

JHDM Project

- Japan Highways Data Model -

Committee Members of the JHDM

Chairman

Prof. H. Furuta, Kansai Univ.

Organizer

Japan Highway Research Institute

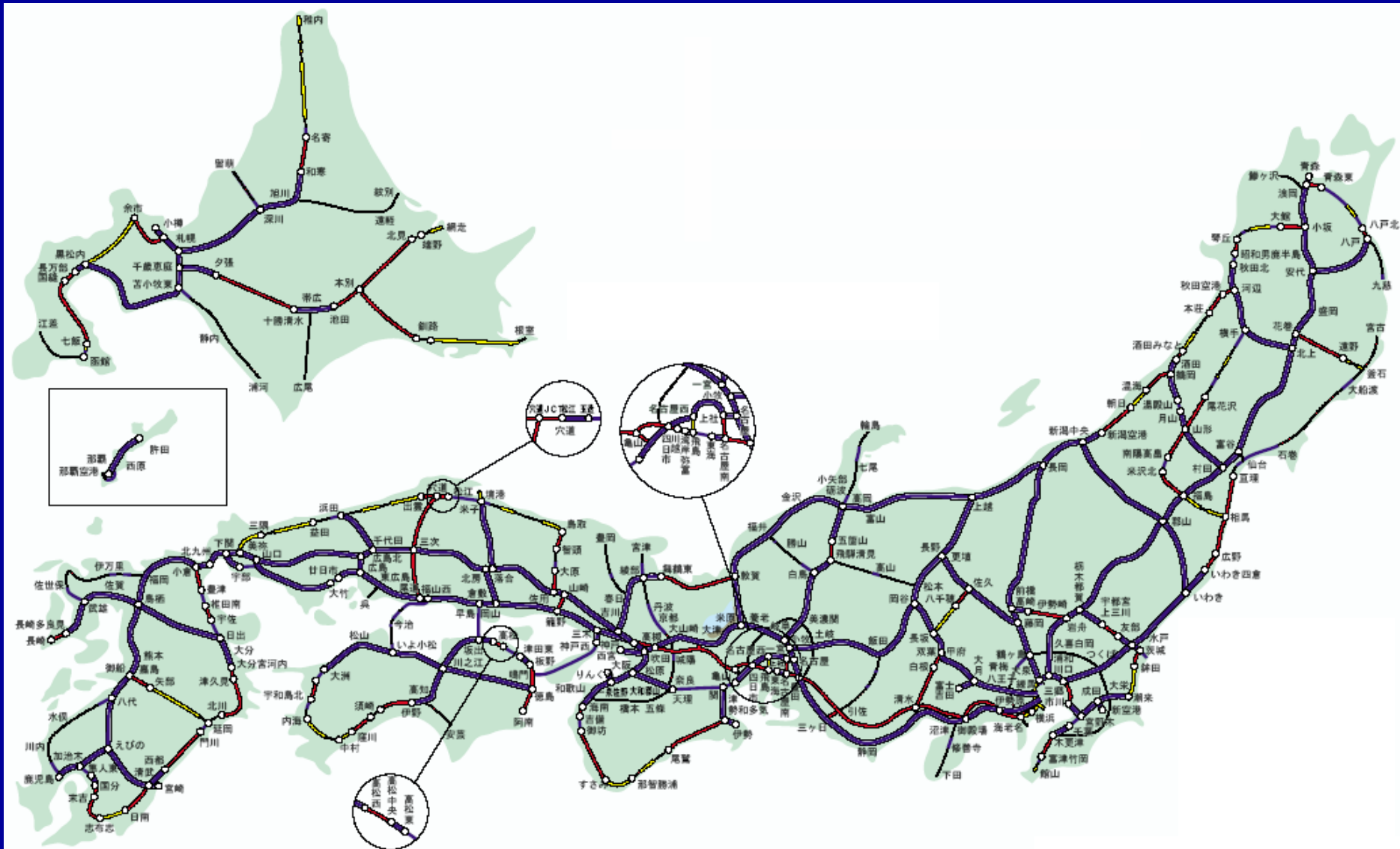
Advisors

Prof. R. Shibasaki, Tokyo Univ.

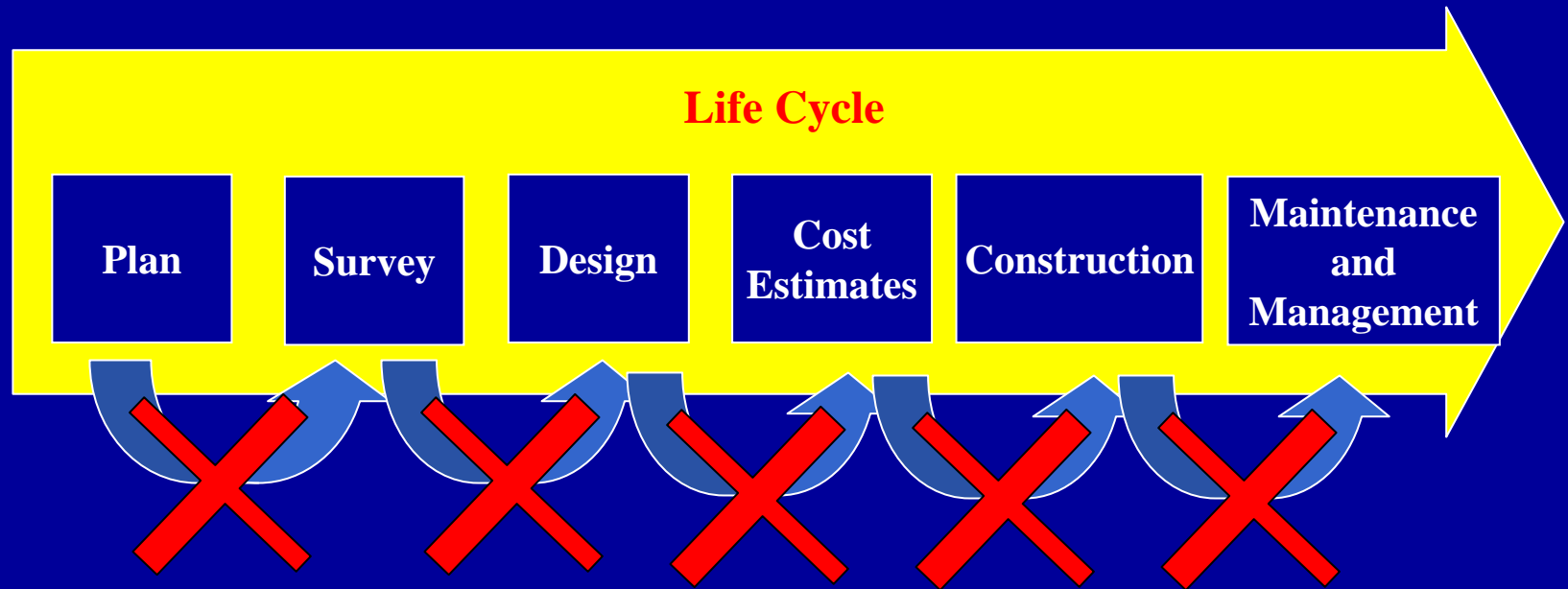
Prof. S. Tanaka, Kansai Univ.

Associate Prof. T. Froese, UBC

The Highway Network in Japan



Problems of the Present Condition



✧ **Problems** are the following:

- Not to deliver data efficiently
- Difficult to recycle data
- Not to manage data effectively

Purpose and Goal

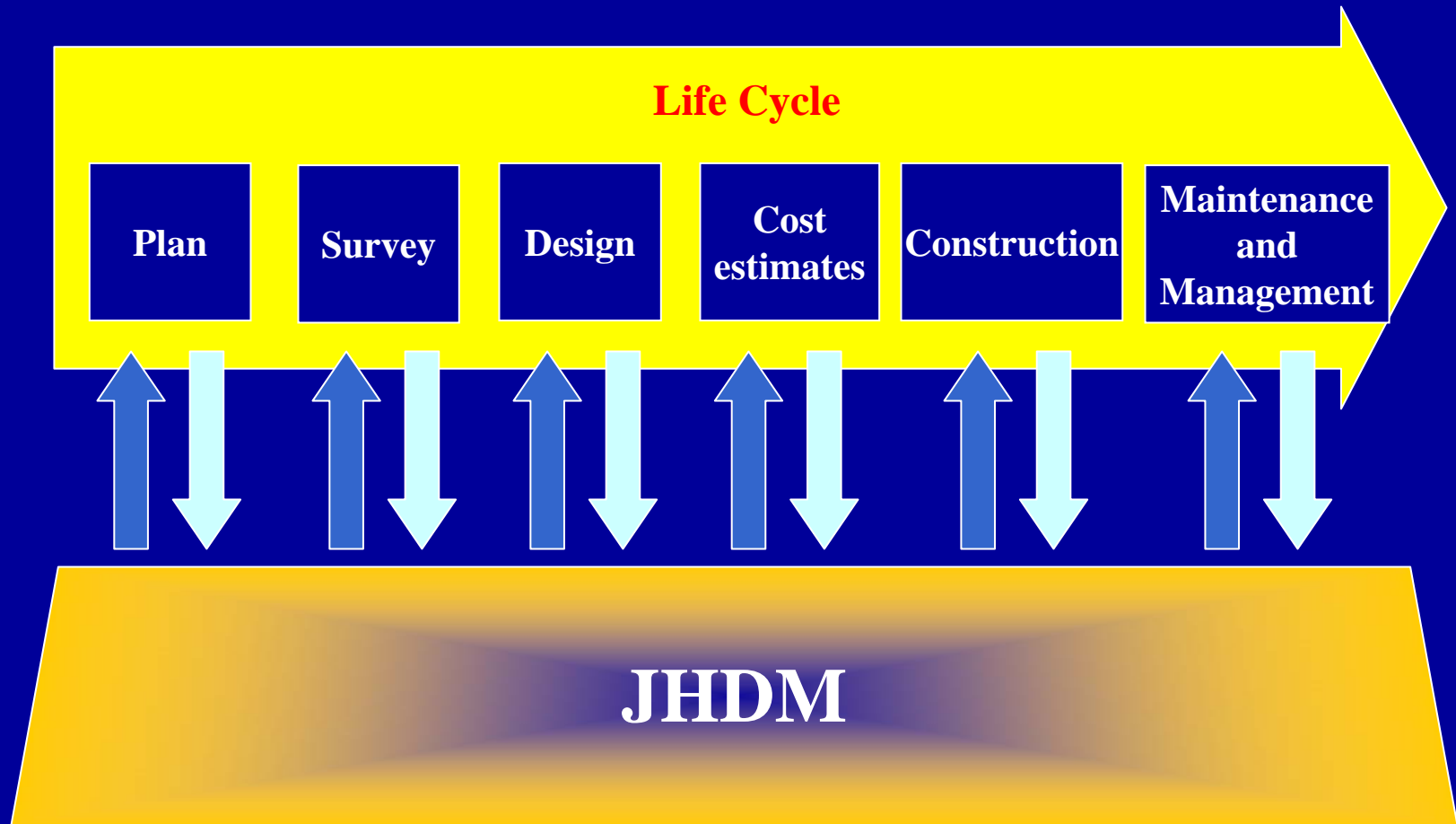
✧ **Purpose** is the following:

- To improve reusability of data
- To keep data certainly
- To improve quality of data
- To save labor of data managing

✧ **Goal** is the following:

- To develop specifications for data exchange in highway administration.

Circulation of Reusable Data from Upper Phase to Lower Phase



Giving and Taking Data by the General Format

Composition of JHDM

JHDM is composed by the following:

- ✧ **Function Activity Model**
- ✧ **Road Structure Model**
- ✧ **XML Schema**

JHDM is arranged by the following documents:

- ✧ **Project Definition**

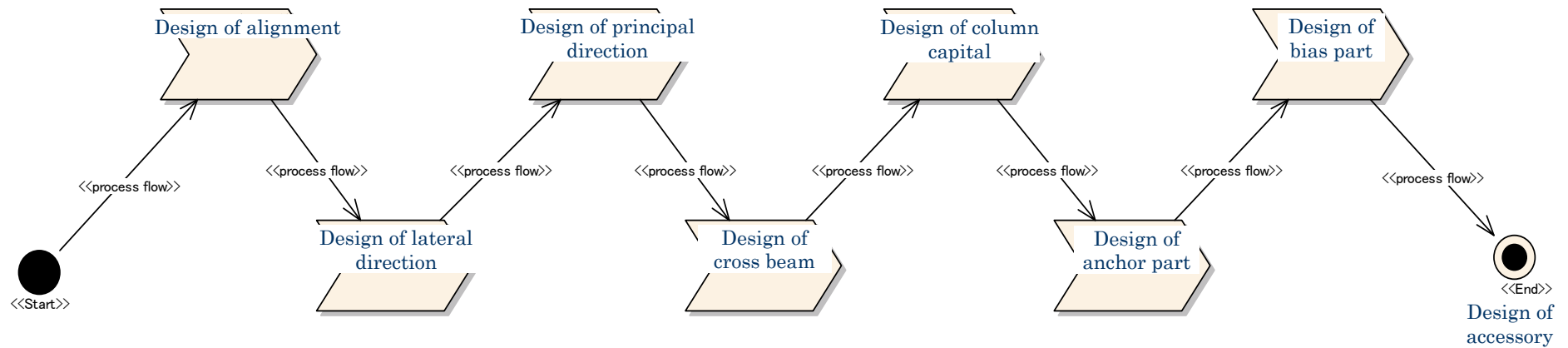
This document describes concepts of JHDM;
e.g. significance, demand, and scope.

