

PREFAB SOLUTIONS



By Emile Völkers

STARTINGPOINT END OF WW2



Rotterdam 1940 - 1945

FIRST STEPS USING PREFAB BEAMS

After the 2nd world war a development and building boom started

Creating new initiatives and innovation

First steps using prefab beams

(using French principles which where developed during the WW1and WW2)



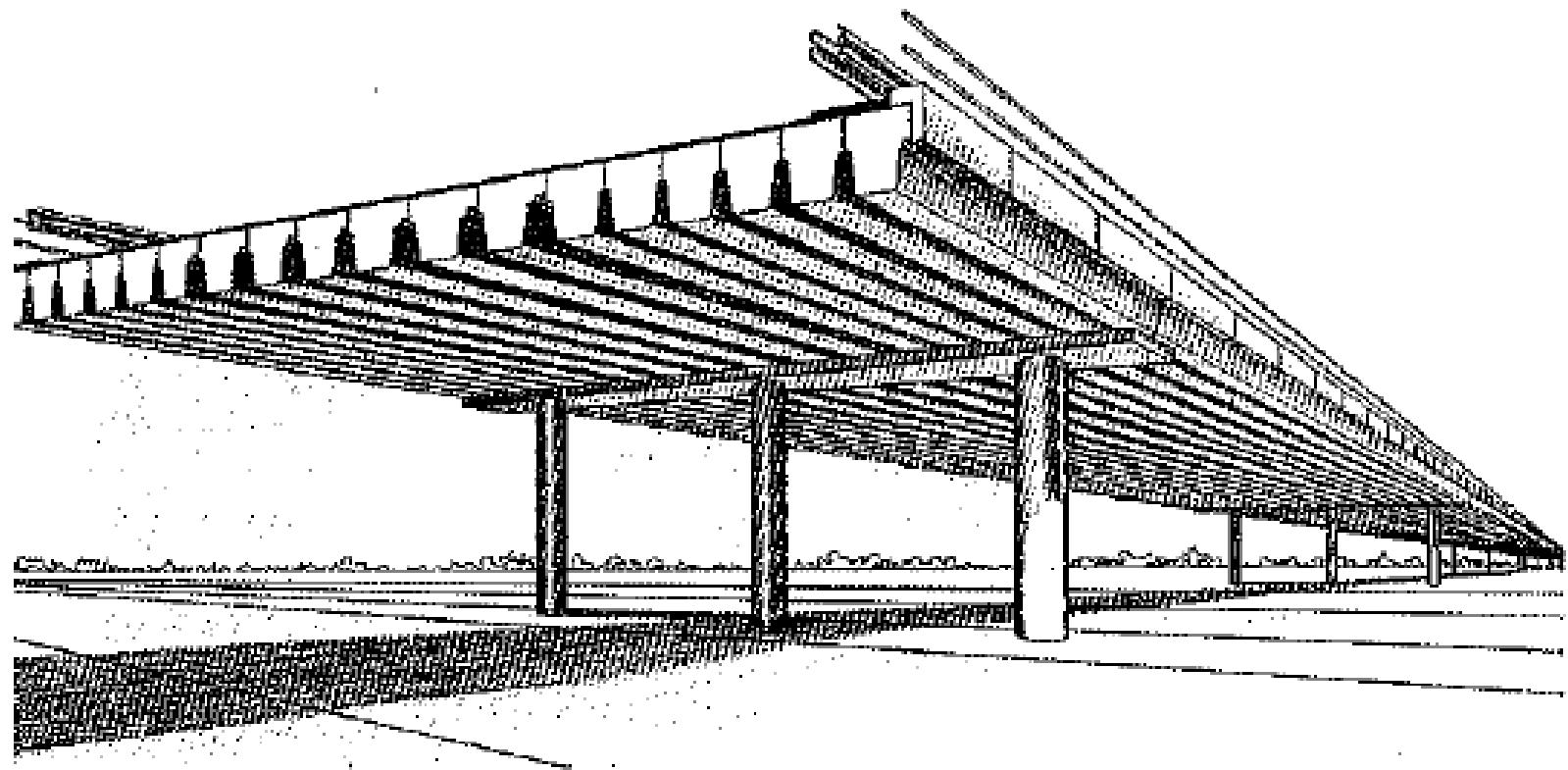
FIRST STEPS USING PREFAB BEAMS



Viaduct in Rijksweg 6 te Badhoevedorp.
Ontwerp: Rijkswaterstaat Directie Wegen.

