BIM

Modélisation des INformations INteropérables
pour les INfrastructures Durables

IFC & Infrastructure

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
Ministère de l'Écologie, du Développement durable et de l'Énergie

advancity
Ville & Mobilité Durables

IREX
Institut pour la recherche appliquée et l'expérimentation en génie civil

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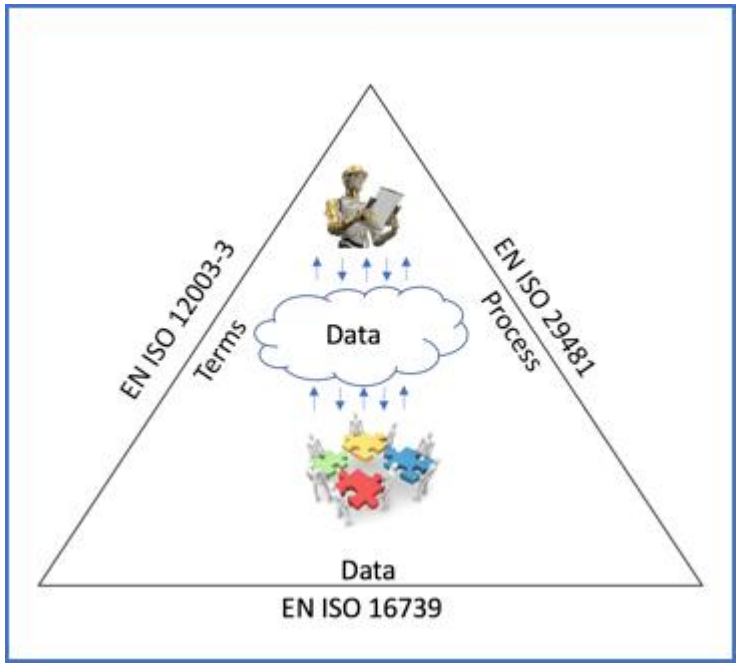
Le format IFC (*Industry Foundation Classes*) est un format de fichier standardisé (norme EN ISO 16739) orienté objet utilisé par l'industrie du bâtiment pour échanger et partager des informations entre logiciels.

La prise en compte des infrastructures est en cours de développement.



Les trois piliers de l'interopérabilité sont :

- *une compréhension commune de la connaissance métier (terminologie et une structure sémantique)* ➔ **bSDD**
- *un ensemble convenu de spécifications des informations échangées pour un processus d'échange donné* ➔ **IDM**
- *une manière normée de stocker et d'échanger des modèles de données* ➔ **IFC**

Source : ISO 6707-1:2014 Building and Civil Engineering Works – Vocabulary – Part 1

Base terms

3.1.1 construction works

everything that is constructed or result from construction operations.

3.1.2 civil engineering work

construction works (3.1.1) comprising a **structure (3.1.4)**, such as a **dam (3.2.22)**, **bridge (3.3.19)**, **road (3.3.1)**, **railway (3.3.3)**, runway, utilities, **pipeline (3.2.30)**, or **sewerage system (5.4.40)**, or the result of operations such as dredging, **earthwork (7.1.6)**, geotechnical processes, but excluding a **building (3.1.3)** and its associated **site (3.1.6)** works

3.1.3 building

construction works (3.1.1) that has the provision of shelter for its occupants or contents as one of its main purposes, usually partially or totally enclosed and designed to stand permanently in one place

3.1.4 structure

construction works (3.1.1) having an organized combination of connected parts designed to provide some measure of rigidity

3.1.5 external works

construction works (3.1.1) or landscape work on **land (10.1)** associated with, and adjacent to, **civil engineering work (3.1.2)** or a **building (3.1.3)**

3.1.6 site

area of land **(10.1)** or water where **construction work (7.1.1)** or other development is undertaken

Source : ISO 6707-1:2014 Building and Civil Engineering Works – Vocabulary – Part 1

Civil engineering works – Transport

3.3.19 bridge

civil engineering works (3.1.2) that affords passage to pedestrians, animals, vehicles, and **services (5.4.1)** above obstacles or between two points at a **height (9.2.20)** above ground (6.2.1)

Function

A bridge is a *structure* built to span physical obstacles without closing the way underneath such as a body of water, valley, or road, for the purpose of providing passage over the obstacle

Key Drivers

The design, construction, operation and maintenance of a bridge are driven by the following key parameters:

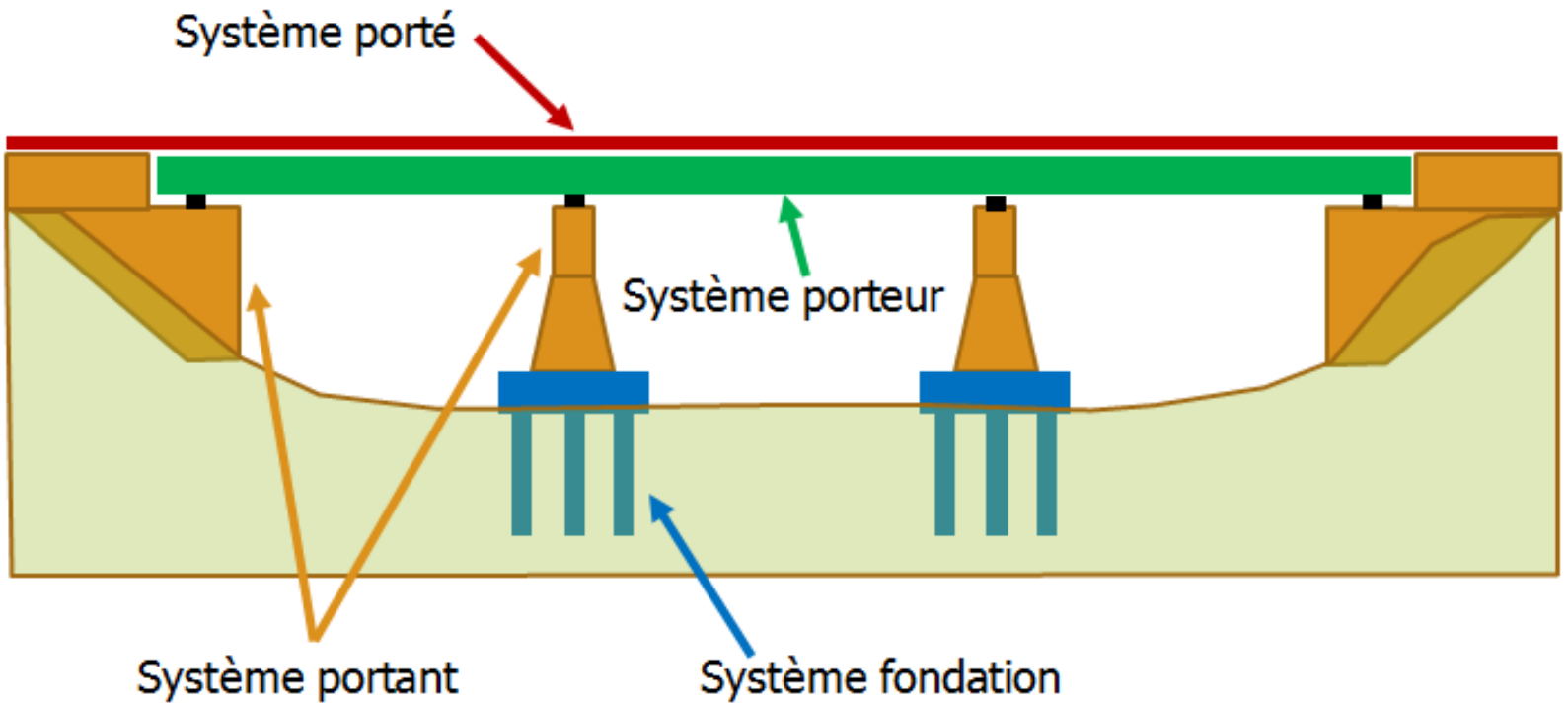
- the characteristics of the **supported traffic** (pedestrian or vehicular road, rail road or canal);
- the characteristics of the traffic, if any, **passing under the bridge**;
- the characteristics of the **body of water**, if any;
- the location, including the **characteristics of the terrain and the supporting soil**;
- the location, including the **surrounding built structures**, if any, that could be impacted by the project;
- the location, including the **urban constraints**, if any, such as available site areas, site access, temporary traffic diversion, etc.