- ✧ **JHDM Specification**

This document describes basic composition,
model definition and so on of JHDM
that are needed at practical using JHDM.

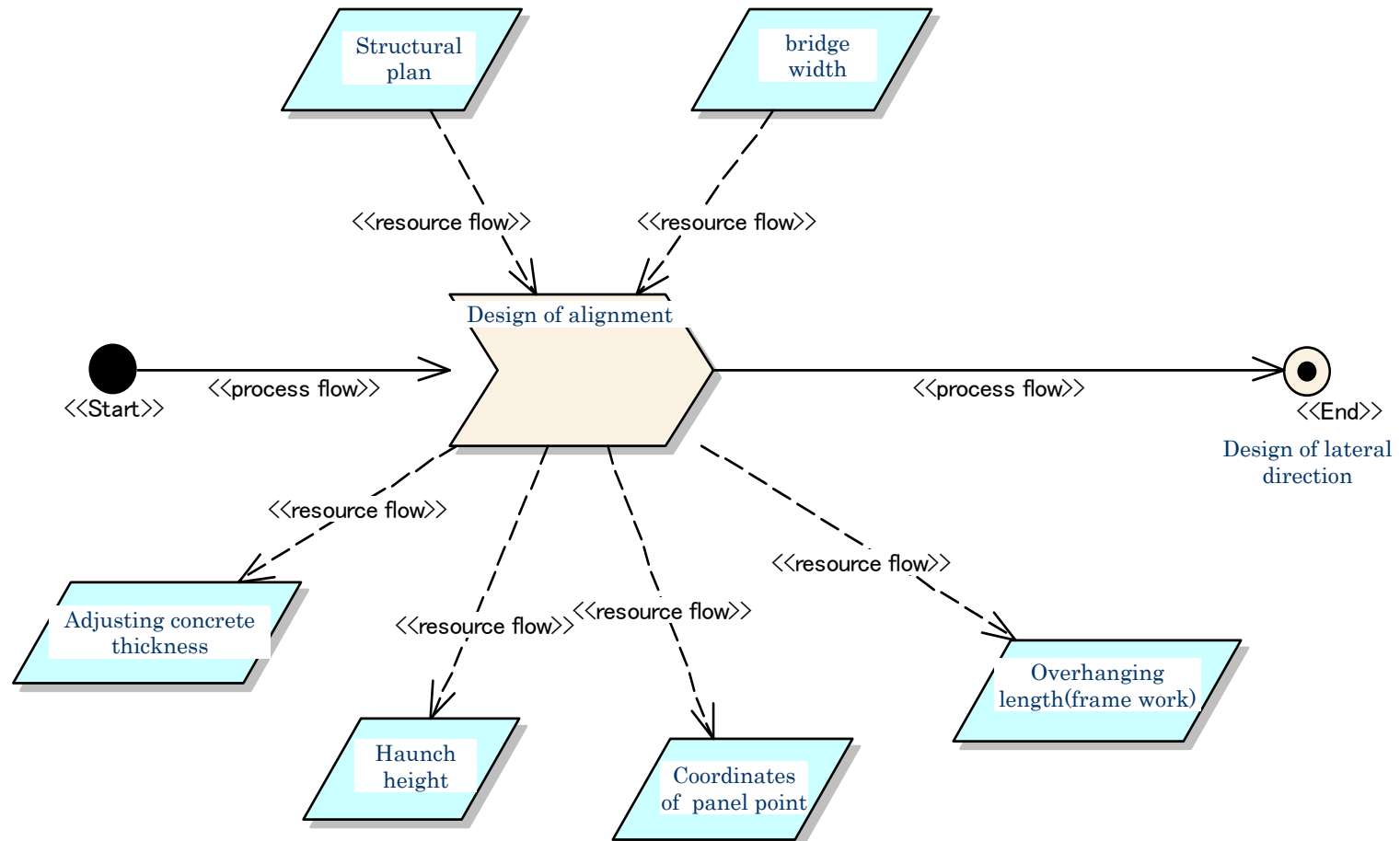
Function Activity Model

Detailed Design of Superstructure



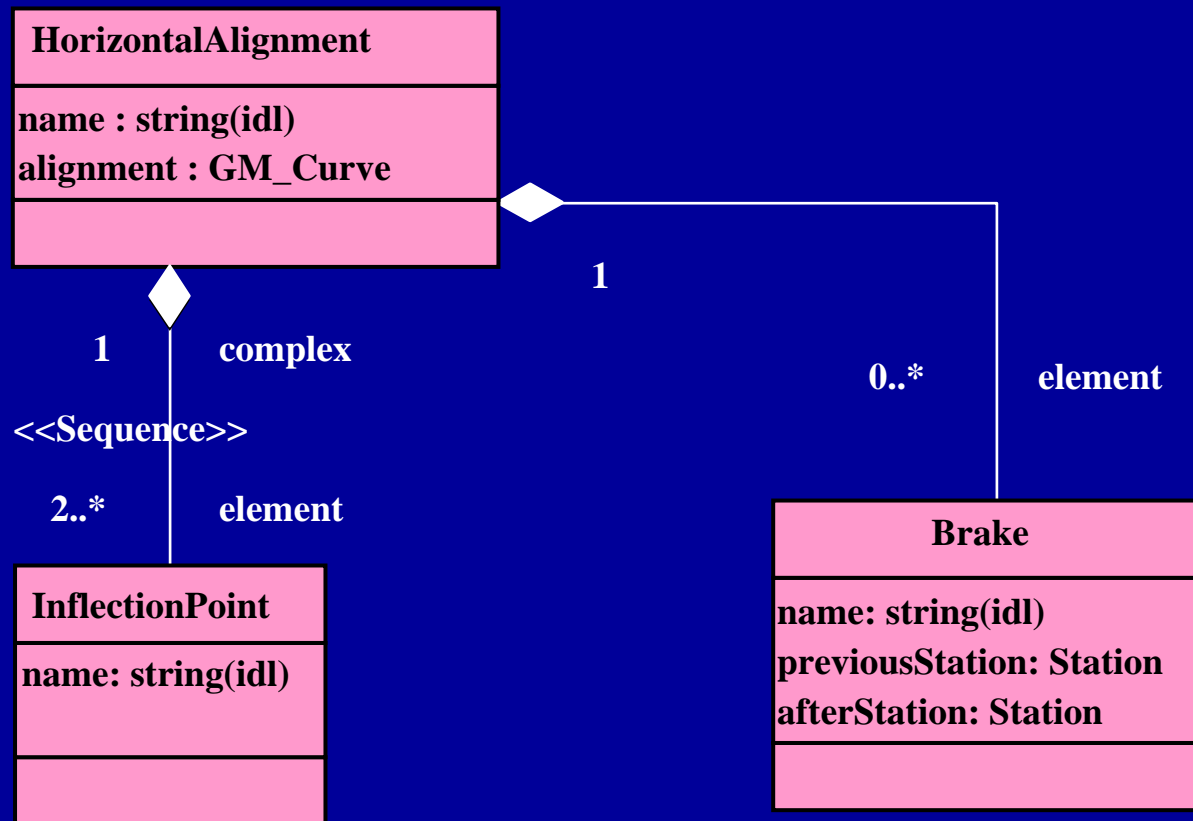
Function Activity Model

e.g. Account of Alignment



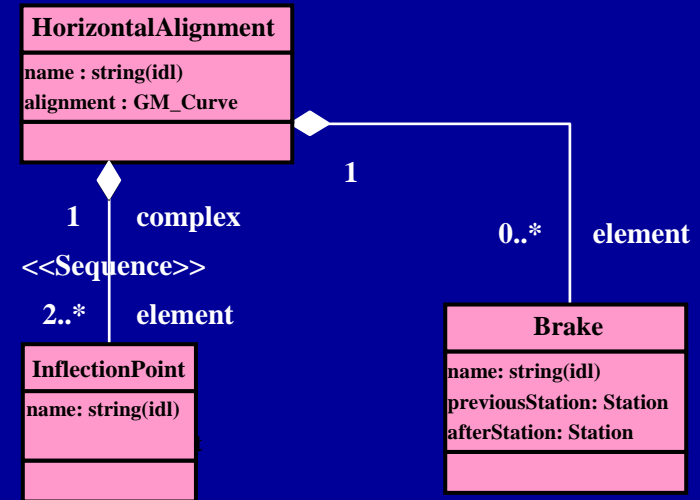
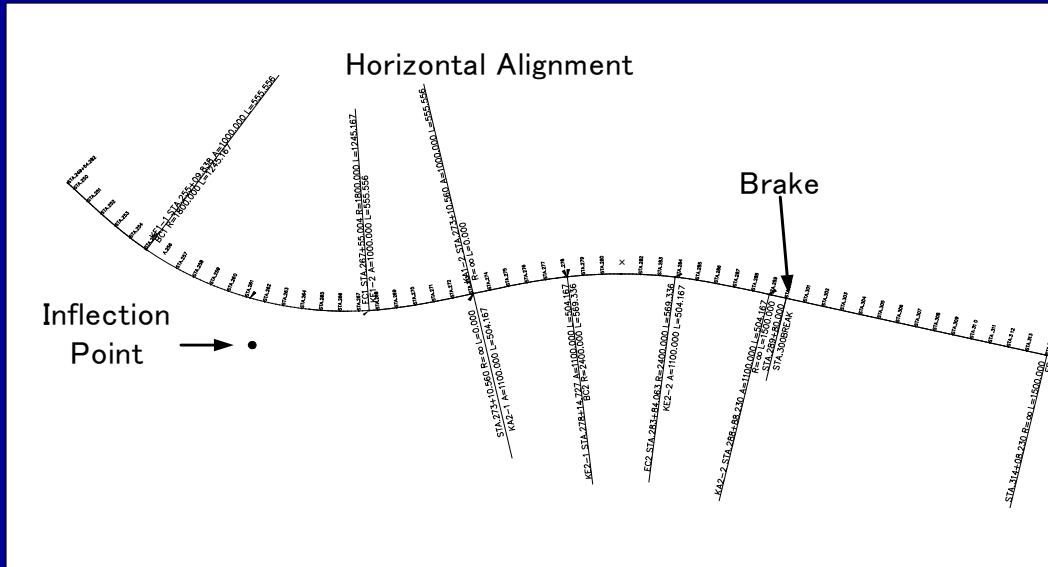
Road Structure Model

● Expression by Class Diagram of UML



XML Schema

- Example of Definition of Horizontal Alignment -



```
<xs:complexType name="HorizontalAlignment">
```

```
<xs:complexContent>
```

```
<xs:extension base="jx:Alignments">
```

```
<xs:sequence>
```

```
<xs:element name="InflectionPoint_element" ... />
```

```
<xs:element name="Brake_element" ... />
```

```
<xs:element name="edge">
```

```
...
```

```
<xs:attribute name="name" type="jxsp:CharacterString"/>
```

```
</xs:extension></xs:complexContent></xs:complexType>
```

(Horizontal Alignment)

(Inherits Alignments Class)

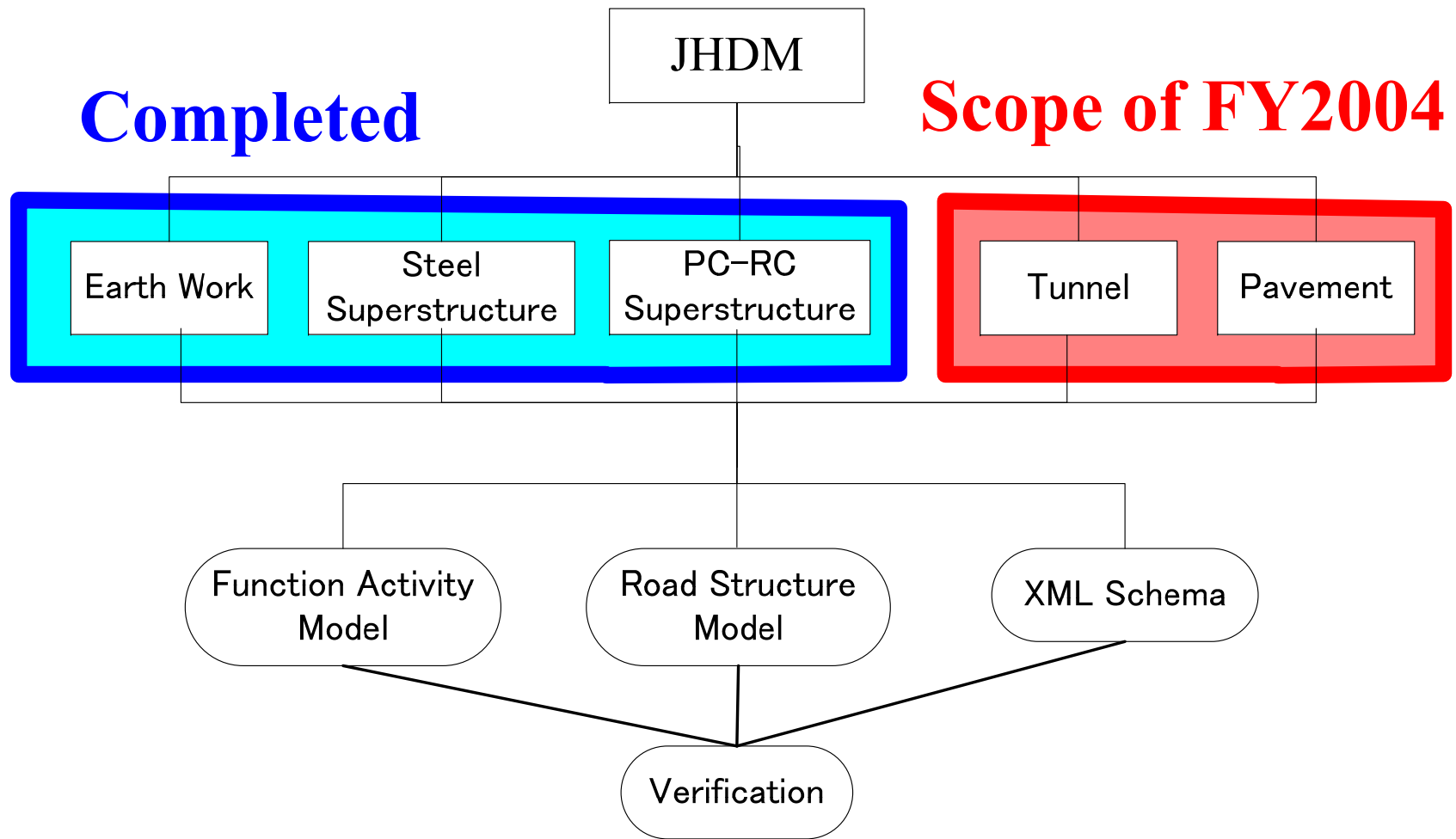
(Inflection Point)