viaduct Rijksweg 6 te Badhoevedorp ca. 1951

FIRST STEPS USING PREFAB BEAMS

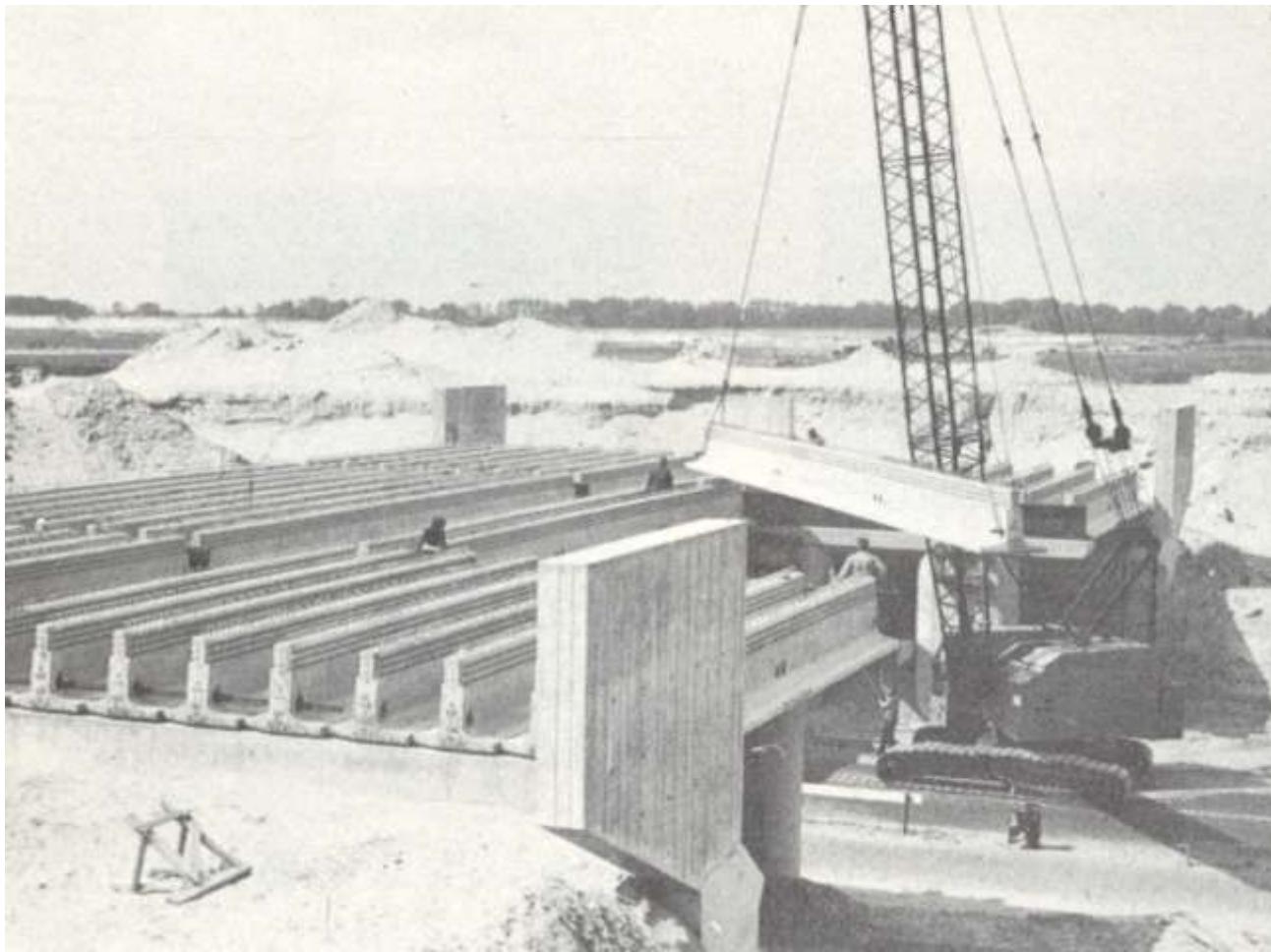


Mid. 60's



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FIRST STEPS USING PREFAB BEAMS



Viaduct with post tensioned T-beams ca. 1970

HOW DID PREFAB BECOME A NECESSITY?

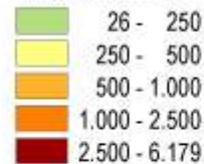
CASE: the Netherlands

- **Population:** 16.947.904
- **Area:** 41.543 km²
(including 18% water)
- **Density:** 500/km²
(ranking no. 27 of the world's most populated countries)

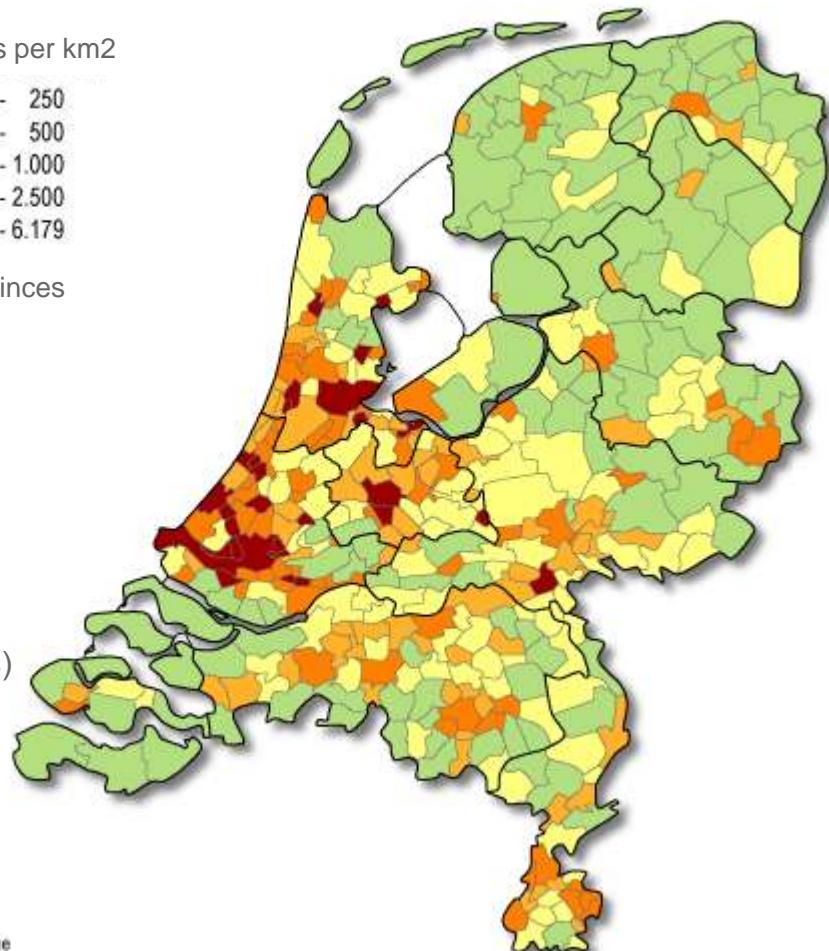
Population density 2013

Per municipality

Inhabitants per km²



— provinces



Bron: CBS Statline

HOW DID PREFAB BECOME A NECESSITY?