Bridge Key Components

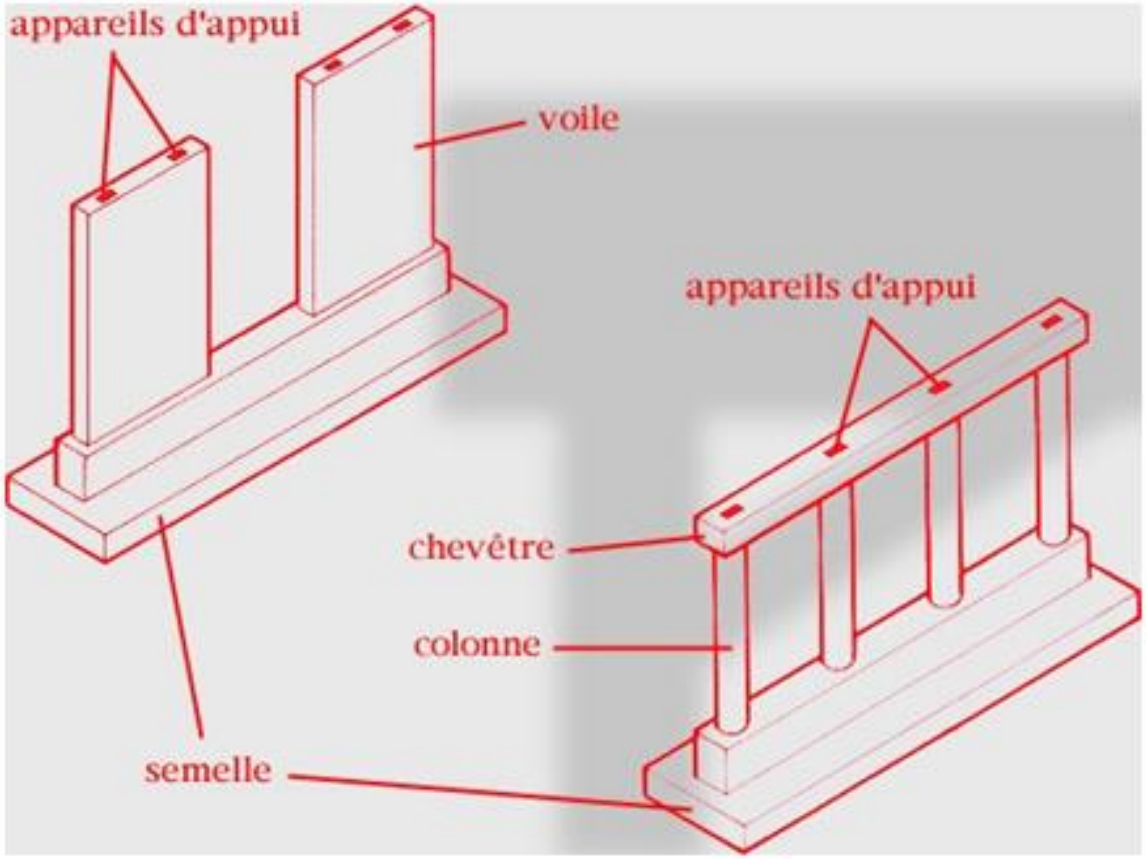
The key components of a bridge are the following ones:

- the **superstructure**, which is the part of the bridge primarily supporting the upper traffic loads and transferring them to the bridge substructure;
- the **substructure**, which is the foundation part of the bridge supporting the superstructure and transferring the loads to the soil. To avoid closing the way underneath, the substructure is composed of a lot of **supports**, splitting the superstructure into adjacent parts called **spans**;
- the **bearings**, which transmit and distribute the superstructure loads to the substructure and allow the superstructure to undergo necessary movements without developing harmful overstress;
- the **abutments** are parts of the substructure, located at each end of the superstructure. They do not only support the superstructure but also retain the adjacent **earth embankment** and support the end of the approach slab which allows a smooth traffic transition between the earth embankment and the bridge structure.