(Brake)





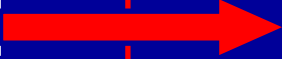
(Alignment)

(Alignment Name)

State of Research in FY2004

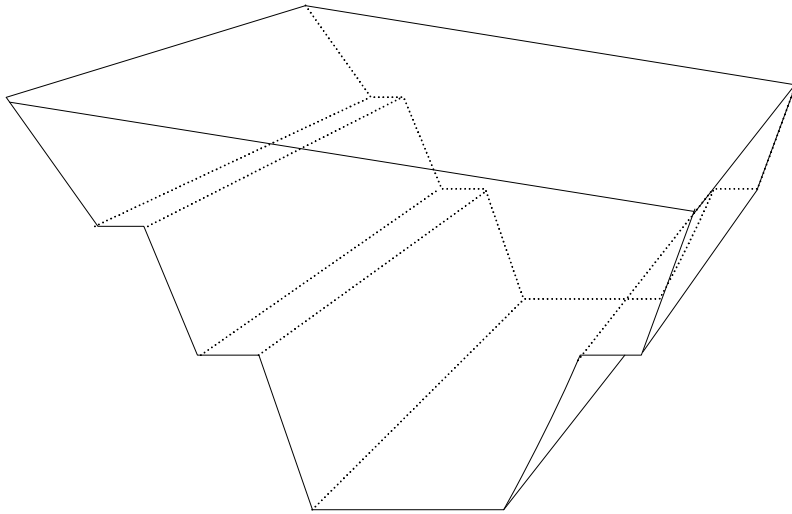


State of Research until FY2004

	FY2001	FY2002	FY2003	FY2004
Earth Work Substructure			Models-XML schema-Verification	
Steel Superstructure			Models-XML schema-Verification	
PC/RC Superstructure	Models-XML schema			
Tunnel Pavement	Models-XML schema-Verification			

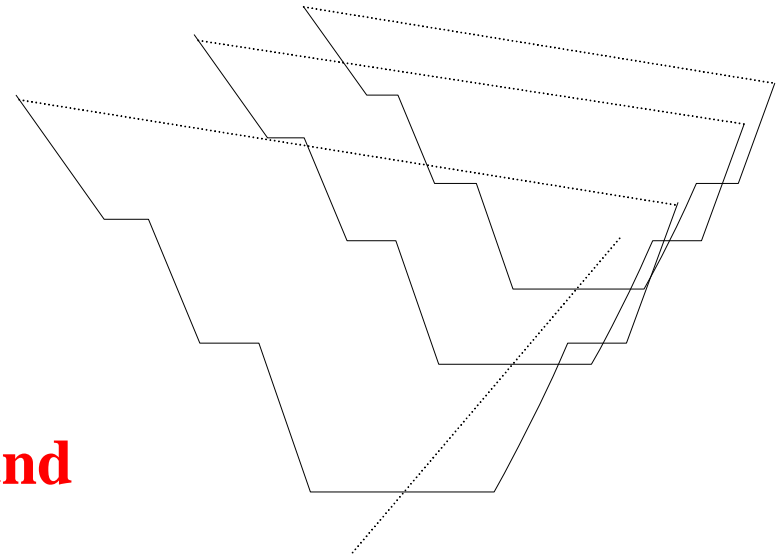
We are here.

Concept of Road Structure Model (Earth Work)



3D Product Model

and

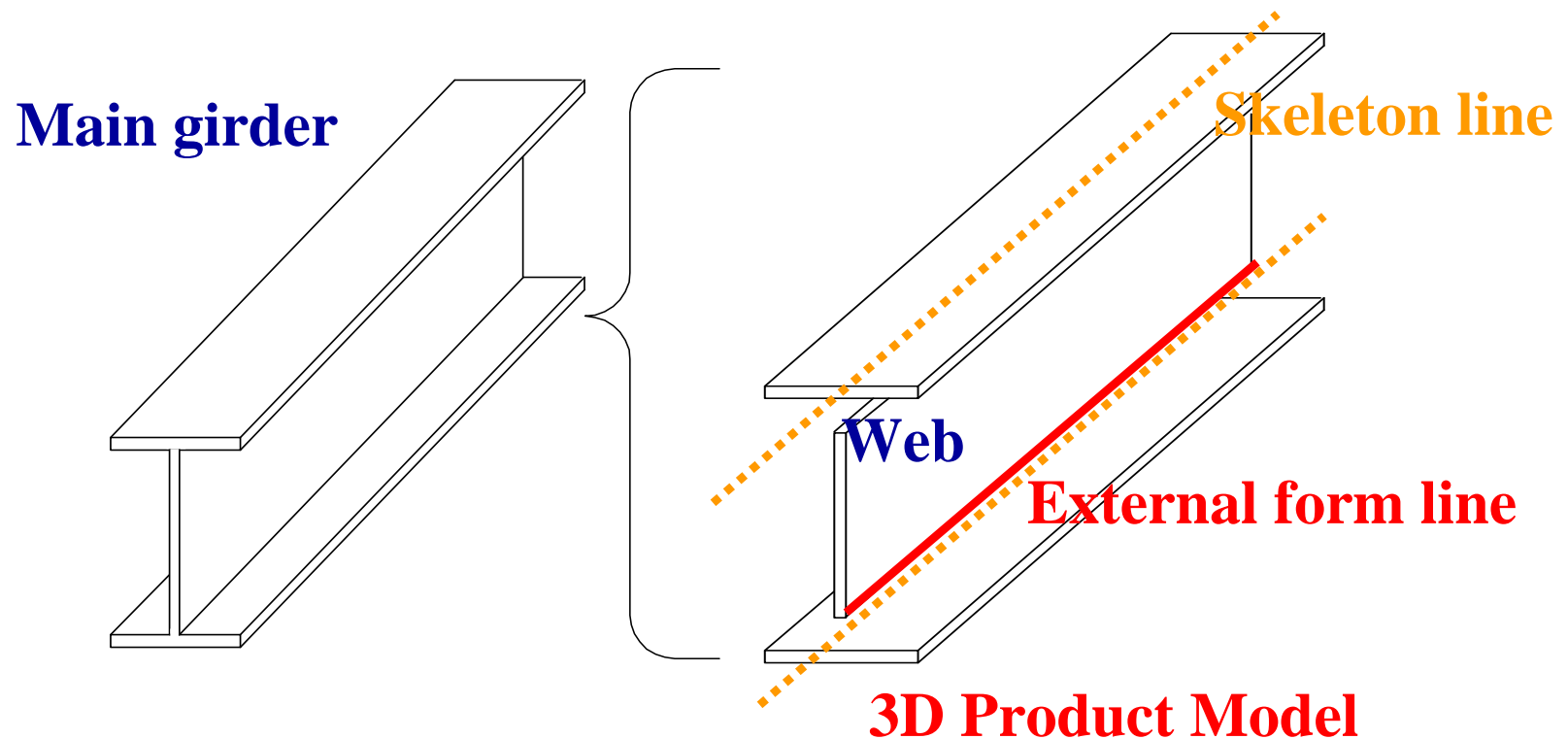


Cross section

» Characteristic

Concepts of each the road-domain CAD and the general-purpose CAD are needed. Therefore, this model is expressed by 3D or 2D-cross section or both of them.

Concept of Road Structure Model (Steel Superstructure)



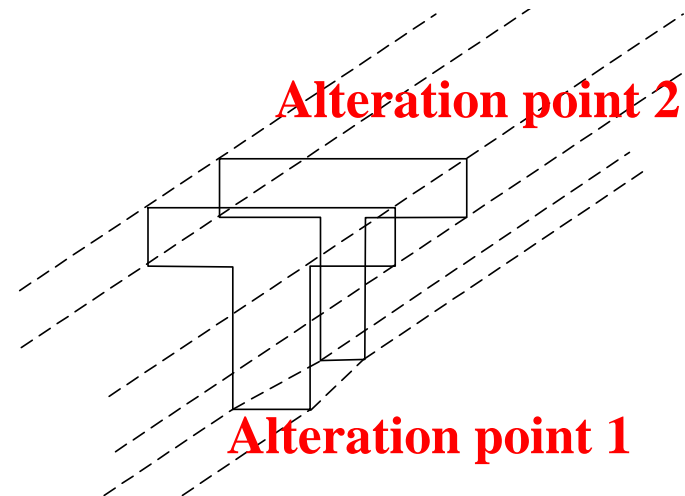
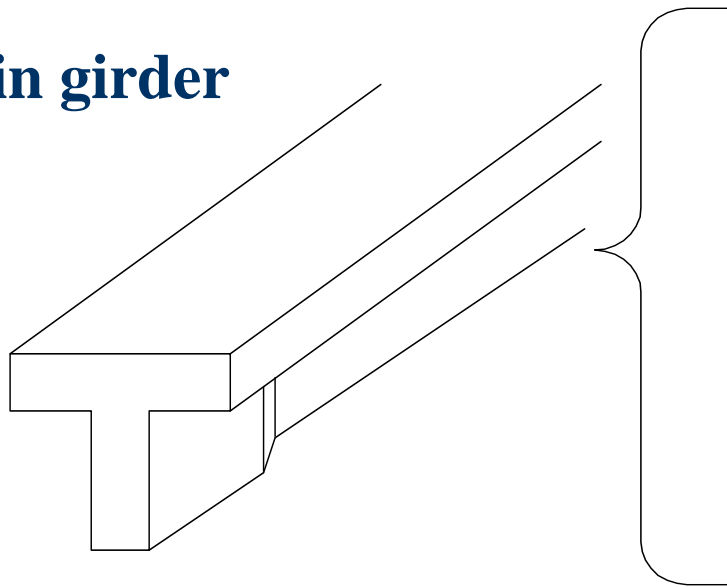
» Characteristic

Steel Superstructure is fabrication of steel plates. Therefore, this model is expressed by the external form line of plates composed by 3D Skeleton line.