Randstad:

- Randstad (one of the biggest agglomerates of Europa (no. 6) consisting of the 3 provinces: North and South Holland and Utrecht): 7,1 million people
- Area: 8.287 km² (including 10% water) → 1.000/km²

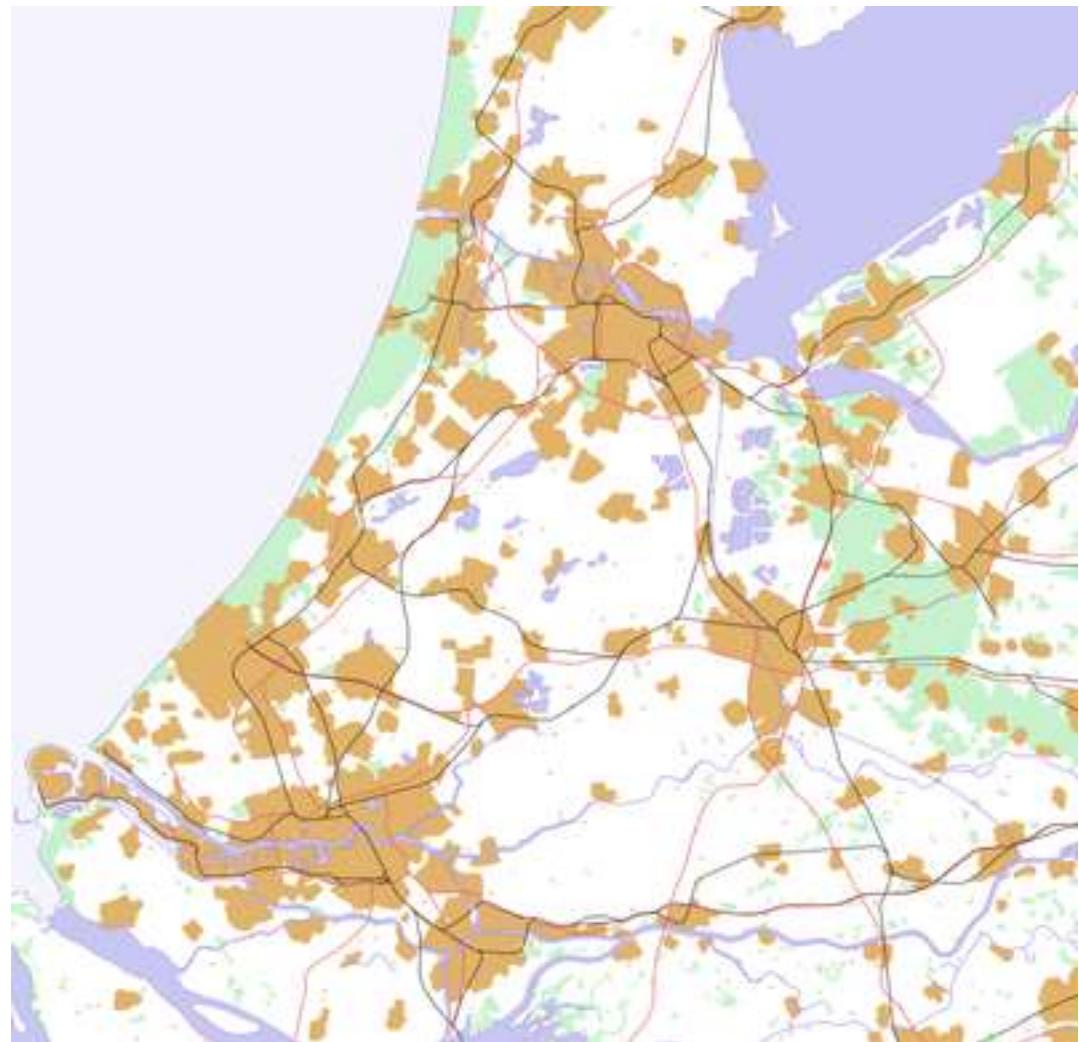
In comparison:

Danmark:

- Population: 5.581.503
- Area: 43.094 km² (1,6% water)
- Density: 129,5/km² (no. 87)

Sjælland:

- Sjælland: 2,3 million people
- Area: 7.031 km² → 327/m²



HOW DID PREFAB BECOME A NECESSITY?

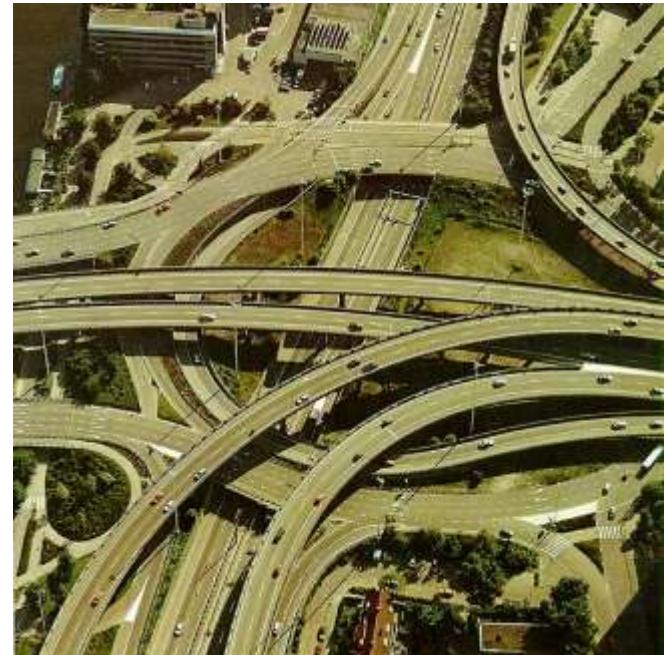
Geography

- Much water and many rivers
- Many highways
- Many train tracks



HOW DID PREFAB BECOME A NECESSITY?