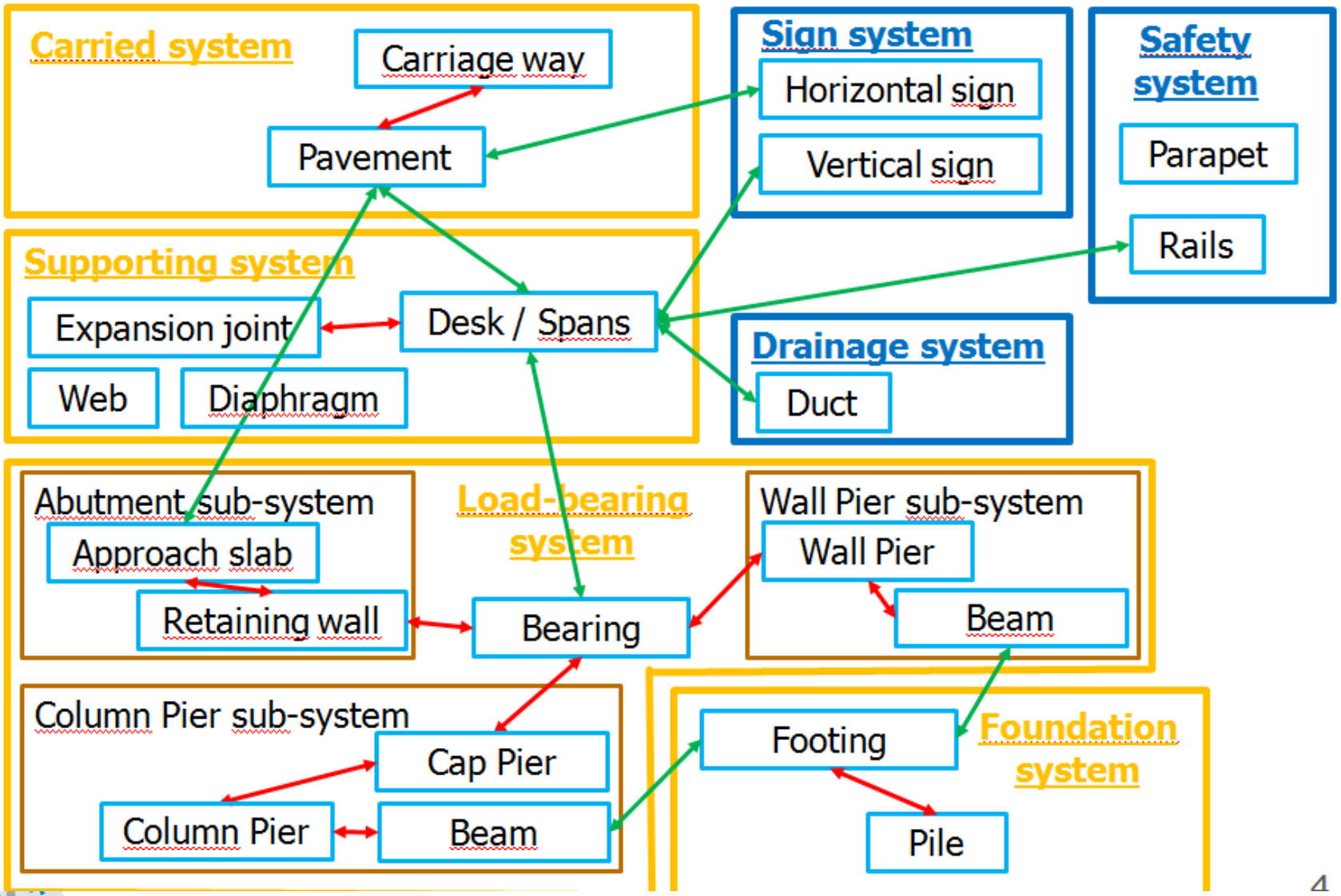
Bridge Key Components



Bridge Key Components



Bridge Key Components



Bridge Erection Methods

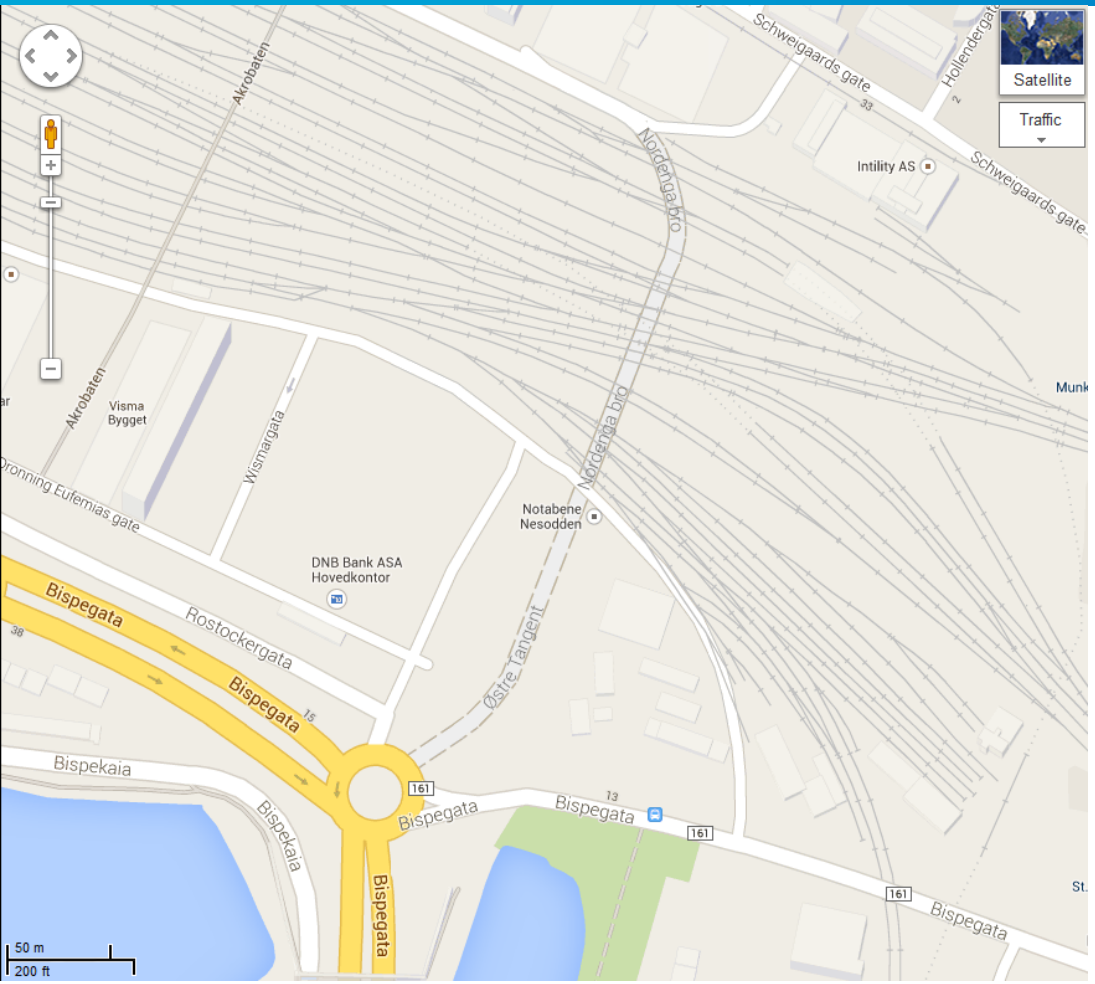
The principal methods of bridge erection are the following:

- on falsework
- by cantilevering
- by hoisting into position
- by rolling or sliding into position (incremental launching method)
- by floating into position
- by suspension erection
- by segmental construction

Bridge Erection Methods

The factors involved in determining which methods of erection are feasible include some of the following:

- condition of the river bed, if any
- amount of interference from navigation, if any
- interference from railroad and vehicular traffic, if any
- water depth, if any
- stream current, if any
- presence of driftwood, ice, etc. in the stream, if any
- bridge height
- utility conflicts, if any
- physical constraints imposed by adjacent structures or facilities
- locally available equipment



Ville d'OSLO

Nouvelle voie de circulation :

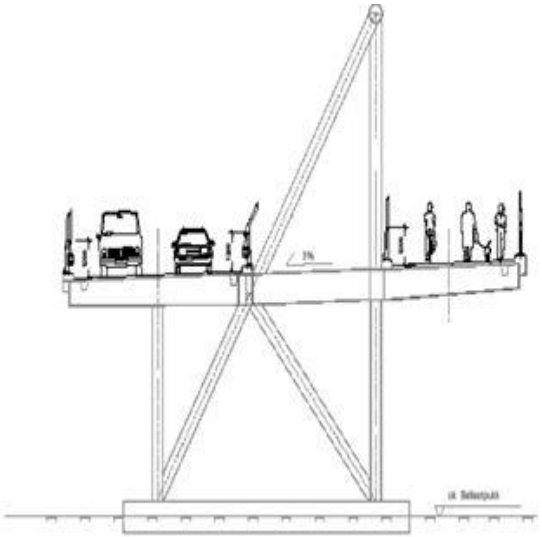
- multimode (auto, vélo, piéton) ;
- franchissement gare centrale ;
- zone en reconstruction ;
- accès temporaire au port.

Contraintes du client

- Minimiser l'impact sur le trafic ferroviaire et les voies de la gare centrale ;
- Minimiser l'impact du chantier sur la zone environnante, en pleine reconstruction (emprise, délai) ;

Solution retenue

- Ouvrage principal : viaduc lancé, en métal, préfabriqué, amené par voie maritime ;
- Ouvrages d'accès en béton armé ou précontraint :
  - accessibilité ;
  - stabilisation de l'ouvrage complet.