Concept of Road Structure Model (PC/RC Superstructure)

● Concrete

Main girder



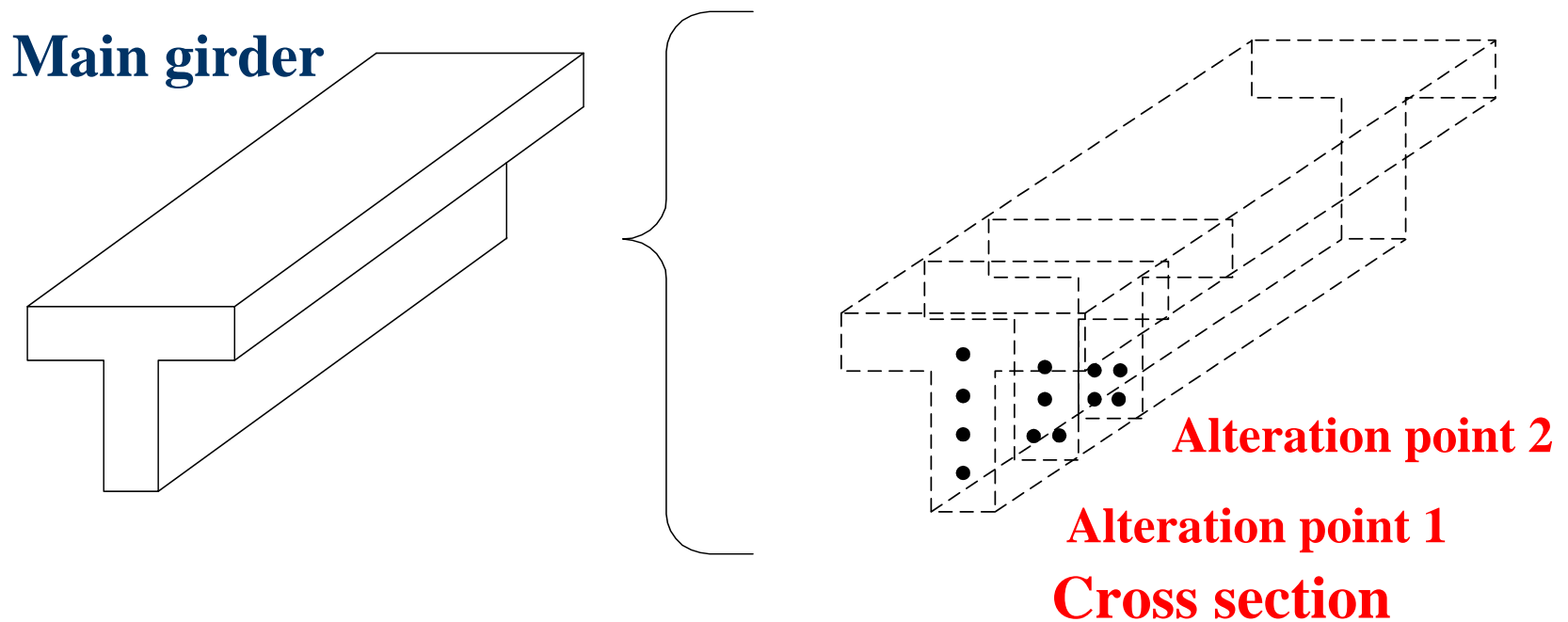
Cross section

» Characteristic

PC/RC Superstructure is an aggregate of Concrete, PC cable and reinforcing bar. Therefore, this model is expressed by 2D-cross section. Alteration points of the cross section are defined as the range between a point and another point measured by sweeping.

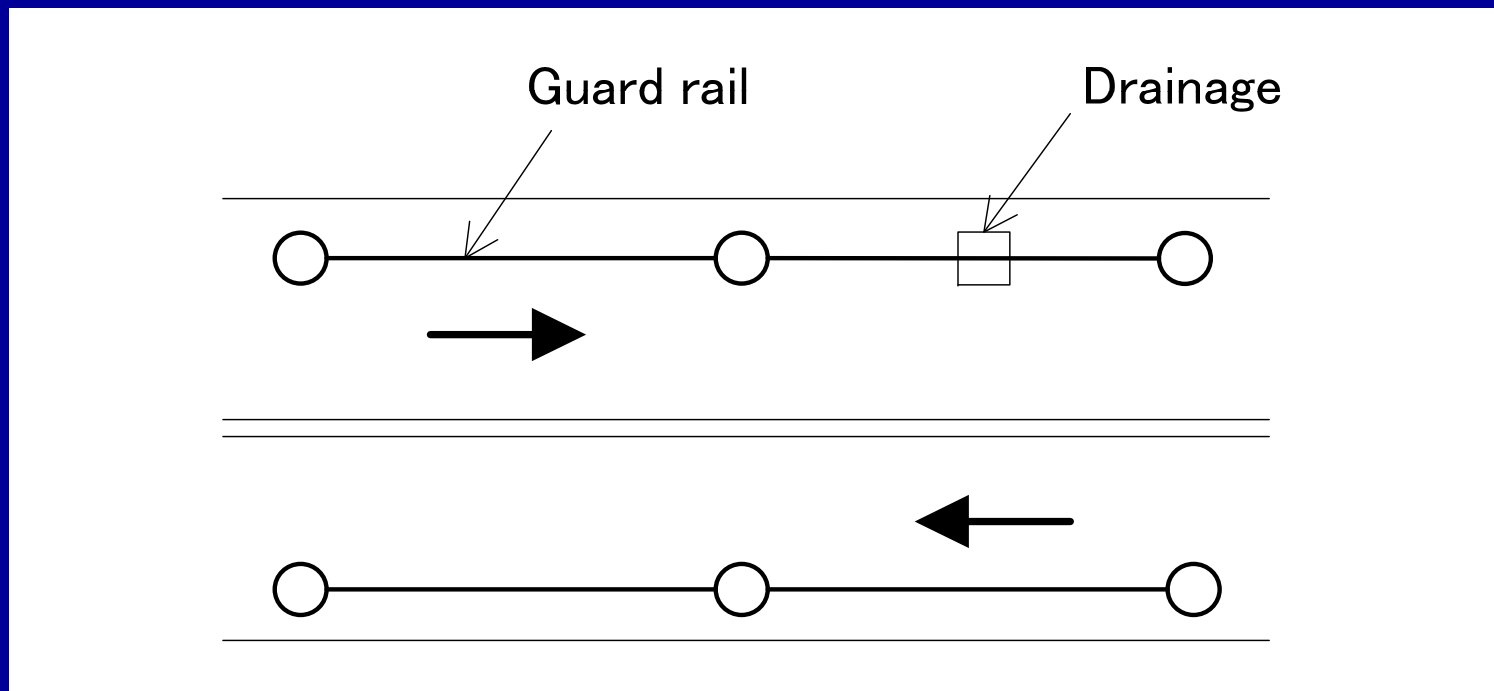
Concept of Road Structure Model (PC/RC Superstructure)

● PC cable

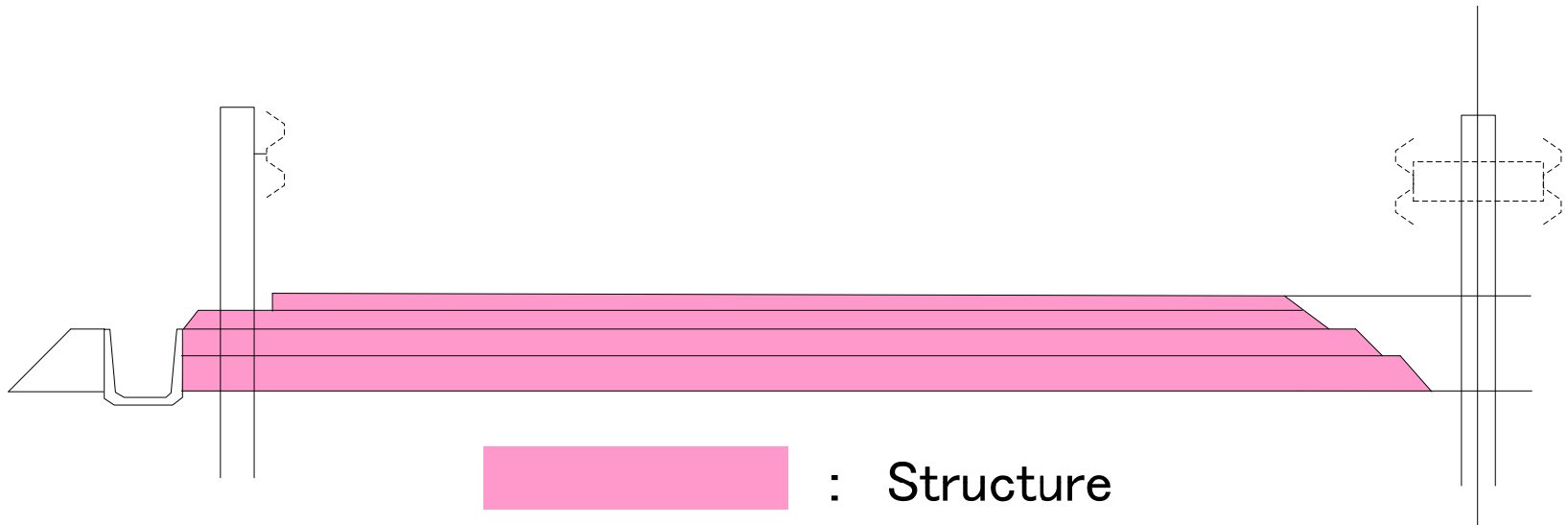



Concept of Road Structure Model (Pavement)

- (1) Pavement is expressed as cross section data, and the whole image is expressed by integration of the cross section data in longitudinal direction.
- (2) The whole image of accessory is expressed as attributes of start point. But deduction of pavement area is expressed by integration of the cross section data.



Concept of Road Structure Model (Pavement)



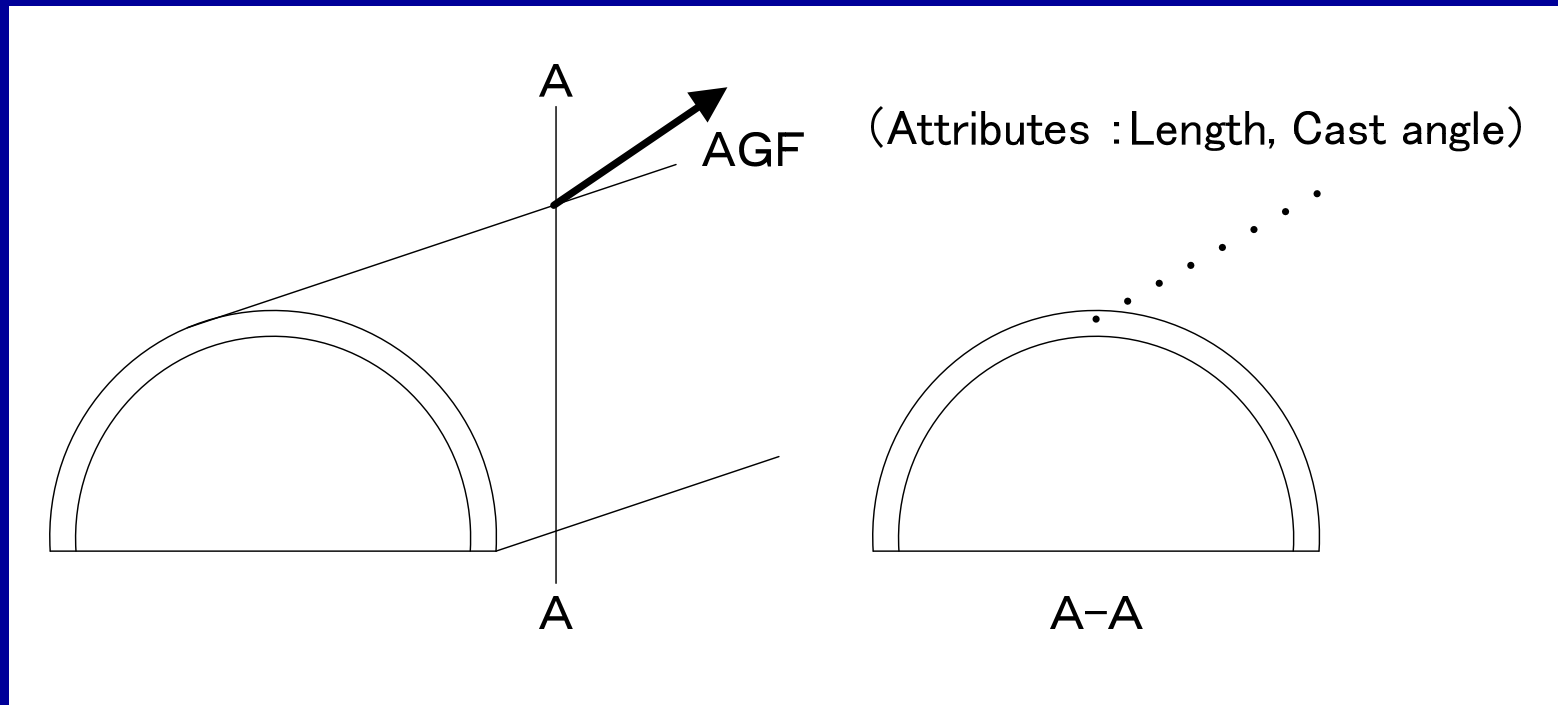
 : Structure
The other part : Accessory

Pavement is expressed as Structure and Accessory:

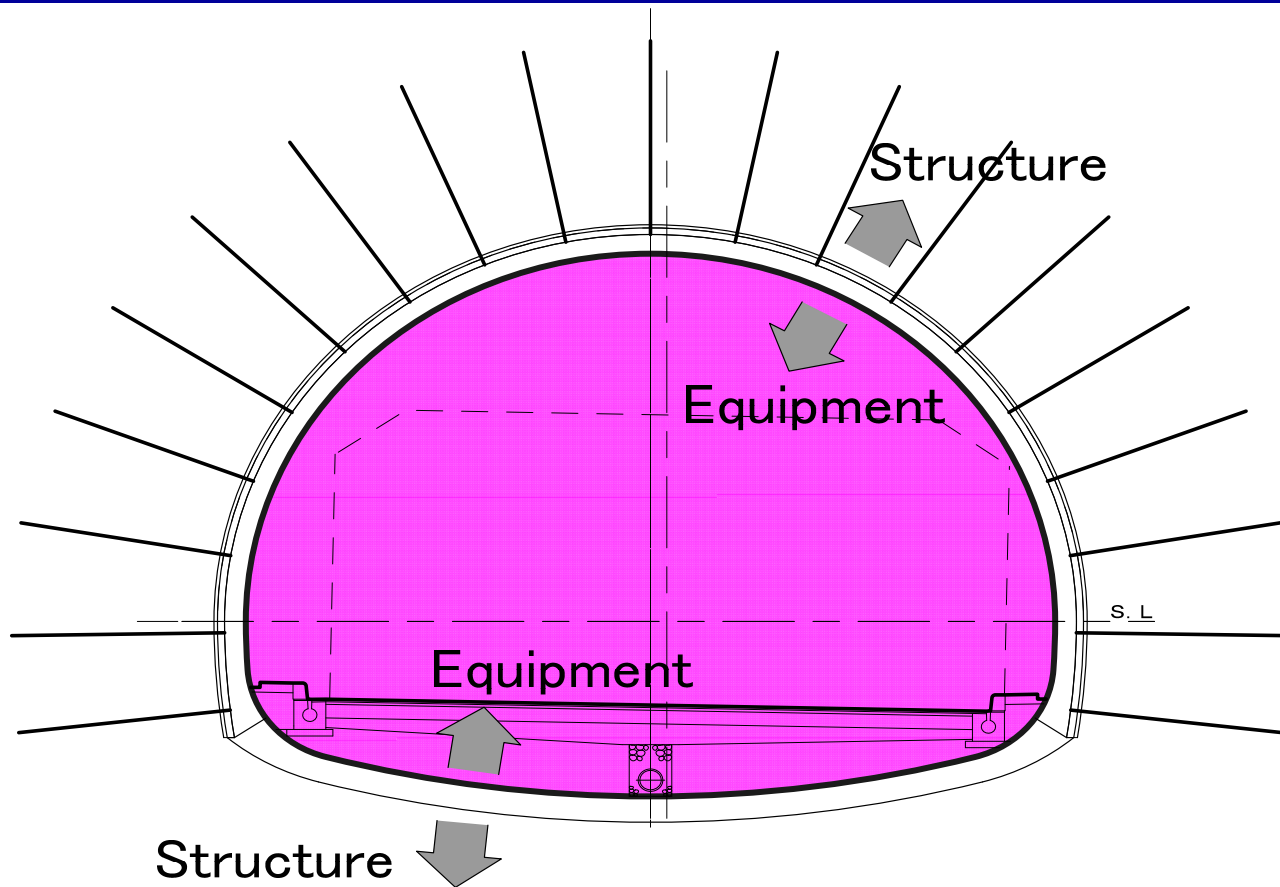
- **Structure** : asphalt, concrete , stabilized base . . .
- **Accessory** : guard fence, marking

Concept of Road Structure Model (Tunnel)

- (1) Permanent work and so on are expressed as cross section data, and the whole image is expressed by integration of the cross section data in longitudinal direction.
- (2) The whole image of accessory is expressed as attributes of start point.



Concept of Road Structure Model (Tunnel)



Tunnel is expressed as inside equipment and outside structure:

- **Equipment**: warden aisle, surface drainage . . .
- **Structure**: staging, lining, entrance work

Finally, Research Plan

JH will be changed from public to private in FY2005.

**When JH will stabilize the organization,
a new phase turn of JHDM will be worked on,
while taking the tendency of SXF Level 4 .**

Japan Highway Data Model

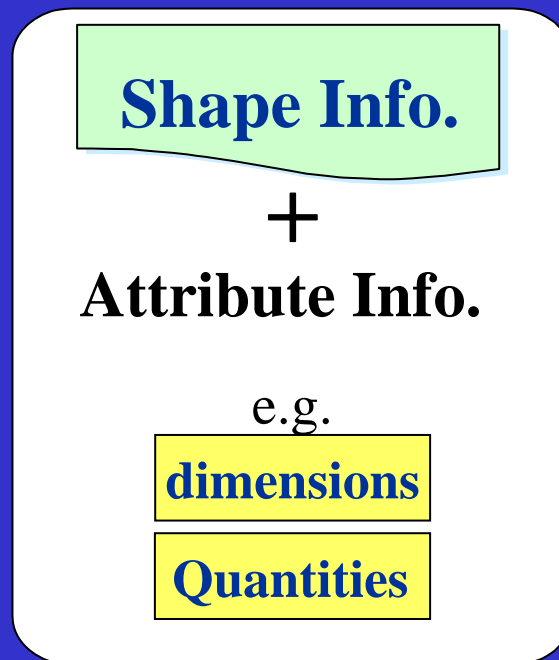
Data Exchange Specifications
for Expressway Business in Japan

Shigenori Tanaka, Kansai Univ.

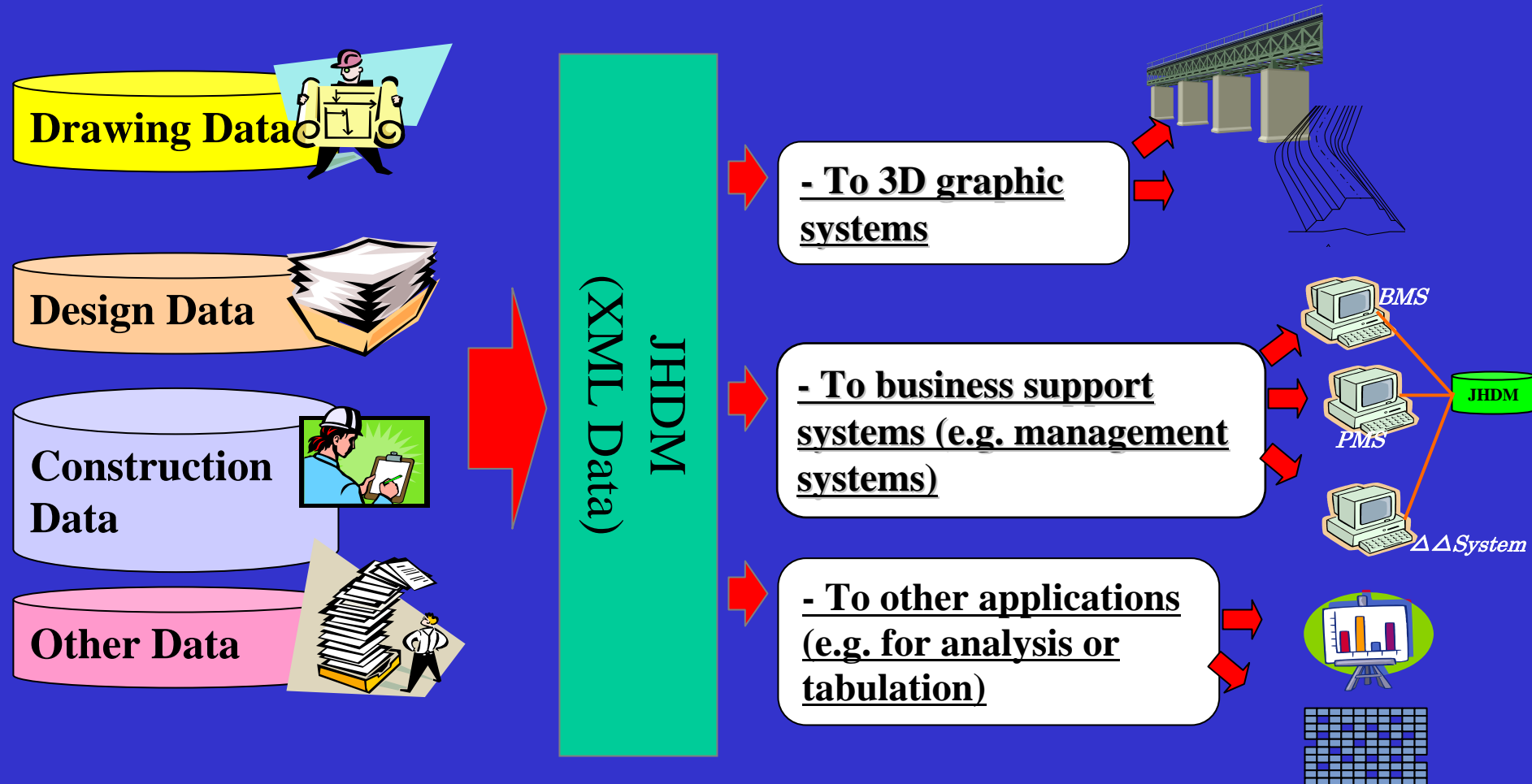
Expressway Technology Center

What is JHDM?

- JHDM is a model that shows the relations between objects on expressways, using “shape information” and “attribute information.”



What is purpose?

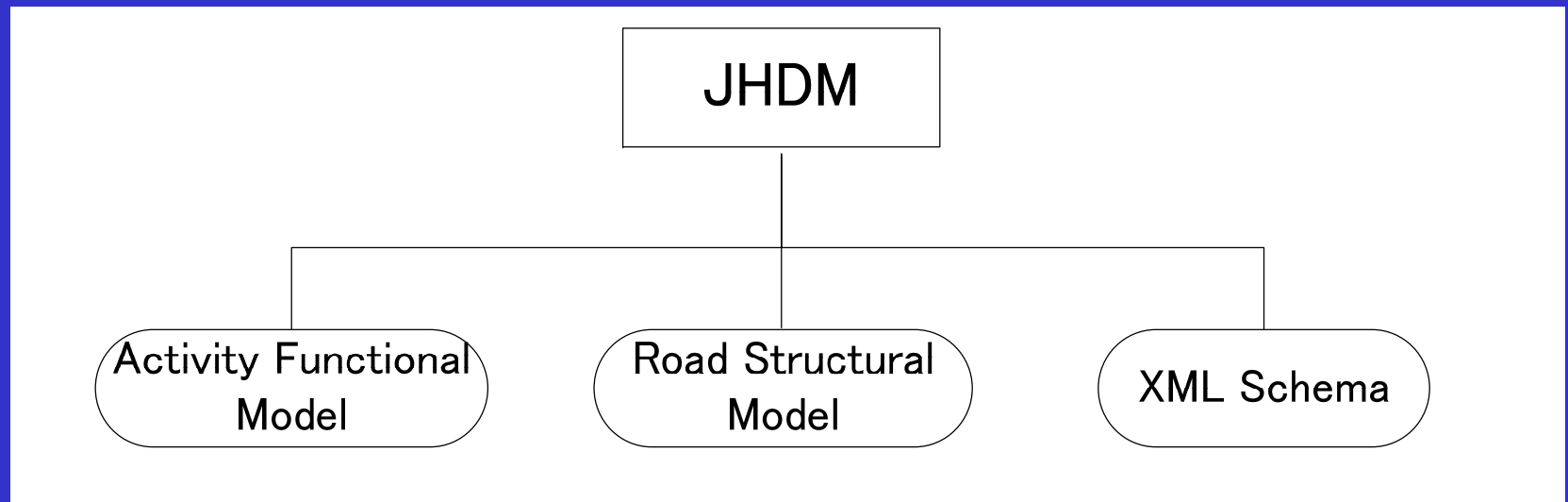


The purpose is that various construction data are applied to 3D graphic system, to business support system, and to other application through JHDM.

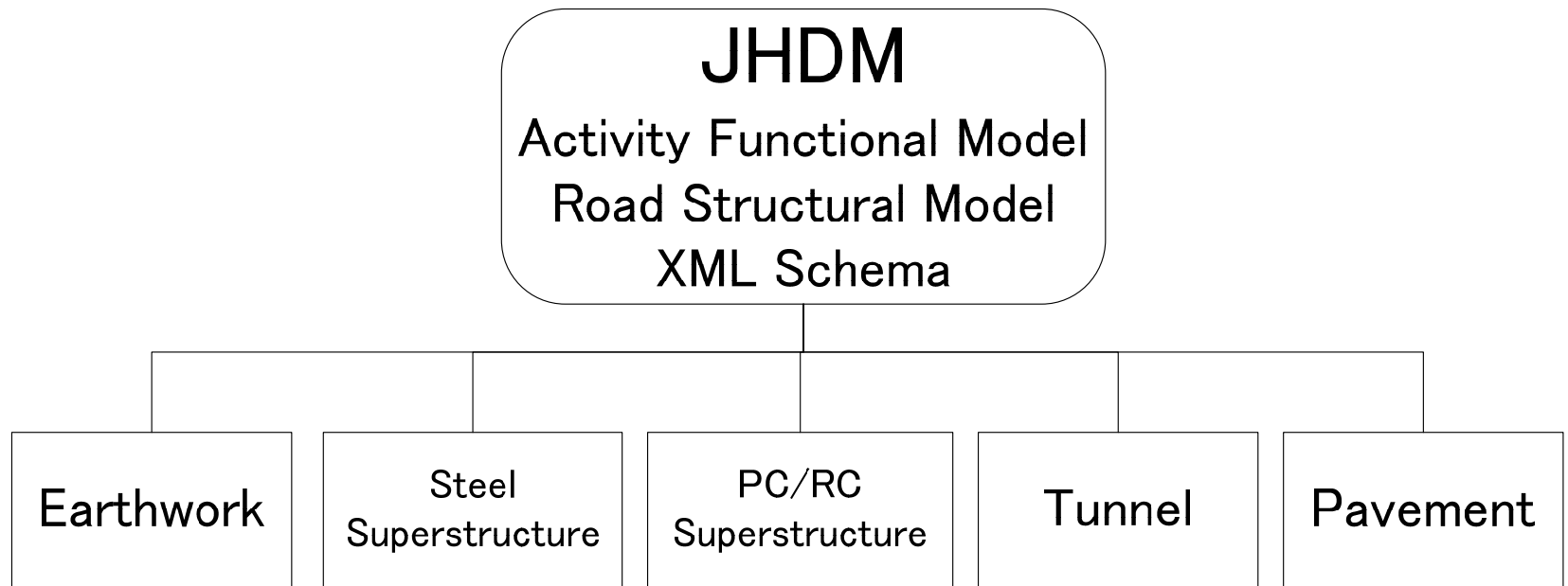
Composition of JHDM

JHDM is composed of the following elements:

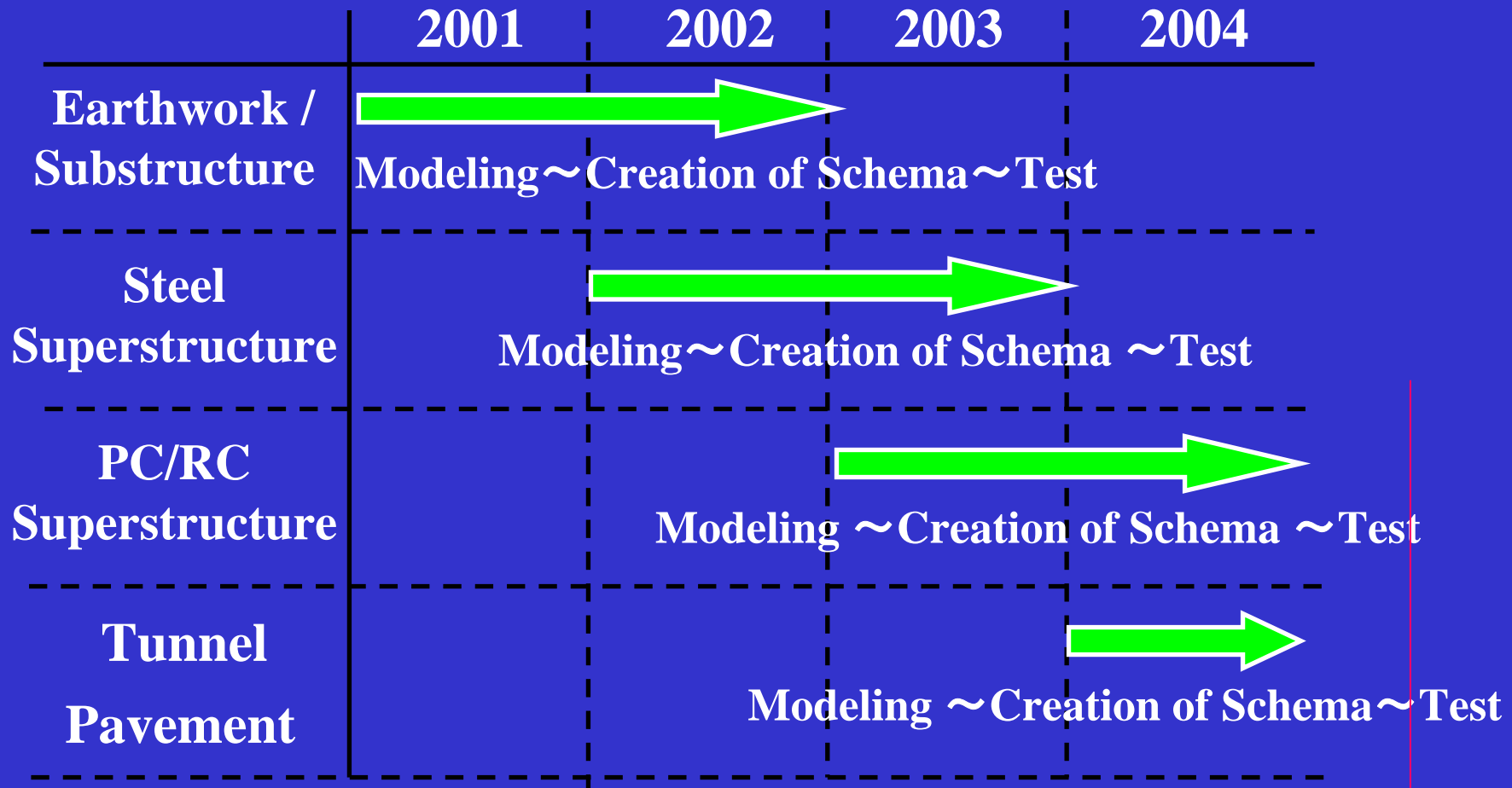
- Activity Functional Model
- Road Structural Model using UML
- XML Schema



Work Types Covered by JHDM



Research History

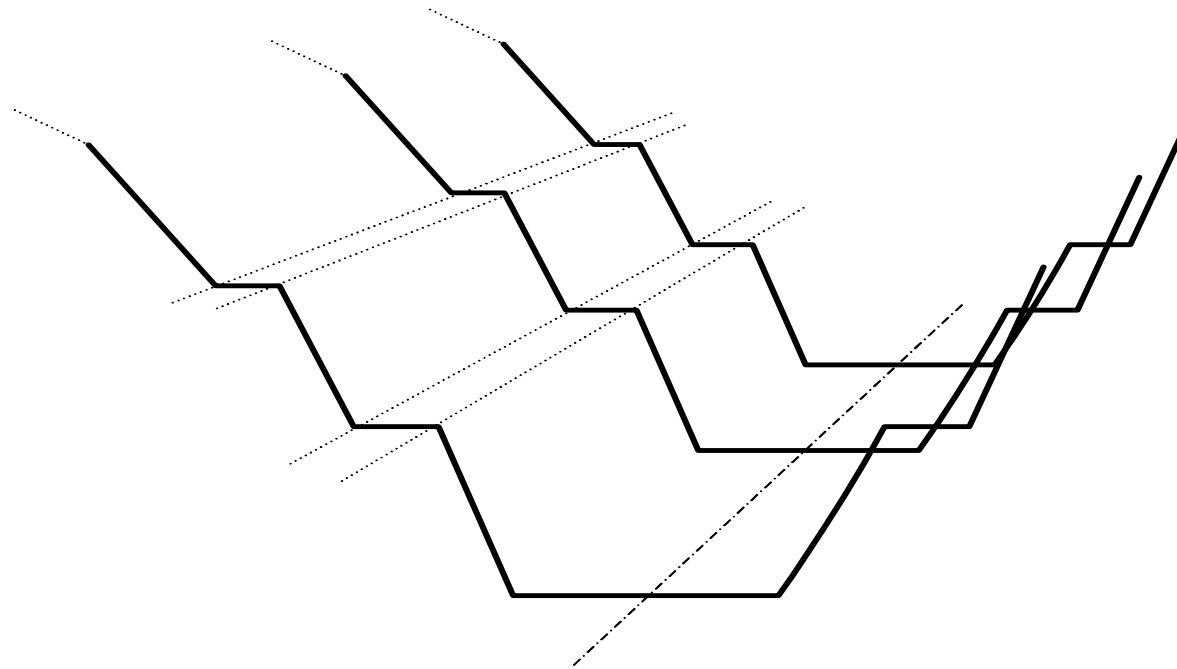


We are here.