A demand for complex and substantial infrastructure:



More than 40.000 bridges and viaducts in the Netherlands

HOW DID PREFAB BECOME A NECESSITY?

Which also needs constant evolution in the crowded surroundings still in use.



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HOW DID PREFAB BECOME A NECESSITY?

Traffic jams:

“Normal” 400 km of traffic jam twice every day, almost 120 locations with daily traffic jams.

On the 15 January 2013: 1000 kilometer



HOW DID PREFAB BECOME A NECESSITY?

The Netherlands is very crowded country

This creates quite rigid boundaries for construction works and this is therefore a decisive factor in using other solutions to build.

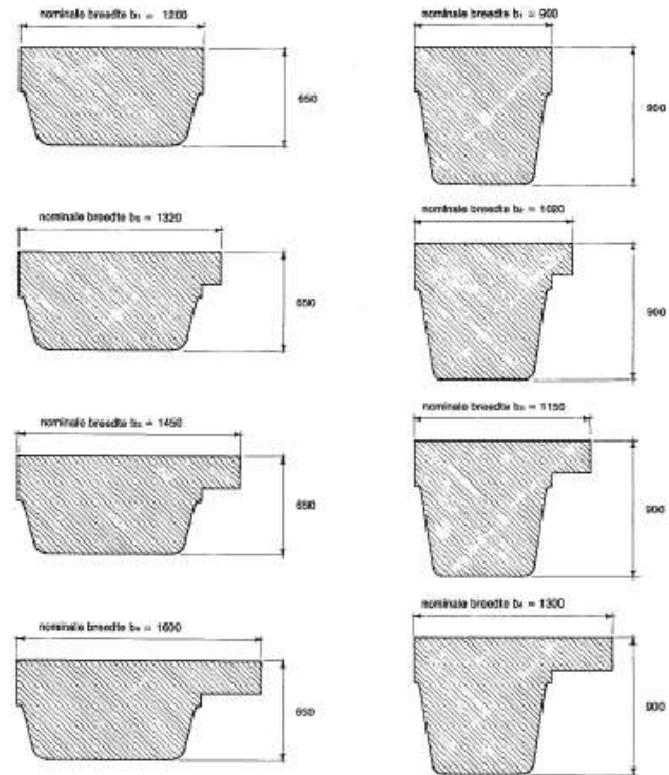
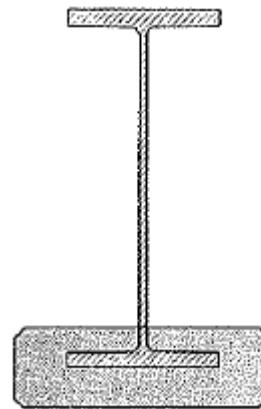
Prefab