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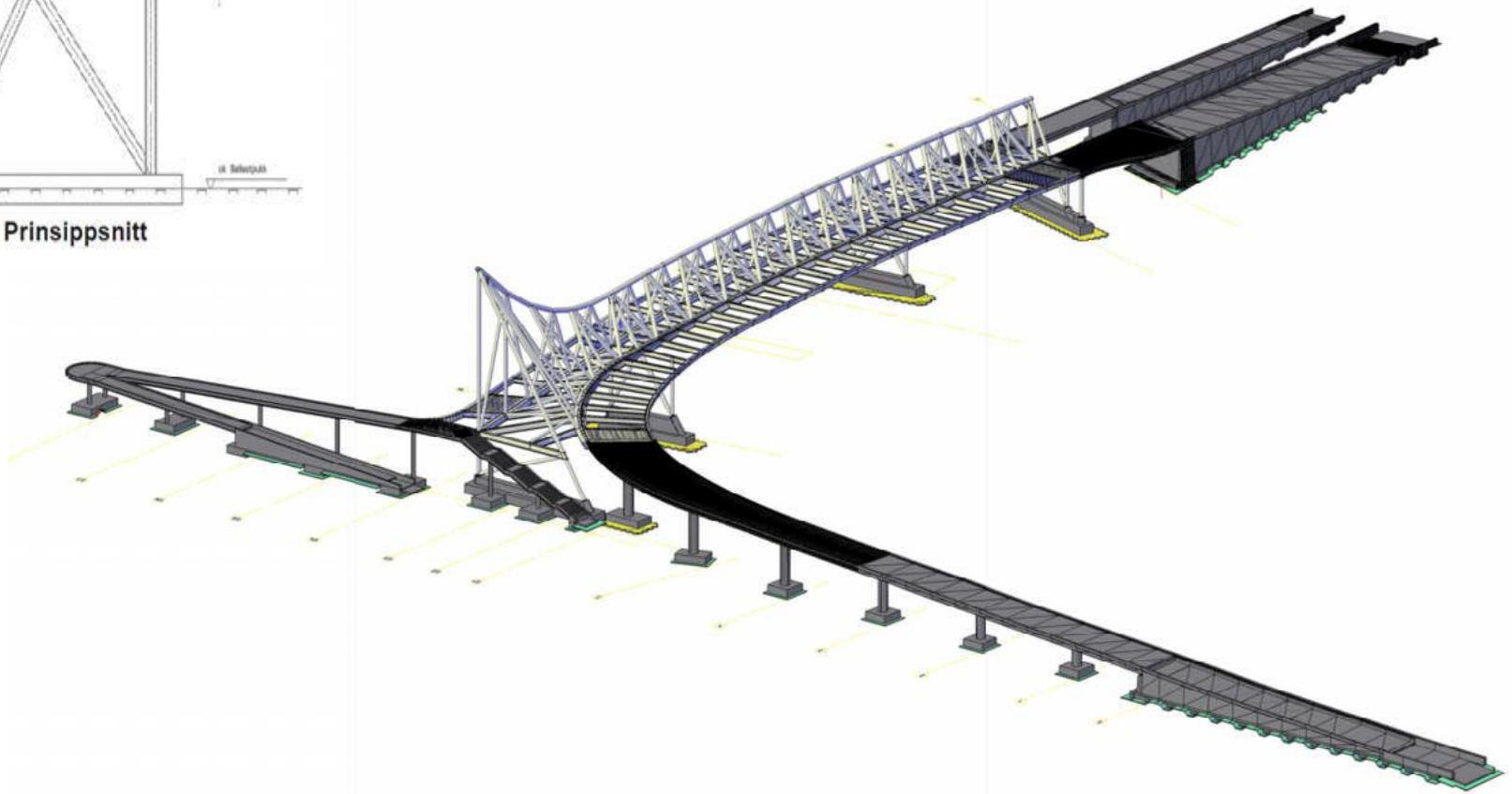