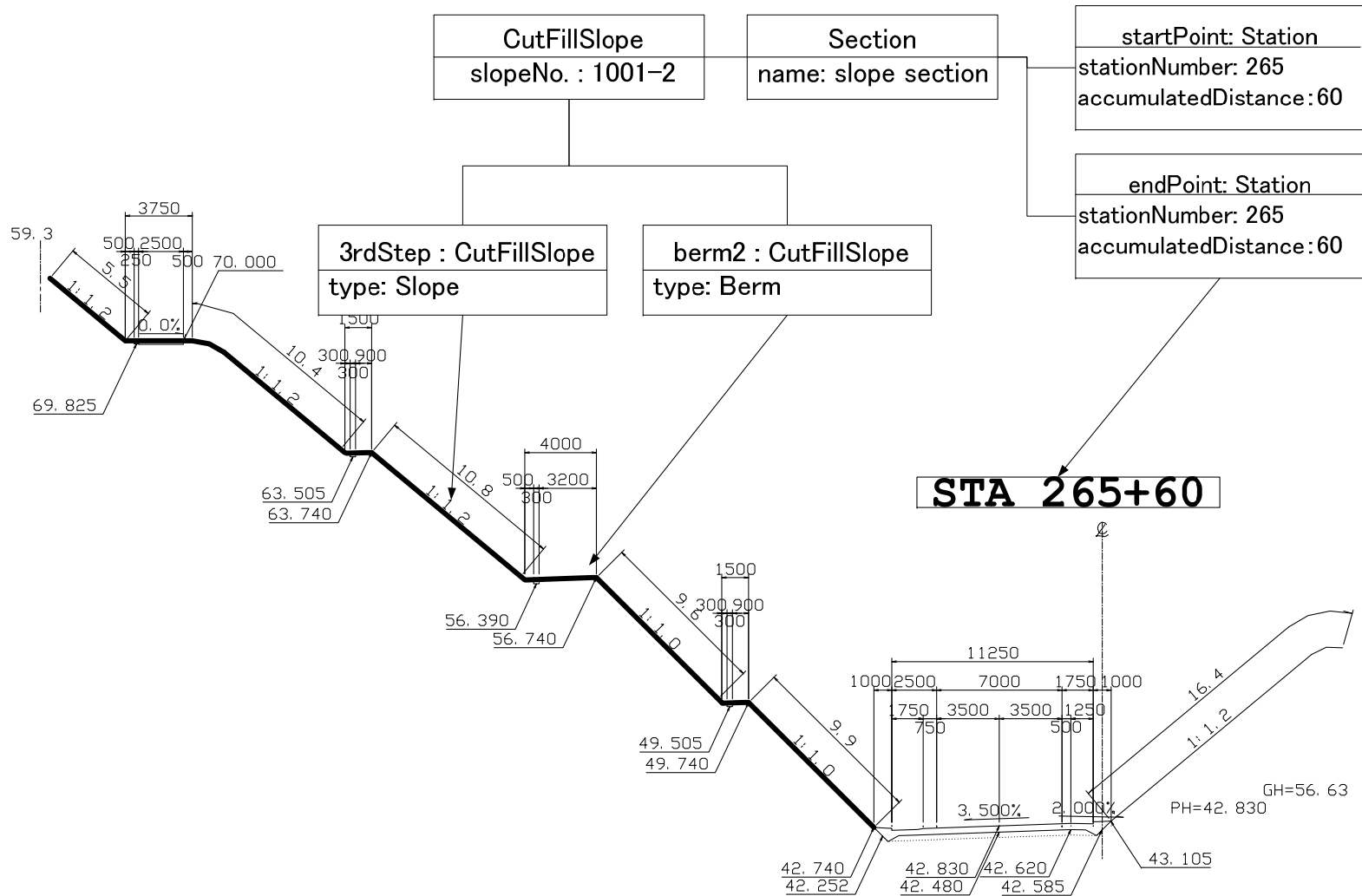
Road Structural Model

Earthwork: Basic Idea

**The shape of an object is represented by
an integration of sections.**



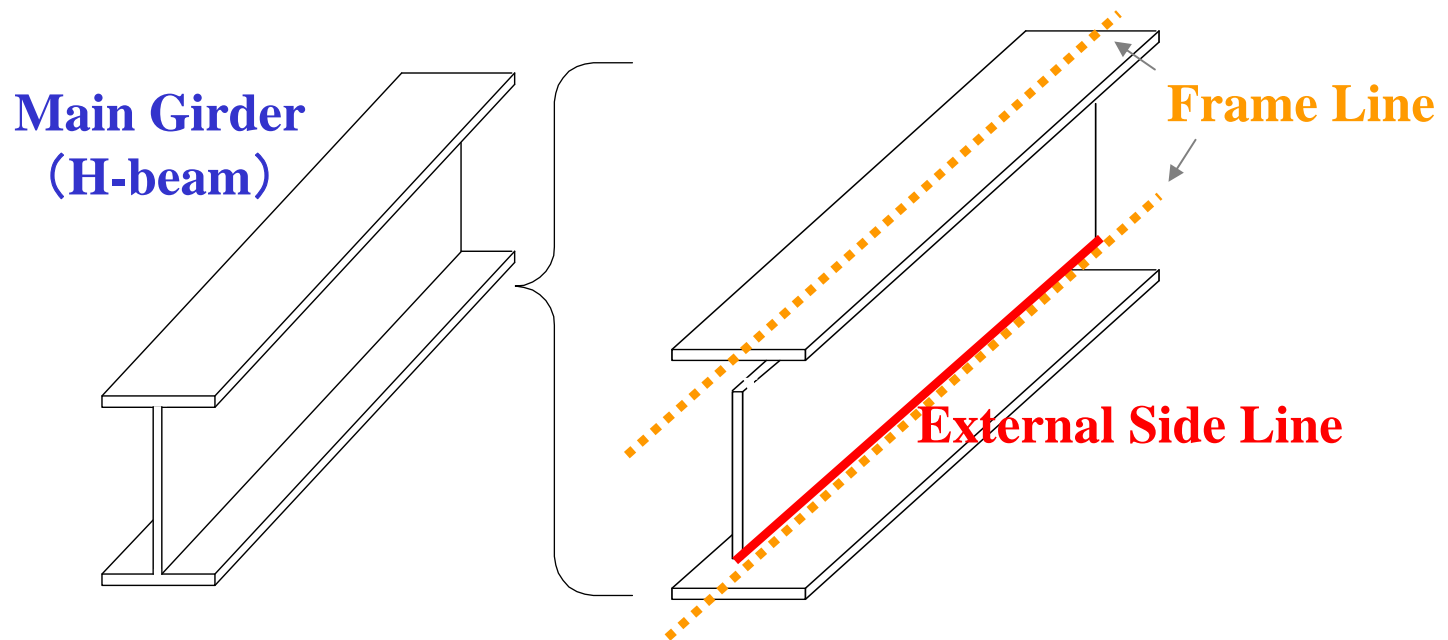
A Part of Instance of Earthwork



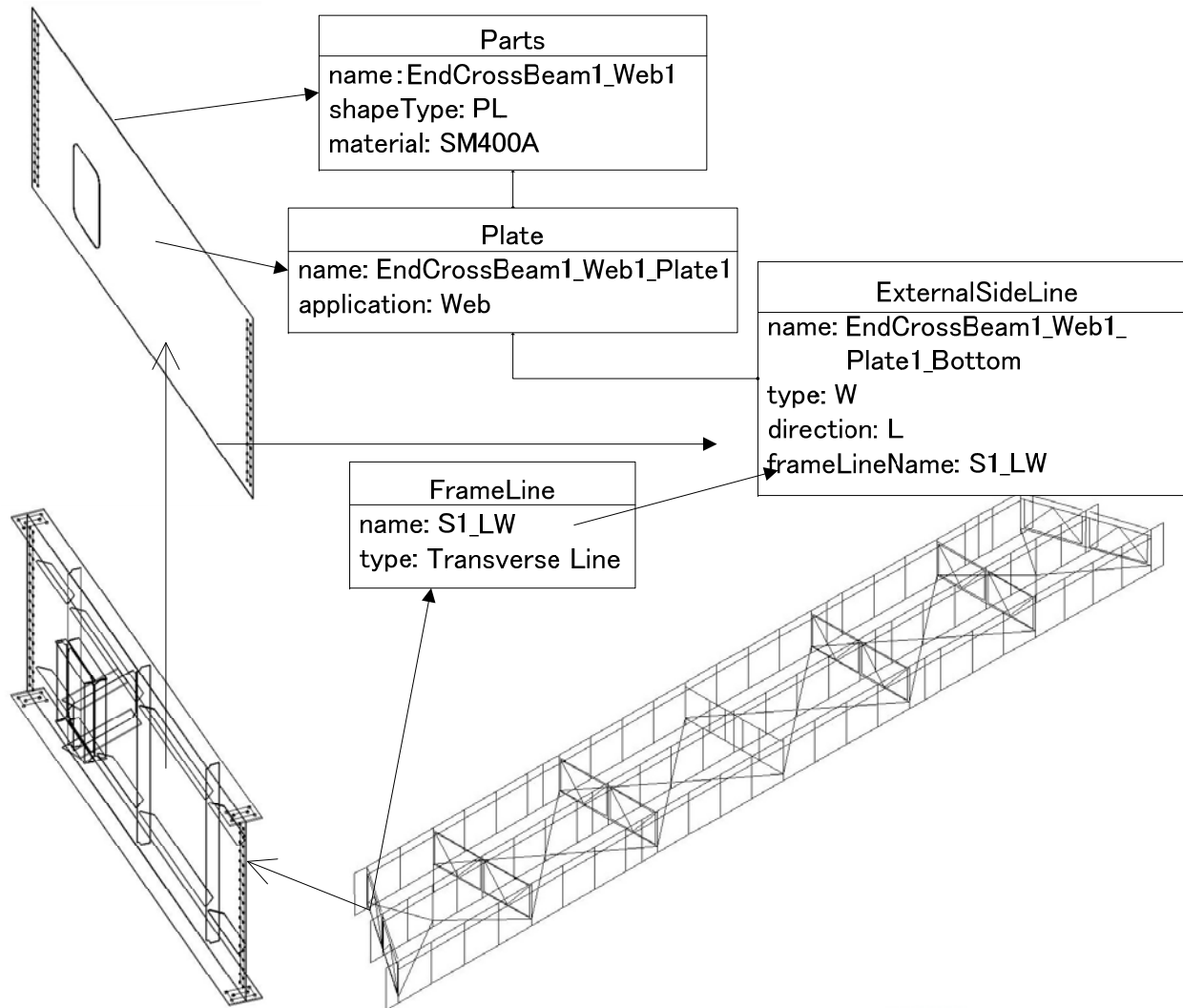
Road Structural Model

Steel Superstructure: Basic Idea

The shape of an object is represented by
the frame lines and the external side lines of the plates.



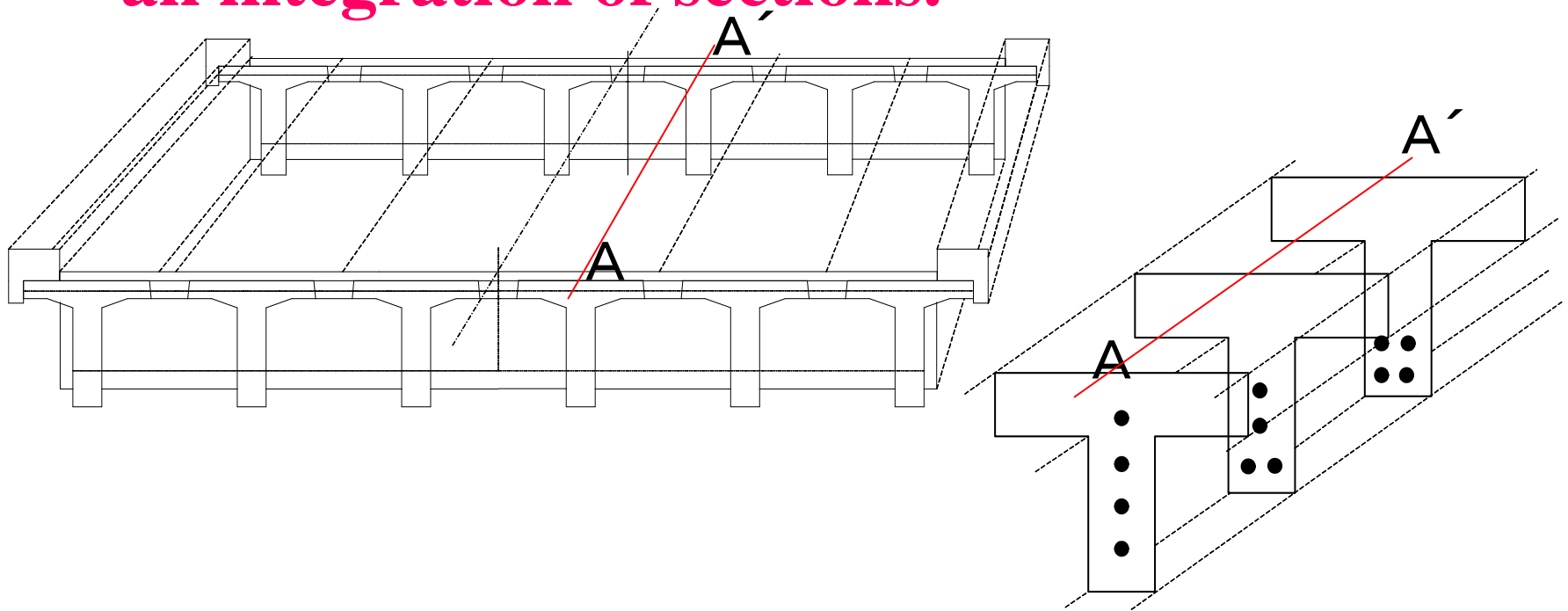
A Part of Instance of Steel Superstructure



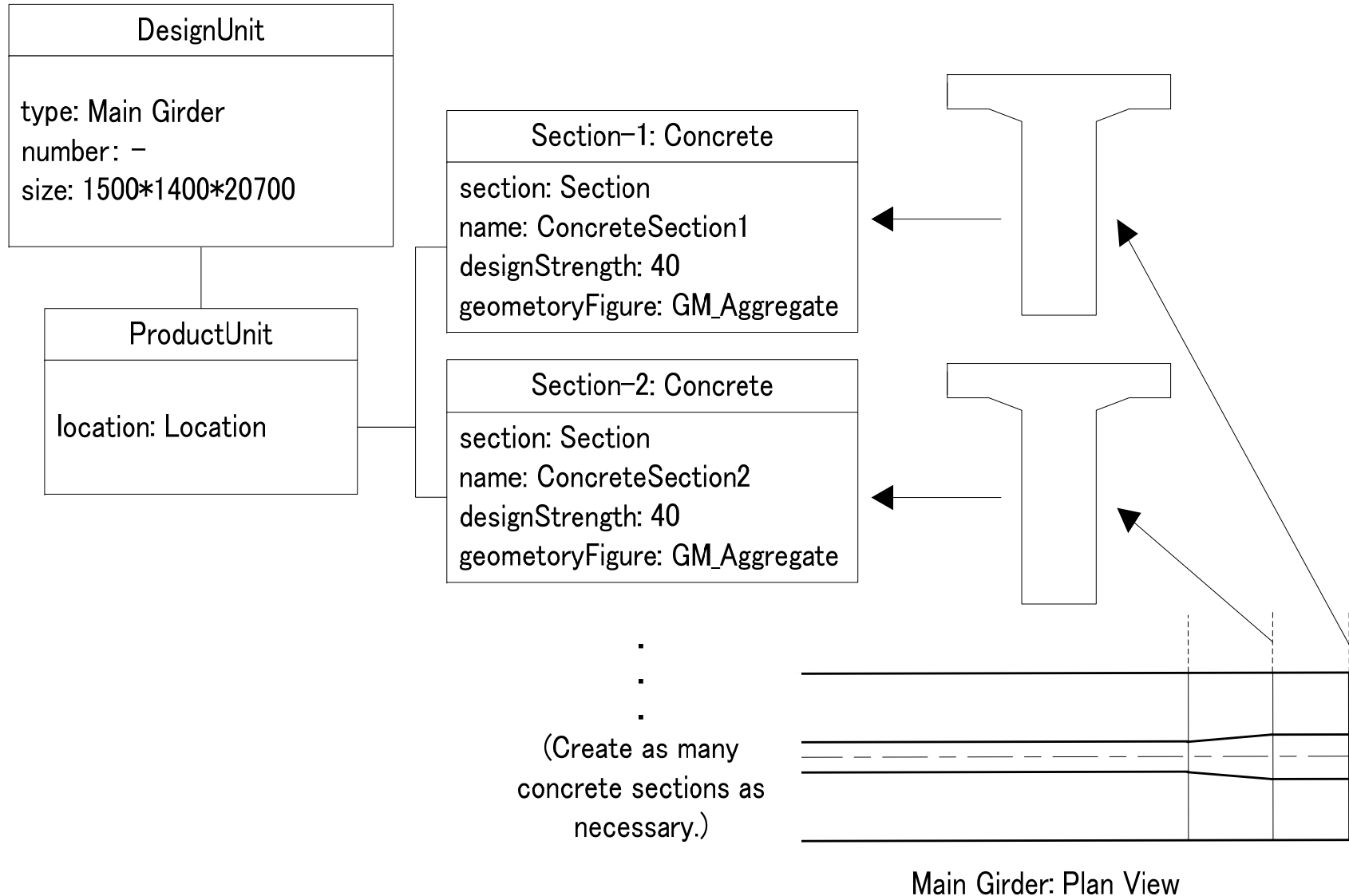
Road Structural Model

PC/RC Superstructure: Basic Idea

The shape of an object is represented by
an integration of sections.



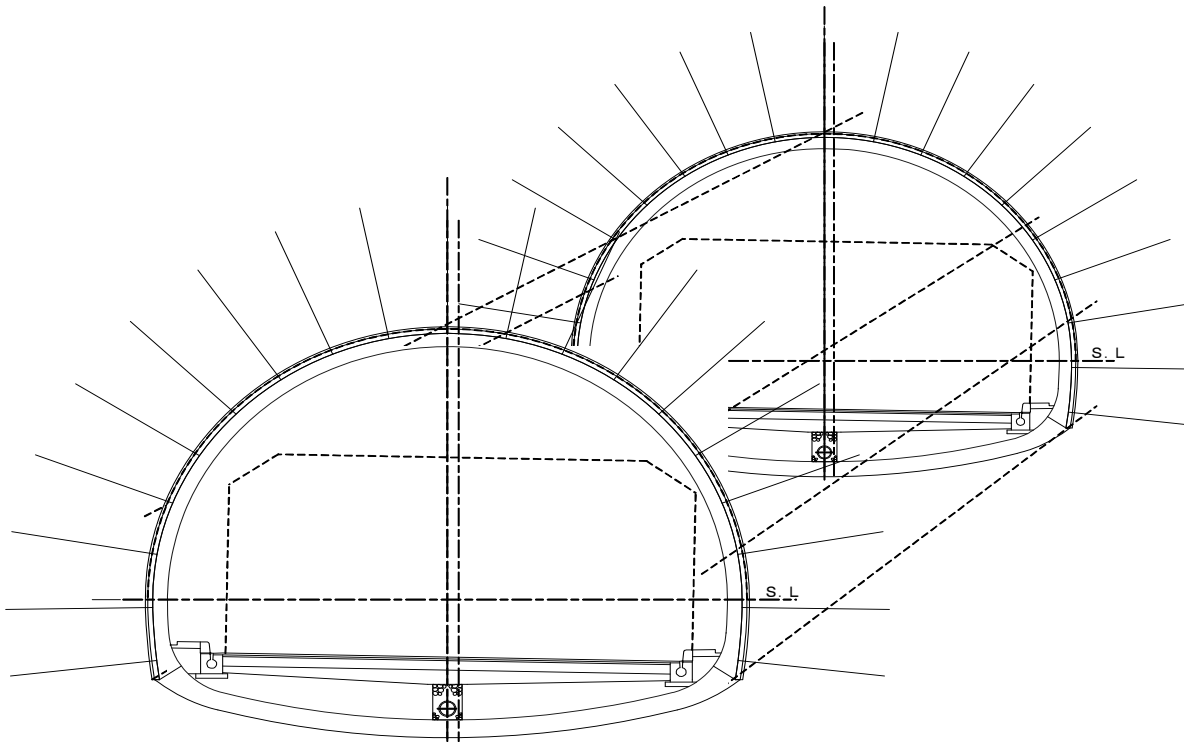
A Part of Instance of PC/RC Superstructure