DEVELOPMENT OF PREFAB BEAMS

Development cross sections

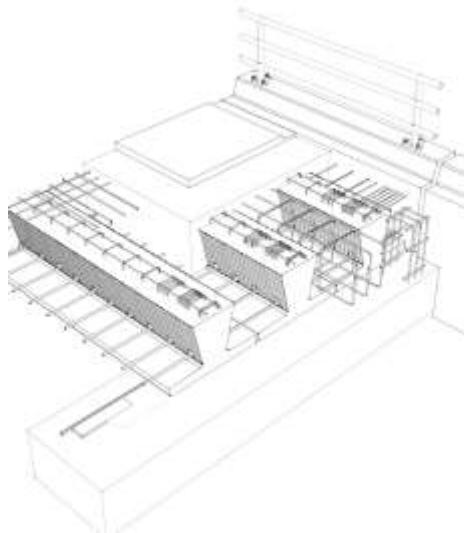


1970 span up till 37,5m with a height of 1260mm

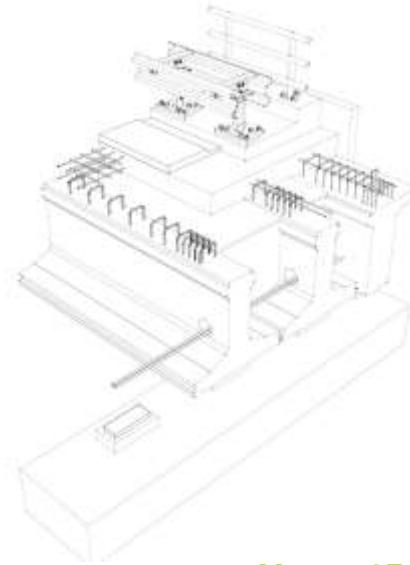


DEVELOPMENT OF PREFAB BEAMS

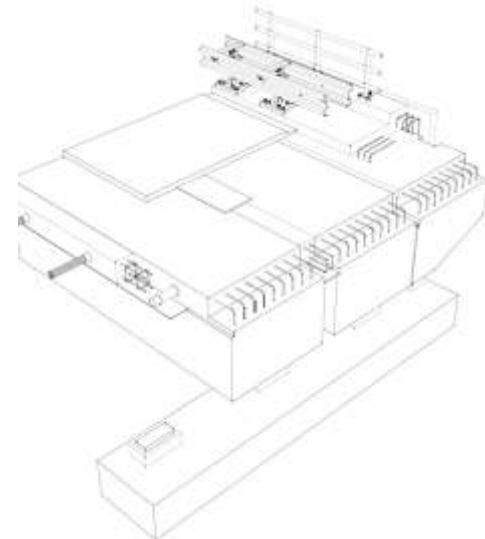
Typical cross sections



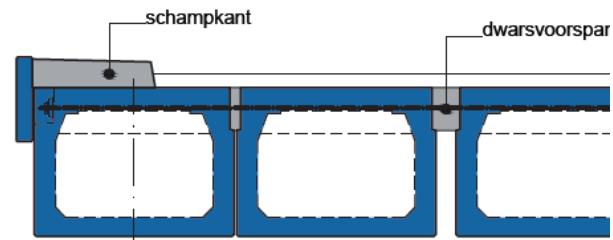
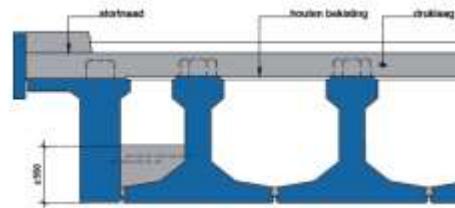
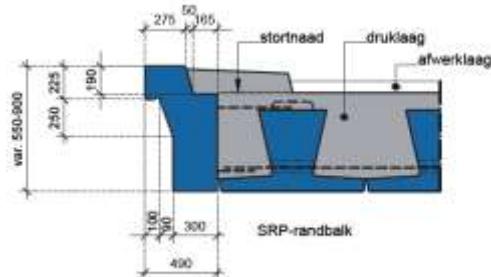
Up to 20 m.



Up to 45 m.

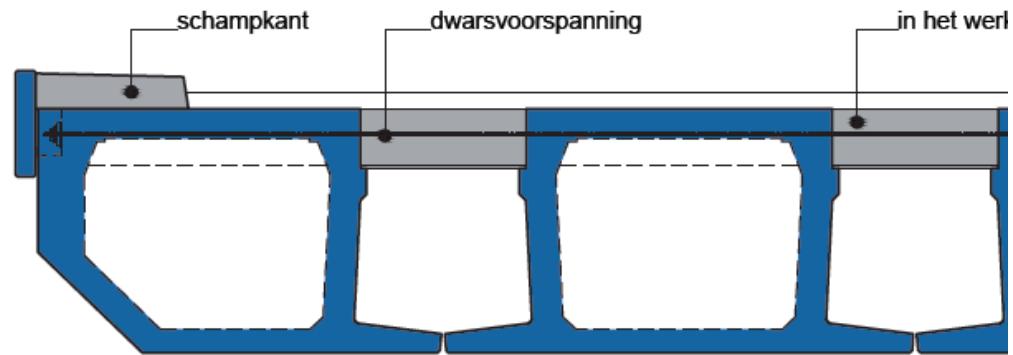
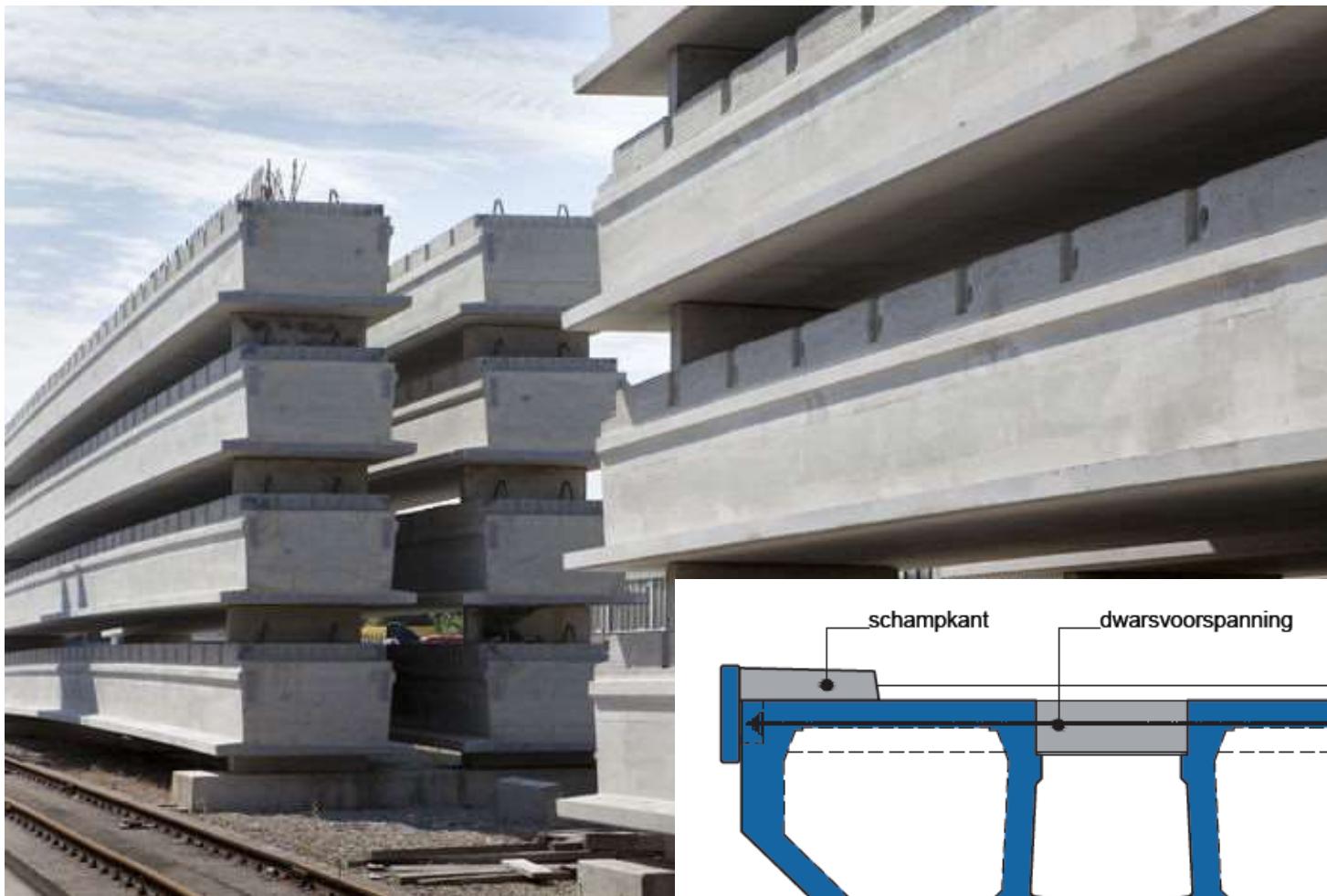


Up to 70 m.