UC3 – NORDENGA BRIDGE

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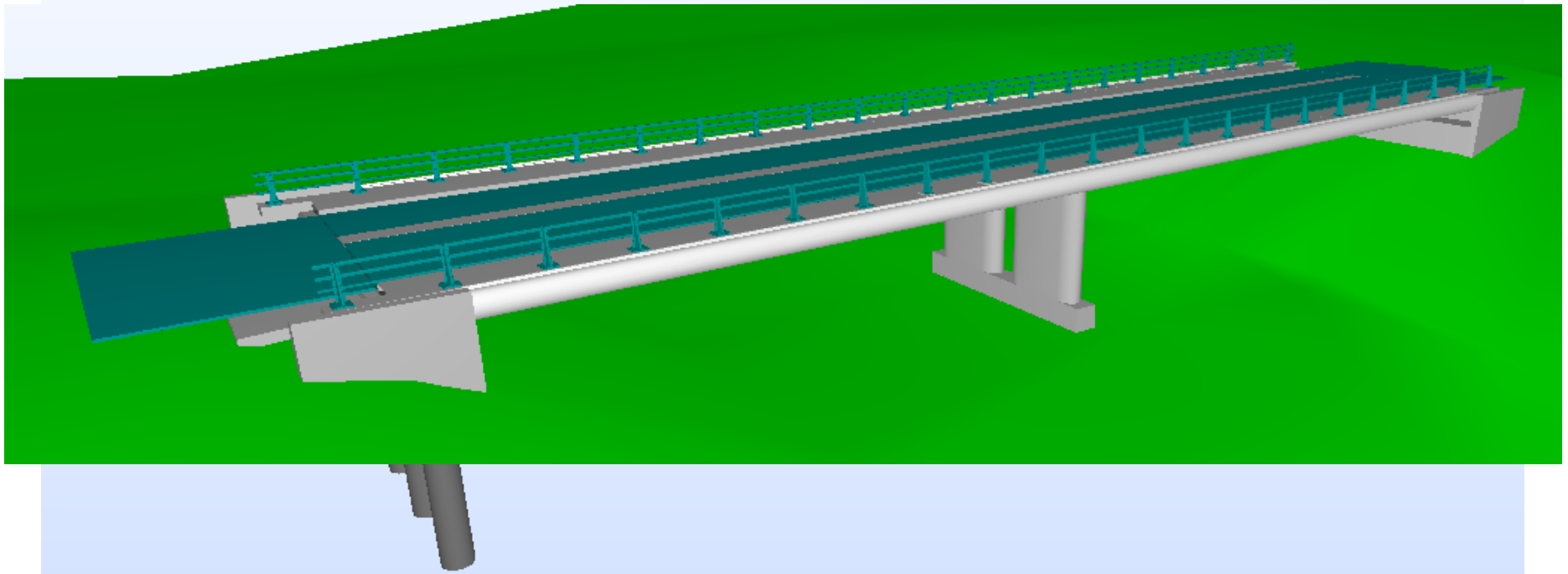
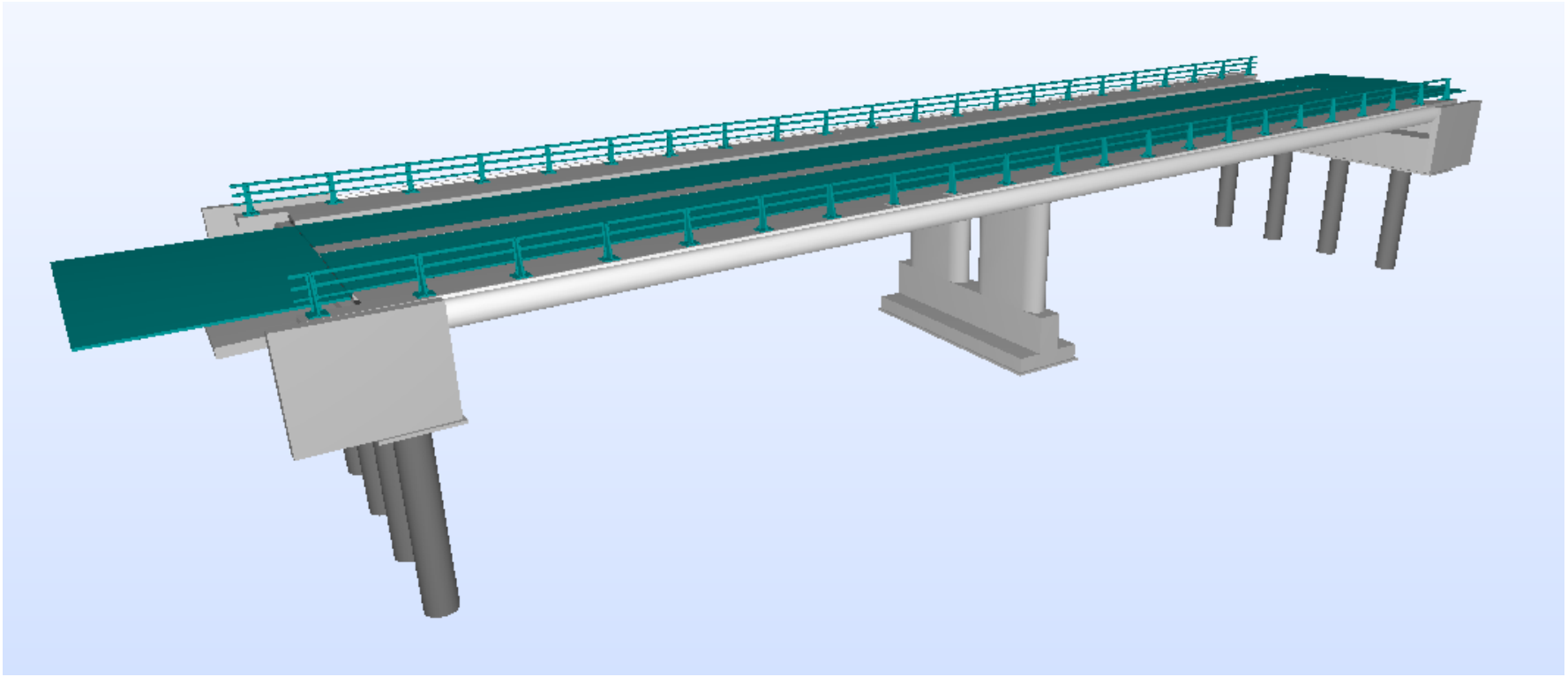
Trailer loadout of bridge section onto Boabarge 32

BOABARGE 32 and BOA SIW transported Nordenga bridge in four sections from Rotterdam, the Netherlands, to Oslo, Norway for charterer Sarens Transrig.