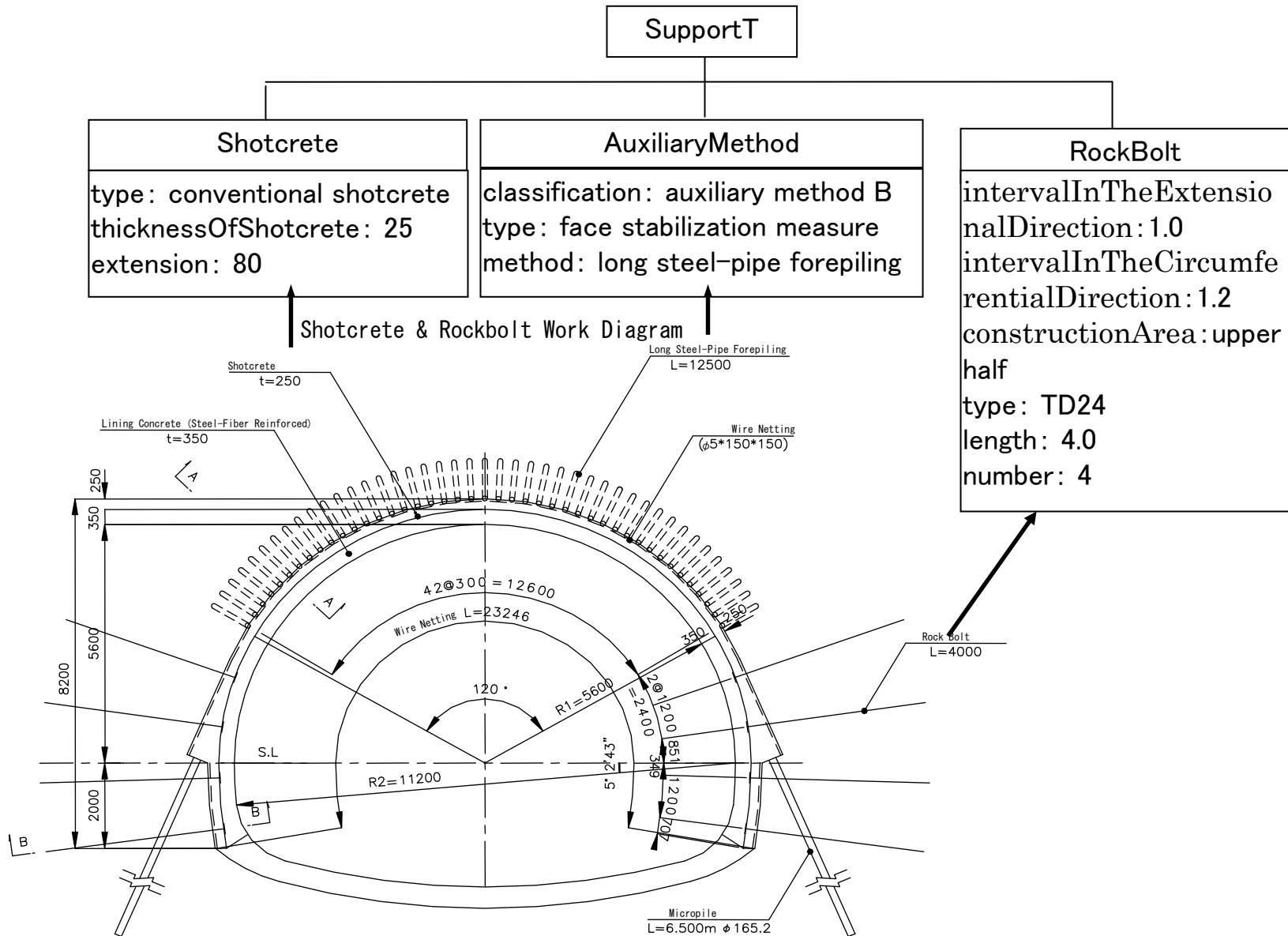
Road Structural Model

Tunnel: Basic Idea

The shape of an object is represented by an integration of sections.



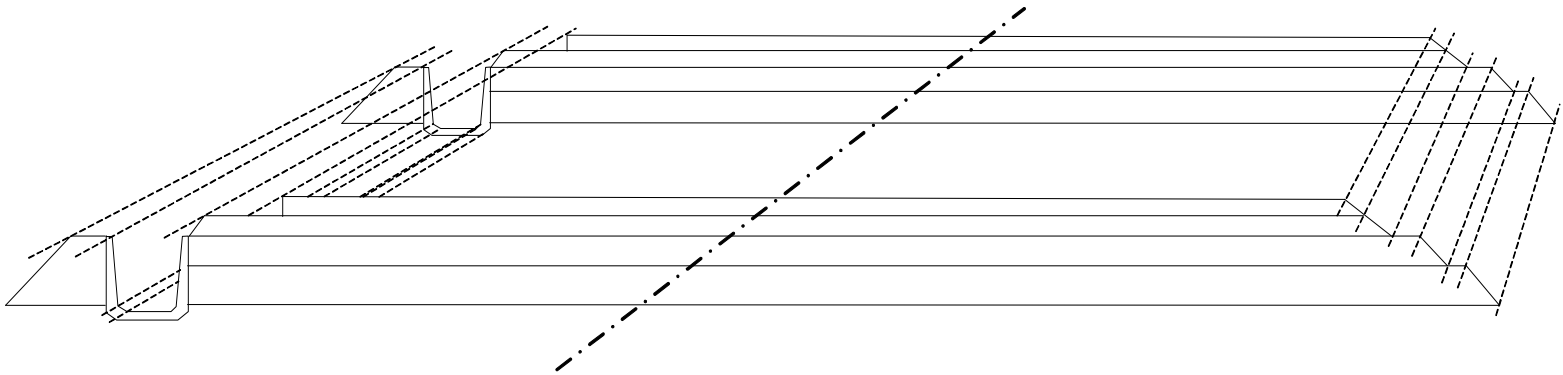
A Part of Instance of Tunnel



Road Structural Model

Pavement: Basic Idea

**The shape of an object is represented by
an integration of sections.**



A Part of Instance of Pavement

BasicInformationOfPavement

sectionID: Tateyama Expressway Futtsu
Pavement Work
section: Section
bound: shared by up and down lanes
type: basic free segment
numberOfLane: 2
branchOffice: XX Construction Bureau
projectOffice: YY Office

Section

name: STA150+40.00 -
STA151+00.00

startPoint: Station

stationNumber:150
accumulatedDistance: 40.00
point: GM_Point

endPoint: Station

stationNumber:151
accumulatedDistance: 00.00
point: GM_Point

PavementStructure

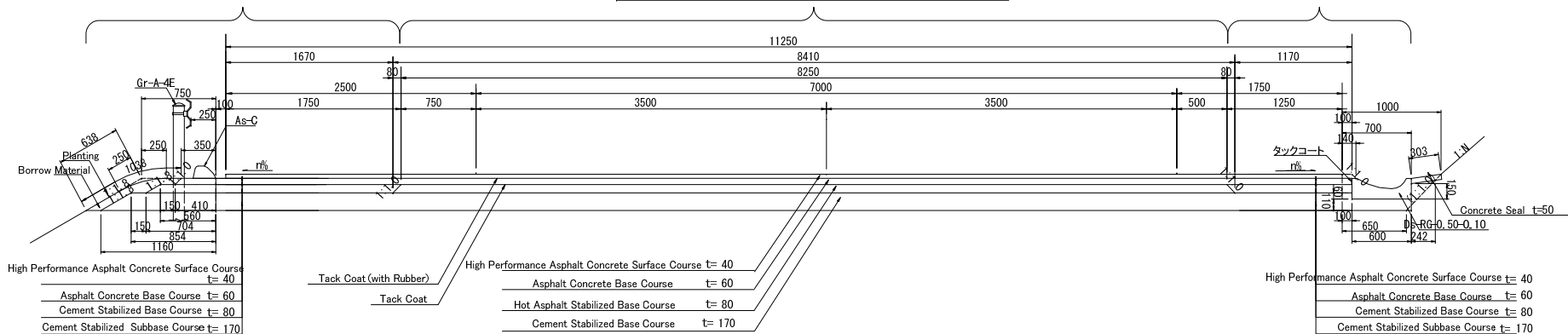
structureClassification: left shoulder
name: S-2

PavementStructure

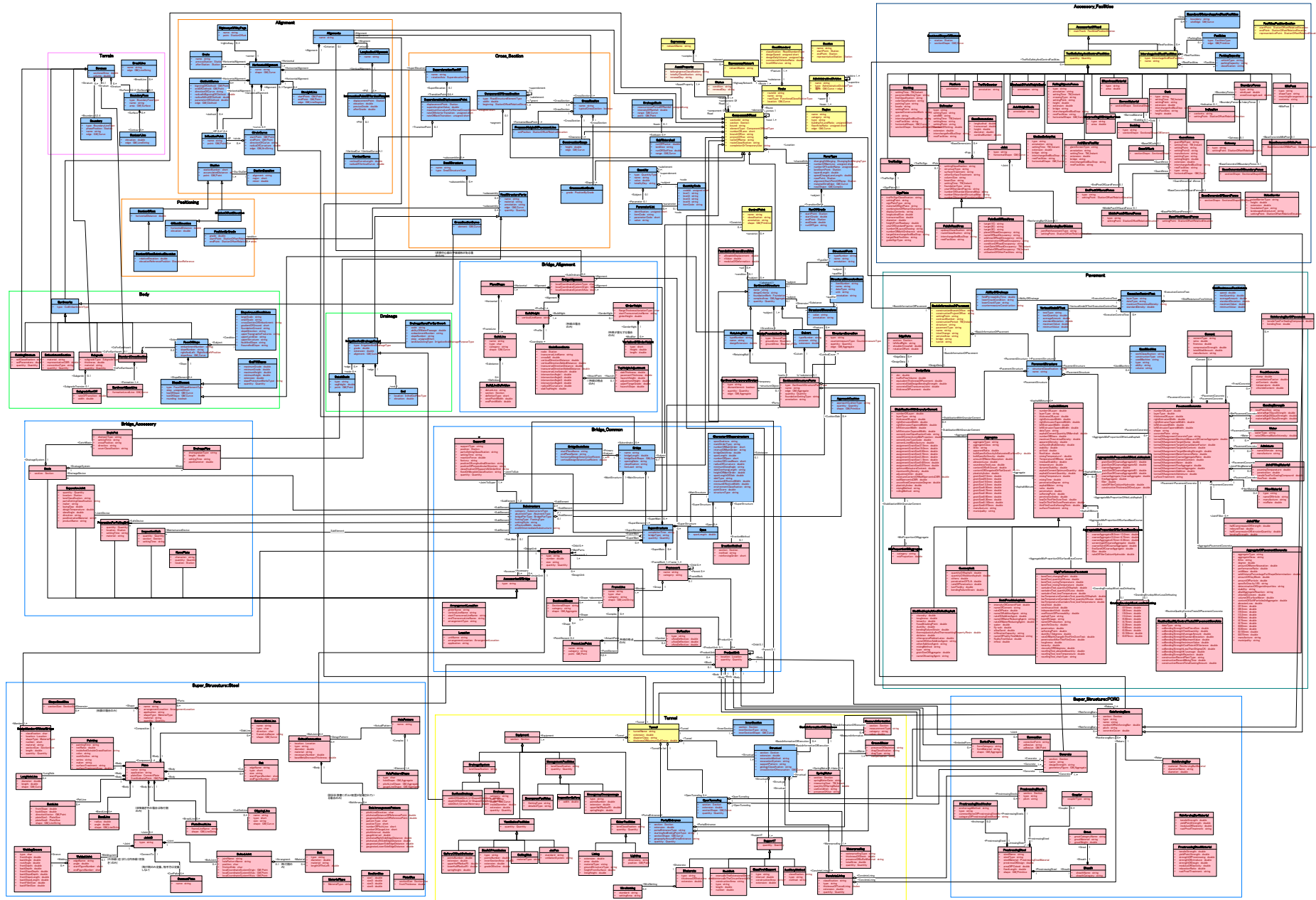
structureClassification: roadway
name: C-2

PavementStructure

structureClassification: right shoulder
name: M-2



Road Structural Model (Overall View)



Conclusion

We think that

- The existing data can be used at higher levels.
- In the future, “Three-dimensional data” can be created from two-dimensional data without human resources.

- Future Tasks for Practical Application
 - **Research on temporal schema.**