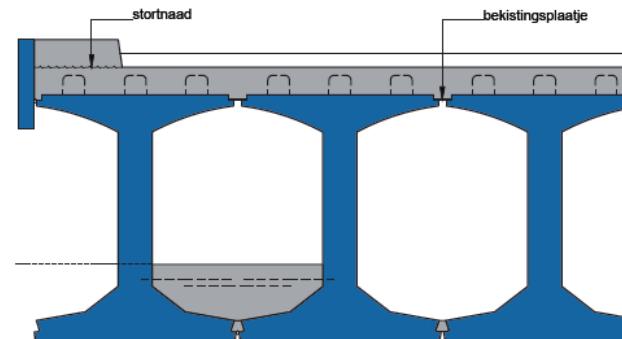


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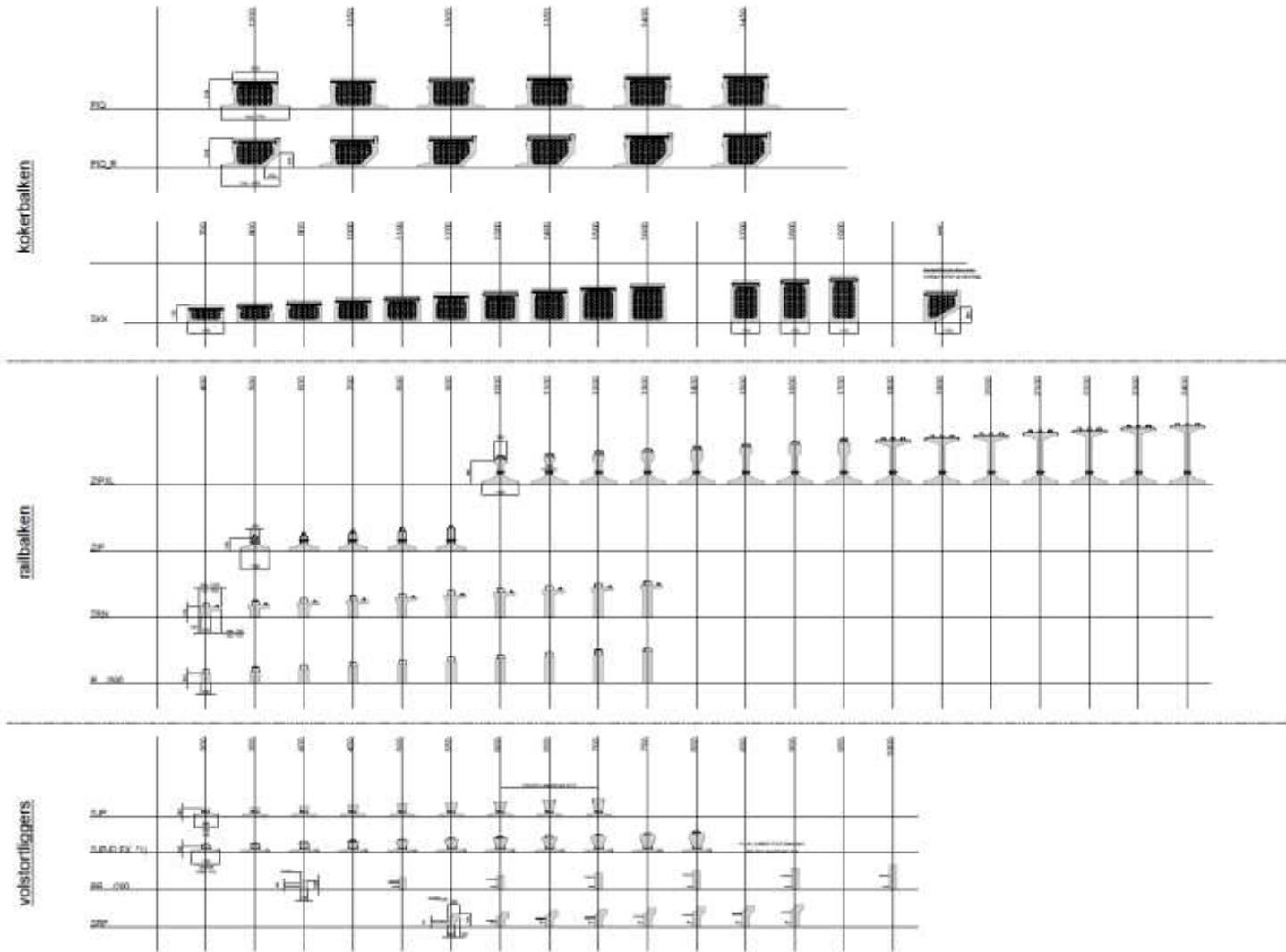