	A	B	C	D
1	**Information Groups**	**Information Items**	**Attribute Sets**	**Attributes**
441	Bridge substructure	Wall pier	Location	Station at wall pier location
442				Skew angle at wall pier location
443				Elevation at the upper left corner
444				Elevation at the upper right corner
445			Dimensions	Wall pier thickness
446				Wall pier depth
447				Wall pier width
448				Fillet radius
449			Material	Wall pier material designation
450		Drilled shaft	Properties	Drilled shaft name
451				Drilled shaft description
452				Drilled shaft type
453				GUID
454			Location	Station at drilled shaft location
455				Skew angle at drilled shaft location
456				Elevation at the top of drilled shaft
457				Elevation at the bottom of drilled shaft
458			Dimensions	Drilled shaft section
459				Drilled shaft diameter
460				Drilled shaft width

Pier column

Cylindrical part or central part of a pier

Fût de pile

Partie cylindrique ou partie centrale d'une pile

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Add comments...

has members

- Properties — Bridge
- Location — Bridge
- Support condition — Bridge
- material — Bridge
- Dimensions — Bridge

is collection for

- Bridge substructure — Bridge

1. **Planning Engineer**
2. **Surveyor**
3. **Utility Manager**
4. **Estimator (Owner)**
5. **Structural Engineer**
6. **Transportation Engineer**
7. **Contractor**
   - Cost Estimate
   - Construction Planning
   - Construction Detailing
   - Construction
8. **Fabricator**
9. **Load Rating Engineer**
10. **Inspector**
11. **Routing and Permitting Engineer**
12. **Asset Manager**

IFC - Bridge

- Modèle d'échange de données entre acteurs ;
- Approche « objets métiers » ;
- Format neutre d'échange ;
- *Machine readable* ;
- Organisation spatiale ;
- Organisation physique ;
- Organisation par discipline ;
- Sémantique ;
- Géométrie ;
- Propriétés (autre que la géométrie) ;
- Relations entre objets ;
- Traçabilité et gestion des changements ;
- Une extension de IFC4 (*ISO 16739:2013*).

Initiation Phase

0- Bridge Planning Model	
Phase	Initiation
Creator	Planning Engineer
Users	Transportation Engineer
Purpose	This model develops the initial bridge program to resolve transportation problems or needs.
Major Elements	Description of the problem, preliminary project objectives, a description how the project addresses the program goals, project elements to be investigated and a preliminary schedule.

1- Survey Model	
Phase	Initiation
Creator	Surveyor
Users	Transportation Engineer
Purpose	This model captures terrain elevations and soil conditions, which may be produced by a surveyor and delivered to an engineer. *Surveyor generates the information model of terrain elevations, soil conditions and soil layers at drill points, with classification and associated structural properties. This activity generates the utility model that can be used by bridge engineers. It is noted that the Surveyor may in fact need to be divided into other specialists such as Geotechnical and Hydraulic Engineers but is used to cover these for this iteration of the map. These specializations could be added in the future if deemed necessary.*
Major Elements	Geographic location and surveying boundaries. Soil layers and drill points, with classification and associated structural properties

2- Utility Model	
Phase	Initiation
Creator	Utility Manager
Users	Transportation Engineer
Purpose	This model identifies locations of utilities as recorded by the controlling jurisdiction. The accuracy of such information is intended to assist a utility locator service in marking utilities on-site; it is not to be relied upon by itself. *Utility manager generates a utility information model including geographic location, utility survey boundaries, distribution systems, classifications, authorities and pipes or cables assigned to each system with locations, axis paths, and profiles locations. This activity generates the utility model that can be used by the bridge engineer.*
Major Elements	Geographic location and utility survey boundaries. Distribution systems, classifications, and authorities. Pipes or cables assigned to each system with locations, axis paths, and profiles.

Preliminary Design Phase

3- Preliminary Roadway Geometry Model	
Phase	Preliminary Design
Creator	Transportation Engineer
Users	Structural Engineer
Purpose	This model provides minimum safe geometrics for the bridge project.
Major Elements	The content of this model includes but is not limited to 1) bridge roadway, 2) facility widths, 3) vertical under clearances, 4) vertical profile of all roads, and 5) horizontal alignment data.
Level of Detail	Preliminary
Special attributes	Vertical clearance

IFC BRIDGE : MINND