. 2. Import the infra models of alignment, track, bridge, subgrade and the OCS pole.	

3. With the evaluation of the condition, position the BTS sites along the alignment according to the requirement specification and telecom standard. 4. Import the model of tower and the telecom technical room on the BTS site and place the model of the telecom equipment including the transport equipment, power supply, rack and BTS inside the technical room. 5. Import the model of the trackside parts and place the cameras and sensors on the OCS pole. **In Scope：** Telecom equipment models; Related models and exchange data from other domains. **Out of Scope:** Cables; Non-physical elements; Build and maintenance data.
Geometry and positioning requirements *[General description / concepts => specific on Excel sheets]*
1. Outdoor placement: take the alignment as the reference coordinate system. 2. Indoor placement: select a reference point for installation. 3. Positioning: Installation mileage, horizontal offset, vertical offset, rotation angle, etc.
Spatial requirements *[General description of spatial element requirements => specific on Excel sheets]*
1. The outdoor telecom equipment shall meet the requirements of installation limits and whether intrude into the railway structure gauge. 2. The indoor telecom equipment shall meet the requirements of installation limits.
Physical and functional requirements *[General description of physical elements, functional elements and important information => specific on Excel sheets]*
1. The infra models of alignment, track, building(technical room) and superstructure model of OCS. 2. Requirement specification and telecom standard. 3. BTS site model and trackside part model of telecom system.

Covered Unit Test: to be filled by Technical Expert(s)

ID	Unit Test
1	Telecom elements breakdown
2	Railway Spatial structure zone
3	Linear Placement
4	Linear Span Placement（Point）
5	Linear Span Placement（broken chainage）

2.1.2 ES Test description and results

Test Completion (Specify level of completion and if reserves/punchlist opened, additional TS works….)
1. Create the 3D models of Telecom equipment including BTS (Base Transceiver station) site and trackside part of telecom system and complete the detailed design model in Autodesk Revit. 2. mapping the telecom equipment with the IFC entities 3. Export the whole model of the project into the ifc 4*3 file from Autodesk Revit by the secondary development of the ifc source file. 4. Check the validity of BIM files by KIT IFC Checking tool. 5. Open the ifc 4*3 file by the BIMvision to check the integrity of the project. 6. Completed at the end of Sep. 2021.
Test Team and Test Leader Satisfaction (Specify the Box/Github links to find the test results or documents….)

1. Due to the large volume of 8km model, it takes a long time to import and export the ifc files. Therefore, the detailed design model is simplified and only one section of the 8km model is selected for the test. 2. The exported detailed design model is complete without information loss. And IFC mapping of telecom equipment is correct. 3. The test team are satisfied with the test.
Tests and Results Archives (Specify the Box/Github links to find the test results or documents….)
BOX link: https://app.boxcn.net/s/mzrjs1jbb74hvf8z5vpge0s0ua30n9sa Github link：https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL03_Design%20a%20New%20HS%20Line%20-%20Telecom/IFC%20files%20from%20implementers

2.2 Updated Exchange Scenario: SLNHLT-DD-ICM-ES2

2.2.1 Updated Exchange Scenario

Id	**SLNHLT-DD-ICM-ES2**
Exchange Scenario Description *[please describe the ES and define In/Out of Scope topics]*	
We mainly focus on collision detection which is based on the assembly model to identify and coordinate the potential conflicts before the construction phase. In order to check whether the telecom equipment layout is reasonable and whether it is coordinated with the surrounding environment, the coordination work with various disciplines will be proceeded, and the telecom design model will be modified according to the collision detection results. 1. Check whether the BTS site and trackside part intrude into the railway structure gauge； 2. Check whether the cameras and sensors on the OCS pole are installed reasonably. 3. Check whether the telecom equipment in the technical room are installed reasonably. 4. The telecom design model will be modified according to the Interference and Coordination Management. **In scope:** Telecom equipment models and other related models which need to be coordinated.	
Geometry and positioning requirements *[General description / concepts => specific on Excel sheets]*	
1. Outdoor placement: take the alignment as the reference coordinate system. 2. Indoor placement: select a reference point for installation.	
Spatial requirements *[General description of spatial element requirements => specific on Excel sheets]*	
1. The outdoor telecom equipment shall meet the requirements of installation limits and whether intrude into the railway structure gauge. 2. The indoor telecom equipment shall meet the requirements of installation limits.	
Physical and functional requirements *[General description of physical elements, functional elements and important information => specific on Excel sheets]*	
1.The infra models of alignment, track, building(technical room) and superstructure model of OCS. 2. Principles of collision detection. 3. BTS site model and trackside part model of telecom system.	
Covered Unit Test: to be filled by Technical Expert(s)	
ID	Unit Test