DEVELOPMENT OF PREFAB BEAMS



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TYPES OF BEAMS



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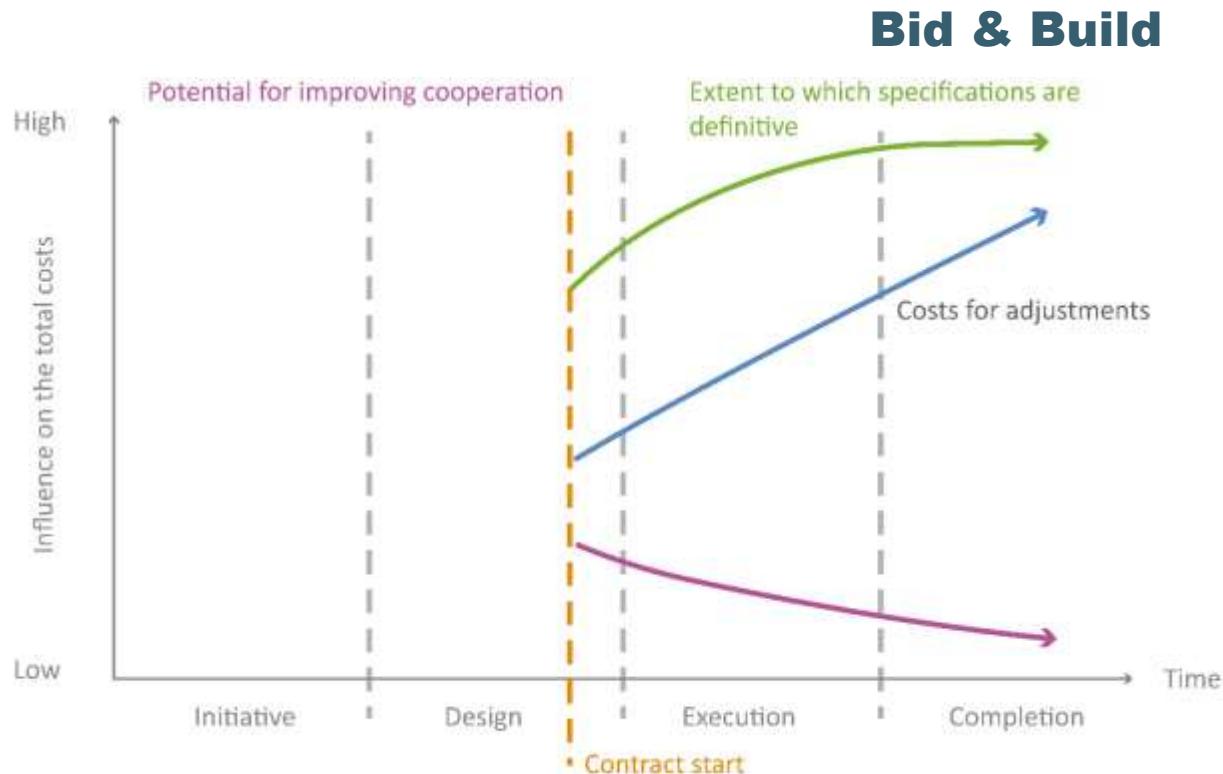


68 m prefab hollow box girder (longest in the world)

DEVELOPMENT IN CONTRACTS IN INFRASTRUCTURE

Shift in the way execution is implemented in the project:

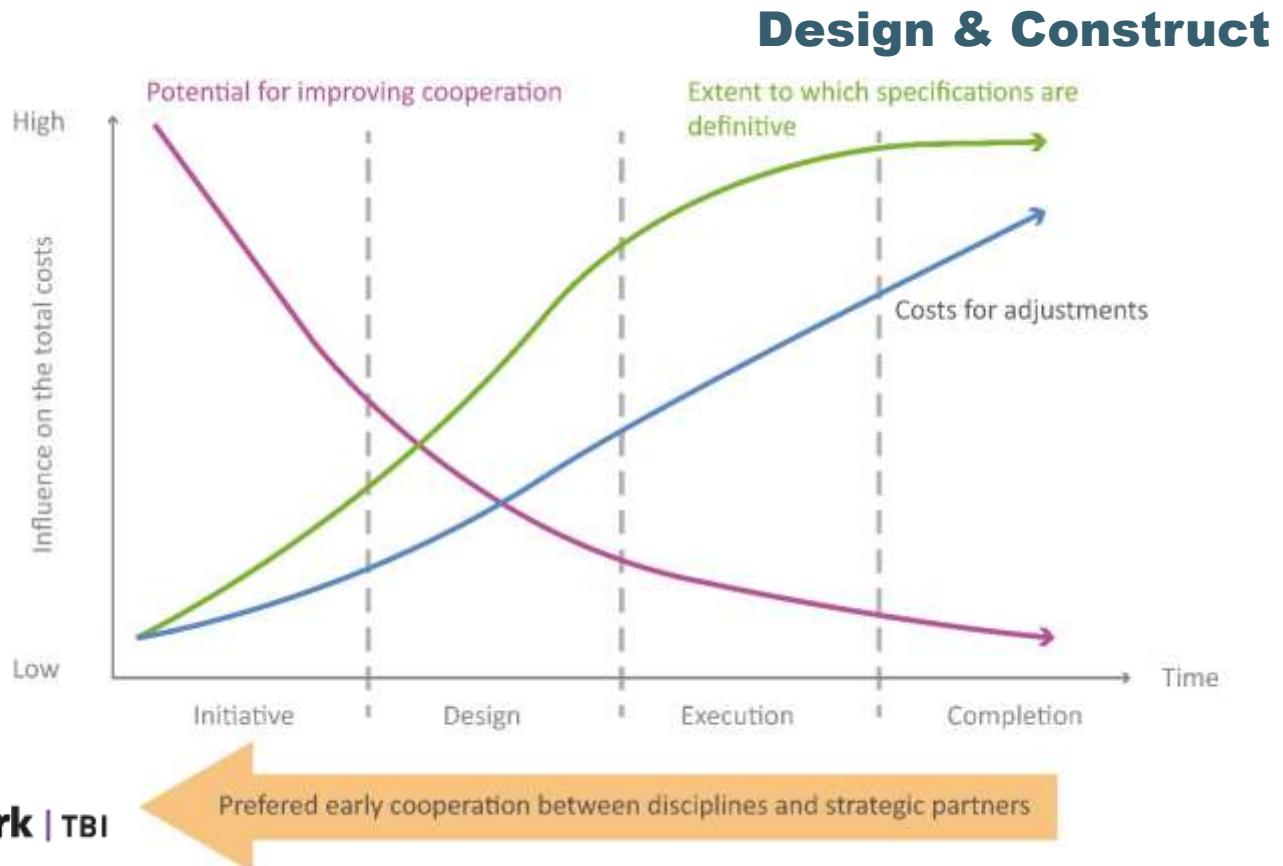
- From Bid & Build to Design & Construct