1	Linear Placement
2	Linear Span Placement（Point）

2.2.2 ES Test description and results

Test Completion (Specify level of completion and if reserves/punchlist opened, additional TS works….)
1. Check whether the BTS site and trackside part intrude into the railway structure gauge； 2. Check whether the cameras and sensors on the OCS pole are installed reasonably. 3. Check whether the telecom equipment in the technical room are installed reasonably. 4. The telecom design model will be modified according to the report. 5. Completed at the end of Oct. 2021.
Test Team and Test Leader Satisfaction (Specify the Box/Github links to find the test results or documents….)
1. According to the placement of the equipment, we can check whether the BTS site and trackside equipment intrude into the railway structure gauge. No matter whether the equipment intrude into the railway structure gauge, the corresponding prompts will be given. If they intrude into the railway structure gauge, the corresponding position of the telecom equipment needs to be modified. 2. According to the placement of the trackside part equipment, we can check whether the trackside part equipment is installed reasonably. If the installation position is reasonable, the corresponding prompts will be given. If it is unreasonable, the corresponding position of trackside part equipment needs to be modified. 3. According to the placement of cabinets, we can check whether the cabinets are installed reasonably. If the installation position is reasonable, the corresponding prompts will be given. If it is unreasonable, the corresponding position of cabinets needs to be modified. 4. The scenario of ICM has been completed. 5. The test team are satisfied with the test.
Tests and Results Archives (Specify the Box/Github links to find the test results or documents….)
BOX link: https://app.boxcn.net/s/mzrjs1jbb74hvf8z5vpge0s0ua30n9sa Github link：https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL03_Design%20a%20New%20HS%20Line%20-%20Telecom/IFC%20files%20from%20implementers

2.3 Updated Exchange Scenario: SLNHLT-DD-QTO-ES3

2.3.1 Updated Exchange Scenario

Id	**SLNHLT-DD-QTO-ES3**
Exchange Scenario Description *[please describe the ES and define In/Out of Scope topics]*	
The global cost should be calculated based on the design export of quantities. The quantity take-off will provide: 1. The quantity of BTS equipment, such as the towers, antenna, feeder, transport equipment, racks, power supply. 2. The quantity of cameras. 3. The quantity of sensors, such as anemograph and rain gauge.	
Geometry and positioning requirements *[General description / concepts => specific on Excel sheets]*	

•
Spatial requirements *[General description of spatial element requirements => specific on Excel sheets]*
•
Physical and functional requirements *[General description of physical elements, functional elements and important information => specific on Excel sheets]*
The related information used for calculating quantities and cost. The cost of different type of different telecom elements;
Covered Unit Test: to be filled by Technical Expert(s)

ID	Unit Test
1	Telecom elements breakdown

2.3.2 ES Test description and results

Test Completion (Specify level of completion and if reserves/punchlist opened, additional TS works….)
1. Calculate the quantity of BTS equipment, such as the towers, antenna, feeder, transport equipment, racks, power supply, cameras, anemographs and rain gauges according to the Pset of the elements. 2. Completed at the end of Oct. 2021.
Test Team and Test Leader Satisfaction (Specify the Box/Github links to find the test results or documents….)
1. The quantity of all the telecom equipment can be accurately taken off. 2. The scenario of QTO has been completed. 3. The test team are satisfied with the test.
Tests and Results Archives (Specify the Box/Github links to find the test results or documents….)
BOX link: https://app.boxcn.net/s/mzrjs1jbb74hvf8z5vpge0s0ua30n9sa Github link： https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL03_Design%20a%20New%20HS%20Line%20-%20Telecom/IFC%20files%20from%20implementers