DEVELOPMENT IN CONTRACTS IN INFRASTRUCTURE

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DEVELOPMENT IN CONTRACTS IN INFRASTRUCTURE

Shift in the way execution is implemented in the project:

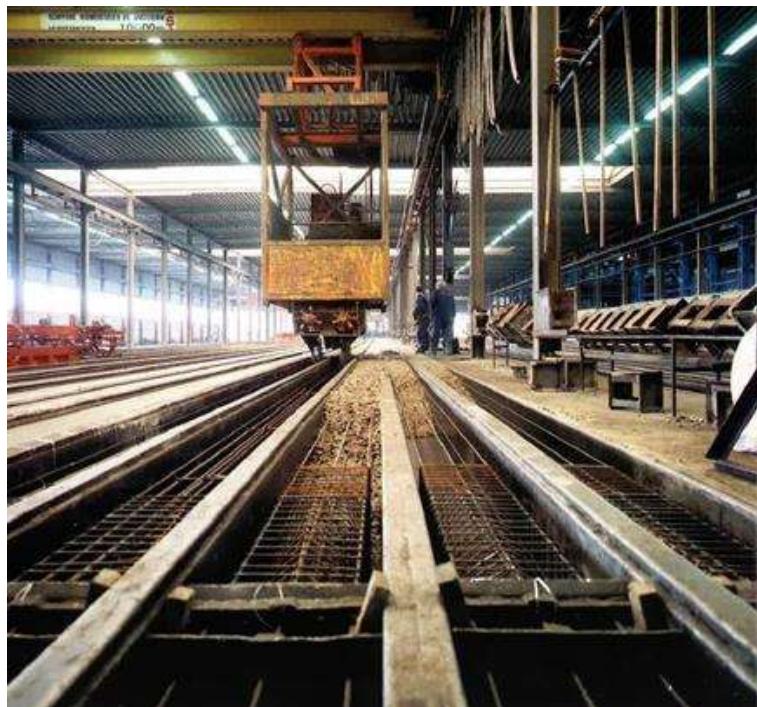
- From Bid & Build to Design & Construct
- Decision criteria in trade-off matrixes:
 - Initial costs
 - Costs for the end result and minimized extra costs, only needed for building
 - Operating and maintenance costs
 - Buildability, phasing and timetable
 - Parallel work flows
 - Logistics
 - Less influence of bad weather on the project due to work inside
 - Safety for execution
 - Architectural
 - Slenderness due to high concrete quality and pre-tensioning
 - Quality
 - Risk mitigation
 - Surroundings and stakeholders

DEVELOPMENT IN CONTRACTS IN INFRASTRUCTURE

Shift in the way execution is implemented in the project:

- From Bid & Build to Design & Construct
- Decision criteria in trade-off matrixes
- Supporting Structure:
 - Costly – without in the end situation
 - Time consuming
 - Lots of work (building, demolishing and lowering process)
 - Unsafe location for the traffic and the staff executing the works (traffic + height)
 - Hindering the surroundings

PRODUCTION



Production of pretensioned foundation piles



Production of pretensioned floor elements

PRODUCTION



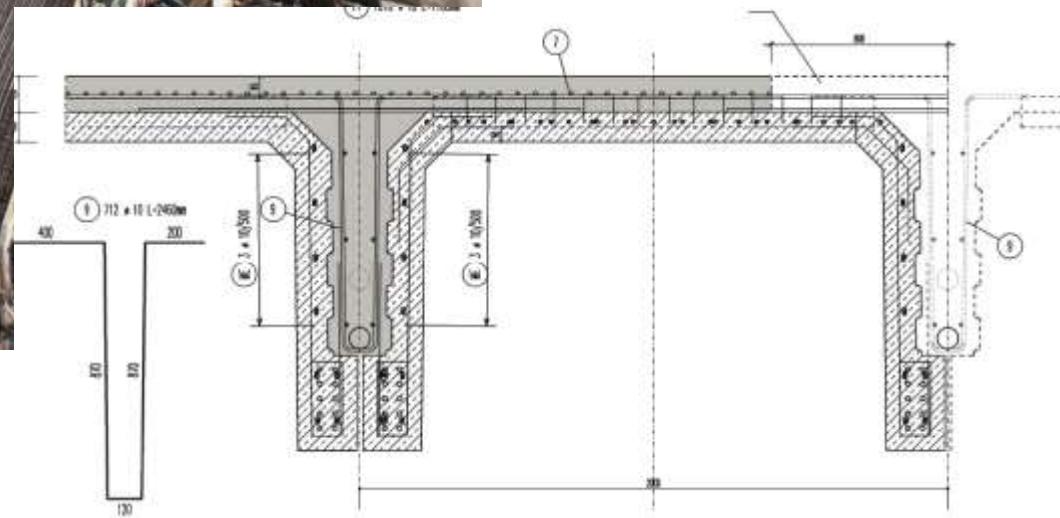
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INSTALLATION AND SAFETY



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Police stop during execution of a bridge over a highway

INSTALLATION AND SAFETY



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68 m prefab hollow box girder (longest in the world)

INSTALLATION AND SAFETY



68 m prefab hollow box girder (longest in the world)

INSTALLATION AND SAFETY



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ARCHITECTURE



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A lot is possible but to keep the economics in balance prefab has an influence on the esthetics of a structure – cross section shape and position of the supports.

ARCHITECTURE



QUALITY AND OTHER POSSIBILITIES