2.4 Updated Exchange Scenario: SLNHLT-DD-3DV -ES4

2.4.1 Updated Exchange Scenario

Id	**SLNHLT-DD-3DV-ES4**
Exchange Scenario Description *[please describe the ES and define In/Out of Scope topics]*	
The 3DV exchange scenario can transform the design model into 3D visual model, which can better communicate the design scheme with the project manager. This 3D model can show the appearance properties of various equipment and relationship between the equipment, so as to provide a complete 3D model of railway for the project manager. Such 3D dossier can be useful to owner, construction company, operation and maintenance company, etc.	
Geometry and positioning requirements *[General description / concepts => specific on Excel sheets]*	

Spatial requirements *[General description of spatial element requirements => specific on Excel sheets]*	
Spatial structure, Domain equipment position and reference	
Physical and functional requirements *[General description of physical elements, functional elements and important information => specific on Excel sheets]*	
1.The civil models of alignment, track, building and superstructure model of OCS. 2.BTS site model and trackside part model of telecom system.	
Covered Unit Test: to be filled by Technical Expert(s)	
ID	Unit Test
1	Telecom elements breakdown

2.4.2 ES Test description and results

Test Completion (Specify level of completion and if reserves/punchlist opened, additional TS works….)
1. 3D model of the detailed design. 2. Completed at the end of Oct. 2021.
Test Team and Test Leader Satisfaction (Specify the Box/Github links to find the test results or documents….)
1. The exported detailed design model is complete without information loss. 2. The scenario of 3DV has been completed. 3. The test team are satisfied with the test.
Tests and Results Archives (Specify the Box/Github links to find the test results or documents….)
BOX link: https://app.boxcn.net/s/mzrjs1jbb74hvf8z5vpge0s0ua30n9sa Github link：https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL03_Design%20a%20New%20HS%20Line%20-%20Telecom/IFC%20files%20from%20implementers

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/7axoc7x43mo67nso709m9xmzjpii1fo7

3.2 SL Data archives

The SL Data of the Telecom Design is archived in the following BOX directory:

Storyline Report: https://app.boxcn.net/s/70io0izee5hpu1ya7q9sccimfdxkrl67

Storyline Implementation Report： https://app.boxcn.net/s/qp3kzkjsufea7a82pw3n1w3omgp2fgif

Storyline Dataset： https://app.boxcn.net/s/tbleih0cjz06jbaktqe8913xygh44i1y

Storyline Supplement Report： https://app.boxcn.net/s/n3rsc254k3oiw84uut1abaozar7lli3r

IFC files:

BOX directory: https://app.boxcn.net/s/tx7rjw77cwpr180leqhx45pdx8foaqrg

GITHUB: https://github.com/IFCRail/IFC-Rail-Unit-Test/tree/master/8_Storylines%20Test%20(SL)/SL03_Design%20a%20New%20HS%20Line%20-%20Telecom/IFC%20files%20from%20implementers

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 Telecom
Dataset description
This dataset provides the relevant data for the storyline of high speed line railway telecommunication. The dataset describes a series of parameters about the alignment (including line plane, line profile and line broken chain), the placement of OCS poles, the layout of cameras/sensors on OCS poles, the placement of base transceiver stations(BTS) sites, and the element breakdown of BTS. This dataset takes the 8 km alignment data of Wuhan-Xiangyang-Shiyan high speed railway as an example to describe the data organization of line plane, line profile and line broken chain in detail. The energy domain experts provide the layout scheme of OCS pole, the telecommunication domain experts provide the layout scheme of cameras/sensors on OCS pole, the layout scheme of BTS sites along the alignment, and the element breakdown of BTS, so as to help the software vendors to implement the import and export of IFC files, and verify the relevant exchange scenarios of the storyline.
Dataset links
BOX link: https://app.boxcn.net/s/mzrjs1jbb74hvf8z5vpge0s0ua30n9sa

4 Appendices

4.1 Storyline Documentation

See Appendix 4.1

The storyline documentation for High Speed Line Telecom has been well documented, and the documentations are available in the following BOX directories:

Storyline Report: https://app.boxcn.net/s/70io0izee5hpu1ya7q9sccimfdxkrl67

Storyline Implementation Report： https://app.boxcn.net/s/qp3kzkjsufea7a82pw3n1w3omgp2fgif

Storyline Dataset： https://app.boxcn.net/s/tbleih0cjz06jbaktqe8913xygh44i1y

Storyline Supplement Report： https://app.boxcn.net/s/n3rsc254k3oiw84uut1abaozar7lli3r